C. Kimo Alameda, Ph.D.
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County of Hawai'i
PLANNING DEPARTMENT

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101 Pauahi Street, Suite 3
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May 02, 2026

Mary Alice Evans, Director
Office of Planning and Sustainable Development
Environmental Review Program
235 S. Beretania Street, Room 702
Honolulu, Hawai'i 96813
VIA EMAIL

Dear Mary Alice Evans,

Subject: **Draft Environmental Assessment (DEA) Anticipated Finding of No Significant Impact (AntFONSI) (PL-ENV-2025-000035)**
Applicant: **Volcano School of Arts and Sciences (VSAS)**
Project: **VSAS New Campus**
TMK: **(3) 1-1-004:010 Por., Volcano, Puna, Hawai'i**

The Hawai'i County Planning Department has reviewed the draft environmental assessment for the subject project and anticipates issuing a Finding of No Significant Impact (AntFONSI) determination for the proposed Volcano School of Arts and Sciences (VSAS) New Campus project. Please publish notice of availability for this project in the May 23, 2026, Environmental Notice.

In addition to this letter, the applicant's representative, on our behalf, has submitted an electronic version of the Environmental Review Program Publication Form and a searchable PDF-formatted copy of the DEA through the online submission platform.

If there are any questions regarding this letter, please contact Christian Kay at (808) 961-8136 or via email at christian.kay@hawaiicounty.gov. You may also contact the project consultant, John Pipan with Pipan Consulting, LLC, with questions related to the submittal of the DEA at (808) 333-3391 or via email at john@pipanconsulting.com.

Sincerely,

Jeffrey W. Darrow
Jeffrey W. Darrow (May 2, 2026 06:13:18 HST)
JEFFREY W. DARROW
Planning Director

cc via email: Pipan Consulting, LLC

From: dbedt.opsd.erp@hawaii.gov
To: DBEDT OPSD Environmental Review Program
Subject: New online submission for The Environmental Notice
Date: Wednesday, May 13, 2026 4:22:21 PM

Action Name

Volcano School of Arts and Sciences (VSAS) New Campus

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

Puna, Hawai‘i

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

(3) 1-1-004:010

Action type

Applicant

Other required permits and approvals

Special Permit, Plan Approval, Building Code/Structural Permits, Grubbing/Grading Permits, Electrical Review, Mechanical/Plumbing Review, Fire Review, Engineering Review, Wastewater System Approval, National Pollutant Discharge Elimination System (NPDES) Permit, Stormwater Pollution Prevention Plan (SWPP), Potential Noise Permit

Discretionary consent required

Special Permit

Agency jurisdiction

County of Hawai‘i

Approving agency

Planning Department

Agency contact name

Christian Kay

Agency contact email (for info about the action)

christian.kay@hawaiicounty.gov

Email address for receiving comments

john@pipanconsulting.com

Agency contact phone

(808) 961-8136

Agency address

101 Pauahi Street Suite 3
Hilo, HI 9672o
United States
Map It

Applicant

The Volcano School of Arts and Sciences

Applicant contact name

Kalima Kinney

Applicant contact email

director@volcanoschool.net

Applicant contact phone

(808) 345-9770

Applicant address

99-128 Old Volcano Rd #845
Volcano, HI 96785
United States
Map It

Is there a consultant for this action?

Yes

Consultant

Pipan Consulting LLC

Consultant contact name

John Pipan

Consultant contact email

john@pipanconsulting.com

Consultant contact phone

(808) 333-3391

Consultant address

PO box 421
Honokaa, HI 96727
United States
Map It

Action summary

VSAS proposes the development of a new 14.9-acre campus on Old Volcano Road between Nahelelani Street and Aliʻi Anela Street (TMK (3) 1-1-004:010). The project follows a four-phase construction timeline planned to be completed in 2032. Once complete, the campus will house Pre-K and 6th–12th grade, supporting 342 full-time students, 100 blended learning students, and 155 staff. Plans for the new campus include Middle School, High School, and Pre-K pod spaces; a central piko courtyard, an administrative building, cafeteria, labs, shops, assembly and performance amphitheater, commercial kitchen and outdoor courts. Plans for the new campus include Middle

School, High School, and Pre-K pod spaces; a central piko courtyard, an administrative building, cafeteria, labs, shops, assembly and performance amphitheater, commercial kitchen and outdoor courts.

Reasons supporting determination

The applicant expects that the County of Hawai'i Planning Department will determine that the proposed action will not significantly alter the environment and will accordingly issue a Finding of No Significant Impact (FONSI). The proposed action is not anticipated to result in significant environmental impacts. Potential construction-related impacts, including temporary noise, dust, and clearing, would be minimized through phased construction, Best Management Practices (BMPs), and required mitigation measures. The proposed action will not involve an irrevocable commitment or loss or destruction of any natural, cultural, or historic resources. Biological surveys confirmed that no rare, threatened, or endangered plant species are present within the project area. The proposed action will have positive impacts on the economic welfare, social welfare, and cultural practices of the community and State. The project would also comply with applicable County and State requirements related to drainage, wastewater, noise, and building safety.

Attached documents (signed agency letter & EA/EIS)

- VSAS_DEA_050926_ADA_CHECKS-v4.pdf
- 2026-05-02-VSAS-DEA_AntFonsi-Letter-PL-ENV-2025-000035-ADA1.pdf

Action location map

- VSAS-Project-Area1.zip

Compliance certification (HRS §368-1.5):

The authorized individual listed below certifies that documents submitted are unlocked, searchable, and compliant with the Hawaii Electronic Information Technology Disability Access Standards (including, but not limited to transcripts, captions, and other descriptions accompanying audio/video files). The individual acknowledges that the submitter retains the responsibility for compliance after documents have been published and any compliance queries will be directed back to the agency and/or applicant.

Authorized individual

John Pipan

Authorized individual email

john@pipanconsulting.com

Authorized individual phone

(808) 333-3391

Authorization

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

DRAFT ENVIRONMENTAL ASSESSMENT

Volcano School of Arts and Sciences (VSAS)
New Campus

April 2026

TMK: 1-1-004:010
Volcano, Puna, County of Hawai‘i, State of Hawai‘i

APPLICANT: Volcano School of Arts and Sciences (VSAS)
99-128 Old Volcano Road
Volcano, HI 96785

DETERMINING AGENCY: County of Hawai‘i
Planning Department
101 Pauahi Street Suite 3
Hilo, Hawai‘i 96720

CONSULTANT:
Pipan Consulting LLC
PO Box 421
Honokaa, Hawai‘i 96727

This document is prepared pursuant to:
The Hawai‘i Environmental Policy Act,
Chapter 343, Hawai‘i Revised Statutes (HRS), and
Title 11, Chapter 200.1, Hawai‘i Department of Health Administrative Rules (HAR)

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Appendices

Abbreviations

AASHTO	American Association of State Highway and Transportation Officials
AMFAC	American Factors
BMP	Best Management Practices
CAA	Clean Air Act
COVID-19	Coronavirus Disease 2019
DEA	Draft Environmental Assessment
DLNR	Department of Land and Natural Resources
DOFAW	Division of Forestry and Wildlife
DOH	Department of Health
DWS	Department of Water Supply
EA	Environmental Assessment
EIS	Environmental Impact Statement
ERZ	East Rift Zone
FEA	Final Environmental Assessment
FEMA	Federal Emergency Management Agency

FHAT	Flood Hazard Assessment Report
FIRM	Flood Insurance Rate Map
FONSI	Finding of No Significant Impact
FPL	Federal Poverty Level
GP	General Plan
HAR	Hawai‘i Administrative Rules
HCC	Hawai‘i County Code
HCM	Highway Capacity Manual
HDOT	Hawai‘i Department of Transportation
HELCO	Hawai‘i Electric Light Company Inc
HRS	Hawai‘i Revised Statues
HWMO	Hawai‘i Wildlife Management Organization
IPCC	Intergovernmental Panel on Climate Change
IWS	Individual Wastewater System
LEED	Leadership in Energy and Environmental Design
LERZ	Lower East Rift Zone
LOS	Level of Service
LUPAG	Land Use Allocation Guide
MSDS	Material Safety Data Sheets
NASA	National Aeronautics and Space Administration
NPDES	National Pollutant Discharge Elimination System
PCDP	Puna Community Development Plan
PCS	Public Charter School
PD	Planning Department
PFE	Pacific Fire Exchange
PPE	Personal Protective Equipment
PPM	Parts Per Million
ROD	Rapid ‘Ōhi‘a Death
SHPD	State Historic Preservation Division
SMA	Special Management Area
SP	Special Permit
SWPPP	Storm Water Pollution Prevention Plan
TDFM	Travel Demand Forecasting Model
TIAR	Traffic Impact Analysis Report
TRB	Transportation Research Board
USDA	United States Department of Agriculture
VSAS	Volcano School of Arts and Sciences
WHSL	W. H. Shipman, Ltd.

SUMMARY OF PROJECT, ENVIRONMENTAL IMPACTS, AND MITIGATION MEASURES

The Volcano School of Arts & Sciences (VSAS) serves 360 students in Pre-K through 12th grade. VSAS is a community school of choice. K-12 Classes are capped at 18-20 depending upon the grade level.

VSAS is located in the rural town of Volcano, Hawai'i, adjacent to Hawai'i Volcanoes National Park. The current campuses straddle the westernmost edge of the Puna district, where 73% of students live, and the easternmost edge of the Ka'u district, where 21% of students live. The remaining 6% of students live in the districts of Hilo, South Kona, and North Kona. 28% of students travel 25 miles or more each way to school. 74% of students come from families in low socio-economic conditions.

Many of the families who send their children long distances to VSAS are actively seeking to break family and community cycles of lower educational achievement and poverty.

The VSAS philosophy is that education is more meaningful to children when presented in an environment that is familiar, relates to their home life, and allows for discovery-based experiential learning and multi-sensory activities that reinforce curriculum instruction. Their mission is to provide an environment in which students are "Learning through Volcano's unique natural and cultural resources to become creative global citizens."

The VSAS Vision of a Graduate is:

- Grounded in knowledge and values of Hawai'i, applying ancestral understandings in an ever-changing world.
- Connected to place, a diligent caretaker actively protecting, preserving, and restoring the abundant land that sustains us.
- Caring and self-reflective, respectful of different perspectives, and acting with integrity and aloha.
- Academically prepared, creative, and confident, advocating and innovating for social and environmental resilience and sustainability.

VSAS Core Values are:

- Kūlia - Kūlia i ka nu'u. *Strive to reach the summit*
- 'Ohana - 'Ike aku, 'ike mai, kōkua aku kōkua mai; pela iho la ka nohona 'ohana. *Recognize and be recognized, help and be helped; such is family life*
- Aloha - Me ke aloha

Since its inception in 2001, VSAS has grown to its current enrollment of 358 students in grades Pre-K through 12 with 223 students on the waitlist in the 2025-2026-year and 369 new student applications for the 2026-2027 school year. In addition to its main campus program, VSAS offers a blended program with 55 total students in grades 3-8.

In order to adapt to increasing enrollment demand, VSAS aims to develop a new campus location in partnership with W. H. Shipman, Ltd. (WHSL) along Old Volcano Road between Nahelelani Street and Aliʻi Anela Street (TMK (3) 1-1-004:010).

The current VSAS campus has two locations in Volcano: 99-128 Old Volcano Road, which is subject to an expiring lease and will close at the end of the 2027-2028 school year, and 19-4024 Haunani Road in Volcano, Hawaiʻi, a 3.15-acre property with a maximum capacity of 250 students and 40 staff.

The proposed new campus would be built on a 14.9-acre section of the property. Upon completion of Phase I of the new campus, the Haunani Road campus would continue to operate, and the 99-128 Old Volcano Road campus will close, as it is subject to an expiring lease agreement.

Gradually, all elementary (K-5th grade) classes (up to 250 students) would be transitioned to the Haunani Road campus and all pre-K and 6th-12th grade classes would be moved to the new campus. The new campus would offer improved facilities, increased enrollment and programming and would remedy enrollment bottlenecks and the expiring lease agreement at the 99-128 Old Volcano Road campus. The new facilities are proposed to serve a maximum of 342 full-time students, 100 blended learning students and 155 staff members. Plans for the new campus include Middle School, High School, and Pre-K pod spaces; a central piko courtyard, an administrative building, cafeteria, labs, shops, assembly and performance amphitheater, commercial kitchen and outdoor courts. The property will provide community access to facilities such as the assembly and performance amphitheater, commercial kitchen, outdoor courts, and meeting space.

During the initial phase of construction, portable transition facilities for Middle and High School will be built to meet enrollment demand. VSAS expects to complete Phase I in 2027. Phase II will include the Cafeteria/Administration building, Assembly Amphitheater, and labs and shops for Middle and High School. This phase is expected to be completed in 2029. Phase III will include PreK, which is estimated for completion in 2030. Phase IV will include the permanent Middle School and High School Pods estimated for completion in 2032.

Total project construction costs are estimated at $43.8 million, with Phase I valuated at approximately $3.5 million, Phase II at $14 million, and Phase III at $8.3 million, and Phase IV at $18 million with completion estimated by 2032.

A biotic survey of a 20-acre forested area within the subject property conducted in April 2025 found no rare, threatened, or endangered plant species on the property. In addition to the biotic survey, an Insect Assessment Report was conducted in May 2025 by Olaʻa Environmental Services, LLC. Assessment results did not detect any threatened or endangered insects within the project area, and the proposed development should not have any impact on any population of threatened or endangered insects.

An Archaeological Literature Review and Field Inspection (AFI) and a subsequent Archaeological Inventory Survey (AIS) were conducted by tesARCH Services due to potential impact on historic resources by the proposed project. The AIS documented two significant

historic sites within the project area: a poorly preserved pair of low rock walls presumed to be for animal control (SIHP # pending), and an abandoned railroad grade from the early 20th century—a branch line of the Hilo Consolidated Rail Co. (SIHP # pending). Both sites are significant under criterion "d", and the railroad grade is additionally significant under criterion "a" for its contribution to the broad patterns of the island's history. Neither site is considered eligible for listing on the Hawai'i or National Register of Historic Places. No further archaeological work is recommended. The documentation provided in the AIS is sufficient per HAR 13-276-8. In the unlikely event that undocumented archaeological resources, including shell, bones, midden deposits, lava tubes, or similar finds, are encountered during construction, work surrounding the area of discovery will be halted, and the State Historic Preservation Division (SHPD) will be contacted to determine the appropriate course of action.

The proposed action does not conflict with the Hawai'i County General Plan (GP) or the Puna Community Development Plan (PCDP). A Special Permit (SP) will be submitted to the Hawai'i County Planning Department in conjunction with this EA to justify unusual and reasonable use according to State Land Use regulations. As the Special Permit petition area does not exceed 15 acres in land area, the authority to grant the request remains with the County Planning Commission. Establishment of the proposed use will not be contrary to the objectives sought to be accomplished by State Land Use laws and regulations.

PART 1: PROJECT DESCRIPTION AND EA PROCESS

1.1 Project Description and Location

The VSAS new campus is located at 11-3525 Old Volcano Road (**Figure 1**). The **project area** refers to the 20-acre area included in the biotic and archaeological surveys and the 14.9-acre area addressed by the special permit is designated as the **project site**. The 785.43-acre **subject property** is located within the Agricultural State land use district and is zoned A-3a. As such, VSAS seeks to obtain a Special Permit to allow for the operation of the proposed new campus as outlined in Chapter 205 of the Hawai'i Revised Statutes. The proposed development would include nine main building areas, A through H, of which are outlined below.

Building Area A: Middle School (Approximately 11,000 square feet building, Covered Area/Lanai 12,000 square feet)

- Ten (10) classroom spaces (8,800 square feet)
- Other rooms (2,200 square feet)
    - Staff and student restroom facilities
    - Two Teacher Workrooms
    - Storage
    - Recreational supplies
- Covered Area/Lanai (12,000 square feet)

Building Area B: Pre-K (Approximately 8,300 square feet building, 17,000 square feet playground area)

- Four classroom spaces (4,900 square feet)
- Other rooms (3,400 square feet)
    - Restroom facilities
    - Two office spaces
    - Health room
    - Reception area
    - Recreational supplies
    - Teacher's work room
    - Storage
    - Janitor Room
    - Record Room
- Two playground areas (17,000 square feet)
- Covered Area/Lanai (12,000 square feet)

Building Area C: High School (Approximately 13,200 square feet building, 13,000 square feet lanai)

- Ten classroom spaces (11,000 square feet)
- Other rooms (2,200 square feet)
    - Staff and student restroom facilities
    - Two Teacher Workrooms
    - Storage
    - Supplies
- Covered Area/Lanai (13,000 square feet)

Building Area D: Administrative Offices and Dining Facilities (Approximately 7,200 square feet building, 3,200 square feet lanai)

- Administrative Building (3,600 square feet)
    - Front desk
    - HR/Finance
    - Health Station
    - Two Administrative offices
    - Student Records
    - Restroom Facilities
    - Teacher breakrooms
    - Supply and Storage rooms
- Dining Facilities (3,600 square feet)
    - Commercial Kitchen
    - Dining and Serving Area
    - Storage Room
- Covered Lanai Dining Area (3,200 square feet)
- Other Covered Area/Lanai (5,600 square feet)

Building Area E: Assembly Amphitheatre (Approximately 20,000 square feet)

- Assembly/Gathering/Presentation/Performance area

Building Area F: Parking, Driveway, and Landscaped Areas (227,200 square feet)

- Entry Gate (200 square feet)
- Roadways/Parking/Medians (187,000 square feet)
- Walkways (10,000 square feet)
- Miscellaneous (30,000 square feet)

Building Area G: STEAM and Shops (Approximately 8,000 square feet)

Building Area H: Facility Maintenance Building (Approximately 5,000 square feet, Covered Area/Lanai 2,000 square feet)

The site plan can be found in **Figure 2.** The proposed buildout includes four (4) construction phases which are listed below.

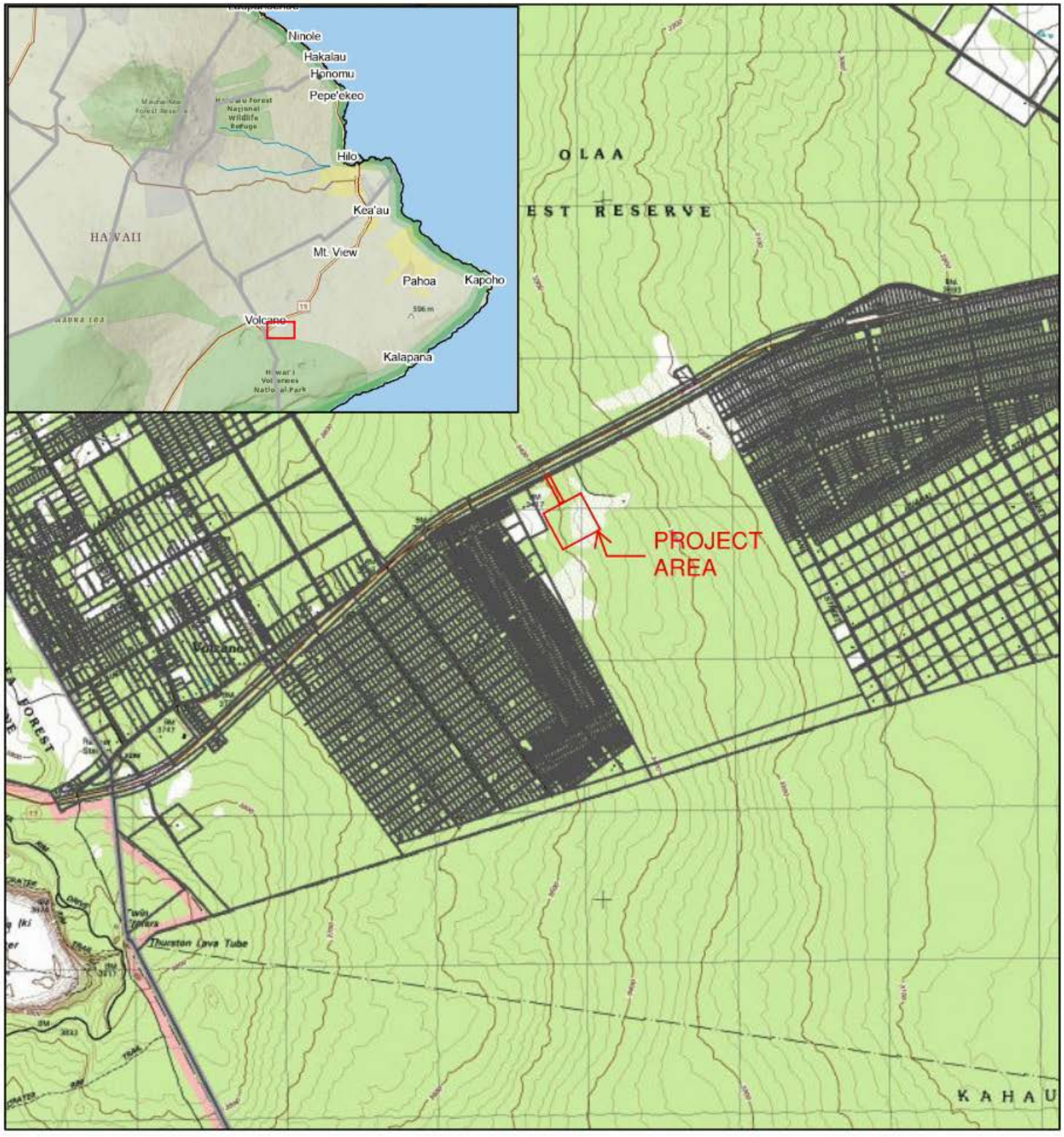
Phase I
- Driveway
- Grubbing & Grading
- Portables (Middle and High School transition)

Phase II
- Cafeteria / Administration
- Assembly Amphitheater
- STEAM/Shops

Phase III
- PreK Classrooms
- Facilities/Maintenance

Phase IV
- High School Pod
- Middle School Pod

Figure 1: Location Map



USGS

Red: Band_1

Green: Band_2

Blue: Band_3

District Boundary

Coastline

Parcels (boundary lines)

1:38,996

NORTH

0 0.3 0.6 1.2 mi

0 0.5 1 2 km

Esri, TomTom, Garmin, SafeGraph, GeoTechnologies, Inc, METI/NASA, USGS, EPA, USDA, USFWS, Esri, NASA, NGA, USGS, Sources: Esri, USGS

ArcGIS Web AppBuilder

Sources: Esri, USGS | Esri, NASA, NGA, USGS | Esri Community Maps Contributors, © OpenStreetMap, Microsoft, Esri, TomTom, Garmin, SafeGraph, GeoTechnologies, Inc, METI/NASA, USGS,

FOR DPW USE

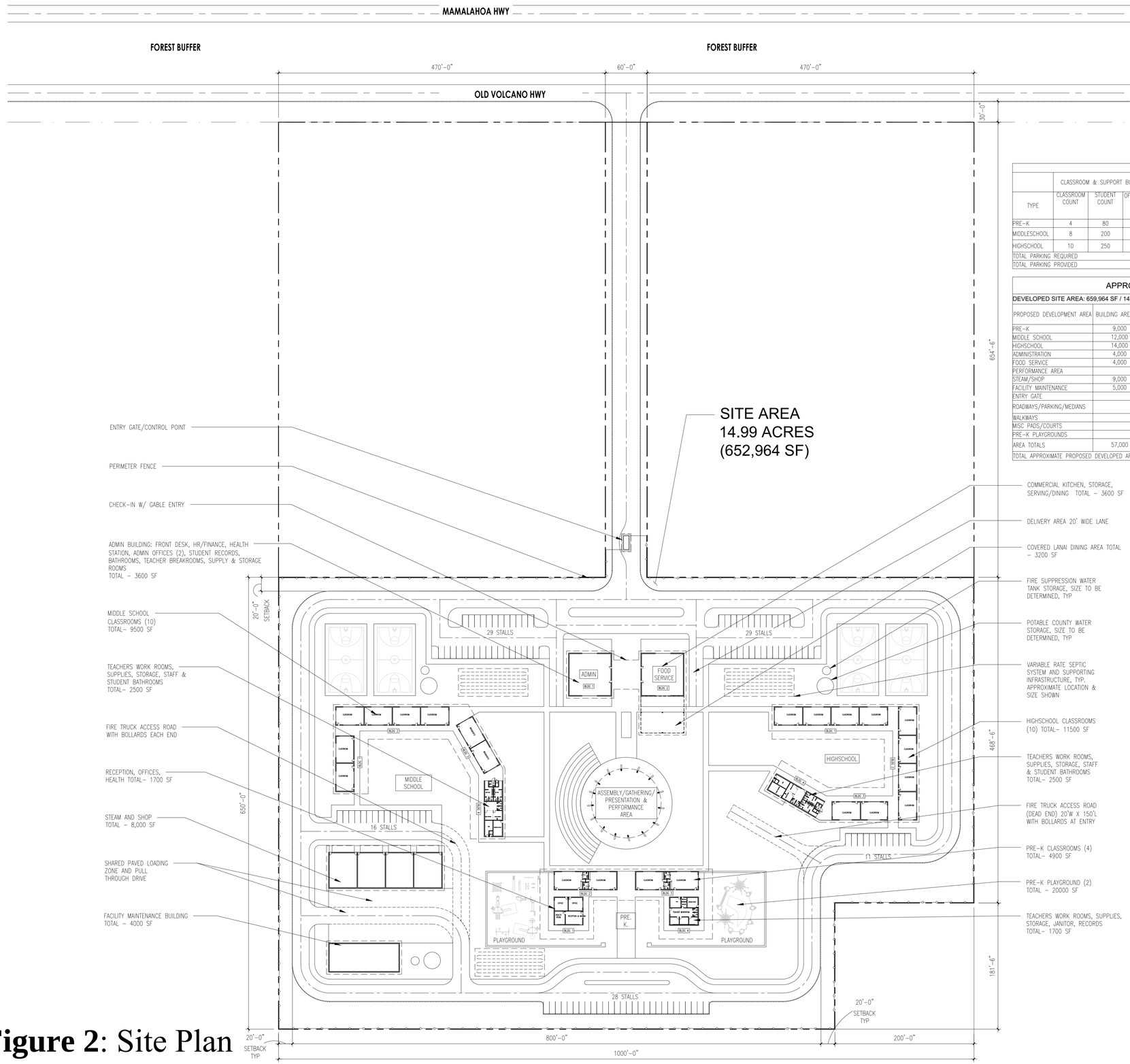


Figure 2: Site Plan

PARKING SPACE REQUIREMENTS

	CLASSROOM & SUPPORT BUILDINGS			PARKING REQUIREMENTS PRE-K		PARKING REQUIREMENTS MIDDLE SCHOOL		PARKING REQUIREMENTS HIGHSCHOOL		
TYPE	CLASSROOM COUNT	STUDENT COUNT	OFFICE/BLDG SF	1 PER 10 STUDENT	1 PER 200 SF OF OFFICE	1 PER 20 STUDENTS	1 PER 400 SF OF OFFICE	1 PER 10 STUDENTS	1 PER 400 SF OF OFFICE	TOTAL
PRE-K	4	80	3500	8.0	17.5					17.5
MIDDLESCHOOL	8	200	9400			10.0	23.5			33.5
HIGHSCHOOL	10	250	2200					25.0	5.5	30.5
TOTAL PARKING REQUIRED										82
TOTAL PARKING PROVIDED										103

APPROXIMATE LOT COVERAGE AREA TABULATION

DEVELOPED SITE AREA: 659,964 SF / 14.99 ACRES

PROPOSED DEVELOPMENT AREA	BUILDING AREA TOTALS	COVERED AREA / LANAI TOTALS	PAVED AREA TOTALS	SEMI-PERMEABLE AREA TOTALS
PRE-K	9,000 SF	12,000 SF		
MIDDLE SCHOOL	12,000 SF	12,000 SF		
HIGHSCHOOL	14,000 SF	13,000 SF		
ADMINISTRATION	4,000 SF	2,000 SF		
FOOD SERVICE	4,000 SF	6,000 SF		
PERFORMANCE AREA		8,000 SF	12,000 SF	
STEAM/SHOP	9,000 SF	4,000 SF		
FACILITY MAINTENANCE	5,000 SF	2,000 SF		
ENTRY GATE			200 SF	
ROADWAYS/PARKING/MEDIANS			187,000 SF	
WALKWAYS			10,000 SF	
MISC PADS/COURTS			30,000 SF	
PRE-K PLAYGROUNDS				20,000 SF
AREA TOTALS	57,000 SF	59,000 SF	239,200 SF	20,000 SF
TOTAL APPROXIMATE PROPOSED DEVELOPED AREA				375,000 SF

H+dIT collaborative, llc

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W: www.hdltcollaborative.com

VOLCANO SCHOOL OF ARTS AND SCIENCES
OLD VOLCANO ROAD CAMPUS (PRE-K & 6-12)

11-3525 OLD VOLCANO ROAD
VOLCANO, HAWAI'I
TMK: (3) 1-1-004-010

SUP SUBMISSION 9.29.25

REVISION DATE

STAMP

PRINCIPAL IN CHARGE
MICHAEL HOFFMAN
PROJECT TEAM
SMH, CAB
REVIEWED
SMH
DRAWN
CAB

SHEET TITLE

CONCEPTUAL MASTER PLAN

PROJECT NUMBER 2422.001 | SHEET NUMBER A1.0

CONCEPTUAL MASTER PLAN | SCALE: 1"= 70'-0" | 1

1.2 Purpose and Need

VSAS enrollment is impacted, and admission is facilitated via lottery. Current admission demand exceeds enrollment capacity, with 223 students on the 2025-2026 waitlist and 369 potential new students on the waitlist for lottery admission for the 2026-2027 school-year. Additionally, the school's current site is approaching the end of its lease term. This new development would offer both a solution to the school's excess demand, as well as permanently establishing necessary educational facilities.
According to the enrollment statistics of VSAS, the majority (73%) of students live in the Puna district. 74% of students come from families in low socio-economic conditions and many of the families who send their children long distances to school are actively seeking to break family and community cycles of lower educational achievement and poverty.

This is related to the demographic and socioeconomic realities of the primary area from which VSAS draws students. The 2020 census data for Puna showed a population increase of 14.6% since 2010. However, according to Affonzo et al. (2010), "Puna communities rank among the poorest in health status and highest in health disparity rates in the State and County for socioeconomic status, poverty, unemployment, household financial aid and low birth weight rates." An estimated 68.5% of children under 18 were below the poverty level." The United Way's ALICE (Asset Limited, Income Constrained, Employed) Program states that 77% of the Puna population is below the poverty threshold. This means that families either live in poverty or "have income above the Federal Poverty Level (FPL), but not high enough to afford a basic household budget that includes housing, childcare, food, transportation, and healthcare."

The school is currently developing a campus extension to house grades K through 5, while the proposed new site will serve grades 6 through 12 and Pre-K. With the original campus lease expiring in 2028, the school needs to develop the new campus in order to maintain current enrollment as well as expand it to waiting students.

1.3 Cost and Schedule

Under the proposed action, total construction costs are estimated to be approximately $43.8 million.

The proposed project may use a combination of public and private funding sources to support various components: planning, design, infrastructure improvements, and construction. Public funding sources may include federal, state, and county grants, legislative appropriations (e.g., Grants-in-Aid), and other government-supported financing mechanisms that may become available during the course of the project.

Specific funding allocations are subject to ongoing project costs, grant applications, and funding availability; therefore, exact amounts and sources cannot be fully defined at this time. However, any public funds secured will be used to support project-related activities such as site preparation, infrastructure development, vertical construction, equipment procurement, and/or programmatic implementation, consistent with the overall project purpose. This strategy is

designed to ensure that the project remains adaptable with consideration to a variety of funding opportunities.

Construction is planned to commence upon completion of permitting and design, with full buildout estimated by 2032, although the campus will be fully functional upon the completion of Phase II, estimated by 2029.

The cost of construction is divided into four phases:

- Phase I: $3.5 M
- Phase II: $14 M
- Phase III: $8.3 M
- Phase IV: $18 M

The timeline estimates that Phase I will be completed in July 2027, Phase II in July 2029, Phase III in July 2032, and Phase IV in July 2032.

Phase I is scheduled for the following timeline:

Milestones

- Right of Entry executed with WHSL - September 16, 2024
- Environmental Assessment initiated - October 25, 2024
- Conceptual Site Plan completed - January 8, 2025
- License agreement executed with WHSL - March 2025

Estimated Timeline

- Special Use Permit Application - March 2026
- Planning Commission - June 2026
- Site Plan approval - July 2026
- Phase I permit set completed - October 2026
- Grubbing & Grading for Phase I completed - January 2027
- Building permit Phase I – Early 2027
- Phase I completed - Mid 2027

1.4 Environmental Assessment Process

In 1974 the Hawai‘i State Legislature enacted the Hawai‘i Environmental Policy Act, which requires State and County agencies to conduct an environmental impact analysis prior to making decisions on actions that may impact the environment.

This Environmental Assessment (EA) is being conducted in accordance with Chapter 343 of the Hawai‘i Revised Statutes (HRS), along with the implementing regulations, Title 11, Chapter 200.1, of the Hawai‘i Administrative Rules (HAR). This law is the basis for the environmental

impact assessment process in the State of Hawai‘i. An EA is necessary for the proposed action due to the anticipated use of public funding sources for the campus development. Public funding sources may include federal, state, and county grants, legislative appropriations (e.g., Grants-in-Aid), and other government-supported financing mechanisms that may become available during the course of the project. These public funds are expected to support infrastructure and construction costs associated with the campus development, including site preparation, building construction, and associated utilities. Because the proposed action involves the use of public funds as defined under HRS §343-5(a)(1), preparation of an Environmental Assessment is required prior to the expenditure of those funds. Specific funding allocations are subject to ongoing project costs, grant applications, and funding availability; therefore, exact amounts and sources cannot be fully defined at this time.

According to Chapter 343, an EA is prepared to determine impacts associated with a proposed action, develop mitigation measures for any discovered adverse impacts, and determine whether the impacts are significant (according to the thirteen specific criteria). If a study concludes that no significant impacts would occur from implementation of the proposed action, a Finding of No Significant Impact (FONSI) is prepared. If a study finds that significant impacts are expected to occur because of a proposed action, then an Environmental Impact Statement (EIS) is prepared to allow deeper investigation of impacts and allow more extensive public involvement.

The following EA discusses alternatives to the proposed action, existing environment and impacts associated with the project, the anticipated determination and the findings made by the applicant in consultation with the County of Hawai‘i Planning Department.

1.5 Public Involvement and Agency Coordination

As part of the environmental assessment process, agency coordination and public involvement are crucial components to understand the full impacts caused by the proposed project. The agencies, organizations, and individuals below have been consulted as part of the environmental assessment process. Copies of correspondence during the early consultation period can be found in **Appendix E.**

State:

Department of Land and Natural Resources, Land Division
Department of Land and Natural Resources, Division of Aquatic Resources
Department of Land and Natural Resources, Division of Forestry and Wildlife
Department of Land and Natural Resources, Office of Conservation & Coastal Lands
Department of Land and Natural Resources, Engineering
Department of Land and Natural Resources, Historic Preservation
Hawai‘i Department of Transportation
Office of Hawaiian Affairs

County:

Planning Department
Fire Department

Police Department
Department of Environmental Management
Department of Public Works
Department of Water Supply
Civil Defense

Private:

Surrounding Property Owners within 500 feet of the Property

Community Meetings:

- Campus Development Community Input and Informational Meeting January 2025

PART 2: ALTERNATIVES

2.1 Proposed Project, Alternative Sites, and Alternative Uses

VSAS and Friends of the Volcano School of Arts and Sciences are working to develop the project area with the intention of creating valuable educational facilities to serve the Puna and Ka'ū districts, as discussed in "Purpose and Need" above. As also mentioned therein, an increase in school capacity is warranted given the limited educational infrastructure in Puna and Ka'ū. Simultaneously, due to the predominance of mature native forests and the scarcity of adequately sized parcels with appropriate road access in the area, along with the infrastructural needs attendant to a Pre-K through 12th grade school, there is no other alternative building site that would be appropriate. After consideration of possible alternative locations, the selected property was determined to be the most viable and sustainable option.

Since 1999, VSAS board and school leadership searched for potential campus locations. The current campus on KSBE land on Old Volcano Road was identified as a temporary site. In 2011, the school was able to obtain a lease with Hawaii Department of Education for the Keakealani Campus and began serving middle school grades in the existing building, raising funds for facility development, and engaging the community in campus design.

The following alternative campus locations were considered during the process of selecting a new property for the proposed new campus:

Alternative 1. Keakealani Campus TMK (3) 1-9-004;019, 19-4024 Haunani Road, 3.15 acres. Existing middle school campus acquired in 2011.

> Reason not selected: Keakealani Campus is too small to accommodate the school's growing student population. The school determined that Keakealani Campus would serve elementary grades and a second site would be needed for secondary grades.

Alternative 2. Cooper Center TMK (3) 1-9-003;017, 19-4030 Wright Road, 10 acres. The forested area behind Cooper Center was considered in the early 2000s and revisited in 2015.

> Reasons not selected: The area is old-growth native forest and is unlikely to receive community support for development. In addition, removal of the forest would not align with the mission of the school. The parcel would provide a maximum of only six acres of usable space for the campus, and demand for community use of campus facilities could conflict with school operations and create concerns related to safety, security, and traffic congestion within such a limited area.

Alternative 3. Haunani Road Fee Simple TMK (3) 1-9-017;010 7.05 acres 19-4282 Haunani and TMK (3) 1-9-017;020 7.03 19-4290 Haunani. Adjacent properties for sale, total $640,000

> Reason not selected: The properties do not have adequate road access, creating traffic concerns for both the school and community residents. Also, capital for purchase was not available at the time and the board felt the purchase price was too high.

Alternative 4-12. Department of Land and Natural Resources (DLNR), various sites (see below). The process to apply for a lease with DLNR involves first completing an Environmental Assessment with no significant impacts before an application may be submitted. The school evaluated various sites for feasibility within the Volcano area as described below. Informal conversations with DLNR revealed the likelihood of no feasible sites in the vicinity.

Properties Adjacent to ʻŌlaʻa Forest Reserve
TMK (3) 1-9-002:006 Kilauea Road 33 acres
TMK (3) 1-9-002:009 Kilauea Road 42 acres
TMK (3) 1-9-003:008 Kilauea Road 18.62 acres
TMK (3) 1-9-002:008 Laukapu Ave 42 acres
TMK (3) 1-9-002:007 Laukapu Ave 27 acres
TMK (3) 1-9-003:011 Kilauea Road 17 acres

> Reasons not selected: These six parcels contain dense native forests adjacent to ʻŌlaʻa Forest Reserve and unlikely to be approved by DLNR. Further, removal of these forests would not be in alignment with the mission of the school.

Properties in Volcano Village Interior
TMK (3) 1-9-013:036 Anapuni Road 16.2 acres
TMK (3) 1-9-013:018 Anapuni Road 15.57 acres
TMK (3) 1-9-013:007 Anapuni Road 8.1 acres

> Reasons not selected: These three adjacent parcels are situated in the interior of the community and surrounded by residential homes presenting concerns with road access, traffic safety and congestion, along with the likely lack of support from community members. The 8.1-acre parcel would have needed to be combined with one or both adjacent parcels to provide sufficient space for facilities.

Alternative 13. W.H. Shipman, LTD (WHSL) Initial Inquiry, TMK (3) 1-1-004;032, 13.76 acres. VSAS requested use this parcel in Volcano Village through donation, sale under market value, or lease.

> Reason not selected: WHSL responded that donation or sale would not be possible and that a lease or license could be considered, but that the requested property was neither available nor suitable for use as a school site. WHSL instead identified the current proposed site for consideration.

Alternative 14. Old Volcano Road Makai Fee Simple, TMK (3) 1-1-004;023, 11-3671 Old Volcano Road. 10 acres. Friends of Volcano School of Arts & Sciences (501c3) purchased this property after receiving a restricted donation of $500,000 for the sole purpose of purchasing of a property.

> Reason not selected: The property includes a residential dwelling and a shop leaving only 6 acres of the site available for school facilities. Because negotiations with WHSL were already underway to acquire the much more suitable current proposed site, FVSAS has

designated the site for the purpose of teacher housing and future investment potential to support the school.

Alternative 15. W.H. Shipman, LTD Site Area Options, TMK (3) 1-1-004;010, 11-3525 Old Volcano Road. 14.9 acres. A few alternative site locations within the 480-acre parcel were considered including the northeast corner (Hilo side), mid-parcel, rear-parcel, and road frontage locations.

Reasons not selected: WHSL required the campus to maintain distance from current and planned uses on the property and recommended preserving space for future school expansion. Additional VSAS considerations included proximity to the Keakealani Campus, a location near the road frontage for access while maintaining a buffer for campus security and space for potential future community use facilities as well as adjacency to FVSAS-owned property and opportunities for future campus expansion.

The proposed site is ideal because it is large enough to accommodate school facility needs, is located in an area with low residential density and no adjacent neighbors apart from Friends of VSAS, has good road access from main two-lane roads off the highway, is situated on land previously disturbed by agricultural use and cattle grazing, and allows for future expansion opportunities.

While the specific shape, size, arrangement, or configuration of buildings may be modified during further permitting and design refinement, such changes would not significantly alter the environmental impacts analyzed in this assessment. Alternative site layouts are discussed in **Section 2.2** below.

The status-quo alternative to this proposed expansion is for VSAS to maintain operations in its current campus, thereby leaving it vulnerable to facility insecurity through its expiring lease, as well as its inability to meet the community need due to the current enrollment capacity deficit. Under the Proposed Action, VSAS would develop a permanent new campus on a 14.9-acre portion of the WHSL parcel, accommodating up to 342 full-time students and 155 staff members by 2032, resolving the expiring lease at the 99-128 Old Volcano Road site, and providing needed community facilities. Environmental impacts would be limited and mitigable, as described throughout Part 3 of this EA. Under the No-Action Alternative, VSAS would continue to operate at its current overcapacity locations with no resolution to the lease expiration, no expansion of enrollment capacity, and no provision of community gathering space. The No-Action Alternative would result in no new physical impacts to the environment but would fail to address the urgent educational infrastructure deficit in Puna. The Proposed Action is therefore clearly preferred over the No-Action Alternative from both an environmental and community need perspective.

2.2 Alternate Site Layout, Phasing, and Access

Any alternative site layout, such as the shape or arrangement of buildings would not entail significant differences in environmental impacts of the project. The subject property is vacant, and thus any deviation from the design would have little impact on any existing infrastructure. The project construction outlines nine (9) building areas encompassing the Pre-K, Middle, and

High schools, along with supporting administrative infrastructure, and any rearrangement would have overall similar impacts to the proposed action. Alternatives to the four-phase construction process or any future adjustments to the grade levels to be served at the site, similarly, would have little impact on the project.

Access to the new development will be via a driveway off Old Volcano Road. Due to the property location, this is the only road whereby access could be facilitated. Thus, no alternative access was considered.

2.3 No Action

Under a No Action Alternative, the proposed new campus for VSAS would not be completed. VSAS would continue to operate at its current location with its existing lease, which expires in May 2028. Without a new campus, the school would face facility insecurity and would be unable to sustain current enrollment, exacerbating the unmet educational demand in the Puna and Kaʻū districts, and even more families seeking quality school options would be turned away. The subject property would likely remain undeveloped. This EA considers the No Action Alternative as the baseline for this project, and all environmental effects will be based off this alternative.

PART 3: ENVIRONMENTAL SETTING, IMPACTS, AND MITIGATION

3.1 Physical Environment

The VSAS new campus property is located at 11-3525 Old Volcano Road. The project area is currently vacant. On a different area of the A-3a zoned subject parcel, a special permit was granted to construct a telecommunication facility by AT&T, although it was not constructed during the permitted 5-year time period. The campus would be developed on 14.9 acres of the parcel. The land is roughly 3,300 feet in elevation. A biotic survey done by Ron Terry, Ph.D. and Patrick J. Hart, Ph.D. in April 2025 found no threatened or endangered plant species on the Project area. The proposed action will not impact any listed scenic resource in the Hawaiʻi County General Plan. Since the Property is approximately 3,300 feet above sea level, there will be no impacts to beaches or shorelines.

3.1.1 Geology, Soils and Geological Hazards and Climate

Environmental Setting: Volcanic Activity

The proposed site sits on the flanks of the highly active Kīlauea volcano. VSAS is situated approximately 2.5 miles from the edge of the Halema'uma'u Crater, at the summit of Kīlauea.

The United States Department of Agriculture (USDA) Natural Resources Conservation Service, Soils Survey Report classifies the soil in this area as primarily Puhimau ashy silt loam, 2 to 10 percent slopes. This is described as ash fields on pahoehoe lava flows. Runoff is high, while it is classified as moderately well draining. The Land Study Bureau classifies the soils on the mauka side of the parcel, including the project area, as "E", or "very poor", and soils on the makai side of the property as primarily "D" or "poor" agricultural productivity.

Geological hazards are frequent island wide, but particularly in the Puna area. According to the Puna Community Development Plan (PCDP), all of Puna lies within the three most hazardous geological risk zones, Lava Zone 1, 2 and 3, on a scale ranging from 9 to 1, ranking from least to most hazardous.

The Property is defined as Lava Zone 3. Historically, most erupted lava first emerges from the ground in Zone 1 (**Figure 3**). Zone 3 is considered less hazardous than Zone 2 due to greater distance from active vents and topographic protection from flow patterns.

Since 1800, 1-5% of Zone 3 has been covered by lava. This percentage has increased over time, with roughly 15-75% coverage over the past 750 years. The most recent eruptions to threaten this area occurred in 2014 and 2018. The Puʻu ʻŌʻō Eruption, which lasted from 1983 to 2018, was the most recent recorded volcanic threat near the subject area. This eruption was the longest and most voluminous outpouring of lava from Kīlauea ERZ in more than 500 years. On June 27, 2014, new fissures erupted on the east flank of Puʻu ʻŌʻō, which started a new lava flow that rapidly advanced to the east toward Pāhoa. The subject property was not at risk due to its location and topographic protection.

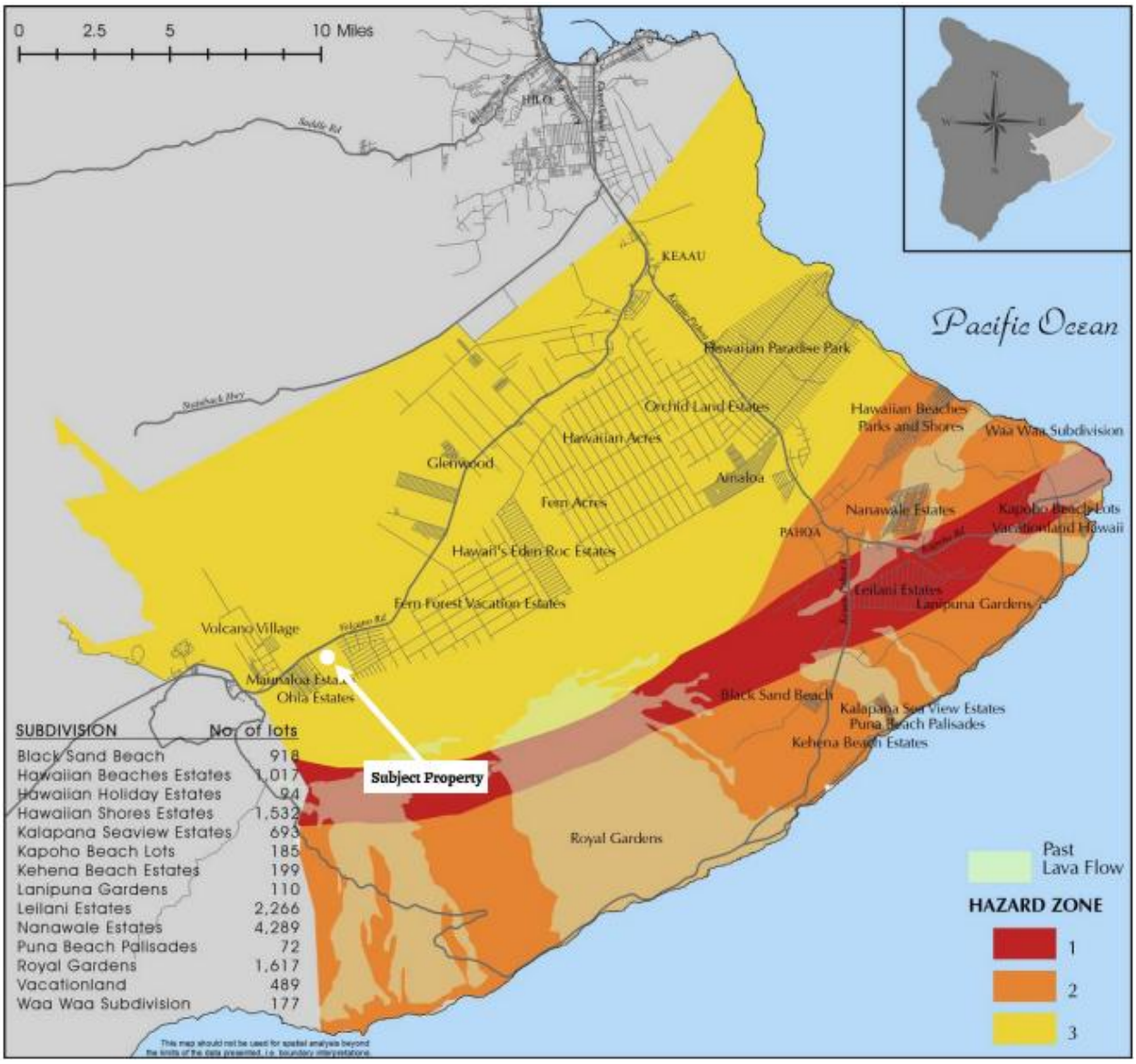

Figure 3: Kīlauea Hazard Zones in Relation to the Subject Property

Environmental Setting: Earthquake Activity

Aside from lava, the Island of Hawai‘i is also susceptible to earthquakes. Kīlauea’s south flank has generated many earthquakes in the past. Fletcher et al. (2002) ranks all Hawai‘i Island a 4 for seismic hazard intensity, classified as “frequent” seismic activity. However, the USGS recently came out with a new model that better estimates earthquake hazard probability for the Hawaiian Islands. The updated ground shaking model indicates there is a 90% chance of experiencing slight or greater damaging levels of shaking during the next 100 years on Hawai‘i Island (**Figure 4**) (USGS, 2021). This probability estimate is island wide. It is much more difficult to predict earthquake probability in a localized area. The largest earthquake in the year 2024 was a magnitude 5.7 earthquake that was centered in Pahala, roughly 20 miles from Volcano village. The largest earthquake to hit Hawaii in the past decade was a magnitude 6.9 earthquake that occurred on May 4, 2018 near the south flank of Kīlauea.

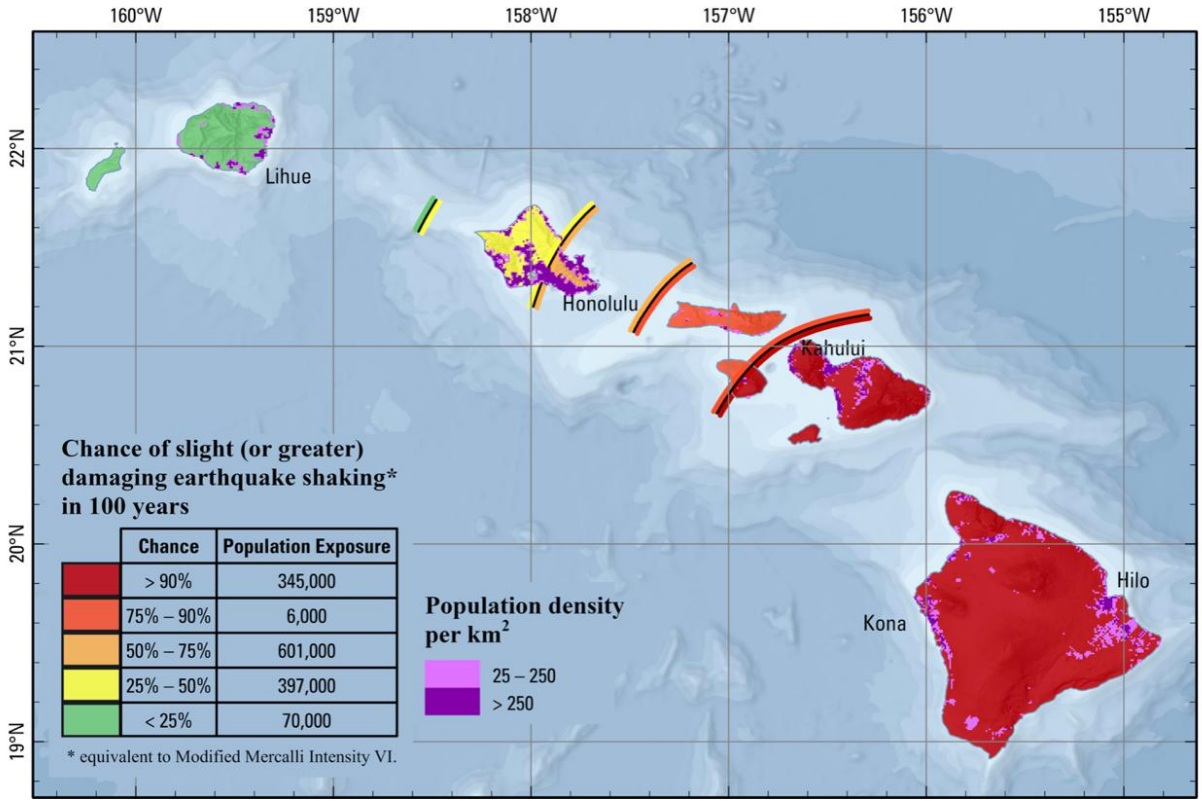

Figure 4: 2021 USGS Model of Earthquake Probability for the Hawaiian Islands

Environmental Setting: Climate

The climate of the Volcano region is generally cool and damp. Daily average temperatures hover around 60 degrees Fahrenheit (°F) in January, to around 67 °F in August, the coldest and warmest months on average. Rainfall is abundant in Volcano, with annual averages around 145 inches. There is relative high variability in the monthly averages, with a recent high of 26 inches in August 2024, and a recent low of 2.5 inches in January of 2024.

The Hawai‘i Revised Statues §226-109 and Hawai‘i Administrative Rules §11-200.1 strongly encourages the environmental review process to analyze the impacts climate change may have on the proposed action. This includes identifying short and long-term effects, levels of resilience, and mitigation measures including potentially beneficial alternatives.

Climate change is a fundamental environmental issue that is particularly complex and far-reaching. The National Aeronautics and Space Administration (NASA) measured carbon dioxide levels in the atmosphere before the industrial revolution began in the late 1700’s. Approximately 280 parts per million (ppm) was present in the atmosphere. In 2013, carbon dioxide levels surpassed 400 ppm for the first time in recorded history (Tetra Tech, 2020). According to the United Nations’ Intergovernmental Panel on Climate Change (IPCC), “Human influence on the climate system is clear, and recent anthropogenic emissions of greenhouse gases are the highest in history. Recent climate changes have had widespread impacts on human and natural systems” (IPCC, 2014).

Mean global air temperatures are projected to increase by 2.7 °F by the end of the century. Increases in air temperatures will subsequently lead to increased ocean temperatures, which are expected to be the highest in tropical and subtropical areas of the Northern Hemisphere. The University of Hawai‘i Sea Grant College Program confirms that Hawai‘i is getting warmer. Data shows an increase in air temperature over the last 30 years of roughly 0.3 °F per decade. For Hawai‘i this not only means rising sea levels, but also more contrast in the wet and dry season, which may lead to more frequent and intense precipitation and flooding (Tetra Tech, 2020).

In general, rainfall in Hawai‘i has been variable in the recent past with some drier and wetter years on average. El Niño provides periodic variation in winds and sea surface temperatures in the Pacific contributing to warming phases, while La Niña contributes to cooling phases. Increases in air temperature related to climate change will lead to more evaporation and moisture in the air, which will contribute to variability in El Niño and La Niña events.

According to Collins et al., 2019, as outlined in an IPCC Special Report on the Ocean and Cryosphere in a Changing Climate*,* climate change will also likely increase the intensity and frequency of storms.

> “The average intensity of tropical cyclones, the proportion of Category 4 and 5 tropical cyclones and the associated average precipitation rates are projected to increase for a 2ºC global temperature rise above any baseline period (*medium confidence*). Rising mean sea levels will contribute to higher extreme sea levels associated with tropical cyclones (*very high confidence*). Coastal hazards will be exacerbated by an increase in the average intensity, magnitude of storm surge and precipitation rates of tropical cyclones.”

In recent years, storms such as Iselle (2014) and Lane (2018) have had damaging effects to the island.

On August 8, 2014, Hurricane Iselle made landfall in the Puna District of Hawai‘i County as a moderate tropical storm with sustained wind speeds of 70mph. Significant damage was felt in the southeastern portions of the Big Island, especially in the Wai‘ōpae area, which is a coastal stretch dotted with anchialine ponds and tide pools, known as the Kapoho Tide Pools. Many homes were heavily damaged in this area. Although the most heavily affected area is located over 25 miles from the property, most of the southeastern portion of the Big Island experienced high winds, heavy rain, and downed trees and power lines, cutting thousands of people off from electricity, water, and transportation for several days (Kimberlain et al., 2018).

Hurricane Lane occurred in late August 2018 and brought significant damage to the Hawaiian Islands from flash flooding and mudslides. Over a four-day period, Hawai‘i Island received an average of 17 inches of rain. Up to 159 structures were damaged, making it the wettest tropical storm to impact the Island. Although most of the flooding impacts were concentrated to Hilo, much of the southern windward side of the island experienced impacts (Beven, 2019).

Wildfires are becoming more frequent and intense due to rising temperatures, change in rainfall patterns and the growth of non-native, fire prone grasses and shrubs. According to the Pacific Fire Exchange (PFE) (2021), “Fire risk is closely tied to wet and dry cycles where grasslands and savannas grow and then dry out.” Up to 25% of land in Hawai‘i is at fire-prone risk. According

to the Hawai‘i Wildfire Management Organization (HWMO), about 0.5% of Hawai‘i’s total land area burns every year. Although the primary source of wildfires on Hawai‘i island is anthropogenic, climate change is beginning to play a very serious role in the frequency and intensity of fires seen across the state. “Human ignitions coupled with an increasing amount of non-native, fire-prone grasses and shrubs and a warming, drying climate have greatly increased the wildfire problem” (HWMO, 2018). Further, expanding non-native, fire-prone grasses are less likely to recover from wildfires. Wildfires were once limited to active volcanic eruptions and infrequent lightning strikes. The increase in wildfire prevalence poses threats to safety, agricultural production, natural and cultural resources (PFE, 2014).

In early August 2021, a vegetation fire ignited near Mana Road and traveled throughout Waimea and South Kohala. Approximately 40,000 acres were burned according to estimates from fire officials. It was the largest wildfire ever recorded in Hawai‘i County. Thousands of people were forced to evacuate from Waiki‘i Ranch and Pu‘u Kapu Hawaiian Homesteads where two homes were destroyed. Governor David Ige declared a state of emergency on August 4, 2021, to protect the health, safety, and welfare of Hawai‘i (West Hawai‘i Today, 2014). **Figure 5** shows the extent of the fire in red.

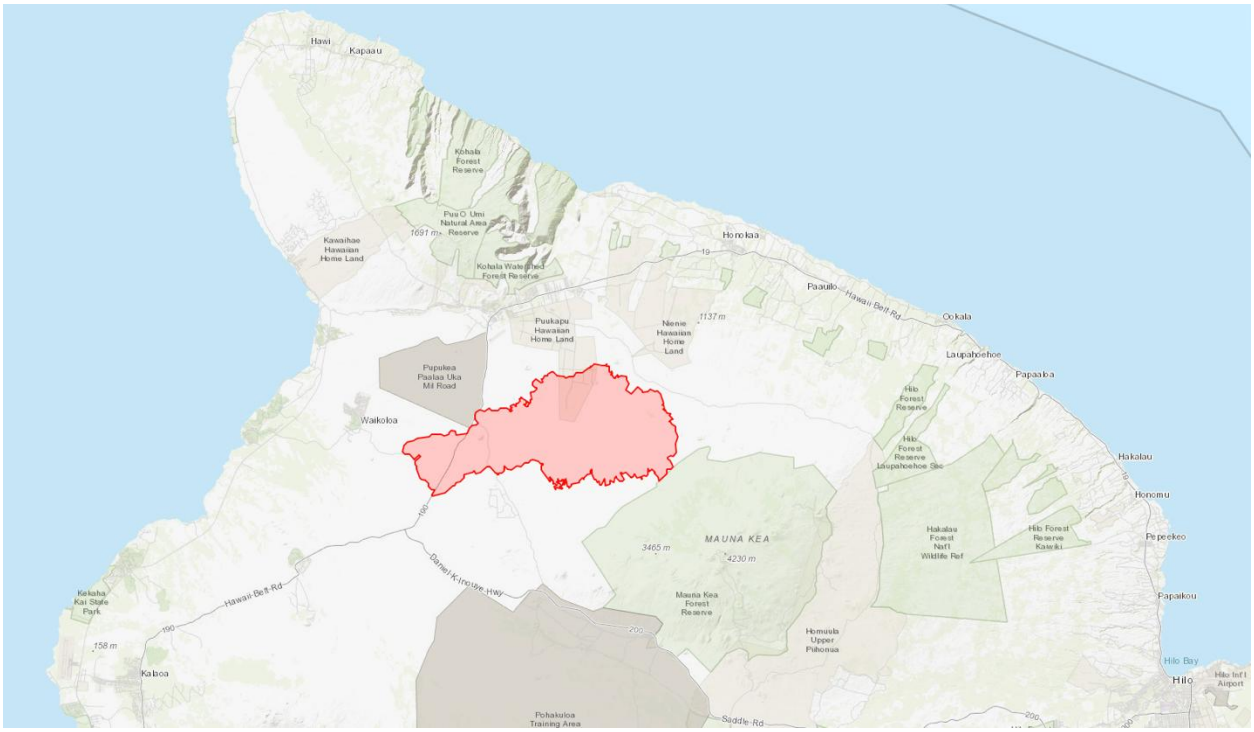

Figure 5: Extent of the 2021 Wildfire in Hawai‘i County (West Hawai‘i Today, 2014)

Impacts and Mitigating Measures

It is crucial that the development of any school considers and implements appropriate safety measures and protocols associated with adverse climate events and geological hazards. All proposed buildings will be designed and engineered to withstand seismic and wind hazards according to the Hawai‘i County Building Code. The new VSAS campus is proposed to be located along Old Volcano Road, with close access to the adjacent Māmalahoa Highway (HI-

11). This positioning will aid in swift and efficient evacuation in the unlikely event it is required due to a wildfire or volcanic eruption.

Geological hazards do not pose undue risk for the proposed expansion. Much of the Puna District faces similar seismic risk and volcanic hazards yet remains the fastest growing region in the state. Despite the volcanic activity present in the area, the subject site remains at lower risk than much of Puna due to its location within Lava Zone 3. Although scientists believe climate change can increase the frequency and intensity of storms for the Hawaiian Islands, VSAS is in a relatively protected area inland (12.2 miles from the coast), reducing its susceptibility to storm hazards. In addition, the proposed action will not have any measurable adverse impacts to natural hazards.

Wildfire risk in the Volcano area is fairly low. Although the Puna District is heavily vegetated in certain areas, the consistent level of rainfall has continued to help suppress fire risk and the ability for large areas to burn (Hawai‘i Wildfire Management Organization, 2013). Additionally, areas of Volcano considered to be at risk are included in the HWMO vegetation management procedures for wildfire mitigation.

With respect to how climate conditions specifically could affect the proposed project, the following considerations apply. The Volcano area receives an average of approximately 140-180 inches of rainfall annually, and climate projections for windward Hawai‘i suggest continued variability in rainfall with potential increases in intense precipitation events. The proposed campus buildings will be designed to current Hawai‘i County Building Code standards, which include requirements for wind resistance consistent with hurricane and high-wind conditions. Roofing and drainage systems will be designed to manage heavy rainfall events and direct runoff away from structures and into appropriate infiltration or detention areas. The project site is located in Flood Zone X (outside the 500-year floodplain), mitigating flooding risk from extreme rainfall events. Regarding wildfire risk, the Volcano area experiences relatively low wildfire frequency due to persistent high rainfall, and the campus will include fire-resistant construction materials and maintained defensible space around structures, consistent with Hawai‘i County requirements. With respect to volcanic hazard, the campus is located in Lava Zone 3, which has had 1–5% coverage by lava since 1800, and evacuation routes via Old Volcano Road and HI-11 are available. Regarding greenhouse gas emissions and sustainability, the proposed campus will incorporate alternative energy systems, energy-efficient appliances, and water conservation measures including rainwater catchment to reduce its carbon footprint and operating costs. VSAS is also exploring the potential for school bus transportation and carpooling programs to reduce vehicle miles traveled by students and staff, which would help minimize the project’s contribution to transportation-related greenhouse gas emissions.The proposed action and listed alternatives are not anticipated to generate any significant impacts relating to geological or climate hazards.

