DAVID Y. IGE
GOVERNOR
STATE OF HAWAII

JOSH GREEN
LT. GOVERNOR
STATE OF HAWAII

WILLIAM J. AILA, JR
CHAIRMAN
HAWAIIAN HOMES COMMISSION

TYLER I. GOMES
DEPUTY TO THE CHAIRMAN

STATE OF HAWAII
DEPARTMENT OF HAWAIIAN HOME LANDS
P. O. BOX 1879
HONOLULU, HAWAII 96805

December 8, 2021

Dr. Keith Kawaoka, Acting Director
Office of Planning and Sustainable Development
Department of Business, Economic Development & Tourism
235 S. Beretania Street, Room 702
Honolulu, Hawaii 96813

Dear Dr. Kawaoka,

Subject: Redevelopment of 820 Isenberg Street
Publication of the Draft Environmental Assessment and Anticipated Finding of No Significant Impact

The Department of Hawaiian Home Lands hereby transmits the draft environmental assessment (DEA – Anticipated FONSI) for the 820 Isenberg Street project located at TMK: (1) 2-7-008: 018 and 020, in the Honolulu District on the island of Oahu for publication in the next available edition of the Environmental Notice.

Enclosed is a completed OEQC Publication Form and a digital copy in Adobe Acrobat PDF format of the DEA-Anticipated FONSI, and an electronic copy of the publication form in MS Word. Simultaneous with this letter, we have submitted the summary of the action in a text file by electronic mail to your office.

If there are any questions, please contact the planning consultant, Mr. Taeyong Kim of Environmental Communications, Inc. or Darrell Ing of the Land Development Division at 620-9276, or via e-mail at darrell.h.ing@hawaii.gov.

Aloha,

William J. Aila Jr., Chairman
Hawaiian Homes Commission

From: webmaster@hawaii.gov
To: DBEDT OPSD Environmental Review Program
Subject: New online submission for The Environmental Notice
Date: Wednesday, December 15, 2021 2:09:02 PM

Action Name

820 Isenberg Street

Type of Document/Determination

Draft environmental assessment and anticipated finding of no significant impact (DEA-AFNSI)

HRS §343-5(a) Trigger(s)

- (1) Propose the use of state or county lands or the use of state or county funds

Judicial district

Honolulu, Oʻahu

Tax Map Key(s) (TMK(s))

(1) 2-7-008: 018 and 020

Action type

Applicant

Other required permits and approvals

DOH NPDES, DOH Community Noise, City and County Building Permits

Discretionary consent required

Honolulu City Council Chapter 201H approval

Approving agency

Dept. of Hawaiian Home Lands

Agency contact name

Darrell Ing

Agency contact email (for info about the action)

darrell.h.ing@hawaii.gov

Email address or URL for receiving comments

darrell.h.ing@hawaii.gov

Agency contact phone

(808) 620-9276

Agency address

P.O. Box 1879
Honolulu, Hawaii 96805
United States
Map It

Applicant

Hale Moiliili LP

Applicant contact name

Kaloa Robinson

Applicant contact email

kaloa@stanfordcarr.com

Applicant contact phone

(808) 537-5220

Applicant address

1100 Alakea Street, 27th Floor
Honolulu, HI 96813
United States
Map It

Was this submittal prepared by a consultant?

Yes

Consultant

Environmental Communications, Inc.

Consultant contact name

Taeyong Kim

Consultant contact email

tkim@environcom.com

Consultant contact phone

(808) 528-4661

Consultant address

P.O. Box 236097
Honolulu, Hawaii 96823
United States
Map It

Action summary

The project site is located on lands that were formerly in use as the Bowl-O-Drome bowling alley and parking lot. The use was established in 1955 and ceased operations in 2004.
The project will primarily provide beneficiaries of the Hawaiian Home Land Trust with access to much needed affordable rental housing in urban Honolulu. The project implements recommendations in the DHHL's Oahu Island Plan adopted by the Hawaiian Homes Commission in 2014. The leases for the workforce and affordable residential units are anticipated to be for a 75-year term.
A 210-foot tall tower and podium will contain 277 dwelling units in studio, one-bedroom, two- bedroom, three-bedroom and three-bedroom townhome configurations. The commercial component of the project will include 4,680 square feet of retail space located on the ground floor. Parking for the complex will consist of approximately 277 residential stalls and 18 retail/commercial stalls for a total of 295 parking stalls in conformance with the C

Reasons supporting determination

As stated in Section 11-200.1-13, EIS Rules, Significance Criteria: in determining whether an action may have a significant effort on the environment, every phase of a proposed action shall be considered. The expected consequences of an action, both primary and secondary, and the cumulative as well as the short-term and long-term effects must be assessed. Each of the significance criteria have been evaluated and the proposed project is not expected to have significant effect on the environment.

Attached documents (signed agency letter & EA/EIS)

- Isenburg-DEA-compiled-pdf.pdf
- 211208-Isenberg-DEA-Publication-Letter-1.pdf

Authorized individual

Taeyong Kim

Authorization

- The above named authorized individual hereby certifies that he/she has the authority to make this submission.

DRAFT ENVIRONMENTAL ASSESSMENT

HALE MOILIILI

820 ISENBERG STREET

TMK 2-7-008: 018 AND 020

HONOLULU, OAHU, HAWAII

THIS DOCUMENT IS PREPARED PURSUANT TO CHAPTER 343, HAWAII REVISED STATUTES

APPROVING AGENCY:
DEPARTMENT OF HAWAIIAN HOME LANDS

APPLICANT:
HALE MOILIILI LP

DECEMBER 2021

DRAFT ENVIRONMENTAL ASSESSMENT
HALE MOILIILI
TMK 2-7-008: 018 AND 020
HONOLULU, OAHU, HAWAII

THIS DOCUMENT IS PREPARED PURSUANT TO CHAPTER 343, HAWAII REVISED STATUTES

APPROVING AGENCY:
DEPARTMENT OF HAWAIIAN HOME LANDS

APPLICANT:
HALE MOILIILI LP

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B *Chapter 6E-8 Historic Preservation Review – Archaeological Inventory Survey at 820 Isenberg Street, Waikiki Ahupuaa, Kona District, Island of Oahu.* State of Hawaii, Department of Land and Natrual Resources, State Historic Preseration Division

C *Architectural Reconnaissance Level Survey of Buildings Located within the Stadium Bowl-O-Drome Area of Potential Effect.* Fung Associates, Inc.

D *Acceptance of Historic American Buildings Survey.* United States Department of the Interior, National Park Service

E *Transportation Assessment Report for the Proposed 820 Isenberg Street Redevelopment Project, Honolulu Oahu, Hawaii.* The Traffic Management Consultant

F *DHHL 820 Isenberg Development – HUD Site Noise Analysis (DLAA #20-033).* D.L. Adams Associates

G *Preliminary Geotechnical Engineering Study, Stadium Bowl-O-Drome, 820 Isenberg Street, Honolulu, Hawaii, TMK: 2-7-008: 018 and 020.* Hirata & Associates

ACRONYMS AND ABBREVIATIONS

201H	Chapter 201H, Hawaii Revised Statutes
343	Environmental Lawa Hawaii Revised Statutes (343 HRS)
AAQS	Ambient Air Quality Standards
AGL	Above Ground Level
ANSI	American National Standards Institute
BLNR	Board of Land and Natural Resources
BMPs	Best Management Practices
BWS	Board of Water Supply
CDUP	Conservation District Use Permit
CEQ	Council on Environmental Quality
CERCLA	Comprehensive Environmental Response Compensation and Liability Act
CFR	Code of Federal Regulations
CIC	Clean Islands Council
City	City and County of Honolulu
CO	Carbon Monoxide
CO_2	Carbon Dioxide
COC	Contaminant of Concern
COPC	Contaminant of Potential Concern
CT	Census Tract
CWA	Clean Water Act of 1977
CZMA	Coastal Zone Management Act
DA	Department of the Army
dB	Decibel
dBA	Decibels A-Weighted Scale
DBEDT	Dept. of Business, Economic Development and Tourism
DHHL	Department of Hawaiian Home Lands
DHS	U.S. Department of Homeland Security
DLM	Department of Land Management (City and County of Honolulu)
DLNR	Department of Land and Natural Resources
DNL	Day-night sound level
DOA	Department of Agriculture (State of Hawaii)
DOD	U.S. Department of Defense
DOE	Department of Education (State of Hawaii)
DOH	Department of Health (State of Hawaii)
DOT-A	Department of Transportation, Airports Division (State of Hawaii)
DOT-H	Department of Transportation, Harbors Division (State of Hawaii)
DPP	Department of Planning and Permitting (City and County of Honolulu)
DU	Decision Units
EA	Environmental Assessment
EFH	Essential Fish Habitats
EHE	Environmental Health Evaluation
EHMP	Environmental Hazard Management Plan
EIS	Environmental Impact Statement
EISPN	Environmental Impact Statement Preparation Notice

EMS	Emergency Medical Services (City and County of Honolulu)
EO	Executive Order(s)
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act of 1973
ESA	Environmental Site Assessment
F	Fahrenheit
FAA	Federal Aviation Administration
FAQ	Frequently Asked Questions
FAR	Federal Aviation Regulations
FEMA	Federal Emergency Management Agency
FHA	Federal Housing Administration
FIRM	Flood Insurance Rate Map(s)
FONSI	Finding of No Significant Impact
FR	Federal Register
FWCA	Fish and Wildlife Coordination Act
GHG	Greenhouse gas
GHGRP	Greenhouse Gas Reporting Program
GWP	Global warming potential
H_2S	Hydrogen Sulfide
HAR	Hawaiʻi Administrative Rules
HART	Honolulu Authority for Rapid Transit
HCDA	Hawaii Community Development Authority (State of Hawaii)
HCM	Highway Capacity Manual
HECO	Hawaiian Electric Company
HEER	Hazard Evaluation and Emergency Response Office (State of Hawaii)
HEPA	Hawaii Environmental Policy Act
HFD	Honolulu Fire Department (City and County of Honolulu)
HHFDC	Hawaii Housing Finance and Development Corporation (State of Hawaii)
HIA	Honolulu International Airport
HISC	Hawaii Invasive Species Council
HPD	Honolulu Police Department (City and County of Honolulu)
HRS	Hawaii Revised Statutes
HTCO	Hawaiian Telcom
HUD	U.S. Department of Housing and Urban Development
IBC	International Building Code
IDPP	Iwilei District Participating Parties
IPCC	Intergovernmental Panel on Climate Change
JBPHH	Joint Base Pearl Harbor-Hickam
KDA	Kapalama Development Area
kV	Kilovolt
LED	Light emitting diode
Leq	Equivalent sound level
LIHTC	State Low Income Housing Tax Credits
LOS	Level of Service
LUC	Land Use Commission (State of Hawaii)
LUO	Land Use Ordinance

MHHW	Mean higher high water
MLLW	Mean lower low water
MS4	Municipal Separate Storm Sewer System
MSL	Mean sea level
MSRC	Marine Spill Response Corporation
MUS	Management Unit Species
NAAQS	National Ambient Air Quality Standards
NAS	National Airspace System
NEC	Network Enterprise Center
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NMFS	National Marine Fisheries Service (National Oceanic and Atmospheric Administration)
NO_2	Nitrogen Dioxide
NOAA	National Oceanic and Atmospheric Administration
NOI	Notice of Intent
NPDES	National Pollutant Discharge Elimination System
NRHP	National Register of Historic Places
O_3	Ozone
OCCL	Office of Conservation and Coastal Lands (State of Hawaii)
OEQC	Office of Environmental Quality Control
OHA	Office of Hawaiian Affairs (State of Hawaii)
OMPO	Oahu Metropolitan Planning Organization
ORMP	Ocean Resources Management Plan (State of Hawaii)
OU1C	Operating Unit 1C
Pb	Lead
PCB	Polychlorinated biphenyl
PET	Polyethylene terephthalate
PUC	Public Utilities Commission
PVC	Polyvinyl chloride
RFP	Request for Proposals
RHRF	Rental Housing Revolving Fund
ROI	Region of influence
ROW	Right of way
SB	Senate Bill
SHPD	State Historic Preservation Division
SLUC	State Land Use Commission
SMA	Special Management Area
SOEST	School of Ocean and Earth Science and Technology (University of Hawaii)
SO_2	Sulfur dioxide
SPS	Sewage Pump Station
State	State of Hawaii
SVOC	Semi-volatile organic compounds
SWMP	Storm Water Management Plan
TMDL	Total Maximum Daily Load(s)

TMK	Tax Map Key
UH	University of Hawaii
US	United States
USACE	U.S. Army Corps of Engineers
USCG	U.S. Coast Guard
USDA	U.S. Department of Agriculture
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
UST	Underground storage tanks
VA	U.S. Department of Veterans Affairs
VOC	Volatile organic compound
VPH	Vehicles per hour
WQC	Water Quality Certification

SECTION ONE
PROJECT SUMMARY

APPLICANT:	Hale Moiliili LP 1100 Alakea Street, 27th Floor Honolulu, Hawaii 96813
APPROVING AGENCY:	Department of Hawaiian Home Lands 91-5420 Kapolei Parkway Kapolei, HI 96707
AGENT:	Environnemental Communications, Inc. P.O. Box 236097 Honolulu, Hawaii 96823
PROJECT NAME:	Hale Moiliili
PROJECT LOCATION:	The project is bounded by Stadium Park to the north and west, the Scenic Tower condominium to the south, and Isenberg Street to the east in Honolulu, Hawaii.
TAX MAP KEY:	2-7-008: 018 and 020
OWNERSHIP:	Department of Hawaiian Home Lands
LOT AREA:	40,000 SF (0.918 acres) for 2-7-008:018 42,493 SF (0.975 acres) for 2-7-008:020
ZONING:	The project area is P-2, General Preservation. The Department is not subject to County Zoning. DHHL has declared that the project will be designed and built in accordance with BMX-3, Business Mixed Use zoning standards.
SPECIAL DISTRICT:	The project is not located in a Special District.
STATE LAND USE:	Urban
EXISTING LAND USE:	The project site is located on lands that were formerly in use as the Bowl-O-Drome bowling alley and parking lot. The use was established in 1955 and ceased operations in 2004. The elevated single-story 22,346 square foot building has been vacant since the closure of the bowling alley function while

the adjacent parking area was in use by a towing company until 2017.

The area immediately mauka (north) consists of the Honolulu Stadium State Park also known as Old Stadium Park, South King Street, the Moiliili Neighborhood Park and a mix of commercial and residential uses.

In the Diamond Head (east) direction, the site is bounded by Isenberg Street and a mix of commercial and residential uses.

The makai (south) direction the site is bordered by the Scenic Tower condominium and a mix of single-family and apartment dwellings.

The Ewa (west) direction consists of a portion of the Old Stadium Park and a mix of apartment uses.

In general, the surrounding areas consist of a mix of commercial uses along the major thoroughfares and a very diverse mix of single-family, low-density and medium to high density apartment buildings. The overall character is one of a medium density urban residential community.

NATURE OF DEVELOPMENT:

The project will primarily provide beneficiaries of the Hawaiian Home Land Trust with access to much needed affordable rental housing in urban Honolulu.

The project implements recommendations in the DHHL's Oahu Island Plan adopted by the Hawaiian Homes Commission in 2014.

DHHL awarded redevelopment of the property to Stanford Carr Development LLC through Solicitation No. RFP-20-HHL-003 on January 30, 2020. The planned development will consist of mixed residential and commercial uses for the benefit of DHHL applicants through the provision of unique housing. The leases for the workforce and affordable residential units are anticipated to be for a 75-year term.

A 210-foot tall tower and podium will contain 277 dwelling units in studio, one-bedroom, two-bedroom, three-bedroom and three-bedroom townhome configurations. The commercial component of the project will include 4,680 square feet of retail space located on the ground floor. Parking for the complex will consist of approximately 277 residential stalls and 18 retail/commercial stalls for a total of 295 parking stalls in conformance with the City and County of Honolulu Land Use Ordinance.

The proposed project will involve the use of Federal HUD 221(d)(4) monies, State Low Income Housing Tax Credits (LIHTC), and Rental Housing Revolving Fund (FHFR) administrated by the Hawaii Housing Finance and Development Corporation (HHFDC). Projects using State lands and funds must meet the provisions of Chapter 343 of the Hawaii Revised Statutes (HRS). The project will also seek Section 201-H, HRS exemptions for waiver or deferral of development fees and some zoning exemptions.

The project will be a mixed use development that provides workforce and critical affordable rental housing inventory within this rapidly growing population center. The project will be a unique urban model of housing opportunities for the applicants of Hawaii Home Lands.

TOTAL PROJECT COST: Approximately $100,000,000

PROJECT SCHEDULE: The project is anticipated to commence in 2023 and will be completed in 2025.

PERMITS REQUIRED: State of Hawaii Agencies

Department of Health
National Pollutant Discharge
Elimination System (NPDES) Permit

Department of Health
Community Noise Permit / Variance

City and County of Honolulu Agencies

Honolulu City Council
Chapter 201H Approval

Department of Planning and Permitting
Building Permits

Department of Planning and Permitting
Certificate of Occupancy

Department of Planning and Permitting
Construction Dewatering Permit

Department of Planning and Permitting
Grading and Stockpiling Permits

Department of Planning and Permitting
Trenching Permit

Department of Planning and Permitting
Erosion Control Plan/Best Management Practices

Department of Environmental Services
Sewer Connection Permit

Department of Transportation Services
Permit to Work Within County Right-of-Way

SECTION TWO
PROPOSED PROJECT AND STATEMENT OF OBJECTIVES

2.1 PROJECT LOCATION

The project is located on a block bounded by Isenberg, Citron, Paani, and Waiola Streets, Makahiki Way, and South King Street in Moiliili, Honolulu, Hawaii and is identified as Tax Map Key: 2-7-008: 018 and 020. The fee interest in the project site is held by the Department of Hawaiian Home Lands. The project is not located within a special district.

The project site is presently occupied by vacant, large single-story structure and parking lot formerly in use as the Stadium Bowl-O-Drome bowling alley. Established in 1955, the operations of the bowling alley ceased in 2004 while the parking lot remained in leased parking use until 2017. The western (Ewa) and northern (mauka) boundaries of the site are adjacent to the Old Stadium Park officially known as Honolulu Stadium State Park. The eastern (Diamond Head) boundary of the site is located on Isenberg Street which provides access to the site. The southern (makai) boundary of the site abuts the high-rise Scenic Tower condominium.

In general, the areas west, south and east of the project site are characterized by a mix of high, medium and low residential uses in A-2 apartment zoning. Areas north (mauka) and east (Diamond Head) are in business mixed use and zoned BMX-3. The overall character of the area is urban residential with a relatively high mix of commercial and public facilities included in the diverse setting.

It is anticipated that a high level of future development is likely in the Diamond Head direction as the University area is planned for improvement which will likely add to the diversity of uses and activities in the project vicinity.

Direct Aerial View overhead along Isenberg Street

Aerial View facing east (Diamond Head)

Aerial View facing south (makai)

Aerial View facing west (Ewa)

2.2 PROJECT DESCRIPTION

2.2.1 PROJECT NEED AND PURPOSE OF THIS DOCUMENT

The project will primarily provide beneficiaries of the Hawaiian Home Land Trust with access to much needed affordable rental housing in urban Honolulu.

The project implements recommendations in the DHHL Oahu Island Plan. The Department's Island Plans are island-specific, 20-year visioning documents that designate land uses for DHHL-owned property. The purpose of the Oahu Island Plan is to provide overarching guidance and recommendations for appropriate land uses at the regional level. The Oahu Island Plan examines infrastructure needs and opportunities from an island wide perspective, gauges beneficiary wants and needs, proposes areas for homesteading and non-homesteading uses, provides cost estimates for on- and off-site infrastructure, and, based on these findings, identifies priority areas for homestead development, community use, and income generation. According to the Oahu Island Plan:

"Redevelopment of the area is proposed to provide increased revenue generation for DHHL, while also addressing the need for housing alternatives through a mixed-use, two to ten story building. Commercial, revenue-generating uses are proposed at the street level with up to 126 alternative housing units on the higher floors."

The Department's Oahu Island Plan articulates the demand for more housing on the island of Oahu for beneficiaries of the Trust:

"Approximately 45% of the Residential and 19% of the Agriculture Applicants statewide are looking for homesteading opportunities on Oahu. However, only 4% of DHHL's landholdings are located on Oahu."

The Oahu Island Plan recommends a number of measures to maximize the Department's ability to serve beneficiaries with the limited resources available on Oahu, including evaluation of the type of housing programs and products offered to better match applicants' product and locational preferences.

In August 2019, Chapter 10-7 Hawaii Administrative Rules was adopted, allowing for the development of "Planned Communities, Multi-family Complexes, and Rental Housing" on Hawaiian Home Lands. The new rules reflected the need for affordable rentals which would allow beneficiaries to resolve financial issues, and/or accumulate savings towards home purchase in other DHHL projects.

To enable this master planned project, the developer will be using HUD and State of Hawaii financing tools as well as additional approvals through the State of Hawaii 201H development process. The subject Environmental Assessment is a requirement of this process as well its use of State lands and funds.

2.2.2 PROJECT DESIGN

The conceptual design of the subject project represents a unique mixed-use residential and commercial development for the Moiliili area. The project's conceptual design is planned to 1) provide affordable rental housing of an optimal density model, 2) provide workforce housing opportunities, 3) offer unique housing types that take advantage of the location and adjacency to Old Stadium Park, and 4) provide retail and dining opportunities that will serve area residents and the general public. This unique and diverse mix of housing types and commercial-retail uses support the objectives of the Department of Hawaiian Home Lands as well as providing additional commercial and employment opportunities to the area.

As presently proposed, the project will consist of 251,000 square feet in the tower structure, 9,800 square feet in townhouse configuration, 4,680 square feet in retail space, and 51,300 square feet in parking use. The total building area is 316,880 square feet of building area on the 82,496square foot site.

2.2.3 RESIDENTIAL UNITS

Residential units within the 820 Isenberg project consists of two types of units; tower units and townhomes. The units located within the tower consist of studio, one, two and three bedroom units. Studio units are sized at 390 square feet and comprise 23 of the total 277 units located in the project. The one bedroom units are also located within the tower and also number at 23 with a unit size of 540 square feet. The majority of dwellings are two bedroom units of 760 square feet. A total of 23 three bedroom units are located in the tower. These units are 960 square feet in size.

A fairly unique component of the project are 7 townhome units located along the mauka boundary of the commercial and parking structure that face Old Stadium Park. These three-bedroom, two-level units consist of 1,380 square feet each and will have a view to park creating a single-family dwelling like experience.

Tower Structure	Townhouse, Retail Parking Structure
STUDIO UNITS 23	RETAIL AREA 1 990 SF
ONE BEDROOM UNITS 23	RETAIL AREA 2 990 SF
TWO BEDROOM UNITS 201	RETAIL AREA 3 1,400 SF
THREE BEDROOM UNITS 23	RETAIL AREA 4 1,300 SF
SUBTOTAL UNITS 270	
	PARKING STRUCTURE STALLS 290
TOWN HOMES 7	PARKING RETAIL (ON GRADE) 18
	PARKING GUEST (ON GRADE) 7
TOTAL RESIDENTIAL UNITS 277	PARKING RESIDENTIAL (ON GRADE) 1
	PARKING STALLS TOTAL 316

2.2.4 COMMERCIAL AREAS

Commercial areas will be located at the base of the parking garage and will create a pedestrian friendly street frontage along Isenberg Street. The four retail units will vary in size from 990 to 1,300 square feet and will have direct access to Isenberg Street.

2.2.5 PARKING AND VEHICULAR ACCESS

Parking for 820 Isenberg project will be located both on grade and in a two-story structure that will also include the retail spaces and the town homes. A driveway located along the western side of the Isenberg Street frontage will provide the required retail parking spaces and guest parking. This driveway will extend into the interior of the site where the primary drop-off and loading area is located. Access into the parking structure is also located at this juncture. Ingress and egress into the site will be through the single driveway on Isenberg Street.

The retail parking component located on grade along the driveway will consist of 18 stalls, while the residential guest parking area will include 7 parking stalls. The remaining 290 resident stalls will be located in the parking structure.

2.2.6 PEDESTRIAN ACCESS AND LOBBY LEVEL

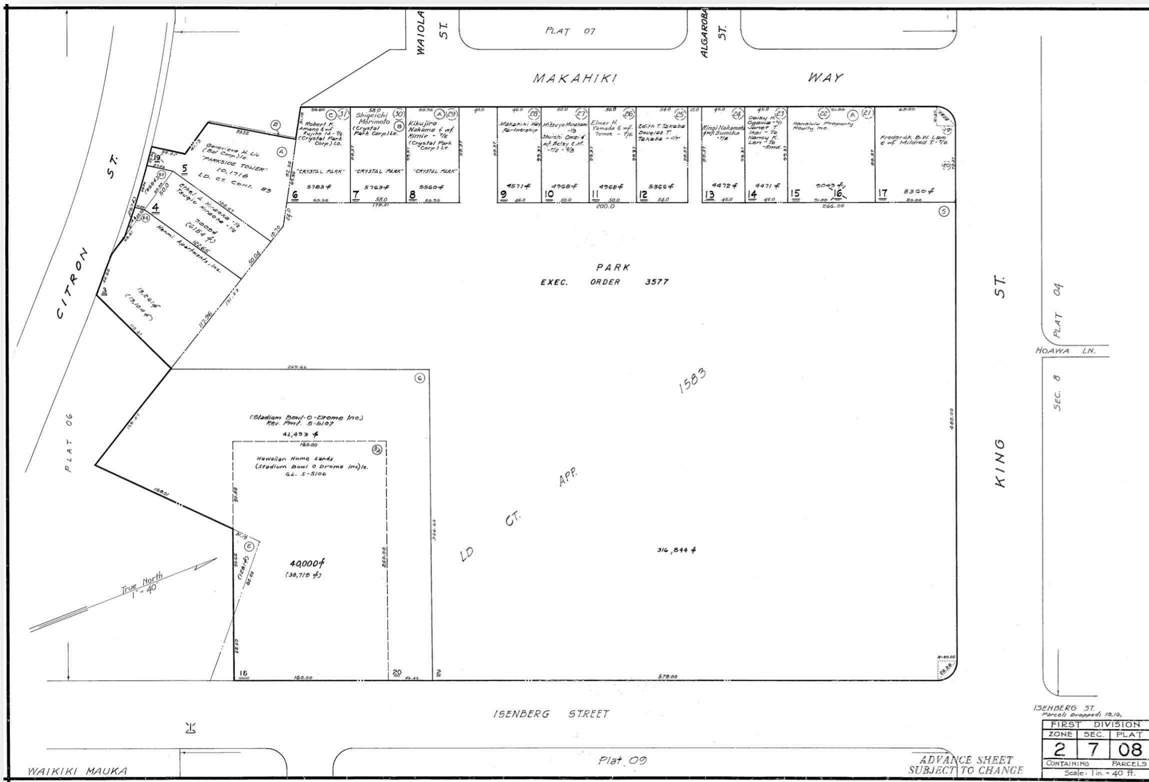
The pedestrian and resident experience is unique as interior site circulation and access to common areas is through a woonerf or outdoor circulation space. This mall like open space serves as the interface between the tower structure and appurtenant common areas, and the parking/retail/townhouse structure.

The main lobby access to tower building will be located on the makai side of the woonerf. The opposite end of the woonerf will offer direct access to the Old Stadium Park. Common areas located on the lobby level include mail room, laundry, office, a maker's lab, and a community room. An outdoor tot lot will be located near the makai end of the tower building.

Figure 1: Location Map Source: City and County of Honolulu

Figure 2: Vicinity Map Source: Google Earth

Figure 3: Tax Map Source: City and County of Honolulu



2.2.7 LANDSCAPING

The project site is located adjacent to a heavily landscaped passive park owned and maintained by the City and County of Honolulu. This visual greenscape provides an open and desirable environment along the northern and eastern sides of the site. The Isenberg Street frontage is highly urban and does not have a street tree plan. The proposed street frontage will reflect this urban environment with street frontages of commercial spaces which will activate the street in contrast to the open, passive green areas that surround the other sides of the site.

2.3 PROJECT OBJECTIVE

The Department of Hawaiian Home Lands is proposing the development of unique urban model of affordable and workforce housing for the applicants and beneficiaries of qualified Hawaiian ancestry. Demand for housing opportunities is significant and outpaces DHHL's ability to provide traditional single-family dwellings and agricultural lands. The proposed action will significantly contribute towards meeting the demands by

DHHL applicants, and will also do so in a more urban environment that is well suited for many applicants. The retail commercial component of the project will contribute revenues to the project to off-set a portion of common area maintenance costs, thereby keeping rental rates low.

By providing a blend of housing types at affordable and workforce rates, the project will meet not only the needs of DHHL, but also is in line with State affordability guidelines. This project is consistent with the Blueprint for Affordable Housing to increase rental housing and supportive opportunities for special needs segments of Hawaii's population. All of the rental units in the project will remain affordable to households earning 100% or below the U.S. Department of Housing and Urban Development (HUD) area median income. The 2020 HUD affordable rental guidelines presently call for maximum allowable income per household as shown below:

Area	$101,600	Studio	1 Bedroom	2 Bedroom	3 Bedroom	4 Bedroom
HONOLULU COUNTY						
30% of Median		$661	$708	$850	$982	$1,095
50% of Median		$1,102	$1,181	$1,417	$1,636	$1,826
60% of Median		$1,323	$1,417	$1,701	$1,964	$2,192
80% of Median		$1,764	$1,890	$2,268	$2,619	$2,922
100% of Median		$2,205	$2,362	$2,835	$3,273	$3,652
120% of Median		$2,646	$2,835	$3,402	$3,928	$4,383
140% of Median		$3,087	$3,307	$3,969	$4,583	$5,113

Source: Hawaii Housing Finance and Development Corporation, 2021

2.4 FUNDING AND SCHEDULE

This workforce and affordable rental housing project will employ the use of Federal and State financing mechanisms including HUD Section 221(d)(4) monies, Low-Income Housing Tax Credits as well as Rental Housing Revolving Fund monies. The project total development cost is approximately $100,000,000.

Upon completion of the Environmental Assessment process, the project will be reviewed and processed through the State 201-H process. The anticipated construction start date is 2023. The project is anticipated to be completed in 2025.

Figure 4: Site Plan and Conceptual Landscaping Source: SCD Development

Figure 5: Site Plan/First Level Source: SCD Development and Alakea Design Group

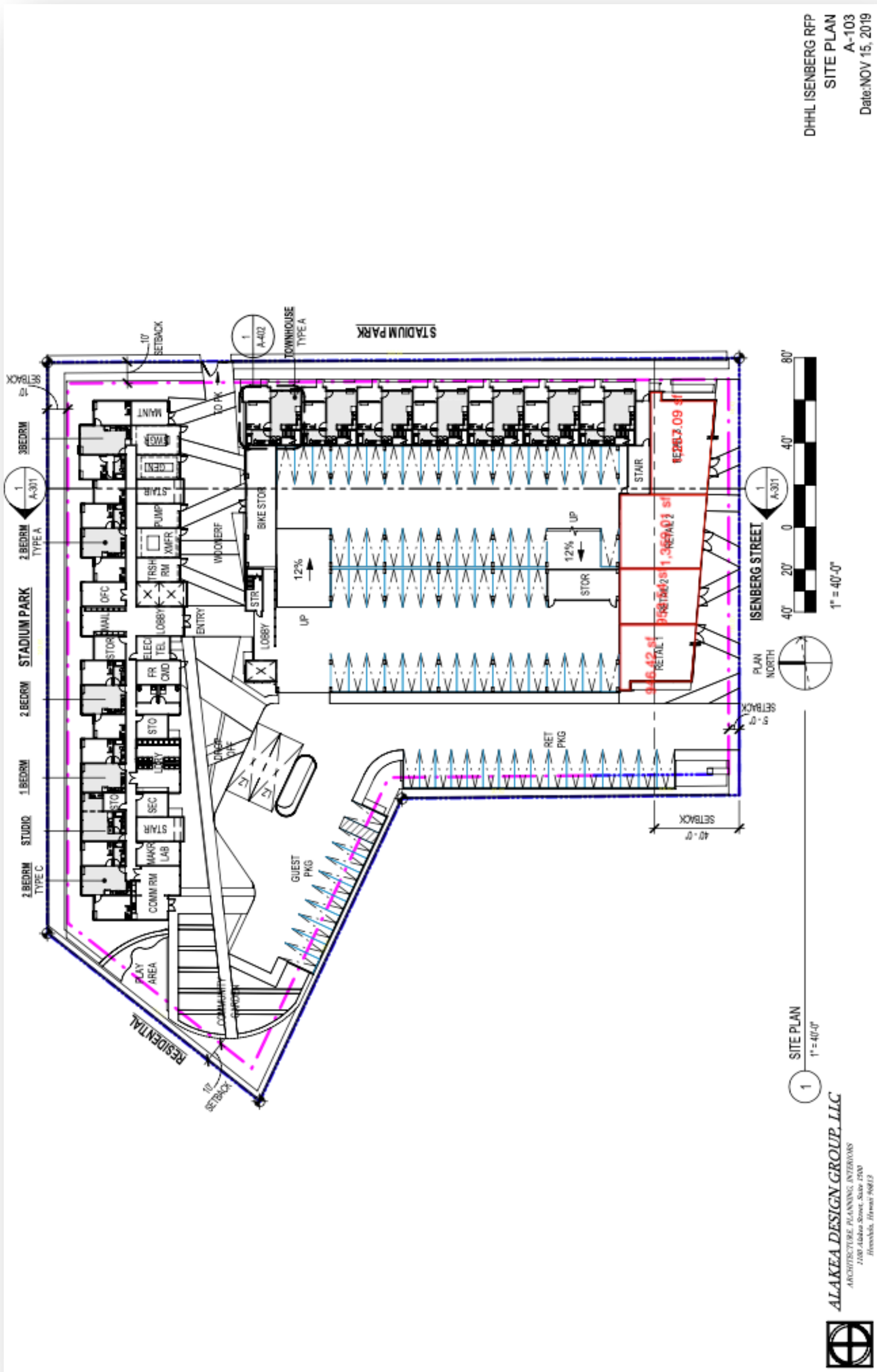


Figure 6: Second Level Plan Source: SCD Development and Alakea Design Group

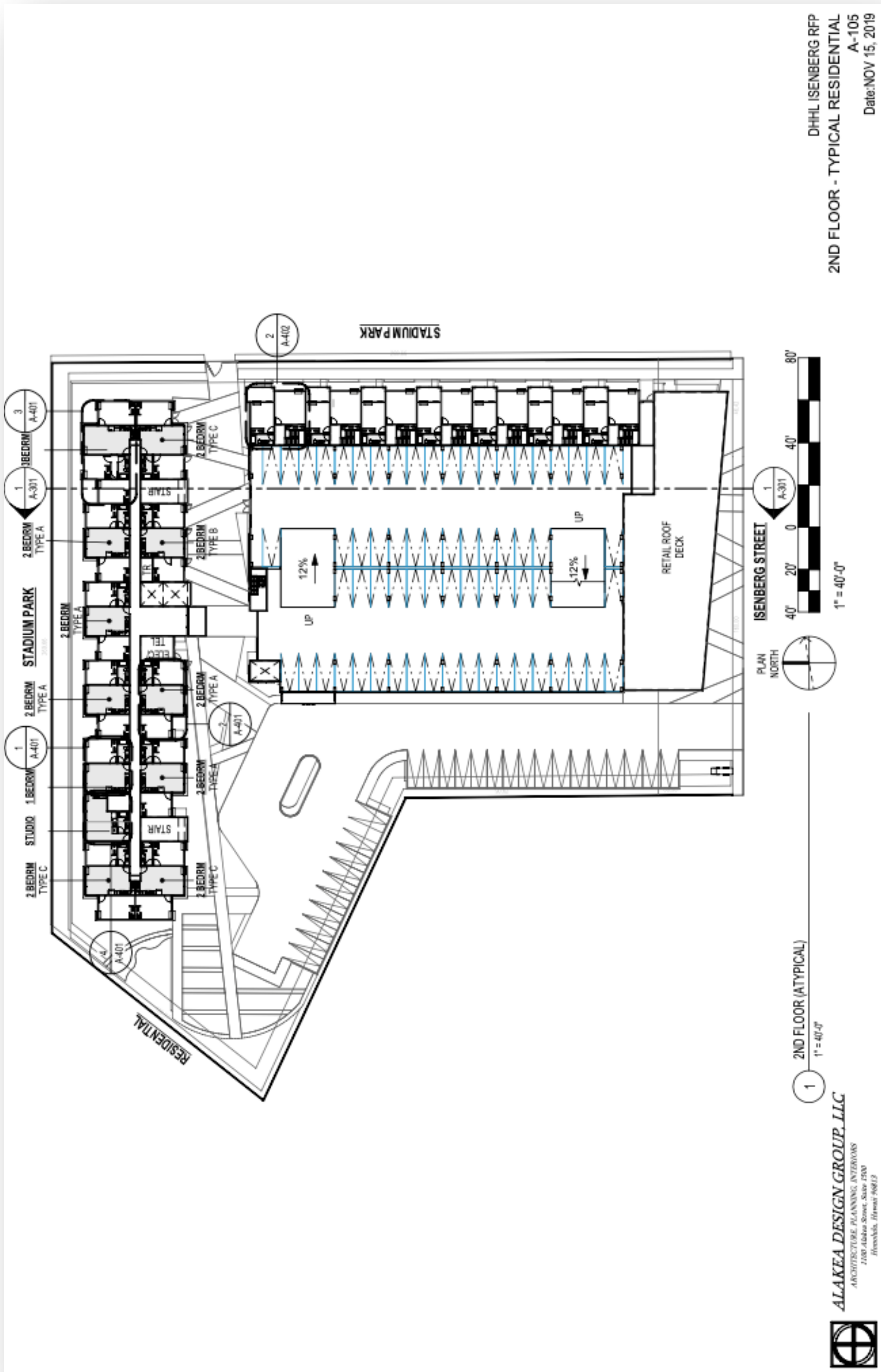


Figure7: North Elevation Source: SCD Development and Alakea Design Group

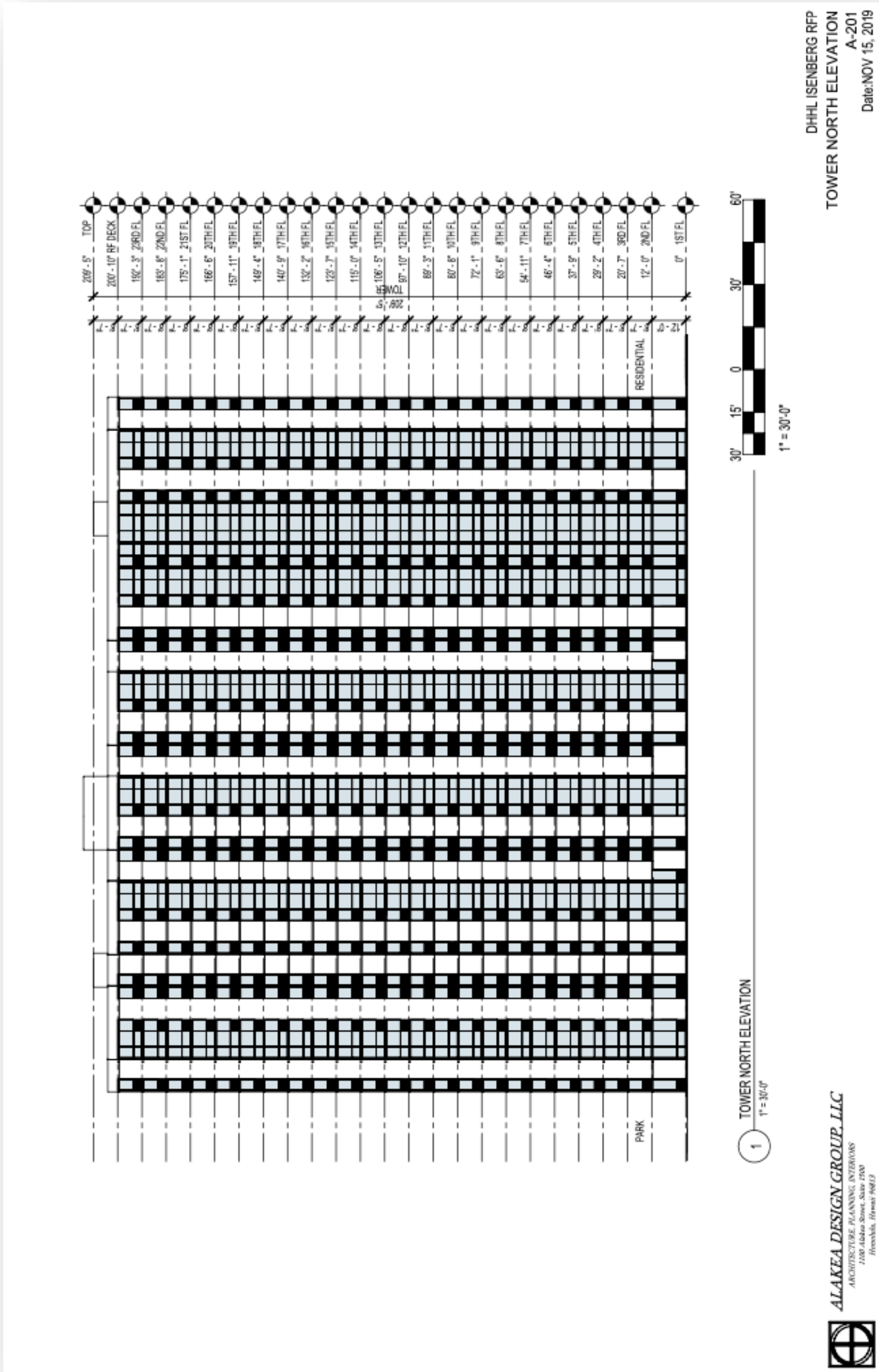


Figure 8: South Elevation Source: SCD Development and Alakea Design Group

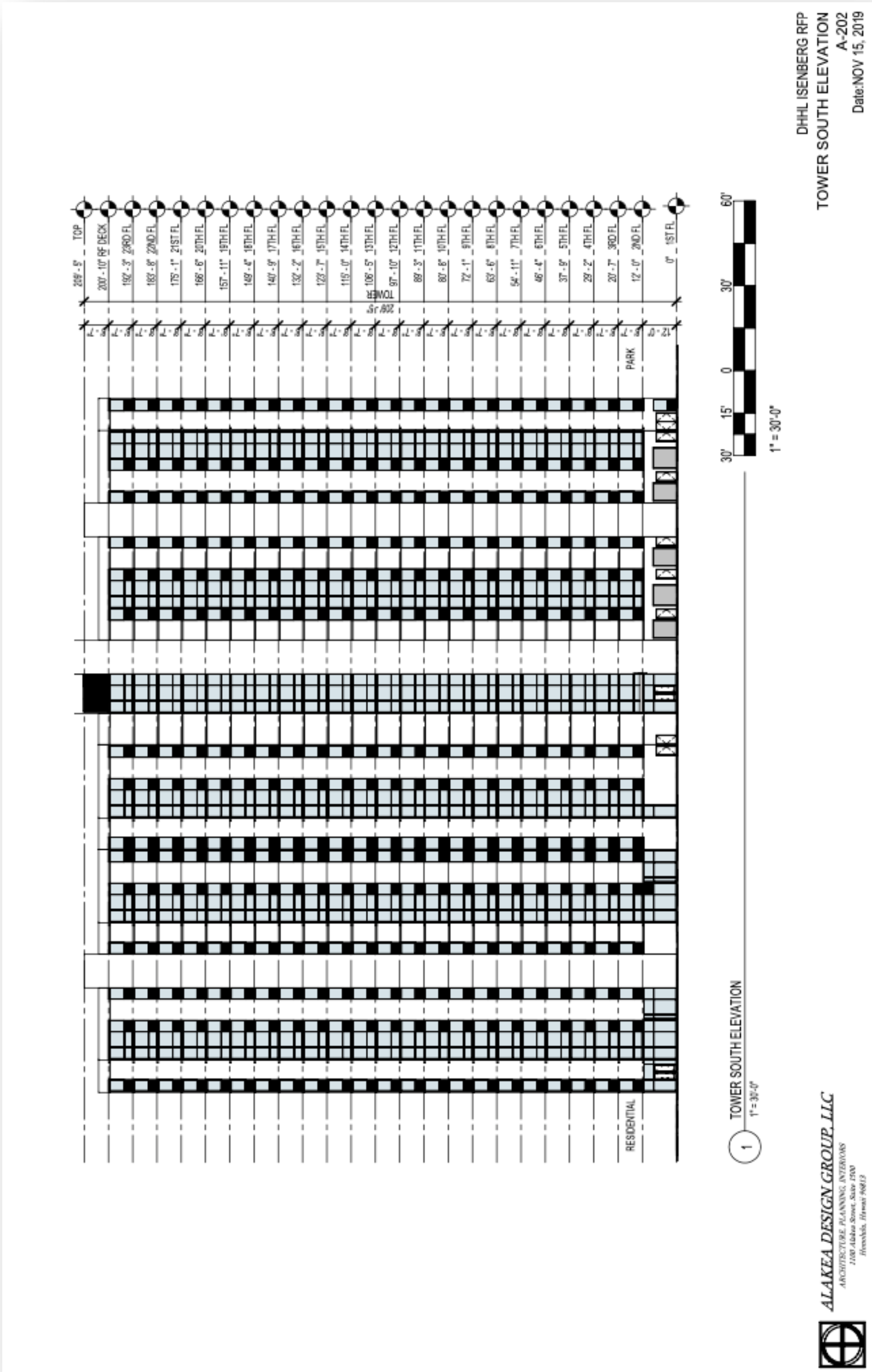


Figure 9: East and West Elevations Source: SCD Development and Alakea Design Group

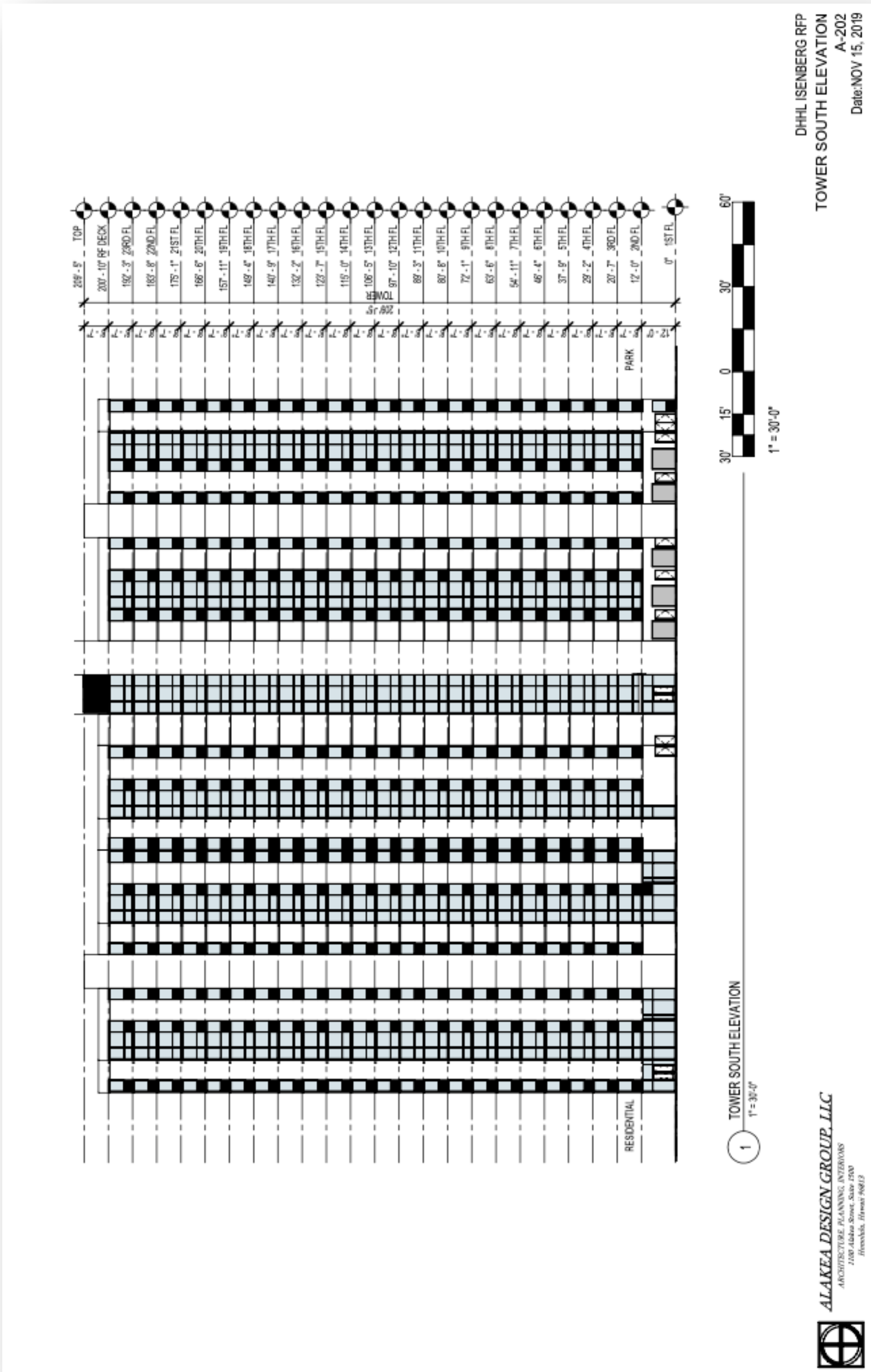


Figure 10: Parking North/South Elevations
Source: SCD Development and Alakea Design Group

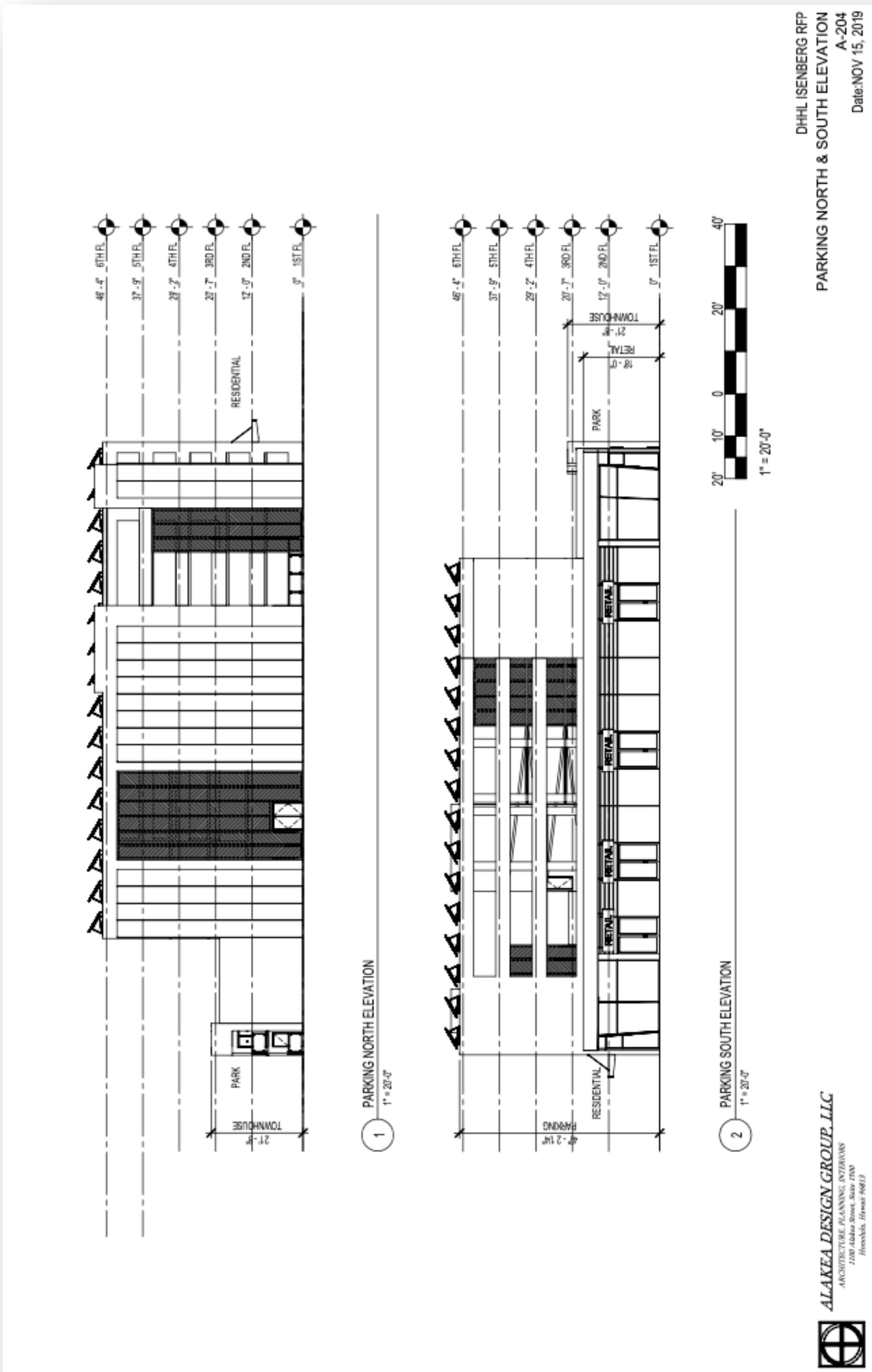


Figure 11: Parking East/West Elevations   Source: SCD Development and Alakea Design Group

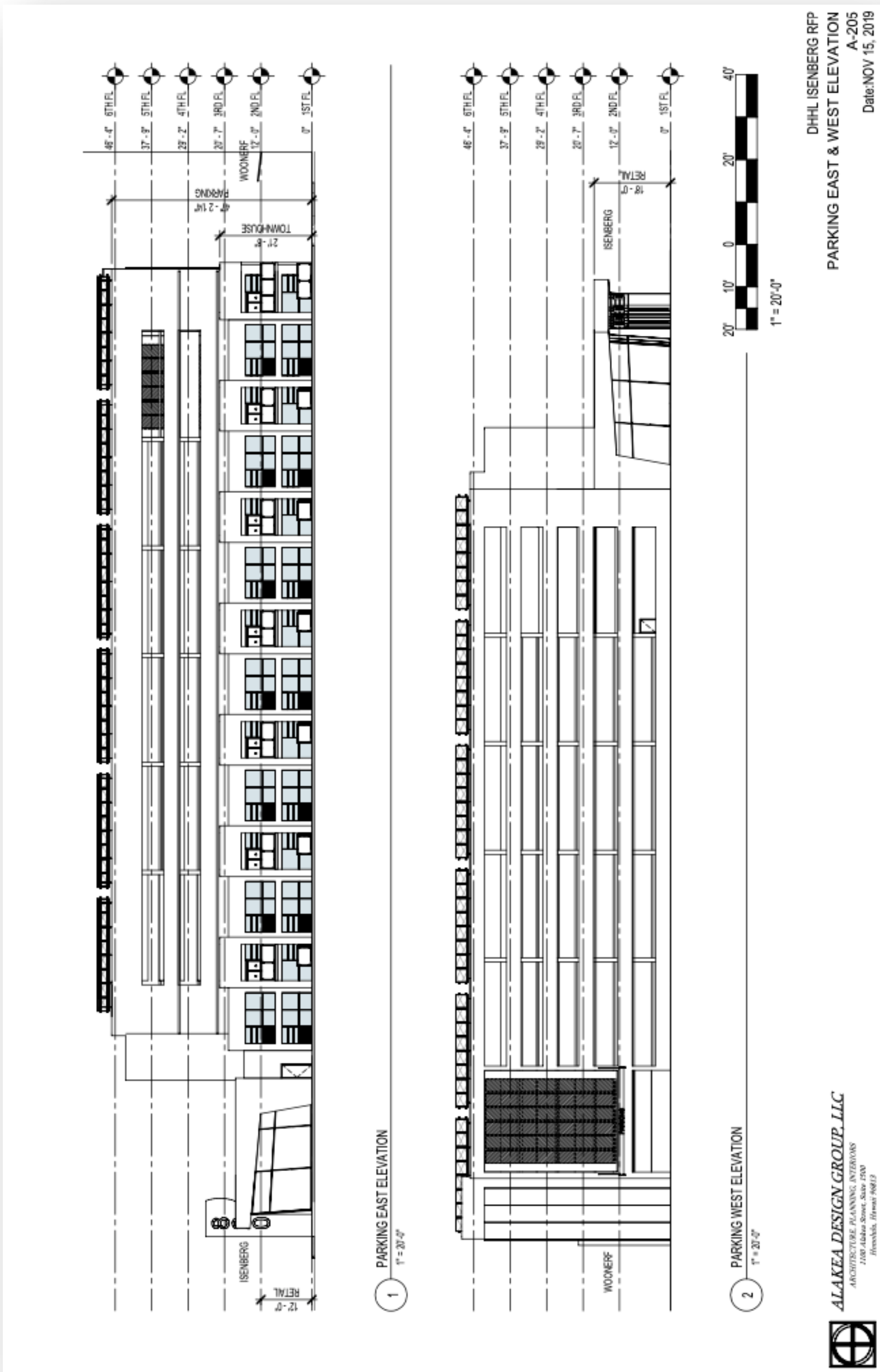


Figure 12: Unit Plans Source: SCD Development and Alakea Design Group

Figure 13: Townhouse Plan Source: SCD Development and Alakea Design Group

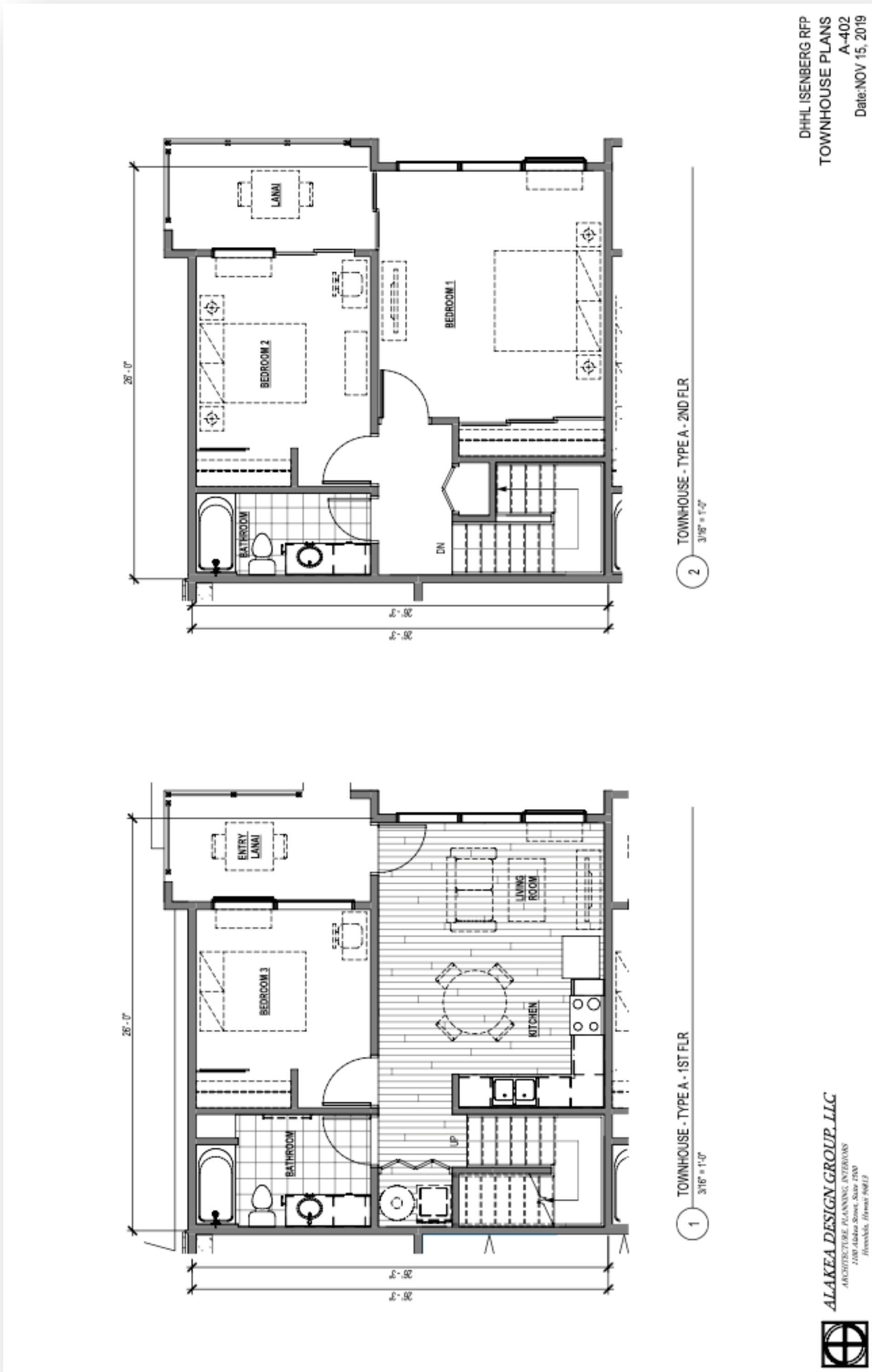


Figure 14: Perspective View Source: SCD Development and Alakea Design Group

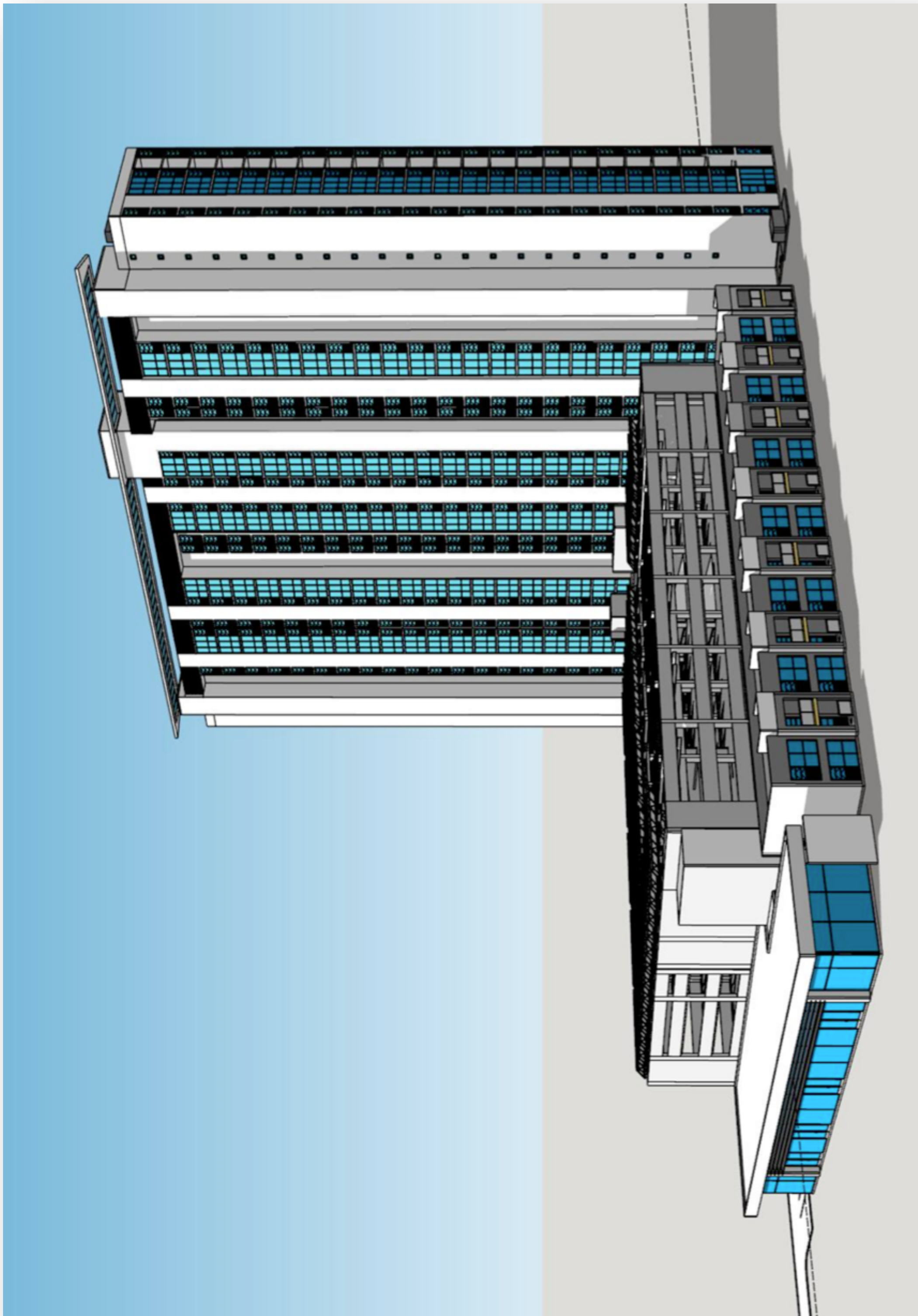


Figure 15: Perspective View Source: SCD Development and Alakea Design Group

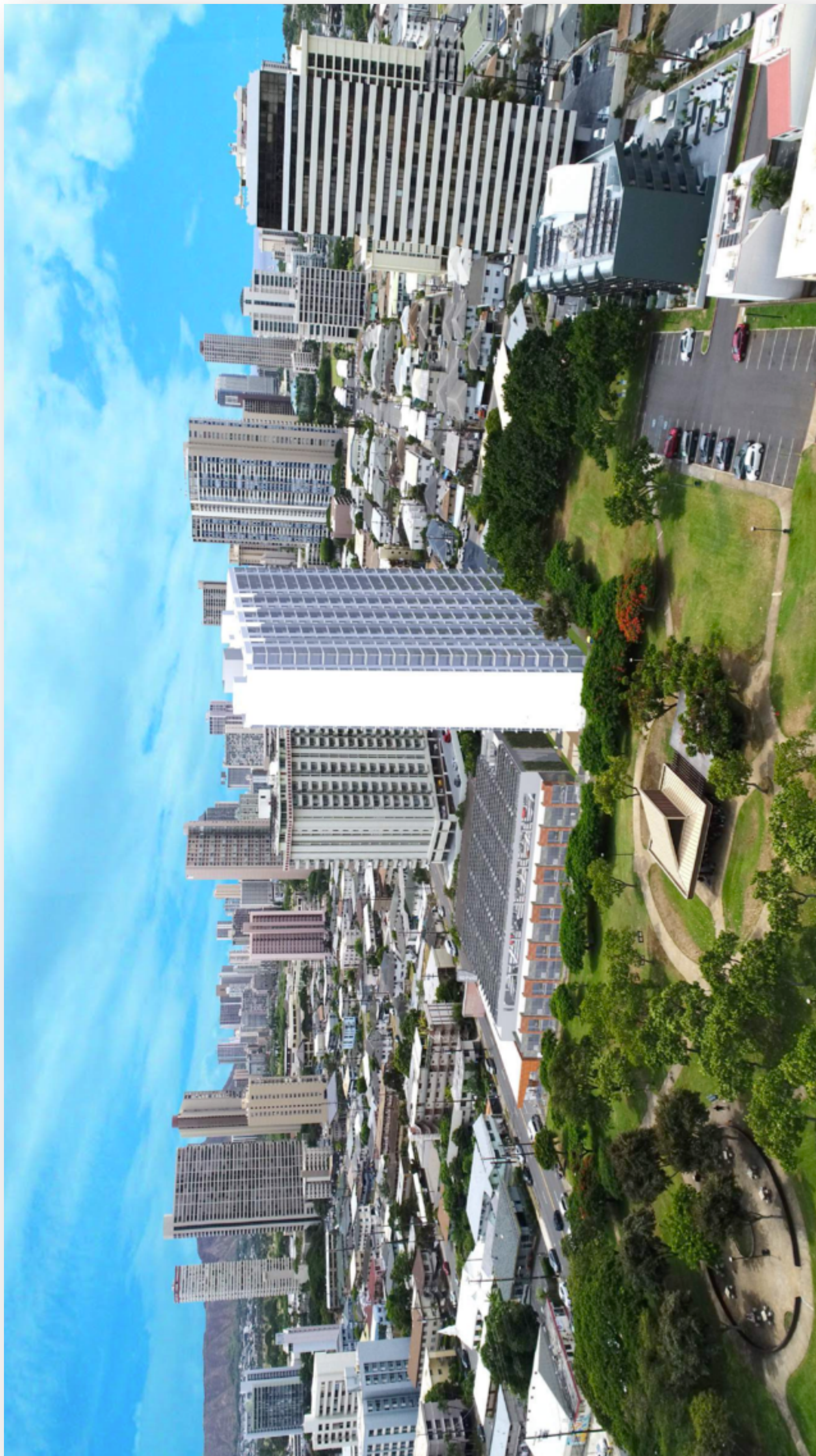


Figure 16: Perspective View Source: SCD Development and Alakea Design Group

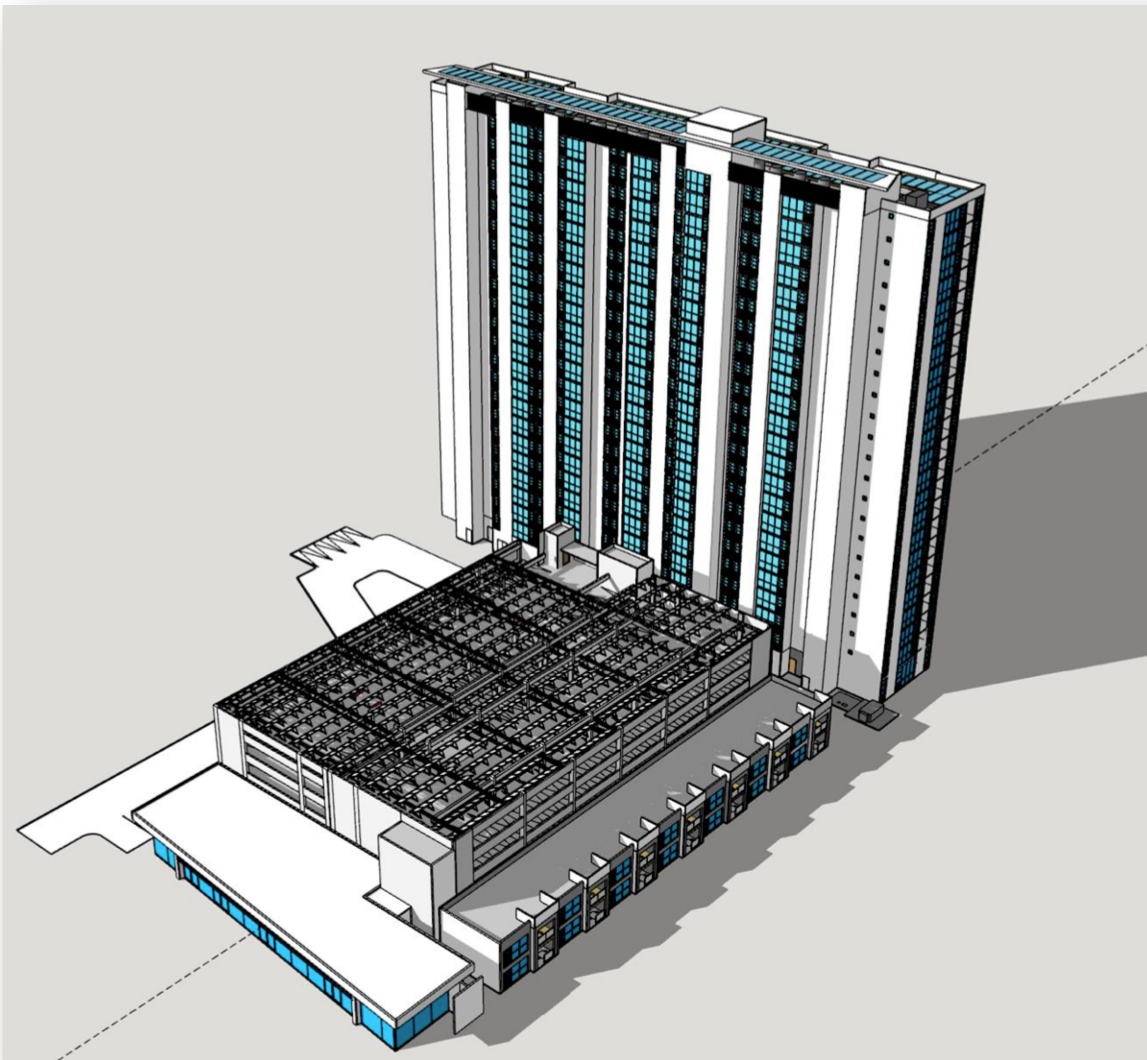


Figure 17: Perspective View Source: SCD Development and Alakea Design Group

Figure 18: Perspective View Source: SCD Development and Alakea Design Group

Figure 19: Perspective View Source: SCD Development and Alakea Design Group

Figure 20: Perspective View Source: SCD Development and Alakea Design Group

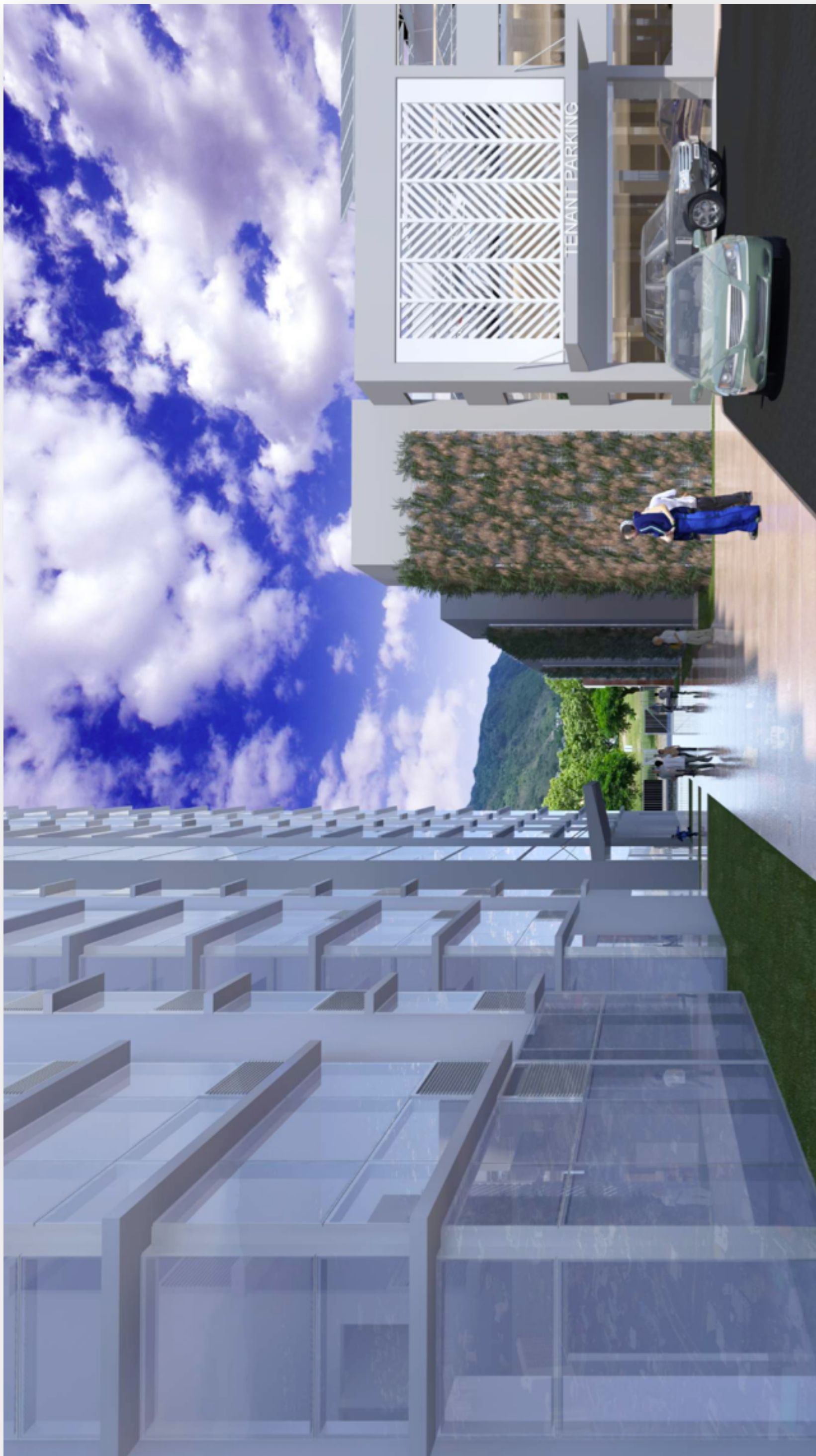


Figure 21: Perspective View Source: SCD Development and Alakea Design Group

Figure 22: Perspective View Source: SCD Development and Alakea Design Group

Figure 23: Perspective View Source: SCD Development and Alakea Design Group

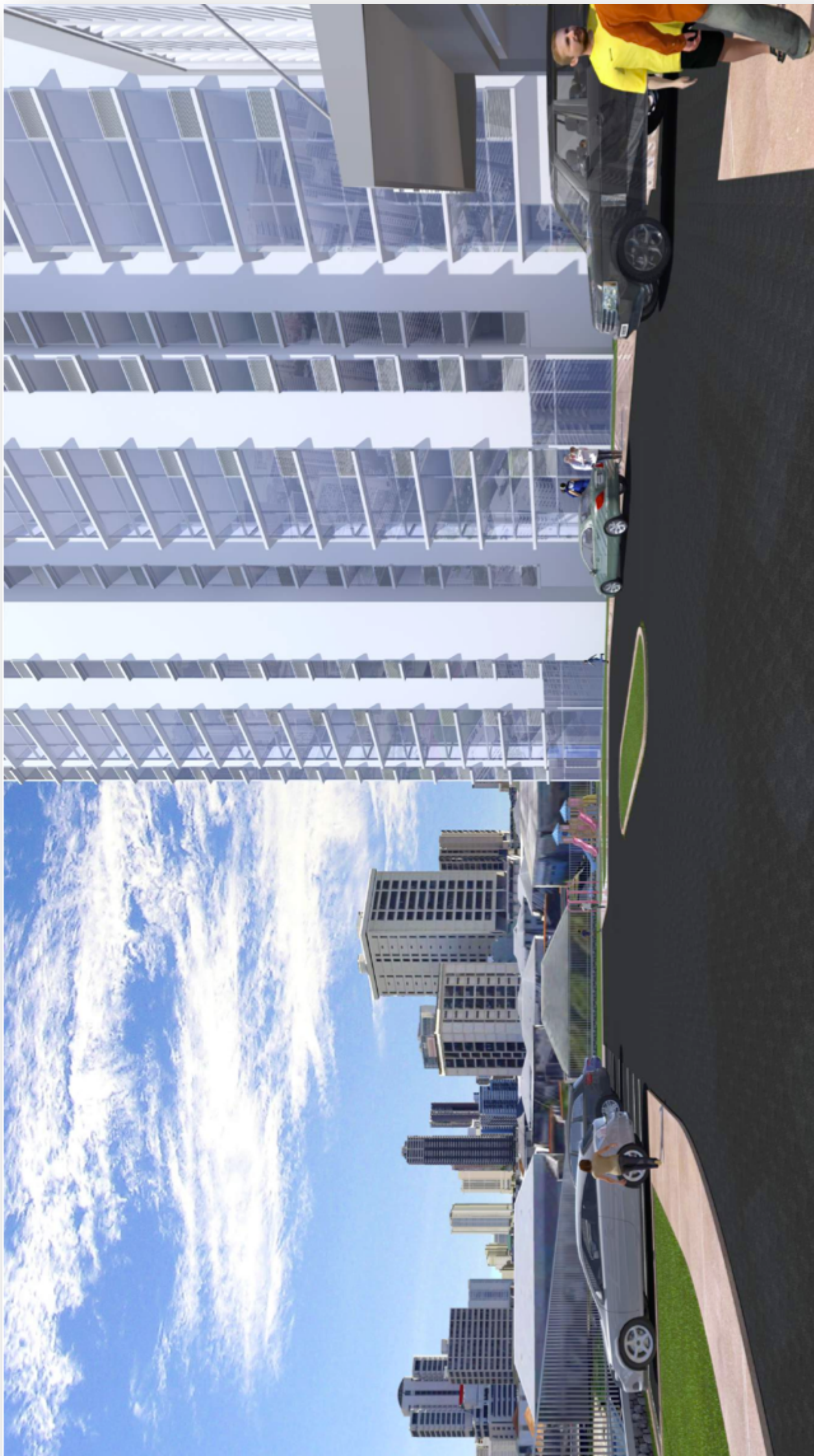


Figure 24: Perspective View Source: SCD Development and Alakea Design Group

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SECTION THREE
DESCRIPTION OF ENVIRONMENT, ANTICIPATED IMPACTS AND MITIGATION MEASURES

3.1 ENVIRONMENTAL SETTING

The project site is located within a highly urbanized area located within the Primary Urban Center. A mix of low to high-rise residential structures, public facilities, and commercial uses are located within the project vicinity. The project is located in the area most commonly known as Moiliili and is not located within a special district or designated place.

The project parcels are located on flat open urban site that is presently unoccupied. The site was formerly in use as the Stadium Bowl-O-Drome bowling alley. The site is paved and is essentially devoid of any vegetation.

The general vicinity is characterized highly urban but the mix of commercial and residential uses still retain a neighborhood feel as the majority of commercial uses are located along the South King Street corridor while the surrounding parks and low to medium density apartment uses keep traffic relatively light and pedestrian friendly.

3.2 SURROUNDING USES

The project site is most notable for its adjacency to the Old Stadium Park which wraps around two sides of the project site. The park and project site also serve as the transition between the A-2 Apartment District to the west and south and the BMX-3 zoning district which prevails in the mauka direction. Moiliili Neighborhood Park serves the general vicinity as an active use park while the adjacent Old Stadium Park is limited to passive use.

In the northern (mauka) direction beyond the Old Stadium Park is the major east-west thoroughfare South King Street and commerical uses including retail establishments and restaurants. In the easterly direction across Isenberg Street are a mix of low-rise commerical properties and low-density apartment uses. Immediately to the south (makai) lies the high-rise Scenic Towers, a 128 unit, 150’ high apartment building located on .75 acres of land, apartment building and mix of single-family dwellings and low-density apartment buildings. The western (Ewa) and immediate northern (mauka) areas adjacent to the project site include the heavily landscaped Old Stadium Park and and mix of single-family dwellings and low, medium and high-density apartment uses.

3.3 ENVIRONMENTAL CONSIDERATIONS

3.3.1 GEOLOGICAL CHARACTERISTICS

Topography

The project site consists of flat urban lands that is occupied by the former Stadium Bowl-O-Drome bowling alley. The entire block other than the adjacent Stadium Park is fully developed and in urban use. The surrounding blocks consist of both low-rise and high-rise buildings. The site is located within a highly urbanized environment and the site is essentially devoid of any plant material and does not serve as a habitat for wildlife.

Climate

The geography of the Honolulu District is typically warm and dry in climate. Prevailing trade winds arrive from the northeast. According to the National Weather Service Honolulu Office, over a period of 30 years, normal monthly high temperatures range from 80 degrees in January to a high of 89 degrees in August for an average of 84 degrees. Normal month low temperatures range from a low of 65 degrees in February and a high of 74 degrees in August for a monthly average of 70 degrees. Precipitation typically ranges from 0.44 inches in August to a high of 3.8 inches in December. The annual average rainfall in Honolulu is 70 inches per year.

USDA Soil Survey Report and Detailed Land Classification – Island of Oahu

The project site is located on soils classified KIA, Kawaihapai clay loam, 0 to 2 percent slopes. Representative profiles of this soil type are of a dark-brown clay loam about 22 inches thick. The next layer is dark brown stratified sandy loam 32 inches thick. Permeability is moderate and runoff is slow, and the erosion hazard is no more than slight according to Panel 62 of the Soil Survey of Islands of Kauai, Oahu, Maui, Molokai, and Lanai, State of Hawaii by the U.S. Department of Agriculture Soil Conservation Service.

A subsequent soils report was prepared by Hirata & Associates dated April 15, 2016 is attached as Appendix

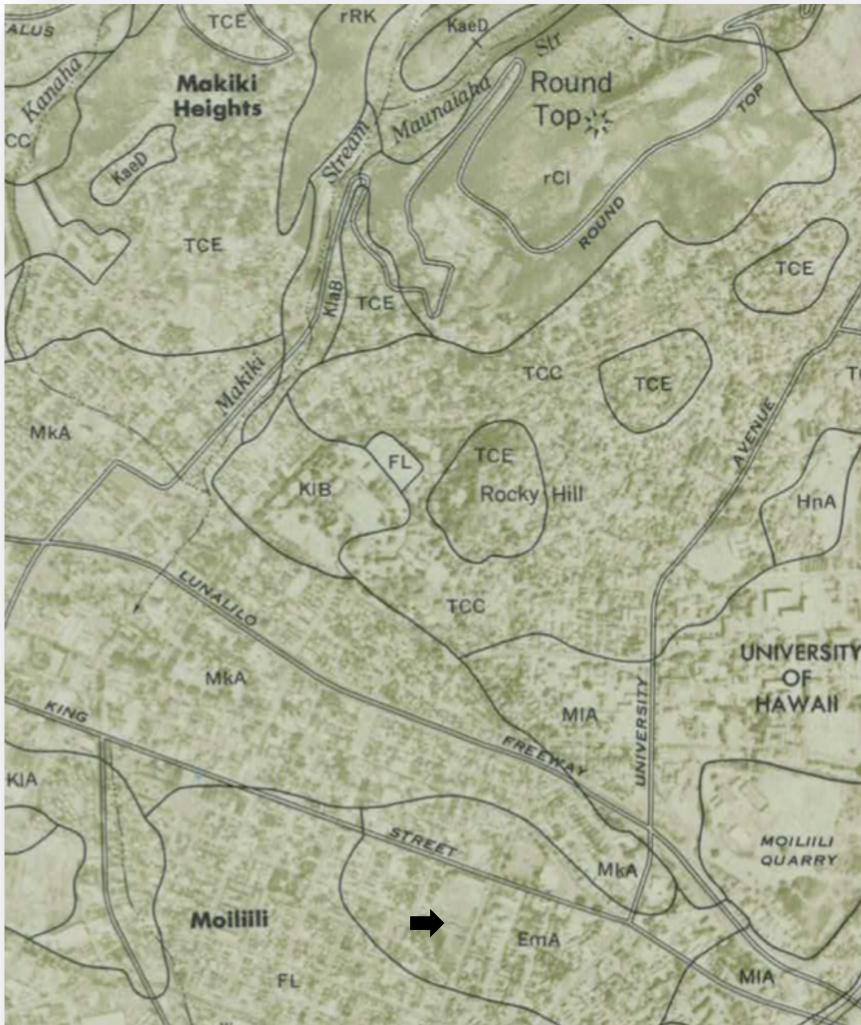


Figure 25: Source: Soil Survey, USDA Soil Conservation Service

The project site is classified as "U" Urban on Map No. 251 of the Detailed Land Classification – Island of Oahu by the University of Hawaii Land Study Bureau.

3.3.2 WATER RESOURCES

Hydrologic Hazards and Resources

According to Panel 150003 C 0366 G of the Federal Emergency Management Agency Flood Insurance Rate Map, the project site is predominantly located in Zone X, an area determined to be outside of the floodplain.

Figure 26: Source: State of Hawaii, DLNR

<u>Tsunami Inundation</u>

According to the National Ocean and Atmospheric Administration (NOAA), the project site is located in an extreme tsunami evacuation area on the Tsunami Hazard Map. This area represents extraordinary event occurance. According to the City and County of Honolulu Department of Emergency Services "Extreme Tsunami Evacuation Zone (XTEZ): If an earthquake happens in the Eastern Aleutian Islands with a magnitude 9.0 or greater, it would cause a rare, more extreme tsunami event that would result in much more extensive flooding throughout Oahu. In this rare case, officials may advise evacuating further inland beyond XTEZ. These areas are shown in YELLOW on the map. For this evacuation you are considered safe when you have reached the GREEN Zone."

<u>Special Management Area</u>

The project site is not located within the boundaries of the Special Management Area (SMA) Map.

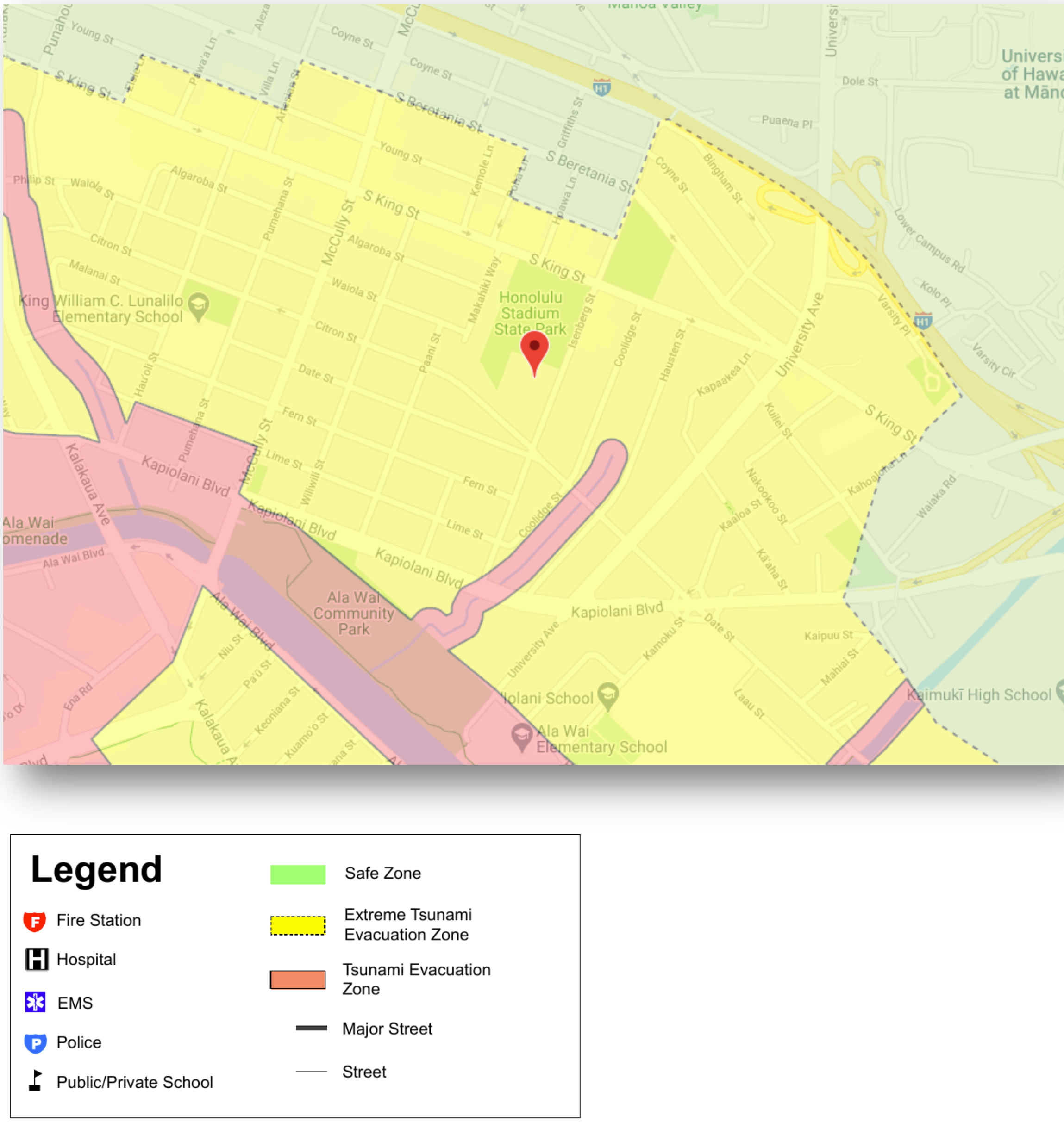


Figure 27 – Tsunami Hazard Map Source: Department of Planning and Permitting

Sea Level Rise Vulnerability

According to the *Hawaii Sea Level Rise Vulnerability and Adaption Report* authored by the Department of Land and Natural Resources, State of Hawaii Office of Planning, Terta Tech, the University of Hawaii School of Ocean and Earth Science and Technology, the University Sea Grant Program, and the Pacific Islands Climate Science Center, sea level rise has been historically noted and is projected to increase throughout the remained of the century. It is now widely accepted that rising sea levels by the year 2100 may reach 3.2 feet above current mean sea level. This is a global phenomenon that is must be addressed on a greater policy level. The 820 Isenberg project lies outside of the 3.2 foot sea level rise zone.

3.3.3 HISTORICAL, CULTURAL AND ARCHAEOLOGICAL ASSESSMENT

A study titled *Archaeological Inventory Survey at 820 Isenberg Street, Waikiki Ahupuaa, Kona District, Island of Oahu TMK: (1) 2-1-054:001* was prepared by Pacific Legacy, Inc. in January 2021. The study, which covered the project block, is summarized in this section and included in its entirety as Appendix A along with confirmation from the Department of Land and Natural Resources Historic Preservation Division. A summary of the findings of these studies is provided below.

Historic Background

The *ahupua*‘*a* (traditional land division) of Waikīkī, literally "spouting water", encompassed the land from Honolulu to Maunalua Bay and from the ocean to the ridge of the Ko‘olau mountain range. The Waikīkī of yesterday was an important political seat and a highly utilized area for agriculture and aquaculture. The Waikīkī of today is highly urbanized, densely populated, and has the highest concentration of visitor accommodations in the State.

The 15th century saw the construction of a vast system of irrigated *lo*‘*i* (pondfields) and *loko* (fishponds) that extended across the littoral plain of Waikīkī.

The importance of Waikīkī as a center of political and social power was displayed in the importance of its *heiau* and continued through the time of Kamehameha I who built a chiefly residential complex there after defeating O‘ahu's chief, Kalanikūpule, in 1795.

By the end of the 18th century, Waikīkī had developed into one of the most densely populated areas on O‘ahu as well as a rich, highly cultivated agricultural and aquacultural district.

A burgeoning agricultural industry in the latter half of the 19th century was rice cultivation. A new, high-yield variety was planted in 1860 and its success increased the value of *lo*‘*i* (pond fields) once used to cultivate *kalo* (taro). Waikīkī was again recognized as one of the "most important growing districts on Oahu" and by 1892, about 542 acres of *lo*‘*i* were planted in rice.

Twentieth Century to Present

In the 1920s and 1930s, the ponds in the area were filled in and the Ala Wai Canal was constructed. Urban development began, transforming the area into the urban setting it is today.

The parcel is most well-known for being the former site of the bowling alley called “Stadium Bowl-O-Drome” (SIHP Site No. 50-80-14-08721) and its parking lot, which operated between 1955 and 2004.

The Stadium Bowl-O-Drome appears to be significant at the local level under Criteria A and C. The building has strong associations with the history of bowling on Oahu. Architecturally, it is also a good example of a bowling alley constructed in Honolulu during the 1950s.

Previous Archaeological Investigations

A review of the previous archaeological investigations was conducted at the State Historic Preservation Division library in Kapolei. The review determined that no previous archaeological investigations have occurred within the current project area.

Summary of Investigations

The subsurface testing program at the Stadium Bowl-O-Drome (SIHP No. 50-80-14-08721) resulted in the identification of a single archaeological site (SIHP No. 50-80-14-08210) dispersed across. This site is a historic dumping area. Site 08210 consists of a series of informal deposits situated within the natural limestone depressions on the coral shelf.

A total of 141 artifacts were recovered from the site. Some of those deposited within the depressions and within fill layers across the site with depths varying between 30 and 115 cms. The artifacts recovered from the deposits range in age between 1886 and the 1960s and are associated with the historic use of the area by residents who lived in the vicinity in the early 1900s, as well as the use of the area for a stadium parking lot and bowling alley.

Significance

The proposed development of 820 Isenberg Street is subject to the regulations associated with the National Register of Historic Places of 1966 (as amended). The project has secured Federal funding through HUD; due to the federal participation, this project is considered an “undertaking” and is subject to Section 106 requirements of the National Historic Preservation Act of 1966, as per 36 CFR 800. This project is also subject to Hawaiʻi Revised Statutes 6E.

Discussion and Recommendations

The subject parcel is currently being considered for redevelopment; as part of the development, DHHL has secured federal funding to assist in planning. Due to this federal participation, this project is considered an “undertaking” and is subject to

Section 106 requirements of the National Historic Preservation Act of 1966, as amended. As part of the project, an Environmental Impact Statement is required to satisfy the requirements of HRS Chapter 343, including the necessity of an archaeological inventory survey of the project area.

A total of 24 trenches were excavated on the subject parcel. The locations of these trenches were situated to obtain a representative sample of the parking lot area surrounding the Stadium Bowl-O-Drome. No excavations were conducted inside the former bowling alley because the indoor area was previously tested for contaminants and the environmental constraints present there posed a serious health risk. All excavations were closely monitored by the project archaeologists and were excavated to the limestone shelf.

The test excavations revealed that fill layers are present and evenly dispersed throughout the project. These fill episodes were likely done in the 1920s–1950s when the project area was used as a parking lot for the former Honolulu Stadium, and later, the parking lot and structure for the Stadium Bowl-O-Drome. These layers overlay the natural limestone karst present in the project area.

