NEIL ABERCROMBIE
GOVERNOR

KATHRYN S. MATAYOSHI
SUPERINTENDENT

STATE OF HAWAI`I
DEPARTMENT OF EDUCATION
P.O. BOX 2360
HONOLULU, HAWAI`I 96804

OFFICE OF SCHOOL FACILITIES AND SUPPORT SERVICES

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DEC 08 2014

October 24, 2014

TO: Ms. Jessica Wooley
Director, Office of Environmental Quality Control
Department of Health

FROM: Tracy T. Okumura J.O.
Acting Public Works Administrator
Facilities Development Branch

SUBJECT: **Draft Environmental Assessment and Anticipated Finding of No Significant Impact (DEA-AFONSI) for the Solomon Elementary School, Campus Improvements, in the District of Wahiawā, Island of O`ahu, TMK: [1] 7-7-001:007**

The State of Hawaii, Department of Education hereby transmits the Draft Environmental Assessment and Anticipated Finding of No Significant Impact (DEA-AFONSI) for the **Solomon Elementary School Campus Improvements (DOE Job No. Q72003-13),** District of Wahiawā, Island of Oahu, TMK: [1] 7-7-001:007 for publication in the next available edition of *The Environmental Notice*.

Enclosed is a completed OEQC Publication Form, two copies of the DEA-AFONSI, an Adobe Acrobat PDF file of the same, and an electronic copy of the publication form in MS Word on the same CD. Simultaneous with this memo we have submitted the summary of the action in a text file by electronic mail to your office.

If there are any questions, please contact Brenda Lowrey at (808) 377-8312.

TTO:bl

Enclosures

c: Catie Cullison, PBR Hawaii
Benjamin Miura, Project Management Section

AGENCY ACTIONS
SECTION 343-5(B), HRS
PUBLICATION FORM (FEBRUARY 2013 REVISION)

Project Name: **Solomon Elementary School**
Island: **O‘ahu**
District: **Wahiawā**
TMK: **TMK (1) 7-7-001:007**
Permits: **Chapter 343, HRS Compliance; Historic Preservation, Section 106; National Pollutant Discharge Elimination System (NPDES) Permit; Plan Approval; Building Permits; Occupancy Permit; Air Conditioning**

Proposing/Determination Agency:
State of Hawai‘i Department of Education
PO Box 2360
Honolulu, HI 96804
Contact: Brenda Lowrey; Phone: (808) 377-8312

Accepting Authority:
(for EIS submittals only)

Consultant:
PBR Hawaii & Associates, Inc., 1001 Bishop Street, Suite 650, Hononlulu, HI 96813
Contact: Catie Cullison; Phone: (808) 521-5631; Fax (808) 523-1402

Status (check one only):

_**X**_DEA-AFNSI	Submit the proposing agency notice of determination/transmittal on agency letterhead, a hard copy of DEA, a completed OEQC publication form, along with an electronic word processing summary and a PDF copy (you may send both summary and PDF to oeqchawaii@doh.hawaii.gov); a 30-day comment period ensues upon publication in the periodic bulletin.
__FEA-FONSI	Submit the proposing agency notice of determination/transmittal on agency letterhead, a hard copy of the FEA, an OEQC publication form, along with an electronic word processing summary and a PDF copy (send both summary and PDF to oeqchawaii@doh.hawaii.gov); no comment period ensues upon publication in the periodic bulletin.
__FEA-EISPN	Submit the proposing agency notice of determination/transmittal on agency letterhead, a hard copy of the FEA, an OEQC publication form, along with an electronic word processing summary and PDF copy (you may send both summary and PDF to oeqchawaii@doh.hawaii.gov); a 30-day consultation period ensues upon publication in the periodic bulletin.
__Act 172-12 EISPN	Submit the proposing agency notice of determination on agency letterhead, an OEQC publication form, and an electronic word processing summary (you may send the summary to oeqchawaii@doh.hawaii.gov). NO environmental assessment is required and a 30-day consultation period upon publication in the periodic bulletin.
__DEIS	The proposing agency simultaneously transmits to both the OEQC and the accepting authority, a hard copy of the DEIS, a completed OEQC publication form, a distribution list, along with an electronic word processing summary and PDF copy of the DEIS (you may send both the summary and PDF to oeqchawaii@doh.hawaii.gov); a 45-day comment period ensues upon publication in the periodic bulletin.
__FEIS	The proposing agency simultaneously transmits to both the OEQC and the accepting authority, a hard copy of the FEIS, a completed OEQC publication form, a distribution list, along with an electronic word processing summary and PDF copy of the FEIS (you may send both the summary and PDF to oeqchawaii@doh.hawaii.gov); no comment period ensues upon publication in the periodic bulletin.
__ Section 11-200-23 Determination	The accepting authority simultaneously transmits its determination of acceptance or nonacceptance (pursuant to Section 11-200-23, HAR) of the FEIS to both OEQC and the proposing agency. No comment period ensues upon publication in the periodic bulletin.
__Section 11-200-27	

Determination	The accepting authority simultaneously transmits its notice to both the proposing agency and the OEQC that it has reviewed (pursuant to Section 11-200-27, HAR) the previously accepted FEIS and determines that a supplemental EIS is not required. No EA is required and no comment period ensues upon publication in the periodic bulletin.
__Withdrawal (explain)	

Summary (Provide proposed action and purpose/need in less than 200 words. Please keep the summary brief and on this one page)**:**

The Project will utilize State and Federal funds to construct improvements for a replacement school on the site of the existing Solomon Elementary School. Construction will be followed by the demolition of all existing buildings and portables. The new school will be approximately 162,000-square feet and will consist of a two-story classroom building, a two-story administration building, a cafeteria, a covered playcourt, a chiller building, two parking lots with a total of 178 stalls, and a grass playfield.

In 2011, the Department of Defense (DoD) prepared a Facilities Condition Assessment Report on the school based on compliance with DoD Education Activity (DoDEA) practices according to facility condition, spatial adequacy, capacity and technical readiness. The assessment found the school to be well maintained and a good learning environment; however, several building systems were found to be beyond their useful life. Solomon Elementary has been listed as 28th on the prioritized list of military impacted schools nationwide in need of facilities improvements. Needs identified in the report include: electrical system upgrades; windows in place of louvers; larger food service area, cafeteria, and library; eleven additional classrooms to accommodate enrollment that is already over capacity under DoD standards; and a covered play area.

Solomon Elementary School Campus Improvements

Draft Environmental Assessment –
Anticipated Finding of No Significant Impacts
(HRS 343)

Prepared for:
State of Hawai‘i, Department of Education

Prepared by:

PBR HAWAII
& ASSOCIATES, INC.

November 2014

SUMMARY

Project Name:	Solomon Elementary School Campus Improvements
Location:	Schofield Barracks, Wahiawā, Oʻahu
Judicial District:	Wahiawā
Tax Map Key (TMK):	(1) 7-7-001:007
Land Area:	Approximately 10 acres
Proposing Agency:	State of Hawaiʻi Department of Education
Accepting Authority:	State of Hawaiʻi Department of Education
Landowner:	United States of America
Existing Use:	Public Elementary School on military installation
Project:	The Project will utilize State and Federal funds to construct improvements for a replacement school on the site of the existing Solomon Elementary School. Construction will be followed by the demolition of all existing buildings and portables. The new school will be approximately 162,000-square feet and will consist of a two-story classroom building, a two-story administration building, a cafeteria, a covered playcourt, a chiller building, two parking lots with a total of 178 stalls, and a grass playfield.
Current Land Use Designations:	*State Land Use:* Urban *Development Plan Area:* Central Oʻahu *Zoning:* F-1 (Federal and Military Preservation) *Special Management Area:* Outside of SMA boundaries
Alternatives Considered:	No Action Partial Renovation and New Construction Construct Replacement School
Potential Impacts and Mitigation Measures:	The Project will replace the existing facilities at Solomon Elementary School and will have beneficial impacts on the student population by creating safer conditions, facilities capable of supporting 21st century technologies and recreational facilities that can be utilized regardless of the weather conditions.
Potential Impacts and Mitigation Measures (continued)	The potential adverse impacts, while minimal can be mitigated: • Short-term construction impacts to air quality, noise, solid waste generation, hazardous material disturbance, storm water quality/quantity are anticipated. The Project will

address these impacts through compliance with County, State and Federal rules, regulations, permit and variance requirements regarding fugitive dust, community noise control, hazardous materials, non-point source discharges. In addition, best management practices that include structural and non-structural controls designed to inhibit run-off, erosion, fugitive dust will be implemented. In addition, an increase in traffic may occur within Schofield Barracks during construction that will be mitigated through coordination with appropriate Schofield Barracks personnel and the creation of a plan designed to allow access while minimizing the inconvenience to motorists and lane closures.

- Long Term impacts to storm water quality/quantity and emergency access are anticipated if not addressed within the project design. To reduce such impacts the project will include low impact development measures to ensure storm water quality/quantity is not increased or degraded. The Project is not anticipated to impact listed species or their habitat, wetlands or any know archaeological or cultural resources. The site is not located within agricultural lands or within flood or tsunami zones.

Anticipated Determination: Finding of No Significant Impact

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LIST OF ACRONYMS AND ABBREVIATIONS

The following is a list of terms, abbreviations, and acronyms used in this document.

ACOE	U.S. Army Corps of Engineers
AIS	Archaeological Inventory Survey
ALISH	Agricultural Lands of Importance to the State of Hawai‘i
amsl	Above mean sea level
BMPs	Best Management Practices
CZM	Coastal Zone Management
DBEDT	State of Hawai‘i, Department of Business, Economic Development, and Tourism
DoD	Department of Defense
DoDEA	Department of Defense Education Activity
DOE	State of Hawai‘i, Department of Education
DOH	State of Hawai‘i, Department of Health
DPP	City and County of Honolulu, Department of Planning and Permitting
EA	Environmental Assessment
FEMA	Federal Emergency Management Agency
FIRM	Flood Insurance Rate Map
FONSI	Finding of No Significant Impact
HAR	Hawai‘i Administrative Rules
HIOSH	State of Hawai‘i Department of Labor and Industrial Relations, Division of Occupational Safety and Health
HRS	Hawai‘i Revised Statutes
LEA	Local Education Authority
LEED	Leadership in Energy and Environmental Design
LID	Low Impact Development
LSB	Land Study Bureau
LUC	State of Hawai‘i, Land Use Commission
LUO	Land Use Ordinance
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act
NPDES	National Pollution Discharge Elimination System
NRCS	Natural Resources Conservation Service
OSHA	Occupational Safety and Health Administration
SHPD	State of Hawai‘i, Department of Land and Natural Resources State Historic Preservation Division
SMA	Special Management Area
TMDL	Total Maximum Daily Load
TMK	Tax Map Key
USFWS	U.S. Fish and Wildlife Service

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1 INTRODUCTION

This Environmental Assessment (EA) is prepared in accordance with Chapter 343, Hawai‘i Revised Statutes (HRS) for the Solomon Elementary School Campus Improvements (Project) in Schofield Barracks, Wahiawā, Island of O‘ahu, State of Hawai‘i.

1.1 LANDOWNER

The United States is the landowner.

Contact: U.S. Army Engineering Division, Pacific Ocean
Corps of Engineers
Building 230
Fort Shafter, Hawai‘i 96850-5440
Phone: (808) 835-4715

1.2 PROPOSING AGENCY AND ACCEPTING AUTHORITY

The State of Hawai‘i Department of Education is the proposing agency and designated accepting authority.

Contact: State of Hawai‘i Department of Education
Public Works
ATTN: Duane Kashiwai, Administrator
P.O. Box 2360
Honolulu, HI 96804
Phone: (808) 586-0430
Fax: (808) 586-8223

1.3 ENVIRONMENTAL CONSULTANT

The environmental planning consultant is PBR HAWAII & Associates, Inc.

Contact: Catie Cullison, AICP
PBR HAWAII & Associates, Inc.
1001 Bishop Street, Suite 650
Honolulu, Hawai‘i 96813
Phone: (808) 521-5631
Fax: (808) 523-1402

1.4 COMPLIANCE WITH STATE OF HAWAI‘I ENVIRONMENTAL LAWS

Preparation of this document is in accordance with the provisions of Chapter 343, HRS and Title 11, Chapter 200, Hawai‘i Administrative Rules (HAR) pertaining to Environmental Impact Statements. Section 343-5, HRS established nine types of actions that “trigger” compliance. The

use of State or County lands or funds is one of these "triggers." Because the State of Hawai‘i Department of Education will use both State funds and lands for the Solomon Elementary School Campus Improvements, compliance with HRS and HAR is required.

1.5 STUDIES CONTRIBUTING TO THIS ENVIRONMENTAL ASSESSMENT

The information contained in this report has been developed from site visits, generally available information regarding the characteristics of the Site and surrounding areas, and technical studies. Technical studies are provided as appendices to this EA. These studies include:

- Archaeological Inventory Survey
- Cultural Impact Assessment
- Army Corps of Engineers' Traffic Study

2 PROJECT DESCRIPTION

2.1 BACKGROUND INFORMATION

2.1.1 Location and Property Description

Solomon Elementary School is a State of Hawai‘i, Department of Education (DOE) school located on Schofield Barracks Military Installation in central O‘ahu (Figure 1). Comprised of approximately 18,000 acres, Schofield Barracks is the largest Army post in Hawai‘i. The school is a 10.035-acre site landlocked within the boundaries of Schofield Barracks Military Installation and identified as TMK (1) 7-7-001:007, District of Wahiawā, Island of O‘ahu (Figure 2). The DOE has a lease on and control of the property provided that there are no changes in use. Solomon Elementary School is within the DOE Leilehua Complex Area.

Solomon Elementary School was originally constructed in 1968 and opened in 1969. It was officially dedicated as 1SG Samuel K. Solomon Elementary School on Veteran’s Day, November 11, 1969. 1SG Solomon was an enlisted member of the Wolfhounds, part of the U.S. Army’s 25th Infantry Division. He earned the Silver Star, Bronze Star, and Purple Heart for his courageous efforts saving wounded members of his company in the Vietnam War.

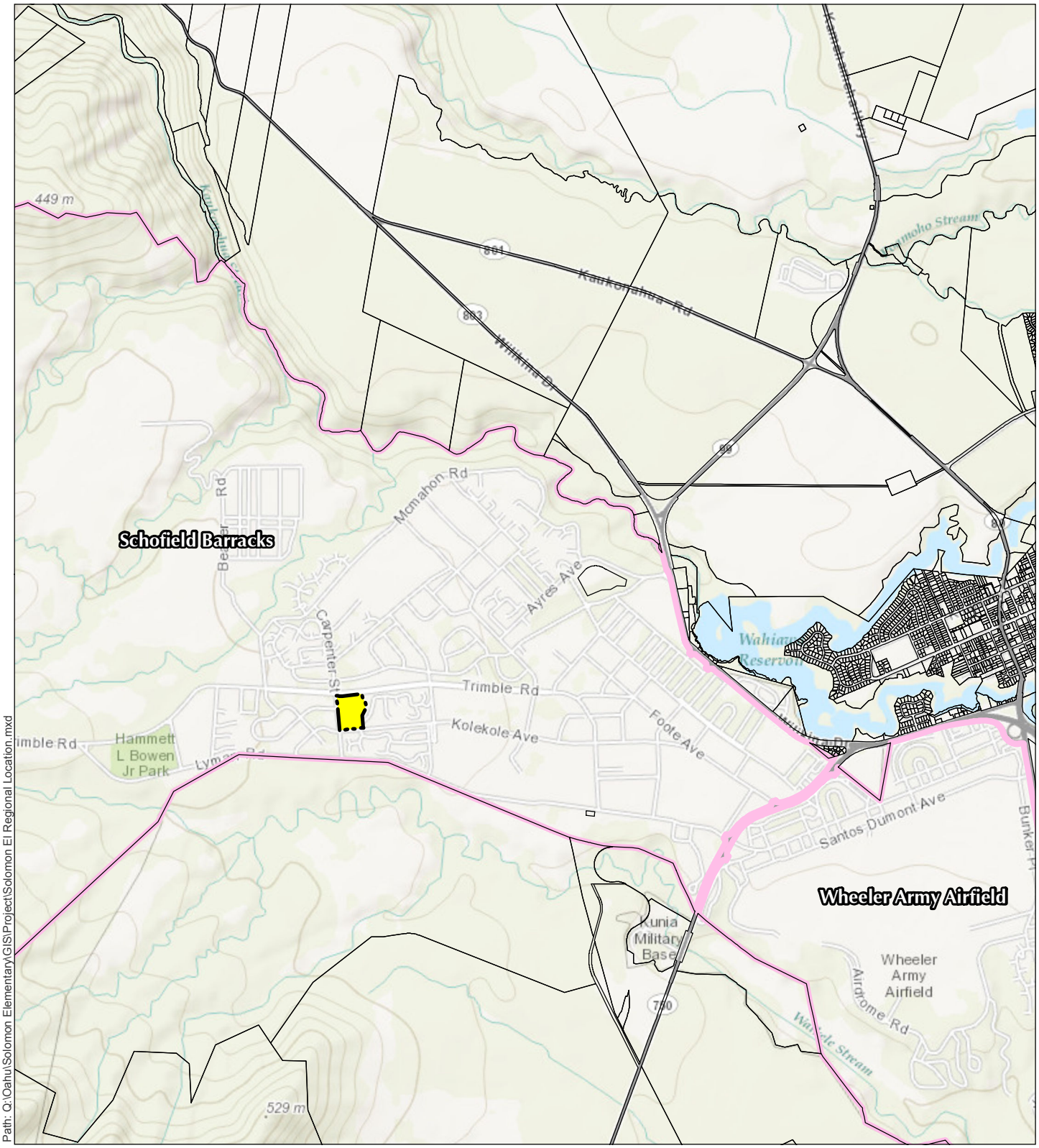
The existing improvements on the site are as follows (Figure 4):

- Four classroom buildings (Buildings A, B, C, and E) housing 39 classrooms
  - Building A includes the library
  - Building B includes the administrative office
- 23 portable classrooms and support structures
- Open pavilion
- Cafetorium (Building D)
- Staff parking lots (includes one paved and one gravel)
- Play court
- Jungle gym
- Kindergarten playground

Site photographs are shown in Figure 5.

Currently, primary vehicle access to the site is provided off of Kunia Road via Lyman Gate, an access-control-point manned by military personnel. The site is located at the intersection of Carpenter Street and Kolekole Avenue, which are military-controlled roads.

The proposed improvements will occur entirely within the existing grounds of Solomon Elementary School. Solomon Elementary School is not located within designated floodplains, floodways, wetlands, or critical habitats.



PDF - Q:\Oahu\Solomon Elementary\PDF\EA Figures\Fig. 1 Regional Location
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DATE: 11/26/2013

LEGEND

- Solomon Elementary School
- Tax Map Key
- Army Installations

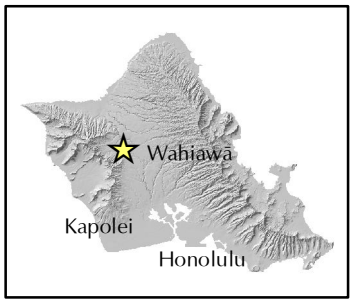


FIGURE 1 :

Regional Location

Solomon Elementary School Improvements

State of Hawai'i Department of Education

Schofield Barracks, Island of O'ahu

North

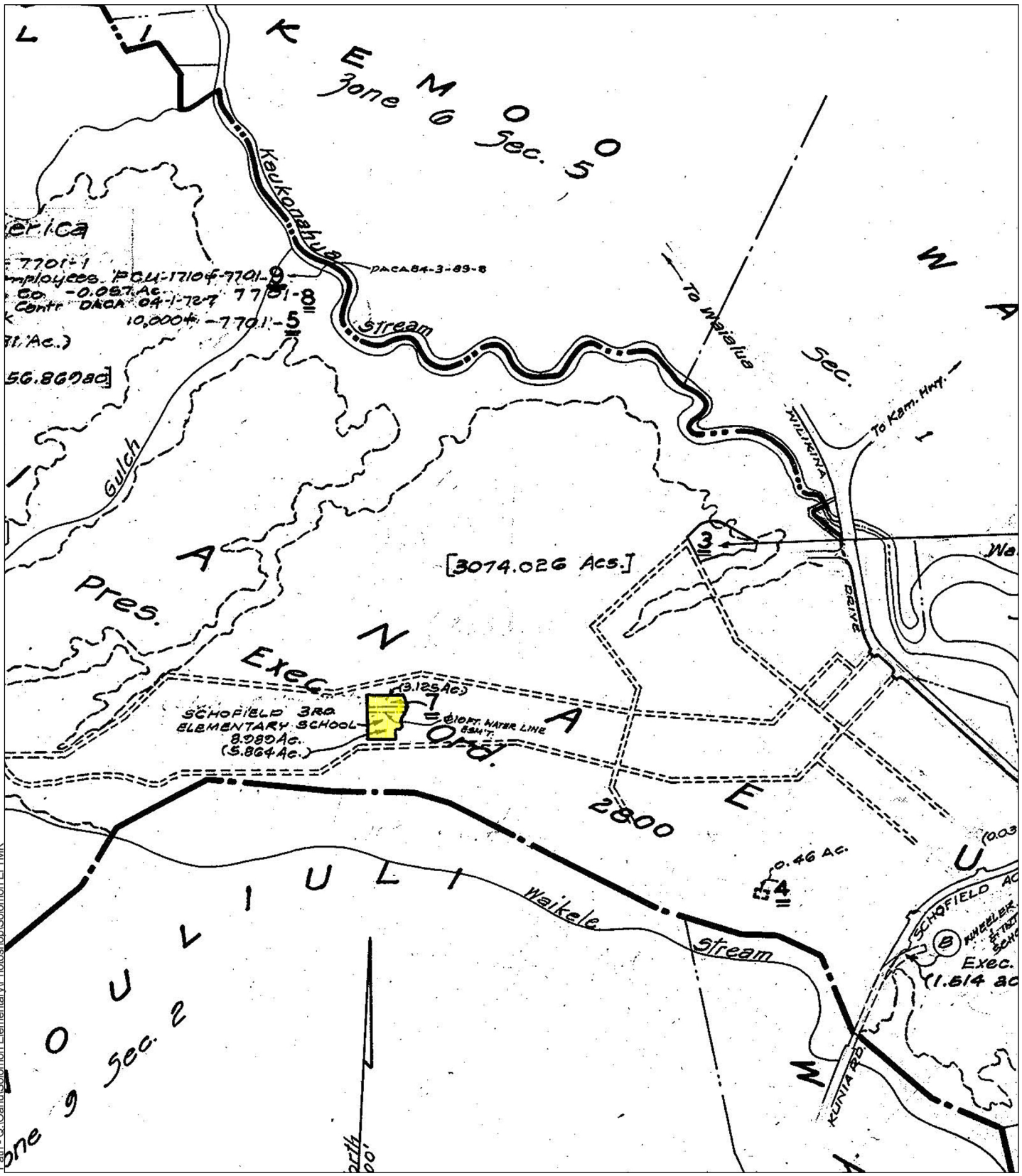
Linear Scale (feet)

0 1,000 2,000 4,000

PBR HAWAII & ASSOCIATES, INC.

Source: ESRI Online Basemap; City and County of Honolulu (2013)

Disclaimer: This graphic has been prepared for general planning purposes only and should not be used for boundary interpretations or other spatial analysis.



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Solomon Elementary School (TMK: 7-7-001:007)

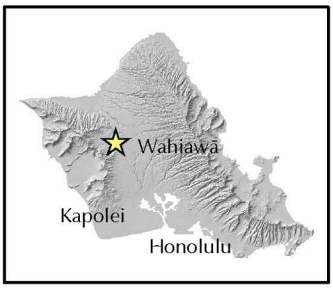

FIGURE 2 :
Tax Map Key
Solomon Elementary School Improvements

State of Hawai'i Department of Education
Schofield Barracks, Island of O'ahu

North

PBR HAWAII & ASSOCIATES, INC.

Source: City and County of Honolulu Tax Map (Zone 7, Sec. 7, Plat 01, last updated in 1978)

Disclaimer: This graphic has been prepared for general planning purposes only and should not be used for boundary interpretations or other spatial analysis beyond the limitations of the data.

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PDF - Q:\Oahu\Solomon Elementary\PDF\EA Figures\Fig. 3 Aerial Campus Map
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DATE: 5/2/2014

LEGEND

Solomon Elementary School

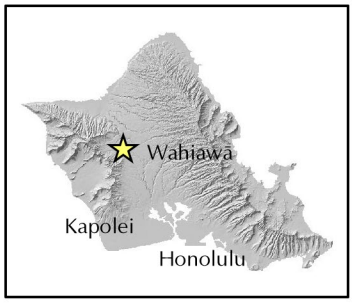


FIGURE 3 :

Campus Map

Solomon Elementary School Improvements

State of Hawai'i Department of Education — Schofield Barracks, Island of O'ahu

North

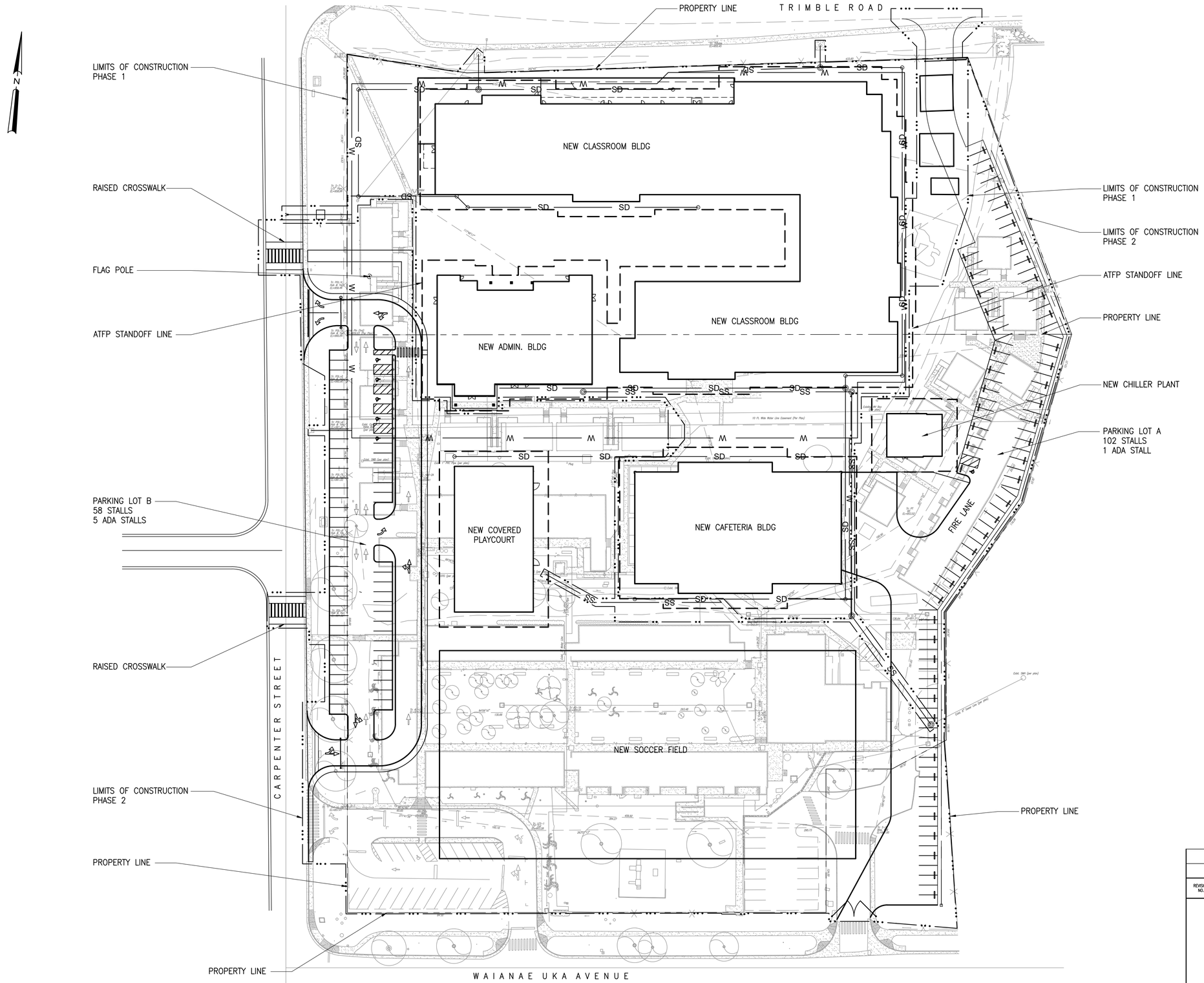
Linear Scale (feet)

0 40 80 160

PBR HAWAII & ASSOCIATES, INC.

Source: Pictometry (2011)

Disclaimer: This graphic has been prepared for general planning purposes only and should not be used for boundary interpretations or other spatial analysis.



LEGEND

- LIMITS OF CONSTRUCTION PHASE 1
- LIMITS OF CONSTRUCTION PHASE 2
- PROPERTY LINE
- ATFP STANDOFF LINE
- RIGHT OF WAY
- NEW FENCE
- STRUCTURE FOOTPRINT
- CONC. WALKWAY/ PAVEMENT
- A.C. PAVEMENT
- POROUS PAVEMENT

1 / C-3.0 OVERALL SITE PLAN

SCALE: 1"=40'

GRAPHIC SCALE

1" = 40' 40' 20' 0 40' 80'

Figure 4:
Site Plan
Solomon Elementary School Improvements
State of Hawai'i Department of Education — Island of O'ahu

REVISION NO.	SYM.	DESCRIPTION	SHT ___ OF ___	DATE	APPROVED

DEPARTMENT OF EDUCATION
STATE OF HAWAII

SOLOMON ELEMENTARY SCHOOL

KAPOLEI — OAHU — HAWAII

OVERALL SITE PLAN

MITSUNAGA & ASSOCIATES, INC.		DOE NO.	DRAWING NO.
DESIGNED BY: CB	CHECKED BY: CB	Q72003-13	C-3.0
DRAWN BY: CB	APPROVED BY: CM	DATE	SHEET XX
SCALE: AS SHOWN		APRIL 23, 2014	OF X SHTS

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1. View of courtyard between Buildings B (left) and C (right) from the cafetorium.

2. View northeast along the easternmost property line.

3. View from playcourts through courtyard between Bldgs C (left) and E (right). Portables P13-15 visible on the right.

4. Portables P1 through P9.

5. Play structure at northeast corner of playfield.

6. View of playcourts. Building C and the cafetorium are visible in the background.

Photos taken on July 2, 2013 by PBR HAWAII & Associates, Inc.

Figure 5A:
Site Photographs

Solomon Elementary School Improvements

State of Hawai'i Department of Education

Schofield Barracks, Island of O'ahu

PBR HAWAII & ASSOCIATES, INC.

7. Looking southeast over playcourts from pavilion.

8. Looking east through pavilion to play structure and portables.

9. Portable P15.

10. Large trees along Trimble Road boundary of school.

11. Large trees along Trimble Road boundary of school. Picnic tables are outside the school fence line.

12. Looking east over playfields.

Photos taken on July 2, 2013 by PBR HAWAII & Associates, Inc.

Figure 5B:

Site Photographs

Solomon Elementary School Improvements

State of Hawai'i Department of Education

Schofield Barracks, Island of O'ahu

PBR HAWAII & ASSOCIATES, INC.

13. Looking north along Carpenter Street boundary fence.

14. Looking south along Carpenter Street boundary fence.

15. Possibly cultivated vegetation near Carpenter Street entrance.

16. Courtyard between Building C (right) and E (left).

17. Pedestrian entrance from Carpenter Street.

Photos taken on July 2, 2013 by PBR HAWAII & Associates, Inc.

Figure 5C:

Site Photographs

Solomon Elementary School Improvements

State of Hawai'i Department of Education

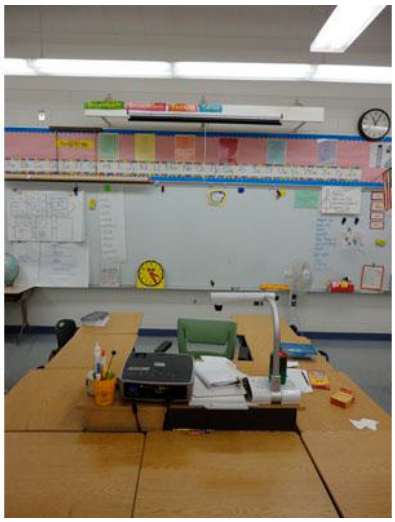
Schofield Barracks, Island of O'ahu

PBR HAWAII & ASSOCIATES, INC.

18. Cafeteria.

19. Cafeteria serving line.

20. Classroom.



21. Classroom technology.

22. Classroom.

23. Library.

Figure 5D:
Site Photographs - Interior

Solomon Elementary School Improvements

State of Hawai'i Department of Education

Schofield Barracks, Island of O'ahu

PBR HAWAII & ASSOCIATES, INC.

Photos from the February 7, 2011 Department of Defense Facility Condition Assessment Report for Solomon Elementary School.

24. Library.

25. Administration hallway.

26. Staff break room.

Figure 5E:
Site Photographs - Interior
Solomon Elementary School Improvements

State of Hawai'i Department of Education
Schofield Barracks, Island of O'ahu

PBR HAWAII & ASSOCIATES, INC.

Photo #24 taken in 2004 and photos #25 and #26 taken in 2010 by Mitsunaga & Associates.

2.1.2 Existing Land Use Designations

Current land use designations for the Site are:

- *State Land Use:* Urban (Figure 6)
- *Zoning:* F-1 (Federal and Military Preservation) (Figure 7)
- *Central Oʻahu Sustainable Communities Plan:* Residential and Low Density Apartment (Figure 8)
- *Special Management Area:* Not within SMA (Figure 9)

2.1.3 Surrounding Land Uses

Solomon Elementary School is surrounded by Schofield Barracks, an active U.S. Army base. Military activities that take place in the surrounding area include industrial, commercial, business, residential, community, and conservation land uses as designated by the requirements of the federal government. To the north, south and west, the school is bounded by roadways. Beyond the roads on every side are residential developments used by military personnel and their families while stationed at Schofield Barracks. To the east, the school is directly adjacent to residences. Trimble Road, which borders the school on the north, is closed from about 6:30 AM to 7:45 AM daily for physical training exercise.

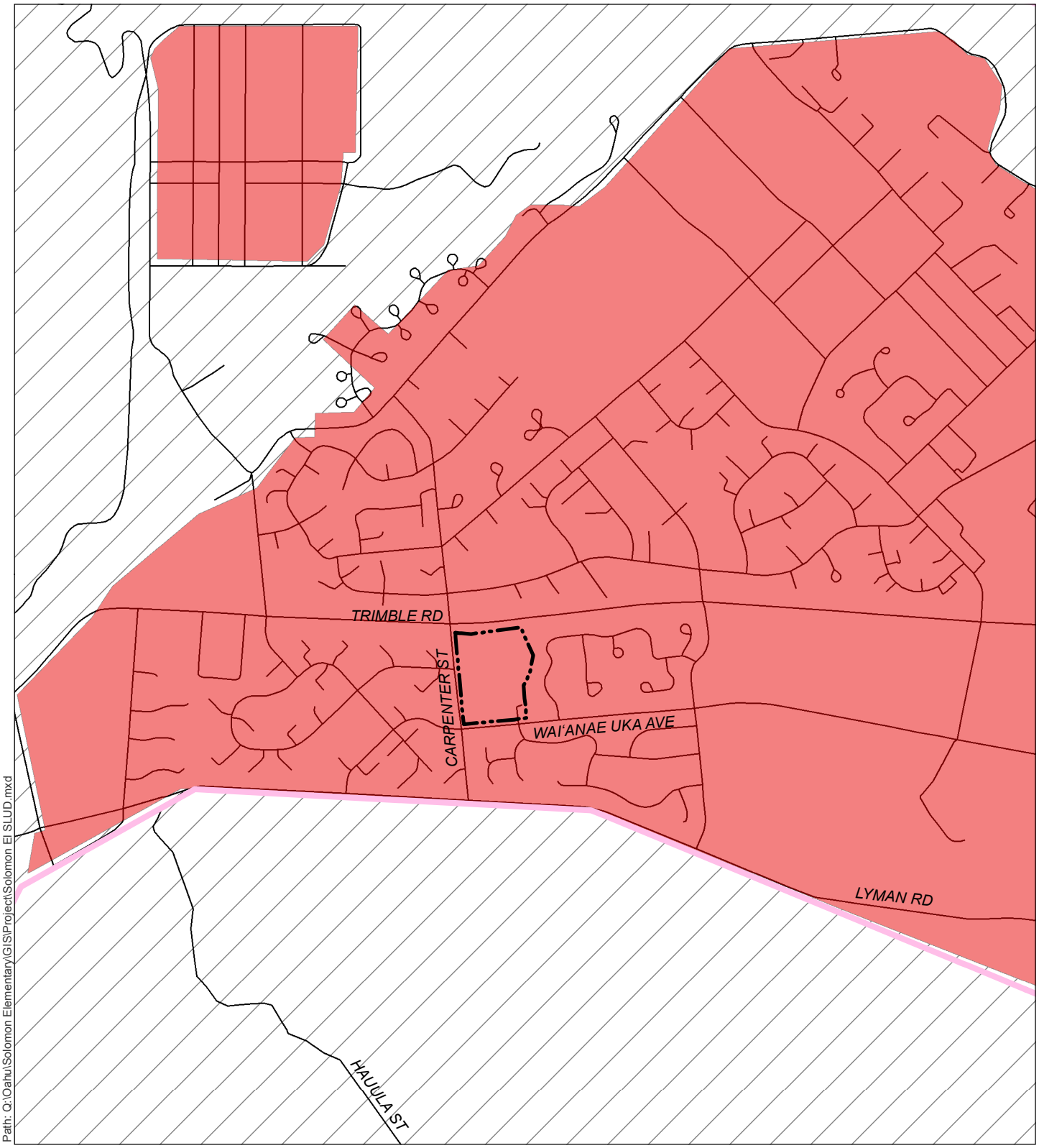
2.1.4 Regional Land Use History

Solomon Elementary School is part of the Waiʻanae Uka *ahupuaʻa* (traditional land division). In 1899, Waiʻanae Uka was formally set aside by the U.S. government as a military reservation. However, it was not until 1909 that temporary and permanent barracks were constructed on the western central plains of Waiʻanae Uka and occupied by army personnel. A network of Oahu Sugar Co. ditches and associated tunnels extended across the Waiʻanae side of the reservation between Waiele Stream (near a cantonment), and Haleʻauʻau, Kalena and Mohiakea streams to the northwest.

Most of the buildings and training infrastructure initially planned for Schofield Barracks were completed during the early 1920s, after World War I. At the beginning of World War II, Schofield Barracks offered the only major training area in the Hawaiian Islands. It was targeted during the infamous Japanese attack on Oʻahu on December 7, 1941, but suffered minimal damage.

Since 1941, Schofield Barracks has been the home of the 25th Infantry Division, known as the Tropic Lightning Division, as well as the Command Headquarters for United States Army Hawaiʻi. Schofield Barracks is also home to the 8th Theater Sustainment Command. Currently the Schofield Barracks Military Reservation comprises three active training ranges: the Impact Area, South Range, and East Range. The Impact Area, containing approximately 2,800 acres, encompasses the lower slope of the Waiʻanae Range west of the main Schofield Barracks housing and administration area. This range is the primary range for live mortar and artillery

firing but is also used for field training of squad and platoon size units, headquarters, elements and service support units. The South Range, just south of the Impact Area, is commonly used for field training of headquarters and service support units. At the time of the 2010 U.S. Census, Schofield Barracks contained a population of 16,370.



PDF - Q:\Oahu\Solomon Elementary\PDF\EA Figures\Fig. 6 SLUD
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DATE: 10/6/2014

LEGEND

- Solomon Elementary School
- Schofield Barracks
- Streets

State Land Use District

- A - Agriculture
- U - Urban

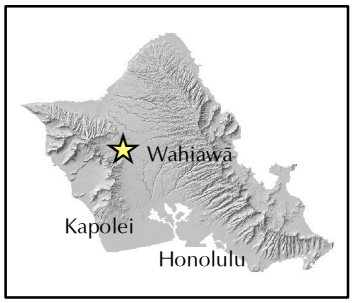


FIGURE 6 :

State Land Use Districts

Solomon Elementary School Improvements

State of Hawai'i Department of Education

Schofield Barracks, Island of O'ahu

North

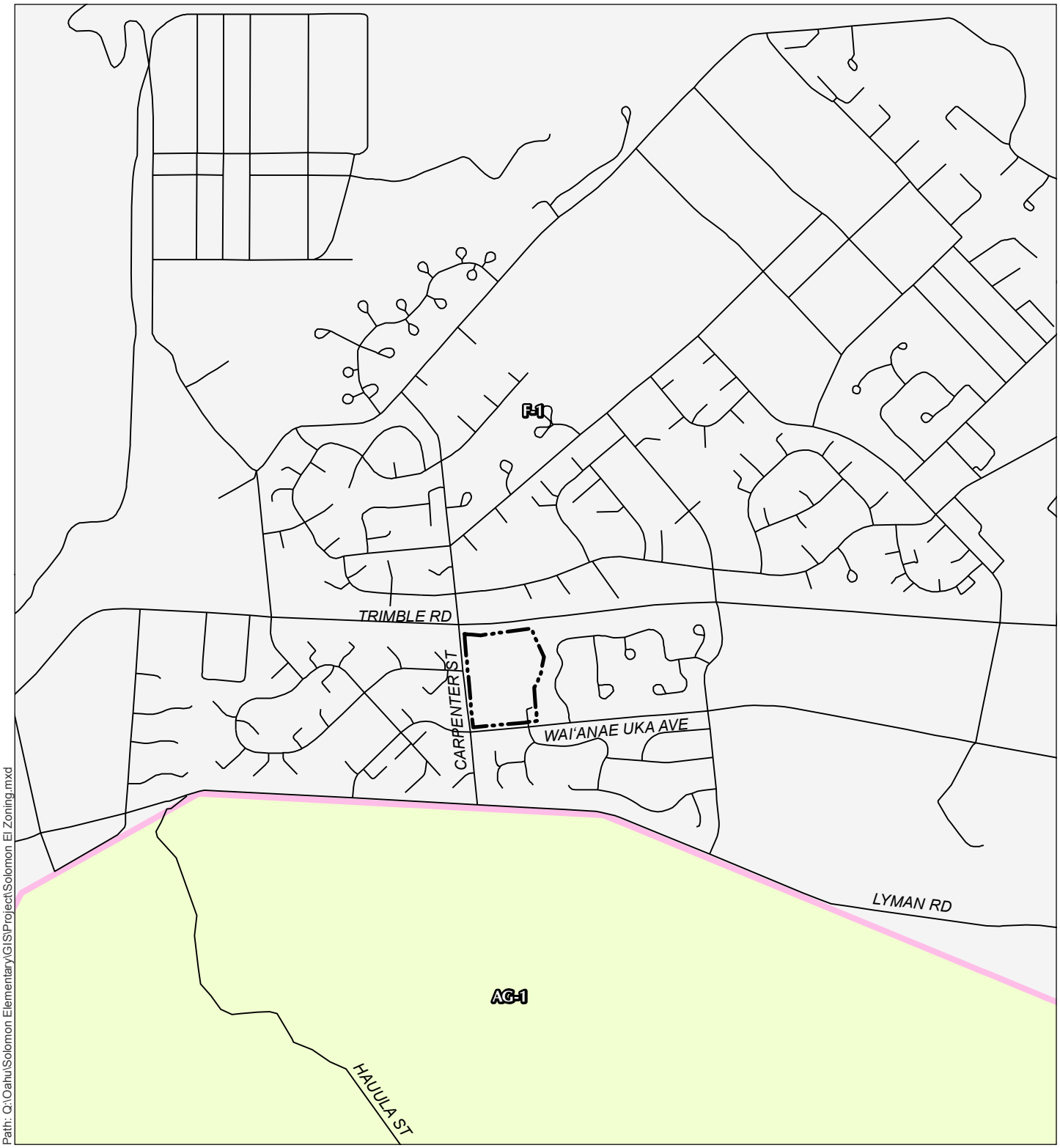
Linear Scale (feet)

0 250 500 1,000

PBR HAWAII & ASSOCIATES, INC.