3.1.2. Flood Zones and Shoreline Setting

Environmental Setting

According to the Federal Emergency Management Agency (FEMA), the VSAS property is located within Flood Zone X, which is outside the 500-year floodplain.

The VSAS new campus is roughly 12.2 miles from the coast and is not within the County designated Special Management Area (SMA) or the County of Hawai‘i tsunami evacuation zone (**Figure 6**). The proposed project will not be impacted by any coastal hazards or affect erosion, coastal ecosystems, or marine resources. There are no naturally occurring wetlands, ponds, or lakes in the area. There is also no risk of stream flooding as there are no streams within the vicinity of the Property.

The Property is adjacent to Old Volcano Road, running parallel to HI-11, which can experience significant runoff from high precipitation events at times. Storm drainage infrastructure will not be adversely impacted by the proposed development.

Impacts and Mitigating Measures

All existing and proposed structures on the property will remain in Flood Zone X. Rainfall is high in the area, averaging between 140-180 inches per year. The proposed action would comply with all required codes and regulations regarding drainage and runoff mitigation. These protections will prevent any adverse impacts relating to flooding potential due to the proposed action. Further, as these protective regulations apply equally to each alternative, there are no appreciable differences in potential impacts relating to flooding or shoreline resources between project alternatives.

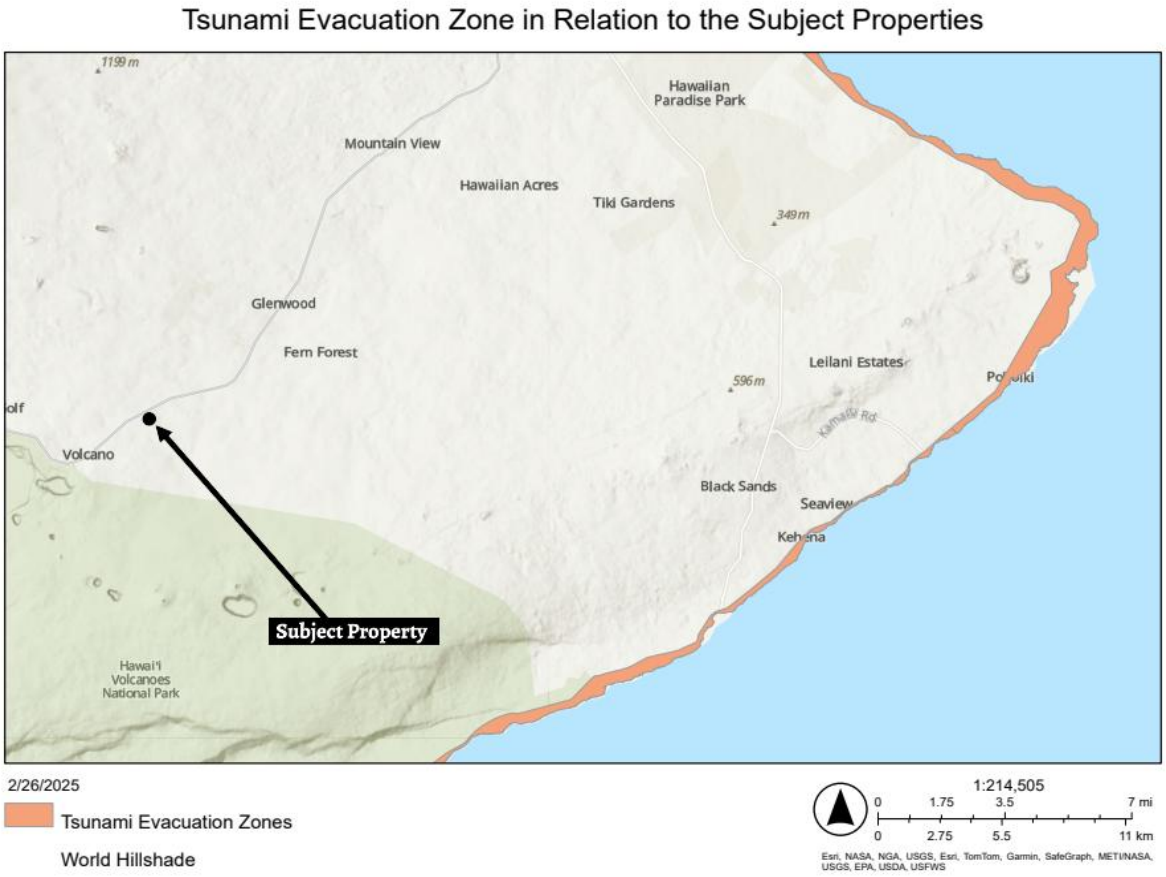

Figure 6: Tsunami Evacuation Zone in Relation to the Subject Property

3.1.3 Water Quality

Environmental Setting

The proposed action will not take place near any naturally occurring body of water. The rapid permeability of young lava flows along with the geologic youth of the landscape makes surface streams rare on Kīlauea. Water is typically conveyed from *mauka* areas underground either through lava tubes or more permeable layers and fractures in the underlying basalt. During periods of intense and prolonged rainfall these subsurface groundwater flows will occasionally reach the surface in low-lying areas. Surface sheet flow of storm water is also possible during intense rainfall.

Impacts and Mitigating Measures

The primary activities with potential to affect storm water are grading and grubbing. Grading plans will be developed with the mitigating measures and BMPs discussed below. On-site improvements would include the placement of school structures, septic systems and access and parking areas. With the proposed mitigations, the development of the VSAS new campus does not pose any risk to aquatic or marine habitats.

VSAS will ensure all earthwork and grading will be conducted in compliance with:

(a) "Storm Drainage Standards," County of Hawai'i, 1970 and as revised
(b) "Flood Control," Chapter 27 of the Hawai'i County Code
(c) Standards and regulations of the Federal Emergency Agency (FEMA)
(d) "Erosion and Sedimentation Control," Chapter 10 of the Hawai'i County Code
(e) Conditions of an NPDES permit, and any additional Best Management Practices required by the Department of Health Clean Water Branch

A County grading permit will be required. Construction activities would occur in an area greater than one acre and thus will require a National Pollutant Discharge Elimination System (NPDES) permit to ensure that erosion and sedimentation impacts will be minimized. This permit requires the completion of a Storm Water Pollution Prevention Plan (SWPPP).

Mitigating measures that will be implemented for this project include:

- A Storm Water Pollution Prevention Plan (SWPPP) will be prepared and implemented prior to beginning grading.
- Erosion controls (silt fencing, wattles, sediment basins) will be installed before ground disturbance and inspected weekly and after rainfall events.
- Disturbed areas will be revegetated or stabilized as soon as practicable following construction.

Additional Best Management Practices (BMPs) to properly manage storm water runoff may include, but are not limited to:

- Minimizing sediment loss by placing structural controls including silt fences, gravel bags, sediment ponds, check dams, and other barriers
- Applying sediment wattles and protective covers to soil and material stockpiles
- Gravel check dams in gutters
- Constructing and using a stabilized construction vehicle entrance, with a designated vehicle wash area that discharges to a sediment pond
- Washing of all vehicles in the designated wash area before leaving the project site
- Use of drip pans beneath vehicles to trap vehicle fluid
- Performing routine inspection and maintenance of structural BMPs by trained personnel
- Properly cleaning significant leaks or spills and disposing at an approved site

Wastewater will be handled through Individual Wastewater Systems (IWS) adhering to County and State regulations meeting the approval of the Department of Health (DOH).

The proposed action will create impermeable surfaces on the property, which can increase the volume and rate of stormwater runoff. However, per Hawai‘i County Code, Chapter 27, the volume of stormwater leaving the site will not increase. A drainage study will be conducted and approved by the County Department of Public Works and drainage structures may be required to accommodate the runoff from new impervious surfaces. Wastewater from the project's facilities will be treated using individual wastewater treatment systems, permitted by the State of Hawai'i Department of Health.

VSAS will use the Best Management Practices created by the University of Hawai‘i-Manoa, College of Tropical Agriculture and Human Resource's *Best Management Practices to Manage Non-Point Pollution in Agriculture* (Abbas and Fares, 2009). These BMPs are intended to address any potential impacts due to landscaping plans and include short- and long-term methods to control erosion and sedimentation, soil management through cultivation, minimizing tillage, adding organic material to soils and establishing ground covers. Since the precipitation is high in the area, little to no watering should be required, other than hand watering of new plantings and during times of relative drought. Nutrient management will be carefully considered and selected by using the appropriate organic manure, which can help stabilize soils and reduce the need for chemical nutrients. Pests will be managed through integrated pest management practices, biological control, and pesticides only when necessary. Proper handling, storage and application of pesticides will always be enforced.

3.1.4 Flora and Fauna

Environmental Setting: Flora

Historically, the primary agricultural use of the immediate area surrounding the subject area was orchid propagation. Adjacent areas within the wider property were also utilized for cattle grazing and experimental tree planting. The natural vegetation of this area is dominated by ‘ōhi‘a (*Metrosideros polymorpha*), uluhe (*Dicranopteris linearis*), ‘uki (*Machaerina spp.)* and hapu‘u (*Cibotium spp*.)

A biotic survey of a 20-acre forested area within the subject property conducted in April 2025 found no rare, threatened, or endangered plant species on the property (**Appendix C**). The subject area contains a medium-stature, early stage, somewhat diverse ʻōhiʻa forest that is lightly to moderately degraded by invasive species. The survey found 68 plant species, of which 25 are native, with 9 being indigenous and 16 endemic. The native plant species documented are reasonably common within Hawaiʻi and on the Big Island. No listed, candidate, or proposed threatened or endangered plant species, as determined by the U.S. Fish and Wildlife Service, were discovered during the survey.

Vegetation in the subject area is primarily composed of an open ʻōhiʻa forest with trees ranging from 15 to 30 feet in height. The understory consists mainly of native plants, including: uluhe, amaʻu, hapuʻu, ʻuki, wawaeʻiole (*Lycopodiella cernua*), ohelo kaulaʻau (*Vaccinium calycinum*), pukiawe (*Leptecophylla tameiameiae*), kukaenene (*Coprosma ernodeoides*), ʻohe (*Isachne distichophylla*), and naupaka kahakai (*Scaevola chamissoniana*). Non-native grasses are also present, such as bush beardgrass (*Schizachrium condensatum*), broomsedge (*Andropogon virginicus*), and smutgrass (*Sporobolus africanus*).

There are also native and non-native sedges in the *Cyperus* and *Carex* genera as well as rushes (*Juncus spp*.) Native plants are subject to infestation, from heavily to not at all, by the highly invasive kahili ginger (*Hedychium gardnerianum*), Himalayan raspberry (*Rubus ellipticus*) and a wide variety of common weeds. Native trees other than ʻōhiʻa are scattered, in descending order of abundance: kawaʻu (*Ilex anomala*), pilo (*Coprosma ochracea*), ʻolapa (*Cheirodendron trigynum),* manono (*Kadua terminalis*), and alani (*Melicope clusiifolia*). A few very scattered non-native trees are present as well, including faya tree (*Morella faya*), strawberry guava (*Psidium cattleianum)* and Asian melastome (*Melastoma candidum*). Fern/fern ally diversity is low, but such species not already mentioned include moa (*Psilotum nudum*), palaʻa (*Sphenomeris chinensis*), wahine noho mauna (*Adenophorus tamariscinus*), ʻōhiʻa ku (*Mecodium recurvum*) and kolokolo (*Grammitis tenella*).

Roughly 40% of the project area, the southeast portion, has regrown from previous clearing due to agricultural use for grazing or farming. The remainder of the subject area had experienced some prior disturbance from the emplacement of water pipelines and other activities. Both areas presently consist of the ʻōhiʻa forest with an understory of uluhe, amaʻu, hapuʻu and ʻuki. However, hapuʻu is taller, and uluhe is taller and thicker, in the regrown portion of the project area. Himalayan blackberry and kahili ginger are also thicker in the regrown portion. However, there was more pukiawe and kukaenene documented in the non-regrown portion. Overall, despite the aforementioned differences, the area as a whole is fairly homogenous.

Table 1 has a complete list of each plant detected on the Properties during the survey.

Table 1: Plant Species Detected on the Proposed Volcano School New Campus

Scientific Name	**Family**	**Common Name**	**Life Form**	**Status***
Adenophorus tamariscinus	Polypodiaceae	Wahine Noho Mauna	Fern	E
Ageratum conyzoides	Asteraceae	Ageratum	Herb	A
Andropogon virginicus	Poaceae	Broomsedge	Herb	A

Arundina bambusifolia	Orchidaceae	Bamboo Orchid	Herb	A
Axonopus fissifolius	Poaceae	Narrow-leafed Carpet Grass	Grass	A
Buddleia asiatica	Buddlejaceae	Dog Tail	Shrub	A
Bulbostylis capillaris	Cyperaceae	Bulbostylis	Sedge	A
Carex macloviana var. *subfusca*	Cyperaceae	St. Malo's Sedge	Herb	I
Cheirodendron trigynum	Araliaceae	ʻOlapa	Tree	E
Cibotium glaucum	Cibotiaceae	Hapuʻu Pulu	Fern	E
Coprosma ernodeoides	Rubiaceae	Kukaenene	Vine	E
Coprosma ochracea	Rubiaceae	Pilo	Tree	E
Crocosmia x crocosmiiflora	Iridaceae	Tritonia	Herb	A
Cyperus halpan	Cyperaceae	Umbrella Sedge	Herb	A
*Cyperus alternifolius**	Cyperaceae	ʻAhuawa haole	Sedge	A
Cyperus polystachyos	Cyperaceae	Pycreus Sedge	Herb	I
Desmodium incanum	Fabaceae	Spanish Clover	Herb	A
Desmodium tortuosum	Fabaceae	Tick Clover	Herb	A
Desmodium triflorum	Fabaceae	Tick Clover	Herb	A
Dicranopteris linearis	Gleicheniaceae	Uluhe	Fern	I
Digitaria violascens	Poaceae	Itchy Crabgrass	Herb	A
Dubautia scabra	Asteraceae	Kupaʻoa	Shrub	E
Erechtites hieracifolia	Asteraceae	Erechtites	Herb	A
Gnaphalium japonicum	Asteraceae	ʻEnaʻena	Herb	A
Grammitis tenella	Grammitidaceae	Kolokolo	Fern	E
Hedychium gardnerianum	Zingiberaceae	Kahili Ginger	Herb	A
Hypericum parvulum	Hypericaceae	St. John's Wort	Herb	A
Hypochoeris radicata	Asteraceae	Cat's Ear	Herb	A
Ilex anomala	Aquifolicaceae	Kawaʻu	Tree	E
Isachne distichophylla	Poaceae	ʻOhe	Grass	E
Juncus planifolius	Juncaceae	Rush	Herb	A
Kadua terminalis	Rubiaceae	Manono	Shrub	E
Kyllinga brevifolia	Cyperaceae	Kyllinga	Herb	A
Leptecophylla tameiameiae	Ericaceae	Pukiawe	Shrub	I
Lotus subbiflorus	Fabaceae	Hairy Bird's Foot Trefoil	Herb	A
Lycopodiella cernua	Lycopodiaceae	Wawaeʻiole	Fern Ally	I
Machaerina angustifolia	Cyperaceae	ʻUki	Herb	I
Machaerina mariscoides subsp. meyenii	Cyperaceae	ʻUki	Herb	I
Mecodium recurvum	Hymenophyllaceae	ʻŌhiʻa Ku	Fern	E
Melastoma candidum	Melastomataceae	Asian Melastome	Shrub	A

Melicope clusiifolia	Rutaceae	Kakaemoa	Tree	E
Melinus minutiflora	Poaceae	Molasses Grass	Herb	A
Metrosideros polymorpha	Myrtaceae	ʻŌhiʻa	Tree	E
Morella faya	Myricaceae	Faya Tree	Tree	A
Neonotonia wightii	Fabaceae	Glycine	Herb	A
Nephrolepis multiflora	Nephrolepidaceae	Sword Fern	Fern	A
Persicaria capitata	Polygonaceae	Knotweed	Shrub	A
Pilea microphylla	Urticaceae	Rockweed	Herb	A
Plantago major	Plantaginaceae	Plantago	Herb	A
Pluchea symphytifolia	Asteraceae	Pluchea	Shrub	A
Polygala paniculata	Polygalaceae	Milkwort	Herb	A
Psidium cattleianum	Myrtaceae	Strawberry Guava	Tree	A
Psilotum complanatum	Psilotaceae	Moa	Fern ally	I
Rubus ellipticus	Rosaceae	Yellow Himalayan Raspberry	Shrub	A
Rumex acetosella	Polygonaceae	Sheep Sorrel	Herb	A
Sacciolepis indica	Poaceae	Glenwood Grass	Herb	A
Sadleria cyatheoides	Blechnaceae	Amaʻu Fern	Fern	E
Scaevola chamissoniana	Goodeniaceae	Naupaka Kuahiwi	Shrub	I
Schizachyrium condensatum	Poaceae	Beardgrass	Herb	A
Sida rhombifolia	Malvaceae	Broomweed	Herb	A
Spermococe assurgens	Rubiaceae	Spermacoce	Herb	A
Sphenomeris chinensis	Lindseaceae	Palaʻa Fern	Fern	I
Sporobolus africanus	Poaceae	Smutgrass	Grass	A
Stachytarpheta sp.	Verbenaceae	Vervain	Shrub	A
Tibouchina herbacea	Melastomataceae	Cane Tibouchina	Herb	A
Torenia glabra	Scrophulariaceae	Wishbone Flower	Herb	A
Vaccinium calycinum	Ericaceae	ʻOhelo Kaulaʻau	Shrub	E
Vaccinium reticulatum	Ericaceae	ʻOhelo	Shrub	E

A=Alien PI=Polynesian Introduction E=Endemic I=Indigenous END= Listed Endangered
* Tentative ID due to insufficient plant material
Notes: Several grasses and sedges were not able to be ID'd but were determined to not be T&E
Several survivals of cultivation were found just outside the area and did not appear to have the ability to spread within: *Magnolia* sp., *Pinus* sp., *Camellia japonica*, and *Rhododendron*

Environmental Setting: Fauna

The survey detected a number of non-native birds present in the subject area, including: warbling white-eye (*Zosterops japonicus*), Japanese bush warbler (*Horornis diphone*), northern cardinal (Cardinalis cardinalis), spotted dove (*Spilopelia chinensis*), house finch (*Haemorhous mexicanus*), melodious laughing thrush (*Garrulax canorus*), zebra dove (*Geopilia striata*), scaly-

breasted munia (*Lonchura punctulata*), domestic chicken (*Gallus gallus*) and Kalij pheasant (*Lophura leucomelanos*).

The area is considered a moderately good habitat for native forest birds, considering its primarily native vegetation. However, the elevation is too low to provide protection from mosquito borne diseases and the Volcano area has abundant populations of bird predators such as cats and rats. Three native birds were observed during the survey: Hawai'i 'amakihi (*Chlorodrepanis virens virens*), 'apapane (*Himatione sanguinea*) and Hawaiian hawk or 'i'o (*Buteo solitarius*). Neither amakihi nor 'apapane are threatened or endangered species and they are, at least currently, widely distributed in wet, forested uplands of the island. As with non-native birds, additional observations at different seasons and times might detect more species, but the habitat does not appear highly suitable for endangered species.

Two Hawaiian hawks were identified during the survey. While they are listed as endangered by the State of Hawai'i, they are no longer listed federally and are commonly seen in forests, agricultural areas, and towns throughout east Hawai'i island. Due to inland location, there are likely no waterbirds or seabirds in the subject area. The only waterbird likely to occasionally fly over is the threatened Hawaiian goose or nēnē (*Branta sandwicensis*). Nēnē habitat ranges from sea level to 7,000 feet. Flocks move between high elevation feeding habitats and lowland nesting areas. There are no grassy patches in the subject area with the characteristics that would be likely to host nēnē, and no signs of this bird were observed. Although they would rarely if ever be visible, several listed seabirds may overfly the Volcano area between the months of May and November, including the endangered Hawaiian petrel (*Pterodroma sandwichensis*), the endangered band-rumped storm petrel (*Oceanodroma castro*), and the threatened Newell's shearwater (*Puffinus auricularis newelli*). These seabirds hunt over the ocean during the day and fly to higher elevations at night to nest.

It is likely that the Hawaiian hoary bat (*Lasiurus cinereus semotus*), the only native Hawaiian land mammal, is sometimes present in the subject area. They have been observed throughout Puna and in most areas on the island. Aside from bats, the only other mammals that could be present in the subject area are all introduced species, such as: feral cats (*Felis catus*), feral pigs (*Sus scrofa*), mongooses (*Herpestes spp.*) and various species of rats (*Rattus spp.*) and mice (*Mus spp.*). No mammals were observed during the survey, but pig trails were common throughout the subject area. No reptiles or amphibians were found, although it is possible that several species may be present, including the highly invasive coqui frog (*Eleutherodactylus coqui*), which has been a periodic problem in Volcano.

In addition to the biotic survey, an Insect Assessment Report was conducted in May 2025 by Ola'a Environmental Services, LLC (**Appendix F**). The assessment was targeted with the purpose of detecting threatened or endangered *Drosophila*. Results of the assessment also provided an overview of insect threats and ecosystem function. It is likely that the invasive species of spotted-wing drosophila, Argentine ant, western yellowjacket, and Jackson's chameleon are well established at the site, putting pressure on native insect communities and ecosystem function. Threats are further amplified by the negative impacts of feral pigs (*Sus scrofa*), Himalayan raspberry *(Rubus ellipticus*), strawberry guava (*Psidium cattleianum*), and kāhili ginger (*Hedychium gardnerianum*), all observed within the project area. Only one species of host plant for the endangered *Drosophila*, 'ōlapa, was found in the project area. Assessment

results did not detect any threatened or endangered insects within the project area, and the proposed development should not have any impact on any population of T&E insects.

Impacts and Mitigation Measures

No rare, threatened, or endangered plant species were found to be present within the subject area. The vegetation is primarily a medium-stature, early stage, somewhat diverse ʻŌhiʻa forest. Clearing of the area would only affect common plants, and would not impact rare, threatened or endangered plants or intrude on a particularly sensitive native ecosystem.

Another concern to address during construction is the spread of invasive species, such as the little fire ants and coqui frogs. Soil and plant material may contain invasive fungal pathogens such as Rapid ʻŌhiʻa Death (ROD), vertebrate and invertebrate pests such as Little Fire Ants (*Wasmannia auropunctata*), or invasive plant parts that could harm native species and ecosystems. Mitigation measures to ensure biosecurity during activity within the subject area will be observed. The two species of fungus called *Ceratocystis lukuohia and C. huliohia* that produce a disease known as Rapid ʻŌhiʻa Death (ROD). This disease has killed hundreds of thousands of ʻōhiʻa trees across more than 34,000 acres of the Big Island. It was first discovered in Lower Puna. Projects that harm or relocate ʻōhiʻa trees can spread the disease, and certain mitigation measures are recommended, although it is important to recognize that treatment protocols are evolving. The following mitigation protocol will be followed during construction:

- Minimize clearing of ʻōhiʻa forest to the degree practicable while still meeting the goals of establishing a VSAS campus.
- Prior to clearing the edges of the subject area, ʻōhiʻa trees on the boundary should be identified. Any such trees that are not planned for removal on the edges should be protected from disturbance entirely, or cut and chipped or buried, to ensure that they do not present a ready target for ROD infection that could spread to other trees;
- Treat any unavoidable scars on ʻōhiʻa trees that result from clearing to prevent infestation of the fungus;
- Stack all removed ʻōhiʻa trees and dispose of by burying or chipping; do not remove from the subject area. Decontaminate boots and work tools before and after working in an area with ʻōhiʻa trees;
- If any material removed from the site is moved to areas without fire ants or ROD, the material will be inspected and treated if necessary.

The potential presence of native birds in the area means the applicant will commit to mitigating measures. Also, since the Hawaiian Hoary Bat or ʻŌpeʻapeʻa has the potential to occur in the vicinity of the project area and may roost in nearby trees mitigating measures will be followed. Mitigating measures for native fauna include:

- Construction will refrain from activities that disturb or remove shrubs or trees taller than 15 feet between June 1 and September 15, when Hawaiian hoary bats may be sensitive to disturbance.
- If land clearing occurs between the months of March and September, inclusive, a pre-construction hawk nest search by a qualified ornithologist using standard methods will be

conducted. If Hawaiian hawk nests are present, no land clearing should be allowed until October, when hawk nestlings will have fledged.

- All exterior lighting will be shielded from shining upward, in conformance with Hawai‘i County Code § 14–50 et seq., to minimize the potential for seabird disorientation. The project should utilize blue-deficient lighting such as filtered LED lights or amber LED lights, with a Correlated Color Temperature (CCT) of 2700 Kelvin or less, which promotes dark skies and minimizes impacts to seabirds.
- Although no T&E waterbirds or Hawaiian geese are likely to be present, if federal funding is involved, the project should be prepared for the requirement to have a biological monitor verify site conditions prior to construction and institute standard avoidance and mitigation measures should these species be detected.

3.1.5 Air Quality, Noise and Scenic Resources

Environmental Setting

Air quality in this area is usually good. In the past, volcanic emissions such as sulfur dioxide from Kīlauea volcano, have resulted in “vog,” which can impact air quality in the Puna District at times. Vog is created when sulfur dioxide reacts chemically with sunlight, oxygen, dust particles and water in the air. Due to the proximity of the proposed VSAS campus expansion site to the caldera of the Kīlauea volcano, there is a propensity for frequent vog conditions.

Vehicles are another source of minor air pollution, which is minimal on Hawai‘i Island. Furthermore, due to this site’s relative ruralness and proximity to large, forested areas, vehicular emissions as a source of localized air pollution can be expected to be particularly low. All Hawai‘i Island meets the standards set by the Clean Air Act (CAA) and HRS §342B.

Noise on the project site varies from low to moderate, with the main source being from motor vehicles on the adjacent highway Noise levels are expected to increase with higher levels of traffic to and from the proposed campus, due to the expanded capacity of students as compared to current enrollment at the current school sites. The proposed action includes the construction of an amphitheater, which may emit noise at times.

Impacts and Mitigating Measures

Air pollutants during construction will be limited and temporary. The main sources of short-term air pollutants are construction equipment exhaust and dust. The State of Hawai‘i Air Pollution Control Regulations outlined in HAR §11-60 prohibit visible emissions of dust from construction activities at the Property boundary. A dust control plan for each construction phase will be necessary due to the proximity of the proposed project to the adjacent roads and residential areas. Potential short-term dust impacts during construction can be mitigated by frequent watering programs and wind screens in particularly dust-prone or dust-sensitive areas to prevent significant impacts.

During operation, the TIAR estimates 154 peak hour vehicular trips, which is not expected to measurably affect air quality. In addition, the proposed project does not anticipate being subject to air quality impacts.

Short-term noise impacts may occur during construction from excavation, grading, vehicle and equipment operation, and the construction of new infrastructure. These impacts will all be temporary and mitigated through construction timing and best management practices, which will provide times of no noise impacts. It is possible that a noise permit may need to be sought if there is ever a potential for construction noise to exceed the Department of Health's maximum permissible noise levels.

Operationally, all noise will be limited to typical workday hours. When the campus is in operation, select community events may increase noise in the area. In the event the site is used outside of normal operating hours, VSAS will adhere to the Department of Heath noise guidelines, which state events will not run past 10:00 p.m.

Mitigation measures planned to reduce noise and air quality impacts include:

- Prior to initiation of ground-disturbing activities, the VSAS will prepare and implement a Construction Dust Control Plan consistent with HAR §11-60.1 and Hawai‘i County Code Chapter 10.
- Exposed soils will be watered at least twice daily during dry or windy conditions, and more frequently as needed to prevent visible dust emissions beyond the project boundary.
- Stockpiled soils will be covered or treated with soil binders if inactive for more than 48 hours.
- All haul trucks transporting soil or aggregate will be covered prior to leaving the site.
- Construction activities generating dust will be suspended during high-wind conditions when dust cannot be effectively controlled.
- Compliance will be monitored by the construction contractor's designated environmental compliance manager and a daily dust control log will be maintained.
- Construction activities shall be limited to business hours Monday through Friday, excluding State and County holidays, unless a Department of Health noise permit is obtained.
- Prior to operation of the amphitheater for community events, VSAS shall establish an Event Noise Management Plan specifying maximum event hours and on-site staff responsible for monitoring noise levels during events.

The County of Hawai‘i General Plan outlines regulations to preserve areas of natural scenic beauty. The grounds and buildings of the proposed campus will be aesthetically pleasing, although sight lines into the project area from HI-11 would be obscured by bordered vegetation.

3.1.6 Hazardous Substances, Toxic Waste and Hazardous Conditions

Environmental Setting

No hazardous substances or toxic waste is expected to be generated or treated by the project during construction or operation. Petroleum products may be used for landscaping equipment such as lawnmowers, weedwhackers, and other machinery for general maintenance.

The quantity of solid waste that the proposed development will produce is unknown, as VSAS has not yet operated with the expanded enrollment capacity. However, VSAS does not anticipate the generation of any hazardous waste by any of its users, despite the increase in participants using the Property.

VSAS will provide various sites for solid waste management disposal areas and adhere to solid waste management best practices to mitigate any negative impacts. Services to dispose of waste will be contracted through local waste management companies. VSAS has also planned to implement a recycling program and composting facilities.

Impacts and Mitigating Measures

Following the guidelines of State and County requirements, to minimize the possibility for spills and hazardous materials during construction, the applicant proposes the following:

- Unused materials and excess fill (if any) will be properly disposed of at an authorized waste disposal site.
- During construction, emergency spill treatment, storage, and disposal of all hazardous materials, will be explicitly required to meet all State and County requirements, and the contractor will adhere to "Good Housekeeping" for all appropriate substances, with the following instructions:
    - Onsite storage to minimum practical quantity of hazardous materials necessary to complete the job
    - Fuel storage and use will be conducted to prevent leaks, spills or fires
    - Products will be kept in their original containers unless non-resealable, and original labels and safety data will be retained
    - Disposal of surplus will follow manufacturer's recommendation and all regulations
    - Manufacturers' instructions for proper use and disposal will be strictly followed
    - Regular inspection by contractor to ensure proper use and disposal
    - Onsite vehicles and machinery will be monitored for leaks and receive regular maintenance
    - Construction materials, petroleum products, waste, debris, and landscaping substances (herbicides, pesticides, and fertilizers) will be prevented from blowing, falling, flowing, washing or leaching into the ocean; and
    - All spills will be cleaned up and properly disposed of immediately after discovery.

During operation, petroleum products may be used for landscape maintenance. Petroleum products can be considered hazardous if not handled or stored properly. All petroleum and chemical products will be stored in the proposed maintenance building, which will be managed by qualified personnel and can be locked when necessary. Personnel who have completed the proper education and training will be the only qualified individuals to handle hazardous products. Any such products will only be used according to the original label on the container. Material Safety Data Sheets (MSDS) must be made readily available and visible within the maintenance

building. Personal Protective Equipment (PPE) will be used at all times and checked regularly, while using potentially hazardous products.

As discussed, wastewater will be handled by Individual Wastewater Systems meeting the standards of the Department of Health.

If at any time, hazardous substances or waste are discovered on the Property during construction, construction work will cease, and appropriate authorities will be contacted. A remediation specialist can be contacted to supervise the appropriate disposal and management of substances. VSAS will require all users and occupants of the facilities to follow all government regulations pertaining to hazardous and toxic substances.

3.2 Socioeconomic and Cultural

3.2.1 Land Use, Socioeconomic Characteristics, and Recreation

Environmental Setting

The Puna District has been Hawai‘i Island’s fastest-growing district over the last thirty years. The population measured in the 2010 U.S. Census was 45,326, a 66 percent increase over the 2000 count of 27,232. The 2020 Census counts are expected to follow this increasing trend.

Puna is desirable for its relatively inexpensive land. Residents from the U.S. mainland and other parts of the State of Hawai‘i continue to seek these affordable properties. The basis of the economy of Puna has evolved from cattle ranching and sugar cane to diversified agriculture and tourism stimulated by Kīlauea volcano. The Puna District is a significant socioeconomic area for Hawai‘i County. It is the leader in the agriculture industry on the Island of Hawai‘i. Some Puna subdivisions between Pāhoa and Volcano (including Hawaiian Paradise Park, Hawaiian Beaches, and Hawaiian Shores), are now partially bedroom communities for Hilo’s workforce.

The subject property is within the Agricultural State land use district and is zoned A-3a (*Agricultural minimum 3 acres*). Adjacent residential areas are zoned A-1a (*Agricultural minimum 1 acre*) and RS-10 (*Residential minimum 10,000 square feet*). Across the highway is a Forest Reserve allocated as conservation land. Nearby Volcano town is primarily made up of A-3a, A-1a, A-5a (*Agricultural minimum 5 acres*), RS-10, RS-20 (*Residential minimum 20,000 square feet*), CV-10 (*Commercial Village District minimum 10,000 square feet*), and CV-20 (*Commercial Village District minimum 10,000 square feet*).

Impacts and Mitigation Measures

The proposed action will have no significant adverse impact to land use, socioeconomic resources, or recreation. The construction of a higher capacity school campus would have positive impacts to the socioeconomic resources and educational outcomes of the area. VSAS’ expansion is necessary to aid in job creation and retention and improve educational resources in a highly populated and growing district. The proposed project would have positive economic and social impacts by providing both short-term and long-term employment and access to education.

There are no recreational resources on the Property, therefore none will be impacted by the proposed action.

All development and operation of the proposed campus will be conducted in compliance with the conditions of the Special Permit and all applicable County and State regulations. VSAS will implement the project in accordance with the approved project phasing to ensure that enrollment growth, staffing levels, and construction remain aligned with available infrastructure and public services. Potential indirect socioeconomic impacts associated with increased noise, dust, or community use of facilities will be minimized through implementation of the mitigation measures identified in **Section 3.1**.

Through adherence to mitigation measures, the proposed project will not result in significant adverse land use or socioeconomic impacts and will benefit the community by expanding access to educational facilities, employment opportunities, and community gathering spaces.

3.2.2 Cultural and Historic Resources

Historical and Cultural Background

Hawai‘i is believed to be first inhabited by voyagers from the Marquesas around 1,000 A.D, however, recent studies have shown that initial Polynesian colonization of Hawai‘i Island occurred between 1220 and 1261 A.D (Rieth et al. 2011). It is believed that Hilo is likely one of the first settlements on Hawai‘i Island. Hilo is known to have rich marine resources accessed at Hilo Bay and additional abundant resources from the forests that descend from Mauna Loa and Mauna Kea. Fresh water was available from Wailoa and Wailuku Rivers and Waiākea, Waiolama, Pukihae and ‘Alenaio Streams. The project area is approximately twenty-four (24) miles southwest of Hilo.

Early Hawaiian settlements incorporated new strategies and structures to adapt to their new environment. Traditional Polynesian philosophies and ideals were used to form new societal standards and structures including the principle of genealogical seniority, observance of gods, such as *Kane, Ku and Lono,* the *kapu* system of law and order, *ahupua‘a* land systems, and various beliefs and values that determined day-to-day protocol and lifestyle such as *mana* and the *‘aumakua* (Fornander, 1969).

The earliest documentation of Hilo is found in ‘Umi-a-Liloa’s conquest of Hawai‘i Island in the sixteenth century, which established Hilo as a royal center for the island. In the account, ‘Umi-a-Liloa began his conquest of the Island of Hawai‘i by defeating chief Kulukulu‘ā, who lived in Waiākea, and the other chiefs of Hilo. ‘Umi-a-Liloa’s son Keawe-nui-a-‘Umi ruled Hāmākua, Hilo and Puna. After the death of Keawe-nui-a-‘Umi, the ruling kingdom was divided into three parts and was established under warring chiefs (Kamakau, 1992).

In 1738 Kamehameha I was born. Chief Kalani‘opu‘u was the high chief during Cook’s arrival in 1779. After the chief’s death in 1782, his son Kiwala‘o, and his nephew, Kamehameha I began to compete for control of the west side of Hawai‘i Island. Kamehameha won the battle of Moku‘ohai against Kiwala‘o in Kona, officially controlling the western half of the island. In 1791, Kamehameha, having gained control of Hilo, fought, and won a battle against his cousin

Keoua at Kawaihae for control of the entire Island of Hawai‘i. In 1795, Kamehameha conquered Maui, Moloka‘i, Lana‘i and O‘ahu. He also received Kaua‘i by cession in 1810 (Kamakau, 1992). Kamehameha’s son Liholiho was born in Hilo in November 1797. Waiākea was inherited by Lihiliho after Kamehameha’s death. The *‘ili kūpono* of Pi‘opi‘o and its royal fishpond were given to his favorite wife, Ka‘ahumanu.

The Puna District was originally one of six chiefdoms or *moku* of the island of Hawai‘i. Puna was not a district that produced any great and powerful chiefs; the area was often controlled by chiefs and rulers from the Hilo District to the north, or the Ka‘u District to the south (Cordy, 2000). Puna is historically known for its rich soil, high rainfall, and frequent volcanic activity. Many parts of the district have been covered in lava over the past 1,000 years. The coastal areas are characterized by thin soil and steep volcanic cliffs, which are met by rough and wind-blown ocean. Historic settlement patterns reflected favorable agricultural activities, which were found inland from the coast. Villages were often spread across large areas and abundant in population (Kelly et al. 1981).

The Puna District is known for its valuable products, such as hogs, gray *kapa* cloth (*‘eleuli*), tapas made of *mamaki* bark, fine mats made of young pandanus blossoms (‘*ahuhinalo*), mats made of young pandanus (*Hala*) leaves (*‘ahuao*), and feathers of the *‘o‘o* and *mamo* birds. Puna was also famous for its abundant *ulu* (breadfruit) (Ellis, 1963). Neighboring villages in the ‘Ola‘a Ahupua‘a were known for their hand made products. These two Ahupua‘a were important sources of forest and agricultural products for the ruling elite in Hilo.

In 1839, King Kamehameha III signed the Bill of Rights, which sought to ensure that the people’s land would not be taken from them. In 1840, the first Constitution of Hawai‘i was enacted. In 1845, the Land Commission was created by Kamehameha III to award land claims, although this could not be done under the current feudal system of land tenure as individuals did not hold title to the land. In 1848 The Great Māhele (Land Division) established a system of private land ownership, which divided all Hawai‘i’s land into three classifications: Crown Lands, Government Lands and Konohiki Lands. Crown, Government and Konohiki lands remained subject to the rights of the *kanaka* who were in possession and cultivated the lands. As land sales between the Crown, Government and Konohiki continued, the rights of the kanaka became an issue. In 1850, the Land Commission moved to award title of land to kanaka who remained in physical possession, cultivated, or improved any portion of Konohiki Lands. These became Kuleana Lands. Very few Kuleana Land claims were made during the Māhele for Puna (McGregor, 1999). Only 19 Land Commission awards were granted in the entire Puna District. Of these, 16 awards were made in large tracts to 10 chiefs who lived outside of Puna. In 1893, the Hawaiian Monarchy was over-thrown, and Queen Lili‘uokalani was imprisoned. The remaining Crown Lands were confiscated by the government and made a part of the public domain (Chinen, 1961).

Between 1845 and 1900, Hilo began to significantly change through the increased presence of foreign vessels, expansion and growth of tourism, the establishment of missions, private land ownership legalization, the presence of the whaling, cattle, and sugar industries, and the construction of Government roads and railroad lines (Kelly et al. 1981). The changes that occurred in the Hilo district began to dictate and impact surrounding districts such as the Puna district to the south. Changes and patterns of residential locations and growth of towns and

villages in the Puna district were driven by the demand for agricultural products, thus prompting settlement near land suited to commercial crops and near newly constructed roads and transportation networks.

The Old Puna Trail and Puna Trail (Ala Hele Puna)/Old Government Road are historic trails that connected the Hilo district to and throughout the Puna district. The Old Puna Trail began at the modern-day Liliʻuokalani Gardens in Hilo and ended at Haʻena. It ran along the eastern coast of the island and ran through various coastal villages. An additional trail called the Puna Trail (Ala Hele Puna), also known as Old Government Road, continued from the south end of the Old Puna Trail, and continued south towards the district of Kaʻu. Lass (1997) also refers to the entire route from Hilo to Kaʻu as the Puna-Kaʻu Trail. These trails were first mapped by the Wilkes Expedition of 1804-41 (Escott and Dols, 2020). The Surveyor General of the Hawaiian Government Survey provided a general description of the area between Old Government Road and the newer upper road from Hilo to Keaʻau to Pāhoa in 1889. The description suggested a depopulation along most of the Puna coastal area when compared to descriptions documented by William Ellis just sixty-six years earlier. Both accounts described people living somewhat inland between the coast and inland gardens. In 1889, people were cultivating *kalo, ʻawa*, coffee and sweet potato. By 1889, it appeared that very few people lived along the Old Government Road (Maly, 1999). Traditional settlements that were near coastal areas began to move inland near newer roads and transportation routes. Additionally, more people began to move inland due to the decaying condition of the coastal trails and to find paid work and to produce cash crops such as sugarcane in more fertile, inland areas.

In 1899, the Olaʻa Sugar Company was founded in response to the rising sugar cane industry. The company leased roughly 4,000 acres of land and expanded to become the most predominant operation in the area. Plantation fields extended for 10 miles between Keaʻau and Mountain View, as well as in Pāhoa and Kapoho (Cutler et al., 2013The Olaʻa Sugar Company was eventually sold to American Factors (AMFAC) in 1969, who expanded production to include a bagasse and trash burning power plant that produced 12.5KW of power for Hawaiʻi Electric Light Company (HELCO). By 1982, AMFAC closed Puna Sugar Company and sold it to Fiji Sugar Corporation in 1988.

Volcano is one of the regions of Puna that has recently experienced the highest levels of population growth. As one of the oldest towns in Puna, Volcano has a recognized historic district and the Puna Community Development Plan (PCDP) recognizes the necessity of preserving the historic nature of the area.

Impacts and Mitigation Measures

The Hawaiʻi State Supreme Court's PASH and Ka Paʻakai O Ka ʻAina decisions require decision-makers to consider a project's impact to native Hawaiian practices and resources. Specifically, prior to making a decision, State and County agencies must identify the cultural, historical, and natural resources and associated traditional and customary practices of the subject site, the impacts of the proposed project to those resources and practices, and the feasible action (i.e. mitigating measures), if any, to protect such resources and practices.

An Archaeological Literature Review and Field Inspection (AFI) was conducted by tesARCH

Services. That review determined that the proposed project may have an impact on historic, archaeological, or cultural resources. Specifically, a segment of an old railroad grade shown on USGS maps and visible on aerial photos was confirmed to traverse the project area. This railroad grade was initially noted in a 2013 AFI conducted by Glenn Escott for the installation of an AT&T monopole on a small section of the subject property. Although that project was given a "no effect" determination by SHPD at the time, the old railroad grade is within the current project area.

A subsequent Archaeological Inventory Survey (AIS) was prepared pursuant to an approved Archaeological Inventory Survey Plan (AISP) and conducted under the direction of Timothy E. Scheffler, Ph.D., Principal Investigator, tesARCH Services (Permit #25-12) (**Appendix B**). The AIS encompassed the 15-acre area of the proposed campus as well as a 5-acre area along the eastern side of the project area, totaling 20 acres. Fieldwork was conducted on April 9, 11, May 13, 26, and September 16 and 18, 2025. The survey methodology included pedestrian transects, archival map research, aerial photo analysis, and LiDAR remote sensing.

The AIS documented two significant historic sites within the project area. The first (SIHP #50-xx-xx-xxxx1) is a poorly preserved pair of low rock walls, presumed to have been used for animal control purposes in the mid- to late 20th century. This site is considered significant under criterion "d" for its ability to yield information important for research on history. The second (SIHP #50-xx-xx-xxxx2) is an abandoned railroad grade from the early 20th century—a branch line of the Hilo Consolidated Rail Co. Noted on the 1963 USGS topographic quadrangle, the railroad grade was an extension of the Hilo Consolidated Railways ʻŌlaʻa Branch Line, which was primarily associated with operations of the ʻŌlaʻa Sugar Mill. This rail extension was planned in the early 1900's as a way to transport tourists from Hilo up to the volcano; however, the rail was never fully constructed past Mountain View. The rail line was abandoned in 1946. The railroad grade is significant under criterion "d" and additionally under criterion "a" for its association with the broad patterns of rail and train transportation on the islands prior to the widespread introduction of automobiles and trucks, and its connection to the important era of sugar plantation development and post-war diversification of plantation infrastructure unique to the Big Island.

Neither site is considered to possess the integrity necessary, or to have sufficient value, to be considered eligible for listing on the Hawaiʻi or National Register of Historic Places. No pre-contact or traditional Hawaiian sites were discovered. The survey confirms a history of land use in upper Keaʻau Ahupuaʻa consistent with previous archaeological findings in the area, with identified historic properties relating to early and mid-20th century infrastructure for ranching, agricultural pursuits, and developing transportation integral to the growth of Volcano Village and the tourist facilities in Hawaiʻi Volcanoes National Park. Both sites and all associated features will be affected by the proposed project; however, as per HAR 13-276-8, the documentation provided in the AIS is sufficient and no further work is recommended.

The project area, though historically unsuitable for traditional agriculture or permanent habitation due to its high altitude, played an important role in precontact Hawaiian society as a site for specialized resource extraction. Areas around Volcano were utilized for gathering a variety of resources, most notably birds and wood, as well as numerous unique plant species.

The land encompassing the project site was purchased by W. H. Shipman from the estate of King William Charles Lunalilo in 1881. Peggy Farias, CEO of W.H. Shipman, Ltd. and great-great-granddaughter of William and Mary Shipman reported, "To my knowledge, the property was never used for cultural purposes, and there are no current cultural practices occurring in the area. I have also spoken to my father and confirmed that he does not remember any cultural activities nor cultural sites on the property as well." (Personal communication, March 30, 2026).

While it is not known for certain whether the subject property or immediate surrounding area were used for cultural practices prior to 1881, the wao nahele regions of ʻŌlaʻa and upper Keaʻau ahupuaʻa as are well-documented as areas for bird catching and gathering of plants and other forest resources such as for making lei. Testimony at the Boundary Commission Hearing on June 4, 1873 by Uma, a Native Hawaiian from "Keahou at Keaau Puna" referred to an old Kauhale manu at the junction of Kahaulea and Keaau, "…thence to Alaalakeiki, which is the end of Waikahekahe Iki and Kahaualea joins Keaau. This place is at an old kauhale manu [bird catchers compound] (opposite a rise of ground, above the seventeen mile post, on the Volcano Road, about two miles above Kanekoa)" (Maly and Maly, 2022, p. 141). The subject property is located at the 25-mile marker on Hwy 11, which would put the Kauhale manu referenced in the testimony approximately 8 miles east of the project site. As the biotic survey has found that the property contains a variety of endemic flora, it is possible that the property could be used for gathering of plants by Native Hawaiians.

The map below indicates that the subject property may be aligned with two place names, Kalaninānuli, and Omauu, likely a misspelling of ʻŌmaʻo and possibly shortened from ʻŌmaʻokuʻululū (Lydgate, 1874).

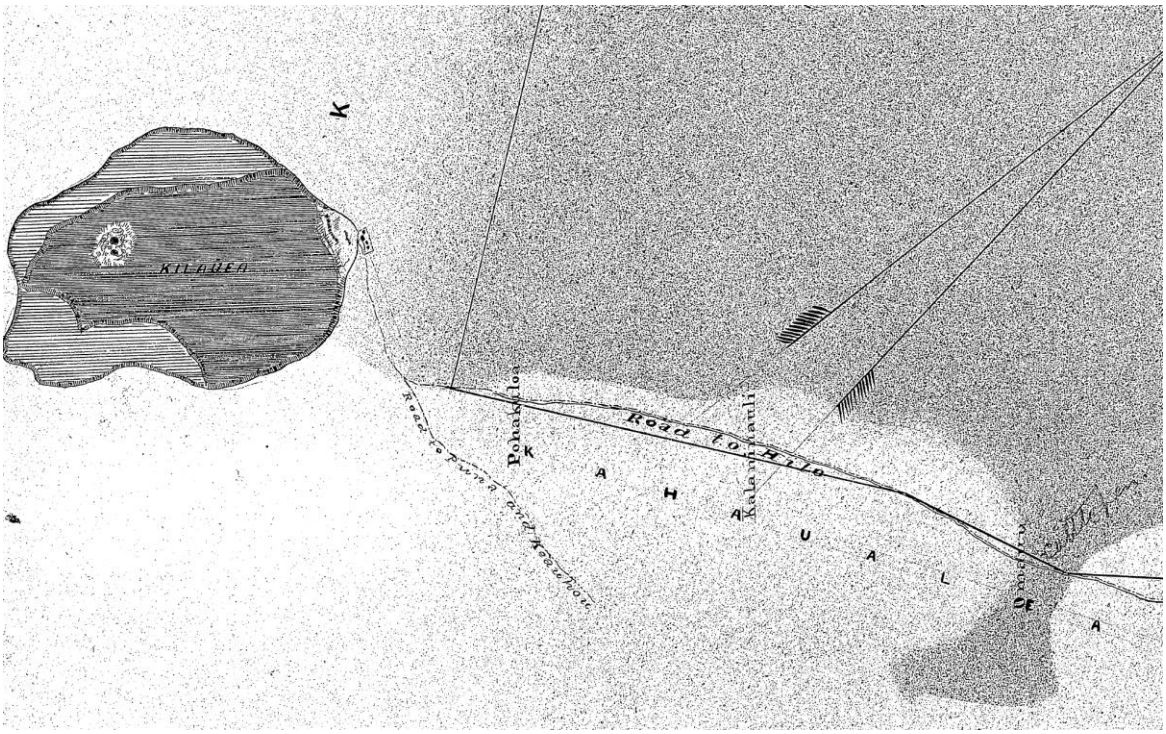

Figure 7: Registered Map 42 : Olaa and Kilauea, Puna, Hawaii
(1874) Lydgate, John M.

Kalaninānuli is referenced in recorded testimonies to the Boundary Commission on June 4, 1873. According to the testimony from Uma, "The boundary of Keaau and Kahaualea is close to the pond, on the south east side, thence mauka to Kalaninauli, the land on the south east side being only about six chains wide thence to Puuenaena (large ohia trees on the road makai of the koa woods)…." (Maly and Maly, 2022, p. 142). Kalaninānuli is also mentioned in a testimony by Nailima, a Native Hawaiian from ʻŌlaʻa, "Thence makai to Pohakuloa, thence makai to Puuenaena (big ohia trees) thence to Kalaninauli, so called by Nahienaena. Thence to Waiaiai, thence to Kauailehulehu, thence to Keanapapa at the 24 mile post thence to Kauwanahunalii, thence to Keekee, thence to Omaolaulau (at ohia woods, and the bullock pen) thence to Pohakuloa…." (Maly and Maly 2022, pp. 143-144). This puts Keanapapa approximately one mile east of the subject property.

While no cultural uses on the subject property have been identified, it may be assumed that since there were names associated, these spaces held cultural value for Native Hawaiians.

Historical records indicate that the area was not a place where people lived. In 1871, Mary S. Whitney wrote in a letter to her father, "There are no inhabitants at all over this region except at Olaa, a little oasis of grass in this desert, where there are two settlements of natives about two miles apart, and this is about half way to the volcano. So tired travelers always stop at one of these places to refresh themselves, and there is a little native house at each place kept for this purpose….The first one is called "Hawilu's [Hawelu's] Half-way House," (Maly and Maly, 2005, p. 148). According to Anita Manning (1981), "Visitors record that Hawelu's was anywhere between 13 and 15 miles from Hilo, at an elevation of 1,138 or 1,150 feet….A comparison of the many descriptions places Hawelu's near a point parallel with the Hilo end of present-day Mountain View, but on the Kea'au-'Ola'a border in what is now sugar cane field" (p. 61). In 1829, Joseph Goodrich wrote, "About 10 o'clock we passed the last houses in Olaa, 12 miles from the Volcano [in the Kapuʻeuhi vicinity], where we made a short stop & took some refreshment" (Maly and Maly, 2005, p. 95).

Cultural consultant, practitioner, and kumu hula, Kaumakaiwa Kanakaʻole provided the following cultural impact summary for the purpose of this study.

> Through historic record, oral traditions and changing socio-political circumstances, we can say with certainty that pre 1793 all of ʻŌlaʼa was never permanently habituated.
>
> It was prudent to give context to the history of land use of Kahauale'a and greater ʻŌlaʼa by first understanding the history of Hawai'i.
>
> There are two traditional Hawaiian altitudinal zone terms in which the school site can be qualified by: the wao maukele and wao nahele. The wao maukele is the cloud forest and rain belt zone and the wao nahele is the upper inland forests. The future school site straddles the ahupua'a of Kahaua'ela and Kea'au. However pre-1848 mahele, the entire area was considered as ʻŌlaʼa forest until the wao kanaka approximately 1000ft elevation.

Wao Akua- The horizontal altitudinal zone that starts from 5000ft elevation until the summit which is typically active the cloud and trade wind inversion layer and above. Between this and the next zone below is what is the cloud forests or the zone with the highest precipitation due to the constant due point and mist.

Wao Maukele- The rain belt zone or rainforest zone ranging from 4000ft to 1000ft elevation. The traditional image of a dense fern and tall tree canopy filled forests.

Wao Nahele- A variety of rainforest fringe growth and dry forest hardwood forests typically in the 2000ft to 1000ft elevation.

Wao Kanaka- From about 1000ft in elevation to sea level is the zone where 98% of human activity and habitation occurred.

Historically the wao maukele where the current and future school sites are would only have been in use for material gathering including lumber for utilitarian work from hale building and maintenance, tools making to canoe building. Forests like Kahauale'a ahupua'a and the greater 'Ōla'a area were also rich in plants, herbs and mosses for medicinal practices treating everything from child birth, arthritis, local anesthetic, blood pressure, asthma, bronchitis, stigmatism, cold and flu. Hula practitioners considered the forests of Kahauale'a, 'Ōla'a, Kea'au and Kīlauea sacred as the dwelling of hula deities. Kiamanu Bird catching and release practices for feather harvest was a noble and revered cultural pursuit of the Kahauale'a and greater 'Ōla'a well until the 1850's.

At no point however was Kahauale'a, 'Ōla'a and greater Kīlauea a place for permanent residence until 1877 when the first wooden cabin was built in the now National Park and even then it served as a temporary cabin stop. These altitudinal zones from ancient times until 1847-48 were considered critical habitat and resources and significant to the hydrology of the island and recharging of our ground water as sustainability was the ethos of the Hawaiian culture and land management at the time.

Those living ma kai or in the wao kanaka would only have temporary camp sites of hale pili or lean-to structures when gathering ma uka and in historically dense forests like Kahauale'a, 'Ōla'a or alpine zones like Mauna Kea and Mauna Loa, temporary structures were the only option. The length of stay was dependent upon the need or function of their gathering expedition, but would not exceed a few days at a time as restocking supplies and man power were managed carefully.

From 1847 to 1910 ranchers would drive cattle from Kohala and Kona, over the saddle and down through Kahauale'a, Keaau and 'Ōla'a. Another route was around Mauna Loa and through Ka'ū. My twice and three times great grandfathers Kanaka'ole worked as paniolo for Kapāpala ranch, Shipman and Parker as a seasonal hires in the 1850's through the early 1900's. They'd even stop in at Hā'ena beach before moving down the coast to Papa'i bay then Hilo. Most of the oral histories of Kahauale'a, Kea'au and 'Ōla'a will either have come from the traditional pre-1847 era where the forests were used as gathering resources, critical habitat for flora and fauna and critical to the recharging of

> ground water or the post paniolo and plantation era where cattle drives and lumber processing for industrial expansion occurred. (Personal communication, March 30, 2026).

These sources demonstrate the project will have no potentially adverse impact relating to cultural practices in the area. Rather, the project will have a positive impact by expanding cultural practices introduced and sustained through the school community.

In the event any inadvertent discoveries of historic, archaeological, or cultural resources are made during any activities related to the proposed project, work will cease, and the applicant will immediately notify the Planning Department and the State DLNR and secure their clearances before proceeding further. Specifically, the following inadvertent discovery protocol shall apply: (1) Upon discovery of any potential archaeological, historical, or cultural materials (including but not limited to artifacts, structural remains, deposits, burials, or human skeletal remains), the construction contractor shall immediately halt all work within a minimum 50-foot radius of the discovery; (2) The discovery shall be secured and protected from disturbance, looting, or unauthorized access; (3) VSAS's project manager or designated cultural resources monitor shall be notified within 24 hours of the discovery; (4) The Hawai‘i County Planning Department and the State Historic Preservation Division (SHPD) shall be notified in writing within 48 hours of the discovery; (5) In the event of discovery of human skeletal remains, the Hawai‘i Department of Land and Natural Resources (DLNR) and, if applicable, the Office of Hawaiian Affairs (OHA) shall also be notified immediately, and all applicable provisions of HRS Chapter 6E shall be followed; (6) Construction within the affected area shall not resume until SHPD has reviewed the find, determined appropriate treatment, and issued written authorization to proceed; and (7) VSAS shall retain a qualified archaeologist (meeting the Secretary of the Interior's Professional Qualification Standards) to assess the significance of the discovery and develop an appropriate treatment plan, if required by SHPD. These steps apply during all phases of construction and site preparation activities. VSAS is responsible for ensuring that all contractors and subcontractors are trained on this protocol prior to commencement of ground-disturbing activities.

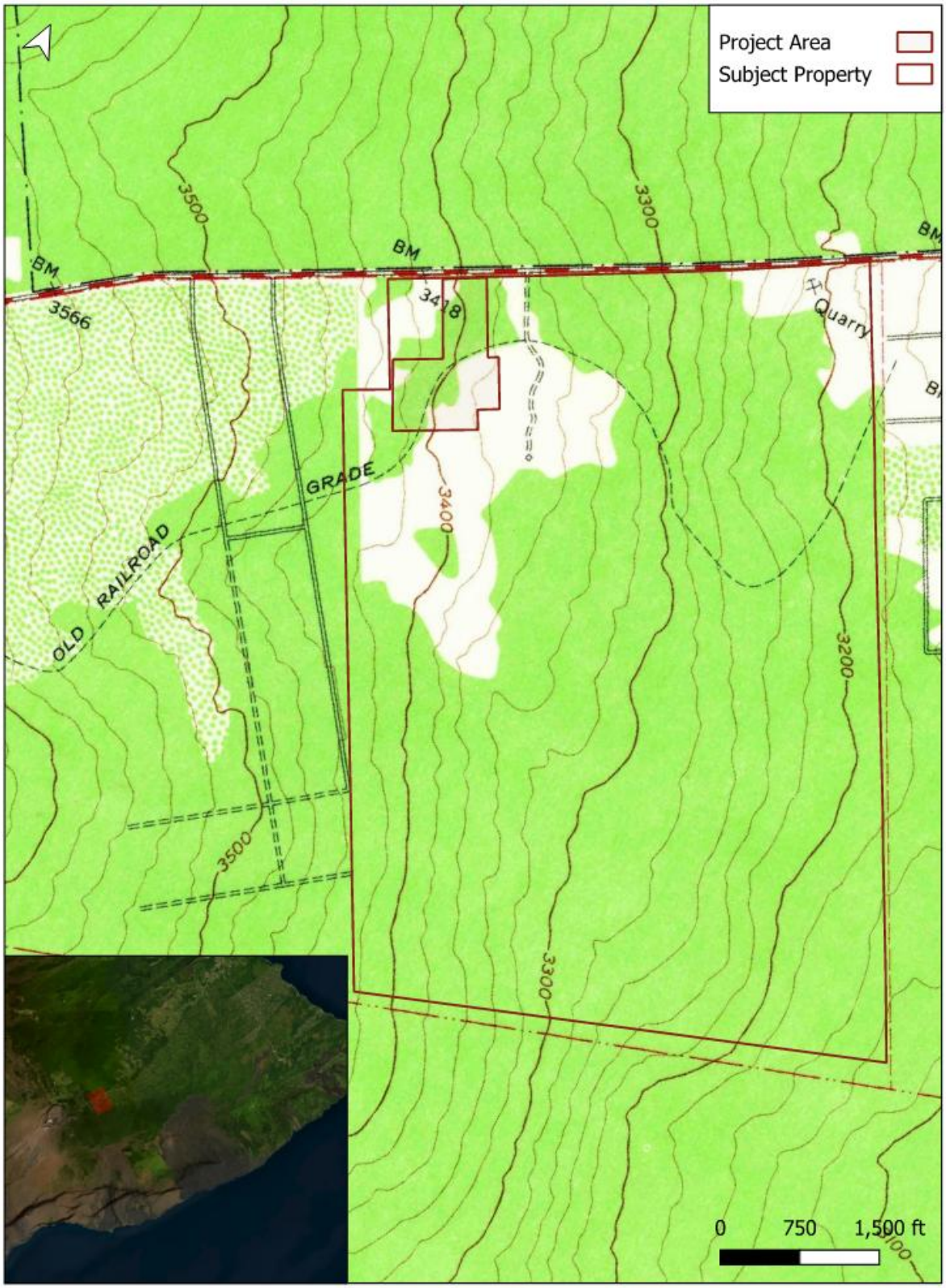

Figure 8: Railroad Grade in Relation to the Subject Property – USGS Topographic 1963

3.3 Public Roads, Services, and Utilities

3.3.1 Roads and Access

Environmental Setting

A Traffic Impact Analysis Report (TIAR) was prepared to evaluate potential traffic impacts from the proposed project (**Appendix A)**. The TIAR was prepared in April 2025 by SSFM International. The VSAS New Campus is located off Old Volcano Road, parallel south of Route 11 and between Aliʻi Anela Street and Nahelelani Street. The roads surrounding the project site and study intersections are shown in **Figure 9**.

VSAS currently operates at two locations with an enrollment of approximately 270 students. The West Campus is scheduled to close in 2027, with students relocating to the East Campus and the proposed New Campus. The East Campus currently serves 80 students in grades 5-8 and will expand to serve 180 students in grades K-8 by 2027, with a maximum capacity of 240 students in grades K-5 by 2040. The New Campus will initially serve 100 Pre-K students and 9th-10th grade students in 2027, expanding to a maximum of 342 students in Pre-K and grades 6-12 by 2040. Total maximum enrollment across both campuses is projected to be 582 students plus 100 blended learning students (with approximately 35 maximum on campus at any given time) by 2040.

The TIAR analyzed existing traffic conditions (2025), future conditions without the project (2040), and future conditions with the project (2040). Traffic counts were conducted at key intersections along Route 11 and Old Volcano Road. The analysis evaluated intersection operations using Level of Service (LOS) methodology, which rates traffic flow from LOS A (best, free flow) to LOS F (worst, forced flow with long delays). Study intersections include Old Volcano Road at Aliʻi Anela Street, Old Volcano Road at the project driveway, Old Volcano Road at Nahelelani Street, and Route 11 at Old Volcano Road.

Impacts and Mitigation Measures

Regional traffic growth and traffic from future surrounding developments were analyzed and added to the roadway network for 2040. Analysis for future conditions with the Project found that all movements are projected to continue to operate at an acceptable Level of Service of A or B for all study intersections through the 2040 planning horizon and therefore mitigation is not suggested.

3.3.2 Other Utilities

Environmental Setting

The Volcano area including the subject property is not served by municipal water supply or wastewater treatment facilities, therefore the project will have to satisfy its own water supply and wastewater treatment needs. Water supply demand and wastewater production calculations were performed for the proposed project (**Appendix D**).