A single archaeological site was identified (SIHP No. 50-80-14-08210). It is comprised of a subsurface historic deposit throughout most of the parking lot area around the existing Stadium Bowl-O-Drome. The deposits consist of natural depressions within the limestone coral shelf, filled in by soil and debris. The artifacts recovered from the deposits range in date between 1886 and the 1960s. The household items, ceramic teacups, bowl and plate fragments and saw- cut faunal remains recovered from the site points to the area being used as a dumping area by nearby residents.

The glass soda and beer bottles collected and observed in some of the trenches date to between the 1920s and the 1950s; representing the use of the project area related to the old Honolulu Stadium which operated adjacent to the project area from 1926 to 1975. The glass soda bottles appear to end around 1960, just after the bowling alley began its 50-year run of operations.

The test excavations were not able to excavate through the limestone shelf that was identified in every trench.

Based upon criteria set forth by the NRHP and the HRS 6E, Site 50-80-14-08210 retains its integrity of location and materials present (the site is a buried historic trash deposit that appears to be in its original deposited location) and is significant under Criteria "D" (NRHP) and "d" (HRS 6E) for the information it has yielded or is likely to yield. The site has produced ceramic and porcelain tableware from Japan, England, and the United States that are representative of the residences in the area during the early 1900s. The mixture is Eastern Western artifacts is suggestive of the mixed races within Mōʻiliʻili at the time. The artifacts recovered from Site 08210 add to our understanding of the historic use of this portion of Mōʻiliʻili.

Based on the presence of historic artifacts associated with historic residences in Mōʻiliʻili, archaeological monitoring is recommended for any future excavation work with the project area.

A letter of acceptance of the archaeological study by the State of Hawaii Department of Land and Natural Resources dated February 26, 2021 is also attached as Appendix B. In the unlikely event during construction that iwi kupuna are discovered, all work will cease and the Honolulu Police Department, Department of Health, and the State Historic Preservation Office will be notified to determine appropriate courses of action regarding the findings.

3.3.4 ARCHITECTURAL SURVEY

An Architectural Reconnaisance of the buildings currently located on the project site was conducted by Fung Associates, Inc. in November of 2017. The study is included in this EA document as Appendix C. A summary of the existing uses and structures was provided by Minotoishi Architects and is incoporated in this section.

Existing Uses and Structures

The proposed project location is at 820 Isenberg Street, situated to the south of Stadium Park.

The building standing on the proposed project area was designed by the Honolulu architectural firm of Rothwell & Lester, and was constructed in 1955 for the Honolulu Stadium Corporation, which operated the then-adjacent Honolulu Stadium. On April 14, 1955, contractor Harry I. Kobayashi broke ground to construct a bowling center on the parcel of land along Isenberg Street to the *makai* side of Honolulu Stadium. On the following day the Honolulu Stadium Corporation signed a lease with Adelaide (Mom) and Arthur (Pop) Stagbar to have them operate a bowling alley in the new building. Named Stadium Bowl-O-Drome, the new enterprise opened for business on December 3, 1955, the twelfth privately owned bowling alley to operate on the island of Oahu. It continued in business under the management of the Stagbars until 1990.

The Department of Hawaiian Home Lands, which took over ownership of the Bowl-O-Drome property in 1995 as part of a land use settlement with the State of Hawaii, found a new leasee, KN Hawai`i Inc., in May 2000. As a result, the bowling operation, re-named University Bowl-O-Drome, reopened and continued on a month to month basis until May 2004, when bowling came to a close at the site. Oahu Auto Service, a car towing and repair company, leased the parking area behind the building on a month-to-month basis beginning in March 2003, running through 2017.

The building and its grounds are presently vacant.

The existing building is a rectangular shaped, 145' x 167', two story, modern style building. It sits on a poured in place concrete slab foundation and has reinforced concrete walls. Its built-up, flat roof has overhanging eaves. The single story front of the building projects approximately 38' from the body of the building. The asymmetrical building is characterized by a right-of-center, corrugated metal pylon which projects approximately 7' from the façade and extends back to and rises above the second story. This rectangular pylon carries on its front edge a neon sign with the word "Bowling", and on both of its sides has a sign comprised of a stylized figure bowling and the words, "Bowl-O-Drome". Immediately *makai* of the pylon is a centered, recessed entry to the building. The front, *mauka* corner of the building is dominated by a set of three canted windows, each with two panes. These floor-to-ceiling, aluminum-framed windows have been boarded over. This "wall" of canted windows wraps around the corner, with four more such windows continuing down the *mauka* side of the building. Behind these windows was the bowling alley's cocktail lounge, which was entered from the *mauka* side.

The interior follows a typical bowling center layout with its lateral running orientation with the lanes traversing the length of the interior. Its wide concourse separates the cocktail lounge, concessions, and other service-related areas from the actual bowling alleys. The 24 maple alleys are placed on a lower level, separated from the concourse by three rows of stadium style audience seating and the bowlers' benches encircling the scorer's table. The streamline designed Brunswick scorer's tables, although not the originals, are over fifty years old and historic.

The *mauka* wall adjacent to the seating and bowlers' benches is adorned with a Hawaiian themed mural made by Honolulu artist Jackie Anderson. Half of this mural is now badly decomposed and has peeled off the wall. The other half is in fair condition. In addition to this mural another one rendered by Ms. Anderson whimsically depicted the history of bowling, but unfortunately it is no longer extant. Subsequent investigation found the murals further damaged by graffiti.

Stadium Bowl-O-Drome view from front and east sides

View of the mauka entry to the bowling alley and cocktail lounge from the north

View of the rear and mauka side of the building from the northwest

Historic Resources

The Bowl-O-Drome is not listed in the National or Hawaii Registers of Historic Places. However, a reconnaissance level architectural survey (RLS) of the proposed project's Area of Potential Effect (APE) was undertaken by Fung Associates in 2017. This study included properties within a one block radius of the Bowl-O-Drome property built prior to 1969. The large survey boundary was meant to include all historic architectural properties that could possibly be affected by any proposed high rise redevelopment project on the property. The survey area encompassed approximately 50 acres. Individual historic properties were identified throughout the area; no potential historic districts were identified.

It appears the proposed development of the Stadium Bowl-O-Drome property will not affect the eligible, historic properties within the APE. However, the proposed development requires the demolition of the Stadium Bowl-O-Drome building, and thus will have an adverse effect upon that building.

In order to mitigate this adverse effect, a Historic American Building Survey report , which included large format photographic documentation, has been prepared and submitted to the State Historic Preservation Division. The National Park Service has approved that report which will be placed in the Library of Congress. In addition, where feasible, available historic elements from the Stadium Bowl-O-Drome building, such as the wrought iron railing in the former cocktail lounge, will be salvaged and incorporated into future development plans and/or an educational component detailing the history of the building, or other appropriate uses.

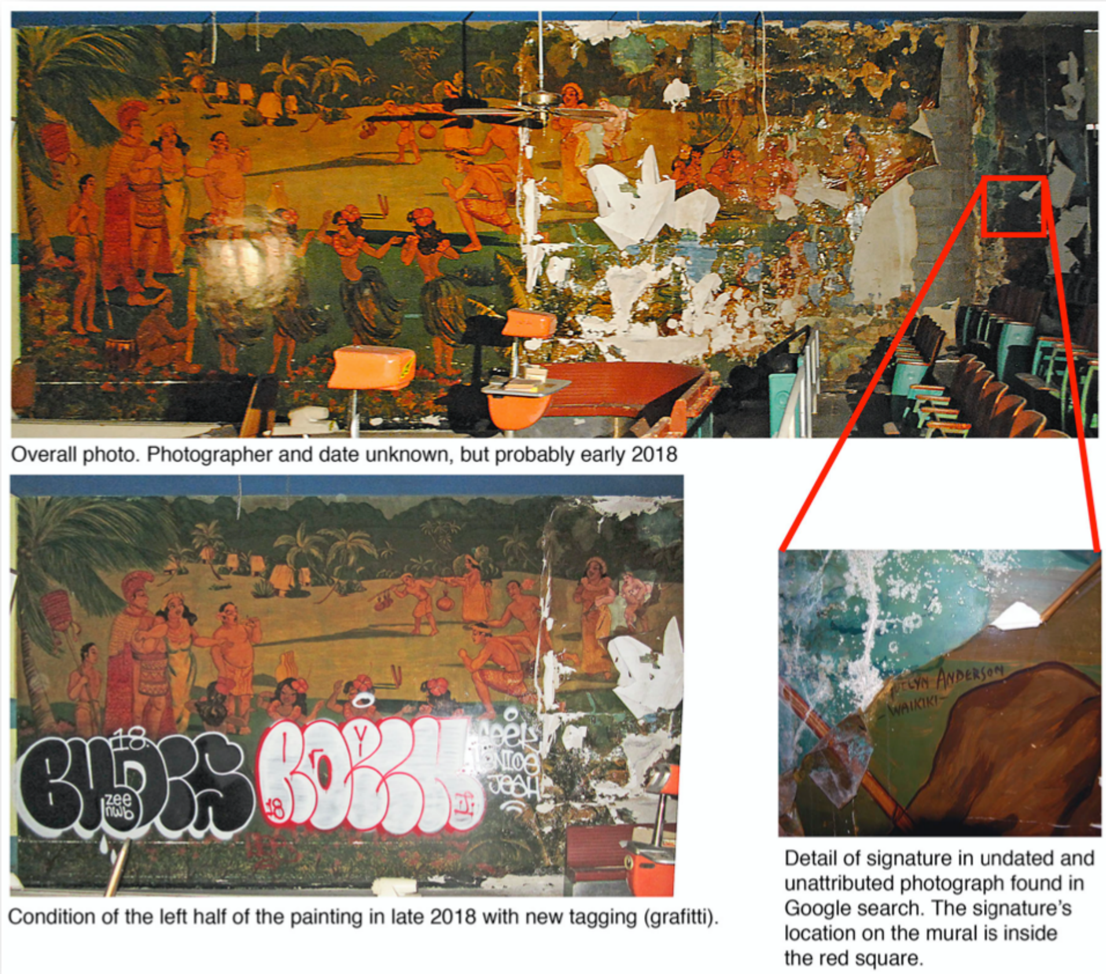
Potential Impacts and Mitigation of Historic Resources

The Stadium Bowl-O-Drome is not listed in the National or Hawaii Registers of Historic Places. However, as the result of an Intensive level Architectural Survey of the property undertaken by Fung Associates in 2017, the building appears to meet the criteria for listing in the Hawaii and National Registers of Historic Places.

The proposed project requires the demolition of the historic bowling center. In order to mitigate this demolition, a Historic American Building Survey report , which will include large format photographic documentation, will be prepared and .submitted to the State Historic Preservation Division and the National Park Service for approval, prior to being placed in the Library of Congress. In addition, where feasible, available historic elements from the Stadium Bowl-O-Drome building, such as the wrought iron railing in the former cocktail lounge and the wood floors of the bowling lanes, will be salvaged and incorporated into future development plans and/or an educational component detailing the history of the building, or other appropriate uses.

In the early 1950's Waikiki artist Jacquelyn Anderson painted the interior of the building with a Hawaiian motif according to Pace Art Conservation, LLC (Pace). Pace added that two large murals were located on opposing walls of the bowling lanes which depicted Hawaiian men and women, taro patches, a sugarcane train and flowers. The Pace report states that the murals were in durable but were also damaged by abuse and subsequent graffiti. The significance of the murals was not determined, however estimates for the preservation of these murals was estimated at $1.62 million dollars rendering preservation unfeasible.

A letter from the United States Department of the Interior National Park Service acknowledges that survey documentation of the buildings has been completed and accepted by the National Park Service's Historic American Buildings Survey (HABS).



Overall photo. Photographer and date unknown, but probably early 2018

Condition of the left half of the painting in late 2018 with new tagging (grafitti).

Detail of signature in undated and unattributed photograph found in Google search. The signature's location on the mural is inside the red square.

Source: Pace Art Conservation, LLC

3.3.5 TRAFFIC CONDITIONS

A traffic study for the 820 Isenberg project was conducted by The Traffic Management Consultant, Inc. in April 2021. This study is titled *Transportation Assessment Report for the Proposed 820 Isenberg Development* is summarized in this section and included in its entirety as Appendix C.

Existing Roadway Conditions

Isenberg Street is a two-way, two- to four-lane collector street between Bingham Street and Kapiolani Boulevard. Curbs, gutters, and sidewalks are provided on both sides of Isenberg Street. Marked parking stalls are located on both sides of Isenberg Street, between South Beretania Street and Kapiolani Boulevard. Parking is prohibited on the Ewa side of Isenberg Street from Young Street to South King Street from 3:30 PM to 5:30 during the weekdays.

Surrounding area streets that impact the project site consist of the following streets.

- South Beretania Street is a one-way Ewa bound, three-lane collector street from University Avenue to McCully Street.
- Young Street is a two-way, two-lane local street between Isenberg Street and McCully Street.
- South King Street is a five-lane, one-way Koko Head bound street from McCully Street to University Avenue.
- Citron Street is two-way, two-lane street between McCully Street and Isenberg Street.
- Date Street is two-way, two-lane street between McCully Street and Isenberg Street.
- Kapiolani Boulevard is a six-lane divided roadway between McCully Street and Date Street.

<u>Existing Traffic Volumes and Operating Conditions</u>

According to the *Highway Capacity Manual* (HCM) which is an industry standard for the assessment of traffic conditions, traffic conditions fall under six Level of Service (LOS) designations ranging from A to F. LOS's A, B and C are generally considered satisfactory, with Level D a desirable minimum, and Levels E and F are considered undesirable.

The existing AM peak hour of traffic in the study area occurred between 7:15 AM and 8:15 AM. Traffic in the project area generally is assessed at Levels B and except for makai bound traffic on Isenberg at Kapiolani where moring traffic graded at Level D.

The existing PM peak hour of traffic in the study area occurred between 4:30 PM and 5:30 PM. Traffic conditions during these hours are good predominantly grading at Level B and C with only the Citron Street and Isenberg intersection and the Isenberg and Kapiolani intersections, grading at Level D.

<u>Future Traffic Volumes and Operating Conditions Without the Project</u>

An annual average growth rate of 0.73 percent was uniformly applied to the pre-pandemic (2019) AM and PM peak hour traffic, to estimate the Year 2025 peak hour traffic demands without the proposed project.

Based on annualized growth Isenberg is expected to operate at LOS D in the mauka direction and LOS C in the makai direction during peak AM hours. The intersection of South King Street and Isenberg Street is expected to operate at satisfactory Levels of Service. The intersection of Citron Street and Isenberg Street are expected to operate at LOS C. The most notable decrease in traffic LOS will occur for left turn movements at the intersection of Isenberg Street and Kapiolani Boulevard.

During the PM peak hour of traffic without the proposed project, the intersection of South Beretania Street and Isenberg Street is expected to operate at an overall LOS C. The left-turn movement on mauka bound Isenberg Street is expected to operate at LOS E.

The intersection of South King Street and Isenberg Street is expected to operate at satisfactory Levels of Service, during the PM peak hour of traffic without the proposed project. The shared left-turn/through lane on makai bound Isenberg Street operated as a default exclusive left-turn lane.

Makai bound Isenberg Street is expected to operate at LOS “E” at Kapiolani Boulevard. The mauka bound left-turn/through movement on the Marco Polo Driveway is expected to operate at LOS “D” at Kapiolani Boulevard. All other afternoon peak hour traffic will remain at acceptable levels without the project.

<u>Transportation Impact Analysis with Project</u>

The peak hour trip generation characteristics for the proposed 820 Isenberg Street Redevelopment are based upon the ITE trip rates for a 270-unit multi-family high-rise housing, a seven (7) unit multi-family low-rise housing, and 4,680 SFGFA of commercial area.

The Project Access Driveway is expected to operate at LOS B at Isenberg Street, during the AM peak hour of traffic with the proposed project. The left-turn movement from mauka bound Isenberg Street is expected to operate at LOS A.

During the AM peak hour of traffic with the proposed project, all the intersections in the study area are expected to operate at the same Levels of Service as during the AM peak hour of traffic without the proposed project.

During the PM peak hour of traffic with the proposed project, the Project Access Driveway is expected to operate at LOS C at Isenberg Street. The left-turn movement from mauka bound Isenberg Street is expected to operate at LOS A.

The left-turn movement on Koko Head bound Kapiolani Boulevard is expected to operate at LOS B. The other traffic movements at the intersection are expected to operate at the same Levels of Service as during the PM peak hour of traffic without the proposed project.

During the PM peak hour of traffic with the proposed project, the other Isenberg Street intersections in the study area are expected to operate at the same Levels of Service as during the PM peak hour of traffic without the proposed project.

Potential Impacts and Mitigation Measures

Both AM and PM conditions at the Isenberg and Kapiolani Boulevard with and without the project are expected to operate at Level E conditions. These conditions warrant mitigation measures due to natural growth projections. In consideration of the growth projections and associated traffic impacts, the following mitigation measures were recommended in the traffic assessment.

1. Makai bound Isenberg Street should be restriped at Kapiolani Boulevard to provide separate left-turn, through, and right-turn lanes to mitigate LOS "E" conditions without the proposed project.

2. On-street parking on the Ewa side of Isenberg Street should be prohibited to maintain appropriate sight distances in both directions from the Project Access Driveway.

The conclusion of the traffic assessment is that the proposed 820 Isenberg Street Redevelopment Project is not expected to significantly impact transportation operations in the vicinity.

3.3.6 NOISE ENVIRONMENT

A noise analysis was conducted by D. L. Adams Associates for the project site in May of 2021. This report entitled, *DHHL Isenberg Development – HUD Site Noise Analysis (DLAA #20-033)* is summarized below and appended in its entirety in the appendices.

Design Criteria

DLAA's noise assessment evaluates the project site based on the Site Acceptability Standards of the U.S. Department of House and Urban Development (HUD). The Site Acceptability Standards are given in the Code of Federal Regulations 24 CFR Part 51B. The standards regulate the acceptability of sites for residential buildings with HUD funding. The noise levels are expressed in terms of the Day-Night Average Sound Level (DNL). The DNL is the average sound level over a 24-hour period to which a 10- decibel penalty has been applied to sound levels occurring during the nighttime hours (10:00 PM to 7:00 AM). DNL level in decibels are A-weighted. The HUD Site Acceptability Standards for exterior sound levels are summarized in the table below.

Acceptable Less than or equal to 65 dBA No special acoustical design consideration necessary

Table 1: HUD Site Acceptability Standards

Category	DNL	Comments
Acceptable	Less than or equal to 65 dBA	No special acoustical design consideration necessary
Normally Unacceptable	Greater than 65 dBA, but less than or equal to 70 dBA	5 dB additional attenuation required through the use of barriers or in design to ensure interior noise levels are acceptable
	Greater than 70 dBA, but less or equal to 75 dBA	10 dB additional attenuation required through the use of barriers or in design to ensure interior noise levels are acceptable
Unacceptable	Greater than 75 dBA	Attenuation measures must be submitted and approved on a case-by-case basis

The intent of the 65 DNL outside criteria is to achieve DNL 45 dBA indoors. HUD typically allows upgrades to the building shell to meet an interior DNL of 45 dBA in Normally Unacceptable or Unacceptable areas. This can be accomplished by specifying building facades, windows, and doors with higher sound transmission class (STC) ratings than normal construction. Addressing windows is particularly important, as they are often the weak link in the building facade with respect to noise intrusion.

HUD Calculations

DLAA analyzed noise levels at eleven (11) different noise assessment locations (NALs) on the 820 Isenberg development site. These include nine (9) representative units on the 10th floor of the tower, as well as two (2) representative 2nd floor townhomes. The selected NALs are considered worst case because they are on the lowest floor with direct line of sight to both lanes of the nearest major roadway: Isenberg Street. Traffic data for nearby roadways were obtained from the “Draft Transportation Assessment Report (TAR) for the Proposed 820 Isenberg Street Redevelopment Project” prepared by Traffic and Mobility Consultants LLC.

Traffic data was used to calculate noise from Citron St, Isenberg St, and S King St. Peak AM and PM hour traffic counts were provided in the TAR for current (2020) and pre-pandemic (2019) conditions. Growth rates sourced from the Oahu Regional Transportation Plan (ORTP) were used in the TAR to make forecasts of traffic counts in 2025 with and without the impact of the project.

DLAA assumed the ratio of combined peak hour traffic counts to 24-hour totals is consistent for Citron, Isenberg, and South King streets. Using this assumption, Average Daily Traffic (ADT) counts were approximated for predicted traffic. Per the HUD Guidelines, DLAA calculated the 10-Year Predicted DNL based on the provided estimated increase in traffic data presented in the TAR. The table below summarizes the calculated DNLs at each NAL.

Table 2: Calculated DNL at Each NAL

	DNL (L_{DN})					
NAL	**Current (2020)**	**Pre-Pandemic (2019)**	**5-year Predicted, No Action (2025)**	**10-year Predicted, No Action (2035)**	**5-year Predicted, With Action (2025)**	**10-year Predicted, With Action (2035)**
NAL #1	59	59	59	59	59	59
NAL #2	61	62	63	63	63	63
NAL #3	59	59	60	60	60	60
NAL #4	59	59	59	60	60	60
NAL #5	59	59	59	60	59	60
NAL #6	61	62	62	63	62	63
NAL #7	62	62	62	63	62	63
NAL #8	61	62	62	62	62	63
NAL #9	60	62	62	62	62	63

	DNL (L_{DN})					
NAL	**Current (2020)**	**Pre-Pandemic (2019)**	**5-year Predicted, No Action (2025)**	**10-year Predicted, No Action (2035)**	**5-year Predicted, With Action (2025)**	**10-year Predicted, With Action (2035)**
NAL #10	66	68	68	68	68	68
NAL #11	63	65	65	65	65	66

Based on the worst-case results of 63 L_{DN} for NALs #1-9, the tower units are considered "Acceptable". Based on the worst-case results of 68 L_{DN} for NALs #10-11, the townhome units are considered "Normally Unacceptable". Further calculations are required to examine interior noise levels due to the exterior wall assemblies at these locations.

Exterior Shell Review

The necessary rating for the building shell to achieve the HUD required interior 45 L_{DN} criteria is the composite STC (STC_C). The STC_C rating differs slightly from a normal STC rating in that it takes an area that is composed of multiple different assemblies (i.e., windows, exterior walls, or mechanical units) and calculates a weighted average of the assemblies' STC ratings. We have assessed the STC_C rating of two exterior assemblies at the 2nd floor of the townhomes representing different window and wall combinations for each NAL deemed "normally unacceptable" under predicted traffic conditions. Locations considered were NAL#10 and NAL#11 – mauka townhomes with Isenberg and South King streets calculated as primary traffic noise sources.

All STC_C calculations assume minimum STC 30-rated windows, which is typical for windows with a 1" insulating glazing assembly comprised of 1/4" Lite - 1/2" air space – 1/4" Lite. The project architect has advised the exterior wall will consist of:

- 1 layer of 5/8" Type X Gypsum board
- 6" metal studs @ 16" O.C. with R-13 fiberglass insulation
- 1 layer of 5/8" exterior sheathing board
- 1 layer of painted EIFS or metal panel exterior system

The stud gauge is assumed to be 16-gauge. The exterior walls include PTAC louvers. The tale below summarizes the calculated STCC ratings at each location.

Table 3: Calculated Composite STC For "Normally Unacceptable" NALs

NAL	DNL (L_{DN})	Required STC_C	Calculated STC_C	Further Action Required?
NAL #10	68	26	32.22	No
NAL #11	66	25	32	No

Based on the provided exterior wall assemblies and minimum STC 30-rated windows, each NAL achieves the HUD maximum interior noise level of 45 dBA and is considered "Acceptable".

Unit Lanais

According to the HUD guidelines, outdoor amenity spaces must not exceed DNLs of 65 L_{DN}, however this does not apply to unit lanais. Unit lanais are considered ancillary spaces and do not need to achieve the 65 L_{DN} criteria imposed on other outdoor spaces that could be used by the entire building population. The unit balconies must have L_{DN} values no greater than 75. DNLs at townhome lanais overlooking Stadium Park are calculated to be at most 68 L_{DN} and DNLs at tower lanais are calculated to be 63 L_{DN} or lower, which achieves the design criteria. No further mitigation techniques are needed at unit balconies.

3.3.7 AIR QUALITY AND HAZARDOUS MATERIALS

The proposed project will have short-term and long-term effect on ambient air quality. The existing contaminated building will be demolished and contaminants removed from site. During demolition and excavation, dust will be generated however fugitive dust is generally controlled by frequent watering and perimeter screening. Best management practices will be used to ensure that dust control during demolition of the existing paving and during construction of the new building are kept to a minimum. These impacts are typical of any new construction project.

3.3.8 BIOLOGICAL CHARACTERISTICS

Flora

The project lot is presently covered with an existing building and asphalt paving. The project site is essentially devoid of any plant material except for weedy species located around the building and site perimeter and a few ornamental trees along the boundary between the existing building and the Scenic Tower condominium. No rare or endangered species of flora were identified on the site.

Fauna

The site does not serve as a wildlife habitat although avifauna, feral cats, and rodents may be found on-site.

3.3.9 INFRASTRUCTURE AND UTILITIES

The proposed improvements are readily serviced by existing utilities located in the immediate vicinity. Electrical and telecommunications services are located in overhead lines.

Water

The project will continue to be serviced by the existing water system. The proposed 820 Isenberg development will result in a significant increase in water demand. The new domestic water and fire protection water meters to serve the project are expected to be upgraded as part of the development. Water conservation efforts are likely to be implemented by the project operator upon completion. The Board of Water Supply has stated that the existing water system can accommodate the project.

Stormwater

The site is presently drains towards Isenberg Street where a curb and gutter system collects and conveys stormwater. The proposed project will be required to control drainage according to prevailing drainage regulations. All storm water runoff from the proposed improvements will be reviewed for conformance with City and County of Honolulu Ordinance 96-34 regarding peak runoff.

Best Management Practices (BMPs) will be put in to place prior to the start of any construction to ensure that runoff in the storm drain system are treated for minimal impact into State receiving waters. Additionally, Low Impact Design feature will be considered for the project.

Wastewater

Approval from City and County of Honolulu Department of Planning and Permitting for municipal sewer system connection to accommodate the proposed project has been issued to the Applicant. Sewer mains are located along each street frontage and an appropriate sewage connection system will be designed in consideration of the most effective connection points.

Solid Waste

It is expected that private refuse collection service will be used to service the project location. The project operator may implement recycling programs upon project completion.

Telephone and Electrical Services

Telephone and electrical services are available to the site. Coordination with the local electric and telephone service providers will be expected during the design and construction phases.

3.3.10 PUBLIC FACILITIES

McCully-Moiliili Fire Station Number 29 provides fire protection service to the project area as well as emergency medical service. The station is located at 2424 Date Street and is located approximately three blocks from the project site. Response time to the site is less than 5 minutes.

Police service is provided by the Honolulu Police Department (HPD) District 7, Sector 4, Beat 754. Response time to the site is less than 5 minutes.

Public schools serving the project area are Lunalilo Elementary School, Washington Middle School and Kaimuki High School. The project will increase enrollment at these schools. The Department of Education (DOE) is required to provide education for all school-aged children. Discussions with DOE staff stated schools serving the project are currently operating with excess capacity and and will continue to have excess capacity over the next five years.

Public schools serving the area presently have limited capacity to accommodate the projected student demand however school enrollments in the project area is expected to increase significantly taxing limited Department of Education facilities. Presently, there are no fees or school impact assessments placed on new developments. In the event that school capacity is reached, the developer will be open to discussion with the Department of Education regarding possible solutions.

The project site is located near the active recreational centers of Moiliili Neighborhood Park located one block away to the north, and the Ala Wai Field located five blocks away in the makai direction. The large but passive activity Old Stadium Park is located adjacent to the project site and is an integral part of the projects design parameters.

SECTION FOUR
RELATIONSHIP TO PLANS, CODES AND ORDINANCES

4.1 STATE OF HAWAII PLANS

State Land Use Boundary

The State Land Use Commission Boundary Maps identify the project site as being within the Urban area. This is consistent with the surrounding uses that include commercial uses and high-density residential development.

Coastal Zone Management

Hawaii Revised Statutes (HRS) § 205A-1 states that the entire State is located within the coastal zone management area. The 820 Isenberg project is generally consistent with all objectives of the CZM and is not located near the shoreline and will not have any effect on the coastal zone. The project does not directly affect coastal recreational, historic, costal ecosystems. The project will not significantly decrease open space but it is inevitable that the project would be developed at some time as the site is zoned for development within this highly urban community. Overall, the project should be considered a managed development that provides a balance of workforce and affordable housing types, and through its additional economic opportunities provided by the new commercial spaces located on the ground level.

Hawaii State Plan

The project is also consistent with the Hawaii State Plan, HRS Chapter 226. The State Plan essentially addresses five broad objectives: objectives and policies for population; objectives and policies for the economy; objectives and policies for the physical environment; objectives and policies for facilities systems, and objectives and policies for socio-cultural advancement.

The proposed project is consistent with the objectives and policies of the State Plan. The project will not have impact on the population as the beneficiaries of the project are primarily existing local residents. The project will contribute to the local economy by creating short and long-term employment during the construction and operation phases of the project. The project is respectful of the physical environment and will productively use an otherwise undesirable use within the urban environment. The project will be served by existing facilities and will not create the need for expanded systems.

Most relevant of the objectives and policies of the State Plan is HRS 226-19 which elaborates on the State's objectives for socio-cultural advancement as it relates to housing. In this regard the Plan states:

(1) Greater opportunities for Hawaii's people to secure reasonably priced, safe, sanitary, and livable homes, located in suitable environments that satisfactorily accommodate the needs and desires of families and individuals, through collaboration and cooperation between government and nonprofit and for-profit developers to ensure that more affordable housing is made available to very low-, low- and moderate-income segments of Hawaii's population, (2) the orderly development of residential areas sensitive to community needs and other land uses, (3) the development and provision of affordable rental housing by the State to meet the housing needs of Hawaii's people.

The 820 Isenberg project will advance HRS 226-19 by providing a variety of housing types including affordable rental and workforce housing that balances the market housing found in the project vicinity.

Furthermore, HRS 226-55, the State functional plan on housing specifies objectives, policies and implementing actions to realize the States objectives for diverse housing types and the intent of the functional plans to work in coordination with other County and regulatory concerns. As stated earlier, the 820 Isenberg project will expand the diversity of housing found in Moiliili area and is clearly supportive of the high demand affordable rental housing market.

The affordable housing provided by the project promotes all of the aforementioned State Plan provision and most significantly addresses HRS 226-106 which elaborates on the priority guidelines on affordable housing which is the primary intent of the subject project. The 820 Isenberg project is not in conflict with any of the State’s housing plan objectives.

HRS 226-108 provides the priority principles and guidelines for sustainability. In this regard, the project is generally consistent with all of the principles but is particularly applicable to the subsection (1) Encouraging balanced economic, social, community, and environmental priorities, and (3) Promoting a diversified and dynamic economy. The project will represent a significant component in creating a balanced Moiliili district by providing affordable rental housing units within an area that is also rich in high-end and market rate housing projects. By creating affordable workforce housing, the project will support diverse economic opportunity as well as social and community balance.

The project will utilize State of Hawaii DURF funds which requires that the project meet the provisions of § 103-50, Hawaii Revised Statutes as follows:

> *All buildings, facilities, and sites shall conform to applicable federal, state, and county accessibility guidelines and standards. Hawaii Revised Statutes §103-50 requires all State of Hawaii or County government buildings, facilities, and sites to be designated and constructed to conform to the Americans with Disabilities Act Accessibility Guidelines, the Federal Fair Housing Amendments Act, and other applicable design*

standards as adopted and amended by the Disability and Communications Access Board. The law further requires all plans and specifications prepared for the construction of State of Hawaii or County government buildings, facilities, and sites to be reviewed by the Disability and Communication Access Board for conformance to those guidelines and standards

4.2 City and County of Honolulu Plans

General Plan

The City and County of Honolulu General Plan provides the overall vision for the island of Oahu and broadly outlines the objectives and policies shaping future growth. While the proposed action is consistent with the Plan overall, it is particularly pertinent to the Section IV, Housing. It is here where proposed action supports Objective A, to provide decent housing for all the people of Oahu at prices they can afford, and Objective C, to provide the people of Oahu with a choice of living environments which are reasonably close to employment, recreation, and commercial centers and which are adequately served by public utilities. The proposed action will provide affordable rental housing that is located within close proximity to major employment centers as well as having excellent access to public transit options.

Development Plan

The City's Primary Urban Center (PUC) development plan guides development in the central urban area of Oahu. While the project is generally consistent with all aspects of the PUC, particularly relevant to the proposed project is Section 3.3 In-Town Housing Choices. It states that the PUC "offers in-town housing choices for people of all ages and incomes". The policies of the PUC plan that support the project include:

- Promote people-scaled apartment and townhouse dwellings in low- or mid-rise buildings oriented to the street.
- Reduce costs for apartment homes.
- Provide for high-density housing options in mixed-use developments.

The 820 Isenberg development addresses all of these policies by providing a full mix of affordable rental, workforce, and people scaled housing.

Required permits will include City and County of Honolulu Building Permits including grading and construction related permits as well as utility connection approvals.

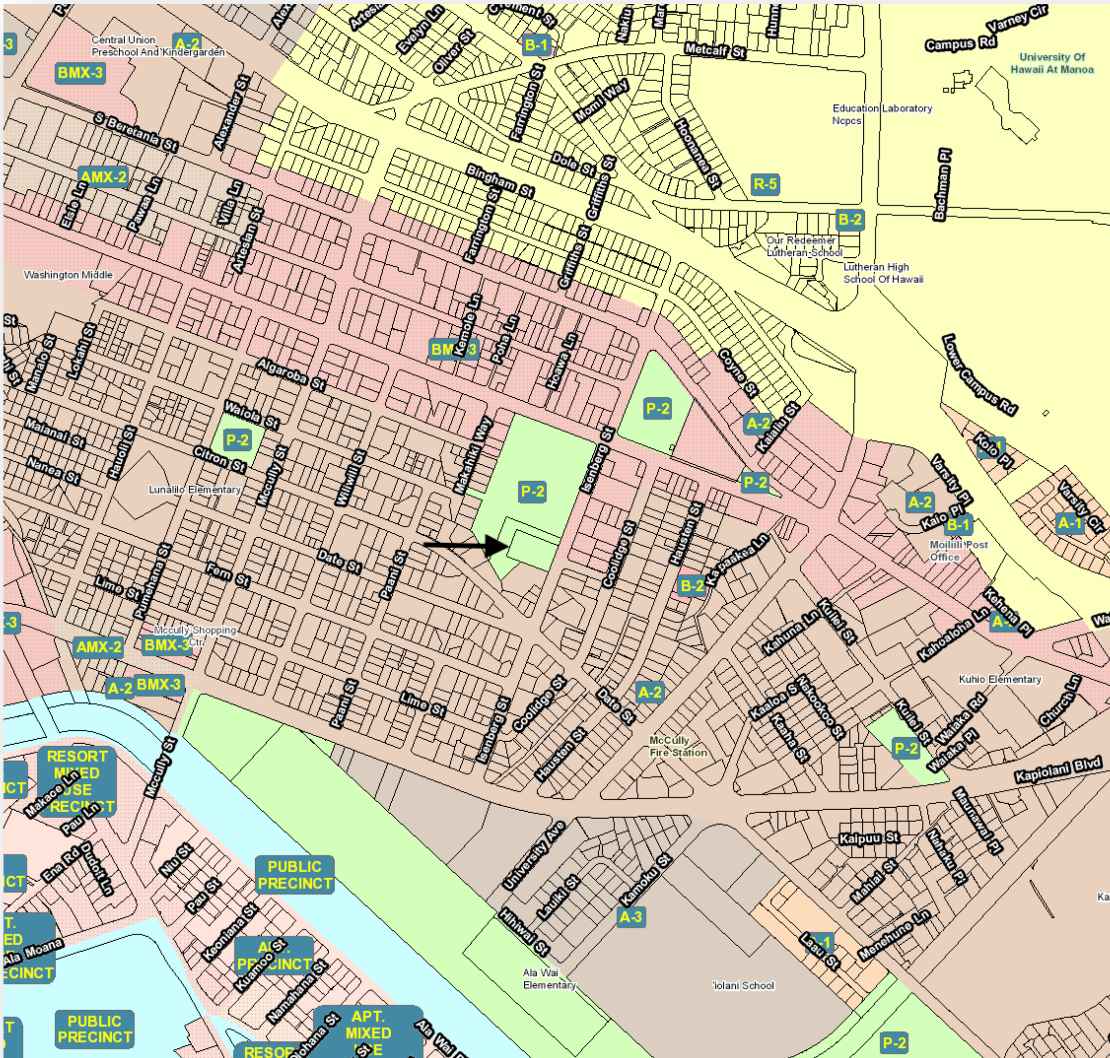


FIGURE 28: ZONING MAP SOURCE: DEPT. OF PLANNING AND PERMITTING

SECTION FIVE
IMPACTS, ALTERNATIVES AND MITIGATION MEASURES

5.1 PROBABLE IMPACTS ON THE ENVIRONMENT

The proposed project represents a significant change from its current and former uses. The project use is consistent with surrounding land uses and urban forms. The prevailing Land Use Ordinance designates the site as P-2 Preservation however through the use of the DHHL authority and 201H housing development initiatives, the proposed development was initiated. Impacts associated with the proposed project have generally been determined to be comparable with developments similar to the proposed project. Views will be impacted as a result of the new facility but should be considered in the context that any development of the site would likely impact views as well.

When viewed in the cumulative, impacts to the environment will be significant. The current use and existing structure is in a blighted condition and does not make any positive contribution to the surrounding community or the proposed beneficiaries. Significantly higher urban density resulting from the build out the project, traffic and noise impacts will rise over the no-action alternative. These cumulative impacts are largely due to the intensive level of activity that are typically associated with residential use however it will provide significant, new housing opportunities in an area conveniently situated to major employment centers, retail establishments and public services.

Positive environmental impacts are expected as a result of the affordable rental residential inventory. The convenience of residing near major employment centers and the University of Hawaii will decrease the need for private cars resulting in decreased traffic volumes and the associated environmental benefits of reduced traffic.

5.2 ADVERSE IMPACTS WHICH CANNOT BE AVOIDED

Adverse impacts that cannot be avoided are generally related to short-term construction impacts. These impacts can be minimized by sound construction practices, Best Management Practices (BMPs) adherence to applicable construction regulations as prescribed by the Department of Health, and coordination with applicable County agencies. Primary construction related impacts are discussed in greater detail in the Traffic Study located in Appendix E.

Increases in traffic and air and noise pollution will occur as is expected of any development of this nature.

5.3 ALTERNATIVES TO THE PROPOSED ACTION

The "No Action" alternative would result in continued deterioration of the site; potential for leaking of hazardous materials from the interior; and continued costs for maintenance and security to DHHL, without any tangible benefits.

Consolidation of the lots and re-subdivision into single-family lots for homestead lease awards was considered, but rejected as not being the best use of the property for the department and its beneficiaries.

Alternate conceptual development plans were submitted to DHHL in response to the Request for Proposals. The proposal by Stanford Carr Development was rated the highest by the evaluation committee.

Within the scope of proposed improvements, alternative density configurations were considered however an optimal high-rise scheme was selected as the most financially feasible while maintaining an attractive pedestrian scale. Commercial space adds in important mix of uses within this comprehensive transit stop.

Alternative locations were not considered as the initial RFP process was conducted specifically for this long vacant and severely underutilized site.

5.4 MITIGATION MEASURES

Long-term impacts resulting from the proposed improvements are expected to be minimal or non-existent based upon the subject environmental assessment. Long-term traffic, air and noise impacts are not expected to change significantly after improvements are completed. Short-term construction related noise and air quality impact mitigation measures include general good housekeeping practices and scheduled maintenance to avoid a prolonged construction period. The contractor will be directed to use best management practices (BMP) wherever applicable. Construction materials and equipment will be transported to the project site during non-peak traffic hours. In the event that existing roadways or sidewalks are damaged during construction activities, the roadways and sidewalks will be restored to original or better condition.

5.5 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

Implementation of the proposed project will result in the irreversible and irretrievable commitment of resources in the use of non-recyclable energy expenditure and labor. Materials used for new construction may have salvage value; however, it is unlikely that such efforts will be cost-effective. The expenditure of these resources is offset by gains in construction-related wages, increased tax base and tertiary spending.

6.0 LIST OF NECESSARY PERMITS AND APPROVALS

Permits and approvals that may be required are contingent upon the actual design of the proposed project. All other permits and approvals are generally ministerial in nature.

State Agencies

Permit or Approval	Approving Agency
National Pollutant Discharge	Dept. of Health
Elimination System (NPDES) Permit	Dept. of Health
Community Noise Permit / Variance	Dept. of Health

County Agencies

Permit or Approval	Approving Agency
Chapter 201H Approval	Honolulu City Council
Building Permits	Dept. of Planning and Permitting
Certificate of Occupancy	Dept. of Planning and Permitting
Construction Dewatering Permit	Dept. of Planning and Permitting
Grading and Stockpiling Permits	Dept. of Planning and Permitting
Sewer Connection Permit	Dept. of Environmental Services
Trenching Permit	Dept. of Planning and Permitting
Erosion Control Plan/Best Management Practices	Dept. of Planning and Permitting
Permit to Work Within County Right-of-Way	Dept. of Transportation Services

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7.0 FINDNGS AND REASONS SUPPORTING ANTICIPATED DETERMINATION OF FINDING OF NO SIGNIFICANT IMPACT

As stated in Section 11-200.1-13, EIS Rules, Significance Criteria: in determining whether an action may have a significant effort on the environment, every phase of a proposed action shall be considered. The expected consequences of an action, both primary and secondary, and the cumulative as well as the short-term and long-term effects must be assessed in determining if an action shall have significant effect on the environment. Each of the significance criteria is listed below and is followed by the means of compliance or conflict (if extant).

- Involves an irrevocable commitment to the loss or destruction of any natural or cultural resource.

The proposed action will occur on an existing developed site and will not impact any surrounding topographical features other than the removal or relocation of some existing trees. Subsurface archaeological artifacts are a possibility; therefore, an archaeological monitor will be present during the construction. In the event that any archaeological remains are uncovered during the course of construction, all work will stop and the State Historic Preservation Office will be contacted for appropriate action.

- Curtails the range of beneficial uses of the environment.

The proposed use will result in a significant change from its existing and former uses but represents an appropriate use that will benefit the public and will be environmentally consistent with the surrounding urban area. The proposed project will not curtail beneficial uses of the environment. The proposed project will provide needed housing inventory in Primary Urban Center and is considered a highest and best use in the public interest.

- Conflicts with the State's long-term environmental policies or guidelines as expressed in Chapter 344, HRS, and any revisions thereof and amendments thereto, court decisions, or executive orders.

The proposed action is consistent with the goals and guidelines expressed in Chapter 344, Hawaii Revised Statutes and NEPA.

- Substantially affects the economic welfare, social welfare, and cultural practices of the community or State.

The proposed action will make a positive contribution to the welfare and economy of the State and City by providing desirable and needed affordable rental housing to the State of Hawaii. The facility will also contribute positively to the community through the use of goods and services in the area, through construction related employment, and through secondary and tertiary spending and taxes. The proposed action will not have any impact on any native cultural practices as the site has been in urban use for over 100 years.

- Substantially affects public health.

The proposed improvements are not expected to have any direct impact on public health but will provide housing for a targeted occupants that may not otherwise have an opportunity for centrally located affordable housing. No recreational resources will be impacted by the project, nor will the project increase any undesirable environmental impacts. The existing contaminated building will be demolished and contaminants removed from the site.

- Involves substantial secondary impacts, such as population changes or effects on public facilities.

The proposed action will increase the population within the community and will increase the demand for public facilities. These impacts are consistent with residential development of this nature and are not considered adverse impacts. The change in population and demand for public facilities will be readily met by existing infrastructure and services.

- Involves a substantial degradation of environmental quality.

The proposed action will not degrade environmental quality. Impacts associated with the project, such as traffic impact and noise quality have been assessed to be minimal. The project is located in a highly urban environment that is expected to be heavily developed in the future. In that respect, the project is consistent with the overall land use of the district.

- Is individually limited but cumulatively has a considerable effect upon the environment or involves a commitment for larger actions.

The 820 Isenberg project is very beneficial in offering a diverse mix of housing types, commercial activity in consonance with the intent and overarching plans for the Primary Urban Center. The site will be appropriately entitled for the proposed activities and through the 201H process and does not serve as a component of a larger development.

- Substantially affects a rare, threatened or endangered species, or its habitat.

The proposed action will not affect any rare, threatened or endangered species of flora or fauna, nor is it known to be near or adjacent to any known wildlife sanctuaries.

- Detrimentally affects air or water quality or ambient noise levels.

The proposed action will not impact air or water quality. Noise levels will change from those associated with vacant land use to a mixed use development. The change in noise level is expected to be negligible and will not significantly affect surrounding properties. The project will reuse grey water.

Minimal impacts on air quality and noise are anticipated during construction, but will be limited by normal construction practices and Department of Health construction mitigation standards.

- Affects or is likely to suffer damage by being located in an environmentally sensitive area such as a flood plain, tsunami zone, beach erosion prone area, geologically hazardous land, estuary, fresh water, or coastal waters.

The project is not on or near an environmentally sensitive area.

- Substantially affects scenic vistas and view planes identified in County or State plans or studies.

The proposed action will not affect any scenic vistas or view planes as surrounding developments already tower around the proposed project. The project is located in a highly urban environment.

- Requires substantial energy consumption.

The project will increase electrical energy consumption over the existing use. This increase will be consistent with residential use and will be typical of any high-density urban use. The project will include energy conservation measures to the greatest extent practicable. General conservation goals include: meeting State energy conservation goals, using energy saving design practices and technologies, and recycling and using recycled-content products. Photovoltaic energy will be used for common areas.

Based on the above stated criteria, the proposed 820 Isenberg mixed use development is not expected to have a significant effect on the environment beyond those associated with a master planned community. As such, a Finding of No Significant Impact (FONSI) is anticipated for the project by Hawaiian Home Land Commission and the Housing Finance and Development Corporation.

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8.0 PARTIES CONSULTED DURING THE PREPARATION OF THE DRAFT ENVIRONMENTAL ASSESSMENT

State Agencies

Department of Education

Department of Hawaiian Home Lands

Department of Land and Natural Resources
Historic Preservation Division

City and County Agencies

Board of Water Supply

Department of Planning and Permitting

Department of Transportation Services

Honolulu Fire Department

Honolulu Police Department

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9.0 LIST OF PARTIES TO BE CONSULTED DURING THE DRAFT ENVIRONMENTAL ASSESSMENT REVIEW PROCESS

Agencies with ministerial or specific interests regarding the proposed project were contacted for their comments regarding the proposed project. Parties contacted are listed and the date of their comments are listed below.

Comment Date

Federal Agencies

US Department of Housing and Urban Development

US Environmental Protection Agency
Region IX Administrator

State Agencies

Department of Business Economic Development & Tourism
Energy, Resources & Technology Division
Department of Education
Department of Health
Department of Health Hazard Evaluation and Emergency Response Office
Department of Health Clean Water Branch
Department of Land and Natural Resources
Department of Land and Natural Resources
State Historic Preservation Officer
Department of Transportation
Disability and Communication Access Board
Hawaii Housing Finance and Development Corporation
Office of Environmental Quality Control
Office of Hawaiian Affairs
Office of Planning
University of Hawaii at Manoa Environmental Center

County Agencies

Board of Water Supply
Department of Community and Social Services
Department of Design and Construction
Department of Environmental Services
Department of Facilities Maintenance
Department of Planning and Permitting
Department of Parks and Recreation
Department of Transportation Services
Fire Department

Police Department

Elected Officials

Senator Mazie Hirono, U.S. Senate
Senator Brian Schatz, U.S. Senate
Representative Ed Case, U.S. House of Representatives
Representative Kaiali'i Kahele, U.S. House of Representatives
Senator Les Ihara, Jr., Senate District 10
Senator Brian Taniguchi, Senate District 11
Senator Sharon Moriwaki, Senate District 12
Representative Scott Nishimoto, Representative District 21
Representative Dale Kobayashi, Representative District 23
Representative Scott Saiki, Representative District 26
Councilman Calvin Say, City Council, District 5

Organizations

Charter Communications
Hawaiian Electric Company
Hawaiian Telcom
Kamehameha Schools
McCully Moiliili Neighborhood Board No. 8
Papakolea Community Development Corporation
The Gas Company
Neighboring Properties

Appendix A

Archaeological Inventory Survey at 820 Isenberg Street, Waikiki Ahupuaa, Kona District, Island of Oahu. Pacific Legacy

Pacific Legacy

Historic Preservation

REVISED DRAFT

ARCHAEOLOGICAL INVENTORY SURVEY AT 820 ISENBERG STREET, WAIKĪKĪ AHUPUA‘A, KONA DISTRICT, ISLAND OF O‘AHU

[TMK (1) 2-7-008:018 and 020]

Pacific Legacy: Exploring the past, informing the present, enriching the future.

CULTURAL RESOURCES CONSULTANTS

Hawai‘i Offices:
Kailua, O‘ahu
Hilo, Hawai‘i

California Offices:
Business Office
Bay Area
Sierra/Central Valley

REVISED DRAFT

ARCHAEOLOGICAL INVENTORY SURVEY AT 820 ISENBERG STREET, WAIKĪKĪ AHUPUAʻA, KONA DISTRICT, ISLAND OF OʻAHU

[TMK (1) 2-7-008:018 and 020]

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ABSTRACT

Pacific Legacy Inc., at the request of the Department of Hawaiian Home Lands (DHHL) conducted an Archaeological Inventory Survey (AIS) on a ca. 1.9-acre property located at 820 Isenberg Street in Mōʻiliʻili on the island of Oʻahu [TMK (1) 2-7-008:018 and 020]. The AIS was undertaken between July 10 and 14, 2017. The investigations were led by Dr. Paul L. Cleghorn, Ph.D. with fieldwork conducted by James D. McIntosh, B.A. and Caleb C. Fechner, B.A.

The site is known as the Stadium Bowl-O-Drome, SIHP Site No. 50-80-14-08721. A total of 24 test trenches were dispersed evenly throughout the project area to identify the presence of any cultural resources. The results identified a single site (SIHP No. 50-80-14-08210) covering portions of the project area. The historic dump site consists of natural limestone depressions filled in with silt soil deposits, interspersed with glass, ceramic and metal artifacts dating to between 1896 and the 1960s. The area is also uniformly covered by several layers of fill material that appear to have capped the site and prepared the area for use as a parking lot. A total of 141 artifacts were recovered from the site.

The proposed development of 820 Isenberg Street is subject to the regulations associated with the National Register of Historic Places (NRHP) of 1966 (as amended). The project has secured Federal funding through HUD. Due to the federal participation, this project is considered an "undertaking" and is subject to Section 106 requirements of the National Historic Preservation Act of 1966, per 36 CFR 800. This project is also subject to Hawaiʻi Revised Statutes (HRS) 6E.

Based upon criteria set forth in the HRS 6E, Site 50-80-14-08210 is significant under Criterion d. Based upon the criteria set forth by the NRHP, Site 50-80-14-08210 is significant under Criterion D.

Archaeological monitoring is recommended for any future excavation work within the project area.

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Cover image: Trench excavation within the Bowl-O-Drome Parking Lot, view to east.

1.0 INTRODUCTION

Pacific Legacy Inc., at the request of the Department of Hawaiian Home Lands (DHHL) conducted an Archaeological Inventory Survey (AIS) in a ca. 1.9-acre project area located at 820 Isenberg Street in Mōʻiliʻili, within the Ahupuaʻa of Waikīkī, Kona District, Island of Oʻahu [TMK (1) 2-7-008:018 and 020] (Figure 1). This property is the site of the still-standing, but unoccupied, Stadium Bowl-O-Drome, SIHP Site No. 50-80-14-08721, and its parking lot, which opened in 1955 and closed 49 years later in 2004. The subject parcel is currently being considered for redevelopment. As part of the development, DHHL has secured federal funding from Housing and Urban Development (HUD) to assist in planning. Due to the federal participation, this project is considered an "undertaking" and is subject to Section 106 requirements of the National Historic Preservation Act of 1966, as amended. As part of the project, an Environmental Impact Statement is required that triggers HRS Chapter 343, which includes the necessity of an archaeological inventory survey of the project area.

In February 2017, Pacific Legacy submitted, via email, an Archaeological Inventory Survey testing strategy to the State Historic Preservation Division (SHPD) that defined the project area and the federal Area of Potential Effect (APE). In March 2017, DHHL submitted a letter that redefined the APE, addressed the visual effects, and proposed a Cultural Impact Assessment, and two architectural surveys—Reconnaissance Level Survey and an Intensive Level Survey of the Bowl-O-Drome building—in addition to the AIS. SHPD subsequently approved the Archaeological Inventory Survey testing plan in a letter dated June 6, 2017 (Cleghorn 2017; Log No. 2017.00486, Doc. No. 1705KN04).

1.1 PROJECT DESCRIPTION

The 820 Isenberg project has both a defined Area of Potential Effect (APE) and the 1.9-acre Project Area, with the APE being larger and more encompassing than the Project Area (Figure 2). The larger APE was defined to assess effects on adjacent historic architectural properties. The APE boundaries run from the *mauka* (north) side of Citron Street north to the *makai* (south) side of Young and Beretania Streets. The APE is bounded on the west by Paʻani Street, Makahiki Way, and Pohā Lane. The east boundary is aligned north–south in the middle of the block between Coolidge and Hausten Streets. This area may be indirectly (e.g., visually) affected should a high-rise building be erected on the Stadium Bowl-O-Drome property. The surrounding area consists primarily of residential and commercial properties.

The project area consists of the existing building parcel, TMK: (1) 2-7-008:018, and a neighboring parking lot parcel, TMK: (1) 2-7-008:020, also owned by DHHL. The abandoned, but still standing, Bowl-O-Drome structure was constructed in 1956 and sits on a 0.918-acre site, and the neighboring parking lot parcel consists of a 0.976-acre site, together totaling the ca. 1.9-acre project site.

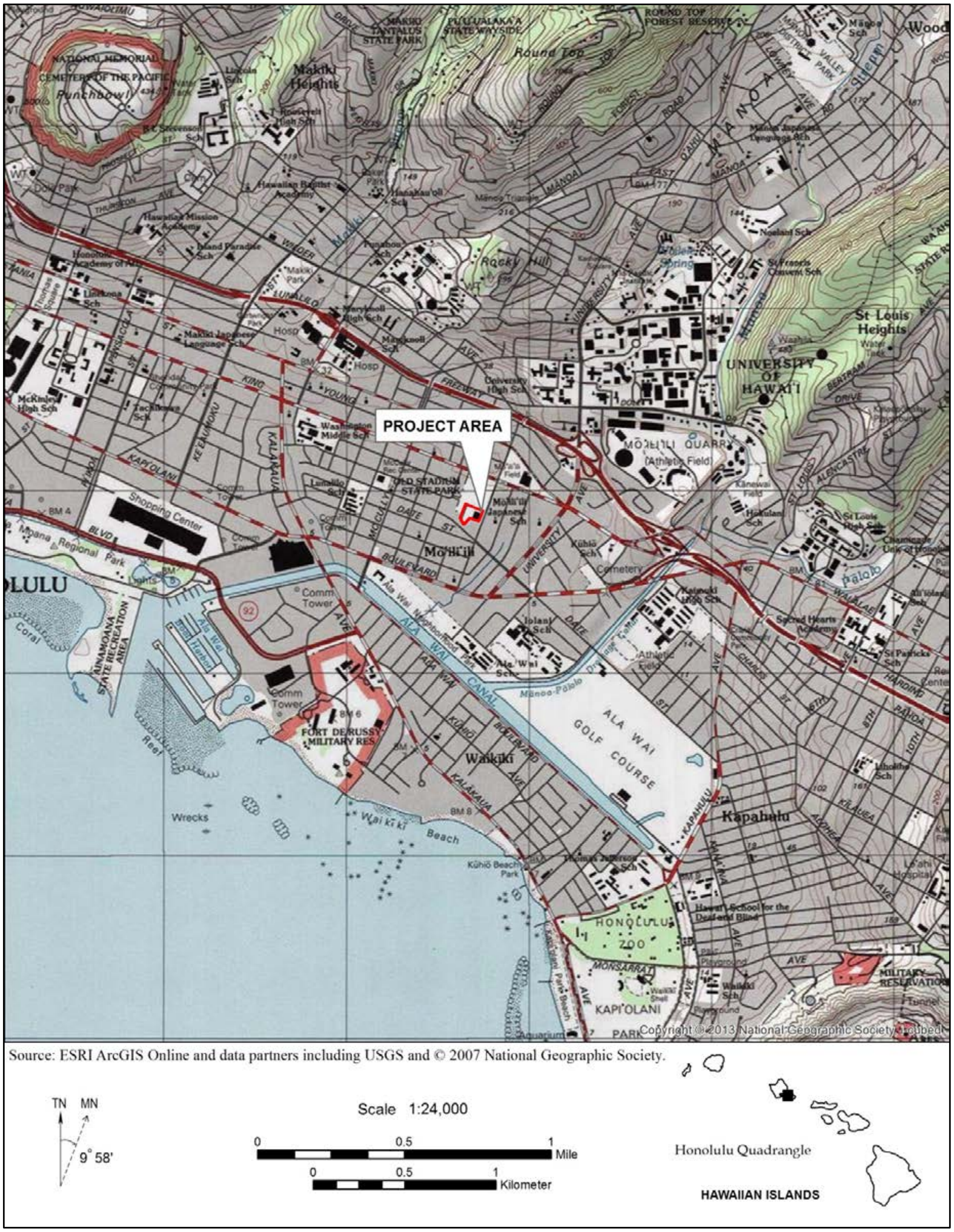

Figure 1. Project Area plotted on 2016 USGS Map, Honolulu Quadrangle.

Figure 2. Google Earth image showing both area of potential effect in yellow and project area in red (Source: Google Earth 2013).

1.2 ENVIRONMENT

The entire project area consists of active roadways, covered with asphalt. The vegetation is limited to the southern side of the project area in a small area of landscaped trees; some of the surrounding area is landscaped with grass and trees, such as the neighboring park. The setting is entirely urban in design. Rainfall in Waikīkī averages 20 inches per year, with the wettest months being December and January (Giambelluca and Schroeder 1998:56). Temperatures typically range between 61º F in January and 90º F in August.

The project area is located 1.6 km north of the coast and the topography is flat. The elevation is approximately 10 ft. In pre-Contact times, Waikīkī consisted of fishponds and *loʻi* (irrigated terraces) that were fed by streams.

1.2.1 Geomorphology of the Area

The island of Oʻahu is comprised of two extinct shield volcanoes that erupted 1.3 and 2.2 million years ago: Koʻolau on the east side of the island and Waiʻanae on the west side. The Koʻolau mountain range consists of eruptive material from the shield and rejuvenated stages in the evolution of a Hawaiian volcano (Clague 1998:38–42).

> In the early Pleistocene Period, one million to ten thousand years ago, the sea level alternately rose and receded +55 feet, then -55 feet, then +95 feet, then +70 feet, then +40 feet. With each rise of the sea, the Koʻolau Formations became eroded by marine action and coral was deposited. Shorelines were farther inland than those of today. The land was deeply dissected by streams. This was the time of widespread glaciations, causing the sea to fall with the freezing part of the cycle, and rise with the melting part of the cycle. (Gardner and Ruby 2005:2–3)

The lavas present in the Honolulu area are rejuvenated-stage lavas—specifically, Honolulu Volcanics and Koʻolau basalt—and include flows of alkali basalt, basanite, nephelinite, and melilitite. Flows from inland eruptions funneled down valleys such as Nuʻuanu and Mānoa, creating flat valley floors. Explosive vent eruptions occurred along Oʻahu's south coast and produced tuff cones, such as Diamond Head. Most lavas of this area appear to be older than 100,000 years, while the most reliably dated vent, Black Point at the base of Diamond Head (aka Lēʻahi), is 410,000 years old (Clague 1998:42).

> A distinctive feature of Oʻahu's geomorphology is the broad plain that extends from Diamond Head across Pearl Harbor to ʻEwa and Barbers Point. Composed of raised coralline limestone, this emergent coastal plain is partly the result of upward seafloor warping or tilting, in response to the weight of the larger islands of Maui and Hawaiʻi. (Juvik and Juvik 1998:7)

A pond was formerly located in the vicinity of the project area:

> Loko Opukaala (meaning unknown) was a Land Commission Award claimed by the *aliʻi* William C. Lunalilo (LCA 8559 B), as a *lele* (a discontinuous section of an *ʻili*) of Pau [...] According to Cobb, the pond was 1.7 acres in 1901. In 1928, the pond had an overflow of 2.42 millions of gallons per day. This might have been the pond on Isenberg Street makai of the Honolulu Stadium described by the long-time residents.

> In the 1920s, the whole complex between South King Street, Kapiʻolani Boulevard, and the Stadium outfield was wild brush. Makai of the Bowl-o-Drome, a Chinese farmer cultivated a lotus pond. When Isenberg Street was cut through from South King Street to Kapiʻolani Boulevard, this pond was covered up. This might have been Loko Opukaalalo, or possibly Loko Maalahia. (Mōʻiliʻili Community Center 2005)

The Mōʻiliʻili area is home to a series of subterranean karst caverns and waterways commonly known as the Moiliili Karst. The Moiliili Karst occurs in Pleistocene reef limestone located just east of the current project area. The area in question covers approximately one square kilometer and is located between the quarry area of the lower University of Hawaiʻi at Mānoa campus, Kapiʻolani Boulevard to the south and Isenberg Street to the west (Figure 3). A geotechnical engineering study completed for the Stadium Bowl-O-Drome site states that, "[t]he project site appears to be outside the limits of the Moiliili Karst" (Truong 2016:3).

The Stadium Bowl-O-Drome is located, approximately, a mere 100 meters west of the western extent of the Moiliili Karst area. This system once contained untapped fresh water fed from several natural artesian springs. The water was reportedly cool, clean, fresh, and contained a type of blind mullet (Mugilidae – typically a salt water fish) (Gardner and Ruby 2005:7). As modern development expanded the use of the Mōʻiliʻili area, these springs and waterways were impacted by increased urbanization. Concrete piles used to support structures have penetrated the karst system and altered springs. Access to these caverns was once allowed but today is limited. The caverns have become polluted and dangerous and have been closed off to public access.

The point labeled C on a map by Halliday (1998:141; Figure 3) is the location of the 1934 excavation during construction activities into a karstic master conduit that caused dewatering of the karst upslope because ponds are connected by drainage conduits, shown as green lines in Figure 3:

> In the autumn of 1934 the karst and its drainage were altered profoundly. Five hundred meters downslope from the King-University intersection, construction activities struck a karstic master conduit -7 m msl […] Upslope, the results of this dewatering were dramatic. The Hausten pond [H, Figure 3] disappeared without warning, draining in less than 24 hours. (Halliday 1998:144)

Sinkholes opened up, and several house foundations lurched and settled, some sidewalks cracked, some water and gas mains ruptured, and some trees sank almost 1 m in the area outlined in red in Figure 3 (Halliday 1998:144).

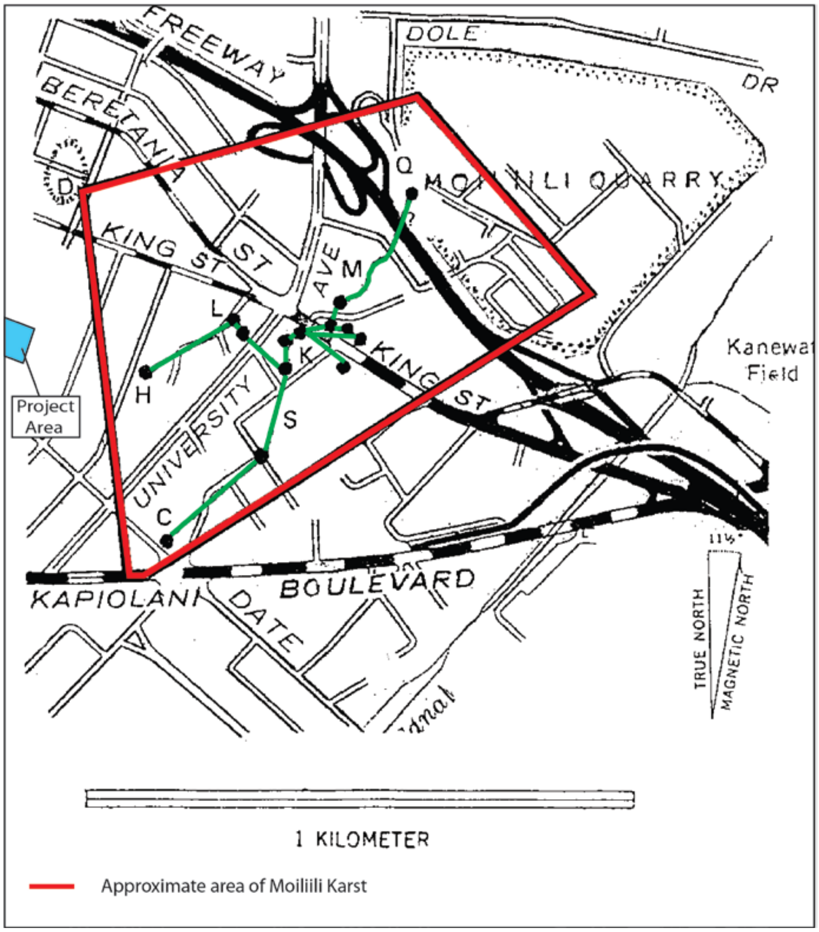

Figure 3. The Moiliili Karst area (adapted from Halliday 1998). The green lines indicate the locations of documented drainage conduits.

1.2.2 Soils

Soils within the project area consist of the Ewa Series, specifically the Ewa silty clay loam, moderately shallow, 0 to 2 percent slopes, (EmA). Other soils in the project vicinity outside of the project area include fill land (FL), Kawaihapai clay loam, 0–2 percent slopes (KIA), Makiki clay loam, 0–2 percent slopes (MkA), and Makiki stony clay loam, 0–3 percent slopes (MIA**)** (Figure 4).

Ewa Series

This soil consists of well-drained soils in basins and on alluvial fans… These soils developed in alluvium derived from basic igneous rock. They are nearly level to moderately sloping. Elevation ranges from near sea level to 150 feet (Foote et al. 1972:29).

> **Ewa silty clay loam, moderately shallow, 0–2 percent slopes (EmA)**
> The depth to coral limestone is 20 to 50 inches. Runoff is very slow, and the erosion hazard is no more than slight. This soil can be used for sugarcane, truck crops, and pasture (Foote et al. 1972:30).

Fill Land

This land type consists of areas filled with material from dredging, excavation from adjacent uplands, garbage, and bagasse and slurry from sugar mills. The areas are on the islands of Kauai, Maui, and Oahu (Foote et al. 1972:31).

> **Fill land, mixed (FL)**
> This land type occurs mostly near Pearl Harbor and in Honolulu, adjacent to the ocean. It consists of areas filled with material dredged from the ocean or hauled from nearby areas, garbage, and general material from other sources. This land type is used for urban development including airports, housing areas, and industrial facilities (Foote et al. 1972:31).

Kawaihapai Series

This series consists of well-drained soils in drainage ways and alluvial fans on the coastal plains…These soils formed in alluvium derived from basic igneous rock in humid uplands (Foote et al. 1972:63).

> **Kawaihapai clay loam, 0–2 percent slopes (KIA)** – This soil occupies smooth slopes… Permeability is moderate. Runoff is slow, and the erosion hazard is no more than slight… In places roots penetrate to a depth of 5 feet or more. In some places this soil is subject to flooding… This soil is used for sugarcane, truck crops, pasture, and orchids (Foote et al. 1972:64).

Makiki Series

This series consists of well-drained soils on alluvial fans and terraces in the city of Honolulu… These soils formed in alluvium mixed with volcanic ash and cinders (Foote et al 1972: 91).

> **Makiki clay loam, 0–2 percent slopes (MkA)** – This soil is on smooth fans and terraces… Permeability is moderately rapid. Runoff is slow, and the erosion

hazard is no more than slight… This soil is almost entirely in urban use (Foote et al. 1972: 92).

Makiki stony clay loam, 0 to 3 percent slopes (MIA) – This soil is similar to Makiki clay loam, 0–2 percent slopes, except that there are enough stones to hinder cultivation. This soil is almost entirely in urban use.

1.3 SOIL CONTAMINATION

During the current AIS, a limited Phase II Environmental Site Assessment was conducted by Element Environmental, LLC. Soil sampling was limited to within the archaeological test trenches, with the emphasis being identification of potential soil contaminants. A draft letter report of their findings has been produced (Element Environmental 2017a). In-field safety precautions were followed as recommended by environmental personnel. Soil contaminants Barium, Lead, Lindane (a pesticide), TPH-DRO and TPH-RRO (Total petroleum hydrocarbons**)** were identified in some form within 14 of the 23 trenches sampled (Trenches 3, 7, 8, 9, 10, 11, 12, 16, 17, 18, 19, 20, 22, 23) and exceed the Hawaii Department of Health (HDOH) Tier 1 Environmental Action Levels (EALs) for Residential land use and/or HDOH EALs for Commercial/Industrial land use in some way (Element Environmental 2017a:9).

Figure 4. Soils map indicating soil type within and around project area (Source Map: USGS 2016, Honolulu Quadrangle and USDA Soil Survey).

2.0 HISTORIC BACKGROUND

2.1 WAIKĪKĪ AREA

The *ahupua*ʻ*a* (traditional land division) of Waikīkī, literally "spouting water" (Pukui et al. 1976:223), encompassed the land from Honolulu to Maunalua Bay and from the ocean to the ridge of the Koʻolau mountain range (Figure 5). The Waikīkī of yesterday was an important political seat and a highly utilized area for agriculture and aquaculture. The Waikīkī of today is highly urbanized, densely populated, and has the highest concentration of visitor accommodations in the State.

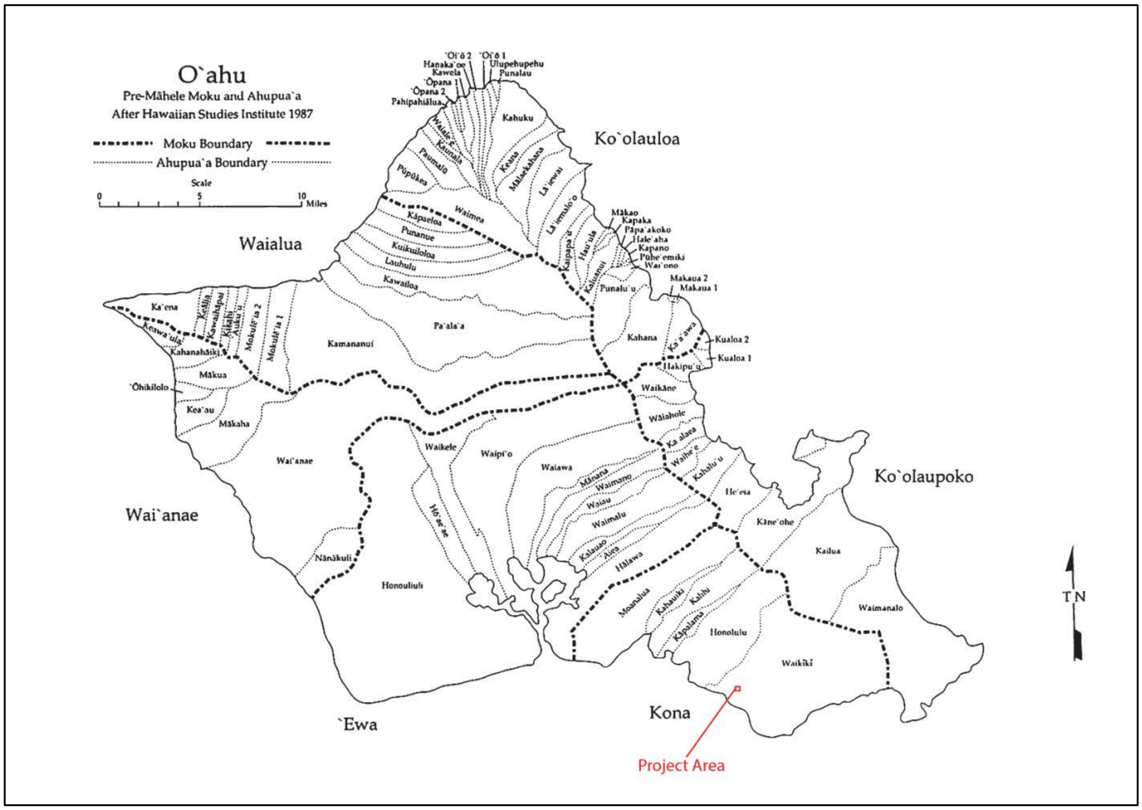

Figure 5. Traditional *moku* and *ahupua*ʻ*a* names and locations on the island of Oʻahu, after Hawaiian Studies Institute (1987).

Although the project area is situated within the *ahupua*ʻ*a* of Waikīkī, it is outside of what most people today would consider Waikīkī proper and is actually situated in the inland area between the areas of Kaimukī and Pāwaʻa. The map by Ober (Figure 6) displays the common names in the project vicinity and indicates the area is situated between Kaimukī, Pāwaʻa and Kālia (ʻĪʻī 1995:93). The map also indicates the project area is in the middle of two trail systems that connected the Honolulu area to Kaimukī and Kāhala areas.

The *ahupua*ʻ*a* of Waikīkī was located in the traditional district or *moku* of Kona. The Kona district *ali*ʻ*i nui* (high chief) Maʻilikūkahi made Waikīkī the seat of government at the end of the 14th century (Beckwith 1940).

The 15th century saw the construction of a vast system of irrigated *lo*ʻ*i* (pondfields) and *loko* (fishponds) that extended across the littoral plain of Waikīkī. The agriculture and aquaculture consisted of extensive *lo*ʻ*i kalo* (taro pondfields), ʻ*auwai* and *loko* (irrigation systems) which dispersed the water resources that flowed from the mountain streams throughout the hinterland of Waikīkī (Nakamura 1979). "In upper Manoa the whole of the level land in the valley bottom was developed in broad taro flats" (Handy 1940:77). The importance of Waikīkī as a center of political and social power was displayed in the importance of its *heiau* and continued through the time of Kamehameha I (Handy et al. 1991) who built a chiefly residential complex there after defeating Oʻahu's chief, Kalanikūpule, in 1795. John Papa ʻĪʻī (1995), retainer to Liholiho (Kamehameha II) and historian, wrote of Kamehameha I's Waikīkī residence — "Kamehameha's houses were at Puaaliiili, makai of the old road, and extended as far as the west side of the sands of Apuakehau. Within it was Helumoa…, where Kaahumanu *ma* went to while away the time. The king built a stone house there, enclosed by a fence…" (ʻĪʻī 1995:17). ʻĪʻī also noted that "this place had long been a residence of chiefs. It is said that it had been Kekuapoi's home, through her husband Kahahana, since the time of Kahekili" (ʻĪʻī 1995:17).

By the end of the 18th century, Waikīkī had developed into one of the most densely populated areas on Oʻahu as well as a rich, highly cultivated agricultural and aquacultural district (Davis 1989). According to Handy and Pukui, the Hawaiian planter "…carefully thought out procedures of cultivation…that were adjusted to every circumstance of climate, altitude, weather, exposure, soil, and locality" (Handy et al. 1991:21). In 1792, George Vancouver, captain of the HMS Discovery, described Waikīkī as follows:

> On the shores [of the bay] the villages appeared numerous and in good repair; and the surrounding country pleasingly interspersed with deep, though not extensive valleys; which, with the plains near the seaside, presented a high degree of cultivation and fertility….To the northward through the village…an exceedingly well-made causeway, about twelve feet broad, with a ditch on either side. This opened to our view a spacious plain, which…had the appearance of the open common fields of England; but on advancing, the major part appeared divided into fields of irregular shape and figure, which were separated from each other by low stone walls, and were in a very high state of cultivation. These several portions of land were planted with the eddo or taro root, in different stages of inundation; none being perfectly dry, and some from three to six or seven inches under water….Near a mile from the beach…was a rivulet five or six feet wide, and about two or three feet deep, well banked up and nearly motionless; some small rills only, finding a passage through the dams that checked the sluggish stream, by which a constant supply was afforded to the taro plantations….At the termination of the causeway the paths of communication with the different fields or plantations were on these narrow stone walls; very rugged and where one person only could pass at a time….The sides of the hills, which were at some distance, seemed rocky and barren; the intermediate valleys, which were all inhabited, produced some large trees, and made a pleasing appearance. The plains, however, if we may judge from the labor bestowed on their cultivation, seem to afford the principal proportion of the different vegetable

productions on which the inhabitants depend for their subsistence. The soil, though tolerably rich and producing rather a luxuriant abundance, differs…from that of…Otaheite (Vancouver 1798: Vol. 1, 360–365).

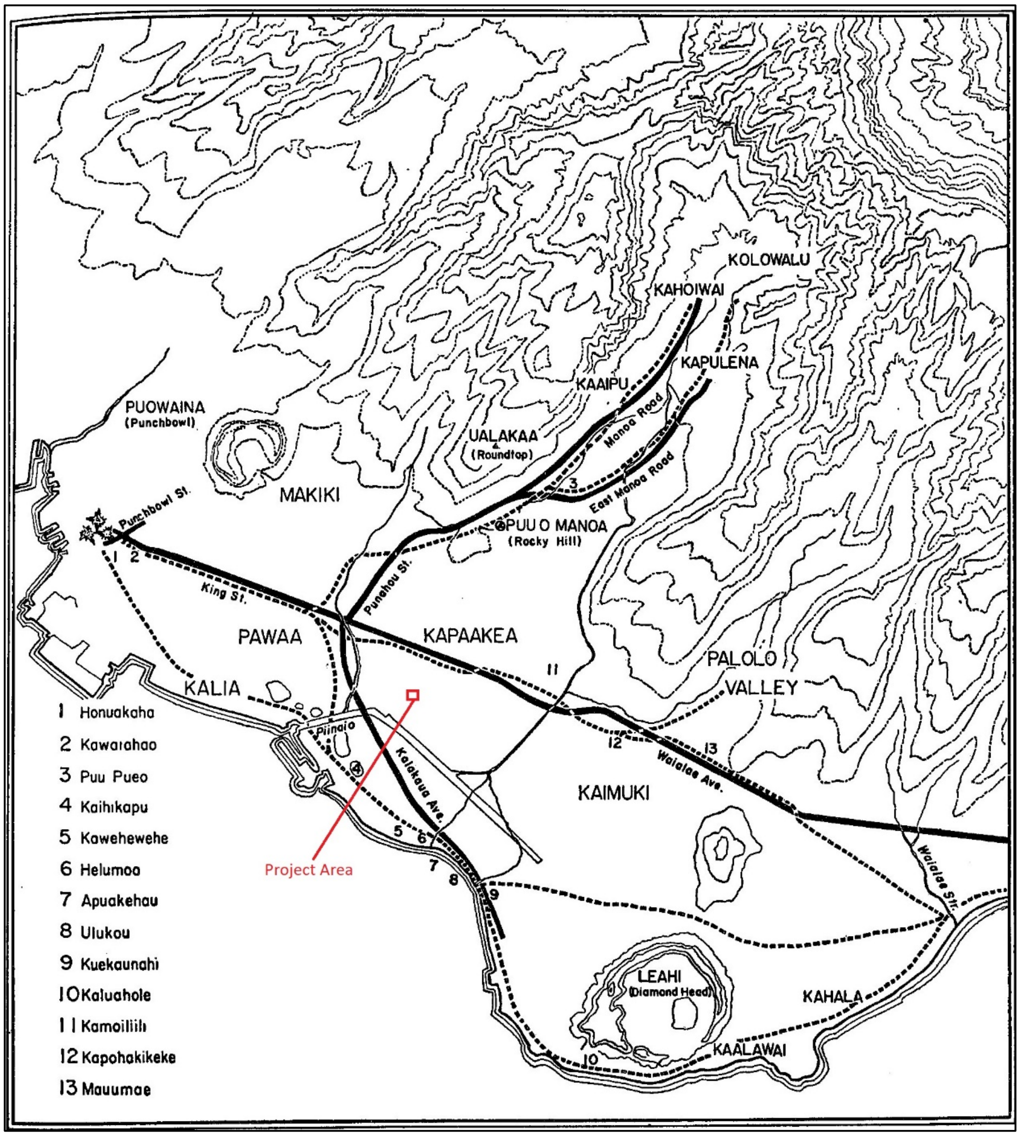

Figure 6. Trails near the project area. Map by Gerald Ober (ʻĪʻī 1995:93).

Archibald Menzies served as surgeon and naturalist aboard the HMS Discovery on three voyages to the Hawaiian Islands between 1792 and 1794. He described the large village of Waikīkī and the agriculture of the surrounding area:

> …The verge of the shore was planted with a large grove of cocoanut palms, affording a delightful shade to the scattered habitations of the natives….We pursued a pleasing path back into the plantation, which was nearly level and very extensive, and laid out with great neatness into little fields planted with taro, yam, sweet potatoes, and the cloth plant.
>
> These, in many cases, were divided by little banks on which grew the sugar cane and a species of Draecena [*ti* – footnote in original] without the aid of much cultivation, and the whole was watered in a most ingenious manner by dividing the general stream into little aqueducts leading in various directions so as to supply the most distant fields at pleasure, and the soil seems to repay the labor and industry of these people by the luxuriancy of its production (Menzies 1920:23–24).

Post-1778, the native population of Hawaii entered a period of rapid decline, the result of introduced diseases that Hawaiians had no immunity to withstand (Lind 1968:40). The decrease in the Hawaiian population and the draw of Honolulu's bustling harbor and foreign trade contributed to the neglect of Waikīkī's *lo*ʻ*i* which were allowed to fall into disuse and revert to what was considered by some swampland. When Levi Chamberlain, an agent of the American missionaries, toured Waikīkī in 1828, the impact of the neglect was apparent:

> …[W]e took a path on our right leading through a grove of tall cocoanut trees towards Waikiki—Our path led us along the borders of extensive plats of marshy ground, having raised banks on one or more sides, and which were once filled with water, and replenished abundantly with esculent fish; but now overgrown with tall rushes waving in the wind. The land all around for several miles has the appearance of having been once under cultivation. I entered into conversation with the natives respecting its present neglected state. They ascribed it to the decrease of population… (Chamberlain 1957:26).

The decline in the population of native Hawaiians saw a commensurate rise in power, both economically and politically, of an oligarchy of Western capitalists (Nakamura 1979). The traditional subsistence economy yielded to external economic forces and a succession of export industries would contribute to the transformation of the social climate and economic landscape of Hawaiʻi.

From 1812 to 1830, the sandalwood trade with China thrived. This industry was monopolized by *nā ali*ʻ*i nui* (high chiefs) who required burdensome tributes and taxes from the *maka*ʻ*āinana* (commoners) to pay off debts and support a growing desire for foreign status goods (Juvik and Juvik 1998). Beginning in 1819 and lasting into the 1860s, the Pacific whaling industry found the harbors of Honolulu and Lāhainā opportune and profitable ports of call. As the whaling industry declined, the American Civil War created a demand for sugar that *haole* (Caucasian) businessmen were quick to exploit. "From 1860 to 1900, sugar production and exports increased steadily, sugarcane acreage expanded, and sugar profits grew. Cultivated on large landholdings with hand labor, sugar turned Hawaiʻi into a plantation society. It was dominated by mostly American elite of plantation owners and their financial associates in Honolulu, tied culturally and economically to the United States" (Juvik and Juvik 1998:174). A decreased, economically and socially disenfranchised Hawaiian population could not satisfy the massive amounts of labor required to support expanding sugar production, thus, requiring the importation of foreign labor. The first influx of indentured laborers arrived from China in 1852 and 1855 (Daws 1982) followed by the Portuguese and Japanese, and by 1896 the "massive infusions of new blood…greatly outnumbered the native Hawaiians" (Schmitt 1968:5). Another burgeoning agricultural industry in the latter half of the 19th century was rice cultivation. In 1858, investors in the Royal Hawaiian Agricultural Society appointed Dr. H. Holstein as proprietor and manager of a tract of land in Nuʻuanu valley where he "…planted seed-rice imported from China in a former taro patch" (Haraguchi 1987:xiii). A new, high-yield variety was planted in 1860 and its success increased the value of *loʻi* (pond fields) once used to cultivate *kalo* (taro). On October 3, 1861, the Commercial Pacific Advertiser reported that "[e]verybody and his wife…are into rice…. Taro patches are held at fabulous valuations…." (Thrum 1877:47 as cited in Haraguchi 1987:xiii). Land investors began to acquire available *loʻi* land since "where taro grows, rice grows also" (Haraguchi 1987:30). Waikīkī was again recognized as one of the "most important growing districts on Oahu" (Iwai 1933:38) and by 1892, about 542 acres of *loʻi* were planted in rice (Nakamura 1979; Iwai 1933; Coulter and Chun 1937). The U.S. Department of Commerce reported that by the 1900 census, rice production in Hawaiʻi was second only to sugar in value and acreage (Coulter and Chun 1937 as in Haraguchi 1987).

2.2 Land Commission Awards

Private land ownership was established in Hawaiʻi with the Māhele ʻĀina, also known as the Great Māhele of 1848. Crown and *aliʻi* lands were awarded in 1848 and *kuleana* titles were awarded to the general populace in 1850 (Chinen 1958). Awarded lands in this process are referred to as Land Commission Awards (LCAs). Over time, Crown lands were sold off to pay government expenses. The purchasers of these lands were awarded Grants or Royal Patent Grants (Chinen 1958). LCAs offer the native and foreign testimonies recorded during the claiming process, which shed light on what the land use of the area was in the early historic period. This information can be used to predict the types of resources that may still be present in the project area.

A review of the available records indicates that seven LCAs were awarded near the current project area (Table 1 and Figure 7, Figure 8, and Figure 9). LCA 2017 was awarded to Ohule, LCA 1047 was awarded to Naukana, LCA 8841 was awarded to Kapeau, LCA 6235 was awarded to Kapaakea, LCA 8035 was awarded to Akaole, LCA 4313 was awarded to Paukaa, and 3721B to Makuaole.

Table 1. Land Commission Awards near the project area.

LCA No.	Awardee	Acreage	Usage
1047	Naukana	-	-
2017	Ohule	ʻili of Kamookahi	Two taro loʻi, one house site, irrigation ditch, hau tree
3721B	Makuaole	-	-
4313B	Paukaa	Within ʻili of Opukaala	One house lot
6235	Kapaakea	3 sections in Waikiki	-
8035	Akaole	-	2 loʻi, house lot
8841	Kapeau	½ of the Pawaa ʻili	-

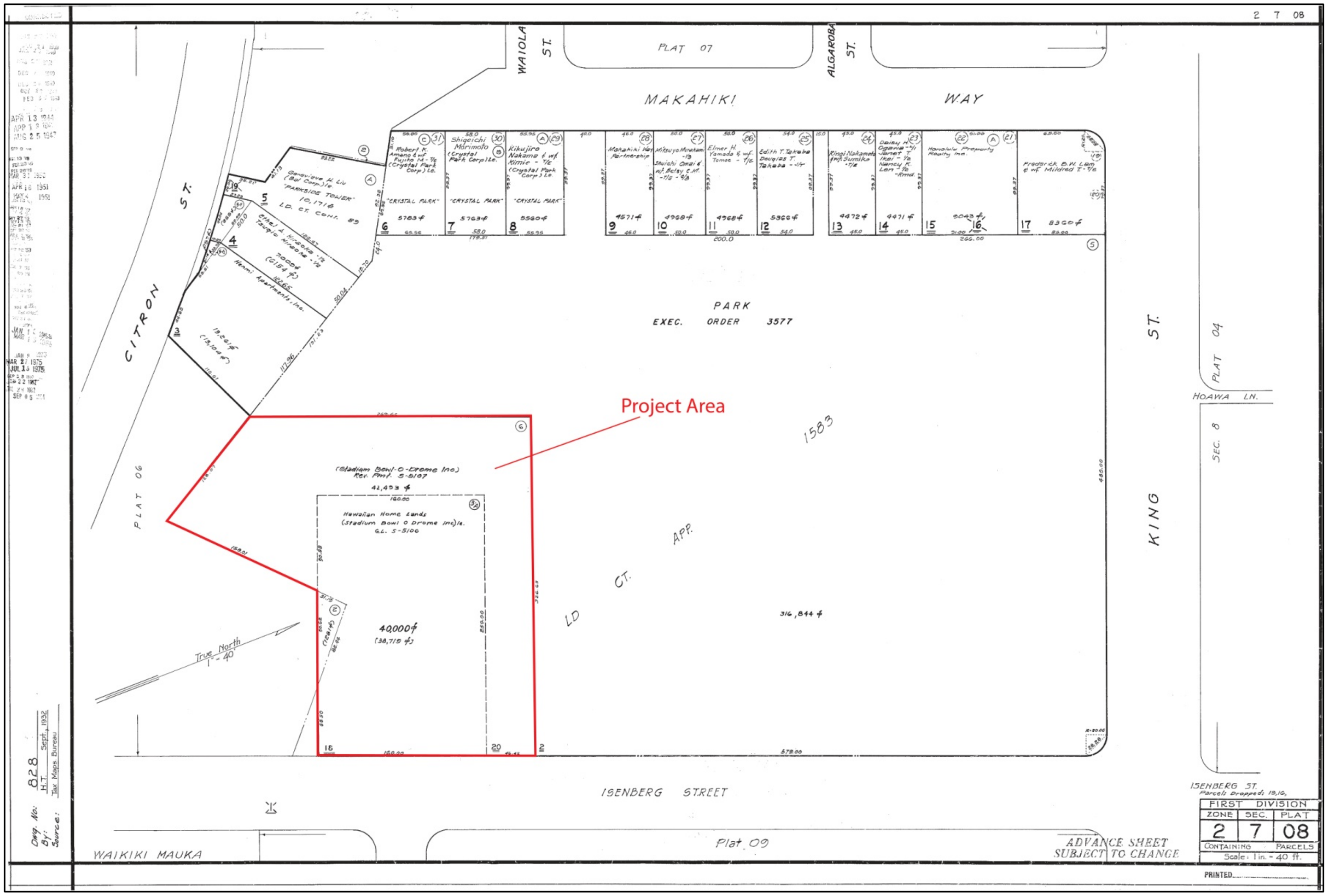

Figure 7. Project area shown on tax map (City & County of Honolulu). No bar scale in original map.

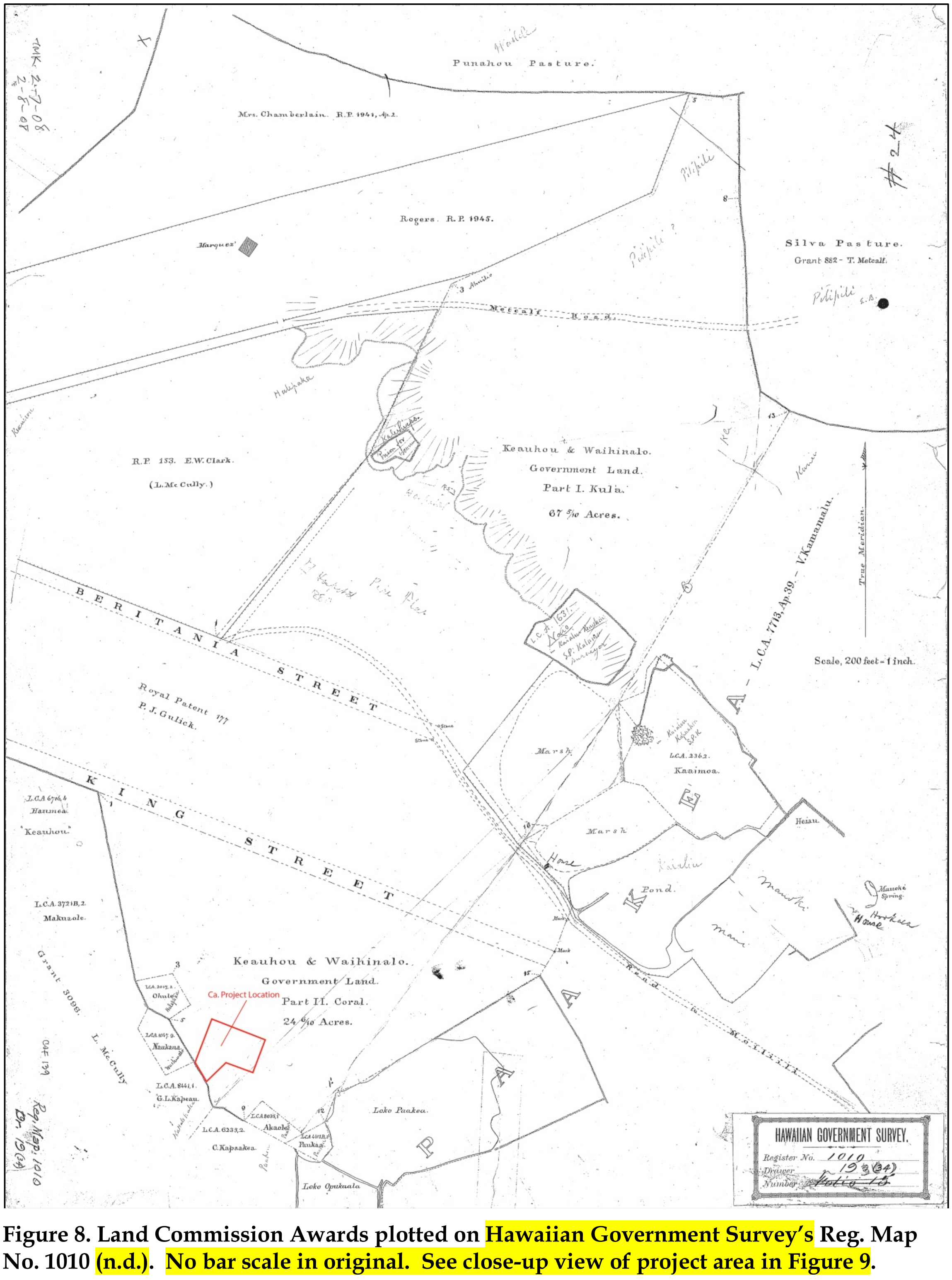

Figure 8. Land Commission Awards plotted on Hawaiian Government Survey's Reg. Map No. 1010 (n.d.). No bar scale in original. See close-up view of project area in Figure 9.

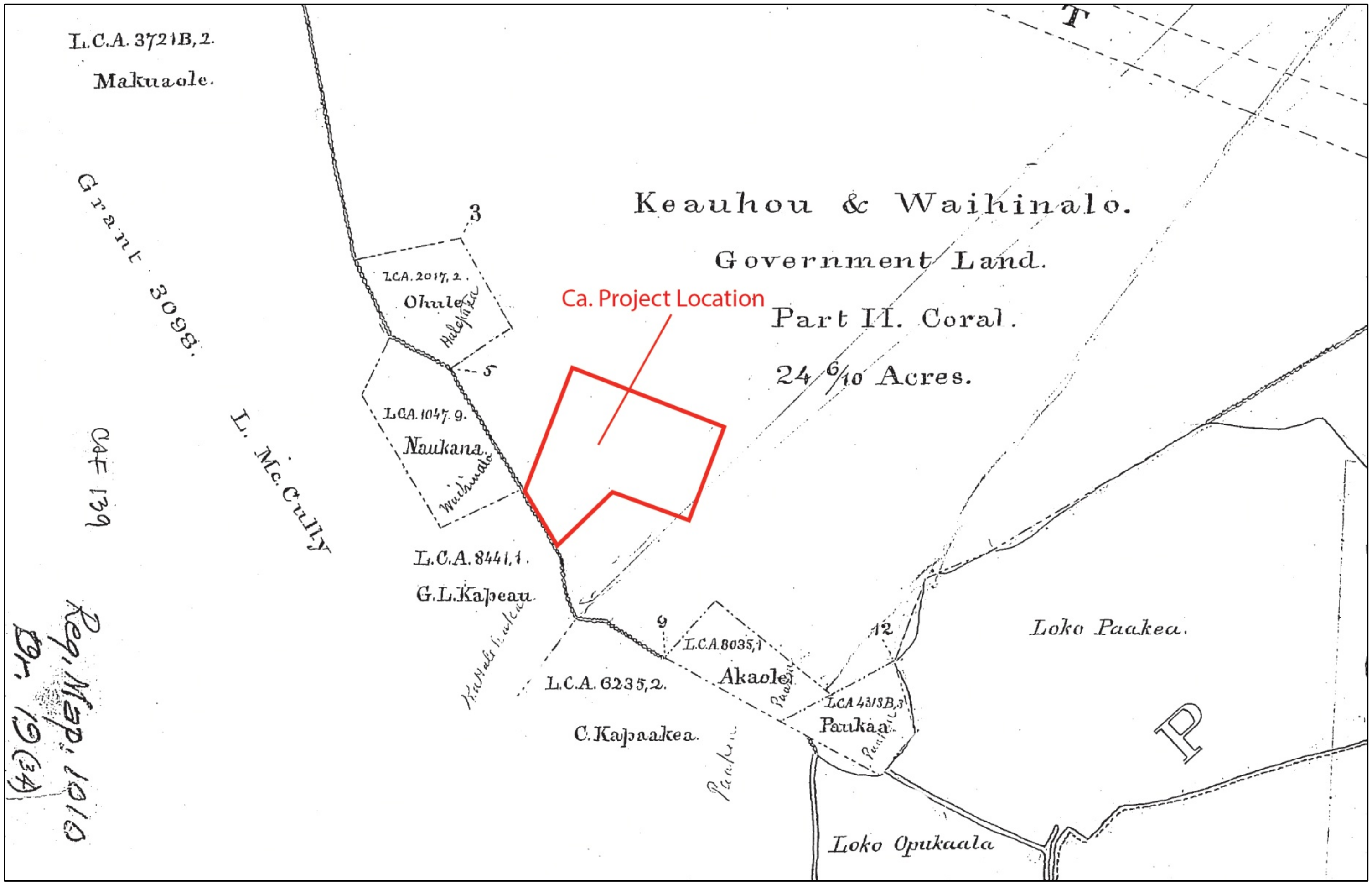

Figure 9. Close up of Land Commission Awards located near the project area (Hawaiian Government Survey's Reg. Map No. 1010, n.d.). No bar scale in original. See Figure 8 for north arrow.