Source: Hawai'i State Land Use Commission (2014)

Disclaimer: This graphic has been prepared for general planning purposes only and should not be used for boundary interpretations or other spatial analysis.



PDF - Q:\Oahu\Solomon Elementary\PDF\EA Figures\Fig. 7 Zoning
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DATE: 10/9/2014

LEGEND

Solomon Elementary School

Schofield Barracks

Streets

Zoning Designations

AG-1 Restricted Agriculture District

F-1 Federal and Military Preservation District

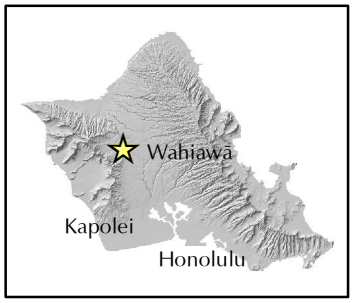

FIGURE 7 :

Zoning

Solomon Elementary School Improvements

State of Hawai'i Department of Education

Schofield Barracks, Island of O'ahu

North

Linear Scale (feet)

0 250 500 1,000

PBR HAWAII & ASSOCIATES, INC.

Source: City and County of Honolulu (2014)

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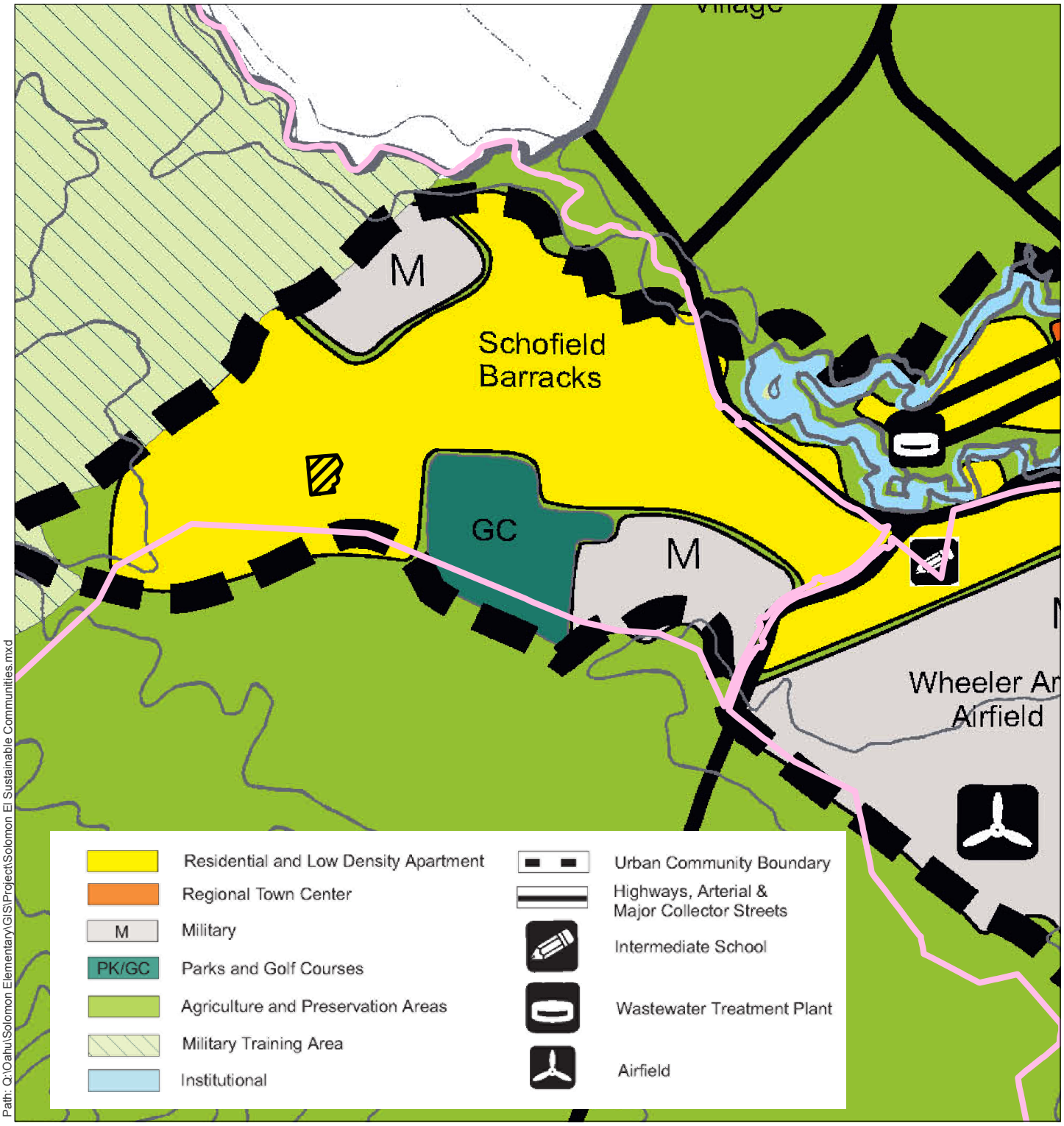

PDF - Q:\Oahu\Solomon Elementary\PDF\EA Figures\Fig. 8 SusCommunities
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DATE: 5/5/2014

LEGEND

Solomon Elementary School

Schofield Barracks

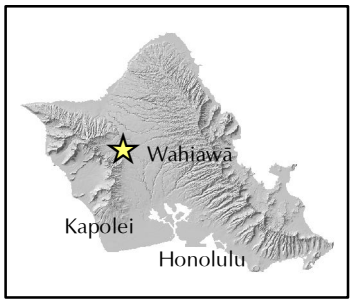

FIGURE 8 :

Central O'ahu
Sustainable Communities Plan
Map A2: Urban Land Use

Solomon Elementary School Improvements

State of Hawai'i Department of Education

Schofield Barracks, Island of O'ahu

North

Linear Scale (feet)

0 600 1,200 2,400

PBR HAWAII & ASSOCIATES, INC.

Source: ESRI Online Basemap; City and County of Honolulu Department of Planning and Permitting (2002)

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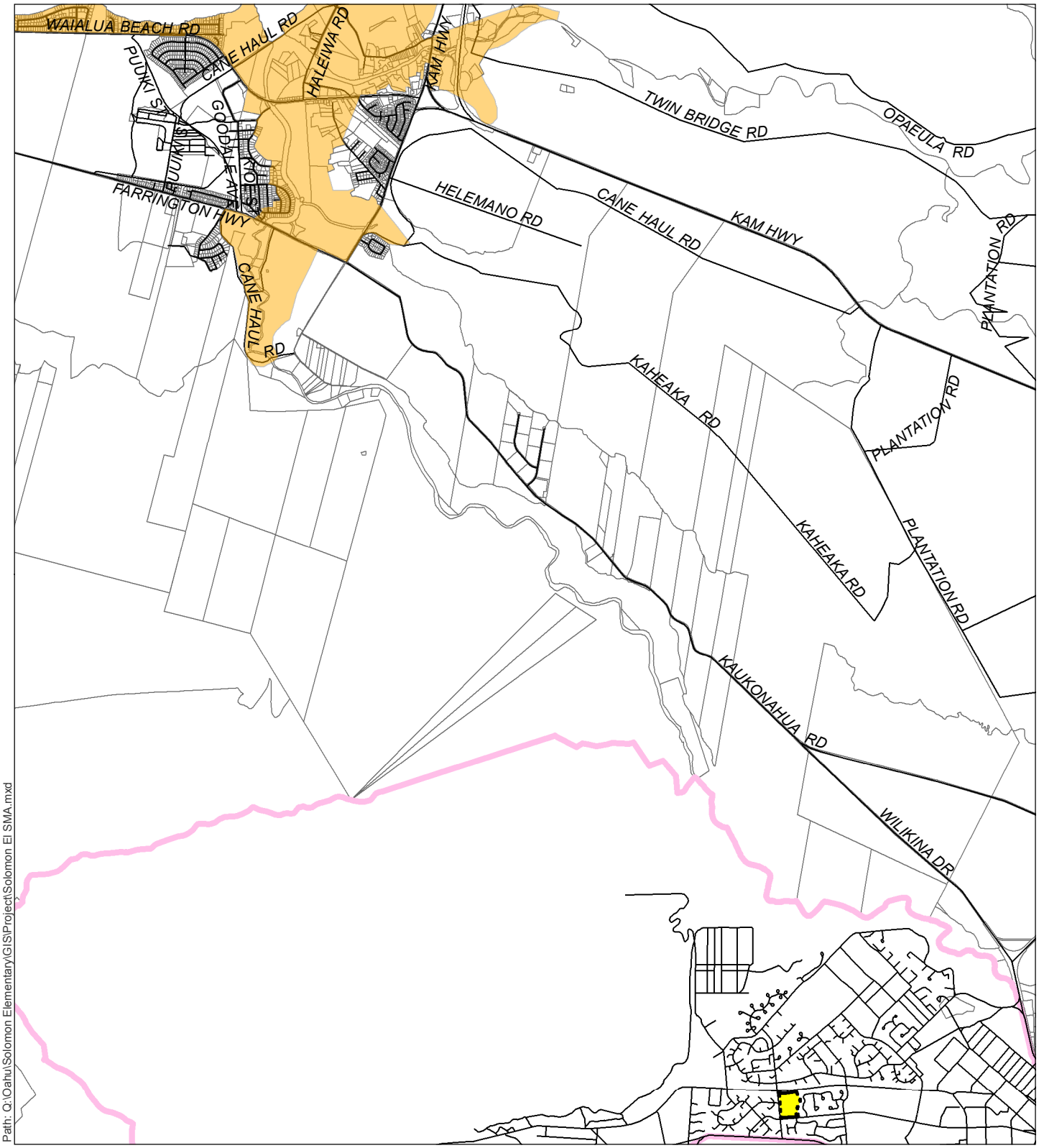

PDF - Q:\Oahu\Solomon Elementary\PDF\EA Figures\Fig. 9 SMA
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DATE: 5/15/2014

LEGEND

- Special Management Area
- Solomon Elementary School
- Schofield Barracks
- Tax Map Key
- Streets

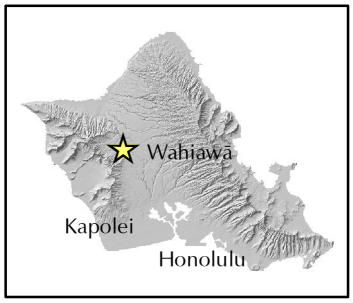


FIGURE 9 :

Special Management Area

Solomon Elementary School Improvements

State of Hawai'i Department of Education
Schofield Barracks, Island of O'ahu

North

Linear Scale (feet)
0 1,000 2,000 4,000

PBR HAWAII & ASSOCIATES, INC.

Source: City and County of Honolulu (2014)

Disclaimer: This graphic has been prepared for general planning purposes only and should not be used for boundary interpretations or other spatial analysis.

2.2 PURPOSE AND NEED

On February 7, 2011, the Department of Defense (DoD) prepared a Facilities Condition Assessment Report on Solomon Elementary School based on compliance with Department of Defense Education Activity (DoDEA) practices according to facility condition, spatial adequacy, capacity and technical readiness. The assessment found the school to be well maintained and a good learning environment; however, several building systems were found to be beyond their useful life. As a result of the assessment, Solomon Elementary has been listed as 28th on the prioritized list of military impacted schools nationwide in need of facilities improvements.

Although the assessment determined that the current classrooms are a good size, an additional eleven (11) classrooms are needed to replace classes held in temporary facilities. According to the DoD's standards, Solomon Elementary is already over its enrollment capacity by more than 200 students.

In addition, Solomon's electrical infrastructure requires upgrades to support current technology and air conditioning. The Facilities Condition Assessment Report further recommended that windows (instead of the current louvers) be installed to prevent dust and humidity infiltration and that campus facilities be upgraded to meet Anti-Terrorism Force Protection Standards.

The school's food service area, cafeteria, and library/information center were found to be too small for DoD's standards. The size of the cafeteria is a particular challenge. However, the assessment recognized that "school staff has done a good job addressing these challenges to help serve the students." The parking lots were also found to be too small, as they only provide enough stalls for 39 privately owned vehicles and lack adequate drop-off zones. This causes issues during pick up and drop off time when parents have to park on the street.

Finally, Solomon does not have a separate gymnasium; however, the DoD grant program does not require school districts to provide gymnasiums if that is not the local education authority (LEA) standard. When students at Solomon need to use a gymnasium (e.g. during inclement weather), they use the cafeteria. However, the length of the four, 30-minute lunch periods limits the usability of the cafeteria as a gymnasium. Given the relatively mild year round climate, none of Hawai'i's public elementary and middle schools have gymnasiums. Instead, outdoor play areas and covered play courts are provided at the schools when the budget allows.

The proposed improvements, described in the following section, are based on the above inadequacies found in the Facilities Condition Assessment Report as well as assessments done by the DOE.

2.3 SOLOMON ELEMENTARY SCHOOL CAMPUS IMPROVEMENTS

A replacement school will be constructed on Solomon's existing playfield and all existing buildings and portables will be demolished. The new school will be approximately 160,000-

square feet and consist of one, large two-story classroom building, a two-story administration/library building, a cafeteria, and a covered playcourt.

The plan includes the construction of two new parking lots with a total of 178 parking stalls (including 8 accessible stalls). The majority of the area where the existing buildings are located will be converted to the aforementioned covered playcourt, a new grass playfield, and landscaping. The covered playcourt addresses DoD's concern that the school does not have a gymnasium.

The Project will take place in three phases over two and a half to three years (see Section 2.6). Most of the existing buildings will not be affected until Phase II when the students will be moved to the new school and the old school facilities will be demolished. However, several portables will need to be relocated until their demolition, and the existing open pavilion will be demolished in Phase I.

The project includes the following specific improvements to Solomon Elementary School:

- <u>Demolition of Permanent and Temporary Structures</u>
    - 23 portable classrooms and support structures (to be relocated off campus or demolished)
    - Four classroom buildings (Buildings A, B, C, and E)
        - Building A includes the library
        - Building B includes the administrative office
    - Open pavilion
    - Cafeteria (Building D)
    - Staff parking lots (includes one paved and one gravel)
    - Play court
    - Jungle gym
    - Kindergarten playground

- <u>Construction of New Facilities</u>
    - Two-story classroom building of approximately 100,000 square feet
        - First floor: approximately 60,000 square feet
        - Second floor: approximately 50,000 square feet
    - Two-story administration building of approximately 20,000 square feet
        - First floor: approximately 11,000 square feet
        - Second floor: approximately 12,000 square feet
    - Cafeteria of approximately 17,000 square feet
    - Covered playcourt of approximately 8,000 square feet
    - Chiller building of approximately 3,000 square feet
    - Two parking lots with total of 178 stalls, including 8 accessible stalls
    - Grass playfield

2.4 SUSTAINABLE PLANNING AND DESIGN

The DOE and consultant architect have designed the new school to a level that would qualify for Leadership in Energy and Environmental Design (LEED) Silver certification or meet the Hawai‘i Collaborative for High Performance Schools (HI-CHPS) Criteria for New Construction and Major Modernizations.

The HI-CHPS Criteria is a system developed by a committee of K-12 school stakeholders under the guidance of the Hawai‘i State DOE and the National CHPS nonprofit organization. The criteria are used to design and construct healthy, high performance, and green schools. Hawai‘i is the 13th state to adopt a CHPS high performance school criteria.

The LEED Green Building Rating System is a nationally accepted benchmark for the design, construction, and operation of sustainable buildings. The LEED System encourages and accelerates global adoption of sustainable green building and development practices through the creation and implementation of universally understood and accepted tools and performance criteria. LEED promotes a whole-building approach to sustainability by recognizing performance in five key areas of human and environmental health: sustainable site development, water savings, energy efficiency, materials selection, and indoor environmental quality.

LEED for New Construction addresses design and construction activities for both new buildings and major renovations of existing buildings. The intent is to promote healthful, durable, affordable, and environmentally sound practices in building and design and construction.

As part of incorporating LEED concepts, with the goal of achieving an equivalent to LEED Silver Certification, a broad range of measures will be considered from the various LEED strategies available. It is anticipated that the following LEED concepts will be incorporated into the project design and construction:

- Create and implement an erosion and sedimentation control plan for all construction activities associated with the project.
- Divert demolition and new construction waste that would normally go to landfill.
- Use materials that are re-used, rapidly renewable, of recycled content, and of certified manufacturers.
- Reduce the heat island effect of roof and non-roof components by selecting reflective or low-heat gain materials.
- Provide natural day lighting to the greatest extent possible
- Reduce light pollution by providing shields and reflectors on exterior light fixtures.
- Utilize native and/or water efficient landscaping
- Optimize energy performance through design of air conditioning and lighting systems.
- Improving indoor environmental quality by providing a construction management plan, specifying low emitting materials, providing a portion of interior spaces with views and day lighting.

2.5 DESIGN PROCESS

The selected architect, Mitsunaga & Associates, Inc., and the DOE held several meetings with key stakeholders including the school principal and staff, DOE facility planners, and the U.S. Army Garrison Hawaii (Garrison).

General input to date has been solicited through the following:

- DOE Workshop
- Meeting between Garrison staff and the State Historic Preservation Division
- Pre-consultation letters for this EA were mailed to federal, state, and county agencies to notify them of the Project and invite any comments to be addressed in the Draft EA. Comment and response letters are reproduced in Appendix A.
- Review by Garrison Environmental Programs
- Copies of the Draft EA will be mailed to federal, state, and county agencies as well as other interested organizations (see Section 8). Those receiving copies of the Draft EA will be invited to provide comments.

On August 21st and 22nd, 2014, a planning and design workshop was held engaging the users and stakeholders in development of significant improvements including proposed classroom and physical education facilities as well as administrative/library/media/computer tech centers. In one activity the users and stakeholders utilized cut-outs representing room components to develop schematic spatial relationships. Results from the workshops as well as solicited input were utilized by the architects and DOE in the design process.

2.6 PROJECT COST AND SCHEDULE

The DOE anticipates construction will commence May 2016. The project is estimated to be completed in three phases over the course of 27 months. General phasing of the project is described in Table 2-1: Project Schedule. The total estimated cost for the design and construction will be approximately 80 million dollars. Twenty percent will be funded through the state capital improvement projects budget. The remainder will be funded by the DoD Office of Economic Adjustment Grant Program for Improvements to Public Schools on Military Installations.

Table 2-1: Project Schedule

Phase	Description of Work
1	• Partial site demolition, including demolition of existing open pavilion and temporary storage shed • Construction of Buildings A, B, C, D, and chiller plant
2	• Demolition of existing portables, permanent buildings, and existing parking along Wai‘anae Uka Avenue
3	• Construction of parking, drop-off, playfields and covered playcourt • Remove temporary service area at new Building C

3 DESCRIPTION OF THE NATURAL ENVIRONMENT, POTENTIAL IMPACTS, AND MITIGATION MEASURES

This section describes existing conditions of the natural environment, potential impacts of the Project, and mitigation measures to minimize impacts.

3.1 CLIMATE

The climate of the region, similar to other parts of Hawaiʻi, can be characterized as mild, subtropical. Regional temperatures are generally cool relative to the rest of Oʻahu due to the approximately 900-foot elevation of Wahiawā. Average annual temperatures in the Project area ranging from 60-83 degrees Fahrenheit (NOAA, 2014). Humidity ranges throughout the year between 68 percent in the morning to 80 percent in the afternoon.

According to *The Rainfall Atlas of Hawaiʻi*, the Site receives an average annual rainfall of approximately 38 inches with summer months being the driest (Giambelluca, et al., 2011).

POTENTIAL IMPACTS AND MITIGATION MEASURES

The Solomon Elementary School campus improvements are not anticipated to have any negative impacts on regional climate. Micro-climatic effects at the site and vicinity, such as temperature and wind changes, however, may occur. No mitigation measures are proposed.

3.2 GEOLOGY AND TOPOGRAPHY

The Island of Oʻahu was formed by two volcanoes; Koʻolau to the east and the older Waiʻanae, to the west. The volcanoes are believed to have formed during the late tertiary to early Pleistocene periods (MacDonald, Abbott, & Peterson, 1983). The site is located over 860 feet above mean sea level (amsl) within the Leilehua plain, an elevated plateau consisting of flows from both volcanoes as well as sand and gravel (Figure 10). The site is relatively flat with a down slope from the north west elevation of about 960 feet amsl to the south east elevation of 946 amsl feet. Figure 11 is a topographic map.

The built portions of the campus are generally within 952 to 960 feet amsl.

POTENTIAL IMPACTS AND MITIGATION MEASURES

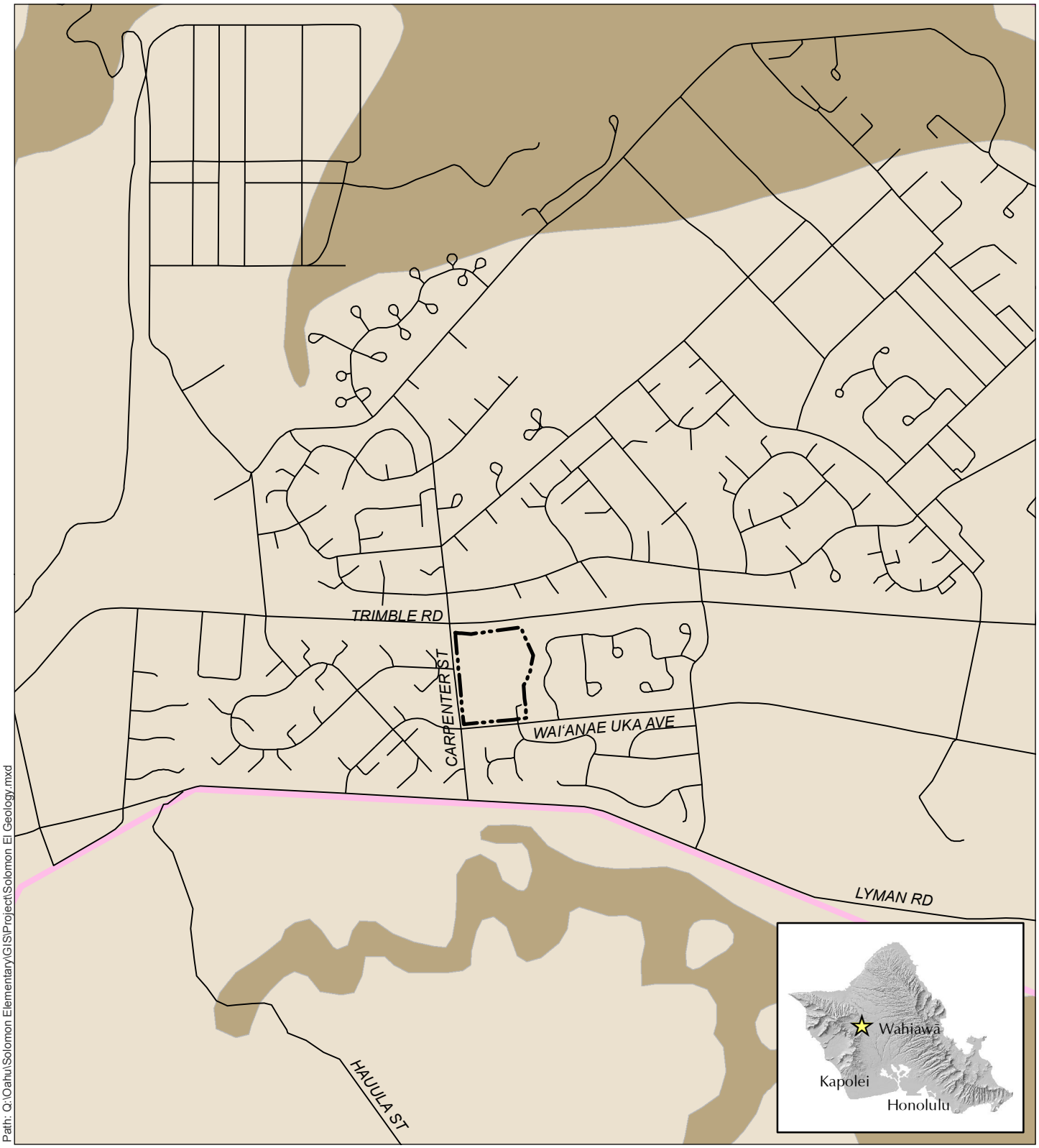
Although the site is mostly flat, the Project will involve grading most of its 10-acre area. Prior to grading, necessary grading permits will be acquired as well as Notice of Intent (NOI) Form C for a National Pollutant Discharge Elimination System (NPDES) Permit. The contractor will submit a site specific construction BMP Plan to the State DOH before grading commences. Grading activities will follow Best Management Practices (BMPs) as described in the NPDES permit.

Clearing and grubbing activities will temporarily disturb the soil retention values of the existing vegetation and expose soils to erosional forces. BMPs that include both structural and non-structural controls will be incorporated into temporary construction practices and permanent site design to minimize impacts. BMPs utilized during construction may include the following:

- Minimizing the time of construction including coordinated phasing for site control;
- Retaining existing ground cover as long as possible;
- Constructing drainage control features early;
- Using temporary area sprinklers in non-active construction areas when ground cover is removed;
- Providing a water truck on-site during the construction period to provide for immediate sprinkling, as needed;
- Using temporary, ground-cover, berms and cut-off ditches, where needed, for control of erosion;
- Watering graded areas when construction activity for each day has ceased;
- Grassing or planting all cut and fill slopes immediately after grading work has been completed; and
- Installing silt fences, sediment traps, and diversion swales, where appropriate.
- Contractor training

After construction, establishment of permanent landscaping will provide long-term erosion control. Construction activities will comply with all applicable Federal, State, and County regulations and rules for erosion control.

No significant impact to drainage is anticipated. Low Impact Development (LID) features will be integrated into the school design to maintain or improve the existing storm peak flows and storm water quality exiting the site of the Project. Drainage on the site will meet LEED Silver standards. Decentralized filtration/infiltration through vegetation will capture increased runoff resulting from the Project and allowing it to seep into the ground rather than leaving the Site. Overflow from the LID features will be conveyed to grass swales.



PDF - Q:\Oahu\Solomon Elementary\PDF\EA Figures\Fig. 10 Geology
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DATE: 5/15/2014

LEGEND

Solomon Elementary School

Schofield Barracks

Rock Type

QTao - Sand and gravel

QTkl - Lava flows

Streets

Source: U.S. Geological Survey (2008)

FIGURE 10 :
Geology

Solomon Elementary School Improvements

State of Hawai'i Department of Education

Schofield Barracks, Island of O'ahu

North

Linear Scale (feet)
0 250 500 1,000

PBR HAWAII & ASSOCIATES, INC.

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PDF - Q:\Oahu\Solomon Elementary\PDF\EA Figures\Fig. 11 Topo
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DATE: 11/26/2013

LEGEND

Solomon Elementary School

5-foot contours

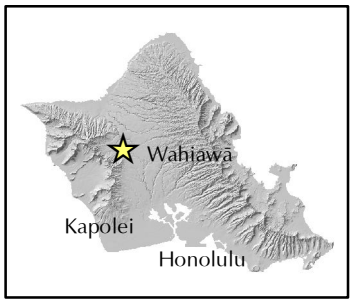


FIGURE 11 :

Topography

Solomon Elementary School Improvements

State of Hawai'i Department of Education

Schofield Barracks, Island of O'ahu

North

Linear Scale (feet)

0 50 100 200

PBR HAWAII & ASSOCIATES, INC.

Source: ESRI Online Basemap

Disclaimer: This graphic has been prepared for general planning purposes only and should not be used for boundary interpretations or other spatial analysis.

3.3 SOILS

There are three soil suitability studies prepared for lands in Hawaiʻi whose principal focus has been to describe the physical attributes of land and the relative productivity of different land types for agricultural production; these are: 1) the U.S. Department of Agriculture Natural Resource Conservation Services (NRCS) Soil Survey; 2) the University of Hawaiʻi Land Study Bureau (LSB) Detailed Land Classification; and 3) the State Department of Agriculture's Agricultural Lands of Importance to the State of Hawaiʻi (ALISH) system.

3.3.1 Natural Resource Conservation Service Soil Survey

The NRCS Soil Survey for the Island of Oʻahu, classifies the soil of the Site as Kunia Silty Clay (KyA) (Figure 12).

Kunia Silty Clay, 0 to 3 percent slopes (KyA), occurs on broad, smooth slopes dissected by very steep gulches. This soil is nearly level to moderately sloping, with elevations ranging from 700 to 1,000 feet. Kunia soils occur on the foot slopes of the Waiʻanae Range, near Schofield Barracks. They are geographically associated with Kolekole, Lahaina, and Wahiawā soils. Permeability is moderate, runoff is slow, and the erosion hazard is no more than slight. The available water capacity is about 1.7 inches per foot of soil. In places roots penetrate to a depth of 5 feet or more. Kunia Silty Clay is used for sugarcane, pineapple, home sites, and military reservations. Capability classification is I if irrigated; IIIc if non-irrigated (Foote, Hill, Nakamura, & Stephens, 1972).

3.3.2 LSB Detailed Land Classification

The University of Hawaiʻi LSB document, Detailed Land Classification, Island of Oʻahu classifies soils based on a productivity rating. Letters indicate class of productivity with A representing the highest class and E the lowest. The Site is not classified under the University of LSB Detailed Land Classification system. This means that soils at the site are not considered to be suitable land for agriculture, or it was already designated within the State Land Use Urban District during the study (Figure 13).

3.3.3 ALISH

The ALISH classification system is based primarily, but not exclusively, on the soil characteristics, the establishment of criteria for classification of lands, and the inventory of prime farm lands that meet the criteria or similar criteria for the respective classes in the national NRCS classification system. The ALISH system identifies and maps three broad classes of agricultural land – Prime, Unique, and Other Important Agricultural Land, as well as Unclassified Land. The Site is not classified under the ALISH classification system (Figure 14).

POTENTIAL IMPACTS AND MITIGATION MEASURES

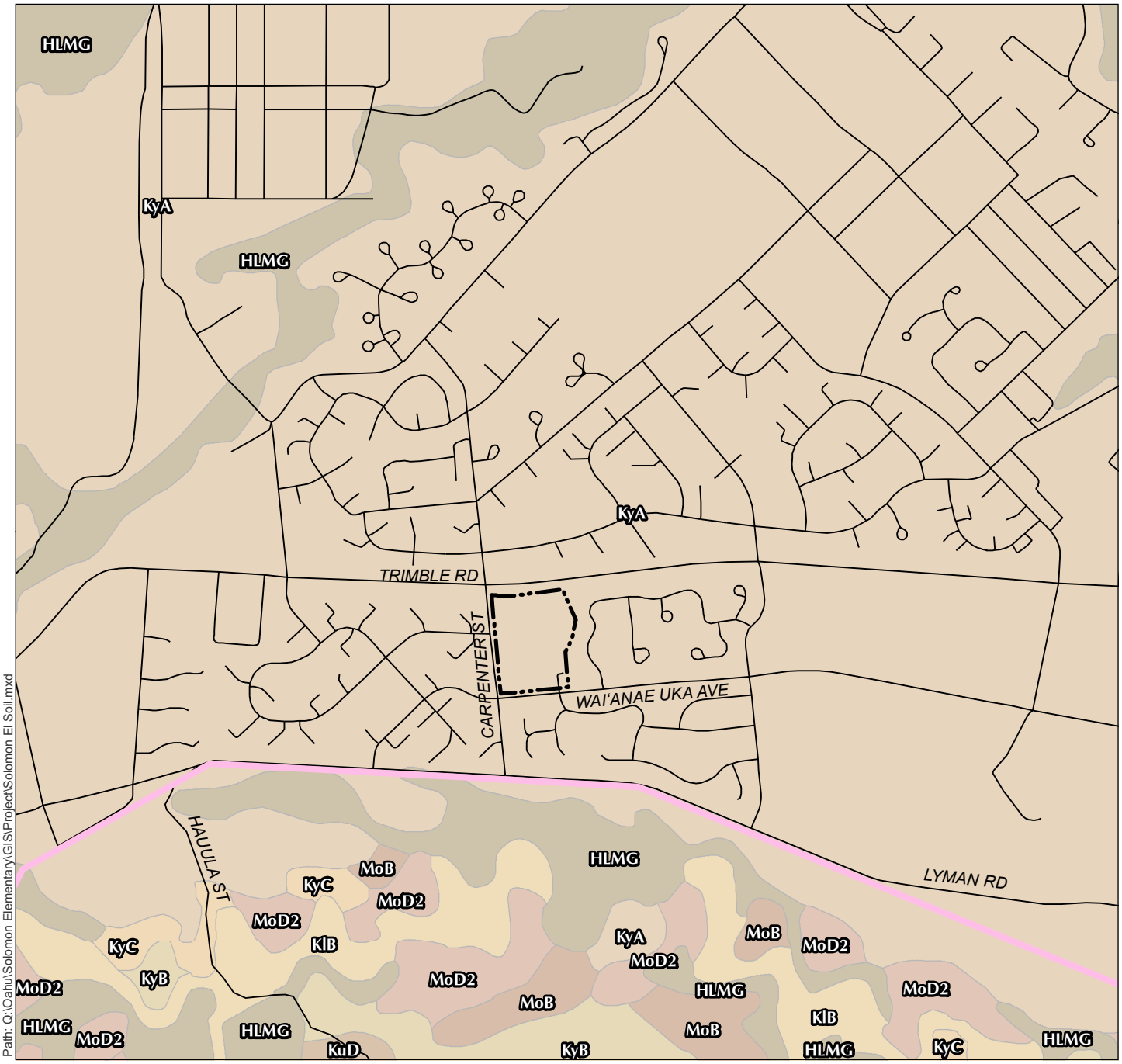
The Project will not reduce the inventory of agriculturally significant land. The Site has a NRCS capability classification of IIIc, meaning it has severe agricultural limitations if irrigation water is not provided and that the climate is too cold or dry. In addition, the Site is not classified under the LSB and ALISH classification system.

Impacts to the soils of the Site include the potential for soil erosion and the generation of dust during grading and construction. Clearing and grubbing activities will temporarily disturb the soil retention values of the existing vegetation and expose soils to erosional forces. Some wind erosion of soils could occur without a proper watering and re-grassing program. Heavy rainfall could also cause erosion of soils within disturbed areas of land. BMPs that include both structural and non-structural controls will be incorporated into temporary construction practices and permanent site design to minimize impacts. BMPs utilized during construction may include the following:

- Minimizing the time of construction including coordinated phasing for site control;
- Retaining existing ground cover as long as possible;
- Constructing drainage control features early;
- Using temporary area sprinklers in non-active construction areas when ground cover is removed;
- Providing a water truck on-site during the construction period to provide for immediate sprinkling, as needed;
- Using temporary, ground-cover, berms and cut-off ditches, where needed, for control of erosion;
- Watering graded areas when construction activity for each day has ceased;
- Grassing or planting all cut and fill slopes immediately after grading work has been completed; and
- Installing silt fences, sediment traps, and diversion swales, where appropriate.
- Contractor training

After construction, establishment of permanent landscaping will provide long-term erosion control.

Construction activities will comply with all applicable Federal, State, and County regulations and rules for erosion control. As typically required for projects on land greater than one acre in size, a National Pollution Discharge Elimination System (NPDES) Notice of General Permit Coverage (NGPC) for Storm Water Associated with Construction Activity will be necessary. A Notice of Intent (NOI) Form C for the NPDES Permit will be filed prior to construction. The contractor will submit a site specific construction BMP Plan to the State DOH before grading commences. Grading activities will follow BMPs as described in the NPDES permit.



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LEGEND

DATE: 5/15/2014

- Solomon Elementary School
- Schofield Barracks
- Streets

Soil

- HLMG - Helemano silty clay, 30-90% slopes
- KlB - Kawaihapai clay loam, 2-6% slopes
- KuD - Kolekole silty clay loam, 12-25% slopes
- KyA - Kunia silty clay, 0-3% slopes
- KyB - Kunia silty clay, 3-8% slopes
- KyC - Kunia silty clay, 8-15% slopes
- MoB - Manana silty clay loam, 2-6% slopes
- MoC - Manana silty clay loam, 6-12% slopes
- MoD2 - Manana silty clay loam, 12-25% slopes, eroded

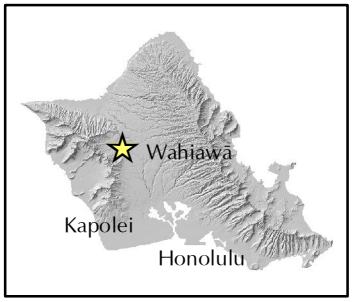


FIGURE 12 :

Soils

Solomon Elementary School Improvements

State of Hawai'i Department of Education
Schofield Barracks, Island of O'ahu

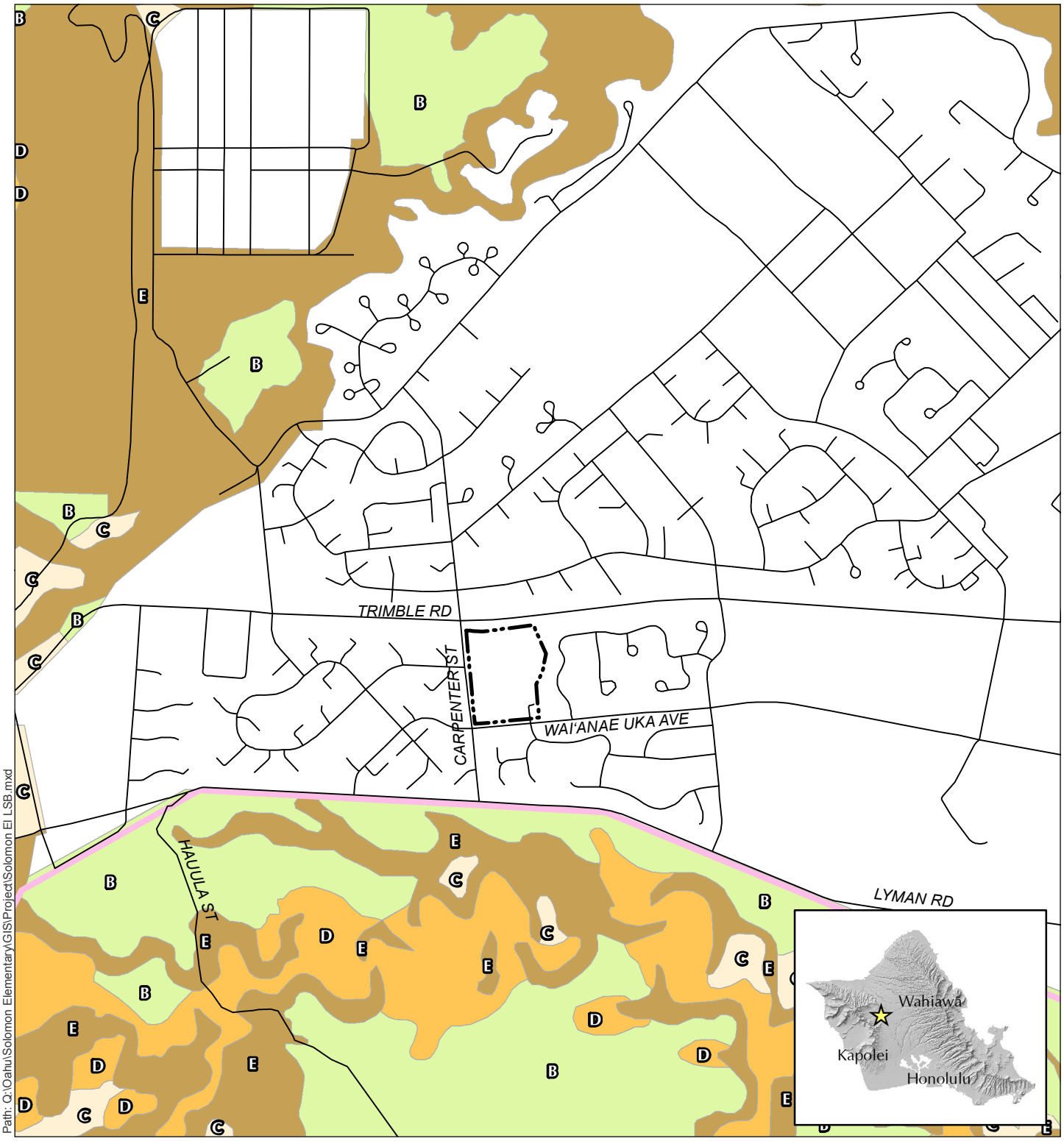
North

Linear Scale (feet)
0 250 500 1,000

PBR HAWAII & ASSOCIATES, INC.

Source: NRCS

Disclaimer: This graphic has been prepared for general planning purposes only and should not be used for boundary interpretations or other spatial analysis.