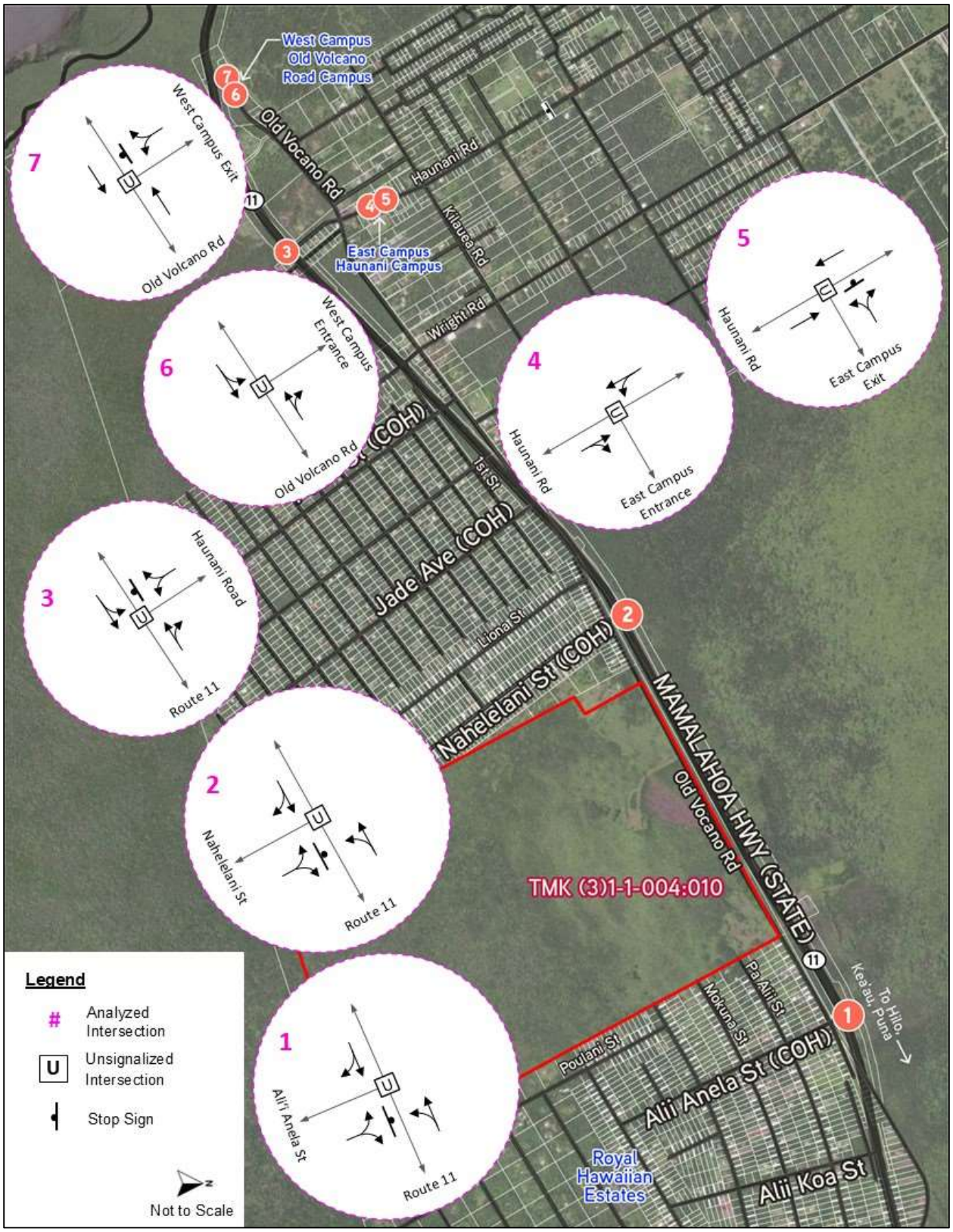

Figure 9: Traffic Study Intersections

Water consumption estimates for the new campus are based on comparable schools in the area. Analysis of water usage data from three similar schools during 2022-2024 shows an average consumption rate of 4.92 gallons per day (GPD) per student. The VSAS New Campus is designed to serve a maximum of 342 full-time students plus 100 blended learning students (with approximately 35 on campus at any given time) and 155 staff members. Total estimated daily potable water consumption is 2,174.64 GPD. Potable water needs will be satisfied by trucking in potable water and storing it in closed tanks on site, as the property is not connected to the County water supply system.

Wastewater generation is estimated at 11,940 gallons per day total, comprising 8,840 GPD from students and 3,100 GPD from employees. This volume is significantly less than the threshold of 49,000 GPD (equivalent to 49 homes) that would trigger additional environmental review under Hawai‘i Revised Statutes Chapter 343. All wastewater will be treated through Individual Wastewater Systems (IWS) approved by the State of Hawai‘i Department of Health.

Impacts and Mitigation Measures

The project will meet its water supply needs through a combination of trucked-in potable water for drinking and sanitation, and separate rainwater catchment systems for irrigation and non-potable uses. Closed storage tanks will be installed on-site to ensure adequate water supply. Water conservation measures will be incorporated into building design, including low-flow fixtures, efficient irrigation systems using drought-tolerant native vegetation requiring minimal watering, and water collection systems for sustainable water retention. These measures will minimize the project’s water demand and ensure self-sufficiency without relying on County water infrastructure.

Individual Wastewater Systems will be designed, installed, and operated in accordance with State of Hawai‘i Department of Health regulations. The systems will be properly sized to handle the estimated daily wastewater generation and will include appropriate treatment and disposal methods suitable for the site’s soil conditions and groundwater characteristics. Regular maintenance and monitoring will be conducted to ensure the systems operate effectively and do not impact groundwater quality. Given the well-drained volcanic soils and deep water table in the area, along with the relatively modest wastewater volumes, the IWS approach is appropriate and will not create adverse environmental impacts.

3.4 Secondary and Cumulative Impacts

The Volcano area mostly consists of low-density rural residences and open space. The VSAS new campus aligns with current educational and community uses, resulting in minimal change to land use patterns in Volcano. Expected development in the Volcano area is expected to be incremental infill rather than major expansion.

The proposed development is to construct nine (9) building areas to provide expanded enrollment capacity for VSAS. The primary ongoing development trend in the vicinity is the gradual residential buildout of Volcano and surrounding subdivisions and there are no major commercial or institutional projects currently planned within the surrounding area. Past development in the area has been limited, consisting primarily of low-density residential

housing, small-scale agriculture, and community facilities. Background regional growth and future residential development were factored into the project Traffic Study. All study intersections are projected to operate at acceptable levels, thus the VSAS development is not expected to significantly impact traffic or require mitigation.

The proposed action will not produce any major secondary impacts, such as population changes or produce any significant impacts to geological processes, water quality, flora and fauna, historic and cultural resources, or public facilities. The development will help provide essential educational opportunities and facilities to the Volcano area. The proposed project is not expected to result in cumulative impacts to the area. As discussed, noise on the Properties will operate at permissible levels during normal work hours and will be buffered with vegetation.

With respect to land use change, the proposed VSAS campus would convert 14.9 acres of agricultural land to an institutional educational use, which is consistent with the area's ongoing transition from agricultural to community service land uses. This incremental land use change, in combination with other past development in the area, does not represent a significant cumulative impact to the agricultural land base, given the extensive agricultural and conservation lands remaining in the ʻŌlaʻa watershed. With respect to water and infrastructure demand, the project's water and wastewater needs are self-contained through potable water trucking, on-site storage tanks, and individual wastewater systems, and will not place additional demand on public water or sewer systems. Based on this analysis, the proposed action will not result in cumulatively significant impacts to the environment.

3.5 Required Permits and Approvals

County of Hawai'i:

Special Permit
Plan Approval
Building Code/Structural Permits
Grubbing/Grading Permits
Electrical Review
Mechanical/Plumbing Review
Fire Review
Engineering Review

State of Hawai'i:

Wastewater System Approval
National Pollutant Discharge Elimination System (NPDES) Permit
Stormwater Pollution Prevention Plan (SWPP)
Potential Noise Permit

3.6 Consistency with Government Plans and Policies

3.6.1 Hawai‘i County General Plan.

The Hawai‘i County General Plan serves as a guiding document for decision-making and the implementation of goals for Hawai‘i Island. The plan was adopted in 1989 by ordinance and was most recently revised in 2005. The General Plan uses the Land Use Allocation Guide Map (LUPAG) to designate land on Hawai‘i Island for future developments in a coordinated and reasonable manner. The designation for the subject property is Extensive Agriculture. Due to the importance of the General Plan in determining the suitability of land-use projects and developments, the following goals, policies, and standards that align with the proposed development are discussed below:

ECONOMIC GOALS

a. Provide residents with opportunities to improve their quality of life through economic development that enhances the County’s natural and social environments.
b. Economic development and improvement shall be in balance with the physical, social, and cultural environments of the island of Hawai‘i.
c. Strive for diversity and stability in the economic system.
d. Provide an economic environment that allows new, expanded, or improved economic opportunities that are compatible with the County’s cultural, natural, and social environment.
e. Strive for an economic climate that provides its residents with an opportunity for choice of occupation.
f. Strive for diversification of the economy by strengthening existing industries and attracting new endeavors.
g. Strive for full employment.
h. Promote and develop the island of Hawai‘i into a unique scientific and cultural model, where economic gains are in balance with social and physical amenities. Development should be reviewed on the basis of total impact on the residents of the County, not only in terms of immediate short run economic benefits.
i. Continue to encourage the research, development and implementation of advanced technologies and processes.
j. Support the development of high technology industries.
t. Assist in the promotion of the agriculture industry whose products are recognized as being produced on the island of Hawai‘i.

ECONOMIC POLICIES

a. Assist in the expansion of the agricultural industry through the protection of important agricultural lands, development of marketing plans and programs, capital improvements and continued cooperation with appropriate State and Federal agencies.
b. Encourage the expansion of the research and development industry by working with and supporting the University of Hawai‘i at Hilo and West Hawai‘i, the Natural Energy Laboratory at Hawai‘i Authority and other agencies' programs that sup- port sustainable economic development in the County of Hawai‘i.

e. Support all levels of educational, employment and training opportunities and institutions.

Discussion: These economic goals and policies are in fundamental alignment with the stated goals and objectives of VSAS's pedagogy:

- Focus on the unique ecosystems and geology of the Volcano area
- Cultivate responsibility for nature and the environment
- Involve the community in ongoing partnerships
- Provide a solid academic foundation for all students
- Encourage creative problem-solving and critical thinking
- Provide avenues for creative self-expressions through the arts
- Teach practical life skills
- Offer a rich multicultural program
- Nurture respect for and understanding of Hawaiian culture
- Foster social responsibility and respect for others
- Impart a lifelong love of learning
- Serve the Volcano community
- Celebrate the learning successes of all children

There is alignment of VSAS' philosophy with the above highlighted economic goals and policies in the following areas:

- *Focus on the unique ecosystems and geology of the Volcano area*

With most acute respect to economic goals (b), this tenet of VSAS' pedagogy is in fundamental alignment. The unique ecosystems and geology of the Volcano area, as s jumping-off point for schooling, provide the foundation for an economy which is "in balance with the physical, social, and cultural environments of the island of Hawai'i".

- *Cultivate responsibility for nature and the environment*

As per economic goal (a), a pedagogy which is rooted in the cultivation of environmental responsibility builds the foundation of an island economy which "provides residents with opportunities to improve their quality of life through economic development that enhances the County's natural and social environments." The skills and ethos imparted through the cultivation of environmental responsibility can offer children the skills and orientations necessary to bolster an economy that values natural stewardship.

- *Nurture respect for and understanding of Hawaiian culture*

As per economic goal (d), a pedagogy that prioritizes the respect for and understanding of Hawaiian culture allows for the next generation to bolster an economy which "allows new, expanded, or improved economic opportunities that are compatible with the County's cultural, natural, and social environment." Through a pedagogical focus on Hawaiian culture, growth in the economy can be

guided in such a way to maintain alignment with the cultural, natural, and social environment.

ENVIRONMENTAL QUALITY GOALS

a. Define the most desirable use of land within the County that achieves an ecological balance providing residents and visitors with quality of life and an environment in which the natural resources of the island are viable and sustainable.
b. Maintain and, if feasible, improve the existing environmental quality of the island.
c. Control pollution.

ENVIRONMENTAL QUALITY POLICIES

a. Take positive action to further maintain the quality of the environment.
c. Encourage the concept of recycling agricultural, industrial, and municipal waste material.

ENVIRONMENTAL QUALITY STANDARDS

a. Pollution shall be prevented, abated, and controlled at levels that will protect and preserve the public health and well-being, through the enforcement of appropriate Federal, State and County standards.
b. Incorporate environmental quality controls either as standards in appropriate ordinances or as conditions of approval.
c. Federal and State environmental regulations shall be adhered to.

Discussion: VSAS will protect and promote the significant environmental resources of Hawai‘i through curricular focus on a responsibility for nature and the environment, along with an emphasis on the unique ecosystems present in the Volcano area. VSAS prioritizes the preservation of natural and cultural resources of the surrounding area, along with a strong connection with the surrounding community. Additionally, it is established as a Hawaiian-Focused School with the goal of integrating Hawaiian values, knowledge, and practices throughout the curriculum. During construction, the transmission of pollutants will be mitigated by following the rules and regulations associated with grubbing/grading permits and strictly following all appropriate ordinances according to Federal, State and County standards.

FLOOD CONTROL AND DRAINAGE GOALS

a. Protect human life.
b. Prevent damage to man-made improvements.
c. Control pollution.
d. Prevent damage from inundation.
e. Reduce surface water and sediment runoff.
f. Maximize soil and water conservation.

FLOOD CONTROL AND DRAINAGE POLICIES

a. Enact restrictive land use and building structure regulations in areas vulnerable to severe damage due to the impact of wave action. Only uses that cannot be located elsewhere due to public necessity and character, such as maritime activities and the necessary public facilities and utilities, shall be allowed in these areas.
g. Development-generated runoff shall be disposed of in a manner acceptable to the Department of Public Works and in compliance with all State and Federal laws.
l. Continue to promote public education programs on tsunami, hurricane, storm surge, and flood hazards.

FLOOD CONTROL AND DRAINAGE STANDARDS

a. "Storm Drainage Standards," County of Hawai'i, October, 1970, and as revised.
b. Applicable standards and regulations of Chapter 27, "Flood Control," of the Hawai'i County Code.
c. Applicable standards and regulations of the Federal Emergency Management Agency (FEMA).
d. Applicable standards and regulations of Chapter 10, "Erosion and Sedimentation Control," of the Hawai'i County Code.
e. Applicable standards and regulations of the Natural Resources Conservation Service and the Soil and Water Conservation Districts.

Discussion: The Flood Insurance Rate Map (FIRM) designates the area of the proposed development to be in Zone X (areas outside of 500-year flood). There are no identified drainage ways, naturally occurring wetlands, ponds, lakes, or rivers on the parcel. Accordingly, the site has not been and should not be subject to flooding, coastal hazards, or erosion.

HISTORIC SITES GOALS

a. Protect, restore, and enhance the sites, buildings, and objects of significant historical and cultural importance to Hawai'i.
b. Appropriate access to significant historic sites, buildings, and objects of public interest should be made available.

HISTORIC SITES POLICIES

a. Agencies and organizations, either public or private, pursuing knowledge about historic sites should keep the public apprised of projects.
b. Amend appropriate ordinances to incorporate the stewardship and protection of historic sites, buildings, and objects.
c. Require both public and private developers of land to provide historical and archaeological surveys and cultural assessments, where appropriate, prior to the clearing or development of land when there are indications that the land under consideration has historical significance.
d. Public access to significant historic sites and objects shall be acquired, where appropriate.

Discussion: An Archaeological Literature Review and Field Inspection (AFI) was conducted by

tesARCH Services. That review determined that the proposed project may have an impact on historic, archaeological, or cultural resources. Specifically, a segment of an old railroad grade shown on USGS maps and visible on aerial photos was confirmed to traverse the project area. This railroad grade was initially noted in a 2013 AFI conducted by Glenn Escott for the installation of an AT&T monopole on a small section of the subject property. Although that project was given a "no effect" determination by SHPD at the time, the old railroad grade is within the current project area.

A subsequent Archaeological Inventory Survey (AIS) was prepared pursuant to an approved Archaeological Inventory Survey Plan (AISP) and conducted under the direction of Timothy E. Scheffler, Ph.D., Principal Investigator, tesARCH Services (Permit #25-12). The AIS encompassed the 15-acre area of the proposed campus as well as a 5-acre area along the eastern side of the project area, totaling 20 acres. Fieldwork was conducted on April 9, 11, May 13, 26, and September 16 and 18, 2025. The survey methodology included pedestrian transects, archival map research, aerial photo analysis, and LiDAR remote sensing.

The AIS documented two significant historic sites within the project area. The first (SIHP #50-xx-xx-xxxx1) is a poorly preserved pair of low rock walls, presumed to have been used for animal control purposes in the mid- to late 20th century. This site is considered significant under criterion "d" for its ability to yield information important for research on history. The second (SIHP #50-xx-xx-xxxx2) is an abandoned railroad grade from the early 20th century—a branch line of the Hilo Consolidated Rail Co. Noted on the 1963 USGS topographic quadrangle, the railroad grade was an extension of the Hilo Consolidated Railways ʻŌlaʻa Branch Line, which was primarily associated with operations of the ʻŌlaʻa Sugar Mill. This rail extension was planned in the early 1900's as a way to transport tourists from Hilo up to the volcano; however, the rail was never fully constructed past Mountain View. The rail line was abandoned in 1946. The railroad grade is significant under criterion "d" and additionally under criterion "a" for its association with the broad patterns of rail and train transportation on the islands prior to the widespread introduction of automobiles and trucks, and its connection to the important era of sugar plantation development and post-war diversification of plantation infrastructure unique to the Big Island.

Neither site is considered to possess the integrity necessary, or to have sufficient value, to be considered eligible for listing on the Hawaiʻi or National Register of Historic Places. No pre-contact or traditional Hawaiian sites were discovered. The survey confirms a history of land use in upper Keaʻau Ahupuaʻa consistent with previous archaeological findings in the area, with identified historic properties relating to early and mid-20th century infrastructure for ranching, agricultural pursuits, and developing transportation integral to the growth of Volcano Village and the tourist facilities in Hawaiʻi Volcanoes National Park. Both sites and all associated features will be affected by the proposed project; however, as per HAR 13-276-8, the documentation provided in the AIS is sufficient and no further work is recommended.

Further, in the event any inadvertent historical, archaeological, or cultural discoveries are made, work will cease, and the applicant will immediately notify the Planning Department and the State DLNR and secure their clearances before proceeding further.

NATURAL BEAUTY GOALS

a. Protect, preserve, and enhance the quality of areas endowed with natural beauty, including the quality of coastal scenic resources.
b. Protect scenic vistas and view planes from becoming obstructed.
c. Maximize opportunities for present and future generations to appreciate and enjoy natural and scenic beauty.

NATURAL BEAUTY POLICIES

a. Increase public pedestrian access opportunities to scenic places and vistas.
b. Develop and establish view plane regulations to preserve and enhance views of scenic or prominent landscapes from specific locations, and coastal aesthetic values.
h. Protect the views of areas endowed with natural beauty by carefully considering the effects of proposed construction during all land use reviews.
i. Do not allow incompatible construction in areas of natural beauty.

Discussion: The proposed campus will be aesthetically pleasing and will not significantly impact the natural beauty of the area.

NATURAL RESOURCES AND SHORELINES GOALS

a. Protect and conserve natural resources from undue exploitation, encroachment, and damage.
b. Provide opportunities for recreational, economic, and educational needs without despoiling or endangering natural resources.
c. Protect and promote the prudent use of Hawai‘i’s unique, fragile, and significant environmental and natural resources.
d. Protect rare or endangered species and habitats native to Hawai‘i.
e. Protect and effectively manage Hawai‘i’s open space, watersheds, shoreline, and natural areas.
f. Ensure that alterations to existing landforms, vegetation, and construction of structures cause minimum adverse effect to water resources, and scenic and recreational amenities and minimum danger of floods, landslides, erosion, siltation, or failure in the event of an earthquake.

NATURAL RESOURCES AND SHORELINES POLICIES

a. Require users of natural resources to conduct their activities in a manner that avoids or minimizes adverse effects on the environment.
c. Maintain the shoreline for recreational, cultural, educational, and/or scientific uses in a manner that is protective of resources and is of the maximum benefit to the general public.
d. Protect the shoreline from the encroachment of man-made improvements and structures.
e. Coordinate programs to protect natural resources with other government agencies.
h. Encourage public and private agencies to manage the natural resources in a manner that avoids or minimizes adverse effects on the environment and depletion of energy and natural resources to the fullest extent.

i. Encourage an overall conservation ethic in the use of Hawai‘i's resources by protecting, preserving, and conserving the critical and significant natural resources of the County of Hawai‘i.
p. Encourage the use of native plants for screening and landscaping.
r. Ensure public access is provided to the shoreline, public trails and hunting areas, including free public parking where appropriate.
t. Preserve and protect significant lava tube caves.
u. Ensure that activities authorized or funded by the County do not damage important natural resources.

Discussion: The site is not adjacent to the ocean and sits at an elevation of approximately 3,300 feet above sea level. As such, the proposed project should not have any adverse impacts on the area's coastal zones or shoreline resources.

EDUCATION POLICIES

Educational policies relate to the provision of facilities rather than programs, which are the province of the State. It is nevertheless recognized that the facilities and programs are the tools necessary to improve total educational service.

a. Encourage continuous joint pre-planning of schools with the Department of Education and the University of Hawai‘i to ensure coordination with roads, water, and other support facilities and considerations such as traffic and safety, and access for vehicle, bicycle, and pedestrian. Encourage master planning of present and proposed public and private institutions.
b. Encourage combining schoolyards with county parks and allow school facilities for afterschool use by the community for recreational, cultural, and other compatible uses.
c. Encourage joint community-school library facilities, where a separate community library may not be feasible, in proximity to other community facilities, affording both pedestrian and vehicular access.
d. Encourage implementation of the Department of Education's 'Educational Specifications and Standards for Facilities.
e. Encourage the Hawai‘i State Library System to seek alternate sites for public libraries located on the campuses of public schools.

EDUCATION STANDARDS

a. In proposed communities, sufficient acreage shall be reserved for school facilities. Sites shall be free from flooding and drainage problems, excessive slope and shall incorporate appropriate street and driveway design and location to minimize traffic interference, pedestrian hazard, and enable safe and easy access for vehicles, bicycles, and pedestrians.

PUNA DISTRICT EDUCATION COURSES OF ACTION

a. Improve existing school complexes to meet the standards established by the State Department of Education.

b. School facilities should be made available to the community for recreation and other compatible uses during after school hours.
c. Encourage the Department of Education to plan and develop school facilities as the need arises.
d. Encourage improvements to pedestrian access between the village of Pāhoa and the school and library facilities.

Discussion: The proposed expansion will provide much-needed school facilities and community gathering space for Volcano and the wider Puna District. Enrollment availability will be significantly increased in order to accommodate students on the waiting list as well as other potential students.

LAND USE GOALS

a. Designate and allocate land uses in appropriate proportions and mix and in keeping with the social, cultural, and physical environments of the County.

LAND USE POLICIES

f. Encourage the development and maintenance of communities meeting the needs of its residents in balance with the physical and social environment.

Discussion: Puna has rapid population growth, of which Volcano is included in. The proposed development would allow VSAS to better keep up with increasing enrollment demand due to population increases. The inclusion of public access space and creation of community partnerships would further benefit the wider community as a whole.

AGRICULTURAL GOALS

b. Preserve the agricultural character of the island.
c. Preserve and enhance opportunities for the expansion of Hawai‘i’s Agricultural Industry.

AGRICULTURAL POLICIES

u. Encourage other compatible economic uses that complement existing agricultural and pastoral activities.

Discussion: VSAS is committed to an environmentally focused curriculum that emphasizes the unique ecosystem of the surrounding area. The school prioritizes the use of locally grown and seasonal foods in their dining program, thus supporting the local agricultural industry.

PUNA COMMUNITY DEVELOPMENT PLAN

The Puna Community Development Plan (PCDP) was developed through the implementation of the 2005 County of Hawai‘i General Plan. CDP’s are designed to translate and implement the goals, policies, and standards of the General Plan as they apply to specific communities and districts. Additionally, they serve as an important framework for a community’s intended

outcome and vision and are often used as forum for community input in terms of land-use, availability of public resources, and overall development. The vision of the Puna CDP is for "residents of Puna live in harmony with the land, while promoting a sustainable vibrant local economy, healthy community, and a viable transportation system that is accessible, friendly and safe for now and future generations." The following goals and objectives outlined in the PCDP apply to the project area and proposed development:

2.1.1 Goals

a. Structures and cultural sites that are significant to Puna's history and cultural traditions are preserved.
b. The design character and natural setting of older communities that are representative of Puna's historic development are perpetuated.
c. Areas of scenic and cultural interest are accessible to the public in a manner that does not detract from their aesthetic, natural and cultural value.
d. Awareness and appreciation of the host culture is expanded.

3.1.1 Goals

a. Puna retains a rural character while it protects its native natural and cultural resources.
b. The quality of life improves, and economic opportunities expand for Puna's residents.
c. Services and community facilities are more accessible in village/town centers that are distributed throughout the region, including the underserved subdivisions that have been experiencing higher levels of development growth.
d. Exposure to high risk from natural hazards situations is reduced.

3.2.1 Goals

a. Lands for agricultural use are preserved.
b. Quality agricultural land is dedicated to agricultural use in perpetuity.
c. Opportunities for diversified agriculture increase.
d. Puna's agricultural production emphasizes environmentally friendly methods.
e. Puna agricultural products represent an increasing local market share.
f. There are more agriculture-related employment training and local job opportunities for youth.
g. Local job growth is primarily in "green" industries such as agriculture, alternative energy, communications technology, eco-tourism and natural resources management.

3.2.2 Objectives

f. Form partnerships with local businesses and educational institutions to advance education and training in two sectors:

- 'Green' sector, to include agriculture, alternative energy, resource recycling and recovery, and other related areas; and
- The information technology sector.

i. Provide infrastructure support for youth education and job training in the technology and agricultural sectors.
k. Create new "green" employment opportunities in the agricultural, alternative energy, and natural resources management in Puna.

3.3.1 Goals

e. Public education is better integrated into Puna's communities.

3.3.2 Objectives

f. Increase opportunities for community involvement in public education.
g. Urge the State to locate its community facilities, such as public schools, in designated village/town centers, and to design them in conformance to the criteria applicable to the type of village/town center at that location.
h. College level classes and vocational training opportunities should be provided in the Puna district to make post high school education more accessible to Puna residents and to help create a more highly trained and skilled local workforce for emerging industries and commerce.

3.3.3 Actions

c. Build partnerships between the County and non-profit organizations to increase the range of social services and economic development opportunities.

3.5.2 Objectives

b. Encourage the collocation of schools, parks, and senior centers to promote interactivity between community members of all ages.

3.5.3 Actions

c. Improve and expand Community Parks as follows:

10) To supplement Community Parks, make recreation facilities and meeting rooms at public schools available for community use after school hours, whether through direct requests from a community representative to a school principal or a formal standing agreement between the County and the Department of Education.

3.6.1 Goals

b. Puna lowers its dependence on fossil fuel as an energy source, becoming a demonstration area for alternative sources, systems, and fuels.

3.6.2 Objectives

a. Promote use of solar technologies, such as solar water heaters and photovoltaic power systems.
b. Employ energy-efficient design standards for public building and residential development, including ventilation and cooling.

3.6.3 Actions

a. Apply Leadership in Energy and Environmental Design (LEED) standards for public buildings, with a minimum goal of silver level.
b. Investigate the use of groundwater cooling systems for public buildings.
c. Promote energy efficiency standards for larger residences. Applicable standards might include better insulation for the outer walls, low-emissivity windows and doors, reduction of roof heat gain, and use of energy-efficient appliances.

4.1.1 Goals

d. The percentage of residents who commute to employment or travel for services outside of Puna is reduced.

4.1.2 Objectives

a. Promote ridesharing, vanpools, and car-pooling.
b. Provide more services and employment within Puna's village and town centers.
c. Create new employment opportunities in Puna to reduce long commuting.

Discussion: As discussed above, the proposed development will significantly improve the quality of life for Volcano and wider Puna residents through expended educational access, job creation through the expansion of staff and faculty, and social advancement through community integration, while maintaining an emphasis on environmental responsibility. The proposed facilities will be energy efficient and include water saving solutions, as VSAS aims to prioritize Healthy, High Performance school building criteria, LEED certification standards, or similar Green Building standards, that mandate the use of environmentally sound building material, efficient use of energy, water and other resources, and the creation of a healthy learning environment for children. Other components to VSAS' action plan include policies to minimize or eliminate the use of hazardous pesticides and herbicides in schools while continuing to remove invasive plants, a school-wide plan to improve energy efficiency, implementation of recycling and composting programs, sustainable farm to school food initiatives, increasing

education of sustainable practices in the curricula, among others.

3.6.2 Hawai‘i County Zoning and Special Management Area

The project site State Land Use District is Agricultural and is zoned by the County of Hawai‘i as A-3a. A Special Use Permit will be submitted to the Hawai‘i County Planning Department in conjunction with the Environmental Assessment.

The project site is located approximately 12.2 miles inland from the designated Special Management Area (SMA) and 3,300 feet above sea level. Therefore, no impacts to the SMA are possible.

3.6.3 Conservation District

The purpose of regulating land-use in the Conservation District is to conserve, protect, and preserve the important natural resources of the State through appropriate management and use to promote their long-term sustainability and the public health, safety, and welfare. The project site is not within the Conservation District; therefore, the proposed action will have no impact on conservation resources.

PART 4: DETERMINATION, FINDINGS, AND REASONS

4.1 Determination

The applicant expects that the County of Hawai‘i Planning Department will determine that the proposed action will not significantly alter the environment and will accordingly issue a Finding of No Significant Impact (FONSI). This determination will be based on comments to the Draft Environmental Assessment (DEA). The Final Environmental Assessment (FEA) will outline the final determination.

4.2 Findings and Supporting Reasons

Agencies must consider several factors to determine whether an Action has significant effects, as outlined in Chapter 11-200.1 of the Hawai‘i Administrative Rules (HAR). The following factors evaluate the sum of effects of the proposed action on the quality of the environment by considering every phase of a proposed action, the expected impacts, and the proposed mitigating measures:

1. *The proposed project will not involve an irrevocable commitment or loss or destruction of any natural, cultural, or historic resource.*

   The proposed action will not involve an irrevocable commitment or loss or destruction of any natural, cultural, or historic resources. Only common native and alien plants were found on the Properties, and native ecosystems are not expected to be adversely affected. Construction will be conducted in four (4) phases and will closely follow all mitigating measures and Best Management Practices to minimize impacts to natural resources.

Specifically, impacts to vegetation resources will be mitigated through the Rapid ʻŌhiʻa Death (ROD) protocol described in Section 3.1.4, which includes minimizing clearing to the extent practicable, treating scars on retained ʻŌhiʻa trees, and properly disposing of removed ʻŌhiʻa material by chipping or burial prior to moving it off-site. All tree clearing activities will be conducted outside of the Hawaiian hoary bat sensitive season (June 1–September 15) or with prior DOFAW consultation as described in Section 3.1.4. Construction activities will not begin without implementation of these mitigation measures. Following application of these mitigation measures, the loss of native vegetation is not significant because the affected area is a small fraction of the available native forest in the surrounding Conservation District and Hawaiʻi Volcanoes National Park, and no rare, threatened, or endangered plant species are present. No significant impacts are expected from this request. As discussed, minor and temporary impacts may be experienced through noise and air quality. Portions of the project area have been previously cleared and used for agriculture. An Archaeological Inventory Survey found two historic sites, which are thoroughly documented therein, and no further work is recommended. It is unlikely any unknown historical, archaeological, or cultural resources will be found. However, in the event any such resources are discovered, all work will cease immediately, and the State Historic Preservation Division will be contacted to determine appropriate action. The subject site is located roughly 5.6 miles inland and does not encroach on public access to scenic resources. Natural, Cultural, and Historic resources are discussed in **Sections 3.1, 3.2.2,** and **3.6.1**.

2. *The proposed project will not curtail the range of beneficial uses of the environment.*

No restriction of beneficial uses would occur under the proposed action. The Project Area is currently vacant and unused. The proposed new campus would allow VSAS to expand their enrollment capacity and increase educational opportunities in the Volcano area. The Volcano area is growing and needs additional educational facilities and community gathering space to support the increase in population. The proposed new campus will provide the proper facilities to facilitate wider enrollment capacity and support sustainable community growth, thus enhancing the range of beneficial uses.

As described in Section 3.2.2, a review of historical records, the AFI report, and consultation with OHA and SHPD did not identify any specific traditional gathering sites or customary practice areas within the 14.9-acre project site. The biotic survey confirmed the presence of endemic plant species with traditional uses, but the proposed development affects only a small portion of a large, primarily undeveloped parcel, and access to the broader 785-acre property for gathering purposes will not be restricted by the project. Based on the research conducted, the project will not curtail the range of beneficial uses of the environment, including traditional and customary Native Hawaiian practices, and impacts are therefore less than significant under this criterion.

3. *The proposed project will not conflict with the State's environmental policies or long-term environmental goals established by law.*

The State's long-term environmental policies are set forth in HRS Chapter 344. The broad goals of this policy are to conserve natural resources and enhance quality of life. The requested action will have no significant impact to environmental processes, nor will it negatively impact quality of life. The project will follow all relevant environmental regulations and employ BMPs to minimize temporary impacts, such as dust and noise, during construction. Phased construction will decrease potential impacts during the development process. The proposed campus would improve the quality of life for the community by providing access to education in an area that is currently underserved. No significant impacts to natural resources will occur. It is therefore consistent with all elements of the State's long-term environmental policies. Consistency with State environmental policies and goals is addressed in **Section 3.6**.

4. *The proposed project will not have a substantial adverse effect on the economic welfare, social welfare, or cultural practices of the community and State.*

   The proposed action will have positive impacts on the economic welfare, social welfare, and cultural practices of the community and State. The proposed expansion will provide essential education for the local community and will support sustainable economic development throughout the larger area through increased employment. Community access spaces will promote cultural practices and help improve social welfare. Effects on economic welfare, social welfare, and cultural practices are addressed in **Sections 3.2** and **3.6**.

5. *The proposed project will not have a substantial adverse effect on public health.*

   The proposed expansion will not have a substantial effect on public health. Minor and short-term impacts to air quality and noise levels may occur during construction but will be mitigated by using Best Management Practices and appropriate permitting such as noise permits. The new campus development will utilize Individual Wastewater Systems.

   Public health will improve with the proposed action by providing essential and comprehensive physical and health education to students, along with ample outdoor recreation spaces. Public health conditions are addressed in **Section 3.6**.

6. *The proposed project will not involve adverse secondary impacts, such as population changes or effects on public facilities.*

   The proposed project will not involve adverse secondary impacts, such as population changes or effects on public facilities. The project will accommodate the educational demand deficit, as well as the growing population in Puna. By addressing the lack of educational options in the area, the project will help address overcrowding in existing schools and reduce pressure on public infrastructure. Additionally, the development is not expected to result in significant increases in population or negatively affect utilities, roads, or other public services. Instead, it aims to enhance the community's resources,

ensuring that the expanding population has access to quality education and facilities without resulting in negative secondary impacts on public facilities or services.

7. *The proposed project will not involve a substantial degradation of environmental quality.*

   The proposed action would not contribute to environmental degradation. VSAS will adhere to all regulations during construction and Best Management Practices will be strictly followed during all phases. The proposed development will enhance environmental stability by providing sustainability education, energy efficiency and renewable technologies, recycling and composting programs, and green spaces.

8. *The proposed project is not one which is individually limited and will not have substantial adverse effect upon the environment or involve a commitment for larger actions.*

   The proposed action will not have substantial adverse effect upon the environment or involve a commitment for larger actions. All buildings associated with the new VSAS campus will incorporate LEED principles. Mitigating measures and Best Management Practices will be strictly followed during construction to minimize potential impacts on air and water quality.

   The grounds are planned to include attractive landscape features and will include outdoor spaces for learning and play, walkways, and open/outdoor gathering spaces.

   There are no expected long-term impacts to water quality. Individual Wastewater Systems will be utilized meeting the approval of the Department of Health. Designs will ensure that all project generated runoff is retained on site.

   The proposed action is not expected to have significant impacts to natural resources such as flora and fauna, recreational, cultural, archaeological, or historical resources.

9. *The proposed project will not have a substantial adverse effect on a rare, threatened, or endangered species, or its habitat.*

   No rare, threatened or endangered plant species are present. The subject area contains a medium-stature, early stage, somewhat diverse ʻōhiʻa forest that is lightly to moderately degraded by invasive species. Clearing of the subject area would destroy many individuals of common native plants, but it would not affect rare, threatened or endangered plants, nor would it intrude into a particularly sensitive native ecosystem. It is recognized that the ʻōhiʻa forest, despite its fairly simple structure and moderate degradation, has intrinsic conservation value and represents a vital stage in the succession of native forests on Kilauea Volcano that provides habitat for a few native birds and the Hawaiian hoary bat or ʻŌpeʻapeʻa (*Lasiurus cinereus semotus*). In the context of the thousands of acres of State land in this area, much of it covered with diverse native forest

protected within the Conservation District or the National Park, the loss of up to 20 acres of this type of ʻōhiʻa forest, although not negligible, is not critical to the preservation of habitat, even considering the cumulative effects of the clearing of much similar land in the many subdivisions of the Volcano to Glenwood area.

The potential presence of native endangered birds in the area means the applicant will commit to mitigating measures. The State listed Hawaiian Hoary has the potential to occur in the vicinity of the project area and may roost in nearby trees. Hoary Bats may be sensitive to disturbance between June 1st and September 15th, throughout which no shrubs or trees taller than 15 feet may be disturbed or removed. If this cannot be avoided, woody plants greater than 15 feet (4.6 meters) tall should be disturbed, removed, or trimmed without consulting the DLNR Division of Forestry and Wildlife (DOFAW). The State listed Hawaiian Hawk, or ʻIo (*Buteo solitarius*) is also known to occur in the project vicinity. If any tree cutting occurs between March and September, DOFAW must be consulted first. A pre-construction hawk nest search by a qualified ornithologist using standard methods must be conducted. If nests are found, no land clearing is permissible until October.

Mitigation protocol is also proposed for the issues presented by Rapid ʻŌhiʻa Death (ROD) and the potential for spread of invasive species such as little fire ants and coqui frogs.

10. *The proposed project will not have a substantial adverse effect on air or water quality or ambient noise levels.*

The proposed action would have minimal and short-term effects on air quality and ambient noise levels during construction. Construction is proposed to occur in four (4) phases to reduce the level of construction occurring at once and the length of potential impacts. Mitigating measures will be strictly followed to reduce impacts to both air quality and noise during all phases of construction. If maximum permissible levels are exceeded during any stage, the contractor will consult with the Department of Health and determine whether a permit is necessary. Noise associated with a typical school will occur during workday hours and is not expected to cause significant impact to the surrounding area due to the rural setting of the subject site. In the event the Campus is used outside of normal operating hours, VSAS will adhere to the County Department of Health noise guidelines, which state noise will not occur past 10:00 p.m.

There are no expected long-term impacts to water quality. Individual Wastewater Systems will be utilized meeting the approval of the Department of Health.

11. *The proposed project will not have a substantial adverse effect on or be likely to suffer damage by being located in an environmentally sensitive area such as a flood plain, tsunami zone, sea level rise exposure area, beach, erosion-prone area, geologically hazardous land, estuary, fresh water, or coastal waters.*

The VSAS new campus site is located roughly 12.2 miles inland from the shoreline and is in Flood Zone X, outside of the 500-year floodplain. The Property will not be impacted by tsunamis, sea level rise, erosion, or freshwater flooding. The Property is in Lava Zone 3 and has the same volcanic/seismic activity risk as the Northern region of Puna. All buildings would be designed according to County building codes to withstand an acceptable level of seismic activity and wind resistance. Environmental risk factors are addressed in **Sections 3.1** and **3.6.**

The proposed action would comply with all required codes and regulations regarding drainage and runoff mitigation. Further, as these protective regulations apply equally to each alternative, there are no appreciable differences in potential impacts related to flooding or shoreline resources between project alternatives.

12. *The proposed project will not have a substantial adverse effect on scenic vistas and viewplanes, during day or night, identified in county or state plans or studies.*

The proposed development of the new VSAS campus would have limited impacts on scenic resources. The proposed construction will not impose on views to or from any listed resource in the General Plan. A forest buffer separates the Property from Highway 11, mitigating temporary impacts to scenic views, air quality and noise. The proposed buildings will be aesthetically pleasing with sustainable design and function and will be set back from the road. By prioritizing native plant landscaping and integrating sustainable architectural elements, the project ensures that scenic resources and views are protected while supporting environmental stewardship and responsible resource usage. Scenic resources are addressed in **Section 3.1.5**.

13. *The proposed project will not require substantial energy consumption or emit substantial greenhouse gases.*

The proposed action will not require substantial energy consumption or emit substantial greenhouse gases. Electricity will be sourced from a combination of sources including Hawai‘i Electric Light Company, Inc. (HELCO) and solar. Water saving methods will be incorporated into every building to conserve water and energy use. Such methods include utilizing energy efficient appliances such as fridges, dishwashers and washing machines, low flow systems in bathrooms for toilets, sinks and shower heads with timed shut off for appropriate devices, natural vegetation that requires minimal watering, water collection systems such as catchment tanks, composting to improve soil conditions and water retention, sustainable food initiatives and food waste reduction programs.

All buildings will be constructed in accordance with County building codes that emphasize energy efficiency and resilience to local environmental risks such as wind and seismic activity. Proposed landscaping supports responsible resource usage and the minimization greenhouse gas emissions. By maintaining a forest buffer around the property and utilizing native species in landscaping, the campus will not only preserve

scenic views but also reduce water and fertilizer usage. Runoff from the site will be managed through BMPs to prevent soil erosion and protect water resources.

Water and Energy efficiency standards for the project are addressed in **Sections 3.3.2** and **3.6**.

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Appendix A

Volcano School of Arts and Sciences New Campus TIAR

TMK (3) 1-1-004:010

Traffic Impact Analysis Report

Volcano, Island of Hawaii

April 2025

Prepared for

Land Planning Hawai‘i, LLC

Prepared by

SSFM INTERNATIONAL

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I. PROJECT DESCRIPTION

Volcano School of Arts & Sciences (VSAS) is a charter school located Volcano, on the Island of Hawai'i, located just east of Volcano National Park. VSAS offers education for grades Pre-K through 12 and primarily serves the communities of Upper Puna and Ka'u. Currently, VSAS operates out of two locations for the existing 270-student enrollment:

- 99-128 Old Volcano Road (West Campus)
- 19-4024 Haunani Road (East Campus)

VSAS proposes to relocate the West Campus to an approximately 15-acre portion of TMK (3) 1-1-004:010 located in Volcano with access off Old Volcano Road. Figure 1 shows the project location. Figure 2 shows the proposed site plan.

The current/proposed enrollment and timeline for the existing West Campus, East Campus, and New Campus are as follows:

- West Campus –
  - Current enrollment of 190 PreK-4th grade and 9th-10th grade students.
  - West Campus will be closed in 2027 with the existing 190 students relocated to the East Campus and New Campus.
- East Campus –
  - Current enrolment of 80 5th-8th grade students.
  - East Campus will serve 180 K-8th grade students in 2027.
  - Anticipated maximum enrollment of 240 Kindergarten - 5th grade students by 2040.
- New Campus –
  - Constructed by 2027 to accommodate an enrollment of 100 Pre-K and 9th-10th grade students.
  - Enrollment will expand to include an anticipated maximum of 342 Pre-K and 6th-12th grade students by 2040.

It is proposed that the total maximum school enrollment in 2040 at both campuses will be 582 students, with an additional 100 students part of a "blended" program. Of these 100 students in the blended program, a maximum of 35 would be on campus at any given time. The blended program students will be on campus two to three times a week on a rotational basis with drop-off and pick-up during non-peak times.

A Traffic Impact Analysis Report (TIAR) is not required by the zoning code and a formal TIAR to date has not been requested by the Hawai'i Department of Transportation (HDOT). However, the TIAR is being prepared to identify any potential traffic impacts the project will generate and recommend any potential mitigation needed for existing roads or intersections.

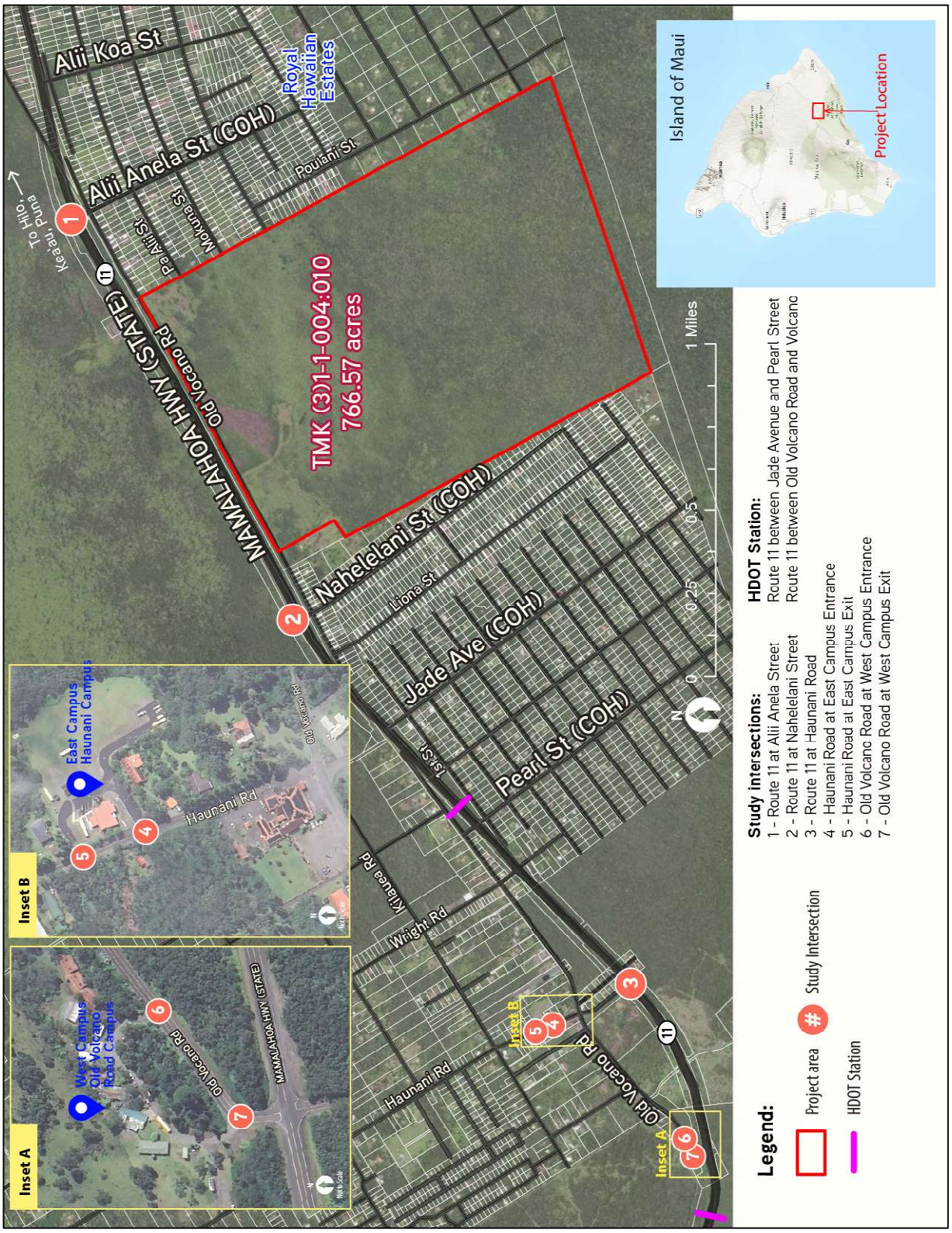

Figure 1: Project Location Map

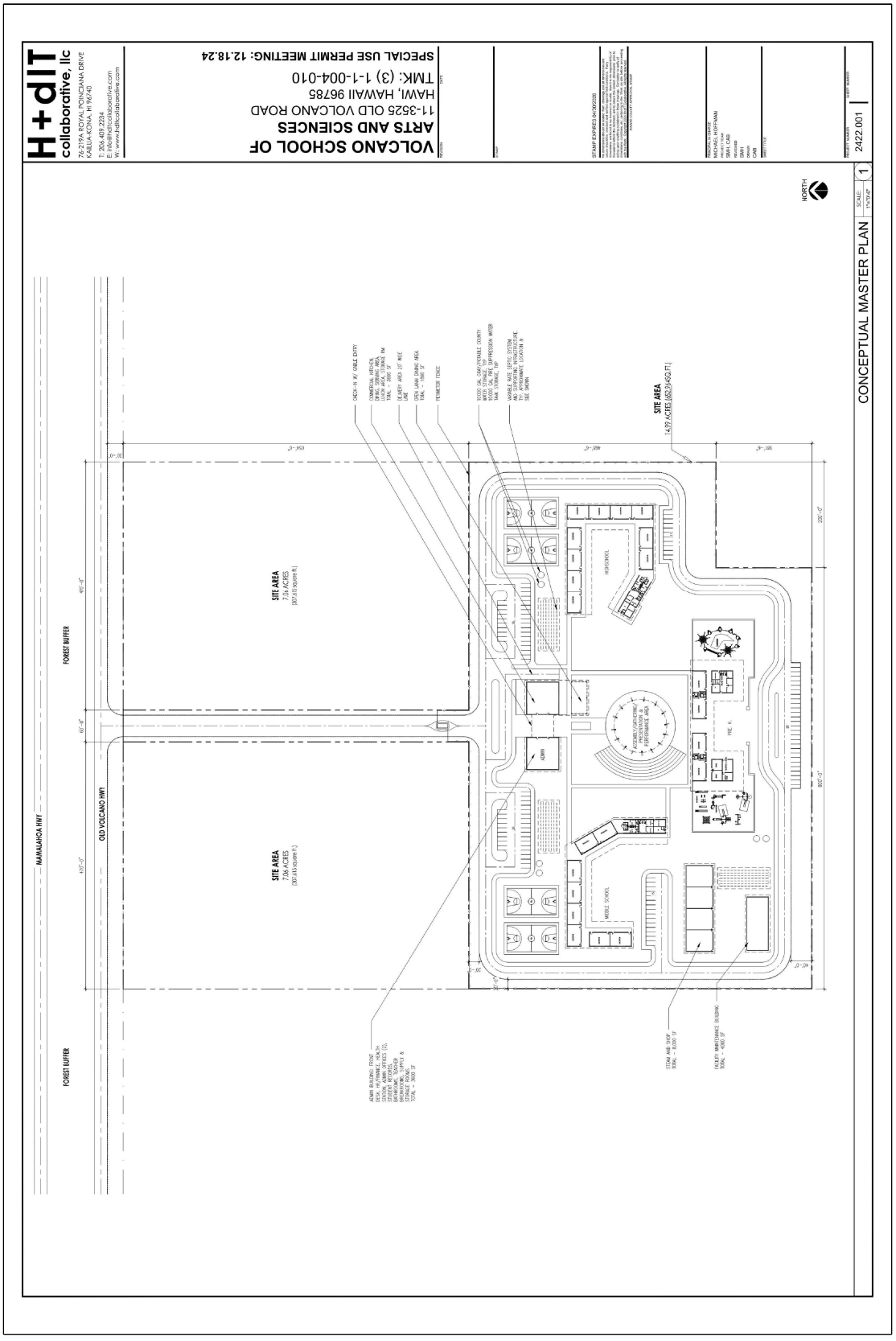

Figure 2: Project Site Plan

II. EXISTING CONDITIONS

The existing VSAS operates on two campuses, West Campus located off Old Volcano Road and the East Campus located off Haunani Road. The New Campus is proposed for construction on 15-acres of an empty 776.57-acre parcel (TMK (3) 1-1-004:010), just south of Route 11 between Aliʻi Anela Street and Nahelelani Street. The existing and proposed campuses are located in rural residential neighborhoods. Some of the nearby attractions and transit facilities are shown in Figure 3.

A. Geometric Configuration

State Route 11 is the primary highway passing through the area. It is also named Kanoelehua Avenue, Māmalahoa Highway, Hawaiʻi Belt Road, Volcano Road, Kuakini Highway, and Queen Kaʻahumanu Extension. However, to avoid confusion, the name Route 11 will be used throughout this report. Route 11 is a State of Hawaiʻi-owned roadway extending 121.97-miles from Hilo to Kona. Within the project vicinity, Route 11 is an east-west oriented, two-lane roadway with one lane in each direction. A two-to-six-foot paved shoulder exists on both directions of Route 11. No curb, gutter, sidewalks, or dedicated bike facilities exist. The posted speed limit is 55 miles per hour (MPH) in both directions.

Old Volcano Road is a County of Hawaiʻi (COH)-owned, two-lane, east-west roadway with one lane in each direction. At the proposed New Campus location, Old Volcano Road is parallel and to the south of Route 11. Within the project vicinity, Old Volcano Road is an east-west oriented, two-lane roadway with one lane in each direction. No curb, gutter, sidewalks, or dedicated bike facilities exist. The posted speed limit is 25 miles per hour (MPH).

Aliʻi Anela Street is a COH-owned, two-lane, north-south roadway with one lane in each direction. The roadway is approximately 18 feet wide with a dividing center line at stop-controlled approaches. No curb, gutter, sidewalks, or dedicated bike facilities exist. The posted speed limit is 25 MPH.

Nahelenani Street is a COH-owned, two-lane, north-south roadway with one lane in each direction. The roadway is approximately 16 feet wide with a dividing center line at stop-controlled approaches. No curb, gutter, sidewalks, or dedicated bike facilities exist. The posted speed limit is 25 MPH.

Haunani Road is a COH-owned, two-lane, north-south roadway with one lane in each direction. The roadway is approximately 20 feet wide with a dividing center line at stop-controlled approaches. No curb, gutter, sidewalks, or dedicated bike facilities exist. Paved shoulders existing on Haunani Street from Route 11 to Old Volcano Road. The posted speed limit is 25 MPH.

B. Study Intersections

Seven intersections, including the existing school driveways, were identified for analysis. The existing lane configurations are shown in Figure 4.

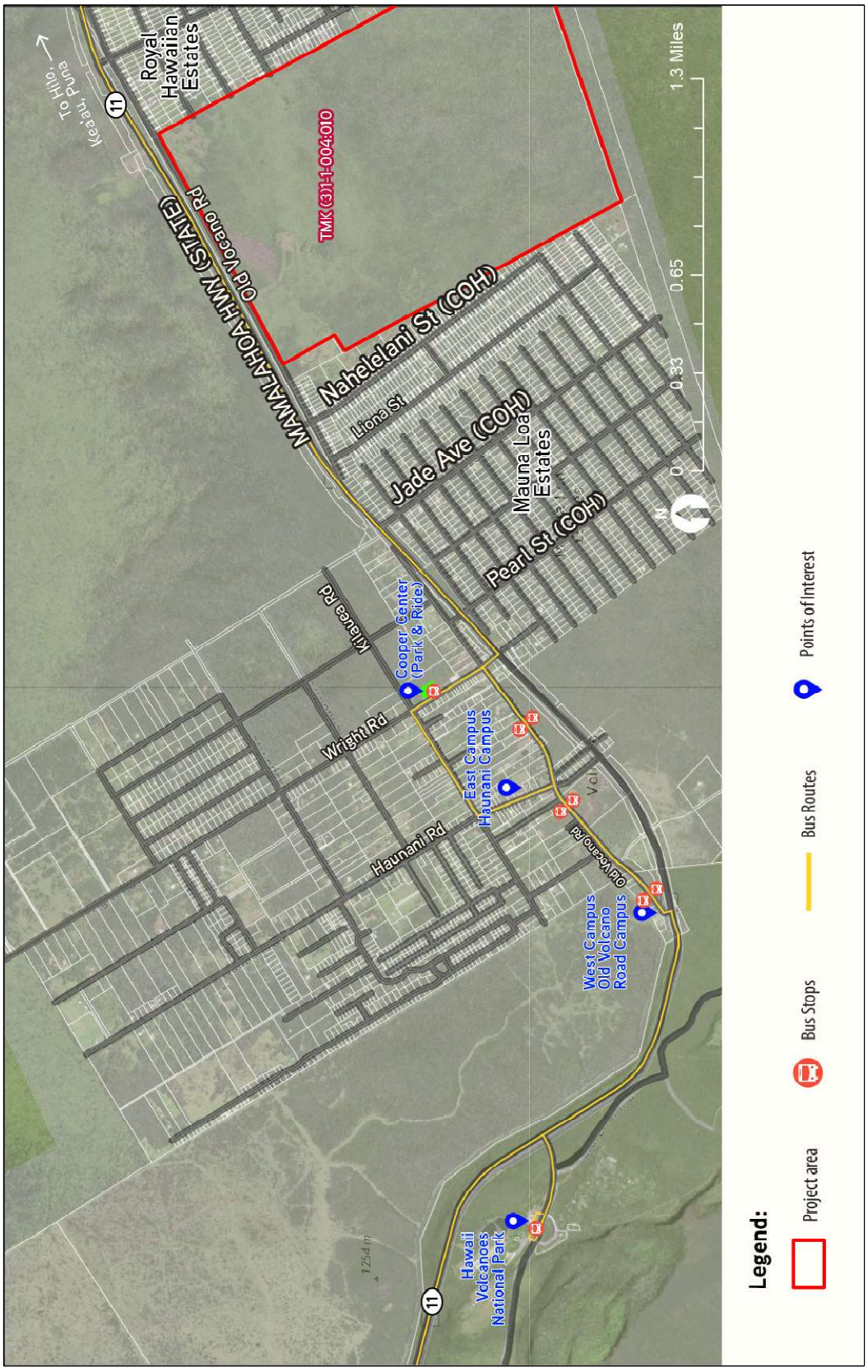

Figure 3: Nearby Attractions

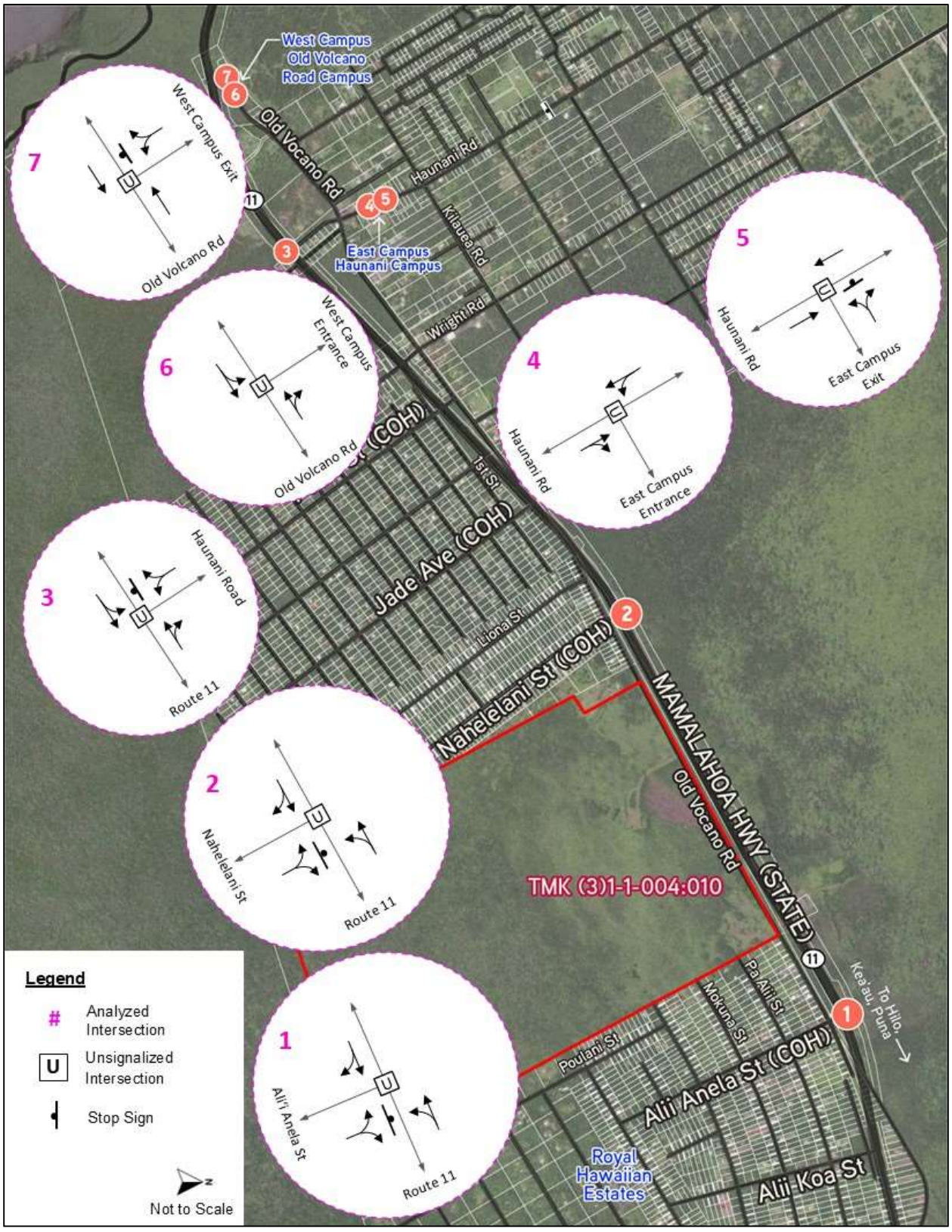

Figure 4: Existing Lane Configuration

1. Route 11 at Ali‘i Anela Street

Route 11 at Ali‘i Anela Street is a stop-controlled, two-lane, T-intersection with one lane in each direction on Route 11. The Ali‘i Anela Street northbound approach is stop controlled with a single lane sharing the left-right movements.

2. Route 11 at Nahelenani Street

Route 11 at Nahelenani Street is a stop-controlled, two-lane, T-intersection with one lane in each direction on Route 11. The Nahelenani Street northbound approach is stop controlled with a single lane sharing the left-right movements.

3. Route 11 at Haunani Road

Route 11 at Haunani Road is a stop-controlled, two-lane, T-intersection with one lane in each direction on Route 11. The Haunani Road southbound approach is stop controlled with a single lane sharing the left-right movements.

4. Haunani Road at East Campus Entrance

Haunani Road at East Campus Entrance is a two-lane, T-intersection with one lane in each direction on Haunani Road.

5. Haunani Road at East Campus Exit

Haunani Road at East Campus Exit is a two-lane, T-intersection with one lane in each direction on Haunani Road. The East Campus exit is stop controlled with a single lane sharing the left-right movements.

6. Old Volcano Road at West Campus Entrance

The West Campus Entrance at Volcano Road is an unsignalized driveway. This driveway only allows for entering vehicles.

7. Old Volcano Road at West Campus Exit

The West Campus Exit at Volcano Road is an unsignalized driveway. This driveway only allows for exiting vehicles. A stop sign exists about 60 feet from the shoulder striping. Drivers roll forward closer to the shoulder striping before coming to a stop.

C. Vehicle Volumes

1. 24-Hour Volume

Historic Hawai‘i Department of Transportation (HDOT) traffic counts between years 2015 and 2024 were available on Route 11 between Jade Avenue and Pearl Avenue and between Old Volcano Road and the Volcano National Park entrance. The average daily traffic (ADT) volumes are summarized in Table 1 and 2. Traffic counts at both stations experienced a decrease in ADT after 2019, likely due to the Covid-19 pandemic. The historic ADT since 2019 show that traffic volumes have not returned to pre-Covid levels.

Table 1: 24-Hour Volume on Route 11 from Jade Avenue to Pearl Avenue

Year	ADT
2016	5,400
2017	
2018	5,500
2019	
2020	4,700
2021	4,600
2022	
2023	
2024	4,500

Table 2: 24-Hour Volume on Route 11 from Jade Avenue to Pearl Avenue

Year	ADT
2015	4,000
2016	4,500
2017	5,500
2018	5,000
2019	5,100
2020	3,600
2021	3,700
2022	3,700

2. Intersection Peak Turning Movement Counts

Turning movement counts were taken at the existing study intersections on Tuesday, March 11, 2025, from 6:30–8:30 AM and 1:30–3:30 PM to align with the peak hours of the adjacent roadway and school. The AM and PM commuter peak hours occurred between 7:15-8:15 AM and 2:00–3:00 PM, respectively. These traffic volumes were taken on a day that saw the Kīlauea summit erupting at Volcano National Park, resulting in atypically higher volumes on Route 11. Historic HDOT traffic volumes taken on Tuesday, April 27, 2021 to Thursday, April 28, 2021 were the most recent HDOT counts that recorded typical traffic volumes and patterns on Route 11. The 2021 HDOT counts are assumed to be comparable to the Existing (2025) volumes on Route 11 and were therefore used to calculate the Route 11 volumes.

The traffic volumes at Route 11 and Haunani Street were calculated through use of the Existing (2025) volumes on Haunani Road with the AM inbound and PM outbound trips distributed based on 2018 data from VSAS that stated:

- 38% of students reside in the Volcano area
- 26% of the students reside in upper Puna
- 33% of students reside in Ka‘u
- 3% of students reside in lower Puna, Hilo, South Kona, and North Kona.

The AM outbound and PM inbound trips were assumed be going to and coming from the Hilo direction. Figure 5 shows the AM and PM peak hour volumes at the study intersections. Appendix A includes traffic count data at the study intersections.