2.3 TWENTIETH CENTURY TO PRESENT

In the 1920s and 1930s, the ponds in the area were filled in and the Ala Wai Canal was constructed. Urban development began, transforming the area into the urban setting it is today. "Some of the lower portions of the old taro area, inland from the slightly elevated land southwest of Rocky Hill [area of Mānoa above Lunalilo Freeway], is now covered by streets and houses" (Handy 1940:77).

The parcel is most well-known for being the former site of the bowling alley called "Stadium Bowl-O-Drome" (SIHP Site No. 50-80-14-08721) and its parking lot, which operated between 1955 and 2004 (Gardner and Ruby 2005:227). The Stadium Bowl-O-Drome structure still stands, but it is currently unoccupied. An intensive architectural survey was completed by Hibbard and Chiu (2017) as a result of Section 106 communications between SHPD and DHHL. The Stadium Bowl-O-Drome structure was constructed in 1955 and was designed by Rothwell & Lester. The SHPD Historic Resource Inventory Form states

> The exterior of Stadium Bowl-O-Drome remains very much intact and retains its historic integrity. The only major alteration has been the addition of the two storage spaces on the rear (northeast) elevation. The only other change is the boarding up of a number of the doors and windows since the closing of the bowling alley in 2006, and the placement of chain link fencing around the property […]
>
> The interior of the Bowl-O-Drome is in poor condition, as a result of its long disuse. In addition, as a result of hazardous materials testing various parts of the interior have been further compromised by probing beneath the surface materials […]
>
> The Stadium Bowl-O-Drome appears to be significant at the local level under Criteria A and C. The building has strong associations with the history of bowling on Oahu. Architecturally, it is also a good example of a bowling alley constructed in Honolulu during the 1950s. (Hibbard and Chiu 2017:5–7)

Most recently, Kuni Automotive and Towing operated within the project area between 2004 and April 2017 and used the former parking lot area as a storage lot for abandoned vehicles.

Before the Stadium Bowl-O-Drome was built in 1955, the lot had been used by the adjacent Honolulu Stadium (1926–1975) for parking (Figure 10) and possibly as a "pit area" during stock car races at the stadium (Gardner and Ruby 2005:223). Prior to use as a parking lot and pit area for the stadium, the subject parcel was used to burn rubbish and contained an incinerator to burn rubbish from the stadium ca. 1949 to 1952 (Figure 11; Element Environmental 2017b:4-10–4-11); the incinerator "was removed sometime prior to 1955 when the bowling alley was constructed" (Element Environmental 2017b:ES-1).

There is no documentation that the project area contained residences in the twentieth century.

Figure 10. The current project area in 1953, being used as the stadium parking lot prior to the Bowl-O-Drome construction. Image from the Alonzo Demello Collection, Earl MA. In Gardner and Ruby 2005.

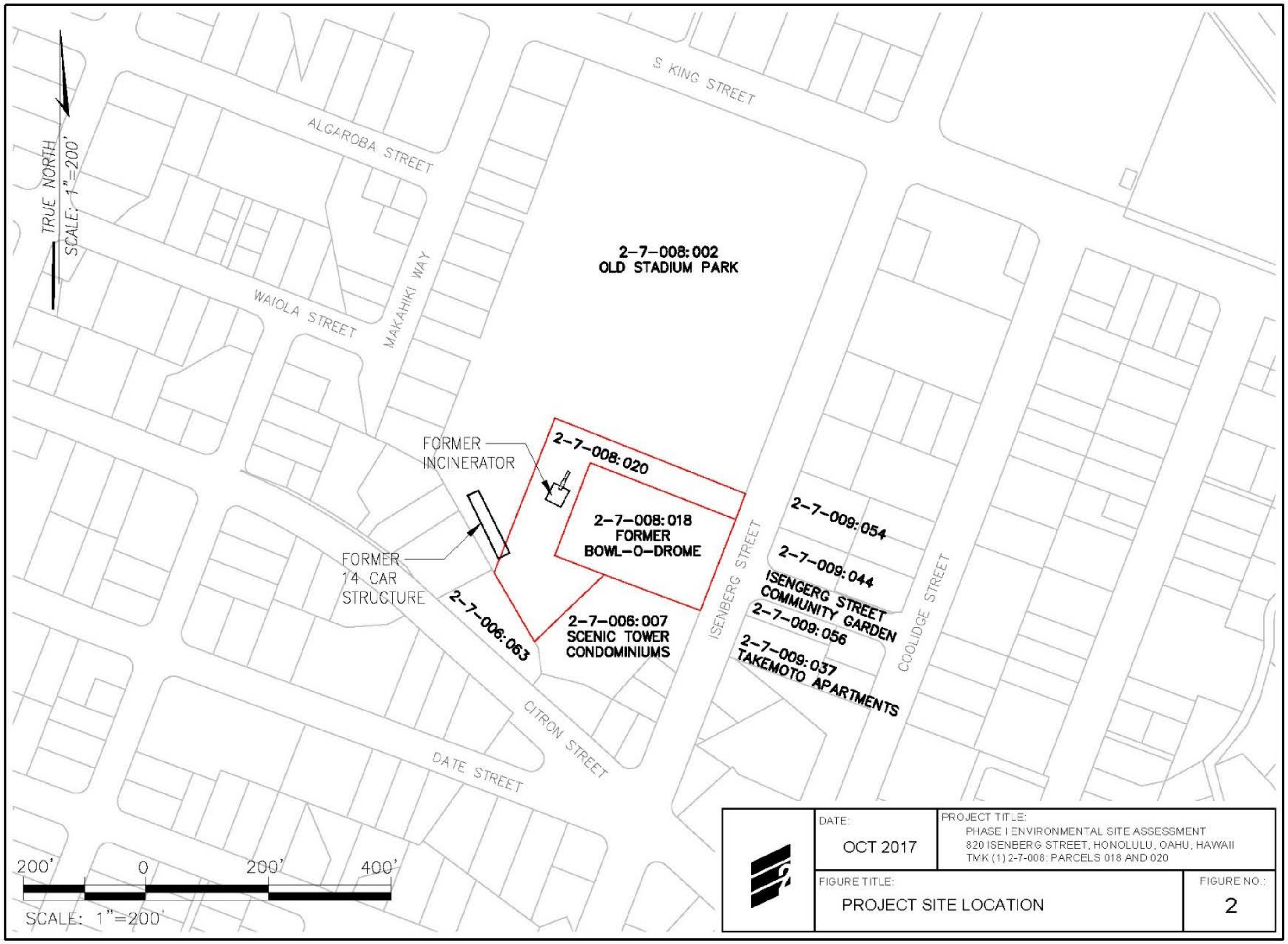

Figure 11. Map by Element Environmental, LLC (2017:Figure 2) showing the location of the incinerator in the project area based on a 1952 aerial photograph (Element Environmental, LLC 2017:4-7).

3.0 PREVIOUS ARCHAEOLOGICAL INVESTIGATIONS

A review of the previous archaeological investigations was conducted at the State Historic Preservation Division library in Kapolei. The review determined that no previous archaeological investigations have occurred within the current project area. However, several studies have taken place north of the current project area within the Mōʻiliʻili/University area (Figure 12).

In 1991, Allan Schilz conducted an archaeological literature review and archival research for a proposed drainage improvement project in Mōʻiliʻili (TMK: [1] 2-7-016, 017). Schilz concluded that "Two ponds, Maui Loko and Loko Paakea, [were] located in the vicinity of the proposed pipeline route, but appear to be situated well away from the trenching" (Schilz 1991:8). Schilz's conclusion was based on a historic map dated 1881 by S.E. Bishop (Schilz 1991:4,6). As a result, he recommended periodic monitoring. In our research, no subsequent monitoring report was found.

In 1994, Scientific Consultant Surveys, Inc. (Chaffee and Spear 1994) conducted an archaeological assessment of four parcels along Hausten Street (located two blocks east of the current project area) [TMK (1) 2-7-009:013, and 014; and 2-7-010:008 and 009]. Although no archaeological sites were observed within the project area, during background research, the authors did note the presence of two sites in the area. Kanewai (located in the University of Hawaiʻi quarry) was a large underground pool of water said to be the "healing waters of Kane" and Kumulae Springs (located at the Willows restaurant) contained water also said to have healing powers.

In 2007, an archaeological literature review and field inspection of several parcels owned by Kamehameha Schools located along University Avenue and Beretania Street was conducted by Cultural Surveys Hawaiʻi, Inc. (O'Hare et al. 2007). The parcels which were the subject of their investigation were determined to be formerly within *loko iʻa kalo* (combination of taro patches and fishponds; Kikuchi 1976) during the pre-Contact and early historic periods. As a result, they concluded it was "unlikely any pre-contact or early post-contact habitation features are present in these once flooded areas" (O'Hare et al. 2007:86). However, it was observed that the Waikīkī area has been known to have burials in sandy areas, including the sandy rims of ponds, and that underground caverns in the Mōʻiliʻili area have contained artifacts and human remains.

Between 2013 and 2014, Cultural Surveys Hawaiʻi, Inc. (Medina et al. 2014) conducted archaeological monitoring of a 12-inch water main located on University Avenue (TMKs: [1] 2-7-016, 2-8-006, and 2-8-024) in Mōʻiliʻili. The project area was located within University Avenue between University Place and the confluence of South Beretania Street, South King Street and University Avenue. The monitoring uncovered "various imported fill deposits associated with modern urban development (i.e., construction of roads and installation of utilities) and historic land reclamation (i.e., the in-filling of ponds and marshland)" (Medina et al. 2014).

> Of note is the presence of a clay loam deposit beneath the imported fill in the northernmost portion of the project area. This deposit has been interpreted as buried wetland soil associated with Loko Kaiʻaliʻu (SIHP # 50-80-14-7588). In addition, a buried asphalt road surface, associated base coarse fill, and a construction pit feature (Feature 1) (SIHP # 50-80-14-7732) likely associated with the 1959 development and paving of University Avenue were identified. Also of interest is the presence of a raised coral shelf encountered in the southern portion of the project area. This was likely exposed prior to the construction of the current road surface, but has since been filled over (Medina et al. 2014:ii).

In 2014, Cultural Surveys Hawaiʻi, Inc. (Enanoria et al. 2016a) conducted archaeological inventory survey for a proposed redevelopment project at Puck's Alley (TMKs: [1] 2-8-024:013 and 030–033). Three archaeological historic properties were identified and described by Enanoria et al. (2016a): State Inventory of Historic Places (SIHP) # 50-80-14-7666, subsurface remnants of "wetland soils" (Loko Mauʻoki); SIHP # 50-80-14-7667, subsurface remnants of "wetland soils" (Maui Loko); and SIHP # 50-80-14-7668, post-Contact structural remnants and trash pit associated with early to mid-twentieth century development (Enanoria et al. 2016a:205). All three sites were assessed as significant under criterion "d" and archaeological monitoring was recommended during construction. In our research, no subsequent monitoring report was found.

Between 2014 and 2015, Cultural Surveys Hawaiʻi, Inc. (Enanoria et al. 2016b) conducted an archaeological inventory survey for a proposed redevelopment project located at various parcels in the Varsity area of Honolulu (TMKs: [1] 2-8-006:001, 032, 036, 038–043). The AIS built upon a study by O'Hare et al. (2007), which had previously determined the presence of three *loko iʻa kalo* (combination of taro patches and fishponds) which were used for cultivation.

During this AIS study, Enanoria et al. (2016b) identified three archaeological historic properties: SIHP # 50-80-14-7588, subsurface remnants of "wetland soils" (Loko Kaiʻaliʻu); SIHP # 50-80-14-7667, subsurface remnants of "wetland soils" (Maui Loko); and SIHP # 50-80-14-7670, post-Contact structural remnants associated with early to mid-twentieth century development. All three sites were assessed as significant under criterion "d" and archaeological monitoring was recommended during construction. In our research, no subsequent monitoring report was found.

In January 2016, Keala Pono (McElroy & Duhaylonsod 2016) conducted an archaeological inventory survey of a 4.45-acre parcel on the campus of the University of Hawaiʻi at Mānoa. The project area is currently occupied by the UHM William S. Richardson School of Law. They conducted a 100% pedestrian survey and determined the entire area had been modified and developed. Subsurface test excavation identified a series of fill layers but no historic properties. No further work was recommended for the project (McElroy & Duhaylonsod 2016:43).

In summary, the previous archaeological investigations show that evidence of the former *loko* in the area can appear as subsurface layers of remnant pond soils. There has also been subsurface layers of remnants of post-Contact construction and development originating from the early to mid-twentieth century. One previous study found a trash pit associated with commercial and residential activity in the early to mid-twentieth century (Enanoria et al. 2016a). On the other hand, no pre-Contact or early post-Contact habitation features have been identified because much of the area was formerly flooded. Thus, the site types predicted to be encountered at the 820 Isenberg Street project area include layers of pond soil, as well as historic-era structural and development remnants. However, there may be sandy areas or underground caverns in the Moiliili Karst that contain artifacts or human remains.

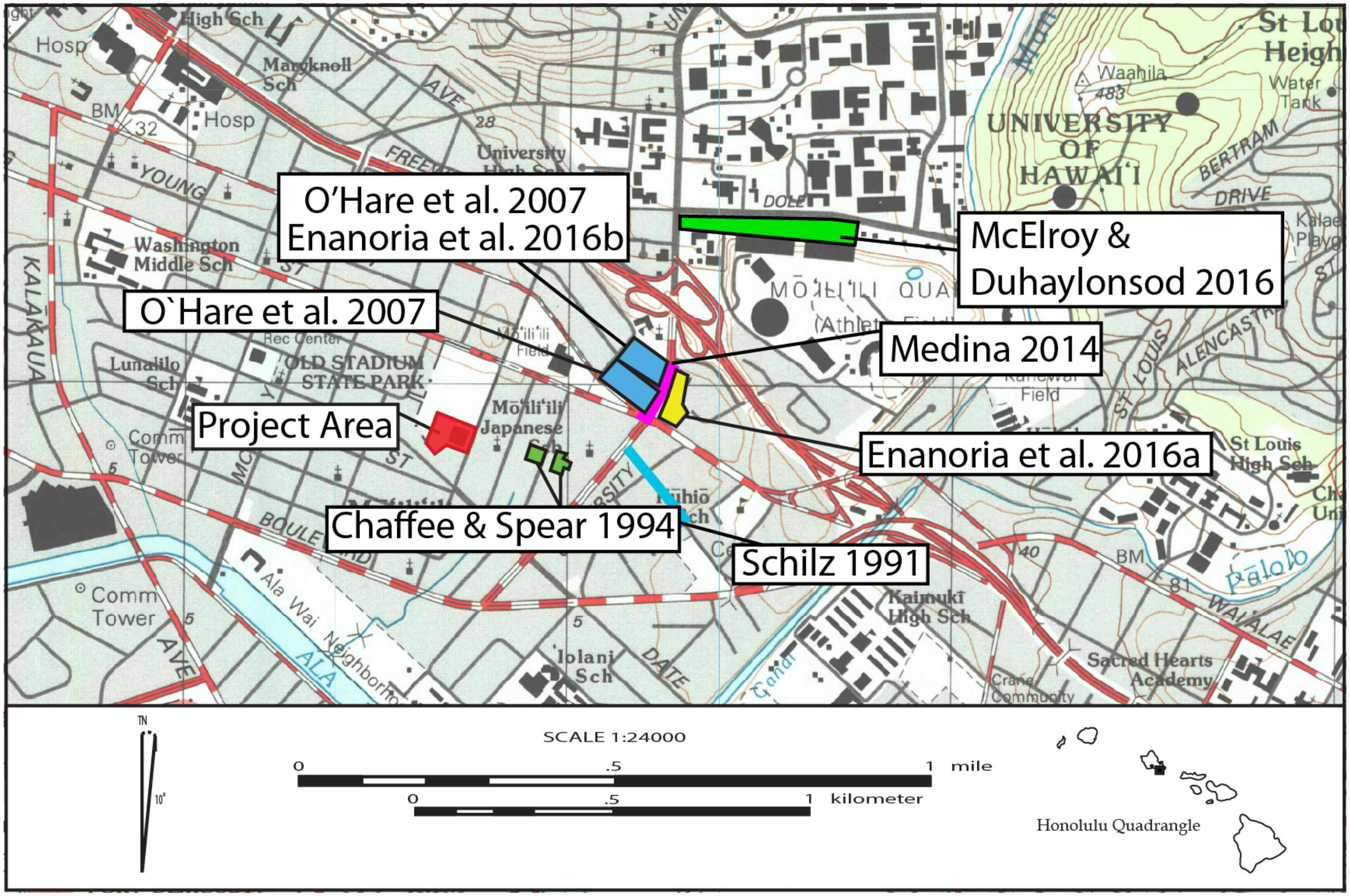

Figure 12. Map depicting previous archaeological investigations in the vicinity of the current project area (USGS Honolulu Quadrangle 2016).

Table 2. Summary of previous archaeological investigations

Investigation (Reference)	Type of Investigation	Findings
Schilz 1991	Literature review and archival research	Two ponds located in the vicinity.
Chaffee and Spear 1994	Assessment	No significant findings.
O'Hare et al. 2007	Literature review and field inspection	*Loko i'a kalo* in the area make it unlikely that any pre-Contact or early post-Contact habitation features are still present.
Medina et al. 2014	Monitoring	Fill deposits associated with modern urban development and historic land reclamation.
Enanoria et al. 2016a	Inventory survey	• 50-80-14-7666: subsurface remnants of Loko Mauʻoki • 50-80-14-7667: subsurface remnants of Maui Loko • 50-80-14-7668: post-Contact structural remnants and trash pit associated with early to mid-twentieth-century development
Enanoria et al. 2016b	Inventory survey	• 50-80-14-7588: subsurface remnants of Loko Kaiʻaliʻu • 50-80-14-7667: subsurface remnants of Maui Loko • 50-80-14-7670: post-Contact structural remnants associated with early to mid-twentieth-century development
McElroy and Duhaylonsod 2016	Inventory survey	No significant findings.

4.0 METHODS

Subsurface trench excavations were conducted throughout the open areas of the current project area between 10 and 14 July 2017. No excavations were conducted inside the former bowling alley because the indoor area was previously tested for contaminants and the environmental constraints present there posed a serious health risk (Muranaka Environmental Consultants, Inc. 2017; Element Environmental, LLC 2017b). A recent architectural study described the interior of the Stadium Bowl-O-Drome building as

> in poor condition, as a result of its long disuse. In addition, as a result of hazardous materials testing various parts of the interior have been further compromised by probing beneath the surface materials. (Hibbard and Chiu 2017)

All excavations were closely monitored by the project archaeologists and were excavated to the limestone shelf. In-field safety precautions were followed as recommended by environmental personnel.

The project was under the overall supervision of Principal Investigator Paul L. Cleghorn, Ph.D. Pacific Legacy archaeologists James McIntosh, B.A., Caleb Fechner, B.A., and Mike Placher, B.A. conducted the excavations for the project. The survey was guided by the AIS strategy report (Cleghorn 2017) which described a two-part excavation strategy:

> The first part will consist of excavating a series of backhoe trenches in the area outside of the existing bowling structure. At the conclusion of these exterior excavations, SHPD will be consulted on the results of this testing and the need to conduct excavations within the bowling structure. If it is determined that interior excavations are needed, they will be undertaken. (Cleghorn 2017:1)

SHPD concurred with this proposed strategy (Log No. 2017.00486, Doc. No. 1705KN04).

Prior to excavation, the proposed excavation trenches in the project area were marked with white paint and The One Call center was contacted to determine if the proposed trenches would possibly encounter buried utilities (see capitol.hawaii.gov for regulations). The One Call center issued Ticket No. 17007772 for our excavation project.

A total of 24 trenches were excavated on the subject parcel. The locations of these trenches are shown in Figure 13 and have been situated to obtain a representative sample of the exterior area. All excavations were closely inspected by the project archaeologists.

Each trench excavation was closely observed during excavation. Excavated material was inspected as it was removed from the trenches and emptied from the backhoe bucket. After excavation, the walls of each trench were cleaned and straightened using a flat nose shovel and trowel in order to clearly distinguish the stratigraphy of the soils. The stratigraphy was recorded for each trench with profiles drawn of at least one sidewall. Standard metric measurements were used in all aspects of recording. All soils were recorded using standard United States Department of Agriculture nomenclature (USDA 1951) and Munsell Soil Color Chart designations (2000).

Photographs of the project area, work in progress, and trench wall profiles were also taken. The photo scale in all of the profile photographs measures 50 cm in length. The location of each trench was recorded with a Trimble GPS unit and processed through ESRI software. Recorded positions were differentially corrected to ensure accuracy with precision of less than 2 m. GPS positions were exported as ESRI shapefiles with a Universal Transverse Mercator, North American Datum for 1983, Zone 4 North (UTM NAD 83 Z4N) projection. Trenches were backfilled after documentation was complete.

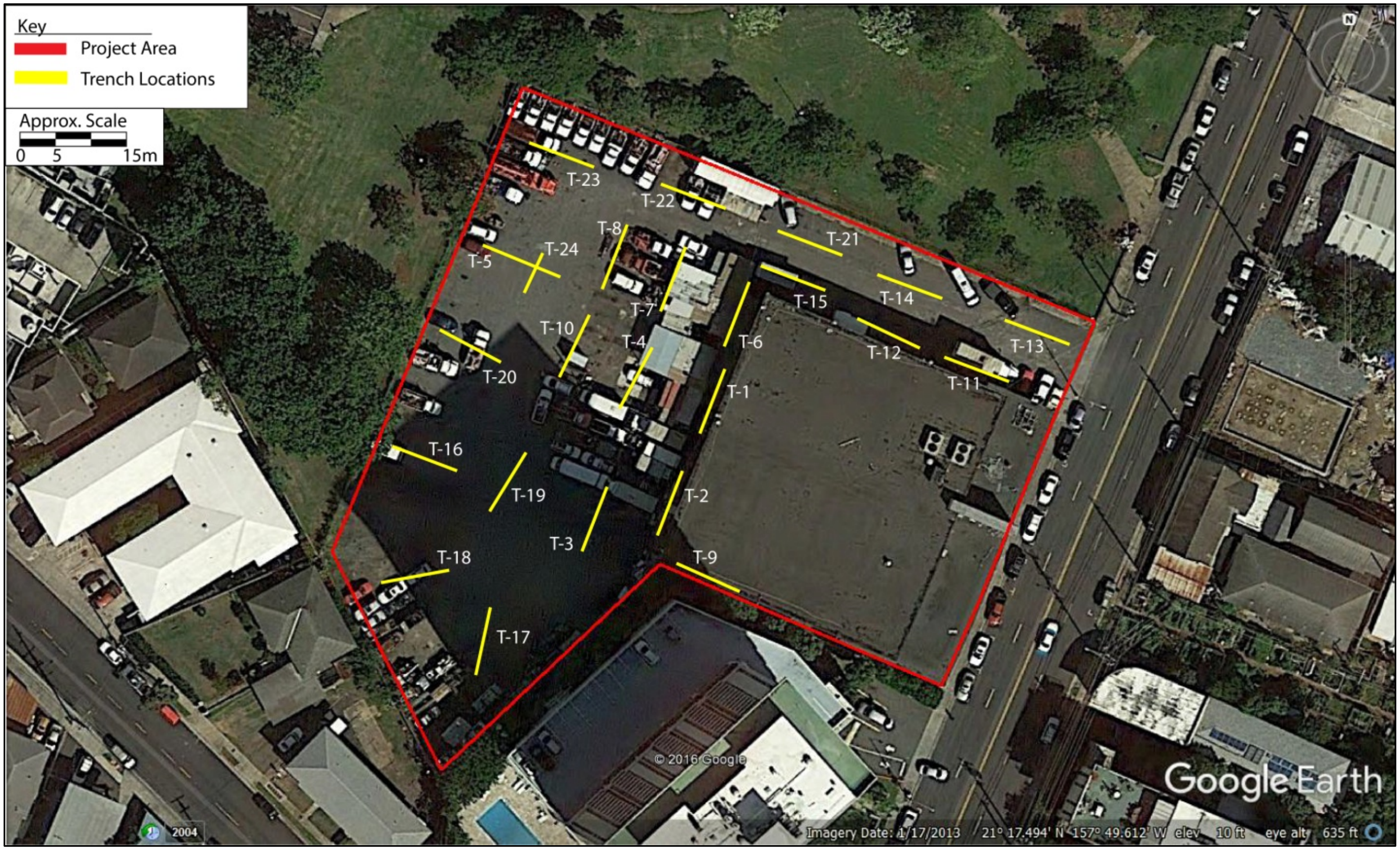

Figure 13. Location of trenches excavated during the current project (Google Earth imagery 2013). No trenches were placed within the Stadium Bowl-O-Drome structure, which sits on the east side of the project area.

5.0 RESULTS

A total of 24 trenches were excavated during the archaeological inventory survey (Figure 13). The trenches were spaced across the project area to obtain a representative coverage and determine the previous use of the subject parcel. All 24 trenches were excavated down to the coral limestone at which point the excavations were terminated. The surface of the coral limestone was encountered at relatively shallow depths in the majority of the trenches, the shallowest instance being ca. 14.0 cm below surface. The maximum depth of the surface of the coral limestone was encountered at ca. 1.6 m below surface.

Trench No. 1

Trench No. 1 (Figure 14 and Figure 15) was located ca. 3.4 meters (m) northwest of the former bowling alley building. The trench was oriented at 20°–200° and measured ca. 9 m long, between 0.85 and 1.5 m wide and 1.15 m deep.

Layer I	0–6 cmbs	Asphalt; abrupt smooth boundary.
Layer II	6–14 cmbs	White (10 YR 8/1) crushed coral base course. Abrupt smooth boundary. Fill layer.
Layer III	14–18 cmbs	Very dark brown (10 YR 2/2) silt; strong, fine sub-angular blocky; firm, slightly sticky, slightly plastic; abrupt smooth boundary. Natural layer.
Layer IV	18–43 cmbs	Very dark grayish brown (10 YR 3/2) cinder; moderate very fine sub-angular blocky; very firm, non-sticky, non-plastic; abrupt smooth boundary. Natural layer.
Layer V	30–118 cmbs	Very dark brown (7.5 YR 2.5/3) silty clay weak medium crumb; friable, very sticky, very plastic; very abrupt, wavy boundary on limestone; contains basalt cobbles and charcoal flecking. Non-cultural. Natural layer.

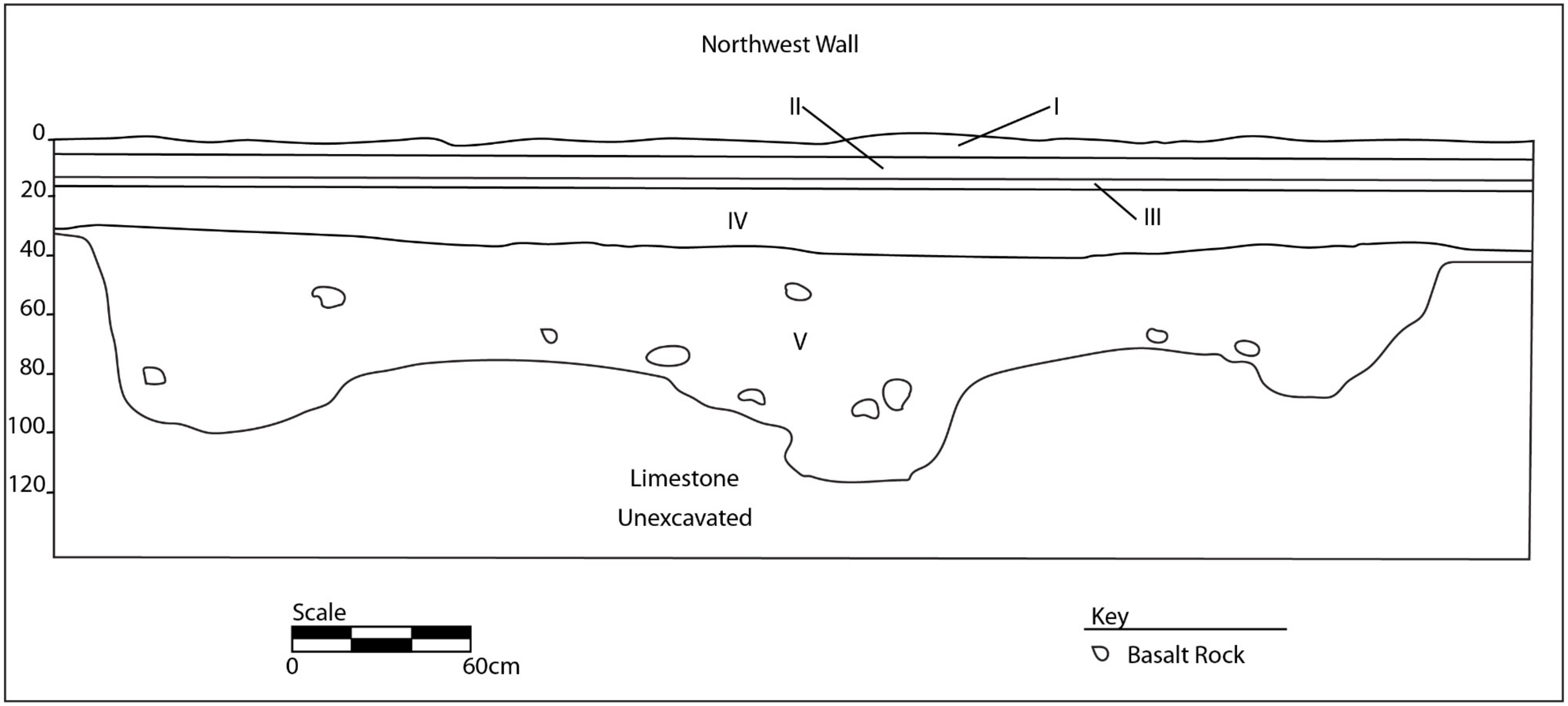

Figure 14. Trench 1, Northwest Wall profile.

Figure 15. Photo of Trench 1 profile, view northwest.

Trench No. 2

Trench No. 2 (Figure 16 and Figure 17) was located ca. 10 m south of Trench No. 1 and 1 m west of the southwest corner of the bowling alley building. It was oriented at 195° and measured ca. 9.5 m long, 1.3 m wide and 1.26 m deep.

Layer I	0–8 cmbs	Asphalt; abrupt smooth.
Layer II	8–27 cmbs	White (10 YR 8/1) crushed coral base course. Abrupt smooth boundary. Fill layer.
Layer III	26–36 cmbs	Dark brown (7.5 YR 3 /4) silty clay loam; moderate medium crumb; friable, sticky, plastic; abrupt smooth boundary. Fill layer.
Layer IV	35–47 cmbs	Black (10 YR 2/1) cinder; moderate fine, sub-angular blocky; firm, non-sticky, non-plastic; abrupt smooth boundary. Fill layer.
Layer V	40–56 cmbs	Very dark grayish brown (10 YR 3/2) silt; moderate, medium granular; firm, non-sticky, non-plastic; abrupt smooth boundary. Fill layer.
Layer VI	56–126 cmbs	Very dark brown (7.5 YR 2.5/2) silty clay; weak, fine crumb; friable, sticky, plastic; contains charcoal and metal fragments. Very abrupt irregular boundary on limestone. Fill layer.

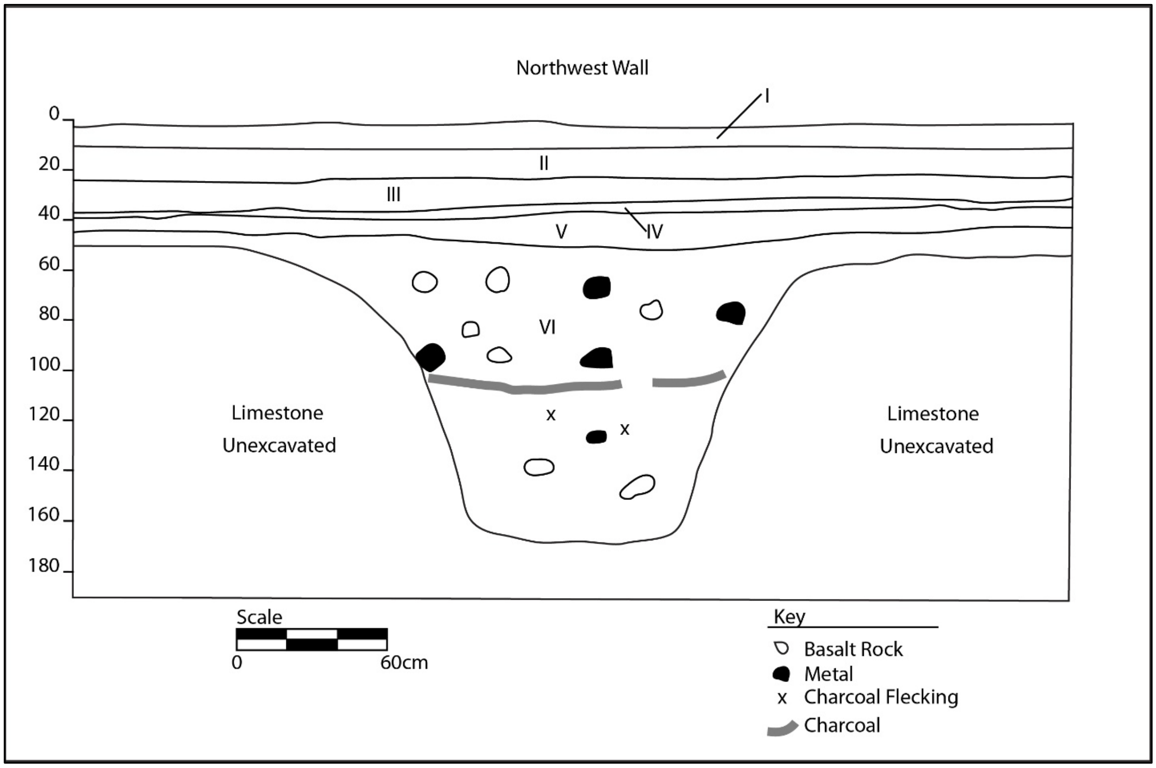

Figure 16. Trench 2, Northwest Wall profile.

Figure 17. Photo of Trench 2 profile, view northwest.

Trench No. 3

Trench No. 3 (Figure 18 and Figure 19) was located on the northwest side of the bowling alley building. It was oriented at 210° and measured ca. 10 m long, 0.90 m wide and 0.80 m deep.

Layer I	0–10 cmbs	Light gray (10 YR 7/1) silt; moderate, very fine, sub-angular blocky; very firm, non-sticky, non-plastic; abrupt smooth boundary. Fill layer.
Layer II	0–7 cmbs	Asphalt, abrupt smooth boundary.
Layer III	7–22 cmbs	White (10 YR 8/1) crushed coral base course. Abrupt smooth boundary. Fill layer.
Layer IV	17–27 cmbs	Dark brown (7.5 YR 3/3) silty clay loam; moderate, fine, sub-angular blocky; firm, sticky, plastic; abrupt smooth boundary. Fill layer.
Layer V	27–35 cmbs	Black (10 YR 2/1) cinder; moderate, fine sub angular blocky; very firm, non-sticky, non-plastic; abrupt smooth boundary. Fill layer.
Layer VI	35–44 cmbs	Brown (10 YR 5/3) silt; moderate fine granular; firm, non-sticky, non-plastic; abrupt smooth boundary. Fill layer.
Layer VII	27–80 cmbs	Dark brown (7.5 YR 3/3) silty clay; weak, fine crumb; friable, sticky, plastic; contains glass and ceramic fragments and cut animal bone. Fill layer.

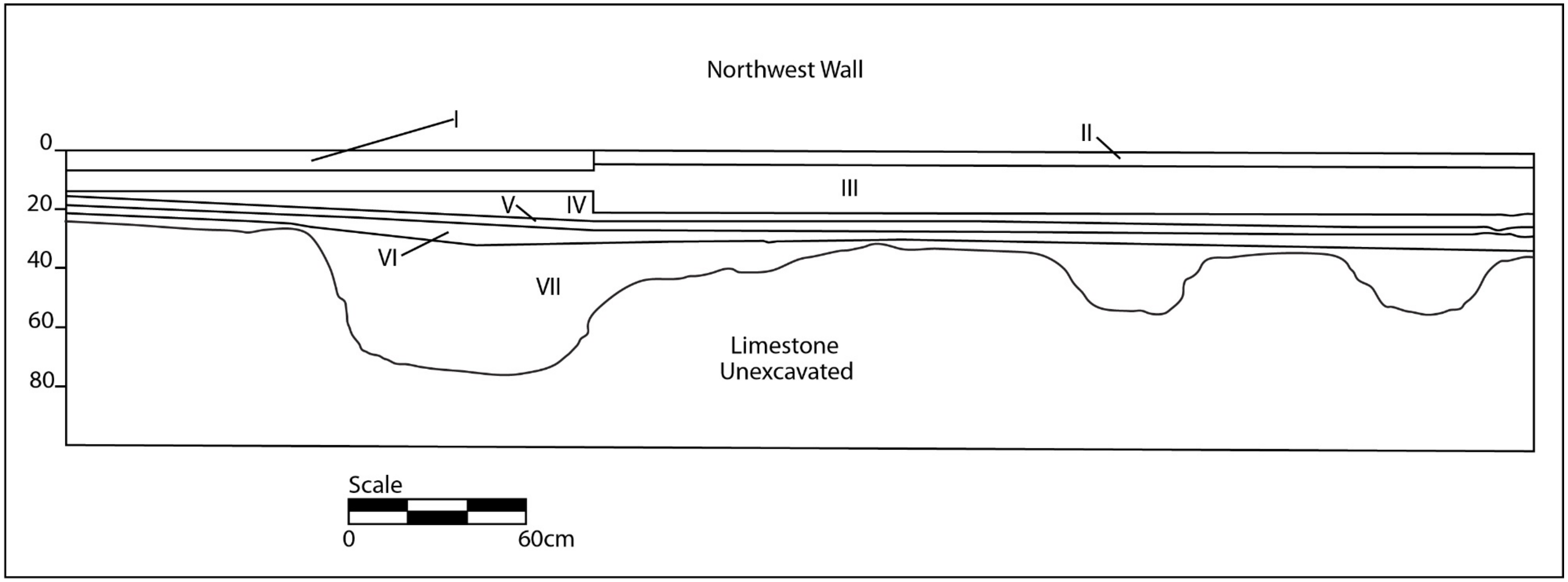

Figure 18. Trench 3, Northwest Wall profile.

Figure 19. Photo of Trench 3 profile, view northwest.

Trench No. 4

Trench No. 4 (Figure 20 and Figure 21) was located ca. 10 m west of Trench No. 1. It was oriented at 195° and measured ca. 10.70 m long, 1.0 m wide and 130 m deep.

Layer IA	0–8 cmbs	Asphalt; abrupt smooth boundary.
Layer IB	0–8 cmbs	Concrete; abrupt smooth boundary.
Layer II	8–23 cmbs	Light gray (10 YR 7/1) crushed coral base course; contains gray bricks; abrupt smooth boundary.
Layer III	18–27cmbs	Very dark brown (10 YR 2/2) silt loam; moderate, fine crumb; firm, non-sticky, non-plastic; smooth abrupt boundary. Fill layer.
Layer IV	18–30 cmbs	Very dark grayish brown (10 YR 3/2) cinder; moderate, fine, sub-angular blocky; very firm, non-sticky, non-plastic; abrupt smooth boundary. Fill layer.
Layer V	30–44 cmbs	Very dark brown (7.5 YR 2.5/2) silty clay; weak fine crumb; friable, sticky, plastic; abrupt smooth boundary. Natural layer.
Layer VI	44–60 cmbs	Dark reddish brown (2.5 YR 3 /4) silty clay; moderate fine, sub-angular blocky; friable, very sticky, very plastic; abrupt wavy boundary. Natural layer.
Layer VII	50–130 cmbs	Dark brown (7.5 YR 3/3) silty clay; weak, fine crumb; friable, very sticky, very plastic, contains fragmented limestone. Natural layer.

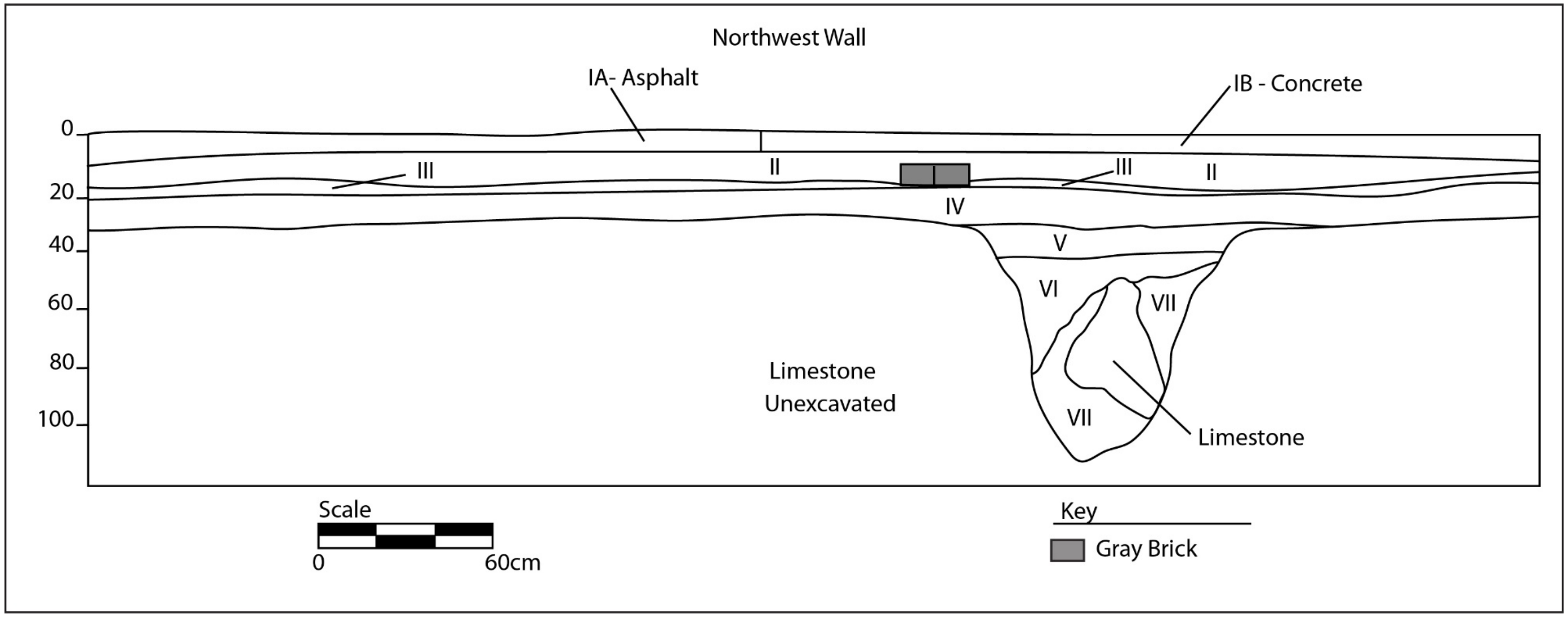

Figure 20. Trench 4, Northwest Wall profile.

Figure 21. Photo of Trench 4 profile, view northwest.

Trench No. 5

Trench No. 5 (Figure 22 and Figure 23) was located on the northwest side of the bowling alley near the central portion of the project area. Concrete footings were identified within the trench and are from an unknown structure. The trench was oriented at 120° and measured ca. 17 m long, 1.25 m wide and 0.95 m deep.

Layer I	0–5 cmbs	Asphalt; abrupt smooth boundary.
Layer II	5–20 cmbs	Grayish brown (10 YR 5/2) silt; moderate, fine granular; firm, non-sticky, non-plastic; contains basalt pebbles; abrupt smooth boundary. Fill layer.
Layer III	18–40 cmbs	Yellowish brown (10 YR 5/4) moderate, very fine, granular; firm; non-sticky, non-plastic; contains concrete blocks/footings; abrupt smooth boundary. Fill layer.
Layer IV	40–95 cmbs	Dark brown (7.5 YR 3/2) silty clay loam; moderate medium crumb; friable, abrupt wavy boundary, very sticky, very plastic; contains glass bottle fragment. Fill layer.

The soil scientists on site from Element Environmental, LLC stated that the concrete footings could be from a former garbage incinerator that reportedly operated on the site (see Element Environmental 2017b); we could find no documentation to support this. In addition, the footings were not *in situ*, and appear to be displaced forming no obvious pattern of a building or structure. The soils identified did not contain any evidence of burning or charring which might be expected if an incinerator were operating there. Likewise, there is no evidence of soil contamination within this trench or Trench No. 24 (excavated across trench No. 5) which would be evident if the incinerator was at this location.

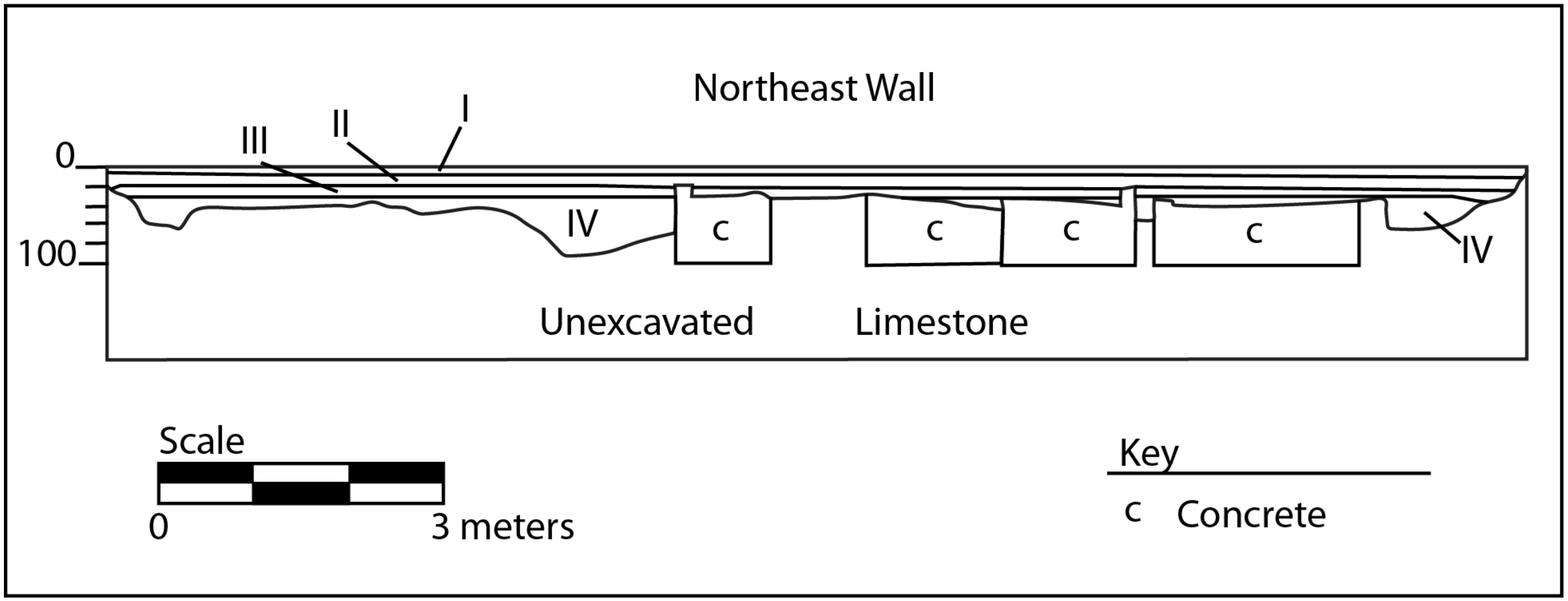

Figure 22. Trench 5, Northeast Wall profile.

Figure 23. Photo of Trench 5 profile, view northeast (Note: concrete block). Compare with Trench 24, Figure 61, p. 99

Trench No. 6

Trench No. 6 (Figure 24 and Figure 25) was located on the northwest side of the bowling alley, near the northwest corner of the building. It was oriented at 210° and measured ca. 10 m long, 1.25 m wide and 0.75 m deep.

Layer I	0–3 cmbs	Asphalt; abrupt smooth boundary.
Layer II	3–7 cmbs	Light gray (10 YR 7/1) crushed coral base course; abrupt smooth boundary. Fill layer.
Layer III	7–9 cmbs	Black (10 YR 2/1) silt; strong, fine, sub angular blocky; firm, slightly sticky, slightly plastic; former oil covered parking lot from the 1950s. Fill layer.
Layer IV	9–30 cmbs	Dark brown (10 YR 3/3) cinder; moderate, fine, sub-angular, blocky; very firm, non-sticky, non-plastic; abrupt smooth boundary. Natural layer.
Layer V	30–75 cmbs	Very dark grayish brown (10 YR 3/2) silty clay; moderate medium crumb, friable, very sticky, very plastic. Abrupt smooth boundary. Natural layer.

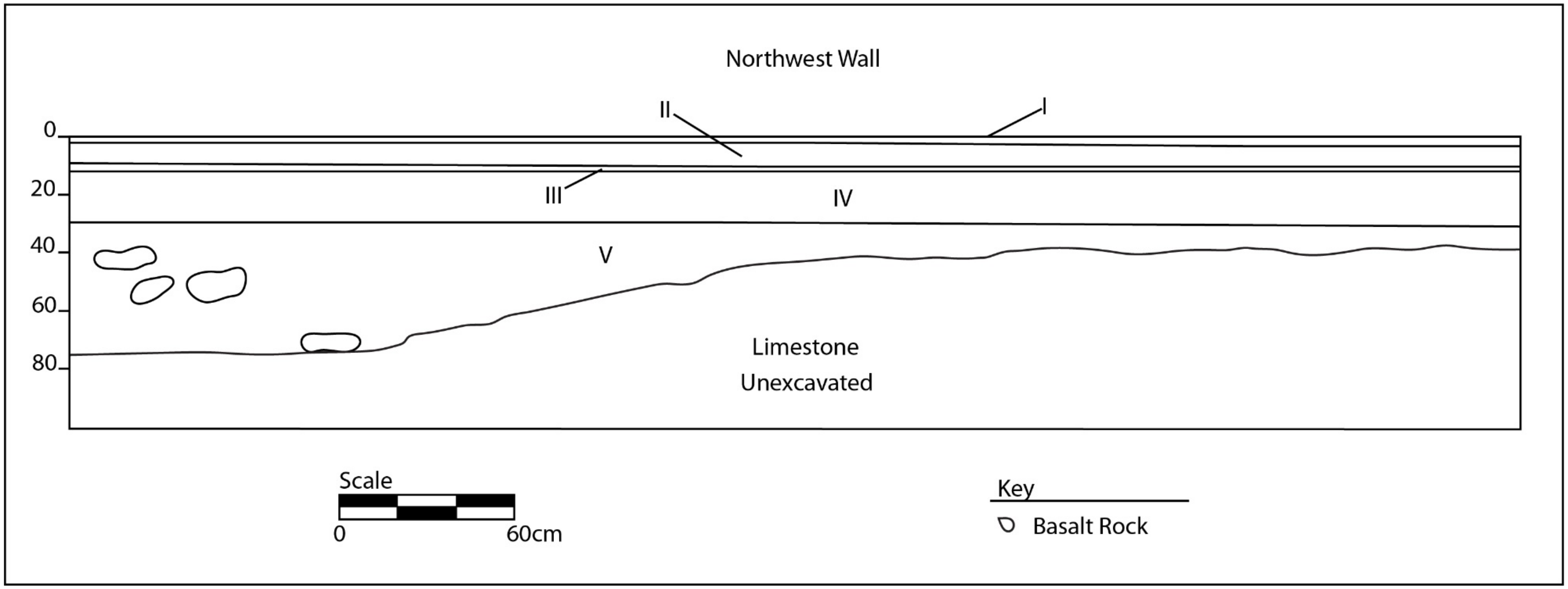

Figure 24. Trench 6, Northwest Wall profile.

Figure 25. Photo of Trench 6 profile, view northwest.

Trench No. 7

Trench No. 7 (Figure 26 and Figure 27) was located ca. 10 m west of Trench No. 6. The trench was oriented at 196° and measured ca. 11.0 m long, 1.0 m wide and 1.20 m deep.

Layer I	0–7 cmbs	Asphalt; abrupt smooth boundary.
Layer II	5–12 cmbs	Light gray (10 YR 7/1) crushed coral base course; abrupt smooth boundary. Fill layer.
Layer III	10–13 cmbs	Black (10 YR 2/1) silt; strong fine sub angular blocky; firm, slightly sticky, slightly plastic; former oil covered parking lot from the 1950s; abrupt smooth boundary. Fill layer.
Layer IV	12–28 cmbs	Grayish brown (10 YR 5/2) silt; moderate fine granular; firm, non-sticky, non-plastic; abrupt smooth boundary. Fill layer.
Lens	20–28 cmbs	Very dark gray-brown (10 YR 3/2) silty clay; moderate fine, subangular blocky; firm, very sticky, very plastic.
Layer V	28–60 cmbs	Dark red (2.5 YR 3/6) silty clay; moderate medium crumb; firm, very sticky, very plastic; contains metal wire and a bottle cap; abrupt smooth boundary. Natural layer.
Layer VI	44–84 cmbs	Dark brown (10 YR 3/3) silty clay; weak medium crumb; friable, very sticky, very plastic; wavy smooth boundary. Natural layer.
Layer VII	80–114 cmbs	Dark brown (7.5 YR 3/3) silty clay; weak fine crumb; friable, sticky, plastic, abrupt smooth boundary. Natural layer.

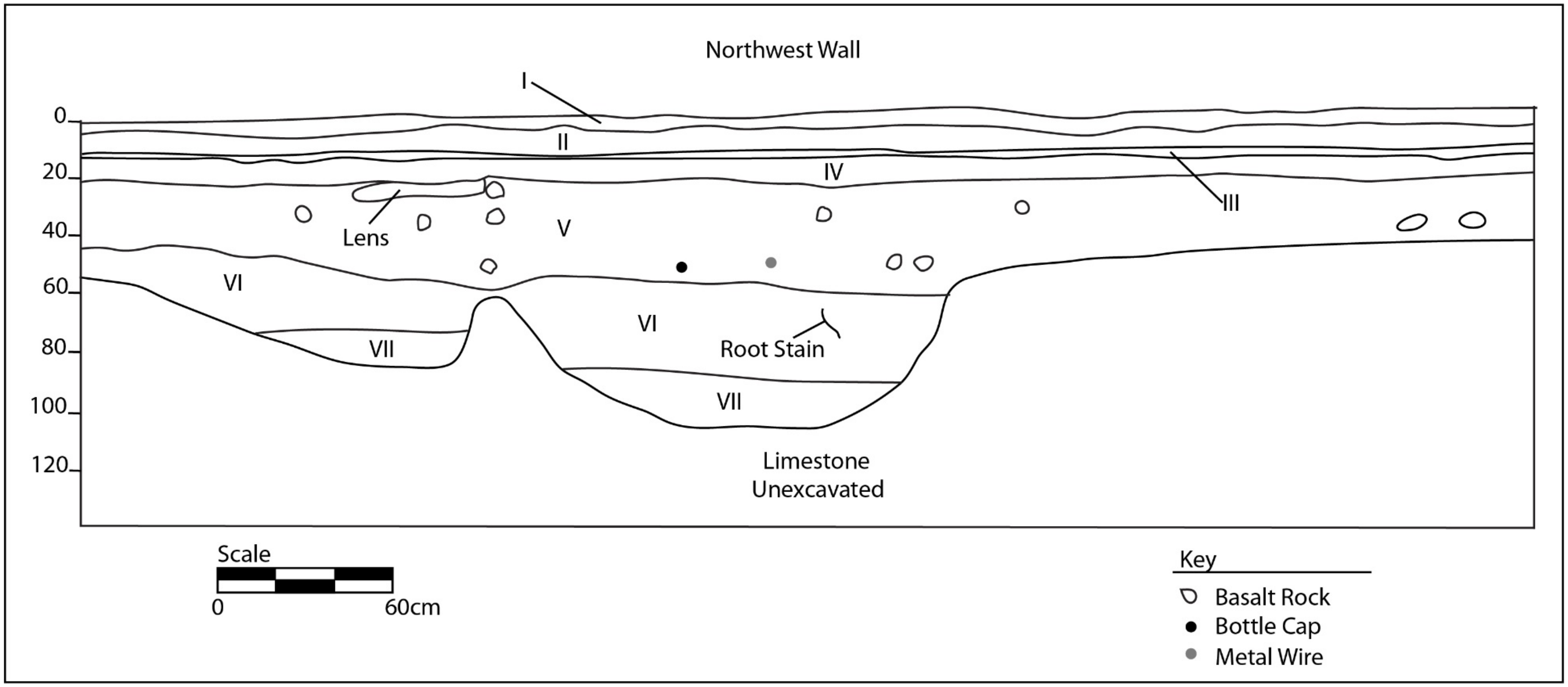

Figure 26. Trench 7, Northwest Wall profile.

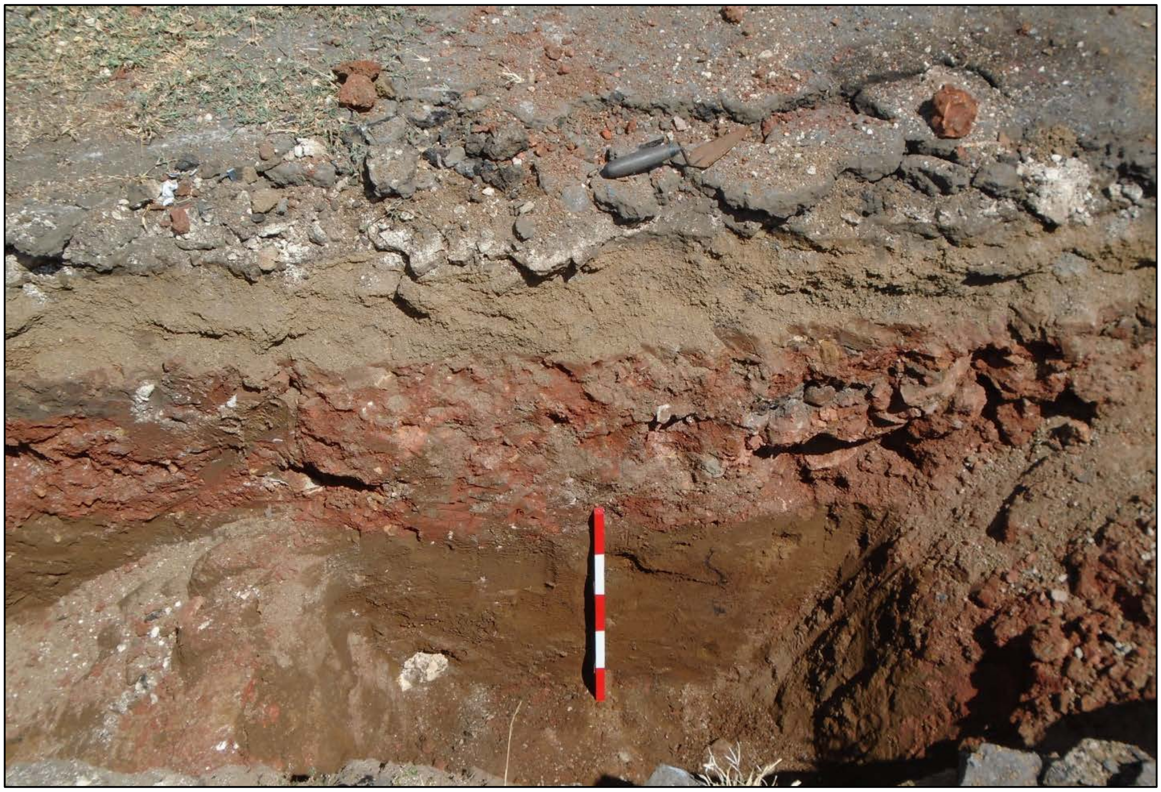

Figure 27. Photo of Trench 7 profile, view northwest.

Trench No. 8

Trench No. 8 (Figure 28 and Figure 29) was located on the northwest side of the bowling alley. The trench was oriented at 200° and measured ca. 11 m long, 1.0 m wide and 0.65 m deep.

Layer I	0–4 cmbs	Asphalt, abrupt smooth boundary.
Layer II	4–14 cmbs	Dark gray (10 YR 4/1) silt; weak fine granular; firm, non-sticky, non-plastic; contains basalt pebbles; abrupt smooth boundary. Fill layer.
Layer III	14–35 cmbs	Very dark grayish brown (10 YR 3/2) silt; moderate, fine granular; firm, non-sticky, non-plastic; abrupt smooth boundary. Natural layer.
Layer IV	34–65 cmbs	Dark reddish brown (2.5 YR 3/4) silty clay; weak, fine, crumb; friable, sticky, plastic. Abrupt, wavy boundary. Natural layer.

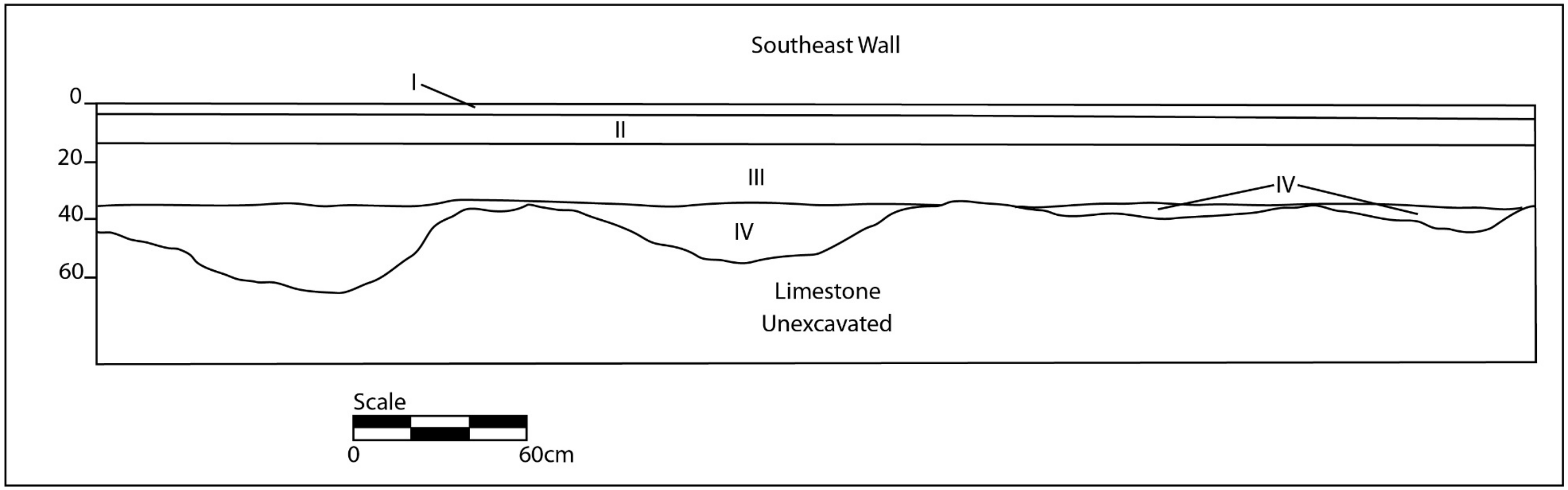

Figure 28. Trench 8, Southeast Wall profile.

Figure 29. Photo of Trench 8 profile, view southeast.

Trench No. 9

Trench No. 9 (Figure 30 and Figure 31) was located in a narrow alley on the southwest side of the bowling alley immediately adjacent to the property boundary. The trench was oriented at 290° and measured ca. 10 m long, 1.2 m wide and 0.90 m deep.

Layer I	0–5 cmbs	Asphalt, abrupt smooth boundary.
Layer II	5–15 cmbs	Light gray (10 YR 7/1) crushed coral base course; abrupt smooth boundary. Fill layer.
Layer III	15–30 cmbs	Dark grayish brown (10 YR 4/2) silt loam; moderate, fine granular; friable, slightly sticky, slightly plastic; abrupt smooth boundary. Fill layer.
Layer IV	30–45 cmbs	Brown (10 YR 4/3) cinder; moderate, fine, sub-angular blocky; very firm, non-sticky, non-plastic; abrupt smooth boundary. Fill layer.
Layer V	30–65 cmbs	Black (10 YR 2/1) silt loam; moderate, medium crumb; firm, slightly sticky, slightly plastic; contains glass bottles and bottle fragments, rusted metal caps, evidence of burning (melted glass); abrupt smooth boundary. Fill layer.
Layer VI	60–90 cmbs	Dark brown (10 YR 3/3) silty clay; weak, fine crumb; friable, sticky, plastic. Abrupt smooth boundary. Natural layer.

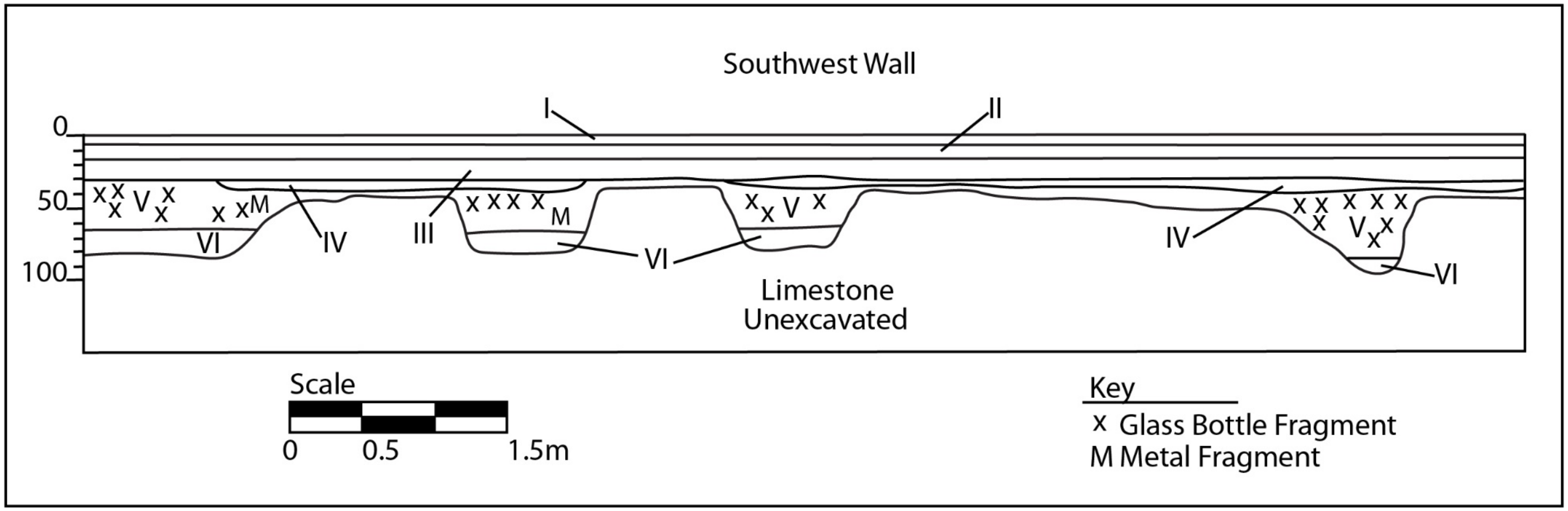

Figure 30. Trench 9, Southwest Wall profile.

Figure 31. Photo of Trench 9 profile, view southwest.

Trench No. 10

Trench No. 10 (Figure 32 and Figure 33) was located less than 19 m south of Trench No. 8, and ca. 10 m west of Trench No. 4. The trench was oriented at 194° and measured ca. 11 m long, 1.25 m wide and 1.25 m deep.

Layer I	0–5 cmbs	Asphalt; abrupt smooth boundary.
Layer II	5–16 cmbs	Gray (10 YR 5/1) silt; moderate fine grain; firm, non-sticky, non-plastic; contains basalt pebbles; abrupt smooth boundary. Fill layer.
Layer III	16–34 cmbs	Brown (10 YR 4/3) silt; moderate fine grain; firm, non-sticky, non-plastic; abrupt wavy boundary. Fill layer.
Layer IV	16–32 cmbs	Dark brown (10 YR 3/3) silty clay; moderate fine crumb; friable, slightly sticky, slightly plastic; abrupt smooth boundary. Natural layer.
Layer V	32–60 cmbs	Dark reddish brown (2.5 YR 3/4) silty clay loam; moderate fine crumb; firm, sticky, plastic; contains wire; abrupt smooth boundary. Natural layer.
Layer VI	60–125 cmbs	Dark brown (10 YR 3/3) silty clay weak fine crumb; friable, very sticky, very plastic; contains concrete fragments, wires and limestone cobbles. Natural layer.

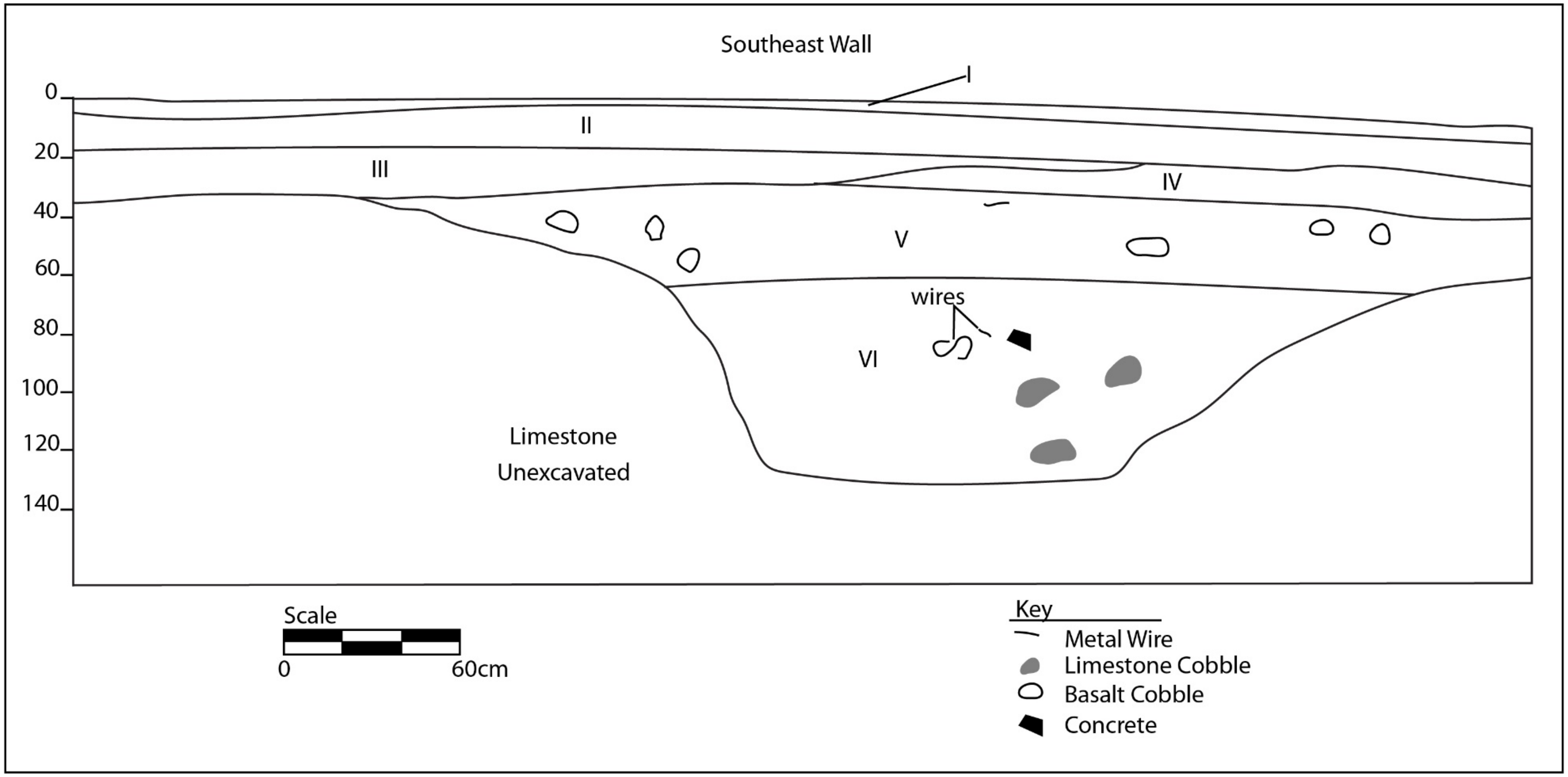

Figure 32. Trench 10, Southeast Wall profile.

Figure 33. Photo of Trench 10 profile, view southeast.

Trench No. 11

Trench No. 11 (Figure 34 and Figure 35) was located on the northeast side of the bowling alley building, immediately in front of the north side staircase leading to the building. Trench No. 11 was oriented at 290° and measured ca. 9.5 m long, 1.1 m wide and 1.0 m deep.

Layer I	0–6 cmbs	Asphalt; abrupt smooth boundary.
Layer II	6–17 cmbs	White (10 YR 8/1) crushed coral; abrupt smooth boundary. Fill layer.
Layer III	6–100 cmbs	Brown (10 YR 4/3) silty clay loam; moderate, fine crumb; firm, sticky, plastic; contains glass bottle fragments, ceramic fragments, metal wire, concrete fragments, and utility pipes; abrupt wavy boundary. Fill layer.
Layer IV	60–85 cmbs	Dark brown (7.5 YR 3/3) silty clay; weak fine crumb; friable, sticky, plastic. Abrupt wavy boundary. Natural layer.

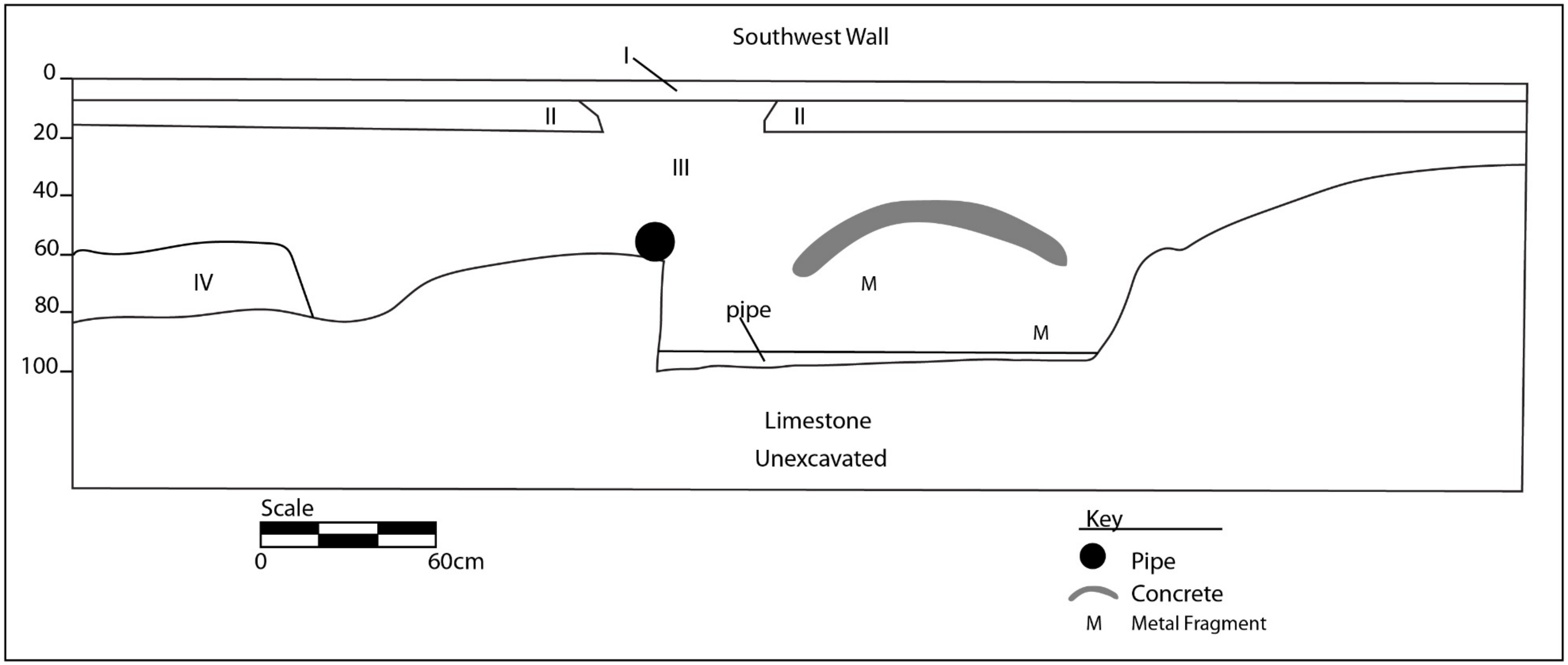

Figure 34. Trench 11, Southwest Wall profile.

Figure 35. Photo of Trench 11 profile, view southwest.

Trench No. 12

Trench No. 12 (Figure 36 and Figure 37) was located ca. 3 m north of the bowling alley building and was oriented at 102°. Overall, the trench measured ca. 11.1 m long, 0.90 m wide and 1.45 m deep.

Layer I	0–5 cmbs	Asphalt; abrupt smooth boundary.
Layer II	4–20cmbs	White (10 YR 8/1) crushed coral base course; Abrupt smooth boundary. Fill layer.
Layer III	20–28 cmbs	Dark brown (7.5 YR 2.5/3) silty clay loam; moderate fine sub-angular blocky; firm, sticky, plastic; abrupt smooth boundary. Fill layer.
Layer IV	28–33 cmbs	Grayish brown (10 YR 3/2) silt; moderate fine granular; firm, non-sticky, non-plastic; abrupt smooth boundary. Fill layer.
Layer V	32–42 cmbs	Dark gray (2.5 YR 4/1) cinder; Moderate fine sub angular blocky; firm, non-sticky, non-plastic; abrupt smooth boundary. Fill layer.
Fe. A	25–40 cmbs	Dark reddish brown (5 YR 2.5/2) silty clay moderate medium crumb; firm, sticky, plastic; contains glass and metal and cut animal bone.
Layer VI	40–57 cm	Brown (7.5 YR 4/4) silty clay; moderate medium, fine crumb; friable, sticky, plastic; abrupt smooth boundary. Natural layer.
Layer VII	56–76 cmbs	Brown (7.5 YR 4/4) silty clay; weak, fine crumb; friable, sticky, plastic; abrupt smooth boundary. Natural layer.
Layer VIII	76–145 cmbs	Dark brown (10 YR 3/3) silty clay; weak very fine sub-angular blocky; friable, very sticky, very plastic; wavy boundary. Natural layer.

A single feature was identified within Trench 12, Layer V. Feature A was a small modern trash deposit measuring 1.2 m wide and 16 cm thick. Glass bottles and bottle glass fragments, and metal fragments were present within the feature.

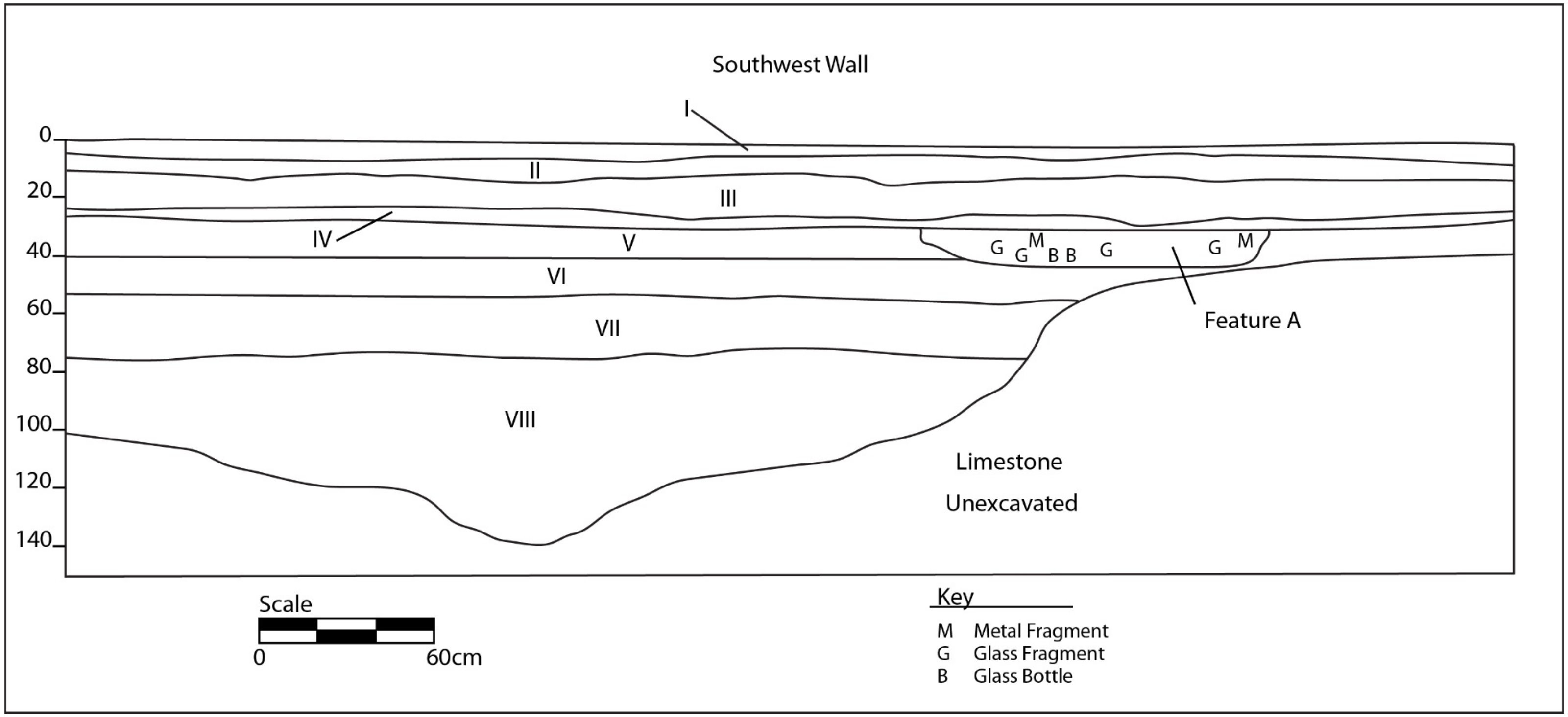

Figure 36. Trench 12, Southwest Wall profile.

Figure 37. Photo of Trench 12 profile, view southwest.

Trench No. 13

Trench No. 13 (Figure 38 and Figure 39) was located in the northeast corner of the project area. The trench was oriented at 290° and measured ca. 9 m long, between 0.80 and 3.2 m wide and 0.90 m deep.

Layer I	0–15 cmbs	Asphalt; abrupt smooth boundary.
Layer II	15–25 cmbs	White (10 YR 8/1) crushed coral base course; abrupt smooth boundary. Fill layer.
Layer III	15–40 cmbs	Brown (10 YR 4/3) silt loam; weak, fine granular; friable, slightly sticky, slightly plastic; abrupt smooth boundary. Natural layer.
Layer IV	40–90 cmbs	Dark brown (7.5 YR 3/3) silty clay loam; weak fine granular; friable, sticky, plastic; Wavy abrupt boundary. Natural layer.

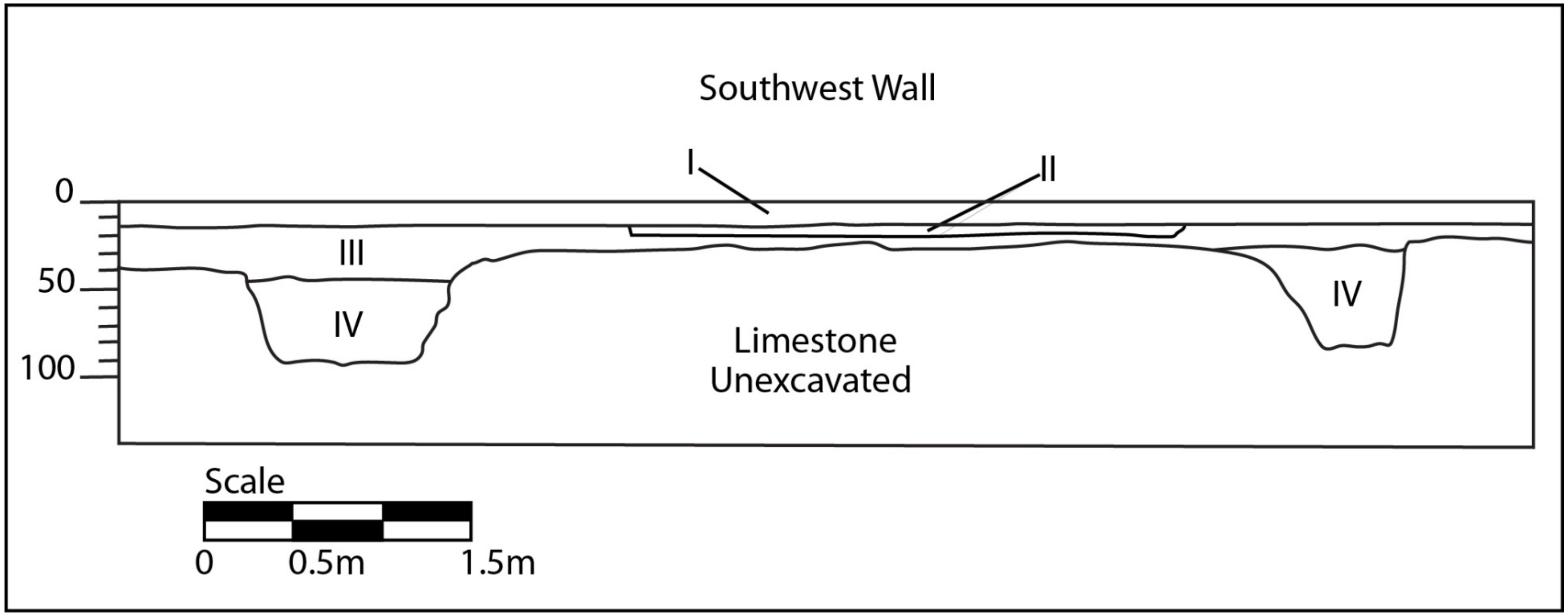

Figure 38. Trench 13, Southwest Wall profile.

Figure 39. Photo of Trench 13 profile, view southwest.

Trench No. 14

Trench No. 14 (Figure 40 and Figure 41) was located ca. 10 m west of Trench 13 and ca. 10 m north of Trench 12. Trench No. 14 was oriented at 102° and measured ca. 11 m long, 1.0 m wide and 1.25 m deep.

Layer I	0–6 cmbs	Asphalt; abrupt smooth boundary.
Layer II	6–18 cmbs	White (10 YR 8/1) crushed coral base course; abrupt smooth boundary. Fill layer.
Layer III	18–20 cmbs	Black (10 YR 2/1) silt; strong fine subangular blocky; very firm, slightly sticky, slightly plastic; former oil covered parking lot; abrupt smooth boundary. Fill layer.
Layer IV	19–30 cmbs	Grayish brown (2.5 YR 5/2) cinder; moderate fine subangular blocky; very firm, non-sticky, non-plastic; abrupt smooth boundary. Fill layer.
Layer V	30–40 cmbs	Dark yellowish brown (10 YR 4/4) silty clay loam; weak fine crumb; friable, sticky, plastic; abrupt smooth boundary. Fill layer.
Fe. B	40–59 cmbs	Dark yellowish brown (10 YR 4/4) silty clay loam; moderate fine granular; friable, slightly sticky, slightly plastic; contains a concrete slab fragment and coral. Abrupt smooth boundary.
Layer VI	45–125 cmbs	Dark brown (10 YR 3/3) silty clay; weak fine crumb; firm, very sticky, very plastic; contains ceramic dish fragments; abrupt smooth boundary. Natural layer.

A single feature was identified within Trench 14, Layer VI. Feature B was a small trash deposit measuring 1.9 m wide and 18 cm thick. Concrete chunks and coral cobbles were present within the feature. Two ceramic vegetable dish fragments were recovered from the backdirt pile. Their exact provenance was not determined but it was likely located within Fe. B.

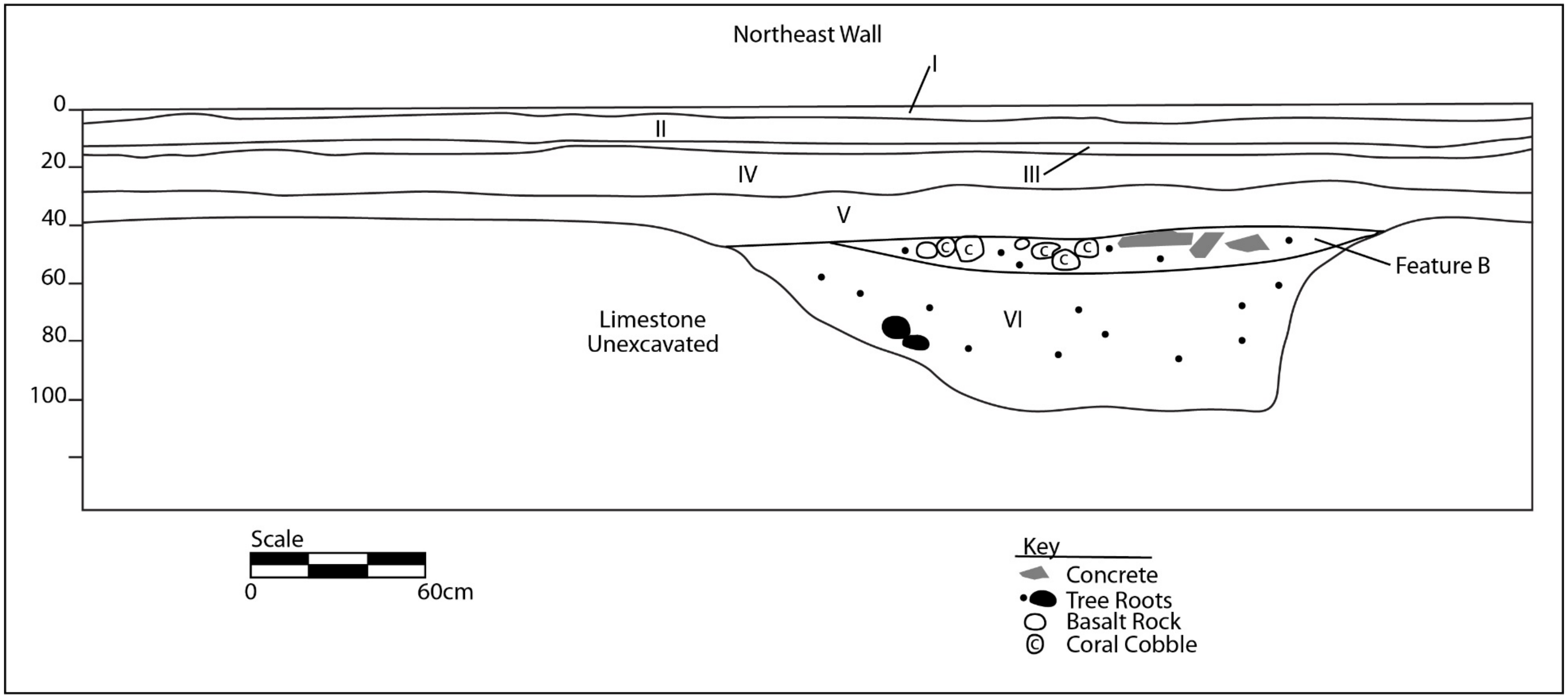

Figure 40. Trench 14, Northeast Wall profile.

Figure 41. Photo of Trench 14 profile, view northeast.

Trench No. 15

Trench No. 15 (Figure 42 and Figure 43) was located on the northeast side of the bowling alley building. The trench was oriented at 280° and measured ca. 10 m long, 1.3 m wide and 1.08 m deep.

Layer I	0–6 cmbs	Asphalt; abrupt smooth boundary.
Layer II	6–18 cmbs	White (10 YR 8/1) crushed coral base course; abrupt smooth boundary. Fill layer.
Layer III	18–30 cmbs	Very dark brown (7.5 YR 2.5/2) silty clay; moderate fine crumb; friable, very sticky, very plastic; abrupt smooth boundary. Fill layer.
Layer IV	30–33 cmbs	Black (10 YR 2/1) silt; strong fine subangular blocky; very firm, slightly sticky, slightly plastic; former oil covered parking lot; abrupt smooth boundary. Fill layer.
Layer V	32–44 cmbs	Very dark grayish brown (10 YR 3/2) silt; moderate fine granular; firm, non-sticky, non-plastic; abrupt smooth boundary. Fill layer.
Layer VI	32–60 cmbs	Dark brown (7.5 YR 3/3) silty clay; moderate medium crumb; friable, very sticky, very plastic; abrupt smooth boundary. Fill layer.
Layer VII	58–81 cmbs	Very dark brown (7.5 YR 2.5/2) silty clay; moderate fine crumb; friable, sticky, plastic; contains bottle glass fragments; abrupt irregular boundary. Natural layer.

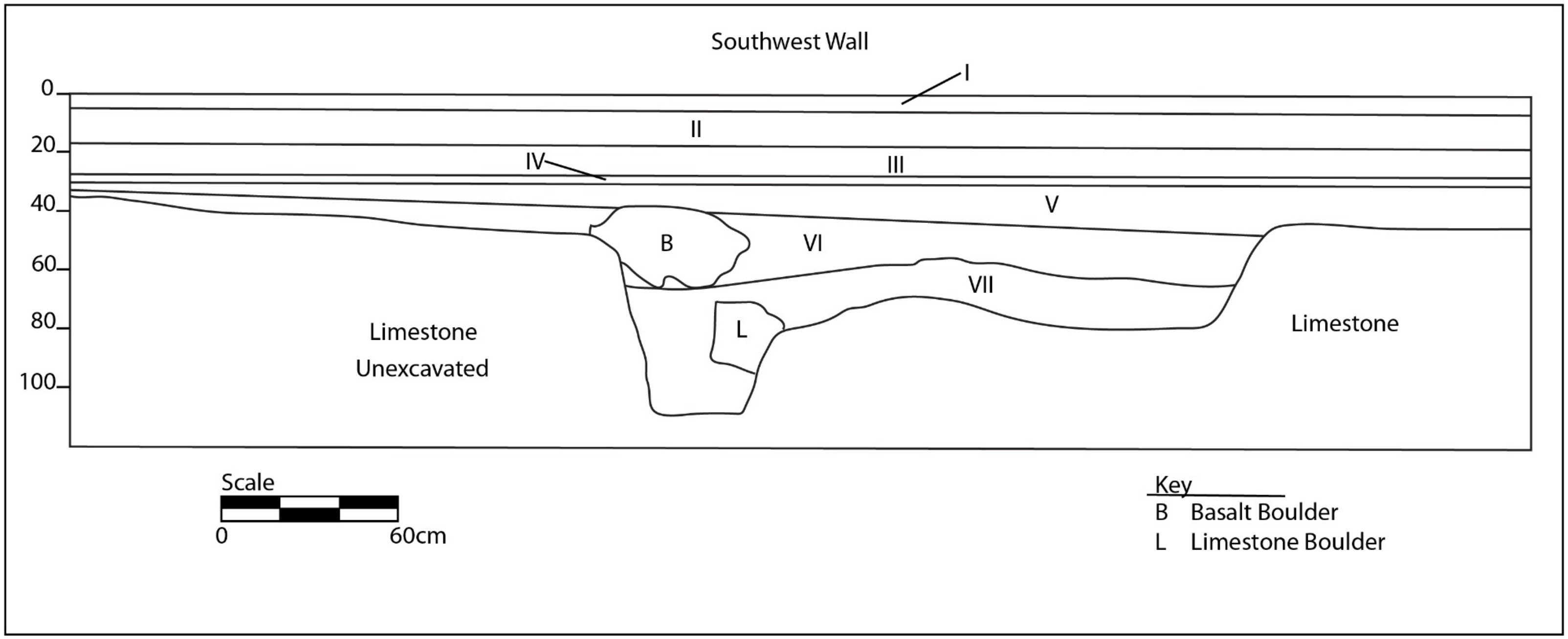

Figure 42. Trench 15, Southwest Wall profile.

Figure 43. Photo of Trench 15 profile, view southwest.

Trench No. 16

Trench No. 16 (Figure 44 and Figure 45) was located near the southwest corner of the parking lot ca. 0.5 m from the Westside fence line. The trench was oriented at 130°and measured ca. 7.5 m long, 0.8 m wide, 0.65 m deep.