PDF - Q:\Oahu\Solomon Elementary\PDF\EA Figures\Fig. 13 LSB
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DATE: 5/15/2014

LEGEND

- Solomon Elementary School
- Streets
- Schofield Barracks

Land Study Bureau Productivity Rating

- A - Very Good
- B - Good
- C - Fair
- D - Poor
- E - Very Poor

FIGURE 13 :

Land Study Bureau's Detailed Agricultural Land Productivity Rating

Solomon Elementary School Improvements

State of Hawai'i Department of Education — Schofield Barracks, Island of O'ahu

North

Linear Scale (feet): 0 250 500 1,000

PBR HAWAII & ASSOCIATES, INC.

Source: University of Hawai'i Land Study Bureau (1972)

Disclaimer: This graphic has been prepared for general planning purposes only and should not be used for boundary interpretations or other spatial analysis.

PDF - Q:\Oahu\Solomon Elementary\PDF\EA Figures\Fig. 14 ALISH
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DATE: 5/15/2014

LEGEND

Solomon Elementary School

Streets

Schofield Barracks

ALISH

Prime ALISH

Unique ALISH

Other ALISH

Unclassified

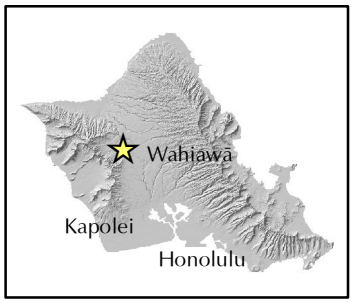


FIGURE 14 :
Agricultural Lands of Importance to the State of Hawai'i

Solomon Elementary School Improvements

State of Hawai'i Department of Education
Schofield Barracks, Island of O'ahu

North

Linear Scale (feet)
0 250 500 1,000

PBR HAWAII & ASSOCIATES, INC.

Source: Hawai'i State Department of Agriculture (1977)
Disclaimer: This graphic has been prepared for general planning purposes only and should not be used for boundary interpretations or other spatial analysis.

3.4 HYDROLOGY

According to the Commission on Water Resource Management, the Site is located within the Central/Wahiawā groundwater hydrologic unit (aquifer sector area code 30501). The Site overlies the northern perimeter of the Southern Oʻahu Basal Aquifer system. (State of Hawaii D. o., 2005)

Sustainable yield is the amount of groundwater that can be pumped without depleting the source. The sustainable yield of the aquifer is 23 million gallons per day.

The elevation of the Site is between 960 and 946 feet amsl. The groundwater level relative to msl ranges between 273- 274 feet msl. Based on the elevation of the Site, the ground level is nearly 700 feet above the groundwater level detected within the monitoring wells, therefore there is a limited likelihood of encountering ground water as a result of this project (United States Geological Survey, 2012).

Waikele Stream, the nearest perennial stream, is located approximately one third of a mile south of the Site and Kiʻikiʻi Stream is located about one-half mile to the north. Kiʻikiʻi Stream flows into Kaukonahua Stream and the Wahiawā Reservoir, a man-made lake is located approximately two miles to the east of the site. Kaukonahua Stream has been identified on the State's Clean Water Act (CWA) Section 303 (d) list. It is has Category 5 waters and is not attaining applicable water quality criteria for total nitrogen, nitrate+nitrite, nitrogen and turbidity. In 2009, Tetra Tech, Inc. prepared a report providing the Total Maximum Daily Loads (TMDLs) for the North and South Forks of Kaukonahua Stream's upper watershed. As a result of the report, TMDLs were developed for nitrogen and turbidity (State of Hawaii D. o., 2011).

POTENTIAL IMPACTS AND MITIGATION MEASURES

The Project is not anticipated to have any significant adverse impact on groundwater or surface water resources. No long-term uses that could contaminate ground water are expected to develop as part of the Project. The United State Army Garrison, Hawaii, Department of Public Works provides water service for Schofield Barracks.

Although the project may increase the total impervious area in the project the onsite storm water will be retained on site so the offsite flows are less or equal to the existing site. LID features will be integrated into the school design to maintain or improve the existing storm peak flows and storm water quality exiting the site of the Project. Drainage on the site will meet LEED Silver standards. Decentralized filtration/infiltration through vegetation will capture increased runoff resulting from the Project and allowing it to seep into the ground rather than leaving the Site. Overflow from the LID features will be conveyed to grass swales.

Protection of ground water quality is also a concern. Solomon Elementary School is located within Oʻahu's Southern Basal Aquifer. Approximately ten (10) acres will be disturbed as a

result of the Project. During construction, the grading will follow BMPs as described in the NPDES Permit and Hawai‘i Administrative Rules on Fugitive Dust, Section 11-60.133, Anti-degradation policy, Section 11-54-1.1. By utilizing BMPs, the Project will minimize sediment coming off the Site, reducing the potential of the Project contributing to the turbidity of area waterways. The contractor will submit a site specific construction BMP Plan to the State Department of Health (DOH) before grading commences. In the long-term, the Project will meet the requirements of the Garrison’s Municipal Separate Storm Sewer System.

Once Solomon Elementary School is fully operational, the school administration will be responsible for implementing and administering programs to ensure that any hazardous materials utilized are properly stored, used, and disposed and that such materials do not enter into the on-site LID stormwater features, the storm drain, or the nearby gulches.

Waste Load Allocations (WLAs) are not required for this site because the TMDLs apply only to the North and South Forks of Kaukonahua Stream’s upper watershed (Tubal, 2013).

Sections 4.4 and 4.6.3 of this EA include further information regarding the drainage improvements and fugitive dust control respectively.

3.5 MARINE WATERS

The Site is approximately seven miles inland from the nearest coastline in Hale‘iwa. Hale‘iwa Beach Park is the closest location where water quality data has been collected by the State DOH. Near shore marine waters off the coast of Hale‘iwa are classified as class “A” and “AA” by the State DOH (State of Hawaii Department of Health Clean Water Branch, 2008).

According to DOH Water Quality Standards, “It is the objective of class A waters that their use for recreational purposes and aesthetic enjoyment be permitted as long as it is compatible with the protection and propagation of fish, shellfish, and wildlife, and with recreation in and on these waters.” “AA” is described as, “It is the objective of class AA waters that these waters remain in their natural pristine state as nearly as possible with an absolute minimum of pollution or alteration of water quality from any human-caused source or actions” (HAR §11-54-03(c)(1)). Kaiaka Bay, the marine receiving water for the Site, is classified as class A waters by the DOH and currently listed as a Section 303(d) impaired water body for excessive nutrients and turbidity.

POTENTIAL IMPACTS AND MITIGATION MEASURES

The Project will increase the amount of impervious surface area of the Site. Direct discharge of storm water runoff into marine waters is not anticipated due to the inland location of the Site. However, compliance with NPDES permit requirements is planned to ensure waters upstream of the marine resources are not impacted. To minimize/eliminate the Project’s contribution to the region’s cumulative nonpoint source pollution, LID features will be integrated into the school

design to maintain or improve the existing storm peak flows and storm water quality exiting the Site. Drainage on the Site will meet LEED Silver standards. Decentralized filtration/infiltration through vegetation will capture increased runoff resulting from the Project and allowing it to seep into the ground rather than leaving the Site. Overflow from the LID features will be conveyed to grass swales.

3.6 NATURAL HAZARDS

O‘ahu is susceptible to potential natural hazards, such as flooding, tsunami inundation, hurricanes, earthquakes, and wildfires. This section provides an analysis of the Site’s vulnerability to such hazards.

The State of Hawai‘i Department of Defense, Office of Civil Defense operates a system of civil defense sirens throughout the State to alert the public of emergencies and natural hazards, particularly tsunamis and hurricanes. The closest siren is siren simulator S-252 located within the boundaries of Schofield Barracks. In the event of natural disaster, the new cafeteria at Solomon Elementary School will be a designated an Emergency Shelter (Figure 16).

3.6.1 Flood

According to the Flood Insurance Rate Map (FIRM) prepared by the Federal Emergency Management Agency (FEMA), National Flood Insurance Program, the Site is located within Zone D, undetermined flood area (Figure 15).

The existing drainage pattern is that runoff sheet flows across the site to landscaped areas or to swales and drainage structures.

3.6.2 Tsunami

Since the early 1800’s, approximately 50 tsunamis have inundated the State of Hawai‘i’s shores. Seven historical events have caused major damage. The most recent tsunami to impact O‘ahu, occurred on March 11, 2011, causing damage at several locations around the island including the north shore, the nearest coastal area to the Site. According to the FEMA FIRM, the Site is located well outside of areas which would be impacted by coastal flooding from a tsunami. There are no records of inundation of lands within Wahiawā or Schofield Barracks during any recorded tsunami.

3.6.3 Hurricane

Hurricanes are classified into one of five categories according to the Saffir-Simpson Hurricane Scale. This scale provides some indication of the potential damage and flooding a hurricane will cause upon landfall. Since 1980, two hurricanes have had a devastating effect on Hawai‘i. They were Hurricane ‘Iwa in 1982 (Category 1- sustained winds between 75–95 mph) and Hurricane ‘Iniki in 1992 (Category 4- sustained winds between 131–155 mph). In both instances, much of

the damage sustained on O‘ahu occurred along the Wai‘anae Coast as the hurricanes passed between the islands of Kaua‘i and O‘ahu. While it is difficult to predict such natural occurrences, it is reasonable to assume that future incidents are likely, given historical events.

3.6.4 Earthquake

In Hawai‘i, most earthquakes are linked to volcanic activity, unlike other areas where a shift in tectonic plates is the cause of an earthquake. Each year, thousands of earthquakes occur in Hawai‘i, the vast majority of which are detectable only with highly sensitive instruments. However, moderate and disastrous earthquakes have occurred in the islands in the past. The largest earthquake in the state (magnitude 7.9) occurred in 1868 on Hawai‘i Island.

3.6.5 Wildland Fires

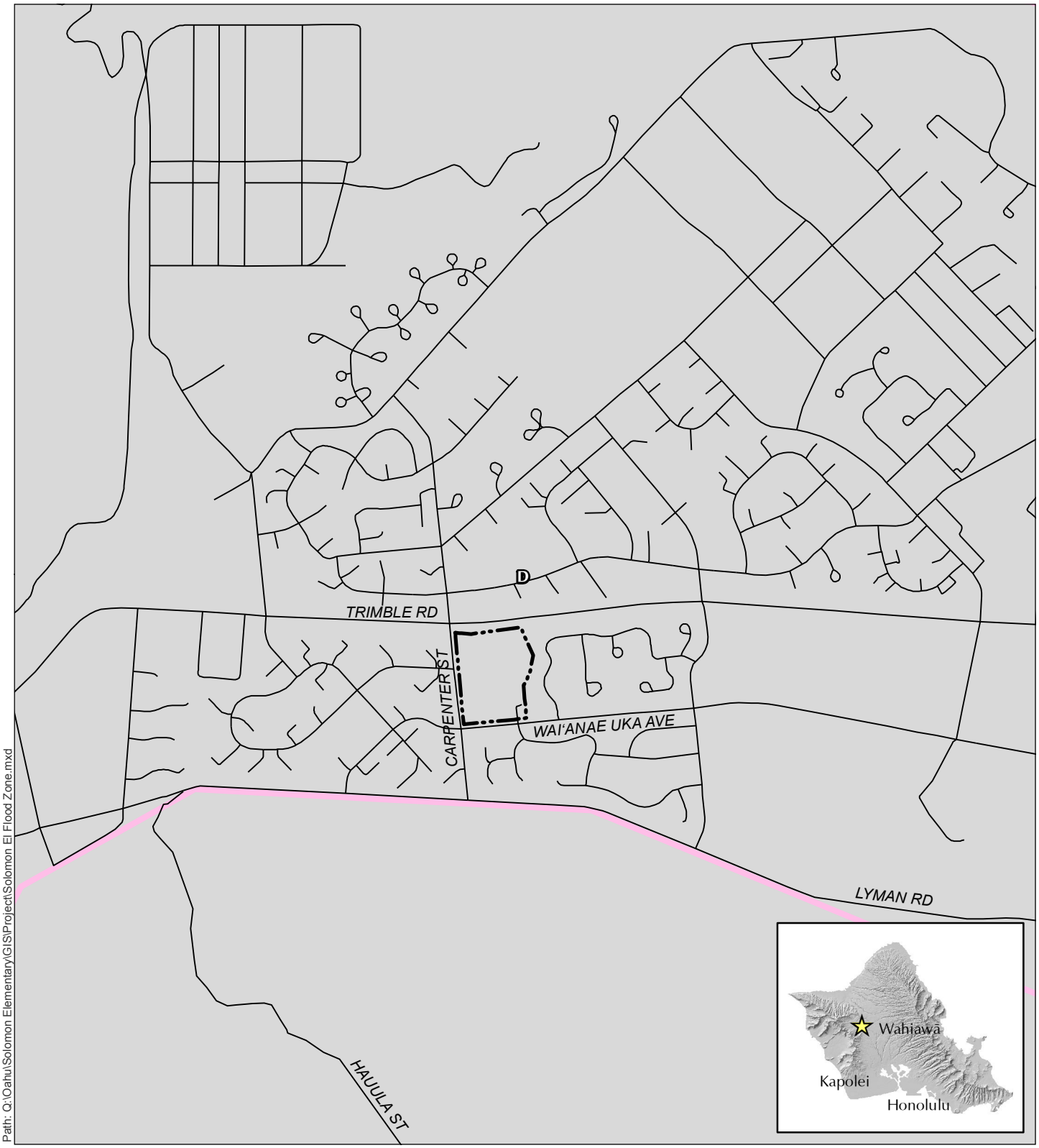
According to the City and County of Honolulu, the greatest danger of fire is where wildland (trees and brush) borders urban areas. Although all the Hawaiian Islands are vulnerable to wildland fires (especially during the summer months, prolonged drought and/or high winds), the great majority of wildfires are human-caused (intentionally caused or by negligence) and start along roadsides. Wildfires can and do also occur naturally. The location of the school within Schofield Barracks limits public access to near-by roadways where fires would be more likely to start.

POTENTIAL IMPACTS AND MITIGATION MEASURES

The Project is not anticipated to increase the Site’s exposure to any natural hazard. Although the project may increase the total impervious area in the project the onsite storm water will be retained on site so the offsite flows are less or equal to the existing site. Drainage on the site will meet LEED Silver standards. Decentralized filtration/infiltration through vegetation will capture increased runoff resulting from the Project and allowing it to seep into the ground rather than leaving the Site. Overflow from the LID features will be conveyed to grass swales.

During construction, BMPs will be implemented to reduce the potential for storm water pollution leaving the project area. Once Solomon Elementary School is fully operational, the school administration will be responsible for implementing and administrating programs to ensure that any hazardous materials utilized are properly stored, used, and disposed and that such materials do not enter into the on-site LID stormwater features, the storm drain, or the nearby gulches.

With the exception of an increase in impervious surface area, construction of the Project will not exacerbate any natural hazard conditions. Should there be a hurricane or earthquake, the potential impact of destructive winds and torrential rainfall and earth movement will be mitigated through compliance with the Uniform Building Code and International Building Code. The site is located outside the designated tsunami evacuation zone and is at an elevation that is very unlikely to be impacted by a tsunami.



PDF - Q:\Oahu\Solomon Elementary\PDF\EA Figures\Fig. 15 Flood Zones
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DATE: 5/15/2014

LEGEND

- Solomon Elementary School
- Streets
- Schofield Barracks
- Zone D: Unstudied areas where flood hazards are undetermined, but flooding is possible. No mandatory flood insurance purchase requirements apply, but coverage is available in participating communities.

Source: Federal Emergency Management Agency (2011)

Disclaimer: This graphic has been prepared for general planning purposes only and should not be used for boundary interpretations or other spatial analysis.

FIGURE 15 :

Flood Insurance Rate Map

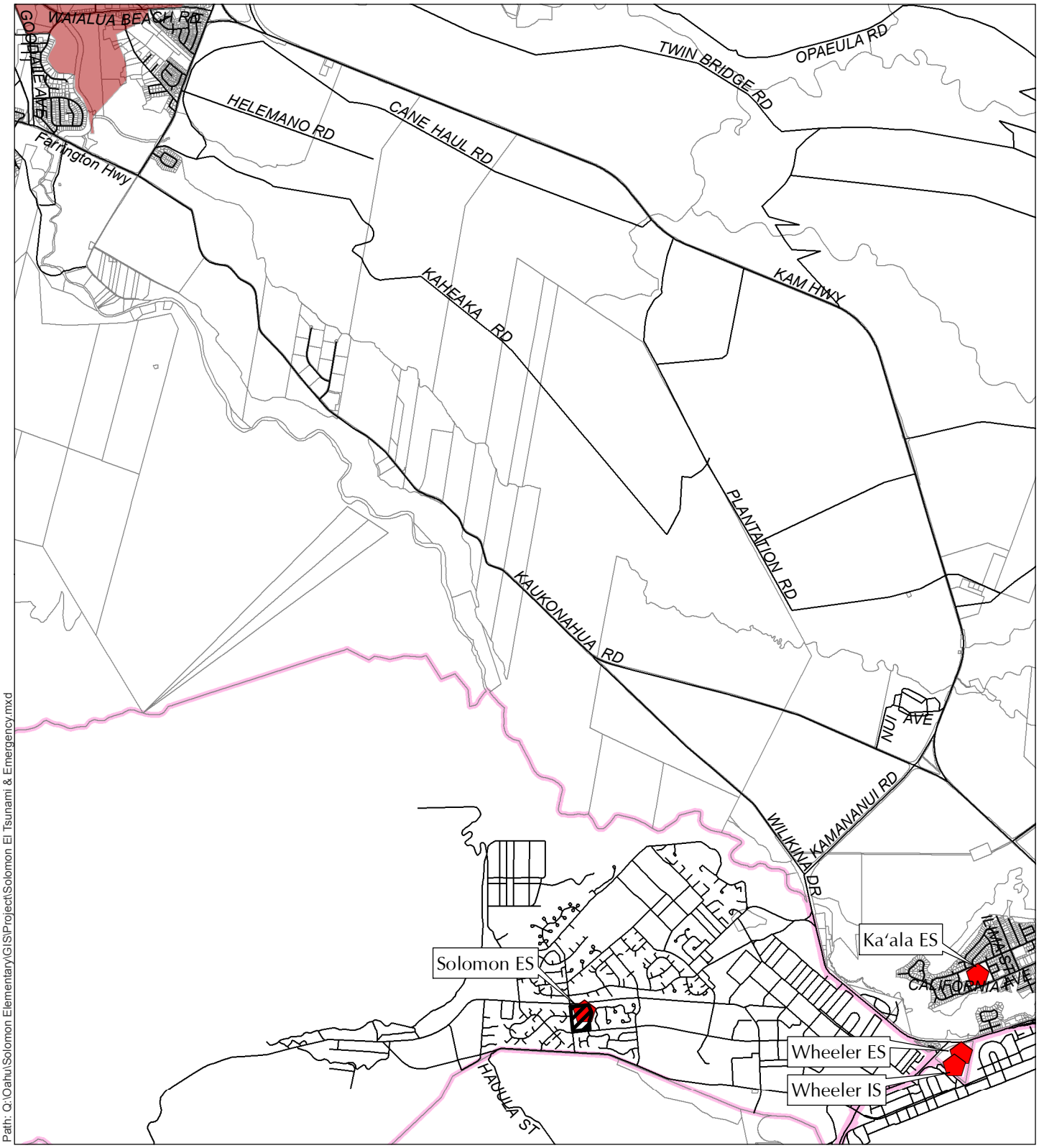
Solomon Elementary School Improvements

State of Hawai'i Department of Education — Schofield Barracks, Island of O'ahu

North

Linear Scale (feet): 0 250 500 1,000

PBR HAWAII & ASSOCIATES, INC.



PDF - Q:\Oahu\Solomon Elementary\PDF\EA Figures\Fig. 16 Tsunami and Emerg. Shelters
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DATE: 10/9/2014

LEGEND

- Solomon Elementary School
- Schofield Barracks
- Emergency Shelters
- Tsunami Evacuation Zone
- Tax Map Key
- Streets

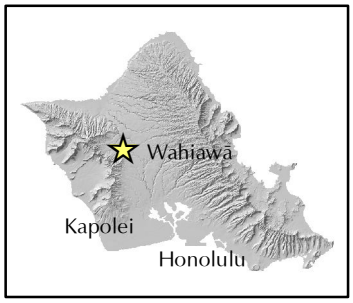

FIGURE 16 :

Tsunami Evacuation Zones and Emergency Shelters

Solomon Elementary School Improvements

State of Hawai'i Department of Education

Schofield Barracks, Island of O'ahu

North

Linear Scale (feet)

0 1,000 2,000 4,000

PBR HAWAII & ASSOCIATES, INC.

Source: City and County of Honolulu, Honolulu Land Information System (2010); Pacific Disaster Center (2005)

Disclaimer: This graphic has been prepared for general planning purposes only and should not be used for boundary interpretations or other spatial analysis.

3.7 BOTANICAL RESOURCES

The Site is a landscaped school (see site photographs in Figure 5). No threatened or endangered plant species are known to exist on the school campus. The Project is located in a previously developed area. The Site was compared to the U.S. Fish and Wildlife Service's (USFWS) surveys of Critical Habitats using the state GIS database and no critical habitats appeared in within the project site. In a letter dated December 30, 2013, the USFWS concurred that "no federally designated or proposed critical habitat occurs within the proposed project site." However, the letter goes on to say that "the endangered Hawaiian hoary bat (*Lasiurus cinereus semotus*) may be present in the vicinity of the proposed project site" (Appendix A).

There are over 50 large and small trees of more than 20 varieties on the Solomon Elementary campus. Most of the trees are located between the existing classroom buildings B and C, but there are several large ones along the campus borders. While not endangered or threatened, these trees provide shade, intercept rainwater, and contribute to the character of the campus.

POTENTIAL IMPACTS AND MITIGATION MEASURES

The Solomon Elementary School campus improvements will not impact any endangered plant species, as none are known to be present at the Site.

Due to the potential presence of the Hawaiian hoary bat, the contractor will follow recommendations presented in the USFWS' letter: "To minimize impacts to the endangered Hawaiian hoary bat, woody plants greater than 15 feet (4.6 meters) tall should not be disturbed, removed, or trimmed during the bat birthing and pup rearing season (June 1 to September 1)." No federally or state listed endangered plants are present on the property.

Most of the trees on the campus are currently in an area planned to be an open grass field for the new school. Therefore, nearly all of the campus trees will need to be either relocated or disposed of. A tree disposition plan is being prepared. New trees and other landscaping will attempt to include native species and/or plants proven to be adaptable to the area.

3.8 WILDLIFE RESOURCES

The Project site is located in a previously developed area and is likely, therefore, to only be home to non-native wildlife, such as rats and feral cats. The Site was compared to the USFWS' surveys of Critical Habitats using the state GIS database and no critical habitats appeared in within the project site. In a letter dated December 30, 2013, the USFWS concurred that "no federally designated or proposed critical habitat occurs within the proposed project site." However, the letter goes on to say that "the endangered Hawaiian hoary bat (*Lasiurus cinereus semotus*) may be present in the vicinity of the proposed project site" (Appendix A).

POTENTIAL IMPACTS AND MITIGATION MEASURES

The Solomon Elementary School campus improvements are not anticipated to have deleterious impacts on native wildlife species. However, to protect the Hawaiian hoary bat that may be present on site, the contractor will consider following recommendations presented in the USFWS' letter to protect the Hawaiian hoary bat: "To minimize impacts to the endangered Hawaiian hoary bat, woody plants greater than 15 feet (4.6 meters) tall should not be disturbed, removed, or trimmed during the bat birthing and pup rearing season (June 1 to September 1)."

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4 DESCRIPTION OF THE HUMAN ENVIRONMENT, POTENTIAL IMPACTS, AND MITIGATION MEASURES

This section describes the existing conditions of the human environment, potential impacts of the Solomon Elementary School campus improvements, and preliminary mitigation measures to minimize any impacts.

4.1 ARCHAEOLOGICAL, HISTORIC AND CULTURAL RESOURCES

Scientific Consultant Services, Inc. conducted an Archaeological Inventory Survey (AIS) (Appendix B) and Cultural Impact Assessment (CIA) (Appendix C) for the Site (Dahger & Spear, 2014a) (Dahger & Speer, 2014b). The AIS was conducted in compliance with Hawaiʻi Revised Statute (HRS) Section 6E Historic Preservation as well as the National Historic Preservation Act (NHPA) Section 106 (Section 106) to determine the presence/absence of archaeological sites and included test pits evaluating the soil horizons. The CIA was prepared as much as possible in accordance with the suggested methodology and content protocol in the *Guidelines for Assessing Cultural Impacts* prepared by OEQC and includes archival and documentary research as well as communication with organizations having knowledge of the project area, its cultural resource, and its practices and beliefs. Findings of the Archaeological Assessment and Cultural Impact Assessment are included in Appendices B and C, respectively. Correspondence showing compliance with Section 106 and HRS Section 6E is in Appendix D.

Solomon Elementary School is located in the Waiʻanae Uka ahupuaʻa, a traditional land division that customarily extended inland from the ocean and upland into the mountains. Originally, Waiʻanae Uka was part of a single land division, the ahupuaʻa of Waiʻanae. This ahupuaʻa was unusual in that it crossed over the entire Waiʻanae Mountain Range, the inland plateau of Oʻahu and a third mountain slope on the leeward side of the Koʻolau Mountain Range. The historic era boundaries separating Waiʻanae Kai and Waiʻanae Uka are delineated at the summits of the central Waiʻanae range.

Pre-Contact (Pre-1778 A.D.). Traditional and historical accounts portray the central plateau of Oʻahu as being an important birthplace and population center for the Hawaiian chiefs (aliʻi). The birthing place of Kūkaniloko is located on the north side of Kaukonahua Stream in present day Wahiawā Ahupuaʻa, or what was once within Kamananui Ahupuaʻa, in the District of Waialua. Kūkaniloko is said to have represented one of two famous aliʻi birth places in Hawaiʻi, with Holoholokū on Kauaʻi being the other. Some of the many distinguished aliʻi born at the birth place includes the chiefess Kūkaniloko, a high chiefess of Oʻahu for whom the stone is named (Fornander, 1980, p. 20), her daughter Kalai-manuia, and the "wise, firm, and judicious chief" of Oʻahu, Maʻili-kukahi (ibid: 89), among many others. Kūkaniloko was also considered a puʻuhonua, or place of refuge, where a person could be saved after committing murder (ʻĪʻī, 1959, p. 138).

Wahi Pana (Legendary Places). Mount Kaʻala, located on the mauka boundary of Waiʻanae Uka, is also accounted for in Hawaiian myth as being close to the home of the goddess Kaiona. The project area is located in an area once known as Līhuʻe, which served as one of the main residential areas of the Oʻahu aliʻi, between 1400 and 1500 A.D. The place name Līhuʻe, translated as "cold chill" (Pukui, Elbert, & Mookini, 1974, p. 132), was regarded as once being the home of a mythical figure named Kaupe, a legendary "cannibal dog-man" who was notorious for overthrowing the government of Ka-hanai-a-keakua (reared by gods). The Kolekole Stone is located just above the pass and was known as a place where students of warfare would practice *lua* fighting.

Post-Contact Period (Post-1778 A.D.). Following the first western contact to Hawaiʻi (ca. 1778), the onslaught of foreigners to the Hawaiian Islands brought a series of transformations to the natural and cultural landscapes throughout the island chain. The establishment of mission stations in Waialua, Waiʻanae and ʻEwa resulted in improved roadways, such as the traditional route across the central plateau and across Kolekole Pass. The over-harvesting of sandalwood and the taking of other timber for whaling ships to "fuel the boilers that rendered whale blubber into oil" (Cuddihy & Stone, 1990, p. 38) resulted in the destruction of many native trees. The central plateau of Oʻahu was often exploited for its sandalwood by the Oʻahu chiefs, commonly to satisfy debts to the King (Kamakau, 1992, pp. 251-252). Wahiawā in particular was famous for its large sandalwood trees (ibid: 207).

After the Great Māhele, the lands of Waiʻanae Uka passed through several hands but ended up in the possession of John Meek, who primarily used the land for cattle ranching. Waiʻanae Uka was part of the Meek and/or James Dowsett Ranch until 1879, at which time both families relinquished the lease back to Crown Lands (ibid).

Kalākaua apparently named the Waiʻanae Uka ranch lands "Leilehua" and in 1882, this land was the two-thirds portion of the land leased to Kalakaua and C. H. Judd (Tomonari-Tuggle, 1994, p. 20). Kalākaua and Judd built a hunting lodge in Waiʻanae Uka as a retreat, where they were known to have entertained other people of influence (Nedbalek, 1984, p. 13). This lodge was named "Malamanui" by Kalākaua and is said to have been located where the former Schofield Golf Course was located. In an effort to payoff some large national debts accumulated by Kalakaua as a result of his extravagant lifestyle, Leilehua Ranch was sold to the original lease holder, James I. Dowsett, and maintained as a ranch up into the early 1900s (Tomonari-Tuggle, 1994, p. 20).

Military Occupation. In 1899, Waiʻanae Uka was formally set aside by the U.S. government as a military reservation. However, it was not until 1909 that temporary and permanent barracks were constructed on the western central plains of Waiʻanae Uka and occupied by army personnel. A network of Oahu Sugar Co. ditches and associated tunnels extended across the Waiʻanae side of the reservation between Waiele Stream (near a cantonment), and Haleʻauʻau, Kalena and Mohiākea streams to the northwest.

Most of the buildings and training infrastructure initially planned for Schofield Barracks were completed during the early 1920s, after World War I. At the beginning of World War II, Schofield Barracks offered the only major training area in the Hawaiian Islands. It was targeted during the infamous Japanese attack on Oʻahu on December 7, 1941, but suffered minimal damage.

Since 1941, Schofield Barracks has been the home of the 25th Infantry Division, known as the Tropic Lightning Division, as well as the Command Headquarters for United States Army Hawaiʻi. Schofield Barracks is also home to the 8th Theater Sustainment Command. Currently the Schofield Barracks Military Reservation comprises three active training ranges: the Impact Area, South Range, and East Range. The Impact Area, containing approximately 2,800 acres, encompasses the lower slope of the Waiʻanae Range west of the main Schofield Barracks housing and administration area. This range is the primary range for live mortar and artillery firing but is also used for field training of squad and platoon size units, headquarters, elements and service support units. The South Range, just south of the Impact Area, is commonly used for field training of headquarters and service support units.

4.1.1 Findings

The archaeological survey of the Site led to the identification of one historic property, State Site 50-80-08-7684. State Site 50-80-08-7684 consists of a shallow, bowl-shaped charcoal concentration, interpreted as clean out from a thermal feature, within Layer II of Stratigraphic Trench 2. The charcoal concentration yielded a conventional radiocarbon age of 210 + 30 B.P or approximately the year 1804. No additional architectural features or artifacts were identified on the ground surface or in subsurface contexts. As no associated artifacts were present, the function of the feature cannot be firmly established.

Based on the responses from those organizations and individuals contacted for CIA, there are no known areas where traditional cultural practices were conducted in the vicinity of the project area.

4.1.2 Architectural History

Five concrete and twenty-three portable buildings were constructed on the Solomon Elementary School campus between 1968 and 2008, making the oldest buildings 46 years old. The project site is located 1,000 feet outside the border of the Schofield Barracks Historic District, which is listed on the National Register of Historic Places. Staff from the State Historic Preservation Division (SHPD) met with the U.S. Army Garrison Directorate of Public Works in September 2013 and determined that the school is not eligible for listing on the National Register of Historic Places since it is less than 50 years old, does not have a distinctive architectural style, and is not associated with significant events or people. On March 20, 2014, SHPD provided a letter to the

Garrison confirming that the school is not eligible for the National Register of Historic Places as it lacks the historical significance or design distinction necessary for listing (Appendix A).

POTENTIAL IMPACTS AND MITIGATION MEASURES

The Project is not anticipated to have a negative impact on the archaeological, cultural, or historical resources of the Site.

State Site 50-80-08-7684 has been evaluated in accordance with criteria established for the Hawai‘i State Register of Historic Places (HAR§13-276) and found to be significant under Criterion “d” which means that the site “has yielded, or is likely to yield, information important for research on prehistory or history.” However, the AIS states that, based on the current findings, no further archaeological work is recommended.

Based on the responses from those organizations and individuals contacted for CIA, there are no known areas where traditional cultural practices were conducted in the vicinity of the project area. Based on historical research and the response from those organizations and individuals contacted, it is reasonable to conclude that Hawaiian rights related to gathering, access or other customary activities within the project area will not be affected and there will be no adverse effect upon cultural practices or beliefs. Because there were no cultural activities identified within the project area, there are no adverse effects.

The State of Hawai‘i DOE and its contractors will comply with all State and County laws and rules regarding the preservation of archaeological and historic sites. The construction documents will include provisions that, should inadvertent discoveries be made during the construction activities, work will cease immediately and the State Historic Preservation Division will be contacted to assess the significance of the find and recommend appropriate mitigation measures, as necessary.

4.1.3 HRS 6E Consultation

The AIS and CIA were transmitted to the State of Hawai‘i Historic Preservation Division (SHPD) for their first review on October 8, 2014. It is expected SHPD will concur with the significance findings in the AIS and CIA.

4.2 TRANSPORTATION

4.2.1 Roadways, Access, and Parking Facilities

The Project Site is located entirely within the boundaries of Schofield Barracks, a restricted access military base. The Site is located approximately two miles from the Foote and Lyman Gates, which provided entry onto the Barracks. The primary roadway network immediately surrounding the site of the Project includes Trimble Road, Wai‘anae Uka Avenue, and Carpenter

Street. Trimble Road is closed from about 6:30 AM to 7:45 AM daily for physical training exercise.

In June 2012, the Army Corps of Engineers performed a traffic engineering study on schools in Schofield Barracks and Wheeler Army Air Field. The study is provided in full as Appendix E. At Solomon Elementary, the Corps found that the drop-off and pick-up operations before and after school occur within the school parking lot. Vehicles enter from Wai‘anae Uka Street and exit onto Carpenter Street. Drop-off and pick-up operations also occur along the Carpenter Street frontage of Solomon Elementary School. The grass shoulder on the south side of Trimble Road, along the school frontage, is used as a parking area for parents who walked their children to and from classes.

While the existing roadways surrounding the campus will not be rerouted, three new driveway access lanes, two from Carpenter Street and one from Trimble Avenue will be constructed. The two Carpenter Street accesses will be used to access the public parking lot while the Trimble Avenue access will be used to access the staff parking lot and act as an emergency access lane. The emergency access lane is designed to provide fire apparatus with adequate space to respond to emergencies at the school. Existing accesses from Wai‘anae Uka Avenue and Carpenter Street will be removed. Therefore, before and after school traffic will be routed from Wai‘anae Uka and Carpenter Street to primarily Carpenter Street. The locations of the new driveways have been coordinated with the Army Garrison Department of Public Works (see Appendix A).

Traffic calming devices are proposed on Carpenter Street at the suggestion of Army Garrison Department of Public Works staff (see comments dated May 22, 2014 in Appendix A). These include raised crosswalks, crosswalk lighting and flashing beacon.

There is parking for up to 39 vehicles in two main parking areas: in front of the administration office and in front of the cafetorium. The DOD Facilities Condition Assessment Report determined that the available parking is inadequate. Underscoring this point, the Corps traffic study also recommended that an off-site parking lot should be constructed along the school frontage on the south side of Trimble Road. This lot would provide a stable parking surface for parents who currently park their vehicles on Trimble Road’s grass shoulder and walk their children to and from classes.

The Corps determined that the primary traffic concern around Solomon was the safety of parents and students crossing Trimble Road before and after school. It was recommended that a third, pedestrian-only phase be added to the two-phase traffic light currently at the intersection of Trimble Road and Carpenter Street. Pedestrian crossing on all legs of the intersection would only be permitted during the pedestrian-only phase.

Fences restrict access to the Solomon Elementary School except through three active gates along Carpenter Street and Wai‘anae Uka Avenue, two gates along Trimble Road, and one gate in the kindergarten playground. The fence along the eastern perimeter of the campus does not have

access points. Sidewalks and pathways surround most of the school. Bicycle facilities are provided within the school campus.

4.2.2 Public Transportation

TheBus is a public transportation service provided by the City and County of Honolulu. Route 72 provides bus service in Schofield Barracks, Whitmore Village and Wahiawā as shown on Figure 17. The nearest bus stop is Trimble Road and Cadet Sheridan Road, which is just under a mile from Solomon Elementary.

4.2.3 Emergency Access

While the existing roadways surrounding the campus will not be rerouted or altered, two new emergency access points, one from Trimble Avenue and one from Wai‘anae Uka Avenue will be constructed. The Project as proposed will include the installation of an emergency access lane within the boundaries of the Site as shown on Figure 4. The lane is designed to provide fire apparatus and other emergency vehicles with adequate space necessary to access and respond to emergencies that may occur at the school.

POTENTIAL IMPACTS AND MITIGATION MEASURES

In the long-term, the Project will not generate any additional trips during school hours as no change in student population is expected. The school improvements are anticipated to have a positive impact on traffic and access at Solomon Elementary. In particular, the Project should improve the parking situation by constructing two parking lots with a total of 178 stalls (or more than four times the existing number of available spots). The Project will also result in improvements to the surrounding streets including raised crosswalks, crosswalk lighting, flashing beacons, and signalization improvements.

However, an increase of vehicular traffic associated with construction is anticipated during a 27 month window for construction. Upon completion of construction, traffic is anticipated to be reduced back to pre-Project. Heavy equipment, construction and contractor personal vehicles are anticipated to obtain access to Schofield Barracks via the Lyman Gate. These vehicles will follow routing directions provided by security forces, but the likely routes are along Lyman Road to Carpenter Street or along Lyman Road to Humphreys Road to Kolekole Avenue/Wai‘anae Uka Avenue.

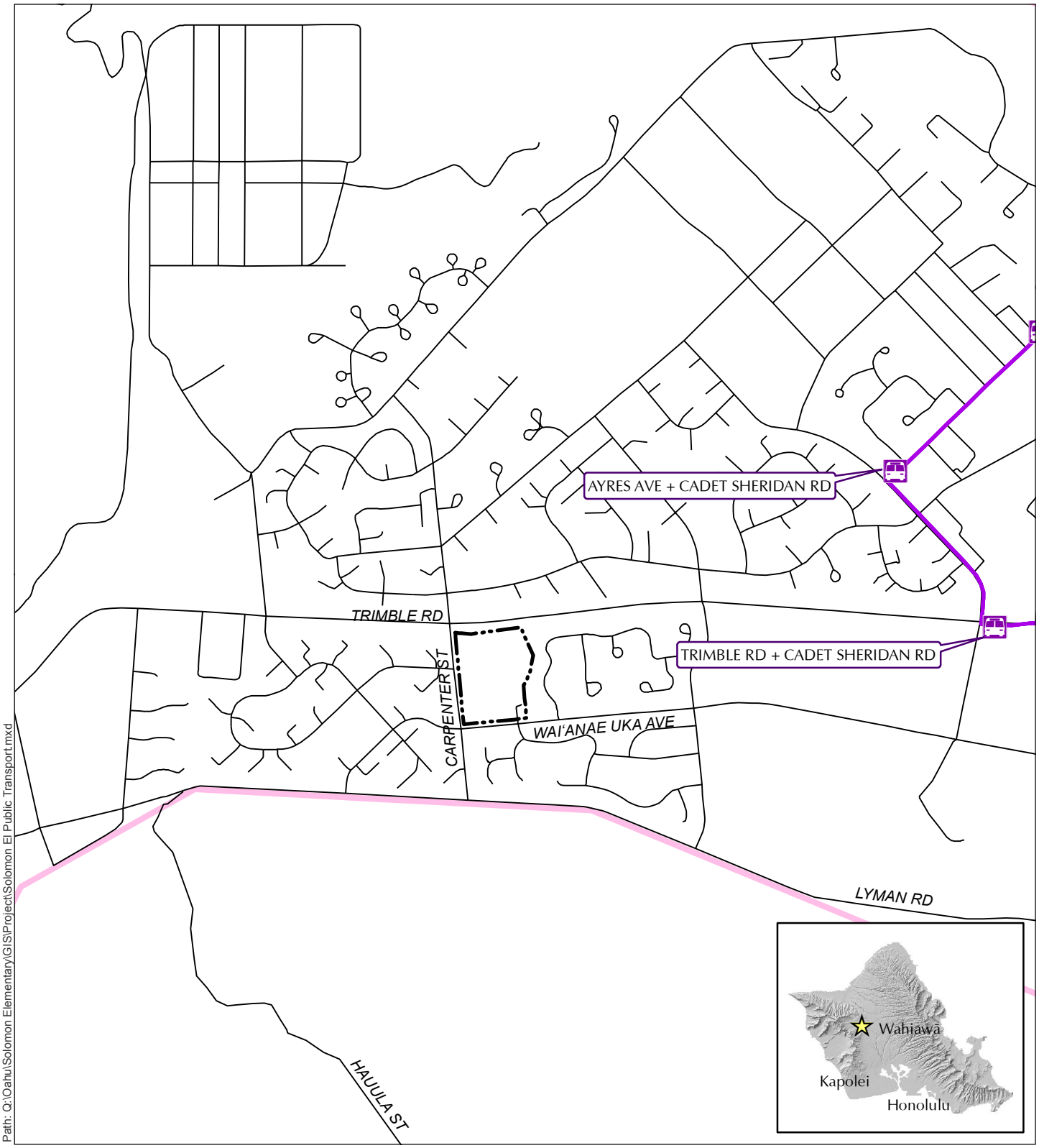
The Project will not require permanent rerouting or alteration of roadway traffic, but it may be required occasionally to accommodate construction equipment or during infrastructure upgrades. A Traffic Control Plan will be developed for each phase of the Project. Traffic cones and other directional devices will be placed in the roadway to guide vehicles around work areas. The contractor will implement measures to provide access past work sites and to minimize the

inconvenience to the community. These measures may include the following and will be coordinated with and approved by Security Forces:

- Posting flagmen for traffic control around work sites.
- Backfilling/covering all trenches at the end of the work day.
- Posting safety devices and signs for the duration of construction.
- Scheduling construction and material deliveries during non-peak traffic hours.
- Scheduling construction activities that require lane closures to occur thirty minutes after school begins, ending thirty minutes prior to the end of the school day

The State of Hawai‘i, Department of Transportation indicated, in a December 19, 2013 letter, that they do not anticipate any significant adverse impact to state highway facilities (Appendix A). They note that the contractor will need to obtain a permit if they transport overweight and/or oversized material on state highway facilities. The City and County of Honolulu, Department of Transportation Services indicated, in a December 19, 2013 letter, that they have no comments at this time (Appendix A).