3. Transit Facilities

The COH public transit system (Hele-On Bus) has three bus routes in the project area that service the VSAS West Campus with the nearest bus stop at Volcano Road and West Campus Entrance. There are no bus routes that service the East Campus or within the vicinity of the proposed New Campus. Bus Route 10 (Hilo to Ocean View), 11 (Red Line – Hilo to Volcano), and 12 (Volcano to Ocean View) provide service along the southbound direction and bus Routes 10, and 11 service the northbound direction. Hele-on Bus allows for bus users to flag down bus drivers at safe locations where the bus can pull over. The Cooper Center Park & Ride lot is located on Wright Road, about 0.5 miles east of the Haunani Road Campus.

4. Pedestrian and Bicycle Volumes

Peak hour intersection pedestrian and bicycle volumes were taken at the existing study intersections on Tuesday, March 11, 2025. The pedestrian volumes are higher in the PM peak hour, especially near the East Campus. Bicycle volumes were low but consistent in the AM and PM peak hours. There were no bikes or pedestrians observed on Route 11 during both peak hours. Table 3 shows a summary of the pedestrian and bicycle counts during the vehicular peak hours. Appendix A includes the pedestrian and bicycle count data at the study intersections.

Table 3: Peak Hour Pedestrian and Bicycle Volumes

Intersection	Pedestrian		Bicycle	
	AM Peak	PM Peak	AM Peak	PM Peak
Route 11 at Ali'i Anela Street	0	0	0	0
Route 11 at Nahelelani Street	0	0	0	0
Haunani Road at East Campus Exit	8	26	2	1
Haunani Road at East Campus Entrance	8	26	2	1
Old Volcano Road at West Campus Entrance	1	10	1	4
Old Volcano Road at West Campus Exit	1	2	0	2

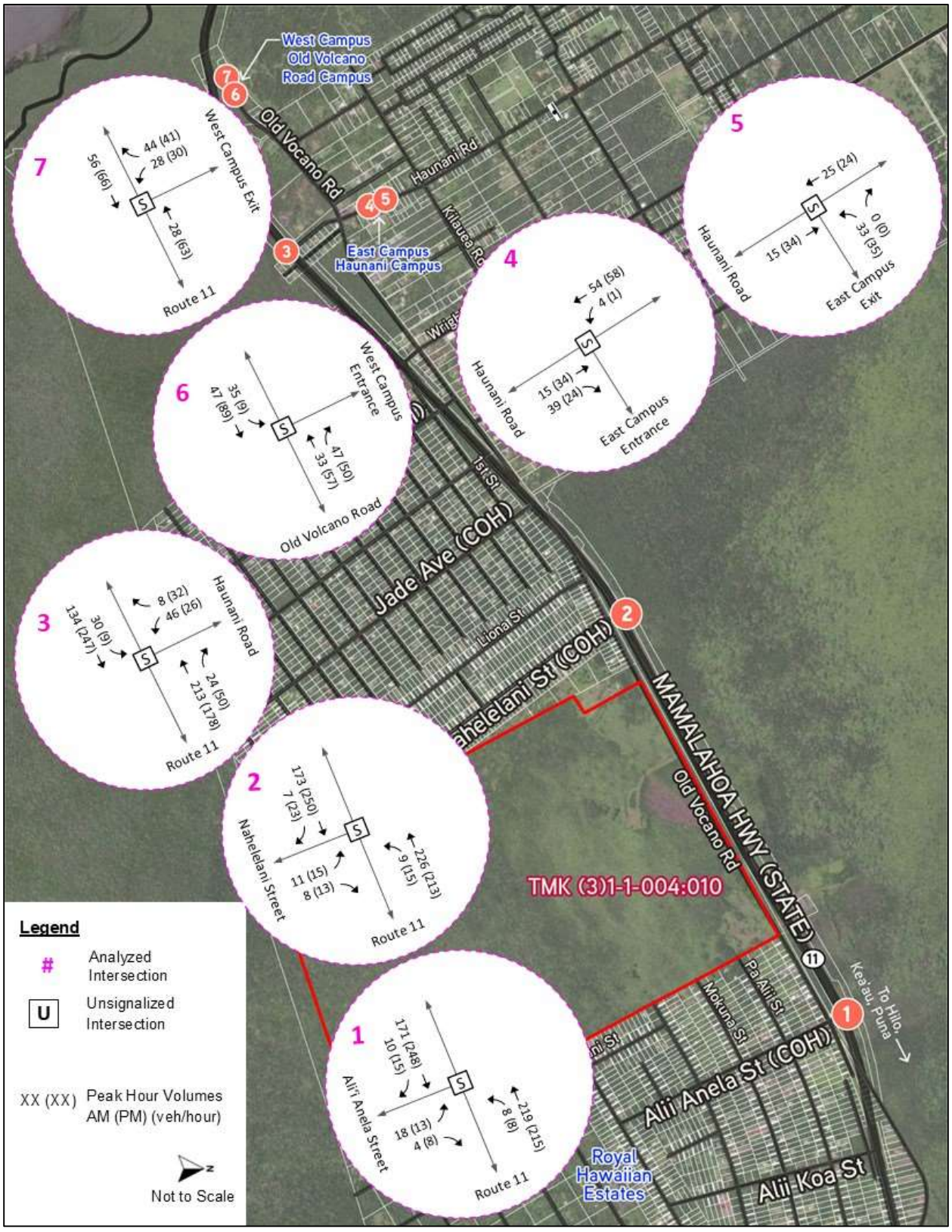

Figure 5: 2025 Peak Hour Volumes

D. Existing Level of Service

1. Methodology

Level of service (LOS) is a rating system used in traffic engineering to measure the effectiveness of roadway operating conditions. There are six LOS ranging from A to F. LOS A is defined as being the least interrupted flow conditions with little or no delays, whereas LOS F is defined as conditions where extreme delays exist. Guidelines state that LOS D or better is appropriate for the study intersections and movements. Intersection LOS and delay was determined for the AM and PM peak hours using Synchro Version 11.0 traffic analysis software.

As stated in the Highway Capacity Manual 6th Edition (*HCM6*) (TRB, 2016), LOS for a two-way stop controlled (TWSC) intersection is determined by the measured control delay (see Table 4). Delay at an all-way stop-controlled (AWSC) intersection is defined for the intersection as a whole and for each movement. Delay at a TWSC intersection is defined by each minor movement and not for the major movements or intersection as a whole. This is because vehicles traveling along the major, free-flow road, of a TWSC intersection, proceed through with minimal delay. Those vehicles approaching the intersection along the minor movement (side-street) are controlled by a stop sign and thus experience delay attributable to the volume of vehicles passing along the free-flow road and the gaps available.

Table 4: LOS Criteria for Unsignalized Intersections

Average Control Delay (s/veh)	LOS by v/c Ratio	
	<=1.0	>1.0
≤ 10.0	A	F
>10 and ≤15	B	F
>15 and ≤25	C	F
>25 and ≤35	D	F
>35 and ≤50	E	F
>50	F	F

Source: *HCM6* (TRB, 2016)

Another measure of intersection operation is the volume to capacity (v/c) ratio. This is the ratio of the volume of traffic utilizing the intersection compared to the maximum volume of vehicles that can be accommodated by the intersection during a specific period of time. A v/c ratio under 0.85 means the intersection is operating under capacity and excessive delays are not experienced. An intersection is operating near its capacity when v/c ratios range from 0.85 to 0.95. Unstable flows are expected when the v/c ratio is between 0.95 and 1.0. Any v/c ratio greater than or equal to 1.0 indicates that the intersection is operating at or above capacity which results in a LOS F per the *HCM6* (TRB, 2016). A traffic movement can have a poor LOS but low v/c which suggests that the traffic volumes along that movement are low but may have to wait a longer time to make the movement.

2. Existing (2025) Intersections LOS Results

Existing (2025) intersection and movement LOS and delay (in seconds per vehicle) was determined for the AM and PM peak hours using *Synchro 11* traffic analysis software and the results are shown in Table 5. Existing (2025) Synchro Analysis Worksheets can be found in Appendix B.

Table 5: Existing (2025) LOS

Intersection and Movement	AM Peak			PM Peak		
	LOS	Delay (sec/veh)	v/c	LOS	Delay (sec/veh)	v/c
Route 11 at Ali'i Anela Street	**-**	**0.7**	**-**	**-**	**0.6**	**-**
Route 11 WB Left-Through	A	7.6	0.01	A	7.9	0.01
Ali'i Anela NB Left-Right	B	11.2	0.04	B	11.8	0.05
Route 11 at Nahelenani Street	**-**	**0.6**	**-**	**-**	**0.8**	**-**
Route 11 WB Left-Through	A	7.6	0.01	A	7.9	0.01
Nahelenani NB Left-Right	B	10.7	0.03	B	11.3	0.05
Route 11 at Haunani Road	**-**	**1.9**	**-**	**-**	**1.3**	**-**
Route 11 EB Left-Through	A	7.8	0.03	A	7.8	0.01
Haunani SB Left-Right	B	12.0	0.10	B	11.1	0.10
Haunani Road at East Campus Entrance	**-**	**0.3**	**-**	**-**	**0.1**	**-**
Haunani Road SB Left-Through	A	7.4	0.01	A	7.4	0.01
Haunani Road at East Campus Exit	**-**	**4.0**	**-**	**-**	**3.5**	**-**
East Campus SB Left-Right	A	8.9	0.04	A	9.4	0.06
Old Volcano Road at West Campus Entrance	**-**	**1.6**	**-**	**-**	**0.3**	**-**
Old Volcano Road EB Left	A	7.5	0.04	A	7.6	0.01
Old Volcano Road at West Campus Exit	**-**	**4.3**	**-**	**-**	**3.5**	**-**
West Campus SB Left-Right	A	9.3	0.12	A	9.9	0.14

Under existing conditions, all movements operate at an acceptable LOS B or better. Therefore, no mitigation is recommended.

III. FUTURE CONDITIONS

Regional traffic growth and future surrounding area development's traffic were analyzed and added to the roadway network for 2040 to align with the schools plans for a maximum enrollment of 240 students and 342 students at the East Campus and New Campus, respectively.

A. Upcoming Planned Projects

1. STIP

Research was completed on March 14, 2025, at the *Statewide Transportation Improvements Program* (STIP) FY 2025-2028 website. The STIP is a four-year forecast that identifies state and county transportation projects to be funded with Federal Highway and Federal Transit funds. There were no roadway construction or improvement projects listed in the STIP (2025-2028) that would impact the project area.

2. OEQC

Research was completed on March 14, 2 025 at the State of Hawaii *Office of Environmental Quality Control* (OEQC) website. The OEQC website provides Environmental Impact Statement (EIS) and Environmental Assessments (EA) available to the public. As of July 2021, the OEQC was renamed the Environmental Review Program (ERP), but the URL led to the old OEQC website. The Keakealani Campus Development Project is the prior redevelopment plan for the existing East Campus.

a) Keakealani Campus Development Project TIAR (Aina Engineers, Inc., 2017)

VSAS proposed to develop the Keakealani Campus, or East Campus, to accommodate up to 250 students with 16 classrooms for PreK-8th grade students. The TIAR concluded that that the intersections on Haunani Road operated at LOS A and did not require or recommend any mitigation. VSAS has since updated the East Campus future use to serve Kindergarden-5th grade with a maximum enrollment of 240 students in 2040. Traffic volumes from the TIAR will not be included in the traffic projections.

3. HDOT Highways Program Status

Research was completed on March 14, 2025 at the HDOT Highway Program Status viewer. The website provides information regarding the current and future roadway projects across all Hawaiian Islands. There is an ongoing project, Project ID HSIP-0100(088), on the entirety of Route 11 to install pavement markings and new rumble strips at various locations. The project is not expected to change vehicle volumes in the study area.

B. Volumes

1. Background Growth

The latest historical traffic volumes along State Route 11 at the two nearest HDOT stations decreased from 2016 to 2024. The *Federal-Aid Highways 2035 Transportation Plan for the District of Hawai'i* (CH2M Hill, 2014) forecasts a compounded annual increase of 2.13% and 1.48% in Puna and Ka'u, respectively, from 2020 to 2035. The VSA campus is near the boundaries of Puna and Ka'u but is expected to have slower growth more similar to projected growth of Ka'u. Therefore, a growth rate of 1.48% will be used for analysis and applied to Route 11 to determine the Future (2040) Without Project volumes (see Figure 6). For this scenario, students at the West Campus are assumed to remain at the existing location.

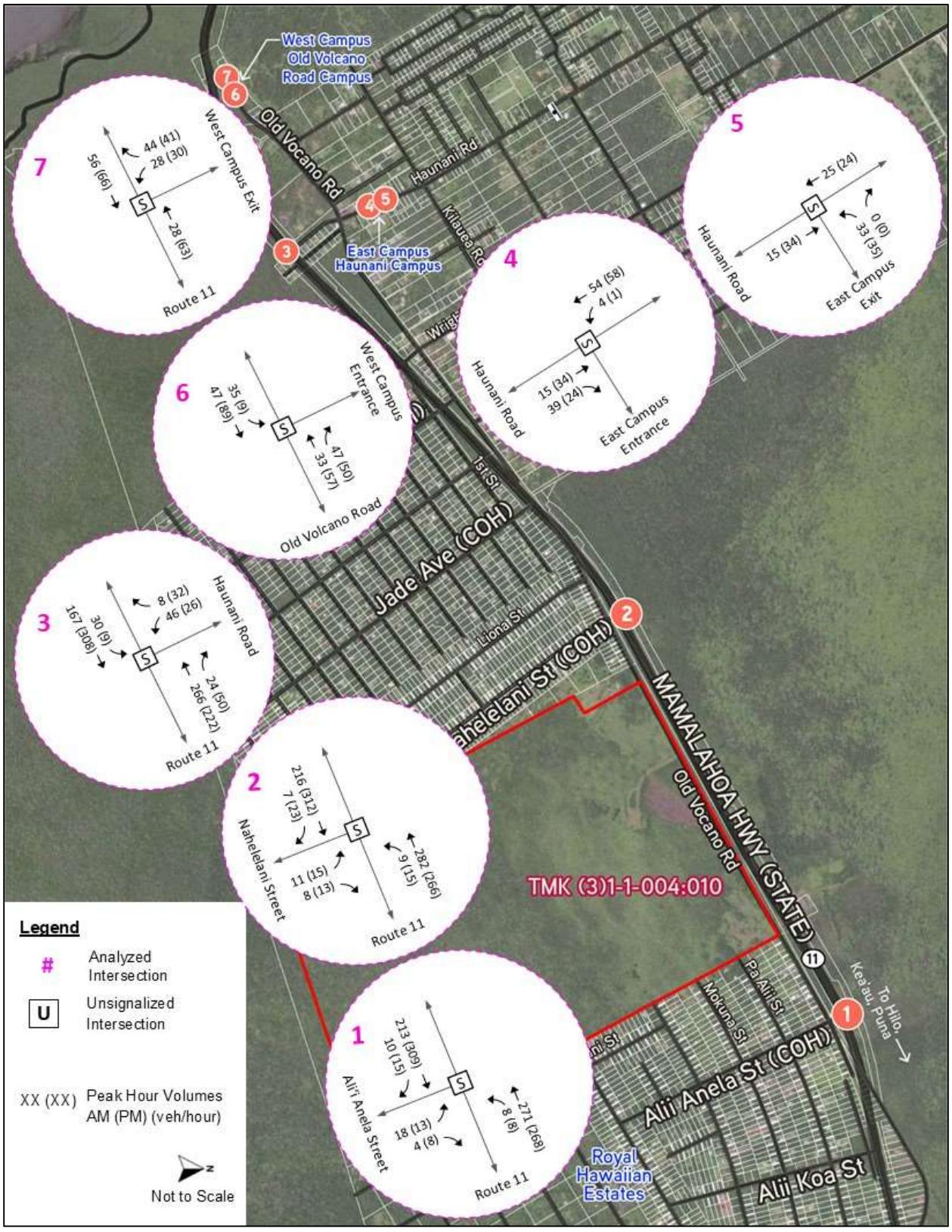

Figure 6: Future (2040) Without Project Peak Hour Volumes

C. Future Without Project Level of Service

1. Future (2040) Without Project Conditions

Future (2040) Without Project intersection and movement LOS and delay (in seconds per vehicle) were determined for the AM and PM peak hours using *Synchro 11* traffic analysis software and are shown in Table 6. This scenario assumed the New Campus has not been constructed and West Campus students have not relocated. Future (2040) Without Project Synchro Analysis Worksheets can be found in Appendix C.

Table 6: Future (2040) Without Project LOS

Intersection and Movement	AM Peak			PM Peak		
	LOS	Delay (sec/veh)	v/c	LOS	Delay (sec/veh)	v/c
Route 11 at Ali'i Anela Street	**-**	**0.5**	**-**	**-**	**0.7**	**-**
Route 11 WB Left-Through	A	7.7	0.01	A	8.1	0.02
Ali'i Anela NB Left-Right	B	11.4	0.04	B	13.1	0.07
Route 11 at Nahelenani Street	**-**	**0.6**	**-**	**-**	**0.5**	**-**
Route 11 WB Left-Through	A	7.7	0.01	A	8.0	0.01
Nahelenani NB Left-Right	B	12.3	0.05	B	12.3	0.04
Route 11 at Haunani Road	**-**	**1.7**	**-**	**-**	**1.2**	**-**
Route 11 EB Left-Through	A	8.0	0.03	A	7.9	0.01
Haunani SB Left-Right	B	13.0	0.12	B	11.9	0.11
Haunani Road at East Campus Entrance	**-**	**0.3**	**-**	**-**	**0.1**	**-**
Haunani Road SB Left-Through	A	7.4	0.01	A	7.4	0.01
Haunani Road at East Campus Exit	**-**	**4.0**	**-**	**-**	**3.5**	**-**
East Campus SB Left-Right	A	8.9	0.04	A	9.4	0.06
Old Volcano Road at West Campus Entrance	**-**	**1.6**	**-**	**-**	**0.3**	**-**
Old Volcano Road EB Left	A	7.5	0.04	A	7.6	0.01
Old Volcano Road at West Campus Exit	**-**	**4.3**	**-**	**-**	**3.5**	**-**
West Campus SB Left-Right	A	9.3	0.12	A	9.9	0.14

All movements are projected to continue to operate at an acceptable LOS and therefore mitigation is not needed for the Future (2040) Without Project conditions.

IV. FUTURE WITH PROJECT CONDITIONS

The East Campus is anticipated to serve a maximum of 240 5th grade through 8th grade students by 2040. The New Campus is anticipated to finish construction in 2027 and accommodate a maximum of 342 PreK and 6th-12th grade students by 2040. Trips resulting from proposed school campuses are included in the Future (2040) With Project analysis.

A. Future With Project Generated Volumes

1. Project Related Volumes

The expected traffic from the proposed project was determined using the following four-step methodology: trip generation, trip distribution, modal choice, and route assignment.

a) Trip Generation

Trip generation was calculated for the proposed 240-student K-5th grade East Campus and the proposed 342-student PreK, 6th-12th grade New Campus using rates from *Trip Generation, 11th Edition* (ITE, September 2021) which is standard traffic engineering practice.

The Charter Elementary School (ITE Code 536), Elementary School (ITE Code 520), and Charter School (K-12) (ITE Code 538) land uses were considered for the East Campus trip generation calculation (see Table 7). The description for Charter Elementary School states: "The school serves students attending kindergarten through the fifth, sixth, or eighth grade." This description matches the intended use of the East Campus and therefore the Charter Elementary School land use calculations was used for analysis. This calculation also results in the highest number of trips and will therefore reflect the more conservative analysis.

Table 7: East Campus Project Related Development Trips Generated – 240 students

Land Use (ITE Code)	AM Peak of Adjacent Street			PM Peak of Generator		
	IN	OUT	TOTAL	IN	OUT	TOTAL
Charter Elementary School (536)	130	120	250	89	93	182
Elementary School (520)	96	82	178	50	58	108
Charter School (K-12) (538)	102	97	199	88	87	175

The High School (ITE Code 525) and Charter School (K-12) (ITE Code 538) land uses were considered for the New Campus trip generation calculation (see Table 8). The New Campus will serve PreK and 6th-12th grade students. Neither the High School nor Charter School (K-12) land uses exactly match the description of the intended use of the New Campus due to its proposed inclusion of PreK. However, the High School land use resulted in a higher number of generated trips and will therefore represent a more conservative analysis.

Table 8: New Campus Project Related Development Trips Generated – 342 students

Land Use (ITE Code)	AM Peak of Adjacent Street			PM Peak of Generator		
	IN	OUT	TOTAL	IN	OUT	TOTAL
High School (525)	175	83	258	49	105	154
Charter School (K-12) (538)	146	139	284	41	41	82

Therefore, Charter Elementary School and High School project generated trips were used for analysis.

b) Trip Distribution/Assignment

The project related trips were distributed based on the Existing (2025) turning movements. Figure 7 shows the forecast project related trips at the study intersections during the AM and PM peak hours. The West Campus will be closed as a part of the Future With Project conditions and are therefore not included.

c) Modal Choice

To assume the worst-case condition for traffic, all project related external trips were assumed to be by private vehicle only due to the expectation that a small percentage of students may walk, bike, or take the bus.

d) Future With Project Volumes

Future (2040) With Project calculations includes two calculations. First, the existing West Campus and East Campus volumes were removed from the Future (2040) Without Project traffic volumes. Then the 240-student East Campus and 342-student New Campus project generated trips (see Figure 8) were added to the Future (2040) Without Project traffic volumes. The resulting Future (2040) With Project trips during the AM and PM peak hours are shown in Figure 8. The West Campus will be closed as a part of the Future With Project conditions and are therefore not included.

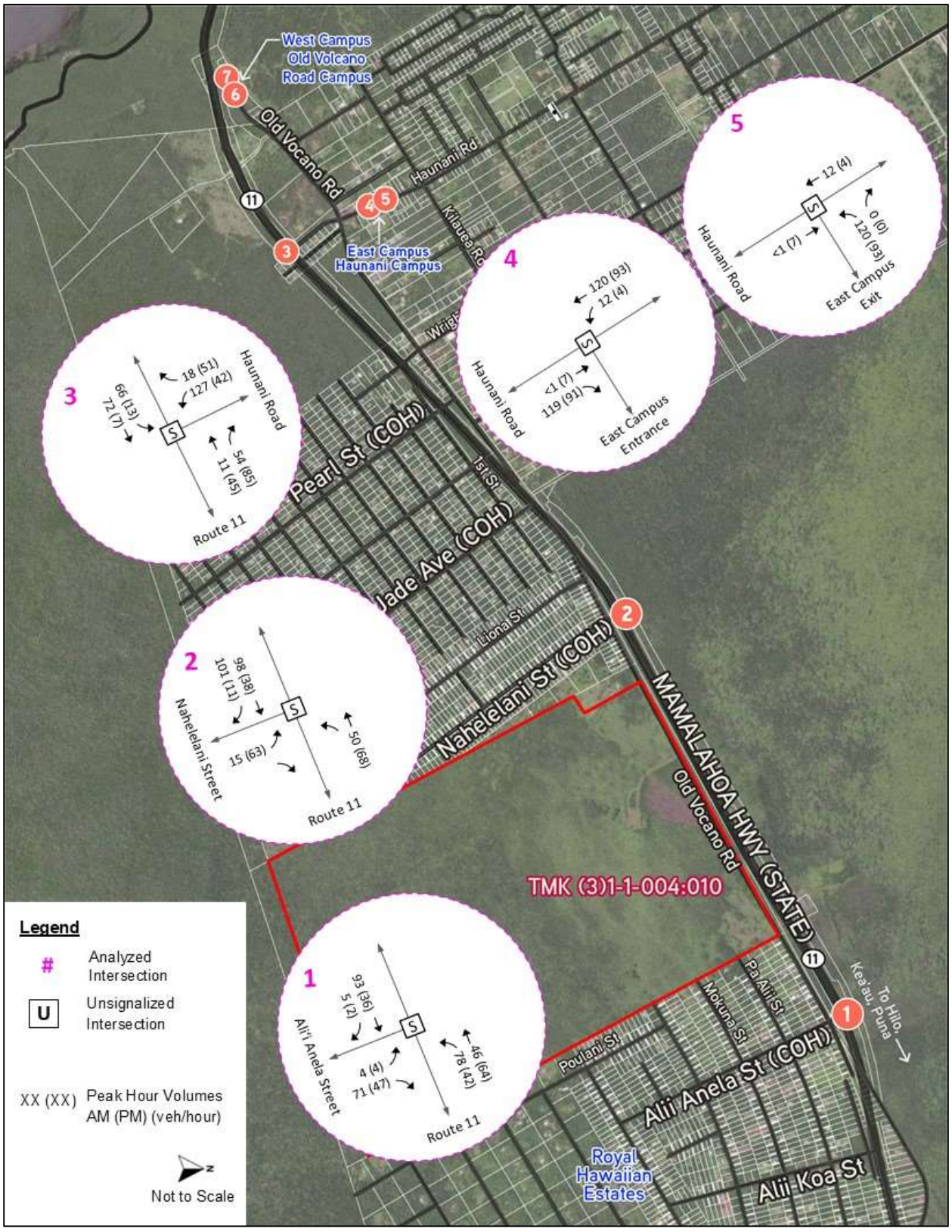

Figure 7: VSAS Project Related Trips

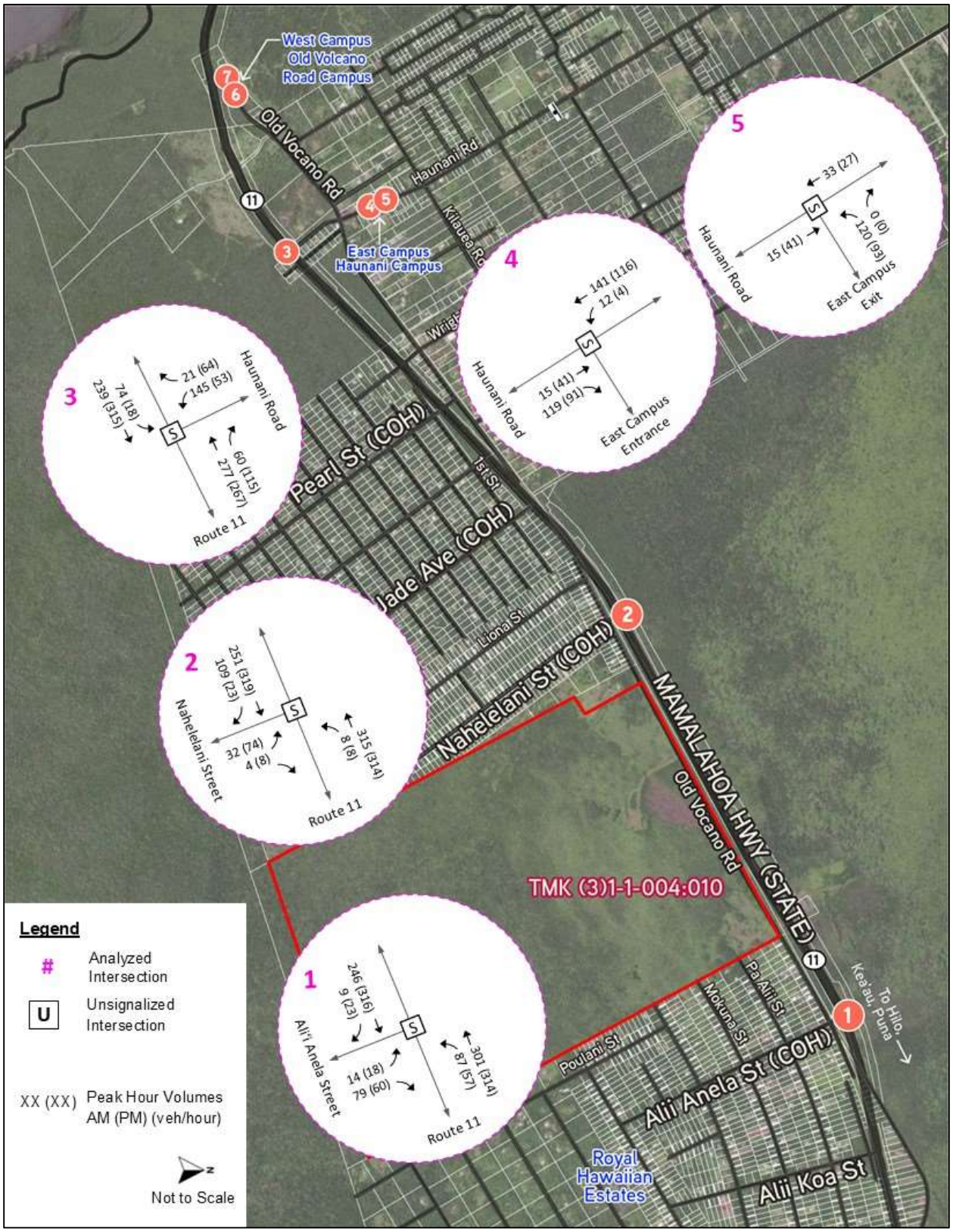

Figure 8: Future (2040) With Project Peak Hour Volumes

B. Future (2040) With Project Level of Service

1. Future (2040) With Project Conditions

Future (2040) With Project intersection and movement LOS and delay (in seconds per vehicle) was determined for the AM and PM peak hours using *Synchro 11* traffic analysis software and are shown in Table 9. Future (2040) With Project Synchro Analysis Worksheets can be found in Appendix D.

Table 9: Future (2040) With Project LOS

Intersection and Movement	AM Peak			PM Peak		
	LOS	Delay (sec/veh)	v/c	LOS	Delay (sec/veh)	v/c
Route 11 at Ali'i Anela Street	**-**	**2.4**	**-**	**-**	**2.0**	**-**
Route 11 WB Left-Through	A	8.0	0.07	A	8.3	0.06
Ali'i Anela NB Left-Right	B	11.7	0.16	B	13.6	0.18
Route 11 at Nahelenani Street	**-**	**0.8**	**-**	**-**	**1.8**	**-**
Route 11 WB Left-Through	A	8.1	0.01	A	8.0	0.01
Nahelenani NB Left-Right	B	14.3	0.09	B	15.7	0.21
Route 11 at Haunani Road	**-**	**5.5**	**-**	**-**	**2.2**	**-**
Route 11 EB Left-Through	A	8.2	0.07	A	8.2	0.02
Haunani SB Left-Right	C	23.5	0.49	B	14.6	0.25
Haunani Road at East Campus Entrance	**-**	**0.3**	**-**	**-**	**0.1**	**-**
Haunani Road SB Left-Through	A	7.6	0.01	A	7.7	0.01
Haunani Road at East Campus Exit	**-**	**6.8**	**-**	**-**	**5.8**	**-**
East Campus SB Left-Right	A	9.5	0.16	B	10.0	0.17

All movements are projected to continue to operate at an acceptable LOS and therefore mitigation is not needed for the Future (2040) With Project conditions.

V. SUMMARY AND RECOMMENDATIONS

VSAS is planning to relocate students from the existing West Campus to an expanded East Campus and proposed New Campus site located on TMK (3) 1-1-004:010 with the West Campus planned 2027 closure. The East Campus has a current enrolment of 80 5th-8th grade students and is anticipated to serve a maximum of 240 Kindergarten through 5th-8th grade students by 2040. The New Campus is anticipated to finish in 2027 to accommodate an enrollment of up to 342 Pre-K and 6th-12th grade students in 2040. Up to 100 students will participate in the "blended program" where students will be on campus two to three times a week on a rotational basis with drop-off and pick-up during non-peak times.

The Existing (2025) and Future (2040) conditions were analyzed and resulted in all study intersection movements operating at an acceptable level of service. Therefore, no traffic mitigation is recommended at this time.

VI. REFERENCES

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Appendix A
Traffic Count Data

Type of peak hour being reported: User-Defined

Method for determining peak hour: Total Entering Volume

LOCATION: West Campus Entrance -- Volcano Rd
CITY/STATE: Volcano, HI

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DATE: Tue, Mar 11 2025

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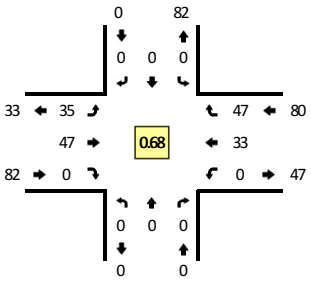
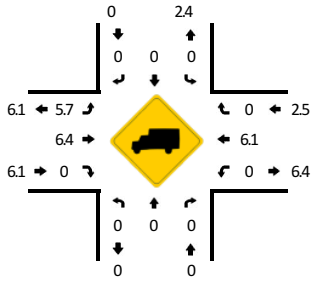
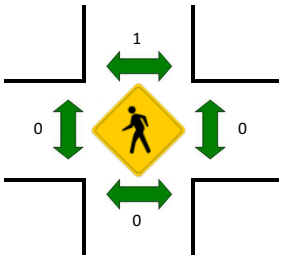
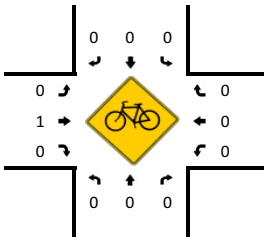
Peak 15-Min: 7:45 AM -- 8:00 AM

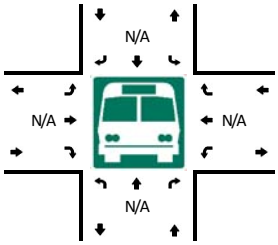


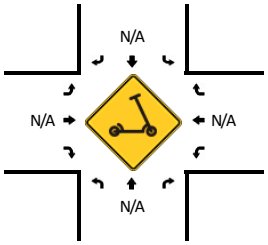


TRUE DATA TO IMPROVE MOBILITY









15-Min Count Period Beginning At	West Campus Entrance (Northbound)				West Campus Entrance (Southbound)				Volcano Rd (Eastbound)				Volcano Rd (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
6:30 AM	0	0	0	0	0	0	0	0	1	2	0	0	0	4	0	0	7	
6:45 AM	0	0	0	0	0	0	0	0	4	5	0	0	0	4	1	0	14	
7:00 AM	0	0	0	0	0	0	0	0	3	6	0	0	0	6	6	0	21	
7:15 AM	0	0	0	0	0	0	0	0	5	4	0	0	0	5	9	0	23	65
7:30 AM	0	0	0	0	0	0	0	0	11	17	0	0	0	12	15	0	55	113
7:45 AM	0	0	0	0	0	0	0	0	14	17	0	0	0	9	20	0	60	159
8:00 AM	0	0	0	0	0	0	0	0	5	9	0	0	0	7	3	0	24	162
8:15 AM	0	0	0	0	0	0	0	0	4	6	0	0	0	5	1	0	16	155

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	0	0	0	0	0	0	0	0	56	68	0	0	0	36	80	0	240
Heavy Trucks	0	0	0		0	0	0		0	0	0		0	0	0		0
Buses																	
Pedestrians		0				4				0				0			4
Bicycles	0	0	0		0	0	0		0	4	0		0	0	0		4
Scooters																	

Comments:

Report generated on 4/14/2025 11:54 AM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

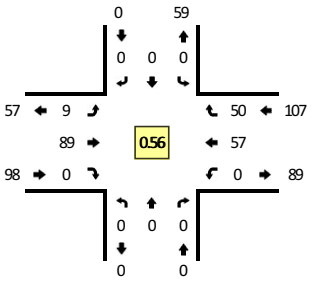
Type of peak hour being reported: User-Defined

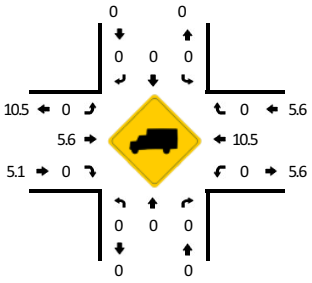
Method for determining peak hour: Total Entering Volume

LOCATION: West Campus Entrance -- Volcano Rd
CITY/STATE: Volcano, HI

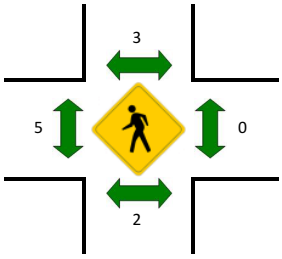
QC JOB #: 16943502
DATE: Tue, Mar 11 2025

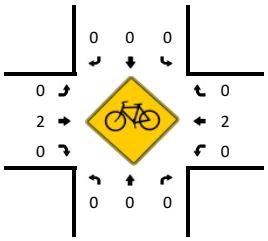
Peak-Hour: 2:00 PM -- 3:00 PM
Peak 15-Min: 2:15 PM -- 2:30 PM

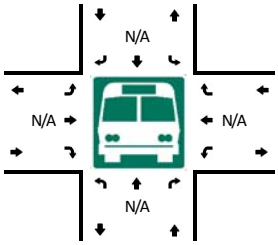


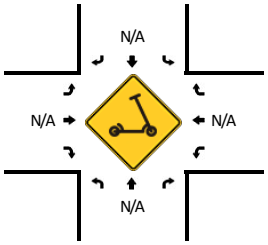


TRUE DATA TO IMPROVE MOBILITY









15-Min Count Period Beginning At	West Campus Entrance (Northbound)				West Campus Entrance (Southbound)				Volcano Rd (Eastbound)				Volcano Rd (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
1:30 PM	0	0	0	0	0	0	0	0	1	13	0	0	0	11	2	0	27	
1:45 PM	0	0	0	0	0	0	0	0	3	19	0	0	0	15	0	0	37	
2:00 PM	0	0	0	0	0	0	0	0	2	22	0	0	0	17	17	0	58	
2:15 PM	0	0	0	0	0	0	0	0	2	40	0	0	0	21	28	0	91	213
2:30 PM	0	0	0	0	0	0	0	0	4	15	0	0	0	10	3	0	32	218
2:45 PM	0	0	0	0	0	0	0	0	1	12	0	0	0	9	2	0	24	205
3:00 PM	0	0	0	0	0	0	0	0	0	9	0	0	0	10	0	0	19	166
3:15 PM	0	0	0	0	0	0	0	0	0	12	0	0	0	9	0	0	21	96

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	0	0	0	0	0	0	0	0	8	160	0	0	0	84	112	0	364
Heavy Trucks	0	0	0		0	0	0		0	8	0		0	20	0		28
Buses																	
Pedestrians		0				8				0				0			8
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Scooters																	

Comments:

Report generated on 4/14/2025 11:55 AM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

Type of peak hour being reported: User-Defined

Method for determining peak hour: Total Entering Volume

LOCATION: West Campus Exit -- Volcano Rd
CITY/STATE: Volcano, HI

QC JOB #: 16943503
DATE: Tue, Mar 11 2025

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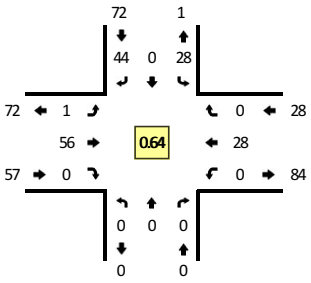
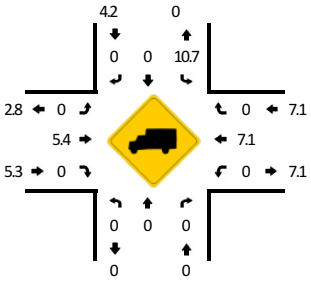
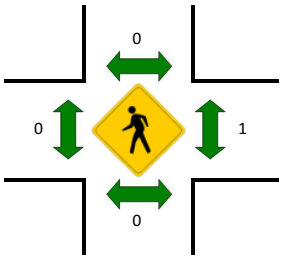
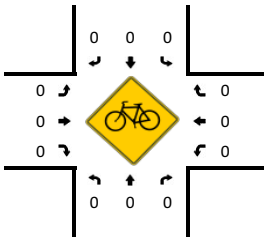
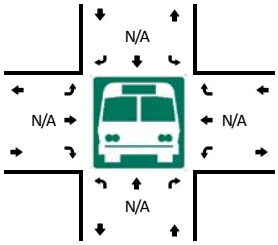
Peak 15-Min: 7:45 AM -- 8:00 AM

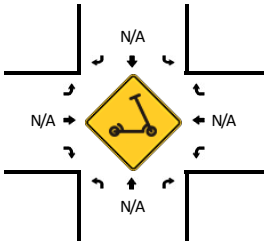












15-Min Count Period Beginning At	West Campus Exit (Northbound)				West Campus Exit (Southbound)				Volcano Rd (Eastbound)				Volcano Rd (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
6:30 AM	0	0	0	0	0	0	0	0	0	3	0	0	0	4	0	0	7	
6:45 AM	0	0	0	0	1	0	1	0	0	8	0	0	0	4	0	1	15	
7:00 AM	0	0	0	0	1	0	3	0	0	8	0	0	0	5	0	0	17	
7:15 AM	0	0	0	0	2	0	3	0	0	7	0	0	0	5	0	0	17	56
7:30 AM	0	0	0	0	8	0	15	0	0	20	0	0	0	9	0	0	52	101
7:45 AM	0	0	0	0	13	0	20	0	1	20	0	0	0	7	0	0	61	147
8:00 AM	0	0	0	0	5	0	6	0	0	9	0	0	0	7	0	0	27	157
8:15 AM	0	0	0	0	2	0	0	0	0	8	0	0	0	5	1	0	16	156

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	0	0	0	0	52	0	80	0	4	80	0	0	0	28	0	0	244
Heavy Trucks	0	0	0		0	0	0		0	0	0		0	0	0		0
Buses																	
Pedestrians		0				0				0				0			0
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Scooters																	

Comments:

Report generated on 4/14/2025 11:55 AM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

Type of peak hour being reported: User-Defined

Method for determining peak hour: Total Entering Volume

LOCATION: West Campus Exit -- Volcano Rd
CITY/STATE: Volcano, HI

QC JOB #: 16943504
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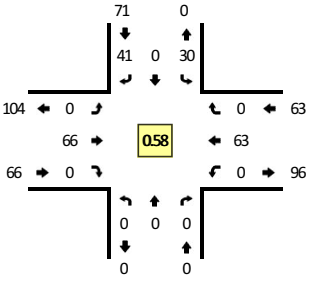
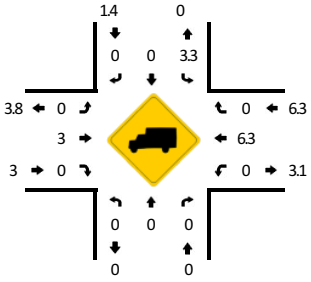
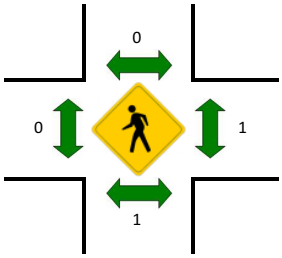
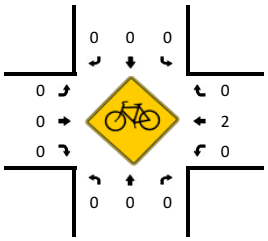
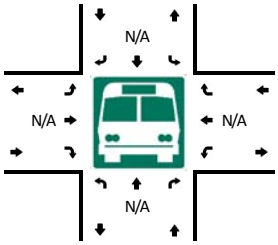
Peak 15-Min: 2:15 PM -- 2:30 PM

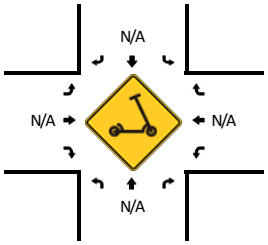












15-Min Count Period Beginning At	West Campus Exit (Northbound)				West Campus Exit (Southbound)				Volcano Rd (Eastbound)				Volcano Rd (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
1:30 PM	0	0	0	0	0	0	1	0	0	16	0	0	0	11	0	0	28	
1:45 PM	0	0	0	0	1	0	0	0	0	20	0	0	0	11	0	1	33	
2:00 PM	0	0	0	0	5	0	4	0	0	23	0	0	0	20	0	0	52	
2:15 PM	0	0	0	0	17	0	23	0	0	22	0	0	0	24	0	0	86	199
2:30 PM	0	0	0	0	6	0	13	0	0	11	0	0	0	10	0	0	40	211
2:45 PM	0	0	0	0	2	0	1	0	0	10	0	0	0	9	0	0	22	200
3:00 PM	0	0	0	0	0	0	2	0	0	10	0	0	0	10	0	0	22	170
3:15 PM	0	0	0	0	1	0	2	0	0	14	0	0	0	8	1	0	26	110

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	0	0	0	0	68	0	92	0	0	88	0	0	0	96	0	0	344
Heavy Trucks	0	0	0		4	0	0		0	4	0		0	16	0		24
Buses																	
Pedestrians		0				0				0				4			4
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Scooters																	

Comments:

Report generated on 4/14/2025 11:55 AM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

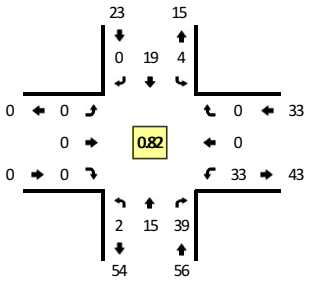
Type of peak hour being reported: User-Defined

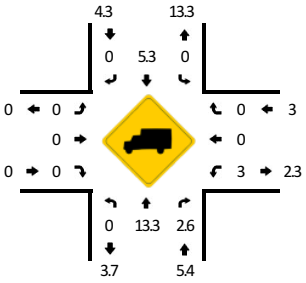
Method for determining peak hour: Total Entering Volume

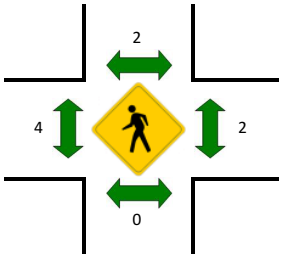
LOCATION: Haunani Rd -- East Campus Entrance (5) and Exit (6)
CITY/STATE: Volcano, HI

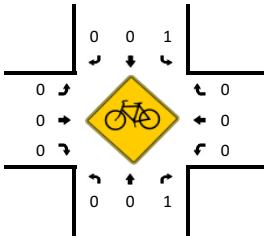
QC JOB #: 16943507
DATE: Tue, Mar 11 2025

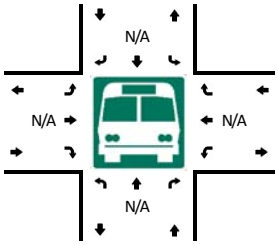
Peak-Hour: 7:15 AM -- 8:15 AM
Peak 15-Min: 7:30 AM -- 7:45 AM

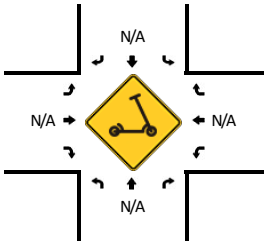












15-Min Count Period Beginning At	Haunani Rd (Northbound)				Haunani Rd (Southbound)				East Campus Entrance (5) and Exit (6) (Eastbound)				East Campus Entrance (5) and Exit (6) (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
6:30 AM	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	4	
6:45 AM	0	3	2	0	0	5	0	0	0	0	0	0	0	0	0	0	10	
7:00 AM	0	6	3	0	1	9	0	0	0	0	0	0	2	0	0	0	21	
7:15 AM	0	3	11	0	3	6	0	0	0	0	0	0	9	0	0	0	32	67
7:30 AM	0	4	15	1	1	4	0	0	0	0	0	0	9	0	0	0	34	97
7:45 AM	0	3	10	1	0	7	0	0	0	0	0	0	13	0	0	0	34	121
8:00 AM	0	5	3	0	0	2	0	0	0	0	0	0	2	0	0	0	12	112
8:15 AM	0	2	0	0	0	7	0	0	0	0	0	0	2	0	0	0	11	91

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	0	16	60	4	4	16	0	0	0	0	0	0	36	0	0	0	136
Heavy Trucks	0	0	4		0	0	0		0	0	0		0	0	0		4
Buses																	
Pedestrians		0				8				12				4			24
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Scooters																	

Comments:

Report generated on 4/14/2025 11:55 AM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

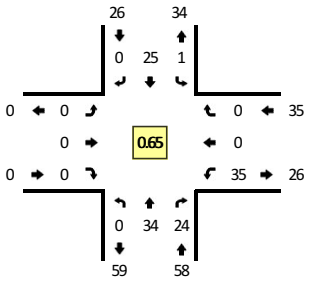
Type of peak hour being reported: User-Defined | Method for determining peak hour: Total Entering Volume

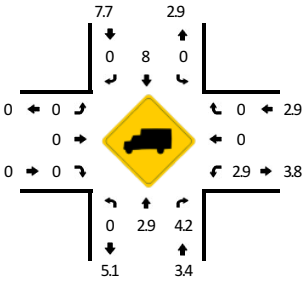
LOCATION: Haunani Rd -- East Campus Entrance (5) and Exit (6) | **QC JOB #:** 16943508

CITY/STATE: Volcano, HI | **DATE:** Tue, Mar 11 2025

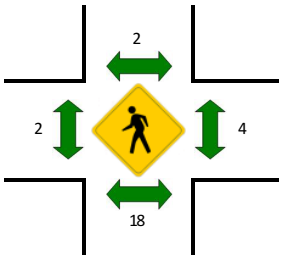
Peak-Hour: 2:00 PM -- 3:00 PM

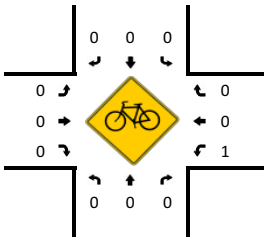
Peak 15-Min: 2:15 PM -- 2:30 PM

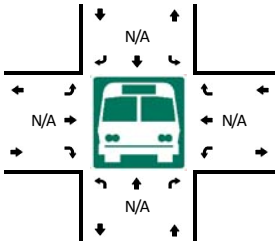


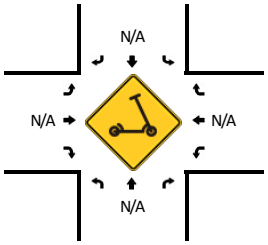


TRUE DATA TO IMPROVE MOBILITY









15-Min Count Period Beginning At	Haunani Rd (Northbound)				Haunani Rd (Southbound)				East Campus Entrance (5) and Exit (6) (Eastbound)				East Campus Entrance (5) and Exit (6) (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
1:30 PM	0	6	2	0	0	6	0	0	0	0	0	0	2	0	0	0	16	
1:45 PM	0	6	1	0	0	10	0	0	0	0	0	0	1	0	1	0	19	
2:00 PM	0	9	10	0	1	7	0	0	0	0	0	0	13	0	0	1	41	
2:15 PM	0	10	11	0	0	9	0	0	0	0	0	0	16	0	0	0	46	122
2:30 PM	0	5	1	0	0	3	0	0	0	0	0	0	4	0	0	0	13	119
2:45 PM	0	10	2	0	0	6	0	0	0	0	0	0	1	0	0	0	19	119
3:00 PM	0	6	0	0	0	3	0	0	0	0	0	0	2	0	0	0	11	89
3:15 PM	0	7	0	0	0	4	0	0	0	0	0	0	0	0	0	0	11	54

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	0	40	44	0	0	36	0	0	0	0	0	0	64	0	0	0	184
Heavy Trucks	0	0	4		0	8	0		0	0	0		4	0	0		16
Buses																	
Pedestrians		64				4				0				0			68
Bicycles	0	0	0		0	0	0		0	0	0		4	0	0		4
Scooters																	

Comments:

Report generated on 4/14/2025 11:55 AM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

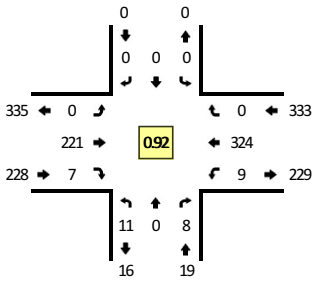
Type of peak hour being reported: User-Defined

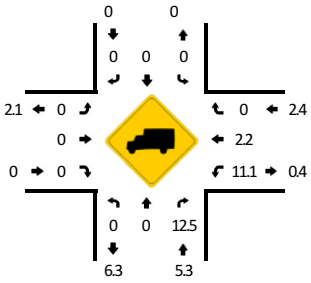
Method for determining peak hour: Total Entering Volume

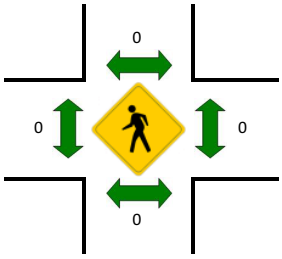
LOCATION: Nahelenani St -- Route 11/Hawaii Belt Rd
CITY/STATE: Volcano, HI

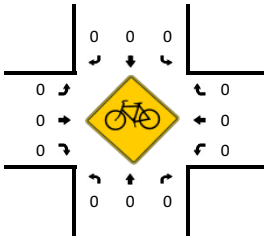
QC JOB #: 16943509
DATE: Tue, Mar 11 2025

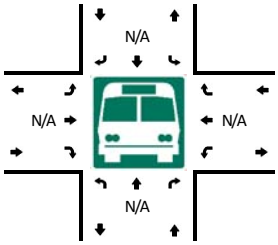
Peak-Hour: 7:15 AM -- 8:15 AM
Peak 15-Min: 7:30 AM -- 7:45 AM

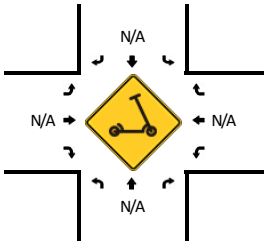












15-Min Count Period Beginning At	Nahelenani St (Northbound)				Nahelenani St (Southbound)				Route 11/Hawaii Belt Rd (Eastbound)				Route 11/Hawaii Belt Rd (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
6:30 AM	1	0	2	0	0	0	0	0	0	43	1	0	0	37	0	0	84	
6:45 AM	4	0	3	0	0	0	0	0	0	34	0	0	0	63	0	0	104	
7:00 AM	5	0	6	0	0	0	0	0	0	43	1	0	0	62	0	0	117	
7:15 AM	3	0	0	0	0	0	0	0	0	43	2	0	1	88	0	0	137	442
7:30 AM	2	0	3	0	0	0	0	0	0	59	1	0	6	87	0	0	158	516
7:45 AM	4	0	4	0	0	0	0	0	0	57	1	0	1	85	0	0	152	564
8:00 AM	2	0	1	0	0	0	0	0	0	62	3	0	1	64	0	0	133	580
8:15 AM	0	0	1	0	0	0	0	0	0	59	0	0	3	51	0	0	114	557

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	8	0	12	0	0	0	0	0	0	236	4	0	24	348	0	0	632
Heavy Trucks	0	0	0		0	0	0		0	0	0		4	4	0		8
Buses																	
Pedestrians		0				0				0				0			0
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Scooters																	

Comments:

Report generated on 4/14/2025 11:55 AM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

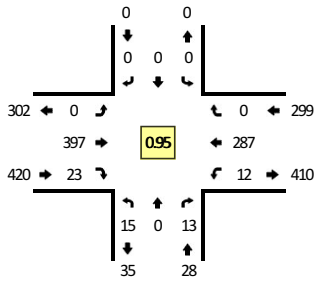
Type of peak hour being reported: User-Defined

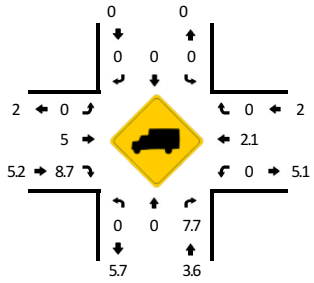
Method for determining peak hour: Total Entering Volume

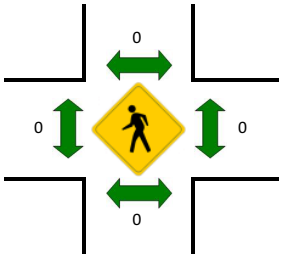
LOCATION: Nahelenani St -- Route 11/Hawaii Belt Rd
CITY/STATE: Volcano, HI

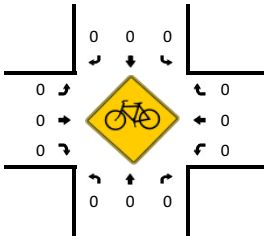
QC JOB #: 16943510
DATE: Tue, Mar 11 2025

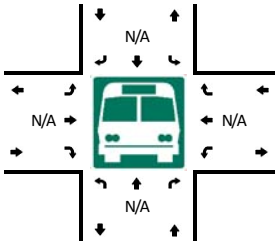
Peak-Hour: 2:00 PM -- 3:00 PM
Peak 15-Min: 2:15 PM -- 2:30 PM

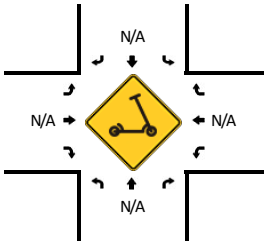












15-Min Count Period Beginning At	Nahelenani St (Northbound)				Nahelenani St (Southbound)				Route 11/Hawaii Belt Rd (Eastbound)				Route 11/Hawaii Belt Rd (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
1:30 PM	5	0	4	0	0	0	0	0	0	75	5	0	3	76	0	0	168	
1:45 PM	4	0	4	0	0	0	0	0	0	90	3	0	0	98	0	0	199	
2:00 PM	6	0	2	0	0	0	0	0	0	94	2	0	3	82	0	0	189	
2:15 PM	3	0	4	0	0	0	0	0	0	114	7	0	3	66	0	0	197	753
2:30 PM	1	0	4	0	0	0	0	0	0	103	8	0	4	69	0	0	189	774
2:45 PM	5	0	3	0	0	0	0	0	0	86	6	0	2	70	0	0	172	747
3:00 PM	3	0	1	0	0	0	0	0	0	111	4	0	1	73	0	0	193	751
3:15 PM	3	0	0	0	0	0	0	0	0	94	5	0	1	58	0	0	161	715

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	12	0	16	0	0	0	0	0	0	456	28	0	12	264	0	0	788
Heavy Trucks	0	0	4		0	0	0		0	16	4		0	0	0		24
Buses																	
Pedestrians		0				0				0				0			0
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Scooters																	

Comments:

Report generated on 4/14/2025 11:55 AM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

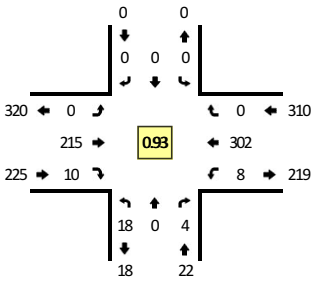
Type of peak hour being reported: User-Defined

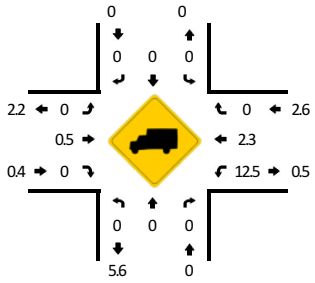
Method for determining peak hour: Total Entering Volume

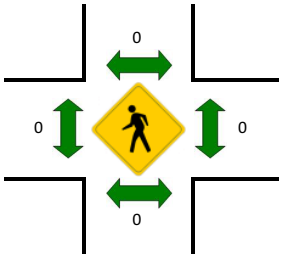
LOCATION: Alii Anela St -- Route 11/Hawaii Belt Rd
CITY/STATE: Royal Hawaiian Estates, HI

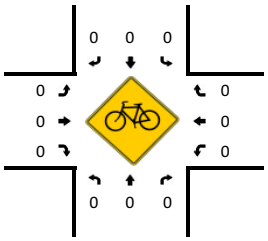
QC JOB #: 16943511
DATE: Tue, Mar 11 2025

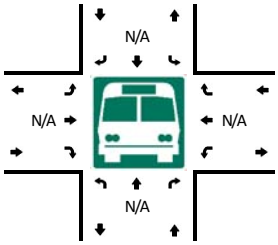
Peak-Hour: 7:15 AM -- 8:15 AM
Peak 15-Min: 7:45 AM -- 8:00 AM

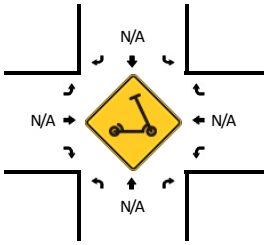












15-Min Count Period Beginning At	Alii Anela St (Northbound)				Alii Anela St (Southbound)				Route 11/Hawaii Belt Rd (Eastbound)				Route 11/Hawaii Belt Rd (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
6:30 AM	1	0	2	0	0	0	0	0	0	45	0	0	2	36	0	0	86	
6:45 AM	3	0	4	0	0	0	0	0	0	37	0	0	4	57	0	0	105	
7:00 AM	5	0	6	0	0	0	0	0	0	46	1	0	3	71	0	0	132	
7:15 AM	5	0	0	0	0	0	0	0	0	43	2	0	1	81	0	0	132	455
7:30 AM	6	0	2	0	0	0	0	0	0	53	2	0	2	77	0	0	142	511
7:45 AM	5	0	0	0	0	0	0	0	0	57	2	0	3	83	0	0	150	556
8:00 AM	2	0	2	0	0	0	0	0	0	62	4	0	2	61	0	0	133	557
8:15 AM	3	0	5	0	0	0	0	0	0	61	2	0	4	61	0	0	136	561

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	20	0	0	0	0	0	0	0	0	228	8	0	12	332	0	0	600
Heavy Trucks	0	0	0		0	0	0		0	4	0		4	4	0		12
Buses																	
Pedestrians		0				0				0				0			0
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Scooters																	

Comments:

Report generated on 4/14/2025 11:55 AM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

Type of peak hour being reported: User-Defined

Method for determining peak hour: Total Entering Volume

LOCATION: Alii Anela St -- Route 11/Hawaii Belt Rd

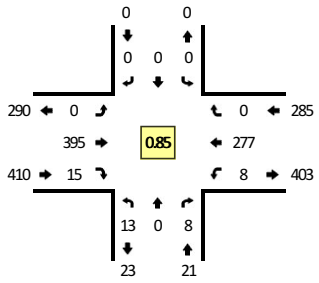
CITY/STATE: Royal Hawaiian Estates, HI

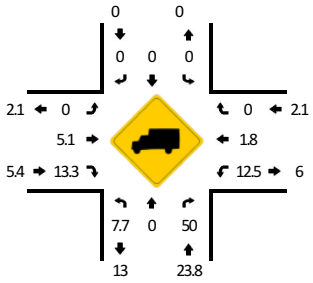
QC JOB #: 16943512

DATE: Tue, Mar 11 2025

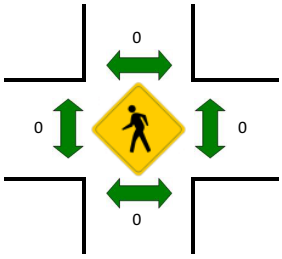
Peak-Hour: 2:00 PM -- 3:00 PM

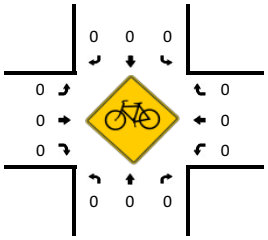
Peak 15-Min: 2:15 PM -- 2:30 PM

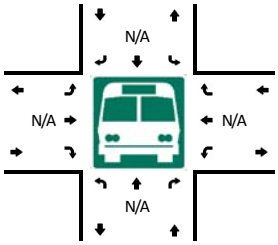


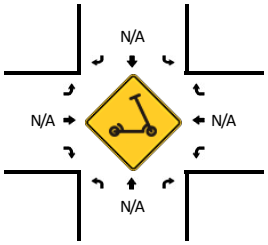


TRUE DATA TO IMPROVE MOBILITY









15-Min Count Period Beginning At	Alii Anela St (Northbound)				Alii Anela St (Southbound)				Route 11/Hawaii Belt Rd (Eastbound)				Route 11/Hawaii Belt Rd (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
1:30 PM	1	0	0	0	0	0	0	0	0	72	2	0	1	78	0	0	154	
1:45 PM	2	0	3	0	0	0	0	0	0	85	2	0	3	103	0	0	198	
2:00 PM	4	0	2	0	0	0	0	0	0	86	5	0	2	69	0	0	168	
2:15 PM	0	0	4	0	0	0	0	0	0	124	4	0	1	77	0	0	210	730
2:30 PM	3	0	2	0	0	0	0	0	0	101	4	0	3	60	0	0	173	749
2:45 PM	6	0	0	0	0	0	0	0	0	84	2	0	2	71	0	0	165	716
3:00 PM	1	0	4	0	0	0	0	0	0	102	7	0	4	70	0	0	188	736
3:15 PM	4	0	7	0	0	0	0	0	0	88	3	0	4	56	0	0	162	688

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	0	0	16	0	0	0	0	0	0	496	16	0	4	308	0	0	840
Heavy Trucks	0	0	12		0	0	0		0	28	4		0	8	0		52
Buses																	
Pedestrians		0				0				0				0			0
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Scooters																	

Comments:

Report generated on 4/14/2025 11:55 AM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