Layer I	0–20 cmbs	Black (10 YR 2/1) silty clay; weak fine crumb; friable, very sticky, very plastic; abrupt smooth boundary. Fill layer.
Layer II	10–24 cmbs	Black (10 YR 2/1) silt; strong fine subangular blocky; very firm, slightly sticky, slightly plastic; former oil covered parking lot; abrupt smooth boundary. Fill layer.
Layer III	20–38 cmbs	Dark gray (2.5 Y 4/1) silt; moderate fine granular; firm, slightly sticky, slightly plastic; contains basalt pebbles and a strong petroleum smell; abrupt smooth boundary. Fill layer.
Layer IV	30–40 cmbs	Very dark grayish brown (2.5 Y 3/2) silty clay loam; moderate fine crumb; friable, sticky, plastic; abrupt smooth boundary. Fill layer.
Layer V	35–45 cmbs	Strong brown (7.5 YR 4/6) silty clay; moderate fine subangular blocky; friable, very sticky, very plastic; abrupt smooth boundary. Fill layer.
Layer VI	44–65 cmbs	Very dark brown (10 YR 2/2) silty clay; moderate fine crumb; friable, sticky, plastic; abrupt, smooth boundary. Fill layer, contains ceramic fragments.

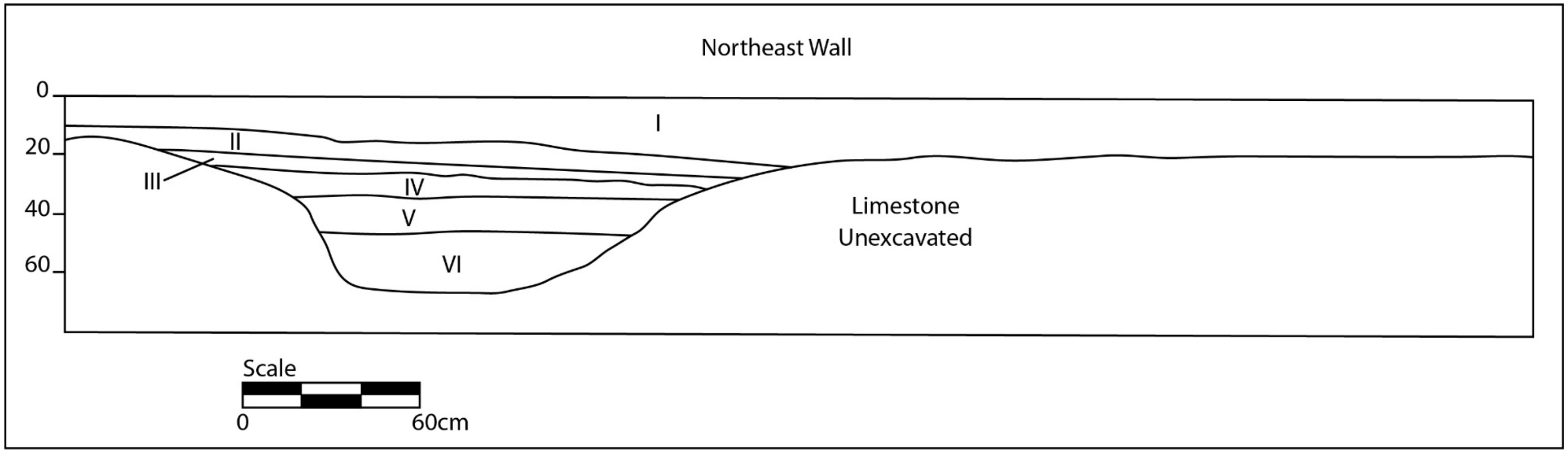

Figure 44. Trench 16, Northeast Wall profile.

Figure 45. Photo of Trench 16 profile, view northeast.

Trench No. 17

Trench No. 17 (Figure 46 and Figure 47) was located on the south side of the project area. It was oriented at 191° and measured ca. 11 m long, 1.0 m wide and 0.02 m deep.

Layer I	0–3 cmbs	Dark brown (10 YR 3/3) silty clay loam; weak, fine, granular; friable, slightly sticky, slightly plastic; abrupt, smooth boundary. Fill layer.
Layer II	0–12 cmbs	Brown (7.5 YR 5/4) silty clay loam; moderate, medium, sub-angular, blocky; firm, sticky, plastic; abrupt, wavy boundary. Fill layer.
Layer III	5–8 cmbs	Light gray (10 YR 7/1) basalt gravel. Fill layer.
Layer IV	10–20 + cmbs	Concrete. Overlies limestone. Fill layer.

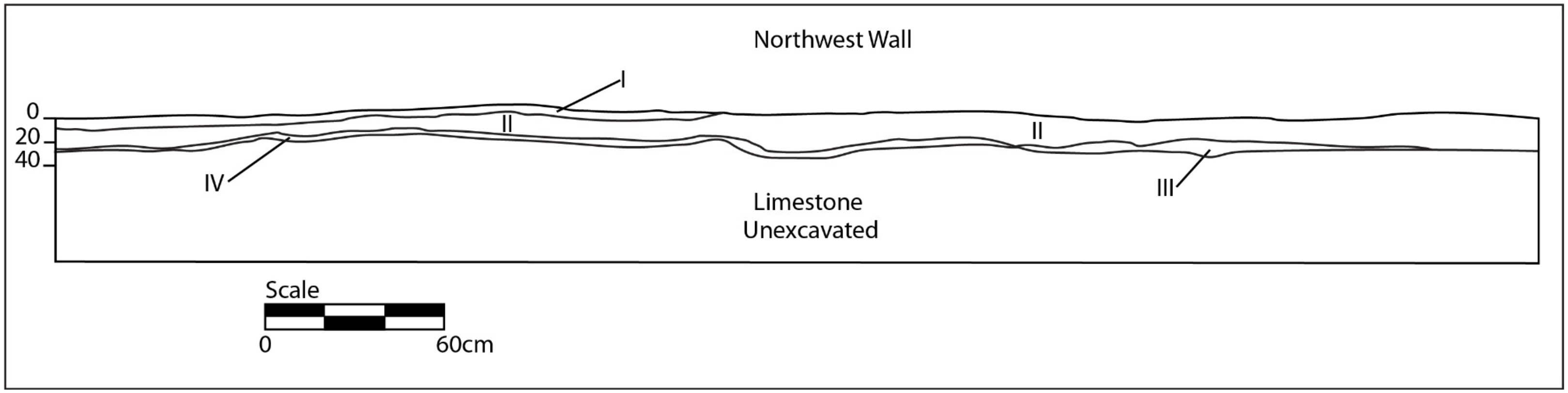

Figure 46. Trench 17, Northwest Wall profile.

Figure 47. Photo of Trench 17 profile, view northwest. Trowel is resting on concrete slab.

Trench No. 18

Trench No. 18 (Figure 48 and Figure 49) was located on the south side of the project area, ca. 10 m south of Trench No. 15 and was oriented at 255°. Overall, Trench No. 15 measured ca. 11 m long, 1.0 m wide and 0.75 m deep.

Layer I	0–20 cmbs	Dark gray (10 YR 4/1) silt loam; moderate Fine, sub-angular, blocky; firm, non sticky, non plastic; abrupt, smooth boundary. Fill layer.
Layer II	20–32 cmbs	Brown (10 YR 5/3) silty clay; moderate, fine, crumb; firm, slightly sticky, slightly plastic; contains bottle glass, porcelain, and plastic sheeting; abrupt, smooth boundary. Fill layer.
Layer III	28–42 cmbs	Dark yellowish brown (10 YR 3/4) silt loam; Weak, fine, crumb; friable, slightly sticky, Slightly plastic; abrupt, smooth boundary. Fill layer.
Layer IV	38–42 cmbs	Very dark brown (10 YR 2/2) silty clay loam; Moderate, fine, crumb; firm, slightly sticky, slightly plastic; abrupt, smooth boundary. Fill layer.
Layer V	12–54 cmbs	Dark brown (7.5 YR 3/2) silty clay; weak, Fine, crumb; friable, sticky, plastic; abrupt, wavy boundary. Natural layer.
Layer VI	50–75 cmbs	Very dark brown (10 YR 2/2) silty clay; Moderate, fine, crumb; friable, sticky, plastic, abrupt smooth layer atop limestone. Natural layer.

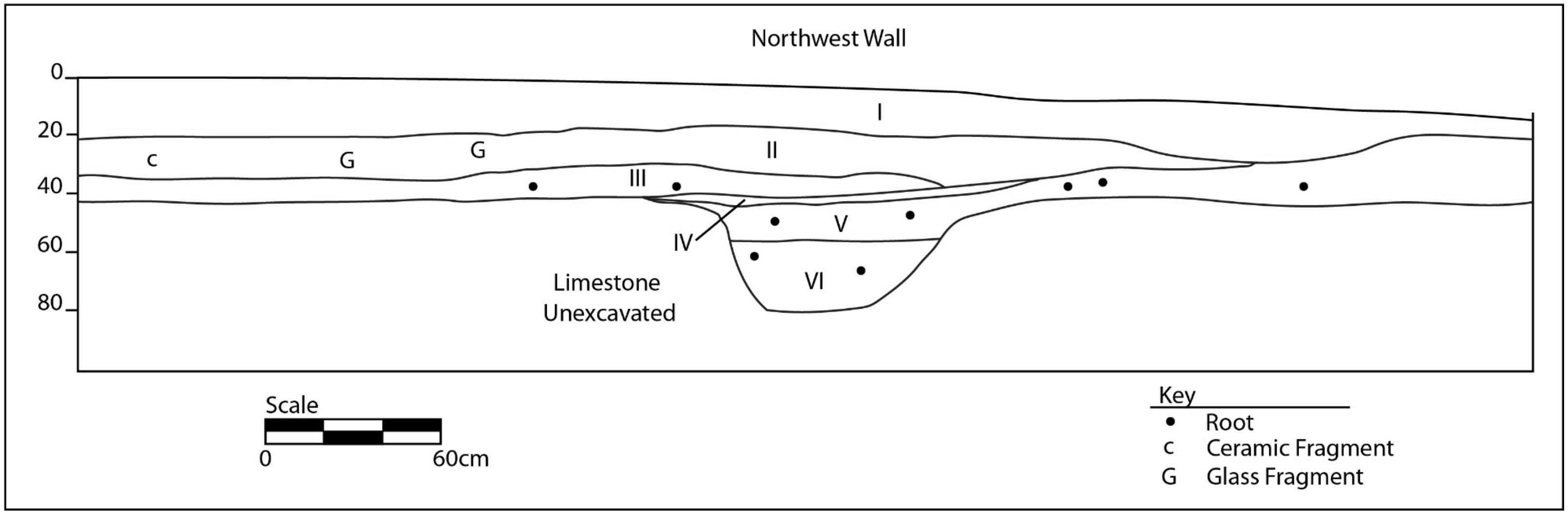

Figure 48. Trench 18, Northwest Wall profile.


Figure 49. Photo of Trench 18 profile, view northwest.

Trench No. 19

Trench No. 19 (Figure 50 and Figure 51) was located on the northwest side of the bowling alley in the south west portion of the parking lot. The trench was oriented at 210° and measured ca. 12.5 m long, 1.1 m wide and 1.15 m deep.

Layer I	0–7 cmbs	Asphalt; abrupt, smooth boundary.
Layer II	5–27 cmbs	Grayish brown (10 YR 5/2) silt; moderate, fine, granular; firm, non sticky, non plastic; contains basalt gravel; abrupt, smooth boundary. Fill layer.
Layer III	26–58 cmbs	Very dark grayish brown (10 YR 3/2) silty Clay loam; moderate, very fine, sub-angular Blocky; firm, sticky, plastic; abrupt, wavy boundary. Fill layer.
Layer IV	50–115 cmbs	Dark brown (10 YR 3/3) silty clay; weak, Fine, crumb; friable, very sticky, very plastic; abrupt, wavy boundary. Natural layer, contains ceramic and glass fragments.

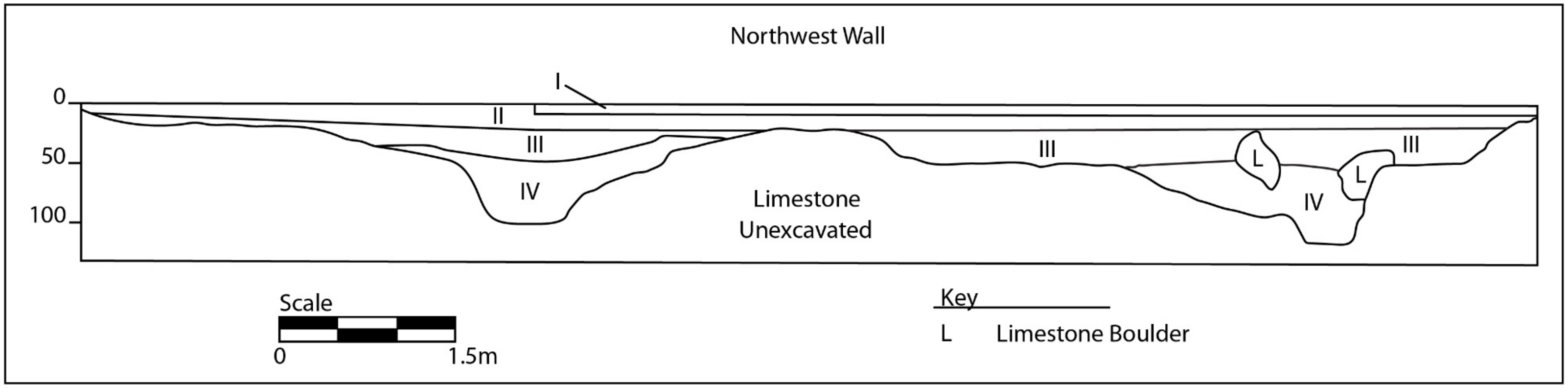

Figure 50. Trench 19, Northwest Wall profile.

Figure 51. Photo of Trench 19 profile, view northwest.

Trench No. 20

Trench No. 20 (Figure 52 and Figure 53) was located ca. 10 m north of Trench No. 16. Trench No. 20 was oriented at 102° and measured ca. 11 m long, 0.90 m wide and 0.85 m deep.

Layer I	0–5 cmbs	Asphalt, abrupt, smooth boundary. Fill layer.
Layer II	4–32 cmbs	Black (10 YR 2/1) loamy sand; strong, medium, granular; firm, non sticky, non plastic; contains gravel; former oil covered parking lot; abrupt, smooth boundary. Fill layer.
Layer III	12–24 cmbs	Very dark gray (10 YR 3/1) loamy sand; strong, medium, granular; firm, non sticky, non plastic; contains gravel; abrupt, broken boundary. Fill layer.
Layer IV	12–30 cmbs	Very dark grayish brown (10 YR 3/2) silty clay loam; weak, fine, sub-angular, blocky; friable, very sticky, very plastic; abrupt, broken boundary. Natural layer.
Layer V	32–45 cmbs	Dark grayish brown (10 YR 4/2) silty clay; weak, thin, platy; friable, very sticky, very plastic; abrupt, smooth boundary. Natural layer.
Layer VI	30–85 cmbs	Very dark grayish brown (10 YR 3/2) silty clay; weak, fine, crumb; friable, very sticky, very plastic. Natural layer.

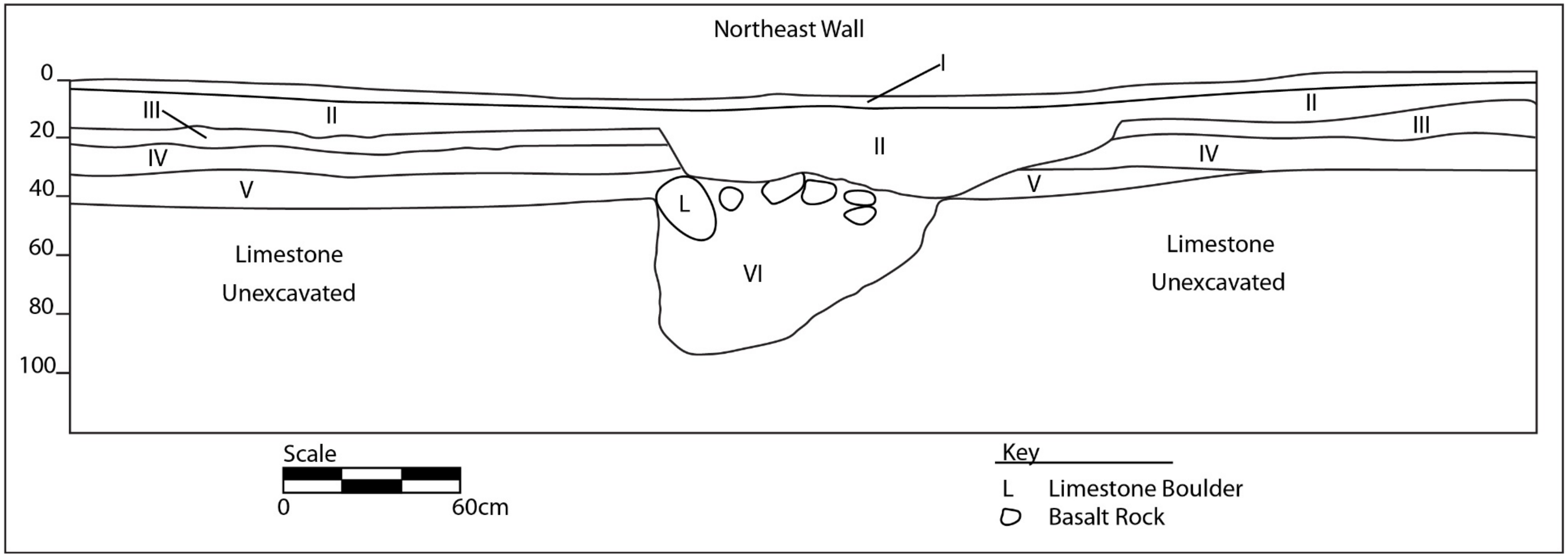

Figure 52. Trench 20, Northeast Wall profile.

Figure 53. Photo of Trench 20 profile, view northeast.

Trench No. 21

Trench No. 21 (Figure 54 and Figure 55) was located on the north east side of the bowling alley building. The trench was oriented at 290° and measured ca. 11 m long, 1.30 m wide and 0.90 m deep.

Layer I	0–7 cmbs	Asphalt; abrupt smooth boundary.
Layer II	7–13 cmbs	White (10 YR 8/2) crushed coral base course; abrupt smooth boundary. Fill layer.
Layer III	13–16 cmbs	Black (10 YR 2/1) silt; weak, very fine, granular; very firm, non-sticky, non-plastic; abrupt smooth boundary. Former oil covered parking lot. Fill layer.
Layer IV	16–32 cmbs	Dark grayish brown (10 YR 4/2) silt loam; moderate fine granular; firm, non-sticky, non-plastic; abrupt smooth boundary. Fill layer.
Layer V	32–63 cmbs	Dark brown (7.5 YR 3/2) silt loam; weak fine granular; friable, slightly sticky, slightly plastic; abrupt, broken boundary. Fill layer.
Layer VI	63–124 cmbs	Dark brown (7.5 YR 3/3) silt loam; moderate fine granular; friable, non- sticky, non-plastic; contains cinder bands and ceramics; abrupt wavy boundary. Fill layer.
Layer VII	124–135 cmbs	Black (10 YR 2/1) cinder. Natural layer.
Layer VIII	135–157 cmbs	Dark yellowish brown (10 YR 3/6) silty clay; weak very fine crumb; very friable, slightly sticky, slightly plastic; wavy boundary. Natural layer.
Layer IX	157+ cmbs	Black (10 YR 2/1) silty clay; weak very fine crumb; very friable, slightly sticky, slightly plastic. Natural layer.

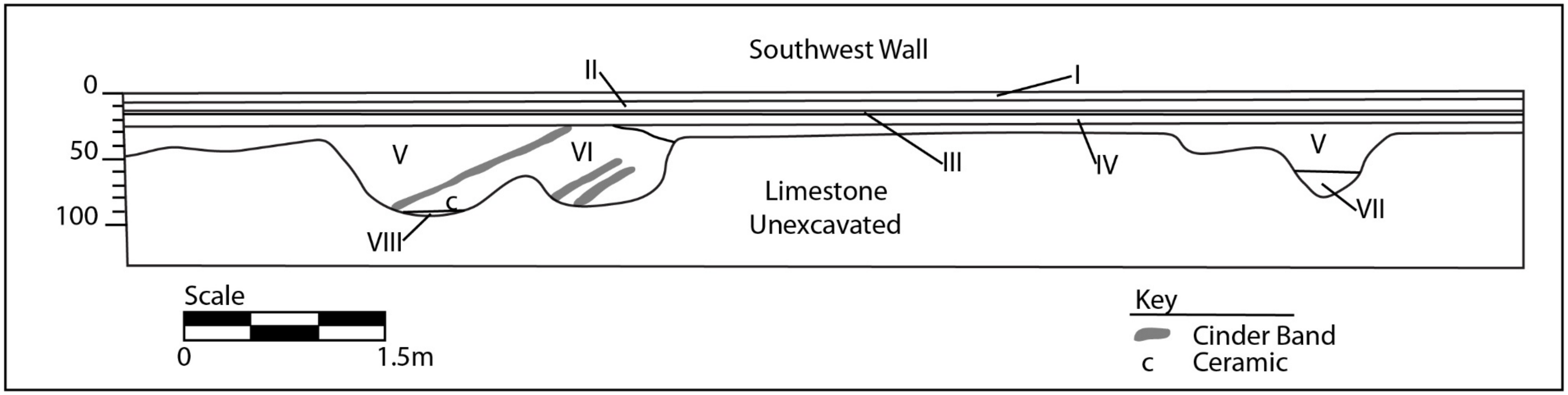

Figure 54. Trench 21, Southwest Wall profile.

Figure 55. Photo of Trench 21 profile, view southwest.

Trench No. 22

Trench No. 22 (Figure 56 and Figure 57) was located near the fence line along the northeast side of the parking lot. The trench was oriented at 290° and measured ca. 10.5 m long, 1.1 m wide and 0.85 m deep.

Layer I	0–4 cmbs	Asphalt; abrupt smooth boundary.
Layer II	4–15 cmbs	White (10 YR 8/1) crushed coral base course; abrupt smooth boundary. Fill layer.
Layer III	14–37 cmbs	Dark grayish brown (10 YR 4/2) silt; moderate, fine, granular; friable, non-sticky, non-plastic; abrupt smooth boundary. Fill layer.
Layer IV	37–68 cmbs	Brown (10 YR 4/3) silt; weak, fine, crumb; friable, non-sticky, non-plastic; abrupt wavy boundary. Fill layer.
Layer V	68–79 cmbs	Very dark gray (10 YR 3/1) cinder; abrupt, broken boundary. Fill layer.
Layer VI	79–100 cmbs	Very dark grayish brown (7.5 YR 3/2) silty clay; weak, fine, crumb; friable, sticky, plastic; contains brick, clay sewer pipe fragments; abrupt smooth boundary. Natural layer.
Layer VII	100–107 cmbs	Very dark brown (10 YR 2/2) silt; weak, very fine granular; very friable, slightly sticky, slightly plastic; contains metal and ceramics; abrupt smooth boundary. Natural layer.

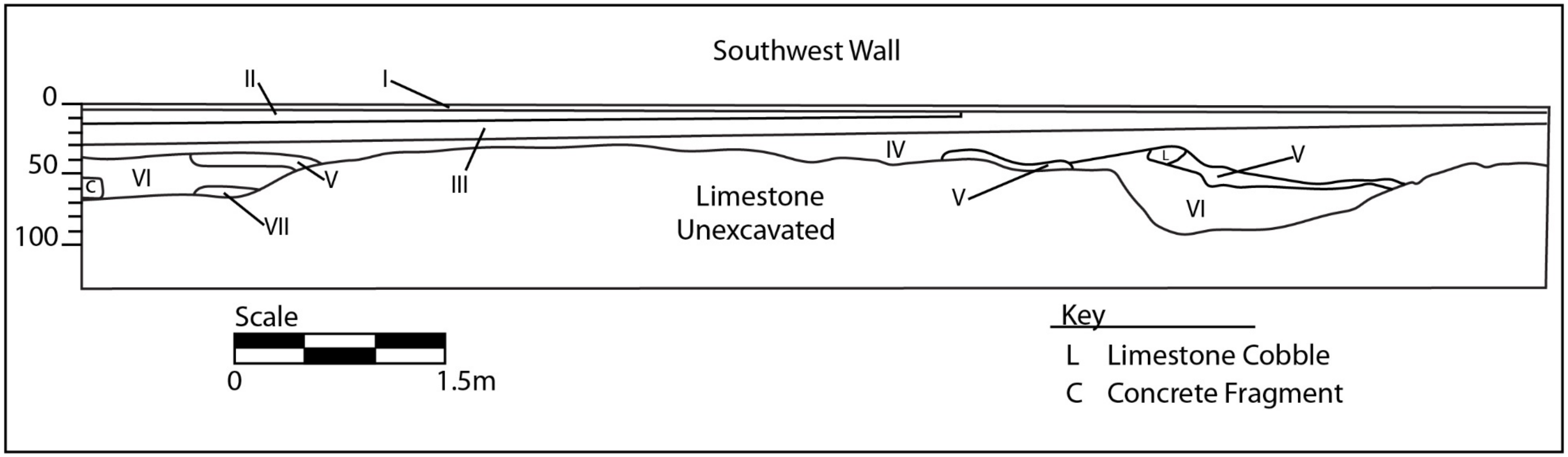

Figure 56. Trench 22, Southwest Wall profile.

Figure 57. Photo of Trench 22 profile, view southwest.

Trench No. 23

Trench No. 23 (Figure 58 and Figure 59) was located in the northwest corner of the project area ca. 3 m from the northwest fence. The trench was oriented at 290° and measured ca. 10.5 m long, between 0.95 and 1.7 m wide and 1.3 m deep.

Layer I	0–8 cmbs	Asphalt; abrupt smooth boundary.
Layer II	8–31 cmbs	Gray (10 YR 5/1) silt; moderate, fine, granular; firm, non sticky, non plastic; contains gravel; abrupt smooth boundary. Fill layer.
Layer III	31–89 cmbs	Dark brown (10 YR 3/3) silt; weak, fine, granular; friable, non-sticky, non-plastic; contains glass, slag and concrete; abrupt smooth boundary. Fill layer.
Layer IV	89–140 cmbs	Dark brown (10 YR 3/3) silty clay; moderate, fine, crumb; firm, sticky, plastic; contains historic artifacts; abrupt wavy boundary. Fill layer.
Layer V	140–158 cmbs	Dark brown (7.5 YR 3/3) silty clay; weak fine crumb; friable, sticky, plastic; contains rusted metal fragments; abrupt smooth boundary. Natural layer.

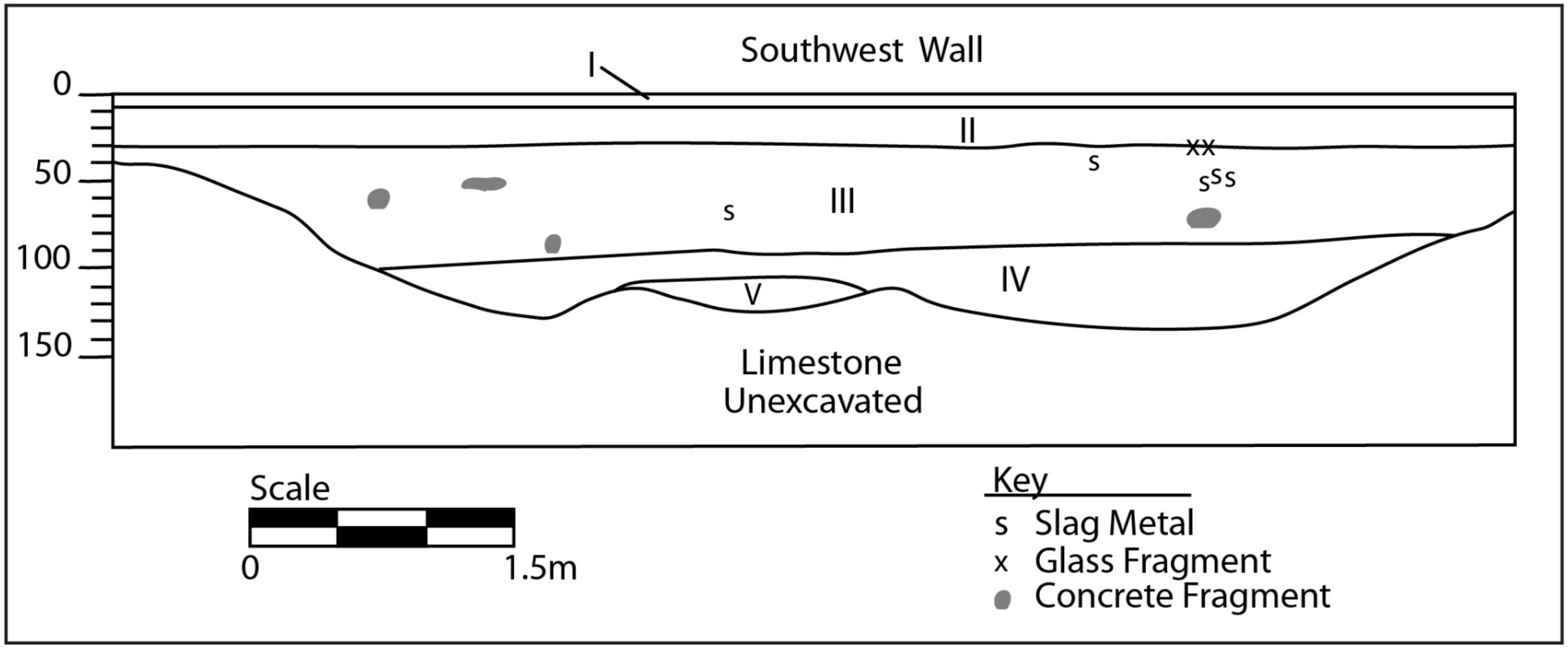

Figure 58. Trench 23, Southwest Wall profile.

Figure 59. Photo of Trench 23 profile, view southwest.

Trench No. 24

Trench No. 24 (Figure 60 and Figure 61) was located perpendicular to, and transected, Trench No. 5 and was located on the northwest side of the bowling alley building. This trench was excavated in an attempt to better identify the concrete footing found in Trench 5. Trench 24 was oriented at 200° and measured ca. 7 m long, 1.2 m wide and 0.80 m deep.

Layer I	0–5 cmbs	Asphalt; abrupt smooth boundary.
Layer II	5–17 cmbs	Grayish brown (10 YR 5/2) silt; moderate, fine, granular; firm, non-sticky, non-plastic; contains basalt pebbles; abrupt smooth boundary. Fill layer.
Layer III	17–62 cmbs	Dark grayish brown (10 YR 4/2) silt; moderate, very fine, granular; firm, non-sticky, non-plastic; contains basalt pebbles; abrupt smooth boundary. Fill layer.
Layer IV	62+ cmbs	Dark grayish brown (10 YR 3/2) silty clay; moderate, fine, crumb; friable, very sticky, plastic; contains brass, rusted metal, plastic, glass; abrupt smooth boundary. Fill layer.

The concrete rubble identified within Trench 24 confirmed to the archaeologists that the footings and slabs were indeed deposited rather than purposely placed in their location. They formed no discernible pattern and, in fact, appeared to be in more disarray than they did in Trench 5.

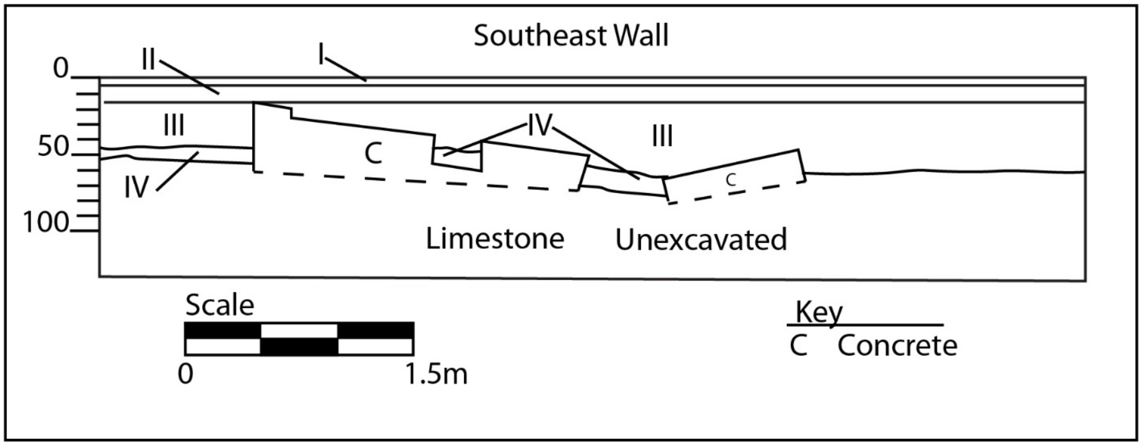

Figure 60. Trench 24, Southeast Wall profile.

Figure 61. Photo of Trench 24 profile, view southeast.

6.0 LABORATORY ANALYSIS

Of the 24 trenches excavated during the project, 14 contained historic artifacts. A total of 141 historic artifacts were recovered. No traditional artifacts or resources were identified within any of the trenches. The majority of artifacts identified were whole and fragmentary glass bottles mainly associated with the use of the area for the former bowling alley (Stadium Bowl-O-Drome) constructed in 1955 and parking facility for the adjacent Honolulu Stadium. However, there were several household items that were likely deposited by residents that lived in the vicinity.

The artifacts recovered during testing are described below and summarized in greater detail in Table 3 and Table 4 at the end of this section (p. 124).

Trench 3

All 28 artifacts and bone fragments recovered from Trench 3 were collected from Layer VII, silty clay 44–80 cmbs (Figure 62, Figure 63, Figure 64, and Figure 65). These include:

- A clear glass two-piece mold soda bottle base and side fragment. Embossed on the side is a portion of the word "Honolulu HI," and it is likely a fragment from a Honolulu Soda Works bottle.
- A clear glass bottle fragment that exhibits an octagonal shape.
- An aqua bottle fragment with an irregular shape, possibly from a medicine bottle.
- An aqua bottle fragment, with embossed letters "EN", probably Enterprise Soda Works.
- Two green porcelain fragments from a straight-sided cup. Japanese origin, late nineteenth to twentieth century.
- Six porcelain base and side fragments of three rice bowls with blue on white transfer-printed dashed line designs. Japanese origin, late nineteenth to twentieth century.
- One white porcelain plate fragment, base with a faint mark on the base: "Limoges, A. Lanternier, Franc". Undetermined date.
- Fifteen saw-cut mammal bone fragments. Most are long bone fragments with cut marks in multiple locations. Likely cow (post-Contact introduction).

Figure 62. Porcelain artifacts recovered from Trench 3.

Figure 63. Glass artifacts recovered from Trench 3.

Figure 64. Saw-cut faunal remains recovered from Trench 3.

Figure 65. A ceramic plate fragment made in France (Limoges), from Trench 3.

Trench 5

Only a single clear glass bottle body fragment was collected from Trench 5, Layer IV silty clay loam, 40–95 cmbs. The glass fragment is from a Diamond Head Beverage Company bottle, as indicated by its white enamel label (Figure 66). Bottles with applied color labeling (ACL) such as this one "typically [date] no earlier than 1933 […] when the ACL process was first adopted for commercial use in the United States" (Lindsey 2020).

Figure 66. Glass bottle fragment recovered from Trench 5.

Trench 9

A total of 25 artifacts were recovered from this trench (Figure 67 and Figure 68). All artifacts were recovered from Layer V silt loam, 30–65 cmbs, and include:

- Seven green glass Coca-Cola soda bottle fragments
- One brown glass fragment
- One green glass Coke bottle
- Eleven clear glass bottle fragments
- Five clear glass bottles

Three of the clear bottles contain maker's marks (Figure 67). One bottle, from the Hazel-Atlas Glass Company dates between 1923 and 1982. The second bottle contains the letter "O" within a diamond with the plant code 20, and a date code of 3. This bottle dates to the 1930s. The third bottle contains the letter "O" within a diamond with the plant code 2A, and a date code of 43. This bottle dates to 1943 (Lindsey 2020).

Figure 67. Selection of glass bottles recovered from Trench 9.

Figure 68. Glass bottle bases recovered from Trench 9.

Trench 11
Ten artifacts were recovered from Trench 11 from within Layer III, silty clay loam, 6–100 cmbs (Figure 69, Figure 70, and Figure 71). These include:

- Five saw-cut animal bones
- Two clear glass bottle fragments – soda bottle and milk bottle
- One brown glass beer bottle fragment
- One ceramic teacup fragment
- One ceramic insulation rod
- Unidentified metal wire was also present but not collected

The brown glass beer bottle is from the Dai Nippon Brewing Company which operated between 1906 and 1949 (Ross 2009:8). "Dai Nippon bottles are embossed in English or Japanese with a logo of the sun (a circle with a dot in the center) [and] a monogram of the letters *DNB*" (Ross 2009:13). On the shoulder, it is embossed with "TRADEMARK," the sun logo, and the stylized DNB monogram. Near the bottom of the body, it is embossed with "DAINIPPON BREWERY CO."

Figure 69. Glass artifacts recovered from Trench 11: *left to right*, soda bottle fragment, milk bottle fragment, beer bottle.

Figure 70. Ceramic artifacts recovered from Trench 11.

Figure 71. Faunal remains recovered from Trench 11.

Trench 12
Twenty-four artifacts (Figure 72, Figure 73, and Figure 74) were recovered from Trench 12 from within Feature A refuse pit excavated from Layer IV. With the exception of one clear glass bottle recovered from the backdirt pile, artifacts from Feature A include:

- One clear glass bottle (from backdirt pile)
- 11 clear glass fragments
- Eight green glass fragments
- Two brown glass fragments
- One light bulb fragment
- One saw-cut animal bone

The green glass bottle is embossed on the bottom with the letter "O" within a diamond with the plant code of 65 and a date code of 41. This bottle is from Owens-Illinois and dates to 1941 (Lindsey 2020).

Figure 72. Glass artifacts recovered from Trench 12: *left to right*, soda bottle, wine(?) bottle, beer bottle, soda bottle.

Figure 73. A glass light bulb recovered from Trench 12.

Figure 74. Saw-cut animal bone collected from Trench 12.

Trench 14
Three artifacts were collected from the backdirt pile in Trench 14. The concrete (Fig. 75) fragments are from Fea. B, while the ceramic bowl fragments (Figs. 76 and 77) were recovered from Layer VI which underlies Fea. B. These items include:

- Two ceramic vegetable dish fragments (from one vessel)
- One plain white ceramic fragment
- Concrete fragments

The ceramic fragments from a nearly complete vegetable dish. The maker's mark on the bottom of the bowl states: "John Maddock & Sons LTD England. Rec R". The company began in 1855 and operated into the 1960s. The fragments are white ironstone with a green transfer-printed floral rim design. An approximate date for this item is post 1896, based upon the maker's mark (Birks n.d.-b).

Figure 75. A concrete fragment recovered from Trench 14.

Figure 76. Conjoined ceramic bowl fragments (made in England) recovered from Trench 14.

Figure 77. Base of ceramic bowl from Trench 14 showing maker's mark.

Trench 15

Two artifacts were recovered from Trench 15, Layer VII silty clay, 58–81 cmbs (Figure 78). They include:

- An aqua glass bottle fragment
- Green glass bottle neck fragment

The green glass fragment contains a patent mark "Priof" as part of the lip finish. The groove is similar to the patented "Priof" bottle feature, used to open a crown cap bottle with any nonstandard bottle opener (Lindsey 2020). This bottle fragment is embossed with a patent mark date of December 11, 1911.

Figure 78. A green glass bottle neck fragment recovered from Trench 15.

Trench 16

Seven artifacts were recovered from Trench 16, Layer VI silty clay, 44–65 cmbs (Figure 79). They include:

- Six green and white ceramic jug fragments (one vessel)
- One porcelain straight-sided cup with a blue on white design; Japanese origin

No maker's marks were present on the ceramics.

Figure 79. Ceramic artifacts recovered from Trench 16.

Trench 18

Five artifacts were recovered from Trench 18, Layer II silty clay, 20–32 cmbs (Figure 80). They include:

- One olive green glass bottle fragment
- One aqua glass bottle fragment
- One white with bluish tint porcelain bowl fragment
- Two fragments of plastic sheeting

The aqua "Coke" soda bottle fragment contains the "Hobble skirt" design which was created in 1915/16 (Lockhart and Porter 2010:46–47).

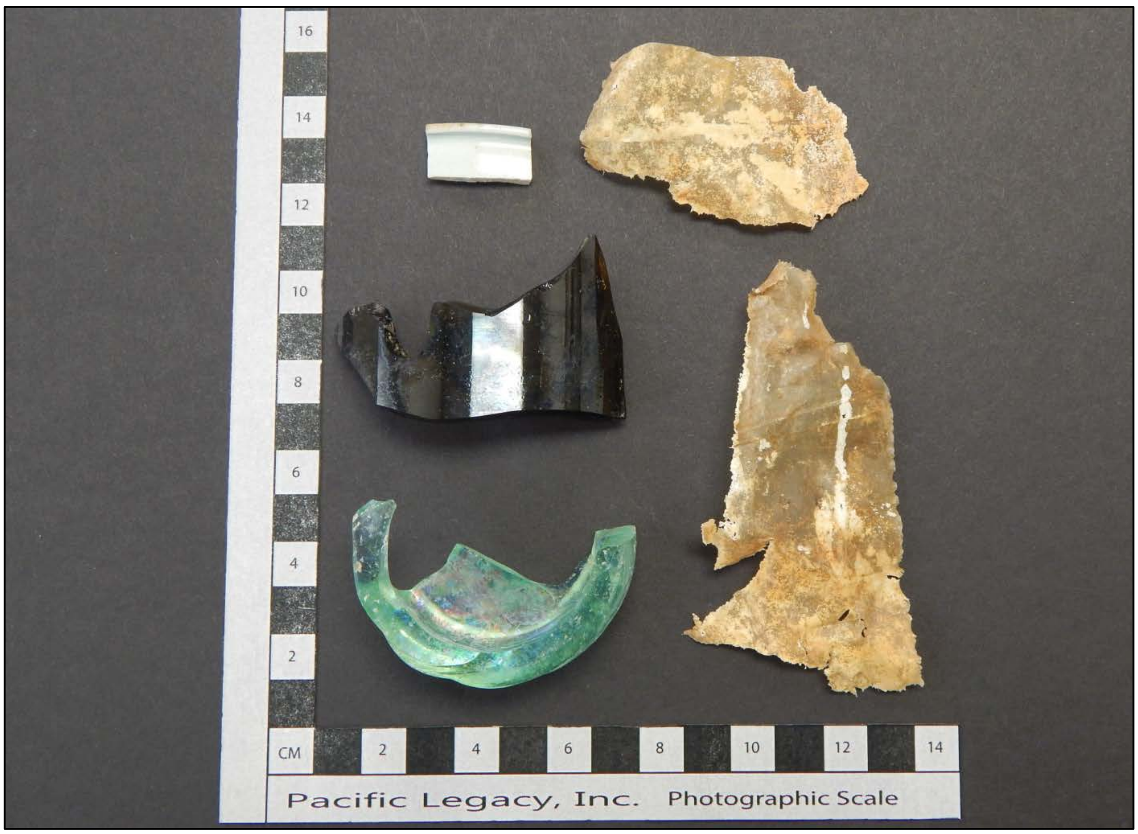

Figure 80. Artifacts recovered from Trench 18.

Trench 19

A total of 19 artifacts were recovered from Trench 19, Layer IV silty clay 50–115 cmbs (Figure 81 and Figure 82). These include:

- One clear glass body and shoulder bottle fragment
- One aqua glass liquor bottle base and heel fragment (7627 on base)
- One green glass Coca-Cola soda bottle fragment from 1915/1916
- One Chinese brown earthenware stone jar rim and body fragment
- Eight white teacup fragments
- Four white plate fragments
- Three white bowl fragments including a plain porcelain rice bowl and a porcelain rice bowl with a blue transferred and hand-painted print

One of the plate fragments is stamped "…ONSTONE CHINA," probably "ironstone." Ironstone is a type of stoneware that originated in England in the early nineteenth century. There is no iron in ironstone; it is so called because of its durability. A large number of American potters were producing ironstone by the 1870s and 1880s. Many of the maker's marks on ironstone include a coat of arms, a lion, and a unicorn (Birks n.d.-a). Because the maker's mark is partial, a firmer date range could not be determined for the artifact.

Figure 81. Glass artifacts recovered from Trench 19.

Figure 82. Ceramic artifacts recovered from Trench 19.

Trench 21

Four artifacts were recovered from Trench 21, Layer VI silty loam, 64–124 cmbs (Figure 83). All four items are white ceramic teacup/bowl fragments from separate vessels. One contains an undetermined bronze/gold design which appears to be Asian.

Two markings were found on the ceramics (Figure 84). The first fragment is a plain white refined earthenware cup fragment consisting of a portion of a flat base, and a small portion of the body with an orange mark that appears to be *kanji*; however, it is very faded and difficult to discern (no translation obtained).

The second fragment (Figure 84) is a plain white porcelain cup fragment consisting of a portion of the base and body (undetermined size). Mark on the base in dark green (*TRADE MARK *MADE IN JAPAN*) in a banner around the outside of the mark, with a five-petal flower in the shape of 5 Ms (*sakura* or cherry blossom) in the center colored in. In the 1920s, porcelain makers began using various marks incorporating cherry blossoms for porcelain that was produced for the U.S. market (Nilsson 2020).

Figure 83. Ceramic artifacts recovered from Trench 21.

Figure 84. Close-up of two ceramic artifacts with markings.

Trench 22
This trench contained four artifacts collected from Layers VI and VII. The items include:

- One fragment of a melted milk glass bottle – Layer VII
- One metal nail – Layer VII
- One brick fragment – Layer VI
- One drainage tile fragment – Layer VI

The milk glass bottle (Figure 85 and Figure 86.) container measures 8 cm tall × 4.5 cm thick with a portion of the neck and body melted and collapsed into the interior. The vessel has 10 even sides with a round opening (uncertain closure type). The base has four "Kanji" characters; no translation was obtained.

Figure 85. Milk glass bottle recovered from Trench 22.

Figure 86. Milk glass bottle with partially melted top.

Trench 23
A total of three artifacts were collected from Trench 23, Layers III and IV. They include:

- A clear glass bottle neck fragment – Layer IV
- Two ceramic fragments – Layer III

One of the ceramics was a blue (Figure 86) on white transfer print porcelain rim fragment (undetermined design type); likely a shallow bowl.

Figure 87. Ceramics recovered from Trench 23.

Trench 24

Seven artifacts (Figure 87, Figure 88, and Figure 89) were recovered from Trench 24, Layer IV silty clay, 62+ cmbs. They include:

- Green glass Coca Cola bottle fragment base with hobbled-skirt design created in 1915/1916
- Two plastic sheets
- A plastic fork fragment
- One metal fencepost collar
- One metal washer
- One crushed metal can

The green "Coke" bottle fragment contains the "Hobble skirt" design which was created in 1915/16 (Lockhart and Porter 2010:46–47).

Figure 88. Metal artifacts recovered from Trench 24.

Figure 89. Glass fragment recovered from Trench 24.

Figure 90. Plastic items recovered from Trench 24.

Table 3. Detailed list of artifacts by trench

Location	Layer	Material Type	Artifact Type	Color	Comments
Trench 3	VII	Glass	Bottle fragment	Clear	It is a round soda bottle, measures 6.8 x 6.0 cm, with embossed lettering (***ks **nolulu H.I.), no maker's mark or other marks on the intact base. Bottle has a side seam, and has a seam along the side of the heel.
Trench 3	VII	Glass	Bottle fragment	Clear	Exhibits an octagonal shape with each side approximately 2.6 cm across. Measures 8.2 x 5.6 cm. No base or rim component to this fragment.
Trench 3	VII	Glass	Bottle fragment	Aqua	Irregular shape, possibly medical bottle fragment measuring 4.6 x 4.0 cm.
Trench 3	VII	Glass	Bottle fragment	Aqua	Measures 5.5 x 4.9 cm. Partial word of embossed lettering (EN**, most likely Enterprise Soda Works). Has a side seam.
Trench 3	VII	Porcelain	Cup fragment	Green	Dark green glazed ceramic rim fragment with a small area of light brown, approximately 6 cm diameter. Measures 4.4 x 3.8 cm.
Trench 3	VII	Porcelain	Cup fragment	Green	Dark green glazed ceramic rim fragment with a small area of light brown, approximately 6 cm diameter. Measures 2.7 x 1.9 cm.
Trench 3	VII	Porcelain	Plate fragment	White	White plain ceramic plate fragment with a faint mark on the base. Limoges – top, Franc – bottom, A. Lanternier – middle.
Trench 3	VII	Porcelain	Bowl fragments	White	3 blue on white ceramic fragments, representing at least 2 similar rice bowls: 1st consisting of the entire base and fragmented sides. Vaguely water-based pattern on the outside surface, with a blue ring on the interior with a circular mark in the center of the interior. No rim. No maker's mark on the base. Measures 8.8 x 8.4 x 3.8 cm. 2nd consisting of about half of the base, with a portion of the side, no rim. Vaguely water-based pattern on the outside surface, with a blue ring on the interior with a circular mark in the center of the interior. No maker's mark. Measures 7.4 x 4.1 x 3.0 cm. 3rd rim fragment. Vaguely water-based pattern on the outside surface, with a repeating pattern vaguely like teeth made up of 3 parts descending from the rim and diminishing in size to a point.
Trench 3	VII	Porcelain	Bowl fragments	White	3 blue on white ceramic fragments of a single rice bowl. 2 of the fragments represent about 2/3 of the bowl base. The third is a rim fragment. The pattern on the outside surface is vaguely geometric with a five-petal flower repeated at intervals. The interior pattern also features the five-petal flower pattern. The fragments measure 6.1 x 5.0 x 3.6 cm, 4.1 x 2.7 x 1.9 cm, and 3.9 x 3.6 cm.
Trench 3	VII	Mammal bone	Saw-cut fragments	n/a	15 large, cut long bones of a horse or cow.

Location	Layer	Material Type	Artifact Type	Color	Comments
Trench 5	IV	Glass	Bottle fragment	Clear	Partial applied color labels on front and back -Front (Dia), Back (d Head *rages **uid ounces). This is Diamond Head Beverages, bottled by Coca-Cola Bottling Co. of Honolulu, LTD (approximately 1950–70s).
Trench 9	V	Glass	Bottles	Clear	1 whole and 1 partial bottle of the same type. Whole bottle measures 8.5 x 2 1/16 in. Embossed lettering on the neck and shoulder (Malolo *with an embossed fish as part of the name). Embossed around the outside of the heel (Net Contents 6 1/2 ounces). Embossed marks on the base: Maker's mark is Owens-Illinois, Diamond with Circle with a dot inside, plant code 20, date code 3 *. Also, a large M inside a triangle with 4128 C underneath. Owens-Illinois Glass Co. used this maker's mark 1929–1960. Date codes - 1930s, probably 1931.
Trench 9	V	Glass	Bottle	Clear	Oval medicine-type bottle with a threaded finish measuring 5.4 x 3.5 x 12.3 cm. Bottle has no labels or embossing on its body. The base has a 3 3/4" embossed on it, as well as the Owens-Illinois Diamond with circle maker's mark. Left code 12, right code 7, under code 3*. Most likely 1930s again, and 1931 specifically.
Trench 9	V	Glass	Bottles	Clear	3 clear glass bottles with identical embossed lettering on the front (Horlick's Malted Milk Lunch Tablets) and threaded finish (one bottle has its metal cap). The bases of all three have the same maker's mark (Stylized H with an A inside it, A then a line with a K under it, then the number 11). The one bottle with the screw cap has a 17 instead. Horlick's was targeted to soldiers as a meal replacement if you were unable to get any food during WWI and WWII. Hazel-Atlas Glass Co. 1923–1982
Trench 9	V	Glass	Bottle fragments	Clear	Three fragments of two clear glass bottles. The first bottle consists of the intact base, heel, and partial body. Second has an intact base, heel, and most of the body. Bottles have an applied color label on the front (SSS, Sunshine Beverages, Sunshine Soda Shop, Tel. No *******, Honolulu, **) and on the back (**R And *** Acid added). The first base has an embossed maker's mark 20 (O with I inside, inside a diamond), 9, with 2 under, then 4419-G. The second has the maker's mark G C (interlinked) with the numbers 5412, 3. Owens-Illinois Glass Co. used this maker's mark 1929–1960. Date code = 1930. Glass Container Co. 1934–1968.
Trench 9	V	Glass	Bottle base fragment	Clear	A maker's mark (20, O with I inside a diamond 1*). Also has the embossed lettering (Design Pat'D Mar 9,25).

Location	Layer	Material Type	Artifact Type	Color	Comments
Trench 9	V	Glass	Bottle fragments	Clear	Two fragments consisting of bases, heels, and partial bodies. Embossed lettering on the body (Rycroft). Around the heel (Artifically Colored Flavored, Trace Benzoate, Citrate Acid Added), opposite side (Contents 6 1/2 Fluid Ounces, Registered). An embossed letter R is present on the base, as well as a maker's mark (20, O with a diamond, 30). Owens-Illinois Glass Co. used this maker's mark 1929–1960. Date code = 1930.
Trench 9	V	Glass	Bottle neck fragment	Clear	Bottle neck and partial shoulder fragment. Two side seams all the way through the lip present. No embossing or labels present. Cork-style closure. Liquor bottle of some kind.
Trench 9	V	Glass	Bottle fragments	Clear	Two clear glass bottle fragments. One almost intact with the neck missing, the other with the base, and partial body missing. Body has a special ribbed bottle design, with an embossed panel (KIST, T.M. REG. U.S.PAT'D.OFF.). Embossed lettering on the heel (T.M. REG. U.S.PAT'D.OFF., CAP. 7 OZ. PAT. JAN 25, 1927.). The base of one bottle has (** O with diamond *) - numbers too faint to make out. Owens-Illinois Glass Co. used this maker's mark 1929–1960.
Trench 9	V	Glass	Bottle fragment	Brown	One fragment consisting of most of the base and some body. The bottle has embossed lettering on the heel (Half Pint), additional embossed lettering appears on the base (D11 56-9), and the maker's mark (O with I inside, within a diamond). Owens-Illinois Glass Co. used this maker's mark in 1929–1960.
Trench 9	V	Glass	Bottle	Green	Partial Coca-Cola soda bottle base with portion of the body on one side. Embossed lettering along the heel (QUART 32A 4/5 QUART 4/5). Embossed lettering on the broken base (*RECHABALA. S.A. OF P.R., INC), with maker's mark (P inside a triangle, unknown).
Trench 9	V	Glass	Bottle fragments	Green	7 Coca-Cola soda bottle fragments. Five of the bottle bases have city names: Honolulu, T.H.; Providence, R.I.; San Francisco, Calif.; Oakland, Calif.; Vallejo, Calif. The other two do not. Five of the fragments have the Owens-Illinois Glass Co. maker's mark from 1929–1960. The dates are not always present, but 1938 and 1939 were seen.

Location	Layer	Material Type	Artifact Type	Color	Comments
Trench 11	III	Glass	Bottle fragments	Clear	1 clear glass milk bottle fragment consisting of the finish, neck, and partial body. No date code on the finish. Measures 12 cm tall, finish is 5.7 cm wide. 1 clear glass soda bottle fragment consisting of the mostly intact base, heel, and small portion of the body. Measures 7.6 cm tall and 5.4 cm wide. The body exhibits a patented bottle design. Embossing around the heel says (T.M. REG. U.S. PAT. *Missing portion [should say OFF.CAP.]* 6 1/2 OZ. PAT. JAN.25,1927). Quality Orange Kist Beverage co. bottle. Bottle is no earlier than 1927 as per the patented design date. Maker's mark on the base is an L inside an oval, which is itself inside an iron cross(?) with the number 4. The L oval maker's mark could be two different glass makers; W.J. Latchford Glass Co. 1925–1939, or Lynchburg Glass Co. 1923–1925. Based on the patent date, likely the first one.
Trench 11	III	Glass	Bottle fragment	Brown	1 dark brown beer bottle. Measures 10 10/16 in. tall and has a 3 in. diameter. Embossed lettering appears on the shoulder (circle with a dot in the center, TRADEMARK, stylized *DNB* logo), and embossing around the body near the heel (DAINIPPON BREWERY CO.). No marks on the base. Dai Nippon Brewing Co. 1906–1949.
Trench 11	III	Ceramic	Teacup fragment	White	A thin plain white teacup fragment with a portion of the rim and body, no base. Measures 3.3 x 6.2 cm.
Trench 11	III	Ceramic	Insulation rod	White	1 white ceramic rod fragment, with a smooth uniform shaft, flaring out then tapering down on the intact end. 9 cm length of fragment x 1.9 cm endpiece (1.4 cm shaft width)
Trench 11	III	Mammal bone	Saw-cut fragments	n/a	4 cut animal long bone fragments (possibly cow), and 1 broken chicken bone
Trench 12	Backdirt pile	Glass	Bottle	Clear	1 clear glass soda bottle, measures 8.5 in. tall and 2 1/16 in. wide. Bottle has embossed lettering on the neck and shoulder (Malolo *with an embossed fish as part of the name). Embossed around the outside of the heel (Net Contents 6 1/2 ounces, *other portion missing due to damage to the bottle heel). Embossed marks on the base are: Maker's mark is Owens-Illinois, Diamond with Circle with a dot inside, plant code 20, date code 3 *. Also, a large M inside a triangle. Owens-Illinois Glass Co. used this maker's mark 1929–1960. Date codes - 1930s, probably 1931.

Location	Layer	Material Type	Artifact Type	Color	Comments
Trench 12	IV, Fe. A	Glass	Bottle fragments	Clear	1st-clear glass bottle fragment consisting of the intact base, heel, and a portion of the body. Coca-Cola hobble-skirt soda bottle design. No labels, no embossing. Faint maker's mark on the body (O with a diamond, 28 plant code on left, 43 date code on right.) Owens-Illinois Glass Co. used this maker's mark 1929–1960. Date codes - 1943. 2nd-clear glass bottle base and heel. Embossed heel (T.M. REG.U.S. PAT.OFF.CAP.7 OZ. PAT. *missing portion*). Maker's mark on base, (O with a diamond, 8 code on left, 9 code on right). Most likely 1939. 3rd-clear glass bottle base fragment, consisting of partial base and heel. Embossing on heel (NET CONTENTS), and on base shows the M inside a triangle, and a maker's mark (O over a diamond with a dot inside, plant code 20 to the left, 7 to the right). Owens-Illinois Glass Co. used this maker's mark 1929–1960. Date codes - 7, possibly 37, 47, 57. But most likely 1937 like the other Malolo bottle in Trench 12. 4th-3 clear glass bottle base fragments. No datable info seen. 5th-2 plain clear glass bottle body fragments. 2 clear glass bottle body fragments with stippling, and one with No Return embossed on it. 6th-clear glass bottle finish with a threaded finish, partial neck flaring out into an oval medicine-bottle-style shape.
Trench 12	IV, Fe. A	Glass	Bottle fragments	Aqua	Three aqua glass Coca-Cola hobble-skirt soda bottle fragments with a base, heel, and partial body. Four body fragments.
Trench 12	IV, Fe. A	Glass	Bottle fragments	Brown	2 brown glass bottle fragments consisting of partial bases, and a portion of the heel. Both have the same stippling, and embossed (Duraglas) and maker's mark (O over the diamond with an I inside, 6 to left, 5* to right, one has a 9 under, the other 11 under). Owens-Illinois Glass Co. used this maker's mark 1929–1960. Date codes - 1950s.
Trench 12	IV, Fe. A	Glass	Bottle fragments	Green	Light green wine or liquor(?) bottle glass fragment consisting of most of the push up base and a small portion of the heel and body. No labels or embossing on the body or heel. On the base, embossed lettering says (CIA RON BICARDI S A, SANTIAGO DE CUBA, *then maker's mark* O over a diamond, plant code 65 to left, date code 41 to right). Owens-Illinois Glass Co. used this maker's mark 1929–1960. Date codes - 1941.
Trench 12	IV, Fe. A	Glass	Lightbulb fragment	Clear	Clear glass lightbulb fragment with two wires running from inside into a fragment of amethyst(?) glass. 6 cm long x 1 cm thick for the lightbulb, 2.3 cm for the amethyst(?) glass base.
Trench 12	IV, Fe. A	Mammal bone	Saw-cut fragment	n/a	One double cut animal bone fragment, possibly cow.

Location	Layer	Material Type	Artifact Type	Color	Comments
Trench 14	Backdirt pile	Ceramic	Vegetable dish fragments	White	Nearly complete reconstructed bowl with blue leafy pattern on the interior along the rim. Bowl is approximately 16 x 12 x 4 cm. No pattern on the exterior. On the base is a mark impressed into the ceramic of a British-style crown. A maker's mark is seen as well (*Lion on platform, with banner underneath with the word Vitrified, John Maddock & Sons LTD, England, Rec to* [possibly an R]).
Trench 14	Backdirt pile	Ceramic	Fragment	White	A white plain ceramic fragment consisting of part of a base and sidewall. No distinguishing marks or features. Measures 4.2 x 2.2 cm.
Trench 14	Backdirt pile	Concrete	Fragment	n/a	A flat piece of concrete with coral and volcanic glass fragments within it. The underside shows evidence of perhaps being poured over grass, or seeds of some kind. Measures 15.5 x 15 cm and 3 cm thick.
Trench 15	VII	Glass	Bottle fragment	Green	Glass bottle fragment consisting of a finish and neck. Patent mark "Prior" lip finish. Two side seams are observed extending all the way to the top of the lip. The finish is set for a crown cap. An inset groove running around the finish below the lip is present with the embossed lettering (Pat'D Dec 19, 1911), below this groove (2.6 cm) is a projecting ring. No earlier than 1911.
Trench 15	VII	Glass	Bottle fragment	Aqua	Glass bottle fragment consisting of a neck and shoulder of a round bottle. No embossing or labels seen. Two side seams are evident.
Trench 16	VI	Ceramic	Jug fragments	White	Six fragments from the same vessel, a large-mouthed jug in white ceramic with a green diamond, circle, diamond repeating pattern along the rim, with a green line on the rim and below the repeated pattern. Below the bottom line is a green 3 leaf clover pattern on long flowing stems extending down the shoulder to another green line at the widest point of the body. The remainder of the body is plain white.
Trench 16	VI	Porcelain	Cup fragment	White	Blue on white ceramic cup fragment of a Japanese straight-sided cup consisting of a portion of the rim and body. A vaguely leafy pattern with possible structural components is visible on the exterior portion of the cup. The interior has a blue line along the rim, and another 2.5 cm below. Additional patterning is observed between the lines, but cannot be made out.
Trench 18	II	Glass	Bottle fragment	Olive green	Olive green round bottle fragment. The fragment is a portion of the body of the bottle. No label, embossing, or marks of any kind are present.
Trench 18	II	Glass	Bottle fragment	Aqua	From a Coca-Cola soda bottle with a Hobble skirt design which was created in 1915/16. Aqua glass round glass bottle fragment consisting of a partial base, heel, and a small amount of the body. No embossing or labels present.
Trench 18	II	Porcelain	Fragment	White	Small ceramic rim fragment with slight bluish tint on the exterior surface. No pattern or distinctive marks present.

Location	Layer	Material Type	Artifact Type	Color	Comments
Trench 18	II	Plastic	Sheeting fragments	Opaque light brown, yellowish color	Two pieces of discolored plastic sheeting.
Trench 19	IV	Glass	Bottle fragment	Clear	Clear glass bottle fragment from the body and shoulder of a round bottle. No embossing or labels present.
Trench 19	IV	Glass	Bottle fragment	Green	Glass bottle fragment consisting of a partial heel, and body of a Coca-Cola hobble-skirt bottle which was created in 1915/16. No embossing or labels are present.
Trench 19	IV	Glass	Bottle fragment	Aqua	Glass bottle fragment consisting of a partial base and heel. Embossed numbers on the base (7627). No other embossing and no labels were present. Likely a large liquor bottle.
Trench 19	IV	Ceramic	Jug fragment	Brown	Dark brown coarse earthenware jug fragment consisting of a partial rim and body. Chinese brown natural glazed stoneware, small food jar.
Trench 19	IV	Ceramic	Teacup fragments	White	7 plain white porcelain fragments of a single cup (undetermined size). 3 small rim fragments, including one with the handle. 4 fragments of the body and base of the vessel.
Trench 19	IV	Ceramic	Plate fragments	White	Three kinds of plate fragments: 1st-2 plain white ceramic fragments of a single plate (about 18 cm diameter). A portion of a maker's mark is present on the base (*RONSTONE CHINA, partial figure of a unicorn). The fragments consist of a portion of the rim and body and small amount of the base. Produced in the United States between 1850-1900. 2nd-white refined earthenware plate fragment consisting of a small portion of the base and rim (undetermined size). Transfer print floral design around the rim. No base markings. 3rd-white refined earthenware plate fragment consisting of a portion of rim and base (19 cm diameter). Design consists of a double row of two blue lines around the rim. No base markings
Trench 19	IV	Ceramic	Bowl fragments	White	Three kinds of bowl fragments: 1st-white porcelain rice bowl fragment (12 cm diameter) consisting of a portion of the rim and body, no base. A faint over glazed hand-painted scenic landscape design present on the exterior surface. 2nd-white porcelain rice bowl fragment (11 cm diameter) consisting of part of the rim and body, no base. A blue on white transfer print floral design on the exterior surface. 3rd-a small plain white porcelain rice bowl rim fragment (undetermined size).

Location	Layer	Material Type	Artifact Type	Color	Comments
Trench 21	VI	Ceramic	Teacup fragments	White	One fragment is almost complete and has a bronze/gold design (Asian). Another fragment has an orange mark on the interior that appears to be a kanji character (no translation obtained). The third fragment is plain white with a flat base. The fourth fragment has a mark that reads "TRADE MARK MADE IN JAPAN" around a sakura flower.
Trench 22	VII	Milk glass	Bottle fragment	White	White glass container (8 cm tall x 4.5 cm thick) with a portion of the neck and body melted and collapsed into the interior. Has 10 sides with a round opening. The base has four Kanji characters.
Trench 22	VII	Metal	Nail	n/a	Rusted iron nail (5.1 cm long, 0.4 cm thick). Head and shaft are round.
Trench 22	VI	Construction materials	Brick fragment	n/a	Red brick fragment approximately 11 x 6 x 4.3 cm thick (the 6 cm wide measurement is an intact portion of the brick, the other two measurements are for broken portions). Evidence of mortar along one edge.
Trench 22	VI	Construction materials	Drainage tile fragment	n/a	Coarse earthenware drain pipe fragment with a dark red glaze (6.3 x 3.8 x 1.5 cm thick).
Trench 23	IV	Glass	Bottle fragment	Clear	Clear glass bottle fragment consisting of a small portion of the neck. No distinguishing features or labels present.
Trench 23	III	Ceramic	Fragments	White	Two fragments: 1st-plain white porcelain plate fragment consisting of a small portion of the base (undetermined size). No base marks, or decoration present. Measures 3 x 2.1 cm. 2nd-blue on white transfer print porcelain rim fragment (undetermined design type). Most likely a shallow bowl. Measures 3.1 x 1.4 cm.
Trench 24	IV	Glass	Bottle fragment	Green	Bottle fragment consisting of a portion of the body from a Coca-Cola soda bottle with a hobble-skirt design which was created in 1915/16. No embossing or labels present. Measures 7.4 x 5.1 cm.
Trench 24	IV	Plastic	Sheeting fragments	Clear	Two fragments of plastic sheeting labeled at the top "Kodak – Safety – Film 616). Date for 616 is 1923–84. Measures 12 x 9.5 cm.
Trench 24	IV	Plastic	Fork fragment	Green	Two tines of a green plastic fork.
Trench 24	IV	Metal	Fencepost collar	n/a	A bronze partially internally threaded ring, possibly as part of a fence post. (9.3 cm external diameter, 8.0 cm internal diameter, 1.5 cm long posts on opposite sides of the outside of the ring, 3.2 cm thick).
Trench 24	IV	Metal	Washer	n/a	Rusted metal washer (3.5 cm diameter, 1.1 cm ring width, 0.2 cm thick).
Trench 24	IV	Metal	Crushed tin can	n/a	Crushed tin can consisting of an intact base, and partial side walls. Can is silver/gray in coloration. Measures 8.4 x 6.4 x 2.0 cm.

Table 4. Totals of artifact types recovered during testing

Artifact List	Trench 3	Trench 5	Trench 9	Trench 11	Trench 12	Trench 14	Trench 15	Trench 16	Trench 18	Trench 19	Trench 21	Trench 22	Trench 23	Trench 24
Glass Bottles														
Clear Glass			5		1									
Fragments	2	1	11	2	11					1			1	
Aqua Glass-Fragments	2						1		1	1				
Milk Glass												1-melted		
Brown Glass				1										
Fragments			1		2									
Green Glass			1											
Fragments			7		8		1		1	1				1
Totals	4	1	25	3	22	0	2	0	2	3	0	1	1	1
Miscellaneous Glass														
Miscellaneous/Other					1-lightbulb fragment									
Totals	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Ceramics														
Jug-Fragments								6		1				
Teacup/Mug														
Fragments	2			1				1		3	4			
Plate-Fragments	1									4				
Bowl						1								
Fragments	5					1				2				
Undetermined Fragments	1								1	5			2	
Other				1-ceramic rod										
Totals	9	0	0	2	0	2	0	7	1	15	4	0	2	0
Metal														
Item/Other												1-nail		1-fence post collar, 1-washer, 1-tin can(crushed)
Totals	0	0	0	0	0	0	0	0	0	0	0	1	0	3
Plastic														
Miscellaneous/Other									2-plastic sheeting					2-plastic sheets, 1-fork fragment
Totals	0	0	0	0	0	0	0	0	2	0	0	0	0	3
Stone Artifacts														
Construction Materials												1-brick frag, 1-drainage tile frag		
Other						1-concrete frag								

Artifact List	Trench 3	Trench 5	Trench 9	Trench 11	Trench 12	Trench 14	Trench 15	Trench 16	Trench 18	Trench 19	Trench 21	Trench 22	Trench 23	Trench 24
Totals	0	0	0	0	0	1	0	0	0	0	0	2	0	0
Faunal														
Animal Bone	15			5	1									
Totals	15	0	0	5	1	0	0	0	0	0	0	0	0	0
Complete Totals	28	1	25	10	24	3	2	7	5	18	4	4	3	7

6.1 SUMMARY OF FINDINGS

The artifacts identified during the AIS were situated within multiple fill deposits and represent the various uses of the project area. Ceramic and porcelain tableware from Japan, England, and the United States (Trenches 3, 11, 14, 16, 19, 21, 22 and 23) are representative of the residences in the area during the early 1900s. The mixture of Eastern and Western artifacts is suggestive of the mixed races within Mōʻiliʻili at the time.

The concrete blocks identified in Trenches 5 and 24 represent the remains of the incinerator that existed in the project area prior to the 1950s. The exact origins and use of the incinerator are unknown; however, its existence on the property possibly explains the residential artifacts (ceramic and glass) identified and implies nearby residents may have used the incinerator to eliminate trash.

Artifactual remains (glass soda and beer bottles) mainly dating between the 1940s and 1960s (Trenches 9, 12, and 24) can be attributed to the construction of the Stadium Bowl-O-Drome and the use of the parking lot for the adjacent Honolulu Stadium in the 1950s. The multiple fill episodes documented throughout the project area were likely an attempt to raise and flatten the area for vehicular parking for the bowling alley and stadium.

Charcoal flecking was identified within Trenches 1 and 2. The charcoal flecking within Trench 1 was scattered throughout the layer and is natural and non-cultural. The charcoal from Trench 2 was identified within a natural limestone depression and associated with metal, limestone, and basalt cobbles. This is a post-1950 fill deposit.

Construction items (Trenches 22 and 23), such as bricks and pipe fragments, are indicative of the period of transition from a parking lot for the stadium to use of the area for the bowling alley (1950s).

7.0 SUMMARY OF INVESTIGATIONS

The subsurface testing program at the Stadium Bowl-O-Drome (SIHP No. 50-80-14-08721) resulted in the identification of a single archaeological site (SIHP No. 50-80-14-08210) dispersed across much of the open portion of the project area (Figure 91 and Figure 92). This site is a historic dumping area, the currently identified distribution of which is shown in Figure 91.

Site 08210 consists of a series of informal deposits situated within the natural limestone depressions on the coral shelf. Throughout the project area, cultural material was documented in Layers II through VI in shallow deposits. Over time, the depressions have been filled by soil through intentional filling. A total of 141 artifacts were recovered from the site. Some of those artifacts and debris have been deposited within the depressions and within fill layers across the site with depths varying between 30 and 115 cmbs. The artifacts recovered from the deposits range in age between 1886 and the 1960s and are associated with the historic use of the area by residents who lived in the vicinity in the early 1900s, as well as the use of the area for a stadium parking lot and bowling alley.

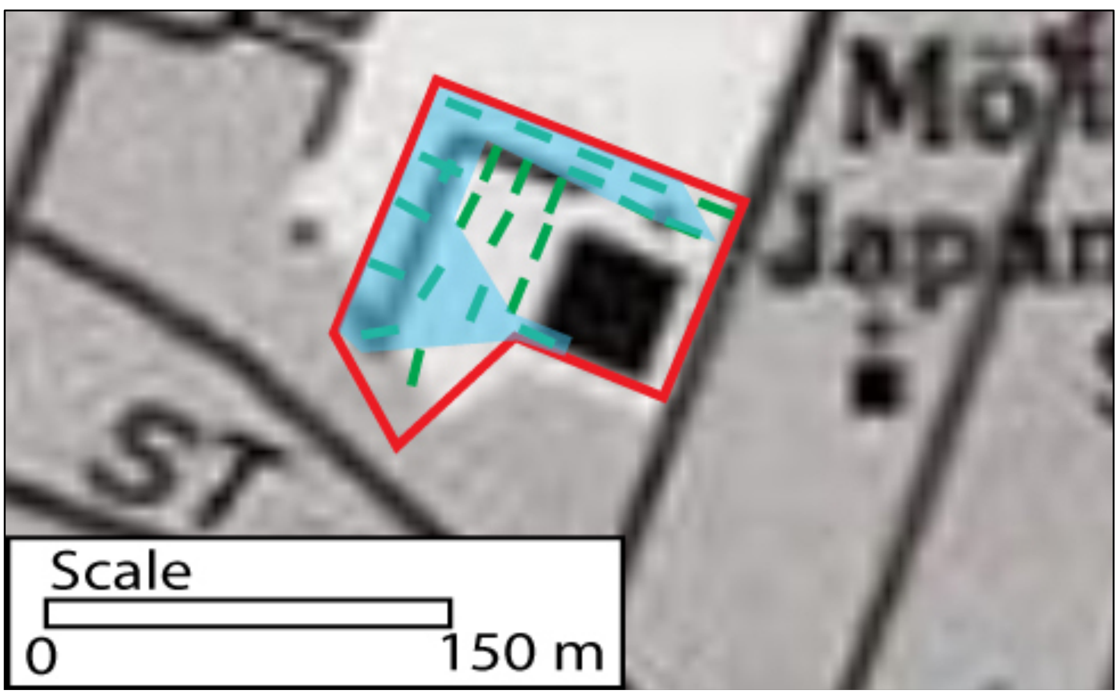

Figure 91. The project area (in red) with the location of test trenches (in green) and archaeological site 50-80-14-08210 (in blue) plotted on USGS Topographic map.

The saw-cut faunal remains and household items, ceramic teacups, and bowl and plate fragments recovered from Site 08210 gives an indication that this area was used as a dumping ground by nearby residents from the early 1900s. The incinerator that formerly existed on the property prior to the 1950s was likely used by the residents to eliminate their residential trash.

Asian porcelain ceramics and the Dai Nippon Brewing brown glass bottle found in Layer III of Trench 11 (which operated between 1906 and 1949 in Japan) also support this conclusion. The presence of these artifacts is appropriate for the Mōʻiliʻili area which had a large Asian population and these items were likely common in their residences.

The Western ceramics from Trenches 3, 14, and 19 (ceramic bowls manufactured in England and the United States) are representative of the residences in the area during the early 1900s. The mixture is Eastern and Western artifacts is suggestive of the mixed races within Mōʻiliʻili at the time.

Glass soda and beer bottles recovered on the site date between the 1920s and the 1950s and represent the use of the project area related to the old Honolulu Stadium, which operated adjacent to the project area from 1926 to 1975. The glass soda bottles appear to end around 1960, just after the bowling alley began its near 50-year run of operations.

Two features were identified at Site 08210. Feature A in Trench 12 was a small modern trash deposit that originated in Layer V and measured 1.2 m wide and 16 cm thick. The top of the feature was ca. 35 cmbs. Glass bottles, glass fragments and metal were present within the feature. One bottle from within the feature dated to 1941. The second feature recorded was Feature B in Trench 14. This feature consisted of a small modern trash deposit that originated in Layer VI and measured 1.9 m wide and 18 cm thick. Concrete chunks and coral cobbles were present within the feature. It is unclear whether the ceramic bowl recovered from Trench 14 is associated with this feature since it was recovered from the backdirt pile.

Modern debris was also identified within the site. These items such as abandoned pipe, plastic, buried concrete chunks and footings likely indicate use of the area after the transition from a parking lot used by the Honolulu Stadium (post-1926) to an active bowling alley and parking lot from 1955 when the Stadium Bowl-O-Drome was constructed.

The oil-covered soils identified within Trenches 6, 7, 14–16, 20, and 21 are suggestive of a parking lot where oil was used to cover the soils to keep dust down. It suggests that this was done in the 1950s, possibly for use of parking associated with Honolulu Stadium or more likely for the bowling alley.

Figure 92. Project area shown on Tax Map Key with locations of test trenches (in green) and approximate location of Site 50-80-14-08210 (in blue).

8.0 SIGNIFICANCE

The proposed development of 820 Isenberg Street is subject to the regulations associated with the National Register of Historic Places of 1966 (as amended). The project has secured Federal funding through HUD; due to the federal participation, this project is considered an "undertaking" and is subject to Section 106 requirements of the National Historic Preservation Act of 1966, as per 36 CFR 800. This project is also subject to Hawai'i Revised Statutes 6E.

8.1 INTEGRITY AND SIGNIFICANCE ASSESSMENTS PER HRS 6E

Hawai'i Administrative Rules §13-284-6 stipulates "to be significant, a historic property shall possess integrity of location, design, setting, materials, workmanship, feeling, and association..." The integrity of Site 50-80-14-08210 remains in its location and materials present. This site is a buried historic trash deposit that appears to be in its original deposited location.

Hawai'i Administrative Rules §13-284-6 stipulates that all identified historic properties must be assessed for their significance and states:

> To be significant, a historic property shall possess integrity of location, design, setting, materials, workmanship, feeling, and association and shall meet one or more of the following criteria:
>
> (a) That are associated with events that have made a significant contribution to the broad patterns of our history; or
>
> (b) That are associated with the lives of persons significant in our past; or
>
> (c) That embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction;
>
> (d) That have yielded, or may be likely to yield, information important in prehistory or history; or
>
> (e) That have an important value to the Native Hawaiian people or to another ethnic group of the State due to associations with cultural practices once carried out or still carried out, at the property or due to associations with traditional beliefs, events or oral accounts – these associations being important to the group's history and cultural identity.

Based upon the above stated criteria, Site 50-80-14-08210 is significant under Criterion "d" for the information it has yielded or is likely to yield. Ceramic and porcelain tableware from Japan, England, and the United States are representative of the residences in the area during the early

1900s. The mixture of Eastern and Western artifacts is suggestive of the mixed races within Mōʻiliʻili at the time. The artifacts recovered from Site 08210 add to our understanding of the historic use of this portion of Mōʻiliʻili.

8.2 Integrity and Significance Assessments per 36 CFR 800

36 CFR 60.4 stipulates "to be significant, a historic property shall possess integrity of location, design, setting, materials, workmanship, feeling, and association…" The integrity of Site 50-80-14-08210 remains in its location and materials present. This site is a buried historic trash deposit that appears to be in its original deposited location.

36 CFR 800 stipulates that all identified historic properties must be assessed for their significance and states:

> To be significant, a historic property shall possess integrity of location, design, setting, materials, workmanship, feeling, and association and shall meet one or more of the following criteria:
>
> (A) That are associated with events that have made a significant contribution to the broad patterns of our history; or
>
> (B) That are associated with the lives of persons significant in our past; or
>
> (C) That embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction; or
>
> (D) That have yielded, or may be likely to yield, information important in prehistory or history.

Based upon the above stated criteria, Site 50-80-14-08210 is significant under Criterion "D" for the information it has yielded or is likely to yield. Ceramic and porcelain tableware from Japan, England and the United States are representative of the residences in the area during the early 1900s. The mixture is Eastern and Western artifacts is suggestive of the mixed races within Mōʻiliʻili at the time. The artifacts recovered from Site 08210 add to our understanding of the historic use of this portion of Mōʻiliʻili.

9.0 DISCUSSION AND RECOMMENDATIONS

Pacific Legacy, Inc. has completed this AIS at the request of the DHHL for a ca. 1.9-acre parcel located at 820 Isenberg Street in Mōʻiliʻili on the island of Oʻahu [TMK (1) 2-7-008:018 and 020]. The property is the site of the still-standing, but unused, Stadium Bowl-O-Drome (SIHP No. 50-80-14-08721) and its parking lot, which opened in 1955 and closed in 2004. The subject parcel is currently being considered for redevelopment; as part of the development, DHHL has secured federal funding to assist in planning. Due to this federal participation, this project is considered an "undertaking" and is subject to Section 106 requirements of the National Historic Preservation Act of 1966, as amended. As part of the project, an Environmental Impact Statement is required to satisfy the requirements of HRS Chapter 343, including the necessity of an archaeological inventory survey of the project area.

Subsurface trench excavations were conducted throughout the current project area between 10 and 14 July 2017. The project was under the overall supervision of Principal Investigator Paul L. Cleghorn, Ph.D. Pacific Legacy archaeologists James McIntosh, B.A., Caleb Fechner, B.A., and Mike Placher, B.A. conducted the excavations for the project.

A total of 24 trenches were excavated on the subject parcel. The locations of these trenches were situated to obtain a representative sample of the parking lot area surrounding the Stadium Bowl-O-Drome. No excavations were conducted inside the former bowling alley because the indoor area was previously tested for contaminants and the environmental constraints present there posed a serious health risk. All excavations were closely monitored by the project archaeologists and were excavated to the limestone shelf.

Contaminated soil was identified within 14 of the archaeological test trenches. In-field safety precautions were followed as recommended by environmental personnel. Barium, Lead, Lindane (a pesticide), TPH-DRO and TPH-RRO (Total petroleum hydrocarbons) were identified in Trenches 3, 7, 8, 9, 10, 11, 12, 16, 17, 18, 19, 20, 22, 23. The results exceeded the Hawaii Department of Health (HDOH) Tier 1 Environmental Action Levels (EALs) for Residential land use and/or HDOH EALs for Commercial/Industrial land use in some way (Element Environmental 2017a:9).

The test excavations revealed that fill layers are present and evenly dispersed throughout the project. These fill episodes were likely done in the 1920s–1950s when the project area was used as a parking lot for the former Honolulu Stadium, and later, the parking lot and structure for the Stadium Bowl-O-Drome. These layers overlay the natural limestone karst present in the project area.

A single archaeological site was identified (SIHP No. 50-80-14-08210). It is comprised of a subsurface historic deposit throughout most of the parking lot area around the existing Stadium Bowl-O-Drome. The deposits consist of natural depressions within the limestone coral shelf, filled in by soil and debris. The artifacts recovered from the deposits range in date between 1886 and the 1960s. The household items, ceramic teacups, bowl and plate fragments and saw-cut faunal remains recovered from the site points to the area being used as a dumping area by nearby residents.

The glass soda and beer bottles collected and observed in some of the trenches date to between the 1920s and the 1950s; representing the use of the project area related to the old Honolulu Stadium which operated adjacent to the project area from 1926 to 1975. The glass soda bottles appear to end around 1960, just after the bowling alley began its 50-year run of operations.

The test excavations were not able to excavate through the limestone shelf that was identified in every trench.

Although there are no reports of the Moiliili Karst being present west of Hausten Street (ca. two blocks east of the project area), it was believed there was possibility of underground caverns being present within the project area. Although none were found during the AIS, this possibility still exists, and caverns may be encountered during construction.

Based upon criteria set forth by the NRHP and the HRS 6E, Site 50-80-14-08210 retains its integrity of location and materials present (the site is a buried historic trash deposit that that appears to be in its original deposited location) and is significant under Criteria "D" (NRHP) and "d" (HRS 6E) for the information it has yielded or is likely to yield. The site has produced ceramic and porcelain tableware from Japan, England, and the United States that are representative of the residences in the area during the early 1900s. The mixture is Eastern and Western artifacts is suggestive of the mixed races within Mōʻiliʻili at the time. The artifacts recovered from Site 08210 add to our understanding of the historic use of this portion of Mōʻiliʻili.

Based on the presence of historic artifacts associated with historic residences in Mōʻiliʻili, archaeological monitoring is recommended for any future excavation work within the project area.

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USDA (U.S. Department of Agriculture)
2001 Soil Survey Geographic (SSURGO) database. U.S. Department of Agriculture, Natural Resources Conservation Service. Fort Worth, Texas. http://www.ncgc.nrcs.usda.gov/products/datasets/ssurgo/

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2016 Honolulu USGS 7.5-minute series topographic quadrangle. USGS Information Services, Denver, Colorado.

Vancouver, George
1798 *A Voyage of Discovery to the North Pacific Ocean and Round the World…Performed in the Years 1790–1795*. Robinsons and Edwards, London.

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2001 *Ka'iulani: Crown Princess of Hawai'i*. Mutual Publishing, Honolulu.

Appendix B

Chapter 6E-8 Historic Preservation Review – Archaeological Inventory Survey at 820 Isenberg Street, Waikiki Ahupuaa, Kona District, Island of Oahu. State of Hawaii, Department of Land and Natrual Resources, State Historic Preseration Division

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES

STATE HISTORIC PRESERVATION DIVISION
KAKUHIHEWA BUILDING
601 KAMOKILA BLVD, STE 555
KAPOLEI, HAWAII 96707

February 26, 2021

IN REPLY REFER TO:
Project No.: 2018PR27750
Log No.: 2020.01352
Doc No.: 2102GC03
Archaeology

William J. Aila, Jr., Director
Department of Hawaiian Home Lands
91-5420 Kapolei Parkway
Kapolei, HI 96707
Email: william.j.aila@hawaii.gov

Dear Mr. Aila:

SUBJECT: **Chapter 6E-8 Historic Preservation Review –**
Archaeological Inventory Survey at 820 Isenberg Street
Waikīkī Ahupuaʻa, Kona District, Island of Oʻahu
TMK: (1) 2-7-008:018 and 020

This letter provides the State Historic Preservation Division's (SHPD's) review of the report titled, *Draft Archaeological Inventory Survey at 820 Isenberg Street, Waikīkī Ahupuaʻa, Kona District, Island of Oʻahu [TMK: (1) 2-7-008:018 and 020]* (McIntosh and Cleghorn, January 2021). SHPD received this submittal on January 29, 2021.

Pacific Legacy, Inc. conducted the archaeological inventory survey (AIS) on behalf of the Department of Hawaiian Home Lands (DHHL), property owner and project proponent. The DHHL proposes to demolish Stadium Bowl-O-Drome, which opened in 1955 and closed in 2004, along with an asphalt parking lot, and redevelop the property for commercial use. As the proposed project involves a public (government) property, it is subject to HRS 6E-8 historic preservation review. Additionally, the US Department of Housing and Urban Development (HUD) has awarded DHHL Native American Housing Assistance and Self Determination Act (NAHASDA) funding for the project and, therefore, the project is also a federal undertaking as defined in 36 CFR 800.16(y) and subject to Section 106 of the National Historic Preservation Act (NHPA), as amended.

The 1.9-acre project area fronts the west side of Isenberg Street, its south (makai) end is a short distance north of Citron Street. The property is surrounded by Honolulu Stadium State Park lands on the west and north. The larger APE is bounded on the south by Citron Street, on the north (mauka) by Wailoa, Young, and Beretania Streets, and on the west by Paʻani Street, Makahiki Way, and Pohā Lane. Most of the east boundary is aligned north-south in the center of the block between Coolidge Street on the west and Hausten Street on the east.

The following project correspondence is available in SHPD's files related to proposed development of the Stadium Bowl- O-Drome property:

- DHHL's letter dated April 18, 2001 requests SHPD's consultation concerning an environmental assessment (EA)designed to satisfy the requirements of HRS Chapter 343.
- SHPD's letter dated May 15, 2001 (Log No. 27483, Doc. No. 0105EJ06) indicates that SHPD believes the Bowl- O-Drome building is a local landmark, and requests architectural documentation prior to any proposed demolition. Additionally, SHPD indicates there are no known archaeological historic properties on the subject parcels [TMK: (1) 2-7-008:018, 020] and, thus, the proposed project would have "no effect" on significant historic [archaeological] sites.

- DHHL's letters dated July 10 and August 28, 2001 thank SHPD for commenting that the Bowl-O-Drome is a local landmark (discussed below). The July 10 letter repeats the "no effect" finding [for archaeological historic properties]. The August 28 letter acknowledges SHPD's request for completion of a historic-resources inventory prior to demolition of the structure; the inventory is needed before the requirements of HRS Chapter 343 can be met.
- DHHL's letter dated July 17, 2001 accompanies copy of the draft EA for SHPD's review, and SHPD's August 10, 2001, reply (Log No. 27993, Doc. No. 0108EJ13) reiterates request for completion of historic-resources inventory prior to demolition of the existing structure.
- DHHL's letter dated March 7, 2017 defines the APE that addresses visual effects and outlines a planning strategy for identification of historic properties on the property which will include submittal of a cultural impact assessment (CIA) and both reconnaissance- and intensive-level architectural survey reports (RLS, ILS). An archaeological inventory survey (AIS) would be conducted and, in support of the AIS, an AIS testing strategy (Cleghorn 2017) was submitted with the letter. Preparation of the letter and the plans followed consultation with SHPD, including a February 6, 2017, meeting focused on coordinating architectural and archaeological resource investigations. DHHL's March 7 letter points out that the Bowl-O-Drome building may be eligible for listing on the National Register of Historic Places (NRHP) at the local level, and comments that the building may contain hazardous materials.
- DHHL's letter dated June 4, 2017 requests the SHPD continue HRS Chapter 6E-8 project consultation and invites SHPD's participation in Section 106 consultation.
- SHPD's letter dated June 6, 2017 (Log No. 2017.00486, Doc. No. 1705KN04) agrees with the proposed APE and accepts the AIS strategy submitted in March 2017 which involves the excavation of 21 backhoe assisted trenches around the exterior of the Bowl-O-Drome building.
- Fung Associates' submittal dated November 13, 2017 included a preliminary site information form and requests a State Inventory of Historic Places (SIHP) site number for Bowl-O-Drome; the site was assigned SIHP Site 50- 80-14- 08721 in 2018.
- SHPD's letter dated June 15, 2018 (Log No. 2017.00486, Doc. No. 1806KN01) acknowledges receipt of the AIS report reviewed here, as well as an intensive-level architectural survey report concerning the Bowl-O-Drome anda three-volume reconnaissance-level survey report concerning buildings in the broader APE.

The revised report provides a good review of environmental, historical, and archaeological background information. Geologically, the general area is underlain by Mo'ili'ili Karst, a porous coralline limestone formation containing caverns and sinkholes that once held fresh water supplied by natural artesian springs. Concrete now covers much of the karst, and the water, which formerly supported a type of blind mullet, is now polluted. Archival records indicate that seven properties nearby (outside the project area) were awarded to individuals during the mid19th-century Māhele. Land uses recorded for three of these properties included a house site on each, and two lo'i kalo (taro pond fields), an 'auwai (irrigation ditch), and a hau tree (Hibiscus tiliaceus) on one.

No archaeological properties had been documented in the project area prior to the current AIS. One historical architectural property is present in the project area, the Stadium Bowl-O-Drome, which opened in 1955 and closed in 2004. The building, SIHP Site # 50-80-14-08721, has been documented with an architectural ILS for this project. Buildings in the broader APE for indirect effects have been documented with an architectural RLS for the project.

The AIS fieldwork included backhoe-assisted excavation of 24 trenches distributed around portions of the property outside the bowling-alley footprint. One archaeological historic property was documented: SIHP Site 50- 80-14-08210, a post-Contact refuse deposit described as filling natural depressions in the limestone throughout most of the former stadium parking lot. Site 50-80-14-08210 was assessed as significant under Criterion d at the state level, and Criterion D at the federal level (for listing in the National Register of Historic Places). The ceramic and porcelain artifacts recovered from Site 50-80-14-08210, originated from Japan, England and the United States and were assessed as typical of assemblages related to ethnic diversity of residents in Mo'ili'ili in the early 1900s. The subsurface trash deposit retains its integrity and appears to be in its original deposited location. Due to Environmental soil testing results conducted within the current project area, no test excavations were conducted within the former bowling alley. The environmental test results exceeded the Hawaii DOH Tier 1 Environmental Action Levels.

Based on the presence of historic artifacts associated with historic residences in Mo'ili'ili, an archaeological monitoring program is recommended for any future excavation work within the project area.

The revised AIS adequately addresses the issues and concerns raised in our earlier correspondence (Log No. 2018.01352, Doc. No. 2001JA01). This AIS report satisfies the requirements of HAR §13-276-5. **It is accepted**. Please send a hard copy of the AIS report, clearly marked FINAL, along with a text-searchable PDF copy of the report and copy of this

review letter to the Kapolei SHPD office, attention SHPD Library. Additionally, please upload one text-searchable PDF of the Final report to HICRIS Project No. 2018PR27550 using the Project Supplement option, and a PDF copy to of the report to Lehua.K.Soares@hawaii.gov.

SHPD looks forward to receiving for review and acceptance an archaeological monitoring plan (AMP) meeting the requirements of HAR §13-279-4 prior to project initiation. Please submit the draft AMP to HICRIS Project No. 2018PR27550.

SHPD also looks forward to continuing the NHPA Section 106 consultation process. Please submit any project related consultation materials or documents to HICRIS Project No. 2018PR27550.

Please contact Dr. Susan A. Lebo, Archaeology Branch Chief, at Susan.A.Lebo@hawaii.gov for any questions regarding this letter.

Aloha,

Alan Downer

Alan S. Downer, PhD
Administrator, State Historic Preservation Division
Deputy State Historic Preservation Officer

cc: Niniau Simmons, DHHL NAHASDA Manager (Niniau.simmons@hawaii.gov)
Paul Cleghorn, Pacific Legacy (cleghorn@pacificlegacy.com)
Mara Mulrooney, Pacific Legacy (mulrooney@pacificlegacy.com)

Appendix C

Architectural Reconnaissance Level Survey of Buildings Located within the Stadium Bowl-O-Drome Area of Potential Effect. Fung Associates, Inc.

Architectural Reconnaissance Level Survey of Buildings Located within the Stadium Bowl-O-Drome Area of Potential Effect

Mo`ili`ili, Honolulu

NOVEMBER 2017

Prepared by Fung Associates, Inc.

Table of Contents

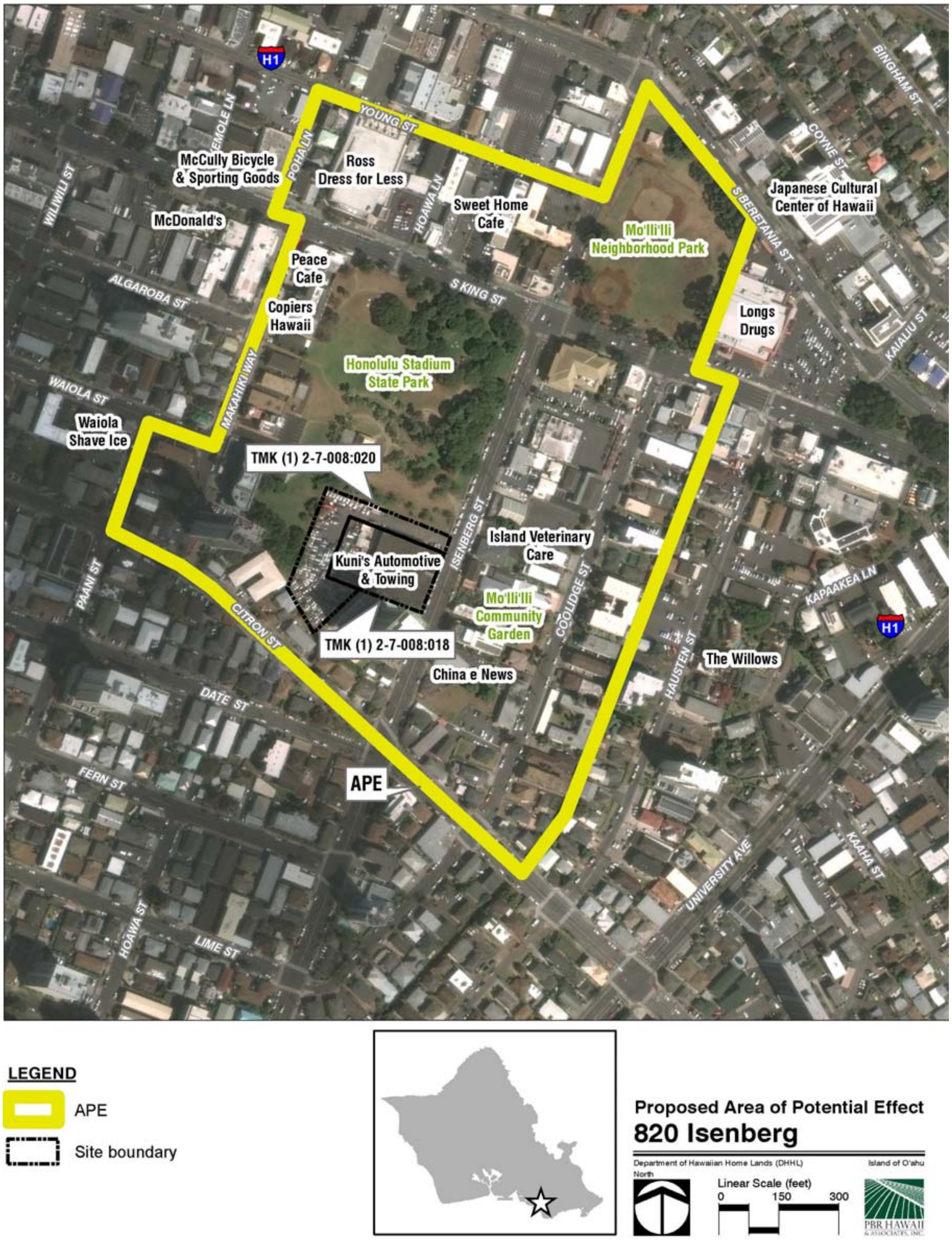
Introduction

This architectural reconnaissance survey was undertaken at the request of the State Historic Preservation Division (SHPD) in anticipation of future development of the Stadium Bowl-O-Drome property (TMKs: 2-7-008: 018 and 020).