It is not anticipated that any of the public transportation routes or stops will be affected the Project. However should either routes or stops be affected, the traffic control will also include coordination with the City and County of Honolulu, Department of Transportation Services.



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DATE: 5/15/2014

LEGEND

- Solomon Elementary School
- Schofield Barracks
- Streets
- Public Bus Stop
- Public Bus Route

FIGURE 17 :

Public Transit

Solomon Elementary School Improvements

State of Hawai'i Department of Education — Schofield Barracks, Island of O'ahu

North

Linear Scale (feet): 0 250 500 1,000

PBR HAWAII & ASSOCIATES, INC.

Source: City and County of Honolulu (2012)

Disclaimer: This graphic has been prepared for general planning purposes only and should not be used for boundary interpretations or other spatial analysis.

4.3 NOISE

Current sources of noise in the vicinity of the Project include noises associated with military ground and air training, vehicular traffic, typical residential and school noises.

The Project is taking place on a school campus, and so children, who are sensitive receptors, may be impacted by high levels of noise. Health care patients may also be impacted by noise as the nearest civilian health care facilities are located within Wahiawā Town, approximately three miles east of the Site. The nearest military health care facility is located along Wai‘anae Avenue is approximately one mile from the eastern perimeter of the Site.

POTENTIAL IMPACTS AND MITIGATION MEASURES

The Project is expected to produce short-term increased noise levels during construction that will include an increase in heavy equipment/vehicular traffic in the area. However, upon completion of the Project, noise levels will be reduced back to pre-construction levels. Because the improvements will occur within the boundaries of the public school campus, the DOE will work closely with school officials regarding construction activities to reduce noise impacts to students and staff.

Community Noise Control regulations (HAR Title 11, Chapter 46) establish maximum permissible sound levels for construction activities occurring within three “acoustical” zoning districts. The Site and surrounding areas are most closely classified in the Class B acoustical zoning district, which limits maximum permissible daytime noise (7AM-10PM) to 60 db(A) and nighttime noise (10PM-7AM) to 50 db(A).

In general, construction activities cannot exceed the permissible noise levels for more than ten percent of the time within any twenty minute period except by permit or variance. Any noise source that emits noise levels in excess of the maximum permissible sound levels cannot be operated without first obtaining a noise permit from the DOH. Although the permit does not attenuate noise, it regulates the hours during which excessive noise is allowed.

Exposure to noise is expected to vary by construction activity, and the type of equipment used during the different activities. Heavy machinery and pneumatic impact equipment will likely generate noise in the range of 82-96 decibels-weighted (dB(A)) within 50 feet of the source. The general contractor(s) is expected to be responsible for obtaining necessary permits and complying with all permit conditions. There is a need to balance work activities to meet permit conditions for "acoustical" zoning districts while minimizing traffic disruptions. Work is expected to be scheduled primarily for daytime hours, as described in HAR Title 11, Chapter 46 (7AM-10:00 PM), Monday through Friday. The contractor is also expected to ensure that all construction equipment with motors is properly equipped with mufflers in good operating condition. The contractor may employ other mitigation measures to minimize those temporary noise impacts.

To the extent possible, noisy construction will be scheduled during the summer months to minimize impact on students. Because the improvements will occur within the boundaries of the nearest public school campus, the DOE and Contractor(s) will work closely with Solomon Elementary School officials regarding construction activities to reduce noise impacts to students and staff particularly during crucial standardized testing periods.

4.4 AIR QUALITY

Air quality in the vicinity of the Project Site is generally good. The State of Hawai‘i is in attainment with all National Ambient Air Quality Standards (NAAQS). The NAAQS have been established for man-made sources of pollution. At times air quality is reduced as a result of an increase in Sulfur Dioxide (SO_2) emissions from a natural source of pollution, Kīlauea Volcano located on the island of Hawai‘i. Occasionally wind patterns carry emissions from Kīlauea Volcano to the northwest, in the direction of the Site. Air flow from this direction carrying volcanic gasses or “vog” can result in an increase in pollution, a decrease in visibility and can impair the health of sensitive receptors.

Kīlauea Volcano is recognized as the largest point source of SO_2 gas in the United States. Gaseous emissions increased dramatically in 2008 when a new vent opened at the volcano’s summit. Emission estimates increased to 3,000 – 5,000 tons per day (tpd) of SO_2, in contrast to previous average emission of 1,700 tpd.

POTENTIAL IMPACTS AND MITIGATION MEASURES

Long-term air quality impacts due to the Project are not expected. Actions associated with the Project are not expected exceed any state or federal air quality standards.

Short-term, air quality impacts due to the Project may result from construction activities. However, emissions are unlikely to violate state or federal air quality standards based on the good air quality and moderate level of existing traffic volumes in the region. On a localized level during construction, air quality in the area may be impacted by exhaust generated from construction equipment and fugitive dust. In a letter dated December 10, 2013, the State of Hawai‘i, DOH Clean Air Branch (CAB) stated, “activities must comply with the provisions of Hawai‘i Administrative Rules Section 11-60.1-33, on Fugitive Dust.” Comments are found in Appendix A. The contractor will implement BMPs necessary to reduce any negative air quality impacts. BMPs for dust control may include but are not limited to the recommendations made by DOH CAB in the December 10, 2013 letter listed below:

(a) Planning the different phases of construction, focusing on minimizing the amount of dust-generating materials and activities, centralizing on–site vehicular traffic routes, and locating potential dust-generating equipment in areas of the least impact;

(b) Providing an adequate water source at the site prior to start-up of construction activities;

(c) Landscaping and providing rapid covering of bare areas, including slopes, starting from the initial grading phase;
(d) Minimizing dust from shoulders and access roads;
(e) Providing adequate dust control measures during weekends, after hours and prior to daily start-up of construction activities; and
(f) Controlling dust from debris being hauled away from the project site. Also, controlling dust from daily operations of material being processed, stockpiled, and hauled to and from the facility.

A combination of these and other measures to mitigate potential air quality impacts will be implemented as appropriate. Exhaust emissions from construction equipment and increased vehicular traffic should not violate state or federal air quality standards based on the moderate level of existing traffic volumes in the region.

4.5 VISUAL RESOURCES

Due to the flat topography of the site, existing two-story buildings, and surrounding residential development, there are no significant view planes or view sheds on the Site. However, the school and residential homes to the east of the school currently have some limited views of the Wai‘anae Mountain Range. The Project site is located outside the Schofield Historic District.

POTENTIAL IMPACTS AND MITIGATION MEASURES

The Project Site is surrounded by the military facility and thus, will not include security fencing or other infrastructure visible from points off-base. Therefore, the Project is in conformance with the Sustainable Communities Plan Guidelines pertaining to Schofield Barracks and visual resources. Due to its location within a restricted military base and its low profile that is similar to surrounding development, the Project will not negatively impact any public viewplanes.

The Project will include construction of new structures that are both single and two-stories in height. The new structures will be built closer to Trimble Avenue, which will result in a visual impact on houses across from Trimble Avenue. However, the roof lines are consistent with existing structures, and there are no notable views from the houses on Trimble Avenue to the south. Houses closer to Wai‘anae Uka Avenue on the eastern border of the school will have an improved view of the Wai‘anae Mountains while the houses closer to Trimble Avenue will have a newly impacted view. The new buildings are not expected to create any negative impacts to on-site or surrounding visual resources relative to the current situation.

4.6 INFRASTRUCTURE AND UTILITIES

A team of technical consultants has been retained to address infrastructure requirements for the proposed improvments. Key findings are summarized in the following sections.

4.6.1 Water System

Water is supplied to Solomon Elementary School by the U.S. Army Garrison Hawai‘i via a water supply line in an adjacent street.

The Project will include new domestic water lines, fire water lines, fire hydrants and an all-weather fire apparatus access lane as part of the site improvements. The new structures will be connected to the existing water system to support plumbing, restrooms, and fire sprinkler requirements. The improvements are anticipated to include fire suppression system (sprinklers) within each of the proposed new facilities.

POTENTIAL IMPACTS AND MITIGATION MEASURES

The school population is anticipated to remain the same; therefore, an increase in the average daily demand for water is not anticipated. A backflow preventer will be installed to prevent potential cross connection during construction. A new water meter will also be installed.

4.6.2 Wastewater System

Wastewater from Solomon Elementary School is captured and treated by the U.S. Army Garrison Hawai‘i wastewater conveyance and treatment system operated by Aqua Engineers located within Schofield Barracks. The wastewater treatment plant operated by Aqua Engineers is operating under an extension of NPDES Permit number HI0110141. Connection to the wastewater system is already in place.

The existing cafetorium is serviced by a grease trap which is periodically pumped and waste is sent to Pacific Biodiesel for recycling and energy production. Installation and management of grease traps is expected to continue with the Project.

POTENTIAL IMPACTS AND MITIGATION MEASURES

Although there will be an increase in restroom facilities, the school population (students and staff) will not increase, therefore, a change in peak waste water flow is not expected. The current and proposed wastewater peak flow is approximately 190 gallons per minute.

Mitsunaga & Associates, Inc. has sent a sewer connection application Aqua Engineers to ensure that the wastewater system is sufficient to meet the needs of the proposed Project improvements.

4.6.3 Drainage System

Schofield Barracks has an extensive drainage system. Run-off throughout the built areas of the Schofield Barracks is eventually captured by a combination of open and underground drainage features, natural gulches, and eventually makes its way to the ocean. The school’s drainage discharges are covered under the DOE’s NPDES small MS4 Permit No. HIS000003, except

where the school's drainage discharges to the Army's Schofield Barracks storm drainage system. As such, a letter of authorization should be acquired by the DOE from the Army to allow discharge and to permit Army inspection of the Solomon system on a periodic basis.

The proposed on-site drainage system will be designed for a 10-year recurrence interval, and will consist of swales, drain inlets, catch basins, manholes, pipes and storm water quality swales. The drainage system will connect to the existing drainage system located along the southeastern half of the property.

The proposed buildings will have downspouts connecting to the new subsurface drainage system. Existing drainage patterns will be maintained, as applicable, where runoff will sheet flow across the site to landscaped areas, or to proposed swales and drainage structures. Swales will be used wherever possible with a minimum slope of 1%. Building finished floors will be higher than the surrounding grades and runoff will be directed away from the buildings.

The Site is designated on the FIRM as Zone D as shown on Figure 15 and described in Sections 3.4 and 3.6.1.

POTENTIAL IMPACTS AND MITIGATION MEASURES

The Project will disturb greater than one acre of land area, therefore a Notice of Intent for Appendix C and a General Form will be submitted to the State DOH under the National Pollutant Discharge Elimination System (NPDES). A copy of the approved Notice of General Permit Coverage (NGPC) shall be on file at the construction site field office.

Although the project may slightly increase the total impervious area in the project, the onsite stormwater will be retained on site so the offsite flows are less than or equal to the existing condition. Drainage calculations are included in Appendix F. LID features will be integrated into the school design to maintain or improve the existing storm peak flows and storm water quality exiting the site of the Project. Drainage on the site will meet LEED Silver standards. Decentralized filtration/infiltration through vegetation will capture increased runoff resulting from the Project and allowing it to seep into the ground rather than leaving the Site. Overflow from the LID features will be conveyed to grass swales.

In the process of demolition, it is likely that the Project will dispose of hazardous materials and/or wastes. The Project will include removal of asbestos containing material as well as lead based paint. Certified contractors will address the abatement of these hazardous materials in a manner that meets the State of Hawai‘i's DOH requirements and ensures that these materials are properly contained and disposed. In addition, construction and renovation will necessitate the use of materials of various toxicities. Adhesives, paints and fuel for equipment are the primary materials that have the potential to be accidentally spilled. The contractor will incorporate sessions that include spill prevention and clean up into its jobsite training. In addition, access

points to the stormwater system will be monitored and controlled to limit construction waste and debris from entering it.

In addition, the Project is being designed to a level that would qualify for LEED Silver certification. While this by itself does not guarantee the use of less toxic or hazardous materials, selection of such materials is one way to achieve credits toward a silver rating.

4.6.4 Electrical and Communications System

Although located within the boundaries of Schofield Barracks, electrical, telephone, data and television services are provided to Solomon Elementary School directly by the service providers. United States Army Garrison, Hawaii, Department of Public Works provides electrical service for Schofield Barracks. Telecommunication including internet service is managed by the DOE's Enterprise Infrastructure Services Branch. Time Warner Cable/Oceanic provides cable television service.

Currently, Solomon Elementary School has a relatively low energy demand. The school does not have air conditioning except in the library, administrative space, and some of the portable buildings. While a few classrooms have fans, most do not.

POTENTIAL IMPACTS AND MITIGATION MEASURES

The existing network of utilities may be impacted during construction. Coordination with the various service and utility providers as well as Garrison DPW is underway. Coordination will continue during the construction phase to insure service interruptions are minimized during construction, and all necessary safety precautions are met.

In an effort to meet State energy conservation, and clean energy goals (HRS Chapters 344 and 226), measures for energy efficiency and cost effective energy conservation will be implemented into the Project to reduce the maximum electrical load and energy consumption. While the installation of a photovoltaic (PV) system is not included within the proposed improvements, the roofs are being designed at the optimal pitch and direction to accommodate future installation with minimal modification to the facilities.

4.6.5 Solid Waste

The Project will include the renovation and removal of various facilities within the Solomon Elementary School campus. Trash collection and disposal is currently handled under a DOE contract. Solomon has three, three-yard dumpsters that are emptied up to once a day when school is in session. Collected trash is then disposed at the H-Power facility in Kalaleloa. H-Power is a waste to energy plant that produces approximately 7% of O'ahu's electricity as it processes approximately 600,000 tons of waste annually. The School has developed a waste minimization program that includes recycling.

In addition, recycling is an Army directive. As such, Schofield Barracks supports all base programs in waste minimization by allowing any individual or organization (including Solomon Elementary School) on Schofield Barracks to utilize the Army Recycling Center. The recycling center located at Building 1087 A&B will accept cardboard, paperboard, newspaper, glossy paper, white and colored paper, phone books, bagged shredded paper, hard plastics 1-5, shrink wrap, toner cartridges, HI-5 beverage containers, Non-HI-5 glass, tin cans, green waste, and certain wood pallets/wood waste.

POTENTIAL IMPACTS AND MITIGATION MEASURES

Solid waste generated at the Site during the construction phase will increase over current conditions. Waste is expected to include materials from renovation and demolition, construction, and grading activities. This Project is being designed to LEED Silver standards. Every effort will be made to reduce the waste generated during the construction phase and when possible materials/structures will be re-used and or recycled. The building plans will include instructions for the contractor to dispose of waste and to calculate the amount of waste from the site.

In the long-term solid waste generation is not expected to increase because there will be no substantive change in enrollment. However, waste minimization measures incorporated into school operations are recommended should DOE decide to follow the LEED for Existing Buildings, Operations and Maintenance program.

4.7 HAZARDOUS MATERIALS

The Project will include the alteration and disposal of various facilities within the Solomon Elementary School campus. The Project will include removal of asbestos containing material as well as lead based paint.

Several studies were completed evaluating the hazardous materials present in the school buildings. A 2007 report found 35 instances of building materials that contained asbestos above the regulatory level of one percent and seven paint samples that contained a lead concentration above the EPA regulatory level of 0.5% lead by weight. A follow-up report in 2013 also found acoustical wall and ceiling tiles in Building D are arsenic containing material. A 2014 limited hazardous materials survey of the roofs of the school found four instances, all on Building B's upper roof, of asbestos containing material. All four instances were in good condition. Other reports have mainly found other, small quantities of asbestos containing material and lead-based paint. These are the two primary hazardous materials of concern at Solomon Elementary School.

POTENTIAL IMPACTS AND MITIGATION MEASURES

In the process of demolition, it is likely that the Project will dispose of hazardous materials and/or wastes.

Certified contractors will address the abatement of these hazardous materials in a manner that ensures that these materials are properly contained and disposed and meets the State of Hawai‘i’s DOH requirements, including:

- HAR Chapter 11-41 Lead-based Paint Activities
- HAR Chapter 11-501 Asbestos Requirements
- HAR Chapter 11-503 Fees for Asbestos Removal and Certification
- HAR Chapter 11-504 Asbestos Abatement Certification Program

Polychlorinated biphenyls (PCBs) may also be present because the buildings proposed for demolition were constructed prior to the 1979 Environmental Protection Agency ban of non-enclosed PCB uses. Any unlabeled fluorescent light ballasts should be sealed in properly labeled drums and disposed of as PCB waste in accordance with regulatory requirements.

In removing lead-based paint, a qualified lead abatement contractor will perform the removal and the contractor should follow the State of Hawai‘i Department of Labor and Industrial Relations, Division of Occupational Safety and Health’s (HIOSH) Lead in Construction Standard (12-148.1, HAR) and the federal Occupational Safety and Health Administration’s (OSHA) 29 CFR 1926.62 when workers have the potential to be exposed to lead during work activities, particularly demolition in the case of this project. Removal of material that contains asbestos should be done by a contractor’s employees who have received training under OSHA 29 CF 1926.1101 and HIOSH 12-145.1, HAR. In addition, due to the likely presence of arsenic containing materials, the contractor should follow the HIOSH Inorganic Arsenic in Construction Standard (12-202-31) when there is any detectable concentration of arsenic.

In addition, construction and renovation will necessitate the use of materials of various toxicities. Adhesives, paints and fuel for equipment are the primary materials that have the potential to be accidentally spilled. The contractor will incorporate sessions that include spill prevention and clean up into its jobsite training. In addition, access points to the stormwater system will be monitored and controlled to limit construction waste and debris from entering it.

In addition, the Project is being designed to a level that would qualify for LEED Silver certification. While this by itself does not guarantee the use of less toxic or hazardous materials, selection of such materials is one way to achieve credits toward a silver rating.

4.8 SOCIO-ECONOMIC CHARACTERISTICS

4.8.1 Population

The U.S. Census reported that the population of O‘ahu was 953,207 in 2010. The overall population increased by approximately 9% between 2000 and 2010 according to the U.S. Census 2010.

The Site is located within the U.S. Census Bureau's Schofield Barracks Census Designated Place (Schofield CDP). In 2010, the population was 16,370 of which 5,393 were 19 years old or younger. The average household size was 3.55 people.

POTENTIAL IMPACTS AND MITIGATION MEASURES

The Project will not affect area population. The construction of the Project will improve the school's facilities in an effort to better meet the needs of the existing school population. The population of Schofield CDP is dictated primarily by the needs of the U.S. Army.

4.8.2 Economy

The local economy within the Schofield CDP is primarily based on the military and military support services. Within the Schofield CDP in 2011, approximately 56.3% of the labor force was in the armed forces and approximately 28.3% were either unemployed or not in the labor force[1].

POTENTIAL IMPACTS AND MITIGATION MEASURES

In the long term, the Project will not affect the economy within the Schofield CDP. The construction of the Project will improve the school's facilities in an effort to better meet the needs of the existing school population. However, in the short term this project will have a positive effect on the State's economy. The project is jointly funded by the State and the Federal governments. The Federal government through the DoD-OEA is expected to pay for approximately 80% of the 80 million dollar project. These funds are expected to have a positive impact on the State by providing work during the planning, design and construction of the project.

4.8.3 Environmental Justice

On February 11, 1994, President Clinton signed Executive Order (E.O.) 12898. This E.O. directs federal agencies to make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high adverse human health or environmental effects of its activities on minority and low-income populations.

Each Federal agency must make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health, environmental, economic, and social effects of its programs, policies, and activities on minority and low-income populations, particularly when such analysis is required by NEPA.

The Site is located in a mixed-race military community where the average median income was $41,602 in 2010. The average median income for the island of O'ahu was $70,093 in 2010.

[1] Based upon the employment status of the population 16 years or older

POTENTIAL IMPACTS AND MITIGATION MEASURES

This Site was selected based upon a nation-wide assessment of schools that primarily service military families. The Facilities Condition Assessment Report on the Solomon Elementary School was based on compliance with DoDEA practices according to facility condition, spatial adequacy, capacity and technical readiness. Solomon Elementary has been listed as 28th on the prioritized list of military impacted schools nationwide in need of facilities improvements.

The Project will provide improved educational facilities and will directly benefit many households within the Schofield CDP, an area where the median household income is just 59% of the median household income for the County and where 28.3% of the population over 16 is not employed (4.1%) or not in the labor force (24.2%). The Project will not negatively impact minority or low income populations.

4.9 PUBLIC SERVICES AND FACILITIES

4.9.1 Schools

Solomon Elementary School is one of ten public schools (seven elementary, two middle, and one high school) within the DOE Leilehua Complex Area. Public schools serving the Schofield Barracks on-post community are Solomon Elementary School, Hale Kula Elementary School, Wheeler Elementary School, Wheeler Middle School, and Leilehua High School. There are no public charter schools in the Leilehua Complex Area. Table 4-1 presents current and projected public school enrollment information for the Leilehua Complex Area.

Table 4-1: Enrollment for Public Schools in Leilehua Complex

School	Enrollment in 2013-2014	Projected Enrollment in 2014- 2015
Hale Kula El	892	828
Helemano El	621	616
Ili‘ahi El	454	454
Ka‘ala El	505	480
Solomon El	1,053	980
Wahiawā El	531	500
Wheeler El	627	632
Wahiawā Middle	818	814
Wheeler Middle	797	841
Leilehua High	1,803	1789

Source: (State of Hawaii Department of Education, 2013)

Private schools in the area include Hoʻāla School (K-12), Abundant Life School (Pre-K-6) and Trinity Lutheran Church & School (P-8). In addition, Wahiawā Community School, an adult education, General Education Development (GED) test program, is located within the Leilehua Complex.

POTENTIAL IMPACTS AND MITIGATION MEASURES

The Project will provide new recreational and dining facilities as well as improved and expanded classroom, administration, library, technology, media and special education space for Solomon Elementary School students. The DoD's Facilities Condition Assessment Report provided a baseline level of facility deficiencies at Solomon Elementary School. The Hawaiʻi DOE also did its own review of the existing facilities to study current and future needs. Responding to the needs identified in these studies, the Project will increase the number of classrooms from 56 to 67 and will include three fully self-contained special education classrooms and four supplemental classrooms for programs such as Hawaiiana, Physical Education, and Robotics.

4.9.2 Police, Fire and Medical

Police Protection

The site is located within Schofield Barracks. The Directorate of Emergency Services (DES) provides 24-hour force protection, law enforcement, fire protection and community assistance to the soldiers, and civilians on Schofield Barracks. Schofield Barrack's Army law enforcement personnel are combination of Army civilian police and military police.

Fire Protection

Fire Protection on Schofield Barracks is provided by the Directorate of Emergency Services, Navy Federal Fire Department (FFD), and the Honolulu Fire Department (HFD) depending on the type of fire, proximity to the nearest fire station and established mutual aid agreements. Brush fires on Schofield Barracks are typically handled by DES while structural fires are handled by the Navy FFD.

Health Care Services

The nearest health care facility for the civilian population is Wahiawā General Hospital located within Wahiawā town, approximately three miles from the Site. Wahiawā General Hospital was founded in 1944 and has 53-bed acute and 107-bed long term care facilities. The hospital handles all levels of patient care including emergency services.

POTENTIAL IMPACTS AND MITIGATION MEASURES

The Project is not expected to create an increased demand on existing Police, Fire and Medical services. While the Project will not reduce the need for these services, the school facilities will

be better equipped to handle emergency situations than under current conditions by improving access for fire apparatus and other emergency equipment, the installation of lightning protection, and fire sprinkler systems in all new structures except for the covered playcourt.

4.9.3 Recreational Facilities

Solomon Elementary School currently has an uncovered hard court, a tetherball court, two climbing play structures, and several grassy fields for active recreational activities. There are no outdoor eating areas. The Project will include the installation of a covered play court.

POTENTIAL IMPACTS AND MITIGATION MEASURES

Currently the Site does not have any recreational facilities that provide protection from inclement weather. The covered play court will provide a location for physical education and fitness activities during inclement weather. In addition, the covered play court will provide protection from the sun. Although it is not entirely enclosed, the mild climate does not justify a fully enclosed play area. The play court will remain cooler with reduced energy inputs by keeping it open rather than fully enclosed. The play court will also provide an alternate venue to the existing cafetorium for assemblies and community events at the discretion of the School's administration. The recreational improvements will have a positive impact on Solomon Elementary School, and no negative impacts on surrounding recreational facilities are anticipated.

5 LAND USE CONFORMANCE

State of Hawai‘i and City and County of Honolulu land use plans, policies, and ordinances relevant to the Solomon Elementary School campus improvements are described below.

5.1 STATE OF HAWAI‘I

5.1.1 State Land Use Law, Chapter 205, Hawai‘i Revised Statutes

The State Land Use Law (Chapter 205, HRS), establishes the State Land Use Commission (LUC) and authorizes this body to designate all lands in the State into one of four Districts: Urban, Rural, Agricultural, or Conservation.

The Site is located within the State Land Use Urban District (Figure 6, State Land Use). Public schools are permitted use in the State Land Use Urban District.

5.1.2 Coastal Zone Management Act, Chapter 205A, Hawai‘i Revised Statutes

The U.S. Congress enacted the Coastal Zone Management (CZM) Act to assist States in better managing coastal and estuarine environments. The act provides grants to States that develop and implement Federally-approved CZM plans. The State of Hawai‘i’s CZM Act Program was enacted pursuant to Chapter 205A, HRS. The program outlines management objectives centered around ten (10) areas: 1) Recreational Resources; 2) Historic Resources; 3) Scenic and Open Space Resources; 4) Coastal Ecosystems; 5) Economic Uses; 6) Coastal Hazards; 7) Managing Development; 8) Public Participation in Coastal Management; 9) Beach Protection; and 10) Marine Resources. All lands within the State of Hawai‘i fall within the CZM area, including the project Site.

The proposed project Site is located outside of the SMA (Figure 9). The objectives and policies of the Hawai‘i Coastal Zone Management (CZM) Program, along with a detailed discussion of how Solomon Elementary School project conforms to these objectives and policies, are discussed below.

Recreational Resources

Objective: Provide coastal recreational opportunities accessible to the public.

> *Policy A: Improve coordination and funding of coastal recreational planning and management; and*
>
> *Policy B: Provide adequate, accessible, and diverse recreational opportunities in the coastal zone management area by:*
>
> *(i) Protecting coastal resources uniquely suited for recreational activities that cannot be provided in other areas;*

(ii) Requiring replacement of coastal resources having significant recreational value, including but not limited to surfing sites, fishponds, and sand beaches, when such resources will be unavoidably damaged by development; or requiring reasonable monetary compensation to the State for recreation when replacement is not feasible or desirable;

(iii) Providing and managing adequate public access, consistent with conservation of natural resources, to and along shorelines with recreational value;

(iv) Providing an adequate supply of shoreline parks and other recreational facilities suitable for public recreation;

(v) Ensuring public recreational uses of County, State, and Federally owned or controlled shoreline lands and waters having recreational value consistent with public safety standards and conservation of natural resources;

(vi) Adopting water quality standards and regulating point and nonpoint sources of pollution to protect, and where feasible, restore the recreational value of coastal waters;

(vii) Developing new shoreline recreational opportunities, where appropriate, such as artificial lagoons, artificial beaches, and artificial reefs for surfing and fishing; and

(viii) Encouraging reasonable dedication of shoreline areas with recreational value for public use as part of discretionary approvals or permits by the land use commission, board of land and natural resources, and County authorities; and crediting such dedication against the requirements of section 46-6.

Discussion: The Site is located in central O‘ahu. It is not a coastal development, is not located on the coastline, and is not in the SMA; therefore, policies regarding shoreline recreation resources are not applicable. However, to protect marine water quality the Project will avoid direct impacts to nearby streams and drainageways. It will also be designed and built in compliance with all applicable Federal, State, and City regulations pertaining to storm water management including the City & County of Honolulu’s grading ordinance and the DOH NPDES permit program. BMPs will be integrated into the construction project. LID features will be integrated into the school design to maintain or improve the existing storm peak flows and storm water quality exiting the site of the Project. Drainage on the site will meet LEED Silver standards. Decentralized filtration/infiltration through vegetation will capture increased runoff resulting from the Project and allowing it to seep into the ground rather than leaving the Site. Overflow from the LID features will be conveyed to the new grass swales.

Historic Resources

Objective: Protect, preserve and, where desirable, restore those natural and manmade historic and prehistoric resources in the coastal zone management area that are significant in Hawaiian and American history and culture.

Policy A: Identify and analyze significant archaeological resources;

Policy B: Maximize information retention through preservation of remains and artifacts or salvage operations; and

Policy C: Support State goals for protection, restoration, interpretation, and display of historic resources.

Discussion: The Cultural Impact Assessment (Appendix C) concluded that based upon information pertaining to traditional cultural practices or access rights received from contacted individuals, and organizations, via the legal notices and archival research the Project is not anticipated to produce adverse effects to any Native Hawaiian rights or ethnic groups related to gathering, access or other customary activities.

The AIS of the Solomon Elementary School campus project area led to the identification of one historic property, State Site 50-80-08-7684, consisting of a shallow, bowl-shaped charcoal concentration, interpreted as clean out from a thermal feature. The charcoal concentration yielded a conventional radiocarbon age of 210 + 30 B.P or approximately the year 1804. State Site 50-80-08-7684 has been evaluated in accordance with criteria established for the Hawai‘i State Register of Historic Places (HAR§13-276) and found to be significant under Criterion “d” which means that the site “has yielded, or is likely to yield, information important for research on prehistory or history.” However, the AIS states that, based on the current findings, no further archaeological work is recommended.

The permanent school buildings were built in 1968, making the structures too young to be eligible for State and/or Federal historic site designation. Staff from the SHPD met with the U.S. Army Garrison Directorate of Public Works in September 2013 and determined that the school is not eligible for listing on the National Register of Historic Places since it is less than 50 years old, does not have a distinctive architectural style, and is not associated with significant events or people. On March 20, 2014, SHPD provided a letter to the Garrison confirming that the school is not eligible for the National Register of Historic Places as it lacks the historical significance or design distinction necessary for listing (Appendix A). The project site is located 1,000 feet outside the border of the Schofield Barracks Historic District and is not anticipated to have an impact on the District.

Scenic and Open Space Resources

Objective: Protect, preserve and, where desirable, restore or improve the quality of coastal scenic and open space resources.

Policy A: Identify valued scenic resources in the coastal zone management area;

Policy B: Ensure that new developments are compatible with their visual environment by designing and locating such developments to minimize the alteration of natural landforms and existing public views to and along the shoreline;

Policy C: Preserve, maintain, and, where desirable, improve and restore shoreline open space and scenic resources; and

Policy D: Encourage those developments which are not coastal dependent to locate in inland areas.

Discussion: The proposed project is not coastal dependent and will be located inland, away from the shoreline; therefore, it is anticipated that there will be no effect on the quality of the coastal scenic and open space resources.

Coastal Ecosystems

Objective: Protect valuable coastal ecosystems, including reefs, from disruption and minimize adverse impacts on all coastal ecosystems.

Policy A: Exercise an overall conservation ethic, and practice stewardship in the protection, use, and development of marine and coastal resources;

Policy B: Improve the technical basis for natural resource management;

Policy C: Preserve valuable coastal ecosystems, including reefs, of significant biological or economic importance;

Policy D: Minimize disruption or degradation of coastal water ecosystems by effective regulation of stream diversions, channelization, and similar land and water uses, recognizing competing water needs; and

Policy E: Promote water quantity and quality planning and management practices that reflect the tolerance of fresh water and marine ecosystems and maintain and enhance water quality through the development and implementation of point and nonpoint source water pollution control measures.

Discussion: The Project is not a coastal development, is not located on the coastline, nor within the SMA. To protect marine water quality the Project will be designed to avoid direct impacts to nearby streams and drainageways. It will also be designed and built in compliance with all applicable federal, state, and county regulations pertaining to storm water management including the City & County of Honolulu's grading ordinance and the DOH fugitive dust and NPDES permit programs. LID features will be integrated into the school design to maintain or improve the existing storm peak flows and storm water quality exiting the site of the Project. Drainage on the site will meet LEED Silver standards. Decentralized filtration/infiltration through vegetation will capture increased runoff resulting from the Project and allowing it to seep into the ground rather than leaving the Site. Overflow from the LID features will be conveyed to grass swales. BMPs will be employed during construction to reduce erosion of soils and fugitive dust during construction. These measures will protect downgradient resources and prevent secondary and cumulative impacts of polluted stormwater.

Economic Uses

Objective: Provide public or private facilities and improvements important to the State's economy in suitable locations.

Policy A: Concentrate coastal dependent development in appropriate areas;

Policy B: Ensure that coastal dependent development such as harbors and ports, and coastal related development such as visitor industry facilities and energy generating facilities, are located, designed, and constructed to minimize adverse social, visual, and environmental impacts in the coastal zone management area; and

Policy C: Direct the location and expansion of coastal dependent developments to areas presently designated and used for such developments and permit reasonable long-term growth at such areas, and permit coastal dependent development outside of presently designated areas when:

(i) Use of presently designated locations is not feasible;

(ii) Adverse environmental effects are minimized; and

(iii) The development is important to the State's economy.

Discussion: The Solomon Elementary School campus improvements do not directly impact the State's coastal-dependent economy. Federal funds will account for approximately 80% of the projected Project costs. This will bring new funds into the State, thereby having a positive impact on the State economy. During construction the Project will generate short-term employment (and accompanying State income and excise tax revenue). In the long-term, an effective educational system can reduce truancy and adolescent crimes which can indirectly affect the economy. This Project will improve the facilities that will be utilized by the DOE to create a foundation for Solomon Elementary students' educational success.

Coastal Hazards

Objective: Reduce hazard to life and property from tsunami, storm waves, stream flooding, erosion, subsidence, and pollution.

Policy A: Develop and communicate adequate information about storm wave, tsunami, flood, erosion, subsidence, and point and non-point source pollution hazards;

Policy B: Control development in areas subject to storm wave, tsunami, flood, erosion, hurricane, wind, subsidence, and point and non-point source pollution hazards;

Policy C: Ensure that developments comply with requirements of the Federal Flood Insurance Program; and

Policy D: Prevent coastal flooding from inland projects.

Discussion: The project located well outside the tsunami inundation zone. In addition, decentralized LID drainage measures will be incorporated into the Project to reduce flooding hazards. There will be no increases in runoff from the Site.

Managing Development

Objective: Improve the development review process, communication, and public participation in the management of coastal resources and hazards.

Policy A: Use, implement, and enforce existing law effectively to the maximum extent possible in managing present and future coastal zone development;

Policy B: Facilitate timely processing of applications for development permits and resolve overlapping or conflicting permit requirements; and

Policy C: Communicate the potential short and long-term impacts of proposed significant coastal developments early in their life cycle and in terms understandable to the public to facilitate public participation in the planning and review process.

Discussion: The Project is not a coastal development, is not located on the coastline, and is not in the SMA. Stakeholders were engaged in workshops early in the design phase of the Project. Pre-consultation comments were obtained and are reproduced in Appendix A. In addition, this EA discusses potential impacts and mitigation measures of the Project and provides an opportunity for input.

Public Participation

Objective: Stimulate public awareness, education, and participation in coastal management.

Policy A: Promote public involvement in coastal zone management processes;

Policy B: Disseminate information on coastal management issues by means of educational materials, published reports, staff contact, and public workshops for persons and organizations concerned with coastal issues, developments, and government activities; and

Policy C: Organize workshops, policy dialogues, and site- specific mediations to respond to coastal issues and conflicts.

Discussion: The Project is not a coastal development, is not located on the coastline, and is not in the SMA. The Neighborhood Board and political representatives for the area were provided detailed information regarding the project and an opportunity to comment and discuss issues and concerns. A listing of individuals, organization, and agencies consulted prior to the release of the Draft EA is included in Appendix A as well as any comments received. In addition, this EA discusses potential impacts and mitigation measures of Project and publication of the document provides an opportunity for input.

Beach Protection

Objective: Protect beaches for public use and recreation.

Policy A: Locate new structures inland from the shoreline setback to conserve open space, minimize interference with natural shoreline processes, and minimize loss of improvements due to erosion;

Policy B: Prohibit construction of private erosion-protection structures seaward of the shoreline, except when they result in improved aesthetic and engineering solutions to erosion at the sites and do not interfere with existing recreational and waterline activities; and

Policy C: Minimize the construction of public erosion-protection structures seaward of the shoreline.

Discussion: The Project is not a coastal development, is not located on the coastline, and is not in the SMA; therefore, this objective and these policies are not applicable.

Marine Resources

Objective: Promote the protection, use, and development of marine and coastal resources to assure their sustainability.

Policy A: Ensure that the use and development of marine and coastal resources are ecologically and environmentally sound and economically beneficial;

Policy B: Coordinate the management of marine and coastal resources and activities to improve effectiveness and efficiency;

Policy C: Assert and articulate the interests of the State as a partner with Federal agencies in the sound management of ocean resources within the United States exclusive economic zone;

Policy D: Promote research, study, and understanding of ocean processes, marine life, and other ocean resources in order to acquire and inventory information necessary to understand how ocean development activities relate to and impact upon ocean and coastal resources; and

Policy E: Encourage research and development of new, innovative technologies for exploring, using, or protecting marine and coastal resources.

Discussion: The Project is not a coastal development, is not located on the coastline, and is not in the SMA; therefore, policies regarding shoreline recreation resources are not applicable. However, to protect marine water quality the Project will be designed and built in compliance with all applicable federal, state, and county regulations pertaining to storm water management including the City & County of Honolulu's grading ordinance and the DOH fugitive dust and NPDES permit programs. LID features will be integrated into the school design to maintain or

improve the existing storm peak flows and storm water quality exiting the site of the Project. Drainage on the site will meet LEED Silver standards. Decentralized filtration/infiltration through vegetation will capture increased runoff resulting from the Project and allowing it to seep into the ground rather than leaving the Site. Overflow from the LID features will be conveyed to grass swales. BMPs will be employed during construction to reduce erosion of soils and fugitive dust during construction. These measures will also protect downgradient resources and prevent secondary and cumulative impacts of stormwater.

5.1.3 Hawai‘i State Plan

The Hawai‘i State Plan (Chapter 226, HRS), establishes a set of goals, objectives and policies that serve as long-range guidelines for the growth and development of the State. Objectives and policies pertinent to the proposed project are as follows:

HRS § 226-9: Objectives and policies for the economy–federal

Objective: *Planning for the State's economy with regard to federal expenditures shall be directed towards achievement of the objective of a stable federal investment base as an integral component of Hawaii's economy.*

Policies:

(5) Promote federal use of local commodities, services, and facilities available in Hawaii;
(6) Strengthen federal-state-county communication and coordination in all federal activities that affect Hawaii.

Discussion: Solomon Elementary School is a State of Hawai‘i DOE school that provides educational services to school age children located primarily on Schofield Barracks, a military installation. The DOE has an open dialogue with DoD-OEA regarding the opportunity to support the military mission at Schofield Barracks by providing educational facilities that meet federal standards. Communication between the State and Federal agencies has resulted in a partnership between the U.S. Army Garrison Hawai‘i, the DOE and DoD-OEA. The Federal government is expected to provide funds to cover approximately 80% of the cost associated with the Project and helping to provide crucial support services for the families of service members stationed in Hawai‘i at Schofield Barracks.

§ 226-14: Objectives and policies for facility systems – in general

Objective: *Planning for the State's facility systems in general shall be directed towards achievement of the objective of water, transportation, waste disposal, and energy and telecommunication systems that support statewide social, economic, and physical objectives.*

Policies:

(2) Encourage flexibility in the design and development of facility systems to promote prudent use of resources and accommodate changing public demands and priorities.
(3) Ensure that required facility systems can be supported within resource capacities and at reasonable cost to the user.
(4) Pursue alternative methods of financing programs and projects and cost-saving techniques in the planning, construction, and maintenance of facility systems.

Discussion: The DOE has identified the need to upgrade school facilities to meet the demands of 21st century technology. The need for upgrade is particularly evident for older schools with outdated electrical and communication systems such as Solomon Elementary. By working with the Federal government, the DOE is able to provide necessary technological improvements as part of a new school in a project funded primarily by the Federal government, resulting in cost-savings to the State.

§ 226-18: Objectives and policies for socio-cultural advancement – health.

Objective: *Planning for the State's socio-cultural advancement with regard to health shall be directed towards achievement of the following objectives:*
(1) Fulfillment of basic individual health needs of the general public.
(2) Maintenance of sanitary and environmentally healthful conditions in Hawaii's communities.

Policies:

(5) Provide programs, services, and activities that ensure environmentally healthful and sanitary conditions.

Discussion: The Project will include the removal and replacement of lead-based paint and asbestos containing materials from Solomon Elementary School through the removal of all buildings on the campus. The activities associated with this project will improve the conditions of the school by removing these hazardous substances that affect environmental health of the classrooms, and other areas frequented by students at Solomon Elementary School.

§ 226-21: Objectives and policies for socio-cultural advancement – education.

Objective: *Planning for the State's socio-cultural advancement with regard to education shall be directed towards achievement of the objective of the provision of a variety of educational opportunities to enable individuals to fulfill their needs, responsibilities, and aspirations.*

Policies:

(1) Support educational programs and activities that enhance personal development, physical fitness, recreation, and cultural pursuits of all groups.
(2) Ensure the provision of adequate and accessible educational services and facilities that are designed to meet individual and community needs.
(3) Provide appropriate educational opportunities for groups with special needs.

(7) Promote programs and activities that facilitate the acquisition of basic skills, such as reading, writing, computing, listening, speaking, and reasoning.

(8) Emphasize quality educational programs in Hawaii's institutions to promote academic excellence.

Discussion: The Project provides educational and recreational opportunities that enhance personal development, physical fitness, recreation, and technological pursuits of all students of Solomon Elementary School. The Project will also include the construction of facilities that will provide space for media, a library, and technology based systems will facilitate the acquisition of basic skills particularly in reading and computing. The Project will also provide three fully self-contained special education classrooms.

HRS § 226-22: Objectives and policies for socio-cultural advancement – Social Services.

Objective: *Planning for the State's socio-cultural advancement with regard to social services shall be directed towards the achievement of the objective of improved public and private social services and activities that enable individuals, families, and groups to become more self-reliant and confident to improve their well-being.*

Policies:

(1) Facilitate the adjustment of new residents, especially recently arrived immigrants, into Hawai‘i's communities

Discussion: The Project has been designed to meet facility standards developed for schools servicing military populations. Children of military families frequently move to new schools. By creating an atmosphere that has similarly functioning facilities to the federal standard can help promote and facilitate the adjustment of new school age residents to Hawai‘i.

HRS § 226-23: Objectives and policies for socio-cultural advancement – leisure.