Appendix B
Analysis Report Existing Conditions

Intersection	
Int Delay, s/veh	0.7

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	171	10	8	217	18	4
Future Vol, veh/h	171	10	8	217	18	4
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	186	11	9	236	20	4

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	197	0	446	192
Stage 1	-	-	-	-	192	-
Stage 2	-	-	-	-	254	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1376	-	570	850
Stage 1	-	-	-	-	841	-
Stage 2	-	-	-	-	788	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1376	-	565	850
Mov Cap-2 Maneuver	-	-	-	-	565	-
Stage 1	-	-	-	-	841	-
Stage 2	-	-	-	-	782	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.3	11.2
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	602	-	-	1376	-
HCM Lane V/C Ratio	0.04	-	-	0.006	-
HCM Control Delay (s)	11.2	-	-	7.6	0
HCM Lane LOS	B	-	-	A	A
HCM 95th %tile Q(veh)	0.1	-	-	0	-

Intersection	
Int Delay, s/veh	0.6

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	173	7	9	226	11	8
Future Vol, veh/h	173	7	9	226	11	8
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	188	8	10	246	12	9

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	196	0	458	192
Stage 1	-	-	-	-	192	-
Stage 2	-	-	-	-	266	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1377	-	561	850
Stage 1	-	-	-	-	841	-
Stage 2	-	-	-	-	779	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1377	-	557	850
Mov Cap-2 Maneuver	-	-	-	-	557	-
Stage 1	-	-	-	-	841	-
Stage 2	-	-	-	-	773	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.3	10.7
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	652	-	-	1377	-
HCM Lane V/C Ratio	0.032	-	-	0.007	-
HCM Control Delay (s)	10.7	-	-	7.6	0
HCM Lane LOS	B	-	-	A	A
HCM 95th %tile Q(veh)	0.1	-	-	0	-

Intersection	
Int Delay, s/veh	1.9

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	30	134	213	24	46	8
Future Vol, veh/h	30	134	213	24	46	8
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	33	146	232	26	50	9

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	258	0	-	0	457	245
Stage 1	-	-	-	-	245	-
Stage 2	-	-	-	-	212	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1307	-	-	-	562	794
Stage 1	-	-	-	-	796	-
Stage 2	-	-	-	-	823	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1307	-	-	-	547	794
Mov Cap-2 Maneuver	-	-	-	-	547	-
Stage 1	-	-	-	-	775	-
Stage 2	-	-	-	-	823	-

Approach	EB	WB	SB
HCM Control Delay, s	1.4	0	12
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1307	-	-	-	573
HCM Lane V/C Ratio	0.025	-	-	-	0.102
HCM Control Delay (s)	7.8	0	-	-	12
HCM Lane LOS	A	A	-	-	B
HCM 95th %tile Q(veh)	0.1	-	-	-	0.3

Intersection	
Int Delay, s/veh	0.3

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	0	0	15	39	4	54
Future Vol, veh/h	0	0	15	39	4	54
Conflicting Peds, #/hr	2	0	0	2	2	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	82	82	82	82	82	82
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	0	18	48	5	66

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	122	44	0	0	68	0
Stage 1	44	-	-	-	-	-
Stage 2	78	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	873	1026	-	-	1533	-
Stage 1	978	-	-	-	-	-
Stage 2	945	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	867	1024	-	-	1530	-
Mov Cap-2 Maneuver	867	-	-	-	-	-
Stage 1	976	-	-	-	-	-
Stage 2	940	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	0	0	0.5
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	-	1530	-
HCM Lane V/C Ratio	-	-	-	0.003	-
HCM Control Delay (s)	-	-	0	7.4	0
HCM Lane LOS	-	-	A	A	A
HCM 95th %tile Q(veh)	-	-	-	0	-

Intersection	
Int Delay, s/veh	4

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	33	0	15	0	0	25
Future Vol, veh/h	33	0	15	0	0	25
Conflicting Peds, #/hr	2	0	0	2	2	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	82	82	82	82	82	82
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	40	0	18	0	0	30

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	50	18	0	-	-	-
Stage 1	18	-	-	-	-	-
Stage 2	32	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	-	-
Pot Cap-1 Maneuver	959	1061	-	0	0	-
Stage 1	1005	-	-	0	0	-
Stage 2	991	-	-	0	0	-
Platoon blocked, %			-			-
Mov Cap-1 Maneuver	957	1061	-	-	-	-
Mov Cap-2 Maneuver	957	-	-	-	-	-
Stage 1	1005	-	-	-	-	-
Stage 2	989	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	8.9	0	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	WBLn1	SBT
Capacity (veh/h)	-	957	-
HCM Lane V/C Ratio	-	0.042	-
HCM Control Delay (s)	-	8.9	-
HCM Lane LOS	-	A	-
HCM 95th %tile Q(veh)	-	0.1	-

Intersection	
Int Delay, s/veh	1.6

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	35	47	33	47	0	0
Future Vol, veh/h	35	47	33	47	0	0
Conflicting Peds, #/hr	1	0	0	1	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	68	68	68	68	68	68
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	51	69	49	69	0	0

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	119	0	-	0	256	85
Stage 1	-	-	-	-	85	-
Stage 2	-	-	-	-	171	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1469	-	-	-	733	974
Stage 1	-	-	-	-	938	-
Stage 2	-	-	-	-	859	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1468	-	-	-	705	973
Mov Cap-2 Maneuver	-	-	-	-	705	-
Stage 1	-	-	-	-	903	-
Stage 2	-	-	-	-	858	-

Approach	EB	WB	SB
HCM Control Delay, s	3.2	0	0
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1468	-	-	-	-
HCM Lane V/C Ratio	0.035	-	-	-	-
HCM Control Delay (s)	7.5	0	-	-	0
HCM Lane LOS	A	A	-	-	A
HCM 95th %tile Q(veh)	0.1	-	-	-	-

Intersection	
Int Delay, s/veh	4.3

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑	↑		Y	
Traffic Vol, veh/h	0	56	28	0	28	44
Future Vol, veh/h	0	56	28	0	28	44
Conflicting Peds, #/hr	0	0	0	0	1	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	64	64	64	64	64	64
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	88	44	0	44	69

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	-	0	-	0	133	44
Stage 1	-	-	-	-	44	-
Stage 2	-	-	-	-	89	-
Critical Hdwy	-	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	0	-	-	0	861	1026
Stage 1	0	-	-	0	978	-
Stage 2	0	-	-	0	934	-
Platoon blocked, %		-	-			
Mov Cap-1 Maneuver	-	-	-	-	861	1026
Mov Cap-2 Maneuver	-	-	-	-	861	-
Stage 1	-	-	-	-	978	-
Stage 2	-	-	-	-	934	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	9.3
HCM LOS			A

Minor Lane/Major Mvmt	EBT	WBT	SBLn1
Capacity (veh/h)	-	-	955
HCM Lane V/C Ratio	-	-	0.118
HCM Control Delay (s)	-	-	9.3
HCM Lane LOS	-	-	A
HCM 95th %tile Q(veh)	-	-	0.4

Intersection	
Int Delay, s/veh	0.6

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	248	15	8	215	13	8
Future Vol, veh/h	248	15	8	215	13	8
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	85	85	85	85	85	85
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	292	18	9	253	15	9

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	310	0	572	301
Stage 1	-	-	-	-	301	-
Stage 2	-	-	-	-	271	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1250	-	482	739
Stage 1	-	-	-	-	751	-
Stage 2	-	-	-	-	775	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1250	-	478	739
Mov Cap-2 Maneuver	-	-	-	-	478	-
Stage 1	-	-	-	-	751	-
Stage 2	-	-	-	-	769	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.3	11.8
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	552	-	-	1250	-
HCM Lane V/C Ratio	0.045	-	-	0.008	-
HCM Control Delay (s)	11.8	-	-	7.9	0
HCM Lane LOS	B	-	-	A	A
HCM 95th %tile Q(veh)	0.1	-	-	0	-

Intersection	
Int Delay, s/veh	0.8

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	250	23	15	213	15	13
Future Vol, veh/h	250	23	15	213	15	13
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	263	24	16	224	16	14

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	287	0	531	275
Stage 1	-	-	-	-	275	-
Stage 2	-	-	-	-	256	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1275	-	509	764
Stage 1	-	-	-	-	771	-
Stage 2	-	-	-	-	787	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1275	-	502	764
Mov Cap-2 Maneuver	-	-	-	-	502	-
Stage 1	-	-	-	-	771	-
Stage 2	-	-	-	-	776	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.5	11.3
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	597	-	-	1275	-
HCM Lane V/C Ratio	0.049	-	-	0.012	-
HCM Control Delay (s)	11.3	-	-	7.9	0
HCM Lane LOS	B	-	-	A	A
HCM 95th %tile Q(veh)	0.2	-	-	0	-

Intersection	
Int Delay, s/veh	1.3

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	9	247	178	50	26	32
Future Vol, veh/h	9	247	178	50	26	32
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	10	268	193	54	28	35

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	247	0	-	0	508	220
Stage 1	-	-	-	-	220	-
Stage 2	-	-	-	-	288	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1319	-	-	-	525	820
Stage 1	-	-	-	-	817	-
Stage 2	-	-	-	-	761	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1319	-	-	-	520	820
Mov Cap-2 Maneuver	-	-	-	-	520	-
Stage 1	-	-	-	-	810	-
Stage 2	-	-	-	-	761	-

Approach	EB	WB	SB
HCM Control Delay, s	0.3	0	11.1
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1319	-	-	-	652
HCM Lane V/C Ratio	0.007	-	-	-	0.097
HCM Control Delay (s)	7.8	0	-	-	11.1
HCM Lane LOS	A	A	-	-	B
HCM 95th %tile Q(veh)	0	-	-	-	0.3

Intersection	
Int Delay, s/veh	0.1

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	0	0	34	24	1	58
Future Vol, veh/h	0	0	34	24	1	58
Conflicting Peds, #/hr	18	2	0	4	4	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	65	65	65	65	65	65
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	0	52	37	2	89

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	186	77	0	0	93	0
Stage 1	75	-	-	-	-	-
Stage 2	111	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	803	984	-	-	1501	-
Stage 1	948	-	-	-	-	-
Stage 2	914	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	785	978	-	-	1495	-
Mov Cap-2 Maneuver	785	-	-	-	-	-
Stage 1	944	-	-	-	-	-
Stage 2	898	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	0	0	0.1
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	-	1495	-
HCM Lane V/C Ratio	-	-	-	0.001	-
HCM Control Delay (s)	-	-	0	7.4	0
HCM Lane LOS	-	-	A	A	A
HCM 95th %tile Q(veh)	-	-	-	0	-

Intersection	
Int Delay, s/veh	3.5

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	35	0	34	0	0	24
Future Vol, veh/h	35	0	34	0	0	24
Conflicting Peds, #/hr	18	2	0	4	4	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	65	65	65	65	65	65
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	54	0	52	0	0	37

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	107	54	0	-	-	-
Stage 1	52	-	-	-	-	-
Stage 2	55	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	-	-
Pot Cap-1 Maneuver	891	1013	-	0	0	-
Stage 1	970	-	-	0	0	-
Stage 2	968	-	-	0	0	-
Platoon blocked, %			-			-
Mov Cap-1 Maneuver	876	1011	-	-	-	-
Mov Cap-2 Maneuver	876	-	-	-	-	-
Stage 1	970	-	-	-	-	-
Stage 2	952	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	9.4	0	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	WBLn1	SBT
Capacity (veh/h)	-	876	-
HCM Lane V/C Ratio	-	0.061	-
HCM Control Delay (s)	-	9.4	-
HCM Lane LOS	-	A	-
HCM 95th %tile Q(veh)	-	0.2	-

Intersection	
Int Delay, s/veh	0.3

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	9	89	57	50	0	0
Future Vol, veh/h	9	89	57	50	0	0
Conflicting Peds, #/hr	3	0	0	3	0	5
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	56	56	56	56	56	56
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	16	159	102	89	0	0

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	194	0	-	0	341	155
Stage 1	-	-	-	-	150	-
Stage 2	-	-	-	-	191	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1379	-	-	-	655	891
Stage 1	-	-	-	-	878	-
Stage 2	-	-	-	-	841	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1375	-	-	-	643	884
Mov Cap-2 Maneuver	-	-	-	-	643	-
Stage 1	-	-	-	-	864	-
Stage 2	-	-	-	-	838	-

Approach	EB	WB	SB
HCM Control Delay, s	0.7	0	0
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1375	-	-	-	-
HCM Lane V/C Ratio	0.012	-	-	-	-
HCM Control Delay (s)	7.6	0	-	-	0
HCM Lane LOS	A	A	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	-

Intersection	
Int Delay, s/veh	3.5

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑	↑		↱	
Traffic Vol, veh/h	0	66	63	0	30	41
Future Vol, veh/h	0	66	63	0	30	41
Conflicting Peds, #/hr	0	0	0	0	1	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	58	58	58	58	58	58
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	114	109	0	52	71

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	-	0	-	0	224	109
Stage 1	-	-	-	-	109	-
Stage 2	-	-	-	-	115	-
Critical Hdwy	-	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	0	-	-	0	764	945
Stage 1	0	-	-	0	916	-
Stage 2	0	-	-	0	910	-
Platoon blocked, %		-	-			
Mov Cap-1 Maneuver	-	-	-	-	764	945
Mov Cap-2 Maneuver	-	-	-	-	764	-
Stage 1	-	-	-	-	916	-
Stage 2	-	-	-	-	910	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	9.9
HCM LOS			A

Minor Lane/Major Mvmt	EBT	WBT	SBLn1
Capacity (veh/h)	-	-	859
HCM Lane V/C Ratio	-	-	0.143
HCM Control Delay (s)	-	-	9.9
HCM Lane LOS	-	-	A
HCM 95th %tile Q(veh)	-	-	0.5

Appendix C
Analysis Report Future Without Project Conditions

Intersection	
Int Delay, s/veh	0.5

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	213	7	9	271	11	8
Future Vol, veh/h	213	7	9	271	11	8
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	232	8	10	295	12	9

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	240	0	551	236
Stage 1	-	-	-	-	236	-
Stage 2	-	-	-	-	315	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1327	-	495	803
Stage 1	-	-	-	-	803	-
Stage 2	-	-	-	-	740	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1327	-	491	803
Mov Cap-2 Maneuver	-	-	-	-	491	-
Stage 1	-	-	-	-	803	-
Stage 2	-	-	-	-	733	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.2	11.4
HCM LOS			B

HCM Lane V/C Ratio	0.035	-	-	0.007	-	
HCM Control Delay (s)	11.4	-	-	7.7	0	
HCM Lane LOS	B	-	-	A	A	
HCM 95th %tile Q(veh)	0.1	-	-	0	-	

Intersection	
Int Delay, s/veh	0.6

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	216	10	8	282	18	4
Future Vol, veh/h	216	10	8	282	18	4
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	235	11	9	307	20	4

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	246	0	566	241
Stage 1	-	-	-	-	241	-
Stage 2	-	-	-	-	325	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1320	-	486	798
Stage 1	-	-	-	-	799	-
Stage 2	-	-	-	-	732	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1320	-	482	798
Mov Cap-2 Maneuver	-	-	-	-	482	-
Stage 1	-	-	-	-	799	-
Stage 2	-	-	-	-	726	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.2	12.3
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	519	-	-	1320	-
HCM Lane V/C Ratio	0.046	-	-	0.007	-
HCM Control Delay (s)	12.3	-	-	7.7	0
HCM Lane LOS	B	-	-	A	A
HCM 95th %tile Q(veh)	0.1	-	-	0	-

Intersection	
Int Delay, s/veh	1.7

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	30	167	266	24	46	8
Future Vol, veh/h	30	167	266	24	46	8
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	33	182	289	26	50	9

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	315	0	-	0	550	302
Stage 1	-	-	-	-	302	-
Stage 2	-	-	-	-	248	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1245	-	-	-	496	738
Stage 1	-	-	-	-	750	-
Stage 2	-	-	-	-	793	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1245	-	-	-	482	738
Mov Cap-2 Maneuver	-	-	-	-	482	-
Stage 1	-	-	-	-	728	-
Stage 2	-	-	-	-	793	-

Approach	EB	WB	SB
HCM Control Delay, s	1.2	0	13
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1245	-	-	-	508
HCM Lane V/C Ratio	0.026	-	-	-	0.116
HCM Control Delay (s)	8	0	-	-	13
HCM Lane LOS	A	A	-	-	B
HCM 95th %tile Q(veh)	0.1	-	-	-	0.4

Intersection	
Int Delay, s/veh	0.3

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	0	0	15	39	4	54
Future Vol, veh/h	0	0	15	39	4	54
Conflicting Peds, #/hr	2	0	0	2	2	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	82	82	82	82	82	82
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	0	18	48	5	66

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	122	44	0	0	68	0
Stage 1	44	-	-	-	-	-
Stage 2	78	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	873	1026	-	-	1533	-
Stage 1	978	-	-	-	-	-
Stage 2	945	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	867	1024	-	-	1530	-
Mov Cap-2 Maneuver	867	-	-	-	-	-
Stage 1	976	-	-	-	-	-
Stage 2	940	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	0	0	0.5
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	-	1530	-
HCM Lane V/C Ratio	-	-	-	0.003	-
HCM Control Delay (s)	-	-	0	7.4	0
HCM Lane LOS	-	-	A	A	A
HCM 95th %tile Q(veh)	-	-	-	0	-

Intersection	
Int Delay, s/veh	4

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	33	0	15	0	0	25
Future Vol, veh/h	33	0	15	0	0	25
Conflicting Peds, #/hr	2	0	0	2	2	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	82	82	82	82	82	82
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	40	0	18	0	0	30

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	50	18	0	-	-	-
Stage 1	18	-	-	-	-	-
Stage 2	32	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	-	-
Pot Cap-1 Maneuver	959	1061	-	0	0	-
Stage 1	1005	-	-	0	0	-
Stage 2	991	-	-	0	0	-
Platoon blocked, %			-			-
Mov Cap-1 Maneuver	957	1061	-	-	-	-
Mov Cap-2 Maneuver	957	-	-	-	-	-
Stage 1	1005	-	-	-	-	-
Stage 2	989	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	8.9	0	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	WBLn1	SBT
Capacity (veh/h)	-	957	-
HCM Lane V/C Ratio	-	0.042	-
HCM Control Delay (s)	-	8.9	-
HCM Lane LOS	-	A	-
HCM 95th %tile Q(veh)	-	0.1	-

Intersection	
Int Delay, s/veh	1.6

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	35	47	33	47	0	0
Future Vol, veh/h	35	47	33	47	0	0
Conflicting Peds, #/hr	1	0	0	1	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	68	68	68	68	68	68
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	51	69	49	69	0	0

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	119	0	-	0	256	85
Stage 1	-	-	-	-	85	-
Stage 2	-	-	-	-	171	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1469	-	-	-	733	974
Stage 1	-	-	-	-	938	-
Stage 2	-	-	-	-	859	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1468	-	-	-	705	973
Mov Cap-2 Maneuver	-	-	-	-	705	-
Stage 1	-	-	-	-	903	-
Stage 2	-	-	-	-	858	-

Approach	EB	WB	SB
HCM Control Delay, s	3.2	0	0
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1468	-	-	-	-
HCM Lane V/C Ratio	0.035	-	-	-	-
HCM Control Delay (s)	7.5	0	-	-	0
HCM Lane LOS	A	A	-	-	A
HCM 95th %tile Q(veh)	0.1	-	-	-	-

Intersection	
Int Delay, s/veh	4.3

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑	↑		Y	
Traffic Vol, veh/h	0	56	28	0	28	44
Future Vol, veh/h	0	56	28	0	28	44
Conflicting Peds, #/hr	0	0	0	0	1	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	64	64	64	64	64	64
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	88	44	0	44	69

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	-	0	-	0	133	44
Stage 1	-	-	-	-	44	-
Stage 2	-	-	-	-	89	-
Critical Hdwy	-	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	0	-	-	0	861	1026
Stage 1	0	-	-	0	978	-
Stage 2	0	-	-	0	934	-
Platoon blocked, %		-	-			
Mov Cap-1 Maneuver	-	-	-	-	861	1026
Mov Cap-2 Maneuver	-	-	-	-	861	-
Stage 1	-	-	-	-	978	-
Stage 2	-	-	-	-	934	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	9.3
HCM LOS			A

Minor Lane/Major Mvmt	EBT	WBT	SBLn1
Capacity (veh/h)	-	-	955
HCM Lane V/C Ratio	-	-	0.118
HCM Control Delay (s)	-	-	9.3
HCM Lane LOS	-	-	A
HCM 95th %tile Q(veh)	-	-	0.4

Intersection	
Int Delay, s/veh	0.7

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	309	23	15	268	15	13
Future Vol, veh/h	309	23	15	268	15	13
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	85	85	85	85	85	85
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	364	27	18	315	18	15

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	391	0	729	378
Stage 1	-	-	-	-	378	-
Stage 2	-	-	-	-	351	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1168	-	390	669
Stage 1	-	-	-	-	693	-
Stage 2	-	-	-	-	713	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1168	-	383	669
Mov Cap-2 Maneuver	-	-	-	-	383	-
Stage 1	-	-	-	-	693	-
Stage 2	-	-	-	-	699	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.4	13.1
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	478	-	-	1168	-
HCM Lane V/C Ratio	0.069	-	-	0.015	-
HCM Control Delay (s)	13.1	-	-	8.1	0
HCM Lane LOS	B	-	-	A	A
HCM 95th %tile Q(veh)	0.2	-	-	0	-

Intersection	
Int Delay, s/veh	0.5

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	312	15	8	266	13	8
Future Vol, veh/h	312	15	8	266	13	8
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	328	16	8	280	14	8

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	344	0	632	336
Stage 1	-	-	-	-	336	-
Stage 2	-	-	-	-	296	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1215	-	444	706
Stage 1	-	-	-	-	724	-
Stage 2	-	-	-	-	755	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1215	-	440	706
Mov Cap-2 Maneuver	-	-	-	-	440	-
Stage 1	-	-	-	-	724	-
Stage 2	-	-	-	-	749	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.2	12.3
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	514	-	-	1215	-
HCM Lane V/C Ratio	0.043	-	-	0.007	-
HCM Control Delay (s)	12.3	-	-	8	0
HCM Lane LOS	B	-	-	A	A
HCM 95th %tile Q(veh)	0.1	-	-	0	-

Intersection	
Int Delay, s/veh	1.2

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	9	308	222	50	26	32
Future Vol, veh/h	9	308	222	50	26	32
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	10	335	241	54	28	35

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	295	0	-	0	623	268
Stage 1	-	-	-	-	268	-
Stage 2	-	-	-	-	355	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1266	-	-	-	450	771
Stage 1	-	-	-	-	777	-
Stage 2	-	-	-	-	710	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1266	-	-	-	446	771
Mov Cap-2 Maneuver	-	-	-	-	446	-
Stage 1	-	-	-	-	769	-
Stage 2	-	-	-	-	710	-

Approach	EB	WB	SB
HCM Control Delay, s	0.2	0	11.9
HCM LOS			B

HCM Lane V/C Ratio	0.008	-	-	-	0.109
HCM Control Delay (s)	7.9	0	-	-	11.9
HCM Lane LOS	A	A	-	-	B
HCM 95th %tile Q(veh)	0	-	-	-	0.4

Intersection	
Int Delay, s/veh	0.1

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	0	0	34	24	1	58
Future Vol, veh/h	0	0	34	24	1	58
Conflicting Peds, #/hr	18	2	0	4	4	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	65	65	65	65	65	65
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	0	52	37	2	89

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	186	77	0	0	93	0
Stage 1	75	-	-	-	-	-
Stage 2	111	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	803	984	-	-	1501	-
Stage 1	948	-	-	-	-	-
Stage 2	914	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	785	978	-	-	1495	-
Mov Cap-2 Maneuver	785	-	-	-	-	-
Stage 1	944	-	-	-	-	-
Stage 2	898	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	0	0	0.1
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	-	1495	-
HCM Lane V/C Ratio	-	-	-	0.001	-
HCM Control Delay (s)	-	-	0	7.4	0
HCM Lane LOS	-	-	A	A	A
HCM 95th %tile Q(veh)	-	-	-	0	-

Intersection	
Int Delay, s/veh	3.5

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	35	0	34	0	0	24
Future Vol, veh/h	35	0	34	0	0	24
Conflicting Peds, #/hr	18	2	0	4	4	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	65	65	65	65	65	65
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	54	0	52	0	0	37

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	107	54	0	-	-	-
Stage 1	52	-	-	-	-	-
Stage 2	55	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	-	-
Pot Cap-1 Maneuver	891	1013	-	0	0	-
Stage 1	970	-	-	0	0	-
Stage 2	968	-	-	0	0	-
Platoon blocked, %			-			-
Mov Cap-1 Maneuver	876	1011	-	-	-	-
Mov Cap-2 Maneuver	876	-	-	-	-	-
Stage 1	970	-	-	-	-	-
Stage 2	952	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	9.4	0	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	WBLn1	SBT
Capacity (veh/h)	-	876	-
HCM Lane V/C Ratio	-	0.061	-
HCM Control Delay (s)	-	9.4	-
HCM Lane LOS	-	A	-
HCM 95th %tile Q(veh)	-	0.2	-

Intersection	
Int Delay, s/veh	0.3

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	9	89	57	50	0	0
Future Vol, veh/h	9	89	57	50	0	0
Conflicting Peds, #/hr	3	0	0	3	0	5
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	56	56	56	56	56	56
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	16	159	102	89	0	0

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	194	0	-	0	341	155
Stage 1	-	-	-	-	150	-
Stage 2	-	-	-	-	191	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1379	-	-	-	655	891
Stage 1	-	-	-	-	878	-
Stage 2	-	-	-	-	841	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1375	-	-	-	643	884
Mov Cap-2 Maneuver	-	-	-	-	643	-
Stage 1	-	-	-	-	864	-
Stage 2	-	-	-	-	838	-

Approach	EB	WB	SB
HCM Control Delay, s	0.7	0	0
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1375	-	-	-	-
HCM Lane V/C Ratio	0.012	-	-	-	-
HCM Control Delay (s)	7.6	0	-	-	0
HCM Lane LOS	A	A	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	-

Intersection	
Int Delay, s/veh	3.5

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑	↑		Y	
Traffic Vol, veh/h	0	66	63	0	30	41
Future Vol, veh/h	0	66	63	0	30	41
Conflicting Peds, #/hr	0	0	0	0	1	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	58	58	58	58	58	58
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	114	109	0	52	71

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	-	0	-	0	224	109
Stage 1	-	-	-	-	109	-
Stage 2	-	-	-	-	115	-
Critical Hdwy	-	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	0	-	-	0	764	945
Stage 1	0	-	-	0	916	-
Stage 2	0	-	-	0	910	-
Platoon blocked, %		-	-			
Mov Cap-1 Maneuver	-	-	-	-	764	945
Mov Cap-2 Maneuver	-	-	-	-	764	-
Stage 1	-	-	-	-	916	-
Stage 2	-	-	-	-	910	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	9.9
HCM LOS			A

Minor Lane/Major Mvmt	EBT	WBT	SBLn1
Capacity (veh/h)	-	-	859
HCM Lane V/C Ratio	-	-	0.143
HCM Control Delay (s)	-	-	9.9
HCM Lane LOS	-	-	A
HCM 95th %tile Q(veh)	-	-	0.5

Appendix D
Analysis Report Future With Project Conditions

Intersection	
Int Delay, s/veh	2.4

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	246	9	87	301	14	79
Future Vol, veh/h	246	9	87	301	14	79
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	267	10	95	327	15	86

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	277	0	789	272
Stage 1	-	-	-	-	272	-
Stage 2	-	-	-	-	517	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1286	-	359	767
Stage 1	-	-	-	-	774	-
Stage 2	-	-	-	-	598	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1286	-	327	767
Mov Cap-2 Maneuver	-	-	-	-	327	-
Stage 1	-	-	-	-	774	-
Stage 2	-	-	-	-	544	-

Approach	EB	WB	NB
HCM Control Delay, s	0	1.8	11.7
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	638	-	-	1286	-
HCM Lane V/C Ratio	0.158	-	-	0.074	-
HCM Control Delay (s)	11.7	-	-	8	0
HCM Lane LOS	B	-	-	A	A
HCM 95th %tile Q(veh)	0.6	-	-	0.2	-

Intersection	
Int Delay, s/veh	0.8

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	251	109	8	315	32	4
Future Vol, veh/h	251	109	8	315	32	4
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	273	118	9	342	35	4

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	391	0	692	332
Stage 1	-	-	-	-	332	-
Stage 2	-	-	-	-	360	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1168	-	410	710
Stage 1	-	-	-	-	727	-
Stage 2	-	-	-	-	706	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1168	-	406	710
Mov Cap-2 Maneuver	-	-	-	-	406	-
Stage 1	-	-	-	-	727	-
Stage 2	-	-	-	-	699	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.2	14.3
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	426	-	-	1168	-
HCM Lane V/C Ratio	0.092	-	-	0.007	-
HCM Control Delay (s)	14.3	-	-	8.1	0
HCM Lane LOS	B	-	-	A	A
HCM 95th %tile Q(veh)	0.3	-	-	0	-

Intersection	
Int Delay, s/veh	5.5

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	74	239	277	60	145	21
Future Vol, veh/h	74	239	277	60	145	21
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	80	260	301	65	158	23

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	366	0	-	0	754	334
Stage 1	-	-	-	-	334	-
Stage 2	-	-	-	-	420	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1193	-	-	-	377	708
Stage 1	-	-	-	-	725	-
Stage 2	-	-	-	-	663	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1193	-	-	-	348	708
Mov Cap-2 Maneuver	-	-	-	-	348	-
Stage 1	-	-	-	-	668	-
Stage 2	-	-	-	-	663	-

Approach	EB	WB	SB
HCM Control Delay, s	1.9	0	23.5
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1193	-	-	-	372
HCM Lane V/C Ratio	0.067	-	-	-	0.485
HCM Control Delay (s)	8.2	0	-	-	23.5
HCM Lane LOS	A	A	-	-	C
HCM 95th %tile Q(veh)	0.2	-	-	-	2.6

Intersection	
Int Delay, s/veh	0.3

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	0	0	15	119	12	141
Future Vol, veh/h	0	0	15	119	12	141
Conflicting Peds, #/hr	2	0	0	2	2	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	82	82	82	82	82	82
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	0	18	145	15	172

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	297	93	0	0	165	0
Stage 1	93	-	-	-	-	-
Stage 2	204	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	694	964	-	-	1413	-
Stage 1	931	-	-	-	-	-
Stage 2	830	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	683	962	-	-	1410	-
Mov Cap-2 Maneuver	683	-	-	-	-	-
Stage 1	929	-	-	-	-	-
Stage 2	818	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	0	0	0.6
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	-	1410	-
HCM Lane V/C Ratio	-	-	-	0.01	-
HCM Control Delay (s)	-	-	0	7.6	0
HCM Lane LOS	-	-	A	A	A
HCM 95th %tile Q(veh)	-	-	-	0	-

Intersection	
Int Delay, s/veh	6.8

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	120	0	15	0	0	33
Future Vol, veh/h	120	0	15	0	0	33
Conflicting Peds, #/hr	2	0	0	2	2	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	82	82	82	82	82	82
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	146	0	18	0	0	40

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	60	18	0	-	-	-
Stage 1	18	-	-	-	-	-
Stage 2	42	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	-	-
Pot Cap-1 Maneuver	947	1061	-	0	0	-
Stage 1	1005	-	-	0	0	-
Stage 2	980	-	-	0	0	-
Platoon blocked, %			-			-
Mov Cap-1 Maneuver	945	1061	-	-	-	-
Mov Cap-2 Maneuver	945	-	-	-	-	-
Stage 1	1005	-	-	-	-	-
Stage 2	978	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	9.5	0	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	WBLn1	SBT
Capacity (veh/h)	-	945	-
HCM Lane V/C Ratio	-	0.155	-
HCM Control Delay (s)	-	9.5	-
HCM Lane LOS	-	A	-
HCM 95th %tile Q(veh)	-	0.5	-

Intersection	
Int Delay, s/veh	2

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	316	23	57	314	18	60
Future Vol, veh/h	316	23	57	314	18	60
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	85	85	85	85	85	85
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	372	27	67	369	21	71

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	399	0	889	386
Stage 1	-	-	-	-	386	-
Stage 2	-	-	-	-	503	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1160	-	314	662
Stage 1	-	-	-	-	687	-
Stage 2	-	-	-	-	607	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1160	-	291	662
Mov Cap-2 Maneuver	-	-	-	-	291	-
Stage 1	-	-	-	-	687	-
Stage 2	-	-	-	-	563	-

Approach	EB	WB	NB
HCM Control Delay, s	0	1.3	13.6
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	512	-	-	1160	-
HCM Lane V/C Ratio	0.179	-	-	0.058	-
HCM Control Delay (s)	13.6	-	-	8.3	0
HCM Lane LOS	B	-	-	A	A
HCM 95th %tile Q(veh)	0.6	-	-	0.2	-

Intersection	
Int Delay, s/veh	1.8

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	319	23	8	314	74	8
Future Vol, veh/h	319	23	8	314	74	8
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	336	24	8	331	78	8

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	360	0	695	348
Stage 1	-	-	-	-	348	-
Stage 2	-	-	-	-	347	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1199	-	408	695
Stage 1	-	-	-	-	715	-
Stage 2	-	-	-	-	716	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1199	-	405	695
Mov Cap-2 Maneuver	-	-	-	-	405	-
Stage 1	-	-	-	-	715	-
Stage 2	-	-	-	-	710	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.2	15.7
HCM LOS			C

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	422	-	-	1199	-
HCM Lane V/C Ratio	0.205	-	-	0.007	-
HCM Control Delay (s)	15.7	-	-	8	0
HCM Lane LOS	C	-	-	A	A
HCM 95th %tile Q(veh)	0.8	-	-	0	-

Intersection	
Int Delay, s/veh	2.2

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	18	315	267	115	53	64
Future Vol, veh/h	18	315	267	115	53	64
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	20	342	290	125	58	70

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	415	0	-	0	735	353
Stage 1	-	-	-	-	353	-
Stage 2	-	-	-	-	382	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1144	-	-	-	387	691
Stage 1	-	-	-	-	711	-
Stage 2	-	-	-	-	690	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1144	-	-	-	378	691
Mov Cap-2 Maneuver	-	-	-	-	378	-
Stage 1	-	-	-	-	695	-
Stage 2	-	-	-	-	690	-

Approach	EB	WB	SB
HCM Control Delay, s	0.4	0	14.6
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1144	-	-	-	503
HCM Lane V/C Ratio	0.017	-	-	-	0.253
HCM Control Delay (s)	8.2	0	-	-	14.6
HCM Lane LOS	A	A	-	-	B
HCM 95th %tile Q(veh)	0.1	-	-	-	1

Intersection	
Int Delay, s/veh	0.1

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	0	0	41	91	4	116
Future Vol, veh/h	0	0	41	91	4	116
Conflicting Peds, #/hr	18	2	0	4	4	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	65	65	65	65	65	65
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	0	63	140	6	178

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	345	139	0	0	207	0
Stage 1	137	-	-	-	-	-
Stage 2	208	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	652	909	-	-	1364	-
Stage 1	890	-	-	-	-	-
Stage 2	827	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	635	904	-	-	1359	-
Mov Cap-2 Maneuver	635	-	-	-	-	-
Stage 1	886	-	-	-	-	-
Stage 2	809	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	0	0	0.3
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	-	1359	-
HCM Lane V/C Ratio	-	-	-	0.005	-
HCM Control Delay (s)	-	-	0	7.7	0
HCM Lane LOS	-	-	A	A	A
HCM 95th %tile Q(veh)	-	-	-	0	-

Intersection	
Int Delay, s/veh	5.8

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	93	0	41	0	0	27
Future Vol, veh/h	93	0	41	0	0	27
Conflicting Peds, #/hr	18	2	0	4	4	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	65	65	65	65	65	65
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	143	0	63	0	0	42

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	123	65	0	-	-	-
Stage 1	63	-	-	-	-	-
Stage 2	60	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	-	-
Pot Cap-1 Maneuver	872	999	-	0	0	-
Stage 1	960	-	-	0	0	-
Stage 2	963	-	-	0	0	-
Platoon blocked, %			-			-
Mov Cap-1 Maneuver	857	997	-	-	-	-
Mov Cap-2 Maneuver	857	-	-	-	-	-
Stage 1	960	-	-	-	-	-
Stage 2	947	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	10	0	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	WBLn1	SBT
Capacity (veh/h)	-	857	-
HCM Lane V/C Ratio	-	0.167	-
HCM Control Delay (s)	-	10	-
HCM Lane LOS	-	B	-
HCM 95th %tile Q(veh)	-	0.6	-

Appendix B

tes ARCH services

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DRAFT Archaeological Inventory Survey for the Volcano School of Arts and Sciences New Campus.

Keaʻau Ahupuaʻa, Puna District, Island of Hawaiʻi

TMK (3) 1-1-004:10 (por.).

Prepared by

Timothy E. Scheffler, Ph.D.

Principal Investigator; SHPD Lic. #25-12.

Prepared for

Wainui Inc.

c/o Land Planning Hawaii, LLC

194 Wiwoole Str. Hilo, HI 96720

October 7, 2025

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Executive Summary

The following Archaeological Inventory Survey was prepared in order to comply with the State of Hawaii Revised Statues §6E-8 and 42 and for inclusion in an Environmental Assessment filed under HRS-§343 for the proposed construction of a new campus for the Volcano School of Arts and Sciences.

The project location and environment are described in detail. The results of a background search of ethnohistoric sources (traditional and historical accounts) as well archaeological and archival material relating to Kea'au Ahupua'a are presented with special emphasis on the upper elevation region where the project area is located.

The unusual conditions presented by both dense vegetation, low archaeological potential and record of past land disturbance were grounds for a proposed AIS sampling strategy set forth in an Archaeological Inventory Survey Plan and approved by the State Historic Preservation Division.

Two significant historic sites were discovered and documented. The first (SIHP #50-xx-xx-xxxx1) is a poorly preserved pair if low rock walls, presumed to be for use in animal control. The second (SIHP #50-xx-xx-xxxx2) is a rail road grade from the early 20th century - an abandoned branch line of the Hilo Consolidated Rail Co.

Both sites are significant under criterion "d". Additionally, the rail road is assessed to be significant under criterion "a" for its contribution to the broad patterns of the island's history. Neither are considered to possess the integrity necessary, or to have sufficient value to be considered eligible for listing on the Hawai'i, or National, Register of Historic Places.

No further work is recommended.

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INTRODUCTION

The Volcano School of Arts & Sciences (VSAS) is a charter school located in Volcano, Hawai‘i, adjacent to Hawai‘i Volcanoes National Park. VSAS serves students in Pre-K through 12th grade and primarily serves the communities of Upper Puna and Ka‘ū (Mountain View to Ocean View). The school intends to secure public funding to develop a new campus on an approximately 20-acre portion of TMK (3) 1-1-004:010 in Kea‘au Ahupua‘a, Puna District, Island of Hawai’i. The project seeks to expand enrollment, programming, and facilities for Pre-K through High School, to remedy enrollment bottlenecks and an expiring lease agreement at the current school location.

An Archaeological Literature Review and Field Inspection (AFI) was begun by tesARCH Services. That review determined that the proposed project may have an impact on historic, archaeological or cultural resources. Specifically, a segment of an old railroad grade shown on USGS maps and visible on aerial photos was confirmed to traverse the project area. This Archaeological Inventory Survey was prepared pursuant to an approved Archaeological Inventory Survey Plan (AISP) and prepared under the direction of Timothy E. Scheffler, Ph. D., Principal Investigator, tesARCH, Volcano HI (Permit #25-12). It includes the 15-acre area of the proposed campus, as well as a 5-acre area along the eastern side of the project area (see Figure 1). The total area of the project is 20 acres. Fieldwork was conducted on April 9, 11, May 13, 26, and September 16 and 18, 2025.

Per §6E-8 and 42, Hawai‘i Revised Statutes, the project described requires review by the State Historic Preservation Division (SHPD). This AIS presents the methodology and sampling program employed in lieu of 100% visual pedestrian inspection. Project area location, environment, and relevant traditional, historical and archaeological background to the investigation are presented first. Previous archaeological studies in upper Kea‘au Ahupua‘a are reviewed, and the results of the sampling methodology are presented. Last, the identified historic properties are described and evaluated for their significance and recommendations are made.

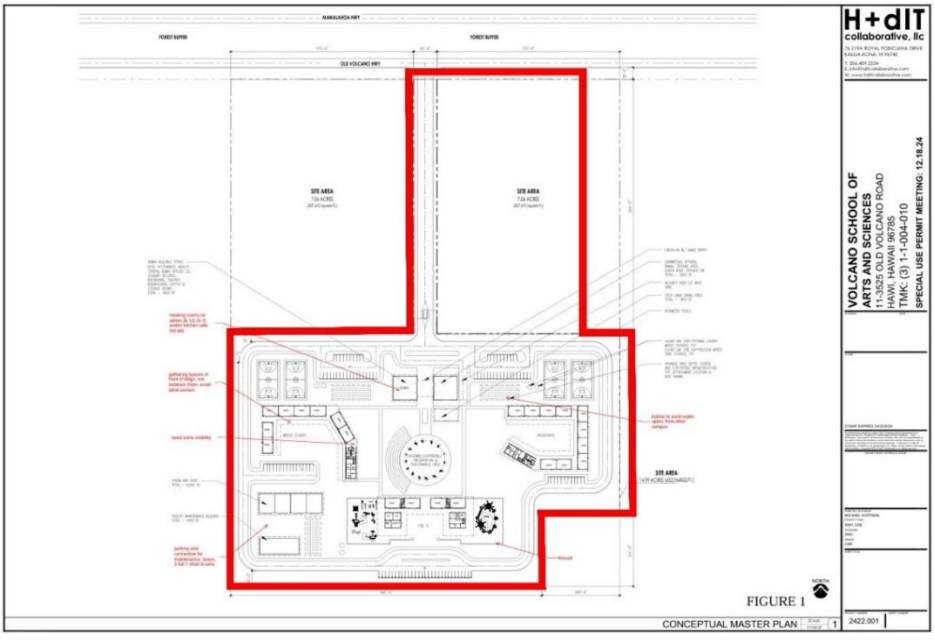


Figure 1 Conceptual master plan for the new VSAS campus (project area outlined in red).

While a combination of private and state funds are anticipated, this project is NOT an activity, or program funded in whole or in part, or under the direct or indirect jurisdiction of any Federal agency, including those carried out by or on behalf of a federal agency; carried out with Federal financial assistance; and/or requiring a federal permit, license or approval. It is NOT subject to compliance with Section-106 of the National Historic Preservation Act (NHPA).

IDENTIFICATION OF THE PROJECT AREA

The project area is located about 5 kilometers east-north-east of the eastern rim of Kīlauea caldera and about 3 kilometers from Volcano Village. It is on the south side of Old Volcano Road, which parallels Highway 11, at approximately mile marker 27, between the large densely populated subdivisions of Mauna Loa Estates to the west and Royal Hawaiian Estates to the east.

The project area is a 20-acre undeveloped portion of a much larger (785 acre) parcel owned by the W.H. Shipman Ltd. estate (see Figures 2 and 3).

The topography across the project area undulates slightly but is overall relatively flat, sloping gradually to the east. The elevation at the western boundary is 3,420 feet above mean sea level (amsl) and at the eastern side 3,370 feet amsl - a drop of 50 feet over a distance of 1,100 feet. There are no prominent landforms or river drainages in the vicinity.

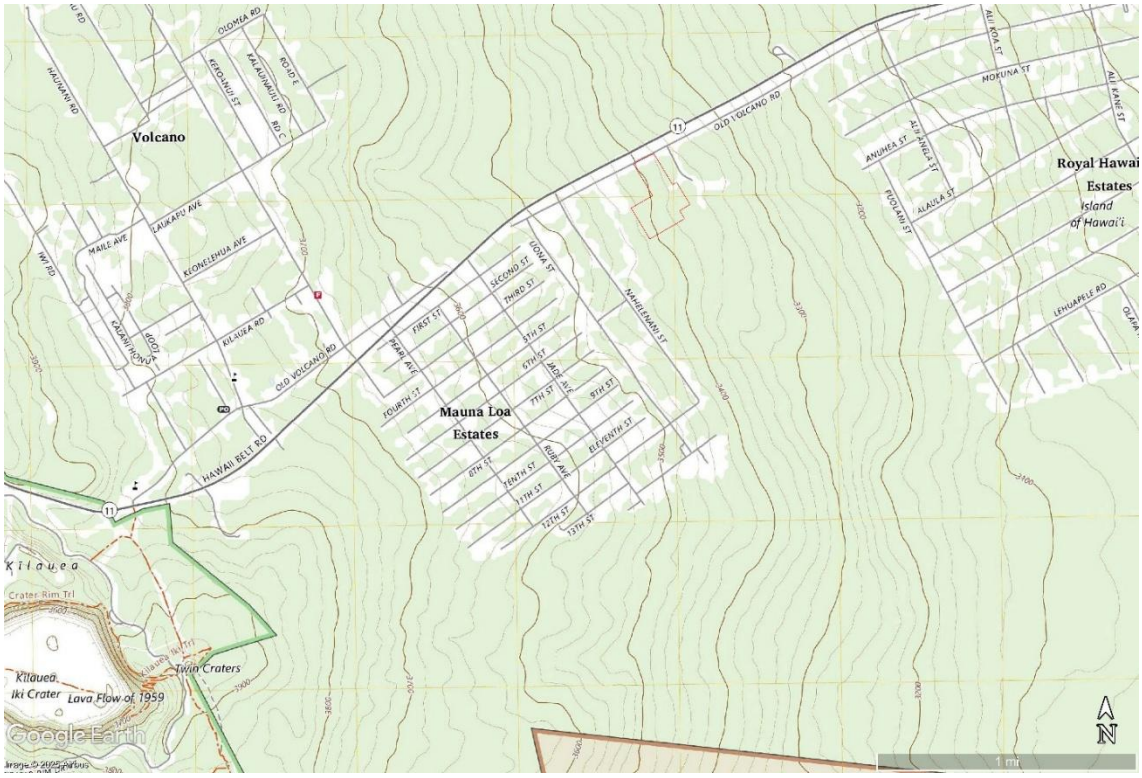


Figure 2 Portion of USGS 1:24k topographic quad – “Volcano“ (2024) with project area indicated in red.

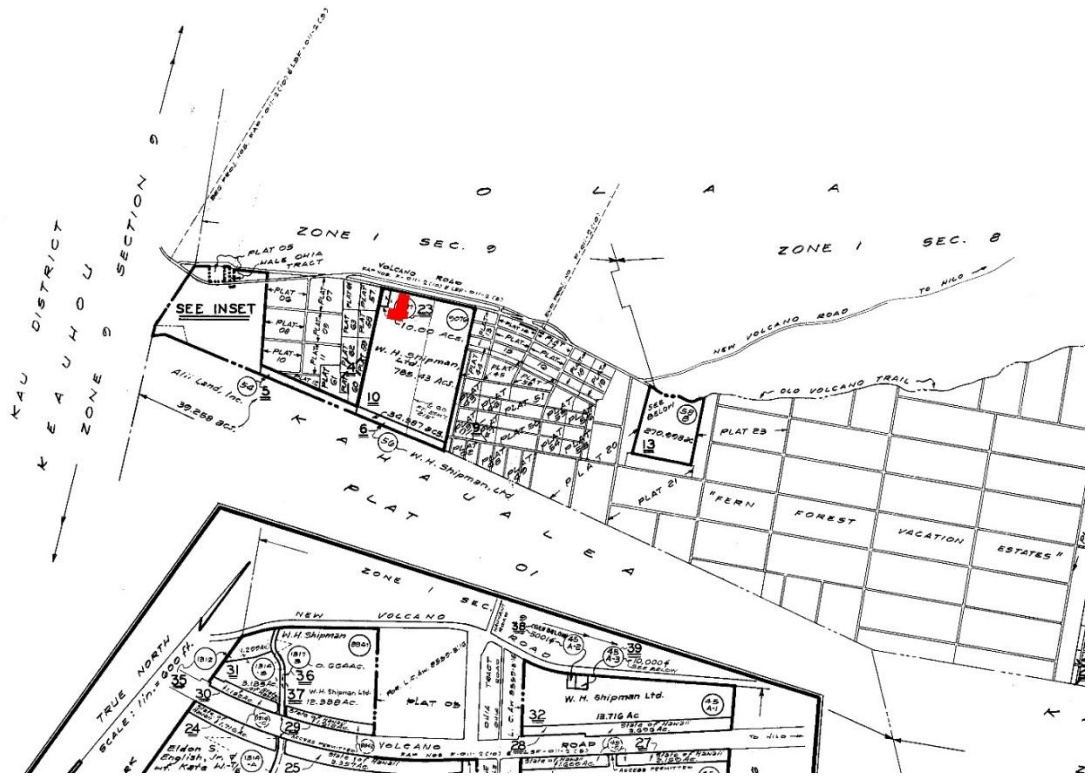


Figure 3 Tax Map Key Zone 1, Section 1, Plat 4 (por.) with project area indicated.

Project Area Environment

The vegetation of the project area is quite typical of the region as a whole. It consists of patchy forest of relatively young age. The dominant tree is the ‘ōhi‘a (*Metrosiderus polymorpha*). In the southern portion of the property, they are noticeably larger than those fronting the road on the north half of the property. This is undoubtably a function of past disturbance (see discussion below). Figure 4 presents an aerial view of the project area taken in 2024 where the distinction between forest color (age and density) is quite apparent.

A diversity of native plants grows amongst the dense thickets of uluhe (*Dicranopteris linearis*) that cover the majority of the ground. These include common endemic flora including a variety of hapu‘u tree ferns (*Cibotium* spp.), pukeawe (*Leptecophylla tameiameiae*), ‘ohelo (*Vaccinium reticulatum*), and kukaenene (*Coprosma ernodeoides*) and ‘uki grass (*Dianella sandwicensis*). Photo 1 illustrates the dense vegetation cover and young ‘ōhi‘a trees present on the front (north) portion of the property.

Several invasive and non-native plants are also conspicuous. These include white and kahili gingers (*Hedychium* spp.) and himalayan blackberry (*Rubus ellipticus*) as well as strawberry guava – waiawi – (*Psidium cattleianum*).

Figure 4 Google image (2022) with project area indicated.

Photo 1 Overview of typical project area vegetation cover.

Geology

The project area is depicted on a geologic map of Hawai‘i Island in Figure 5. A single geologic unit underlies the entire project area. The extensive flows, shown in pink and designated unit “p4”, consist of typical tholeiitic basalt lava flows erupted between A.D. 1290 and A.D. 1470 (Trusdell et al., 2006; Sherrod et al., 2007).

The lava deltas produced during these eruptions formed what was previously called the ‘Ailā‘au flow field (Holcomb 1987; Clague et al. 1999). This eruption lasted for 180 years and would have been witnessed by native Hawaiians of the 15th century. This flow field has recently been renamed Kualoloa, a name found in the mele oli (chants) of Pelehonuamea mā (Camara et al. 2024). These flows covered 30% of the Kīlauea’s surface area and culminated in the collapse of Kīlauea’s edifice. The Kualoloa eruptions ended around A.D. 1470 and the summit collapse probably occurred within a century. The area now comprises the Kahaualea Natural Forest Reserve and the (still) fiery pit of Halema‘uma‘u.

Kilauea’s slopes and summit are the location of many a storied place. For example, the character and sequence of the Kualoloa flows and the subsequent collapse of Kilauea’s summit caldera, as understood today by volcanologists, has an often-unrecognized correspondence with indigenous oral histories concerning the exploits of the goddess Pele, her little sister Hi‘iaka and Hi‘iaka’s beloved Hōpoe (the embodied ‘ōhi‘a forests of Puna). Don Swanson, a scientist at the United States Geological Survey’s Hawaiian Volcano Observatory, has associated 400 years of these Hawaiian oral traditiona with Kīlauea’s past volcanism and with the Kualoloa event in particular (Swanson 2008). The indigenous narratives were relayed and preserved for us by native scholars such as David Kalakaua (1990), S.M. Kamakau (1961), David Malo (1951), and John Papa ‘Ī‘ī (1973) in the 19th century. The writings of Nathanial Emerson (1915), Robert Fornander (Fornander and Thrum 1916; Fornander 1996), and William Ellis (1963) also provide insights, as do early Hawaiian newspaper reports (Silva & Badis 2008).

In this epic tale, Pele asks her sisters if one of them would go to Kaua‘i to bring her lover Lohi‘au back to her. The older sisters all declined out of fear, but the youngest, Hi‘iaka, agrees. As Hi‘iaka prepared to go on the journey she called to Pele saying “If during my absence you go forth on one of your raids, you are welcome to ravage and consume the lands that are common to us both; but see to it that you do not consume my forests of lehua. And, again, if the fit does come upon you and you must ravage and destroy, look to it that you harm not my friend Hōpoe.” (Emerson 1915:1-29).

Hōpoe (lit.) Fully developed (as lehua blossom) was a deity of the lehua forest and dancers, as well as a place - Lava flats and forest, extending between the points of Ka‘īlio and Kaloli, Kea‘au Ahupua‘a. (Maly 2022:44). Pele does not heed Hi‘iaka’s request and subsequently Hi‘iaka laments the loss of Hōpoe with references to noted features of Kea‘au:

> *Hōpoe ka lehua ki‘eki‘e luna la Maka‘u ka lehua i ke kanaka la Lilo a i lalo e hele ai*
>
> Hōpoe is highest of the lehua While the lehua fears mankind, The devastation comes from below (Emerson 1915:34).

Another chant recited by Hi`iaka before her battle with the mo`o wahine (the lizard goddess Pana`ewa) also makes reference to Kea‘au’s sacred landscape:

> *Kua loloa Keaau i ka nahele hala;*
> *Kua huluhulu Pana-ewa i ka laau;*
> *Inoino ka maha, ka ohi`a o La`a, e...*
>
> Long is the reach of Keaau's palms;
> Bristly-backed Pana-ewa's woodlands;
> Spoiled are the restful groves of La`a... (ibid.)

Despite Hi‘iaka’s pleas, Pele sets fire to the forests of Puna to spite her sister Hi‘iaka. Hi‘iaka loved the beautiful ‘ōhi‘a trees of the area (and Hōpoe). However, Pele had become impatient with her for not fulfilling the promise to bring the handsome Lohi‘au from Kaua‘i back to Pele. Hi‘iaka is so angry at her sister’s spiteful retribution, that she openly makes love to Lohi‘au at Kīlauea’s summit. He is subsequently slain by Pele and thrown into the fiery pit of Halema‘uma‘u. Hi‘iaka dives in to rescue him, digging furiously after her true love. This mo‘olelo, so abbreviated here, corresponds to two geological realities of the time – a vast forest being burned down and the caldera’s deepening, both events attributable to Pele’s actions.

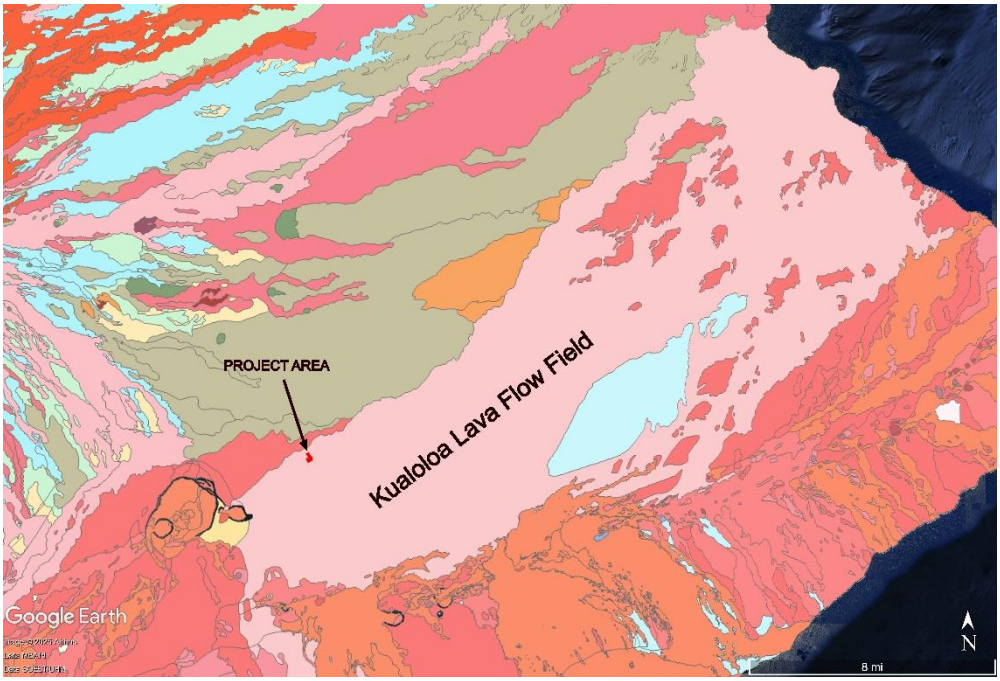


Figure 5 The Kualoloa (pink) lava flow field and project area indicated.

In fact, the Hawaiian worldview is sustained by stories and values linked to specific events, named places, families and the reciprocal obligations passed to them through the origin stories of the landscape. These traditions instill a deep ethic of stewardship for the land in Hawaiians (Kanahele 1986). These landscape-level histories animate the lives of people in descendant communities today whose identities are tied to the storied places of Kīlauea’s slopes and to the ‘aina momona (the fat, fertile, or rich land).

Soils

Given the homogenous geology, the soils of the project area are similarly uniform. They consist entirely of “Puhimau ashy silt loam” (Sato 1973, USDA WSS 2025). The soils have formed on slopes of between 2 – 10%. They are moderately well drained and relatively shallow due to their young age. They consist of ash, loam and decomposed rock on top of smooth, ropey, pāhoehoe bedrock. Silt loams contain more silt sized particles (>70%) in relation to their relatively low clay content (<30%) along with 20 - 50% sand. The typical profile and composition of Puhimau soils are shown in Table 1, below.

Soil Horizon	Depth (in inches)	Description
A	0-3	ashy silt loam
Bw	3-6	extremely gravelly ashy loamy coarse sand
C	6-8	ashy loam
2Bw	8-11	ashy silt loam
2C	11-13	ashy loam
R	13-23	bedrock

Table 1 Typical soil profile of Puhimau ashy silt loam.

Climate, rainfall and hydrology

The climate around Volcano is that of a sub-tropical rainforest. It is characteristically wet throughout the year. The amount of rainfall on the slopes of Kīlauea, generally, is a function of geographical location and especially elevation (see Figure 6). Meteorological conditions at the project area, at an elevation of 3,400 feet amsl, contribute to a mean annual precipitation of 4,100 millimeters per year (161.4 inches). Most of this rain falls in in February and the driest month is June. However, the potential for rainfall in the Volcano area is ever present. The month with the highest average number of rainy days is March (22.9 days). The month with the least rainy days, on average, is January (13.3 days) and clear skies average 31-42% of days throughout the year (Giambelluca et al. 2013; Weather-US.com 2025; Climate.gov 2025).

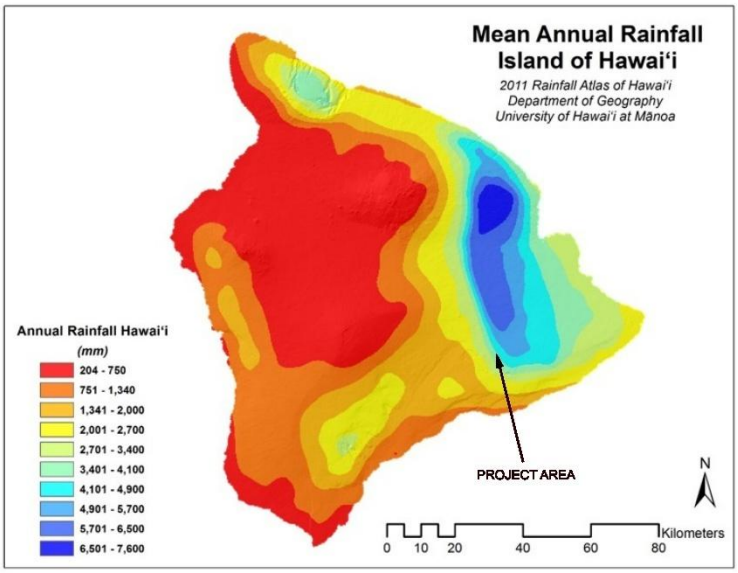


Figure 6 Average annual rainfall.

Temperatures in the vicinity are also typically sub-tropical with a peak average high of 75.4°F (24.1°C) in August, and a low of 69.6°F (20.9°C) in March. The average lows, are between 64°F (17.8°C) in March to 70°F (21.1°C) in September.

BACKGROUND TO THE HISTORICAL AND ARCHAEOLOGICAL RECORD

Ethnohistory

The pre-contact political history of Puna as recorded in traditional accounts is complex. Its giant expanse located between the districts of Hilo and Ka‘ū made it a very contested area (Barrere 1959). When ‘Umi-a-Līloa, the son of Līloa, ascended to the throne of his father (around A.D. 1525), he brought all of the districts directly under his rule and subjugated all rebel chiefs. Kamakau (1961) wrote that Hua‘a was the chief of Puna, when Puna was seized by ‘Umi and his warrior adopted sons. Hua‘a was killed by Pi‘imaiwa‘a on the battle field of Kuolo in Kea‘au, and Puna became ‘Umi-a-Liloa’s (Kamakau 1961:17-18). Fornander (1996) also notes that at this time, parts of Puna were ruled by the renowned, blind chief of Ka‘ū - ‘Īmaikalani. It was only after lengthy battles that ‘Umi was able to secure all of Puna and Ka‘ū under his rule. (Fornander 1996:34).

In more recent times, again in the context of chiefs vying for supremacy of the entire island, disagreements arose over the division and redistribution of lands. Following the demise of Kalani‘ōpu‘u in the last years of the 18th century, Papa I‘i records that while the division of lands to be made by Kīwala‘ō was being discussed, his half-brother, Keōua, was told by one of his advisers that “Perhaps you should go to the chief and ask that these lands be given to us. Let Waiakea and Keaau be the container from whence our food is to come and Olaa the lid.” Keōua did so, but the other Ka‘u chiefs objected to this and spoke disparagingly to him. When Keōua returned, his advisor asked, “How was your venture?” When Keōua told him all that had been said, the man remarked seriously, “A break in a gourd container can be mended by patching, but a break in the land cannot be mended that way…” (Ii, 1959:14). The reference to ‘Ōla‘a as the “lid,” may be taken to imply that the fine resources of bird feathers, olonā fiber for cordage, and the famous kapa (bark cloth) called ‘ō‘ū-holo-wai-o-La‘a were the wealth which covered the needs of the chiefs. (Maly 2022:38).

Even into the 20th century political activism continued to be important to the people of Puna. The following newspaper advertisement demonstrates the continuous appeal made by politicians to native identity and to Puna’s association with the forest, the rain, the lava and the birds:

> *“E Puna—e! Hoolono Mai!! …E lohe mai ai hoi na keiki e noho mai la i ka wehi o ka hulu o-o o ka uka o Olaa, a pela pu me ka ua kilihune o Pahoa, na keiki ae hoi e puliki mai la i ka lae o Kumukahi a hoea loa i na keiki o ka uka o Ka (liu), kahi o ka awa ili lena, a pela mai no ka nee papa ana a hiki i ka ulu niu o Kaimu, a ko Kalapana a ma o aku…”* (Ka Na‘i Aupuni, October 16, 1906).
>
> A call for residents of Puna to turn out and vote. O Puna—! Hear this!! Listen all of you the descendants who dwell in the ‘ō‘ō feather adorned uplands of ‘Ōla‘a, also those who reside in the misty rains of Pāhoa, the descendants who embrace the sun at the point of Kumukahi, which reaches all the way to those offspring who reside at Kali‘u, place of the yellow-skinned ‘awa, and also those who reside on the plains that move [descriptive of the lava flows], reaching to the coconut groves of Kaimū and Kalapana, and beyond… (translation by Maly 2022:26)

The district of Puna was coveted and is famous for many highly culturally significant elements, including the rising of the sun at Cape Kumukahi (the easternmost point of the island chain), for Pele and volcanic phenomena described above, for the groves of pū hala (pandanus trees) and growth of ‘awa (*Piper methysticum*) in the lowlands; and for the ‘ōhi‘a lehua groves of Hōpoe. Puna is also famed for its more ancient association with Kāne, a Hawaiian god and ancestor of the chiefs and commoners, a god of sunlight, fresh water, verdant growth, and forests. (ibid.).