The objective of the survey is to ascertain whether any possible historic properties are located within the Area of Potential Effect (APE) should the property under the control of the Bernice Pauahi Bishop Estate on which the present Stadium Bowl-O-Drome sits be developed, and to identify any adverse effects, as well as mitigative alternatives should adverse effects exist. A brief historic context of the Moiliili neighborhood surrounding the Stadium Bowl-O-Drome property was prepared as a part of this survey.

In anticipation of Section 106 consultation of the National Historic Preservation Act (NHPA) of 1966, as amended, the survey boundary was limited to surface historic properties along TMKs within the identified APE. A map showing the project and survey area can be found on the next page (see Figures 1 and 2).

The survey followed a methodology which included performing background research, completing a site visit to photograph and gather information on the buildings located in the APE, and writing up the results of the survey so any identified properties may be placed in the SHPD's Statewide Inventory of Historic Places (SIHP).



Source: Geographic Information System (GIS), ESRI World Street Map, 2016.
Disclaimer: This graphic has been prepared for general planning purposes only and should not be used for boundary interpretations or other spatial analysis.

Figure 1: Area of Potential Effect

Figure 2: Project Area

Coverage and Methodology

The survey examined a one block area surrounding the Stadium Bowl-O-Drome property. The area surveyed is considered the overall APE, which encompasses portions of Tax Map plats (1) 2-7 and 2-8. The project area consists of Tax Map Keys: (1) 2-7-008: 018 and 020.

The area surveyed encompasses approximately 50 acres. The boundaries run from the *mauka* (north) side of Citron Street to the *makai* (south) side of Young Street. The area is bounded on the west by Paani Street and Makahiki Way, and on the east by both sides of Coolidge Street. This area was deemed to be potentially indirectly visually effected should a high-rise building be erected on the Stadium Bowl-O-Drome property. The survey examined all properties within the APE built prior to 1969.

Prior to the start of any fieldwork, background research was undertaken. The preliminary background research involved an examination of pertinent materials provided by the client, and City & County tax records publicly available online. The SHPD inventory files disclosed that this area is not yet included in the Statewide Inventory of Historic Places.

Mayu Ohama and Don Hibbard, both of who meet the Secretary of the Interior's Professional Qualifications Standards as architectural historians, walked the survey area on the afternoons of March 6 and 8, 2017, examining all the buildings in the survey area. Approximately seven hours were spent in the field photographing and taking notes on the physical character of the buildings and structures within the study area. One hundred percent of the survey area was investigated.

Following the site survey, additional research was undertaken by Don Hibbard, who meets the Secretary of the Interior's Professional Qualification Standards as an architectural historian, at the County Tax Office, Department of Planning and Permitting, and Hawaii State Library. This included a review of tax records, newspaper articles, and building permits. Following the gathering of information, this report was prepared, reviewed, and finalized.

Reconnaissance level inventory forms were completed for 90 properties.

Historic Context

Moiliili has a long history stretching back to pre-contact times. This study will concentrate on the development of the area's built environment during the twentieth century, and more specifically the area to either side of Isenberg Street between Kapiolani Boulevard and King Street. Those interested in the broader expanse of Moiliili and other aspects of the area's history will find *Mō`ili`ili: The Life of a Community*, written by Laura Ruby, contains invaluable information beyond the scope of this project.

Nineteenth century Moiliili was sparsely settled, primarily by Hawaiians and Chinese, with much of the area characterized by wetlands. Development was primarily situated east of what is presently known as University Avenue, where there were fast lands and/or numerous *kuleana*. It was here, at the location now occupied by the Contessa Apartments (built 1971), that the stone Kamoiliili Church was completed in 1846, as an *apana* church to Kawaiahao (see Figure 3). It was also here that a stone quarry was developed in the 1880s, where the University of Hawaii's lower campus is now located, and in December 1882, train operation began along Beretania Street, running from the quarry to Alapai Street to deliver materials for road work in the city.

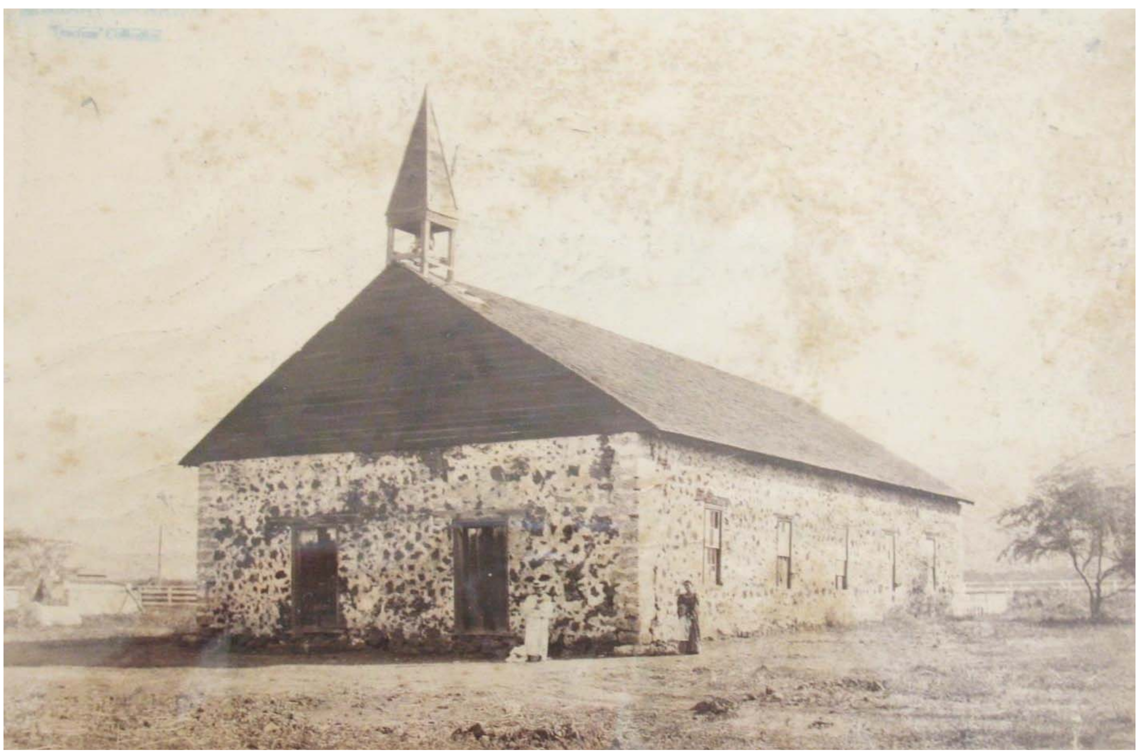


Figure 3: Kamoiliili Church, completed in 1846 (no longer extant).

The quarry provided employment to a number of people. The 1900 census reported that 84 of Moiliili's 364 residents worked either at the quarry or in a quarry-related occupation – such as draying, stable keeping, or stone trucking. In 1900, 76 of these 84 men who found quarry-related employment were

Japanese. In 1910, the Honolulu Construction and Draying Company leased the quarry area, and from 1911 until November 1949 they operated the quarry. Following the close of quarry operations, the University of Hawaii acquired the property in December 1953.

During the 1890s a number of Japanese began to move into the Moiliili area, with the Kihachi and Shika Kashiwabara family reputedly the earliest to settle in the area (1893, see Figure 4). They built a home on leased lands now occupied by Longs Drugs. In addition to their house, they also erected a number of rentals on the property to form a residential "camp."

Figure 4: The home of Kihachi and Shika Kashiwabara, built in 1897-98, is considered the first grand home in Moiliili.[1]

Over the next two decades, this pattern of development would become common in the greater Moiliili area, especially on lands east of present day University Avenue. On the east side of Kashiwabara camp was Tanaka camp; west of Kashiwabara camp was another camp operated by Kikutaro and Kalei Matsumoto for Mr. Matsumoto's employees (see Figure 5). Mr. Matsumoto was a building contractor and quarry operator. His quarry was located west and north of today's Church of the Crossroads. By 1900, 188 of the area's 346 residents were Japanese. By midcentury, almost ninety percent of the population was Japanese.

[1] Image provided by Ruby, Laura, *Mō`ili`ili----The Life of a Community* (Honolulu: Mō`ili`ili Community Center, 2005).

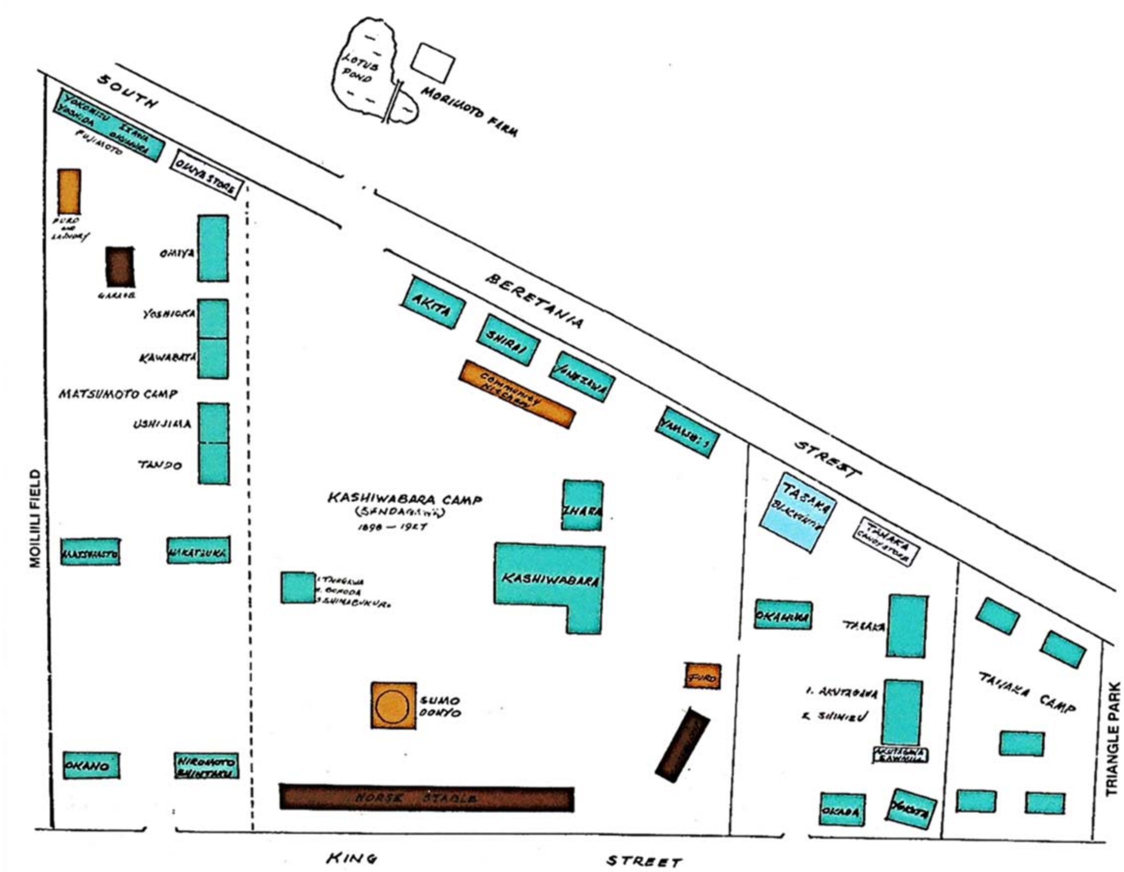


Figure 5: Diagram of the Matsumoto Camp, Kashiwabara Camp, Tanaka Camp, located in Moiliili, 1898-1927.[2]

During the nineteenth and early twentieth centuries, that portion of Moiliili south of King Street and west of present day University Avenue was not developed in any extensive manner. Much of this area was originally under water and part of Land Commission Award (LCA) 7713, which King Kamehameha III deeded to Victoria Kamamalu in 1861. It included the area named Kapaakea and extended over to Keauhou. Upon the princess's death, the lands passed to her father; then in turn to her half-sister Ruth Kaelekolani; and subsequently, to Bernice Pauahi Bishop in 1883, ultimately becoming part of today's Bishop Estate.

The other major nineteenth century landholding in the study area was Land Grant 3098, which lay to the south and west sides of LCA 7713. This area encompassed approximately 118 acres (see Figure 6). King Lunalilo, in return for $1,000, granted these lands to Hawaii Supreme Court Justice Lawrence McCully in May 1873; previously, McCully leased these lands from the government.

[2] Ibid.

In 1900, eight years after the Hawaii Supreme Court Justice's death, the McCully Land Company platted the McCully Tract, which encompassed 53 blocks and extended from what is now Algaroba Street down to the present day Ala Wai Canal, and from Kalakaua Avenue to just beyond present day Makahiki Way. The main *mauka-makai* thoroughfare was McCully Street. The streets that ran perpendicular to McCully Street were named after trees: Algaroba, Citron, Fern, Date, Lime, Banyan (later renamed Waiola), and Mango (later incorporated into Kapiolani Boulevard). Orange, Palm, and Tamarind Streets – although platted – did not materialize.

Like the area immediately *mauka* and *makai* of it, most of the McCully tract was underwater and utilized for wetland agriculture, resulting in slow sales, as the company refused to give buyers the deed to their purchase until the lands were filled. As a result, the Guardian Trust Company – owned by Walter Dillingham and W. O. Smith – acquired the stymied real estate project in 1912. However, it was not until the construction of the Ala Wai Canal (1921-1928) and subsequently, the Manoa-Palolo Canal (1935-1936) and Alanaio Canal (1929) that the wetlands in the McCully-Moiliili area – including the inland fishponds, Loko Kapaakea, Loko Maalahia, and Loko Opukaala – were filled and made suitable for urban development.

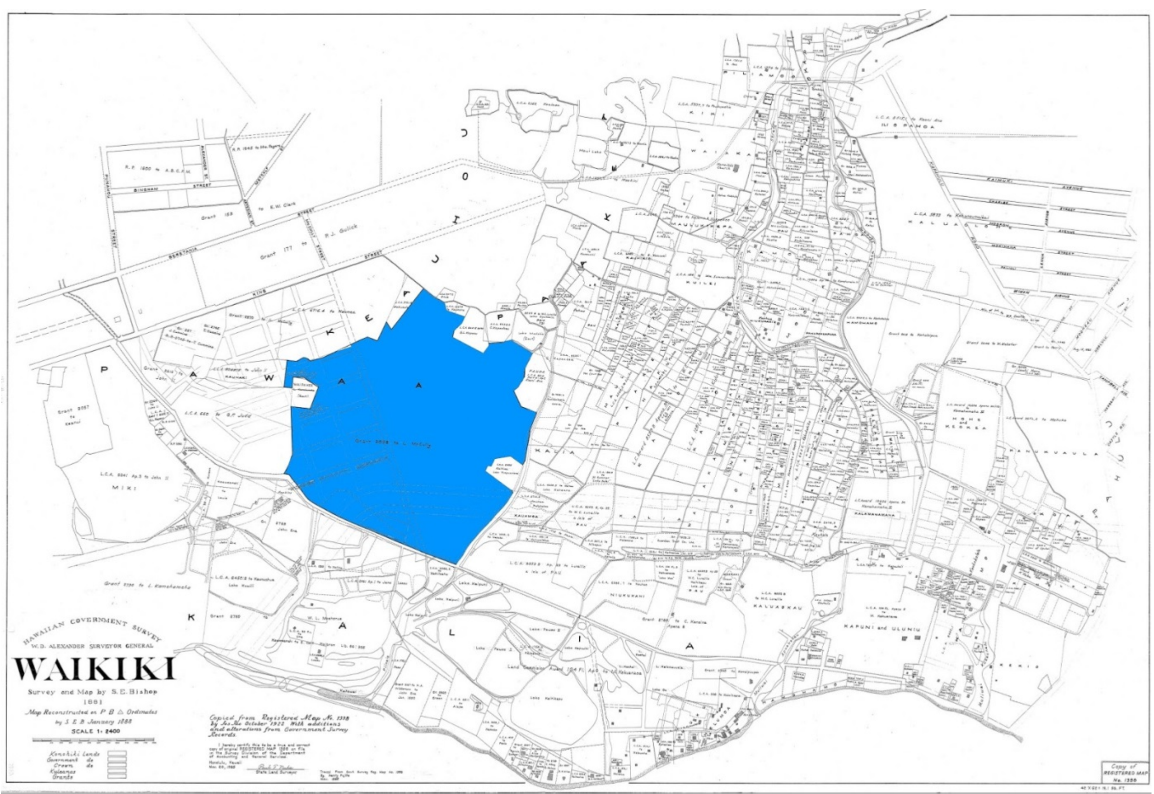


Figure 6: Land Grant 3098 area in McCully is shown in blue on this Waikiki Survey and Map by S.E. Bishop, produced under the authority of the Hawaiian Government Survey. The map outlines Konohiki Lands, Government Lands, Crown Lands, and Grants. Map dated 1881.

Following annexation, the Bishop Estate divested itself of the lands encompassing LCA 7713, little by little. As a result, these lands developed in a sporadic manner, with much of the area requiring reclamation prior to assuming an urban use. As such, early changes in the area were gradual and episodic rather than an overnight, planned transformation.

One of the earliest post-annexation developments in the area was Moiliili Field. In 1903, the Honolulu Rapid Transit & Land Company acquired property from the Bernice Pauahi Bishop Estate, in the area of the present day intersection of King and Isenberg streets. They developed Moiliili Field as a venue for sporting events. Although built as an attraction to encourage ridership on the company's new line from Kalakaua Avenue and King Street to Kaimuki, the field soon fell into disrepair. In 1914, the company undertook a major refurbishment of the baseball diamond and bleachers. With these improvements, the field supplanted the Athletic Park near downtown as the major center for organized sports in Honolulu; along with Aala Park, Moiliili Field became the favored location for carnivals.

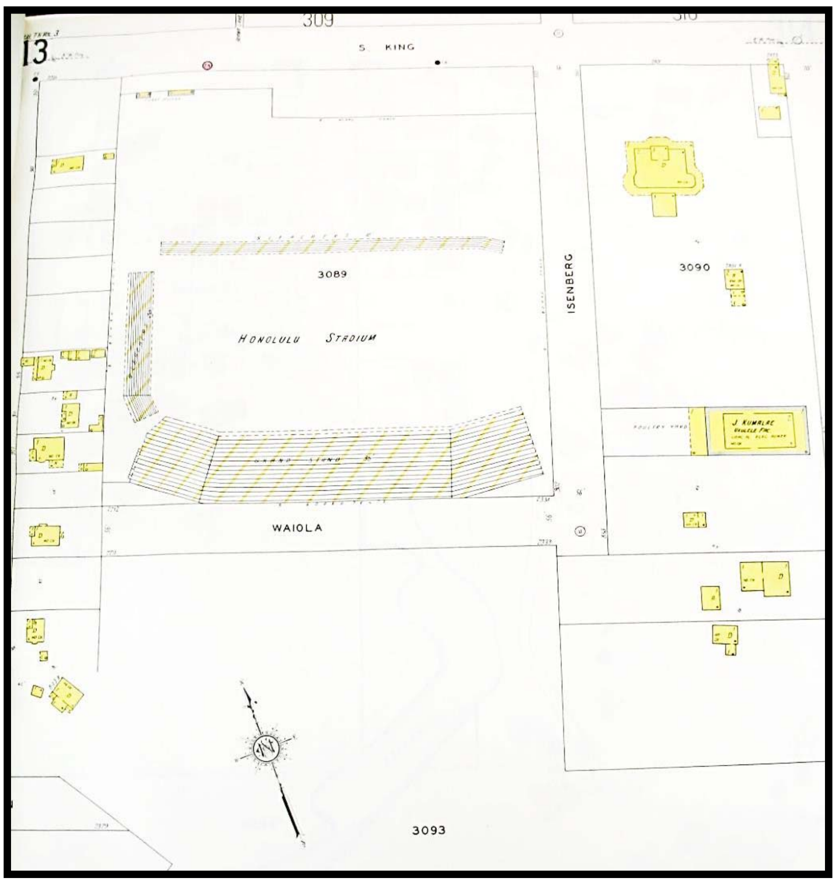


Figure 7: 1927 Sanborn map showing Honolulu Stadium, located on a 14-acre parcel at the intersection of S. King and Isenberg Streets. Two small ticket booths are located in the northwest corner of the property, fronting on S. King Street. Most buildings in the area were wood-framed buildings (yellow); primarily dwellings with small auto shops, or commercial, such as the J. Kumalae Ukulele Factory.

Mr. John Ashman Beaven (1869-1946) obtained a lease on the revitalized field in 1918 and further developed it by adding a large grandstand to promote baseball and football games. Beaven was born in New York. He worked in Connecticut, San Francisco, and Asia before settling in Hawaii in 1910. A newspaper man and lawyer by profession, in 1912, he established the Oahu Baseball League and the Oahu Service Athletic League. In addition, he was Secretary of the Outrigger Canoe Club, and quickly emerged as Honolulu's primary sports promoter.

Demand outstripped Moiliili Field's grandstand and bleacher capacity. In 1925, Beaven purchased a 14-acre parcel from the Kaauila Land Trust.[3] The land was comprised of coral flats and duck ponds adjacent to King Street and diagonally opposite Moiliili Field.[4] Beaven then organized Honolulu Stadium Ltd. to develop and manage a new sports stadium with a 23,000 seating capacity. The new stadium became the epicenter for sports in Honolulu, quickly eclipsing Moiliili Field (see Figures 7 and 8). Here, Beaven operated the Hawaii Baseball League, retiring from the stadium's management in 1939.

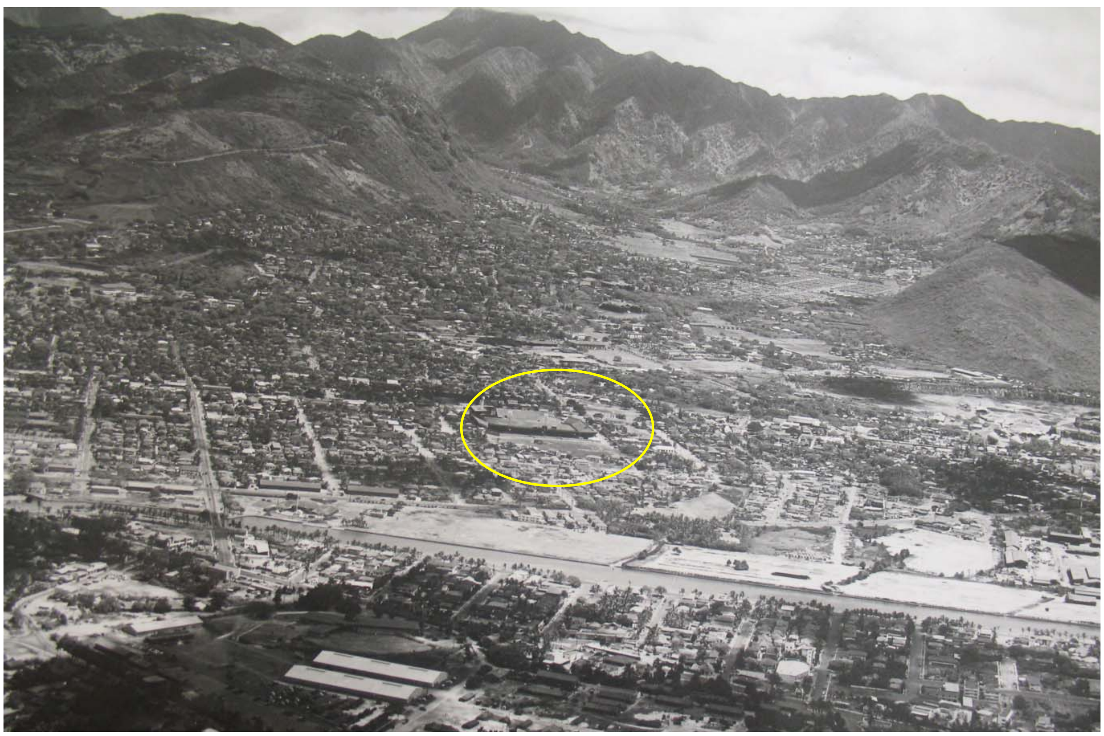


Figure 8: Aerial view of Moiliili in July 1959, view facing north.
Honolulu Stadium (no longer extant), can be seen directly at the center of this photograph, circled in yellow.
The Ala Wai Community Park is seen in the foreground; Manoa Valley in the background.

[3] The Kaauila Land Trust came into existence and obtained these lands, as well as Moiliili Field, in 1922 – when the Honolulu Rapid Transit & Land Company separated its public utility and land operations into two entities, the Honolulu Rapid Transit Company and the Kaauila Land Company.
[4] These lands were originally part of LCA 7713 and were included in the Honolulu Rapid Transit Company's initial land purchase from Bishop Estate in 1903.

With the ascendency of the new stadium, Moiliili Field was converted into a community park with the Kaauila Land Trust leasing the park to the City & County of Honolulu for one dollar per year. In 1939, the land company informed the city that it would not renew the lease on the park as they intended to sell the approximately 3.7-acre property and its baseball diamond to investors who were interested in developing a residential subdivision on the property. As a result, the City & County of Honolulu acquired Moiliili Field in 1941, and continues to operate it as a recreational park today.

Honolulu Stadium would have a more prolonged life than Moiliili Field as Honolulu's premier sporting venue, but it eventually shared a similar ending. Since 1936 – when University of Hawaii President David Crawford (who also served as Honolulu Stadium Ltd.'s inaugural vice president) had convinced many stockholders in the company to donate their shares to the University of Hawaii's Board of Regents – the University held a controlling interest in the stadium. With an eye towards a larger sporting facility, the owners allowed the stadium to deteriorate after World War II, and with the opening of the State's new Aloha Stadium in Halawa in 1974, the useful life of Honolulu Stadium came to an end. The stadium closed its gates after an Islander baseball game on September 8, 1975. Under threat of condemnation, the stockholders of Honolulu Stadium Ltd. agreed to sell the stadium and its land to the State of Hawaii for $8.5 million. In September 1976, the stadium was razed and in 1978, Stadium Park – under the administration of the City & County of Honolulu – was opened to the public (see Figure 9).

Figure 9: View of the Old Stadium Park, which stands on the site of the original Honolulu Stadium demolished in 1976.

However, not all of the original stadium land acquisition is included in Stadium Park. Almost immediately after the acquisition of the 14-acre parcel, Honolulu Stadium Ltd. sold 4.93 acres of its lands on the west side of the property to the Union Trust Company, who in turn developed the Stadium Tract along the east side of Makahiki Way. In April 1926, the trust company sold these newly platted lots to the Hawaiian Industrial Company, which was owned by Ushisuke Taira and Seiji Miwa. This company then proceeded to sell its lots to individual owners. By 1927 there were four single-family, wood dwellings along the east side of Makahiki Way between Waiola and King Streets. Within four years these were joined by four more houses, while a masonry service station and plumbing supply store commanded the corner lot at King Street and Makahiki Way.

The other part of the original parcel – which is not included in Old Stadium Park – is on the south side of the park. Originally this was a parking lot and a staging area for such events as stock car races. In April 1955, the Honolulu Stadium Corporation signed a lease with Adelaide and Arthur Stagbar to operate a bowling alley on this property. Opening in December 1955 as Stadium Bowl-O-Drome, this bowling center remained in operation until May 2007.

In addition to Moiliili Field and Honolulu Stadium, the third major building near the intersection of King Street and what would become Isenberg Street was the residence of Jonah Kumalae, an ukulele manufacturer (see Figure 7). In 1917, Kumalae purchased fourteen acres of LCA 7713 from Charles M. Cooke Ltd. This included the fast lands along King Street, as well as Kapaakea Pond, which extended from the location of the present-day Willows restaurant on the east to Coolidge Street on the west. Also in that year, Kumalae acquired the rights to Claus Spreckels' former mansion, which stood on Punahou Street. He dismantled and rebuilt the three-story house on his Moiliili property, minus the second story.

In 1937, Kumalae sold the house to the St. Louis Alumnae Association, who converted it into a clubhouse. In July 1950, the house went up in flames – the result of a soda dispensing machine's faulty electrical wiring. The Alumnae Association built a new, more modest clubhouse, designed by Wood & Weed, at the rear of their lot in 1953.

Modern commercial structures eventually also came to occupy the property – with Chunky's Drive-In Restaurant (constructed 1964) on the corner of King and Isenberg Streets, and on the rear of the lot facing Isenberg Street, Super Value Market was constructed in 1957. Today, a branch of the First Hawaiian Bank stands on the corner, and Agu Restaurant occupies the former Super Value Market.

In 1919, Kumalae sold approximately ten acres of his parcel, including Kapaakea Pond to attorney Frank Thompson. Thompson had filled much of the newly acquired area, and the Leahi Investment and Land Company, managed by H. Mirikitani, moved forward to subdivide this property as the Mirikitani Tract (File Plan 233). The proposed subdivision extended approximately 832' south of King Street, encompassing both sides of present day Hausten Street (then named Thompson Street), as well as both sides of present day Coolidge Street (originally named Mirikitani Street). In addition, the subdivision included the Kumalae residence and ukulele factory and six lots south of it, with each of the six lots having approximately a 40' frontage on the then-proposed extension of Isenberg Street. The venture foundered, and P.E.B. Strauch acquired the ten acre, unimproved Mirikitani subdivision in October 1924 with the intention of developing a 60 lot subdivision. His plans also did not immediately materialize and eventually Frederick E. Steere of the Henry Waterhouse Trust Company, on May 12, 1926, obtained approval for the 11.226-acre McKinley Park Tract (File Plan 253). Sales were brisk in the new subdivision and by 1927 most all the lots were developed. These were primarily small, wood-framed, residential complexes comprised of three or four duplexes, as well as around a dozen single-family residences. Jonah Kumalae still retained the large corner lot at King Street and what would become Isenberg Street.

At the same time that the McKinley Park Tract was being sold off to prospective home owners and investors, the McCully Tract – after remaining in wetland agriculture for several decades – also began to assume an urban appearance, as the Dillingham-owned Hawaiian Dredging Company began to fill the tract's wetlands using materials garnered by the expansion of the Ala Wai Canal. The canal had been completed as specified by 1924; however, Hawaiian Dredging was awarded a new contract to widen the canal an additional one hundred feet to satisfy Dillingham's need for inexpensive fill for the McCully Tract parcels.

In April 1926, the *Honolulu Advertiser* reported that roads were finally being constructed on the recently reclaimed lands, and "two houses are now under construction with a number more contemplated."[5] The article went on to note the area "has been having something of a boom during the past two months. In that time approximately $150,000 worth of property has been sold by the Bishop Trust Company."[6] As part of this development, the Hawaiian Dredging Company channelized the Naio Stream from the present day Willows restaurant down to Date Street. The section of the stream between Date Street and Kapiolani Boulevard was purchased by the Territory of Hawaii and received the same treatment, in anticipation of the extension of Kapiolani Boulevard beyond Kalakaua Avenue.

The much larger McCully Tract took longer than the relatively small McKinley Park Tract to develop – especially with the crash of the stock market in October 1929 and the ensuing Great Depression. However, by the late 1930s the McCully Tract too was dotted with many modest wood residences. Thus, on the eve of World War II, Moiliili was a product of the individual efforts of a variety of private property owners. Typical of the city as a whole, it had grown without any effective planning for the future.

In 1940, City Planning Engineer Charles R. Welsh sought to rectify this situation by developing a master plan for Honolulu. Unfortunately, with the outbreak of World War II, such planning was all but curtailed, and it was not until the close of the war that a Master Plan for the City was adopted. The master plan designated the King Street corridor in Moiliili as business, and the area below that business designation as hotel/apartment. The subsequent development of the area around Isenberg and King Streets reflected the authorized uses under the adopted zoning code (see Figure 10).

[5] "McCully Tract Roads Being Constructed*" (*Honolulu: *Honolulu Advertiser*, April 25, 1926), 14.
[6] Ibid.

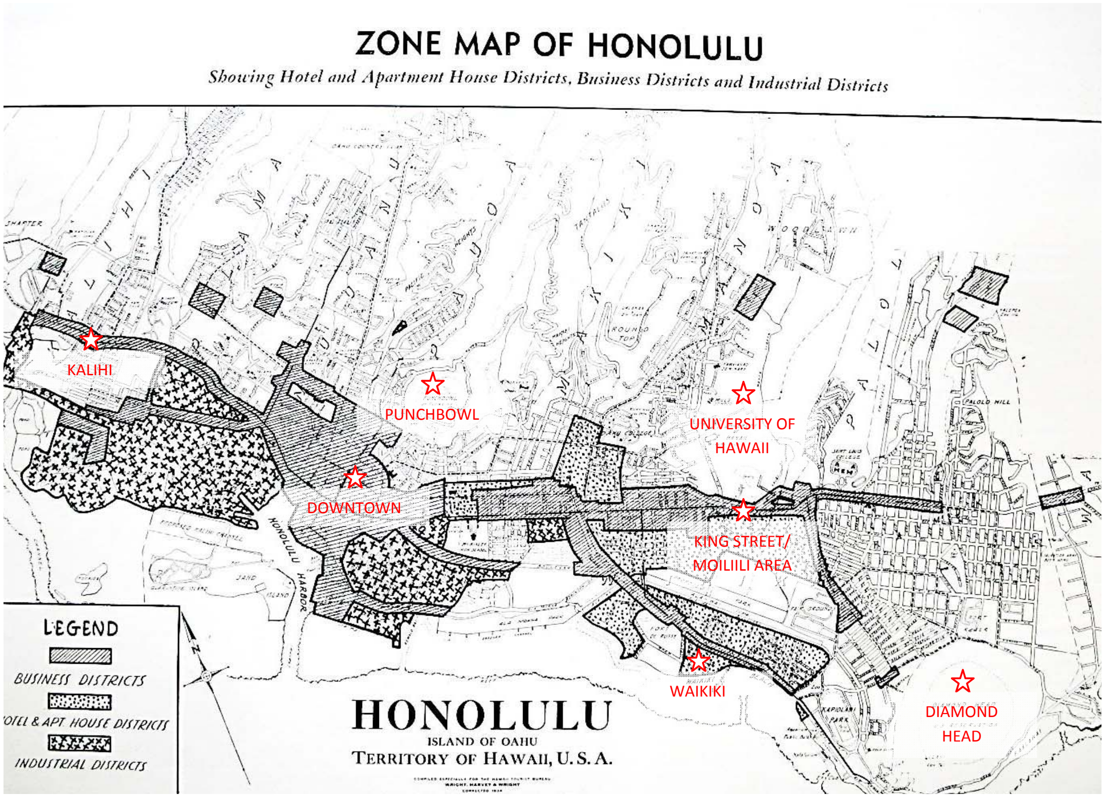


Figure 10: The 1940 Zoning Map of Honolulu illustrates areas considered business districts, residential/hotel/apartment districts, and industrial districts. King Street continuing east and bisected by Kalakaua Avenue is zoned for business and commercial, while immediately south, the Moiliili area is distinguished as a residential district.

In the 1950s, new business buildings appeared along the King Street proximity, including such enterprises as the previously mentioned Chunky's Drive-In, Super Value Market, and Stadium Bowl-O-Drome, as well as Star Market (1954), B.K. Kop's Hula Supply Center (1955) and Leilani Chop Suey (1959). The Leilani Chop Suey business was operated by the Lee family and eventually became Maple Garden restaurant in 1975. The Waiola Store, which was erected at Waiola and Paani Streets in 1940, is a rare example of a business building constructed in the area prior to adoption of the 1945 Master Plan.

Also, a number of walk-up apartments – primarily built of concrete masonry unit (CMU) blocks, but also some new buildings of wood – began to supplant the older wood dwellings in the area. Many of these new walk-up apartments were built primarily in the 1960s – perhaps at times when owners recognized an opportunity to maximize the economic potential of their lots. Thus, by 1965, five masonry apartment buildings were to be found on Coolidge Street between King and Citron Streets, and four more could be found on the same block along Isenberg Street. In addition, a number of people elevated their wood houses to add a CMU dwelling unit on the ground floor.

Similarly, by 1965 along Makahiki Way, four two-story masonry apartments had supplanted four of the street's eight wood dwellings. Also by this time the streetscape on Citron Street between Isenberg Street and Makahiki Way had become one of walk-up apartments.

High rise apartments also began to appear in the greater Moiliili area in the 1960s, with the ten-story, 77-unit Park Terrace (now named the Ala Wai Cove, built 1961) at 509 University Avenue the first to extend above the height of the trees in the neighborhood. With the revision of the Honolulu comprehensive Zoning Code in 1969, even larger buildings began to cast their shadows on the area, with the 25-story Ala Wai Plaza (1970), 36-story Marco Polo (1971), 38-story Ala Wai Skyrise (1971), 37-story Contessa Apartments (1971) and 19-story Kaimana Lanais (1974) all built within five years of the passage of the new ordinance. Similarly, within the neighborhood of Isenberg and Citron Streets, the 20-story Scenic Towers were designed by Ernest Hara and completed in 1974, and the 17-story H & M Apartments designed by Robert Matsushita opened at Date and Paani Streets in 1975.

Survey Results

Of the 90 properties examined in the RLS, none are presently listed in either the Hawaii or National Registers of Historic Places. Approximately half of the properties surveyed (47) appear to meet the criteria for listing in the Hawaii and National Registers of Historic Places for their associations with the architectural traditions of Hawaii. Of these 47 properties, the majority are eligible for listing under Criterion C, including one public space area – Moiliili Community Park.

Eligible properties found throughout the survey area encompass residential (including apartments), commercial, religious residential, and commercial and mixed use, and park or public spaces. Details about each property type are below, and recommendations are provided for future study.

Notably, Stadium Bowl-O-Drome was determined eligible for listing under both Criteria A and C – as a good example of a bowling alley constructed in Honolulu during the 1950s, and for its strong associations with the history and development of bowling, both locally in Hawaii and on the national scene, with the owners successfully campaigning for multi-ethnic teams to compete together. A separate, intensive level architectural survey was undertaken for the Stadium Bowl-O-Drome.

There are 43 properties that do not appear to meet the criteria for listing in either historic register because their historic integrity has been compromised.

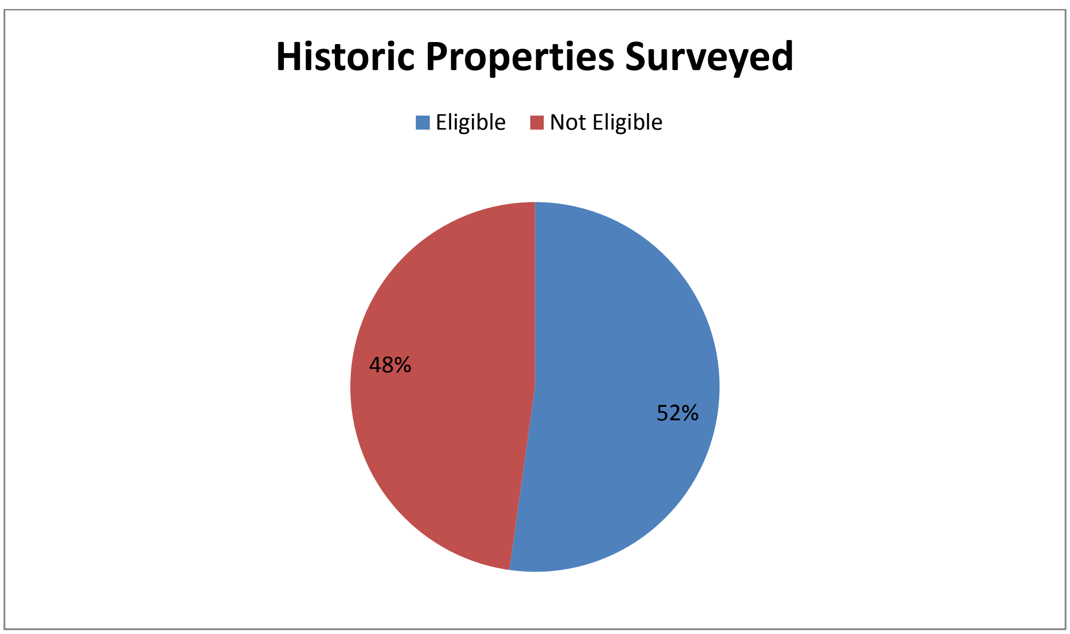


Figure 11: Of the 90 buildings visually surveyed, 47 buildings appear to be eligible for listing in the Hawaii State and National Registers of Historic Places.

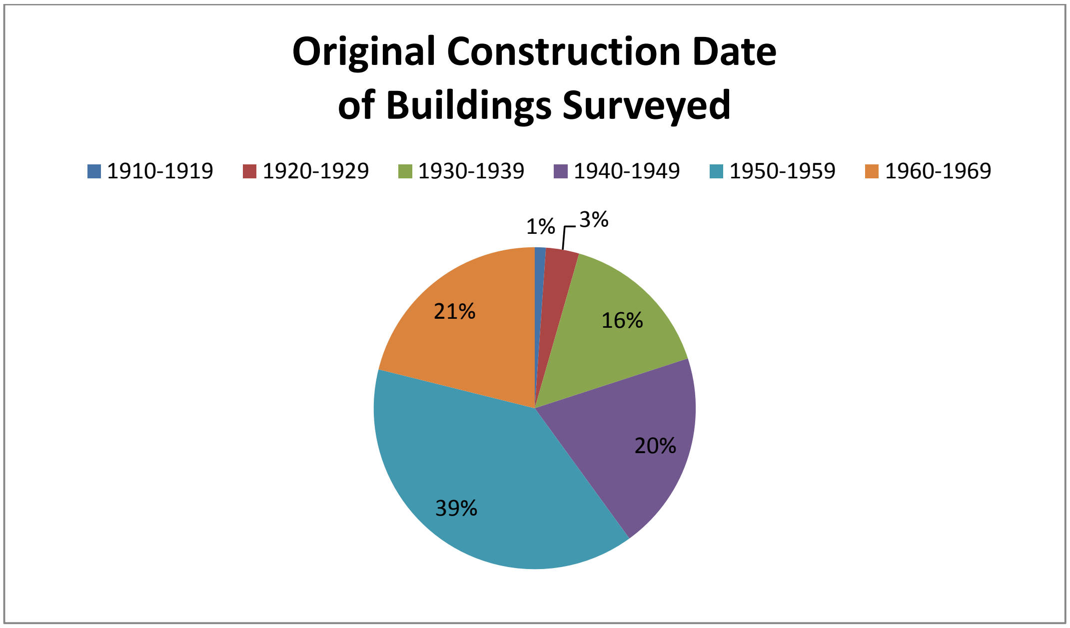


Figure 12: Buildings surveyed are identified above by decade of original construction date.

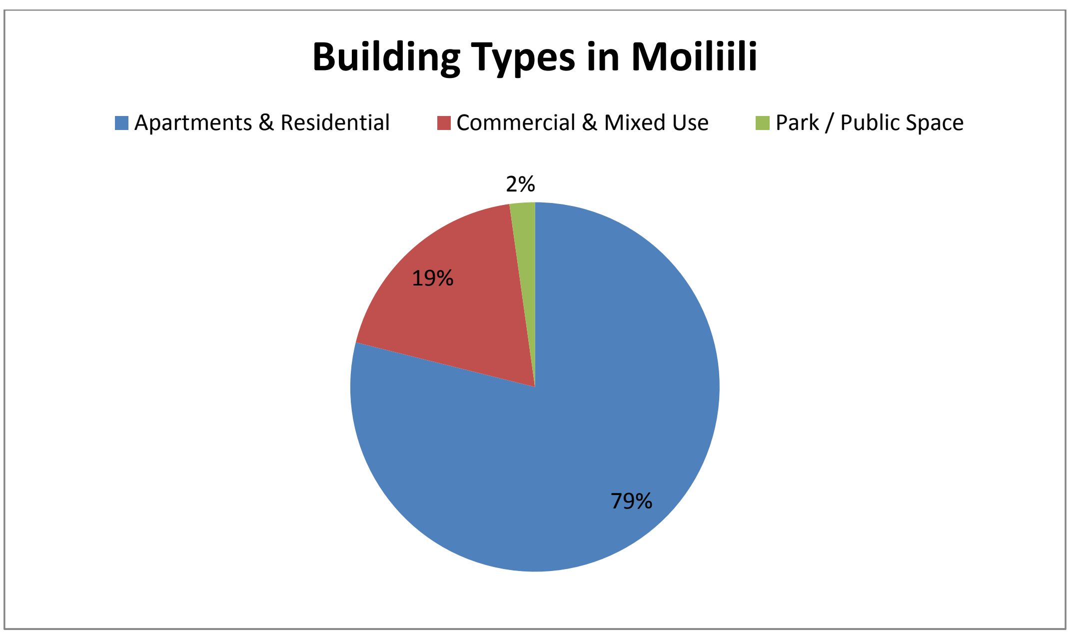


**Figure 13: Moiliili is a primarily residential area,
with commercial and mixed use buildings integrated throughout, and dedicated public space.**

Original construction dates of all buildings surveyed were identified through City & County tax records. Of those identified as being over 50 years of age, approximately one-third were constructed during the 1930s and 1940s, and more than half were originally constructed during the 1950s and 1960s. There are very few properties that exist from the pre-1930s era; of the 4 properties that remain from this era, only one (917 Coolidge Street) was determined eligible for listing on a historic register.

The area is essentially residential in character, with commercial and a handful of mixed-use buildings primarily situated along the King Street corridor. The one religious property identified – the Moiliili Nishi Hongwanji Dormitory – is also residential in nature. Eligible residential properties were found throughout the area.

Most of the buildings are one to three stories in height, with several non-historic high-rise buildings within the APE or on its periphery, including the 20-story Scenic Towers condominium which sits on the property adjacent to the Stadium Bowl-O-Drome.

Summary of Potential Effects and Treatment Recommendations

This survey was completed at the request of the Hawaii State Historic Preservation Division under Hawaii Revised Statutes Chapter 6E-8 and in anticipation of Section 106 of the National Historic Preservation Act. The review processes are designed to identify significant historic properties in project areas/APEs and to develop and execute plans to handle impacts to significant historic properties. The survey supports the historic preservation review process by providing baseline information about historic properties within the APE and identifying potential effects that may be caused by a project.

This architectural reconnaissance survey included properties within a one block radius of the subject property located at 820 Isenberg Street built prior to 1969. The survey area encompassed approximately 50 acres. Individual historic properties were identified throughout the area; no potential historic districts were identified. The large survey boundary was meant to include all architectural properties that could be affected by the redevelopment project in the absence of a final design. Effects of the redevelopment project will need to be assessed once a design is provided for evaluation.

The area around Isenberg Street, between King Street and Kapiolani Boulevard, has witnessed many changes in the first 80 years of the twentieth century, transforming from an area dominated by wetland agriculture to a single-family residential district during the period 1926-1960, to a neighborhood characterized by apartment living. There are few pre-war buildings that remain, and even fewer that are eligible. The pre-war and post-war properties determined potentially eligible (see Appendix A) may be individually listed on a historic register should individual owners desire tax benefits.

Few of the identified historic properties, have the potential to be physically affected as construction will be limited to the project area. The area also combines mixed use purposes and mixed density throughout. Since 1970, the land use has become increasingly apartment oriented, with increasingly taller buildings as the trend for the future. Today, the Moiliili streetscape presents a variety of forms ranging from small business buildings to single-family residences, to low-rise and high-rise apartments, which reflects the course of the last 100 years of its history. As such, we believe future development of the Stadium Bowl-O-Drome property will not affect the eligible, historic properties within the APE.

However, future development of the Stadium Bowl-O-Drome property will likely affect the historic building, which is determined significant under Criteria A and C.

Pending further consultation with SHPD, the following recommendations are included to help facilitate state and federal review processes.

- Historic research to the Historic American Building Standard (HABS) survey with photographic documentation, according to the appropriate level as recommended by National Park Service. HABS level documentation shall also document artwork in the bowling alley.
- Where feasible, salvage available historic items from the Stadium Bowl-O-Drome, to be incorporated into future development plans and/or an educational component detailing the history of the building.

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Appendix D

Acceptance of Historic American Buildings Survey
United States Department of the Interior, National Park Service

United States Department of the Interior

NATIONAL PARK SERVICE
1849 C Street, NW
Washington, DC 20240

4 May 2021

Lorraine Minatoishi
Minatoishi Architects
1003 Bishop Street, Suite 1975
Honolulu, HI 96813

Dear Lorraine Minatoishi,

On behalf of the National Park Service's Heritage Documentation Programs (HABS/HAER/HALS), I acknowledge the acceptance of the Historic American Buildings Survey documentation of the Stadium Bowl-O-Drome (HABS HI-615).

The completed documentation will be transmitted to the Prints and Photographs Division of the Library of Congress. The records are in the public domain and will be accessible through the library. Thank you for donating this documentation to the HABS Collection.

Sincerely,

MARY MCPARTLAND Digitally signed by MARY MCPARTLAND
Date: 2021.05.04 15:25:33 -04'00'

Mary McPartland

Collections Manager
Heritage Documentation Programs (HABS/HAER/HALS)

Appendix E

Transportation Assessment Report for the Proposed 820 Isenberg Street Redevelopment Project, Honolulu Oahu, Hawaii.
The Traffic Management Consultant

DRAFT TRANSPORTATION ASSESSMENT REPORT

FOR THE PROPOSED

820 ISENBERG STREET REDEVELOPMENT PROJECT

HONOLULU, OAHU, HAWAII

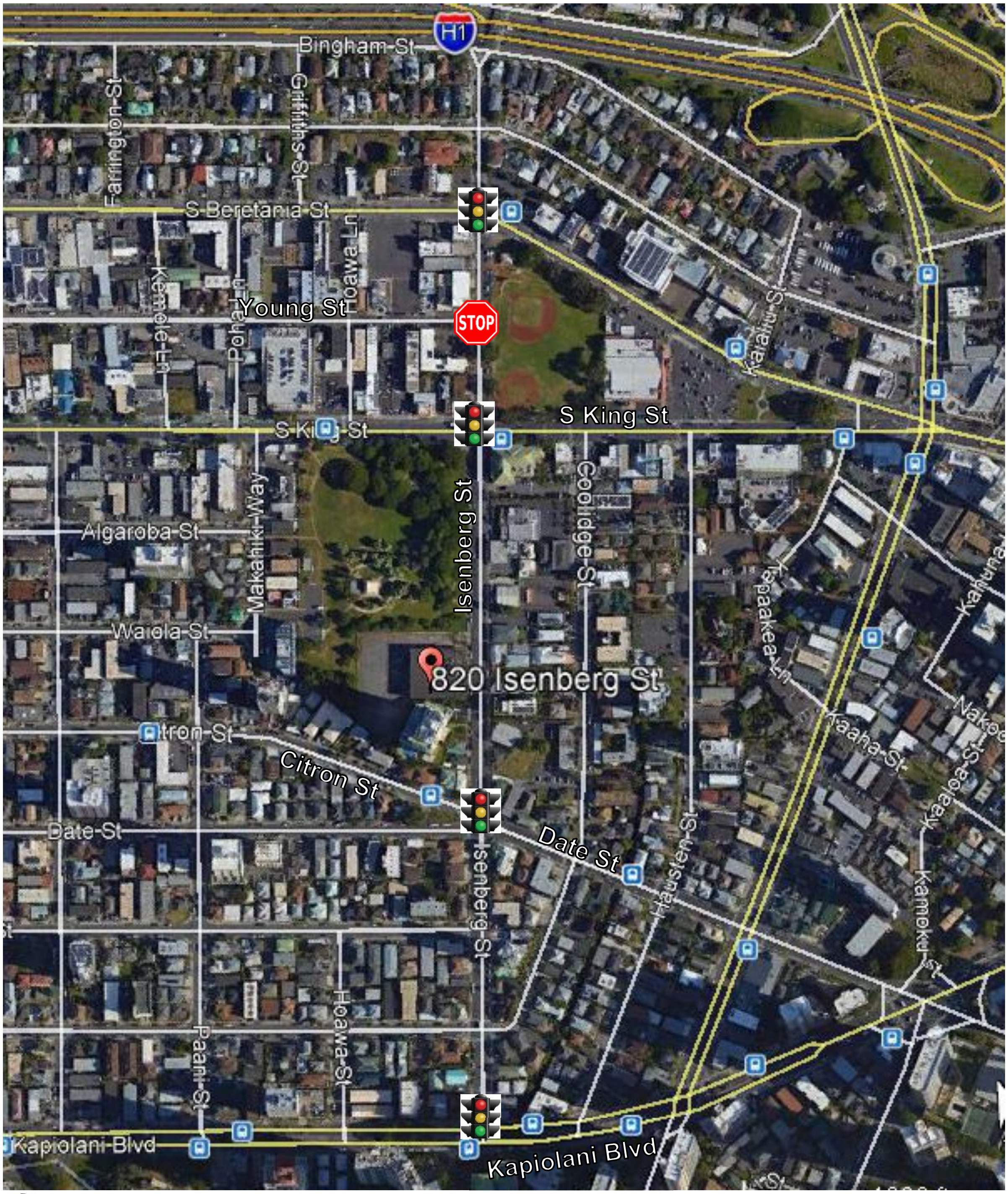
TAX MAP KEY: (1) 2-7-008:018 & 020

I. Introduction

A. Project Description

The Department of Hawaiian Homelands (DHHL) has selected the partnership of Stanford Carr Development, LLC and Hawaiian Dredging Construction Company to redevelop the former Stadium Bowl-O-Drome at 820 Isenberg Street in Mo`ili`ili, Honolulu, Hawai`i. The project site is located on the Ewa (west) side of Isenberg Street, between South King Street and Citron Street, immediately makai (south) of the Honolulu Stadium State Park. The 1.89-acre site is identified as Tax Map Key: (1) 2-7-008:018 & 020. The project location is depicted in Figure 1.

The 820 Isenberg Street Redevelopment Project is planned as a mixed-use residential and commercial project. The proposed project will consist of 270 rental apartments in a 23-story high-rise building and seven (7) townhouses in a low-rise building above the commercial area and parking structure for a total of 277 dwelling units. The commercial space, totaling 4,680 square feet of gross leasable floor area (SFGLA), will be located on the ground level fronting Isenberg Street. Two hundred ninety-five (295) parking stalls are planned. A single access driveway is proposed on Isenberg Street. For the purpose of this transportation study the Year 2025 is expected to be the first full year of full build-out and occupancy of the 820 Isenberg Street Redevelopment Project. Figure 2 depicts the proposed project site plan.



Study Intersections

Figure 1. Location Map

Figure 3. Project Site Plan

B. Purpose and Scope of the Study

The purpose of this study is to analyze the transportation impacts resulting from the development of the proposed 820 Isenberg Street Redevelopment. This report presents the findings and recommendations of the study, the scope of which includes:

1. Description of the proposed project.
2. Evaluation of existing roadways and transportation conditions.
3. Estimation of pre-pandemic traffic conditions.
4. Analysis of the Year 2025 traffic conditions without the proposed project.
5. Development of trip generation characteristics of the proposed project.
5. Identification and analysis of the transportation impacts resulting from the proposed project.
6. Recommendations of improvements that would mitigate the transportation impacts identified in this study.

C. Methodologies

1. Capacity Analysis Methodology

The highway capacity analysis, performed in this study, is based upon procedures presented in the Highway Capacity Manual, 6th Edition (HCM), published by the Transportation Research Board. HCM defines the Level of Service (LOS) as "a quantitative stratification of a performance measure or measures representing quality of service." HCM defines the six (6) Levels of Service from the traveler's perspective, ranging from the best LOS "A" to the worst LOS "F". LOS translates the complex mathematical results of highway capacity analysis into an A through F grading system for the purpose of simplifying the roadway performance for decision-makers.

LOS's "A", "B", and "C" are considered satisfactory Levels of Service. LOS "D" is generally considered a "desirable minimum" operating Level of Service. LOS's "E" and "F" are undesirable conditions. Intersection LOS is primarily based upon average delay (d) in seconds per vehicle (sec/veh). The delays at unsignalized intersections, which includes stop-controlled intersections and roundabouts, are generally shorter than signalized intersections, due to the drivers' expectation and acceptance of longer delays at higher-volume signalized intersections. Table 1 summarizes the LOS criteria.

Table 1. Intersection Level of Service Criteria (HCM)			
LOS	Signalized Control	Unsignalized Control	Description
	Delay d (sec/veh)		
A	d ≤ 10	d ≤ 10	Control delay is minimal.
B	10 < d ≤ 20	10 < d ≤ 15	Control delay is not significant.
C	20 < d ≤ 35	15 < d ≤ 25	Stable operation. Queuing begins to occur.
D	35 < d ≤ 55	25 < d ≤ 35	Less stable condition. Increase in delays, decrease in travel speeds.
E	55 < d ≤ 80	35 < d ≤ 50	Unstable operation, significant delays.
F	d > 80	d > 50	High delays, extensive queuing.

Synchro is a traffic analysis software that was developed by Trafficware. Synchro is an intersection analysis program that is based upon HCM methodology. Synchro was used to calculate the Levels of Service, v/c ratios, and the delays at the intersections in the study area. Worksheets for the capacity analysis, performed throughout this study, are compiled in the Appendix.

2. Trip Generation Methodology

The trip generation methodology is based upon generally accepted techniques developed by the Institute of Transportation Engineers (ITE) and published in Trip Generation, 10th Edition. The ITE trip rates are developed by correlating the total vehicle trip generation data with various activity/land use characteristics, such as the vehicle trips per hour (vph) per dwelling unit. The trip generation characteristics for the proposed project are based upon the ITE peak hour trip rates for a high-rise multi-family residential development, a low-rise multi-family residential development, and commercial retail space.

A portion of the peak hour trips generated by a commercial center is considered to be "pass-by" trips, i.e., traffic already on the roadway stopping by at a "secondary" destination enroute to its primary destination. The percentages of pass-by trips were compared with the gross leasable floor areas of the shopping centers, which were collected from traffic studies and compiled by ITE. The results of the analysis were published in the Trip Generation Handbook 3rd Edition, dated August 2014. All (100 percent) of the PM peak hour trips generated by the proposed 4,680 square foot retail center are expected to be pass-by trips. The AM peak hour pass-by trip rate for a retail center was not published by ITE.

II. Existing Conditions

A. Roadways

Isenberg Street is a two-way, two- to four-lane collector street between Bingham Street and Kapiolani Boulevard. Curbs, gutters, and sidewalks are provided on both sides of Isenberg Street. Marked parking stalls are located on both sides of Isenberg Street, between South Beretania Street and Kapiolani Boulevard. Parking is prohibited on the Ewa side of Isenberg Street from Young Street to South King Street from 3:30 PM to 5:30 during the weekdays.

South Beretania Street is a one-way Ewa bound, three-lane collector street from University Avenue to McCully Street. A one-way Ewa bound bicycle lane is provided on the mauka side of South Beretania Street. Curbs, gutters, and sidewalks are provided on both sides of South Beretania Street. South Beretania Street is signalized at its four-legged intersection with Isenberg Street.

Young Street is a two-way, two-lane local street between Isenberg Street and McCully Street. Continuous curbs, gutters, and sidewalks are not provided on Young Street between McCully Street and Isenberg Street. Young Street is designated as a bicycle route. Young Street is stop-controlled at its Tee-intersection with Isenberg Street.

South King Street is a five-lane, one-way Koko Head bound street from McCully Street to University Avenue. A two-way bicycle lane is provided on the mauka side of South King Street from Isenberg Street to Punchbowl Street. Curbs, gutters, and sidewalks are provided on both sides of South King Street. South King Street is signalized at its four-legged intersection with Isenberg Street.

Citron Street is two-way, two-lane street between McCully Street and Isenberg Street. Curbs, gutters, and sidewalks are provided on both sides of Citron Street. Parking is permitted on both sides of Citron Street. Citron Street is signalized at its five-legged intersection with Date Street and Isenberg Street.

Date Street is two-way, two-lane street between McCully Street and Isenberg Street. Date Street becomes a two-way four-lane street between Date Street and University Avenue. Curbs, gutters, and sidewalks are provided on both sides of Date Street. Parking is permitted on both sides of Date Street, between McCully Street and University Avenue. Date Street is signalized at its five-legged intersection with Citron Street and Isenberg Street.

Kapiolani Boulevard is a six-lane divided roadway between McCully Street and Date Street. Curbs, gutters, and sidewalks are provided on both sides of Kapiolani Boulevard. An exclusive left-turn lane is provided on Koko Head (east) bound Kapiolani Boulevard at Isenberg Street. The left-turn movement from Ewa bound Kapiolani Boulevard is prohibited. Kapiolani Boulevard in signalized at its four-legged intersection with Isenberg Street/Marco Polo Driveway.

B. Public Transit

The Mo`ili`ili area is well-serviced by TheBus. TheBus routes are located along South Beretania Street and South King Street (Routes 1, 4, & 6), and along Kapiolani Boulevard (Routes 3 & 9) with bus stops near their intersections with Isenberg Street.

C. Field Investigation

Turning movement traffic count surveys were conducted during the AM peak period of traffic (6:30 AM to 8:30 AM) and the PM peak period of traffic (3:30 PM to 5:30 PM) on December 8 and 9, 2020 at the following intersections along Isenberg Street:

- South Beretania Street
- Young Street
- South King Street
- Date Street/Citron Street
- Kapiolani Boulevard

The COVID-19 pandemic shutdown has dramatically reduced the peak hour work trips, school trips, and visitor traffic in Honolulu. The most significant school trip generators in the region are the University of Hawaii at Manoa, Iolani School, and Ala Wai Elementary School, all of which were restricted to virtual learning during the 2020 field investigation. Another significant visitor and work trip generator is Waikiki, which was at about 25 percent hotel-occupancy. As a result, the existing (2020) traffic volumes and traffic circulation patterns were not representative of pre-pandemic peak hour conditions.

Turning movement traffic count data were collected by The Traffic Management Consultant on October 15, 2013 during the AM peak period of traffic (6:30 AM to 8:30 AM) and the PM peak period of traffic (3:00 PM to 6:00 PM) at the following intersections along Isenberg Street:

- South King Street
- Date Street/Citron Street
- Kapiolani Boulevard

The turning movement traffic count data are included in the Appendix. The 2020 and 2013 peak hour turning movement traffic volumes are summarized in Table 2.

Table 2. Turning Movement Traffic Count Comparison

Intersection	Peak Hour	Year	EBL	EBT	EBR	WBL	WBT	WBR			NBL	NBT	NBR	SBL	SBT	SBR						Totals
South King Street and Isenberg Street	AM	2020	24	734	101	N/A	N/A	N/A			N/A	191	52	126	180	N/A						1,408
		2013	35	1,327	130	N/A	N/A	N/A			N/A	290	80	144	197	N/A						2,203
	PM	2020	50	1,636	189	N/A	N/A	N/A			N/A	100	81	270	280	N/A						2,606
		2013	69	1,889	263	N/A	N/A	N/A			N/A	147	101	357	280	N/A						3,106
Date Street/ Citron Street and Isenberg Street	Peak Hour	Year	EBL	EBT	EBR	WBL	WBT	WBR	WBR2	NBL2	NBL	NBT	NBR	SBL	SBT	SBR	SBR2	SEL2	SEL	SET	SER	Totals
	AM	2020	4	42	6	33	36	152	162	0	6	64	40	161	95	1	13	2	24	N/A	0	841
		2013	3	80	3	76	77	265	213	0	4	114	75	226	102	6	19	15	43	N/A	2	1,323
	PM	2020	3	55	4	47	46	135	76	1	0	71	63	239	173	22	42	6	55	N/A	4	1,042
		2013	2	43	8	56	68	231	91	0	2	87	40	249	186	11	55	5	49	N/A	1	1,184
Kapiolani Boulevard and Isenberg Street	Peak Hour	Year	EBL	EBT	EBR	WBL	WBT	WBR			NBL	NBT	NBR	SBL	SBT	SBR						Totals
	AM	2020	2	452	1	0	1,733	27			35	21	26	51	23	50						2,421
		2013	11	578	1	1	2,571	27			47	48	29	82	27	93						3,515
	PM	2020	35	1,484	0	0	974	24			19	14	22	96	49	69						2,786
		2013	63	1,614	0	0	810	40			10	12	28	105	57	48						2,787

Legend

EBL–Eastbound Left-Turn
EBT–Eastbound Through
EBR–Eastbound Right-Turn

WBL–Westbound Left-Turn
WBT–Westbound Through
WBR–Westbound Right-Turn to Isenberg Street
WBR2-Westbound Right-Turn to Citron Street

NBL2-Northbound Left-Turn to Date Street
NBL–Northbound Left-Turn to Citron Street
NBT–Northbound Through
NBR–Northbound Right-Turn

SBL–Southbound Left-Turn
SBT–Southbound Through
SBR–Southbound Right-Turn to Date Street
SBR2–Southbound Right-Turn to Citron Street

SEL2–Southeast Bound Left-Turn to Isenberg Street
SEL–Southeast Bound Left-Turn to Date Street
SET–Southeast Bound Through
SER–Southeast Bound Right-Turn to Isenberg Street

D. Existing Traffic Volumes and Operating Conditions (2020)

1. Existing AM Peak Hour Traffic

The existing AM peak hour of traffic in the study area occurred between 7:15 AM and 8:15 AM. South Beretania Street carried about 1,100 vehicles per hour (vph) and seven (6) bicycles per hour (bph). Young Street carried about 200 vph and three (3) bph, total for both directions. South King Street carried about 900 vph and one (1) bph. The bicycle lane on South King Street carried 16 bph, total for both directions. Isenberg Street carried over 500 vph and seven (7) bph, total for both directions. East of Isenberg Street, Date Street carried about 650 vph and 19 bph, total for both directions. Kapiolani Boulevard carried about 2,300 vph and one (1) bph, total for both directions.

The intersection of South Beretania Street and Isenberg Street operated at an overall Level of Service "B", during the existing AM peak hour of traffic. South Beretania Street operated at LOS "B". Both mauka bound and makai bound Isenberg Street operated at LOS "C" at South Beretania Street. During the existing AM peak hour of traffic, Young Street operated at LOS "B" at Isenberg Street.

South King Street operated at LOS "B" at Isenberg Street, during the existing AM peak hour of traffic. Mauka bound and makai bound Isenberg Street both operated at LOS "C".

The intersection of Isenberg Street and Date Street/Citron Street operated at an overall LOS "B". The individual traffic movements at the intersection operated at satisfactory Levels of Service, i.e., LOS "C" or better, during the existing AM peak hour of traffic.

The intersection of Kapiolani Boulevard and Isenberg Street operated at an overall LOS "B", during the existing AM peak hour of traffic. The left-turn/through movement on makai bound Isenberg Street operated at LOS "D" at Kapiolani Boulevard. The Marco Polo Driveway also operated at LOS "D". The other movements at the intersection of Kapiolani Boulevard and Isenberg Street/Marco Polo Driveway operated at satisfactory Levels of Service. Figure 3 depicts the existing AM peak hour traffic volumes.

2. Existing PM Peak Hour Traffic

The existing PM peak hour of traffic in the study area occurred between 4:30 PM and 5:30 PM. South Beretania Street carried about 800 vph and eleven (11) bph. Young Street carried about 275 vph and two (2) bph, total for both directions. South King Street carried about 1,900 vph and two (2) bph. The bicycle lane on South King Street carried 26 bph, total for both directions. Isenberg Street carried over 600 vph and 16 bph, total for both directions. East of Isenberg Street, Date Street carried about 600 vph and 14 bph, total for both directions. Kapiolani Boulevard carried about 2,300 vph and 17 bph, during the existing PM peak hour of traffic.

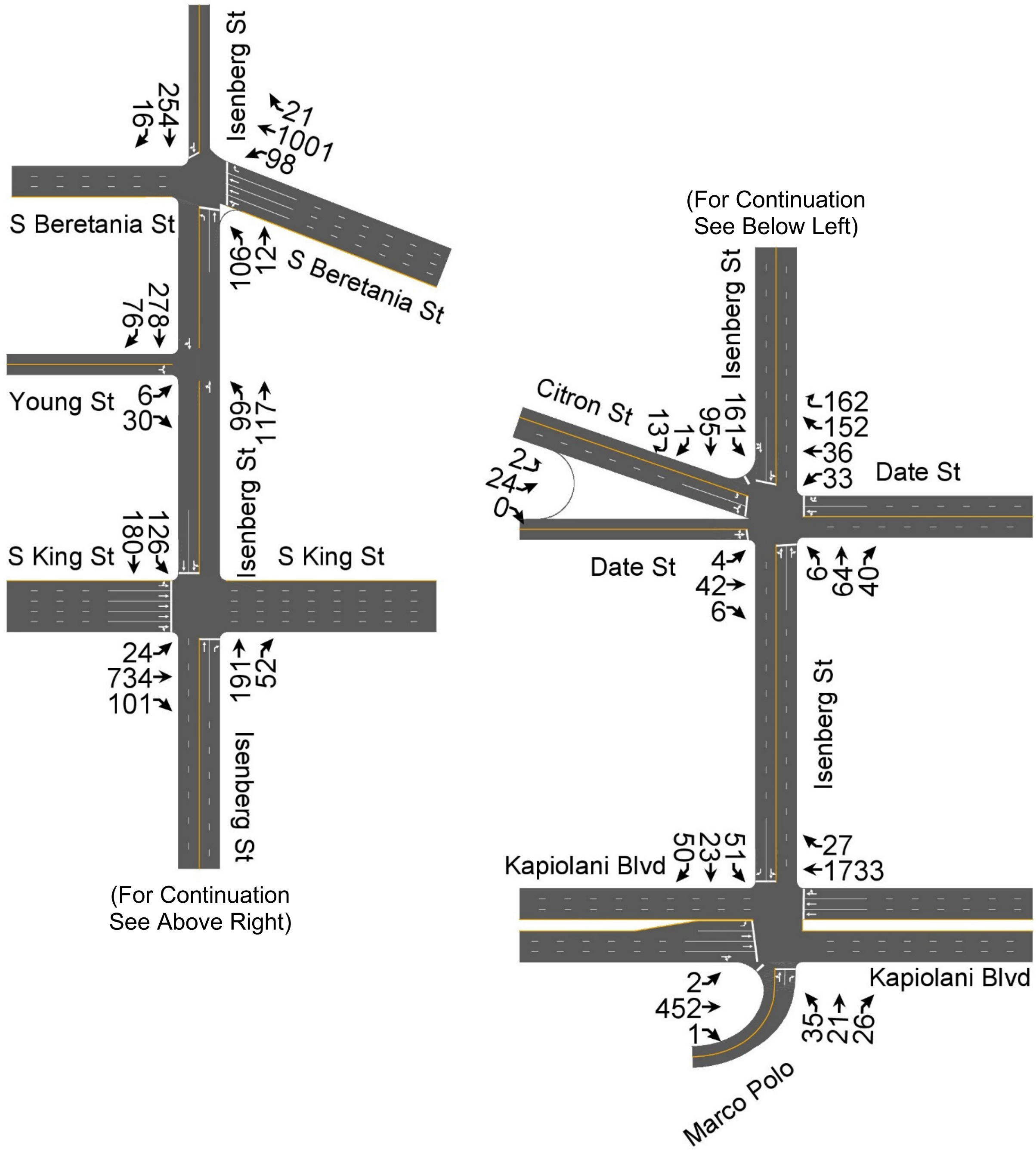


Figure 3. Existing AM Peak Hour Traffic (2020)

During the existing PM peak hour of traffic, the intersection of South Beretania Street and Isenberg Street operated at an overall LOS "B". South Beretania Street operated at LOS "B" at Isenberg Street. Mauka bound and makai bound Isenberg Street both operated at LOS "C". Young Street operated at LOS "B" at Isenberg Street, during the existing PM peak hour of traffic.

The intersection of South King Street and Isenberg Street operated at satisfactory Levels of Service, during the existing PM peak hour of traffic.

The overall intersection of Isenberg Street and Citron Street/Date Street operated at LOS "B", during the existing PM peak hour of traffic. Citron Street operated at LOS "D" at Isenberg Street. The other traffic movements at the intersection operated at satisfactory Levels of Service, during the existing PM peak hour of traffic.

Kapiolani Boulevard and Isenberg Street operated at an overall LOS "B", during the existing PM peak hour of traffic. Makai bound Isenberg Street and the Marco Polo Driveway operated at LOS "D" at Kapiolani Boulevard. The other movements at the intersection of Kapiolani Boulevard and Isenberg Street/Marco Polo Driveway operated at satisfactory Levels of Service. The existing PM peak hour traffic volumes are depicted on Figure 4.

E. Data Collection

Historical traffic count data were obtained from Hawaii State Department of Transportation (HDOT) on various surface streets in the study area. Figure 5 depicts the HDOT traffic count stations and the turning movement count (TMC) survey locations.

The traffic count data on the surface streets in the study area clearly show declines in traffic during the COVID pandemic shutdown. The 2020 total daily traffic in the study area declined by about 34 percent from 2019. The 2019 total daily traffic in the study area was about 8 percent lower than 2013. The differences between the pre-pandemic 2019 and 2013 data can be attributed to the seasonal variation in traffic, where the 2019 data were collected during the summer months when schools were not in session. Table 3 summarizes the two-day average historical traffic count data in the study area.

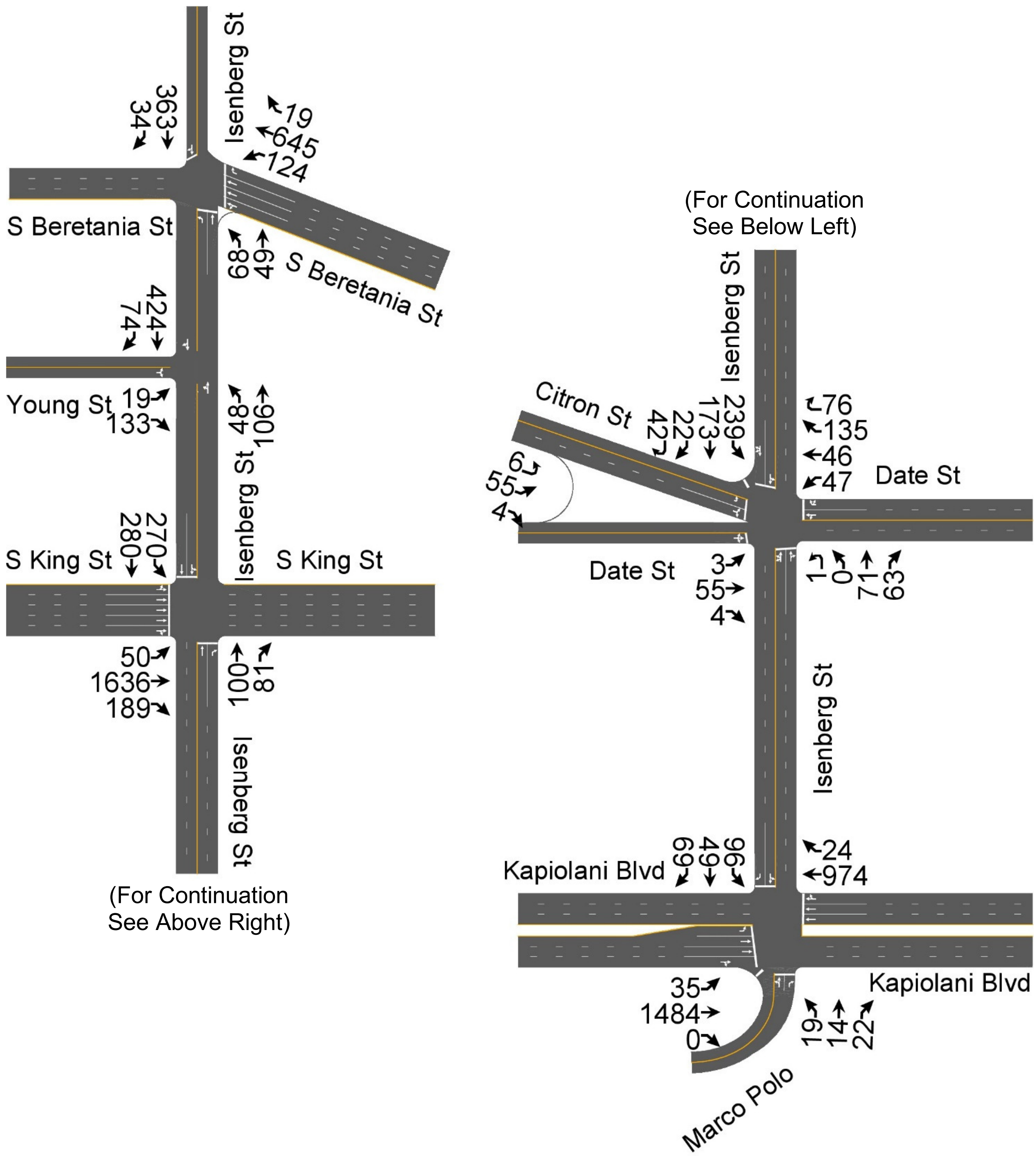


Figure 4. Existing PM Peak Hour Traffic (2020)

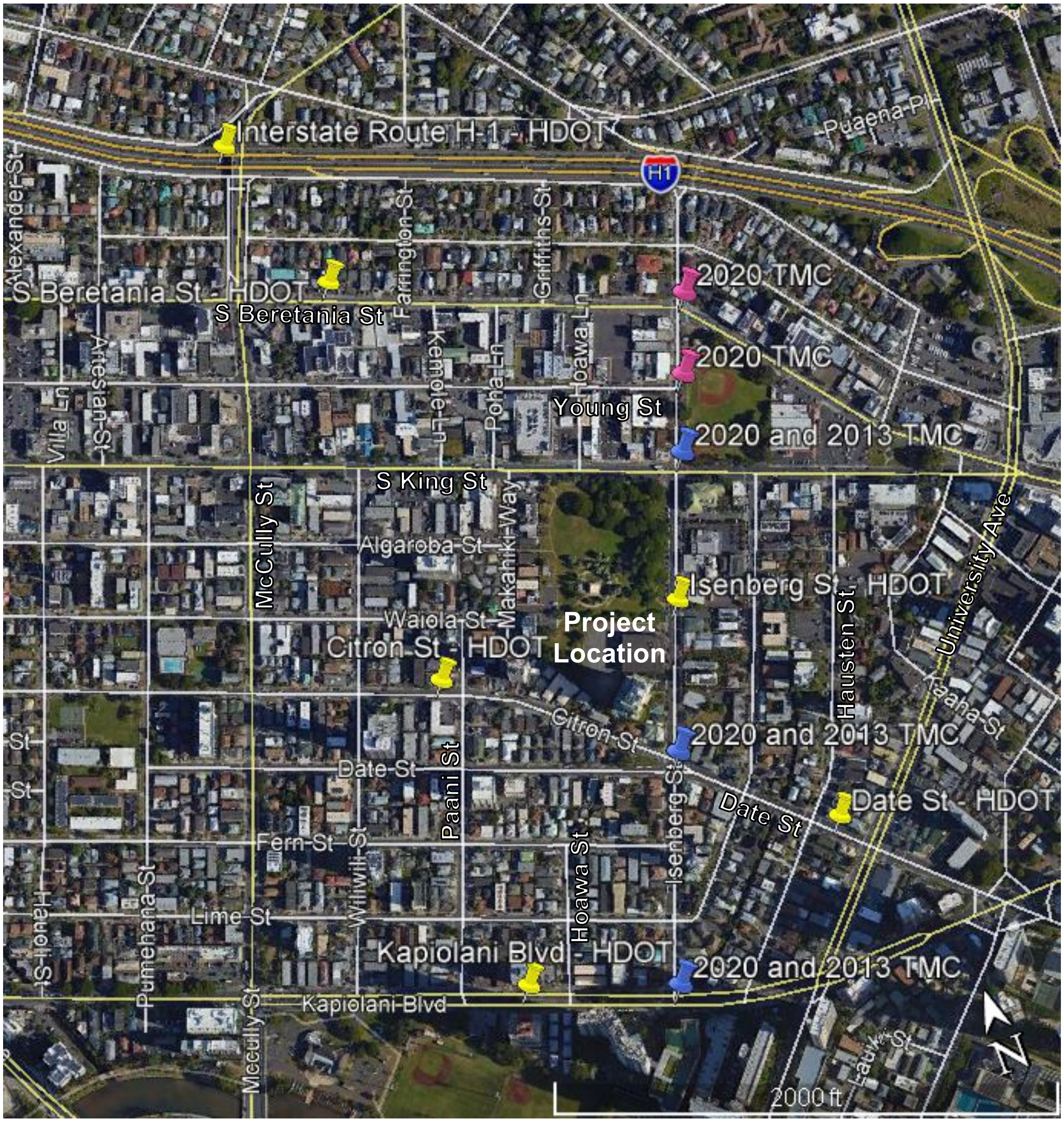


Figure 5. Traffic Count Survey Locations

Table 3. HDOT Traffic Count Data					
Location	**Period**	**Date**	**9/3-4/20**	**7/18-19/19**	**8/29-30/13**
Isenberg Street Between South King Street and Citron Street	**24-Hour**	**NB**	1,966	3,355	3,884
		SB	3,926	9,430	7,704
		Total	5,892	12,785	11,587
	AM	**NB**	125	276	369
		SB	179	671	519
		Total	304	947	888
	PM	**NB**	142	262	411
		SB	366	799	704
		Total	508	1,061	1,115
Date Street Between Hausten Street and University Avenue	**Period**	**Date**	**12/3-4/20**	**6/19-20/19**	**5/14-15/13**
	24-Hour	**EB**	4,451	5,757	5,768
		WB	4,269	5,364	5,513
		Total	8,720	11,121	11,280
	AM	**EB**	270	381	703
		WB	345	513	453
		Total	615	894	1,156
	PM	**EB**	420	518	510
		WB	345	451	552
		Total	765	968	1,062

Table 3. HDOT Traffic Count Data (Cont'd.)					
Location	**Period**	**Date**	**9/10-11/20**	**7/11-12/19**	**8/29-30/13**
Kapiolani Boulevard Between Paani Street and Hoawa Street	**24-Hour**	**NB**	11,605	20,869	25,011
		SB	12,676	20,653	21,575
		Total	24,280	41,522	46,586
	AM	**NB**	587	829	1,351
		SB	850	1,824	2,209
		Total	1,437	2,653	3,560
	PM	**NB**	1,212	1,912	3,127
		SB	826	995	948
		Total	2,037	2,907	4,075
South Beretania Street Between McCully Street and Farrington Street	**Period**	**Date**	**12/3-4/20**	**7/24-25/19**	**12/16-17/13**
	24-Hour	**EB**	N/A	N/A	N/A
		WB	14,568	16,404	19,996
		Total	14,568	16,404	19,996
	AM	**EB**	N/A	N/A	N/A
		WB	1,158	1,211	1,691
		Total	1,158	1,211	1,691
	PM	**EB**	N/A	N/A	N/A
		WB	1,035	1,049	1,406
		Total	1,035	1,049	1,406

Table 3. HDOT Traffic Count Data (Cont'd.)					
Location	**Period**	**Date**	**10/28-29/20**	**8/1-2/19**	**8/29-30/13**
Citron Street Between Paani Street and Wiliwili Street	**24-Hour**	**EB**	612	723	603
		WB	2,273	2,659	2,688
		Total	2,884	3,382	3,291
	AM	**EB**	29	41	48
		WB	154	200	288
		Total	183	240	335
	PM	**EB**	71	99	56
		WB	179	205	433
		Total	250	303	489
Totals	**Period**	**Year**	**2020**	**2019**	**2013**
	24-Hour	**Total**	56,343	85,213	92,739
	AM	**Total**	3,696	5,944	7,630
	PM	**Total**	4,594	6,288	8,146

Legend
NB – Northbound EB – Eastbound
SB – Southbound WB – Westbound

Historical traffic count data were obtained from HDOT at the continuous traffic count station on Interstate Route H-1 at the McCully Street Overpass on the specific dates of the 2020 and 2013 turning movement traffic count surveys and the corresponding dates during the pre-pandemic 2019. The total daily traffic volumes on Interstate Route H-1 in 2020 decreased about 17 percent from the pre-pandemic 2019 traffic volumes. Between the Years 2013 and 2019, the total daily traffic volumes on Interstate Route H-1 increased by about 5 percent. Table 4 summarizes the traffic count data on Interstate Route H-1 at the McCully Street Overpass.

Table 4. HDOT Interstate Route H-1 at McCully St Traffic Count Data

Time Period	Direction	Date		
		Tuesday 12/8/20	Tuesday 10/15/19	Tuesday 10/15/13
24-Hour	EB	61,025	74,933	70,865
	WB	58,566	69,605	66,635
	Totals	119,591	144,538	137,500
AM	EB	4,118	5,068	4,585
	WB	4,985	4,853	4,723
	Totals	9,103	9,921	9,308
PM	EB	5,208	5,480	5,544
	WB	4,311	4,229	3,902
	Totals	9,519	9,709	9,446

The 24-hour 2020 and 2019 traffic count data on Interstate Route H-1 were used to derive an adjustment factor of 1.21, which was uniformly applied to the 2020 traffic count data at the South Beretania Street and Young Street intersections with Isenberg Street to estimate 2019 pre-pandemic traffic conditions. The 24-hour 2013 and 2019 total traffic count data on Interstate Route H-1 were used to derive an adjustment factor of 1.05, which was uniformly applied to the 2013 traffic count data to estimate 2019 pre-pandemic traffic conditions at the Isenberg Street intersections with the South King Street, Citron Street/Date Street, and Kapiolani Boulevard.

F. Pre-Pandemic Traffic Volumes and Operating Conditions (2019)

1. Pre-Pandemic AM Peak Hour Traffic

The overall intersection of South Beretania Street and Isenberg Street operated at LOS "C" at Isenberg Street, during the pre-pandemic AM peak hour of traffic. Mauka bound and makai bound Isenberg Street operated at LOS "D" and LOS "C", respectively. During the pre-pandemic AM peak hour of traffic, Young Street operated at LOS "B" at Isenberg Street.

South King Street operated at LOS "B" at Isenberg Street, during the pre-pandemic AM peak hour of traffic. Both mauka bound and makai bound Isenberg Street operated at LOS "C".

The intersection of Isenberg Street and Date Street/Citron Street operated at an overall LOS "C", during the pre-pandemic AM peak hour of traffic. The individual traffic movements at the intersection operated at satisfactory Levels of Service. The shared left-turn/through lane on makai bound Isenberg Street operated as a default exclusive left-turn lane.

The intersection of Kapiolani Boulevard and Isenberg Street operated at an overall LOS "C", during the pre-pandemic AM peak hour of traffic. The makai bound left-turn/through movement on Isenberg Street operated at LOS "E" at Kapiolani Boulevard. The right-turn movement on makai bound Isenberg Street and the Marco Polo Driveway operated at LOS "D". The other movements at the intersection of Kapiolani Boulevard and Isenberg Street/Marco Polo Driveway operated at satisfactory Levels of Service. Figure 6 depicts the pre-pandemic AM peak hour traffic volumes.

2. Pre-Pandemic PM Peak Hour Traffic

The intersection of South Beretania Street and Isenberg Street operated at an overall LOS "C", during the pre-pandemic PM peak hour of traffic. South Beretania Street operated at LOS "B". The left-turn movement on mauka bound Isenberg Street operated at LOS "D". Makai bound Isenberg Street also operated at LOS "D". Young Street operated at LOS "C" at Isenberg Street, during the pre-pandemic PM peak hour of traffic.

The intersection of South King Street and Isenberg Street operated at satisfactory Levels of Service, during the pre-pandemic PM peak hour of traffic. The shared left-turn/through lane on makai bound Isenberg Street operated as a default exclusive left-turn lane. The makai bound traffic on Isenberg Street was estimated to have queued from South King Street back to Young Street.

The intersection of Isenberg Street and Date Street/Citron Street operated at an overall LOS "C", during the pre-pandemic PM peak hour of traffic. Citron Street operated at LOS "D" at Isenberg Street. The other traffic movements at the intersection operated at satisfactory Levels of Service, during the pre-pandemic PM peak hour of traffic.

The left-turn/through movement on makai bound Isenberg Street operated at LOS "E" at Kapiolani Boulevard, during the pre-pandemic PM peak hour of traffic. The Marco Polo Driveway operated at LOS "D" at Kapiolani Boulevard. The other movements at the intersection of Kapiolani Boulevard and Isenberg Street/Marco Polo Driveway operated at satisfactory Levels of Service. The pre-pandemic PM peak hour traffic volumes are depicted on Figure 7.

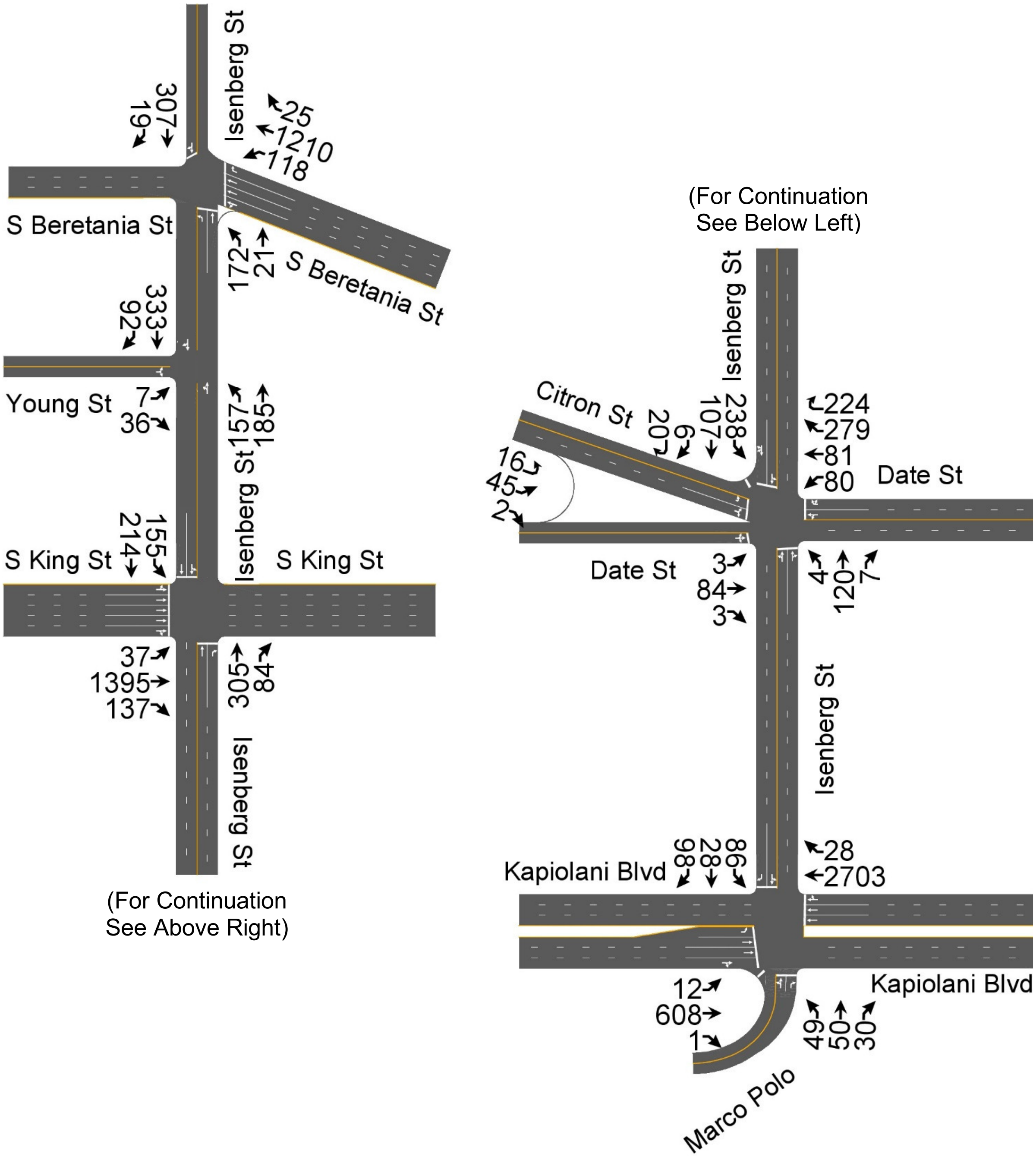


Figure 6. Pre-Pandemic AM Peak Hour Traffic (2019)

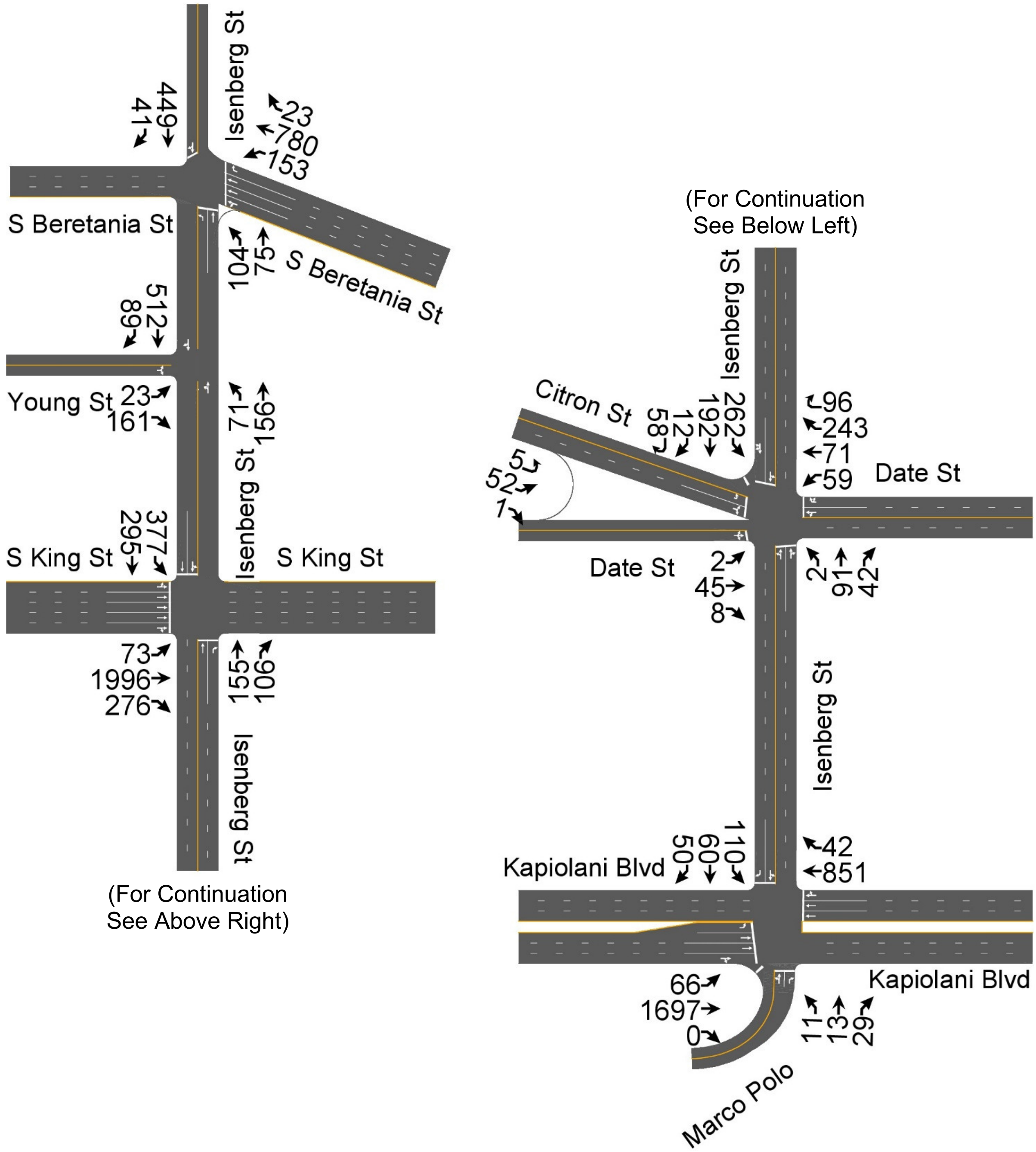


Figure 7. Pre-Pandemic PM Peak Hour Traffic (2019)

III. Future Traffic Conditions

A. Travel Forecasts

The Oahu Regional Transportation Plan (ORTP) was prepared for the Oahu Metropolitan Planning Organization. The ORTP travel forecasts are based upon socio-economic projections in the region. The ORTP published average annual growth rates of 0.73 percent increase in the number of households, 0.58 percent increase in the population, and 0.61 percent increase in employment. An annual average growth rate of 0.73 percent was uniformly applied to the pre-pandemic (2019) AM and PM peak hour traffic, to estimate the Year 2025 peak hour traffic demands without the proposed project.