Objective: *Planning for the State’s socio-cultural advancement with regard to leisure shall be directed towards the achievement of the objective of the adequate provision of resources to accommodate diverse cultural, artistic, and recreational needs for present and future generations.*

Policies:

(3) Enhance the enjoyment of recreational experiences through safety and security measures, educational opportunities, and improved facility design and maintenance.

(6) Assure the availability of sufficient resources to provide for future cultural, artistic, and recreational needs.

Discussion: The Project supports planning for the State's socio-cultural advancement with regard to leisure through the provision of a quality educational and recreational facility to meet the Solomon Elementary School community's needs. The facility will contribute toward fulfilling recreational by providing a modern, up-to-date recreational facility that can be utilized regardless of the outdoor weather conditions and without relying on the cafeteria being available.

5.2 CITY AND COUNTY OF HONOLULU

County-specific land use plans and ordinances pertaining to the Project include the O‘ahu General Plan, Central O‘ahu Sustainable Community Plan and Land Use Ordinance.

5.2.1 County of Hawai‘i General Plan

The O‘ahu General Plan is the policy document for the long-range development of the Island of O‘ahu. The O‘ahu General Plan is a statement of general conditions to be sought in the 20-year planning horizon and policies to help direct attainment of the plan's objectives. Specific General Plan goals and policies applicable to the Project follow.

Section IX*- Health and Education*

Objective: *(B) To provide a wide range of educational opportunities for the people of O‘ahu.*

Policies:

(1) Support education programs that encourage the development of employable skills.
(3) Encourage the after-hours use of school buildings, grounds and facilities
(4) Encourage the construction of school facilities that are designed for flexibility and high levels of use.
(5) Facilitate the appropriate location of learning institutions from the preschool through the university levels.

Discussion: The proposed Project is consistent with the City and County of Honolulu General Plan Section IX, Objective B. Existing school programming allows for use of facilities after hours for various programs and activities. The new school is being designed to allow for flexible uses, particularly the new covered play area. In addition, the Project will include the construction of support facilities including a library, media, technology, and student centers. These facilities are designed to support educational programs that will develop skills necessary for employment in a technologically advanced society.

5.2.2 Central O‘ahu Sustainable Community Plan

The City and County of Honolulu has adopted the Central O‘ahu Sustainable Community Plan (COSCP) as one of eight community-oriented plans to guide public policy, investment and decision making through the 2030 planning horizon. The COSCP was developed by the

Department of Planning and Permitting (DPP) and its consulting team in partnership with the community. The document contains policies specific to Central Oʻahu. These policies are then adopted through ordinances. The current COSCP was adopted in 2002. In 2007, with community input, the City and County of Honolulu along with their consultants began revising the plan. A draft is currently undergoing internal review. According to the Chief of Development Plans and Zone Change Branch of DPP, the Public Review Draft of the COSCP is expected to be released in 2014. In general, the vision based on the COSCP adopted in 2002 is the following:

1) The protection of agricultural and preservation areas
2) Revitalization of Waipahu and Wahiawā
3) Continued development of master planned communities
4) Development of infrastructure to support the region

The COSCP identified a shortfall of DOE funding necessary to meet the needs of new classrooms in 2002 and recommended that developer contributions and alternative financing be developed. The COSCP also recommended that schools be utilized as community centers, collocated with parks, share facilities and require fair share contributions from developers.

Discussion: The project is consistent with the currently adopted COSCP. The Project will be completely contained within the boundaries of the existing school campus and will not encroach upon any agricultural or preservation areas. The Project is designed to improve the existing Solomon Elementary campus by constructing an entirely new school, which will not only include new facilities but also will include updated infrastructure to support the greater demands of today's (and the future's) technology.

5.2.3 City and County of Honolulu Land Use Ordinance

The Land Use Ordinance (LUO) is housed in Chapter 21 of the Revised Ordinances of Honolulu 1990. It implements the goals and objectives of the Oʻahu General Plan and the COSCP. All lands within the City and County of Honolulu are zoned into specific districts. According to the DPP, the project is zoned F-1 "Federal and Military Preservation." See Figure 7.

Sec. 21-3.40(c) The purpose of F-1 military and federal preservation district is to identify areas in military or federal government use and to permit the full range of military or federal government activities.

Sec. 21-3.40-1(b) Within an F-1 military and federal preservation district, all military and federal uses and structures shall be permitted.

Discussion: The project is consistent with the LUO. Solomon Elementary School provides education primarily in support facility of the military families located at Schofield Barracks, a military installation.

5.2.4 Special Management Area

The Site is not located within the Special Management Area. See **Error! Reference source not found.**. Conformance with the Coastal Zone Management Act was previously discussed.

5.3 APPROVALS AND PERMITS

A listing of permits and approvals required for the Project is presented below:

Table 5-1: Approvals and Permits

Permit/Approval	Responsible Agency
Chapter 343, HRS Compliance	Office of Environmental Quality Control
Historic Preservation, Section 106	State Historic Preservation Division
Chapter 6E, HRS Compliance	
ADA Compliance	State Disability & Communication Access Board
National Pollutant Discharge Elimination System (NPDES) Permit	State Department of Health
Plan Approval	City and County of Honolulu, Department of Planning and Permitting
Building Permits (including electrical and plumbing)	
Occupancy	
NEPA Compliance/REC Concurrence Infrastructure connection approvals	Directorate of Public Works, U.S. Garrison
Design Approval	
Air Conditioning	State Department of Health

Due to the connection of some infrastructure to Schofield Barracks systems, coordination with the Garrison DPW in addition to the City and County of Honolulu will be necessary.

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6 ALTERNATIVES

This section identifies and evaluates a range of alternatives that could meet the purpose and need and possibly avoid, reduce, or minimize adverse environmental effects.

6.1 NO ACTION ALTERNATIVE

Under the "no action" alternative, the construction of a new school with improved infrastructure and facilities would not occur. Solomon Elementary School would continue to utilize facilities containing potentially hazardous materials. The school would also be operating above its capacity as the DoD Facilities Condition Assessment Report determined that eleven additional classrooms are needed and the school is already over its capacity by 200 students. With "no action," Solomon Elementary's students would also be overcrowded in the food service area, cafeteria, and library/information center, all of which are too small under DoD's standards. The "no action" alternative would preserve the existing problems with traffic and parking as the school only has 39 parking spaces. Because no new facilities would be built, there would be no increase in energy demand or impervious surface area that could impact storm water quality or quantity.

6.2 PARTIAL RENOVATION & NEW CONSTRUCTION

Another alternative considered was to renovate the existing buildings and add four new buildings: an administration building/library; an 18-classroom building; a cafeteria, kitchen, and custodial service center; and a covered playcourt. The functions of the existing buildings would also change in some ways – the existing library would be converted to three classrooms; the existing administration area would be converted to three classrooms; and the new media center and library would occupy the second floor of the existing administration building. The newest portable buildings would remain but be relocated. Two new parking areas would also be added to the school along Kolekole Avenue and Carpenter Avenue. During construction of the new buildings, none of the existing portables or buildings would be impacted. It was estimated that this alternative would take 56 months or about five years to complete. Renovating the old infrastructure would also be quite complex. This alternative was rejected because the construction timeline was too long and the community and users will likely not accept the extended duration.

6.3 CONSTRUCT REPLACEMENT SCHOOL

The preferred alternative described in this EA is to construct a replacement school and demolish all existing buildings. Construction time for this alternative, as described in Section 2.6, is estimated at two and a half to three years. Most of the existing portables will not be affected, and the new school can be built with no need for students to be displaced. The new buildings are constructed in Phase I, students and staff are moved in Phase II, and the existing buildings are

demolished in Phase III. This is the preferred alternative for its minimal disruption to the students' education, its relatively rapid timeline, and the ease of building the new infrastructure. It is also estimated to be nearly the same cost as the partial renovation alternative.

7 FINDINGS AND ANTICIPATED DETERMINATION

To determine whether the implementation of the Project may have a significant impact on the physical and human environment, all phases and expected consequences of the proposed project have been evaluated, including potential primary, secondary, short-range, long-range, and cumulative impacts. Based on this evaluation, the Proposing Agency (State of Hawai‘i DOE) anticipates issuing a Finding of No Significant Impact (AFONSI). The supporting rationale for this finding is presented below.

7.1 SIGNIFICANCE CRITERIA

The discussion below evaluates the significance of the Project’s impacts based upon the Significance Criteria set forth in Hawaii Administrative Rules section 11-200-12.

(1) Involves an irrevocable commitment to loss or destruction of any natural or cultural resource;

Discussion: The Site is an existing school within the built environment of Schofield Barracks. Environmental and cultural studies have been conducted in and around the Site. A tree disposition plan will be prepared to relocate or dispose of (in the case that they are not salvageable) the existing trees on the campus. Site investigations revealed the absence of any resources potentially subject to irrevocable loss as a result of construction.

(2) Curtails the range of beneficial uses of the environment;

Discussion: The current use of the site as a school will not change as a result of this project. The site will continue to be utilized as an elementary school campus.

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

Discussion: The Environmental Policies enumerated in Chapter 344, HRS, and NEPA promote conservation of natural resources, and an enhanced quality of life for all citizens. The Project is not expected to significantly impact any natural resources and is expected to enhance the quality of life of for families with children attending Solomon Elementary School by improving the technological resources, and removing existing environmental hazards.

(4) Substantially affects the economic or social welfare of the community or State;

Discussion: The Project is anticipated to have a beneficial impact on the social welfare of the community by improving the educational facilities at Solomon Elementary.

(5) Substantially affects public health;

Discussion: The Project's recreational facilities will promote exercise and a healthy lifestyle by creating a covered play court that can be utilized in inclement weather. The project will also have a positive impact on public health by removing asbestos containing material and lead based paint from existing public school facilities.

(6) Involves substantial secondary impacts, such as population changes or effects on public facilities;

Discussion: The project will not result in a change in population and is not anticipated to generate or stimulate growth. The new facilities may also be available for community uses at the discretion of the school administration, thereby having a beneficial impact by increasing the venues potentially available to the Schofield Barracks community.

(7) Involves a substantial degradation of environmental quality;

Discussion: The Project as proposed will be built to a level comparable to LEED Silver. Wherever possible, green materials like recycled flooring, paints with low volatile organic compounds will be integrated into the ultimate design of the Project. A tree disposition plan will be prepared to relocate or dispose of (in the case that they are not salvageable) the existing trees on the campus. Landscaping will attempt to utilize native trees and shrubbery. No substantial environmental degradation is anticipated as a result of the Project, particularly because the Project is occurring entirely within a previously disturbed area. Also, as the Project will be in compliance with all pertinent statutes and regulations (e.g., regulations pertaining to grading), no substantial environmental degradation is anticipated.

(8) Is individually limited but cumulatively has considerable effect on the environment, or involves a commitment for larger actions;

Discussion: The Project is not part of a larger project, nor does it commit the State or County to any other larger actions, and will not generate any additional actions having a cumulative effect on the environment. A facilities assessment was conducted to determine compliance with DoDEA practices. Solomon Elementary been listed as 28th on the prioritized list of military impacted schools nationwide in need of facilities improvements. This listing resulted in Solomon's eligibility for existing improvement funds. As discussed throughout, construction activities may generate temporary impacts that can be addressed through BMPs for construction. Long term, the facility improvements have some potential to contribute to cumulative impacts (i.e. addition of impervious surfaces to the site), but with planned mitigation measures (i.e. LID techniques to infiltrate stormwater) the improvements are not anticipated to generate any cumulative impacts to the human or natural environment.

(9) Substantially affects a rare, threatened or endangered species or its habitat;

Discussion: The Project is located within the built environment of Solomon Elementary School. No rare, threatened or endangered species have been identified in the vicinity of the Site. In a December 20, 2013 letter, the USFWS concurred that "no federally designated or proposed critical habitat occurs within the proposed project site." However, the letter goes on to say that "the endangered Hawaiian hoary bat (*Lasiurus cinereus semotus*) may be present in the vicinity of the proposed project site" Therefore, the contractor will follow recommendations presented in the USFWS' letter to protect the Hawaiian hoary bat: "To minimize impacts to the endangered Hawaiian hoary bat, woody plants greater than 15 feet (4.6 meters) tall should not be disturbed, removed, or trimmed during the bat birthing and pup rearing season (June 1 to September 1)."

(10) Detrimentally affects air or water quality or ambient noise levels;

Discussion: No State or Federal air quality standards will be violated during or after the construction of the Project. The only anticipated issues related to air quality may be during construction; however, construction activities would be temporary. Long-term negative impacts related to air quality are not expected.

No State or Federal water quality standards will be violated during or after the construction of the Project; the Project will be required to comply with nonpoint source prevention measures through the NPDES permit. While the Project will result in an increase in impervious surface area, LID elements have been incorporated into the design so water quality will remain unchanged from pre-construction conditions. The quantity and quality of storm water runoff will not be impacted by the Project.

Construction activities will inevitably create temporary noise impacts. If necessary, contractors will employ mitigation measures to minimize those temporary noise impacts including the use of mufflers and implementing construction curfew periods. Pursuant to Chapter 11-46, Hawai'i Administrative Rules, all construction activities must comply with all community noise controls. Long-term noise impacts are expected to return to preconstruction levels.

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

Discussion: The Site does not lie in an environmentally sensitive area such as a flood zone, tsunami zone, geologically hazardous area, beach, erosion-prone area, estuary, freshwater or coastal waters.

(12) Substantially affects scenic vistas and view planes identified in County or State plans or studies; or,

Discussion: The Project is located within the interior of Schofield Barracks and is consistent with view shed recommendations identified within the Central Oʻahu Sustainable Community Plan for Schofield Barracks. It is outside the Schofield Barracks Historic District and will not affect the District's historic visual resources.

(13) Requires substantial energy consumption.

Discussion: The Project may result in an increase in energy demand. However, the project will be constructed to the standard necessary to achieve LEED Silver and energy conservation will be incorporated into the Project design. The new buildings will include energy saving design elements and the cafeteria will be oriented to maximize natural ventilation and day lighting. The preliminary engineering analysis has determined that power is currently available in the area and the capacity can support the Project.

7.2 ANTICIPATED DETERMINATION

Pursuant to Chapter 343, HRS, the State of Hawaiʻi DOE anticipates issuing a Finding of No Significant Impact (FONSI) based on this Environmental Assessment. This finding is founded on the basis of impacts and mitigation measures examined in this document, public comments received during the pre-consultation and public review phases, and analyzed under the above criteria.

8 CONSULTATION

8.1 INDIVIDUALS AND ORGANIZATIONS CONSULTED WITH PRIOR TO THE EA PROCESS

In the course of planning for the improvements at Solomon Elementary School, workshops were held with stakeholders and pre-consultation information packets were mailed out, meetings were held with various organizations.

8.1.1 Pre-Consultation Letters

Detailed information regarding the Project was provided to following individuals, community organizations, private groups, and government agencies. The information notified them that an EA was being prepared for the Project and solicited concerns or comments. The comments received and corresponding responses are reproduced in Appendix A.

Federal

- U.S. Army Corps of Engineers, Honolulu District
- U.S. Fish and Wildlife Service

State of Hawai‘i

- Office of Environmental Quality Control
- Department of Agriculture
- Department of Business, Economic Development and Tourism (DBEDT)
- DBEDT-Hawaii State Energy Office
- DBEDT-State Office of Planning
- Department of Defense
- Department of Health (DOH)
- DOH-Clean Air Branch
- DOH-Hazard Evaluation and Emergency Response Office
- DOH-Clean Water Branch
- DOH-Safe Drinking Water Branch
- Department of Human Services
- Department of Labor and Industrial Relations
- Department of Land and Natural Resources (DLNR)
- DLNR-Land Division
- DLNR-State Historic Preservation Division
- Department of Transportation
- Office of Hawaiian Affairs
- University of Hawai‘i Water Resources Research Center
- Department of Accounting and General Services
- Department of Hawaiian Homelands

- State Representative Lauren Cheape
- State Senator Clayton Hee

City and County of Honolulu

- Board of Water Supply
- Department of Community Services
- Department of Design and Construction
- Department of Environmental Services
- Department of Facility Maintenance
- Department of Parks and Recreation
- Department of Planning and Permitting
- Department of Transportation Services
- Fire Department
- Police Department
- Office of the Mayor
- Neighborhood Board #26
- Councilmember Ernest Martin

Other

- Historic Hawai‘i Foundation
- The Outdoor Circle
- Hawaiian Electric Company, Inc.
- Oceanic Time Warner Cable
- Hawaiian Telecom

9 REFERENCES

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Appendix A
Pre-Consultation Comments & Responses

BOARD OF WATER SUPPLY

CITY AND COUNTY OF HONOLULU
630 SOUTH BERETANIA STREET
HONOLULU, HI 96843

December 30, 2013

KIRK CALDWELL, MAYOR

DUANE R. MIYASHIRO, Chairman
MAHEALANI CYPHER, Vice Chair
THERESIA C. McMURDO
ADAM C. WONG
DAVID C. HULIHEE

ROSS S. SASAMURA, Ex-Officio
GLENN M. OKIMOTO, Ex-Officio

ERNEST Y. W. LAU, P.E.
Manager and Chief Engineer

ELLEN E. KITAMURA, P.E.
Deputy Manager and Chief Engineer

Ms. Catie Cullison, AICP
PBR HAWAII & Associates, Inc.
1001 Bishop Street, Suite 650
Honolulu, Hawaii 96813-3484

Dear Ms. Cullison:

Subject: Your Letter Dated November 22, 2013 on the Pre-Consultation for the Solomon Elementary School Improvements, Schofield Barracks, Tax Map Key: 7-7-001:007

Thank you for the opportunity to comment on the proposed school improvements.

Water service should be provided by the private water system serving this area.

If you have any questions, please contact Robert Chun at 748-5443.

Very truly yours,

ERNEST Y. W. LAU, P.E.
Manager and Chief Engineer

PBR HAWAII
& ASSOCIATES, INC.

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ROY TAKEMOTO
Managing Director - Hilo

SCOTT MURAKAMI, ASLA, LEED®AP
Associate

DACHENG DONG, LEED®AP
Associate

MARC SHIMATSU, ASLA
Associate

CATIE CULLISON, AICP
Associate

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November 21, 2014

Mr. Ernest Y.W. Lau, P.E.
City & County of Honolulu
Board of Water Supply
630 South Beretania Street
Honolulu, HI 96843

SUBJECT: Pre-Consultation for Solomon Elementary School Improvements, Schofield Barracks, Wahiawā, O'ahu, Hawai'i (TMK: 7-7-001:007)

Dear Mr. Lau,

Thank you for your Department's letter dated December 30, 2013 regarding our request for pre-consultation comments for the proposed improvements to Solomon Elementary School. As the planning consultant for Mitsunaga and Associates, Inc., we are responding to your comments.

We acknowledge that your Department has no comments to offer at this time because water service will be provided by Schofield's private water system.

We appreciate your participation in the environmental review process. We will send you a copy of the Draft Environmental Assessment when it is available.

Sincerely,

PBR HAWAII

Catie Cullison, AICP
Associate

Copy: Steve Wong, AIA, Mitsunaga and Associates, Inc.-via email
Dale Kanehisa-Lam, USAG-HI, Directorate of Public Works-via email
Robert Antonio, USAG-HI, Directorate of Public Works, Master Planning Branch-via email
Brenda Lowrey, State of Hawai'i, Department of Education, Planning Section-via email

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DEPARTMENT OF DESIGN AND CONSTRUCTION
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET, 11TH FLOOR
HONOLULU, HAWAII 96813
Phone: (808) 768-8480 • Fax: (808) 768-4567
Web site: www.honolulu.gov

KIRK CALDWELL
MAYOR

CHRIS T. TAKASHIGE, P.E., CCM
DIRECTOR

MARK YONAMINE, P.E.
DEPUTY DIRECTOR

December 17, 2013

PBR Hawaii & Associates, Inc.
1001 Bishop Street, Suite 650
Honolulu, Hawaii 96813

Attn: Catie Cullison, AICP

Dear Ms. Cullison:

Subject: Pre-Consultation for the Solomon Elementary School Improvements, Schofield Barracks, Wahiawa, Oahu, Hawaii (TMK: 7-7-001:007)

The Department of Design and Construction does not have any comments to offer on the pre-consultation.

Thank you for the opportunity to review and comment. Should there be any questions, please contact me at 768-8480.

Sincerely,

for M. Yonamine

Chris T. Takashige, P.E., CCM
Director

CTT: cf (539840)

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& ASSOCIATES, INC.

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CATIE CULLISON, AICP
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November 21, 2014

Mr. Chris T. Takashige, P.E., CCM
City and County of Honolulu
Department of Design and Construction
650 South King Street, 11th Floor
Honolulu, HI 96813

SUBJECT: Pre-Consultation for Solomon Elementary School Improvements, Schofield Barracks, Wahiawā, O'ahu, Hawai'i (TMK: 7-7-001:007)

Dear Mr. Takashige,

Thank you for your Department's letter dated December 17, 2013 regarding our request for pre-consultation comments for the proposed improvements to Solomon Elementary School. As the planning consultant for Mitsunaga and Associates, Inc., we are responding to your comments.

We acknowledge that your Department has no comments to offer at this time.

We appreciate your participation in the environmental review process. We will send you a copy of the Draft Environmental Assessment when it is available.

Sincerely,

PBR HAWAII

Catie Cullison, AICP
Associate

Copy: Steve Wong, AIA, Mitsunaga and Associates, Inc.-via email
Dale Kanehisa-Lam, USAG-HI, Directorate of Public Works-via email
Robert Antonio, USAG-HI, Directorate of Public Works, Master Planning Branch-via email
Brenda Lowrey, State of Hawai'i, Department of Education, Planning Section-via email

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DEPARTMENT OF TRANSPORTATION SERVICES
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET, 3RD FLOOR
HONOLULU, HAWAII 96813
Phone: (808) 768-8305 • Fax: (808) 768-4730 • Internet: www.honolulu.gov

KIRK CALDWELL
MAYOR

MICHAEL D. FORMBY
DIRECTOR

MARK N. GARRITY, AICP
DEPUTY DIRECTOR

TP11/13-539934R

December 19, 2013

Ms. Catie Cullison, AICP
PBR Hawaii & Associates, Inc.
1001 Bishop Street, Suite 650
Honolulu, Hawaii 96813-3484

Dear Ms. Cullison:

SUBJECT: Pre-Consultation Draft Environmental Assessment (DEA) Solomon Elementary School Improvements, Schofield Barracks; Wahiawa, Oahu, Hawaii

In response to your letter dated November 22, 2013, we have no comments to offer at this time.

We reserve further comment pending submission and review of the DEA.

Thank you for the opportunity to review this matter. Should you have any further questions, please contact Michael Murphy of my staff at 768-8359.

Very truly yours,

Michael D. Formby
Director

cc: Steve Wong, AIA, Mitsunaga Associates
Dale Kanehisa-Lam, USAG-HI
Directorate of Public Works
Robert Antonio, USAG-HI
Directorate of Public Works, Master
Planning Branch
Brenda Lowery, State of Hawaii, Department of Education,
Planning Section

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November 21, 2014

Mr. Michael D. Formby
City and County of Honolulu
Department of Transportation Services
650 South King Street, 3rd Floor
Honolulu, HI 96813

SUBJECT: *Your reference: TP11/13-539934R*
Pre-Consultation for Solomon Elementary School Improvements,
Schofield Barracks, Wahiawā, O'ahu, Hawai'i (TMK: 7-7-001:007)

Dear Mr. Formby,

Thank you for your Department's letter dated December 19, 2013 regarding our request for pre-consultation comments for the proposed improvements to Solomon Elementary School. As the planning consultant for Mitsunaga and Associates, Inc., we are responding to your comments.

We acknowledge that your Department has no comments to offer at this time but reserves further comment pending submission and review of the Draft Environmental Assessment.

We appreciate your participation in the environmental review process. We will send you a copy of the Draft Environmental Assessment when it is available.

Sincerely,

PBR HAWAII

Catie Cullison, AICP
Associate

Copy: Steve Wong, AIA, Mitsunaga and Associates, Inc.-via email
Dale Kanehisa-Lam, USAG-HI, Directorate of Public Works-via email
Robert Antonio, USAG-HI, Directorate of Public Works, Master Planning Branch-via email
Brenda Lowrey, State of Hawai'i, Department of Education, Planning Section-via email

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DEPARTMENT OF PLANNING AND PERMITTING
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KIRK CALDWELL
MAYOR

GEORGE I. ATTA, FAICP
DIRECTOR

ARTHUR D. CHALLACOMBE
DEPUTY DIRECTOR

December 12, 2013

Ms. Catie Cullison, AICP
Associate
PBR Hawaii & Associates, Inc.
1001 Bishop Street, Suite 650
Honolulu, Hawaii 96813

Dear Ms. Cullison:

Thank you for your letter dated November 22, 2013 regarding the Pre-Consultation for the Solomon Elementary School Improvements located at Wheeler/Schofield Army Air Field. Mayor Kirk Caldwell has asked me to respond to you directly.

The Department of Planning and Permitting has no comments at this time.

Should you have any questions, please contact Kathy Sokugawa of our staff at 768-8053.

Very truly yours,

for George I. Atta, FAICP
Director

GIA:js

cc: Mayor Kirk Caldwell

PBR HAWAII
& ASSOCIATES, INC.

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November 21, 2014

Mr. George I. Atta, FAICP
City and County of Honolulu
Department of Planning and Permitting
650 South King Street, 7th Floor
Honolulu, HI 96813

SUBJECT: Pre-Consultation for Solomon Elementary School Improvements, Schofield Barracks, Wahiawā, O'ahu, Hawai'i (TMK: 7-7-001:007)

Dear Mr. Atta,

Thank you for your Department's letter dated December 12, 2013 regarding our request for pre-consultation comments for the proposed improvements to Solomon Elementary School. As the planning consultant for Mitsunaga and Associates, Inc., we are responding to your comments.

We acknowledge that your Department has no comments to offer at this time.

We appreciate your participation in the environmental review process. We will send you a copy of the Draft Environmental Assessment when it is available.

Sincerely,

PBR HAWAII

Catie Cullison, AICP
Associate

Copy: Steve Wong, AIA, Mitsunaga and Associates, Inc.-via email
Dale Kanehisa-Lam, USAG-HI, Directorate of Public Works-via email
Robert Antonio, USAG-HI, Directorate of Public Works, Master Planning Branch-via email
Brenda Lowrey, State of Hawai'i, Department of Education, Planning Section-via email

DEPARTMENT OF PARKS & RECREATION

CITY AND COUNTY OF HONOLULU

1000 Uluohia Street, Suite 309, Kapolei, Hawaii 96707
Phone: (808) 768-3003 • Fax: (808) 768-3053
Website: www.honolulu.gov

KIRK CALDWELL
MAYOR

TONI P. ROBINSON
DIRECTOR

JEANNE C. ISHIKAWA
DEPUTY DIRECTOR

December 10, 2013

Ms. Catie Cullison, AICP
Associate
PBR Hawaii & Associates, Inc.
1001 Bishop Street, Suite 650
Honolulu, Hawaii 96813-3484

SUBJECT: Pre-Consultation For the Solomon Elementary School Improvements, Schofield Barracks, Wahiawa, Oahu, Hawaii, (TMK: 7-7-001:007)

Dear Ms. Cullison:

We have reviewed the above-mentioned proposed project and have determined that it will have no impact on the Department of Parks and Recreation's existing or proposed projects, plans, policies or programs.

Should you have any questions, please contact Dexter Liu, Leeward Oahu District Manager, at 675-6030.

Sincerely,

Toni P. Robinson

Toni P. Robinson
Director

TPR:by
(539926)

PBR HAWAII
& ASSOCIATES, INC.

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Managing Director - Kapolei

ROY TAKEMOTO
Managing Director - Hilo

SCOTT MURAKAMI, ASLA, LEED®AP
Associate

DACHENG DONG, LEED®AP
Associate

MARC SHIMATSU, ASLA
Associate

CATIE CULLISON, AICP
Associate

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Hilo, Hawai'i 96720-1553
Tel/Cel: (808) 315-6878

November 21, 2014

Ms. Toni P. Robinson
City and County of Honolulu
Department of Parks & Recreation
1000 Ulohia Street, Suite 309
Kapolei, HI 96707

SUBJECT: Pre-Consultation for Solomon Elementary School Improvements, Schofield Barracks, Wahiawā, O'ahu, Hawai'i (TMK: 7-7-001:007)

Dear Ms. Robinson,

Thank you for your Department's letter dated December 10, 2013 regarding our request for pre-consultation comments for the proposed improvements to Solomon Elementary School. As the planning consultant for Mitsunaga and Associates, Inc., we are responding to your comments.

We acknowledge that the project does not impact any of your Department's existing or proposed projects, plans, policies, or programs.

We appreciate your participation in the environmental review process. We will send you a copy of the Draft Environmental Assessment when it is available.

Sincerely,

PBR HAWAII

Catie Cullison, AICP
Associate

Copy: Steve Wong, AIA, Mitsunaga and Associates, Inc.-via email
Dale Kanehisa-Lam, USAG-HI, Directorate of Public Works-via email
Robert Antonio, USAG-HI, Directorate of Public Works, Master Planning Branch-via email
Brenda Lowrey, State of Hawai'i, Department of Education, Planning Section-via email

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NEIL ABERCROMBIE
GOVERNOR

Dean H. Seki
Comptroller

Maria E. Zielinski
Deputy Comptroller

STATE OF HAWAII
DEPARTMENT OF ACCOUNTING AND GENERAL SERVICES
P.O. BOX 119, HONOLULU, HAWAII 96810-0119

DEC - 2 2013

(P)1283.3

Ms. Catie Cullison, AICP
PBR HAWAII & Associates, Inc.
1001 Bishop Street
ASB Tower, Suite 650
Honolulu, Hawaii 96813-3484

Dear Ms. Cullison:

Subject: Solomon Elementary School Improvements, Schofield Barracks
Wahiawa, Oahu, Hawaii
TMK: 7-7-001:007

Thank you for the opportunity to provide comments for the subject project. This project does not impact any of the Department of Accounting and General Services' projects or existing facilities in this area and we have no comments to offer at this time.

If you have any questions, please call me at 586-0400 or your staff may call Mr. Alva Nakamura of the Public Works Division at 586-0488.

Sincerely,

DEAN H. SEKI
Comptroller

PBR HAWAII
& ASSOCIATES, INC.

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November 21, 2014

Mr. Dean H. Seki
State of Hawai'i
Department of Accounting and General Services
P.O. Box 119
Honolulu, HI 96810-0119

SUBJECT: Pre-Consultation for Solomon Elementary School Improvements, Schofield Barracks, Wahiawā, O'ahu, Hawai'i (TMK: 7-7-001:007)

Dear Mr. Seki,

Thank you for your Department's letter dated December 2, 2013 regarding our request for pre-consultation comments for the proposed improvements to Solomon Elementary School. As the planning consultant for Mitsunaga and Associates, Inc., we are responding to your comments.

We acknowledge that the project does not impact any of your Department's projects or existing facilities and that your Department has no comments to offer at this time.

We appreciate your participation in the environmental review process. We will send you a copy of the Draft Environmental Assessment when it is available.

Sincerely,

PBR HAWAII

Catie Cullison, AICP
Associate

Copy: Steve Wong, AIA, Mitsunaga and Associates, Inc.-via email
Dale Kanehisa-Lam, USAG-HI, Directorate of Public Works-via email
Robert Antonio, USAG-HI, Directorate of Public Works, Master Planning Branch-via email
Brenda Lowrey, State of Hawai'i, Department of Education, Planning Section-via email

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OFFICE OF PLANNING
STATE OF HAWAII

NEIL ABERCROMBIE
GOVERNOR

JESSE K. SOUKI
DIRECTOR
OFFICE OF PLANNING

235 South Beretania Street, 6th Floor, Honolulu, Hawaii 96813
Mailing Address: P.O. Box 2359, Honolulu, Hawaii 96804

Telephone: (808) 587-2846
Fax: (808) 587-2824
Web: http:/planning.hawaii.gov/

Ref. No. P-14215

December 19, 2013

Ms. Catie Cullison, AICP
PBR HAWAII & Associates, Inc.
1001 Bishop Street, Suite 650
Honolulu, Hawaii 96813-3484

Dear Ms. Cullison:

Subject: Pre-Consultation for the Solomon Elementary School Improvements, Schofield Barracks, Wahiawa, Oahu; TMK: 7-7-001:007

Thank you for the opportunity to provide pre-consultation comments on the Solomon Elementary School Improvements project located at Schofield Barracks, Wahiawa, Oahu.

We have reviewed the documents received by letter dated November 22, 2013, and have the following comments to offer:

1. The entire state is defined to be within the Coastal Zone Management Area, see Hawaii Revised Statutes (HRS) §205A-1 (definition of "coastal zone management area"). The Draft Environmental Assessment (Draft EA) should include a discussion of the proposed project's ability to meet the objectives and policies set forth in HRS §205A-2.

2. During the construction phase of this project, there is a possibility that nonpoint pollution may be generated and may have an impact on coastal waters. Please review the Hawaii Watershed Guidance, which provides a summary and links to management measures that may be implemented to minimize coastal nonpoint pollution impact. Specifically, please examine the management measures described in the section on Urban Areas/Urban Runoff (pages 120-122) and Urban Areas/Existing Development (pages 122-123).

   The Hawaii Watershed Guidance can be viewed or downloaded from the Office of Planning website at http://files.hawaii.gov/dbedt/op/czm/initiative/nonpoint/HIWatershedGuidance Final.pdf.

3. For potential impacts to water resources from stormwater and inundation concerns, please consider utilizing the Office of Planning's Stormwater Impact Assessment, to incorporate into the environmental review process. Specifically, examine Stormwater Design & Mitigation (page 11) and Low-Impact Development Concepts/Stormwater Control Measures (pages 15-16) of the Stormwater Impact Assessment. The Appendices include a list of Data Resources, Best Management Practice Techniques, and a Reviewers Checklist. The Stormwater Impact Assessment guidance document can be found at http://files.hawaii.gov/dbedt/op/czm/initiative/stomwater_imapct/final_stormwater_impact_assessments_guidance.pdf.

4. The Draft EA should include the Coastal Zone Management Act, HRS Chapter 205A, in the list of "Relationship to Land Use Plans, Policies, and Controls."

If you have any questions regarding this comment letter, please contact Josh Hekekia of our Hawaii CZM Program at 587-2845.

Sincerely,

Jesse K. Souki
Director

c: Mr. Steve Wong, AIA, Mitsunaga &Associates
Ms. Dale Kanehisa-Lam, USAG-HI, Directorate of Public Works
Mr. Robert Antonio, USAG-HI, Directorate of Public Works
Ms. Brenda Lowery, Department of Education, Planning Section

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& ASSOCIATES, INC.

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November 21, 2014

Mr. Leo Asuncion
State of Hawai'i
Office of Planning
P.O. Box 2359
Honolulu, HI 96804

SUBJECT: Pre-Consultation for Solomon Elementary School Improvements, Schofield Barracks, Wahiawā, O'ahu, Hawai'i (TMK: 7-7-001:007)

Dear Mr. Asuncion,

Thank you for your Department's letter dated December 19, 2013 regarding our request for pre-consultation comments for the proposed improvements to Solomon Elementary School. As the planning consultant for Mitsunaga and Associates, Inc., we offer the following responses in the respective order of your comments:

1. The Draft Environmental Assessment (EA) will include a discussion of the proposed project's ability to meet the objectives and policies set forth in HRS §205A-2. The Draft EA will also include the Coastal Management Act, HRS Chapter 205A in the list of "Relationship to Land Use Plans, Policies, and Controls."

2. We will review the Hawai'i Watershed Guidance for management measures that may be implemented to minimize coastal nonpoint pollution impact. We will include in the Draft EA those measures that are applicable to this project.

3. We will review the Office of Planning's Stormwater Impact Assessment to ensure that the project incorporates best practices related to stormwater design and low-impact development.

We appreciate your participation in the environmental review process. We will send you a copy of the Draft EA when it is available.

Sincerely,

PBR HAWAII

Catie Cullison, AICP
Associate

Copy: Steve Wong, AIA, Mitsunaga and Associates, Inc.-via email
Dale Kanehisa-Lam, USAG-HI, Directorate of Public Works-via email
Robert Antonio, USAG-HI, Directorate of Public Works, Master Planning Branch-via email
Brenda Lowrey, State of Hawai'i, Department of Education, Planning Section-via email

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GOVERNOR
STATE OF HAWAII

JOBIE M. K. MASAGATANI
CHAIRMAN
HAWAIIAN HOMES COMMISSION

DARRELL T. YOUNG
DEPUTY TO THE CHAIRMAN

STATE OF HAWAII
DEPARTMENT OF HAWAIIAN HOME LANDS

P. O. BOX 1879
HONOLULU, HAWAII 96805

November 27, 2013

PBR Hawaii & Associates, Inc.
Attn: Ms. Catie Cullison, AICP Associate
1001 Bishop Street, Suite 650
Honolulu, Hawai'i 96813-3484

Subject: Pre-Consultation for the Solomon Elementary School Improvement, Schofield Barracks, Wahiawa, O'ahu, Hawai'i (TMK: 7-7-001:007)

Thank you for the opportunity to review the subject Pre-Consultation. The Department of Hawaiian Home Lands has no comment to offer at this time.

If you have any questions, please contact our Planning Office at (808) 620-9480.

Aloha,

Darrell C. Yagodich,
Planning Program Manager

PBR HAWAII
& ASSOCIATES, INC.

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Associate

MARC SHIMATSU, ASLA
Associate

CATIE CULLISON, AICP
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Tel/Cel: (808) 315-6878

November 21, 2014

Mr. Darrell C. Yagodich
State of Hawai'i
Department of Hawaiian Homelands
P.O. Box 1879
Honolulu, HI 96805

SUBJECT: Pre-Consultation for Solomon Elementary School Improvements, Schofield Barracks, Wahiawā, O'ahu, Hawai'i (TMK: 7-7-001:007)

Dear Mr. Yagodich,

Thank you for your Department's letter dated November 27, 2013 regarding our request for pre-consultation comments for the proposed improvements to Solomon Elementary School. As the planning consultant for Mitsunaga and Associates, Inc., we are responding to your comments.

We acknowledge that your Department has no comments to offer at this time.

We appreciate your participation in the environmental review process. We will send you a copy of the Draft Environmental Assessment when it is available.

Sincerely,

PBR HAWAII

Catie Cullison, AICP
Associate

Copy: Steve Wong, AIA, Mitsunaga and Associates, Inc.-via email
Dale Kanehisa-Lam, USAG-HI, Directorate of Public Works-via email
Robert Antonio, USAG-HI, Directorate of Public Works, Master Planning Branch-via email
Brenda Lowrey, State of Hawai'i, Department of Education, Planning Section-via email

NEIL ABERCROMBIE
GOVERNOR

PATRICIA McMANAMAN
DIRECTOR

BARBARA A. YAMASHITA
DEPUTY DIRECTOR

STATE OF HAWAII
DEPARTMENT OF HUMAN SERVICES
Benefit, Employment & Support Services Division
820 Mililani Street, Suite 606
Honolulu, Hawaii 96813

December 5, 2013

Refer to 13-0739

Catie Cullison, AICP
PBR Hawaii and Associates
1001 Bishop Street, Suite 650
Honolulu, Hawaii 96813-3484

Subject: Pre-Consultation for the Solomon Elementary School Improvements, Schofield Barracks, Wahiawa, Oahu, Hawaii (TMK:7-7-001:007)

Dear Ms. Cullison:

Thank you for your letter dated November 22, 2013 that requests the Department of Human Services (DHS) comment on the proposed project which is the construction of a completely new school and the demolition of all existing buildings and portables.

The DHS has reviewed the location map and new site plan of the proposed project. Solomon Elementary School is wholly located within a military installation and the DHS has no jurisdiction over any Federal property. There are no DHS licensed child care facilities located within Wheeler/Schofield Army Air Field and as such DHS has no comment at this time.

If you have any questions or need further information, please contact Ms. Jill Arizumi, Child Care Program Specialist, at (808) 586-5240.

Sincerely,

Scott Nakasone
Assistant Division Administrator

c: Patricia McManaman, DHS Director

PBR HAWAII
& ASSOCIATES, INC.

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1719 Haleloke Street
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November 21, 2014

Mr. Scott Nakasone
State of Hawai'i
Department of Human Services
820 Mililani Street, Suite 606
Honolulu, HI 96813

SUBJECT: Pre-Consultation for Solomon Elementary School Improvements, Schofield Barracks, Wahiawā, O'ahu, Hawai'i (TMK: 7-7-001:007)

Dear Mr. Nakasone,

Thank you for your Department's letter dated December 5, 2013 regarding our request for pre-consultation comments for the proposed improvements to Solomon Elementary School. As the planning consultant for Mitsunaga and Associates, Inc., we are responding to your comments.

We acknowledge that DHS has no jurisdiction of property located wholly within a military installation and that there are no DHS-licensed child care facilities located within Schofield Barracks. We further acknowledge that, because of the above facts, your Department has no comments to offer at this time.

We appreciate your participation in the environmental review process. We will send you a copy of the Draft Environmental Assessment when it is available.

Sincerely,

PBR HAWAII

Catie Cullison, AICP
Associate

Copy: Steve Wong, AIA, Mitsunaga and Associates, Inc.-via email
Dale Kanehisa-Lam, USAG-HI, Directorate of Public Works-via email
Robert Antonio, USAG-HI, Directorate of Public Works, Master Planning Branch-via email
Brenda Lowrey, State of Hawai'i, Department of Education, Planning Section-via email

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NEIL ABERCROMBIE
GOVERNOR OF HAWAII

WILLIAM J. AILA, JR.
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

December 20, 2013

PBR HAWAII & Associates, Inc.
Attention: Ms. Catie Cullison
1001 Bishop Street, Suite 650
Honolulu, Hawaii 96813-3484 via email: ccullison@pbrhawaii.com

Dear Ms. Cullison,

SUBJECT: Pre-Consultation for the Solomon Elementary School Improvements, Schofield Barracks, Wahiawa, O`ahu, Hawai`i (TMK: 7-7-001:007)

Thank you for the opportunity to review and comment on the subject matter. The Department of Land and Natural Resources' (DLNR) Land Division distributed or made available a copy of your report pertaining to the subject matter to DLNR Divisions for their review and comments.

At this time, enclosed are comments from (1) Land Division – Oahu District; and (2) Engineering Division. No other comments were received as of our suspense date. Should you have any questions, please feel free to call Supervising Land Agent Steve Molmen at 587-0439. Thank you.