Puna contains some 50 named ahupua‘a. Kea‘au was one of the highly favored lands of Puna, and is found in a number of historical accounts and traditional mo‘olelo. Kea‘au was ideal for coastal settlement as its shore was easily accessible by canoe. Kea‘au is translated literally as “white current”

(Pukui and Elbert 1971; Soeren 2010). Many of these accounts refer to or take place in the coastal areas where the bulk of the population resided. However, given the thin soils of the kula (the hot coastal plains), agricultural fields were located upslope. Many of the stories and traditions refer to the dense forests that reach all the way to the summit of Kīlauea.

For example, when William Ellis passed through Puna in 1823 on his journey around the island he remarks:

> [From Kahuwai] we walked on, in an inland direction to Honoruru, a small village situated in the midst of a wood. ...traveling toward the sea-shore, reached Waiakaheula [Waiakahi‘ulā] ...[proceeding thence] the country was populous, but the houses stood singly, or in small clusters, generally on the plantations, which were scattered over the whole country. Grass and herbage were abundant, vegetation in many places luxuriant, and the soil, though shallow, was light and fertile... they reached Kaau [Kea‘au], the last village in the division of Puna [going toward Hilo]. It was extensive and populous, abounding with well-cultivated plantations of taro, sweet potatoes and sugar-cane, and probably owes its fertility to a fine, rapid stream [Waipāhoehoe], which, descending from the mountains, runs through it into the sea. It was the second stream they had seen on the island [proceeding from Kona] (Ellis 1963)

The once rich traditional agricultural heritage of Kea‘au and Puna, generally, is also referred by E.S. Craighill Handy in his summary of Hawaiian farming:

> One of the most interesting things about Puna is that Hawaiians believe, and their traditions imply, that this was once Hawaii’s richest agricultural region and that it is only in relatively recent time that volcanic eruption has destroyed much of its best land. Unquestionably, lava flows in historic times have covered more good gardening land than in any other district. But the present desolation is largely due to gradual abandonment of their country by Punans after sugar and ranching came in… (Handy 1940:172-174).

The fertile uplands provided the population with access to arable land and other natural resources important to sustaining the local economy and regional trading relationships. However, extensive agricultural field systems in the region generally extended only from the 400-foot elevation to about the 2,500-foot elevation (Maly 2022: 27). This corresponds roughly to the area between Kea‘au town and Glenwood.

A major theme in ethnohistoric accounts relating to the project area is the exploitation of the natural resources of the montane forest region above these elevations. In their early historic period attempt to climb Mauna Loa in 1793 and again in 1794, Archibald Menzies trekked up into these upper slopes. He details some of the activities he observed in a passage from his book “Hawaii Nei 128 Years Ago”. His comments illustrate the seasonal activities and resource use taking place in these upper elevation forests. They provide a rich description of the context of precontact land-use in “Na Wao Akua”:

> The villages we passed, in the wood, I said were temporary, as the occupiers, consisting of a few families, had come up here only for a time to pursue various occupations. The men were differently engaged, some in felling of large timber for various purposes, others in hollowing out and forming canoes and planks in the rough, which after laying some time in the wood, to season, were dragged down, in that state, to the seaside, to be finished by their canoe builders who are distinct persons from those who thus form them in the rough; while a third set seemed to have no other occupation than that of catching small birds for the sake of their feathers, especially those of a red, yellow, or black color; these feathers are in great estimation; it is with them that a large portion of the rents are annually paid to the chiefs by the lower class of people, who thus employ themselves by catching the birds with bird-lime, which they do by spreading a little of it here and there on the boughs, and placing two or three red berries near it, which the birds are very fond of, and as they perch to eat them they are entangled with the bird-lime. But the natives are very cautious of not exterminating the birds by killing all that are in this manner caught; many of them, after being stripped of their most valuable feathers, are again set at liberty, and run the chances of being fleeced in the same way next year. The women were no less assiduous in collecting and

> manufacturing the bark of a shrubby species of nettle which grew wild in the woods, for making a kind of coarse russet cloth, and which they prepared and used as follows: The inner bark being separated from the long twigs, the exterior rind was made up into small bundles, and a certain quantity of a particular kind of fern—a species of Adiantum —mixed with it, and both wrapped up together in the leaves of plantains of the Dracaena ferrea, Linn. [sic.] A number of these bundles being in this manner got ready, an oven is made by digging a hole in the ground, where they are put, intermixed with hot stones, and covered up with green leaves and earth, in the same manner as they dress or bake their victuals. By this heating, or sweating, process the fern imparts a reddish brown color to the bark, which is afterwards beat out into cloth (Menzies 1920).

Te Rangi Hiroa (Peter S. Buck) also describes the activities and species associated with feather work crafts in traditional Hawai`i (1957). Hiroa lists `i`iwi (*Vestiaria coccinea*) and `apapane (*Himatione sanguinea*) as the birds sought for their red feathers and the `ō`ō (Moho nobilis) and mamo (*Drepanis pacifica*) as those sought for their yellow plumage. The `ō`ū (*Psittirostra psittacea*) was also pursued for its green feathers. Hiroa notes that when larger feathers were necessary, those of roosters, the ko`ae (Tropic Bird – *Phaethon lepturus dorotheae*) or, "Man-of-War Hawk [sic]" were also used (ibid.:217).

Because the `ō`ō was only found on Hawai`i Island, it was especially valued. While predominantly red-feathered birds did not survive plucking and were mostly eaten, others, having only small tufts of yellow, were plucked and set free. Feather craft reached quite a sophisticated level in Hawaiian society. Special terms were given to the types of feathers, with respect to where (anatomically) they were taken from what bird (species). For example, the yellow mamo tufts from above and below the tail were called "ko`o mamo", while the short ones from the thighs of the birds were known as the "`ae mamo". Likewise, the `ō`ō wing tufts were termed "`e`e", the rump "pu`e [pue?]" and those of the tail were referred to as "puapua" (ibid.:224).

Feather work was one of many components in the suite of Hawaiian arts and crafts that were incorporated in to the social fabric and symbolic worldview held traditionally. The feather cloaks and royal robes worn by the ali'i nui (kings) were a powerful symbolic signal of their control of resources, labor and the abundance purveyed under their divine right and leadership. For example, in the famous battle at Mokuohai, Ke`ei, South Kona where Kamehameha defeated the first of his rivals, Kiwalaō, the slain warrior chief's cloak was claimed and donned by Kamehameha as a declaration of victory and dominance. This very cloak is housed at the Bishop Museum in Honolulu along with another, the so-called Kamehameha cloak made exclusively of yellow mamo feathers with a border of red `i`iwi at the neck. This cloak has been estimated to have required around 450,000 mamo feathers or, approximately 80,000 birds for its production (ibid.:230-31).

Although several of these birds are now extinct, traditional Hawaiian hunting pressure is not considered a cause. These birds (the `ō`ō, and mamo, in particular) did not become extinct until well into the contact period, and if hunting pressure were a factor it was not until the Hawaiians were armed with shotguns that a dramatic impact was made on the species' population (McEldowny 1979:42). By the late 19th C. this trend was apparent, however, as Nathanial Emerson laments: "The days of the bird catchers of ancient Hawai`i are over. Their place has been taken by those who know not Ku-huluhulumanu and the other gods of the craft. In their hands, instead of the snare and the pole, with its gum, its flowers and decoys, there is the deadly shot-gun." (1915:111).

While the project area is well above the range for traditional agriculture or habitation, the area was likely used for specialized resource extraction in the precontact period. These resources include, but are by no means limited to, birds and wood, and probably included a great variety of plant species unique to these high-altitude regions. So, though agriculturally limited, the area held potential riches in symbolically valuable forest products significant to the prehistoric political economy.

Handy, Handy and Pukui (1972) present a traditional land taxonomy in their extensive ethnographic work, “Native Planters in Old Hawai`I”. To native Hawaiians the upland forested slopes of the project area may have been considered wao lā`au, and classified as part of a wild landscape type that surmounts the upland kula slopes on every major island (Handy et al. 1972:56). These lands are found above the highest `ama`u zone (3,000+ feet amsl) far above and removed from agriculturally productive fields. They have therefore received little attention from historians couching so much of their work in terms of Boundary Commission Testimony, recorded for the purposes of proving that land was being put to intensive food production. Rights to, and use of collected resources such as these are mentioned in the Boundary Commission records, but are usually not the basis for kuleana claims as specific parcels and plots of permanent fields were the driving force in fee-simple land tenure definition. Handy et al. (1972:258) describe several different forest birds that were sought after by native Hawaiians and that may have occurred in na wao. `Ō`ū, `ōma`o, and `ō`ō, are described as being good eating, however most of these smaller and resplendently feathered birds were hunted primarily for their plumage. Often, the technique used was that of gumming a stick with the sap of papala kepau (*Pisonia* sp.) to trap the honeycreepers as they perched to feed on lehua blossoms. The red feathers of the `i`iwi, for example, were especially prized for the manufacture of cloaks for ali`i.

One of the most detailed native accounts of places, people, and events around the island of Hawai‘i, was recorded in “Kaao Hooniua Puuwai no Ka-Miki” (The Heart Stirring Story of Ka Miki). The tradition is a lengthy and complex one that was published over a period of four years (1914-1917) in the weekly Hawaiian-language newspaper Ka Hoku o Hawaii. Kamiki (The quick, or adept, one) and Maka‘iole (Rat [squinting] eyes), were supernatural brothers who traveled around the island of Hawai‘i along the ancient ala loa and ala hele (trails and paths) that encircled the island.

Kamiki and Maka‘iole were empowered by their ancestress Ka-uluhe-nui-hihi-kolo-i-uka (The great entangled growth of uluhe fern which spreads across the uplands), one of the embodiments of the goddess Haumea - the creative force of nature - also called Papa or Hina - who was also a goddess of priests and competitors (Maly 2022:32).

Aside from the ‘ohi‘a there is perhaps no other plant more ubiquitous in the project area than the impenetrable uluhe fern. The dense homogeneity of these large tracts of native forest can be foreboding. Kamiki and Maka‘iole were warned during their travels through Kea‘au that if they got lost in this forest, there was no way out. Calling out in the forest caused an echo which sounded like a person calling, but following the echo led one deeper into the forest:

> *E nihi e ka hele mai ho‘opā,*
> *mai pūlale i ka ‘ike a ka maka o ako hewa i ka nui o ka lehua,*
> *a ho‘opuni ‘ia e ka ‘ino*
>
> Travel cautiously, being careful not to touch [the lehua],
> don’t rush to see things lest you mistakenly break the many lehua,
> causing you to be overcome by misfortune (Ka Hoku o Hawaii, October 4, 1915, translation by Maly 2022:33).

While somewhat removed from the upland context of the project area, one of the most famous events in Kamehameha-the-Great’s history occurred in the ahupua‘a of Kea‘au, albeit along her coastline. As recorded in the Hawaiian newspaper Nupepa Ku Okoa, S.M. Kamakau relays how the famous Kānāwai Māmalahoa (Law of the Splintered Paddle) came to be. While spying on events around Hilo, Kamehameha and his companion Kahaku‘i secretly paddled from Laupāhoehoe to Kea‘au:

> *Holo akula o ia ma Papai, ma Keaau i Puna, e lawaia ana kekahi poe kanaka a me kekahi mau wahine, a he wahi keiki uuku i ke kua o kekahi kanaka. A ike o Kamehameha i ua poe lawaia nei e makaukau ana e hoi, o kona lele akula no ia mai luna aku o kona waa, me ka manao e kii i kela poe kanaka e pepehi, aka, ua holo kekahi poe me na wahine, a koe iho elua kanaka i hakaka me Kamehameha, aka, ua luuluu kekahi kanaka i ke keiki ma ke kua. O ka hakaka ihola no ia, e poholo iho ana ka wawae o Kamehameha i ka mawae pohaku, a paa loa ihola, no laila, hahau ia ihola kona poo i ka hoe a ka poe lawaia. A no ka luuluu o ua kanaka lawaia nei i ke keiki, a no ka ike ole ia no hoi kekahi o Kamehameha keia e hakaka pu nei, ina ua make loa o Kamehameha i ia la. Ua kapa ia ka inoa o ia hakaka ana o Kaleleiki. O ka pa ana hoi o ke poo o Kamehameha i ka hoe, ua lilo ia i Kanawai Mamalahoa no Kamehameha…50 …Ua kau o Kamehameha i ke kanawai, “E hele ka elemakule a me ka luahine a me ke keiki a moe i ke alanui…”*
>
> He [Kamehameha] went to Papa‘i, at Kea‘au, Puna, and he came upon some men and women who were fishing, and a little child rested on the back of one of the men. Seeing the fishermen preparing to go away, he leaped from his canoe intending to catch and kill them, but, some of the men and the women fled, two of the men stayed to fight with Kamehameha, but one man was burdened with the child on his back. During the fight, Kamehameha slipped and caught his foot in a crevice of the rock and was securely held, the fishermen then struck him over the head with a paddle. It is only because one of the men was hampered with the child, and that they did not know that it was Kamehameha that they were fighting with, that Kamehameha was not killed that day. This fight was named Ka-lele-iki. And from the striking of Kamehameha’s head with a paddle, the law of Māmala-hoe (Broken Paddle) was made for Kamehameha… Kamehameha issued the law, “Let the old men and women and children go in peace and sleep [in safety] on the trails…”. (Nupepa Ku Okoa, March 16, 1867. Nupepa Ku Okoa, November 23, 1867; Kamakau 1961:126 (M.K. Pukui, translator); Nupepa Ku Okoa, November 23, 1867 (translation by Maly 2022:52)).

Last in this review of the ethnohistory and mo‘olelo of Kea‘au, Puna Hawai‘i is one of the great Hawaiian ballads, published by Charles E. King in 1916 (without attributions to original source or composer). It is titled “‘Imi au iā ‘oe” (I search for you). The song is reportedly sung by a young man of Puna who is seeking his beloved companion who was lost in Puna and refers not only to the windward rain and lush vegetation but also speaks symbolically of the endangered ‘i‘iwi. There is perhaps no other iconic image so tied to the upper slopes of Kīlauea, her forests or the growing village of Volcano:

> *…‘Imi au iā ‘oe e ke aloha lā Ma nā pāia ‘a‘ala o Puna A i hea lā ‘oe i nalowale iho nei Ho‘i mai nō kāua e pili ‘A‘ohe kohukohu o ka ua lā Ke pili mai me a‘u ka wahine u‘i Aia ko‘u hoa a e kohu ai ‘O ka ‘i‘iwi hulu ‘ula o ka nahele.*
>
> I search for you my love in the fragrant groves of Puna. Where have you been lost? Return that we may again be together. The rains do not interest me when I am holding close to the beautiful woman that is the companion that I chose. The red-feathered ‘i‘iwi of the forest.

Archaeological and Historical Background

The earliest settlements in Hawaii were likely located windward, where permanent pond-field taro farming could be practiced with great success. Small coastal sites on the leeward Kona-side may have also been established early with a special focus on marine exploitation. These earliest Kona sites (perhaps established by A.D. 1100 or later) would be where fresh water was available (Cordy 2000:130, Kirch 2017). These small permanent habitations centered around sheltered bays, or near caves – critical for water catchment. These small hamlets were likely composed of extended family units cooperating and exchanging goods by way of canoe. However, the District of Kohala is reported by Fornander (1996) to have perhaps been one of the first regions to be occupied by Hawaiians, a fact corroborated by early dates (perhaps as early as A.D. 1200) in Kaoma Ahupua‘a (Cordy 2000:14).

Inland settlements do not become common in the archaeological record until several centuries later. After A.D. 1400 upland sites increase in density and by the 1500’s it is clear that population is growing

along with the development of large field systems and intensifying agriculture (Newman 1972). During this expansion, the archaeological record also shows an increasing separation between a ruling political elite, a religious class, and the common people (Hommon 1976, 2013). The role of agricultural production in this social development is the topic of ongoing archaeological debate.

By Umi’s time and through the 1600’s populations are thought to have stabilized and land management was efficiently organized in the form of the ahupua`a system. With the introduction of a productive dry-land crop, the sweet potato, further development and cultural elaboration led arguably to the emergence of a political economy characteristic of state-level societies in other parts of the globe; comparable in complexity to those of Mesopotamia, the Indus Valley, the Basin of Mexico, or Egypt (Hommon 1976, 2013). In fact, the earliest directly dated specimen of sweet potato (Ladefoged, Graves and Coil 2005) comes from a site in the Leeward Kohala Field System (LKFS), with a date of A.D. 1290 – 1430.

The organization of labor and authority of the ali‘i is manifest in the construction of heiau (Kirch and McCoy 2023:350) including those dedicated to human sacrifice. This tradition is thought to have been introduced by Pā‘ao and his high priest Pili-kaaiea. The acceleration of construction may mark the beginnings of truly stratified social structure in Hawaii which before then would have been organized along lines of kinship and family rank (Kirch 2012). This new social hierarchy and intensive stratification may also have been accompanied by the formalization of the ahupua‘a system, wherein lands from the mountain to the sea become the proprietary focus of local communities. With in these self-sufficient “pie-shaped” units, which were sustained by the production of all necessary resources from mauka to makai, communities and their leadership gained their own social, economic and political significance (Hommon 1986). During and subsequent to this period, heiau building flourished and politico-religious institutions became more complex and further embedded in territorial competition (Kirch 1990:206).

During the subsequent Expansion Period (A.D. 1400 – 1600) incipient central places develop in what Hommon has called "salubrious cores" (in Kirch 2000:293). Sites like Hōnaunau, rich coastal areas with close and well-organized links to interior agricultural production, begin to define a social hierarchy that includes paramount chiefdoms with subordinate ranking sub-chieftains.

The proto-historic, or Archaic State Period (A.D. 1600 – 1795) is one full of elaborate dynasties of rulers and is well reflected in the archaeological record with ubiquitous remains of heiau and other large-scale sites and site complexes that remain to this day. Heiau became functionally differentiated, for example smaller temples might mark individual lands, whereas much larger luakini (temples dedicated to human sacrifice) structures were associated with the paramount chiefs and the cult of war were located at these centralized chiefly centers. The archaeological record shows a multi-tier settlement hierarchy that further reflects the development of social stratification across precontact Hawai`i (Kirch and McCoy 2023:102).

Historic period archaeology in Hawai`i begins with the tragic encounter between Captain Cook and Kalani`ōpu`u. Ever since, Hawaiian history has continued to be shaped by outside influences and interactions within a globalizing economy. The rich historical record is a valuable testimonial to the process of ethnic integration as well as to the role that varied industries have played in shaping this ethic heritage (cf. Mills 2002). Hawaii's historic period is one of repeated “invasions” of global economic forces. The commodities involved have ranged from real estate, to sandalwood, to cattle, to sugar, to tourists, and all have had their unique impact.

Between 1845 and 1900, traditional land-use and residential patterns began to change drastically. In particular, the regular use of Hilo Bay by foreign vessels, the growth of tourism, the presence of the whaling industry, the establishment of missions in the Hilo area, the legalization of private land

ownership, the introduction of cattle ranching, the introduction of sugar cane cultivation, and the construction of Government Roads and railroad lines all brought about changes in settlement patterns and changes to long established land-use patterns (Kelly et al. 1981).

Volcano Road was built from Hilo to Kīlauea’s summit between 1889 and 1893 partly to accommodate tourism, but also to increase access to forest products and agricultural land. Numerous small field parcels belonging to the ‘Ōla‘a Sugar Company and the ‘Ōla‘a Coffee Company were located along this route. The improved Volcano Road is Route 11, though it has been straightened and improved several times since its initial construction. The modern history of land-use in Kea‘au Ahupua‘a is tied to the development of commercial agriculture and the construction of these transportation routes. The potential of the rich arable land of upper Kea‘au for commercial production was recognized as early as the 1870s when parts of it were leased for coffee growing and for cattle grazing. In 1881, the entire ahupua‘a was purchased at auction by Samuel Damon, William H. Shipman, and E. Elderts from trustees of the deceased William C. Lunalilo Estate. Shipman bought out the two partners within three years of purchasing the land (Escott 2017:13, Cahill 1996:165)

The Mahele Era Record

Post-contact history is marked in large part by trends associated with the Great Mahele [def.: a “Portion, division, section, …land division of 1848” (Pukui and Elbert 1986)] beginning in 1848. This was by and large an attempt by the Hawaiian Kingdom to promote the fee-simple ownership of land by the common people, thus protecting them from foreign “takeover”. It also provided investment incentives to haole businessmen and was promoted by the missionaries as a means of improving the status of tenant farmers (Creed 2004). Kamehameha III sought to divide the island into three property types. His own came to be called “Crown” lands, those he deemed the property of the State were known as “Government” lands, and the rest were “*Konohiki”* [def.: the headman of an ahupua‘a land division under the chief (Pukui and Elbert 1986)] lands, acknowledged to be chiefly holdings, or “*kuleana”* lands that were open to claim by the common people. Land Commission Awards (“LCAs”) were referred to as kuleana claims, these were granted in addition to gifts that came directly from the Kingdom. Following the Mahele further royal grants and “patents” were awarded, or sold, by the Kingdom in an attempt to encourage acceptance of the new free-hold system, to raise revenue, and to guarantee and confirm the private property rights of individuals (Chinen 1978).

The Great Mahele left a legacy of a rich record of written descriptions. These documents outline individual claims to specific pieces of land justified in terms of the means by which they were putting it under production. These testimonies were collected mainly between the years of 1873 – 1885 and give historical insight into land use of the 19th Century.

The Great Mahele marks a major turning point in Hawaiian history and political economy (Kuykendall 1961). The transfer from a system of traditional land rights held by an absolute monarch, to a market system of fee-simple private property ownership, took some time to accomplish. Nevertheless, the process was meticulously documented by the Kingdom and the resultant historical record provides a unique window into land use of the area in the late-19th century. The following information is drawn from the Office of Hawaiian Affairs “Kipuka” database (2025) and the Waihona ‘Aina database (2025), both online archives of these records.

King William Charles Lunalilo was the son of High Chiefess Miriam ‘Auhea Kekāuluohi and High Chief Charles Kana‘ina. Lunalilo became the first elected monarch of the Hawaiian Kingdom in 1873. He was the grandnephew of King Kamehameha I. In 1852, in cooperation with his father Kana‘ina, he submitted a claim for all of Kea‘au Ahupua‘a in Puna. In fact, this was just one of several dozen claims made in Land

Commission Award 8559B (apana 16 of at least 46 others). With these claims he sought legal title to lands on Hawai‘i, Maui, Lana‘i, Molokai, and O‘ahu. A portion of the claim concerning Kea‘au and a description of the location of apana 16 is shown in Figure 7.

Lunalilo died on February 3, 1874 less than a year after his election to the throne. On the 3rd of January 1879, Kana‘ina followed up Lunalilo’s claim with a Royal Patent application (#7223) in which he requested that the government relinquish any further claims or interest in the land. This grant was signed by King Kalaukaua and conveyed all 64,275 acres to his heirs in perpetuity.

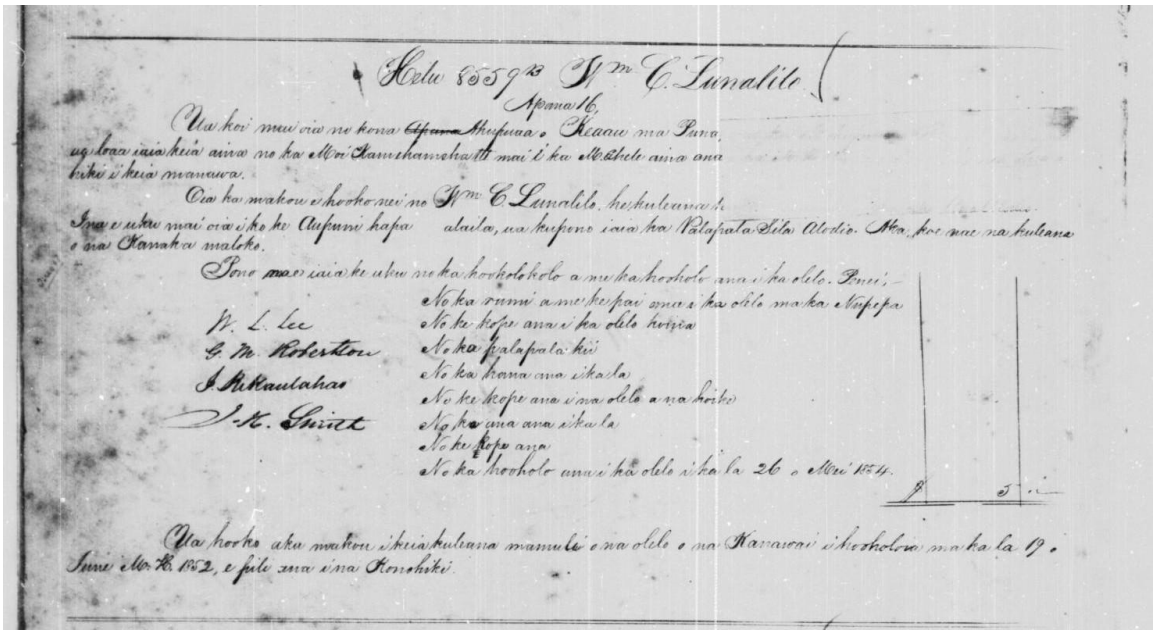


Figure 7 Excerpt from Land Commission Award 8559B, apana 16, Kea‘au Ahupua‘a, to W.C. Lunalilo.

Previous Archaeological Studies in Kea‘au Ahupua‘a

Kea‘au Ahupua‘a is very large, stretching from the coast to the summit of Kīlauea volcano, 4,009 feet amsl. Most of the archaeological projects done within the ahupua‘a were undertaken in service of development in these low-lying residential areas. In particular, within the burgeoning subdivision of Hawaiian Paradise Park. These studies on the coastal flats, below (makai of) the town of Kea‘au (elevation of 341 feet amsl) have very little relevance to the vast reaches of upland (mauka) forest lands of the current project area. Searches of the Hawaii Island Cultural Resources Information System (HICRIS), direct consultations with the State Historic Preservation Division’s Librarian and requests of the larger Big Island archaeological consulting firms for assistance were made. These were undertaken in order to summarize the results of previous archaeological projects above (mauka of) Kea‘au town. However, very few previous archaeological projects have been completed in this area. Therefore, the search was enlarged to include the adjacent ahupua‘a of ‘Ōla‘a (to the north) and Kahauale‘a (to the south).

These searches resulted in a list of twelve previous projects which are summarized below. The projects are presented in Table 2 in order of their date of publication. The following discussion, instead, reviews the results of each geographically. The twelve studies can be grouped into four rough spatial categories: 1) Those projects in-and-around the town of Kea‘au, 2) those in the vicinity of Mountain View (1,034

feet amsl), 3) the large-scale inventories of major forest tracts spanning the intermediate elevations (500 – 3,000 feet amsl), 4) and those that have been completed in and around the summit of Kīlauea, within Hawaii Volcanoes National Park, or in Volcano Village (4,000 feet amsl). The location of each project is illustrated in Figure 8.

Authors	Year	Ahupuaa	Type	Title	Acres	Sites
Hammatt and Borthwick	1988	Kahauale‘a ‘Ōla‘a and	AA	Geothermal Sites	21,219	na
Morrison et al.	1993	Keaau	AIS	Volcano Village Historic Buildings	na	100+
Escott	2014	‘Ōla‘a	AIS	Church of JCLDS	23	1
Escott	2013	Kea‘au	AFI	ATT monopole	0.23	0
Wheeler et al.	2013	Kea‘au	ALRFI	Keaau Middle School	2.6	3
Haun and Henry	2014	Waiākea and ‘Ōla‘a	AIS	Waiakea Timber Management Area	556	2
Reeve and Cleghorn	2015	‘Ōla‘a	AMP	VSAS Keakealani	3.15	1
Barna and Glennon	2016	‘Ōla‘a and Kea‘au	AIS	Connector Roads	46	1
Barna	2017	‘Ōla‘a	CIA	VSAS Keakealani	3.15	2
Escott	2017	Kea‘au	AIS	Shipman Office	8	1
Scheffler	2020	‘Ōla‘a	AFI	Mathieu lot 10	49	0
Kettner and Clark	2024	Keauhou	AIS	Pole and Utilities HAVO	31.6	4

Table 2 Summary of previous archaeology projects in upper Kea‘au Ahupua‘a.

Furthest removed from the current project area, at the lowest elevation, two archaeological projects were found in the SHPD records. The first was carried out by Scientific Consultant Services, Inc. (Escott 2017). This AIS covered a project area of 8 acres for a new W.H. Shipman Ltd. Office complex, prominent today at the intersection of Hwy 11 and the Kea‘au-Pāhoa road. A single historic site was recorded which consisted of a linear trench. The trench was presumed to lie in the location of a cane flume observed on maps from 1932, though no wooden structural components of the flume remained (SIHP #50-10-35-30613). A second project included an Archaeological Literature Review and Field Inspection of the Kea‘au Middle School, buildings B, D, E and G which were scheduled for demolition (Wheeler, Wilkinson and Hammatt 2013). The 2.6-acre project area was later the subject of a Archaeological Monitoring (Wilkinson and Hammatt 2016). In this case, the historic structures (the school buildings themselves) were recorded for the Historic American Building Survey (HABS). In addition, a historic ‘auwai (ditch or canal) was documented and left unimpacted (no SIHP # available).

Barna and Glennon (2016) completed an Archaeological Inventory Survey (AIS) of 46 acres of connector roads in Mountain View. This survey across the ahupua‘a of both ‘Ōla‘a and Kea‘au described 8 features and a single significant historic site. The features included a culvert, 4 drainage ditches, a concrete post and a plantation road. The single site (SIHP #50-10-44-30575) was another road, “South Lauko”. Glenn Escott (2014) surveyed a parcel of land, 23 acres, for the Church of Jesus Christ of Latter-Day Saints. This survey recorded a single significant historic site (SIHP #50-10-44-29815), a drainage ditch 2 meters wide and 210 meters long, also associated with plantation era water management and cane field operations in the vicinity of Mountain View.

In the vast forests that lie above the towns of Kea‘au and Mountain View, three studies have been done that serve as samples for the mid-slopes of Kīlauea. The first was an AIS survey of 556 acres carried out

by Haun and Associates (Haun and Henry 2014). This inventory was carried out on both sides of Stainback Road between the elevations of 400 – 3,000 feet amsl in order to allow for the development of the large, Waiakea Timber Management Area where State Foresters carry out experiments with tree growth and timber management methods. These surveys straddled the ahupua‘a of both Waiākea and ‘Ōla‘a. Two new sites were recorded, including the remnants of a flume and a historic road. Haun and Henry report also on a reported burial cave in the lower elevations, however, they were unable to relocate this site and suggest that access to it may have either grown-over or been disturbed by earlier roadway work on Stainback. The second, even larger scale Archaeological Assessment in the mid elevation area was done in Kahauale‘a ahupua‘a and included lands all the way along the rift zone to Kapoho (Hammatt and Borthwick 1988). This literature review sought to determine the impacts that three geothermal sites might have on archaeological resources of the area, in particular subterranean sites that are known to exist on Kīlauea’s Middle East Rift Zone. The project area covered an enormous area of 21,219 acres within the Waokele O Puna Forest Reserve, up to an elevation of 2,000 feet amsl. The authors performed no field work for this assessment, instead they came up with recommendations for project specific surveys on older lava flows (those pre-dating A.D. 1800) where caves and “lava tubes” were likely to be present. This included two significant known caves, Kazumura Cave and Puna Cave both of which, formed by Kīlauea summit eruptions, extend from the coastal flats well into the uplands. Hammatt and Borthwick’s literature review did not uncover any traditionally recorded sites or other archaeological resources in the upper forest zone. They conclude that “Most of the areas that would have been within the upland planting zone have been inundated by recent lava or saw long-term use in sugar cultivation.” (Hammatt and Borthwick 1988:30). The last study by Scheffler (2020) included an Archaeological Field Inspection of a 49-acre parcel at an elevation of 1,800 feet in Ōla‘a Tract. While a historic trail and length of cane-era flume were identified in the vicinity on old maps, the only historic feature found within the project area was an old house. While constructed more than fifty years ago, it lacked the integrity or preservation to consider it significant.

The last set of archaeological studies done near the current project area include those in Volcano Village and within the Hawaii Volcanoes National Park. Two of these concerned previous compliance work for the VSAS Keakealani Campus located on Wright Road. Barna (2017) completed a Cultural Impact Assessment for the campus, and Reeve and Cleghorn (2015) prepared an Archaeological Monitoring Plan for the site which includes two historic structures with strong ties to the history of Volcano Village and some of its founding community members, including Peter Lee. No archaeological sites are present on the campus. Another broad survey of architectural heritage was compiled by Boone Morrison Architects, Inc. at the request of the State Historic Preservation Division and in order to establish the extent of the Volcano Village Historic District. This inventory (Morrison, Finley, Loh-Palumbo and Dryden 1993) documented over 100 historic homes in the Village. The oldest surviving structure, a log cabin located on ‘Ōhi‘a Lane, dates to 1886. However, most of the single-wall, wood frame, post and pier structures with double hung windows are from the mid-20th century. The authors were surprised by how many pre-World War II houses (25% of the total) there were in such a small village. The authors were also struck by how many of these historic houses incorporated recycled materials from older structures on the same site, or salvaged from other locations. Much more recently, Ketner and Clark (2024) surveyed 31.6 acres consisting of two, 15 meter wide by 4,200-meter-long corridors within Hawaii Volcanoes National Park. These corridors from near the park entrance and around the north east side of Kīlauea, crater at an elevation of 4,000 feet amsl, were planned to be used for new power poles and utility lines. Three previously known sites were noted as well as a single new site. These were all historic sites, including the Kilauea Military Camp Steam Bath House (SIHP #50-10-52-30283), the Tahara House (SIHP #50-10-52-31200), the Peter Lee Short-Cut Road (SIHP #50-10-52-29785) and a historic orchard (SIHP #50-10-52-31506). Last in this summit area, is an Archaeological Field Inspection of a small portion

of land on the same TMK as the current project area. ATT planned the installation of a “monopole” on the property and Glenn Escott (2013) did the AFI. In the report Escott notes the presence of an Old Railroad Grade near, but outside, the project area and SHPD made a determination of “no effect” (Donham 2014).

It is notable that in none of the above surveys between 400 and 1,400 feet amsl, were any pre-contact, or traditional Hawaiian sites discovered. However, a plain pattern does emerge from those sites that were recorded; they were all historic resources associated with the plantation era and the operations of the ‘Ōla‘a (Puna) Sugar Co. All of the sites were considered significant under criterion “d” for their contribution to history of Hawai‘i. These included overwhelmingly the infrastructure necessary for the maintenance of the plantation’s cane fields, or to transport sugar cane to processing facilities, including, roads, flumes, ditches. Above 1,400 ft amsl no pre-contact, or traditional Hawaiian sites were discovered either. Instead, this landscape is dominated by early 20th century architectural resources related to the growth of Volcano Village and in particular the Hawaii Volcanoes National Park and its facilities.

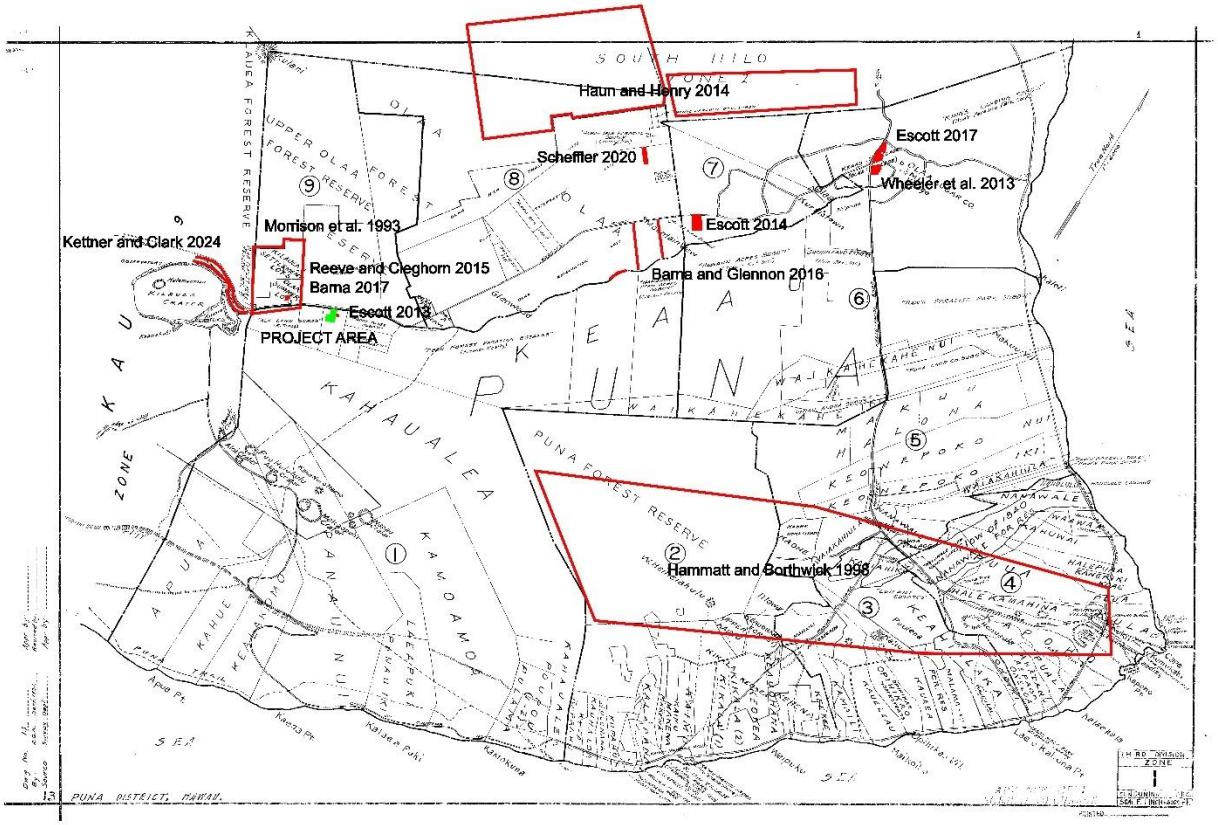


Figure 8 Locations of previous archaeological surveys reviewed in the text.

RESEARCH DESIGN AND METHODS OF THE SURVEY

Current vegetation cover across the project area presented a significant obstacle to the implementation of any 100% pedestrian inspection. Given the infeasibility of full pedestrian coverage, an alternate methodology was proposed which incorporates a focused pedestrian sample of eleven transects along with the analysis of aerial images and remote sensing data.

If prehistoric sites are to be found in this area they would necessarily be of extremely low archaeological visibility and dispersed on the landscape, indicative of transient and temporary use associated perhaps with the extraction of specialized resources. More likely to be encountered are remnants of historic infrastructure of the mid to late 20th century agricultural activities.

Preliminary investigation of an aerial image from 1954 as well as cursory inspection of google images going back to 2001 indicate that the entire property was subject to clearing activities, The south half seems to have been cleared almost completely early on, while the north half has been impacted more recently.

Therefore, because of the physical limitations, low likelihood of prehistoric sites and known disturbance, a multi-prong strategy was implemented for the AIS.

The first includes a thorough survey of aerial images available to look at landscape changes and identify features of interest. Any rock walls, fence lines, large lava tubes or skylight openings, enclosures or structures should be visible with appropriate resolution photographs. These included high resolution images available on Google Earth that go back to at least 2001 as well as an analysis of photos taken by the Navy that go back to 1954.

In combination with these photos, a comprehensive survey of available USGS maps was undertaken. These maps have proven invaluable already in the identification of the abandoned rail road grade that prompted the need for an AISP. USGS maps are available going back to 1922 and were examined for the presence of historic roads, pipelines, structure and other notable features of cultural interest.

In addition to the photographic images, airborne Laser-imaging, Detection, and Ranging (LiDAR) data are available for the area. These detailed maps of the ground surface eliminate some of the obfuscating effects of thick vegetation and enable the identification of anomalous topographic features. An open-source data-set is available from "kilauealidar.com". These images, which are available on-line at a resolution of 50 centimeters were taken by the US Army Corps of Engineers - Engineer Research and Development Center for the purposes of monitoring Kīlauea volcano's summit eruption and caldera transformations. Fortuitously, these images capture the project area as well, and were also used in this AIS.

Lastly, the entire project area was inspected visually by qualified archaeologists using a systematic random sample of 11 transects. These transects were spaced 40 meters apart running both north-south and east-west along arbitrary UTM eastings/northings to cover the entire project area. Figure 9 shows the layout of the transects. These transects were cut by hand by community volunteers and school groups in order to facilitate other aspects of environmental survey required for development permitting. They are 1.5 to 2 meters wide, and provide visibility to either side of at least 5 meters depending on surrounding vegetation. These transects were walked twice each (out and back) by a pair of qualified archaeologists inspecting the ground surface and investigating all indications of potential sites to either side.

The eleven transects total 2,556 meters in length. Given a visible width of 12 meters (2 meters wide and a view of 5 meters to either side), the total area of visual pedestrian inspection was 30,672 square meters. This represents a sample of 7.6 acres of the 20 acre-project area, or 38%.

In addition, the identified old rail road grade was surveyed on foot for its entire length and recorded to current standards. This included GPS location and representative photographs. Also, scaled section drawings were drafted at all of the rail road grade’s intersections with the transect (T1-T9) and descriptions of the feature’s construction along it’s entire length were noted.

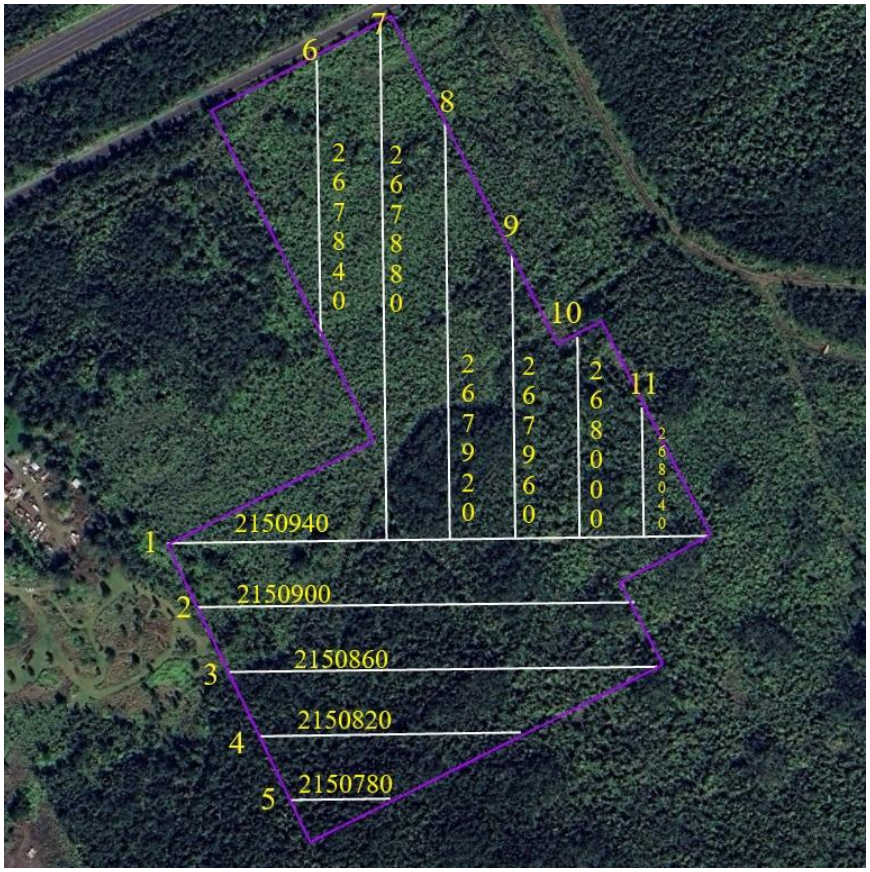


Figure 9 Planned transects (1-11) across the project area.

RESULTS

Archival Maps Findings

Prior to fieldwork, several historic and modern maps, aerial photos and google images from different years spanning the last 100 were reviewed for insight into past land use. In 1922 (see Figure 10) there are no structures, roads trails, significant political boundaries, notes, or other features near the project area and the land was likely undisturbed forest at the time.

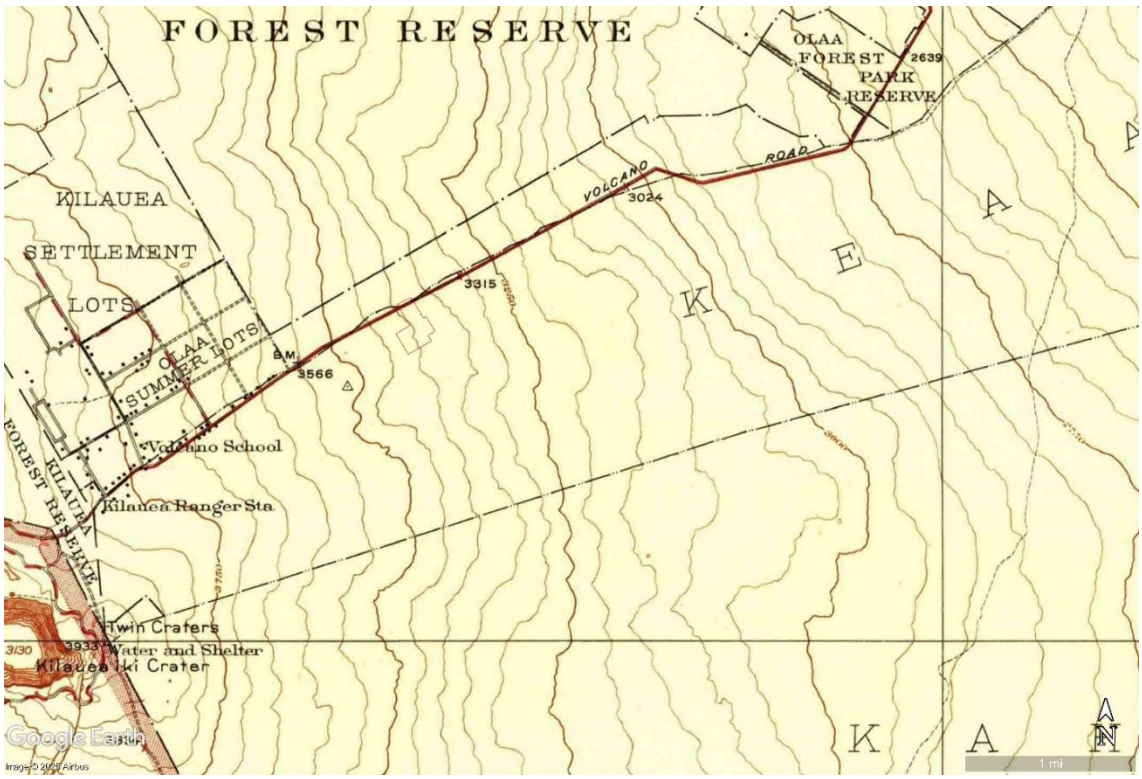


Figure 10 Portion of USGS 1:62,500 scale map, “Puna” (1922), with project area indicated.

However, by 1963 there are two features of interest on the USGS topographic quadrangle (see Figure 11). The first is a rough road just to the east of the project area. While no structures are shown, this might be part of developing ranch infrastructure (see below).

Within the project area, there is a curving dashed line labeled “Old Railroad Grade”. It meanders sinuously downslope from Pearl Street on the west side into and continuing through what is now Royal Hawaiian Estates. This rail grade is an extension of what the Hilo Consolidated Railways (which was associated with the ‘Ōla‘a/Puna Sugar Mill) called the ‘Ōla‘a Branch Line.

From the Hawai`i Sugar Planter's Association, Plantation Archives:

> “The cane was transported to the mill by fluming and by railroad. Although Olaa Sugar Company had 72 miles of flumes, it had no dependable water source for their operation. The railroad was relied upon for delivery of 60% of the cane. In addition to its own standard gauge 35 miles of railway track, the company ran cars over the Consolidated Railway tracks to bring its cane in from more distant fields. The history of Olaa Sugar Company is closely connected with the

> southern branches of the Hawaii Consolidated Railway Co. because they were interdependent from the start. The cane fields were in four widely separated areas cut off from each other by stretches of barren lava. The railroad was therefore vital to the plantation, which in turn helped support the railroad. When a tidal wave on April 1, 1946 destroyed much of the Hawaii Consolidated Railway Company's tracks, it ceased operations. The plantation was then forced to convert to trucks in order to transport sugar and molasses to the Hilo wharf.” (Cambell and Ogburn 2004).

The ‘Ōla‘a Branch Line was planned in the early 1900's in a commercial venture aimed at shuttling tourists up to the Kīlauea volcano. While the plan was for a train to run from Hilo, through Kea‘au, past Mountain View and Glenwood, the line only ever made it as far as Mountain View. The endeavor was scaled back in 1936 as more and more trucks became available and affordable and the Volcano Hwy was nearing completion – cheaper ways to haul cane as well as tourists. After a major 1946 tsunami Walter F. Dillingham and his partners in the rail line abandoned the entire enterprise, selling at a great financial loss (Lafferty and May 1931, Akinaka 1939, NPS 1953, Peterson 2010, Laupahoehoe Train Museum 2025).

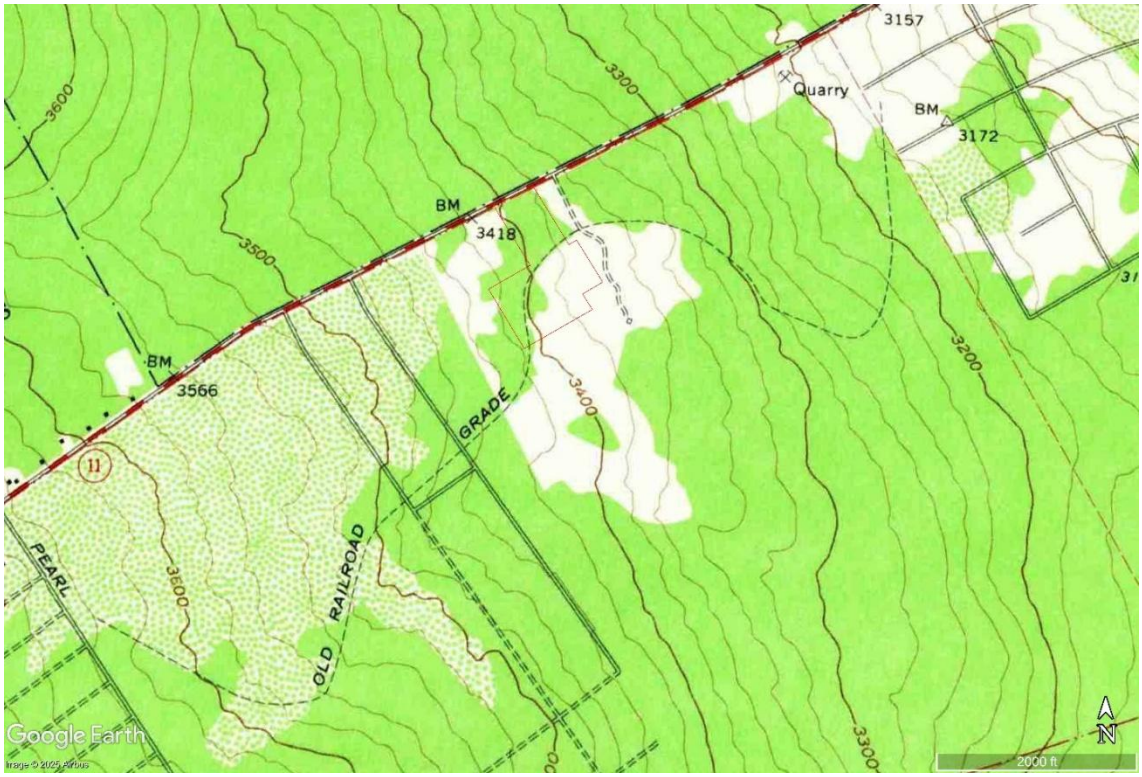
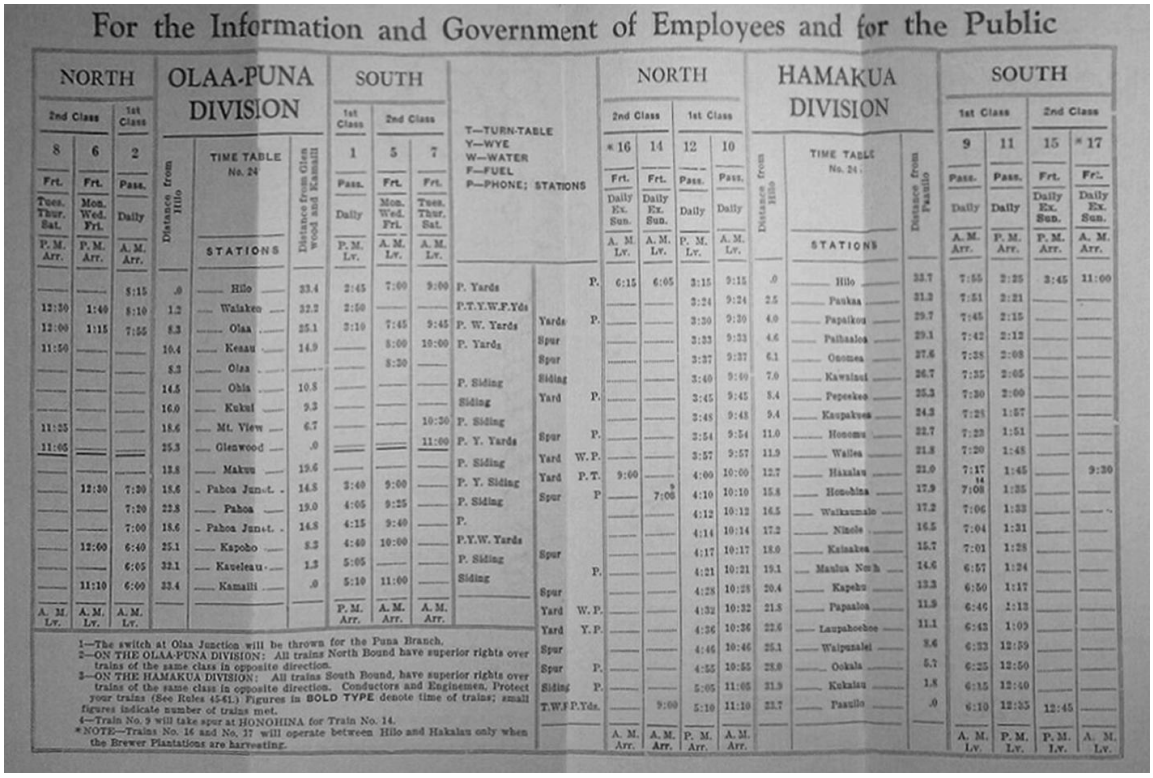


Figure 11 Portion of USGS “Volcano” (1963) showing project area and the old railroad grade.

The railroad began operation in the Hilo area in 1899, and was abandoned in 1946. A main railroad line and several feeder lines were constructed in the early 1900s from Kea‘au to Pāhoa and to locations in lower Puna District. The major line ran from Hilo through Kea‘au to the Kapoho area. A branch line ran from the ‘Ōla‘a Sugar Mill in Kea‘au to a point southwest of present-day Glenwood. A second branch line ran to a depot in Pāhoa town (Kelly et al. 1981). Figure 12 shows a timetable from 1931 with stops along the way from Hilo to Mtn. View and onward to Glenwood. Figure 13 is a photo of a Baldwin 4-6-0,

standard gauge locomotive. This particular engine was derailed on Hilo’s Bayfront on April Fool’s Day in 1946 (Collyer 2025). Figure 14 (DAGS 2025) shows the planned route of the rail line extension filed with the Territory in 1901. No similarly registered map could be located for the further extension up the summit. Nevertheless, it provides a very likely *terminus post quem* (earliest possible date) for the entire line’s construction.



For the Information and Government of Employees and for the Public

OLAA-PUNA DIVISION — TIME TABLE No. 24

NORTH 2nd Class	NORTH 2nd Class	NORTH 1st Class	Distance from Hilo	STATIONS	Distance from Glenwood and Kamaili	SOUTH 1st Class	SOUTH 2nd Class	SOUTH 2nd Class
8	6	2				1	5	7
Frt.	Frt.	Pass.				Pass.	Frt.	Frt.
Tues. Thur. Sat.	Mon. Wed. Fri.	Daily				Daily	Mon. Wed. Fri.	Tues. Thur. Sat.
P. M. Arr.	P. M. Arr.	A. M. Arr.				P. M. Lv.	A. M. Lv.	A. M. Lv.
		5:15	.0	Hilo	33.4	2:45	7:00	9:00
12:30	1:40	8:10	1.2	Waiakea	32.2	2:50		
12:00	1:15	7:55	8.3	Olaa	25.1	3:10	7:45	9:45
11:50			10.4	Keaau	14.9		8:00	10:00
			8.3	Olaa			8:30	
			14.5	Ohia	10.8			
			16.0	Kukui	9.3			
11:25			18.6	Mt. View	6.7			10:30
11:05			25.3	Glenwood	.0			11:00
			13.8	Makuu	19.6			
	12:30	7:30	18.6	Pahoa Junct.	14.5	3:40	9:00	
		7:20	22.8	Pahoa	19.0	4:05	9:25	
		7:00	18.6	Pahoa Junct.	14.8	4:15	9:40	
	12:00	6:40	25.1	Kapoho	8.3	4:40	10:00	
		6:05	32.1	Kaueleau	1.3	5:05		
	11:10	6:00	33.4	Kamaili	.0	5:10	11:00	
A. M. Lv.	A. M. Lv.	A. M. Lv.				P. M. Arr.	A. M. Arr.	A. M. Arr.

T—TURN-TABLE
Y—WYE
W—WATER
F—FUEL
P—PHONE; STATIONS

P. Yards		P.
P.T.Y.W.F.Yds		
P. W. Yards	Yards	P.
P. Yards	Spur	
	Spur	
P. Siding	Siding	
Siding	Yard	P.
P. Siding		
P. Y. Yards	Spur	P.
P. Siding	Yard	W. P.
P. Y. Siding	Yard	P. T.
P. Siding	Spur	P
P.		
P.Y.W. Yards		
P. Siding	Spur	
Siding		P.
	Spur	
	Yard	W. P.
	Yard	Y. P.
	Spur	
	Spur	P.
	Siding	P.
	T.W.F.P.Yds.	

1—The switch at Olaa Junction will be thrown for the Puna Branch.
2—ON THE OLAA-PUNA DIVISION: All trains North Bound have superior rights over trains of the same class in opposite direction.
3—ON THE HAMAKUA DIVISION: All trains South Bound, have superior rights over trains of the same class in opposite direction. Conductors and Enginemen, Protect your trains (See Rules 45-61.) Figures in BOLD TYPE denote time of trains; small figures indicate number of trains met.
4—Train No. 9 will take spur at HONOHINA for Train No. 14.
*NOTE—Trains No. 16 and No. 17 will operate between Hilo and Hakalau only when the Brewer Plantations are harvesting.

HAMAKUA DIVISION — TIME TABLE No. 24

NORTH 2nd Class	NORTH 2nd Class	NORTH 1st Class	Distance from Hilo	STATIONS	Distance from Paauilo	SOUTH 1st Class	SOUTH 1st Class	SOUTH 2nd Class	SOUTH 2nd Class
*16	14	12				9	11	15	*17
Frt.	Frt.	Pass.				Pass.	Pass.	Frt.	Frt.
Daily Ex. Sun.	Daily Ex. Sun.	Daily				Daily	Daily	Daily Ex. Sun.	Daily Ex. Sun.
A. M. Lv.	A. M. Lv.	P. M. Lv.				A. M. Arr.	P. M. Arr.	P. M. Arr.	A. M. Arr.
6:15	6:05	3:15	.0	Hilo	33.7	7:55	2:25	3:45	11:00
		3:24	2.5	Paukaa	31.2	7:51	2:21		
		3:30	4.0	Papaikou	29.7	7:45	2:15		
		3:33	4.6	Pailaalea	29.1	7:42	2:12		
		3:37	6.1	Onomea	27.6	7:38	2:08		
		3:40	7.0	Kawainui	26.7	7:35	2:05		
		3:45	8.4	Pepeekeo	25.3	7:30	2:00		
		3:48	9.4	Kaupakuea	24.3	7:28	1:57		
		3:54	11.0	Honomu	22.7	7:23	1:51		
		3:57	11.9	Wailea	21.8	7:20	1:48		
9:00		4:00	12.7	Hazalau	21.0	7:17	1:45		9:30
	7:00	4:10	15.8	Honohina	17.9	7:08	1:35		
		4:12	16.5	Waikaumalo	17.2	7:06	1:33		
		4:14	17.2	Ninole	16.5	7:04	1:31		
		4:17	18.0	Kainaiea	15.7	7:01	1:28		
		4:21	19.1	Maulua North	14.6	6:57	1:24		
		4:28	20.4	Kapehu	13.3	6:50	1:17		
		4:32	21.8	Papaaloa	11.9	6:46	1:13		
		4:36	22.6	Laupahoehoe	11.1	6:43	1:09		
		4:46	25.1	Waipunalei	8.6	6:33	12:59		
		4:55	28.0	Ookala	5.7	6:25	12:50		
		5:05	21.9	Kukaiau	1.8	6:15	12:40		
	9:00	5:10	23.7	Paauilo	.0	6:10	12:35	12:45	
A. M. Arr.	A. M. Arr.	P. M. Arr.	A. M. Arr.			A. M. Lv.	P. M. Lv.	P. M. Lv.	A. M. Lv.

Figure 12 Hawaii Consolidated Railway, Ltd. Timetable No. 24 (Lafferty and May 1931).

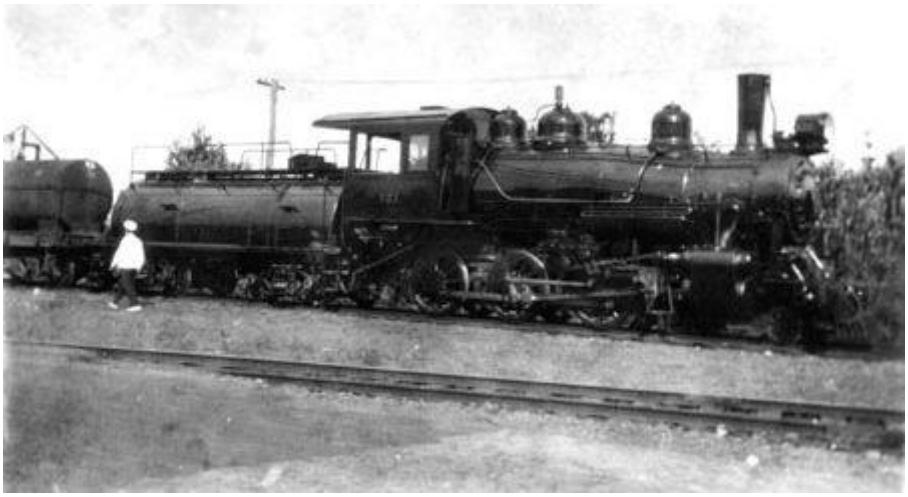


Figure 13 Hawaii Consolidated Railway, Ltd.’s “Engine 121”, photo from The Pacific Tsunami Museum

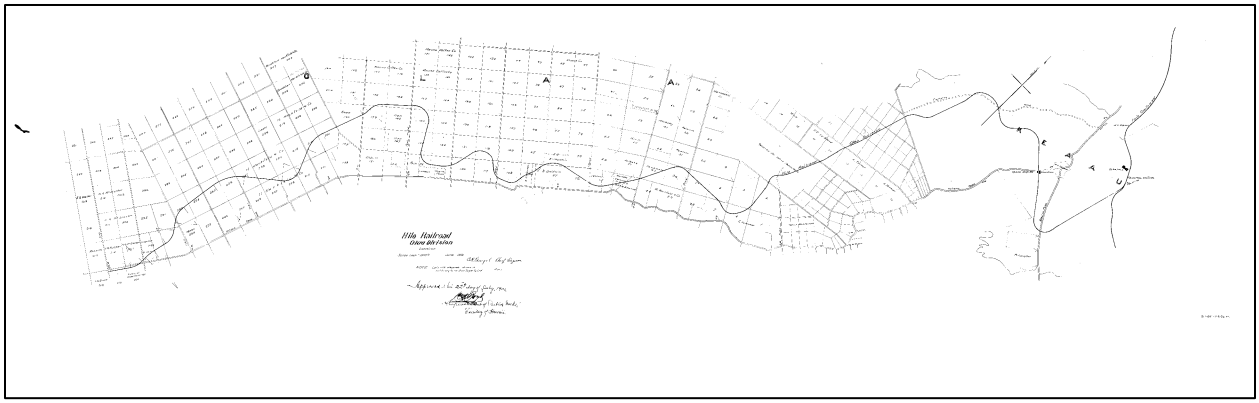


Figure 14 Hawaii Registered Map #1990 showing the planned rail line from Keaau to Glenwood, dated 1901.