B. Year 2025 AM Peak Hour Traffic Analysis Without Project

The overall intersection of South Beretania Street and Isenberg Street is expected to operate at LOS "C" at Isenberg Street, during the 2025 AM peak hour of traffic without the proposed project. Mauka bound and makai bound Isenberg Street are expected to operate at LOS "D" and LOS "C", respectively. During the 2025 AM peak hour of traffic without the proposed project, Young Street is expected to operate at LOS "C" at Isenberg Street.

The intersection of South King Street and Isenberg Street is expected to operate at satisfactory Levels of Service.

The intersection of Isenberg Street and Date Street/Citron Street is expected to operate at an overall LOS "C", during the 2025 AM peak hour of traffic without the proposed project. The left-turn/through movement on Citron Street at Isenberg Street is expected to operate at LOS "D". The other traffic movements at the intersection are expected to operate at satisfactory Levels of Service. The shared left-turn/through lane on makai bound Isenberg Street operated as a default exclusive left-turn lane.

The intersection of Kapiolani Boulevard and Isenberg Street is expected to operate at an overall LOS "C", during the 2025 AM peak hour of traffic without the proposed project. The makai bound left-turn/through movement on Isenberg Street is expected to operate at LOS "E" at Kapiolani Boulevard. The right-turn movement on makai bound Isenberg Street and the Marco Polo Driveway are expected to operate at LOS "D". The traffic movements on Kapiolani Boulevard are expected to operate at satisfactory Levels of Service. Figure 8 depicts the AM peak hour traffic volumes without the proposed project.

C. Year 2025 PM Peak Hour Traffic Analysis Without Project

During the PM peak hour of traffic without the proposed project, the intersection of South Beretania Street and Isenberg Street is expected to operate at an overall LOS "C". South Beretania Street is expected to operate at LOS "B" at Isenberg Street. The left-turn movement on mauka bound Isenberg Street is expected to operate at LOS "E". Makai bound Isenberg Street is expected to operate at LOS "C". Young Street is expected to operate at LOS "C" at Isenberg Street, during the PM peak hour of traffic without the proposed project.

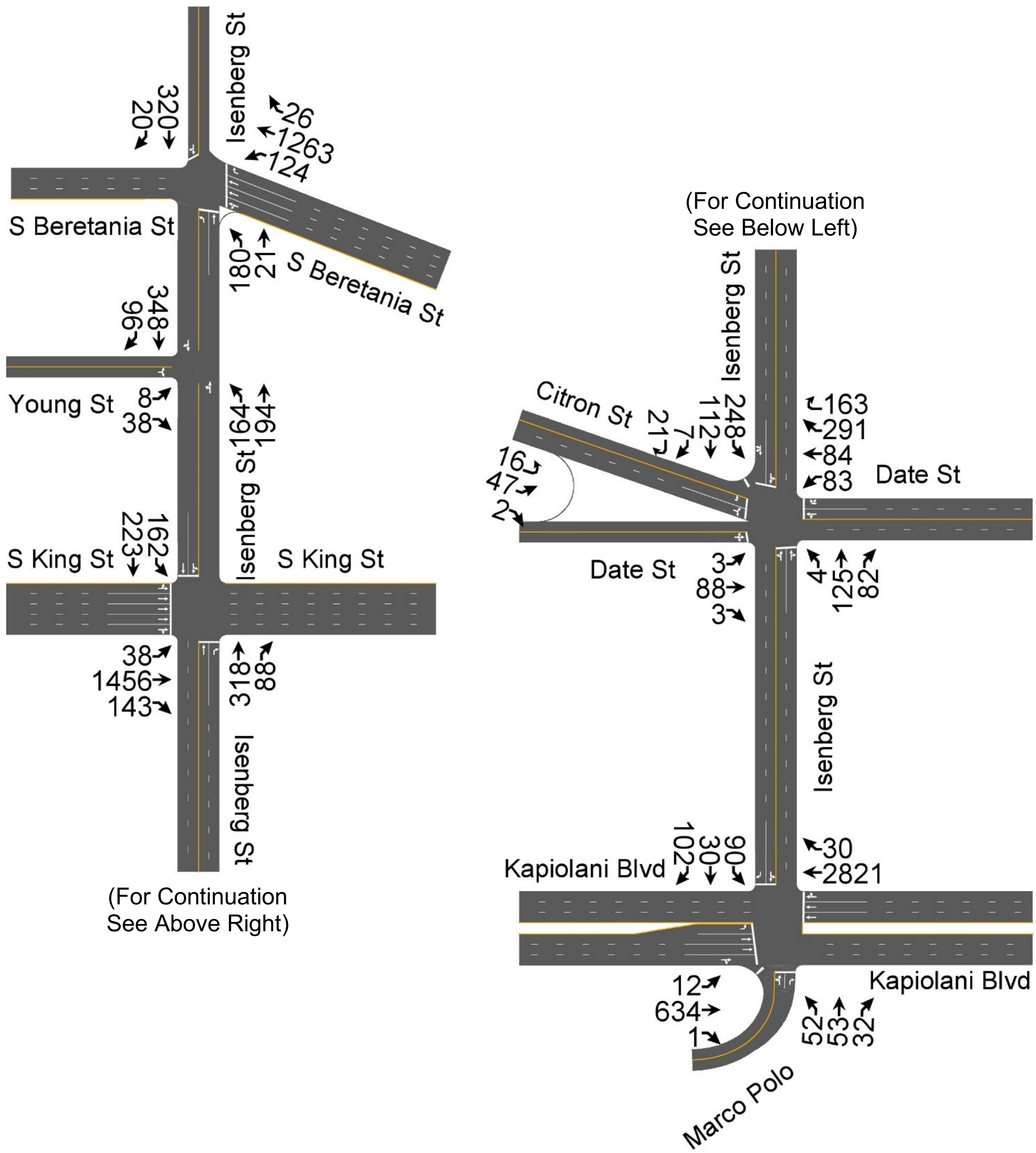


Figure 8. AM Peak Hour Traffic Without Project

The intersection of South King Street and Isenberg Street is expected to operate at satisfactory Levels of Service, during the PM peak hour of traffic without the proposed project. The shared left-turn/through lane on makai bound Isenberg Street operated as a default exclusive left-turn lane.

The overall intersection of Isenberg Street and Citron Street/Date Street is expected to operate at LOS "C", during the PM peak hour of traffic without the proposed project. Citron Street is expected to operate at LOS "D" at Isenberg Street. The other traffic movements at the intersection are expected to operate at satisfactory Levels of Service, during the PM peak hour of traffic without the proposed project.

During the PM peak hour of traffic without the proposed project, the intersection of Kapiolani Boulevard and Isenberg Street is expected to operate at an overall LOS "B". Makai bound Isenberg Street is expected to operate at LOS "E" at Kapiolani Boulevard. The mauka bound left-turn/through movement on the Marco Polo Driveway is expected to operate at LOS "D" at Kapiolani Boulevard. The other movements at the intersection of Kapiolani Boulevard and Isenberg Street/Marco Polo Driveway are expected to operate at satisfactory Levels of Service. The PM peak hour traffic volumes without the proposed project are depicted on Figure 9.

IV. Transportation Impact Analysis

A. Trip Generation

The peak hour trip generation characteristics for the proposed 820 Isenberg Street Redevelopment are based upon the ITE trip rates for a 270-unit multi-family high-rise housing, a seven (7) unit multi-family low-rise housing, and 4,680 SFGFA of commercial area. Table 5 summarizes the trip generation characteristics for the proposed project.

Table 5. Trip Generation Characteristics

Land Use (ITE Code)	Units	AM Peak Hour (vph)			PM Peak Hour (vph)		
		Enter	Exit	Total	Enter	Exit	Total
Multi-Family Housing High-Rise (222)	270 DU	21	67	88	61	39	100
Multi-Family Housing Low-Rise (220)	7 DU	1	3	4	3	2	5
Retail (820)	4,680 SFGFA	3	2	5	9	9	18
	Pass-By	0	0	0	(-)9	(-)9	(-)18
Total Trips		**25**	**72**	**97**	**64**	**41**	**106**

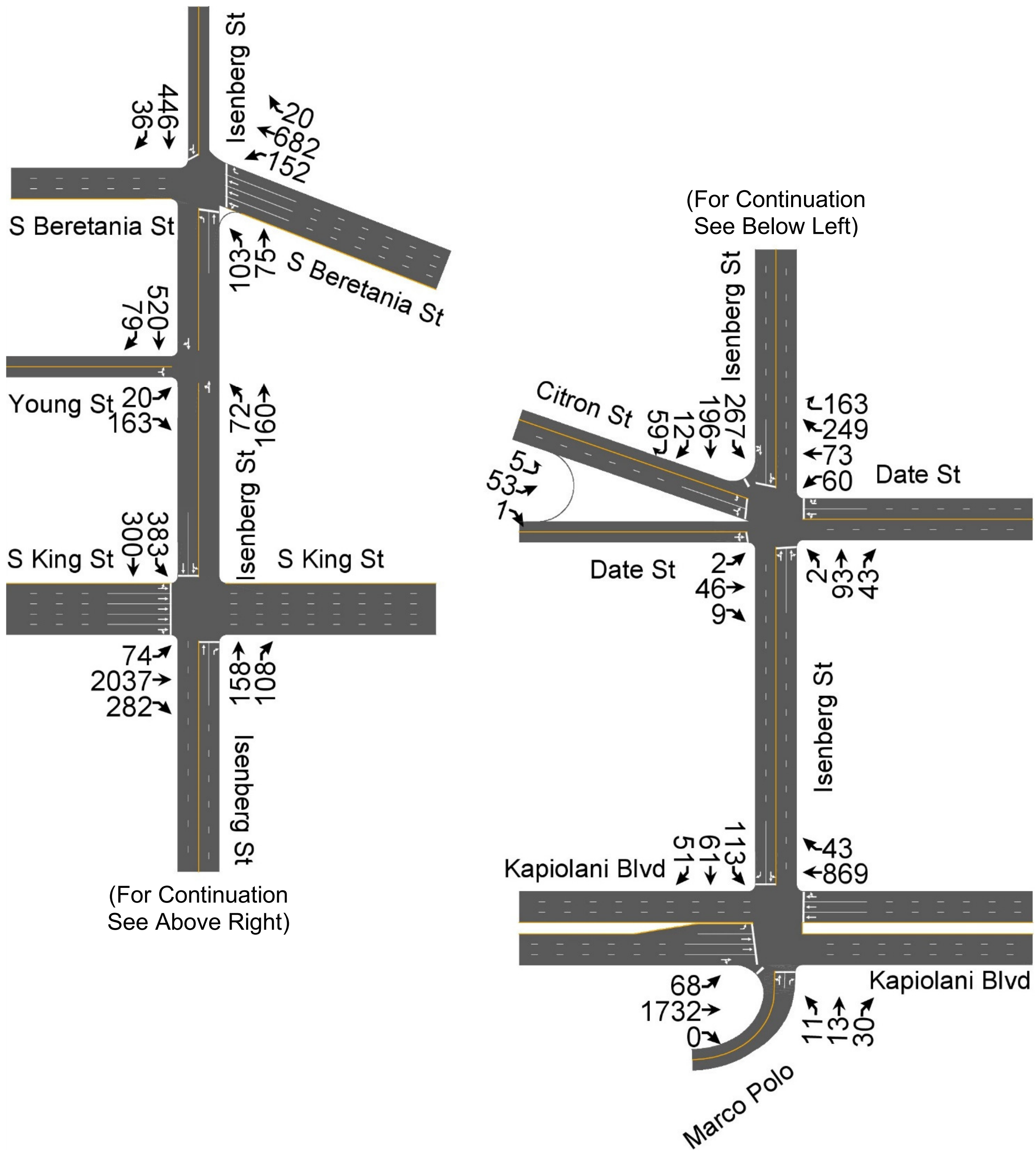


Figure 9. PM Peak Hour Traffic Without Project

The peak hour traffic assignments are based upon the pre-pandemic traffic circulation patterns in the study area. Figures 10 and 11 depict the AM and PM peak hour site traffic assignments, respectively.

B. AM Peak Hour Transportation Impact Analysis With Project

The Project Access Driveway is expected to operate at LOS "B" at Isenberg Street, during the AM peak hour of traffic with the proposed project. The left-turn movement from mauka bound Isenberg Street is expected to operate at LOS "A".

During the AM peak hour of traffic with the proposed project, all the intersections in the study area are expected to operate at the same Levels of Service as during the AM peak hour of traffic without the proposed project. The AM peak hour traffic volumes with the proposed project are depicted on Figure 12.

C. PM Peak Hour Transportation impact Analysis With Project

During the PM peak hour of traffic with the proposed project, the Project Access Driveway is expected to operate at LOS "C" at Isenberg Street. The left-turn movement from mauka bound Isenberg Street is expected to operate at LOS "A".

The left-turn movement on Koko Head bound Kapiolani Boulevard is expected to operate at LOS "B". The other traffic movements at the intersection are expected to operate at the same Levels of Service as during the PM peak hour of traffic without the proposed project.

During the PM peak hour of traffic with the proposed project, the other Isenberg Street intersections in the study area are expected to operate at the same Levels of Service as during the PM peak hour of traffic without the proposed project. Figure 13 depicts the PM peak hour traffic volumes with the proposed project.

V. Recommendations and Conclusions

A. Recommendations

1. Makai bound Isenberg Street should be restriped at Kapiolani Boulevard to provide separate left-turn, through, and right-turn lanes to mitigate LOS "E" conditions without the proposed project.

2. On-street parking on the Ewa side of Isenberg Street should be prohibited to maintain appropriate sight distances in both directions from the Project Access Driveway.

B. Conclusion

The proposed 820 Isenberg Street Redevelopment Project is <u>not</u> expected to significantly impact transportation operations in the vicinity. Table 6 summarizes the capacity analysis for this transportation study.

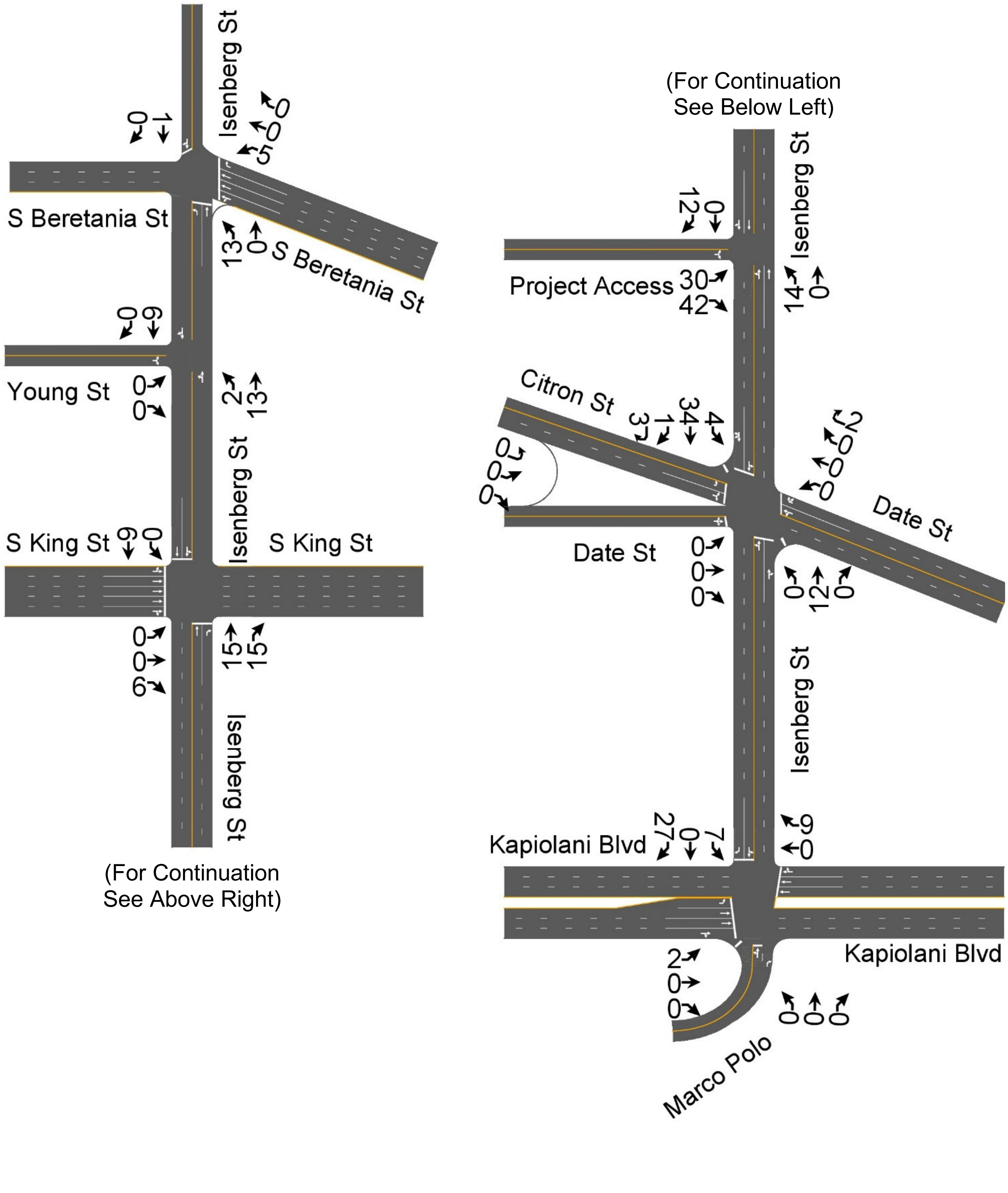


Figure 10. AM Peak Hour Site Traffic Assignment

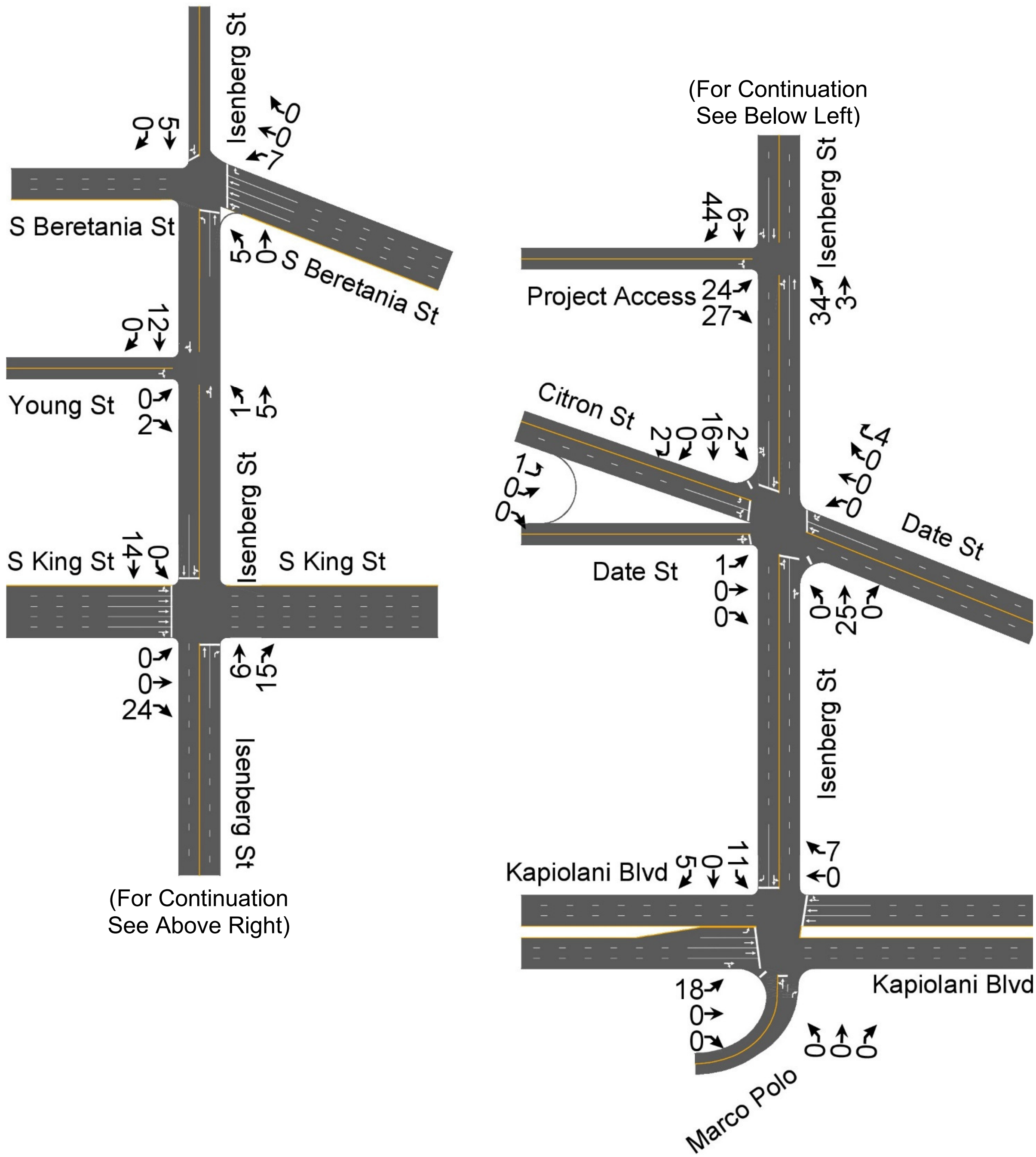


Figure 11. PM Peak Hour Site Traffic Assignment

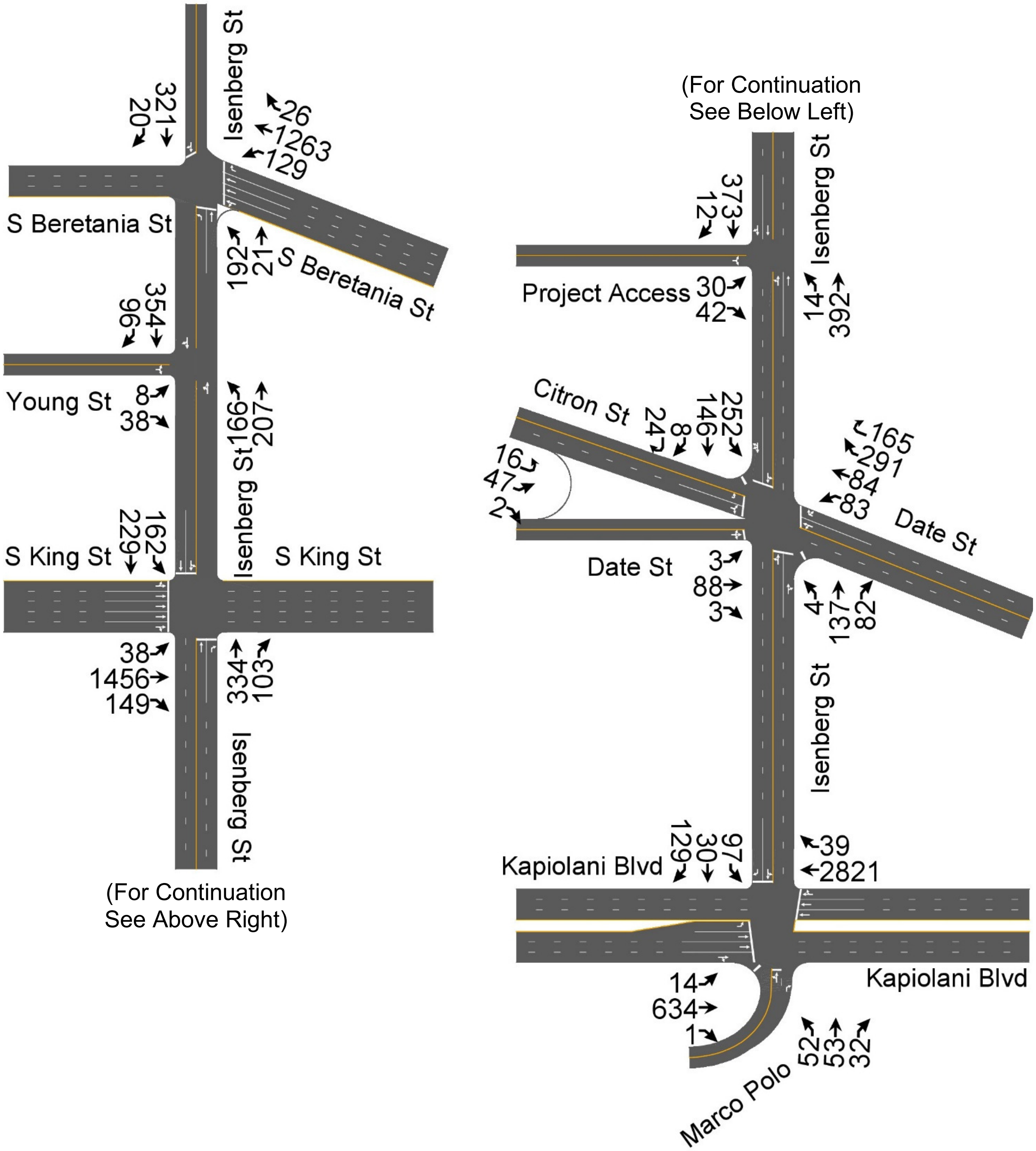


Figure 12. AM Peak Hour Traffic With Project

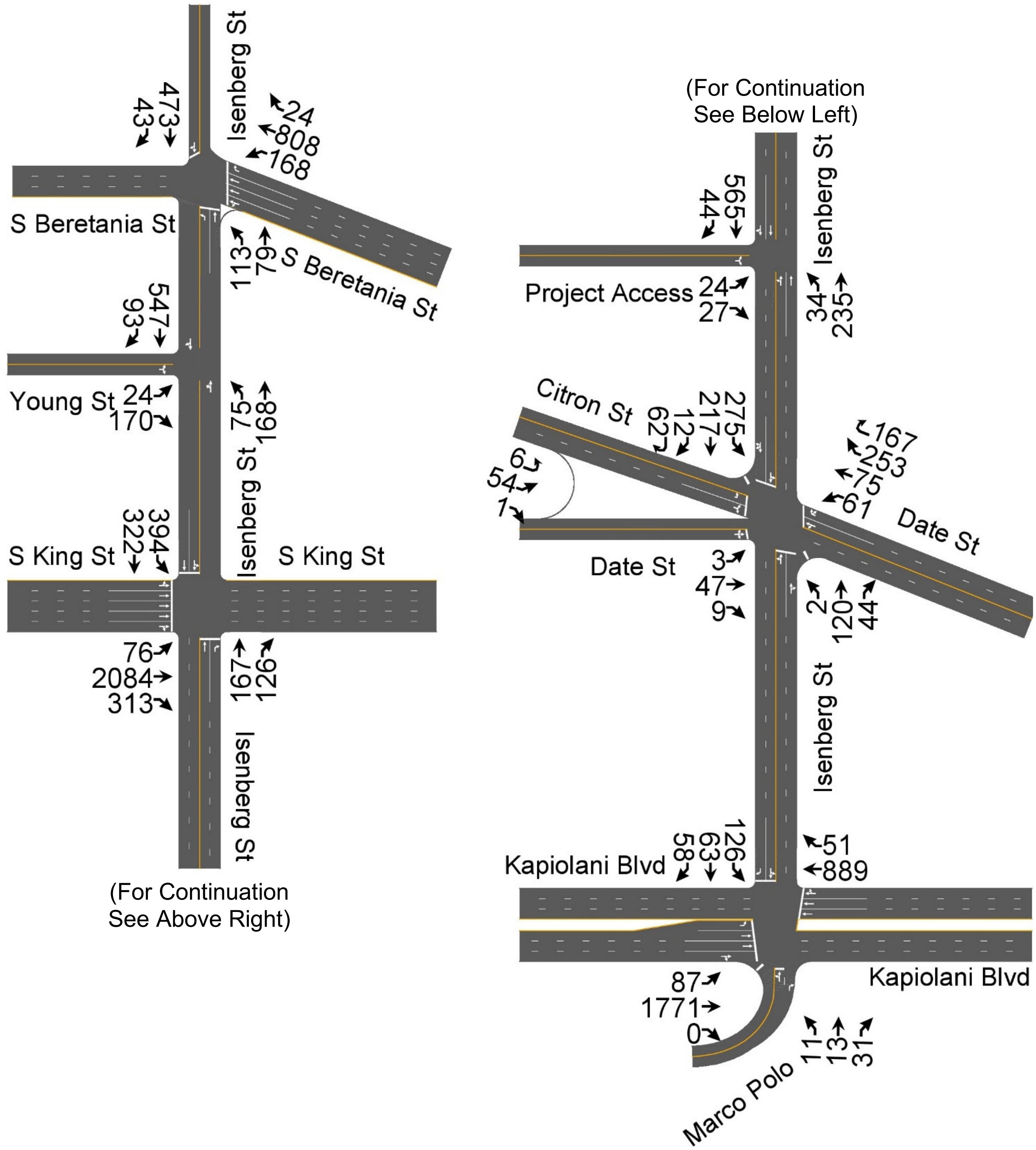


Figure 13. PM Peak Hour Traffic With Project

Table 6. Summary of Capacity Analysis

Scenario	Intersection	MOE	EBL	EBT	EBR	WBL	WBT	WBR	WBR2	NBL2	NBL	NBT	NBR	SBL	SBT	SBR	SBR2	SEL2	SEL	SET	SER	Intersection
Existing AM Peak Hour (2020)	Isenberg St & S Beretania St	Volume	N/A	N/A	N/A	98	1001	21	N/A	N/A	106	12	N/A	N/A	254	16	N/A	N/A	N/A	N/A	N/A	1508
		LOS	N/A	N/A	N/A	B		A	N/A	N/A	C	B	N/A	N/A	C		N/A	N/A	N/A	N/A	N/A	B
		Delay	N/A	N/A	N/A	14.5		4.3	N/A	N/A	25.4	18.4	N/A	N/A	24.4		N/A	N/A	N/A	N/A	N/A	16.9
		v/c	N/A	N/A	N/A	0.48		0.03	N/A	N/A	0.37	0.02	N/A	N/A	0.46		N/A	N/A	N/A	N/A	N/A	0.48 (max.)
	Isenberg St & Young St	Volume	6	N/A	30	N/A	N/A	N/A	N/A	N/A	99	117	N/A	N/A	278	76	N/A	N/A	N/A	N/A	N/A	606
		LOS	B			N/A	N/A	N/A	N/A	N/A	A	-	N/A	N/A	-	-	N/A	N/A	N/A	N/A	N/A	A
		Delay	12.1			N/A	N/A	N/A	N/A	N/A	8.6	-	N/A	N/A	-	-	N/A	N/A	N/A	N/A	N/A	2.1
		v/c	0.08			N/A	N/A	N/A	N/A	N/A	0.11	-	N/A	N/A	-	-	N/A	N/A	N/A	N/A	N/A	N/A
	Isenberg St & S King St	Volume	24	734	101	N/A	N/A	N/A	N/A	N/A	N/A	191	52	126	180	N/A	N/A	N/A	N/A	N/A	N/A	1408
		LOS	B			N/A	N/A	N/A	N/A	N/A	N/A	C	A	C		N/A	N/A	N/A	N/A	N/A	N/A	B
		Delay	11.9			N/A	N/A	N/A	N/A	N/A	N/A	21.3	5.8	21.6		N/A	N/A	N/A	N/A	N/A	N/A	15
		v/c	0.27			N/A	N/A	N/A	N/A	N/A	N/A	0.30	0.09	0.36		N/A	N/A	N/A	N/A	N/A	N/A	0.36 (max.)
	Isenberg St & Date St & Citron St	Volume	4	42	6	33	36	152	162	0	6	64	40	161	95	1	13	2	24	N/A	0	841
		LOS	A			B		B		B				C				C	C			B
		Delay	10.0			11.0		10.9		13.6				23.6				26.5	27.2			15.8
		v/c	0.07			0.10		0.46		0.19				0.56				0.01	0.12			0.56 (max.)
	Marco Polo Dwy/Isenberg St & Kapiolani Blvd	Volume	2	452	1	N/A	1733	27	N/A	N/A	35	21	26	51	23	50	N/A	N/A	N/A	N/A	N/A	2421
		LOS	A	A		N/A	B		N/A	N/A	D		B	D		C	N/A	N/A	N/A	N/A	N/A	B
		Delay	7.5	7.4		N/A	12.0		N/A	N/A	49.2		15.6	50.7		31.3	N/A	N/A	N/A	N/A	N/A	13.6
		v/c	0.02	0.16		N/A	0.59		N/A	N/A	0.20		0.08	0.27		0.17	N/A	N/A	N/A	N/A	N/A	0.59 (max.)
Existing PM Peak Hour (2020)	Isenberg St & S Beretania St	Volume	N/A	N/A	N/A	124	645	19	N/A	N/A	68	49	N/A	N/A	363	34	N/A	N/A	N/A	N/A	N/A	1302
		LOS	N/A	N/A	N/A	B		A	N/A	N/A	C	B	N/A	N/A	C		N/A	N/A	N/A	N/A	N/A	B
		Delay	N/A	N/A	N/A	13.5		4.1	N/A	N/A	25.5	18.5	N/A	N/A	28.1		N/A	N/A	N/A	N/A	N/A	18.7
		v/c	N/A	N/A	N/A	0.34		0.03	N/A	N/A	0.34	0.08	N/A	N/A	0.64		N/A	N/A	N/A	N/A	N/A	0.64 (max.)
	Isenberg St & Young St	Volume	19	N/A	133	N/A	N/A	N/A	N/A	N/A	48	106	N/A	N/A	424	74	N/A	N/A	N/A	N/A	N/A	804
		LOS	B			N/A	N/A	N/A	N/A	N/A	A	-	N/A	N/A	-	-	N/A	N/A	N/A	N/A	N/A	A
		Delay	14.3			N/A	N/A	N/A	N/A	N/A	8.6	-	N/A	N/A	-	-	N/A	N/A	N/A	N/A	N/A	3.2
		v/c	0.29			N/A	N/A	N/A	N/A	N/A	0.05	-	N/A	N/A	-	-	N/A	N/A	N/A	N/A	N/A	N/A
	Isenberg St & S King St	Volume	50	1636	189	N/A	N/A	N/A	N/A	N/A	N/A	100	N/A	270	280	N/A	N/A	N/A	N/A	N/A	N/A	2606
		LOS	B			N/A	N/A	N/A	N/A	N/A	N/A	B	B	C		N/A	N/A	N/A	N/A	N/A	N/A	B
		Delay	15.0			N/A	N/A	N/A	N/A	N/A	N/A	19.3	14.4	25.1		N/A	N/A	N/A	N/A	N/A	N/A	17.3
		v/c	0.53			N/A	N/A	N/A	N/A	N/A	N/A	0.15	0.14	0.57		N/A	N/A	N/A	N/A	N/A	N/A	0.57 (max.)
	Isenberg St & Date St & Citron St	Volume	3	55	4	47	46	135	76	1	0	71	63	239	173	22	42	6	55	N/A	4	1042
		LOS	B			B		B		B				C				C	D			B
		Delay	14.6			15.8		10.8		10.7				25.1				31.3	35.8			19.5
		v/c	0.08			0.15		0.32		0.15				0.68				0.03	0.33			0.68 (max.)
	Marco Polo Dwy/Isenberg St & Kapiolani Blvd	Volume	35	1484	0	N/A	974	24	N/A	N/A	19	14	22	96	49	69	N/A	N/A	N/A	N/A	N/A	2786
		LOS	A	A		N/A	A		N/A	N/A	D		B	E		B	N/A	N/A	N/A	N/A	N/A	B
		Delay	7.7	9.5		N/A	8.0		N/A	N/A	52.3		17.5	63.3		11.6	N/A	N/A	N/A	N/A	N/A	12.4
		v/c	0.12	0.45		N/A	0.31		N/A	N/A	0.12		0.07	0.53		0.21	N/A	N/A	N/A	N/A	N/A	0.53 (max.)

Table 6. Summary of Capacity Analysis (Cont'd.)

Scenario	Intersection	MOE	EBL	EBT	EBR	WBL	WBT	WBR	WBR2	NBL2	NBL	NBT	NBR	SBL	SBT	SBR	SBR2	SEL2	SEL	SET	SER	Intersection
Pre-Pandemic AM Peak Hour (2019)	Isenberg St & S Beretania St	Volume	N/A	N/A	N/A	118	1210	25	N/A	N/A	172	21	N/A	N/A	307	19	N/A	N/A	N/A	N/A	N/A	1872
		LOS	N/A	N/A	N/A	B		A	N/A	N/A	D	B	N/A	N/A	C		N/A	N/A	N/A	N/A	N/A	C
		Delay	N/A	N/A	N/A	15.9		4.2	N/A	N/A	43.0	18.7	N/A	N/A	26.6		N/A	N/A	N/A	N/A	N/A	20.1
		v/c	N/A	N/A	N/A	0.58		0.03	N/A	N/A	0.72	0.04	N/A	N/A	0.56		N/A	N/A	N/A	N/A	N/A	0.72 (max.)
	Isenberg St & Young St	Volume	7	N/A	36	N/A	N/A	N/A	N/A	N/A	157	185	N/A	N/A	333	92	N/A	N/A	N/A	N/A	N/A	810
		LOS	B			N/A	N/A	N/A	N/A	N/A	A	-	N/A	N/A	-	-	N/A	N/A	N/A	N/A	N/A	A
		Delay	14.4			N/A	N/A	N/A	N/A	N/A	9.2	-	N/A	N/A	-	-	N/A	N/A	N/A	N/A	N/A	2.5
		v/c	0.12			N/A	N/A	N/A	N/A	N/A	0.19	-	N/A	N/A	-	-	N/A	N/A	N/A	N/A	N/A	N/A
	Isenberg St & S King St	Volume	37	1395	137	N/A	N/A	N/A	N/A	N/A	N/A	305	84	155	214	N/A	N/A	N/A	N/A	N/A	N/A	2327
		LOS	B			N/A	N/A	N/A	N/A	N/A	N/A	C	B	C		N/A	N/A	N/A	N/A	N/A	N/A	B
		Delay	14.5			N/A	N/A	N/A	N/A	N/A	N/A	24.4	14.8	24.1		N/A	N/A	N/A	N/A	N/A	N/A	17.3
		v/c	0.48			N/A	N/A	N/A	N/A	N/A	N/A	0.48	0.16	0.49		N/A	N/A	N/A	N/A	N/A	N/A	0.49 (max.)
	Isenberg St & Date St & Citron St	Volume	3	84	3	80	81	279	224	0	4	120	7	238	107	6	20	16	45	N/A	2	1319
		LOS	B			B		C		B				C				C	C			C
		Delay	14.4			16.1		28.2		17.5				25.3				31.1	33.6			24.2
		v/c	0.13			0.29		0.82		0.17				0.85dl				0.09	0.27			0.82 (max.)
	Marco Polo Dwy/Isenberg St & Kapiolani Blvd	Volume	12	608	1	N/A	2703	28	N/A	N/A	49	50	30	86	28	98	N/A	N/A	N/A	N/A	N/A	3693
		LOS	C	A		N/A	C		N/A	N/A	D		C	E		D	N/A	N/A	N/A	N/A	N/A	C
		Delay	27.1	7.8		N/A	24.2		N/A	N/A	53.3		26.4	58.3		45.4	N/A	N/A	N/A	N/A	N/A	23.9
		v/c	0.30	0.21		N/A	0.92		N/A	N/A	0.37		0.10	0.50		0.34	N/A	N/A	N/A	N/A	N/A	0.92 (max.)
Pre-Pandemic PM Peak Hour (2019)	Isenberg St & S Beretania St	Volume	N/A	N/A	N/A	153	780	23	N/A	N/A	104	75	N/A	N/A	449	41	N/A	N/A	N/A	N/A	N/A	1625
		LOS	N/A	N/A	N/A	B		A	N/A	N/A	E	B	N/A	N/A	D		N/A	N/A	N/A	N/A	N/A	C
		Delay	N/A	N/A	N/A	14.3		4.6	N/A	N/A	61.2	19.0	N/A	N/A	35.1		N/A	N/A	N/A	N/A	N/A	23.6
		v/c	N/A	N/A	N/A	0.42		0.03	N/A	N/A	0.77	0.12	N/A	N/A	0.79		N/A	N/A	N/A	N/A	N/A	0.79 (max.)
	Isenberg St & Young St	Volume	23	N/A	161	N/A	N/A	N/A	N/A	N/A	71	156	N/A	N/A	512	89	N/A	N/A	N/A	N/A	N/A	1012
		LOS	C			N/A	N/A	N/A	N/A	N/A	A	-	N/A	N/A	-	-	N/A	N/A	N/A	N/A	N/A	A
		Delay	18.2			N/A	N/A	N/A	N/A	N/A	9.1	-	N/A	N/A	-	-	N/A	N/A	N/A	N/A	N/A	3.9
		v/c	0.42			N/A	N/A	N/A	N/A	N/A	0.08	-	N/A	N/A	-	-	N/A	N/A	N/A	N/A	N/A	N/A
	Isenberg St & S King St	Volume	73	1996	276	N/A	N/A	N/A	N/A	N/A	N/A	155	106	377	295	N/A	N/A	N/A	N/A	N/A	N/A	3278
		LOS	B			N/A	N/A	N/A	N/A	N/A	N/A	C	B	C		N/A	N/A	N/A	N/A	N/A	N/A	B
		Delay	17.1			N/A	N/A	N/A	N/A	N/A	N/A	20.3	15.5	30.2		N/A	N/A	N/A	N/A	N/A	N/A	19.9
		v/c	0.67			N/A	N/A	N/A	N/A	N/A	N/A	0.23	0.19	0.88dl		N/A	N/A	N/A	N/A	N/A	N/A	0.74 (max.)
	Isenberg St & Date St & Citron St	Volume	2	45	8	59	71	243	96	0	2	91	42	262	192	12	58	5	52	N/A	1	1241
		LOS	B			B		B		B				C				C	D			C
		Delay	14.9			17.6		16.7		12.4				24.7				32.8	36.8			20.6
		v/c	0.08			0.21		0.53		0.14				0.69				0.03	0.30			0.69 (max.)
	Marco Polo Dwy/Isenberg St & Kapiolani Blvd	Volume	66	1697	0	N/A	851	42	N/A	N/A	11	13	29	110	60	50	N/A	N/A	N/A	N/A	N/A	2929
		LOS	A	B		N/A	A		N/A	N/A	D		B	E		B	N/A	N/A	N/A	N/A	N/A	B
		Delay	8.7	10.3		N/A	7.7		N/A	N/A	51.5		15.9	66.9		13.0	N/A	N/A	N/A	N/A	N/A	13.2
		v/c	0.20	0.52		N/A	0.28		N/A	N/A	0.08		0.09	0.61		0.16	N/A	N/A	N/A	N/A	N/A	0.61 (max.)

Table 6. Summary of Capacity Analysis (Cont'd.)

Scenario	Intersection	MOE	EBL	EBT	EBR	WBL	WBT	WBR	WBR2	NBL2	NBL	NBT	NBR	SBL	SBT	SBR	SBR2	SEL2	SEL	SET	SER	Intersection
2025 AM Peak Hour Without Project	Isenberg St & S Beretania St	Volume	N/A	N/A	N/A	124	1263	26	N/A	N/A	180	21	N/A	N/A	320	20	N/A	N/A	N/A	N/A	N/A	1954
		LOS	N/A	N/A	N/A	B		A	N/A	N/A	D	B	N/A	N/A	C		N/A	N/A	N/A	N/A	N/A	C
		Delay	N/A	N/A	N/A	16.3		4.2	N/A	N/A	50.9	18.7	N/A	N/A	27.2		N/A	N/A	N/A	N/A	N/A	21.3
		v/c	N/A	N/A	N/A	0.60		0.04	N/A	N/A	0.79	0.04	N/A	N/A	0.58		N/A	N/A	N/A	N/A	N/A	0.79 (max.)
	Isenberg St & Young St	Volume	8	N/A	38	N/A	N/A	N/A	N/A	N/A	164	194	N/A	N/A	348	96	N/A	N/A	N/A	N/A	N/A	848
		LOS	C			N/A	N/A	N/A	N/A	N/A	A	-	N/A	N/A	-	-	N/A	N/A	N/A	N/A	N/A	A
		Delay	15.2			N/A	N/A	N/A	N/A	N/A	9.4	-	N/A	N/A	-	-	N/A	N/A	N/A	N/A	N/A	2.6
		v/c	0.14			N/A	N/A	N/A	N/A	N/A	0.20	-	N/A	N/A	-	-	N/A	N/A	N/A	N/A	N/A	N/A
	Isenberg St & S King St	Volume	38	1456	143	N/A	N/A	N/A	N/A	N/A	N/A	318	88	162	223	N/A	N/A	N/A	N/A	N/A	N/A	2428
		LOS	B			N/A	N/A	N/A	N/A	N/A	N/A	C	B	C		N/A	N/A	N/A	N/A	N/A	N/A	B
		Delay	14.7			N/A	N/A	N/A	N/A	N/A	N/A	24.8	15.1	24.7		N/A	N/A	N/A	N/A	N/A	N/A	17.6
		v/c	0.50			N/A	N/A	N/A	N/A	N/A	N/A	0.51	0.17	0.52		N/A	N/A	N/A	N/A	N/A	N/A	0.52 (max.)
	Isenberg St & Date St & Citron St	Volume	3	88	3	83	84	291	163	0	4	125	82	248	112	7	21	16	47	N/A	2	1379
		LOS	B			B		C		B				C				C	D			C
		Delay	15.4			17.3		24.8		11.7				25.7				32.2	35.1			21.9
		v/c	0.14			0.31		0.75		0.26				0.91dl				0.09	0.29			0.75 (max.)
	Marco Polo Dwy/Isenberg St & Kapiolani Blvd	Volume	12	634	1	N/A	2821	30	N/A	N/A	52	53	32	90	30	102	N/A	N/A	N/A	N/A	N/A	3857
		LOS	C	A		N/A	C		N/A	N/A	D		C	E		D	N/A	N/A	N/A	N/A	N/A	C
		Delay	27.1	7.8		N/A	28.9		N/A	N/A	54.3		27.4	59.7		46.1	N/A	N/A	N/A	N/A	N/A	27.5
		v/c	0.30	0.22		N/A	0.96		N/A	N/A	0.40		0.10	0.53		0.36	N/A	N/A	N/A	N/A	N/A	0.96 (max.)
2025 PM Peak Hour Without Project	Isenberg St & S Beretania St	Volume	N/A	N/A	N/A	152	682	20	N/A	N/A	103	75	N/A	N/A	446	36	N/A	N/A	N/A	N/A	N/A	1514
		LOS	N/A	N/A	N/A	B		A	N/A	N/A	E	B	N/A	N/A	C		N/A	N/A	N/A	N/A	N/A	C
		Delay	N/A	N/A	N/A	13.8		4.5	N/A	N/A	55.3	19.0	N/A	N/A	34.4		N/A	N/A	N/A	N/A	N/A	23.3
		v/c	N/A	N/A	N/A	0.37		0.03	N/A	N/A	0.74	0.12	N/A	N/A	0.78		N/A	N/A	N/A	N/A	N/A	0.78 (max.)
	Isenberg St & Young St	Volume	20	N/A	163	N/A	N/A	N/A	N/A	N/A	72	160	N/A	N/A	520	79	N/A	N/A	N/A	N/A	N/A	1014
		LOS	C			N/A	N/A	N/A	N/A	N/A	A	-	N/A	N/A	-	-	N/A	N/A	N/A	N/A	N/A	A
		Delay	18.1			N/A	N/A	N/A	N/A	N/A	9.1	-	N/A	N/A	-	-	N/A	N/A	N/A	N/A	N/A	3.9
		v/c	0.41			N/A	N/A	N/A	N/A	N/A	0.08	-	N/A	N/A	-	-	N/A	N/A	N/A	N/A	N/A	N/A
	Isenberg St & S King St	Volume	74	2037	282	N/A	N/A	N/A	N/A	N/A	N/A	158	108	383	300	N/A	N/A	N/A	N/A	N/A	N/A	3342
		LOS	B			N/A	N/A	N/A	N/A	N/A	N/A	C	B		C	N/A	N/A	N/A	N/A	N/A	N/A	C
		Delay	17.3			N/A	N/A	N/A	N/A	N/A	N/A	20.4	15.6		30.8	N/A	N/A	N/A	N/A	N/A	N/A	20.2
		v/c	0.68			N/A	N/A	N/A	N/A	N/A	N/A	0.24	0.19		0.90dl	N/A	N/A	N/A	N/A	N/A	N/A	0.90 (max.)
	Isenberg St & Date St & Citron St	Volume	2	46	9	60	73	249	163	0	2	93	43	267	196	12	59	5	53	N/A	1	1333
		LOS	B			B		C		B				C				C	D			C
		Delay	14.9			17.8		21.0		12.3				24.8				33.0	37.2			21.7
		v/c	0.08			0.22		0.65		0.14				0.70				0.03	0.31			0.70 (max.)
	Marco Polo Dwy/Isenberg St & Kapiolani Blvd	Volume	68	1732	0	N/A	869	43	N/A	N/A	11	13	30	113	61	51	N/A	N/A	N/A	N/A	N/A	2991
		LOS	A	B		N/A	A		N/A	N/A	D		B	E		B	N/A	N/A	N/A	N/A	N/A	B
		Delay	8.9	10.5		N/A	7.7		N/A	N/A	51.5		17.4	67.7		13.0	N/A	N/A	N/A	N/A	N/A	13.4
		v/c	0.21	0.53		N/A	0.28		N/A	N/A	0.08		0.09	0.62		0.16	N/A	N/A	N/A	N/A	N/A	0.63 (max.)

Table 6. Summary of Capacity Analysis (Cont'd.)

Scenario	Intersection	MOE	EBL	EBT	EBR	WBL	WBT	WBR	WBR2	NBL2	NBL	NBT	NBR	SBL	SBT	SBR	SBR2	SEL2	SEL	SET	SER	Intersection
2025 AM Peak Hour With Project	Isenberg St & S Beretania St	Volume	N/A	N/A	N/A	129	1263	26	N/A	N/A	192	21	N/A	N/A	321	20	N/A	N/A	N/A	N/A	N/A	1972
		LOS	N/A	N/A	N/A	B		A	N/A	N/A	D	B	N/A	N/A	C		N/A	N/A	N/A	N/A	N/A	C
		Delay	N/A	N/A	N/A	17.2		4.4	N/A	N/A	50.4	18.0	N/A	N/A	26.1		N/A	N/A	N/A	N/A	N/A	21.8
		v/c	N/A	N/A	N/A	0.62		0.04	N/A	N/A	0.80	0.04	N/A	N/A	0.57		N/A	N/A	N/A	N/A	N/A	0.80 (max.)
	Isenberg St & Young St	Volume	8	N/A	38	N/A	N/A	N/A	N/A	N/A	166	207	N/A	N/A	354	96	N/A	N/A	N/A	N/A	N/A	869
		LOS	C			N/A	N/A	N/A	N/A	N/A	A	-	N/A	N/A	-	-	N/A	N/A	N/A	N/A	N/A	A
		Delay	15.5			N/A	N/A	N/A	N/A	N/A	9.4	-	N/A	N/A	-	-	N/A	N/A	N/A	N/A	N/A	2.6
		v/c	0.14			N/A	N/A	N/A	N/A	N/A	0.20	-	N/A	N/A	-	-	N/A	N/A	N/A	N/A	N/A	N/A
	Isenberg St & S King St	Volume	38	1456	149	N/A	N/A	N/A	N/A	N/A	N/A	334	103	162	229	N/A	N/A	N/A	N/A	N/A	N/A	2471
		LOS	B			N/A	N/A	N/A	N/A	N/A	N/A	C	B		C	N/A	N/A	N/A	N/A	N/A	N/A	B
		Delay	17.7			N/A	N/A	N/A	N/A	N/A	N/A	21.4	13.5		21.0	N/A	N/A	N/A	N/A	N/A	N/A	18.5
		v/c	0.55			N/A	N/A	N/A	N/A	N/A	N/A	0.47	0.18		0.47	N/A	N/A	N/A	N/A	N/A	N/A	0.55 (max.)
	Isenberg St & Project Access	Volume	30	N/A	42	N/A	N/A	N/A	N/A	N/A	14	392	N/A	N/A	373	12	N/A	N/A	N/A	N/A	N/A	863
		LOS	B			N/A	N/A	N/A	N/A	N/A	A	A	N/A	N/A	-	-	N/A	N/A	N/A	N/A	N/A	A
		Delay	12.5			N/A	N/A	N/A	N/A	N/A	8.2	0.1	N/A	N/A	-	-	N/A	N/A	N/A	N/A	N/A	1.2
		v/c	0.14			N/A	N/A	N/A	N/A	N/A	0.01	-	N/A	N/A	-	-	N/A	N/A	N/A	N/A	N/A	N/A
	Isenberg St & Date St & Citron St	Volume	3	88	3	83	84	291	165	0	4	137	82	252	146	8	24	16	47	N/A	2	1435
		LOS	B			B		C		B				C				C	D			C
		Delay	16.3			18.3		26.7		11.7				26.0				33.2	36.3			22.9
		v/c	0.15			0.32		0.77		0.26				0.89dl				0.09	0.30			0.89 (max.)
	Marco Polo Dwy/Isenberg St & Kapiolani Blvd	Volume	14	634	1	N/A	2821	39	N/A	N/A	52	53	32	97	30	129	N/A	N/A	N/A	N/A	N/A	3902
		LOS	C	A		N/A	C		N/A	N/A	D		C	E		D	N/A	N/A	N/A	N/A	N/A	C
		Delay	31.4	7.8		N/A	29.4		N/A	N/A	54.7		27.4	61.4		50.0	N/A	N/A	N/A	N/A	N/A	28.3
		v/c	0.34	0.22		N/A	0.96		N/A	N/A	0.41		0.10	0.57		0.46	N/A	N/A	N/A	N/A	N/A	0.96 (max.)
2025 PM Peak Hour With Project	Isenberg St & S Beretania St	Volume	N/A	N/A	N/A	168	808	24	N/A	N/A	113	79	N/A	N/A	473	43	N/A	N/A	N/A	N/A	N/A	1708
		LOS	N/A	N/A	N/A	B		A	N/A	N/A	E	B	N/A	N/A	C		N/A	N/A	N/A	N/A	N/A	C
		Delay	N/A	N/A	N/A	15.9		4.9	N/A	N/A	63.3	17.7	N/A	N/A	33.2		N/A	N/A	N/A	N/A	N/A	24.2
		v/c	N/A	N/A	N/A	0.46		0.04	N/A	N/A	0.80	0.12	N/A	N/A	0.79		N/A	N/A	N/A	N/A	N/A	0.80 (max.)
	Isenberg St & Young St	Volume	24	N/A	170	N/A	N/A	N/A	N/A	N/A	75	168	N/A	N/A	547	93	N/A	N/A	N/A	N/A	N/A	1077
		LOS	C			N/A	N/A	N/A	N/A	N/A	A	-	N/A	N/A	-	-	N/A	N/A	N/A	N/A	N/A	A
		Delay	20.2			N/A	N/A	N/A	N/A	N/A	9.3	-	N/A	N/A	-	-	N/A	N/A	N/A	N/A	N/A	4.3
		v/c	0.46			N/A	N/A	N/A	N/A	N/A	0.09	-	N/A	N/A	-	-	N/A	N/A	N/A	N/A	N/A	N/A
	Isenberg St & S King St	Volume	76	2084	313	N/A	N/A	N/A	N/A	N/A	N/A	167	126	394	322	N/A	N/A	N/A	N/A	N/A	N/A	3482
		LOS	B			N/A	N/A	N/A	N/A	N/A	N/A	C	B	C		N/A	N/A	N/A	N/A	N/A	N/A	C
		Delay	17.7			N/A	N/A	N/A	N/A	N/A	N/A	20.6	16.6	32.9		N/A	N/A	N/A	N/A	N/A	N/A	21
		v/c	0.71			N/A	N/A	N/A	N/A	N/A	N/A	0.25	0.22	0.95dl		N/A	N/A	N/A	N/A	N/A	N/A	0.95 (max.)
	Isenberg St & Project Access	Volume	24	N/A	27	N/A	N/A	N/A	N/A	N/A	34	235	N/A	N/A	565	44	N/A	N/A	N/A	N/A	N/A	929
		LOS	C			N/A	N/A	N/A	N/A	N/A	A	A	N/A	N/A	-	-	N/A	N/A	N/A	N/A	N/A	A
		Delay	15.1			N/A	N/A	N/A	N/A	N/A	9.1	0.2	N/A	N/A	-	-	N/A	N/A	N/A	N/A	N/A	1.2
		v/c	0.13			N/A	N/A	N/A	N/A	N/A	0.04	-	N/A	N/A	-	-	N/A	N/A	N/A	N/A	N/A	N/A

Table 6. Summary of Capacity Analysis (Cont'd.)

Scenario	Intersection	MOE	EBL	EBT	EBR	WBL	WBT	WBR	WBR2	NBL2	NBL	NBT	NBR	SBL	SBT	SBR	SBR2	SEL2	SEL	SET	SER	Intersection
2025 PM Peak Hour With Project	Isenberg St & Date St & Citron St	Volume	3	47	9	61	75	253	167	0	2	120	44	275	217	12	62	6	54	N/A	1	1408
		LOS	B			B		C		B				C				C	D			C
		Delay	15.8			18.9		22.9		12.5				25.0				34.2	38.7			22.5
		v/c	0.09			0.23		0.67		0.16				0.72				0.03	0.32			0.72 (max.)
	Marco Polo Dwy/Isenberg St & Kapiolani Blvd	Volume	87	1771	0	N/A	889	51	N/A	N/A	11	13	31	126	63	58	N/A	N/A	N/A	N/A	N/A	3100
		LOS	B	B		N/A	A		N/A	N/A	D		B	E		B	N/A	N/A	N/A	N/A	N/A	B
		Delay	10.2	10.7		N/A	7.8		N/A	N/A	51.5		20.0	71.0		12.4	N/A	N/A	N/A	N/A	N/A	13.9
		v/c	0.28	0.54		N/A	0.29		N/A	N/A	0.08		0.10	0.68		0.18	N/A	N/A	N/A	N/A	N/A	0.68 (max.)
2025 AM Peak Hour With Improvement	Marco Polo Dwy/Isenberg St & Kapiolani Blvd	Volume	14	634	1	N/A	2821	39	N/A	N/A	52	53	32	97	30	129	N/A	N/A	N/A	N/A	N/A	3902
		LOS	C	A		N/A	C		N/A	N/A	D		C	D	D	D	N/A	N/A	N/A	N/A	N/A	C
		Delay	33.5	8.5		N/A	33.9		N/A	N/A	0.34		0.10	0.42	0.08	0.43	N/A	N/A	N/A	N/A	N/A	31.2
		v/c	0.35	0.22		N/A	0.98		N/A	N/A	0.24		0.24	0.24	0.24	0.24	N/A	N/A	N/A	N/A	N/A	0.48 (max.)
2025 PM Peak Hour With Improvement	Marco Polo Dwy/Isenberg St & Kapiolani Blvd	Volume	87	1771	0	N/A	889	51	N/A	N/A	11	13	31	126	63	58	N/A	N/A	N/A	N/A	N/A	3100
		LOS	B	B		N/A	B		N/A	N/A	D		C	D	D	B	N/A	N/A	N/A	N/A	N/A	B
		Delay	13.0	13.7		N/A	10.1		N/A	N/A	46.6		22.2	54.7	48.0	11.1	N/A	N/A	N/A	N/A	N/A	15.2
		v/c	0.30	0.57		N/A	0.31		N/A	N/A	0.07		0.08	0.41	0.15	0.16	N/A	N/A	N/A	N/A	N/A	0.57 (max.)

Legend
EBL–Eastbound Left-Turn
EBT–Eastbound Through
EBR–Eastbound Right-Turn
WBL–Westbound Left-Turn
WBT–Westbound Through
WBR–Westbound Right-Turn to Isenberg Street
WBR2-Westbound Right-Turn to Citron Street
NBL2-Northbound Left-Turn to Date Street
NBL–Northbound Left-Turn to Citron Street
NBT–Northbound Through
NBR–Northbound Right-Turn
SBL–Southbound Left-Turn
SBT–Southbound Through
SBR–Southbound Right-Turn to Date Street
SBR2–Southbound Right-Turn to Citron Street
SEL2–Southeast Bound Left-Turn to Isenberg Street
SEL–Southeast Bound Left-Turn to Date Street
SET–Southeast Bound Through
SER–Southeast Bound Right-Turn to Date Street
dl–Default Left-Turn Lane

Appendix F

DHHL 820 Isenberg Development – HUD Site Noise Analysis (DLAA #20-033).
D.L. Adams Associates

D. L. ADAMS ASSOCIATES
acoustics | performing arts | technology

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May 13, 2021

Stanford Carr Development
1100 Alakea Street
27th Floor
Honolulu, HI 96823

Subject: DHHL 820 Isenberg Development – HUD Site Noise Analysis (DLAA #20-033)

Dear Kaloa Robinson,

We have completed our Department of Housing and Urban Development (HUD) analysis of the 820 Isenberg residential development located in Honolulu, Hawaii with respect to the sound isolation performance of the exterior wall and window assemblies. Our analysis and recommendations are based on meeting HUD requirements for exterior sound transmission to residential units.

Our recommendations are based on meeting acoustical objectives only and should be reviewed by qualified personnel prior to implementation.

HUD STUDY

Design Criteria

DLAA's noise assessment evaluates the project site based on the Site Acceptability Standards of the U.S. Department of House and Urban Development (HUD). The Site Acceptability Standards are given in the Code of Federal Regulations 24 CFR Part 51B. The standards regulate the acceptability of sites for residential buildings with HUD funding. The noise levels are expressed in terms of the Day-Night Average Sound Level (DNL). The DNL is the average sound level over a 24-hour period to which a 10-decibel penalty has been applied to sound levels occurring during the nighttime hours (10:00 PM to 7:00 AM). DNL level in decibels are A-weighted. The HUD Site Acceptability Standards for exterior sound levels are summarized in **Table 1** below.

Table 1: HUD Site Acceptability Standards

Category	DNL	Comments
Acceptable	Less than or equal to 65 dBA	No special acoustical design consideration necessary
Normally Unacceptable	Greater than 65 dBA, but less than or equal to 70 dBA	5 dB additional attenuation required through the use of barriers or in design to ensure interior noise levels are acceptable
	Greater than 70 dBA, but less or equal to 75 dBA	10 dB additional attenuation required through the use of barriers or in design to ensure interior noise levels are acceptable

Category	DNL	Comments
Unacceptable	Greater than 75 dBA	Attenuation measures must be submitted and approved on a case-by-case basis

The intent of the 65 DNL outside criteria is to achieve DNL 45 dBA indoors. HUD typically allows upgrades to the building shell to meet an interior DNL of 45 dBA in Normally Unacceptable or Unacceptable areas. This can be accomplished by specifying building facades, windows, and doors with higher sound transmission class (STC) ratings than normal construction. Addressing windows is particularly important, as they are often the weak link in the building facade with respect to noise intrusion.

HUD Calculations

DLAA analyzed noise levels at eleven (11) different noise assessment locations (NALs) on the 820 Isenberg development site. These include nine (9) representative units on the 10th floor of the tower, as well as two (2) representative 2nd floor townhomes. The selected NALs are considered worst case because they are on the lowest floor with direct line of sight to both lanes of the nearest major roadway: Isenberg Street. Site plan and elevation markups in **Attachment 1** illustrate the eleven NALs. Traffic data for nearby roadways were obtained from the “Draft Transportation Assessment Report (TAR) for the Proposed 820 Isenberg Street Redevelopment Project” prepared by Traffic and Mobility Consultants LLC.

Traffic data was used to calculate noise from Citron St, Isenberg St, and S King St. Peak AM and PM hour traffic counts were provided in the TAR for current (2020) and pre-pandemic (2019) conditions. Growth rates sourced from the Oahu Regional Transportation Plan (ORTP) were used in the TAR to make forecasts of traffic counts in 2025 with and without the impact of the project.

DLAA assumed the ratio of combined peak hour traffic counts to 24-hour totals is consistent for Citron, Isenberg, and South King streets. Using this assumption, Average Daily Traffic (ADT) counts were approximated for predicted traffic. Per the HUD Guidelines, DLAA calculated the 10-Year Predicted DNL based on the provided estimated increase in traffic data presented in the TAR. **Table 2** below summarizes the calculated DNLs at each NAL. All HUD DNL Calculator sheets are included in **Attachment 2**.

Table 2: Calculated DNL at Each NAL

	DNL (L_{DN})					
NAL	**Current (2020)**	**Pre-Pandemic (2019)**	**5-year Predicted, No Action (2025)**	**10-year Predicted, No Action (2035)**	**5-year Predicted, With Action (2025)**	**10-year Predicted, With Action (2035)**
NAL #1	59	59	59	59	59	59
NAL #2	61	62	63	63	63	63
NAL #3	59	59	60	60	60	60
NAL #4	59	59	59	60	60	60
NAL #5	59	59	59	60	59	60
NAL #6	61	62	62	63	62	63
NAL #7	62	62	62	63	62	63
NAL #8	61	62	62	62	62	63
NAL #9	60	62	62	62	62	63

	DNL (L_{DN})					
NAL	**Current (2020)**	**Pre-Pandemic (2019)**	**5-year Predicted, No Action (2025)**	**10-year Predicted, No Action (2035)**	**5-year Predicted, With Action (2025)**	**10-year Predicted, With Action (2035)**
NAL #10	66	68	68	68	68	68
NAL #11	63	65	65	65	65	66

Based on the worst-case results of 63 L_{DN} for NALs #1-9, the tower units are considered "Acceptable". Based on the worst-case results of 68 L_{DN} for NALs #10-11, the townhome units are considered "Normally Unacceptable". Further calculations are required to examine interior noise levels due to the exterior wall assemblies at these locations.

Exterior Shell Review

The necessary rating for the building shell to achieve the HUD required interior 45 L_{DN} criteria is the composite STC (STC_C). The STC_C rating differs slightly from a normal STC rating in that it takes an area that is composed of multiple different assemblies (i.e. windows, exterior walls, or mechanical units) and calculates a weighted average of the assemblies' STC ratings. We have assessed the STC_C rating of two exterior assemblies at the 2nd floor of the townhomes representing different window and wall combinations for each NAL deemed "normally unacceptable" under predicted traffic conditions. Locations considered were NAL#10 and NAL#11 – mauka townhomes with Isenberg and South King streets calculated as primary traffic noise sources. All HUD STC Calculator sheets are included in **Attachment 3.**

All STC_C calculations assume minimum STC 30-rated windows, which is typical for windows with a 1" insulating glazing assembly comprised of 1/4" Lite - 1/2" air space – 1/4" Lite. The project architect has advised the exterior wall will consist of:

- 1 layer of 5/8" Type X Gypsum board
- 6" metal studs @ 16" O.C. with R-13 fiberglass insulation
- 1 layer of 5/8" exterior sheathing board
- 1 layer of painted EIFS or metal panel exterior system

The stud gauge is assumed to be 16-gauge. The exterior walls include PTAC louvers. Refer to **Attachment 4** for sound isolation performance predictions for each element. **Table 3** below summarizes the calculated STCC ratings at each location.

Table 3: Calculated Composite STC For "Normally Unacceptable" NALs

NAL	DNL (L_{DN})	Required STC_C	Calculated STC_C	Further Action Required?
NAL #10	68	26	32.22	No
NAL #11	66	25	32	No

The floor markups in **Attachment 1** highlight the composite partitions referenced in **Table 3**.

Based on the provided exterior wall assemblies and minimum STC 30-rated windows, each NAL achieves the HUD maximum interior noise level of 45 dBA and is considered "Acceptable".

Unit Lanais

According to the HUD guidelines, outdoor amenity spaces must not exceed DNLs of 65 L_{DN}, however this does not apply to unit lanais. Unit lanais are considered ancillary spaces and do not need to achieve the 65 L_{DN} criteria imposed on other outdoor spaces that could be used by the entire building population. The unit balconies must have L_{DN} values no greater than 75. DNLs at townhome lanais overlooking Stadium Park are calculated to be at most 68 L_{DN} and DNLs at tower lanais are calculated to be 63 L_{DN} or lower, which achieves the design criteria. No further mitigation techniques are needed at unit balconies.

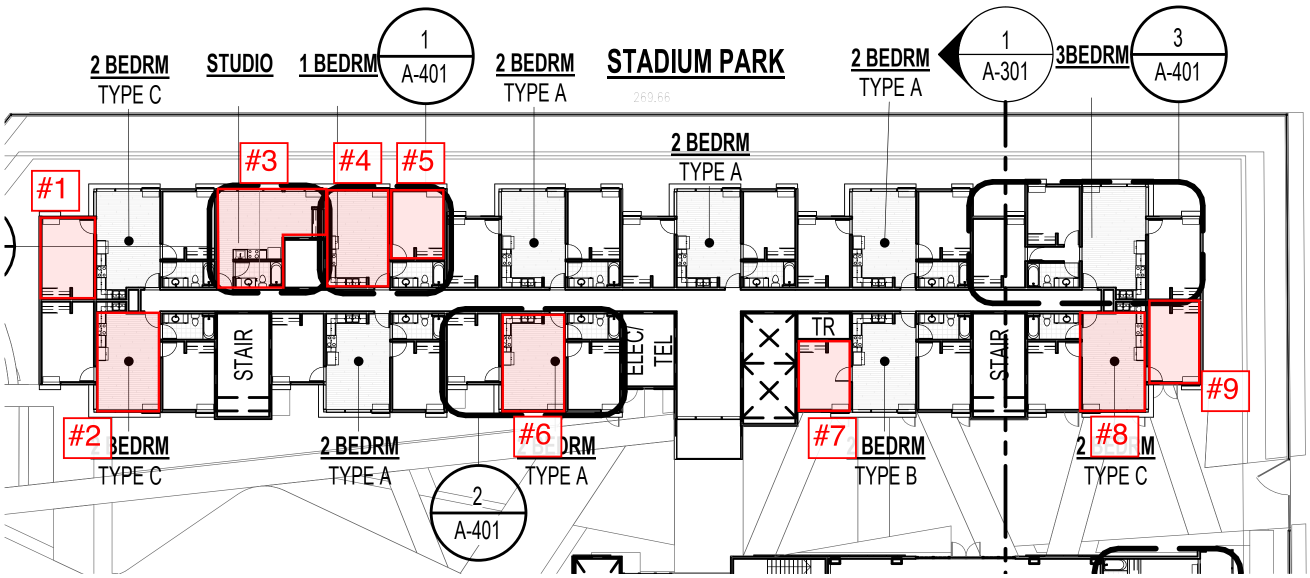
Please let us know if you have any questions.

Sincerely,

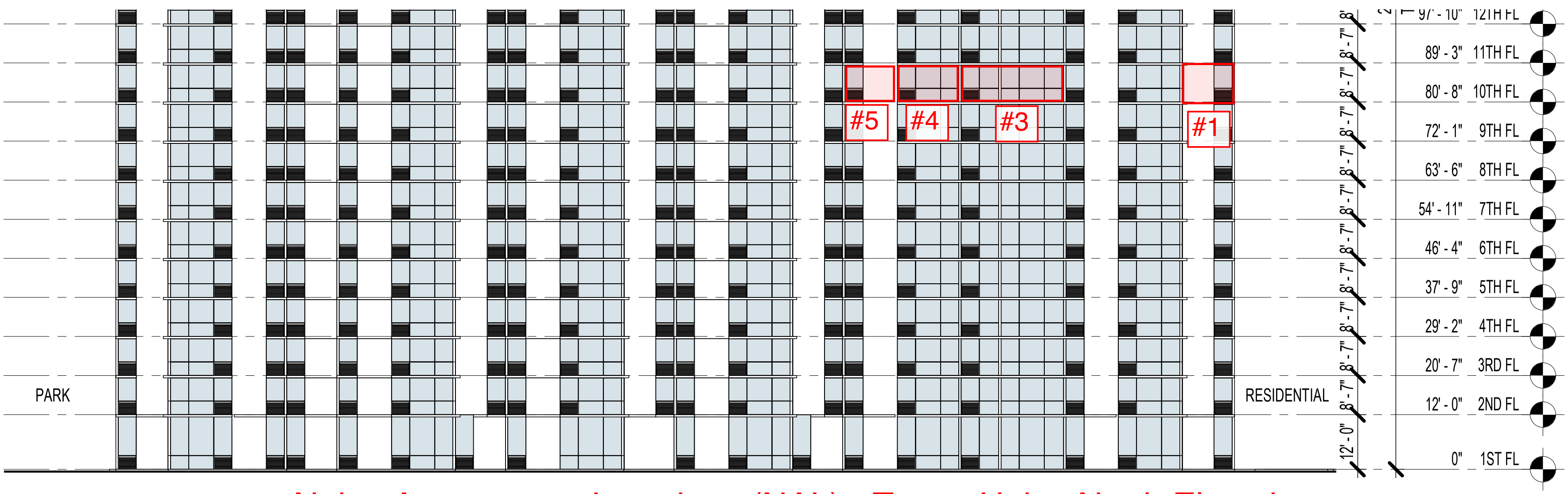
Lucas Johnson
Senior Consultant

Encl.: Attachments 1-4

ATTACHMENT 1
Noise Assessment Locations

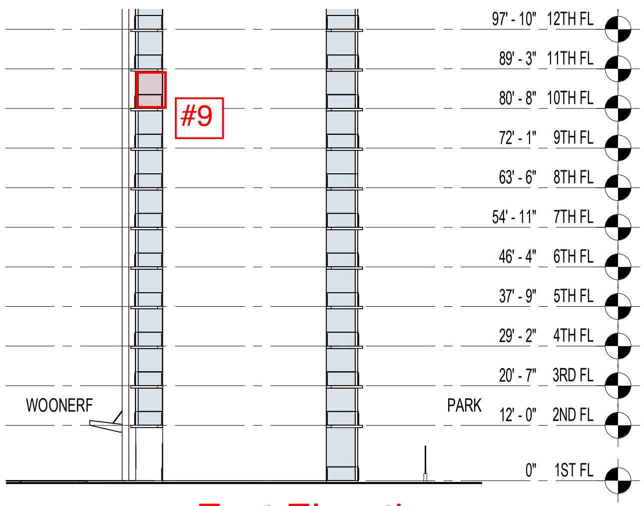


Noise Assessment Locations (NAL) - Tower Units, 10th Floor

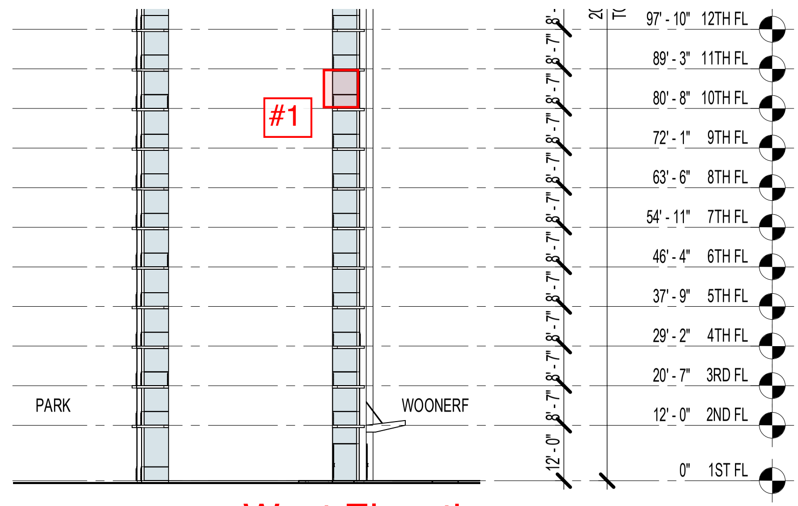


Noise Assessment Locations (NAL) - Tower Units, North Elevation

Noise Assessment Locations (NAL) - Tower Units, South Elevation

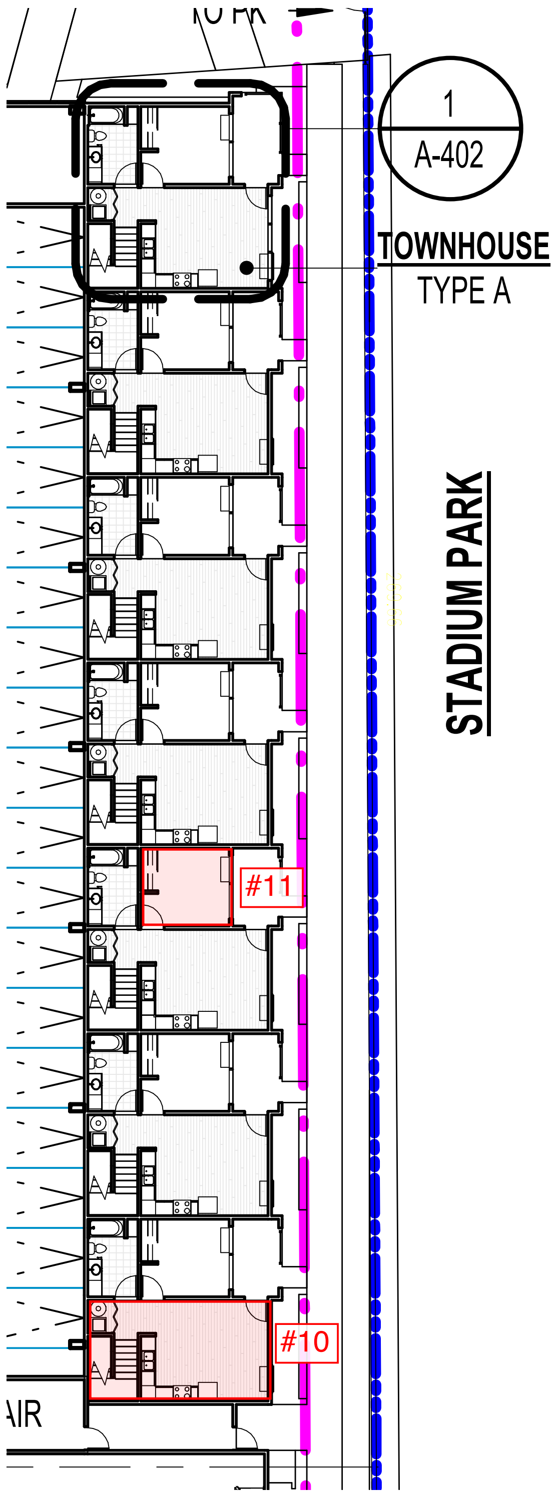


East Elevation



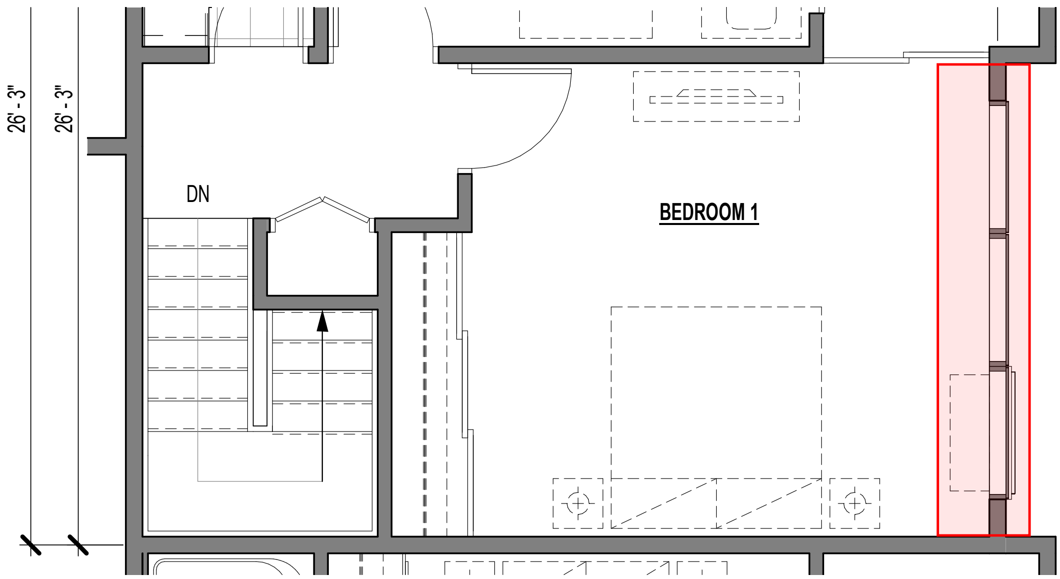
West Elevation

Noise Assessment Locations (NAL) - Tower Units

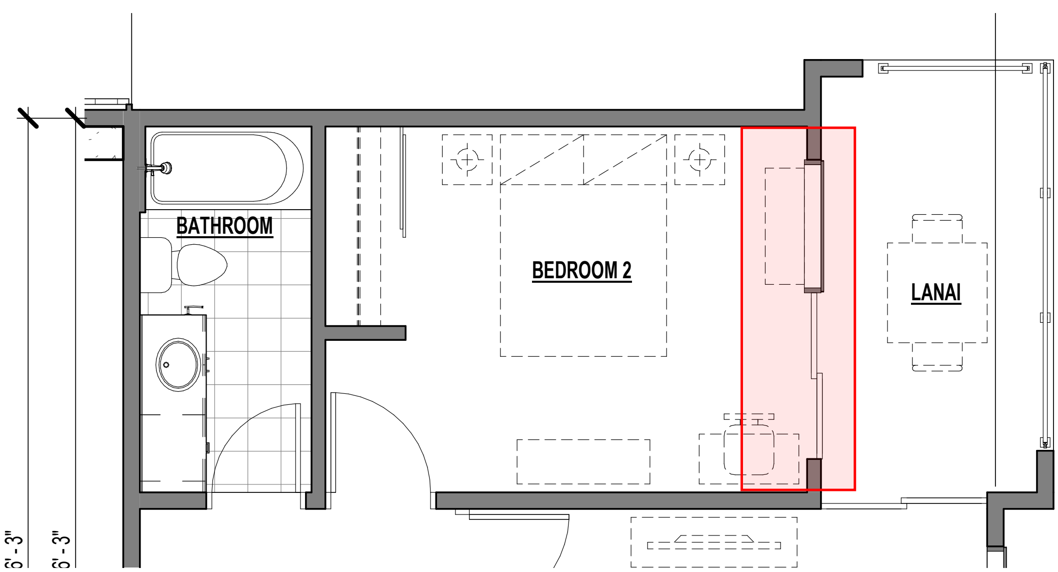


Noise Assessment Locations (NAL) - Townhome Units, 2nd Floor

Noise Assessment Locations (NAL) - Townhome Units, East Elevation



NAL #10 Partition



NAL #11 Partition

ATTACHMENT 2
DNL Results Compiled - NAL1-11

Home (/) > **Programs (/programs/)** > **Environmental Review (/programs/environmental-review/)** > DNL Calculator

DNL Calculator

The Day/Night Noise Level Calculator is an electronic assessment tool that calculates the Day/Night Noise Level (DNL) from roadway and railway traffic. For more information on using the DNL calculator, view the **Day/Night Noise Level Calculator Electronic Assessment Tool Overview (/programs/environmental-review/daynight-noise-level-electronic-assessment-tool/)**.

Guidelines

- To display the Road and/or Rail DNL calculator(s), click on the "Add Road Source" and/or "Add Rail Source" button(s) below.
- All Road and Rail input values must be positive non-decimal numbers.
- All Road and/or Rail DNL value(s) must be calculated separately before calculating the Site DNL.
- All checkboxes that apply must be checked for vehicles and trains in the tables' headers.
- **Note #1:** Tooltips, containing field specific information, have been added in this tool and may be accessed by hovering over all the respective data fields (site identification, roadway and railway assessment, DNL calculation results, roadway and railway input variables) with the mouse.
- **Note #2:** DNL Calculator assumes roadway data is always entered.

DNL Calculator

Site ID	820 Isenberg – NAL#1; Current (2020)
Record Date	05/05/2021
User's Name	D.L. Adams Associates

Road # 1 Name:	**Citron EB**

Road #1

Vehicle Type	Cars ☑	Medium Trucks ☑	Heavy Trucks ☑
Effective Distance	152	152	152
Distance to Stop Sign			
Average Speed	25	25	25
Average Daily Trips (ADT)	607	26	26
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	41	38	51
Calculate Road #1 DNL	51	Reset	

Road # 2 Name:	Citron WB

Road #2

Vehicle Type	Cars ☑	Medium Trucks ☑	Heavy Trucks ☑
Effective Distance	137	137	137
Distance to Stop Sign			
Average Speed	25	25	25
Average Daily Trips (ADT)	2323	101	101
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	48	44	57
Calculate Road #2 DNL	58	Reset	

Add Road Source | Add Rail Source

Airport Noise Level	
Loud Impulse Sounds?	○Yes ◉No
Combined DNL for all Road and Rail sources	**59**
Combined DNL including Airport	**N/A**
Site DNL with Loud Impulse Sound	

Calculate | Reset

Mitigation Options

If your site DNL is in Excess of 65 decibels, your options are:

- **No Action Alternative**: Cancel the project at this location
- **Other Reasonable Alternatives**: Choose an alternate site
- **Mitigation**
  - **Contact your Field or Regional Environmental Officer (/programs/environmental-review/hud-environmental-staff-contacts/)**
  - Increase mitigation in the building walls (only effective if no outdoor, noise sensitive areas)
  - Reconfigure the site plan to increase the distance between the noise source and noise-sensitive uses
  - Incorporate natural or man-made barriers. See ***The Noise Guidebook (/resource/313/hud-noise-guidebook/)***
  - Construct noise barrier. See the **Barrier Performance Module (/programs/environmental-review/bpm-calculator/)**

Tools and Guidance

Day/Night Noise Level Assessment Tool User Guide (/resource/3822/day-night-noise-level-assessment-tool-user-guide/)

Day/Night Noise Level Assessment Tool Flowcharts (/resource/3823/day-night-noise-level-assessment-tool-flowcharts/)

Home (/) > **Programs (/programs/)** > **Environmental Review (/programs/environmental-review/)** > DNL Calculator

DNL Calculator

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- **Note #2:** DNL Calculator assumes roadway data is always entered.

DNL Calculator

Site ID	820 Isenberg – NAL#1; Pre-Pandemic (2019)
Record Date	05/05/2021
User's Name	D.L. Adams Associates

Road # 1 Name:	**Citron EB**

Road #1

Vehicle Type	Cars ☑	Medium Trucks ☑	Heavy Trucks ☑
Effective Distance	152	152	152
Distance to Stop Sign			
Average Speed	25	25	25
Average Daily Trips (ADT)	708	31	31
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	42	39	51
Calculate Road #1 DNL	52	Reset	

Road # 2 Name: **Citron WB**

Road #2

Vehicle Type	Cars ☑	Medium Trucks ☑	Heavy Trucks ☑
Effective Distance	137	137	137
Distance to Stop Sign			
Average Speed	25	25	25
Average Daily Trips (ADT)	2114	92	92
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	48	44	57
Calculate Road #2 DNL	58	Reset	

Add Road Source | Add Rail Source

Airport Noise Level	
Loud Impulse Sounds?	◯Yes ◯No
Combined DNL for all Road and Rail sources	**59**
Combined DNL including Airport	**N/A**
Site DNL with Loud Impulse Sound	

Calculate | Reset

Mitigation Options

If your site DNL is in Excess of 65 decibels, your options are:

- **No Action Alternative**: Cancel the project at this location
- **Other Reasonable Alternatives**: Choose an alternate site
- **Mitigation**
  - **Contact your Field or Regional Environmental Officer (/programs/environmental-review/hud-environmental-staff-contacts/)**
  - Increase mitigation in the building walls (only effective if no outdoor, noise sensitive areas)
  - Reconfigure the site plan to increase the distance between the noise source and noise-sensitive uses
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  - Construct noise barrier. See the **Barrier Performance Module (/programs/environmental-review/bpm-calculator/)**

Tools and Guidance

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Day/Night Noise Level Assessment Tool Flowcharts (/resource/3823/day-night-noise-level-assessment-tool-flowcharts/)

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- **Note #2:** DNL Calculator assumes roadway data is always entered.

DNL Calculator

Site ID	820 Isenberg – NAL#1; 5-year Predicted, No Action (2025)
Record Date	05/05/2021
User's Name	D.L. Adams Associates

Road # 1 Name:	**Citron EB**

Road #1

Vehicle Type	Cars ☑	Medium Trucks ☑	Heavy Trucks ☑
Effective Distance	152	152	152
Distance to Stop Sign			
Average Speed	25	25	25
Average Daily Trips (ADT)	727	32	32
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	42	39	52
Calculate Road #1 DNL	52	Reset	

Road # 2 Name: **Citron WB**

Road #2

Vehicle Type	Cars ☑	Medium Trucks ☑	Heavy Trucks ☑
Effective Distance	137	137	137
Distance to Stop Sign			
Average Speed	25	25	25
Average Daily Trips (ADT)	2161	94	94
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	48	44	57
Calculate Road #2 DNL	58	Reset	

Add Road Source | Add Rail Source

Airport Noise Level	
Loud Impulse Sounds?	○Yes ◉No
Combined DNL for all Road and Rail sources	**59**
Combined DNL including Airport	**N/A**
Site DNL with Loud Impulse Sound	

Calculate | Reset

Mitigation Options

If your site DNL is in Excess of 65 decibels, your options are:

- **No Action Alternative**: Cancel the project at this location
- **Other Reasonable Alternatives**: Choose an alternate site
- **Mitigation**
  - **Contact your Field or Regional Environmental Officer (/programs/environmental-review/hud-environmental-staff-contacts/)**
  - Increase mitigation in the building walls (only effective if no outdoor, noise sensitive areas)
  - Reconfigure the site plan to increase the distance between the noise source and noise-sensitive uses
  - Incorporate natural or man-made barriers. See ***The Noise Guidebook (/resource/313/hud-noise-guidebook/)***
  - Construct noise barrier. See the **Barrier Performance Module (/programs/environmental-review/bpm-calculator/)**

Tools and Guidance

Day/Night Noise Level Assessment Tool User Guide (/resource/3822/day-night-noise-level-assessment-tool-user-guide/)

Day/Night Noise Level Assessment Tool Flowcharts (/resource/3823/day-night-noise-level-assessment-tool-flowcharts/)

Home (/) > **Programs (/programs/)** > **Environmental Review (/programs/environmental-review/)** > DNL Calculator

DNL Calculator

The Day/Night Noise Level Calculator is an electronic assessment tool that calculates the Day/Night Noise Level (DNL) from roadway and railway traffic. For more information on using the DNL calculator, view the **Day/Night Noise Level Calculator Electronic Assessment Tool Overview (/programs/environmental-review/daynight-noise-level-electronic-assessment-tool/)**.

Guidelines

- To display the Road and/or Rail DNL calculator(s), click on the "Add Road Source" and/or "Add Rail Source" button(s) below.
- All Road and Rail input values must be positive non-decimal numbers.
- All Road and/or Rail DNL value(s) must be calculated separately before calculating the Site DNL.
- All checkboxes that apply must be checked for vehicles and trains in the tables' headers.
- **Note #1:** Tooltips, containing field specific information, have been added in this tool and may be accessed by hovering over all the respective data fields (site identification, roadway and railway assessment, DNL calculation results, roadway and railway input variables) with the mouse.
- **Note #2:** DNL Calculator assumes roadway data is always entered.

DNL Calculator

Site ID	820 Isenberg – NAL#1; 5-year Predicted, With Action (2025)
Record Date	05/05/2021
User's Name	D.L. Adams Associates

Road # 1 Name:	**Citron EB**

Road #1

Vehicle Type	**Cars** ☑	**Medium Trucks** ☑	**Heavy Trucks** ☑
Effective Distance	152	152	152
Distance to Stop Sign			
Average Speed	25	25	25
Average Daily Trips (ADT)	[illegible]	[illegible]	[illegible]

Average Daily Trips (ADT)	738	32	32
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	42	39	52
Calculate Road #1 DNL	52	Reset	

Road # 2 Name:	**Citron WB**

Road #2

Vehicle Type	**Cars** ☑	**Medium Trucks** ☑	**Heavy Trucks** ☑
Effective Distance	137	137	137
Distance to Stop Sign			
Average Speed	25	25	25
Average Daily Trips (ADT)	2214	96	96
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	48	44	57
Calculate Road #2 DNL	58	Reset	

Add Road Source Add Rail Source

Airport Noise Level	
Loud Impulse Sounds?	○**Yes** ◉**No**
Combined DNL for all Road and Rail sources	**59**
Combined DNL including Airport	**N/A**

	N/A
Site DNL with Loud Impulse Sound	

Calculate Reset

Mitigation Options

Click on this button to determine the Day-Night Noise Level (DNL) for the site being assessed in units of decibel (dB).

If your site DNL is in Excess of 65 decibels, your options are:

- **No Action Alternative**: Cancel the project at this location
- **Other Reasonable Alternatives**: Choose an alternate site
- **Mitigation**
  - **Contact your Field or Regional Environmental Officer (/programs/environmental-review/hud-environmental-staff-contacts/)**
  - Increase mitigation in the building walls (only effective if no outdoor, noise sensitive areas)
  - Reconfigure the site plan to increase the distance between the noise source and noise-sensitive uses
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Tools and Guidance

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DNL Calculator

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- **Note #1:** Tooltips, containing field specific information, have been added in this tool and may be accessed by hovering over all the respective data fields (site identification, roadway and railway assessment, DNL calculation results, roadway and railway input variables) with the mouse.
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DNL Calculator

Site ID	820 Isenberg – NAL#1; 10-year Predicted, No Action (2035)
Record Date	05/05/2021
User's Name	D.L. Adams Associates

Road # 1 Name:	**Citron EB**

Road #1

Vehicle Type	Cars ☑	Medium Trucks ☑	Heavy Trucks ☑
Effective Distance	152	152	152
Distance to Stop Sign			
Average Speed	25	25	25
Average Daily Trips (ADT)	779	34	34
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	43	39	52
Calculate Road #1 DNL	53	Reset	

Road # 2 Name: **Citron WB**

Road #2

Vehicle Type	Cars ☑	Medium Trucks ☑	Heavy Trucks ☑
Effective Distance	137	137	137
Distance to Stop Sign			
Average Speed	25	25	25
Average Daily Trips (ADT)	2319	101	101
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	48	44	57
Calculate Road #2 DNL	58	Reset	

Add Road Source | Add Rail Source

Airport Noise Level	
Loud Impulse Sounds?	○Yes ◉No
Combined DNL for all Road and Rail sources	**59**
Combined DNL including Airport	**N/A**
Site DNL with Loud Impulse Sound	

Calculate | Reset

Mitigation Options

If your site DNL is in Excess of 65 decibels, your options are:

- **No Action Alternative**: Cancel the project at this location
- **Other Reasonable Alternatives**: Choose an alternate site
- **Mitigation**
  - **Contact your Field or Regional Environmental Officer (/programs/environmental-review/hud-environmental-staff-contacts/)**
  - Increase mitigation in the building walls (only effective if no outdoor, noise sensitive areas)
  - Reconfigure the site plan to increase the distance between the noise source and noise-sensitive uses
  - Incorporate natural or man-made barriers. See ***The Noise Guidebook (/resource/313/hud-noise-guidebook/)***
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Tools and Guidance

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DNL Calculator

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DNL Calculator

Site ID	820 Isenberg – NAL#1; 10-year Predicted, With Action (2035)
Record Date	05/05/2021
User's Name	D.L. Adams Associates

Road # 1 Name:	**Citron EB**

Road #1

Vehicle Type	**Cars** ☑	**Medium Trucks** ☑	**Heavy Trucks** ☑
Effective Distance	152	152	152
Distance to Stop Sign			
Average Speed	25	25	25
Average Daily Trips (ADT)	791	34	34

Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	43	39	52
Calculate Road #1 DNL	53	Reset	

Road # 2 Name: **Citron WB**

Road #2

Vehicle Type	**Cars** ☑	**Medium Trucks** ☑	**Heavy Trucks** ☑
Effective Distance	137	137	137
Distance to Stop Sign			
Average Speed	25	25	25
Average Daily Trips (ADT)	2373	103	103
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	48	44	57
Calculate Road #2 DNL	58	Reset	

Add Road Source Add Rail Source

Airport Noise Level	
Loud Impulse Sounds?	○Yes ◉No
Combined DNL for all Road and Rail sources	**59**
Combined DNL including Airport	**N/A**

Site DNL with Loud Impulse Sound

Calculate Reset

Mitigation Options

Click on this button to determine the Day-Night Noise Level (DNL) for the site being assessed in units of decibel (dB).

If your site DNL is in Excess of 65 decibels, your options are:

- **No Action Alternative**: Cancel the project at this location
- **Other Reasonable Alternatives**: Choose an alternate site
- **Mitigation**
  - **Contact your Field or Regional Environmental Officer (/programs/environmental-review/hud-environmental-staff-contacts/)**
  - Increase mitigation in the building walls (only effective if no outdoor, noise sensitive areas)
  - Reconfigure the site plan to increase the distance between the noise source and noise-sensitive uses
  - Incorporate natural or man-made barriers. See ***The Noise Guidebook (/resource/313/hud-noise-guidebook/)***
  - Construct noise barrier. See the **Barrier Performance Module (/programs/environmental-review/bpm-calculator/)**

Tools and Guidance

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Day/Night Noise Level Assessment Tool Flowcharts (/resource/3823/day-night-noise-level-assessment-tool-flowcharts/)

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DNL Calculator

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Guidelines

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- **Note #2:** DNL Calculator assumes roadway data is always entered.