Sincerely,

Russell Y. Tsuji
Land Administrator

Enclosure(s)

NEIL ABERCROMBIE
GOVERNOR OF HAWAII

WILLIAM J. AILA, JR.
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

November 26, 2013

MEMORANDUM

TO: **DLNR Agencies:**
__Div. of Aquatic Resources
__Div. of Boating & Ocean Recreation
X Engineering Division
__Div. of Forestry & Wildlife
__Div. of State Parks
X Commission on Water Resource Management
X Office of Conservation & Coastal Lands
X Land Division – Oahu District
X Historic Preservation

FROM: Russell Y. Tsuji, Land Administrator
SUBJECT: Pre-Consultation for the Solomon Elementary School Improvements, Schofield Barracks
LOCATION: Schofield Barracks, Wahiawa, O`ahu, Hawai`i (TMK: 7-7-001:007); "The proposed improvements will occur entirely within the existing grounds of Solomon Elementary School."
APPLICANT: State of Hawai`i Department of Education (DOE) and United States Department of Defense (DoD) – Office of Economic Adjustment (OEA)

Transmitted for your review and comment on the above referenced document. We would appreciate your comments on this document. Please submit any comments by December 19, 2013.

If no response is received by this date, we will assume your agency has no comments. If you have any questions about this request, please contact Supervising Land Agent Steve Molmen at (808) 587-0439. Thank you.

Attachments

( ) We have no objections.
(✓) We have no comments.
( ) Comments are attached.

Signed: _____
Print Name: Tim Chee
Date: 12/2/2013

cc: Central Files

hl

NEIL ABERCROMBIE
GOVERNOR OF HAWAII

WILLIAM J. AILA, JR.
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

November 26, 2013

MEMORANDUM

TO: FR.

DLNR Agencies:
__Div. of Aquatic Resources
__Div. of Boating & Ocean Recreation
X Engineering Division
__Div. of Forestry & Wildlife
__Div. of State Parks
X Commission on Water Resource Management
X Office of Conservation & Coastal Lands
X Land Division – Oahu District
X Historic Preservation

TO

FROM: Russell Y. Tsuji, Land Administrator
SUBJECT: Pre-Consultation for the Solomon Elementary School Improvements, Schofield Barracks
LOCATION: Schofield Barracks, Wahiawa, O`ahu, Hawai`i (TMK: 7-7-001:007); "The proposed improvements will occur entirely within the existing grounds of Solomon Elementary School."
APPLICANT: State of Hawai`i Department of Education (DOE) and United States Department of Defense (DoD) – Office of Economic Adjustment (OEA)

Transmitted for your review and comment on the above referenced document. We would appreciate your comments on this document. Please submit any comments by December 19, 2013.

If no response is received by this date, we will assume your agency has no comments. If you have any questions about this request, please contact Supervising Land Agent Steve Molmen at (808) 587-0439. Thank you.

Attachments

( ) We have no objections.
( ) We have no comments.
(✓) Comments are attached.

Signed: _____
Print Name: Carty S. Chang, Chief Engineer
Date: 12/5/13

cc: Central Files

DEPARTMENT OF LAND AND NATURAL RESOURCES
ENGINEERING DIVISION

LD/ Russell Y. Tsuji
REF: Pre-Consultation for Solomon Elementary School Improvements, Schofield Barracks Oahu 020

COMMENTS

( ) We confirm that the project site, according to the Flood Insurance Rate Map (FIRM), is located in Flood Zone ___.

(X) Please take note that the project site, according to the Flood Insurance Rate Map (FIRM), is located in Zone D, an area where flood hazards are undetermined.

( ) Please note that the correct Flood Zone Designation for the project site according to the Flood Insurance Rate Map (FIRM) is ___.

( ) Please note that the project must comply with the rules and regulations of the National Flood Insurance Program (NFIP) presented in Title 44 of the Code of Federal Regulations (44CFR), whenever development within a Special Flood Hazard Area is undertaken. If there are any questions, please contact the State NFIP Coordinator, Ms. Carol Tyau-Beam, of the Department of Land and Natural Resources, Engineering Division at (808) 587-0267.

Please be advised that 44CFR indicates the minimum standards set forth by the NFIP. Your Community's local flood ordinance may prove to be more restrictive and thus take precedence over the minimum NFIP standards. If there are questions regarding the local flood ordinances, please contact the applicable County NFIP Coordinators below:

( ) Mr. Mario Siu Li at (808) 768-8098 or Ms. Ardis Shaw-Kim at (808) 768-8296 of the City and County of Honolulu, Department of Planning and Permitting.

( ) Mr. Frank DeMarco at (808) 961-8042 of the County of Hawaii, Department of Public Works.

( ) Mr. Carolyn Cortez at (808) 270-7813 of the County of Maui, Department of Planning.

( ) Mr. Stanford Iwamoto at (808) 241-4884 of the County of Kauai, Department of Public Works.

(X) The applicant should include water demands and infrastructure required to meet project needs. Please note that State sponsored projects requiring water service from the Honolulu Board of Water Supply system may be required to pay a resource development charge, in addition to Water Facilities Charges for transmission and daily storage.

(X) The applicant should provide the water demands and calculations to the Engineering Division so it can be included in the State Water Projects Plan Update.

( ) Additional Comments: _____

( ) Other: _____

Should you have any questions, please call Mr. Dennis Imada of the Planning Branch at 587-0257.

Signed: _____
CARTY S. CHANG, CHIEF ENGINEER

Date: 12/5/13

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& ASSOCIATES, INC.

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November 21, 2014

Mr. Russell Y. Tsuji
State of Hawai‘i
Department of Land and Natural Resources
Land Division
P.O. Box 621
Honolulu, HI 96809

SUBJECT: Pre-Consultation for Solomon Elementary School Improvements, Schofield Barracks, Wahiawā, O‘ahu, Hawai‘i (TMK: 7-7-001:007)

Dear Mr. Tsuji,

Thank you for your letter dated December 20, 2013 regarding our request for pre-consultation comments for the proposed improvements to Solomon Elementary School. As the planning consultant for Mitsunaga and Associates, Inc., we are responding to comments received from the following Department of Land and Natural Resources (DLNR) divisions: 1) Land Division – O‘ahu District and 2) Engineering Division.

Land Division – O‘ahu District

We acknowledge that the Land Division has no comments to offer at this time.

Engineering Division

We acknowledge that the project site is located in Zone D according to the Flood Insurance Rate Map. In the Environmental Assessment, we will provide a description of water demands and infrastructure required to meet project needs. Please note that the project water supply comes from the Garrison and is *not* connected to the Honolulu Board of Water Supply system.

We appreciate your participation in the environmental review process. We will send you a copy of the Draft Environmental Assessment when it is available.

Sincerely,

PBR HAWAII

Catie Cullison, AICP
Associate

Copy: Steve Wong, AIA, Mitsunaga and Associates, Inc.-via email
Dale Kanehisa-Lam, USAG-HI, Directorate of Public Works-via email
Robert Antonio, USAG-HI, Directorate of Public Works, Master Planning Branch-via email
Brenda Lowrey, State of Hawai‘i, Department of Education, Planning Section-via email

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MAJOR GENERAL DARRYLL D. M. WONG
DIRECTOR OF CIVIL DEFENSE

DOUG MAYNE
VICE DIRECTOR OF CIVIL DEFENSE

PHONE (808) 733-4300
FAX (808) 733-4287

STATE OF HAWAII
DEPARTMENT OF DEFENSE
OFFICE OF THE DIRECTOR OF CIVIL DEFENSE
3949 DIAMOND HEAD ROAD
HONOLULU, HAWAII 96816-4495

December 9, 2013

Ms. Catie Cullison, AICP
PBR Hawaii and Associates, Inc.
1001 Bishop Street, Suite 650
Honolulu, Hawaii 96813-3484

Dear Ms. Culllison:

Pre-Consultation for the Solomon Elementary School Improvements,
Schofield Barracks, Wahiawa, Oahu, Hawaii (TMK: 7-7001:007)

Thank you for the opportunity to comment on this project. State Civil Defense (SCD) has no pre-consultation comments at this time and defers to the appropriate State and federal agencies as to the protection of any cultural, historical, or environmental considerations for the proposed project.

Please contact this office upon completion of the environmental assessment for further review. If you have any questions or concerns, please have your staff contact Mr. Ian Duncan, SCD Hazard Mitigation Officer, at 808 733 4300, ext 555.

Sincerely,

DOUG MAYNE
Vice Director of Civil Defense

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& ASSOCIATES, INC.

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DACHENG DONG, LEED®AP
Associate

MARC SHIMATSU, ASLA
Associate

CATIE CULLISON, AICP
Associate

November 21, 2014

Mr. Doug Mayne
State of Hawai‘i
Department of Defense, Office of the Director of Civil Defense
3949 Diamond Head Road
Honolulu, HI 96816-4495

SUBJECT: Pre-Consultation for Solomon Elementary School Improvements, Schofield Barracks, Wahiawā, O‘ahu, Hawai‘i (TMK: 7-7-001:007)

Dear Mr. Mayne,

Thank you for your Department’s letter dated December 9, 2013 regarding our request for pre-consultation comments for the proposed improvements to Solomon Elementary School. As the planning consultant for Mitsunaga and Associates, Inc., we are responding to your comments.

We acknowledge that your Department has no comments to offer at this time.

We appreciate your participation in the environmental review process. We will send you a copy of the Draft Environmental Assessment when it is available.

Sincerely,

PBR HAWAII

Catie Cullison, AICP
Associate

Copy: Steve Wong, AIA, Mitsunaga and Associates, Inc.-via email
Dale Kanehisa-Lam, USAG-HI, Directorate of Public Works-via email
Robert Antonio, USAG-HI, Directorate of Public Works, Master Planning Branch-via email
Brenda Lowrey, State of Hawai‘i, Department of Education, Planning Section-via email

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LORETTA J. FUDDY, A.C.S.W., M.P.H.
DIRECTOR OF HEALTH

STATE OF HAWAII
DEPARTMENT OF HEALTH
P. O. BOX 3378
HONOLULU, HI 96801-3378

In reply, please refer to:
File:

13-1030A CAB

December 10, 2013

Ms. Catie Cullison, AICP
Associate
PBR Hawaii & Associates, Inc.
1001 Bishop Street, Suite 650
Honolulu, Hawaii 96813-3484

Dear Ms. Cullison:

SUBJECT: Pre-Consultation
Solomon Elementary School Improvements
Schofield Barracks, Wahiawa, Oahu, Hawaii
Tax Map Key: 7-7-001:007

Construction/Demolition that May Involve Asbestos
If the proposed project includes demolition activities which may involve asbestos, the applicant should contact the Asbestos Abatement Office in the Indoor and Radiological Health Branch at 586-5800.

Control of Fugitive Dust
A significant potential for fugitive dust emissions exists during all phases of demolition and construction. The activities must comply with the provisions of Hawaii Administrative Rules, §11-60.1-33 on Fugitive Dust. In addition, for cases involving mixed land use, we strongly recommend that buffer zones be established, wherever possible, in order to alleviate potential nuisance problems.

We encourage the contractor to implement a dust control plan, which does not require approval by the Department of Health, to comply with the fugitive dust regulations. Dust control measures may include, but are not limited to, the following:

a) Planning the different phases of construction, focusing on minimizing the amount of dust-generating materials and activities, centralizing on-site vehicular traffic routes, and locating potential dust-generating equipment in areas of the least impact;
b) Providing an adequate water source at the site prior to start-up of construction activities;
c) Landscaping and providing rapid covering of bare areas, including slopes, starting from the initial grading phase;
d) Minimizing dust from shoulders and access roads;
e) Providing adequate dust control measures during weekends, after hours, and prior to daily start-up of construction activities; and
f) Controlling dust from debris being hauled away from the project site. Also, controlling dust from daily operations of material being processed, stockpiled, and hauled to and from the facility.

If you have any questions, please contact Mr. Barry Ching of the Clean Air Branch at 586-4200.

Sincerely,

NOLAN S. HIRAI, P.E.
Manager, Clean Air Branch

BC:rg

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November 21, 2014

Mr. Nolan S. Hirai, P.E.
State of Hawai'i
Department of Health
Environmental Management Division, Clean Air Branch
P.O. Box 3378
Honolulu, HI 96801-3378

SUBJECT: Pre-Consultation for Solomon Elementary School Improvements, Schofield Barracks, Wahiawā, O'ahu, Hawai'i (TMK: 7-7-001:007)

Dear Mr. Hirai,

Thank you for your Department's letter dated December 10, 2013 regarding our request for pre-consultation comments for the proposed improvements to Solomon Elementary School. As the planning consultant for Mitsunaga and Associates, Inc., we offer the following responses in the respective order of your comments:

We acknowledge the project will include demolition activities that may involve asbestos containing materials and your recommendation to contact the Asbestos Abatement Office in the Indoor and Radiological Health Branch. We received pre-consultation comments from that branch on December 17, 2013.

We concur that demolition and construction may have the potential to create fugitive dust emissions. The general contractor will be advised of Hawaii Administrative Rule §11-60.1-33 regarding fugitive dust and measures to control dust such as those provided in your letter will be included in construction specifications.

We appreciate your participation in the environmental review process. We will send you a copy of the Draft Environmental Assessment when it is available.

Sincerely,

PBR HAWAII

Catie Cullison, AICP
Associate

Copy: Steve Wong, AIA, Mitsunaga and Associates, Inc.-via email
Dale Kanehisa-Lam, USAG-HI, Directorate of Public Works-via email
Robert Antonio, USAG-HI, Directorate of Public Works, Master Planning Branch-via email
Brenda Lowrey, State of Hawai'i, Department of Education, Planning Section-via email

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DIRECTOR OF HEALTH

STATE OF HAWAII
DEPARTMENT OF HEALTH
P. O. BOX 3378
HONOLULU, HI 96801-3378

In reply, please refer to:
EMD/CWB

12003PCTM.13

December 2, 2013

Ms. Catie Cullison, AICP
Associate
PBR Hawaii & Associates, Inc.
1001 Bishop Street. Suite 650
Honolulu, Hawaii 96813-3484

Dear Ms. Cullison:

SUBJECT: Comments on the Pre-Consultation for the Solomon Elementary School Improvements Project Wahiawa, Island of Oahu, Hawaii

The Department of Health (DOH), Clean Water Branch (CWB), acknowledges receipt of your letter, dated November 22, 2013, requesting comments on your project. The DOH-CWB has reviewed the subject document and offers these comments. Please note that our review is based solely on the information provided in the subject document and its compliance with the Hawaii Administrative Rules (HAR), Chapters 11-54 and 11-55. You may be responsible for fulfilling additional requirements related to our program. We recommend that you also read our standard comments on our website at: http://health.hawaii.gov/epo/files/2013/10/CWB_Oct22.pdf

1. Any project and its potential impacts to State waters must meet the following criteria:

   a. Antidegradation policy (HAR, Section 11-54-1.1), which requires that the existing uses and the level of water quality necessary to protect the existing uses of the receiving State water be maintained and protected.

   b. Designated uses (HAR, Section 11-54-3), as determined by the classification of the receiving State waters.

   c. Water quality criteria (HAR, Sections 11-54-4 through 11-54-8).

2. You may be required to obtain a National Pollutant Discharge Elimination System (NPDES) permit for discharges of wastewater, including storm water runoff, into State surface waters (HAR, Chapter 11-55). An application for an NPDES individual permit must be submitted at least 180 calendar days before the commencement of the discharge. To request NPDES permit coverage, you must submit the CWB Individual NPDES Form through the e-Permitting Portal and the hard copy certification statement with $1,000 filing fee. Please open the e-Permitting Portal

website at: https://eha-cloud.doh.hawaii.gov/epermit/View/home.aspx. You will be asked to do a one-time registration to obtain your login and password. After you register, click on the Application Finder tool and locate the "CWB Individual NPDES Form." Follow the instructions to complete and submit this form.

3. If your project involves work in, over, or under waters of the United States, it is highly recommend that you contact the Army Corp of Engineers, Regulatory Branch (Tel: 438-9258) regarding their permitting requirements.

   Pursuant to Federal Water Pollution Control Act [commonly known as the "Clean Water Act" (CWA)], Paragraph 401(a)(1), a Section 401 Water Quality Certification (WQC) is required for "[a]ny applicant for Federal license or permit to conduct any activity including, but not limited to, the construction or operation of facilities, which may **result** in any discharge into the navigable waters..." (emphasis added). The term "discharge" is defined in CWA, Subsections 502(16), 502(12), and 502(6); Title 40 of the Code of Federal Regulations, Section 122.2; and Hawaii Administrative Rules (HAR), Chapter 11-54.

4. Please note that all discharges related to the project construction or operation activities, whether or not NPDES permit coverage and/or Section 401 WQC are required, must comply with the State's Water Quality Standards. Noncompliance with water quality requirements contained in HAR, Chapter 11-54, and/or permitting requirements, specified in HAR, Chapter 11-55, may be subject to penalties of $25,000 per day per violation.

If you have any questions, please visit our website at: http://health.hawaii.gov/cwb, or contact the Engineering Section, CWB, at (808) 586-4309.

Sincerely,

Darryl Lum TH for AW

ALEC WONG, P.E., CHIEF
Clean Water Branch

CTM:rh

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November 21, 2014

Mr. Alec Wong
State of Hawai‘i
Department of Health
Environmental Management Division, Clean Water Branch
P.O. Box 3378
Honolulu, HI 96801-3378

SUBJECT: *Your reference: 12003PCTM.13*
Pre-Consultation for Solomon Elementary School Improvements, Schofield Barracks, Wahiawā, O‘ahu, Hawai‘i (TMK: 7-7-001:007)

Dear Mr. Wong,

Thank you for your Department’s letter dated December 2, 2013 regarding our request for pre-consultation comments for the proposed improvements to Solomon Elementary School. As the planning consultant for Mitsunaga and Associates, Inc., we offer the following responses in the respective order of your comments:

1. As recommended, the Standard Comments on the Department of Health’s website were reviewed for applicability to the proposed improvements at Solomon Elementary School.

2. We acknowledge your Department’s comments that the project and its impacts must meet the HAR, Sections 11-54-1.1 (Antidegradation policy), 11-54-3 (Designated uses), and 11-54-4 through 11-54-8 (Water quality criteria). We have reviewed these policies for applicability to the proposed improvements at Solomon Elementary School.

3. Solomon Elementary School is covered under the Department of Education’s NPDES small MS4 Permit No. HIS000003. In addition, prior to construction, a Notice of Intent Form C for a NPDES Permit will be completed and filed.

4. We appreciate the recommendation to contact the Army Corps of Engineers, Regulatory Branch. Although the project does not involve work in, over, or under waters of the United States, we have requested pre-consultation comments from the Honolulu District of the Army Corps.

5. All discharges related to project construction or operation activities will comply with the State’s Water Quality Standards.

We appreciate your participation in the environmental review process. We will send you a copy of the Draft Environmental Assessment when it is available.

Sincerely,

PBR HAWAII

Catie Cullison, AICP
Associate

Copy: Steve Wong, AIA, Mitsunaga and Associates, Inc.-via email
Dale Kanehisa-Lam, USAG-HI, Directorate of Public Works-via email
Robert Antonio, USAG-HI, Directorate of Public Works, Master Planning Branch-via email
Brenda Lowrey, State of Hawai‘i, Department of Education, Planning Section-via email

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LORETTA J. FUDDY, A.C.S.W., M.P.H.
DIRECTOR OF HEALTH

STATE OF HAWAII
DEPARTMENT OF HEALTH
P. O. BOX 3378
HONOLULU, HI 96801-3378

In reply, please refer to:
File:
13-227
Solomon Elementary

December 10, 2013

Ms. Catie Cullison, AICP
PBR HAWAII & Associates, Inc.
1001 Bishop Street, Suite 650
Honolulu, Hawaii 96813-3484

Dear Ms. Cullison:

SUBJECT: Pre-Consultation for the Solomon Elementary School Improvements Schofield Barracks, Wahiawa, Oahu, Hawaii, TMK: 7-7-001: 007

The Department of Health (DOH), Environmental Planning Office (EPO), acknowledges receipt of your letter dated November 22, 2013. Thank you for allowing us to review and comment on the subject document. Due to the planned demolition, the document was routed to the Indoor & Radiological Health Branch as a precautionary measure. They will provide specific comments to you if necessary. EPO recommends that you review the standard comments at: http://health.hawaii.gov/epo/home/landuse-planning-review-program/.
You are required to adhere to all standard comments specifically applicable to this application.

EPO suggests the applicant examine the many sources available on strategies to support the sustainable design of communities, including the:
U.S. Department of Health and Human Services: http://www.hhs.gov/about/sustainability/;
State of Hawaii, Office of Planning: www.planning.hawaii.gov and the new 2013 ORMP;
U.H., School of Ocean and Earth Science and Technology: www.soest.hawaii.edu;
U.S. Environmental Protection Agency's sustainability programs: www.epa.gov/sustainability; and
U.S. Green Building Council's LEED program: www.usgbc.org/leed.

DOH encourages everyone to apply these sustainability strategies and principles early in the planning and review of projects. We also request that for future projects you consider conducting a Health Impact Assessment (HIA). More information is available at: www.cdc.gov/healthyplaces/hia.htm. We request you share all of this information with others to increase community awareness on sustainable, innovative, inspirational, and healthy community design.

We require a written response confirming receipt of this letter and any other letters you receive from DOH in regards to this submission. You may mail your response to 919 Ala Moana Blvd., Ste. 312, Honolulu, Hawaii 96814. However, we would prefer an email submission to: epo@doh.hawaii.gov. We anticipate that our letter(s) and your response(s) will be included in the final document. If you have any questions, please contact me at (808) 586-4337.

Mahalo,

Laura Leialoha Phillips McIntyre, AICP
Manager, Environmental Planning Office

PBR HAWAII
& ASSOCIATES, INC.

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CATIE CULLISON, AICP
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November 21, 2014

Ms. Laura Leialoha Phillips McIntyre
State of Hawai'i
Department of Health
Environmental Planning Office
P.O. Box 3378
Honolulu, HI 96801-3378

SUBJECT: *Your reference: 13-227 Solomon Elementary*
Pre-Consultation for Solomon Elementary School Improvements,
Schofield Barracks, Wahiawā, O'ahu, Hawai'i (TMK: 7-7-001:007)

Dear Ms. McIntyre,

Thank you for your Department's letter dated December 2, 2013 regarding our request for pre-consultation comments for the proposed improvements to Solomon Elementary School. As the planning consultant for Mitsunaga and Associates, Inc., we offer the following responses in the respective order of your comments:

1. Thank you for forwarding our letter to the Indoor & Radiological Health Branch. We have received their comments.

2. We have reviewed the standard comments on your Department's website for applicability to this project.

3. We appreciate the references to the many sources available on strategies to support the sustainable design of communities. In keeping the Department of Education's policy, the improvements to the Solomon Elementary School will meet either LEED Silver certification standards or Hawai'i Collaborative for High Performance Schools Criteria for New Construction and Major Modernizations.

We appreciate your participation in the environmental review process. We will send you a copy of the Draft Environmental Assessment when it is available.

Sincerely,

PBR HAWAII

Catie Cullison, AICP
Associate

Copy: Steve Wong, AIA, Mitsunaga and Associates, Inc.-via email
Dale Kanehisa-Lam, USAG-HI, Directorate of Public Works-via email
Robert Antonio, USAG-HI, Directorate of Public Works, Master Planning Branch-via email
Brenda Lowrey, State of Hawai'i, Department of Education, Planning Section-via email

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NEIL ABERCROMBIE
GOVERNOR OF HAWAII

LORETTA J. FUDDY, A.C.S.W., M.P.H.
DIRECTOR OF HEALTH

STATE OF HAWAII
DEPARTMENT OF HEALTH
P. O. BOX 3378
HONOLULU, HI 96801-3378

In reply, please refer to:
File:

December 17, 2013

Ms. Catie Cullison, AICP
PBR HAWAII & Associates, Inc.
1001 Bishop Street, Suite 650
Honolulu, HI 96813-3484

Dear Ms. Cullison:

This correspondence is in response to your request for Pre-Consultation for the Solomon Elementary School Improvements (TMK: 7-7-001: 007), Schofield Barracks, Wahiawa, Oahu.

Project activities shall comply with the following Administrative Rules of the Department of Health:

- Chapter 11-41 Lead-based Paint Activities
- Chapter 11-46 Community Noise Control
- Chapter 11-501 Asbestos Requirements
- Chapter 11-503 Fees for Asbestos Removal & Certification
- Chapter 11-504 Asbestos Abatement Certification Program

Should you have any questions, please contact me at (808) 586-4700.

Sincerely,

Jeffrey M. Eckerd
Program Manager
Indoor and Radiological Health Branch

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& ASSOCIATES, INC.

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MARC SHIMATSU, ASLA
Associate

CATIE CULLISON, AICP
Associate

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Hilo, Hawai'i 96720-1553
Tel/Cel: (808) 315-6878

printed on recycled paper

November 21, 2014

Mr. Jeffrey M. Eckerd
State of Hawai'i
Department of Health
Environmental Health Service Division, Indoor and Radiological Health Branch
P.O. Box 3378
Honolulu, HI 96801-3378

SUBJECT: Pre-Consultation for Solomon Elementary School Improvements, Schofield Barracks, Wahiawā, O'ahu, Hawai'i (TMK: 7-7-001:007)

Dear Mr. Eckerd,

Thank you for your Department's letter dated December 17, 2013 regarding our request for pre-consultation comments for the proposed improvements to Solomon Elementary School. As the planning consultant for Mitsunaga and Associates, Inc., we offer the following responses in the respective order of your comments:

We appreciate your references to the relevant Administrative Rules of the Department of Health. We have reviewed those rules and will address them as appropriate.

We appreciate your participation in the environmental review process. We will send you a copy of the Draft Environmental Assessment when it is available.

Sincerely,

PBR HAWAII

Catie Cullison, AICP
Associate

Copy: Steve Wong, AIA, Mitsunaga and Associates, Inc.-via email
Dale Kanehisa-Lam, USAG-HI, Directorate of Public Works-via email
Robert Antonio, USAG-HI, Directorate of Public Works, Master Planning Branch-via email
Brenda Lowrey, State of Hawai'i, Department of Education, Planning Section-via email

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GOVERNOR OF HAWAII

LORETTA J. FUDDY, A.C.S.W., M.P.H.
DIRECTOR OF HEALTH

STATE OF HAWAII
DEPARTMENT OF HEALTH
SAFE DRINKING WATER BRANCH
919 ALA MOANA BLVD., ROOM 308
HONOLULU, HI 96814-4920

In reply, please refer to:
File: SDWB
Solomon Elem1.docx

December 3, 2013

Ms. Catie Cullison, AICP
PBR Hawaii & Associates, Inc.
1001 Bishop Street, Suite 650
Honolulu, Hawaii 96813-3484

Dear Ms. Cullison:

SUBJECT: PRE-CONSULTATION FOR THE SOLOMON ELEMENTARY SCHOOL IMPROVEMENTS, SCHOFIELD BARRACKS, WAHIAWA, OAHU, HAWAII, (TMK: 7-7-001:007)

The Safe Drinking Water Branch (SDWB) has reviewed the subject document and has the following comments:

1. The description of the project does not clearly identify the source of drinking water for the project. Please clearly identify the source of drinking water or confirm the existing water system connection to the Schofield Barracks water system will be used for the re-built school.

2. The Contractor shall take every precaution to protect the Schofield Barracks water system from potential cross-connection during construction.

3. The SDWB highly recommends a backflow preventer be installed at the school as part of the construction to prevent potential cross-connection following construction.

If there are any questions, please call Ms. Jennifer Nikaido of the SDWB Engineering Section at 586-4258.

Sincerely,

JOANNA L. SETO, P.E., CHIEF
Safe Drinking Water Branch

JN:cb

c: EPO [via email only]

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& ASSOCIATES, INC.

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MARC SHIMATSU, ASLA
Associate

CATIE CULLISON, AICP
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November 21, 2014

Ms. Joanna L. Seto
State of Hawai'i
Department of Health
Environmental Management Division, Safe Drinking Water Branch
919 Ala Moana Boulevard, Room 308
Honolulu, HI 96814-4920

SUBJECT: Pre-Consultation for Solomon Elementary School Improvements, Schofield Barracks, Wahiawā, O'ahu, Hawai'i (TMK: 7-7-001:007)

Dear Ms. Seto,

Thank you for your Department's letter dated December 3, 2013 regarding our request for pre-consultation comments for the proposed improvements to Solomon Elementary School. As the planning consultant for Mitsunaga and Associates, Inc., we offer the following responses in the respective order of your comments:

1. The existing connection to the Schofield Barracks water system will be used for the re-built school as the drinking water source.

2. The contractor will take every precaution to protect the Schofield Barracks water system from potential cross-connection during construction.

3. A backflow preventer will be installed at the school as part of the construction to prevent potential cross-connection following construction.

We appreciate your participation in the environmental review process. We will send you a copy of the Draft Environmental Assessment when it is available.

Sincerely,

PBR HAWAII

Catie Cullison, AICP
Associate

Copy: Steve Wong, AIA, Mitsunaga and Associates, Inc.-via email
Dale Kanehisa-Lam, USAG-HI, Directorate of Public Works-via email
Robert Antonio, USAG-HI, Directorate of Public Works, Master Planning Branch-via email
Brenda Lowrey, State of Hawai'i, Department of Education, Planning Section-via email

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GOVERNOR

GLENN M. OKIMOTO
DIRECTOR

Deputy Directors
FORD N. FUCHIGAMI
RANDY GRUNE
AUDREY HIDANO
JADINE URASAKI

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
869 PUNCHBOWL STREET
HONOLULU, HAWAII 96813-5097

IN REPLY REFER TO:

STP 8.1423

December 19, 2013

Ms. Catie Cullison, AICP
Associate
PBR Hawaii & Associates, Inc.
1001 Bishop Street, Suite 650
Honolulu, Hawaii 96813-3484

Dear Ms. Cullison:

Subject: Solomon Elementary School Improvements
Pre-Consultation for Hawaii Environmental Policy Act and National Environmental Policy Act
TMK: (1) 7-7-001:007

The subject project is not expected to significantly impact the State highway facility. However, the applicant is required to obtain a permit from DOT Highways Division, for the transport of oversized and/or overweight materials and equipment on State highway facilities.

If there are any questions, please contact Mr. Norren Kato of the DOT Statewide Transportation Planning Office at telephone number (808) 831-7976.

Very truly yours,

GLENN M. OKIMOTO, Ph.D.
Director of Transportation

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& ASSOCIATES, INC.

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November 21, 2014

Mr. Glenn M. Okimoto, Ph.D.
State of Hawai'i
Department of Transportation
869 Punchbowl Street
Honolulu, HI 96813-5097

SUBJECT: *Your reference: STP 8.1423*
Pre-Consultation for Solomon Elementary School Improvements,
Schofield Barracks, Wahiawā, O'ahu, Hawai'i (TMK: 7-7-001:007)

Dear Mr. Okimoto,

Thank you for your Department's letter dated December 19, 2013 regarding our request for pre-consultation comments for the proposed improvements to Solomon Elementary School. As the planning consultant for Mitsunaga and Associates, Inc., we are responding to your comments.

We acknowledge that the subject property is not expected to significantly impact the State highway facility. The contractor will be informed to the requirement to obtain a permit from DOT Highways Division if there is need to transport oversized or overweight materials and equipment on State highway facilities.

We appreciate your participation in the environmental review process. We will send you a copy of the Draft Environmental Assessment when it is available.

Sincerely,

PBR HAWAII

Catie Cullison, AICP
Associate

Copy: Steve Wong, AIA, Mitsunaga and Associates, Inc.-via email
Dale Kanehisa-Lam, USAG-HI, Directorate of Public Works-via email
Robert Antonio, USAG-HI, Directorate of Public Works, Master Planning Branch-via email
Brenda Lowrey, State of Hawai'i, Department of Education, Planning Section-via email

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From: Liu, Rouen [mailto:rouen.liu@heco.com]
Sent: Monday, December 23, 2013 2:21 PM
To: sysadmin
Subject: Pre-consultation for the Solomon Elementary School Improvements - Hawaiian Electric Company Reply

Dear Ms. Cullison,

Thank you for the opportunity to comment on the subject project. Hawaiian Electric Company has no objections to the project. Should HECO have existing easements and facilities on the subject property, we will need continued access for maintenance of our facilities.

We appreciate your efforts to keep us apprised of the subject project in the planning process. As the Solomon Elementary School project comes to fruition, please continue to keep us informed. Further along in the design, we will be better able to evaluate the effects on our system facilities.

If you have any questions, please call me at 543-7245.

Sincerely,

Rouen Liu
Permits Engineer
Hawaiian Electric Company

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1719 Haleloke Street
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November 21, 2014

Mr. Rouen Liu
Hawaiian Electric Company
rouen.liu@heco.com

SUBJECT: Pre-Consultation for Solomon Elementary School Improvements, Schofield Barracks, Wahiawā, O'ahu, Hawai'i (TMK: 7-7-001:007)

Dear Mr. Liu,

Thank you for your email dated December 23, 2013 regarding our request for pre-consultation comments for the proposed improvements to Solomon Elementary School. As the planning consultant for Mitsunaga and Associates, Inc., we are responding to your comments.

We acknowledge that the Hawaiian Electric Company has no objections to the project at this time but that you will need continued access to the property if there are Hawaiian Electric Company easements or facilities on site.

We appreciate your participation in the environmental review process. We will send you a copy of the Draft Environmental Assessment when it is available.

Sincerely,

PBR HAWAII

Catie Cullison, AICP
Associate

Copy: Steve Wong, AIA, Mitsunaga and Associates, Inc.-via email
Dale Kanehisa-Lam, USAG-HI, Directorate of Public Works-via email
Robert Antonio, USAG-HI, Directorate of Public Works, Master Planning Branch-via email
Brenda Lowrey, State of Hawai'i, Department of Education, Planning Section-via email

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HONOLULU FIRE DEPARTMENT

CITY AND COUNTY OF HONOLULU

636 South Street
Honolulu, Hawaii 96813-5007
Phone: 808-723-7139 Fax: 808-723-7111 Internet: www.honolulu.gov/hfd

KIRK CALDWELL
MAYOR

MANUEL P. NEVES
FIRE CHIEF

LIONEL CAMARA JR.
DEPUTY FIRE CHIEF

December 11, 2013

Ms. Catie Cullison, AICP
Associate
PBR Hawaii & Associates, Inc.
1001 Bishop Street, Suite 650
Honolulu, Hawaii 96813-3484

Dear Ms. Cullison:

Subject: Preconsultation for Solomon Elementary School Improvements
Schofield Barracks, Wahiawa, Oahu
Tax Map Key: 7-7-001: 007

In response to your letter of November 22, 2013, regarding the above-mentioned subject, the Honolulu Fire Department (HFD) requires that the following be complied with:

1. Fire department access roads shall be provided such that any portion of the facility or any portion of an exterior wall of the first story of the building is located not more than 150 feet (46 m) from fire department access roads as measured by an approved route around the exterior of the building or facility. (National Fire Protection Association [NFPA] 1; Uniform Fire Code [UFC]™, 2006 Edition, Section 18.2.3.2.2.)

   A fire department access road shall extend to within 50 ft (15 m) of at least one exterior door that can be opened from the outside and that provides access to the interior of the building. (NFPA1; UFC™, 2006 Edition, Section 18.2.3.2.1.)

2. A water supply approved by the county, capable of supplying the required fire flow for fire protection, shall be provided to all premises upon which facilities or buildings, or portions thereof, are hereafter constructed, or moved into or within the county. When any portion of the facility or building is in excess of 150 feet (45 720 mm) from a

water supply on a fire apparatus access road, as measured by an approved route around the exterior of the facility or building, on-site fire hydrants and mains capable of supplying the required fire flow shall be provided when required by the AHJ [Authority Having Jurisdiction]. (NFPA 1; UFC™, 2006 Edition, Section 18.3.1, as amended.)

3. Submit civil drawings to the HFD for review and approval.

Should you have questions, please contact Battalion Chief Socrates Bratakos of our Fire Prevention Bureau at 723-7151 or sbratakos@honolulu.gov.

ROLLAND J. HARVEST
Assistant Chief

RJH/SY:bh

PBR HAWAII
& ASSOCIATES, INC.

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November 21, 2014

Mr. Rolland J. Harvest
City and County of Honolulu
Honolulu Fire Department
636 South Street
Honolulu, HI 96813-5007

SUBJECT: Pre-Consultation for Solomon Elementary School Improvements, Schofield Barracks, Wahiawā, O'ahu, Hawai'i (TMK: 7-7-001:007)

Dear Mr. Harvest,

Thank you for your Department's letter dated December 11, 2013 regarding our request for pre-consultation comments for the proposed improvements to Solomon Elementary School.

Mitsunaga and Associates, Inc., the architect and civil engineer for the Department of Education, will coordinate with your Department to ensure that the improvements meet the Uniform Fire Code. Civil drawings will be submitted to your Department for review and approval when they are available.

We appreciate your participation in the environmental review process. We will send you a copy of the Draft Environmental Assessment when it is available.

Sincerely,

PBR HAWAII

Catie Cullison, AICP
Associate

Copy: Steve Wong, AIA, Mitsunaga and Associates, Inc.-via email
Dale Kanehisa-Lam, USAG-HI, Directorate of Public Works-via email
Robert Antonio, USAG-HI, Directorate of Public Works, Master Planning Branch-via email
Brenda Lowrey, State of Hawai'i, Department of Education, Planning Section-via email

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POLICE DEPARTMENT

CITY AND COUNTY OF HONOLULU

801 SOUTH BERETANIA STREET · HONOLULU, HAWAII 96813
TELEPHONE: (808) 529-3111 · INTERNET: www.honolulupd.org

KIRK CALDWELL
MAYOR

LOUIS M. KEALOHA
CHIEF

DAVE M. KAJIHIRO
MARIE A. McCAULEY
DEPUTY CHIEFS

OUR REFERENCE EO-WS

December 16, 2013

Ms. Catie Cullison, AICP
Associate
PBR Hawaii & Associates, Inc.
1001 Bishop Street, Suite 650
Honolulu, Hawaii 96813-3484

Dear Ms. Cullison:

This is in response to your letter dated November 22, 2013, requesting comments on the Pre-Consultation Environmental Assessment for the improvements to Solomon Elementary School located on Schofield Barracks.

This project should have no significant impact on the facilities or operations of the Honolulu Police Department.

If there are any questions, please contact Acting Major Larry Lawson of District 2 (Wahiawa) at 723-8703 or via e-mail at llawson@honolulu.gov.

Sincerely,

LOUIS M. KEALOHA
Chief of Police

By Randal K. Macadangdang
RANDAL K. MACADANGDANG
Assistant Chief
Support Services Bureau

PBR HAWAII
& ASSOCIATES, INC.

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November 21, 2014

Chief Louis M. Kealoha
City and County of Honolulu
Police Department
801 South Beretania Street
Honolulu, HI 96813

SUBJECT: *Your reference: EO-WS*
Pre-Consultation for Solomon Elementary School Improvements,
Schofield Barracks, Wahiawā, O'ahu, Hawai'i (TMK: 7-7-001:007)

Dear Chief Kealoha,

Thank you for your Department's letter dated December 16, 2013 regarding our request for pre-consultation comments for the proposed improvements to Solomon Elementary School. As the planning consultant for Mitsunaga and Associates, Inc., we are responding to your comments.

We acknowledge that the proposed project will have no significant impact on your Department's facilities or operations.

We appreciate your participation in the environmental review process. We will send you a copy of the Draft Environmental Assessment when it is available.

Sincerely,

PBR HAWAII

Catie Cullison, AICP
Associate

Copy: Steve Wong, AIA, Mitsunaga and Associates, Inc.-via email
Dale Kanehisa-Lam, USAG-HI, Directorate of Public Works-via email
Robert Antonio, USAG-HI, Directorate of Public Works, Master Planning Branch-via email
Brenda Lowrey, State of Hawai'i, Department of Education, Planning Section-via email

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United States Department of the Interior

FISH AND WILDLIFE SERVICE
Pacific Islands Fish and Wildlife Office
300 Ala Moana Boulevard, Room 3-122
Honolulu, Hawai'i 96850

In Reply Refer To:
2014-TA-0081

December 30, 2013

Ms. Catie Cullison, AICP
Associate
PBR Hawai'i
1001 Bishop Street, Suite 650
Honolulu, Hawai'i 96813-3484

Subject: Technical Assistance for the Solomon Elementary School Improvements Project, Schofield Barracks, Wahiawā, O'ahu

Dear Ms. Cullison:

The U.S. Fish and Wildlife Service (Service) received your letter on November 25, 2013, requesting a list of federally listed species or designated critical habitat that may occur within the vicinity of the proposed Solomon Elementary School Improvements Project, located at Schofield Barracks, Wahiawā, O'ahu [TMK: (1) 7-7-001:007]. The State of Hawai'i Department of Education and United States Department of Defense – Office of Economic Adjustment are proposing to improve the facilities of Solomon Elementary School by construction of a completely new school on Solomon's existing playfield followed by the demolition of all existing buildings and portables. The new school will be approximately 146,000-square feet entirely within the existing grounds of Solomon Elementary School. The school is landlocked within the boundaries of Schofield Barracks Military Installation. During construction, the demolition of facilities will include the disturbance or removal of lead based paint, and asbestos containing material. Abatement activities will be implemented to contain, control and properly dispose these hazardous materials.

We have reviewed the information you provided and pertinent information in our files, including data compiled by the Hawai'i Biodiversity and Mapping Program as it pertains to listed species and designated critical habitat. No federally designated or proposed critical habitat occurs within the proposed project site. Our data indicate the endangered Hawaiian hoary bat (*Lasiurus cinereus semotus*) may be present in the vicinity of the proposed project site. We offer the following recommendations to assist you in the proposed project.

Hawaiian Hoary Bat

The Hawaiian hoary bat roosts in both exotic and native woody vegetation and, while foraging, will leave young unattended in "nursery" trees and shrubs when they forage. If trees or shrubs

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suitable for bat roosting are cleared during the breeding season, there is a risk that young bats could inadvertently be harmed or killed. To minimize impacts to the endangered Hawaiian hoary bat, woody plants greater than 15 feet (4.6 meters) tall should not be disturbed, removed, or trimmed during the bat birthing and pup rearing season (June 1 through September 15). Site clearing should be timed to avoid disturbance to Hawaiian hoary bats in the project area.