Aerial Photos and Disturbance and Recent Land Alteration

Preliminary survey of a single aerial image from 1954 (Figure 15) and the above 1963 USGS map shows the project area to have undergone quite a significant amount of change in the last 70 years. In fact, it is quite clear that most of the property was previously bulldozed and cleared at one time or another. This coincides with information provided by several informants of the Shipman family who note that the area was used for cattle ranching and also for orchid greenhouses (which lay outside the project area to the west).

Peggy Farias, President of W.H. Shipman Ltd. and Tom English's daughter (Shipman family descendants) relayed the following family recollections:

> I was able to speak with my dad, Tom English, about the VSAS parcel and surrounding area this afternoon. I am summarizing what we discussed here....
>
> The railroad grade that you saw on the aerial photos and likely found on the property used to extend from Glenwood all the way into Hawaii Volcanoes National Park. As far as my dad is aware, it was constructed with the intent to extend the railroad from Glenwood to the park, likely with the primary intent of transporting tourists. However, the track was never laid and it was never actually used for railroad purposes. Our company files and land court information have no record of any subdivisions or easements to allow for railroad use in that area.
>
> The primary ag use in the area would have been orchid propagation, with several greenhouses and large water tanks on the 10-acre parcel that FVSAS purchased from the Mulliken family recently. There was one large greenhouse on the larger TMK, near the back but possibly outside of the proposed VSAS parcel. You may or may not have come across remnants of water lines that ran from the tanks on the Mulliken parcel to the greenhouse and propagation areas on the larger parcel. Herbert Shipman also used the area for some experimental plantings (such as loblolly pines), but most of those would have been outside the proposed VSAS parcel. It is also possible that the area was used for grazing cattle. To our knowledge it was never used for sugar cane…
>
> As far as I know, the land would have been used for ranching from 1882 (possibly earlier) through the 1950s or 60s. I don't think that it was ever used for sugar cane.
>
> Part of the property was also used as a greenhouse for orchid propagation for several decades, but I believe that the greenhouse location is outside of the area you will be using.
>
> Some of our other properties in the Volcano area have evidence of an easement that was graded and prepared for laying railroad tracks, but I don't think the plantation rail system ever made it all the way up to Volcano.

In 1954 the rear (south) portion of the property is extensively cleared. In Figure 15 and Figure 16, a Google image from 2001, the old railroad grade is clearly visible as a curved line bisecting the project area. To the south of the old railroad grade the forest has been removed, however, a network of small patches are visible. These are probably push piles of the cleared vegetation, though perhaps some larger trees were left standing. They seem to exist in a fairly regularly spaced pattern of small "islands" (darker dots in a regularly spaced arrangement). These islands are visible still on the Google image from 2024 (see Figure 4, above), though dense secondary forest has grown up in between them.

By 2001 this pattern of land clearance was reversed. Figure 16, the image from 2001 shows the rear portion of the project area (south of the rail road grade) to be recovering. After a little under fifty years much of the vegetation has grown back. However, now it is north of the rail road grade that has been extensively cleared and disturbed.

Given the testimony of the Shipman family (see above), I suspect the early clearing was for the purposes of cattle ranching and that the later phases occurred in the late 20th century and were directed closer to the highway and had to do with different diversified productive pursuits, perhaps associated with the cluster of houses and infrastructure directly to the west and the orchid operation that is mentioned.

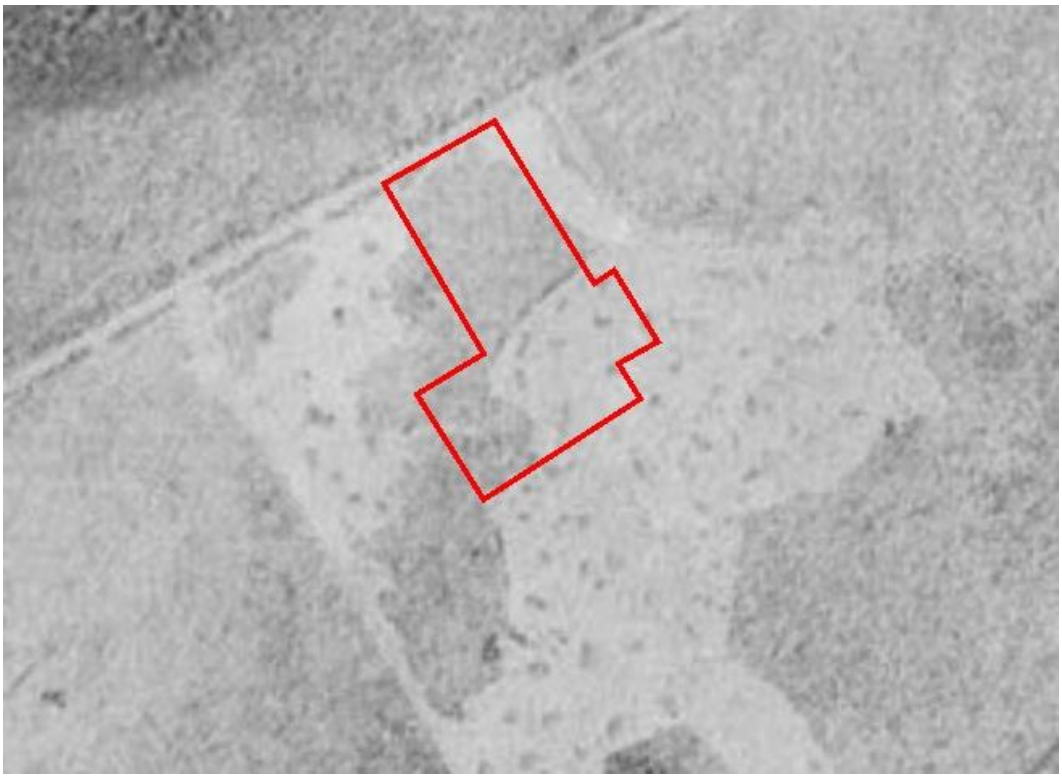


Figure 15 Aerial Photo (1954) showing project area and land clearing south of the old railroad grade (note push piles).

Figure 16 Google image (2001) showing project area and land clearing north of the old railroad grade.

Remote Sensing Results (LiDAR images)

A high-quality laser image distance and ranging (LiDAR) dataset was accessed on line through Kīlauea LiDAR (2025). This large point-cloud data set was constructed and made available by the United States Army Corps of Engineers’ Engineering Research and Development Center (CRREL 2025). The data was collected in July of 2018 and included several coverages including the summit of Kīlauea volcano. The data set was explored using Potree Viewer tools, designed for the purpose (Schütz 2025) and which allowed for magnification and viewing from alternate angles and elevations.

A representative image of the data set is shown in Figure 17. Unfortunately, the LiDAR method did not eliminate the obscuring forest canopy as well as had been hoped. Nevertheless, the high-definition representation of the surface did confirm with greater clarity much of what was inferred from dated aerial images and the historical topographic maps.

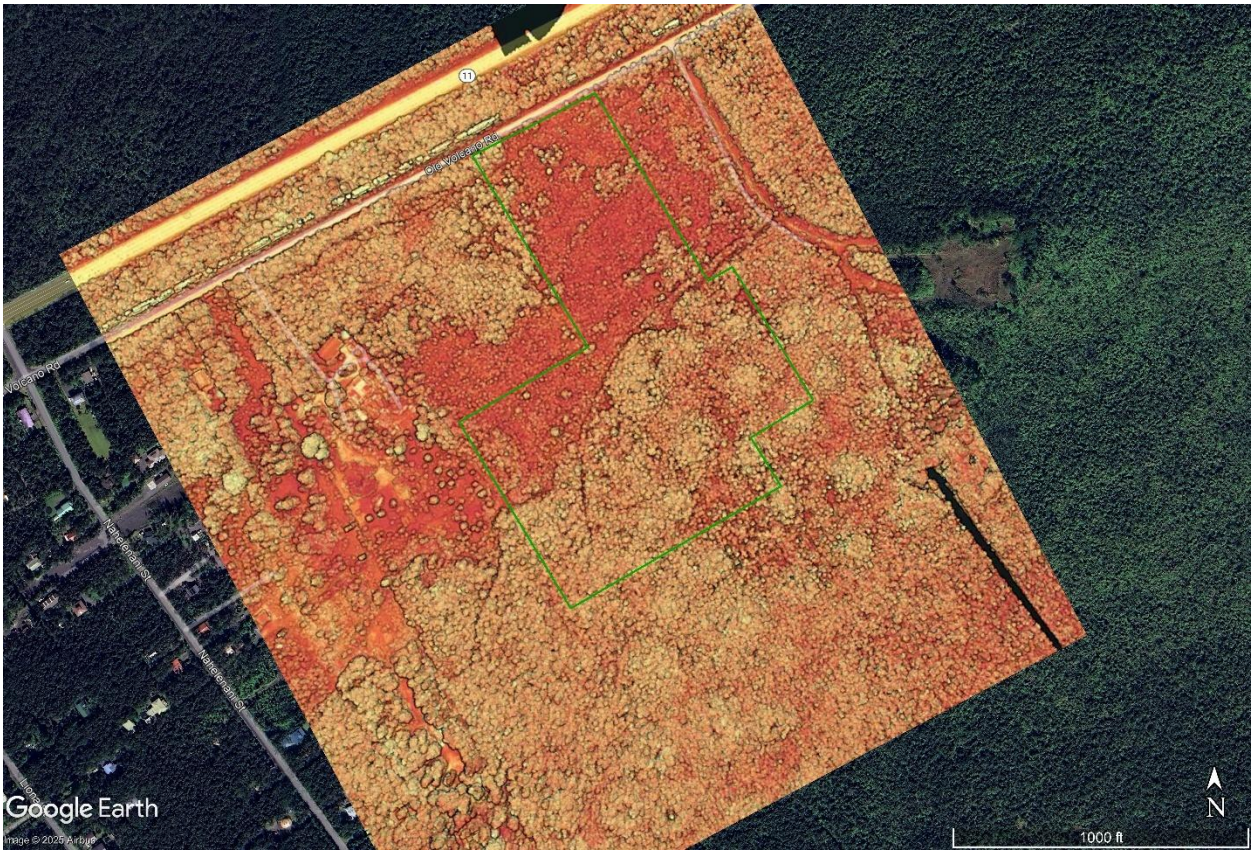


Figure 17 LiDAR image (2018) overlain on Google Earth (2024).

First, the rail road grade is even more clearly visible in the LiDAR data. The “gash” in the forest canopy is obvious. In the image presented in Figure 17 the yellow-colored dots represent higher elevation points and the red color represent lower elevation. These colors show even more clearly how extensive the disturbance (red) between the rail line and the highway is. Furthermore, the small “islands” of push piles referred to above in earlier episodes of forest clearing, and seen on the 1954 aerial photo, are also still clearly visible in 2018 as a grid of yellow vegetation remnants of higher forest in the southern portion of the project area.

Second, while it was hoped that any additional rock walls, larger cave entrances, or other topographic anomalies might be seen in the LiDAR image, none were found. Nevertheless, we do see a clear difference in the nature of the vegetation surrounding Site #50-xx-xx-xxxx1. This higher tree cover may indicate that the site was spared the clear cutting that affected the rest of the project area between the highway and the rail road grade.

Pedestrian Survey

Two new sites were identified in the survey, a set of contiguous rock wall alignments and the abandoned rail road grade. These are described below.

Rock Wall Alignments (SIHP #50-xx-xx-xxxx1)

Site #50-xx-xx-xxxx1 is a pair of two roughly parallel rock walls set perpendicular to a larger piled rock alignment along the west boundary of the project area (see Figure 18 and 19 and Photos 2 - 6). The site is located at the UTM coordinates: 0267756mE/2150922mN (NAD83, zone 05Q); this point was taken at the site datum which was placed where Transect 1 intersects with the main arm (see Figure 19).

The piled rock, oriented northwest-southeast is the modified remnants of bulldozing push from the graded, level property to the west. This linear rubble pile forms a long 1.0 to 1.5 meter high shoulder along the edge of the project areas lower lying ground. This shoulder continues in both directions for an unknown distance. However, no further modification was observed along these extents. Both inside and outside portions of the piled rock seem to have been intentionally stacked to form a more vertical wall (indicated by solid lines on the plan view map, Figure 19).

Figure 18.. Site #50-xx-xx-xxxx1 site datum and boundaries on USGS "Volcano" topo map (2024).

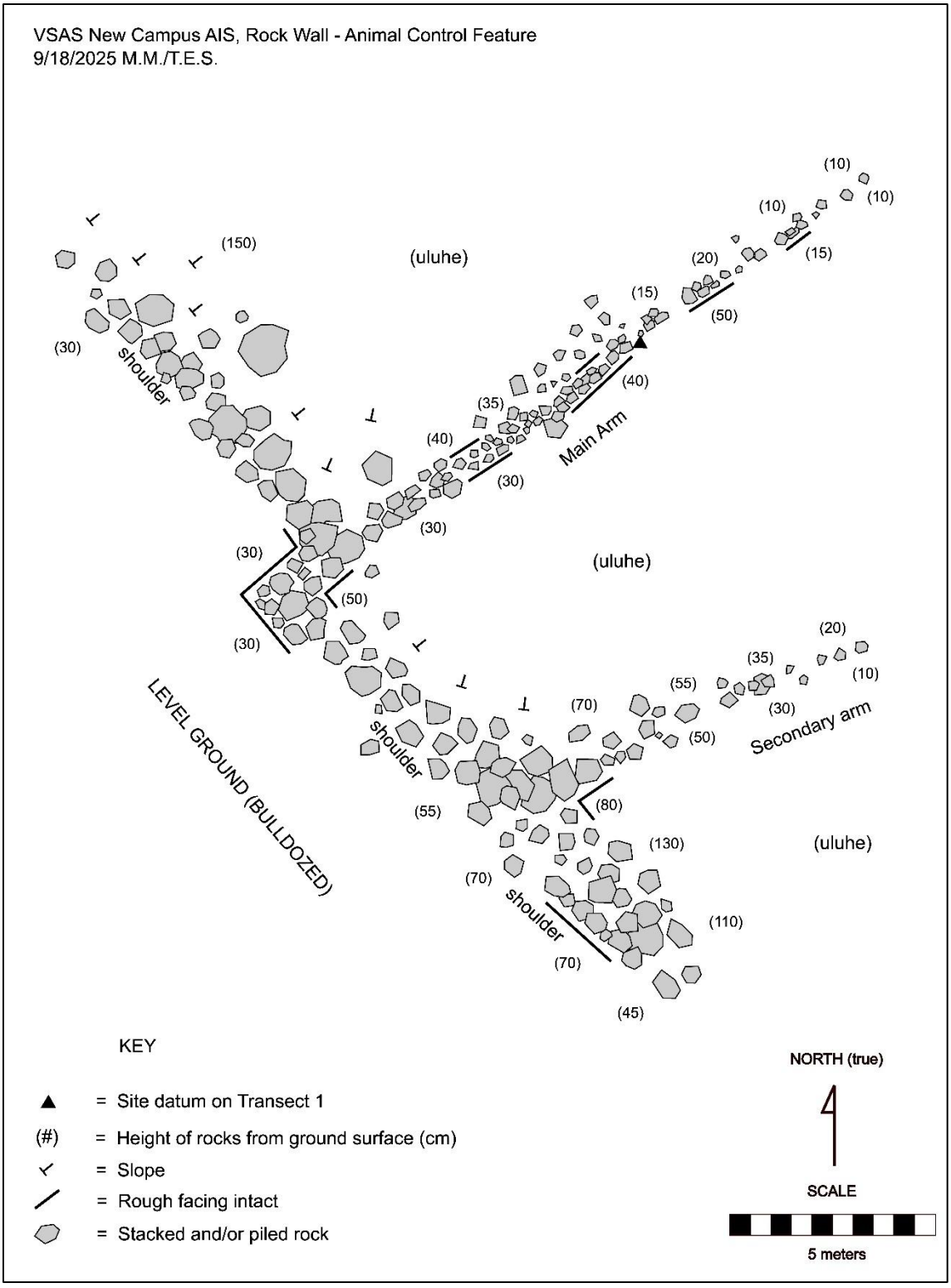


Figure 19 Plan view of SIHP #50-xx-xx-xxxx1.

The main arm extends in a northeasterly direction for approximately 20 meters. It is a low (30 to 50 centimeter high), roughly faced wall of two to three courses of tabular pahoehoe slabs and boulders, stacked in places two deep and about 75 centimeters wide.

The secondary arm is shorter (9 meters in length) and less well defined by any facing. It is a low mound of piled rock and boulders, diminishing in height from 70 – 80 centimeters at its intersection with the shoulder, to less than 20 at its terminus. If not for a small portion of its exterior southern corner, which is formed of well-aligned and faced rock, it gives the impression of a bulldozer-pushed line of rubble.

Photo 2 Site #50-xx-xx-xxxx1, Overview of main arm, view south.

Photo 3 Site #50-xx-xx-xxxx1, main arm, view to the east from shoulder.

Photo 4 Site #50-xx-xx-xxxx1, rough facing on upper shoulder, view north.

Photo 5 Site #50-xx-xx-xxxx1, secondary arm, view southeast.

Photo 6 Site #50-xx-xx-xxxx1, rough facing on main arm, view north.

The area between these arms forms an open rectangular area of approximately 9-by-5 meters. The entire site area is 15-by-20 meters. The walls likely served to fortify a taller wire or wooden fence structure, though no remnants of any construction materials were encountered. This can be explained by the cost of fencing material in historic times and its likely recycling for other needs. The site required extensive hand-clearing of uluhe and other brush to reveal it’s extents which allowed for the fine-grained search for artifacts. Despite this intensive search across the site, no other cultural material, glass, ceramic, or other artifacts were recovered. There is a very low probability of any sub-surface remains on-site. Soils are thin with less than 10 centimeters of depth before pahoehoe bedrock is encountered.

The site is in a very poor state of preservation. Most wall segments are collapsed and disturbed. The entire site area required extensive hand-clearing of dense uluhe and naupaka brush. Open areas between the arms are relatively level and overgrown with dense uluhe thicket. Small ‘ōhi‘a lehua (most less than 2 centimeters in diameter) grow rather homogenously over the site and from the walls.

The site likely functioned as an animal control feature of some kind. Perhaps it represents three sides of a previously enclosed pen, or it may have served as a corral designed to herd cattle or sheep into during round-ups from a larger paddock.

The site age is estimated to be between 50 and 75 years old. This estimate is based on evaluation of aerial photos that indicate mechanical clearing in the immediate post-War period and a rough estimate of the minimum age of the small ‘ōhi‘a growing out of the constructed elements.

Old Rail Road Grade (SIHP #50-xx-xx-xxxx2)

Site #50-xx-xx-xxxx2 is a 440 meter long rail road grade described above in the historical background. It runs in an arc from the southern corner of the project area, curving northeast and then east to the project areas eastern side (see Figure 20). It continues outside the project on both ends.

The eastern half of the rail road grade skirts the edge of two distinctly different aged forests. Bulldozing of the northern and southern halves of the project area (described above) seem to have used the rail line as an arbitrary boundary, clearing on either side at different times. The result is a much denser older forest with isolated patches of Himalayan blackberry on the south and a younger one, more dominated by invasive weeds such as Kahili ginger, and native ‘uki grass (*Dianella sandwicensis*) and consisting of much smaller trees on the north.

Portions of the grade are represented by a raised trapezoidal berm, sometimes of 1 meter, or more in height. Other portions of the grade are cut into the natural topography with nearly vertical sides, in some locations of 1.5 meters in height. In both cases, these edges are sometimes roughly-faced with blocky pahoehoe slabs that reinforce the lateral slopes. On average the level center bed is 3 meters wide and consists of packed gravel and cobble fill (see Table 3 for a summary of dimensions). No actual tracks were ever laid along this planned route (see above archival research), and no evidence of anything other than the contouring and leveling of the proposed rail road grade bed were encountered. That is, no cultural artifacts or other historic materials were observed (other than a pair of modern pipelines discussed below). This may in part be due to the heavy vegetation cover. Soils are relatively thin and vegetation is dense with forest litter obscuring most of the ground surface. Nevertheless, the probability of sub-surface remains is low, with no surface evidence for artifact scatters or other activity areas.

Most locations along the grade are deteriorating and have slumped or otherwise not retained their original shape or width. Nevertheless, its condition overall remains in a state of fair preservation (see Table 3 for specific locations and variability).

Figures 21, 22 and 23 show scaled cross-sections of the railroad grade at nine points within the project area where survey transects crossed the feature (T1 – T9, see Table 3 for GPS/UTM coordinates). These nine locations present a representative sample of the variation encountered along the planned route of the rail line and are shown in more detail below and with accompanying photographs.

Figure 20 Site #50-xx-xx-xxxx2 site boundaries and datum points on USGS “Volcano” topo (2024).

Location	Easting	Northing	Form	Height (cm)	Height (cm)	Width (cm)	Preservation
T1	267863	2150951	cut	-60	-80	310	poor
T2	267849	2150887	berm	80	150	305	fair
T3	267847	2150863	berm	20	45	?	v. poor
T4	267852	2150812	berm	150	65	290	good
T5	267871	2150770	cut	-160	-130	310	fair
T6	267893	2150992	berm	45	95	310	poor
T7	267904	2151025	berm	35	50	265	poor
T8	267924	2151039	berm	30	30	325	fair
T9	267965	2151075	berm	95	40	300	fair

Table 3 Summary of UTM (GPS, NAD83, zone 05Q) and rail road grade dimensions.

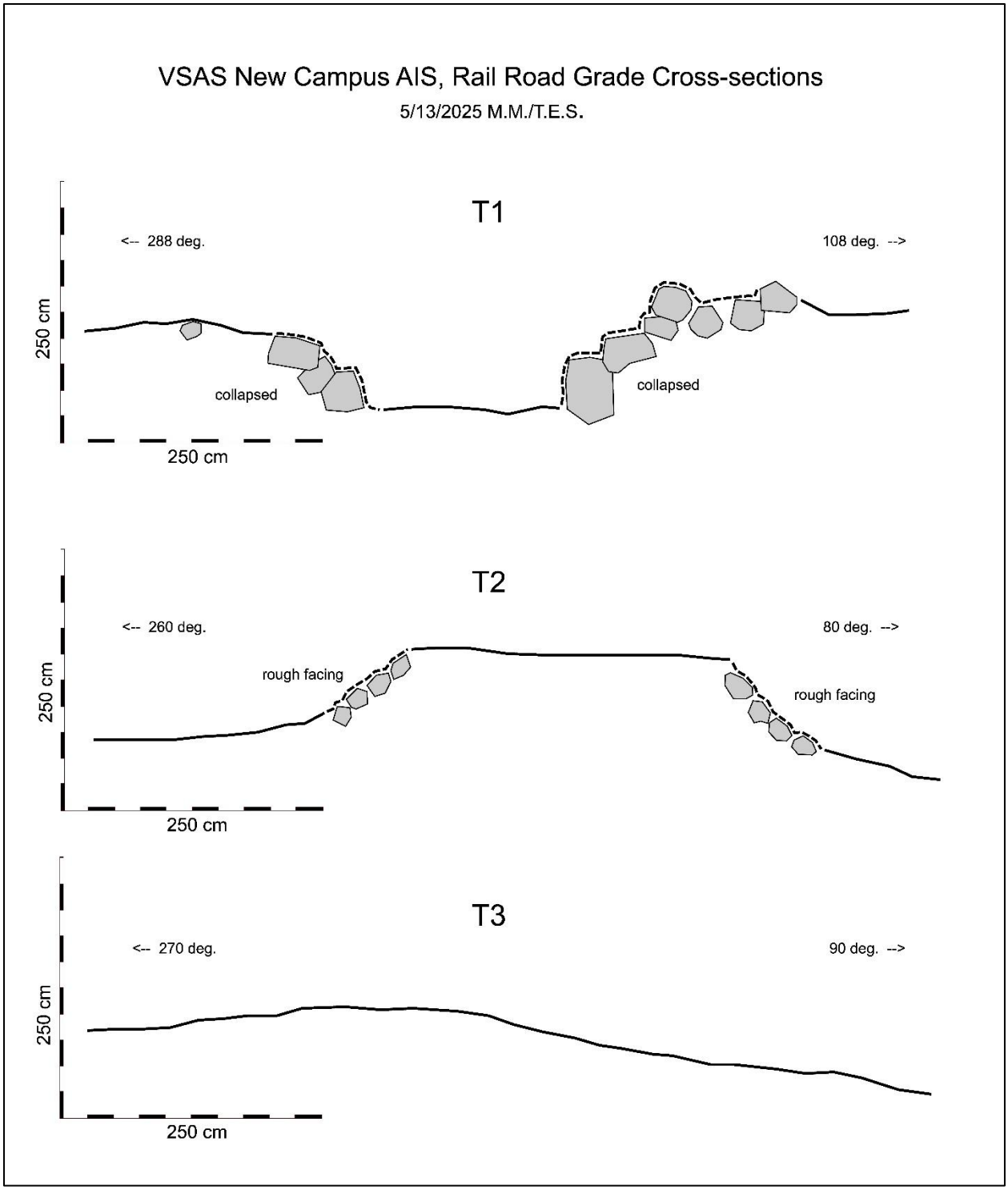


Figure 21 Cross-section views of SIHP #50-xx-xx-xxxx2 at T1, T2, and T3.

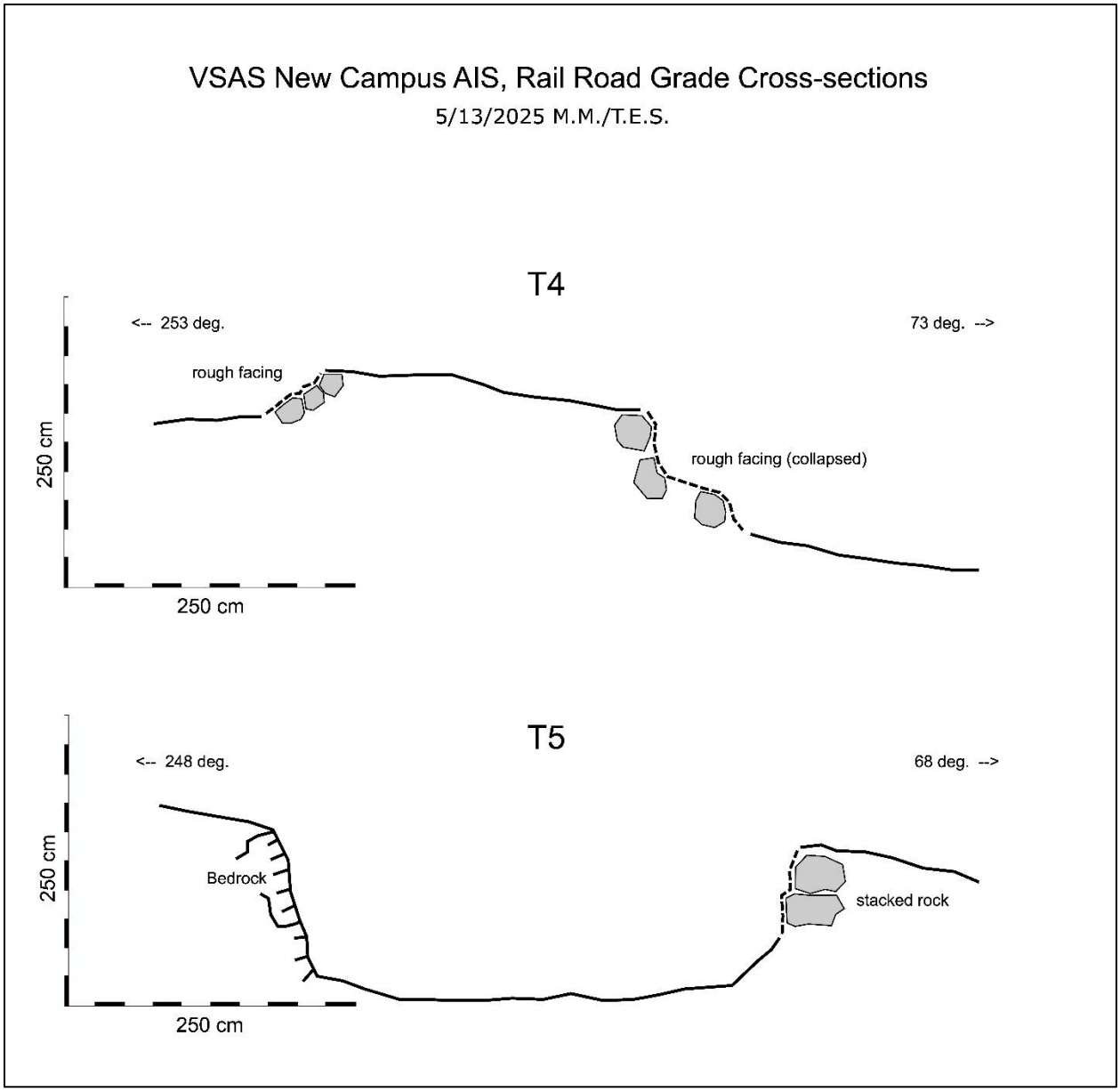


Figure 22 Cross-section views of SIHP #50-xx-xx-xxxx2 at T4, and T5.

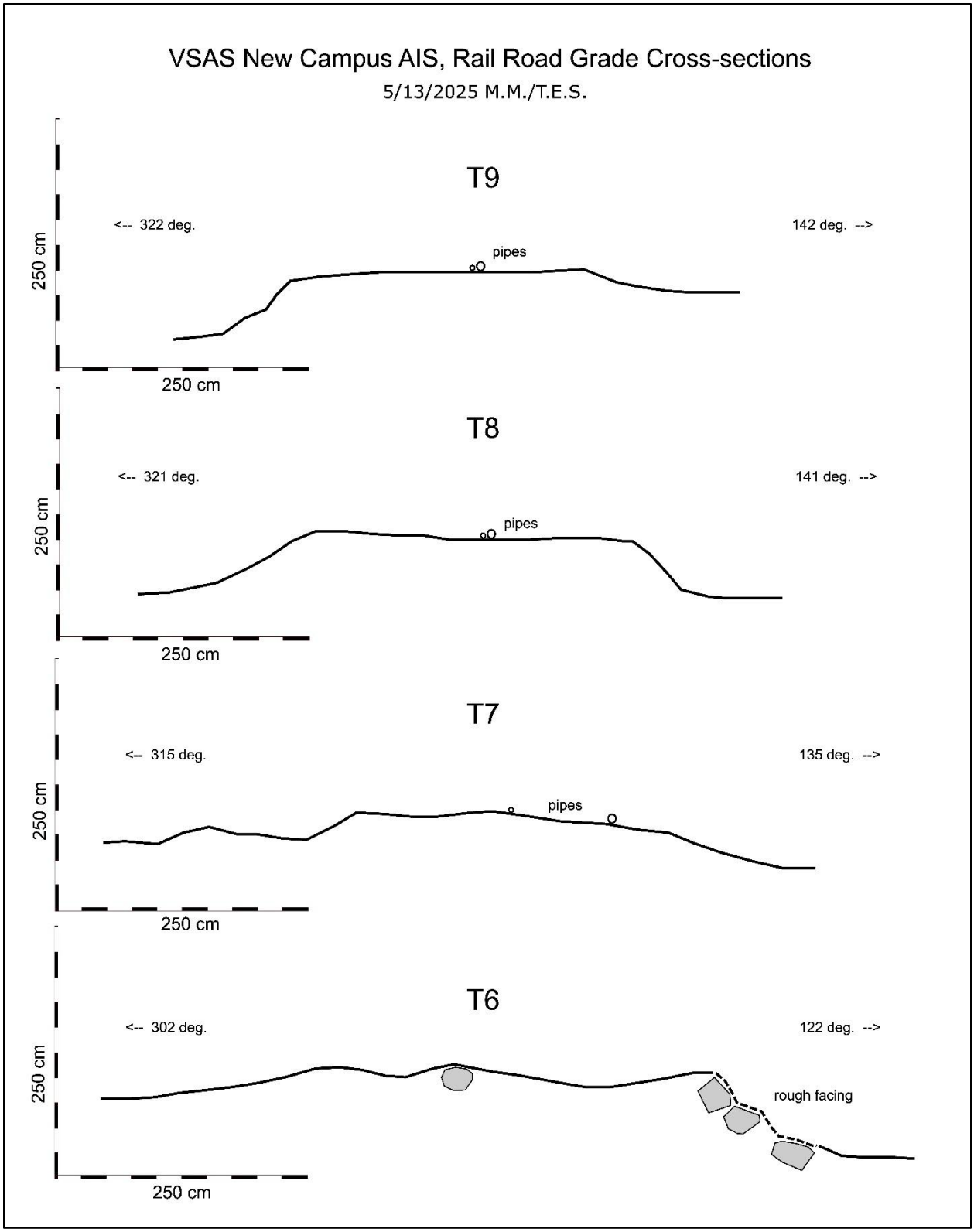


Figure 23 Cross-section views of SIHP #50-xx-xx-xxxx2 at T6, T7, T8 and T9.

The railroad grade is heavily grown over with weedy uluhe, Rubus thickets, some guava, molasses grass, ‘uki grasses and Tritonia. However, perhaps as a result of the packed gravel bed, very few trees have regrown along the grade. What remains is a very clear and distinctly linear gap in the forest canopy surrounding it (see Photo 8 and 12). It is this characteristic which allowed for its easy identification on aerial photos and on the LiDAR image used to aid in the survey.

Photo 7 SIHP #50-xx-xx-xxxx2, rail road grade bed with stone facing on east edge, T4, view west.

Photo 8 SIHP #50-xx-xx-xxxx2, forest gap and uluhe overgrowth at T8, view north-northeast.

The entire length of the grade was inspected by a pair of archaeologists walking the alignment several times. No cultural artifacts were associated with the grade with the exception of a pair of irrigation pipes that were lain on the raised sections between T9 and T7. One of these pipes was modern 1” PVC, however, parallel to it was an older highly corroded 1 ½” steel line that the PVC seems to have replaced (see Photo 12). The lines extend outside the project boundary on the east and while the railroad grade curved to the south the pipes continue roughly straight west in the direction of the structures and buildings on the adjacent property. The pipes seem to have been supplying water from tanks outside the project area on the east across the project area to the facilities on the western side, part of mid to late 20th C. Shipman operation infrastructure.

Photo 9 SIHP #50-xx-xx-xxxx2, rail road bed and “cut” at T5, view north.

Photo 10 SIHP #50-xx-xx-xxxx2, rail road “cut” into bedrock at T1, view east.

Photo 11 SIHP #50-xx-xx-xxxx2, clearing at “P2”, a possible staging area near T9, view south

Photo 12 SIHP #50-xx-xx-xxxx2, water pipe lines laid along rail road bed at T8, view west.

There were two other cultural modifications associated with the railroad grade. At T6 and at T9 upright ¾” steel pipes were found projecting 40 centimeters vertically out of the ground, near the southern edge of the grade (see Photo 13). These pipes may have been survey pins used to plan and align the grading route.

There is a 20-by-20 meter cleared and level area at the eastern edge of the project area associated with one of these pipes (T9). This area was considered briefly to have been a possible staging area, or other special purpose use area associated with the rail road grade (see Photo 11). However, despite intensive efforts no artifacts or cultural materials other than the upright pipe could be found to corroborate this hypothesis. Given its proximity to the historically present road outside the project area to the east and what appear to be the more recent effects of fire, as well as known modern activities associated with Shipman Ltd., it was excluded from the rail road grade’s site boundaries.

Photo 13 SIHP #50-xx-xx-xxxx2, survey pipe “P1” near T6.

This site functioned as a planned route for an extension of the Puna Sugar Mill’s rail line from Kea‘au. As explained above the Company had planned to extend train service to the summit of Kilauea to take advantage of increasing tourist interest in the volcano and the then growing accommodations in Hawaii Volcanoes National Park which was established August 1, 1916.

The age of the rail road grade can be estimated with some accuracy, if not great precision. Historical records from UH Manoa’s Sugar Plantation Archives, historical sources from the National Park and Laupahoehoe Train Museum websites and Hawaii State Registered maps cited above indicate that planning for the rail line’s extension began by at least 1901. It is also clear that while the line was extended to Glenwood after that time, further plans to go further were abandoned by 1936. Therefore, the unimproved rail road grade is more than 89 and less than 124 years old.

SITE SIGNIFICANCE ASSESSMENTS

The current survey has identified two sites which are likely to be older than fifty years of age, and therefore must be considered a historic property, “… any building, structure, object, district, area, or site, including heiau and underwater site, which is over 50 years old” (HRS §6E-2).

The significance of such properties is determined based on an evaluation of the sites’ “Integrity of location, design, setting, materials, workmanship, feeling, or association” and with the application of one of the following criteria set forth in Hawaii Administrative Rules, Ch. 13-284-6:

> a – associated with events that have made an important contribution to the broad patterns of our history
>
> b – associated with the lives of persons important in our past
>
> c – embody the distinctive characteristics of a type, period, or method of construction; represent the work of a master; or possess high artistic value
>
> d – have yielded, or is likely to yield, information important for research on prehistory or history
>
> e – 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.

Site #50-xx-xx-xxxx1, the paired rock walls, has yielded information important for research on the history of Hawai‘i and land use in upper Kea‘au Ahupua‘a. Therefore, it is considered significant under **“criterion d”**

Site #50-xx-xx-xxxx2, the rail road grade, has also yielded information important for research on the history of Hawai‘i. Therefore, it is considered significant under **“criterion d”**. Furthermore, the railroad grade is a unique remnant of what was once a very important component of Plantation Era infrastructure. The Railroad system present in Hawaii prior to World War II is underappreciated and notable for its extent at the time. The site is therefore also significant for its association with the broad pattern of rail and train transportation on the islands prior to the widespread introduction of automobiles and trucks in the cane and tourism industries, and qualifies under **“criterion a”**.

Site Integrity and Eligibility for National/State Register Listing

The Hawai‘i Register of Historic Places is an official list of properties that have been recognized for their significance to the history, architecture, archaeology, or culture of Hawai‘i communities. Buildings, structures, sites, district, and objects over 50 years old are eligible for nomination to the Hawai‘i Register. The Hawai‘i Register of Historic Places is intended to be representative of the various types of significant historic properties in Hawai‘i; it is not inclusive of all significant properties.

A building, structure, object, site, or district is eligible for the Register for its association with historic events or patterns, its association with an important historical figure, an example of engineering or architectural type or a work of a master, or for its ability to yield information about our history. Additionally, properties nominated to the Register must maintain integrity of materials, design, feeling, location, association, workmanship, and setting (DLNR 2025).

Hawaii Administrative Rules §13-198-8 includes the criteria for decisions and considerations for the inclusion of historic properties on the Register. In evaluating the eligibility for inclusion, the property must meet or possess, individually or in combination, the following:

(1) The quality of significance in Hawaiian history, architecture, archaeology, and culture, which is present in districts, sites, buildings, structures, and objects of State and local importance that possess integrity of location, design, setting, materials, workmanship, feeling, and association;

(2) Environmental impact, i.e., whether the preservation of the building, site, structure, district, or object significantly enhances the environmental quality of the State;

(3) The social, cultural, educational, and recreational value of the building, site, structure, district, or object, when preserved, presented, or interpreted, contributes significantly to the understanding and enjoyment of the history and culture of Hawaii, the pacific area, or the nation.

While site Site #50-xx-xx-xxxx2 does contribute to our knowledge of the past and to the history of the railroad industry in Hawaii (criterion d and a, above) it lacks sufficient integrity to be listed on the Hawaii (or National) Register. The elements present are in poor condition; the materials (rock facings and contoured surfaced, e.g.) have been disturbed by natural and artificial forces in the last 50 - 100 years and no longer maintain their function. While the location illustrates elements of train track engineering through unique enviroments of the Hawaiian rainforest, their dilapidated condition detracts from their workmanship. No associated features that might increase the value of their preservation were encountered and its preservation is unlikely to enhance the environmental quality of the state. The educational value they may represent could be achieved elsewhere. The site is therefore, NOT considered eligible for the Hawaii, or National Register of Historic Places.

SUMMARY OF FINDINGS

Two newly recorded significant historic properties were documented. Site #50-xx-xx-xxxx1, a pair of rock walls in poor condition were likely used for animal control purposes in the mid- to late 20th C and is considered significant under criterion “d” only. Site #50-xx-xx-xxxx2, an abandoned rail road grade bed constructed in the early 20th C. is considered significant under criterion “d” and “a” for both its general contribution to Hawaii history and for its association with the important era of sugar plantation development and post war diversification of plantation infrastructure, including train transport, unique to the Big Island.

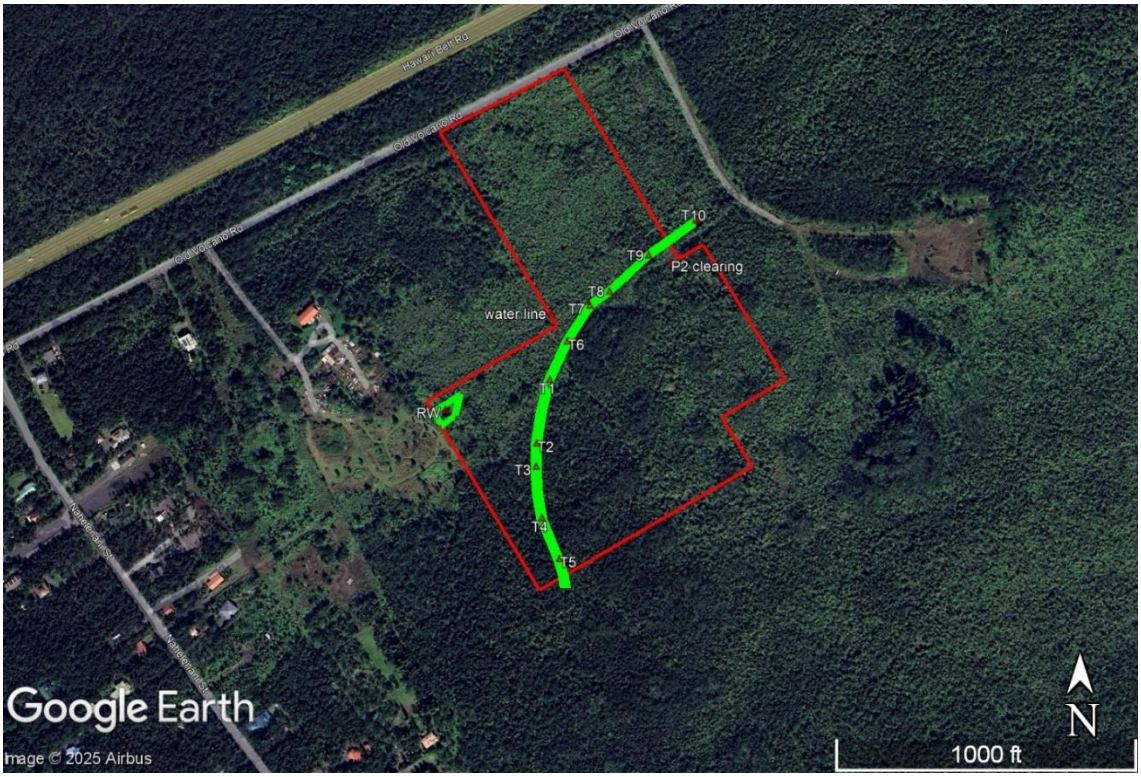


Figure 24..Project area and sites #50-xx-xx-xxxx1 and #50-xx-xx-xxxx2 on Google image (2025).

The current survey allows for a reaffirmation of the history of land use in upper Kea‘au Ahupua‘a that is largely in line with the predictions outlined above. No pre-contact, or traditional Hawaiian sites were discovered. Consistent with previous archaeology in Kea‘au, the historical properties that were identified in the current survey belong to early and mid-20th C. infrastructure relating to ranching and agricultural pursuits as well as with developing transportation that was integral to the growth and commercialization of Volcano Village and the tourist facilities in the Hawaii Volcanoes National Park, including the Volcano House and Kīlauea volcano.

Nevertheless, new insight has been gained into the scope and degree of investment by Puna Sugar Co. in the clearing and grading of many miles of railway bed. The effort is testimony to the scale and ambition of plans for tourist development focused on Kilauea volcano even in early territorial days. The endeavors’ abandonment is also testimony to the impact that unique natural hazards in Hawaii present to large scale business plans, with a tsunami, in this case changing the course of history for this Volcano

summit region. The remote sensing research presented above shows the extent to which large tracts of land were cleared and disturbed for various alternate economic pursuits in the later half of the 20th C., post-World War II. The archaeological remains speak to the development and continued expansion of cattle ranching in the area.

RECOMMENDATIONS

The site and all its features will be affected by this project. However, as per HAR13-276-8, the documentation provided above is sufficient and **no further work** is recommended.

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Appendix C

Biological Survey of Proposed Expansion Area for Volcano School of Arts and Sciences TMK (3) 1-1-004:010, Puna District, Island of Hawai‘i

By Ron Terry, Ph.D and Patrick J. Hart, Ph.D.
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April 2025

Introduction

This biological survey concerns a 20-acre forested area near Mauna Loa Estates in Volcano, Hawai‘i, a property, as mapped in Figure 1. The area is proposed to be utilized for development of a campus of the Volcano School of Arts & Sciences (VSAS), a public charter school located in Volcano. VSAS primarily serves the communities of Upper Puna and Ka‘ū, and the project seeks to expand enrollment, programming, and facilities for Pre-K through High School, remedy enrollment bottlenecks and address an expiring lease agreement at the current school location. The school intends to secure State funding to develop a new campus on an approximately 15-acre portion of TMK (3) 1-1-004:010 and will also utilize a corridor back to Old Volcano Highway somewhere within an approximately 5-acre portion the property for access. In order to conduct this development activity responsibly, project planners commissioned this biological survey of the 20 acres to help project planners determine the impact the proposed project could have on any threatened or endangered (T&E) species and native habitat and to devise mitigation measures to avoid or minimize impacts.

The property was surveyed by biologists Ron Terry, Patrick Hart, Nikolai Braedt and Dustin Smith on various days in March and April 2025 following documentary research by Ron Terry based on prior surveys by Geometrician Associates (GEO) and others of sites near Pahoa, Glenwood, various parts of Volcano, and Puu Maka‘ala (Geometrician Associates 2009a, 2009b, 2018; DOFAW 2013; Stantec 2017; Terry and Hart 2003; Terry, Price and Hart 2018). As part of background research, we reviewed USFWS critical habitat maps for the area. As shown in Figure 2, the USFWS’s online Critical Habitat Mapper shows no designated critical habitat on or adjacent to the property. Across Volcano Highway approximately 0.3 miles away is critical habitat for multiple species, including *Phyllostegia floribunda* and *Drosophila mulli*. About two miles to the south lies another unit that is critical habitat for the now rare epiphytic fern *Adenophorus periens*. We analyzed listings of rare and threatened and endangered (T&E) plant and animal taxa for the Hawaiian Islands, and then extracted those species that were historically or currently present at about the 3,400-foot elevation on the windward side of Kilauea, in order to increase the accuracy of detecting a potential T&E species. A variety of ferns, herbs, shrubs and trees met such criteria. Based on experience nearby, we determined that *Adenophorus periens* and various species in the *Clermontia*, *Cyanea*, *Cyrtandra*, and perhaps other plant genera could be present. A number of wide-ranging T&E vertebrate species are also documented to be present throughout the Puna District.

The objectives of the botanical survey component of the survey were to: 1) describe the vegetation; 2) list all species encountered; and 3) identify the locations of any individual

plants with rare, threatened or endangered status. The faunal portion of the survey consisted of visual/auditory faunal surveys both during and apart from the botanical survey that covered birds and introduced mammals, reptiles, or amphibians, as well as habitat assessment. Although no Hawaiian hoary bat surveys were undertaken, the general value of the habitat for the bat was evaluated. Not included in the survey was invertebrate survey.

Vegetation Type and Influences

The property is located on the flank of Kīlauea, an active volcano. The surface consists of lava flows of the Puna Basalt series dated to about 1400 CE, originating from the volcano's summit (Wolfe and Morris 1996). Annual rainfall at the subject property averages about 180 inches (Giambelluca et al. 2014). Soil on the property is classified by the U.S. Natural Resources Conservation Service (1973) as Puhimau ashy silt loam, 2 to 10 percent slopes (https://websoilsurvey.nrcs.usda.gov/app/WebSoilSurvey.aspx). The Puhimau series consists of shallow, well-drained silt loams that formed in volcanic ash and pumice over pahoehoe lava bedrock. Puhimau soils were and are used mostly for woodland, with small areas used for pasture and truck crops. The soil has layers of silt loam and loamy fine sand to a depth of about a foot, where it is underlain by pahoehoe lava. This soil dehydrates irreversibly into sand-size aggregates. It is medium acid in the surface layer and slightly acid in the underlying material. Permeability is rapid, runoff is slow, and the erosion hazard is moderate. Roots are matted over the pahoehoe lava bedrock, but they can extend a few feet into cracks and crevices.

The natural vegetation of similarly aged lava flows in this part of the Puna rainforest is dominated by ʻōhiʻa (*Metrosideros polymorpha*), uluhe (*Dicranopteris linearis*), ʻuki (*Machaerina* spp.) and hapuʻu (*Cibotium* spp.) (Gagne and Cuddihy 1990). In many places, especially near highways and in the sprawling subdivisions, these original communities have been destroyed or heavily degraded by low-density residential development, farming and cattle grazing, infrastructure, quarries and small urban centers.

Cattle ranching was the earliest cause for large-scale alteration of vegetation in this area. Ranching got its start here at least as early as 1873, when rancher Obed B. Spencer leased the entire massive Keaʻau Ahupuaʻa from Charles Kanaina and Charles R. Bishop, guardians of King William C. Lunalilo, for a term of ten years. Spencer then transferred the lease and sold his personal property, including about 300 cattle, 4,000 goats, and numbers of horses and sheep, to another group (Maly 1999:78). The lease was extended and ultimately sold to J. E. Elderts and William H. Shipman, who ended up controlling almost all the land between Keaʻau and Kapoho and Volcano (Maly 1999:84; Cahill 1996). Lands with suitable soils near Keaʻau, Mt. View and Pāhoa were put into sugar cultivation over the course of the next few decades. The high elevation of the greater Volcano area was unsuitable for sugar, but many areas were grazed, farmed and logged for large trees.

Consultation of historic U.S. Geological Survey (USGS) maps and U.S. Department of Agriculture airphotos and maps, as well as discussion with W.H. Shipman descendants familiar with the land use history, provide some indication of the former use of the land in the area. A 1963 USGS map has white shading indicating clearing on a portion of the

property and an "Old Railroad Grade" cutting diagonally through the property (Figure 3). According to Tom English, this railroad grade used to extend from Glenwood all the way into Hawai‘i Volcanoes National Park. It was built to extend the sugar cane railroad from Glenwood to the park, probably for transporting prospective tourists. However, the track was never actually laid. Mr. English examined W.H. Shipman Ltd. company files and land court information and did not find any record of any subdivisions or easements to allow for railroad use in that area. He recalled that the primary agricultural use in area was orchid propagation, with several greenhouses and large water tanks on the 10-acre property VSAS recently bought, just to the west of the 20-acre subject area. There was also one large greenhouse just to the east of the subject area. Water lines that ran between the two greenhouse areas are still visible within the subject area. Some areas outside the 20 acres but within TMK 1-1-004:010 were not farmed in sugar cane but were used by Herbert Shipman for cattle grazing and experimental tree plantings, including loblolly pines. Aerial photos from 1954 and 1965 show two large clearings and what appear to be regularly spaced slash piles and/or trees both within and outside the subject area (Figure 4). A portion of the subject area is forested in both the airphotos and the USGS map, although this could previously have been cleared and regrown.

Field Methodology

The project area was surveyed on portions of five days by various members of a 4-person team, including Ron Terry, Pat Hart, Dustin Johnson, and Nikolai Braedt, all of whom had experience with the identification of lowland plants in Hawai‘i. An initial foray into the area indicated site hazards of extremely dense uluhe, Himalyan raspberry, sharp dropoffs and ground-nesting wasps. Based on this, VSAS and GEO decided that lightly cut trails in a grid would be necessary to access the site efficiently. After training in native plant ID by GEO personnel, VSAS staff, parents, students and community supporters cut half the trails, while DLNR crews assisted with the remainder. Portions of GEO's crew then walked wandering transects that followed subtle openings or at least less dense thickets of uluhe and Himalayan raspberry over the course of five days. These paths offered more habitat for plants other than uluhe and allowed views of surrounding areas. All areas were able to be covered with reasonable completeness. Plant species were identified in the field and, as necessary, collected and keyed out in the laboratory. All bird species were identified in the field using listening and 10X42 power binoculars. A single crew-member (Hart) conducted acoustic surveys for the presence of Hawaiian hawks on various portions of the site using broadcast playbacks of ‘io calls known to elicit a strong behavioral response.

Findings: Vegetation

Vegetation in the subject area is composed of an open ‘ōhi‘a forest with trees mostly ranging from 15 to 30 feet in height. Both glabrous and pubescent varieties of ‘ōhi‘a were present. The understory is primarily composed of the natives uluhe, ama‘u, hapu‘u, ‘uki, wawae‘iole (*Lycopodiella cernua*), ohelo kaula‘au (*Vaccinium calycinum*), pukiawe (*Leptecophylla tameiameiae*), kukaenene (*Coprosma ernodeoides*), ‘ohe (*Isachne distichophylla*), and, suprisingly, naupaka kahakai (*Scaevola chamissoniana*), along with alien grasses including bush beardgrass (*Schizachrium condensatum*), broomsedge (*Andropogon virginicus)*, and smutgrass (*Sporobolus africanus*). There are also native

and non-native sedges in the *Cyperus* and *Carex* genera as well as rushes (*Juncus* spp.) The primarily native dominant assemblage is irregularly infested, from heavily to not at all, with the highly invasive kahili ginger (*Hedychium gardnerianum*), Himalayan raspberry (*Rubus ellipticus*) and a wide variety of common weeds. Native trees other than ʻōhiʻa are scattered to very scattered, in descending order of abundance: kawaʻu (*Ilex anomala*), pilo (*Coprosma ochracea*), ʻolapa (*Cheirodendron trigynum*), *Kadua terminalis*, and alani (*Melicope clusiifolia*). A few very scattered non-native trees are present as well, including faya tree (*Morella faya*), strawberry guava (*Psidium cattleianum*) and Asian melastome (*Melastoma candidum*). Fern/fern ally diversity is low, but such species not already mentioned include moa (*Psilotum nudum*), palaʻa (*Sphenomeris chinensis*), wahine noho mauna (*Adenophorus tamariscinus*), ʻōhiʻa ku (*Mecodium recurvum*) and kolokolo (*Grammitis tenella*).

The southeast roughly 40 percent of the subject area has apparently regrown from being cleared for grazing and/or farming. The remainder experienced at least some disturbance from emplacement of water pipelines and perhaps other activities. Although both areas feature ʻōhiʻa forest with an understory of uluhe, amaʻu, hapuʻu and ʻuki, there are a few subtle differences. Hapuʻu in the regrown portion slightly taller, and the uluhe is on the average taller and thicker as well. Himalayan blackberry and kahili ginger are generally thicker there too. By contrast, there is more pukiawe and kukaenene in the non-regrown portion. The area as a whole is fairly homogeneous though, and in its paucity of secondary native trees, shrubs and ferns has a fairly simple structure. Although koa (*Acacia koa*) is common in the more disturbed property next door, none is present in the subject area, perhaps because it never underwent grading, which often helps koa to germinate and thrive.

Findings: Flora and Rare, Threatened or Endangered Species

Table 1 is a list of plant species detected. Of the 68 species, 25 are native, with 9 being indigenous (native to Hawaiʻi and elsewhere) and 16 endemic (native only to Hawaiʻi). The natives we found are reasonably common on the Big Island and elsewhere in Hawaiʻi. The 4-person crew made a concerted effort to locate any individuals of *Adenophorus periens*, *Clermontia, Cyanea*, and *Cyrtandra* species, and uncommon plants in the Lamiaceae, but none were detected. No listed, candidate or proposed threatened or endangered plant species (USFWS 2025) were found during the survey. Again, no existing or proposed federally designated critical habitat for plants (or animals) is present in or near the subject area.

Findings: Fauna

The survey determined that a number of non-native birds are present. These include warbling white-eye (*Zosterops japonicus*), Japanese bush warbler (*Horornis diphone*), northern cardinal (*Cardinalis cardinalis*), spotted dove (*Spilopelia chinensis*), house finch (*Haemorhous mexicanus*), melodious laughing thrush (*Garrulax canorus*), zebra dove (*Geopilia striata*), scaly-breasted munia (*Lonchura punctulata*), domestic chicken (*Gallus gallus*) and Kalij pheasant (*Lophura leucomelanos*). Additional observations at different seasons and times of the day would undoubtedly reveal more non-native

species. These birds are widespread throughout the islands and are generally deleterious to native biota and not of conservation concern.

The area is moderately good habitat for native forest birds due to its largely native vegetation, but the elevation of only 3,400 feet is too low to shield it from the mosquito-borne diseases of the Hawaiian lowlands. The Volcano area also has abundant bird predators such as rats and cats. We observed three native birds: Hawai'i 'amakihi (*Chlorodrepanis virens virens*), 'apapane (*Himatione sanguinea*) and Hawaiian hawk or 'i'o (*Buteo solitarius*). Bird survey work in Puna documented in Spiegel et al (2006) indicates that in many lowland forests, Hawai'i 'amakihi are the most common and widespread native birds. They are significantly associated with 'ōhi'a. Some populations of this native honeycreeper appear to have adapted to mosquito-borne diseases. At low elevations there has been widespread recovery of this species and a changing composition of the forest bird community. Neither amakihi nor 'apapane are T&E species and they are, at least currently, widely distributed in wet, forested uplands of the island. As with non-native birds, additional observations at different seasons and times might detect more species, but the habitat does not appear highly suitable for T&E species.

Two Hawaiian hawks responded within one minute to the recorded Hawaiian hawk challenge calls. One perched in an 'ōhi'a tree about 20 feet above our team and remained there for at least five minutes, while the other circled above. This formerly federally-listed endangered bird (still listed by the State of Hawai'i) is very commonly seen in forests, agricultural areas, and even towns throughout East Hawai'i. Hawaiian hawks generally prefer 'ōhi'a forest habitat but are known to breed successfully in both native and non-native forests. They occur throughout the island of Hawai'i from sea level to 8,530 feet in elevation. Hawks often forage in forests near agricultural tracts and nest in tall trees of a variety of species. Most nesting occurs in tall native 'ōhi'a trees, although hawks may also nest in non-native trees, including eucalyptus, ironwood, mango, coconut palm and macadamia. Nest construction is protracted, beginning up to two months before the first egg is laid and continuing into the nestling period. Egg-laying generally occurs from March to June, and fledging from July to September. Both sexes contribute to nest-building. Clutch size is nearly always one, although clutches of two and three eggs have been reported. Both sexes incubate but females perform most of the brooding of nestlings, while males provide most of the food to chicks and female. Both adults feed fledglings, which are dependent on adults for up to nine months. Hawks are vulnerable to disturbance during the nesting season from March 1 to September 30 of each year. It is fairly likely that the pair of Hawaiian hawks we saw is nesting on or near the subject area. Interestingly, this was the only sighting of Hawaiian hawks during five days of survey.

Due to the inland location and lack of streams or ponds nearby, there is no waterbird habitat. The only waterbird likely to occasionally fly over is the threatened Hawaiian goose or nēnē (*Branta sandwicensis*). Nēnē have become very common on many Hawaiian islands and can be found at elevations ranging from sea level to sub-alpine areas above 7,000 feet. Historically, flocks moved between high-elevation feeding habitats and lowland nesting areas. Nests consist of a shallow scrape lined with plant material and down. Breeding pairs usually return to the previous year's nest site, typically in dense vegetation. Nēnē have an extended breeding season, and nesting may occur in all months except May, June, and July. There are no grassy patches in the subject area with

the characteristics that would be likely to host nēnē, and no signs of this bird were observed.

Although they would rarely if ever be visible, several listed seabirds may overfly the Volcano area between the months of May and November, including the endangered Hawaiian petrel (*Pterodroma sandwichensis*), the endangered band-rumped storm petrel (*Oceanodroma castro*), and the threatened Newell's shearwater (*Puffinus auricularis newelli*). These seabirds hunt over the ocean during the day and fly to higher elevations at night to nest. The Hawaiian petrel was formerly common on the Island of Hawai'i. This pelagic seabird reportedly nested in large numbers on the slopes of Mauna Loa, Mauna Kea and in the saddle area between Mauna Loa and Mauna Kea, as well as at the mid-to-high elevations of Hualālai. It has within recent historic times been reduced to relict breeding colonies located at high elevations on Mauna Loa, Mauna Kea, Kohala and, possibly, Hualālai. The Hawaiian petrel (as well as the band-rumped storm petrel) generally nest on the Big Island well above 5,000 feet in elevation. Some Hawaiian petrel nests have recently been found at lower elevations on Kohala volcano. Both the Newell's shearwater and Hawaiian petrel are known to burrow under ferns on forested mountain slopes. These burrows are used year after year, usually by the same pair of birds. Although capable of climbing shrubs and trees before taking flight, they need an open downhill flight path through which they can become airborne. Once abundant on all the main Hawaiian islands, most Newell's shearwater colonies are today found in the steep terrain between 500 to 2,300 feet on Maui and Kaua'i. Band-rumped storm petrels have recently been discovered to be nesting on the Mauna Loa side of the saddle between this mountain and Mauna Kea. Although each of these seabirds may fly over the subject area on their way to and from mountain nesting areas and the open ocean, no suitable nesting habitat for any of them is present in the subject area.

The primary cause of mortality in these seabird species in Hawai'i is thought to be predation by alien mammals at the nesting colonies. Collision with man-made structures is another significant cause. Seabirds flying at night, especially fledglings on their way to sea in the summer and fall, can become disoriented by exterior lighting. Disoriented seabirds may collide with manmade structures and, if not killed outright, become easy targets of predatory mammals including cats and mongooses.

It is highly likely that Hawaiian hoary bats (*Lasiurus cinereus semotus*), the only native Hawaiian land mammals, are sometimes present in the subject area. They have been found throughout Puna and in most areas on the island of Hawai'i. Bats may forage for flying insects in the subject area on a seasonal basis and may also roost in trees and large shrubs. Bats are often visible while they are feeding on flying insects near dusk and dawn at various locations around the island of Hawai'i. The presence of these bats can also be verified by radar and echolocation detectors. If a bat is detected during a night's study, this merely indicates that they were present in the area. Determination of bat populations or usage patterns requires much more sophisticated, long term studies. Conversely, the absence of bat detections does not indicate an absence of bats, which may have been absent for only a night, a week, or a season, or may have simply gone undetected. No bats were observed in the survey, which took place in daylight and did not use any detection equipment. For the purposes of this assessment, it is assumed that Hawaiian hoary bats are present at least some of the time, as they have been frequently seen and

detected in ʻōhiʻa and groves of other species. Hawaiian hoary bats are vulnerable to disturbance during the summer pupping season and require special mitigation measures. Aside from bats, the other mammals in the project area are all introduced species, including feral cats (*Felis catus*), feral pigs (*Sus scrofa*), mongooses (*Herpestes* spp.) and various species of rats (*Rattus* spp.) and mice (*Mus* spp.). Surveyors did not observe any mammals during the survey, but pig trails were common throughout the project area. As for reptiles and amphibians, although none were seen, several non-native species may be present. The highly invasive coqui frog (*Eleutherodactylus coqui*) has been a periodic problem in Volcano Village, although none were heard during our daytime surveys. None of the non-native mammals, reptiles and amphibians are of conservation concern and all are deleterious to native flora and fauna.

Impacts and Mitigation Measures

No rare, threatened or endangered plant species are present. The subject area contains a medium-stature, early stage, somewhat diverse ʻōhiʻa forest that is lightly to moderately degraded by invasive species. Clearing of the subject area would destroy many individuals of common native plants, but it would not affect rare, threatened or endangered plants, nor would it intrude into a particularly sensitive native ecosystem. It is recognized that the ʻōhiʻa forest, despite its fairly simple structure and moderate degradation, has intrinsic conservation value and represents a vital stage in the succession of native forests on Kilauea Volcano that provides habitat for a few native birds and the Hawaiian hoary bat. In the context of the thousands of acres of State land in this area, much of it covered with diverse native forest protected within the Conservation District or the National Park, the loss of up to 20 acres of this type of ʻōhiʻa forest, although not negligible, is not critical to the preservation of habitat, even considering the cumulative effects of the clearing of much similar land in the many subdivisions of the Volcano to Glenwood area.