DNL Calculator

Site ID	820 Isenberg – NAL#2; Current (2020)
Record Date	05/05/2021
User's Name	D.L. Adams Associates

Road # 1 Name:	**Isenberg NB**

Road #1

Vehicle Type	Cars ☑	Medium Trucks ☑	Heavy Trucks ☑
Effective Distance	266	266	266
Distance to Stop Sign			
Average Speed	25	25	25
Average Daily Trips (ADT)	1809	79	79
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	43	39	52
Calculate Road #1 DNL	53	Reset	

Road # 2 Name: **Isenberg SB**

Road #2

Vehicle Type	Cars ☑	Medium Trucks ☑	Heavy Trucks ☑
Effective Distance	282	282	282
Distance to Stop Sign			
Average Speed	25	25	25
Average Daily Trips (ADT)	3612	157	157
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	45	42	55
Calculate Road #2 DNL	55	Reset	

Road # 3 Name:	S King EB

Road #3

Vehicle Type	Cars ☑	Medium Trucks ☑	Heavy Trucks ☑
Effective Distance	844	844	844
Distance to Stop Sign			
Average Speed	30	30	30
Average Daily Trips (ADT)	18251	794	794
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	47	43	54
Calculate Road #3 DNL	55	Reset	

Road # 4 Name:	Citron EB

Road #4

Vehicle Type	Cars ☑	Medium Trucks ☑	Heavy Trucks ☑
Effective Distance	211	211	211
Distance to Stop Sign			
Average Speed	25	25	25
Average Daily Trips (ADT)	607	26	26
Night Fraction of ADT	15	15	15

Road Gradient (%)			1
Vehicle DNL	39	36	49
Calculate Road #4 DNL	49	Reset	

Road # 5 Name:	**Citron WB**

Road #5

Vehicle Type	**Cars** ☑	**Medium Trucks** ☑	**Heavy Trucks** ☑
Effective Distance	193	193	193
Distance to Stop Sign			
Average Speed	25	25	25
Average Daily Trips (ADT)	2323	101	101
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	46	42	55
Calculate Road #5 DNL	56	Reset	

Add Road Source Add Rail Source

Airport Noise Level	
Loud Impulse Sounds?	○Yes ◉No

Combined DNL for all Road and Rail sources	**61**
Combined DNL including Airport	**N/A**
Site DNL with Loud Impulse Sound	

Calculate Reset

Mitigation Options

If your site DNL is in Excess of 65 decibels, your options are:

- **No Action Alternative**: Cancel the project at this location
- **Other Reasonable Alternatives**: Choose an alternate site
- **Mitigation**
  - **Contact your Field or Regional Environmental Officer (/programs/environmental-review/hud-environmental-staff-contacts/)**
  - Increase mitigation in the building walls (only effective if no outdoor, noise sensitive areas)
  - Reconfigure the site plan to increase the distance between the noise source and noise-sensitive uses
  - Incorporate natural or man-made barriers. See ***The Noise Guidebook (/resource/313/hud-noise-guidebook/)***
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Tools and Guidance

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Day/Night Noise Level Assessment Tool Flowcharts (/resource/3823/day-night-noise-level-assessment-tool-flowcharts/)

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DNL Calculator

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Guidelines

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- All Road and Rail input values must be positive non-decimal numbers.
- All Road and/or Rail DNL value(s) must be calculated separately before calculating the Site DNL.
- All checkboxes that apply must be checked for vehicles and trains in the tables' headers.
- **Note #1:** Tooltips, containing field specific information, have been added in this tool and may be accessed by hovering over all the respective data fields (site identification, roadway and railway assessment, DNL calculation results, roadway and railway input variables) with the mouse.
- **Note #2:** DNL Calculator assumes roadway data is always entered.

DNL Calculator

Site ID	820 Isenberg – NAL#2; Pre-Pandemic (2019)
Record Date	05/05/2021
User's Name	D.L. Adams Associates

Road # 1 Name:	**Isenberg NB**

Road #1

Vehicle Type	Cars ☑	Medium Trucks ☑	Heavy Trucks ☑
Effective Distance	266	266	266
Distance to Stop Sign			
Average Speed	25	25	25
Average Daily Trips (ADT)	3808	166	166
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	46	42	55
Calculate Road #1 DNL	56	Reset	

Road # 2 Name:	**Isenberg SB**

Road #2

Vehicle Type	Cars ☑	Medium Trucks ☑	Heavy Trucks ☑
Effective Distance	282	282	282
Distance to Stop Sign			
Average Speed	25	25	25
Average Daily Trips (ADT)	5242	228	228
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	47	43	56
Calculate Road #2 DNL	57	Reset	

Road # 3 Name:	S King EB

Road #3

Vehicle Type	Cars ☑	Medium Trucks ☑	Heavy Trucks ☑
Effective Distance	844	844	844
Distance to Stop Sign			
Average Speed	30	30	30
Average Daily Trips (ADT)	22927	997	997
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	48	44	55
Calculate Road #3 DNL	56	Reset	

Road # 4 Name:	Citron EB

Road #4

Vehicle Type	Cars ☑	Medium Trucks ☑	Heavy Trucks ☑
Effective Distance	211	211	211
Distance to Stop Sign			
Average Speed	25	25	25
Average Daily Trips (ADT)	708	31	31
Night Fraction of ADT	15	15	15

Road Gradient (%)			1
Vehicle DNL	40	36	49
Calculate Road #4 DNL	50	Reset	

Road # 5 Name:	**Citron WB**

Road #5

Vehicle Type	**Cars** ☑	**Medium Trucks** ☑	**Heavy Trucks** ☑
Effective Distance	193	193	193
Distance to Stop Sign			
Average Speed	25	25	25
Average Daily Trips (ADT)	2114	92	92
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	45	42	55
Calculate Road #5 DNL	55	Reset	

Add Road Source Add Rail Source

Airport Noise Level	
Loud Impulse Sounds?	○**Yes** ◉**No**

Combined DNL for all Road and Rail sources	**62**
Combined DNL including Airport	**N/A**
Site DNL with Loud Impulse Sound	

Calculate Reset

Mitigation Options

If your site DNL is in Excess of 65 decibels, your options are:

- **No Action Alternative**: Cancel the project at this location
- **Other Reasonable Alternatives**: Choose an alternate site
- **Mitigation**
  - **Contact your Field or Regional Environmental Officer (/programs/environmental-review/hud-environmental-staff-contacts/)**
  - Increase mitigation in the building walls (only effective if no outdoor, noise sensitive areas)
  - Reconfigure the site plan to increase the distance between the noise source and noise-sensitive uses
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Tools and Guidance

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Day/Night Noise Level Assessment Tool Flowcharts (/resource/3823/day-night-noise-level-assessment-tool-flowcharts/)

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- **Note #2:** DNL Calculator assumes roadway data is always entered.

DNL Calculator

Site ID	820 Isenberg – NAL#2; 5-year Predicted, No Action (2025)
Record Date	05/05/2021
User's Name	D.L. Adams Associates

Road # 1 Name:	**Isenberg NB**

Road #1

Vehicle Type	Cars ☑	Medium Trucks ☑	Heavy Trucks ☑
Effective Distance	266	266	266
Distance to Stop Sign			
Average Speed	25	25	25
Average Daily Trips (ADT)	3937	171	171
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	46	42	55
Calculate Road #1 DNL	56	Reset	

Road # 2 Name: **Isenberg SB**

Road #2

Vehicle Type	Cars ☑	Medium Trucks ☑	Heavy Trucks ☑
Effective Distance	282	282	282
Distance to Stop Sign			
Average Speed	25	25	25
Average Daily Trips (ADT)	5342	232	232
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	47	43	56
Calculate Road #2 DNL	57	Reset	

Road # 3 Name:	**S King EB**

Road #3

Vehicle Type	**Cars** ☑	**Medium Trucks** ☑	**Heavy Trucks** ☑
Effective Distance	844	844	844
Distance to Stop Sign			
Average Speed	30	30	30
Average Daily Trips (ADT)	23606	1026	1026
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	48	44	56
Calculate Road #3 DNL	57	Reset	

Road # 4 Name:	**Citron EB**

Road #4

Vehicle Type	**Cars** ☑	**Medium Trucks** ☑	**Heavy Trucks** ☑
Effective Distance	211	211	211
Distance to Stop Sign			
Average Speed	25	25	25
Average Daily Trips (ADT)	727	32	32
Night Fraction of ADT	15	15	15

Road Gradient (%)			1
Vehicle DNL	40	37	49
Calculate Road #4 DNL	50	Reset	

Road # 5 Name:	**Citron WB**

Road #5

Vehicle Type	**Cars** ☑	**Medium Trucks** ☑	**Heavy Trucks** ☑
Effective Distance	193	193	193
Distance to Stop Sign			
Average Speed	25	25	25
Average Daily Trips (ADT)	2161	94	94
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	45	42	55
Calculate Road #5 DNL	55	Reset	

Add Road Source Add Rail Source

Airport Noise Level	
Loud Impulse Sounds?	○**Yes** ◉**No**

Combined DNL for all Road and Rail sources	**63**
Combined DNL including Airport	**N/A**
Site DNL with Loud Impulse Sound	

Calculate Reset

Mitigation Options

If your site DNL is in Excess of 65 decibels, your options are:

- **No Action Alternative**: Cancel the project at this location
- **Other Reasonable Alternatives**: Choose an alternate site
- **Mitigation**
  - **Contact your Field or Regional Environmental Officer (/programs/environmental-review/hud-environmental-staff-contacts/)**
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- **Note #2:** DNL Calculator assumes roadway data is always entered.

DNL Calculator

Site ID	820 Isenberg – NAL#2; 5-year Predicted, With Action (2025)
Record Date	05/05/2021
User's Name	D.L. Adams Associates

Road # 1 Name:	**Isenberg NB**

Road #1

Vehicle Type	Cars ☑	Medium Trucks ☑	Heavy Trucks ☑
Effective Distance	266	266	266
Distance to Stop Sign			
Average Speed	25	25	25
Average Daily Trips (ADT)	3954	172	172
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	46	42	55
Calculate Road #1 DNL	56	Reset	

Road # 2 Name: **Isenberg SB**

Road #2

Vehicle Type	Cars ☑	Medium Trucks ☑	Heavy Trucks ☑
Effective Distance	282	282	282
Distance to Stop Sign			
Average Speed	25	25	25
Average Daily Trips (ADT)	5835	254	254
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	47	44	57
Calculate Road #2 DNL	57	Reset	

Road # 3 Name: S King EB

Road #3

Vehicle Type	Cars ☑	Medium Trucks ☑	Heavy Trucks ☑
Effective Distance	844	844	844
Distance to Stop Sign			
Average Speed	30	30	30
Average Daily Trips (ADT)	24110	1048	1048
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	48	44	56
Calculate Road #3 DNL	57	Reset	

Road # 4 Name: Citron EB

Road #4

Vehicle Type	Cars ☑	Medium Trucks ☑	Heavy Trucks ☑
Effective Distance	211	211	211
Distance to Stop Sign			
Average Speed	25	25	25
Average Daily Trips (ADT)	738	32	32
Night Fraction of ADT	15	15	15

Road Gradient (%)			1
Vehicle DNL	40	37	49
Calculate Road #4 DNL	50	Reset	

Road # 5 Name:	**Citron WB**

Road #5

Vehicle Type	**Cars** ☑	**Medium Trucks** ☑	**Heavy Trucks** ☑
Effective Distance	193	193	193
Distance to Stop Sign			
Average Speed	25	25	25
Average Daily Trips (ADT)	2214	96	96
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	46	42	55
Calculate Road #5 DNL	56	Reset	

Add Road Source | Add Rail Source

Airport Noise Level	
Loud Impulse Sounds?	○ **Yes** ◉ **No**

Combined DNL for all Road and Rail sources	**63**
Combined DNL including Airport	**N/A**
Site DNL with Loud Impulse Sound	

Calculate Reset

Mitigation Options

If your site DNL is in Excess of 65 decibels, your options are:

- **No Action Alternative**: Cancel the project at this location
- **Other Reasonable Alternatives**: Choose an alternate site
- **Mitigation**
    - **Contact your Field or Regional Environmental Officer (/programs/environmental-review/hud-environmental-staff-contacts/)**
    - Increase mitigation in the building walls (only effective if no outdoor, noise sensitive areas)
    - Reconfigure the site plan to increase the distance between the noise source and noise-sensitive uses
    - Incorporate natural or man-made barriers. See ***The Noise Guidebook (/resource/313/hud-noise-guidebook/)***
    - Construct noise barrier. See the **Barrier Performance Module (/programs/environmental-review/bpm-calculator/)**

Tools and Guidance

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Day/Night Noise Level Assessment Tool Flowcharts (/resource/3823/day-night-noise-level-assessment-tool-flowcharts/)

Home (/) > **Programs (/programs/)** > **Environmental Review (/programs/environmental-review/)** > DNL Calculator

DNL Calculator

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Guidelines

- To display the Road and/or Rail DNL calculator(s), click on the "Add Road Source" and/or "Add Rail Source" button(s) below.
- All Road and Rail input values must be positive non-decimal numbers.
- All Road and/or Rail DNL value(s) must be calculated separately before calculating the Site DNL.
- All checkboxes that apply must be checked for vehicles and trains in the tables' headers.
- **Note #1:** Tooltips, containing field specific information, have been added in this tool and may be accessed by hovering over all the respective data fields (site identification, roadway and railway assessment, DNL calculation results, roadway and railway input variables) with the mouse.
- **Note #2:** DNL Calculator assumes roadway data is always entered.

DNL Calculator

Site ID	820 Isenberg – NAL#2; 10-year Predicted, No Action (2035)
Record Date	05/05/2021
User's Name	D.L. Adams Associates

Road # 1 Name:	**Isenberg NB**

Road #1

Vehicle Type	Cars ☑	Medium Trucks ☑	Heavy Trucks ☑
Effective Distance	266	266	266
Distance to Stop Sign			
Average Speed	25	25	25
Average Daily Trips (ADT)	4224	184	184
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	46	43	56
Calculate Road #1 DNL	56	Reset	

Road # 2 Name: **Isenberg SB**

Road #2

Vehicle Type	Cars ☑	Medium Trucks ☑	Heavy Trucks ☑
Effective Distance	282	282	282
Distance to Stop Sign			
Average Speed	25	25	25
Average Daily Trips (ADT)	5729	249	249
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	47	44	57
Calculate Road #2 DNL	57	Reset	

Road # 3 Name:	**S King EB**

Road #3

Vehicle Type	**Cars** ☑	**Medium Trucks** ☑	**Heavy Trucks** ☑
Effective Distance	844	844	844
Distance to Stop Sign			
Average Speed	30	30	30
Average Daily Trips (ADT)	25334	1101	1101
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	48	44	56
Calculate Road #3 DNL	57	Reset	

Road # 4 Name:	**Citron EB**

Road #4

Vehicle Type	**Cars** ☑	**Medium Trucks** ☑	**Heavy Trucks** ☑
Effective Distance	211	211	211
Distance to Stop Sign			
Average Speed	25	25	25
Average Daily Trips (ADT)	779	34	34
Night Fraction of ADT	15	15	15

Road Gradient (%)			1
Vehicle DNL	40	37	50
Calculate Road #4 DNL	50	Reset	

Road # 5 Name: **Citron WB**

Road #5

Vehicle Type	**Cars** ☑	**Medium Trucks** ☑	**Heavy Trucks** ☑
Effective Distance	193	193	193
Distance to Stop Sign			
Average Speed	25	25	25
Average Daily Trips (ADT)	2319	101	101
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	46	42	55
Calculate Road #5 DNL	56	Reset	

Add Road Source | Add Rail Source

Airport Noise Level	
Loud Impulse Sounds?	○ **Yes** ◉ **No**

Combined DNL for all Road and Rail sources	**63**
Combined DNL including Airport	**N/A**
Site DNL with Loud Impulse Sound	

Calculate Reset

Mitigation Options

If your site DNL is in Excess of 65 decibels, your options are:

- **No Action Alternative**: Cancel the project at this location
- **Other Reasonable Alternatives**: Choose an alternate site
- **Mitigation**
  - **Contact your Field or Regional Environmental Officer (/programs/environmental-review/hud-environmental-staff-contacts/)**
  - Increase mitigation in the building walls (only effective if no outdoor, noise sensitive areas)
  - Reconfigure the site plan to increase the distance between the noise source and noise-sensitive uses
  - Incorporate natural or man-made barriers. See ***The Noise Guidebook (/resource/313/hud-noise-guidebook/)***
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Tools and Guidance

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Home (/) > **Programs (/programs/)** > **Environmental Review (/programs/environmental-review/)** > DNL Calculator

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- **Note #2:** DNL Calculator assumes roadway data is always entered.

DNL Calculator

Site ID	820 Isenberg – NAL#2; 10-year Predicted, With Action (2035)
Record Date	05/05/2021
User's Name	D.L. Adams Associates

Road # 1 Name:	**Isenberg NB**

Road #1

Vehicle Type	Cars ☑	Medium Trucks ☑	Heavy Trucks ☑
Effective Distance	266	266	266
Distance to Stop Sign			
Average Speed	25	25	25
Average Daily Trips (ADT)	4247	185	185
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	46	43	56
Calculate Road #1 DNL	56	Reset	

Road # 2 Name:	Isenberg SB

Road #2

Vehicle Type	Cars ☑	Medium Trucks ☑	Heavy Trucks ☑
Effective Distance	282	282	282
Distance to Stop Sign			
Average Speed	25	25	25
Average Daily Trips (ADT)	6256	272	272
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	48	44	57
Calculate Road #2 DNL	58	Reset	

Road # 3 Name:	S King EB

Road #3

Vehicle Type	Cars ☑	Medium Trucks ☑	Heavy Trucks ☑
Effective Distance	844	844	844
Distance to Stop Sign			
Average Speed	30	30	30
Average Daily Trips (ADT)	25873	1125	1125
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	48	45	56
Calculate Road #3 DNL	57	Reset	

Road # 4 Name:	Citron EB

Road #4

Vehicle Type	Cars ☑	Medium Trucks ☑	Heavy Trucks ☑
Effective Distance	211	211	211
Distance to Stop Sign			
Average Speed	25	25	25
Average Daily Trips (ADT)	791	34	34
Night Fraction of ADT	15	15	15

Road Gradient (%)			1
Vehicle DNL	40	37	50
Calculate Road #4 DNL	50	Reset	

Road # 5 Name:	Citron WB

Road #5

Vehicle Type	Cars ☑	Medium Trucks ☑	Heavy Trucks ☑
Effective Distance	193	193	193
Distance to Stop Sign			
Average Speed	25	25	25
Average Daily Trips (ADT)	2373	103	103
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	46	42	55
Calculate Road #5 DNL	56	Reset	

Add Road Source Add Rail Source

Airport Noise Level	
Loud Impulse Sounds?	○Yes ◉No

Combined DNL for all Road and Rail sources	**63**
Combined DNL including Airport	**N/A**
Site DNL with Loud Impulse Sound	

Calculate Reset

Mitigation Options

If your site DNL is in Excess of 65 decibels, your options are:

- **No Action Alternative**: Cancel the project at this location
- **Other Reasonable Alternatives**: Choose an alternate site
- **Mitigation**
  - **Contact your Field or Regional Environmental Officer (/programs/environmental-review/hud-environmental-staff-contacts/)**
  - Increase mitigation in the building walls (only effective if no outdoor, noise sensitive areas)
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Day/Night Noise Level Assessment Tool Flowcharts (/resource/3823/day-night-noise-level-assessment-tool-flowcharts/)

Home (/) > **Programs (/programs/)** > **Environmental Review (/programs/environmental-review/)** > DNL Calculator

DNL Calculator

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Guidelines

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- All Road and/or Rail DNL value(s) must be calculated separately before calculating the Site DNL.
- All checkboxes that apply must be checked for vehicles and trains in the tables' headers.
- **Note #1:** Tooltips, containing field specific information, have been added in this tool and may be accessed by hovering over all the respective data fields (site identification, roadway and railway assessment, DNL calculation results, roadway and railway input variables) with the mouse.
- **Note #2:** DNL Calculator assumes roadway data is always entered.

DNL Calculator

Site ID	820 Isenberg – NAL#3; Current (2020)
Record Date	05/05/2021
User's Name	D.L. Adams Associates

Road # 1 Name:	**Citron EB**

Road #1

Vehicle Type	Cars ☑	Medium Trucks ☑	Heavy Trucks ☑
Effective Distance	217	217	217
Distance to Stop Sign			
Average Speed	25	25	25
Average Daily Trips (ADT)	607	26	26
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	39	35	48
Calculate Road #1 DNL	49	Reset	

Road # 2 Name:	Citron WB

Road #2

Vehicle Type	Cars ☑	Medium Trucks ☑	Heavy Trucks ☑
Effective Distance	199	199	199
Distance to Stop Sign			
Average Speed	25	25	25
Average Daily Trips (ADT)	2323	101	101
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	46	42	55
Calculate Road #2 DNL	56	Reset	

Road # 3 Name:	**S King EB**

Road #3

Vehicle Type	**Cars** ☑	**Medium Trucks** ☑	**Heavy Trucks** ☑
Effective Distance	824	824	824
Distance to Stop Sign			
Average Speed	30	30	30
Average Daily Trips (ADT)	18251	794	794
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	47	43	55
Calculate Road #3 DNL	56	Reset	

Add Road Source | Add Rail Source

Airport Noise Level	
Loud Impulse Sounds?	○Yes ◉No
Combined DNL for all Road and Rail sources	**59**
Combined DNL including Airport	**N/A**
Site DNL with Loud Impulse Sound	

Calculate Reset

Mitigation Options

If your site DNL is in Excess of 65 decibels, your options are:

- **No Action Alternative**: Cancel the project at this location
- **Other Reasonable Alternatives**: Choose an alternate site
- **Mitigation**
  - **Contact your Field or Regional Environmental Officer (/programs/environmental-review/hud-environmental-staff-contacts/)**
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DNL Calculator

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Guidelines

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- **Note #1:** Tooltips, containing field specific information, have been added in this tool and may be accessed by hovering over all the respective data fields (site identification, roadway and railway assessment, DNL calculation results, roadway and railway input variables) with the mouse.
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DNL Calculator

Site ID	820 Isenberg – NAL#3; Pre-Pandemic (2019)
Record Date	05/05/2021
User's Name	D.L. Adams Associates

Road # 1 Name:	**Citron EB**

Road #1

Vehicle Type	Cars ☑	Medium Trucks ☑	Heavy Trucks ☑
Effective Distance	217	217	217
Distance to Stop Sign			
Average Speed	25	25	25
Average Daily Trips (ADT)	708	31	31
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	40	36	49
Calculate Road #1 DNL	50	Reset	

Road # 2 Name:	Citron WB

Road #2

Vehicle Type	Cars ☑	Medium Trucks ☑	Heavy Trucks ☑
Effective Distance	199	199	199
Distance to Stop Sign			
Average Speed	25	25	25
Average Daily Trips (ADT)	2114	92	92
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	45	42	54
Calculate Road #2 DNL	55	Reset	

Road # 3 Name:	S King EB

Road #3

Vehicle Type	Cars ☑	Medium Trucks ☑	Heavy Trucks ☑
Effective Distance	824	824	824
Distance to Stop Sign			
Average Speed	30	30	30
Average Daily Trips (ADT)	22927	997	997
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	48	44	56
Calculate Road #3 DNL	57	Reset	

Add Road Source | Add Rail Source

Airport Noise Level	
Loud Impulse Sounds?	○Yes ◉No

Combined DNL for all Road and Rail sources	**59**
Combined DNL including Airport	**N/A**
Site DNL with Loud Impulse Sound	

Calculate Reset

Mitigation Options

If your site DNL is in Excess of 65 decibels, your options are:

- **No Action Alternative**: Cancel the project at this location
- **Other Reasonable Alternatives**: Choose an alternate site
- **Mitigation**
  - **Contact your Field or Regional Environmental Officer (/programs/environmental-review/hud-environmental-staff-contacts/)**
  - Increase mitigation in the building walls (only effective if no outdoor, noise sensitive areas)
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- **Note #2:** DNL Calculator assumes roadway data is always entered.

DNL Calculator

Site ID	820 Isenberg – NAL#3; 5-year Predicted, No Action (2025)
Record Date	05/05/2021
User's Name	D.L. Adams Associates

Road # 1 Name:	**Citron EB**

Road #1

Vehicle Type	**Cars** ☑	**Medium Trucks** ☑	**Heavy Trucks** ☑
Effective Distance	217	217	217
Distance to Stop Sign			
Average Speed	25	25	25

Average Daily Trips (ADT)	727	32	32
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	40	36	49
Calculate Road #1 DNL	50	Reset	

Road # 2 Name:	Citron WB

Road #2

Vehicle Type	Cars ☑	Medium Trucks ☑	Heavy Trucks ☑
Effective Distance	199	199	199
Distance to Stop Sign			
Average Speed	25	25	25
Average Daily Trips (ADT)	2161	94	94
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	45	42	55
Calculate Road #2 DNL	55	Reset	

Road # 3 Name:	S King EB

Road #3

Vehicle Type	Cars ☑	Medium Trucks ☑	Heavy Trucks ☑
Effective Distance	824	824	824
Distance to Stop Sign			
Average Speed	30	30	30
Average Daily Trips (ADT)	23606	1026	1026

Average Daily Trips (ADT)	23606	1026	1026
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	48	44	56
Calculate Road #3 DNL	57	Reset	

Add Road Source Add Rail Source

Airport Noise Level	
Loud Impulse Sounds?	○Yes ◉No

Combined DNL for all Road and Rail sources	**60**
Combined DNL including Airport	**N/A**
Site DNL with Loud Impulse Sound	

Calculate Reset

Mitigation Options

If your site DNL is in Excess of 65 decibels, your options are:

- **No Action Alternative**: Cancel the project at this location

- **Other Reasonable Alternatives**: Choose an alternate site
- **Mitigation**
  - **Contact your Field or Regional Environmental Officer (/programs/environmental-review/hud-environmental-staff-contacts/)**
  - Increase mitigation in the building walls (only effective if no outdoor, noise sensitive areas)
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DNL Calculator

Site ID	820 Isenberg – NAL#3; 5-year Predicted, With Action (2025)
Record Date	05/05/2021
User's Name	D.L. Adams Associates

Road # 1 Name:	**Citron EB**

Road #1

Vehicle Type	Cars ☑	Medium Trucks ☑	Heavy Trucks ☑
Effective Distance	217	217	217
Distance to Stop Sign			
Average Speed	25	25	25
Average Daily Trips (ADT)	738	32	32
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	40	36	49
Calculate Road #1 DNL	50	Reset	

Road # 2 Name: **Citron WB**

Road #2

Vehicle Type	Cars ☑	Medium Trucks ☑	Heavy Trucks ☑
Effective Distance	199	199	199
Distance to Stop Sign			
Average Speed	25	25	25
Average Daily Trips (ADT)	2214	96	96
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	45	42	55
Calculate Road #2 DNL	55	Reset	

Road # 3 Name:	S King EB

Road #3

Vehicle Type	Cars ☑	Medium Trucks ☑	Heavy Trucks ☑
Effective Distance	824	824	824
Distance to Stop Sign			
Average Speed	30	30	30
Average Daily Trips (ADT)	24110	1048	1048
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	48	44	56
Calculate Road #3 DNL	57	Reset	

Add Road Source Add Rail Source

Airport Noise Level	
Loud Impulse Sounds?	○Yes ◉No
Combined DNL for all Road and Rail sources	**60**
Combined DNL including Airport	**N/A**
Site DNL with Loud Impulse Sound	

Calculate Reset

Mitigation Options

If your site DNL is in Excess of 65 decibels, your options are:

- **No Action Alternative**: Cancel the project at this location
- **Other Reasonable Alternatives**: Choose an alternate site
- **Mitigation**
    - **Contact your Field or Regional Environmental Officer (/programs/environmental-review/hud-environmental-staff-contacts/)**
    - Increase mitigation in the building walls (only effective if no outdoor, noise sensitive areas)
    - Reconfigure the site plan to increase the distance between the noise source and noise-sensitive uses
    - Incorporate natural or man-made barriers. See ***The Noise Guidebook (/resource/313/hud-noise-guidebook/)***
    - Construct noise barrier. See the **Barrier Performance Module (/programs/environmental-review/bpm-calculator/)**

Tools and Guidance

Day/Night Noise Level Assessment Tool User Guide (/resource/3822/day-night-noise-level-assessment-tool-user-guide/)

Day/Night Noise Level Assessment Tool Flowcharts (/resource/3823/day-night-noise-level-assessment-tool-flowcharts/)

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DNL Calculator

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Guidelines

- To display the Road and/or Rail DNL calculator(s), click on the "Add Road Source" and/or "Add Rail Source" button(s) below.
- All Road and Rail input values must be positive non-decimal numbers.
- All Road and/or Rail DNL value(s) must be calculated separately before calculating the Site DNL.
- All checkboxes that apply must be checked for vehicles and trains in the tables' headers.
- **Note #1:** Tooltips, containing field specific information, have been added in this tool and may be accessed by hovering over all the respective data fields (site identification, roadway and railway assessment, DNL calculation results, roadway and railway input variables) with the mouse.
- **Note #2:** DNL Calculator assumes roadway data is always entered.

DNL Calculator

Site ID	820 Isenberg – NAL#3; 10-year Predicted, No Action (2035)
Record Date	05/05/2021
User's Name	D.L. Adams Associates

Road # 1 Name:	**Citron EB**

Road #1

Vehicle Type	Cars ☑	Medium Trucks ☑	Heavy Trucks ☑
Effective Distance	217	217	217
Distance to Stop Sign			
Average Speed	25	25	25
Average Daily Trips (ADT)	779	34	34
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	40	37	50
Calculate Road #1 DNL	50	Reset	

Road # 2 Name:	Citron WB

Road #2

Vehicle Type	Cars ☑	Medium Trucks ☑	Heavy Trucks ☑
Effective Distance	199	199	199
Distance to Stop Sign			
Average Speed	25	25	25
Average Daily Trips (ADT)	2319	101	101
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	46	42	55
Calculate Road #2 DNL	56	Reset	

Road # 3 Name:	S King EB

Road #3

Vehicle Type	Cars ☑	Medium Trucks ☑	Heavy Trucks ☑
Effective Distance	824	824	824
Distance to Stop Sign			
Average Speed	30	30	30
Average Daily Trips (ADT)	25334	1101	1101
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	48	45	56
Calculate Road #3 DNL	57	Reset	

Add Road Source Add Rail Source

Airport Noise Level	
Loud Impulse Sounds?	○Yes ◉No

Combined DNL for all Road and Rail sources	**60**
Combined DNL including Airport	**N/A**
Site DNL with Loud Impulse Sound	

Calculate Reset

Mitigation Options

If your site DNL is in Excess of 65 decibels, your options are:

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DNL Calculator

Site ID	820 Isenberg – NAL#3; 10-year Predicted, With Action (2035)
Record Date	05/05/2021
User's Name	D.L. Adams Associates

Road # 1 Name:	**Citron EB**

Road #1

Vehicle Type	Cars ☑	Medium Trucks ☑	Heavy Trucks ☑
Effective Distance	217	217	217
Distance to Stop Sign			
Average Speed	25	25	25
Average Daily Trips (ADT)	791	34	34
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	40	37	50
Calculate Road #1 DNL	50	Reset	

Road # 2 Name: **Citron WB**

Road #2

Vehicle Type	Cars ☑	Medium Trucks ☑	Heavy Trucks ☑
Effective Distance	199	199	199
Distance to Stop Sign			
Average Speed	25	25	25
Average Daily Trips (ADT)	2373	103	103
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	46	42	55
Calculate Road #2 DNL	56	Reset	

Road # 3 Name:	**S King EB**

Road #3

Vehicle Type	**Cars** ☑	**Medium Trucks** ☑	**Heavy Trucks** ☑
Effective Distance	824	824	824
Distance to Stop Sign			
Average Speed	30	30	30
Average Daily Trips (ADT)	25873	1125	1125
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	48	45	56
Calculate Road #3 DNL	57	Reset	

Add Road Source Add Rail Source

Airport Noise Level	
Loud Impulse Sounds?	○Yes ◉No

Combined DNL for all Road and Rail sources	**60**
Combined DNL including Airport	**N/A**
Site DNL with Loud Impulse Sound	

Calculate Reset

Mitigation Options

If your site DNL is in Excess of 65 decibels, your options are:

- **No Action Alternative**: Cancel the project at this location
- **Other Reasonable Alternatives**: Choose an alternate site
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  - **Contact your Field or Regional Environmental Officer (/programs/environmental-review/hud-environmental-staff-contacts/)**
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- **Note #2:** DNL Calculator assumes roadway data is always entered.

DNL Calculator

Site ID	820 Isenberg – NAL#4; Current (2020)
Record Date	05/05/2021
User's Name	D.L. Adams Associates

Road # 1 Name:	**Citron EB**

Road #1

Vehicle Type	Cars ☑	Medium Trucks ☑	Heavy Trucks ☑
Effective Distance	225	225	225
Distance to Stop Sign			
Average Speed	25	25	25
Average Daily Trips (ADT)	607	26	26
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	39	35	48
Calculate Road #1 DNL	49	Reset	

Road # 2 Name: **Citron WB**

Road #2

Vehicle Type	Cars ☑	Medium Trucks ☑	Heavy Trucks ☑
Effective Distance	206	206	206
Distance to Stop Sign			
Average Speed	25	25	25
Average Daily Trips (ADT)	2323	101	101
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	45	42	55
Calculate Road #2 DNL	55	Reset	

Road # 3 Name:	S King EB

Road #3

Vehicle Type	Cars ☑	Medium Trucks ☑	Heavy Trucks ☑
Effective Distance	808	808	808
Distance to Stop Sign			
Average Speed	30	30	30
Average Daily Trips (ADT)	18251	794	794
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	47	43	55
Calculate Road #3 DNL	56	Reset	

Add Road Source Add Rail Source

Airport Noise Level	
Loud Impulse Sounds?	○Yes ◉No
Combined DNL for all Road and Rail sources	**59**
Combined DNL including Airport	**N/A**
Site DNL with Loud Impulse Sound	

Calculate Reset

Mitigation Options

If your site DNL is in Excess of 65 decibels, your options are:

- **No Action Alternative**: Cancel the project at this location
- **Other Reasonable Alternatives**: Choose an alternate site
- **Mitigation**
  - **Contact your Field or Regional Environmental Officer (/programs/environmental-review/hud-environmental-staff-contacts/)**
  - Increase mitigation in the building walls (only effective if no outdoor, noise sensitive areas)
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DNL Calculator

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DNL Calculator

Site ID	820 Isenberg – NAL#4; Pre-Pandemic (2019)
Record Date	05/05/2021
User's Name	D.L. Adams Associates

Road # 1 Name:	**Citron EB**

Road #1

Vehicle Type	Cars ☑	Medium Trucks ☑	Heavy Trucks ☑
Effective Distance	225	225	225
Distance to Stop Sign			
Average Speed	25	25	25
Average Daily Trips (ADT)	708	31	31
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	40	36	49
Calculate Road #1 DNL	50	Reset	

Road # 2 Name:	Citron WB

Road #2

Vehicle Type	Cars ☑	Medium Trucks ☑	Heavy Trucks ☑
Effective Distance	206	206	206
Distance to Stop Sign			
Average Speed	25	25	25
Average Daily Trips (ADT)	2114	92	92
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	45	41	54
Calculate Road #2 DNL	55	Reset	

Road # 3 Name:	S King EB

Road #3

Vehicle Type	**Cars** ☑	**Medium Trucks** ☑	**Heavy Trucks** ☑
Effective Distance	808	808	808
Distance to Stop Sign			
Average Speed	30	30	30
Average Daily Trips (ADT)	22927	997	997
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	48	44	56
Calculate Road #3 DNL	57	Reset	

Add Road Source Add Rail Source

Airport Noise Level	
Loud Impulse Sounds?	○**Yes** ◉**No**

Combined DNL for all Road and Rail sources	**59**
Combined DNL including Airport	**N/A**
Site DNL with Loud Impulse Sound	

Calculate Reset

Mitigation Options

If your site DNL is in Excess of 65 decibels, your options are:

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- **Other Reasonable Alternatives**: Choose an alternate site
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  - **Contact your Field or Regional Environmental Officer (/programs/environmental-review/hud-environmental-staff-contacts/)**
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Tools and Guidance

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DNL Calculator

Site ID	820 Isenberg – NAL#4; 5-year Predicted, No Action (2025)
Record Date	05/05/2021
User's Name	D.L. Adams Associates

Road # 1 Name:	**Citron EB**

Road #1

Vehicle Type	Cars ☑	Medium Trucks ☑	Heavy Trucks ☑
Effective Distance	225	225	225
Distance to Stop Sign			
Average Speed	25	25	25
Average Daily Trips (ADT)	727	32	32
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	40	36	49
Calculate Road #1 DNL	50	Reset	

Road # 2 Name: **Citron WB**

Road #2

Vehicle Type	Cars ☑	Medium Trucks ☑	Heavy Trucks ☑
Effective Distance	206	206	206
Distance to Stop Sign			
Average Speed	25	25	25
Average Daily Trips (ADT)	2161	94	94
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	45	41	54
Calculate Road #2 DNL	55	Reset	

Road # 3 Name:	S King EB

Road #3

Vehicle Type	Cars ☑	Medium Trucks ☑	Heavy Trucks ☑
Effective Distance	808	808	808
Distance to Stop Sign			
Average Speed	30	30	30
Average Daily Trips (ADT)	23606	1026	1026
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	48	44	56
Calculate Road #3 DNL	57	Reset	

Add Road Source | Add Rail Source

Airport Noise Level	
Loud Impulse Sounds?	○Yes ◉No
Combined DNL for all Road and Rail sources	**59**
Combined DNL including Airport	**N/A**
Site DNL with Loud Impulse Sound	

Calculate Reset

Mitigation Options

If your site DNL is in Excess of 65 decibels, your options are:

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DNL Calculator

Site ID	820 Isenberg – NAL#4; 5-year Predicted, With Action (2025)
Record Date	05/05/2021
User's Name	D.L. Adams Associates

Road # 1 Name:	**Citron EB**

Road #1

Vehicle Type	Cars ☑	Medium Trucks ☑	Heavy Trucks ☑
Effective Distance	225	225	225
Distance to Stop Sign			
Average Speed	25	25	25
Average Daily Trips (ADT)	738	32	32
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	40	36	49
Calculate Road #1 DNL	50	Reset	

Road # 2 Name:	Citron WB

Road #2

Vehicle Type	Cars ☑	Medium Trucks ☑	Heavy Trucks ☑
Effective Distance	206	206	206
Distance to Stop Sign			
Average Speed	25	25	25
Average Daily Trips (ADT)	2214	96	96
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	45	41	54
Calculate Road #2 DNL	55	Reset	

Road # 3 Name:	**S King EB**

Road #3

Vehicle Type	**Cars** ☑	**Medium Trucks** ☑	**Heavy Trucks** ☑
Effective Distance	808	808	808
Distance to Stop Sign			
Average Speed	30	30	30
Average Daily Trips (ADT)	24110	1048	1048
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	48	45	56
Calculate Road #3 DNL	57	Reset	

Add Road Source Add Rail Source

Airport Noise Level	
Loud Impulse Sounds?	○**Yes** ◉**No**
Combined DNL for all Road and Rail sources	**60**
Combined DNL including Airport	**N/A**
Site DNL with Loud Impulse Sound	

Calculate Reset

Mitigation Options

If your site DNL is in Excess of 65 decibels, your options are:

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DNL Calculator

Site ID	820 Isenberg – NAL#4; 10-year Predicted, No Action (2035)
Record Date	05/05/2021
User's Name	D.L. Adams Associates

Road # 1 Name:	**Citron EB**

Road #1

Vehicle Type	Cars ☑	Medium Trucks ☑	Heavy Trucks ☑
Effective Distance	225	225	225
Distance to Stop Sign			
Average Speed	25	25	25
Average Daily Trips (ADT)	779	34	34
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	40	36	49
Calculate Road #1 DNL	50	Reset	

Road # 2 Name:	Citron WB

Road #2

Vehicle Type	Cars ☑	Medium Trucks ☑	Heavy Trucks ☑
Effective Distance	206	206	206
Distance to Stop Sign			
Average Speed	25	25	25
Average Daily Trips (ADT)	2319	101	101
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	45	42	55
Calculate Road #2 DNL	55	Reset	

Road # 3 Name:	S King EB

Road #3

Vehicle Type	Cars ☑	Medium Trucks ☑	Heavy Trucks ☑
Effective Distance	808	808	808
Distance to Stop Sign			
Average Speed	30	30	30
Average Daily Trips (ADT)	25334	1101	1101
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	48	45	56
Calculate Road #3 DNL	57	Reset	

Add Road Source | Add Rail Source

Airport Noise Level	
Loud Impulse Sounds?	○Yes ◉No
Combined DNL for all Road and Rail sources	**60**
Combined DNL including Airport	**N/A**
Site DNL with Loud Impulse Sound	

Calculate Reset

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If your site DNL is in Excess of 65 decibels, your options are:

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  - Reconfigure the site plan to increase the distance between the noise source and noise-sensitive uses
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  - Construct noise barrier. See the **Barrier Performance Module (/programs/environmental-review/bpm-calculator/)**

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Day/Night Noise Level Assessment Tool Flowcharts (/resource/3823/day-night-noise-level-assessment-tool-flowcharts/)

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DNL Calculator

The Day/Night Noise Level Calculator is an electronic assessment tool that calculates the Day/Night Noise Level (DNL) from roadway and railway traffic. For more information on using the DNL calculator, view the **Day/Night Noise Level Calculator Electronic Assessment Tool Overview (/programs/environmental-review/daynight-noise-level-electronic-assessment-tool/)**.

Guidelines

- To display the Road and/or Rail DNL calculator(s), click on the "Add Road Source" and/or "Add Rail Source" button(s) below.
- All Road and Rail input values must be positive non-decimal numbers.
- All Road and/or Rail DNL value(s) must be calculated separately before calculating the Site DNL.
- All checkboxes that apply must be checked for vehicles and trains in the tables' headers.
- **Note #1:** Tooltips, containing field specific information, have been added in this tool and may be accessed by hovering over all the respective data fields (site identification, roadway and railway assessment, DNL calculation results, roadway and railway input variables) with the mouse.
- **Note #2:** DNL Calculator assumes roadway data is always entered.

DNL Calculator

Site ID	820 Isenberg – NAL#4; 10-year Predicted, With Action (2035)
Record Date	05/05/2021
User's Name	D.L. Adams Associates

Road # 1 Name:	**Citron EB**

Road #1

Vehicle Type	Cars ☑	Medium Trucks ☑	Heavy Trucks ☑
Effective Distance	225	225	225
Distance to Stop Sign			
Average Speed	25	25	25
Average Daily Trips (ADT)	791	34	34
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	40	36	49
Calculate Road #1 DNL	50	Reset	

Road # 2 Name:	Citron WB

Road #2

Vehicle Type	Cars ☑	Medium Trucks ☑	Heavy Trucks ☑
Effective Distance	206	206	206
Distance to Stop Sign			
Average Speed	25	25	25
Average Daily Trips (ADT)	2373	103	103
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	45	42	55
Calculate Road #2 DNL	55	Reset	

Road # 3 Name:	**S King EB**

Road #3

Vehicle Type	**Cars** ☑	**Medium Trucks** ☑	**Heavy Trucks** ☑
Effective Distance	808	808	808
Distance to Stop Sign			
Average Speed	30	30	30
Average Daily Trips (ADT)	25873	1125	1125
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	48	45	56
Calculate Road #3 DNL	57	Reset	

Add Road Source | Add Rail Source

Airport Noise Level	
Loud Impulse Sounds?	○Yes ◉No
Combined DNL for all Road and Rail sources	**60**
Combined DNL including Airport	**N/A**
Site DNL with Loud Impulse Sound	

Calculate Reset

Mitigation Options

If your site DNL is in Excess of 65 decibels, your options are:

- **No Action Alternative**: Cancel the project at this location
- **Other Reasonable Alternatives**: Choose an alternate site
- **Mitigation**
  - **Contact your Field or Regional Environmental Officer (/programs/environmental-review/hud-environmental-staff-contacts/)**
  - Increase mitigation in the building walls (only effective if no outdoor, noise sensitive areas)
  - Reconfigure the site plan to increase the distance between the noise source and noise-sensitive uses
  - Incorporate natural or man-made barriers. See ***The Noise Guidebook (/resource/313/hud-noise-guidebook/)***
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- **Note #2:** DNL Calculator assumes roadway data is always entered.

DNL Calculator

Site ID	820 Isenberg – NAL#5; Current (2020)
Record Date	05/05/2021
User's Name	D.L. Adams Associates

Road # 1 Name:	**Citron EB**

Road #1

Vehicle Type	Cars ☑	Medium Trucks ☑	Heavy Trucks ☑
Effective Distance	232	232	232
Distance to Stop Sign			
Average Speed	25	25	25
Average Daily Trips (ADT)	607	26	26
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	39	35	48
Calculate Road #1 DNL	49	Reset	

Road # 2 Name:	**Citron WB**

Road #2

Vehicle Type	Cars ☑	Medium Trucks ☑	Heavy Trucks ☑
Effective Distance	214	214	214
Distance to Stop Sign			
Average Speed	25	25	25
Average Daily Trips (ADT)	2323	101	101
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	45	41	54
Calculate Road #2 DNL	55	Reset	

Road # 3 Name:	S King EB

Road #3

Vehicle Type	Cars ☑	Medium Trucks ☑	Heavy Trucks ☑
Effective Distance	800	800	800
Distance to Stop Sign			
Average Speed	30	30	30
Average Daily Trips (ADT)	18251	794	794
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	47	43	55
Calculate Road #3 DNL	56	Reset	

Add Road Source | Add Rail Source

Airport Noise Level	
Loud Impulse Sounds?	○Yes ◉No

Combined DNL for all Road and Rail sources	**59**
Combined DNL including Airport	**N/A**
Site DNL with Loud Impulse Sound	

Calculate Reset

Mitigation Options

If your site DNL is in Excess of 65 decibels, your options are:

- **No Action Alternative**: Cancel the project at this location
- **Other Reasonable Alternatives**: Choose an alternate site
- **Mitigation**
  - **Contact your Field or Regional Environmental Officer (/programs/environmental-review/hud-environmental-staff-contacts/)**
  - Increase mitigation in the building walls (only effective if no outdoor, noise sensitive areas)
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DNL Calculator

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- All checkboxes that apply must be checked for vehicles and trains in the tables' headers.
- **Note #1:** Tooltips, containing field specific information, have been added in this tool and may be accessed by hovering over all the respective data fields (site identification, roadway and railway assessment, DNL calculation results, roadway and railway input variables) with the mouse.
- **Note #2:** DNL Calculator assumes roadway data is always entered.

DNL Calculator

Site ID	820 Isenberg – NAL#5; Pre-Pandemic (2019)
Record Date	05/05/2021
User's Name	D.L. Adams Associates

Road # 1 Name:	**Citron EB**

Road #1

Vehicle Type	Cars ☑	Medium Trucks ☑	Heavy Trucks ☑
Effective Distance	232	232	232
Distance to Stop Sign			
Average Speed	25	25	25
Average Daily Trips (ADT)	708	31	31
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	39	36	49
Calculate Road #1 DNL	49	Reset	

Road # 2 Name:	Citron WB

Road #2

Vehicle Type	Cars ☑	Medium Trucks ☑	Heavy Trucks ☑
Effective Distance	214	214	214
Distance to Stop Sign			
Average Speed	25	25	25
Average Daily Trips (ADT)	2114	92	92
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	45	41	54
Calculate Road #2 DNL	55	Reset	

Road # 3 Name:	S King EB

Road #3

Vehicle Type	Cars ☑	Medium Trucks ☑	Heavy Trucks ☑
Effective Distance	800	800	800
Distance to Stop Sign			
Average Speed	30	30	30
Average Daily Trips (ADT)	22927	997	997
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	48	44	56
Calculate Road #3 DNL	57	Reset	

Add Road Source Add Rail Source

Airport Noise Level	
Loud Impulse Sounds?	○Yes ◉No
Combined DNL for all Road and Rail sources	**59**
Combined DNL including Airport	**N/A**
Site DNL with Loud Impulse Sound	

Calculate Reset

Mitigation Options

If your site DNL is in Excess of 65 decibels, your options are:

- **No Action Alternative**: Cancel the project at this location
- **Other Reasonable Alternatives**: Choose an alternate site
- **Mitigation**
  - **Contact your Field or Regional Environmental Officer (/programs/environmental-review/hud-environmental-staff-contacts/)**
  - Increase mitigation in the building walls (only effective if no outdoor, noise sensitive areas)
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DNL Calculator

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DNL Calculator

Site ID	820 Isenberg – NAL#5; 5-year Predicted, No Action (2025)
Record Date	05/05/2021
User's Name	D.L. Adams Associates

Road # 1 Name:	**Citron EB**

Road #1

Vehicle Type	Cars ☑	Medium Trucks ☑	Heavy Trucks ☑
Effective Distance	232	232	232
Distance to Stop Sign			
Average Speed	25	25	25
Average Daily Trips (ADT)	727	32	32
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	40	36	49
Calculate Road #1 DNL	50	Reset	

Road # 2 Name: **Citron WB**

Road #2

Vehicle Type	Cars ☑	Medium Trucks ☑	Heavy Trucks ☑
Effective Distance	214	214	214
Distance to Stop Sign			
Average Speed	25	25	25
Average Daily Trips (ADT)	2161	94	94
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	45	41	54
Calculate Road #2 DNL	55	Reset	

Road # 3 Name:	**S King EB**

Road #3

Vehicle Type	**Cars** ☑	**Medium Trucks** ☑	**Heavy Trucks** ☑
Effective Distance	800	800	800
Distance to Stop Sign			
Average Speed	30	30	30
Average Daily Trips (ADT)	23606	1026	1026
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	48	45	56
Calculate Road #3 DNL	57	Reset	

Add Road Source | Add Rail Source

Airport Noise Level	
Loud Impulse Sounds?	○Yes ◉No

Combined DNL for all Road and Rail sources	**59**
Combined DNL including Airport	**N/A**
Site DNL with Loud Impulse Sound	

Calculate Reset

Mitigation Options

If your site DNL is in Excess of 65 decibels, your options are:

- **No Action Alternative**: Cancel the project at this location
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- **Mitigation**
  - **Contact your Field or Regional Environmental Officer (/programs/environmental-review/hud-environmental-staff-contacts/)**
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DNL Calculator

Site ID	820 Isenberg – NAL#5; 5-year Predicted, With Action (2025)
Record Date	05/05/2021
User's Name	D.L. Adams Associates

Road # 1 Name:	**Citron EB**

Road #1

Vehicle Type	Cars ☑	Medium Trucks ☑	Heavy Trucks ☑
Effective Distance	232	232	232
Distance to Stop Sign			
Average Speed	25	25	25
Average Daily Trips (ADT)	738	32	32
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	40	36	49
Calculate Road #1 DNL	50	Reset	

Road # 2 Name:	Citron WB

Road #2

Vehicle Type	Cars ☑	Medium Trucks ☑	Heavy Trucks ☑
Effective Distance	214	214	214
Distance to Stop Sign			
Average Speed	25	25	25
Average Daily Trips (ADT)	2214	96	96
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	45	41	54
Calculate Road #2 DNL	55	Reset	

Road # 3 Name:	**S King EB**

Road #3

Vehicle Type	**Cars** ☑	**Medium Trucks** ☑	**Heavy Trucks** ☑
Effective Distance	800	800	800
Distance to Stop Sign			
Average Speed	30	30	30
Average Daily Trips (ADT)	24110	1048	1048
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	48	45	56
Calculate Road #3 DNL	57	Reset	

Add Road Source Add Rail Source

Airport Noise Level	
Loud Impulse Sounds?	○**Yes** ◉**No**

Combined DNL for all Road and Rail sources	**59**
Combined DNL including Airport	**N/A**
Site DNL with Loud Impulse Sound	

Calculate Reset

Mitigation Options

If your site DNL is in Excess of 65 decibels, your options are:

- **No Action Alternative**: Cancel the project at this location
- **Other Reasonable Alternatives**: Choose an alternate site
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  - **Contact your Field or Regional Environmental Officer (/programs/environmental-review/hud-environmental-staff-contacts/)**
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DNL Calculator

Site ID	820 Isenberg – NAL#5; 10-year Predicted, No Action (2035)
Record Date	05/05/2021
User's Name	D.L. Adams Associates

Road # 1 Name:	**Citron EB**

Road #1

Vehicle Type	Cars ☑	Medium Trucks ☑	Heavy Trucks ☑
Effective Distance	232	232	232
Distance to Stop Sign			
Average Speed	25	25	25
Average Daily Trips (ADT)	779	34	34
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	40	36	49
Calculate Road #1 DNL	50	Reset	

Road # 2 Name:	Citron WB

Road #2

Vehicle Type	Cars ☑	Medium Trucks ☑	Heavy Trucks ☑
Effective Distance	214	214	214
Distance to Stop Sign			
Average Speed	25	25	25
Average Daily Trips (ADT)	2319	101	101
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	45	41	54
Calculate Road #2 DNL	55	Reset	

Road # 3 Name:	S King EB

Road #3

Vehicle Type	Cars ☑	Medium Trucks ☑	Heavy Trucks ☑
Effective Distance	800	800	800
Distance to Stop Sign			
Average Speed	30	30	30
Average Daily Trips (ADT)	25334	1101	1101
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	48	45	56
Calculate Road #3 DNL	57	Reset	

Add Road Source Add Rail Source

Airport Noise Level	
Loud Impulse Sounds?	○Yes ◉No
Combined DNL for all Road and Rail sources	**60**
Combined DNL including Airport	**N/A**
Site DNL with Loud Impulse Sound	

Calculate Reset

Mitigation Options

If your site DNL is in Excess of 65 decibels, your options are:

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- **Mitigation**
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Tools and Guidance

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DNL Calculator

Site ID	820 Isenberg – NAL#5; 10-year Predicted, With Action (2035)
Record Date	05/05/2021
User's Name	D.L. Adams Associates

Road # 1 Name:	**Citron EB**

Road #1

Vehicle Type	Cars ☑	Medium Trucks ☑	Heavy Trucks ☑
Effective Distance	232	232	232
Distance to Stop Sign			
Average Speed	25	25	25
Average Daily Trips (ADT)	791	34	34
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	40	36	49
Calculate Road #1 DNL	50	Reset	

Road # 2 Name:	**Citron WB**

Road #2

Vehicle Type	Cars ☑	Medium Trucks ☑	Heavy Trucks ☑
Effective Distance	214	214	214
Distance to Stop Sign			
Average Speed	25	25	25
Average Daily Trips (ADT)	2373	103	103
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	45	42	54
Calculate Road #2 DNL	55	Reset	

Road # 3 Name:	S King EB

Road #3

Vehicle Type	Cars ☑	Medium Trucks ☑	Heavy Trucks ☑
Effective Distance	800	800	800
Distance to Stop Sign			
Average Speed	30	30	30
Average Daily Trips (ADT)	25873	1125	1125
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	49	45	56
Calculate Road #3 DNL	57	Reset	

Add Road Source Add Rail Source

Airport Noise Level	
Loud Impulse Sounds?	○Yes ◉No
Combined DNL for all Road and Rail sources	**60**
Combined DNL including Airport	**N/A**
Site DNL with Loud Impulse Sound	

Calculate Reset

Mitigation Options

If your site DNL is in Excess of 65 decibels, your options are:

- **No Action Alternative**: Cancel the project at this location
- **Other Reasonable Alternatives**: Choose an alternate site
- **Mitigation**
  - **Contact your Field or Regional Environmental Officer (/programs/environmental-review/hud-environmental-staff-contacts/)**
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DNL Calculator

The Day/Night Noise Level Calculator is an electronic assessment tool that calculates the Day/Night Noise Level (DNL) from roadway and railway traffic. For more information on using the DNL calculator, view the **Day/Night Noise Level Calculator Electronic Assessment Tool Overview (/programs/environmental-review/daynight-noise-level-electronic-assessment-tool/)**.

Guidelines

- To display the Road and/or Rail DNL calculator(s), click on the "Add Road Source" and/or "Add Rail Source" button(s) below.
- All Road and Rail input values must be positive non-decimal numbers.
- All Road and/or Rail DNL value(s) must be calculated separately before calculating the Site DNL.
- All checkboxes that apply must be checked for vehicles and trains in the tables' headers.
- **Note #1:** Tooltips, containing field specific information, have been added in this tool and may be accessed by hovering over all the respective data fields (site identification, roadway and railway assessment, DNL calculation results, roadway and railway input variables) with the mouse.
- **Note #2:** DNL Calculator assumes roadway data is always entered.

DNL Calculator

Site ID	820 Isenberg – NAL#6; Current (2020)
Record Date	05/05/2021
User's Name	D.L. Adams Associates

Road # 1 Name:	**Isenberg NB**

Road #1

Vehicle Type	Cars ☑	Medium Trucks ☑	Heavy Trucks ☑
Effective Distance	266	266	266
Distance to Stop Sign			
Average Speed	25	25	25
Average Daily Trips (ADT)	1809	79	79
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	43	39	52
Calculate Road #1 DNL	53	Reset	

Road # 2 Name: **Isenberg SB**

Road #2

Vehicle Type	Cars ☑	Medium Trucks ☑	Heavy Trucks ☑
Effective Distance	282	282	282
Distance to Stop Sign			
Average Speed	25	25	25
Average Daily Trips (ADT)	3612	157	157
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	45	42	55
Calculate Road #2 DNL	55	Reset	

Road # 3 Name:	S King EB

Road #3

Vehicle Type	Cars ☑	Medium Trucks ☑	Heavy Trucks ☑
Effective Distance	765	765	765
Distance to Stop Sign			
Average Speed	30	30	30
Average Daily Trips (ADT)	18251	794	794
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	47	44	55
Calculate Road #3 DNL	56	Reset	

Road # 4 Name:	Citron EB

Road #4

Vehicle Type	Cars ☑	Medium Trucks ☑	Heavy Trucks ☑
Effective Distance	286	286	286
Distance to Stop Sign			
Average Speed	25	25	25
Average Daily Trips (ADT)	607	26	26
Night Fraction of ADT	15	15	15

Road Gradient (%)			1
Vehicle DNL	37	34	47
Calculate Road #4 DNL	47	Reset	

Road # 5 Name:	**Citron WB**

Road #5

Vehicle Type	**Cars** ☑	**Medium Trucks** ☑	**Heavy Trucks** ☑
Effective Distance	267	267	267
Distance to Stop Sign			
Average Speed	25	25	25
Average Daily Trips (ADT)	2323	101	101
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	44	40	53
Calculate Road #5 DNL	54	Reset	

Add Road Source | Add Rail Source

Airport Noise Level	
Loud Impulse Sounds?	○ **Yes** ◉ **No**

Combined DNL for all Road and Rail sources	**61**
Combined DNL including Airport	**N/A**
Site DNL with Loud Impulse Sound	

Calculate Reset

Mitigation Options

If your site DNL is in Excess of 65 decibels, your options are:

- **No Action Alternative**: Cancel the project at this location
- **Other Reasonable Alternatives**: Choose an alternate site
- **Mitigation**
    - **Contact your Field or Regional Environmental Officer (/programs/environmental-review/hud-environmental-staff-contacts/)**
    - Increase mitigation in the building walls (only effective if no outdoor, noise sensitive areas)
    - Reconfigure the site plan to increase the distance between the noise source and noise-sensitive uses
    - Incorporate natural or man-made barriers. See ***The Noise Guidebook (/resource/313/hud-noise-guidebook/)***
    - Construct noise barrier. See the **Barrier Performance Module (/programs/environmental-review/bpm-calculator/)**

Tools and Guidance

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Day/Night Noise Level Assessment Tool Flowcharts (/resource/3823/day-night-noise-level-assessment-tool-flowcharts/)

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- **Note #2:** DNL Calculator assumes roadway data is always entered.

DNL Calculator

Site ID	820 Isenberg – NAL#6; Pre-Pandemic (2019)
Record Date	05/05/2021
User's Name	D.L. Adams Associates

Road # 1 Name:	**Isenberg NB**

Road #1

Vehicle Type	Cars ☑	Medium Trucks ☑	Heavy Trucks ☑
Effective Distance	266	266	266
Distance to Stop Sign			
Average Speed	25	25	25
Average Daily Trips (ADT)	3808	166	166
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	46	42	55
Calculate Road #1 DNL	56	Reset	

Road # 2 Name: **Isenberg SB**

Road #2

Vehicle Type	Cars ☑	Medium Trucks ☑	Heavy Trucks ☑
Effective Distance	282	282	282
Distance to Stop Sign			
Average Speed	25	25	25
Average Daily Trips (ADT)	5242	228	228
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	47	43	56
Calculate Road #2 DNL	57	Reset	

Road # 3 Name:	S King EB

Road #3

Vehicle Type	Cars ☑	Medium Trucks ☑	Heavy Trucks ☑
Effective Distance	765	765	765
Distance to Stop Sign			
Average Speed	30	30	30
Average Daily Trips (ADT)	22927	997	997
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	48	45	56
Calculate Road #3 DNL	57	Reset	

Road # 4 Name:	Citron EB

Road #4

Vehicle Type	Cars ☑	Medium Trucks ☑	Heavy Trucks ☑
Effective Distance	286	286	286
Distance to Stop Sign			
Average Speed	25	25	25
Average Daily Trips (ADT)	708	31	31
Night Fraction of ADT	15	15	15

Road Gradient (%)			1
Vehicle DNL	38	34	47
Calculate Road #4 DNL	48	Reset	

Road # 5 Name:	**Citron WB**

Road #5

Vehicle Type	**Cars** ☑	**Medium Trucks** ☑	**Heavy Trucks** ☑
Effective Distance	267	267	267
Distance to Stop Sign			
Average Speed	25	25	25
Average Daily Trips (ADT)	2114	92	92
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	43	40	53
Calculate Road #5 DNL	53	Reset	

Add Road Source | Add Rail Source

Airport Noise Level	
Loud Impulse Sounds?	○**Yes** ◉**No**

Combined DNL for all Road and Rail sources	**62**
Combined DNL including Airport	**N/A**
Site DNL with Loud Impulse Sound	

Calculate Reset

Mitigation Options

If your site DNL is in Excess of 65 decibels, your options are:

- **No Action Alternative**: Cancel the project at this location
- **Other Reasonable Alternatives**: Choose an alternate site
- **Mitigation**
  - **Contact your Field or Regional Environmental Officer (/programs/environmental-review/hud-environmental-staff-contacts/)**
  - Increase mitigation in the building walls (only effective if no outdoor, noise sensitive areas)
  - Reconfigure the site plan to increase the distance between the noise source and noise-sensitive uses
  - Incorporate natural or man-made barriers. See ***The Noise Guidebook (/resource/313/hud-noise-guidebook/)***
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Tools and Guidance

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Day/Night Noise Level Assessment Tool Flowcharts (/resource/3823/day-night-noise-level-assessment-tool-flowcharts/)

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DNL Calculator

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Guidelines

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- **Note #2:** DNL Calculator assumes roadway data is always entered.

DNL Calculator

Site ID	820 Isenberg – NAL#6; 5-year Predicted, No Action (2025)
Record Date	05/05/2021
User's Name	D.L. Adams Associates

Road # 1 Name:	**Isenberg NB**

Road #1

Vehicle Type	Cars ☑	Medium Trucks ☑	Heavy Trucks ☑
Effective Distance	266	266	266
Distance to Stop Sign			
Average Speed	25	25	25
Average Daily Trips (ADT)	3937	171	171
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	46	42	55
Calculate Road #1 DNL	56	Reset	

Road # 2 Name: **Isenberg SB**

Road #2

Vehicle Type	Cars ☑	Medium Trucks ☑	Heavy Trucks ☑
Effective Distance	282	282	282
Distance to Stop Sign			
Average Speed	25	25	25
Average Daily Trips (ADT)	5342	232	232
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	47	43	56
Calculate Road #2 DNL	57	Reset	

Road # 3 Name:	**S King EB**

Road #3

Vehicle Type	**Cars** ☑	**Medium Trucks** ☑	**Heavy Trucks** ☑
Effective Distance	765	765	765
Distance to Stop Sign			
Average Speed	30	30	30
Average Daily Trips (ADT)	23606	1026	1026
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	48	45	56
Calculate Road #3 DNL	57	Reset	

Road # 4 Name:	**Citron EB**

Road #4

Vehicle Type	**Cars** ☑	**Medium Trucks** ☑	**Heavy Trucks** ☑
Effective Distance	286	286	286
Distance to Stop Sign			
Average Speed	25	25	25
Average Daily Trips (ADT)	727	32	32
Night Fraction of ADT	15	15	15

Road Gradient (%)			1
Vehicle DNL	38	35	48
Calculate Road #4 DNL	48	Reset	

Road # 5 Name: **Citron WB**

Road #5

Vehicle Type	Cars ☑	Medium Trucks ☑	Heavy Trucks ☑
Effective Distance	267	267	267
Distance to Stop Sign			
Average Speed	25	25	25
Average Daily Trips (ADT)	2161	94	94
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	43	40	53
Calculate Road #5 DNL	53	Reset	

Add Road Source Add Rail Source

Airport Noise Level	
Loud Impulse Sounds?	○ **Yes** ◉ **No**

Combined DNL for all Road and Rail sources	**62**
Combined DNL including Airport	**N/A**
Site DNL with Loud Impulse Sound	

Calculate Reset

Mitigation Options

If your site DNL is in Excess of 65 decibels, your options are:

- **No Action Alternative**: Cancel the project at this location
- **Other Reasonable Alternatives**: Choose an alternate site
- **Mitigation**
  - **Contact your Field or Regional Environmental Officer (/programs/environmental-review/hud-environmental-staff-contacts/)**
  - Increase mitigation in the building walls (only effective if no outdoor, noise sensitive areas)
  - Reconfigure the site plan to increase the distance between the noise source and noise-sensitive uses
  - Incorporate natural or man-made barriers. See ***The Noise Guidebook (/resource/313/hud-noise-guidebook/)***
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Tools and Guidance

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Day/Night Noise Level Assessment Tool Flowcharts (/resource/3823/day-night-noise-level-assessment-tool-flowcharts/)

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DNL Calculator

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- **Note #2:** DNL Calculator assumes roadway data is always entered.

DNL Calculator

Site ID	820 Isenberg – NAL#6; 5-year Predicted, With Action (2025)
Record Date	05/05/2021
User's Name	D.L. Adams Associates

Road # 1 Name:	**Isenberg NB**

Road #1

Vehicle Type	Cars ☑	Medium Trucks ☑	Heavy Trucks ☑
Effective Distance	266	266	266
Distance to Stop Sign			
Average Speed	25	25	25
Average Daily Trips (ADT)	3954	172	172
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	46	42	55
Calculate Road #1 DNL	56	Reset	

Road # 2 Name:	Isenberg SB

Road #2

Vehicle Type	Cars ☑	Medium Trucks ☑	Heavy Trucks ☑
Effective Distance	282	282	282
Distance to Stop Sign			
Average Speed	25	25	25
Average Daily Trips (ADT)	5835	254	254
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	47	44	57
Calculate Road #2 DNL	57	Reset	

Road # 3 Name:	S King EB

Road #3

Vehicle Type	Cars ☑	Medium Trucks ☑	Heavy Trucks ☑
Effective Distance	765	765	765
Distance to Stop Sign			
Average Speed	30	30	30
Average Daily Trips (ADT)	24110	1048	1048
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	49	45	56
Calculate Road #3 DNL	57	Reset	

Road # 4 Name:	Citron EB

Road #4

Vehicle Type	Cars ☑	Medium Trucks ☑	Heavy Trucks ☑
Effective Distance	286	286	286
Distance to Stop Sign			
Average Speed	25	25	25
Average Daily Trips (ADT)	738	32	32
Night Fraction of ADT	15	15	15

Road Gradient (%)			1
Vehicle DNL	38	35	48
Calculate Road #4 DNL	48	Reset	

Road # 5 Name: **Citron WB**

Road #5

Vehicle Type	**Cars** ☑	**Medium Trucks** ☑	**Heavy Trucks** ☑
Effective Distance	267	267	267
Distance to Stop Sign			
Average Speed	25	25	25
Average Daily Trips (ADT)	2214	96	96
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	43	40	53
Calculate Road #5 DNL	53	Reset	

Add Road Source | Add Rail Source

Airport Noise Level	
Loud Impulse Sounds?	○ **Yes** ◉ **No**

Combined DNL for all Road and Rail sources	**62**
Combined DNL including Airport	**N/A**
Site DNL with Loud Impulse Sound	

Calculate Reset

Mitigation Options

If your site DNL is in Excess of 65 decibels, your options are:

- **No Action Alternative**: Cancel the project at this location
- **Other Reasonable Alternatives**: Choose an alternate site
- **Mitigation**
  - **Contact your Field or Regional Environmental Officer (/programs/environmental-review/hud-environmental-staff-contacts/)**
  - Increase mitigation in the building walls (only effective if no outdoor, noise sensitive areas)
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  - Incorporate natural or man-made barriers. See ***The Noise Guidebook (/resource/313/hud-noise-guidebook/)***
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Tools and Guidance

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DNL Calculator

Site ID	820 Isenberg – NAL#6; 10-year Predicted, No Action (2035)
Record Date	05/05/2021
User's Name	D.L. Adams Associates

Road # 1 Name:	**Isenberg NB**

Road #1

Vehicle Type	Cars ☑	Medium Trucks ☑	Heavy Trucks ☑
Effective Distance	266	266	266
Distance to Stop Sign			
Average Speed	25	25	25
Average Daily Trips (ADT)	4224	184	184
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	46	43	56
Calculate Road #1 DNL	56	Reset	

Road # 2 Name: **Isenberg SB**

Road #2

Vehicle Type	Cars ☑	Medium Trucks ☑	Heavy Trucks ☑
Effective Distance	282	282	282
Distance to Stop Sign			
Average Speed	25	25	25
Average Daily Trips (ADT)	5729	249	249
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	47	44	57
Calculate Road #2 DNL	57	Reset	

Road # 3 Name:	S King EB

Road #3

Vehicle Type	Cars ☑	Medium Trucks ☑	Heavy Trucks ☑
Effective Distance	765	765	765
Distance to Stop Sign			
Average Speed	30	30	30
Average Daily Trips (ADT)	25334	1101	1101
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	49	45	56
Calculate Road #3 DNL	57	Reset	

Road # 4 Name:	Citron EB

Road #4

Vehicle Type	Cars ☑	Medium Trucks ☑	Heavy Trucks ☑
Effective Distance	286	286	286
Distance to Stop Sign			
Average Speed	25	25	25
Average Daily Trips (ADT)	779	34	34
Night Fraction of ADT	15	15	15

Road Gradient (%)			1
Vehicle DNL	38	35	48
Calculate Road #4 DNL	48	Reset	

Road # 5 Name:	**Citron WB**

Road #5

Vehicle Type	**Cars** ☑	**Medium Trucks** ☑	**Heavy Trucks** ☑
Effective Distance	267	267	267
Distance to Stop Sign			
Average Speed	25	25	25
Average Daily Trips (ADT)	2319	101	101
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	44	40	53
Calculate Road #5 DNL	54	Reset	

Add Road Source Add Rail Source

Airport Noise Level	
Loud Impulse Sounds?	○**Yes** ◉**No**

Combined DNL for all Road and Rail sources	**63**
Combined DNL including Airport	**N/A**
Site DNL with Loud Impulse Sound	

Calculate Reset

Mitigation Options

If your site DNL is in Excess of 65 decibels, your options are:

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  - **Contact your Field or Regional Environmental Officer (/programs/environmental-review/hud-environmental-staff-contacts/)**
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- **Note #2:** DNL Calculator assumes roadway data is always entered.

DNL Calculator

Site ID	820 Isenberg – NAL#6; 10-year Predicted, With Action (2035)
Record Date	05/05/2021
User's Name	D.L. Adams Associates

Road # 1 Name:	**Isenberg NB**

Road #1

Vehicle Type	Cars ☑	Medium Trucks ☑	Heavy Trucks ☑
Effective Distance	266	266	266
Distance to Stop Sign			
Average Speed	25	25	25
Average Daily Trips (ADT)	4247	185	185
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	46	43	56
Calculate Road #1 DNL	56	Reset	

Road # 2 Name:	Isenberg SB

Road #2

Vehicle Type	Cars ☑	Medium Trucks ☑	Heavy Trucks ☑
Effective Distance	282	282	282
Distance to Stop Sign			
Average Speed	25	25	25
Average Daily Trips (ADT)	6256	272	272
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	48	44	57
Calculate Road #2 DNL	58	Reset	

Road # 3 Name:	S King EB

Road #3

Vehicle Type	Cars ☑	Medium Trucks ☑	Heavy Trucks ☑
Effective Distance	765	765	765
Distance to Stop Sign			
Average Speed	30	30	30
Average Daily Trips (ADT)	25873	1125	1125
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	49	45	57
Calculate Road #3 DNL	58	Reset	

Road # 4 Name:	Citron EB

Road #4

Vehicle Type	Cars ☑	Medium Trucks ☑	Heavy Trucks ☑
Effective Distance	286	286	286
Distance to Stop Sign			
Average Speed	25	25	25
Average Daily Trips (ADT)	791	34	34
Night Fraction of ADT	15	15	15

Road Gradient (%)			1
Vehicle DNL	39	35	48
Calculate Road #4 DNL	48	Reset	

Road # 5 Name:	**Citron WB**

Road #5

Vehicle Type	**Cars** ☑	**Medium Trucks** ☑	**Heavy Trucks** ☑
Effective Distance	267	267	267
Distance to Stop Sign			
Average Speed	25	25	25
Average Daily Trips (ADT)	2373	103	103
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	44	40	53
Calculate Road #5 DNL	54	Reset	

Add Road Source Add Rail Source

Airport Noise Level	
Loud Impulse Sounds?	○**Yes** ◉**No**

Combined DNL for all Road and Rail sources	**63**
Combined DNL including Airport	**N/A**
Site DNL with Loud Impulse Sound	

Calculate Reset

Mitigation Options

If your site DNL is in Excess of 65 decibels, your options are:

- **No Action Alternative**: Cancel the project at this location
- **Other Reasonable Alternatives**: Choose an alternate site
- **Mitigation**
  - **Contact your Field or Regional Environmental Officer (/programs/environmental-review/hud-environmental-staff-contacts/)**
  - Increase mitigation in the building walls (only effective if no outdoor, noise sensitive areas)
  - Reconfigure the site plan to increase the distance between the noise source and noise-sensitive uses
  - Incorporate natural or man-made barriers. See ***The Noise Guidebook (/resource/313/hud-noise-guidebook/)***
  - Construct noise barrier. See the **Barrier Performance Module (/programs/environmental-review/bpm-calculator/)**

Tools and Guidance

Day/Night Noise Level Assessment Tool User Guide (/resource/3822/day-night-noise-level-assessment-tool-user-guide/)

Day/Night Noise Level Assessment Tool Flowcharts (/resource/3823/day-night-noise-level-assessment-tool-flowcharts/)

Home (/) > **Programs (/programs/)** > **Environmental Review (/programs/environmental-review/)** > DNL Calculator

DNL Calculator

The Day/Night Noise Level Calculator is an electronic assessment tool that calculates the Day/Night Noise Level (DNL) from roadway and railway traffic. For more information on using the DNL calculator, view the **Day/Night Noise Level Calculator Electronic Assessment Tool Overview (/programs/environmental-review/daynight-noise-level-electronic-assessment-tool/)**.

Guidelines

- To display the Road and/or Rail DNL calculator(s), click on the "Add Road Source" and/or "Add Rail Source" button(s) below.
- All Road and Rail input values must be positive non-decimal numbers.
- All Road and/or Rail DNL value(s) must be calculated separately before calculating the Site DNL.
- All checkboxes that apply must be checked for vehicles and trains in the tables' headers.
- **Note #1:** Tooltips, containing field specific information, have been added in this tool and may be accessed by hovering over all the respective data fields (site identification, roadway and railway assessment, DNL calculation results, roadway and railway input variables) with the mouse.
- **Note #2:** DNL Calculator assumes roadway data is always entered.

DNL Calculator

Site ID	820 Isenberg – NAL#7; Current (2020)
Record Date	05/05/2021
User's Name	D.L. Adams Associates

Road # 1 Name:	**Isenberg NB**

Road #1

Vehicle Type	Cars ☑	Medium Trucks ☑	Heavy Trucks ☑
Effective Distance	266	266	266
Distance to Stop Sign			
Average Speed	25	25	25
Average Daily Trips (ADT)	1809	79	79
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	43	39	52
Calculate Road #1 DNL	53	Reset	

Road # 2 Name:	Isenberg SB

Road #2

Vehicle Type	Cars ☑	Medium Trucks ☑	Heavy Trucks ☑
Effective Distance	282	282	282
Distance to Stop Sign			
Average Speed	25	25	25
Average Daily Trips (ADT)	3612	157	157
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	48	44	57
Calculate Road #2 DNL	58	Reset	

Road # 3 Name:	S King EB

Road #3

Vehicle Type	Cars ☑	Medium Trucks ☑	Heavy Trucks ☑
Effective Distance	700	700	700
Distance to Stop Sign			
Average Speed	30	30	30
Average Daily Trips (ADT)	18251	794	794
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	48	44	56
Calculate Road #3 DNL	57	Reset	

Road # 4 Name:	Citron EB

Road #4

Vehicle Type	Cars ☑	Medium Trucks ☑	Heavy Trucks ☑
Effective Distance	347	347	347
Distance to Stop Sign			
Average Speed	25	25	25
Average Daily Trips (ADT)	607	26	26
Night Fraction of ADT	15	15	15

Road Gradient (%)			1
Vehicle DNL	36	32	45
Calculate Road #4 DNL	46	Reset	

Road # 5 Name:	**Citron WB**

Road #5

Vehicle Type	**Cars** ☑	**Medium Trucks** ☑	**Heavy Trucks** ☑
Effective Distance	327	327	327
Distance to Stop Sign			
Average Speed	25	25	25
Average Daily Trips (ADT)	2323	101	101
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	42	39	52
Calculate Road #5 DNL	52	Reset	

Add Road Source | Add Rail Source

Airport Noise Level	
Loud Impulse Sounds?	○ **Yes** ◉ **No**

Combined DNL for all Road and Rail sources	**62**
Combined DNL including Airport	**N/A**
Site DNL with Loud Impulse Sound	

Calculate Reset

Mitigation Options

If your site DNL is in Excess of 65 decibels, your options are:

- **No Action Alternative**: Cancel the project at this location
- **Other Reasonable Alternatives**: Choose an alternate site
- **Mitigation**
  - **Contact your Field or Regional Environmental Officer (/programs/environmental-review/hud-environmental-staff-contacts/)**
  - Increase mitigation in the building walls (only effective if no outdoor, noise sensitive areas)
  - Reconfigure the site plan to increase the distance between the noise source and noise-sensitive uses
  - Incorporate natural or man-made barriers. See ***The Noise Guidebook (/resource/313/hud-noise-guidebook/)***
  - Construct noise barrier. See the **Barrier Performance Module (/programs/environmental-review/bpm-calculator/)**

Tools and Guidance

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Day/Night Noise Level Assessment Tool Flowcharts (/resource/3823/day-night-noise-level-assessment-tool-flowcharts/)

Home (/) > **Programs (/programs/)** > **Environmental Review (/programs/environmental-review/)** > DNL Calculator

DNL Calculator

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Guidelines

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- All checkboxes that apply must be checked for vehicles and trains in the tables' headers.
- **Note #1:** Tooltips, containing field specific information, have been added in this tool and may be accessed by hovering over all the respective data fields (site identification, roadway and railway assessment, DNL calculation results, roadway and railway input variables) with the mouse.
- **Note #2:** DNL Calculator assumes roadway data is always entered.

DNL Calculator

Site ID	820 Isenberg – NAL#7; Pre-Pandemic (2019)
Record Date	05/05/2021
User's Name	D.L. Adams Associates

Road # 1 Name:	**Isenberg NB**

Road #1

Vehicle Type	Cars ☑	Medium Trucks ☑	Heavy Trucks ☑
Effective Distance	266	266	266
Distance to Stop Sign			
Average Speed	25	25	25
Average Daily Trips (ADT)	3808	166	166
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	46	42	55
Calculate Road #1 DNL	56	Reset	

Road # 2 Name: **Isenberg SB**

Road #2

Vehicle Type	Cars ☑	Medium Trucks ☑	Heavy Trucks ☑
Effective Distance	282	282	282
Distance to Stop Sign			
Average Speed	25	25	25
Average Daily Trips (ADT)	5242	228	228
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	47	43	56
Calculate Road #2 DNL	57	Reset	

Road # 3 Name:	S King EB

Road #3

Vehicle Type	Cars ☑	Medium Trucks ☑	Heavy Trucks ☑
Effective Distance	700	700	700
Distance to Stop Sign			
Average Speed	30	30	30
Average Daily Trips (ADT)	22927	997	997
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	49	45	57
Calculate Road #3 DNL	58	Reset	

Road # 4 Name:	Citron EB

Road #4

Vehicle Type	Cars ☑	Medium Trucks ☑	Heavy Trucks ☑
Effective Distance	347	347	347
Distance to Stop Sign			
Average Speed	25	25	25
Average Daily Trips (ADT)	708	31	31
Night Fraction of ADT	15	15	15

Road Gradient (%)			1
Vehicle DNL	37	33	46
Calculate Road #4 DNL	47	Reset	

Road # 5 Name:	Citron WB

Road #5

Vehicle Type	**Cars** ☑	**Medium Trucks** ☑	**Heavy Trucks** ☑
Effective Distance	327	327	327
Distance to Stop Sign			
Average Speed	25	25	25
Average Daily Trips (ADT)	2114	92	92
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	42	38	51
Calculate Road #5 DNL	52	Reset	

Add Road Source Add Rail Source

Airport Noise Level	
Loud Impulse Sounds?	○**Yes** ◉**No**

Combined DNL for all Road and Rail sources	**62**
Combined DNL including Airport	**N/A**
Site DNL with Loud Impulse Sound	

Calculate Reset

Mitigation Options

If your site DNL is in Excess of 65 decibels, your options are:

- **No Action Alternative**: Cancel the project at this location
- **Other Reasonable Alternatives**: Choose an alternate site
- **Mitigation**
  - **Contact your Field or Regional Environmental Officer (/programs/environmental-review/hud-environmental-staff-contacts/)**
  - Increase mitigation in the building walls (only effective if no outdoor, noise sensitive areas)
  - Reconfigure the site plan to increase the distance between the noise source and noise-sensitive uses
  - Incorporate natural or man-made barriers. See ***The Noise Guidebook (/resource/313/hud-noise-guidebook/)***
  - Construct noise barrier. See the **Barrier Performance Module (/programs/environmental-review/bpm-calculator/)**

Tools and Guidance

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Day/Night Noise Level Assessment Tool Flowcharts (/resource/3823/day-night-noise-level-assessment-tool-flowcharts/)

Home (/) > **Programs (/programs/)** > **Environmental Review (/programs/environmental-review/)** > DNL Calculator

DNL Calculator

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Guidelines

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- **Note #2:** DNL Calculator assumes roadway data is always entered.

DNL Calculator

Site ID	820 Isenberg – NAL#7; 5-year Predicted, No Action (2025)
Record Date	05/05/2021
User's Name	D.L. Adams Associates

Road # 1 Name:	**Isenberg NB**

Road #1

Vehicle Type	Cars ☑	Medium Trucks ☑	Heavy Trucks ☑
Effective Distance	266	266	266
Distance to Stop Sign			
Average Speed	25	25	25
Average Daily Trips (ADT)	3937	171	171
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	46	42	55
Calculate Road #1 DNL	56	Reset	

Road # 2 Name: **Isenberg SB**

Road #2

Vehicle Type	Cars ☑	Medium Trucks ☑	Heavy Trucks ☑
Effective Distance	282	282	282
Distance to Stop Sign			
Average Speed	25	25	25
Average Daily Trips (ADT)	5342	232	232
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	47	43	56
Calculate Road #2 DNL	57	Reset	

Road # 3 Name:	**S King EB**

Road #3

Vehicle Type	**Cars** ☑	**Medium Trucks** ☑	**Heavy Trucks** ☑
Effective Distance	700	700	700
Distance to Stop Sign			
Average Speed	30	30	30
Average Daily Trips (ADT)	23606	1026	1026
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	49	45	57
Calculate Road #3 DNL	58	Reset	

Road # 4 Name:	**Citron EB**

Road #4

Vehicle Type	**Cars** ☑	**Medium Trucks** ☑	**Heavy Trucks** ☑
Effective Distance	347	347	347
Distance to Stop Sign			
Average Speed	25	25	25
Average Daily Trips (ADT)	727	32	32
Night Fraction of ADT	15	15	15

Road Gradient (%)			1
Vehicle DNL	37	33	46
Calculate Road #4 DNL	47	Reset	

Road # 5 Name:	**Citron WB**

Road #5

Vehicle Type	**Cars** ☑	**Medium Trucks** ☑	**Heavy Trucks** ☑
Effective Distance	327	327	327
Distance to Stop Sign			
Average Speed	25	25	25
Average Daily Trips (ADT)	2161	94	94
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	42	38	51
Calculate Road #5 DNL	52	Reset	

Add Road Source Add Rail Source

Airport Noise Level	
Loud Impulse Sounds?	○ **Yes** ◉ **No**

Combined DNL for all Road and Rail sources	**62**
Combined DNL including Airport	**N/A**
Site DNL with Loud Impulse Sound	

Calculate Reset

Mitigation Options

If your site DNL is in Excess of 65 decibels, your options are:

- **No Action Alternative**: Cancel the project at this location
- **Other Reasonable Alternatives**: Choose an alternate site
- **Mitigation**
  - **Contact your Field or Regional Environmental Officer (/programs/environmental-review/hud-environmental-staff-contacts/)**
  - Increase mitigation in the building walls (only effective if no outdoor, noise sensitive areas)
  - Reconfigure the site plan to increase the distance between the noise source and noise-sensitive uses
  - Incorporate natural or man-made barriers. See ***The Noise Guidebook (/resource/313/hud-noise-guidebook/)***
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Tools and Guidance

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Day/Night Noise Level Assessment Tool Flowcharts (/resource/3823/day-night-noise-level-assessment-tool-flowcharts/)

Home (/) > **Programs (/programs/)** > **Environmental Review (/programs/environmental-review/)** > DNL Calculator

DNL Calculator

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Guidelines

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- **Note #1:** Tooltips, containing field specific information, have been added in this tool and may be accessed by hovering over all the respective data fields (site identification, roadway and railway assessment, DNL calculation results, roadway and railway input variables) with the mouse.
- **Note #2:** DNL Calculator assumes roadway data is always entered.

DNL Calculator

Site ID	820 Isenberg – NAL#7; 5-year Predicted, With Action (2025)
Record Date	05/05/2021
User's Name	D.L. Adams Associates

Road # 1 Name:	**Isenberg NB**

Road #1

Vehicle Type	Cars ☑	Medium Trucks ☑	Heavy Trucks ☑
Effective Distance	266	266	266
Distance to Stop Sign			
Average Speed	25	25	25
Average Daily Trips (ADT)	3954	172	172
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	46	42	55
Calculate Road #1 DNL	56	Reset	

Road # 2 Name:	**Isenberg SB**

Road #2

Vehicle Type	Cars ☑	Medium Trucks ☑	Heavy Trucks ☑
Effective Distance	282	282	282
Distance to Stop Sign			
Average Speed	25	25	25
Average Daily Trips (ADT)	5835	254	254
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	47	44	57
Calculate Road #2 DNL	57	Reset	

Road # 3 Name:	S King EB

Road #3

Vehicle Type	Cars ☑	Medium Trucks ☑	Heavy Trucks ☑
Effective Distance	700	700	700
Distance to Stop Sign			
Average Speed	30	30	30
Average Daily Trips (ADT)	24110	1048	1048
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	49	45	57
Calculate Road #3 DNL	58	Reset	

Road # 4 Name:	Citron EB

Road #4

Vehicle Type	Cars ☑	Medium Trucks ☑	Heavy Trucks ☑
Effective Distance	347	347	347
Distance to Stop Sign			
Average Speed	25	25	25
Average Daily Trips (ADT)	738	32	32
Night Fraction of ADT	15	15	15

Road Gradient (%)			1
Vehicle DNL	37	33	46
Calculate Road #4 DNL	47	Reset	

Road # 5 Name:	**Citron WB**

Road #5

Vehicle Type	**Cars** ☑	**Medium Trucks** ☑	**Heavy Trucks** ☑
Effective Distance	327	327	327
Distance to Stop Sign			
Average Speed	25	25	25
Average Daily Trips (ADT)	2214	96	96
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	42	38	51
Calculate Road #5 DNL	52	Reset	

Add Road Source Add Rail Source

Airport Noise Level	
Loud Impulse Sounds?	○**Yes** ◉**No**

Combined DNL for all Road and Rail sources	**62**
Combined DNL including Airport	**N/A**
Site DNL with Loud Impulse Sound	

Calculate Reset

Mitigation Options

If your site DNL is in Excess of 65 decibels, your options are:

- **No Action Alternative**: Cancel the project at this location
- **Other Reasonable Alternatives**: Choose an alternate site
- **Mitigation**
  - **Contact your Field or Regional Environmental Officer (/programs/environmental-review/hud-environmental-staff-contacts/)**
  - Increase mitigation in the building walls (only effective if no outdoor, noise sensitive areas)
  - Reconfigure the site plan to increase the distance between the noise source and noise-sensitive uses
  - Incorporate natural or man-made barriers. See ***The Noise Guidebook (/resource/313/hud-noise-guidebook/)***
  - Construct noise barrier. See the **Barrier Performance Module (/programs/environmental-review/bpm-calculator/)**

Tools and Guidance

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- **Note #1:** Tooltips, containing field specific information, have been added in this tool and may be accessed by hovering over all the respective data fields (site identification, roadway and railway assessment, DNL calculation results, roadway and railway input variables) with the mouse.
- **Note #2:** DNL Calculator assumes roadway data is always entered.

DNL Calculator

Site ID	820 Isenberg – NAL#7; 10-year Predicted, No Action (2035)
Record Date	05/05/2021
User's Name	D.L. Adams Associates

Road # 1 Name:	**Isenberg NB**

Road #1

Vehicle Type	Cars ☑	Medium Trucks ☑	Heavy Trucks ☑
Effective Distance	266	266	266
Distance to Stop Sign			
Average Speed	25	25	25
Average Daily Trips (ADT)	4224	184	184
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	46	43	56
Calculate Road #1 DNL	56	Reset	

Road # 2 Name: **Isenberg SB**

Road #2

Vehicle Type	Cars ☑	Medium Trucks ☑	Heavy Trucks ☑
Effective Distance	282	282	282
Distance to Stop Sign			
Average Speed	25	25	25
Average Daily Trips (ADT)	5729	249	249
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	47	44	57
Calculate Road #2 DNL	57	Reset	

Road # 3 Name:	S King EB

Road #3

Vehicle Type	Cars ☑	Medium Trucks ☑	Heavy Trucks ☑
Effective Distance	700	700	700
Distance to Stop Sign			
Average Speed	30	30	30
Average Daily Trips (ADT)	25334	1101	1101
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	49	46	57
Calculate Road #3 DNL	58	Reset	

Road # 4 Name:	Citron EB

Road #4

Vehicle Type	Cars ☑	Medium Trucks ☑	Heavy Trucks ☑
Effective Distance	347	347	347
Distance to Stop Sign			
Average Speed	25	25	25
Average Daily Trips (ADT)	779	34	34
Night Fraction of ADT	15	15	15

Road Gradient (%)			1
Vehicle DNL	37	34	47
Calculate Road #4 DNL	47	Reset	

Road # 5 Name:	**Citron WB**

Road #5

Vehicle Type	**Cars** ☑	**Medium Trucks** ☑	**Heavy Trucks** ☑
Effective Distance	327	327	327
Distance to Stop Sign			
Average Speed	25	25	25
Average Daily Trips (ADT)	2319	101	101
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	42	39	52
Calculate Road #5 DNL	52	Reset	

Add Road Source Add Rail Source

Airport Noise Level	
Loud Impulse Sounds?	○ **Yes** ◉ **No**

Combined DNL for all Road and Rail sources	**63**
Combined DNL including Airport	**N/A**
Site DNL with Loud Impulse Sound	

Calculate Reset

Mitigation Options

If your site DNL is in Excess of 65 decibels, your options are:

- **No Action Alternative**: Cancel the project at this location
- **Other Reasonable Alternatives**: Choose an alternate site
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  - **Contact your Field or Regional Environmental Officer (/programs/environmental-review/hud-environmental-staff-contacts/)**
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Tools and Guidance

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Day/Night Noise Level Assessment Tool Flowcharts (/resource/3823/day-night-noise-level-assessment-tool-flowcharts/)

Home (/) > **Programs (/programs/)** > **Environmental Review (/programs/environmental-review/)** > DNL Calculator

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- **Note #2:** DNL Calculator assumes roadway data is always entered.

DNL Calculator

Site ID	820 Isenberg – NAL#8; Current (2020)
Record Date	05/05/2021
User's Name	D.L. Adams Associates

Road # 1 Name:	**Isenberg NB**

Road #1

Vehicle Type	Cars ☑	Medium Trucks ☑	Heavy Trucks ☑
Effective Distance	266	266	266
Distance to Stop Sign			
Average Speed	25	25	25
Average Daily Trips (ADT)	1809	79	79
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	43	39	52
Calculate Road #1 DNL	53	Reset	

Road # 2 Name:	Isenberg SB

Road #2

Vehicle Type	Cars ☑	Medium Trucks ☑	Heavy Trucks ☑
Effective Distance	282	282	282
Distance to Stop Sign			
Average Speed	25	25	25
Average Daily Trips (ADT)	3612	157	157
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	45	42	55
Calculate Road #2 DNL	55	Reset	

Road # 3 Name:	S King EB

Road #3

Vehicle Type	Cars ☑	Medium Trucks ☑	Heavy Trucks ☑
Effective Distance	642	642	642
Distance to Stop Sign			
Average Speed	30	30	30
Average Daily Trips (ADT)	18251	794	794
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	48	45	56
Calculate Road #3 DNL	57	Reset	

Road # 4 Name:	Citron EB

Road #4

Vehicle Type	Cars ☑	Medium Trucks ☑	Heavy Trucks ☑
Effective Distance	407	407	407
Distance to Stop Sign			
Average Speed	25	25	25
Average Daily Trips (ADT)	607	26	26
Night Fraction of ADT	15	15	15

Road Gradient (%)			1
Vehicle DNL	35	31	44
Calculate Road #4 DNL	45	Reset	

Road # 5 Name:	**Citron WB**

Road #5

Vehicle Type	**Cars** ☑	**Medium Trucks** ☑	**Heavy Trucks** ☑
Effective Distance	387	387	387
Distance to Stop Sign			
Average Speed	25	25	25
Average Daily Trips (ADT)	2323	101	101
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	41	38	51
Calculate Road #5 DNL	51	Reset	

Add Road Source | Add Rail Source

Airport Noise Level	
Loud Impulse Sounds?	○ **Yes** ◉ **No**

Combined DNL for all Road and Rail sources	**61**
Combined DNL including Airport	**N/A**
Site DNL with Loud Impulse Sound	

Calculate Reset

Mitigation Options

If your site DNL is in Excess of 65 decibels, your options are:

- **No Action Alternative**: Cancel the project at this location
- **Other Reasonable Alternatives**: Choose an alternate site
- **Mitigation**
  - **Contact your Field or Regional Environmental Officer (/programs/environmental-review/hud-environmental-staff-contacts/)**
  - Increase mitigation in the building walls (only effective if no outdoor, noise sensitive areas)
  - Reconfigure the site plan to increase the distance between the noise source and noise-sensitive uses
  - Incorporate natural or man-made barriers. See ***The Noise Guidebook (/resource/313/hud-noise-guidebook/)***
  - Construct noise barrier. See the **Barrier Performance Module (/programs/environmental-review/bpm-calculator/)**

Tools and Guidance

Day/Night Noise Level Assessment Tool User Guide (/resource/3822/day-night-noise-level-assessment-tool-user-guide/)

Day/Night Noise Level Assessment Tool Flowcharts (/resource/3823/day-night-noise-level-assessment-tool-flowcharts/)

Home (/) > **Programs (/programs/)** > **Environmental Review (/programs/environmental-review/)** > DNL Calculator

DNL Calculator

The Day/Night Noise Level Calculator is an electronic assessment tool that calculates the Day/Night Noise Level (DNL) from roadway and railway traffic. For more information on using the DNL calculator, view the **Day/Night Noise Level Calculator Electronic Assessment Tool Overview (/programs/environmental-review/daynight-noise-level-electronic-assessment-tool/)**.

Guidelines

- To display the Road and/or Rail DNL calculator(s), click on the "Add Road Source" and/or "Add Rail Source" button(s) below.
- All Road and Rail input values must be positive non-decimal numbers.
- All Road and/or Rail DNL value(s) must be calculated separately before calculating the Site DNL.
- All checkboxes that apply must be checked for vehicles and trains in the tables' headers.
- **Note #1:** Tooltips, containing field specific information, have been added in this tool and may be accessed by hovering over all the respective data fields (site identification, roadway and railway assessment, DNL calculation results, roadway and railway input variables) with the mouse.
- **Note #2:** DNL Calculator assumes roadway data is always entered.