If it is determined that the proposed project may affect federally listed species, we recommend you contact our office in the planning process so that we may assist you with Endangered Species Act (ESA) compliance. If the proposed project is funded, authorized, or permitted by a Federal agency, then the Federal agency should consult with us pursuant to section 7(a)(2) of the ESA. If no Federal agency is involved with the proposed project, the applicant should apply for an incidental take permit under section 10(a)(1)(B) of the ESA. A section 10 permit application must include a habitat conservation plan laying out the proposed actions, determine the effects of the action on affected fish and wildlife species and their habitats, and define measures to minimize and mitigate adverse effects.

Unless the project description changes, or new information reveals that the proposed project may affect listed species in a manner or to an extent not considered, or a new species or critical habitat is designated that may be affected by the proposed action, no further action pursuant to section 7 of the ESA is necessary.

We appreciate your efforts to conserve protected species. If you have questions regarding this letter, please contact Jiny Kim, Fish and Wildlife Biologist (phone: 808-792-9400; email: jiny_kim@fws.gov).

Sincerely,

12/30/2013

X Joy Hiromasa Acting for

Vickie Caraway
Acting Team Lead
Signed by: JOY BROWNING

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& ASSOCIATES, INC.

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November 21, 2014

Ms. Joy Hiromasa, acting for Vickie Caraway
United States Department of the Interior
Fish and Wildlife Office
300 Ala Moana Boulevard, Room 3-122
Honolulu, HI 96850

SUBJECT: *Your reference: 2014-TA-0081*
Pre-Consultation for Solomon Elementary School Improvements,
Schofield Barracks, Wahiawā, O'ahu, Hawai'i (TMK: 7-7-001:007)

Dear Ms. Hiromasa,

Thank you for your Department's letter dated December 30, 2013 regarding our request for pre-consultation comments for the proposed improvements to Solomon Elementary School. As the planning consultant for Mitsunaga and Associates, Inc., we offer the following responses in the respective order of your comments:

1. We appreciate your confirmation that there are no federally designated or proposed critical habitat within the project site.

2. We acknowledge that the endangered Hawaiian hoary bat may be present in the vicinity of the proposed project site. We have informed the contractor of your recommendation to not disturb, remove, or trim woody plants greater than 15 feet tall between June 1 and September 15.

3. We acknowledge that no further action pursuant to section 7 of the ESA is necessary.

We appreciate your participation in the environmental review process. We will send you a copy of the Draft Environmental Assessment when it is available.

Sincerely,

PBR HAWAII

Catie Cullison, AICP
Associate

Copy: Steve Wong, AIA, Mitsunaga and Associates, Inc.-via email
Dale Kanehisa-Lam, USAG-HI, Directorate of Public Works-via email
Robert Antonio, USAG-HI, Directorate of Public Works, Master Planning Branch-via email
Brenda Lowrey, State of Hawai'i, Department of Education, Planning Section-via email

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Appendix B
Archaeological Inventory Survey

SCS Project Number 1563 AIS-1

AN ARCHAEOLOGICAL INVENTORY SURVEY REPORT FOR THE SOLOMON ELEMENTARY SCHOOL CAMPUS IMPROVEMENTS PROJECT SCHOFIELD BARRACKS MILITARY RESERVATION WAI`ANAE UKA AHUPUA`A, WAHIAWĀ DISTRICT ISLAND OF O`AHU [TMK (1) 7-7-001:007]

Prepared by:
Cathleen A. Dagher, B.A.
and
Robert L. Spear, Ph.D.

October 2014
DRAFT

Prepared for:
PBR Hawaii & Associates, Inc.
1001 Bishop Street, Suite 650
Honolulu, Hawai`i 96707

ABSTRACT

At the request of, PBR Hawaii & Associates, Inc., Scientific Consultant Services, Inc. conducted an Archaeological Inventory Survey of the Solomon Elementary School campus project area. The approximately 9.289 acre elementary school campus is situated on land owned by the United and leased to the State of Hawai`i (Department of Education), located in Wai`anae Uka Ahupua`a, `Ewa District, Island of O`ahu [TMK: (1) 7-7-001:007]The Archaeological Inventory Survey was conducted in order to identify and document historic properties, to gather sufficient information on these properties, to evaluate the significance of any newly identified historic properties, to determine the project effect on these properties, and to make mitigation recommendations to address possible adverse impacts to identified historic properties, pursuant to Hawaii Administrative Rules (HAR) § 13-284 and HAR § 13-276.

The Solomon Elementary School was constructed in 1968 and is named after First Sargent Samuel K. Solomon, a Vietnam veteran who was killed by a sniper as he removed critically wounded soldiers from the battlefield. The proposed improvements to Solomon Elementary School are in response to a one-time Department of Defense grant program which will fund the construction, renovation, repair, or expansion of public schools located on military installations. The proposed improvements to Solomon Elementary School will include the construction of new two-story school buildings, followed by the demolition of existing buildings. Site improvements will include reconfigured parking areas, reconfigured driveways, on-site utility reconfigurations as necessary, on-site storm-water management facilities, and landscaping. All of the proposed improvements will be located within the existing site boundaries.

During the survey, one historic property, State Site 50-80-08-7684 was newly identified. State Site 50-80-08-7684 consisted of a shallow, bowl-shaped charcoal concentration, interpreted as clean out from a thermal feature, within Layer II of Stratigraphic Trench 2. The charcoal concentration yielded a conventional radiocarbon age of 210 + 30 B.P. State Site 50-80-08-7684 has been evaluated in accordance with criteria established for the Hawai`i State Register of Historic Places (HAR§13-276) and was found to be significant under Criterion "d" (for information content). Based on the current findings no additional archaeological work is recommended.

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INTRODUCTION

At the request of PBR & Associates Hawaii, Inc., Scientific Consultant Services, Inc. (SCS) conducted an Archaeological Inventory Survey (AIS) for the proposed improvements to Solomon Elementary School. The approximately 9.289 acre elementary school campus is situated on land owned by the United States and leased to the State of Hawai`i (Department of Education), located in Wai`anae Uka Ahupua`a, `Ewa District, Island of O`ahu [TMK: (1) 7-7-001:007] (Figures 1 through 3).

The Solomon Elementary School was constructed in 1968 and is named after First Sargent Samuel K. Solomon, a Vietnam veteran who was killed by a sniper as he removed critically wounded soldiers from the battlefield. The proposed improvements to Solomon Elementary School are in response to a one-time Department of Defense grant program which will fund the construction, renovation, repair, or expansion of public schools located on military installations. The proposed improvements to Solomon Elementary School will include the construction of new two-story school buildings, followed by the demolition of existing buildings. Site improvements will include reconfigured parking areas, reconfigured driveways, on-site utility reconfigurations as necessary, on-site storm-water management facilities, and landscaping. All of the proposed improvements will be located within the existing site boundaries.

The Archaeological Inventory Survey fieldwork was conducted from July 1 through July 3, 2014 by SCS archaeologist Guerin Tome, B.A., under the direction of Robert L. Spear, Ph.D., Principal Investigator. The AIS was performed in order to identify and document historic properties, to gather sufficient information on these properties, to evaluate the significance of any newly identified historic properties, to determine the project effect on these properties, and to make mitigation recommendations to address possible adverse impacts to identified historic properties, pursuant to Hawaii Administrative Rules (HAR) § 13-284 and HAR § 13-276.

ENVIRONMENTAL SETTING

The project area consists of a developed property containing the existing Solomon Elementary School, which was built in 1968. Solomon Elementary School is located within the southern portion of the Schofield Barracks Military Reservation. The project area situated in the interior of the south-central portion of the island of O`ahu and positioned on the slopes of the Schofield Plateau, "…which was formed

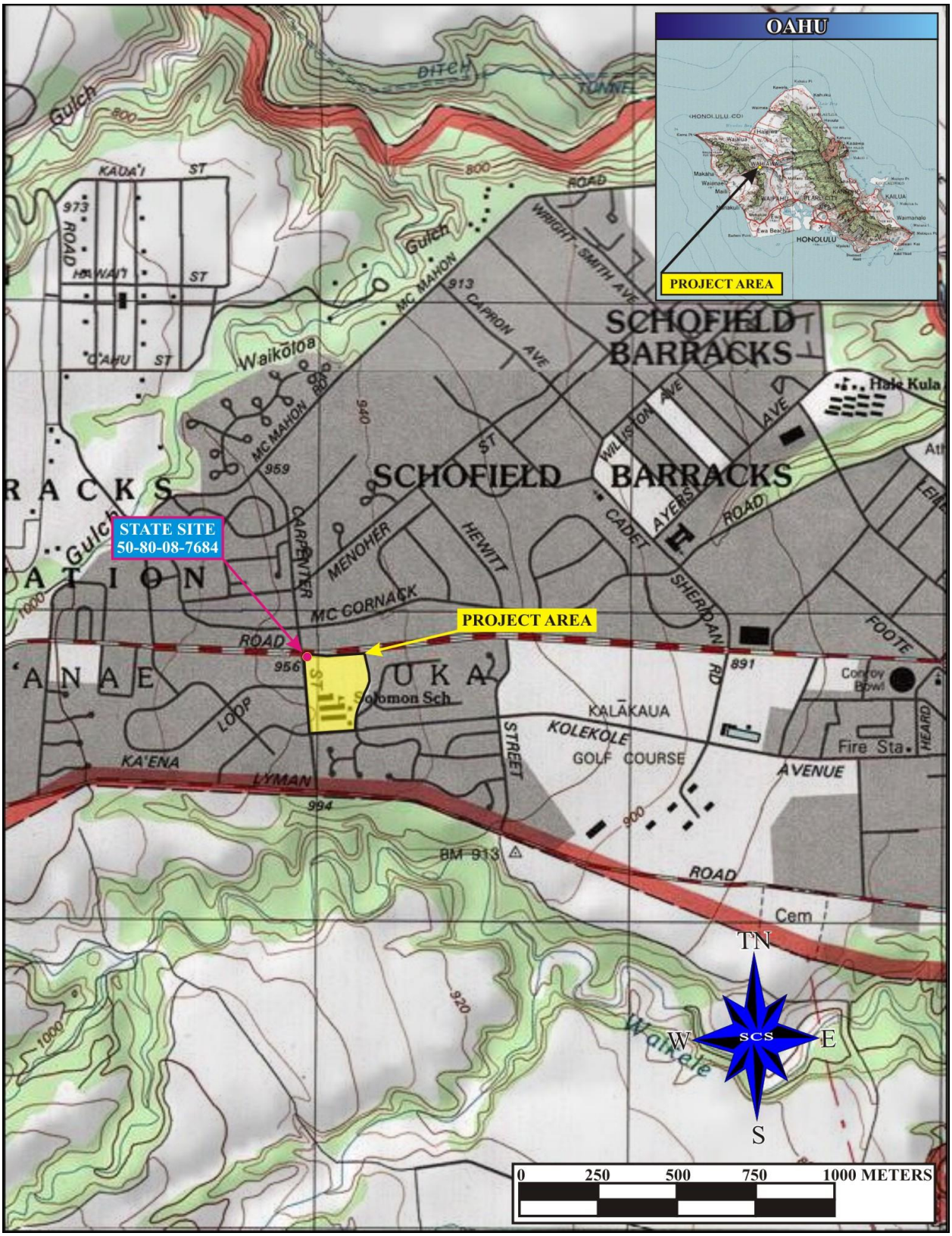

Figure 1: USGS Quadrangle (Schofield Barracks 1998) Map Showing Project Area Location.

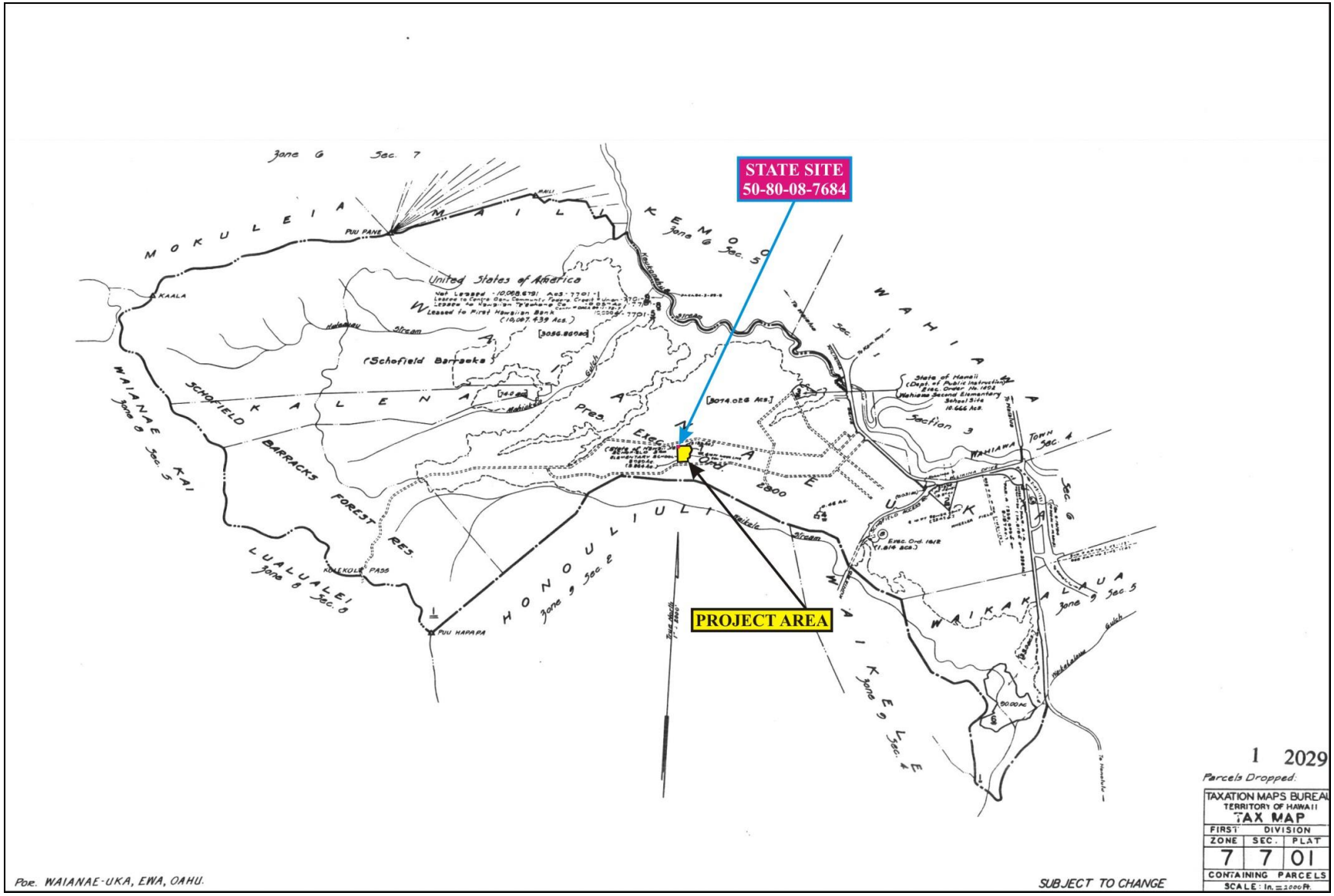

Figure 2: Tax map Key [TMK: (1) 7-7-001] Showing Project Area Location.

Figure 3: Google Earth Image (Aerial imagery from Google, Digital Globe dated 1/29/2013) Showing Project Area Location.

by the lavas from the Koolau Range banking against the older Waianae Range" (Armstrong 1980:12; Stearns 1966:79). The project area is located approximately 3,219 m (2 miles) northwest of Wheeler Air Force Base, approximately 15, 289 m (9.5 miles) inland and approximately 14, 484 m (9 miles) northwest of the Pearl Harbor. The project area is situated at approximately 940 to 1,000 feet above mean sea level (amsl).

LOCATION

The project area is bounded by Carpenter Street on the west, by Wai`anae Uka to the south, by military family housing to the east, and by Trimble Road to the East. Topographically, the northern portion of the project area is relatively flat, while the southern half is sloped downward approximately 10 degrees, from the northwest to the southeast. As the project area is a built environment, it has been subjected to extensive modifications. There are multiple manhole covers and access ports throughout the project area, indicating that subsurface modifications are also quite extensive. In addition, there are existing water and sewer lines throughout the property. The only area where manholes or access ports were not observed was the open field located in the northern half of the project area.

Surface modifications within the project area also include existing multiple concrete buildings and wooden portables. Other existing structures located in the project area include metal containers and metal fences. There are several existing small gardens which are used to support the school cafeteria. One of these gardens, which currently contains sweet potatoes, is on the site of the proposed Parking Lot B.

CLIMATE

Temperatures in the project area can range from as low as the mid-40s during the winter months to as high as the low 90s during the summer (Armstrong 1980:58). During the summer months the project area is quite dry, primarily during the months of June and July, while the winter months can bring as much approximately 15 to 25 inches of rainfall annually (*ibid*:56).

SOILS

According to Foote *et al*. (1972: Sheet Map 40), soils within the project area are comprised of the Kunia Soil Series, specifically Kunia silty clay (KyA). Kunia Soils, derived from alluvium, are known to occur within the foothills of the Wai`anae Mountain Range in the Schofield Barracks area on the Island of O`ahu (*ibid*: 77). The well-drained KyA soils occur on 0 to 3 percent slopes and exhibit moderate permeability, slow runoff, and very slight erosion

hazard. The KyA soils are utilized for the commercial production of sugarcane and pineapple, and found in residential areas and military installations (*ibid*: 88).

VEGETATION

The vegetation within the project area reflects an artificially landscaped area, within a built environment, dominated by exotic and native species, used for ornamental purposes. Vegetation within the project area includes: manicured lawns, Monkeypod Tree (*Samanea saman*), Money Tree (*Dracaena marginata*), Autograph Tree (*Clusia rosea*), Octopus Tree (*Schefflera actinophylla*), Plumeria (*Plumeria spp*.), Coconut Palm Tree (*Cocos nucifera*), hibiscus (*Hibiscus spp.*), Fiddlewood (*Citharexylum spinosum*), Wedelia (*Complaya trilobata*); sweet potato (*Ipomoea batatas*); plantain weed (*Plantago major*); red and green *ti* plants (*Cordyline fruticosa*); aloe (*Aloe vera*), and torch ginger (*Etlingera elatior*).

CULTURAL AND HISTORICAL CONTEXT

The island of O`ahu ranks third in size of the eight main islands in the Hawaiian Archipelago. The Wai`anae and Ko`olau Mountain ranges were formed by two volcanoes. Through the millennia the constant force of water carved fertile amphitheater-headed valleys and rugged passes eroded at lower elevations providing access from one side of the island to another (Macdonald and Abbott 1970).

TRADITIONAL AND HISTORICAL SETTING

POLITICAL BOUNDARIES

Traditionally, the division of land into districts (*moku*) and sub-districts (*`ili*) was said to be performed by a ruling chief, who was chosen by the islands' chiefs to be the *mō`īho`oponopono o ke aupuni* (administrator of the government; Kamakau 1991). Land was considered the property of the king or *ali`i `ai moku* (literally, the *ali`i* who eats the island/district), which he held in trust for the gods. The title of *ali`i `ai moku* ensured rights and responsibilities to the land, but did not confer absolute ownership. The king kept the parcels he wanted, his higher chiefs received large parcels from him and, in turn, distributed smaller parcels to lesser chiefs. The *maka`āinana* (commoners) worked the individual plots of land.

In general, several terms, such as *moku*, *ahupua`a*, *`ili* or *`ili` āina* were used to delineate various land sections on all the islands. A district (*moku*) contained smaller land divisions

(*ahupua`a*) that customarily continued inland from the ocean and upland into the mountains. Extended household groups living within the *ahupua`a* were able to harvest from both the land and the sea. Ideally, this situation allowed each *ahupua`a* to be self-sufficient by supplying needed resources from different environmental zones (Lyons 1875:111). The *`ili `āina* or *`ili* were smaller land divisions next in importance to the *ahupua`a* and were administered by the chief who controlled the *ahupua`a* in which it was located (Lyons 1875:33; Lucas 1995:40). The *mo`o`āina* were narrow strips of land within an *`ili*. The land holding of a tenant or *hoa `āina* residing in an *ahupua`a* was called a *kuleana* (Lucas 1995:61). The present project area is located in Wai`anae Uka Ahupua`a.

As a single land division, the *ahupua`a* of Wai`anae was unusual in that it crossed over the entire Wai`anae Mountain Range, the inland plateau of O`ahu and a third mountain slope on the leeward side of the Ko`olau Mountain Range. The historic era boundaries separating Wai`anae Kai and Wai`anae Uka are delineated at the summits of the central Wai`anae range. At least two significant landforms occur at the summit boundary: Mount Ka`ala, the highest peak on O`ahu, and Kolekole Pass, a prominent dip in the Wai`anae mountain range. Kolekole Pass provided an accessible, lowland passage between Wai`anae Kai and Wai`anae Uka. The fission of various Hawaiian *ahupua`a*, such as Wai`anae Uka and Wai`anae Kai, were a common occurrence during pre-Contact (pre-1778) times and especially in the Historic Period (Cordy 1994:17).

The separation of the Wai`anae Ahupua`a into two portions may have transpired during historic times as a result of land subdivisions during the Māhele (ca. 1840s). Some *ahupua`a* may have been subdivided during this time so that land could be allocated to a number of chiefs or *konohiki* or for the sole purpose of public sale (*ibid*). Wai`anae Uka Ahupua`a and Wahiawa Ahupua`a, located to the north, are within the present day District of Wahiawa, while Wai`anae-Kai and several other leeward *ahupua`a* are part of the Wai`anae District. Similar to the fission of *ahupua`a*, island districts were also subdivided or new ones became developed, mainly for political reasons or matters of convenience (Coulter 1935:214).

In accordance with Act 84 of the Session Laws of 1909, the districts of `Ewa and Wai`anae were created [in 1859 both district areas were in the `Ewa District (*ibid*: 216)] and Wai`anae Uka Ahupua`a was placed in the Waialua District (*ibid*: 220). The year 1909 was also when Schofield Barracks Military Reservation began to be constructed (Pukui *et al*. 1974:210).

In 1913 a new district named Wahiawa was created to include the *ahupua`a* of Wahiawa and Wai`anae Uka (Coulter 1935:221).

TRADITIONAL SETTLEMENT PATTERNS

Archaeological settlement pattern data suggests that initial colonization and occupation of the Hawaiian Islands first occurred on the windward shoreline areas of the main islands between A. D. 850 and 1100, with populations eventually settling in drier leeward areas during later periods (Kirch 2011). Although coastal settlement was dominant, Native Hawaiians began cultivating and living in the upland *kula* (plains) zones. Greater population expansion to inland areas began around the 14th century and continued through the 16th century. Large scale, or intensive, agriculture was implemented in association with habitation, religious, and ceremonial activities.

The Hawaiian economy was based on agricultural production and marine exploitation, as well as raising livestock and collecting wild plants and birds. Extended household groups settled in various *ahupua`a*. During the pre-Contact Period, there were primarily two types of agriculture, wetland and dry land, both of which were dependent upon geography and physiography. River valleys provided ideal conditions for wetland *kalo* (*Colocasia esculenta*) agriculture that incorporated pond fields and irrigation canals. Other cultigens, such as *kō* (sugar cane, *Saccharum officinaruma*) and *mai`a* (banana, *Musa* sp.), were also grown and, where appropriate, such crops as *`uala* (sweet potato, *Ipomoea batatas*) were produced. This was the typical agricultural pattern seen during the pre-Contact Period on all the Hawaiian Islands (Kirch and Sahlins 1992, Vol. 1:5, 119; Kirch 1985).

PRE-CONTACT (PRE-1778 A.D.)

Traditional and historical accounts portray the central plateau of O`ahu as being an important birthplace and population center for the Hawaiian chiefs (*ali`i*). The birthing place of Kukaniloko is located on the north side of Kaukonahua Stream in present day Wahiawa Ahupua`a, or what was once within Kamananui Ahupua`a, in the District of Waialua (Kirch and Sahlins 1992, Vol.1:19). Kukaniloko is said to have represented one of two famous *ali`i* birth places in Hawai`i, with Holoholoku on Kaua`i being the other (Kamakau 1992:38). Kukaniloko was originally established as a birth place by the chief Nanakaoko and his wife Kahihiokalani for the birth of their son Kapawa (Fornander 1980:20), which based on genealogical lines, may have transpired during the 1300s (Yent 1995). The royal lineage of Nanakaoko was appropriated by his father, who represented one of several families initially settling the Hawaiian Islands from

southern origins (Fornander 1919, Vol.6:247). This family consisted of three main branches named Nanakaoko, Nanakulei, and Nanamaoa, all of whom lived in central O`ahu at Wahiawa and Lihue (*ibid*).

Since the creation of Kukaniloko as an important *ali`i* birthplace, the *ali`i* subsequently born there were considered "born in the purple" and they "enjoyed the distinction, privileges, and tabus which that fact conferred" (*ibid*). These chiefs were also regarded as the *akua* of the land as well as *ali`i kapu* (Kamakau 1992:53). Some of the many distinguished *ali`i* born at the birth place includes the chiefess Kukaniloko, a high chiefess of O`ahu for whom the stone is named (Fornander 1980:Vol.11:20), her daughter Kalai-manuia, and the "wise, firm, and judicious chief" of O`ahu, Ma`ili-kukahi (*ibid*: 89), among many others. The *ali`i mo `i* Ma`ili-kukahi was known as a benevolent chief whose *kulanakauhale* or "village" (Pukui and Elbert 1981:165) included the land between Oahunui and Halahape in Waialua (Kamakau 1991:55). He was considered to be a "religious chief" who refused to conduct human sacrifices; such was "the way of Kukaniloko chiefs" (*ibid*).

The significance of Kukaniloko as a birthplace for *ali`i* was perpetuated into early historic times. According to Kamakau, Kamehameha I brought Keopuolani to Kukaniloko to give birth to their son Liholiho. However, Keopuolani left Kukaniloko without giving birth (Kamakau 1991:38). A slightly different story is accounted by Fornander (1969: Vol.2:21) in which he states that Keopuolani was not able to go to Kukaniloko because she was too ill.

After the birth of an *ali`i,* the child was taken into the *waihau heiau,* Ho`olonopahu, located "a furlong and a half" to the south of Kukaniloko (Kamakau 1991:38). With the help of 48 chiefs, the navel cord of the child was cut in the *heiau.* The birth of an *ali`i* was announced by beating the sacred drum Hawea, located to the west of Kukaniloko (*ibid*). Kukaniloko was also considered a *pu `uhonua,* or place of refuge, where a person could be saved after committing murder (`Ī`ī 1959:138).

WAHI PANA (LEGENDARY PLACES)

Mount Ka`ala, located on the *mauka* boundary of Wai`anae Uka, is also accounted for in Hawaiian myth as being close to the home of the goddess Kaiona. Kaiona was known as the "lady of sunshine" and, according to Mrs. Mary Kawena Pukui; the goddess was kind and never harmed anyone (Pukui in Sterling and Summers 1978:133). A pond at the top of Mount Ka`ala

(McAllister's Site 212) is believed to have been guarded by the *mo`o* Kamaoha (McAllister 1933:133.

The project area is located in an area once known as Lihu`e, which served as one of the main residential areas of the O`ahu *ali`i*, between 1400 and 1500 A.D. The place name Lihu`e, translated as "cold chill" (Pukui *et al.* 1974:132), was regarded as once being the home of a mythical figure named Kaupe. Kaupe was a legendary "cannibal dog-man" who was notorious for overthrowing the government of Ka-hanai-a-keakua (reared by gods) and ruled the land from Nu`uanu (Beckwith 1970:345). Kaupe ate people from O`ahu and Maui but never attacked high chiefs. He was finally killed by a Hawai`i chief who had learned the prayer for killing an enemy (*ibid*).

The Kolekole Stone (McAllister Site 214; Figure 4) is located just above the pass and it was the only site recorded by McAllister (1933) that the Bishop Museum was able to relocate during their late 1970s survey (Rosendahl 1977: vol. 2:35). The Kolekole Stone was known as a place where students of warfare would practice *lua* fighting (Stokes in Sterling and Summers 1974:135). *Lua* was a fighting technique that included bone breaking, dislocating joints, and provoking pain by pressing on nerve centers (Pukui and Elbert 1981:213). Stokes asserts that the *lua* students would wait for passing victims to practice their combat techniques on the "plains of Leilehua" (*ibid*). Leilehua was a historic-era name of the western plains of the central plateau of O`ahu, which included Wai`anae Uka (Tomanari-Tuggle 1994:14).

The Kolekole Stone is said to represent the female guardian of the pass named Kolekole (McAllister 1933:134). The stone contains ribbed depressions on its sides which may have formed a drainage of sorts ascending from a basin in the top of the stone (*ibid*: 14). McAllister

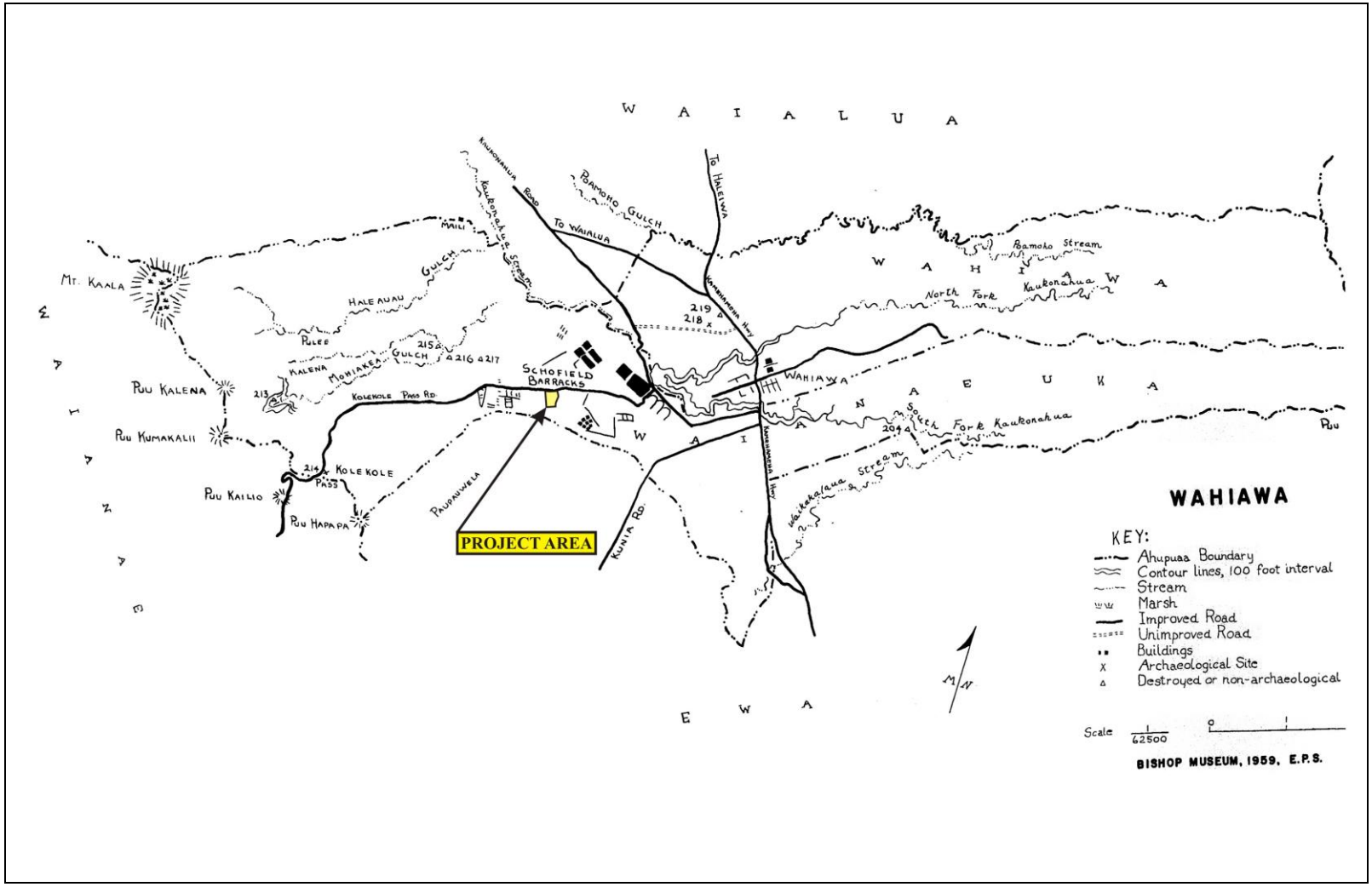

Figure 4: Wahiawa (Waianae Uka) District Map (Sterling and Summers 1978) Showing Project Area Location.

discredits a story that the stone was used as a platform for decapitating people, as he believed that such a story was started as a joke (*ibid*).

POPULATION CENTERS

Wahiawa, Halemano, and Lihu`e are mentioned by Kamakau as being chiefly settlements on the central plateau associated with the *loa li`i* (Kamakau 1991:40). These chiefs were considered to be gods that resembled men and they were classified as such because they "lived there continually and guarded their *kapu* (from whom a 'guaranteed' chief might be obtained, *loa`a*)" (*ibid*). Other chiefly settlements, including Oahunui and Kukaniloko, are also mentioned in legends and historical accounts.

Wahiawa, a traditionally named population center (Kamakau 1991:40) and historic *ahupua`a* that borders the Schofield Barracks Military Reservation (SBMR), is literally translated as "place of noise" apparently because rough seas could be heard there (Pukui *et al.* 1974:218). The suggested origin of these rough seas is along the Waialua coast, as is described in the legend of Hi`iaka's journey when she crosses over the region. In a portion of a chant translated in Henry *et al.* (1992:4), Hi`iaka hears the noise of the waves in Wahiawa:

At Waialua is the great voiced ocean
Heard to the uplands of Lihu`e,
Rumbling atop Wahiawa,
Deafening is the voice of the sea,
It is a deafening voice,
Indeed the ocean has a voice

The settlement of Halemano, also referred to as Helemano on United States Geological Survey Topographic maps or Halemanu (McAllister 1933:137), was at one time associated with a cannibalistic chief known as `Aikanaka ("man eater"), Kalo`aikanaka, Kalo, or Keali`i`aikanaka (*ibid*). `Aikanaka's people lived in the area of "Halemanu" in Pa`ala`a, not far from `Aikanaka's house and ceremonial feasting grounds where human flesh was cooked and eaten (McAllister 1933:137, Beckwith 1970:340-341). `Aikanaka's people "were darker than the Hawaiians, with a different speech and no tapu laws" (Beckwith 1970:341). Some suggested that `Aikanaka's people were foreigners who came from the "South Seas" and after being driven out of Kaua`i, and then Mokule`ia and Waialua, they settled in the upper lands of Helemanu (*ibid*: 342; McAllister 1933:138; and Sterling and Summers 1978:111). Beckwith (1970:341) attributes a narrow ridge near Kukaniloko as being a place where "the last cannibals of O`ahu took their stand and seized upon victims for their cannibal feasts."

A settlement referred to as Oahunui was apparently named for the chief Oahunui who once resided there. The settlement of Oahunui was located in proximity to the legendary Oahunui Stone, which may have been near the east fork of Kaukonahua Stream or along the nearby Waiakakalaua Stream to the south of Wai`anae Uka. The Oahunui Stone allegedly embodies the chief Oahunui at the place where he was murdered. The chief Oahunui was known to have been a friend and contemporary of the cannibalistic chief `Aikanaka, from whom he acquired a taste for human flesh (Sterling and Summers 1978:111). According to legend, Oahunui was killed after he arranged his brother-in-law, Lehuanui, to be absent from the village while he ate Lehuanui's two chiefly sons. Upon returning to Oahunui and discovering the deaths of his sons, Lehuanui killed Oahunui, Oahunui's wife (for allowing the murders), and any servants who complied with the killing of his sons. It is believed that each of these individuals turned to stone along the banks of Kaukonahua or Waiakakalaua Stream. In the 1890s, people from Honolulu would ride out to Oahunui and walk around the stone (McAllister 1933:132). Thus, it was contended that "no one could say that he had been entirely around the island of O`ahu unless he had been around this stone" (*ibid*).

A settlement referenced as Lihu`e was inhabited by a long line of chiefs, According to Fornander (1969 Vol.2-85), the inland location of Lihu`e was too remote and distant from the sea for the chiefess Kelea, the Maui wife of the chief Lo-Lale:

> For several years Kelea lived with Lo-Lale at Lihue, and bore him three children...but the inland situation of Lihue, at the foot of the Ka`ala mountains, and far from the sea, became wearisome and monotonous to the gay and volatile temper of Kelea (*ibid*).

The actual location of Lihu`e on the central plateau of O`ahu differs among various historic accounts, Fornander describes Lihu`e as being on the "uplands of the Wai`anae side of Wahiawa" and that it included "Kalena on the plains of Haleauau" (in Sterling and Summers 1978:136). An 1850s land survey similarly refers to the *`ili* of Kalena as being in the district of Lihu`e (Department of Interior, Document 255). In contrast, other accounts given in Sterling and Summers (1978) describe Lihu`e as being in `Ewa just south of Maunaauna and the place name Lihu`e is labeled as an *`ili* south of Maunaauna on an 1881 Hawaiian Government Survey map.

An "ancient Kahua Maika" *(ulu maika* field) once existed at a place called Kokoloea, Lihu`e, where Kuali`i was victorious. The `Ewa chiefs however, made another effort to retrieve

their fortunes, and fought a second battle with Kuali`i at Malamanui and Paupauwela, in which they were worsted and the authority of Kuali`i as *Mō`ī* (monarch) of O`ahu finally secured and acknowledged. Kuali`i and his warriors battled against the chiefly factions of `Ewa and Waialua sometime during the middle to late 1600s (Tomonari-Tuggle 1994:13).

Another famous battle between the Maui chiefdom under Kahekili and the O`ahu chiefdom under Kahahana occurred in the Wai`anae Mountain Range, and at one point in proximity to Kolekole Pass on the western boundary of Wai`anae Uka. Under the direction of Kahekili's warrior Kahahawai, a battle at Niuhelewai was fought between the two factions and afterwards both forces retreated to the mountains of Wai`anae. That evening a crafty battle plan was ordered by Kahahawai, which lead to a successful defeat of the O`ahu forces:

> They were well supplied with war implements and other things necessary for the destruction of their enemies. So Kahahawai told them to prepare torches. When these were ready they went one evening to the top of a hill which was near to the rendezvous of the enemies where they lighted their torches. After the torches were lit they moved away to a cliff called Kolekole and hid themselves there, leaving their torches burning at the former place until they [the torches] died out. The enemies thought that Kahahawai and his men had gone off to sleep. They therefore made a raid on the men of Kahahawai. But Kahahawai and his men arose and destroyed all the people who were asleep on the hills and the mountains of Kaala. Thus, the enemies were annihilated, none escaping. Those who raided the torch encampment were captured, there being no avenue for escape from death and destruction by Kahahawai and his men." (Sterling and Summers 1978:135).

SUBSISTENCE RESOURCES

E.S. Craighill Handy and Elizabeth G. Handy (1972) characterize the central plateau of O`ahu as extraordinary because it represents the most level landscape on the island at such a high elevation (*ibid*: 465). As is evidenced by an abundance of *lo`i* or irrigated taro fields "northwest of the present town of Wahiawa," Handy and Handy contend that the Wahiawa region once had a sizable population (*ibid*: *464*). Sweet potato and yams were also cultivated in the general region, with Wahiawa being known as one of only a few known irrigated sweet potato fields (*ibid*). Although there was some taro cultivated in the valleys of Wai`anae Uka, sweet potato, grown on *kula* lands, is claimed by Handy (1940:75) as being the main vegetable crop in the *ahupua`a*.

Handy and Handy (1972:465) also speculate that Wai`anae Uka residents probably received most of their fish from Wai`anae Kai which was well known for its deep-sea fishery. Freshwater fish were obtained from the streams bisecting the central plateau, as is suggested by a historic reference to a "fishing place" at a locality called Paka (Tomonari-Tuggle 1994:11).

A local informant, Hookala, remembered the presently existing swamp at the top of Mount Ka`ala as being a fish pond, which McAllister called Luakini Fish Pond (McAllister 1933: 133). Hookala mentioned that his father used to obtain fish from the pond at Ka`ala, and back then it was stocked with shore fish, *hinalea, wuwoa,* a kind of mullet and others (*ibid*).

TRANSPORTATION ROUTES

John Papa `Ī`ī (1959) described at least four trail sections that crossed through different portions of Wai`anae Uka. Although `Ī`ī observes that these trails were in use during the historic period, it is likely that some were used during the pre-Contact period. The main travel route in central O`ahu extended in a roughly north-south direction between the north and south shores of O`ahu.

Two additional trails in Wai`anae Uka (or close by) extended to the east and west of the main trail. One of these spur trails connected to the place name Oahunui (*ibid*: 99) which was located somewhere near the south fork of the Kaukonahua Stream or nearby Waikakalaua Stream, in proximity to the legendary Oahunui Stone. The trail to Oahunui was probably the same travel route used during the 1890s by people from Honolulu who would ride out to Oahunui and walk around the stone (McAllister 1933:132). The other trail that extended to the west of the main trail is said to have begun at Kukaniloko from which point it crossed through Wai`anae Uka and ascended over Kolekole Pass (`Ī'ī 1959:96-97).

John Papa `Ī`ī (*ibid*) tells of a "long cliff trail called Elou" that passed over Mount Ka`ala to eastern Wai`anae from Kaukonahua Gulch. The Elou Cliff trail was described as running through Hale`au`au and Kalena in Wai`anae Uka (*ibid*).

POST-CONTACT PERIOD (POST-1778)

Following the first western contact to Hawai`i (*ca.* 1778), the onslaught of foreigners to the Hawaiian Islands brought a series of transformations to the natural and cultural landscapes throughout the island chain.

Victualing to the foreign shippers necessitated an increase in surplus of traditional crops (taro, sweet potato, and bananas) and the introduction of new western crops (Cuddihy and Stone 1990:37), such as Irish potato, cabbage, watermelon, and squash.

The establishment of mission stations in Waialua, Wai`anae and `Ewa resulted in improved roadways, such as the traditional route across the central plateau and across Kolekole Pass. In 1837 Reverend Emerson, pastor of the Waialua mission station, reported that the traditional Kolekole Pass trail was converted to a more traversable horse trail:

> During the year past, a number of patches of road have been made, which considerably facilitate our access to some remote parts of the station and to Waianae. The pali between Waialua and Waianae, which formerly rendered the latter place inaccessible from Waialua except on foot, has been so improved that a horse can be rode up and down without difficulty (Emerson 1837: Missionary Letters).