An issue for construction in subject area with ʻōhiʻa trees has recently surfaced. Two species of fungus called *Ceratocystis lukuohia and C. huliohia* produce a disease that is new to science and new to Hawaiʻi – Rapid ʻŌhiʻa Death (ROD) (Hawaiʻi Division of Forestry and Wildlife [DOFAW] 2017). This disease has killed hundreds of thousands of ʻōhiʻa trees across more than 34,000 acres of the Big Island. It was first discovered in Lower Puna. Projects that harm or relocate ʻōhiʻa trees can spread the disease, and certain mitigation measures are recommended, although it is important to recognize that treatment protocols are evolving. The following mitigation protocol is proposed, and as construction planning progresses, it should be supplied to DOFAW to ensure it meets current standards as part of the development process:

- Minimize clearing of ʻōhiʻa forest to the degree practicable while still meeting the goals of establishing a VSAS campus.
- Prior to clearing the edges of the subject area, ʻōhiʻa trees on the boundary should be identified. Any such trees that are not planned for removal on the edges should be protected from disturbance entirely, or cut and chipped or buried, to ensure that they do not present a ready target for ROD infection that could spread to other trees;
- Treat any unavoidable scars on ʻōhiʻa trees that result from clearing to prevent

infestation of the fungus;
- Stack all removed ʻōhiʻa trees and dispose of by burying or chipping; do not remove from the subject area. Decontaminate boots and work tools before and after working in an area with ʻōhiʻa trees;

Another concern for the movement of products is the spread of invasive species, particularly little fire ants and coqui frogs. A biosecurity plan specifying requirements for construction contractors to clean equipment prior to entering or leaving the work site should be instituted in order to reduce the spread of these species. DOFAW and the Big Island Invasive Species Council should be consulted in order to solicit comments and potential additional measures that could reasonably be adopted.

In order to avoid impacts to the endangered but regionally widespread terrestrial vertebrates listed above, we recommend that the project commit to several conditions.

- Construction should refrain from activities that disturb or remove shrubs or trees taller than 15 feet between June 1 and September 15, when Hawaiian hoary bats may be sensitive to disturbance.
- If landclearing occurs between the months of March and September, inclusive, a pre-construction hawk nest search by a qualified ornithologist using standard methods should be conducted. If Hawaiian hawk nests are present, no land clearing should be allowed until October, when hawk nestlings will have fledged.
- All exterior lighting should be shielded from shining upward, in conformance with Hawaiʻi County Code § 14–50 et seq., to minimize the potential for seabird disorientation. The project should utilize blue-deficient lighting such as filtered LED lights or amber LED lights, with a Correlated Color Temperature (CCT) of 2700 Kelvin or less, which promotes dark skies and minimizes impacts to seabirds.
- Although no T&E waterbirds or Hawaiian geese are likely to be present, if federal funding is involved, the project should be prepared for the requirement to have a biological monitor verify site conditions prior to construction and institute standard avoidance and mitigation measures should these species be detected.

Report Limitations

No biological survey of a large area can claim to have detected every species present. Some plant species are cryptic in juvenile or even mature stages of their life cycle. Dry conditions can render almost undetectable plants that extended rainfall may later invigorate and make obvious. Thick brush can obscure even large, healthy specimens. Birds utilize different patches of habitat during different times of the day and seasons, and only long-term study can determine the exact species composition. The findings of this survey must therefore be interpreted with proper caution; in particular, there is no warranty as to the absence of any particular species.

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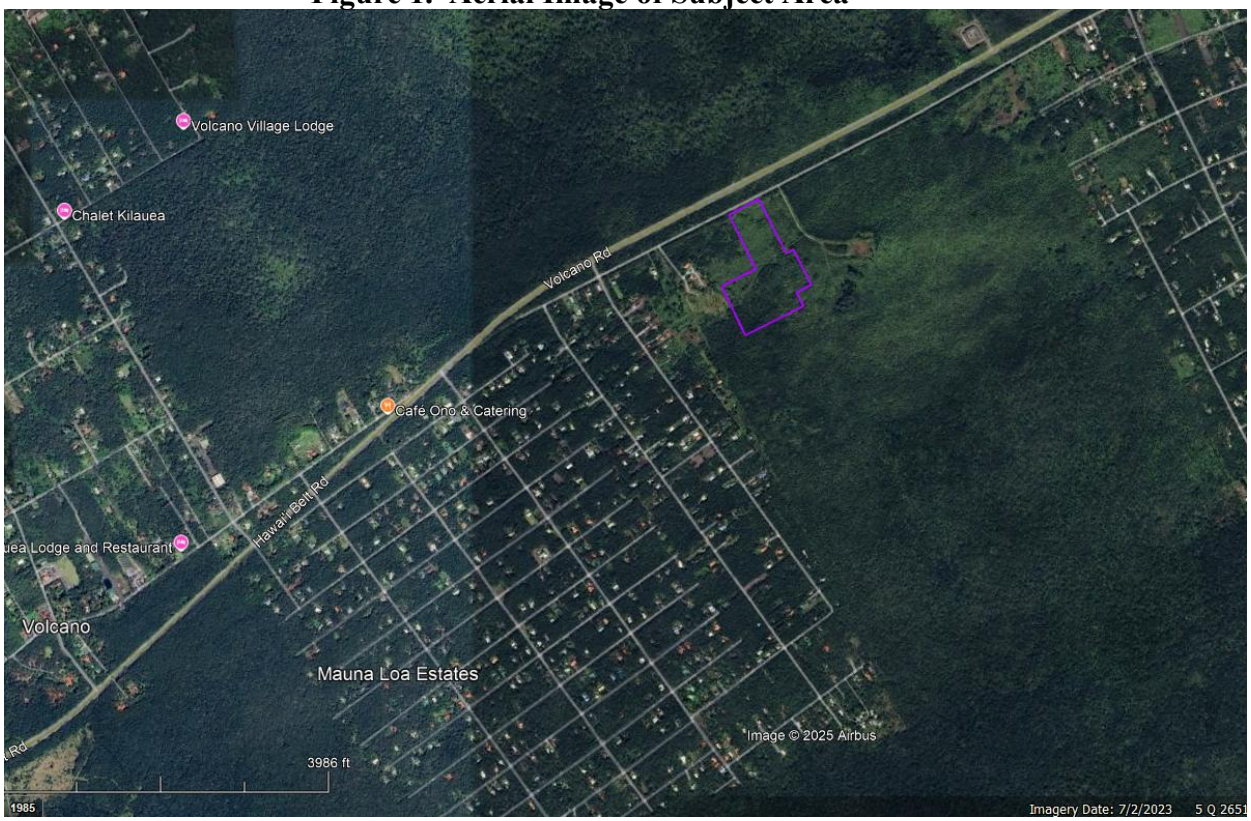
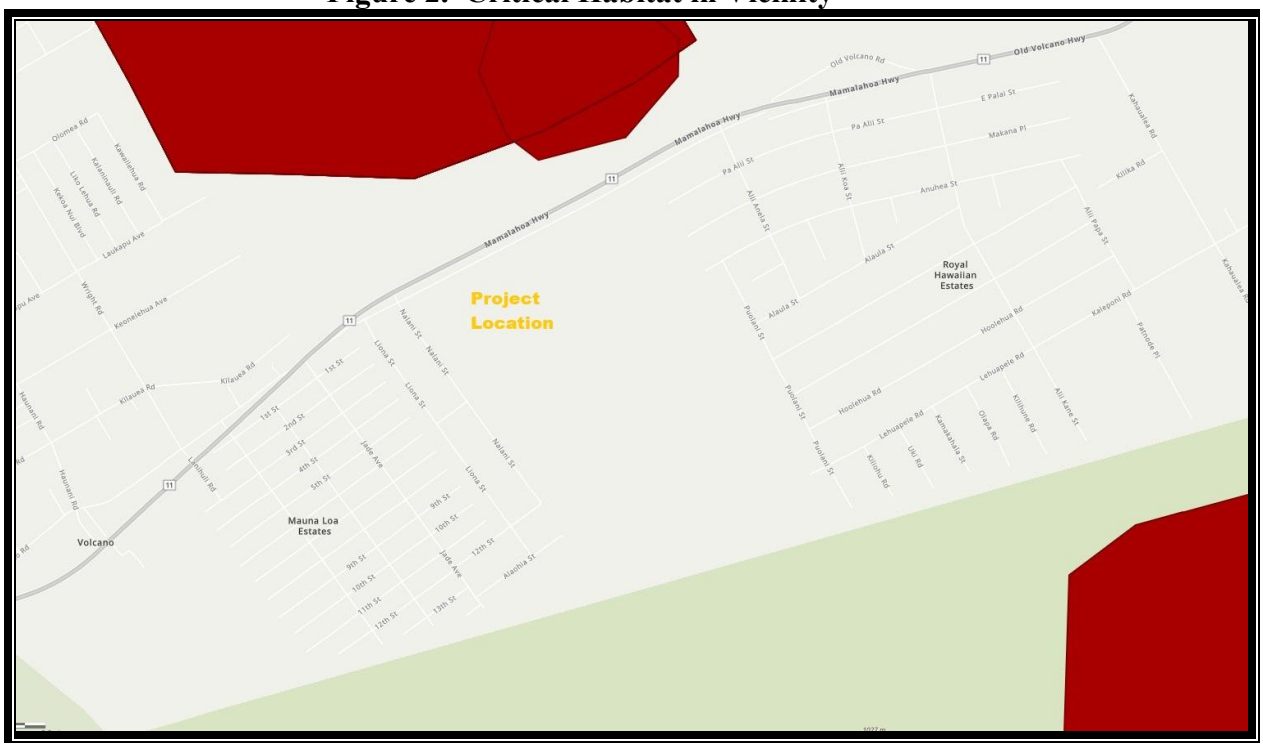
Figure 1. Aerial Image of Subject Area



Aerial Image Base Map © Google Earth. Includes Expansion Area and Access

Figure 2. Critical Habitat in Vicinity



Source: https://ecos.fws.gov/ecp/report/table/critical-habitat.html
Polygons indicate critical habitat for single or multiple T&E plants and animals;

Figure 3. Portion of USGS 1963 Topo Map

Figure 4. 1965 Airphoto Over 1963 Topo Map and Google Earth © Image

Figure 5. Subject Area Photos

a. Site in forest with 90% natives ▲ ▼ b. Naupaka kuahiwi closeup

Figure 5. Subject Area Photos

c. Forest with Kahili ginger in foreground ▲ ▼ d. Forest with ‘olapa

Figure 5. Subject Area Photos

e. Hawk responding to challenge call ▲

▼ f. Tiny epiphytic ferns on mossy trunk

Table 1. Plants Detected at Subject Site

Scientific Name	Family	Common Name	Life Form	Status*
Adenophorus tamariscinus	Polypodiaceae	Wahine Noho Mauna	Fern	E
Ageratum conyzoides	Asteraceae	Ageratum	Herb	A
Andropogon virginicus	Poaceae	Broomsedge	Herb	A
Arundina bambusifolia	Orchidaceae	Bamboo Orchid	Herb	A
Axonopus fissifolius	Poaceae	Narrow-leafed Carpet Grass	Grass	A
Buddleia asiatica	Buddlejaceae	Dog Tail	Shrub	A
Bulbostylis capillaris	Cyperaceae	Bulbostylis	Sedge	A
Carex macloviana var. *subfusca*	Cyperaceae	St. Malo's Sedge	Herb	I
Cheirodendron trigynum	Araliaceae	ʻOlapa	Tree	E
Cibotium glaucum	Cibotiaceae	Hapuʻu Pulu	Fern	E
Coprosma ernodeoides	Rubiaceae	Kukaenene	Vine	E
Coprosma ochracea	Rubiaceae	Pilo	Tree	E
Crocosmia x crocosmiiflora	Iridaceae	Tritonia	Herb	A
Cyperus halpan	Cyperaceae	Umbrella Sedge	Herb	A
*Cyperus alternifolius**	Cyperaceae	ʻAhuawa haole	Sedge	A
Cyperus polystachyos	Cyperaceae	Pycreus Sedge	Herb	I
Desmodium incanum	Fabaceae	Spanish Clover	Herb	A
Desmodium tortuosum	Fabaceae	Tick Clover	Herb	A
Desmodium triflorum	Fabaceae	Tick Clover	Herb	A
Dicranopteris linearis	Gleicheniaceae	Uluhe	Fern	I
Digitaria violascens	Poaceae	Itchy Crabgrass	Herb	A
Dubautia scabra	Asteraceae	Kupaʻoa	Shrub	E
Erechtites hieracifolia	Asteraceae	Erechtites	Herb	A
Gnaphalium japonicum	Asteraceae	ʻEnaʻena	Herb	A
Grammitis tenella	Grammitidaceae	Kolokolo	Fern	E
Hedychium gardnerianum	Zingiberaceae	Kahili Ginger	Herb	A
Hypericum parvulum	Hypericaceae	St. John's Wort	Herb	A
Hypochoeris radicata	Asteraceae	Cat's Ear	Herb	A
Ilex anomala	Aquifolicaceae	Kawaʻu	Tree	E
Isachne distichophylla	Poaceae	ʻOhe	Grass	E
Juncus planifolius	Juncaceae	Rush	Herb	A
Kadua terminalis	Rubiaceae	Manono	Shrub	E
Kyllinga brevifolia	Cyperaceae	Kyllinga	Herb	A
Leptecophylla tameiameiae	Ericaceae	Pukiawe	Shrub	I
Lotus subbiflorus	Fabaceae	Hairy Bird's Foot Trefoil	Herb	A
Lycopodiella cernua	Lycopodiaceae	Wawaeʻiole	Fern Ally	I
Machaerina angustifolia	Cyperaceae	ʻUki	Herb	I
Machaerina mariscoides subsp. meyenii	Cyperaceae	ʻUki	Herb	I
Mecodium recurvum	Hymenophyllaceae	ʻŌhiʻa Ku	Fern	E
Melastoma candidum	Melastomataceae	Asian Melastome	Shrub	A
Melicope clusiifolia	Rutaceae	Kakaemoa	Tree	E

Table 1, continued				
Scientific Name	**Family**	**Common Name**	**Life Form**	**Status***
Melinus minutiflora	Poaceae	Molasses Grass	Herb	A
Metrosideros polymorpha	Myrtaceae	ʻŌhiʻa	Tree	E
Morella faya	Myricaceae	Faya Tree	Tree	A
Neonotonia wightii	Fabaceae	Glycine	Herb	A
Nephrolepis multiflora	Nephrolepidaceae	Sword Fern	Fern	A
Persicaria capitata	Polygonaceae	Knotweed	Shrub	A
Pilea microphylla	Urticaceae	Rockweed	Herb	A
Plantago major	Plantaginaceae	Plantago	Herb	A
Pluchea symphytifolia	Asteraceae	Pluchea	Shrub	A
Polygala paniculata	Polygalaceae	Milkwort	Herb	A
Psidium cattleianum	Myrtaceae	Strawberry Guava	Tree	A
Psilotum complanatum	Psilotaceae	Moa	Fern ally	I
Rubus ellipticus	Rosaceae	Yellow Himalayan Raspberry	Shrub	A
Rumex acetosella	Polygonaceae	Sheep Sorrel	Herb	A
Sacciolepis indica	Poaceae	Glenwood Grass	Herb	A
Sadleria cyatheoides	Blechnaceae	Amaʻu Fern	Fern	E
Scaevola chamissoniana	Goodeniaceae	Naupaka Kuahiwi	Shrub	I
Schizachyrium condensatum	Poaceae	Beardgrass	Herb	A
Sida rhombifolia	Malvaceae	Broomweed	Herb	A
Spermococe assurgens	Rubiaceae	Spermacoce	Herb	A
Sphenomeris chinensis	Lindseaceae	Palaʻa Fern	Fern	I
Sporobolus africanus	Poaceae	Smutgrass	Grass	A
Stachytarpheta sp.	Verbenaceae	Vervain	Shrub	A
Tibouchina herbacea	Melastomataceae	Cane Tibouchina	Herb	A
Torenia glabra	Scrophulariaceae	Wishbone Flower	Herb	A
Vaccinium calycinum	Ericaceae	ʻOhelo Kaulaʻau	Shrub	E
Vaccinium reticulatum	Ericaceae	ʻOhelo	Shrub	E

A=Alien PI=Polynesian Introduction E=Endemic I=Indigenous END= Listed Endangered

* Tentative ID due to insufficient plant material

Notes: Several grasses and sedges were not able to be ID'd but were determined to not be T&E

Several survivals of cultivation were found just outside the area and did not appear to have the ability to spread within: *Magnolia* sp., *Pinus* sp., *Camellia japonica*, and *Rhododendron*

Appendix D

PIPAN CONSULTING LLC

PO Box 421 Honokaa, HI 96727
(808) 333-3391
info@pipanconsulting.com

February 10, 2026

Subject: **Water Consumption and Wastewater Estimates**
Applicant: Volcano School of Arts and Sciences
Volcano, Hawaii TMK: (3) 1-1-004: 010

Historic water use records from schools in the area comparable to the proposed charter school campus were used to produce anticipated average daily water use estimates. The proposed use on the property includes only the proposed charter school. The data table below reflects a two-year average of Department of Water Supply consumption data (2022-2024).

School Use

School	Students	Avg. GPD	Eq. Units	GPD/Student
Kea'au Elementary	811	5,164.58	12.91	6.37
Kea'au Intermediate	542	3,630.41	9.08	6.70
Keaukaha Elementary	379	2,131.93	5.33	5.63
E.B Desilva	461	2,353.60	5.88	5.11
Pahoa Elementary	394	871.54	2.63	2.21
Pahoa Intermediate & High	758	3,136.60	2.53	4.14
Waiakea Elementary	720	3,784.16	9.46	5.26
Waiakea Intermediate	854	3,407.50	8.52	3.99
Average	615	3,060.04	7.65	4.92

Totals

The campus is proposed to be developed in three phases. The timeline estimates that Phase I will be completed in August 2027, Phase II in August 2029, and Phase III in August 2032. At the completion of all phases of construction, the new campus is proposed to serve a maximum of 342 full-time students, 100 blended learning students and 155 staff. The blended learning students are included in the calculations, although they will not be on campus full time.

	#	GPD/unit	Subtotal GPD
Students	442	4.92	2,174.64
		Total	2,174.64

As there is no County water system in the area, potable water needs will be satisfied by trucking in potable water and storing in closed tanks on the campus.

Wastewater

Wastewater is estimated for the proposed project based on Hawaii Administrative Rules 11-62 Table 1 as follows. Total anticipated wastewater generation (11,940 gallons per day) is much less than the equivalent of 49 homes (49,000 gallons per day) that would trigger further environmental review per Hawaii Revised Statutes Chapter 343.

Wastewater		#	GPD	Subtotal GPD
School Use	Students	442	20	8840
School Employees	Employees	155	20	3100
			Total	11,940

If there are questions relating to this matter, please feel free to direct them to me. Thank you very much.

Sincerely,

John Pipan
Planning Consultant

Appendix E

C. Kimo Alameda, Ph.D.
Mayor

William V. Brilhante, Jr.
Managing Director

Benjamin T. Moszkowicz
Police Chief

Reed K. Mahuna
Deputy Police Chief

County of Hawai`i

POLICE DEPARTMENT

349 Kapi'olani Street • Hilo, Hawai'i 96720-3998
(808) 935-3311 • Fax (808) 961-2389

May 7, 2025

John Pipan
Planning Administrator
Land Planning Hawaii, LLC
194 Wiwo'ole Street
Hilo, Hawaii 96720

Dear Mr. Pipan:

SUBJECT: UPDATED EARLY REQUEST FOR COMMENT FOR A HAWAI'I ENVIRONMENTAL POLICY ACT (HEPA) ENVIRONMENTAL ASSESSMENT (EA)
RE: NEW CONSTRUCTION OF AN EXPANDED VSAS CAMPUS
APPLICANT: VOLCANO SCHOOL OF ARTS & SCIENCES (VSAS)
LOCATION: VOLCANO, HAWAI'I TMK 1-1-004:010

This is in response to your letter dated April 23, 2025, requesting input for an Environmental Assessment (EA) in compliance with the Hawaii Environmental Policy Act (HEPA) on behalf of Volcano School of Arts & Sciences (VSAS) to determine possible impacts associated with the campus expansion, in compliance with Chapter 343, Hawai'i Revised Statutes, and Title 11, Chapter 200.1, Hawai'i Administrative Rules (HAR).

Staff, upon reviewing the provided documents, does not anticipate any significant impact to traffic and/or public safety concerns.

Thank you for allowing us the opportunity to comment.

If you have any questions, please contact our Puna District Commander, Captain Todd Pataray at (808) 965-2716 or email Todd.Pataray@hawaiicounty.gov.

Sincerely,

KENNETH A.K QUIOCHO
ASSISTANT POLICE CHIEF
AREA I OPERATIONS BUREAU

JOSH GREEN, M.D.
GOVERNOR

KEITH T. HAYASHI
SUPERINTENDENT

STATE OF HAWAIʻI
DEPARTMENT OF EDUCATION
KA ʻOIHANA HOʻONAʻAUAO
P.O. BOX 2360
HONOLULU, HAWAIʻI 96804

OFFICE OF FACILITIES AND OPERATIONS

May 20, 2025

Mr. John Pipan
Planning Administrator
Land Planning Hawaii LLC
194 Wiwoole Street
Hilo, HI 96720

Re: Early Request for Comment for a Hawaii Environmental Policy Act Environmental Assessment for New Construction of an Expanded Volcano School of Arts & Sciences

Dear Mr. Pipan:

Thank you for your letter dated April 23, 2025. The Hawaii State Department of Education provided comments on March 28, 2025, and has no additional comments.

Should you have any questions, please contact Cori China of the Facilities Development Branch, Planning Section, at (808) 784-5080 or via email at cori.china@k12.hi.us.

We appreciate the opportunity to comment.

Sincerely,

Roy Ikeda
Acting Public Works Manager
Planning Section

RI:ctc
c: Facilities Development Branch

C. Kimo Alameda, Ph.D.
Mayor

William V. Brilhante, Jr.
Managing Director

West Hawai'i Office
74-5044 Ane Keohokālole Hwy
Kailua-Kona, Hawai'i 96740
Phone (808) 323-4770
Fax (808) 327-3563

County of Hawai'i
PLANNING DEPARTMENT

Jeffrey W. Darrow
Director

Michelle S. Ahn
Deputy Director

East Hawai'i Office
101 Pauahi Street, Suite 3
Hilo, Hawai'i 96720
Phone (808) 961-8288
Fax (808) 961-8742

April 15, 2025

Land Planning Hawai'i, LLC
Attn: John Pipan
194 Wiwo'ole Street
Hilo, Hawai'i 96720

Dear Mr. Pipan:

SUBJECT: Early Request for Comment for a National Environmental Policy Act (NEPA) Environmental Assessment (EA)
Project: New Construction of an Expanded VSAS Campus
Applicant: Volcano School of Arts & Sciences (VSAS)
TMK: (3) 1-1-004:010, Volcano, Hawai'i

Thank you for your letter dated March 4, 2025, requesting comments from this office regarding the preparation of a Draft Environmental Assessment (DEA) for the subject project.

The applicant proposes to expand enrollment, programs, and facilities for Pre-K through High School to address current and anticipated community education needs, alleviate enrollment constraints, and relocate from the 99-128 Old Volcano Road campus due to the lease expiration in 2028. This project would be implemented on approximately 14.9 acres, featuring driveway access, parking, classrooms, restrooms, outdoor play and program spaces, as well as office and administrative areas for the school. The initial phase would prioritize High School and Pre-K facilities, with subsequent development addressing middle school facilities and additional building needs. Given the anticipated increase in traffic from bussing, pickup and drop-off, daily field trips, after-school activities, and staff commuting, a Traffic Impact Analysis Report (TIAR) is being conducted. Additionally, an Archaeological Field Inspection and Biotic Surveys are currently underway.

The subject parcel, TMK (3) 1-1-004:010, on which the proposed 14.9 acres of development is to occur, is zoned Agriculture District (A-3a) and Agriculture by the State Land Use Commission. According to the County of Hawai'i General Plan 2005 (amended December 2006), the subject property is designated as Extensive Agriculture and Conservation by the Land Use Pattern Allocation Guide (LUPAG) Map. While the entire Island of Hawai'i is within the Coastal Zone Management Area, the subject parcel is not located within the Special Management Area (SMA).

The following goals, policies, and courses of action in the County of Hawai'i General Plan 2005 (amended 2006) related to the economy, natural resources, public facilities, and land use are relevant to the subject project:

2.3 (f)	Support all levels of educational, employment and training opportunities and institutions.
8.2 (b)	Provide opportunities for recreational, economic, and educational needs without despoiling or endangering natural resources.
10.2.4.6.2 (a)	Encourage continual improvements to existing educational facilities.
14.1.3 (f)	Encourage the development and maintenance of communities meeting the needs of its residents in balance with the physical and social environment.

The project site is located within the Puna Community Development Plan (CDP) planning area. The Puna CDP, as amended, was adopted on September 10, 2008, and contains goals, objectives, and actions to guide the future development of the Puna planning area. The DEA should include an analysis of the project in relation to the Puna CDP goals and objectives.

The Volcano Long Range Plan (2015) is a community-driven long-range vision for the future of Volcano, prepared by the Long-Range Planning Committee of the Volcano Community Association. This action plan is tiered to the Puna CDP and offers several objectives and actions that are relevant to the subject project:

Objective 4:	Develop a permanent campus for the Volcano School of Arts and Sciences that blends into the community. (Public Safety, Sanitation, and Social Services)
Action 4:	Support efforts to complete the relocation of the VSAS campus and be fully engaged in the planning process so that the new campus blends into the community. (Public Safety, Sanitation, and Social Services)

The Volcano Long Range Plan can be accessed electronically using the following link: https://records.hawaiicounty.gov/Weblink/1/fol/146846/Row1.aspx

We have no further comments to offer at this time. However, please provide our department with a copy of the Draft Environmental Assessment for our review and comment.

If you have any questions or if you need further assistance, please feel free to contact Janice Hata of this office at (808) 961-8854 or email janice.hata@hawaiicounty.gov.

Sincerely,

Jeffrey W. Darrow

Jeffrey W. Darrow (Apr 16, 2025 13:49 HST)

JEFFREY W. DARROW
Planning Director

JH:ad
V:\PL\PL\planning\public\wpwin60\Janice\Letters\Preconsult Draft EA-New Construction of Expanded VSAS Campus.docx

JOSH GREEN, M.D.
GOVERNOR

KEITH T. HAYASHI
SUPERINTENDENT

STATE OF HAWAIʻI
DEPARTMENT OF EDUCATION
KA ʻOIHANA HOʻONAʻAUAO
P.O. BOX 2360
HONOLULU, HAWAIʻI 96804

OFFICE OF FACILITIES AND OPERATIONS

March 28, 2025

Mr. John Pipan
Planning Administrator
Land Planning Hawaii LLC
194 Wiwoole Street
Hilo, HI 96720

Re: Early Request for Comment for a National Environmental Policy Act Environmental Assessment, New Construction of an Expanded VSAS Campus

Dear Mr. Pipan:

Thank you for your letter dated March 4, 2025. We reviewed the information provided and determined that the proposed project will not affect the operations of the Hawaii State Department of Education campuses.

Should you have any questions, please contact Cori China of the Facilities Development Branch, Planning Section, at (808) 784-5080 or via email at cori.china@k12.hi.us.

We appreciate the opportunity to comment.

Sincerely,

Roy Ikeda
Interim Public Works Manager
Planning Section

RI:ctc
c: Facilities Development Branch

Re: VSAS expansion and new construction notice for 1-1-4-10 john < john@pipanconsulting.com >

Print options

- [x] Tags
- [x] Attachments
- [x] User info

John Pipan < john@hawaiilandplanning.com >

Mon, 24 Mar 2025 8:44:18 AM -1000

To "Martie Law"<martielaw808@gmail.com>

Aloha Martie,

Yes, we will send you a notice when the Draft EA is ready for review and comment, it will contain the Traffic Study.

Best,

John Pipan
Planning Administrator
Land Planning Hawaii LLC
194 Wiwoole St, Hilo, HI 96720
Office: (808)333-3391
Cell: (808)557-2681

LAND PLANNING HAWAII LLC

---- On Mon, 17 Mar 2025 10:33:00 -1000 **Martie Law <martielaw808@gmail.com>** wrote ---

Thank you for your reply. Will the draft of the Traffic Study be sent to us when it's done?

Martie Law
martielaw808@gmail.com
808-639-8496

On Mar 17, 2025, at 9:20 AM, John Pipan <john@hawaiilandplanning.com> wrote:

Aloha Martie,

Thank you for reaching out. We sent notices to properties within 500 ft of the larger 785 acre property, while VSAS is proposing to develop their campus on less than 15 acres. Please see attached Project Area location map to better show where the use is proposed. It looks like your properties are approximately 1,000 feet from the boundary of the project area.

The Traffic Study is underway now and when a draft is ready it will outline any proposed traffic mitigations that may be required due to the school use. As yet, we don't know what that might entail. Access is proposed only on Old Volcano Road.

The project would also require a Special Permit from the Windward Planning Commission. No change of zone is proposed, and any future commercial or industrial development in the area would need to secure entitlements in the form of a change of zone or further special permits each with public comment/meetings. To my knowledge no such plans exist.

Please let me know if you have additional questions or want to discuss further.

Best,

John Pipan
Planning Administrator
Land Planning Hawaii LLC
194 Wiwoole St, Hilo, HI 96720
Office: (808)333-3391
Cell: (808)557-2681

<1634252383195000_1248874558.jpg>

---- On Fri, 14 Mar 2025 09:15:07 -1000 **Martie Law <martielaw808@gmail.com>** wrote ---

Hello John,
I received a notice from you in regards to my property at TMK 3-1-1-57, 73/74/75/76/77 being 500 feet from a proposed development for VSAS where comments are requested as part of the Environmental Assessment process.

It is unclear in the letter exactly how this affects us so I am requesting more information.

Where exactly is this property in regards to mine? The TMK map for Shipmans parcel is so large that finding lot 10 is difficult, also the online version is awful, it closes when you try to move the map around to find lot 10. Are you guys able to provide a more readable TMK map so I can locate this parcel in regards to mine?

What are the proposed traffic installments that would affect us so we can comment appropriately? Does this involved reduced speeds on the highway or is access just on Old Volcano Road? Will Speed bumps be added on our street at Nahelenani? What specifically impacts us other than noise from kids all day? And are there mitigations in place for that?

Also, if you know, what are the proposed future developments that schools usually have in tow with them? For instance, Is this the beginning of a series of housing projects, and/or commercial or industrial space being used on the Shipman parcel because a school is now there?

Please advise how I can gain more information on the project so I can voice concerns appropriately, if deemed necessary.

Aloha,
martie

Martie Law
martielaw808@gmail.com
808-639-8496

<Location Map.pdf>

C. Kimo Alameda, Ph.D.
Mayor

William V. Brilhante Jr.
Managing Director

Benjamin T. Moszkowicz
Police Chief

Reed K. Mahuna
Deputy Police Chief

County of Hawai`i

POLICE DEPARTMENT

349 Kapi'olani Street • Hilo, Hawai'i 96720-3998
(808) 935-3311 • Fax (808) 961-2389

March 18, 2025

John Pipan
Planning Administrator
Land Planning Hawaii, LLC
194 Wiwo'ole Street
Hilo, Hawaii 96720

Dear Mr. Pipan:

SUBJECT: EARLY REQUEST FOR COMMENT FOR A NATIONAL ENVIRONMENTAL POLICY ACT (NEPA) ENVIRONMENTAL ASSESSMENT (EA)
RE: NEW CONSTRUCTION OF AN EXPANDED VSAS CAMPUS
APPLICANT: VOLCANO SCHOOL OF ARTS & SCIENCES (VSAS)
LOCATION: VOLCANO, HAWAI'I TMK 1-1-004:010

This is in response to your letter dated March 4, 2025, requesting input for an Environmental Assessment (EA) in compliance with the Hawaii Environmental Policy Act (HEPA) on behalf of Volcano School of Arts & Sciences (VSAS) to determine possible impacts associated with the campus expansion, in compliance with Chapter 343, Hawai'i Revised Statutes, and Title 11, Chapter 200.1, Hawai'i Administrative Rules.

Staff, upon reviewing the provided documents, does not anticipate any significant impact to traffic and/or public safety concerns.

Thank you for allowing us the opportunity to comment.

If you have any questions, please contact our Puna District Commander, Captain Todd Pataray, at (808) 965-2716 or email Todd.Pataray@hawaiicounty.gov.

Sincerely,

SCOTT P. AMARAL
ACTING ASSISTANT POLICE CHIEF

JOSH GREEN, M.D.
GOVERNOR | KE KIA'ĀINA

SYLVIA LUKE
LIEUTENANT GOVERNOR | KA HOPE KIA'ĀINA

STATE OF HAWAI'I | KA MOKU'ĀINA 'O HAWAI'I
DEPARTMENT OF LAND AND NATURAL RESOURCES
KA 'OIHANA KUMUWAIWAI 'ĀINA
Office of Conservation and Coastal Lands
P.O. BOX 621
HONOLULU, HAWAII 96809

DAWN N.S. CHANG
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

RYAN K.P. KANAKA'OLE
FIRST DEPUTY

CIARA W.K. KAHAHANE
DEPUTY DIRECTOR - WATER

AQUATIC RESOURCES
BOATING AND OCEAN RECREATION
BUREAU OF CONVEYANCES
COMMISSION ON WATER RESOURCE MANAGEMENT
CONSERVATION AND COASTAL LANDS
CONSERVATION AND RESOURCES ENFORCEMENT
ENGINEERING
FORESTRY AND WILDLIFE
HISTORIC PRESERVATION
KAHOOLAWE ISLAND RESERVE COMMISSION
LAND
STATE PARKS

REF: OCCL: KS

COR: HA 25-152

Mar 12, 2025

John Pipan, Planning Administrator
Land Planning Hawaii LLC
194 Wiwoole Street
Hilo, Hawaii 96720

SUBJECT: Early Consultation Comments for Hawaii Environmental Policy Act (HEPA) Environmental Assessment for the Volcano School of Arts & Sciences Campus Expansion
Located at 99-128 Old Volcano Road
Por. Keaau, Puna, Island of Hawaii
Tax Map Key (TMK): (3) 1-1-004:010

Dear John Pipan:

The Office of Conservation and Coastal Lands (OCCL) has reviewed your letter. The Volcano School of Arts and Sciences is seeking early consultation comments for the Environmental Assessment. It appears the subject parcel lies within the State Land Use Agriculture District.

The OCCL regulates land uses in the State Land Use Conservation District through the issuance of Conservation District Permits (CDUPs) and Site Plan Approvals (SPAs) to help conserve, protect and preserve important natural and cultural resources.

Based on the information you have provided; it appears the campus expansion of the Volcano School of Arts & Sciences is not under the jurisdiction of the Department of Land and Natural Resources (DLNR) and therefore not regulated by the OCCL. If VSAS is proposing any land uses in the Conservation District, this will require review and potentially authorization from the Department or Board of Land and Natural Resources.

Should you have any questions regarding this matter, contact Kariann Stark of the Office of Conservation and Coastal Lands at (808) 587-0380 or kariann.stark@hawaii.gov.

Sincerely,

Michael Cain, Administrator
Office of Conservation and Coastal Lands

CC: Hawaii Land Division
County of Hawaii, Planning Department

JOSH GREEN, M.D.
GOVERNOR | KE KIA'ĀINA

SYLVIA LUKE
LIEUTENANT GOVERNOR | KA HOPE KIA'ĀINA

DAWN N. S. CHANG
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

May 21, 2025

John Pipan, Planning Administrator
Land Planning Hawaii LLC
194 Wiwo'ole Street
Hilo, Hawaii 96720

via email: info@landplanninghawaii.com

SUBJECT: Request for Comment for a National Environmental Policy Act (NEPA) Environmental Assessment (EA) for New Construction of an Expanded Volcano School of Arts & Sciences (VSAS), Island of Hawaii; TMK (3)1-1-004:010

Dear Mr Pipan:

Thank you for the opportunity to review and comment on the subject matter. The Land Division of the Department of Land and Natural Resources (DLNR) distributed or made available a copy of your request to the DLNR Divisions for their review and comments and we provided a previous reply with comments dated April 4, 2025.

We are providing you with the attached late comment by the Division of Forestry and Wildlife dated May 16, 2025, for your potential inclusion and review in any future processing of the subject project.

If you have any questions, please contact Raymond Severn at (808) 587-0554 or email raymond.severn@hawaii.gov.

Sincerely,

Ian C. Hirokawa
Acting Land Administrator

Enclosures
cc: Central Files

JOSH GREEN, M.D.
GOVERNOR | KE KIA'ĀINA

SYLVIA LUKE
LIEUTENANT GOVERNOR | KA HOPE KIA'ĀINA

DAWN N. S. CHANG
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

April 4, 2025

John Pipan, Planning Administrator
Land Planning Hawaii LLC
194 Wiwo'ole Street
Hilo, Hawai'i 96720

via email: info@landplanninghawaii com

SUBJECT: Early Request for Comment for a National Environmental Policy Act (NEPA) Environmental Assessment (EA) for New Construction of an Expanded Volcano School of Arts & Sciences (VSAS), Island of Hawaii; TMK (3)1-1-004:010

Dear Mr. Pipan:

Thank you for the opportunity to review and comment on the subject matter. The Land Division of the Department of Land and Natural Resources (DLNR) distributed or made available a copy of your request to the DLNR Divisions for their review and comments.

At this time, one response with multiple comments has been received from the Commission on Water Resource Management, dated March 27, 2025, on the subject project.

If you have any questions, please contact Raymond Severn at (808) 587-0554 or email raymond.severn@hawaii.gov.

Sincerely,

For Russell Y. Tsuji
Land Administrator

Enclosures
cc: Central Files

JOSH GREEN, M.D.
GOVERNOR | KE KIA'ĀINA

SYLVIA LUKE
LIEUTENANT GOVERNOR | KA HOPE KIA'ĀINA

DAWN N. S. CHANG
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

STATE OF HAWAI'I | KA MOKU'ĀINA 'O HAWAI'I
DEPARTMENT OF LAND AND NATURAL RESOURCES
KA 'OIHANA KUMUWAIWAI 'ĀINA
LAND DIVISION

P.O. BOX 621
HONOLULU, HAWAII 96809

March 5, 2025

MEMORANDUM

FROM: **DLNR Agencies:**
__Div. of Aquatic Resources
__Div. of Boating & Ocean Recreation
X Engineering Division (DLNR.ENGR@hawaii.gov)
X Div. of Forestry & Wildlife (rubyrosa.t.terrago@hawaii.gov)
__Div. of State Parks
X Commission on Water Resource Management (DLNR.CWRM@hawaii.gov)
__Office of Conservation & Coastal Lands
X Land Division – Hawaii District (candace.m.martin@hawaii.gov)
X Aha Moku Advisory Committee (leimana.k.damate@hawaii.gov)

TO: Russell Y. Tsuji, Land Administrator *Russell Tsuji*
SUBJECT: Early Request for Comments for a NEPA EA re New Construction of an Expanded **Volcano School of Arts & Sciences Campus**
LOCATION: 11-3525 Old Volcano Road, Keaau, Puna, Island of Hawaii; TMK: (3) 1-1-004:010
APPLICANT: Land Planning Hawaii LLC on behalf of Volcano School of Arts & Sciences

Transmitted for your review and comment is information on the above-referenced subject matter. Please submit comments by **April 3, 2025.**

If no response is received by the above date, we will assume your agency has no comments. Should you have any questions about this request, please contact Darlene Nakamura at darlene.k.nakamura@hawaii.gov. Thank you.

BRIEF COMMENTS:

( ) We have no objections.
( ) We have no comments.
( ) We have no additional comments.
(☑) Comments are included/attached.

Signed: JDO
Print Name: Jason D. Omick, Wildlife Prog. Mgr.
Division: Forestry and Wildlife
Date: May 16, 2025

Attachments
cc: Central Files

STATE OF HAWAI'I | KA MOKU'ĀINA 'O HAWAI'I
DEPARTMENT OF LAND AND NATURAL RESOURCES
KA 'OIHANA KUMUWAIWAI 'ĀINA

DIVISION OF FORESTRY AND WILDLIFE
1151 PUNCHBOWL STREET, ROOM 325
HONOLULU, HAWAII 96813

May 15, 2025

MEMORANDUM

TO: IAN HORIKAWA, Acting Land Administrator
Department of Land and Natural Resources

FROM: JASON D. OMICK, Wildlife Program Manager
Division of Forestry and Wildlife

SUBJECT: Request for Early Comments on NEPA Environmental Assessment (EA) for New Construction of an Expanded Volcano School of Arts & Sciences Campus

The Department of Land and Natural Resources, Division of Forestry and Wildlife (DOFAW) has received your request for early consultation on a NEPA draft environmental assessment (EA) for the new construction of an expanded Volcano School of Arts & Sciences Campus; impacting TMK (3) 1-1-004:010. The proposed project intends to develop 14.9 acres for a new campus that will serve Pre-K, Middle School, and High School grades. Construction will occur in two phases with the first focused on facilities for Pre-K and High School, and the second on Middle School facilities and other building needs.

The project site is not near any Federal declared critical habitat. However, it is within 2.4 miles of the federally administrated Hawai'i Volcanoes National Park. Additionally, it is under a mile from the State administrated 'Ola'a Forest Reserve and within a mile of the Kahaualea Natural Area Reserve. The development of this parcel will create an urban-wildland interface (where most wildland fire ignitions occur). Both the National Park and State reserves preserve and protect unique botanical assets that provide habitat for a variety of native wildlife species. Therefore, DOFAW requests that special attention is paid to the recommendations made at the end of this letter regarding fire prevention and planning, forest pathogens, and invasive species.

DOFAW has determined that several State listed species occur within the project area. These include: **1)** 'ōpe'ape'a, or Hawaiian hoary bat (*Lasiurus semotus*); **2)** several species of seabirds; **3)** Nēnē or Hawaiian goose (*Branta sandvicensis*); **4)** Blackburn's

sphinx moth (*Manduca blackburni*); and **5)** numerous species of State listed ferns and plants.

The State listed ʻōpeʻapeʻa or Hawaiian hoary bat (*Lasiurus semotus*) could potentially occur at or in the vicinity of the project and may roost in nearby trees. Any required site clearing should be timed to avoid disturbance to bats during their birthing and pup rearing season (June 1 through September 15). During this period woody plants greater than 15 feet (4.6 meters) tall should not be disturbed, removed, or trimmed. Barbed wire should also be avoided in any construction as bats can become ensnared and killed by such fencing material during flight.

Artificial lighting can adversely impact seabirds that may pass through the area at night by causing them to become disoriented. This disorientation can result in their collision with manmade structures or the grounding of birds. For nighttime work that might be required, DOFAW recommends that all lights used be fully shielded to minimize the attraction of seabirds. Nighttime work that requires outdoor lighting should be avoided during the seabird fledging season, from September 15 through December 15, when young seabirds make their maiden voyage to sea.

If nighttime construction is required during the seabird fledgling season (September 15 to December 15), we recommend that a qualified biologist be present at the project site to monitor and assess the risk of seabirds being attracted or grounded due to the lighting. If seabirds are seen circling around the area, lights should then be turned off. If a downed seabird is detected, please follow DOFAW's recommended response protocol by visiting https://dlnr.hawaii.gov/wildlife/seabird-fallout-season/.

Permanent lighting also poses a risk of seabird attraction, and as such should be minimized or eliminated to protect seabird flyways and preserve the night sky. For illustrations and guidance related to seabird-friendly light styles that also protect seabirds and the dark starry skies of Hawaiʻi please visit https://dlnr.hawaii.gov/wildlife/files/2016/03/DOC439.pdf.

The State listed nēnē or Hawaiian goose (*Branta sandvicensis*) could potentially occur in the vicinity of the proposed project site. It is against State law to harm or harass these species. If any are present during construction, all activities within 100 feet (30 meters) should cease and the bird or birds should not be approached. Work may continue after the bird or birds leave the area of their own accord. If a nest is discovered at any point, please contact the **Hawaiʻi Island Branch DOFAW Office at (808) 974-4221** and establish a buffer zone around the nest.

The project area is within the range of the State listed Blackburn's sphinx moth (*Manduca blackburni*) or BSM. Larvae of BSM feed on many nonnative hostplants, which includes tree tobacco (*Nicotiana glauca*), that grow in disturbed areas. We recommend contacting the **Hawaiʻi Island Branch DOFAW office at (808) 974-4221** for further information about where BSM may be present and whether a vegetation survey should be conducted to determine the presence of BSM host plants. DOFAW recommends removing plants

less than one meter in height or during the dry season to avoid harming BSM. If there is intent to either remove tree tobacco over one meter in height, or to disturb the ground around or within several meters of these plants, they must be thoroughly inspected by a qualified entomologist for the presence of BSM eggs and larvae.

Similarly, any of the activities associated with developing this new campus may impact several species of State listed plants to include ferns. In native dominant forested areas DOFAW recommends that a survey be conducted by a qualified botanist to determine if any listed species are present in the project area and to assess any potential impacts to those species. If any listed species are found, please notify **DOFAW Hawai‘i Island Branch DOFAW office at (808) 974-4221**.

Due to the risks of wildfire to listed species and native habitats, we recommend coordinating with the **Hawai‘i Wildfire Management Organization at (808)-850-0900 or admin@hawaiiwildfire.org**, on how wildfire prevention can be addressed in the project area. When engaging in activities that have a high risk of starting a wildfire—like wielding in/near tall grass, it is recommended that you: **1)** wet down the area before starting your task, **2)** continuously wet down the area as needed, **3)** have a fire extinguisher on hand, and **4)** in the event that your vision is impaired, (i.e. welding goggles) have a spotter to watch for fire ignitions. Additionally, do not park any vehicles in or near tall grass as heat from the engine/exhaust may ignite dry vegetation.

To prevent the spread of Rapid ‘Ōhi‘a Death (ROD), DOFAW requests that removal, pruning/trimming, and potentially injury to ‘ōhi‘a trees be avoided as much as possible. Wounds serve as entry points for ROD fungus and increase the odds that the tree will be infected and die. Also, clean gear/tools, clothes, footwear, and vehicles before and after use. Make sure to removal all loose soil from the aforementioned items, spray gear/tools with 70% rubbing alcohol, and wash clothes with hot water and soap. Wash tires and undercarriages of all vehicles/machinery with a high-pressure water source. If ‘ōhi‘a trees must be removed or pruned/trimmed, please conduct these activities on a still day to minimize blown sawdust and use a sharp saw to create chips rather than dust. Seal all wounds to these trees with a stump seal product (e.g. Spectracide Pruning Seal, etc.). For more information, please consult https://cms.ctahr.hawaii.edu/rod.

We recommend contacting the **Big Island Invasive Species Committee (BIISC) at (808) 933-3340 or biisc@hawaii.edu** to learn about potential high-risk invasive species in the area, and for best management practices to avoid spreading of invasive plants and animals. Soil and plant material may contain detrimental fungal pathogens (like Rapid ‘Ōhi‘a Death), vertebrate and invertebrate pests (e.g. Little Fire Ants, and Coqui Frogs), or invasive plant propagules (e.g. Albizia, Barbados Gooseberry, etc.) that will harm our native ecosystems, and the unique native found within them. Therefore, DOFAW advances the guidance that all equipment and personal items—to include clothing and foot ware should be cleaned of excess soil and debris to minimize the risk of spreading invasive species. Additionally, DOFAW recommends minimizing the movement of plant or soil material between worksites. Suspect pests should be reported through the statewide pest hotline. Photos, videos, and locations can be shared at www.643pest.org

or call: 743-PEST. All equipment, materials, and personnel should be cleaned of excess soil and debris to minimize the risk of spreading invasive species.

The invasive Coconut Rhinoceros Beetle (*Oryctes rhinoceros*) or CRB is widespread on the island of O‘ahu. CRB have been detected on other islands with moderate infestation on Kaua‘i, one incipient site on Hawai‘i Island, and only one positive site on Maui in 2023. Hawaii Department of Agriculture interim rule 24-1 restricts the movement of CRB-host material from the island of O‘ahu, which is defined as the Quarantine Area. Regulated material (host material or host plants) is considered a risk for potential CRB infestation. Host material for the beetle specifically includes **1)** entire dead trees; **2)** mulch, compost, trimmings, fruit and vegetative scraps, and **3)** decaying stumps. CRB host plants include the live palm plants in the following genera: *Washingtonia*, *Livistona*, and *Pritchardia* (all commonly known as fan palms), *Cocos* (coconut palms), *Phoenix* (date palms), and *Roystonea* (royal palms). When such material or these specific plants are moved there is a risk of spreading CRB because they may contain CRB in any life stage. Inspection and/or treatment approved by HDOA is mandatory before inter-island transport. For more information regarding CRB, please visit https://dlnr.hawaii.gov/hisc/info/invasive-species-profiles/coconut-rhinoceros-beetle/.

Mahalo for contacting our office to receive guidance regarding the conservation of our native species. These comments are general guidelines and should not be considered comprehensive for this site or project. It is the responsibility of the applicant to do their own due diligence to avoid any negative environmental impacts. Should the scope of the project change significantly, or should it become apparent that threatened or endangered species may be impacted, please contact our staff as soon as possible. If you have any questions, please contact Jesse W. Adams, Protected Species Habitat Conservation Planning Associate, at jesse.w.adams.researcher@hawaii.gov or call (808) 265-3276.

Sincerely,

JASON D. OMICK
Wildlife Program Manager

Appendix F

Insect Assessment for Proposed Development of New VSAS Campus, Volcano, Hawai'i Island

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Prepared for Volcano School of Arts and Sciences

May 2025

Introduction

The Volcano School of Arts & Sciences (VSAS) is a charter school that serves students in Pre-K through 12th grade and is located in Volcano, Hawai'i, adjacent to Hawai'i Volcanoes National Park. The school intends to develop a new campus on a 15-acre portion of TMK (3) 1-1-004:010 in Volcano (Figure 1). As part of the proposed development, VSAS requested a botanical and faunal assessment of the 15-acre project area and adjacent 5 acres to the east side of the project area to determine whether the proposed project area for the operation of a new school campus may have impacts on threatened and endangered (T&E) floral or faunal resources. This insect assessment report serves as part of the faunal assessment request.

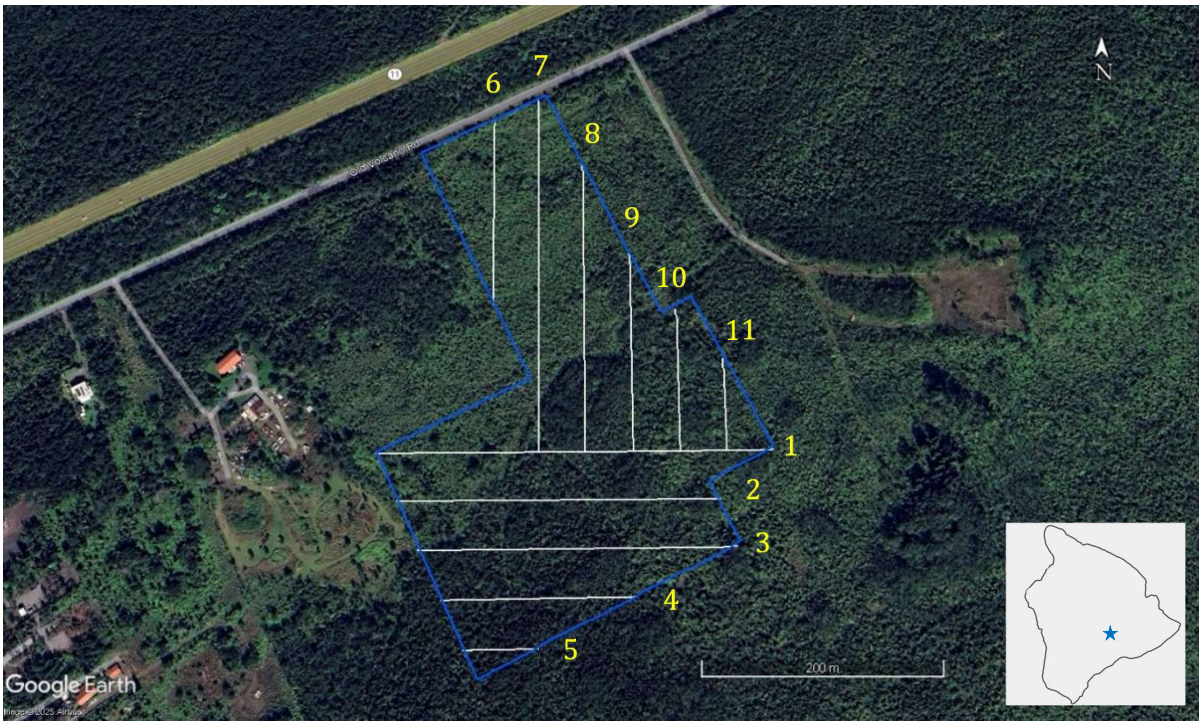

Figure 1: Map of project area; blue lines delineate the boundary of the area proposed for the new campus. White lines represent transect trails, labeled 1-11 in yellow.

Scope of Work

Conduct insect surveys focused on the presence of T&E species within the 20-acre project and adjacent area and assess any impacts the project may have on T&E insects at the site.

There are four T&E Hawaiian picture-wing fly species likely to be present in the project area: *Drosophila heteroneura, D. digressa, D. mulli,* and *D. ochrobasis* (USFWS 2025, Table 1). Hawaiian picture-wing flies are host-specific to select Hawaiian plant species; larvae of each species are dependent on a single or a few related plant species (USFWS 2022, Table 1). These flies are usually associated with the decaying phase of select plant species. Baited sponges are used to detect *Drosophila* presence (OANRP 2017, Montgomery 2007).

Table 1: Hawaiian Picture-wing fly species and associated plant species

Hawaiian Picture-wing species	**Federal Status[1]**	**Host plant species**
Drosophila heteroneura	END	*Cheirodendron* spp., *Clermontia* spp., *Delissea* spp.
Drosophila digressa	END	*Pisonia brunoniana, P.sanwicensis, Charpentiera* spp.
Drosophila mulli	TH	*Pritchardia beccariana*
Drosophila ochrobasis	END	*Clermontia* spp., *Myrsine* spp., and *Marattia douglasii*

[1]END= Endangered, TH= Threatened

Methods

A Native Invertebrate Scientific permit was obtained from the Department of Land and Natural Resources to conduct surveys for this assessment (Permit No. 250225140621-INVERT). Surveys were conducted from April 5th through April 18th, 2025. Prior to surveys beginning, eleven transect trails were cut and flagged within the project area (Figure 1); transects were vital for access throughout the site.

Figure 2: Sponge placement along transect trails.

Cellulose sponges were attached to native plant species every 15-20 m (as measured on GPS unit) along transect trails and were baited with fermented mushroom juice and mashed banana mixed with baker's

yeast (Figures 2 & 3). Sponges were hung with wire at eye level in shaded areas on branches or stems of ʻōhiʻa (*Metrosideros polymorpha)*, pilo (*Coprosma* sp.), naupaka kuahiwi (*Scaevola chamissoniana*), ʻōhelo kau laʻau (*Vaccinium calycinum*), ʻōlapa (*Cheirodendron trigynum*), hāpuʻu pulu (*Cibotium glaucum*), and kāwaʻu (*Ilex anomala*). *Drosophila*-specific host plants (Table 1) and opportunistic shaded areas were also targeted for sponge placement when observed along the transect trail (Figure 1).

Figure 3: Baited sponge with non-native D. suzukii

Sponges were left out for 1-2 hours between 8am and 12pm and checked for insect activity 4-5 times, with ~ 20-30 min between each check. Sponges and wires were removed from the field each day. A total of 134 sponges were placed within the project area (Figure 1, Table 2).

Table 2: Number of Sponges placed per Transect

Transect	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**Totals**
~Distance(m)	340	275	265	165	64	170	320	260	175	125	80	**2,239m**
# of Sponges	21	13	16	10	4	11	20	15	10	9	5	**134**

Photographs were taken of new insects observed on the sponges with each check along the transect trail. No specimens were collected. Photographed insects were identified using the State of Hawaiʻi arthropod resource list (Nishida 2002), identification keys, and online photographs. Without specimen collection, it is difficult to identify some groups of insect species to the genus or species level. However, it is possible to identify the T&E *Drosophila* species and most insects to the family level.

Results

There were no T&E insects found within the project area (Table 3) and the only *Drosophila*-specific host plant species (Table 1) observed along the transects was ʻōlapa. A native leafhopper, *Iolania perkinsi*, was observed and is the only native insect that could be confirmed as native from the photos taken (Figure 4). By far the most abundant species observed on sponges was the non-native spotted-wing *Drosophila, D. suzukii* (Figure 5). All other insects were sighted once or twice (Table 3). Although not part of the insect

assessment, it is worth mentioning that a single male Jackson's chameleon (*Chamaeleo jacksonii*) was observed along the trail on Transect 3 (Figures 1 & 6).

Table 3: Baited Sponge Observations

Order	**Family Name**	***Scientific name***	**Common name**	**Nativity**
Araneae	Mycmenidae/ Theridiosomatidae	*unknown*	dwarf cobweb weavers/ ray spiders	non-native
Coleoptera	Staphylinidae	*unknown*	rove beetle	unknown
Diptera	Calliphoridae	*Chrysomya megacephala*	oriental latrine fly	non-native
Diptera	Drosophilidae	*Drosophila suzukii*	spotted-wing drosophila	non-native
Diptera	Drosophilidae	*Drosophila melanogastor*	common fruit fly	non-native
Diptera	Ephydridae	*unknown*	brine fly	unknown
Diptera	Sciaridae	*unknown*	fungus gnat	unknown
Diptera	Sphaeroceridae	*unknown*	small dung fly	unknown
Hemiptera	Cixiidae	*Iolania perkinsi*	planthopper	endemic
Hemiptera	Psyllidae	*Unknown*	jumping plant lice	unknown
Hymenoptera	Formicidae	*Linepithema humile*	Argentine Ant	non-native
Isopoda	Porcellionidae	*Porcellio scaber*	common pill bug	non-native
Psocoptera	Psocidae	*unknown, wingless*	barklice	unknown

Figure 4: Hawaiian endemic planthopper, Iolania perkinsi

Figure 5: Spotted-wing drosophila (D. suzukii) male & female

Figure 6: Male Jackson's chameleon (Chamaeleo jacksonii)

Discussion

It is important to note that the baited sponge survey is specifically targeted to attract *Drosophila* species and does not give a full picture of all the insects within the project area. Using a variety of trapping methods would give a more comprehensive picture of the insects present at the site. However, the goal of this assessment was to determine whether T&E *Drosophila* are present, and our survey did not find any native *Drosophila* or T&E species; the only *Drosophila*-specific host plant present within the site was ʻōlapa (Table 1).

A total of thirteen taxa were observed on sponges during the survey; 6 are confirmed as non-native, one endemic, and the other 6 taxa with unknown origins (families include both non-native and endemic species). The only confirmed native insect found within the project site was the endemic leafhopper, *Iolania perkinsi* (Figure 4). The Argentine ant and spotted-wing *Drosophila* (Figure 5) are considered as threat species. Other threat species observed that were not part of the survey include the western yellowjacket and the Jackson's chameleon (Figure 6). Background information about some of the taxa observed during the survey are provided below.

Endemic planthopper *(Iolani perkinsi)*

The most interesting species observed during the assessment is the endemic cixiid, or planthopper, *Iolani perkinsi* (Figure 4). There are two major groups of planthoppers in Hawaiʻi; genera *Iolani* and *Oliarus*. *Iolani* species tend to be more island-specific, with at least one species on each of the main Hawaiian Islands except for Molokaʻi, whereas *Oliarus* has undergone rapid evolution, with more than 80 species across the islands all derived from a single ancestor (Nishida 2002, Hoch 2006, Hoch et al. 2024). Hawaiian planthoppers feed on native plant species (mostly mono- or oliophagus) and are found in nearly all Hawaiian environments and habitats, including cave systems. Their ecology, biology, and evolution are not well studied and new species are still being found (Hoch 2006, Hoch et al. 2024).

Spotted-Wing *Drosophila* *(Drosophila suzukii)*

The spotted-wing *Drosophila* (SWD), *D. suzukii,* is an agricultural pest that was first detected in Hawaiʻi in the 1980s. Thought to be native to eastern and south-eastern Asia, SWD adults deposit eggs on ripening soft-skin fruits; larvae feed on the pulp, leading to rapid fruit decay before the fruit reaches maturity (CABI 2022). In Hawaiʻi, SWD fruit damage has been observed on invasive strawberry guava (*Psidium cattleianum*) and raspberries (*Rubus spp.*), (Magnacca et al. 2008) and on native ʻōhelo (*Vaccinium reticulatum*) (Curbelo et al. 2021). The invasive strawberry guava, Himalayan raspberry (*Rubus ellipticus*), and native ʻōhelo kau laʻau (*Vaccinium calycinum)* were present within the project area. It is likely that SWD use other common native plant species in the project area such as kāwaʻu (CABI 2022) to maintain populations as well. A study in Switzerland

found that SWD are the most abundant and dominant *Drosophila* species throughout the forest and likely compete with other frugivores, disrupting seed resources and dispersal mutualisms (Bühlmann & Gossner 2022). No native *Drosophila* were observed within the project area and almost all baited sponges (~95%) detected at least one SWD individual, suggesting similar ecosystem impacts of *D. suzukii* in Hawaiian forests as well.

Argentine Ant (*Linepithema humile)*
Two Argentine ants, *L. humile*, were observed on baited sponges on two separate transect trails, indicating their presence at the site. Baited sponges are not an effective method to detect ant species and therefore we cannot make any conclusions on their abundance or distribution throughout the project area. Argentine ants can establish large populations that disrupt ecosystem function; they outcompete and reduce arthropod populations and negatively impact vertebrates (i.e. native birds) and plants (Cole et al. 1992, Krushelnycky et al. 2005, Daugherty & Hung 2025).

Western Yellowjacket *(Vespula pensylvanica)*
Although not observed during the assessment on sponges or on transect trails, there was mention from other field crews that yellowjacket nests were found within the project area. Western yellowjacket populations are commonly found in the Hawai‘i Volcanoes National Park (Eckles et al. 2008), approximately 2.5 miles away from the project area. Studies have shown that the western yellowjacket prey upon Hawaiian endemic taxa and pose a threat to biodiversity (Gambino 1992).

Jackson’s Chameleon *(Chamaeleo jacksonii)*
First introduced to Hawai‘i in the early 1970s, the Jackson’s are now well established on O‘ahu, Maui, Hawai‘i island, and Kaua‘i (Waring 1996). The diets of wild Jackson’s chameleon populations on O‘ahu were studied and were found to feed on Hawaiian taxa including 5 native insect genera and 11 species of Hawaiian tree snails, 4 of which are endangered (Holland et al. 2009). Endemic planthoppers in the genus *Oliarus* were the primary native insect and food source observed in the chameleons’ stomach contents (Holland et al. 2009). *Iolania perkinsi,* a close relative to *Oliarus*, was observed within the project area. Although few studies have assessed the impacts of Jackson’s chameleons in Hawai‘i, evidence from this study suggests that this reptile is a threat to Hawaiian invertebrates.

Assessment & Recommendations

This insect assessment was targeted to detect threatened or endangered *Drosophila*. In the process, we also detected insect threats within the project area that give us an idea of ecosystem function. It is likely that the spotted-wing drosophila, Argentine ant, western yellowjacket, and Jackson's chameleon are well established at the site, putting pressure on native insect communities and ecosystem function. Threats are further amplified by the negative impacts of feral pigs (*Sus scrofa*), Himalayan raspberry (*Rubus ellipticus)*, strawberry guava (*Psidium cattleianum)*, and kāhili ginger (*Hedychium gardnerianum*), all observed within the project area.

Given the invasive species threats present at the site and the insect assessment results that did not detect any threatened or endangered insects within the project area, development of a new campus would not appear to have any impacts to the threatened or endangered insect community. Furthermore, only one species of host plant (Table 1) for the T&E *Drosophila* was present within the project area, indicating the site is not suitable to maintain T&E insect populations.

We recommend that all vehicles, equipment, and earth moving supplies or materials that will be used at the site be thoroughly cleaned and inspected for invasive species to reduce the impacts and spread of invasive seeds and insects and of rapid ohia death fungi to the surrounding forest and the site itself. It doesn't appear that little fire ants (*Wasmannia auropunctata*) are within the project area, but taking preventative measures to clean and inspect equipment and materials will benefit the campus and its students, as well as the surrounding forest, as treatment for little fire ants is expensive and requires ongoing management.

We also recommend that when clearing the forest for development, if possible, the forest be cleared in small sections over a period of time and strategically from the middle of the project area outward to allow native planthoppers and other native insects that may be present at the site to move into the adjacent forest bordering the project area.

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