DNL Calculator

Site ID	820 Isenberg – NAL#8; Pre-Pandemic (2019)
Record Date	05/05/2021
User's Name	D.L. Adams Associates

Road # 1 Name:	**Isenberg NB**

Road #1

Vehicle Type	Cars ☑	Medium Trucks ☑	Heavy Trucks ☑
Effective Distance	266	266	266
Distance to Stop Sign			
Average Speed	25	25	25
Average Daily Trips (ADT)	3808	166	166
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	46	42	55
Calculate Road #1 DNL	56	Reset	

Road # 2 Name:	Isenberg SB

Road #2

Vehicle Type	Cars ☑	Medium Trucks ☑	Heavy Trucks ☑
Effective Distance	282	282	282
Distance to Stop Sign			
Average Speed	25	25	25
Average Daily Trips (ADT)	5242	228	228
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	47	43	56
Calculate Road #2 DNL	57	Reset	

Road # 3 Name:	S King EB

Road #3

Vehicle Type	Cars ☑	Medium Trucks ☑	Heavy Trucks ☑
Effective Distance	642	642	642
Distance to Stop Sign			
Average Speed	30	30	30
Average Daily Trips (ADT)	22927	997	997
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	49	46	57
Calculate Road #3 DNL	58	Reset	

Road # 4 Name:	Citron EB

Road #4

Vehicle Type	Cars ☑	Medium Trucks ☑	Heavy Trucks ☑
Effective Distance	407	407	407
Distance to Stop Sign			
Average Speed	25	25	25
Average Daily Trips (ADT)	708	31	31
Night Fraction of ADT	15	15	15

Road Gradient (%)			1
Vehicle DNL	36	32	45
Calculate Road #4 DNL	46	Reset	

Road # 5 Name:	**Citron WB**

Road #5

Vehicle Type	**Cars** ☑	**Medium Trucks** ☑	**Heavy Trucks** ☑
Effective Distance	387	387	387
Distance to Stop Sign			
Average Speed	25	25	25
Average Daily Trips (ADT)	2114	92	92
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	41	37	50
Calculate Road #5 DNL	51	Reset	

Add Road Source | Add Rail Source

Airport Noise Level	
Loud Impulse Sounds?	○**Yes** ◉**No**

Combined DNL for all Road and Rail sources	**62**
Combined DNL including Airport	**N/A**
Site DNL with Loud Impulse Sound	

Calculate Reset

Mitigation Options

If your site DNL is in Excess of 65 decibels, your options are:

- **No Action Alternative**: Cancel the project at this location
- **Other Reasonable Alternatives**: Choose an alternate site
- **Mitigation**
  - **Contact your Field or Regional Environmental Officer (/programs/environmental-review/hud-environmental-staff-contacts/)**
  - Increase mitigation in the building walls (only effective if no outdoor, noise sensitive areas)
  - Reconfigure the site plan to increase the distance between the noise source and noise-sensitive uses
  - Incorporate natural or man-made barriers. See ***The Noise Guidebook (/resource/313/hud-noise-guidebook/)***
  - Construct noise barrier. See the **Barrier Performance Module (/programs/environmental-review/bpm-calculator/)**

Tools and Guidance

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Day/Night Noise Level Assessment Tool Flowcharts (/resource/3823/day-night-noise-level-assessment-tool-flowcharts/)

DNL Calculator

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Guidelines

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- All checkboxes that apply must be checked for vehicles and trains in the tables' headers.
- **Note #1:** Tooltips, containing field specific information, have been added in this tool and may be accessed by hovering over all the respective data fields (site identification, roadway and railway assessment, DNL calculation results, roadway and railway input variables) with the mouse.
- **Note #2:** DNL Calculator assumes roadway data is always entered.

DNL Calculator

Site ID	820 Isenberg – NAL#7; 10-year Predicted, With Action (2035)
Record Date	05/05/2021
User's Name	D.L. Adams Associates

Road # 1 Name:	**Isenberg NB**

Road #1

Vehicle Type	Cars ☑	Medium Trucks ☑	Heavy Trucks ☑
Effective Distance	266	266	266
Distance to Stop Sign			
Average Speed	25	25	25
Average Daily Trips (ADT)	4247	185	185
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	46	43	56
Calculate Road #1 DNL	56	Reset	

Road # 2 Name:	**Isenberg SB**

Road #2

Vehicle Type	Cars ☑	Medium Trucks ☑	Heavy Trucks ☑
Effective Distance	282	282	282
Distance to Stop Sign			
Average Speed	25	25	25
Average Daily Trips (ADT)	6256	272	272
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	48	44	57
Calculate Road #2 DNL	58	Reset	

Road # 3 Name:	S King EB

Road #3

Vehicle Type	Cars ☑	Medium Trucks ☑	Heavy Trucks ☑
Effective Distance	700	700	700
Distance to Stop Sign			
Average Speed	30	30	30
Average Daily Trips (ADT)	25873	1125	1125
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	49	46	57
Calculate Road #3 DNL	58	Reset	

Road # 4 Name:	Citron EB

Road #4

Vehicle Type	Cars ☑	Medium Trucks ☑	Heavy Trucks ☑
Effective Distance	347	347	347
Distance to Stop Sign			
Average Speed	25	25	25
Average Daily Trips (ADT)	791	34	34
Night Fraction of ADT	15	15	15

Road Gradient (%)			1
Vehicle DNL	37	34	47
Calculate Road #4 DNL	47	Reset	

Road # 5 Name:	**Citron WB**

Road #5

Vehicle Type	**Cars** ☑	**Medium Trucks** ☑	**Heavy Trucks** ☑
Effective Distance	327	327	327
Distance to Stop Sign			
Average Speed	25	25	25
Average Daily Trips (ADT)	2373	103	103
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	42	39	52
Calculate Road #5 DNL	52	Reset	

Add Road Source | Add Rail Source

Airport Noise Level	
Loud Impulse Sounds?	○**Yes** ◉**No**

Combined DNL for all Road and Rail sources	**63**
Combined DNL including Airport	**N/A**
Site DNL with Loud Impulse Sound	

Calculate Reset

Mitigation Options

If your site DNL is in Excess of 65 decibels, your options are:

- **No Action Alternative**: Cancel the project at this location
- **Other Reasonable Alternatives**: Choose an alternate site
- **Mitigation**
  - **Contact your Field or Regional Environmental Officer (/programs/environmental-review/hud-environmental-staff-contacts/)**
  - Increase mitigation in the building walls (only effective if no outdoor, noise sensitive areas)
  - Reconfigure the site plan to increase the distance between the noise source and noise-sensitive uses
  - Incorporate natural or man-made barriers. See ***The Noise Guidebook (/resource/313/hud-noise-guidebook/)***
  - Construct noise barrier. See the **Barrier Performance Module (/programs/environmental-review/bpm-calculator/)**

Tools and Guidance

Day/Night Noise Level Assessment Tool User Guide (/resource/3822/day-night-noise-level-assessment-tool-user-guide/)

Day/Night Noise Level Assessment Tool Flowcharts (/resource/3823/day-night-noise-level-assessment-tool-flowcharts/)

Home (/) > **Programs (/programs/)** > **Environmental Review (/programs/environmental-review/)** > DNL Calculator

DNL Calculator

The Day/Night Noise Level Calculator is an electronic assessment tool that calculates the Day/Night Noise Level (DNL) from roadway and railway traffic. For more information on using the DNL calculator, view the **Day/Night Noise Level Calculator Electronic Assessment Tool Overview (/programs/environmental-review/daynight-noise-level-electronic-assessment-tool/)**.

Guidelines

- To display the Road and/or Rail DNL calculator(s), click on the "Add Road Source" and/or "Add Rail Source" button(s) below.
- All Road and Rail input values must be positive non-decimal numbers.
- All Road and/or Rail DNL value(s) must be calculated separately before calculating the Site DNL.
- All checkboxes that apply must be checked for vehicles and trains in the tables' headers.
- **Note #1:** Tooltips, containing field specific information, have been added in this tool and may be accessed by hovering over all the respective data fields (site identification, roadway and railway assessment, DNL calculation results, roadway and railway input variables) with the mouse.
- **Note #2:** DNL Calculator assumes roadway data is always entered.

DNL Calculator

Site ID	820 Isenberg – NAL#8; 5-year Predicted, No Action (2025)
Record Date	05/05/2021
User's Name	D.L. Adams Associates

Road # 1 Name:	**Isenberg NB**

Road #1

Vehicle Type	Cars ☑	Medium Trucks ☑	Heavy Trucks ☑
Effective Distance	266	266	266
Distance to Stop Sign			
Average Speed	25	25	25
Average Daily Trips (ADT)	3937	171	171
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	46	42	55
Calculate Road #1 DNL	56	Reset	

Road # 2 Name: **Isenberg SB**

Road #2

Vehicle Type	Cars ☑	Medium Trucks ☑	Heavy Trucks ☑
Effective Distance	282	282	282
Distance to Stop Sign			
Average Speed	25	25	25
Average Daily Trips (ADT)	5342	232	232
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	47	43	56
Calculate Road #2 DNL	57	Reset	

Road # 3 Name:	S King EB

Road #3

Vehicle Type	Cars ☑	Medium Trucks ☑	Heavy Trucks ☑
Effective Distance	642	642	642
Distance to Stop Sign			
Average Speed	30	30	30
Average Daily Trips (ADT)	23606	1026	1026
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	50	46	57
Calculate Road #3 DNL	58	Reset	

Road # 4 Name:	Citron EB

Road #4

Vehicle Type	Cars ☑	Medium Trucks ☑	Heavy Trucks ☑
Effective Distance	407	407	407
Distance to Stop Sign			
Average Speed	25	25	25
Average Daily Trips (ADT)	727	32	32
Night Fraction of ADT	15	15	15

Road Gradient (%)			1
Vehicle DNL	36	32	45
Calculate Road #4 DNL	46	Reset	

Road # 5 Name:	**Citron WB**

Road #5

Vehicle Type	**Cars** ☑	**Medium Trucks** ☑	**Heavy Trucks** ☑
Effective Distance	387	387	387
Distance to Stop Sign			
Average Speed	25	25	25
Average Daily Trips (ADT)	2161	94	94
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	41	37	50
Calculate Road #5 DNL	51	Reset	

Add Road Source | Add Rail Source

Airport Noise Level	
Loud Impulse Sounds?	○ **Yes** ◉ **No**

Combined DNL for all Road and Rail sources	**62**
Combined DNL including Airport	**N/A**
Site DNL with Loud Impulse Sound	

Calculate Reset

Mitigation Options

If your site DNL is in Excess of 65 decibels, your options are:

- **No Action Alternative**: Cancel the project at this location
- **Other Reasonable Alternatives**: Choose an alternate site
- **Mitigation**
  - **Contact your Field or Regional Environmental Officer (/programs/environmental-review/hud-environmental-staff-contacts/)**
  - Increase mitigation in the building walls (only effective if no outdoor, noise sensitive areas)
  - Reconfigure the site plan to increase the distance between the noise source and noise-sensitive uses
  - Incorporate natural or man-made barriers. See ***The Noise Guidebook (/resource/313/hud-noise-guidebook/)***
  - Construct noise barrier. See the **Barrier Performance Module (/programs/environmental-review/bpm-calculator/)**

Tools and Guidance

Day/Night Noise Level Assessment Tool User Guide (/resource/3822/day-night-noise-level-assessment-tool-user-guide/)

Day/Night Noise Level Assessment Tool Flowcharts (/resource/3823/day-night-noise-level-assessment-tool-flowcharts/)

DNL Calculator

The Day/Night Noise Level Calculator is an electronic assessment tool that calculates the Day/Night Noise Level (DNL) from roadway and railway traffic. For more information on using the DNL calculator, view the **Day/Night Noise Level Calculator Electronic Assessment Tool Overview (/programs/environmental-review/daynight-noise-level-electronic-assessment-tool/)**.

Guidelines

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- All checkboxes that apply must be checked for vehicles and trains in the tables' headers.
- **Note #1:** Tooltips, containing field specific information, have been added in this tool and may be accessed by hovering over all the respective data fields (site identification, roadway and railway assessment, DNL calculation results, roadway and railway input variables) with the mouse.
- **Note #2:** DNL Calculator assumes roadway data is always entered.

DNL Calculator

Site ID	820 Isenberg – NAL#8; 10-year Predicted, No Action (2035)
Record Date	05/05/2021
User's Name	D.L. Adams Associates

Road # 1 Name:	**Isenberg NB**

Road #1

Vehicle Type	Cars ☑	Medium Trucks ☑	Heavy Trucks ☑
Effective Distance	266	266	266
Distance to Stop Sign			
Average Speed	25	25	25
Average Daily Trips (ADT)	4224	184	184
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	46	43	56
Calculate Road #1 DNL	56	Reset	

Road # 2 Name: **Isenberg SB**

Road #2

Vehicle Type	Cars ☑	Medium Trucks ☑	Heavy Trucks ☑
Effective Distance	282	282	282
Distance to Stop Sign			
Average Speed	25	25	25
Average Daily Trips (ADT)	5729	249	249
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	47	44	57
Calculate Road #2 DNL	57	Reset	

Road # 3 Name:	**S King EB**

Road #3

Vehicle Type	**Cars** ☑	**Medium Trucks** ☑	**Heavy Trucks** ☑
Effective Distance	642	642	642
Distance to Stop Sign			
Average Speed	30	30	30
Average Daily Trips (ADT)	25334	1101	1101
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	50	46	58
Calculate Road #3 DNL	59	Reset	

Road # 4 Name:	**Citron EB**

Road #4

Vehicle Type	**Cars** ☑	**Medium Trucks** ☑	**Heavy Trucks** ☑
Effective Distance	407	407	407
Distance to Stop Sign			
Average Speed	25	25	25
Average Daily Trips (ADT)	779	34	34
Night Fraction of ADT	15	15	15

Road Gradient (%)			1
Vehicle DNL	36	33	45
Calculate Road #4 DNL	46	Reset	

Road # 5 Name:	**Citron WB**

Road #5

Vehicle Type	**Cars** ☑	**Medium Trucks** ☑	**Heavy Trucks** ☑
Effective Distance	387	387	387
Distance to Stop Sign			
Average Speed	25	25	25
Average Daily Trips (ADT)	2319	101	101
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	41	38	51
Calculate Road #5 DNL	51	Reset	

Add Road Source | Add Rail Source

Airport Noise Level	
Loud Impulse Sounds?	○ **Yes** ◉ **No**

Combined DNL for all Road and Rail sources	**63**
Combined DNL including Airport	**N/A**
Site DNL with Loud Impulse Sound	

Calculate Reset

Mitigation Options

If your site DNL is in Excess of 65 decibels, your options are:

- **No Action Alternative**: Cancel the project at this location
- **Other Reasonable Alternatives**: Choose an alternate site
- **Mitigation**
  - **Contact your Field or Regional Environmental Officer (/programs/environmental-review/hud-environmental-staff-contacts/)**
  - Increase mitigation in the building walls (only effective if no outdoor, noise sensitive areas)
  - Reconfigure the site plan to increase the distance between the noise source and noise-sensitive uses
  - Incorporate natural or man-made barriers. See ***The Noise Guidebook (/resource/313/hud-noise-guidebook/)***
  - Construct noise barrier. See the **Barrier Performance Module (/programs/environmental-review/bpm-calculator/)**

Tools and Guidance

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Day/Night Noise Level Assessment Tool Flowcharts (/resource/3823/day-night-noise-level-assessment-tool-flowcharts/)

Home (/) > **Programs (/programs/)** > **Environmental Review (/programs/environmental-review/)** > DNL Calculator

DNL Calculator

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Guidelines

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- All checkboxes that apply must be checked for vehicles and trains in the tables' headers.
- **Note #1:** Tooltips, containing field specific information, have been added in this tool and may be accessed by hovering over all the respective data fields (site identification, roadway and railway assessment, DNL calculation results, roadway and railway input variables) with the mouse.
- **Note #2:** DNL Calculator assumes roadway data is always entered.

DNL Calculator

Site ID	820 Isenberg – NAL#8; 10-year Predicted, With Action (2035)
Record Date	05/05/2021
User's Name	D.L. Adams Associates

Road # 1 Name:	**Isenberg NB**

Road #1

Vehicle Type	Cars ☑	Medium Trucks ☑	Heavy Trucks ☑
Effective Distance	266	266	266
Distance to Stop Sign			
Average Speed	25	25	25
Average Daily Trips (ADT)	4247	185	185
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	46	43	56
Calculate Road #1 DNL	56	Reset	

Road # 2 Name:	**Isenberg SB**

Road #2

Vehicle Type	Cars ☑	Medium Trucks ☑	Heavy Trucks ☑
Effective Distance	282	282	282
Distance to Stop Sign			
Average Speed	25	25	25
Average Daily Trips (ADT)	6256	272	272
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	48	44	57
Calculate Road #2 DNL	58	Reset	

Road # 3 Name:	S King EB

Road #3

Vehicle Type	Cars ☑	Medium Trucks ☑	Heavy Trucks ☑
Effective Distance	642	642	642
Distance to Stop Sign			
Average Speed	30	30	30
Average Daily Trips (ADT)	25873	1125	1125
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	50	46	58
Calculate Road #3 DNL	59	Reset	

Road # 4 Name:	Citron EB

Road #4

Vehicle Type	Cars ☑	Medium Trucks ☑	Heavy Trucks ☑
Effective Distance	407	407	407
Distance to Stop Sign			
Average Speed	25	25	25
Average Daily Trips (ADT)	791	34	34
Night Fraction of ADT	15	15	15

Road Gradient (%)			1
Vehicle DNL	36	33	45
Calculate Road #4 DNL	46	Reset	

Road # 5 Name:	**Citron WB**

Road #5

Vehicle Type	**Cars** ☑	**Medium Trucks** ☑	**Heavy Trucks** ☑
Effective Distance	387	387	387
Distance to Stop Sign			
Average Speed	25	25	25
Average Daily Trips (ADT)	2373	103	103
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	41	38	51
Calculate Road #5 DNL	51	Reset	

Add Road Source | Add Rail Source

Airport Noise Level	
Loud Impulse Sounds?	○**Yes** ◉**No**

Combined DNL for all Road and Rail sources	**63**
Combined DNL including Airport	**N/A**
Site DNL with Loud Impulse Sound	

Calculate Reset

Mitigation Options

If your site DNL is in Excess of 65 decibels, your options are:

- **No Action Alternative**: Cancel the project at this location
- **Other Reasonable Alternatives**: Choose an alternate site
- **Mitigation**
  - **Contact your Field or Regional Environmental Officer (/programs/environmental-review/hud-environmental-staff-contacts/)**
  - Increase mitigation in the building walls (only effective if no outdoor, noise sensitive areas)
  - Reconfigure the site plan to increase the distance between the noise source and noise-sensitive uses
  - Incorporate natural or man-made barriers. See ***The Noise Guidebook (/resource/313/hud-noise-guidebook/)***
  - Construct noise barrier. See the **Barrier Performance Module (/programs/environmental-review/bpm-calculator/)**

Tools and Guidance

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Day/Night Noise Level Assessment Tool Flowcharts (/resource/3823/day-night-noise-level-assessment-tool-flowcharts/)

Home (/) > **Programs (/programs/)** > **Environmental Review (/programs/environmental-review/)** > DNL Calculator

DNL Calculator

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- All checkboxes that apply must be checked for vehicles and trains in the tables' headers.
- **Note #1:** Tooltips, containing field specific information, have been added in this tool and may be accessed by hovering over all the respective data fields (site identification, roadway and railway assessment, DNL calculation results, roadway and railway input variables) with the mouse.
- **Note #2:** DNL Calculator assumes roadway data is always entered.

DNL Calculator

Site ID	820 Isenberg – NAL#9; Current (2020)
Record Date	05/05/2021
User's Name	D.L. Adams Associates

Road # 1 Name:	**Isenberg NB**

Road #1

Vehicle Type	Cars ☑	Medium Trucks ☑	Heavy Trucks ☑
Effective Distance	285	285	285
Distance to Stop Sign			
Average Speed	25	25	25
Average Daily Trips (ADT)	1809	79	79
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	42	39	51
Calculate Road #1 DNL	52	Reset	

Road # 2 Name:	Isenberg SB

Road #2

Vehicle Type	Cars ☑	Medium Trucks ☑	Heavy Trucks ☑
Effective Distance	266	266	266
Distance to Stop Sign			
Average Speed	25	25	25
Average Daily Trips (ADT)	3612	157	157
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	46	42	55
Calculate Road #2 DNL	56	Reset	

Road # 3 Name:	**S King EB**

Road #3

Vehicle Type	**Cars** ☑	**Medium Trucks** ☑	**Heavy Trucks** ☑
Effective Distance	606	606	606
Distance to Stop Sign			
Average Speed	30	30	30
Average Daily Trips (ADT)	18251	794	794
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	49	45	57
Calculate Road #3 DNL	58	Reset	

Add Road Source | Add Rail Source

Airport Noise Level	
Loud Impulse Sounds?	○Yes ◉No
Combined DNL for all Road and Rail sources	**60**
Combined DNL including Airport	**N/A**
Site DNL with Loud Impulse Sound	

Calculate Reset

Mitigation Options

If your site DNL is in Excess of 65 decibels, your options are:

- **No Action Alternative**: Cancel the project at this location
- **Other Reasonable Alternatives**: Choose an alternate site
- **Mitigation**
  - **Contact your Field or Regional Environmental Officer (/programs/environmental-review/hud-environmental-staff-contacts/)**
  - Increase mitigation in the building walls (only effective if no outdoor, noise sensitive areas)
  - Reconfigure the site plan to increase the distance between the noise source and noise-sensitive uses
  - Incorporate natural or man-made barriers. See ***The Noise Guidebook (/resource/313/hud-noise-guidebook/)***
  - Construct noise barrier. See the **Barrier Performance Module (/programs/environmental-review/bpm-calculator/)**

Tools and Guidance

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Day/Night Noise Level Assessment Tool Flowcharts (/resource/3823/day-night-noise-level-assessment-tool-flowcharts/)

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DNL Calculator

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Guidelines

- To display the Road and/or Rail DNL calculator(s), click on the "Add Road Source" and/or "Add Rail Source" button(s) below.
- All Road and Rail input values must be positive non-decimal numbers.
- All Road and/or Rail DNL value(s) must be calculated separately before calculating the Site DNL.
- All checkboxes that apply must be checked for vehicles and trains in the tables' headers.
- **Note #1:** Tooltips, containing field specific information, have been added in this tool and may be accessed by hovering over all the respective data fields (site identification, roadway and railway assessment, DNL calculation results, roadway and railway input variables) with the mouse.
- **Note #2:** DNL Calculator assumes roadway data is always entered.

DNL Calculator

Site ID	820 Isenberg – NAL#9; Pre-Pandemic (2019)
Record Date	05/05/2021
User's Name	D.L. Adams Associates

Road # 1 Name:	**Isenberg NB**

Road #1

Vehicle Type	Cars ☑	Medium Trucks ☑	Heavy Trucks ☑
Effective Distance	285	285	285
Distance to Stop Sign			
Average Speed	25	25	25
Average Daily Trips (ADT)	3808	166	166
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	45	42	55
Calculate Road #1 DNL	55	Reset	

Road # 2 Name:	**Isenberg SB**

Road #2

Vehicle Type	Cars ☑	Medium Trucks ☑	Heavy Trucks ☑
Effective Distance	266	266	266
Distance to Stop Sign			
Average Speed	25	25	25
Average Daily Trips (ADT)	5242	228	228
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	47	44	57
Calculate Road #2 DNL	57	Reset	

Road # 3 Name:	**S King EB**

Road #3

Vehicle Type	Cars ☑	Medium Trucks ☑	Heavy Trucks ☑
Effective Distance	606	606	606
Distance to Stop Sign			
Average Speed	30	30	30
Average Daily Trips (ADT)	22927	997	997
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	50	46	58
Calculate Road #3 DNL	59	Reset	

Add Road Source Add Rail Source

Airport Noise Level	
Loud Impulse Sounds?	○Yes ◉No

Combined DNL for all Road and Rail sources	**62**
Combined DNL including Airport	**N/A**
Site DNL with Loud Impulse Sound	

Calculate Reset

Mitigation Options

If your site DNL is in Excess of 65 decibels, your options are:

- **No Action Alternative**: Cancel the project at this location
- **Other Reasonable Alternatives**: Choose an alternate site
- **Mitigation**
  - **Contact your Field or Regional Environmental Officer (/programs/environmental-review/hud-environmental-staff-contacts/)**
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DNL Calculator

Site ID	820 Isenberg – NAL#9; 5-year Predicted, No Action (2025)
Record Date	05/05/2021
User's Name	D.L. Adams Associates

Road # 1 Name:	**Isenberg NB**

Road #1

Vehicle Type	Cars ☑	Medium Trucks ☑	Heavy Trucks ☑
Effective Distance	285	285	285
Distance to Stop Sign			
Average Speed	25	25	25
Average Daily Trips (ADT)	3937	171	171
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	45	42	55
Calculate Road #1 DNL	55	Reset	

Road # 2 Name: **Isenberg SB**

Road #2

Vehicle Type	Cars ☑	Medium Trucks ☑	Heavy Trucks ☑
Effective Distance	266	266	266
Distance to Stop Sign			
Average Speed	25	25	25
Average Daily Trips (ADT)	5342	232	232
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	47	44	57
Calculate Road #2 DNL	57	Reset	

Road # 3 Name:	S King EB

Road #3

Vehicle Type	Cars ☑	Medium Trucks ☑	Heavy Trucks ☑
Effective Distance	606	606	606
Distance to Stop Sign			
Average Speed	30	30	30
Average Daily Trips (ADT)	23606	1026	1026
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	50	46	58
Calculate Road #3 DNL	59	Reset	

Add Road Source | Add Rail Source

Airport Noise Level	
Loud Impulse Sounds?	○Yes ◉No
Combined DNL for all Road and Rail sources	**62**
Combined DNL including Airport	**N/A**
Site DNL with Loud Impulse Sound	

Calculate Reset

Mitigation Options

If your site DNL is in Excess of 65 decibels, your options are:

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- **Other Reasonable Alternatives**: Choose an alternate site
- **Mitigation**
  - **Contact your Field or Regional Environmental Officer (/programs/environmental-review/hud-environmental-staff-contacts/)**
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DNL Calculator

Site ID	820 Isenberg – NAL#9; 5-year Predicted, With Action (2025)
Record Date	05/05/2021
User's Name	D.L. Adams Associates

Road # 1 Name:	**Isenberg NB**

Road #1

Vehicle Type	Cars ☑	Medium Trucks ☑	Heavy Trucks ☑
Effective Distance	285	285	285
Distance to Stop Sign			
Average Speed	25	25	25
Average Daily Trips (ADT)	3954	172	172
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	46	42	55
Calculate Road #1 DNL	56	Reset	

Road # 2 Name:	Isenberg SB

Road #2

Vehicle Type	Cars ☑	Medium Trucks ☑	Heavy Trucks ☑
Effective Distance	266	266	266
Distance to Stop Sign			
Average Speed	25	25	25
Average Daily Trips (ADT)	5835	254	254
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	48	44	57
Calculate Road #2 DNL	58	Reset	

Road # 3 Name: **S King EB**

Road #3

Vehicle Type	**Cars** ☑	**Medium Trucks** ☑	**Heavy Trucks** ☑
Effective Distance	606	606	606
Distance to Stop Sign			
Average Speed	30	30	30
Average Daily Trips (ADT)	24110	1048	1048
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	50	46	58
Calculate Road #3 DNL	59	Reset	

Add Road Source Add Rail Source

Airport Noise Level	
Loud Impulse Sounds?	○**Yes** ◉**No**

Combined DNL for all Road and Rail sources	**62**
Combined DNL including Airport	**N/A**
Site DNL with Loud Impulse Sound	

Calculate Reset

Mitigation Options

If your site DNL is in Excess of 65 decibels, your options are:

- **No Action Alternative**: Cancel the project at this location
- **Other Reasonable Alternatives**: Choose an alternate site
- **Mitigation**
  - **Contact your Field or Regional Environmental Officer (/programs/environmental-review/hud-environmental-staff-contacts/)**
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DNL Calculator

Site ID	820 Isenberg – NAL#9; 10-year Predicted, No Action (2035)
Record Date	05/05/2021
User's Name	D.L. Adams Associates

Road # 1 Name:	**Isenberg NB**

Road #1

Vehicle Type	Cars ☑	Medium Trucks ☑	Heavy Trucks ☑
Effective Distance	285	285	285
Distance to Stop Sign			
Average Speed	25	25	25
Average Daily Trips (ADT)	4224	184	184
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	46	42	55
Calculate Road #1 DNL	56	Reset	

Road # 2 Name:	**Isenberg SB**

Road #2

Vehicle Type	Cars ☑	Medium Trucks ☑	Heavy Trucks ☑
Effective Distance	266	266	266
Distance to Stop Sign			
Average Speed	25	25	25
Average Daily Trips (ADT)	5729	249	249
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	48	44	57
Calculate Road #2 DNL	58	Reset	

Road # 3 Name:	**S King EB**

Road #3

Vehicle Type	**Cars** ☑	**Medium Trucks** ☑	**Heavy Trucks** ☑
Effective Distance	606	606	606
Distance to Stop Sign			
Average Speed	30	30	30
Average Daily Trips (ADT)	25334	1101	1101
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	50	47	58
Calculate Road #3 DNL	59	Reset	

Add Road Source Add Rail Source

Airport Noise Level	
Loud Impulse Sounds?	○Yes ◉No
Combined DNL for all Road and Rail sources	**62**
Combined DNL including Airport	**N/A**
Site DNL with Loud Impulse Sound	

Calculate Reset

Mitigation Options

If your site DNL is in Excess of 65 decibels, your options are:

- **No Action Alternative**: Cancel the project at this location
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- **Mitigation**
  - **Contact your Field or Regional Environmental Officer (/programs/environmental-review/hud-environmental-staff-contacts/)**
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Tools and Guidance

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DNL Calculator

Site ID	820 Isenberg – NAL#9; 10-year Predicted, With Action (2035)
Record Date	05/05/2021
User's Name	D.L. Adams Associates

Road # 1 Name:	**Isenberg NB**

Road #1

Vehicle Type	Cars ☑	Medium Trucks ☑	Heavy Trucks ☑
Effective Distance	285	285	285
Distance to Stop Sign			
Average Speed	25	25	25
Average Daily Trips (ADT)	4247	185	185
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	46	42	55
Calculate Road #1 DNL	56	Reset	

Road # 2 Name:	**Isenberg SB**

Road #2

Vehicle Type	Cars ☑	Medium Trucks ☑	Heavy Trucks ☑
Effective Distance	266	266	266
Distance to Stop Sign			
Average Speed	25	25	25
Average Daily Trips (ADT)	6256	272	272
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	48	44	57
Calculate Road #2 DNL	58	Reset	

Road # 3 Name:	S King EB

Road #3

Vehicle Type	Cars ☑	Medium Trucks ☑	Heavy Trucks ☑
Effective Distance	606	606	606
Distance to Stop Sign			
Average Speed	30	30	30
Average Daily Trips (ADT)	25873	1125	1125
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	50	47	58
Calculate Road #3 DNL	59	Reset	

Add Road Source | Add Rail Source

Airport Noise Level	
Loud Impulse Sounds?	○Yes ◉No

Combined DNL for all Road and Rail sources	**63**
Combined DNL including Airport	**N/A**
Site DNL with Loud Impulse Sound	

Calculate Reset

Mitigation Options

If your site DNL is in Excess of 65 decibels, your options are:

- **No Action Alternative**: Cancel the project at this location
- **Other Reasonable Alternatives**: Choose an alternate site
- **Mitigation**
  - **Contact your Field or Regional Environmental Officer (/programs/environmental-review/hud-environmental-staff-contacts/)**
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- **Note #2:** DNL Calculator assumes roadway data is always entered.

DNL Calculator

Site ID	820 Isenberg – NAL#10; Current (2020)
Record Date	05/06/2021
User's Name	D.L. Adams Associates

Road # 1 Name:	**Isenberg NB**

Road #1

Vehicle Type	Cars ☑	Medium Trucks ☑	Heavy Trucks ☑
Effective Distance	95	95	95
Distance to Stop Sign			
Average Speed	25	25	25
Average Daily Trips (ADT)	1809	79	79
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	49	46	59
Calculate Road #1 DNL	59	Reset	

Road # 2 Name:	Isenberg SB

Road #2

Vehicle Type	Cars ☑	Medium Trucks ☑	Heavy Trucks ☑
Effective Distance	76	76	76
Distance to Stop Sign			
Average Speed	25	25	25
Average Daily Trips (ADT)	3612	157	157
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	54	50	63
Calculate Road #2 DNL	64	Reset	

Road # 3 Name:	S King EB

Road #3

Vehicle Type	Cars ☑	Medium Trucks ☑	Heavy Trucks ☑
Effective Distance	632	632	632
Distance to Stop Sign			
Average Speed	30	30	30
Average Daily Trips (ADT)	18251	794	794
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	49	45	56
Calculate Road #3 DNL	57	Reset	

Add Road Source | Add Rail Source

Airport Noise Level	
Loud Impulse Sounds?	○Yes ◉No
Combined DNL for all Road and Rail sources	**66**
Combined DNL including Airport	**N/A**
Site DNL with Loud Impulse Sound	

Calculate Reset

Mitigation Options

If your site DNL is in Excess of 65 decibels, your options are:

- **No Action Alternative**: Cancel the project at this location
- **Other Reasonable Alternatives**: Choose an alternate site
- **Mitigation**
  - **Contact your Field or Regional Environmental Officer (/programs/environmental-review/hud-environmental-staff-contacts/)**
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DNL Calculator

Site ID	820 Isenberg – NAL#10; Pre-Pandemic (2019)
Record Date	05/06/2021
User's Name	D.L. Adams Associates

Road # 1 Name:	**Isenberg NB**

Road #1

Vehicle Type	Cars ☑	Medium Trucks ☑	Heavy Trucks ☑
Effective Distance	95	95	95
Distance to Stop Sign			
Average Speed	25	25	25
Average Daily Trips (ADT)	3808	166	166
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	53	49	62
Calculate Road #1 DNL	63	Reset	

Road # 2 Name:	Isenberg SB

Road #2

Vehicle Type	Cars ☑	Medium Trucks ☑	Heavy Trucks ☑
Effective Distance	76	76	76
Distance to Stop Sign			
Average Speed	25	25	25
Average Daily Trips (ADT)	5242	228	228
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	55	52	65
Calculate Road #2 DNL	65	Reset	

Road # 3 Name:	S King EB

Road #3

Vehicle Type	Cars ☑	Medium Trucks ☑	Heavy Trucks ☑
Effective Distance	632	632	632
Distance to Stop Sign			
Average Speed	30	30	30
Average Daily Trips (ADT)	22927	997	997
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	50	46	57
Calculate Road #3 DNL	58	Reset	

Add Road Source Add Rail Source

Airport Noise Level	
Loud Impulse Sounds?	○Yes ◉No
Combined DNL for all Road and Rail sources	**68**
Combined DNL including Airport	**N/A**
Site DNL with Loud Impulse Sound	

Calculate Reset

Mitigation Options

If your site DNL is in Excess of 65 decibels, your options are:

- **No Action Alternative**: Cancel the project at this location
- **Other Reasonable Alternatives**: Choose an alternate site
- **Mitigation**
  - **Contact your Field or Regional Environmental Officer (/programs/environmental-review/hud-environmental-staff-contacts/)**
  - Increase mitigation in the building walls (only effective if no outdoor, noise sensitive areas)
  - Reconfigure the site plan to increase the distance between the noise source and noise-sensitive uses
  - Incorporate natural or man-made barriers. See ***The Noise Guidebook (/resource/313/hud-noise-guidebook/)***
  - Construct noise barrier. See the **Barrier Performance Module (/programs/environmental-review/bpm-calculator/)**

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Day/Night Noise Level Assessment Tool Flowcharts (/resource/3823/day-night-noise-level-assessment-tool-flowcharts/)

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DNL Calculator

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Guidelines

- To display the Road and/or Rail DNL calculator(s), click on the "Add Road Source" and/or "Add Rail Source" button(s) below.
- All Road and Rail input values must be positive non-decimal numbers.
- All Road and/or Rail DNL value(s) must be calculated separately before calculating the Site DNL.
- All checkboxes that apply must be checked for vehicles and trains in the tables' headers.
- **Note #1:** Tooltips, containing field specific information, have been added in this tool and may be accessed by hovering over all the respective data fields (site identification, roadway and railway assessment, DNL calculation results, roadway and railway input variables) with the mouse.
- **Note #2:** DNL Calculator assumes roadway data is always entered.

DNL Calculator

Site ID	820 Isenberg – NAL#10; 5-year Predicted, No Action (2025)
Record Date	05/06/2021
User's Name	D.L. Adams Associates

Road # 1 Name:	**Isenberg NB**

Road #1

Vehicle Type	Cars ☑	Medium Trucks ☑	Heavy Trucks ☑
Effective Distance	95	95	95
Distance to Stop Sign			
Average Speed	25	25	25
Average Daily Trips (ADT)	3937	171	171
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	53	49	62
Calculate Road #1 DNL	63	Reset	

Road # 2 Name: **Isenberg SB**

Road #2

Vehicle Type	Cars ☑	Medium Trucks ☑	Heavy Trucks ☑
Effective Distance	76	76	76
Distance to Stop Sign			
Average Speed	25	25	25
Average Daily Trips (ADT)	5342	232	232
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	55	52	65
Calculate Road #2 DNL	65	Reset	

Road # 3 Name:	S King EB

Road #3

Vehicle Type	Cars ☑	Medium Trucks ☑	Heavy Trucks ☑
Effective Distance	632	632	632
Distance to Stop Sign			
Average Speed	30	30	30
Average Daily Trips (ADT)	23606	1026	1026
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	50	46	57
Calculate Road #3 DNL	58	Reset	

Add Road Source | Add Rail Source

Airport Noise Level	
Loud Impulse Sounds?	○Yes ◉No
Combined DNL for all Road and Rail sources	**68**
Combined DNL including Airport	**N/A**
Site DNL with Loud Impulse Sound	

Calculate Reset

Mitigation Options

If your site DNL is in Excess of 65 decibels, your options are:

- **No Action Alternative**: Cancel the project at this location
- **Other Reasonable Alternatives**: Choose an alternate site
- **Mitigation**
  - **Contact your Field or Regional Environmental Officer (/programs/environmental-review/hud-environmental-staff-contacts/)**
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DNL Calculator

Site ID	820 Isenberg – NAL#10; 5-year Predicted, With Action (2025)
Record Date	05/06/2021
User's Name	D.L. Adams Associates

Road # 1 Name:	**Isenberg NB**

Road #1

Vehicle Type	Cars ☑	Medium Trucks ☑	Heavy Trucks ☑
Effective Distance	95	95	95
Distance to Stop Sign			
Average Speed	25	25	25
Average Daily Trips (ADT)	3954	172	172
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	53	49	62
Calculate Road #1 DNL	63	Reset	

Road # 2 Name:	Isenberg SB

Road #2

Vehicle Type	Cars ☑	Medium Trucks ☑	Heavy Trucks ☑
Effective Distance	76	76	76
Distance to Stop Sign			
Average Speed	25	25	25
Average Daily Trips (ADT)	5835	254	254
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	56	52	65
Calculate Road #2 DNL	66	Reset	

Road # 3 Name:	**S King EB**

Road #3

Vehicle Type	**Cars** ☑	**Medium Trucks** ☑	**Heavy Trucks** ☑
Effective Distance	632	632	632
Distance to Stop Sign			
Average Speed	30	30	30
Average Daily Trips (ADT)	24110	1048	1048
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	50	46	58
Calculate Road #3 DNL	58	Reset	

Add Road Source | Add Rail Source

Airport Noise Level	
Loud Impulse Sounds?	○Yes ◉No

Combined DNL for all Road and Rail sources	**68**
Combined DNL including Airport	**N/A**
Site DNL with Loud Impulse Sound	

Calculate Reset

Mitigation Options

If your site DNL is in Excess of 65 decibels, your options are:

- **No Action Alternative**: Cancel the project at this location
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- **Mitigation**
  - **Contact your Field or Regional Environmental Officer (/programs/environmental-review/hud-environmental-staff-contacts/)**
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DNL Calculator

Site ID	820 Isenberg – NAL#10; 10-year Predicted, No Action (2035)
Record Date	05/06/2021
User's Name	D.L. Adams Associates

Road # 1 Name:	**Isenberg NB**

Road #1

Vehicle Type	Cars ☑	Medium Trucks ☑	Heavy Trucks ☑
Effective Distance	95	95	95
Distance to Stop Sign			
Average Speed	25	25	25
Average Daily Trips (ADT)	4224	184	184
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	53	49	62
Calculate Road #1 DNL	63	Reset	

Road # 2 Name:	**Isenberg SB**

Road #2

Vehicle Type	Cars ☑	Medium Trucks ☑	Heavy Trucks ☑
Effective Distance	76	76	76
Distance to Stop Sign			
Average Speed	25	25	25
Average Daily Trips (ADT)	5729	249	249
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	56	52	65
Calculate Road #2 DNL	66	Reset	

Road # 3 Name:	S King EB

Road #3

Vehicle Type	Cars ☑	Medium Trucks ☑	Heavy Trucks ☑
Effective Distance	632	632	632
Distance to Stop Sign			
Average Speed	30	30	30
Average Daily Trips (ADT)	25334	1101	1101
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	50	46	58
Calculate Road #3 DNL	59	Reset	

Add Road Source Add Rail Source

Airport Noise Level	
Loud Impulse Sounds?	○Yes ◉No

Combined DNL for all Road and Rail sources	**68**
Combined DNL including Airport	**N/A**
Site DNL with Loud Impulse Sound	

Calculate Reset

Mitigation Options

If your site DNL is in Excess of 65 decibels, your options are:

- **No Action Alternative**: Cancel the project at this location
- **Other Reasonable Alternatives**: Choose an alternate site
- **Mitigation**
  - **Contact your Field or Regional Environmental Officer (/programs/environmental-review/hud-environmental-staff-contacts/)**
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DNL Calculator

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- **Note #2:** DNL Calculator assumes roadway data is always entered.

DNL Calculator

Site ID	820 Isenberg – NAL#10; 10-year Predicted, With Action (2035)
Record Date	05/06/2021
User's Name	D.L. Adams Associates

Road # 1 Name:	**Isenberg NB**

Road #1

Vehicle Type	Cars ☑	Medium Trucks ☑	Heavy Trucks ☑
Effective Distance	95	95	95
Distance to Stop Sign			
Average Speed	25	25	25
Average Daily Trips (ADT)	4247	185	185
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	53	49	62
Calculate Road #1 DNL	63	Reset	

Road # 2 Name: **Isenberg SB**

Road #2

Vehicle Type	Cars ☑	Medium Trucks ☑	Heavy Trucks ☑
Effective Distance	76	76	76
Distance to Stop Sign			
Average Speed	25	25	25
Average Daily Trips (ADT)	6256	272	272
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	56	53	65
Calculate Road #2 DNL	66	Reset	

Road # 3 Name:	S King EB

Road #3

Vehicle Type	Cars ☑	Medium Trucks ☑	Heavy Trucks ☑
Effective Distance	632	632	632
Distance to Stop Sign			
Average Speed	30	30	30
Average Daily Trips (ADT)	25873	1125	1125
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	50	46	58
Calculate Road #3 DNL	59	Reset	

Add Road Source | Add Rail Source

Airport Noise Level	
Loud Impulse Sounds?	○Yes ◉No
Combined DNL for all Road and Rail sources	**68**
Combined DNL including Airport	**N/A**
Site DNL with Loud Impulse Sound	

Calculate Reset

Mitigation Options

If your site DNL is in Excess of 65 decibels, your options are:

- **No Action Alternative**: Cancel the project at this location
- **Other Reasonable Alternatives**: Choose an alternate site
- **Mitigation**
  - **Contact your Field or Regional Environmental Officer (/programs/environmental-review/hud-environmental-staff-contacts/)**
  - Increase mitigation in the building walls (only effective if no outdoor, noise sensitive areas)
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Tools and Guidance

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DNL Calculator

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DNL Calculator

Site ID	820 Isenberg – NAL#11; Current (2020)
Record Date	05/06/2021
User's Name	D.L. Adams Associates

Road # 1 Name:	**Isenberg NB**

Road #1

Vehicle Type	Cars ☑	Medium Trucks ☑	Heavy Trucks ☑
Effective Distance	150	150	150
Distance to Stop Sign			
Average Speed	25	25	25
Average Daily Trips (ADT)	1809	79	79
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	46	43	56
Calculate Road #1 DNL	56	Reset	

Road # 2 Name:	Isenberg SB

Road #2

Vehicle Type	Cars ☑	Medium Trucks ☑	Heavy Trucks ☑
Effective Distance	130	130	130
Distance to Stop Sign			
Average Speed	25	25	25
Average Daily Trips (ADT)	3612	157	157
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	50	47	60
Calculate Road #2 DNL	60	Reset	

Road # 3 Name:	**S King EB**

Road #3

Vehicle Type	**Cars** ☑	**Medium Trucks** ☑	**Heavy Trucks** ☑
Effective Distance	632	632	632
Distance to Stop Sign			
Average Speed	30	30	30
Average Daily Trips (ADT)	18251	794	794
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	49	45	56
Calculate Road #3 DNL	57	Reset	

Add Road Source Add Rail Source

Airport Noise Level	
Loud Impulse Sounds?	○**Yes** ◉**No**

Combined DNL for all Road and Rail sources	**63**
Combined DNL including Airport	**N/A**
Site DNL with Loud Impulse Sound	

Calculate Reset

Mitigation Options

If your site DNL is in Excess of 65 decibels, your options are:

- **No Action Alternative**: Cancel the project at this location
- **Other Reasonable Alternatives**: Choose an alternate site
- **Mitigation**
  - **Contact your Field or Regional Environmental Officer (/programs/environmental-review/hud-environmental-staff-contacts/)**
  - Increase mitigation in the building walls (only effective if no outdoor, noise sensitive areas)
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DNL Calculator

Site ID	820 Isenberg – NAL#11; Pre-Pandemic (2019)
Record Date	05/06/2021
User's Name	D.L. Adams Associates

Road # 1 Name:	**Isenberg NB**

Road #1

Vehicle Type	Cars ☑	Medium Trucks ☑	Heavy Trucks ☑
Effective Distance	150	150	150
Distance to Stop Sign			
Average Speed	25	25	25
Average Daily Trips (ADT)	3808	166	166
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	50	46	59
Calculate Road #1 DNL	60	Reset	

Road # 2 Name:	Isenberg SB

Road #2

Vehicle Type	Cars ☑	Medium Trucks ☑	Heavy Trucks ☑
Effective Distance	130	130	130
Distance to Stop Sign			
Average Speed	25	25	25
Average Daily Trips (ADT)	5242	228	228
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	52	48	61
Calculate Road #2 DNL	62	Reset	

Road # 3 Name:	**S King EB**

Road #3

Vehicle Type	**Cars** ☑	**Medium Trucks** ☑	**Heavy Trucks** ☑
Effective Distance	632	632	632
Distance to Stop Sign			
Average Speed	30	30	30
Average Daily Trips (ADT)	22927	997	997
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	50	46	57
Calculate Road #3 DNL	58	Reset	

Add Road Source | Add Rail Source

Airport Noise Level	
Loud Impulse Sounds?	○Yes ◉No
Combined DNL for all Road and Rail sources	**65**
Combined DNL including Airport	**N/A**
Site DNL with Loud Impulse Sound	

Calculate Reset

Mitigation Options

If your site DNL is in Excess of 65 decibels, your options are:

- **No Action Alternative**: Cancel the project at this location
- **Other Reasonable Alternatives**: Choose an alternate site
- **Mitigation**
  - **Contact your Field or Regional Environmental Officer (/programs/environmental-review/hud-environmental-staff-contacts/)**
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DNL Calculator

Site ID	820 Isenberg – NAL#11; 5-year Predicted, No Action (2025)
Record Date	05/06/2021
User's Name	D.L. Adams Associates

Road # 1 Name:	**Isenberg NB**

Road #1

Vehicle Type	Cars ☑	Medium Trucks ☑	Heavy Trucks ☑
Effective Distance	150	150	150
Distance to Stop Sign			
Average Speed	25	25	25
Average Daily Trips (ADT)	3937	171	171
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	50	46	59
Calculate Road #1 DNL	60	Reset	

Road # 2 Name: **Isenberg SB**

Road #2

Vehicle Type	Cars ☑	Medium Trucks ☑	Heavy Trucks ☑
Effective Distance	130	130	130
Distance to Stop Sign			
Average Speed	25	25	25
Average Daily Trips (ADT)	5342	232	232
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	52	48	61
Calculate Road #2 DNL	62	Reset	

Road # 3 Name:	S King EB

Road #3

Vehicle Type	Cars ☑	Medium Trucks ☑	Heavy Trucks ☑
Effective Distance	632	632	632
Distance to Stop Sign			
Average Speed	30	30	30
Average Daily Trips (ADT)	23606	1026	1026
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	50	46	57
Calculate Road #3 DNL	58	Reset	

Add Road Source Add Rail Source

Airport Noise Level	
Loud Impulse Sounds?	○Yes ◉No

Combined DNL for all Road and Rail sources	**65**
Combined DNL including Airport	**N/A**
Site DNL with Loud Impulse Sound	

Calculate Reset

Mitigation Options

If your site DNL is in Excess of 65 decibels, your options are:

- **No Action Alternative**: Cancel the project at this location
- **Other Reasonable Alternatives**: Choose an alternate site
- **Mitigation**
  - **Contact your Field or Regional Environmental Officer (/programs/environmental-review/hud-environmental-staff-contacts/)**
  - Increase mitigation in the building walls (only effective if no outdoor, noise sensitive areas)
  - Reconfigure the site plan to increase the distance between the noise source and noise-sensitive uses
  - Incorporate natural or man-made barriers. See ***The Noise Guidebook (/resource/313/hud-noise-guidebook/)***
  - Construct noise barrier. See the **Barrier Performance Module (/programs/environmental-review/bpm-calculator/)**

Tools and Guidance

Day/Night Noise Level Assessment Tool User Guide (/resource/3822/day-night-noise-level-assessment-tool-user-guide/)

Day/Night Noise Level Assessment Tool Flowcharts (/resource/3823/day-night-noise-level-assessment-tool-flowcharts/)

Home (/) > **Programs (/programs/)** > **Environmental Review (/programs/environmental-review/)** > DNL Calculator

DNL Calculator

The Day/Night Noise Level Calculator is an electronic assessment tool that calculates the Day/Night Noise Level (DNL) from roadway and railway traffic. For more information on using the DNL calculator, view the **Day/Night Noise Level Calculator Electronic Assessment Tool Overview (/programs/environmental-review/daynight-noise-level-electronic-assessment-tool/)**.

Guidelines

- To display the Road and/or Rail DNL calculator(s), click on the "Add Road Source" and/or "Add Rail Source" button(s) below.
- All Road and Rail input values must be positive non-decimal numbers.
- All Road and/or Rail DNL value(s) must be calculated separately before calculating the Site DNL.
- All checkboxes that apply must be checked for vehicles and trains in the tables' headers.
- **Note #1:** Tooltips, containing field specific information, have been added in this tool and may be accessed by hovering over all the respective data fields (site identification, roadway and railway assessment, DNL calculation results, roadway and railway input variables) with the mouse.
- **Note #2:** DNL Calculator assumes roadway data is always entered.

DNL Calculator

Site ID	820 Isenberg – NAL#11; 5-year Predicted, With Action (2025)
Record Date	05/06/2021
User's Name	D.L. Adams Associates

Road # 1 Name:	**Isenberg NB**

Road #1

Vehicle Type	Cars ☑	Medium Trucks ☑	Heavy Trucks ☑
Effective Distance	150	150	150
Distance to Stop Sign			
Average Speed	25	25	25
Average Daily Trips (ADT)	3954	172	172
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	50	46	59
Calculate Road #1 DNL	60	Reset	

Road # 2 Name:	Isenberg SB

Road #2

Vehicle Type	Cars ☑	Medium Trucks ☑	Heavy Trucks ☑
Effective Distance	130	130	130
Distance to Stop Sign			
Average Speed	25	25	25
Average Daily Trips (ADT)	5835	254	254
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	52	49	62
Calculate Road #2 DNL	62	Reset	

Road # 3 Name:	**S King EB**

Road #3

Vehicle Type	**Cars** ☑	**Medium Trucks** ☑	**Heavy Trucks** ☑
Effective Distance	632	632	632
Distance to Stop Sign			
Average Speed	30	30	30
Average Daily Trips (ADT)	24110	1048	1048
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	50	46	58
Calculate Road #3 DNL	58	Reset	

Add Road Source | Add Rail Source

Airport Noise Level	
Loud Impulse Sounds?	○**Yes** ◉**No**
Combined DNL for all Road and Rail sources	**65**
Combined DNL including Airport	**N/A**
Site DNL with Loud Impulse Sound	

Calculate Reset

Mitigation Options

If your site DNL is in Excess of 65 decibels, your options are:

- **No Action Alternative**: Cancel the project at this location
- **Other Reasonable Alternatives**: Choose an alternate site
- **Mitigation**
    - **Contact your Field or Regional Environmental Officer (/programs/environmental-review/hud-environmental-staff-contacts/)**
    - Increase mitigation in the building walls (only effective if no outdoor, noise sensitive areas)
    - Reconfigure the site plan to increase the distance between the noise source and noise-sensitive uses
    - Incorporate natural or man-made barriers. See ***The Noise Guidebook (/resource/313/hud-noise-guidebook/)***
    - Construct noise barrier. See the **Barrier Performance Module (/programs/environmental-review/bpm-calculator/)**

Tools and Guidance

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Day/Night Noise Level Assessment Tool Flowcharts (/resource/3823/day-night-noise-level-assessment-tool-flowcharts/)

Home (/) > **Programs (/programs/)** > **Environmental Review (/programs/environmental-review/)** > DNL Calculator

DNL Calculator

The Day/Night Noise Level Calculator is an electronic assessment tool that calculates the Day/Night Noise Level (DNL) from roadway and railway traffic. For more information on using the DNL calculator, view the **Day/Night Noise Level Calculator Electronic Assessment Tool Overview (/programs/environmental-review/daynight-noise-level-electronic-assessment-tool/)**.

Guidelines

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- All Road and Rail input values must be positive non-decimal numbers.
- All Road and/or Rail DNL value(s) must be calculated separately before calculating the Site DNL.
- All checkboxes that apply must be checked for vehicles and trains in the tables' headers.
- **Note #1:** Tooltips, containing field specific information, have been added in this tool and may be accessed by hovering over all the respective data fields (site identification, roadway and railway assessment, DNL calculation results, roadway and railway input variables) with the mouse.
- **Note #2:** DNL Calculator assumes roadway data is always entered.

DNL Calculator

Site ID	820 Isenberg – NAL#11; 10-year Predicted, No Action (2035)
Record Date	05/06/2021
User's Name	D.L. Adams Associates

Road # 1 Name:	**Isenberg NB**

Road #1

Vehicle Type	Cars ☑	Medium Trucks ☑	Heavy Trucks ☑
Effective Distance	150	150	150
Distance to Stop Sign			
Average Speed	25	25	25
Average Daily Trips (ADT)	4224	184	184
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	50	46	59
Calculate Road #1 DNL	60	Reset	

Road # 2 Name: **Isenberg SB**

Road #2

Vehicle Type	Cars ☑	Medium Trucks ☑	Heavy Trucks ☑
Effective Distance	130	130	130
Distance to Stop Sign			
Average Speed	25	25	25
Average Daily Trips (ADT)	5729	249	249
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	52	49	62
Calculate Road #2 DNL	62	Reset	

Road # 3 Name:	S King EB

Road #3

Vehicle Type	Cars ☑	Medium Trucks ☑	Heavy Trucks ☑
Effective Distance	632	632	632
Distance to Stop Sign			
Average Speed	30	30	30
Average Daily Trips (ADT)	25334	1101	1101
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	50	46	58
Calculate Road #3 DNL	59	Reset	

Add Road Source Add Rail Source

Airport Noise Level	
Loud Impulse Sounds?	○Yes ◉No
Combined DNL for all Road and Rail sources	**65**
Combined DNL including Airport	**N/A**
Site DNL with Loud Impulse Sound	

Calculate Reset

Mitigation Options

If your site DNL is in Excess of 65 decibels, your options are:

- **No Action Alternative**: Cancel the project at this location
- **Other Reasonable Alternatives**: Choose an alternate site
- **Mitigation**
  - **Contact your Field or Regional Environmental Officer (/programs/environmental-review/hud-environmental-staff-contacts/)**
  - Increase mitigation in the building walls (only effective if no outdoor, noise sensitive areas)
  - Reconfigure the site plan to increase the distance between the noise source and noise-sensitive uses
  - Incorporate natural or man-made barriers. See ***The Noise Guidebook (/resource/313/hud-noise-guidebook/)***
  - Construct noise barrier. See the **Barrier Performance Module (/programs/environmental-review/bpm-calculator/)**

Tools and Guidance

Day/Night Noise Level Assessment Tool User Guide (/resource/3822/day-night-noise-level-assessment-tool-user-guide/)

Day/Night Noise Level Assessment Tool Flowcharts (/resource/3823/day-night-noise-level-assessment-tool-flowcharts/)

Home (/) > **Programs (/programs/)** > **Environmental Review (/programs/environmental-review/)** > DNL Calculator

DNL Calculator

The Day/Night Noise Level Calculator is an electronic assessment tool that calculates the Day/Night Noise Level (DNL) from roadway and railway traffic. For more information on using the DNL calculator, view the **Day/Night Noise Level Calculator Electronic Assessment Tool Overview (/programs/environmental-review/daynight-noise-level-electronic-assessment-tool/)**.

Guidelines

- To display the Road and/or Rail DNL calculator(s), click on the "Add Road Source" and/or "Add Rail Source" button(s) below.
- All Road and Rail input values must be positive non-decimal numbers.
- All Road and/or Rail DNL value(s) must be calculated separately before calculating the Site DNL.
- All checkboxes that apply must be checked for vehicles and trains in the tables' headers.
- **Note #1:** Tooltips, containing field specific information, have been added in this tool and may be accessed by hovering over all the respective data fields (site identification, roadway and railway assessment, DNL calculation results, roadway and railway input variables) with the mouse.
- **Note #2:** DNL Calculator assumes roadway data is always entered.

DNL Calculator

Site ID	820 Isenberg – NAL#11; 10-year Predicted, With Action (2035)
Record Date	05/06/2021
User's Name	D.L. Adams Associates

Road # 1 Name:	**Isenberg NB**

Road #1

Vehicle Type	Cars ☑	Medium Trucks ☑	Heavy Trucks ☑
Effective Distance	150	150	150
Distance to Stop Sign			
Average Speed	25	25	25
Average Daily Trips (ADT)	4247	185	185
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	50	46	59
Calculate Road #1 DNL	60	Reset	

Road # 2 Name:	**Isenberg SB**

Road #2

Vehicle Type	Cars ☑	Medium Trucks ☑	Heavy Trucks ☑
Effective Distance	130	130	130
Distance to Stop Sign			
Average Speed	25	25	25
Average Daily Trips (ADT)	6256	272	272
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	53	49	62
Calculate Road #2 DNL	63	Reset	

Road # 3 Name:	**S King EB**

Road #3

Vehicle Type	**Cars** ☑	**Medium Trucks** ☑	**Heavy Trucks** ☑
Effective Distance	632	632	632
Distance to Stop Sign			
Average Speed	30	30	30
Average Daily Trips (ADT)	25873	1125	1125
Night Fraction of ADT	15	15	15
Road Gradient (%)			1
Vehicle DNL	50	46	58
Calculate Road #3 DNL	59	Reset	

Add Road Source | Add Rail Source

Airport Noise Level	
Loud Impulse Sounds?	○Yes ◉No
Combined DNL for all Road and Rail sources	**66**
Combined DNL including Airport	**N/A**
Site DNL with Loud Impulse Sound	

Calculate Reset

Mitigation Options

If your site DNL is in Excess of 65 decibels, your options are:

- **No Action Alternative**: Cancel the project at this location
- **Other Reasonable Alternatives**: Choose an alternate site
- **Mitigation**
  - **Contact your Field or Regional Environmental Officer (/programs/environmental-review/hud-environmental-staff-contacts/)**
  - Increase mitigation in the building walls (only effective if no outdoor, noise sensitive areas)
  - Reconfigure the site plan to increase the distance between the noise source and noise-sensitive uses
  - Incorporate natural or man-made barriers. See ***The Noise Guidebook (/resource/313/hud-noise-guidebook/)***
  - Construct noise barrier. See the **Barrier Performance Module (/programs/environmental-review/bpm-calculator/)**

Tools and Guidance

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Day/Night Noise Level Assessment Tool Flowcharts (/resource/3823/day-night-noise-level-assessment-tool-flowcharts/)

ATTACHMENT 3
STC Results Compiled - NAL10-11

Sound Transmission Classification Assessment Tool (STraCAT)

Overview

The Sound Transmission Classification Assessment Tool (STraCAT) is an electronic version of Figures 17 and 19 in The HUD Noise Guidebook. The purpose of this tool is to document sound attenuation performance of wall systems. Based on wall, window, and door Sound Transmission Classification (STC) values, the STraCAT generates a composite STC value for the wall assembly as a whole. Users can enter the calculated noise level related to a specific Noise Assessment Location in front of a building façade and STraCAT will generate a target required attenuation value for the wall assembly in STC. Based on wall materials, the tool will state whether the composite wall assembly STC meets the required attenuation value.

How to Use This Tool

Location, Noise Level and Wall Configuration to Be Analyzed
STraCAT is designed to calculate the attenuation provided by the wall assembly for one wall of one unit. If unit exterior square footage and window/door configuration is identical around the structure, a single STraCAT may be sufficient. If units vary, at least one STraCAT should be completed for each different exterior unit wall configuration to document that all will achieve the required attenuation. Additionally, if attenuation is not based on a single worst-case NAL, but there are multiple NALs which require different levels of attenuation around the structure, a STraCAT should be completed for each differing exterior wall configuration associated with each NAL.

Exterior wall configurations associated with an NAL include those with parallel (facing) or near-parallel exposure as well as those with perpendicular exposure. When a façade has parallel or perpendicular exposure to two or more NALs, you should base the required attenuation on the NAL with the highest calculated noise level. For corner units where the unit interior receives exterior noise through two facades, the STraCAT calculation should incorporate the area of wall, window and door materials pertaining to the corner unit's total exterior wall area (i.e., from both walls).

Information to Be Entered
Users first enter basic project information and the NAL noise level that will be used as the basis for required attenuation. This noise level must be entered in whole numbers. STraCAT users then enter information on wall, window and door component type and area. Again, as noted above, the wall, window and door entries are based on one unit, and one wall (except for corner units as discussed above). The tool sums total wall square footage based on the combined area of walls, doors and windows for the façade being evaluated.

Users may input STC values for materials in one of two ways. The tool includes a dropdown menu of common construction materials with STC values prefilled. If selected construction materials are not included in this dropdown menu, the user may also enter the STC for a given component manually. Verification of the component STC must be included in the ERR. Documentation includes the architect or construction manager's project plans showing wall material specifications. For new construction or for components that will be newly installed in an existing wall, documentation also includes the manufacturer's product specification sheet (cut sheet) documenting the STC rating of selected doors and windows.

Required STC Rating and Determination of Compliance
Finally, based on project information entered the tool will indicate the required STC rating for the wall assembly being evaluated and whether or not the materials specified will produce a combined rating that meets this requirement. Note that for noise levels above 75 dB DNL, either HUD (for 24 CFR Part 50 reviews) or the Responsible Entity (for 24 CFR Part 58 reviews) must approve the level and type of attenuation, among other processing requirements. Required attenuation values generated by STraCAT for NALs above 75 dB DNL should therefore be considered tentative pending approval by HUD or the RE.

Part I - Description

Part I - Description

Project

820 Isenberg - NAL#10

Sponsor/Developer

Stanford Carr Development

Location

820 Isenberg St, Honolulu, HI

Prepared by

D.L. Adams Associates

Noise Level

68

Date

5/11/2021

Primary Source(s)

Isenberg St, S King St

Part II - Wall Components

Part II - Wall Components

Wall Construction Detail	Area	STC
EXTERIOR WALL - 5/8" Type X Gypsum, 6" Steel studs (25ga) @ 16" O.C. w/ fiberglass insulation, 5"/8" exterior sheathing board, EIFS	114	40
PTAC - Chigo CPS-CNR1	5	32
PTAC Blank-Off Panel - reference: "Louver Blank-Off - STC 21 Rating"	7	21
Add new wall		
	126 Sq. Feet	**32.54**

Window Construction Detail	Quantity	Sq Ft/Unit	STC
WINDOW - 1" overall - 1/4" glass, 1/2" airspace, 1/4" glass	1	72	32

Add new window

Door Construction Detail	Quantity	Sq Ft/Unit	STC

Add new door

Part III - Results

Part III - Results

Wall Statistics

Stat	Value
Area:	126 ft^2
Wall STC:	32.54

Aperture Statistics

Aperture	Count	Area	% of wall
Windows:	1	**72 ft^2**	**57.14%**
Doors:	0	**0 ft^2**	**0%**

Evaluation Criteria

Criteria	Value
Noise source sound level (dB):	**68**
Combined STC for wall assembly:	**32.22**
Required STC rating:	**26**
Does wall assembly meet requirements?	**Yes**

Print

Part 4 - Tips

Part 4 - Tips

What do you do if the preferred wall design is not sufficient to achieve the required attenuation? Another wall design with more substantial materials will work, but may not be the most cost-effective solution. Try adding some other elements for just a little more attenuation.

For example:

- Staggering the studs in a wall offers approximately 4dB of additional protection.
- Increasing the stud spacing from 16" on center to 24" can increase the STC from 2-5dB.
- Adding a 2" air space can provide 3dB more attenuation.
- Increasing a wall's air space from 3" to 6"can reduce noise levels by an additional 5dB.
- Adding a layer of ½" gypsum board on "Z" furring channels adds 2dB of attenuation.
- Using resilient channels and clips between wall panels and studs can improve the STC from 2-5dB.
- Adding a layer of ½" gypsum board on resilient channels adds 5dB of attenuation.
- Adding acoustical or isolation blankets to a wall's airspace can add 4-10dB of attenuation.
- A 1" rockwool acoustical blanket adds 3dB to the wall's STC.
- Filling the cells of lightweight concrete masonry units with expanded mineral loose-fill insulation adds 2dB to the STC.

Home (/) > STraCAT

Sound Transmission Classification Assessment Tool (STraCAT)

Overview

The Sound Transmission Classification Assessment Tool (STraCAT) is an electronic version of Figures 17 and 19 in The HUD Noise Guidebook. The purpose of this tool is to document sound attenuation performance of wall systems. Based on wall, window, and door Sound Transmission Classification (STC) values, the STraCAT generates a composite STC value for the wall assembly as a whole. Users can enter the calculated noise level related to a specific Noise Assessment Location in front of a building façade and STraCAT will generate a target required attenuation value for the wall assembly in STC. Based on wall materials, the tool will state whether the composite wall assembly STC meets the required attenuation value.

How to Use This Tool

Location, Noise Level and Wall Configuration to Be Analyzed
STraCAT is designed to calculate the attenuation provided by the wall assembly for one wall of one unit. If unit exterior square footage and window/door configuration is identical around the structure, a single STraCAT may be sufficient. If units vary, at least one STraCAT should be completed for each different exterior unit wall configuration to document that all will achieve the required attenuation. Additionally, if attenuation is not based on a single worst-case NAL, but there are multiple NALs which require different levels of attenuation around the structure, a STraCAT should be completed for each differing exterior wall configuration associated with each NAL.

Exterior wall configurations associated with an NAL include those with parallel (facing) or near-parallel exposure as well as those with perpendicular exposure. When a façade has parallel or perpendicular exposure to two or more NALs, you should base the required attenuation on the NAL with the highest calculated noise level. For corner units where the unit interior receives exterior noise through two facades, the STraCAT calculation should incorporate the area of wall, window and door materials pertaining to the corner unit’s total exterior wall area (i.e., from both walls).

Information to Be Entered
Users first enter basic project information and the NAL noise level that will be used as the basis for required attenuation. This noise level must be entered in whole numbers. STraCAT users then enter information on wall, window and door component type and area. Again, as noted above, the wall, window and door entries are based on one unit, and one wall (except for corner units as discussed above). The tool sums total wall square footage based on the combined area of walls, doors and windows for the façade being evaluated.

Users may input STC values for materials in one of two ways. The tool includes a dropdown menu of common construction materials with STC values prefilled. If selected construction materials are not included in this dropdown menu, the user may also enter the STC for a given component manually. Verification of the component STC must be included in the ERR. Documentation includes the architect or construction manager’s project plans showing wall material specifications. For new construction or for components that will be newly installed in an existing wall, documentation also includes the manufacturer’s product specification sheet (cut sheet) documenting the STC rating of selected doors and windows.

Required STC Rating and Determination of Compliance
Finally, based on project information entered the tool will indicate the required STC rating for the wall assembly being evaluated and whether or not the materials specified will produce a combined rating that meets this requirement. Note that for noise levels above 75 dB DNL, either HUD (for 24 CFR Part 50 reviews) or the Responsible Entity (for 24 CFR Part 58 reviews) must approve the level and type of attenuation, among other processing requirements. Required attenuation values generated by STraCAT for NALs above 75 dB DNL should therefore be considered tentative pending approval by HUD or the RE.

Part I - Description

Part I - Description

Project

820 Isenberg - NAL#11

Sponsor/Developer

Stanford Carr Development

Location

820 Isenberg St, Honolulu, HI

Prepared by

D.L. Adams Associates

Noise Level

66

Date

5/12/2021

Primary Source(s)

Isenberg St, S King St

Part II - Wall Components

Part II - Wall Components

Wall Construction Detail	Area	STC
EXTERIOR WALL - 5/8" Type X Gypsum, 6" Steel studs (25ga) @ 16" O.C. w/ fiberglass insulation, 5"/8" exterior sheathing board, EIFS	77	40
PTAC - Chigo CPS-CNR1	5	32
PTAC Blank-Off Panel - reference: "Louver Blank-Off - STC 21 Rating"	7	21

Add new wall

	89 Sq. Feet	**31.27**

Window Construction Detail	Quantity	Sq Ft/Unit	STC
WINDOW - 1" overall - 1/4" glass, 1/2" airspace, 1/4" glass	1	89	32

Add new window

Door Construction Detail	Quantity	Sq Ft/Unit	STC

Add new door

Part III - Results

Part III - Results

Wall Statistics

Stat	Value
Area:	89 ft²
Wall STC:	31.27

Aperture Statistics

Aperture	Count	Area	% of wall
Windows:	1	**89 ft²**	**100%**
Doors:	0	**0 ft²**	**0%**

Evaluation Criteria

Criteria	Value
Noise source sound level (dB):	**66**
Combined STC for wall assembly:	**32**
Required STC rating:	**25**
Does wall assembly meet requirements?	**Yes**

Print

Part 4 - Tips

Part 4 - Tips

What do you do if the preferred wall design is not sufficient to achieve the required attenuation? Another wall design with more substantial materials will work, but may not be the most cost-effective solution. Try adding some other elements for just a little more attenuation.

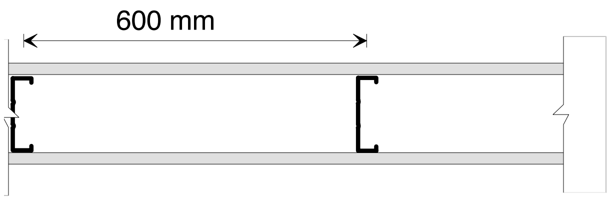
For example:

- Staggering the studs in a wall offers approximately 4dB of additional protection.
- Increasing the stud spacing from 16” on center to 24” can increase the STC from 2-5dB.
- Adding a 2” air space can provide 3dB more attenuation.
- Increasing a wall’s air space from 3” to 6”can reduce noise levels by an additional 5dB.
- Adding a layer of ½” gypsum board on “Z” furring channels adds 2dB of attenuation.
- Using resilient channels and clips between wall panels and studs can improve the STC from 2-5dB.
- Adding a layer of ½” gypsum board on resilient channels adds 5dB of attenuation.
- Adding acoustical or isolation blankets to a wall’s airspace can add 4-10dB of attenuation.
- A 1” rockwool acoustical blanket adds 3dB to the wall’s STC.
- Filling the cells of lightweight concrete masonry units with expanded mineral loose-fill insulation adds 2dB to the STC.

ATTACHMENT 4
Partition Elements Sound Isolation

Exterior Wall Assembly - Sound Isolation

Table SS-7: 31x152 mm, 25 gauge (0.50 mm) non-loadbearing steel studs at 600 mm o.c. with one layer gypsum board each side



one layer of gypsum board
31x152 mm, 25 gauge (0.50 mm) non-loadbearing steel studs at 600 mm o.c., with absorptive material (as noted) in stud cavity
one layer of gypsum board

Gypsum Board	Absorptive Material		Test Number	STC	R_w
15.9 mm Type X (C)	glass fibre (G1)	150 mm batt	TL-93-298	51	51
12.7 mm Type X (A)	glass fibre (G1)	150 mm batt	TL-93-299	52	52

With worst-case scenario of 16-gauge studs, DLAA predicts field sound isolation performance of exterior partition to be approximately STC 40.

PTAC Unit - Sound Isolation

CHIGO CENTRAL AIR-CONDITIONING	Model name		CPS-09CNR1-C	CPS-12CNR1-C
	Power supply	V/Ph/Hz	208/230V/1/60	208/230V/1/60
Cooling	Capacity	Btu/h	9300/9500	11800/12000
	EER	Btu/w.h	11.7/11.4	10.7/10.5
Heating	Capacity	Btu/h	/	/
	COP	W/W	/	/
	Power input	W	/	/
Electric heater		kW	/	/
Indoor side performance	Indoor air flow (Hi/Lo)	CFM	352/250	405/333
	Indoor noise level (Hi/Lo)	dB(A)	45/35	48/42
	STC	/	32	32
Compressor Type			Rotary	Rotary
Net dimension (W×D×H)		mm	1066*535*408	1066*535*408
Packing dimension (WxDxH)		mm	1150*630*480	1150*630*480
Unit weight	Net	LBS	99	106
	Gross	LBS	112	119
Refrigerant	Type		R410A	R410A
	Charge	g	930	950

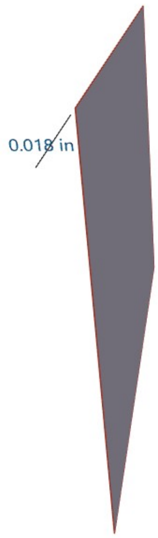
Sound Insulation Prediction (v9.0.23)

Louver Blank-Off Panel - Sound Isolation

INSUL

Margin of error is generally within STC ±3 dB
 - Key No. 1853
Job Name:
Job No.: Initials:ZWright
Date:5/12/2021
File Name:

Notes:



STC 21
OITC 15

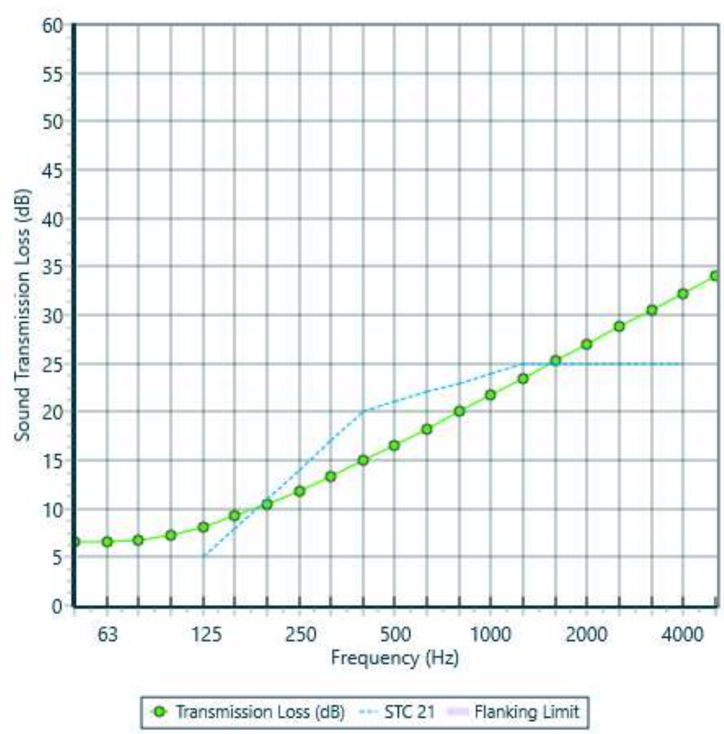
Panel Size = 8.9 ft x 13.1 ft

Partition surface mass = 0.73 lb/ft2

System description

Panel 1 : 1 x 0.018 in Steel

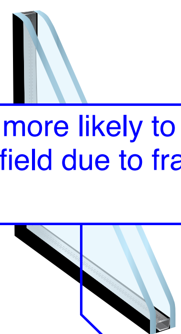
freq.(Hz)	TL(dB)	TL(dB)
50	7	
63	7	7
80	7	
100	7	
125	8	8
160	9	
200	10	
250	12	12
315	13	
400	15	
500	17	16
630	18	
800	20	
1000	22	21
1250	23	
1600	25	
2000	27	27
2500	29	
3150	31	
4000	32	32
5000	34	



Window - Sound Isolation

VIRACON®

ACOUSTIC PERFORMANCE DATA TABLES



Window is more likely to provide STC 32 in field due to framing loss.

INSULATING ACOUSTICAL DATA

Viracon Acoustical Glass is made from combinations of various glass types along with acoustical window frames to help you effectively reduce sound transmission from airplanes, trains, vehicles and other unwanted noises. The performance data below applies to an insulating unit constructed with two plies of glass and an air or argon filled space. Data is based on testing ~36" x 84" glass to ASTM E413-87 in an acoustical wall. *OITC is estimated based on this test. Glass size and glazing system will affect STC rating.

The **STC (Sound Transmission Class)** rating is a single-number rating system for interior building partitions and viewing windows used to categorize acoustic performance. Its original intent was to quantify interior building partitions not exterior wall components. As a result it is not recommended for glass selection of exterior wall applications since the single-number rating was achieved under a specific set of laboratory conditions.

The **OITC (Outside-Inside Transmission Class)** rating is used to classify acoustic performance of glazing in exterior applications.

Insulating Glass Construction	STC	OITC*	Frequency (Hz) / Sound Transmission Loss (dB) 100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000	2500	3150	4000	5000
1/2" overall - 1/8" glass, 1/4" airspace, 1/8" glass	**28**	**26**	26	21	23	23	26	21	19	24	27	30	33	36	40	44	46	39	34	45
5/8" overall - 1/8" glass, 3/8" airspace, 1/8" glass	**31**	**26**	26	23	23	20	23	19	23	27	29	32	35	39	44	47	48	41	36	43
1" overall - 1/4" glass, 1/2" airspace, 1/4" glass	**35**	**30**	27	24	29	22	22	25	30	33	35	38	40	42	42	37	37	43	46	49
1" overall - 1/4" glass, 1/2" **argon** space, 1/4" glass	**35**	**29**	32	29	28	22	20	25	30	33	37	40	43	45	44	39	40	45	49	52
1" overall - 1/4" glass, 9/16" airspace, 3/16" glass	**37**	**30**	32	26	25	20	24	29	33	34	38	41	43	46	46	42	36	43	48	53
1-1/8" overall - 5/16" glass, 1/2" airspace, 5/16" glass	**37**	**32**	26	24	25	31	24	32	32	35	37	39	39	38	36	38	42	44	46	49
1-1/4" overall - 3/8" glass, 1/2" airspace, 3/8" glass	**37**	**32**	29	23	23	29	31	34	34	35	36	36	35	35	36	40	43	47	49	48
1-1/2" overall - 1/4" glass, 1" airspace, 1/4" glass	**37**	**30**	22	19	27	23	31	30	35	35	36	39	41	42	41	36	37	46	51	56
1-1/16" overall - 1/4" glass, 1/2" airspace, 5/16" glass	**38**	**33**	30	24	29	26	29	33	34	36	39	41	41	40	38	37	39	43	46	48
1-1/4" overall - 1/4" glass, 3/4" airspace, 1/4" glass	**38**	**31**	27	23	28	21	27	29	34	35	37	41	43	45	44	39	39	46	49	52
1-1/8" overall - 1/4" glass, 1/2" airspace, 3/8" glass	**39**	**34**	28	26	32	29	29	31	35	37	38	39	41	43	41	40	41	44	47	49
1-3/16" overall - 5/16" glass, 1/2" airspace, 3/8" glass	**39**	**34**	29	26	26	31	30	37	36	37	39	39	40	37	35	39	43	46	48	49
1-3/8" overall - 1/4" glass, 3/4" airspace, 3/8" glass	**40**	**33**	30	23	31	28	33	37	39	40	41	39	38	38	39	39	40	47	51	53

Appendix G

Preliminary Geotechnical Engineering Study, Stadium Bowl-O-Drome, 820 Isenberg Street, Honolulu, Hawaii, TMK: 2-7-008: 018 and 020. Hirata &

Hirata & Associates
Geotechnical Engineering
Hirata & Associates, Inc.
99-1433 Koaha Pl
Aiea, HI 96701
tel 808.486.0787
fax 808.486.0870

LETTER OF TRANSMITTAL

W.O. 15-5915

April 15, 2016

TO: Mr. Vincent Shigekuni
PBR Hawaii & Associates, Inc.
1001 Bishop Street, Suite 650
Honolulu, Hawaii 96813

SUBJECT: Stadium Bowl-O-Drome
820 Isenberg Street
Honolulu, Hawaii
TMK: 2-7-008: 018 & 020

WE ARE TRANSMITTING THE FOLLOWING:

COPIES	DATE	DESCRIPTION
1	04/15/16	Preliminary Geotechnical Engineering Study

__X__ For your information and use
_____ As requested
_____ For review
_____ Other

Con C. Truong, P.E.

Hirata & Associates
Geotechnical Engineering
Hirata & Associates, Inc.
99-1433 Koaha Pl
Aiea, HI 96701
tel 808.486.0787
fax 808.486.0870

April 15, 2016
W.O. 15-5915

Mr. Vincent Shigekuni
PBR Hawaii & Associates, Inc.
1001 Bishop Street, Suite 650
Honolulu, Hawaii 96813

Dear Mr. Shigekuni:

Re: Preliminary Geotechnical Engineering Study
Stadium Bowl-O-Dome Site
820 Isenberg Street
Honolulu, Hawaii
TMK: 2-7-008: 018 and 020

This letter report presents the results of our preliminary geotechnical engineering study performed for the above referenced site. We understand that a mixed-use residential and commercial building is being considered for development of the site and may consist of a high-rise structure.

Our findings and opinions are based on a review of available in-house information pertinent to the site and our past experience in the project area, as well as information provided by your office. This study was conducted in general conformance with the scope of services presented in our proposal dated January 19, 2016, and included the following:

- A visual reconnaissance of the site to observe existing conditions which may affect the project. The general location of the project site is shown on the enclosed Location Map, Plate A.
- A review of available in-house soils information pertinent to the site and the proposed project.
- Preparation of a letter report presenting the expected subsurface soil conditions, and our opinions regarding geotechnical issues which may impact development of the property.

Site Description

The site is located on the west side of Isenberg Street, south of its intersection with King Street in the Moiliili area of Honolulu. The site is currently occupied by the former Stadium Bowl-O-Drome building, located on the eastern portion of the site, with the remainder of the parcel covered with asphaltic concrete (AC) pavement. The AC paved area located in the western portion of the site is presently occupied by a towing company. The site is bordered on the north by Old Stadium Park and on the south by a high-rise apartment building.

The surface soil conditions could not be visually observed because the entire site is either occupied by the existing building or covered with AC pavement.

Review of Available In-House Soils Information

Soil Survey - The Soil Survey, prepared by the Soil Conservation Service, identifies the soil type in the project area as Ewa silty clay loam, moderately shallow, 0 to 2 percent slopes (EmA), of the Ewa Series. A Soils Survey Map is shown on Plate B.

Ewa silty clay loam soils were developed in alluvium derived from basic igneous rock. In a representative profile, the surface layer is dark reddish brown, silty clay loam, about 18 to 42 inches thick. The substratum is coral limestone, sand, or gravelly alluvium. The Soil Survey also describes the soil as having a moderate shrink-swell potential.

The Soil Survey identifies the soil type in the areas south of the site as Fill Land (FL). Fill Land primarily consists of material dredged from the ocean or hauled from nearby areas that was spread over low-lying areas along the coastal flats, coral sand, coral limestone, or areas shallow to bedrock.

Previous Projects - Previous soils investigations were performed by our firm for the Old Stadium Park located to the north and west of the subject parcel, and for other projects located to the northwest and northeast. Borings drilled for these investigations generally encountered coral at relatively shallow depths, ranging from near ground surface to about 4 feet. The coral was in a dense to medium hard condition and extended to the maximum depths of the borings which ranged from about 4.5 to 21 feet deep. Our past experience indicates that the coral layer usually will transition to a silty coralline gravel at deeper depths. Overlying the coral were generally brown, mottled brown, to reddish brown clayey silt and silty clay in a medium stiff to stiff condition.

Our firm also performed soils investigations for several projects located south of the subject parcel, in areas described by the Soil Survey as Fill Land located south of Date Street. Borings drilled for these investigations encountered coral at relatively deeper depths ranging from about 13 to 19 feet below existing ground, extending to depths of about 40 to 42 feet. Underlying the coral layer was medium stiff to stiff silty clay. Overlying the coral and below the surface fill soil were highly compressible soils consisting of loose to medium dense gray silty sand and soft gray to dark gray sandy silt.

Moiliili Karst - Moiliili Karst consists of a network of underground caves/dissolution caverns within the coral formation underlying the Moiliili area of Honolulu. The dissolution caverns were reportedly as high as 10 feet in some areas. The center of this network of underground caves/dissolution caverns is near the intersection of the University Avenue and King Street. Based on published information, the approximate extent of the Moiliili Karst is shown on Plate A.

Findings and Opinions

Based on a review of available in-house soils information, and our past experience in the project area, it is our opinion that, from a geotechnical viewpoint, the site can generally be developed as planned. The following are geotechnical issues regarding the site.

- Our review of previous geotechnical investigation performed by our firm near the project area confirms that the surface soils are similar to that described in the Soil Survey.
- Based on the known location of the Moiliili Karst. The project site appears to be outside the limits of the Moiliili Karst.
- Based on our exploratory borings performed for the Honolulu Stadium State Park adjacent to the site and a property along Makahiki Way, coral can be expected underlying the site at relatively shallow depths. While coral was encountered in our previous studies at relatively shallow depths on the north and west sides of the site, the coral layer was generally

encountered at depths of about 13 to 19 feet in areas immediately south of Date Street. As a result, it should be noted that the coral layer underlying the site may slope downward in a southerly direction.

- If coral is at shallow depths as anticipated, conventional shallow foundations bearing directly on the dense to medium hard coral may be used for support of structure with light to moderate structural loads. However, if the proposed development consists of a high rise structure with heavy column and wall loads, deep foundations such as auger cast piles or drilled shafts may be required.

- Due to the potential for voids in the coral stratum, a probing and grouting program will be required prior to construction of shallow foundations.

- It is our opinion that excavations into the surface soils can be accomplished using conventional excavating equipment. However, we expect that excavations into the dense to medium hard coral will require hydraulic equipment.

- Due to its moderate expansion potential, we expect that onsite soils will not be acceptable for re-use as structural fill.

- Ground elevations at the project site range from approximately +7 to +10. As a result, groundwater is not expected to impact the proposed development, assuming that the proposed structure will not have basement levels. Basements will require dewatering during construction and waterproofing for the basement walls and floor slabs.

- A more detailed geotechnical investigation is recommended. The investigation should include exploratory test borings, soil sampling, laboratory testing, and analyses of the field and laboratory data, to confirm the assumed subsurface soil conditions at the site, and to provide geotechnical recommendations for the design of foundations, concrete slabs-on-grade, pavement, and site grading.

- If the results of the geotechnical investigation determines that the site is underlain by soft and compressible soils over the dense to medium hard coral, deep foundations, such as auger cast piles or drilled shafts, will most likely be required for support of the proposed structure.

Limitations

This letter report was prepared specifically for PBR Hawaii and Associates, Inc. and their sub-consultants for the preparation of an Environmental Impact Statement (EIS) for the redevelopment of the former Bowl-O-Drome site located at 820 Isenberg Street in Honolulu, Hawaii. The opinions presented in this letter report are for planning purposes only, and are not intended for use in design or in developing cost estimates by a contractor.

Our opinions are based upon a visual reconnaissance of the project site, review of the Soil Survey, available in-house soils information, the preliminary project information made available, and our experience and engineering judgement. The conclusions are professional opinions which we have strived to develop in a manner consistent with that level of care, skill, and competence ordinarily exercised by members of the profession in good standing, currently practicing under similar conditions. No warranty is made regarding the services performed under this agreement, either express or implied. We appreciate this opportunity to be of service.

Should you have any questions concerning this study, please feel free to call on us.

Respectfully submitted,

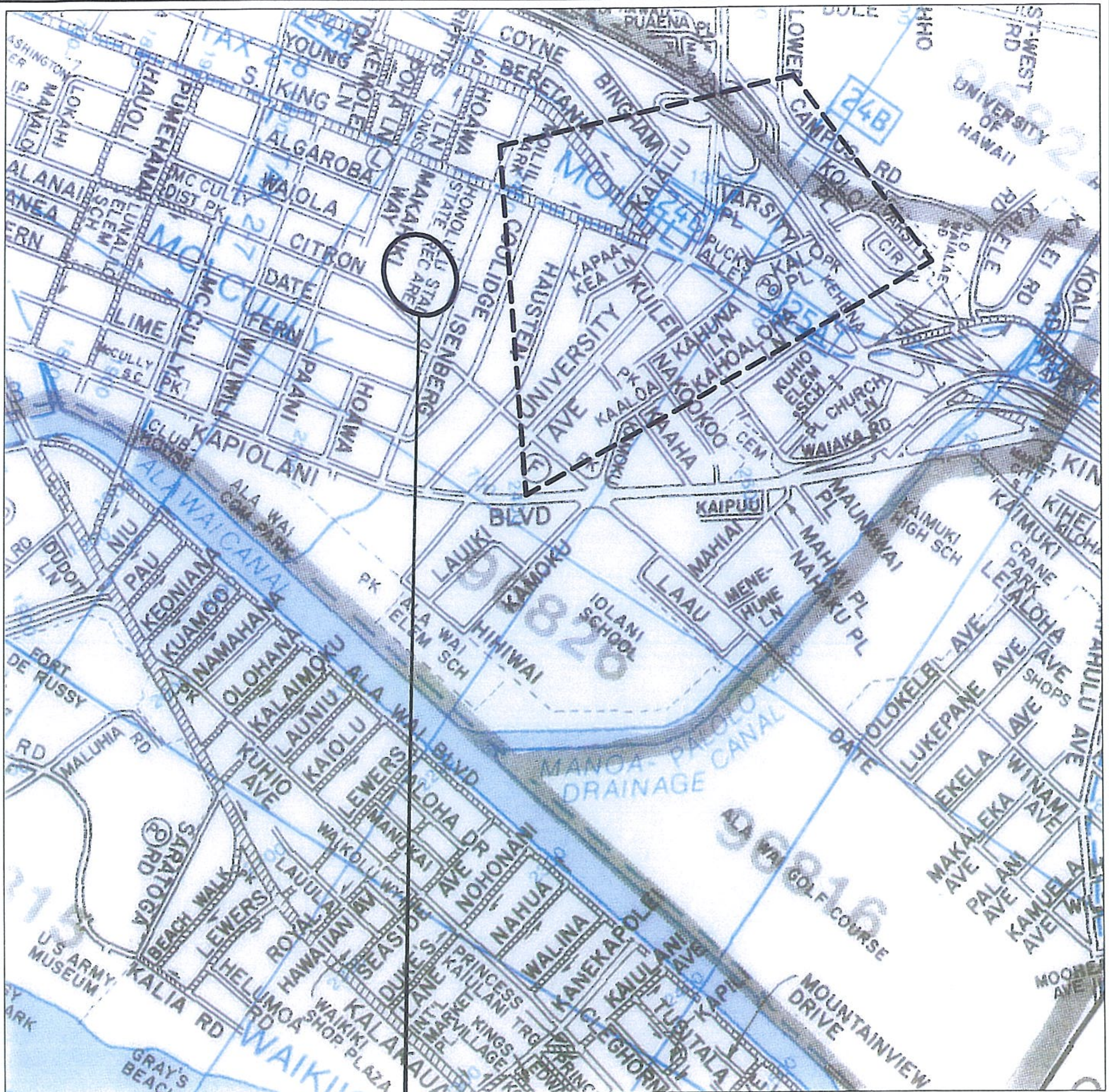
HIRATA & ASSOCIATES, INC.

Con C. Truong, P.E.

CON C. TRUONG
LICENSED PROFESSIONAL ENGINEER
No. 9019-C
HAWAII, U.S.A.

This work was prepared by
me or under my supervision
Expiration Date of License:
April 30, 2018

Enc: Location Map .... Plate A
Soils Survey Map .... Plate B

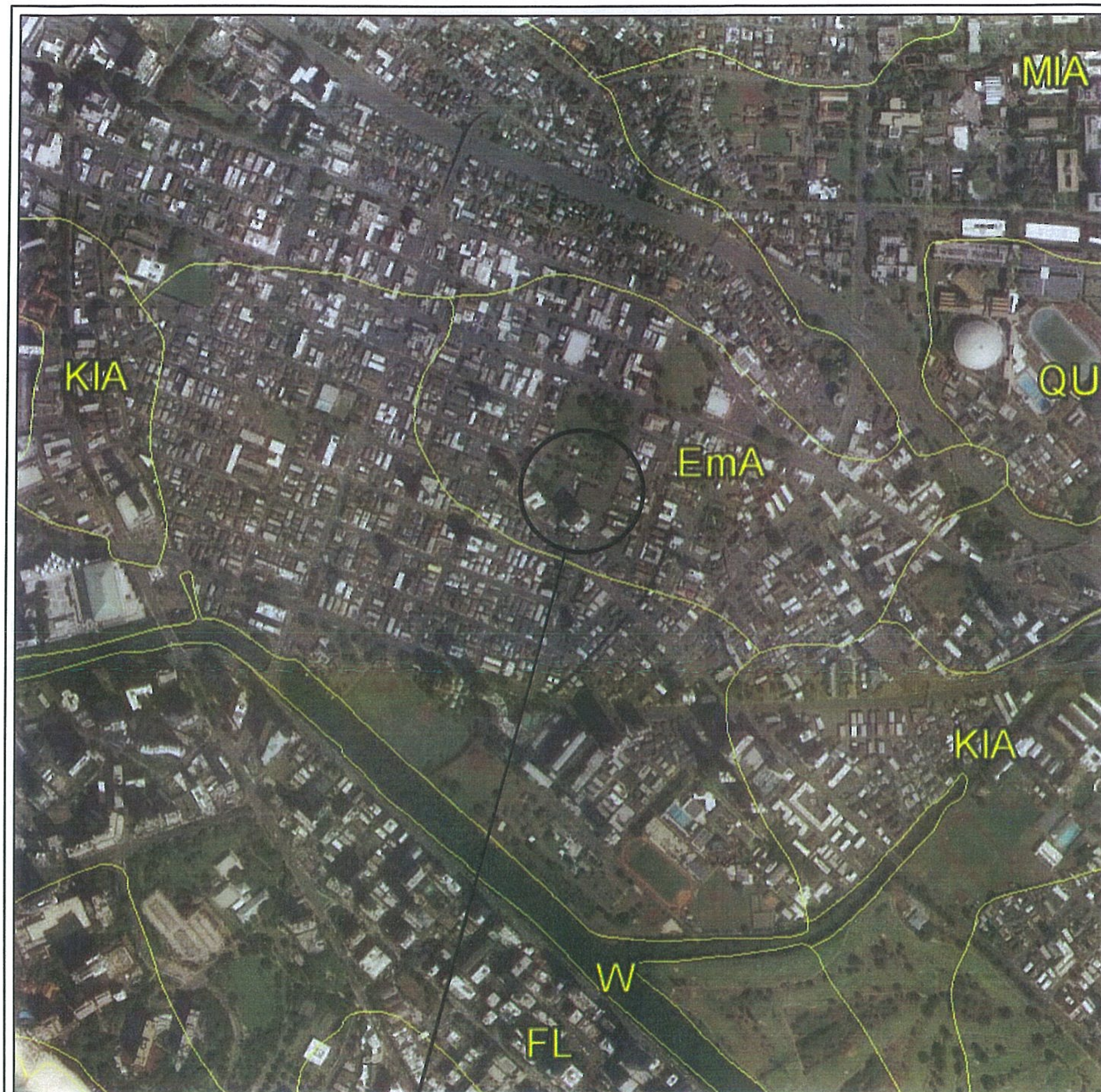


PROJECT SITE

Approximate location of Moiliili Karst
History and Status of the Moiliili Karst, William R. Haliday.

Reference: Bryan's Sectional Maps, 2008 Edition
(Copyright J.R. Clere, used with permission)

Stadium Bowl-O-Drome Site		
Hirata & Associates, Inc. Geotechnical Engineering	**LOCATION MAP**	Plate A
W.O. 15-5915		



PROJECT SITE

Stadium Bowl-O-Drome Site		
Hirata & Associates, Inc. Geotechnical Engineering W.O. 15-5915	**SOIL SURVEY MAP**	Plate B