The over-harvesting of sandalwood and the taking of other timber for whaling ships to "fuel the boilers that rendered whale blubber into oil" (Cuddihy and Stone 1990:38) resulted in the destruction of many native trees. The central plateau of O`ahu was often exploited for its sandalwood by the O`ahu chiefs, commonly to satisfy debts to the King (Kamakau 1992:251-252). Wahiawa in particular was famous for its large sandalwood trees (*ibid*: 207). The virtual devastation of most of the sandalwood forest was swiftly facilitated when the trees became more rare and the method of locating them was to burn the forest and identify a tree by the burning fragrance of sandalwood (Bishop in Tomonari-Tuggle 1994:17).

Foreign diseases probably had the most adverse effect on the native Hawaiian population. Reverend Artemis Bishop (1849: Missionary Letters) described a measles epidemic that devastated the Wai`anae and `Ewa native communities between 1848 and 1849:

The past has been a year of trials and sorrows among my people in passing through scenes of sickness and death, beyond what I had ever witnessed... how strikingly their former athletic frames and warlike habits contrast with their present enfeebled and effeminate bodies.

> Middle of October the measles broke out and spread like wildfire...burning the dead was the great work, all other occupations were suspended and people staggered about like walking corpses.

LAND TENURE

Another conspicuous effect of the ever-growing influence of foreigners in Hawai`i was the systematic division of lands, called by some the "Māhele," or "great division." The Land Commission oversaw land divisions of three groups, Crown Lands (for the King), Konohiki Lands and Government Lands, all of which were "subject to the rights of native tenants" (Chinen 1958). With the exception of the *`ili* of Kalena, the *ahupua`a* of Wai`anae Uka was designated as Crown Lands and no *kuleana* were claimed.

Kalena`Ili was a narrow tract of land (approximately 533 acres) that extended from near the 1000-foot elevation to the steep mountain peaks of the Wai`anae Range. At an unknown date, prior to Pahoa's death (ca.1848), half of Kalena `Ili (266.3 acres) was granted to him as Land Commission Award No. 16 (Records of the Board of Commissioners to Quiet and Titles). The remaining half of Kalena `Ili was granted to John Meek (Landrum *et al*. 1994:30).

In 1851 Pahoa's half of Ka`ena was conveyed to Rev. Artemis Bishop as Land Grant No. 527. In addition to being pastor of the `Ewa and Wai`anae mission stations, Rev. Bishop participated in many "surveying expeditions," which he emphasizes was done primarily for exercise (Bishop 1851: Missionary Letters). Bishop's survey data of Kalena, consisting of boundary descriptions and a corresponding sketch map, provides a hint that traditional practices were maintained in Kalena during this period; he wrote:

> I can devise no method to divide the land without spoiling its value. The lower part is a ravine and contains taro patches for 4 or 5 families. The Upper part is stony and mountainous and is only fit for pasture (Department of the Interior Document 255).

Bishop's sketch map denotes the locations of at least six houses. These were likely inhabited by the 4 or 5 families whom the taro patches belonged to (*ibid*). Interestingly, Rev. Bishop writes in his survey notes that the *`ili* of Kalena was in the "District of Lihue, Wai`anae, Oahu," again suggesting that the traditional place name of Lihu`e probably included the western lands of Wai`anae Uka. It is suggested that an additional district named Lihu`e may have existed among the central plateau of O`ahu.

On June 9 of 1851, the Rev. Bishop and his wife sold the property to John Meek (Bureau of Land Conveyances, Book 17: 148), whom later acquired the entirety of Wai`anae Uka for ranch lands. As Crown Land, the remaining land of Wai`anae Uka was leased to various foreign

entrepreneurs, who were in one way or another involved with cattle ranching on the central plateau of O`ahu between the years 1875 and 1887, and the initial purchase of Wai`anae Uka in 1889 by J.I. Dowsett.

Prior to its being leased, sometime during the reign of Kamehameha IV (1855- I863), the *ahupua`a* of Wai`anae Uka was reportedly given by the King to a lawyer and legislator named Mahoe (Tomonari-Tuggle 1994:22). No records exist that confirm this land allocation. However, it is said that Mahoe's claim to Wai`anae Uka "was later lost during the overthrow of the monarchy" (*ibid*). Nedbalek (1984) suggests that Kaliikaua wanted Wai`anae Uka for his own and in exchange, he gave Mahoe a land plot in Honolulu. According to a 1900-1901 Waialua Agricultural Co. map and grant records (on microfilm in the State Division of Land Management, DLNR), the area currently considered to be a northern section of western Wai`anae Uka, between the prominent Pu`u Pane ridge and north boundary of Wai`anae Uka, was subdivided into 9 grants referred to as the Maile Grants. Tomonari-Tuggle (1994:20) compiled a summary of these leaseholds:

WAIANAE UKA LEASEHOLDS:

1875 - May I

• 10-year lease for the lands of Wai`anae Uka and Pouhala Uka (except for timber trees) to the heirs of John Meek, who died on January 20, 1875 and James Dowsett; lease was $500.00 per year (Liber. 43 p. 97-101).

1879 - February 1

• The Meeks transferred their lease to James I. Dowsett; on the same day, Dowsett surrendered the lease to the Crown Lands Estate (Liber. 70, p. 424).

1882 - January 14

• Crown Lands Estate awarded a 30-year lease (at $500/year*)* to Hervey E. Whitney for the lands of Wai`anae Uka, Waikakalaua, and Pouhala (Brown 1886) "as by survey by W.D. Alexander in Crown Land Book of Survey, pages 160, 161, 162. Except the timber trees and all young trees fit and proper to be raised and preserved for timber trees**".**

• On the same day, Whitney sold 1/3 of the lease to Kalakaua and 1/3 to C.H. Judd for 1.00; the lease included Nanakuli and Aiea (Liber. 76, p. 140) and Whitney and Judd sold 2,000 head of cattle called the "Meek herd" to Alexander J. Cartwright and George Galbraith for $30,000; it also appears that Whitney assigned his lease to Cartwright and Galbraith (Liber. 70, p. 428).

1887 - November 21

• Kaliikaua transferred a deed to trustees of his estate, C.H. Judd, S.M. Damon, C.P. Iaukea, and A.J. Cartwright (Liber. 105, p. 268).

1889 - March 12
• Leilehua Ranch sold at auction to James I. Dowsett for $41,500; the ranch included 20,000 acres stretching from `Ewa to about 5 or 6 miles south of Waialua, 3,000 head of cattle and other stock; was owned by Kalakaua and C.H. Judd (p.C. Advertiser 1889).

1889 - March 21
• Deed formally transferred to J.1. Dowsett; it included Kalauao Ewa, Nanakuli, Wai`anae Uka, Pouhala, Waikakalaua, Ke`elikolani taro patches at Waiawa, Kalena at Wai`anae, Aiea, as well as 2,500 to 3,000 head of cattle, 23 work horses, colts, and two mules, three ox carts and yokes, and "all that property known as Leilehua Ranch", including among other things, all "cattle branded with a crown" (Liber. 112, p. 401.).

The boundaries of the nine grants extended on their *mauka* ends from a common point on P`u Pane (at a "Koa tree") and terminated at their widest points along the northwest side of Hale`au`au Stream or Kaukonahua Stream to the north. These grants were acquired between 1851 and 1853, and all but one of the grants (Grant 629, purchased by Mark Ivers) was associated with Hawaiian names (Index of Grants 1916). An 1881 survey map shows the location of a dairy on the opposite (southeast) side of Iver's grant land, thus suggesting that Ivers was affiliated with cattle ranching. All nine grants were clearly designed to incorporate the resources of Hale` au` au or Kaukonahua Stream into the widest portions of each parcel.

In 1846 the east half of Waikakalaua, an 836-acre land parcel south of the present Wai`anae Uka boundaries, was conveyed to John L. Gilman (Grant 6) for the price of $1.00 (on microfilm in the State Division of Land Management, DLNR). The west half of Waikakalaua was retained as Crown Lands. A metes and bounds map of Grant 6 identifies the land immediately east of the grant, and within Wai`anae Uka, as Oahunui. A "rock at Oahunui" is shown as a boundary marker at the northeast corner of the grant.

RANCHING (CA. 1840 TO 1928)

John Meek, one of the earliest lease holders of Wai`anae Uka, was a well-known ship captain and Honolulu harbor master (*ibid*: 19). He was also a prominent O`ahu cattle rancher. The success of Meek's ranching endeavors on the central plateau of O`ahu is elaborated in the later 1922 account:

> The days are recalled, also, when Captain Meek controlled Lihue and Wahiawa on Oahu under lease from the government. He raised thoroughbred horses, and his daughters rode the finest in the island. The Meek animals were known all over the group, especially his white horse which he called "Pu-a". His oldest daughter, Eliza, was often seen riding

> the horse through the streets of Honolulu garbed in a wonderful pa-u with a dozen or more followers wearing the same color of fluttering skirt garment (Taylor 1922:223 in Tomonari-Tuggle 1994: 19).

An 1881 Government Survey map shows a house labeled as "Crabbe" near Kokoloea at the center of Wai`anae Uka. This was probably a ranch house once occupied by Horatio Crabbe and his wife Elizabeth Meeks Crabbe, the daughter of John Meeks. Horatio Crabbe was also the executer of John Meek's will (*ibid*: 22). This same house was considered to be the "old Dowsett ranch house" by Alika Dowsett, the son of James Dowsett (Meek's lease partner of the land). Wai`anae Uka was part of the Meek and/or Dowsett Ranch until 1879, at which time both families relinquished the lease back to Crown Lands (*ibid*).

Kalakaua apparently named the Wai`anae Uka ranch lands "Leilehua" and in 1882, this land was the two-thirds portion of the land leased to Kalakaua and C. H. Judd (Tomonari-Tuggle 1994:20). Kalakaua and Judd built a hunting lodge in Wai`anae Uka as a retreat, where they were known to have entertained other people of influence (Nedbalek 1984: 13). This lodge was named "Malamanui" by Kalakaua and is said to have been located where the former Schofield Golf Course was located.

Malamanui is also mentioned by Papa `Ī`ī (1959:97) as being a place that the Kolekole trail passed through. In an effort to payoff some large national debts accumulated by Kalakaua as a result of his extravagant lifestyle, Leilehua Ranch was sold to the original lease holder, James I. Dowsett, and maintained as a ranch up into the early 1900s (Tomonari-Tuggle 1994:20).

During the late 1800s, when much of Wai`anae Uka was part of the Meek Dowsett`s ranch lands, the 1878 government census indicated that 19 households still existed there, including 54 males and 41 females. All but 12 of the 96 residents were reported to be of Hawaiian ethnicity, and all but two of the names were Hawaiian names (*ibid*: 24). An 1886 photograph of what appears to be Waiele Stream gulch is evidence that irrigated taro *(lo`i*) was still being cultivated in Wai`anae Uka during the late 19th century. This photograph also shows the presence of a humble residence next to the taro fields.

A 1911 "Map of Taro and Watered Lands in the Kaukonahua Gulch" (Gomes 1911) shows the locations of several, presumably 18th century historic house sites, an area of graves, and a multitude of taro lands along the banks of Kaukonahua Stream west of the Wahiawa Dam. One of these house sites appears to have been located within the present day SBMR, at the

confluence of Mohiakea and Kaukonahua stream gulches. The area of graves indicated on the map seems to lie roughly north of the present day Wright-Smith Avenue in Schofield Barracks.

MILITARY OCCUPATION (1899 THROUGH PRESENT)

In 1899 Wai`anae Uka was formally set aside by the U.S. government as a military reservation. However, it was not until 1909 that temporary and permanent barracks were constructed on the western central plains of Wai`anae Uka and occupied by army personnel. Most of the buildings and training infrastructure initially planned for Schofield Barracks were completed during the early 1920s, after World War 1. At the beginning of World War II, Schofield Barracks offered the only major training area in the Hawaiian Islands. The military base was also targeted during the infamous Japanese attack on O`ahu on December 7, 1941. Presently, the land of Wai`anae Uka is completely under U.S. military jurisdiction. The lower portion of Wai`anae Uka west of Wilikina Drive is encompassed by the Schofield Barrack's residential and operational facilities. Three training ranges *(i.e.,* Impact Area, South Range and East Range) and forest reserve land comprise the remaining portion of Wai`anae Uka.

Patricia Alvarez in *A History of Schofield Barracks Military Reservation* (1982) provides a detailed account of the history and modern events associated with the U.S. military occupation of Wai`anae Uka. The historical sequence of military use of Wai`anae Uka *(ca.* 1909-1946) began in the year 1899 when Wai`anae Uka (with the exception of Kalena `Ili) (*ibid*: 9*)* was set aside as a United States military reservation (Executive Order G. O. 147). The initial intent was that the reserve be a place for soldiers to recuperate after fighting in the Philippines (O'Hare *et al*. 1993: A-7).

The location of Wai`anae Uka was also considered to be advantageous as the "base for Oahu's mobile defense troops because of its strategic central location on the island" (Tomonari-Tuggle 1994:25). Despite the 1907 request of the Hawaiian Governor Walter Frear to reserve Wai`anae Uka for homesteading (Alvarez 1982:21), the U.S. military first occupied the central plains of Wai`anae Uka in 1909. The pioneer group, consisting of 473 men from the 5th Cavalry Regiment, was housed in temporary and permanent structures (Tomonari-Tuggle 1994:27) in the southeast coner of modern day Schofield Barracks.

Schofield Barracks was originally called Castner Village, named after Captain Castner who initiated the construction of the barracks and associated structures (Alvarez 1982:25). In April 1909, the military settlement was formally named Schofield Barracks, in honor of a former

Commanding General of the U.S. Army, Lt. General John M. Schofield. According to a 1910 Reservation Map of Schofield Barracks, a network of Oahu Sugar Co. ditches and associated tunnels extended across the Wai`anae side of the reservation between Waiele Stream (near a cantonment), and Hale`au`au, Kalena and Mohiakea streams to the northwest.

By 1916 several new barracks were constructed at Schofield Barracks, each of which were designed to be self-contained units and included kitchen and mess hall facilities, eight squad rooms, and an administration building. The administration building provided housing and office space for the residents, as well as reading and music rooms, and a medical examination room. The top third floor of each newly constructed barrack housed a large auditorium that had a stage and orchestra pit (*ibid*: 34).

Although a pause in construction occurred during World War I, following the declaration of war in 1917, most of the major building projects initially planned for Schofield were finished in the early 1920s (*ibid*: 42). Such projects included the construction of general officer's bungalows in 1918, the 1919 and 1923 construction of new artillery barracks for the increasing number of artillery troops at Schofield (located away from the infantry and cavalry areas), the 1920 and 1921 construction of new infantry barracks, and the addition of many officer's quarters in association with the infantry and cavalry sections (*ibid*: 43).

During the Japanese attack on O`ahu on December 7, 1941, Schofield Barracks received minimal damage in the form of bullet holes in buildings, such as Carter Hall, Upper Post storage tanks, and building T-1632. The attack gave the Post's 25th Division the distinction of being the first army unit to receive hostile fire in the war. The 25th Division units were responsible for shooting down one Japanese fighter plane and one American fighter plane (*ibid*: 64-65).

At the beginning of World War II Schofield Barracks comprised the only major training area in the Hawaiian islands, which included artillery ranges, small arms firing ranges, and bayonet and obstacle courses (*ibid*: 69). Soon after, larger facilities were constructed to accommodate the newly established Ranger Combat School "whose objective was to toughen the soldier for the jungle's rigors" commonly experienced in the Pacific battleground *(ibid.)*. By the end of World War II (this marked by the Japanese surrender in 1945) the population at Schofield Barracks decreased to just 5,000 individuals (*ibid*: 74).

Currently the Schofield Barracks Military Reservation comprises three active training ranges: the Impact Area, South Range and East Range. The Impact Area, containing approximately 2,800 acres, encompasses the lower slope of the Wai`anae Range west of the main Schofield Barracks housing and administration area. This range is the primary range for live mortar and artillery firing, but is also used for field training of squad and platoon size units, headquarters, elements and service support units. The South Range, just south of the Impact Area, is commonly used for field training of headquarters and service support units. At the time of the 2010 U.S. Census, Schofield Barracks contained a population of 16,370 (United States Census Bureau Website (http://quickfacts.census.gov/qfd/states).

PREVIOUS ARCHAEOLOGICAL RESEARCH

A number of archaeological and science-related studies have been conducted in Wai`anae Uka (McAllister 1933; Griffin and Yent 1977; Rosendahl 1977; O'Hare *et al.* 1993; McIntosh *et al.* 1994a and 1994b; and Tomonari-Tuggle 1994) (Figure 5). Sterling and Summers (1978) provide information regarding legendary sites and some of the previously recorded archaeological sites on the Schofield Barracks Military Reservation.

Archaeological sites were observed in the western portion of Wai`anae Uka by Bishop Museum Zoologist W.A. Bryan in 1901. While on route to Hale`au`au Valley (written as "Hale o o") from a cabin to the south, Bryan observed "as many as perhaps a dozen stone enclosures, which probably were the walls of old dwellings" (Bryan 1901). Bryan describes "Hale o Temple" as being "farther down the valley" from the settlement, below a large enclosure *(ibid).* The large enclosure measured 190 ft. by 100 ft. and had an elevated "square place" in one of its coners (*ibid*). At a vantage point at "Hale O Temple," Bryan observed walls "a few hundred yards" down the valley that he hypothesized as being "the house of a thrifty kanaka country gentleman surrounded by his lots and pens" (*ibid*). Further up in this same valley, Bryan observed the "remains of ancient kalo ponds".

The earliest formal archaeological work in the region was done during a 1930 island-wide survey by J. Gilbert McAllister, under the auspices of the Bishop Museum. McAllister (1933) recorded seven sites in Wai`anae Uka. All but one of these sites were located in the western portion of Wai`anae Uka, along the northeast slope of the Wai`anae mountain range.

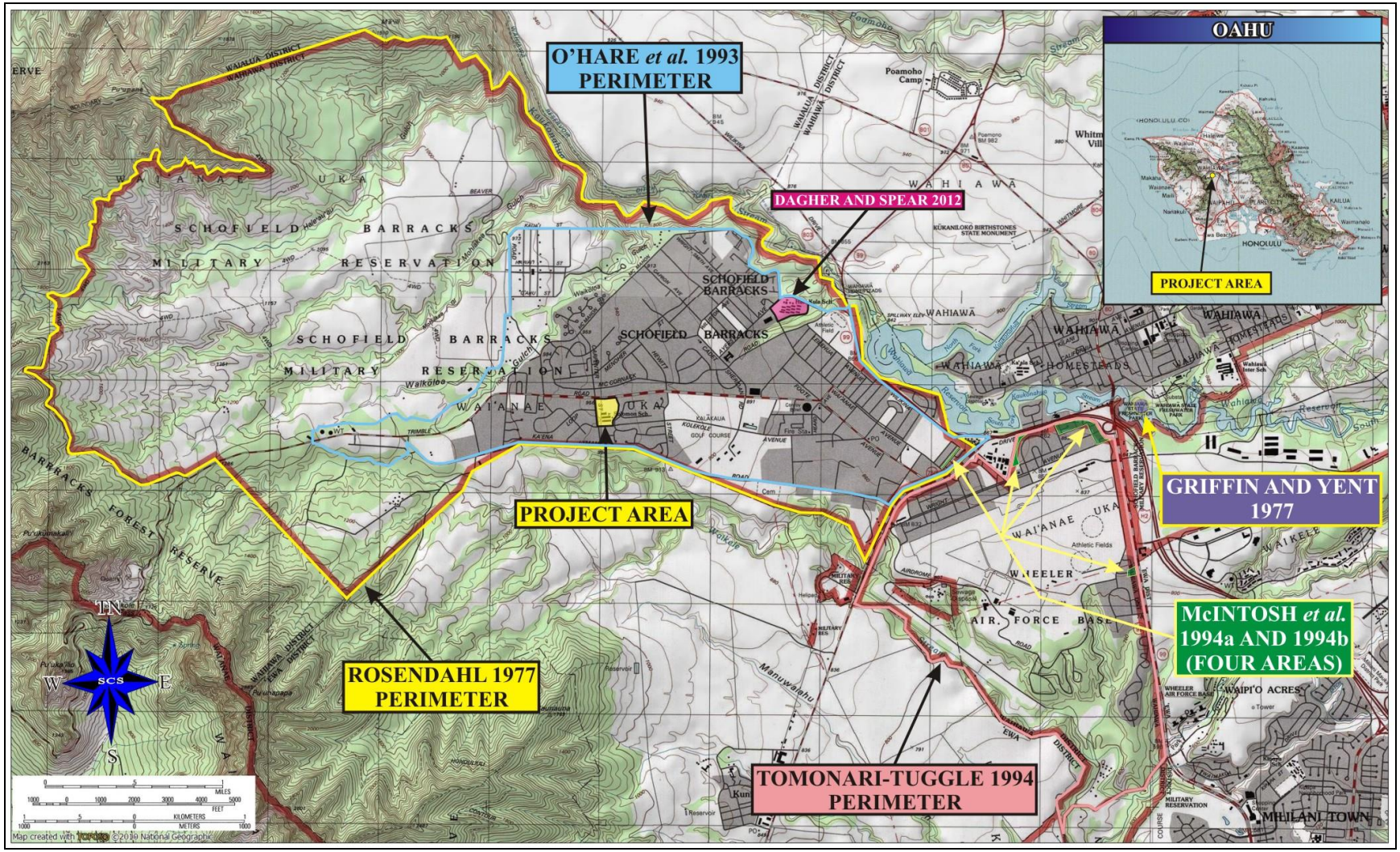

Figure 5: USGS Quadrangle (Schofield Barracks 1998) Map Showing Previous Archaeological Projects Conducted in the Vicinity.

The sites documented by McAllister (1933 in Sterling and Summers 1978:134-137) consisted of two *heiau*, and a habitation site located near Mohiakea Gulch, the "Kolekole Stone" (Site 214) near Kolekole Pass, Kumakalii Heiau (Site 213) in Pukaloa Gulch below Pu`u Kumakali`i and Pu`u Kalena, and Luakini Fishpond at the top of Mauna Ka`ala (see Figure 4). In the east portion of Wai`anae Uka, McAllister recorded the "Oahunui Stone" (Site 204), on the South Fork of Kaukonahua Gulch. McAllister (1933 in Sterling and Summers 1978: 132, 137) noted that all but three of the seven sites had been destroyed and one site, the fishpond on top of Mauna Ka`ala, was no longer an active fishpond, but a swamp. Twenty years later, Thomas McGuire contended that it was unlikely that the swamp at Mt. Ka`ala was ever a fishpond because of the lack of dykes or stone walls necessary to contain such a pond and the apparent old age of the vegetation growth in the marsh (McGuire in Sterling and Summers 1978: 132).

Of the more eminent sites recorded in the area by McAllister were the Kukaniloko birth stones and the associated Ho`olonopahu Heiau (McAllister 1933: 134-137), located in Wahiawa just north of Schofield Barracks. Unfortunately, nothing remained of Ho`olonopahu Heiau at the time of McAllister's survey and the surrounding land was planted in pineapple (*ibid*).

Three *heiau* have been recorded in Wai`anae Uka within the western portion of the SBMR. Kumakali`i Heiau was recorded as being in the upper part of "Pukaloa Gulch" (McAllister 1933: 133) at approximately the 2,200 foot contours (State Historic Preservation Division, Kapolei, files). Pukaloa Gulch, also named by Bryan (1901) in his explorations, seems to refer to present day Kumakali`i Stream valley.

Hale`au`au Heiau (McAllister Site 215) was shown by Sterling and Summers (1978) as being located on the west side of the confluence of Kalena Gulch and Mohiakea Gulch (see Figure 4). McAllister described the *heiau* to be on the side of "Pukaloa Gulch" (McAllister 1933: 133), which may be an older name for Mohiakea Gulch. However, the *heiau* name suggests an association with Hale` au` au Stream located north of Kalena and Mohiakea. This location is further supported by a McAllister (1933) photograph of Hale`au`au Heiau that exhibits a closer back drop of the Wai`anae Mountain range and road (currently called Firebreak Road) than would be expected if the site was located at Kalena and Mohiakea.

Hale`au`au Heiau (McAllister Site 215) was described by McAllister as a stepped platform with a pit feature, situated on "a natural hill on the side of the gulch" (*ibid*: 134-135). Although Hale`au`au Heiau was reportedly in better condition than the other two *heiau*, most of its features had been destroyed by artillery as the site was located on the edge of a military firing range.

The location of Kalena Gulch Heiau (McAllister Site 217) is more questionable as it was identified by McAllister as being located "in Kalena Gulch on the land of Mohiakea" (*ibid*: 134). However, Sterling and Summers (1978) shows the location of Kalena Gulch Heiau as being on the upper plateau about 100 feet to the east of the confluence of Kalena Gulch and Mohiakea Gulch (see Figure 4). McAllister (1933) reported that Kalena Gulch Heiau had been completely destroyed by artillery because it was also located on a military firing range. Local residents once claimed that an underground "tunnel" containing burials existed in Kalena Gulch Heiau (*ibid*: 134).

Thrum (1907 in McAllister 1933: 133-134) describes Kumakali`i Heiau (McAllister Site 213) as being "an important heiau in its day and of large size; visited by Kalakaua in the '70s". McAllister (*ibid*: 134) reported that Kumakali`i Heiau was dismantled and "the stones were used in the building of the Wahiawa dam "located nearly 5 miles to the east of the site". A local informant (in Tomonari-Tuggle 1994: 14) has mentioned the presence of a "navigational *heiau"*, referred to as "Kumakali`i", located at the base of Maunaauna just south of Kolekole Pass. It is possible that both of these *heiau* named "Kumakali`i" may actually refer the same. That the *heiaus* were placed in two different locations may indicate flaws in the mapping technology of the 1800 and early 1900s.

During the late 1970s, the Bishop Museum conducted a reconnaissance survey of Schofield Barracks, under contract to the U.S. Army Corps of Engineers (Rosendahl 1977). The work included a ground survey that focused on approximately 8% of the total 9,280-acre project and literature research and oral histories. The resulting report presents an inventory of nine sites, including six of the seven sites recorded by McAllister (1933), the Elou Cliff trail (State Site 50-80-08-9516) described by Papa `Ī`ī (1959:97), and two newly identified sites: a series of dryland agricultural terraces (State Site 50-80-08-9527) and a platform (State Site 50-80-08-9528) (Rosendahl 1977: vol. 2-36). Although Papa `Ī`ī's narrative seems to describe the trail as crossing over the east side of Mauna Ka`ala from Hale`au`au and Kalena, Rosendahl (1977) places State Site 50-80-08-9516 in closer proximity to the Kolekole Pass Road (map on file at the State Historic Preservation Division, Kapolei) and Rosendahl (1977) states that the site was "destroyed probably by construction of the present road" (*ibid*).

An archaeological "surface survey" was conducted at the Wahiawa Fresh Water Park situated at the west boundary of the Schofield Barracks Military Reservation's East Range (Griffin and Yent 1977). As a result of this survey, two Historic Era sites were located adjacent to the South Fork of Kaukonahua Stream: an Oahu Railway and Land railroad bed, and a terrace

complex. Griffin and Yent were uncertain whether the terrace complex was prehistoric in origin and historically modified or historic in origin (*ibid*: 2). Likewise, they speculate that either "the terraces may have been used to grow and irrigate wild taro" or they were "used to prevent erosion along the slope of the stream bank" (*ibid*).

The "Kalo ponds" observed by Bryan further up Hale`au`au Valley probably correlate with agricultural terraces, `auwai and associated house sites observed in the "Aerial Tram Valley" during an early 1980s botanical survey conducted by the Waimea Arboretum (Powell 1984 letter). On a 1954 USGS Topographical Map of the Island of O`ahu, "Aerial Tram" refers to a dashed line that extends from Hale`au`au Stream valley to the peak of Mount Ka`ala. The following excerpt from Powell's letter to the Army Corp of Engineers provides a detailed summary of the Hale`au`au Valley sites (*ibid*):

> Terraces seen were of loose rock formation. To my untrained eye they seem typical of the walls observed in Waimea Valley. Most appear to be terrace retaining walls... I began counting easily noted walls on my … trek and they numbered 35. I did not count small sections or pieces, only those that were obviously untouched walls. There were 4 sites that might have more significance. They were enclosures of some sort. One was quite intact and measured approximately 10 feet. Another was slightly smaller and two of the walls were formed partially by large boulders. Walls had been constructed up to and including them. There were two auwai trenches that I counted and one that I did not have the time to clear but suspect it was as well. One of interest to me was a section along the river that was carefully walled and seemed to form a viaduct of sorts away from the river. It was leading off into an area that I did not follow.

A survey of historic buildings was undertaken at Schofield Barracks by Paul H. Rosendahl, Inc. (O'Hare *et al.* 1993). The goal of the study was "to identify and evaluate all structures with potential historic significance at the installation," including those structures that were constructed before 1942 (upon review of the report, the DLNR requested that the cutoff date be 1950) (*ibid*: 1 and E-1). This work supplemented an inventory and evaluation of historic buildings in Schofield Barracks previously done by the Bishop Museum (Rosendahl 1977). A total of 374 properties were ultimately identified at Schofield Barracks. The historic significance of the 374 sites were evaluated in accordance with four categories (Category I through IV) used by the U.S. Army. It was proposed that a number of "buildings constructed before World War 1or as a result of the 1916 construction plan" be included in the Schofield Barracks Historic District (O'Hare *et al.* 1993:7).

Four archaeological or historical studies have been conducted on the more developed portions of Wai`anae Uka in the centrally located areas of Schofield Barracks and Wheeler Army Airfield (O'Hare *et al*. 1993; McIntosh *et al.* 1994a and 1994b; and Tomonari-Tuggle 1994).

In the early 1990s, the International Archaeological Research Institute, Inc. conducted an "assessment of cultural resources" was done at Wheeler Army Airfield (Tomonari-Tuggle 1994). The study included a comprehensive compilation of the traditional and historical background and previous archaeological studies of the area. A ground survey was conducted in selected areas determined as having the least degree of ground disturbance and thus, greater probability of site preservation. Five archaeological sites were recorded in the sample areas including a remnant of the Oahu Rail and Land Company railroad and four probable military structures.

An inventory of historic properties was also undertaken and all buildings dating before 1952 were evaluated (Bouthillier in Tomonari-Tuggle 1994). Fifty-four buildings were identified and a portion of these were recommended to be designated a National Register Historic District (Tomonari-Tuggle 1994: iii).

Two separate archaeological studies were conducted by BioSystems Analysis Inc. at several parcels along the perimeter of Wheeler Army Airfield (McIntosh *et al*. 1994a) and on the south side of Kaukonahua Stream adjoining Schofield Barracks (McIntosh *et al.* 1994b). Two historic buildings and a grinding stone next to one of the buildings were identified in the Wheeler Army Airfield parcels. The grinding stone was interpreted as prehistoric in origin and because it was "out of context" (McIntosh *et al.* 1994b:27), it was recommended to be preserved elsewhere where it could be better protected.

Scientific Consultant Services, Inc. conducted three Phases of work in SBMR (Robins and Spear 1997a, 1997b, and Carson 2000). This work was primarily aimed at developing an inventory of archaeological sites and assessing site functions and was completed through detailed mapping, recording and excavation. A total of 76 traditional Hawaiian sites, 21 ranching or military sites, and four sites of undetermined function were investigated.

Scientific Consultant Services, Inc. conducted Cultural Resources Inventory Survey and Limited Testing, Phase I, of the Schofield Barracks Training Areas for the Preparation of a Cultural Resource Management Plan for U.S. Army Training Ranges And Areas, O`ahu Island, Hawai`i (TMK 7-6-01 and 7-7-01) (Robins and Spear 2002a). A total of 73 archaeological sites were identified as a result of the Inventory Survey. The site inventory consists primarily of Traditional-type Hawaiian structures that were interpreted as irrigated (pondfield) and non-

irrigated (dryland) agriculture, habitation, burial, and trails. Several historic ranching and U.S. military structures are also included in the inventory. Limited testing was conducted at two Hawaiian pondfield agriculture sites (50-80-08-5392 and 5394), a permanent habitation enclosure (in Site 50-80-08-5448) and a dryland agriculture terrace (in Site 50-80-08-5427). The stratigraphy of the pondfield sites suggested the presence of at least two cultivation zones that were evidenced by alternating oxidation and reduction soils. It is posited that the field boundaries exposed on the surfaces of the pondfield sites are a later, possibly Historic Era development. Radiocarbon dating analysis of the four sites revealed a continuation of Hawaiian settlement and agricultural developments in Wai`anae Uka between the 13th and 17th centuries.

Scientific Consultant Services, Inc. also conducted Cultural Resources Inventory Survey And Limited Testing, Phase II, of the U.S. Army Schofield Barracks Training Areas for the U.S. Army Garrison Hawaii Ecosystem Management Program, Island Of O`ahu, Hawai`i (Robins and Spear 2002b). Eleven individual areas were selected for survey based on a site prediction model generated from background research of the region. A total of 19 archaeological sites were identified during the inventory survey. The site inventory consists of nine traditional Hawaiian sites interpreted as irrigated (pondfield) and non-irrigated (dryland) agriculture and habitation, one possible road section associated with ranching or military training, and eight U.S. military sites. Limited testing was conducted at one Hawaiian pondfield agriculture sites (50-80-08-5393), a permanent habitation terrace (in Site 50-80-08-5448), an *imu* (subterranean earth oven) and dryland agriculture feature (in Site 50-80-08-5423), and two temporary habitation sites (Sites 50-80-08-5431 and 5507). Radiocarbon dating analysis of the four sites revealed a continuation of Hawaiian settlement and agricultural developments in Wai`anae Uka between the 15th and 20th centuries.

In 2004, Garcia and Associates (GANDA) conducted Archaeological Surveys for the Stryker Brigade Combat Team (SBCT) U.S. Army Hawaii Schofield Barracks Hawaii (Buffum *et al*. 2004). This study focused on SBCT training facilities at Schofield Barracks Military Reservation, Kahuku Training Area, Wheeler Army Airfield, military vehicle trails from Schofield Barracks to Dillingham Training Area and to Helemano Military Reservation, O`ahu Island, and at the Pohakuloa Training Area, Hawai`i Island. However, only the findings at the SBCT training facilities at Schofield Barracks will be discussed. No new or previously identified sites were encountered.

Scientific Consultant Services, Inc. conducted a site relocation project involving Global Positioning System (GPS)/site survey fieldwork on 48 previously identified sites within the U. S. Army's Kawailoa Training Area (KLOA) on O`ahu (Kaschko and Dega 2005). Global

Positioning System coordinates were acquired from all but two sites formerly identified during Phase I and Phase II archaeological research. Global Positioning System points were taken in the approximate location of the two small, non-identified sites. All other sites were subject to GPS measurement and assessed for preservation integrity. All the sites but one, a hearth remnant on Pu`u Kapu, have retained their integrity since original recordation in 1997 and 1998. During this survey, several previously unidentified sites were located.

In 2006, Archaeological Monitoring was conducted of the Duckfield Water-line Installation at Schofield Barracks Military Reservation (Descantes 2006). During the monitoring activities no new or previously identified archaeological sites were identified. However, three historic artifacts were observed during trench excavations. These artifacts included one glass Coca Cola bottle and two horseshoes, which most likely date between the 1920s and the 1950s.

Scientific Consultant Services, Inc. conducted an Archaeological Assessment of nine locations totally 13.76 acres situated at Wheeler Army Air Field and Schofield Barracks Military Reservation, Wai`anae Ahupua`a, Wahiawā District, Island Of O`ahu [TMK: (1) 7-7-001: various] (Tome and Spear 2010). A total of six sites were identified during the assessment work; these included site TS-1, a culvert; TS-2, a pulley target system; TS-3, a wooden structure; TS-4, a concrete structure; TS-5 a historic trash dump; and TS-6, which included a culvert and six artificial excavations found in a cliff face.

Scientific Consultant Services, Inc. conducted an Archaeological Inventory Survey-Investigation of the Hale Kula Elementary School project area (Dagher and Spear 2012). No historic properties were identified.

FIELDWORK EXPECTATIONS

Based on the location of the project area and the findings of previous archaeological work in the general area, expected findings included historic artifacts associated with the early 20th century US military use of the area (*i.e.*, rifle casings, belt buckles, personal effects, historic bottles, etc.), as well as historic sites and artifacts associated with homesteading.

Additional potential site types that were expected to be encountered within the current project area included pre-Contact and early Historic Period habitation sites, artifacts, and (possibly) burials. Several previous archaeological studies in the area identified new, previously unrecorded, agricultural features to the growing list of sites, suggesting the potential for evidence of agricultural sites, in subsurface contexts, within the project area.

METHODOLOGY

The Archaeological Inventory Survey-level fieldwork was conducted from July 1 through July 3, 2014 by SCS archaeologist Guerin Tome, B.A., under the direction of Robert L. Spear, Ph.D., Principal Investigator. The fieldwork, which consisted of a 100 percent coverage surface survey and the excavation of 5 stratigraphic trenches, was performed in order to identify and document historic properties, to gather sufficient information on these properties, to evaluate the significance of any newly identified historic properties, to determine the project effect on these properties, and to make mitigation recommendations to address possible adverse impacts to identified historic properties, pursuant to Hawaii Administrative Rules (HAR) § 13-284 and HAR § 13-276.

Multiple field tasks were completed during the current Archaeological Inventory Survey-level fieldwork. First, a pedestrian survey, comprised of a systematic pedestrian survey covering 100 percent of the project area, was conducted in order to identify archaeological sites and assess the proposed project area geographical/physiographical features. During the pedestrian survey, results were compiled on standard graphing paper as well as with digital photography. Each stratigraphic trench was hand plotted on a United States Geological Survey (USGS) map with a handheld Garmin GPS Map 60 CSx global positioning system (GPS) unit. The datum and coordinate system used for the GPS unit was NAD83 and UTM (Universal Transverse Mercator). True north compass orientation was also employed. All measurements were recorded in metric. The site boundary was primarily determined by the feature boundaries.

Representative plan view sketches showing the location and morphology of the identified feature was compiled and illustrated. Photographs were taken of the subsurface feature and are presented in the Fieldwork Results section.

EXCAVATION METHODOLOGY

To supplement the surface pedestrian survey, limited excavation was conducted during the current Archaeological Inventory Survey. Excavation efforts were not focused on surface architecture, as the project area is located in a built environments containing exiting modern structures. Excavation focused on identifying subsurface archaeological cultural materials, subsurface features, and human influence to strata. A total of five stratigraphic trenches (ST-1 through ST-5) were manually excavated utilizing a pick and a trowel. Standard excavation and recording procedures were used during the project. All excavated material was screened through 1/4” and 1/8” inch wire mesh and visually inspected for the presence of cultural material.

Equipment utilized to perform these excavations included shovels, trowels, whisk brooms, and metric tape measures.

Areas selected for excavation were located within the footprint of the current building/demolition footprints for the proposed improvements to the Solomon Elementary School. The areas selected for excavation did not contain existing structures or play courts, did not exhibit evidence of prior ground disturbance, and did not contain existing infrastructure (i.e., electric, sewer, or water lines). In addition, the areas selected for excavation did not contain buildings slated for demolition, as these areas contained existing structures.

Soil stratigraphy encountered during excavation was documented utilizing metric graph paper and United States Department of Agriculture (USDA) Munsell (2000) soil color charts. Stratigraphic profiles were completed for ST-1 through ST-5. All stratigraphic profiles were drafted for presentation in this Archaeological Inventory Survey report. The stratigraphic profiles of the four excavated stratigraphic trenches are presented in the Stratigraphic Trench Excavations section.

LABORATORY METHODOLOGY

All field notes and digital photographs were curated at the SCS laboratory in Honolulu. Representative plan view sketches showing location and morphology of identified sites/features/deposits were illustrated. No archaeological food midden or traditional artifacts were observed within excavations. Thus, none are available for analysis. With the exception of the firepit within ST-2, cultural materials observed within the excavations were contained within historic and modern fill deposits. All metric measurements and weights are also recorded for quantitative analysis. All data are clearly recorded on standard laboratory forms that included numbers and weights (as appropriate) of each constituent category.

Charcoal was collected from State Site 50-80-08-7684, a discrete feature comprised of a shallow bowl-shaped charcoal concentration located within ST-2, and submitted to Beta Analytic Labs for radiocarbon dating in order to document feature chronology. The radiocarbon charcoal sample was collected by trowel directly from its *in situ* context and placed directly into sealed aluminum paper sheets. The charcoal sample was not submitted for taxonomic identification, prior to submittal for radiocarbon analysis due to the small size and the friability of the individual charcoal pieces comprising the sample. The radiocarbon sample has been calibrated through OxCal for presentation within this report. The radiocarbon data is presented in Appendix A.

CURATION

Scientific Consultant Services, Inc. will curate all collected materials until the AIS report has been completed, reviewed, and accepted by the SHPD. All materials gathered during this project (including documentation) are ultimately the property of the landowner.

FIELDWORK RESULTS

The current Archaeological Inventory Survey included a 100 percent surface survey of the project area and the manual excavation of five Stratigraphic Trenches (ST-1 through ST-5) (Figure 6). During the survey one site (State Site 50-80-08-7684, which consisted of a shallow,, bowl-shaped charcoal concentration interpreted as clean out from a thermal feature) was newly identified within Layer II of ST-2 (see Figure 6). Using conventional radiocarbon age analysis, the charcoal concentration yielded a conventional radiocarbon age of 210 + 30 B.P. All of the existing Solomon Elementary School structures are less than 50 years old. No pre- or post-Contact cultural material or structures were observed on the ground surface of the school.

STATE SITE 50-80-08-7684

Feature Type: Charcoal Concentration **GPS Coordinates:** East 595989 and North 2376833

Function: Food Preparation or Heat Production

Feature (#): 1

Age: pre-Contact

Condition: Fair to Good

State Site 50-80-08-7684 consists of a shallow bowl-shaped charcoal concentration measuring 28 cm by 21 by 10 cm thick and oriented along a north/south axis (000/180°, Magnetic) (see Figures 1, 2, and 6). Global Positioning System points were taken directly over State Site 50-80-08-7684 (E 595989/N 2376833). The charcoal concentration was comprised of compact very dark brown (7.5YR 2.5/3, dry) silty clay with grass roots.

One charcoal sample was collected from a charcoal concentration (State Site 50-80-08-7684) within Layer II (4-14 cmbs). This sample dated the timing of the site/feature activity (food preparation or heat production). Using conventional radiocarbon age analysis, the sample yielded a conventional radiocarbon age of 210 + 30 B.P. (see Appendix A).

State Site 50-80-08-7684 was in fair to good condition. Based on context and the absence of any associated features or artifacts, the charcoal concentration was interpreted as used in food preparation or heat production.

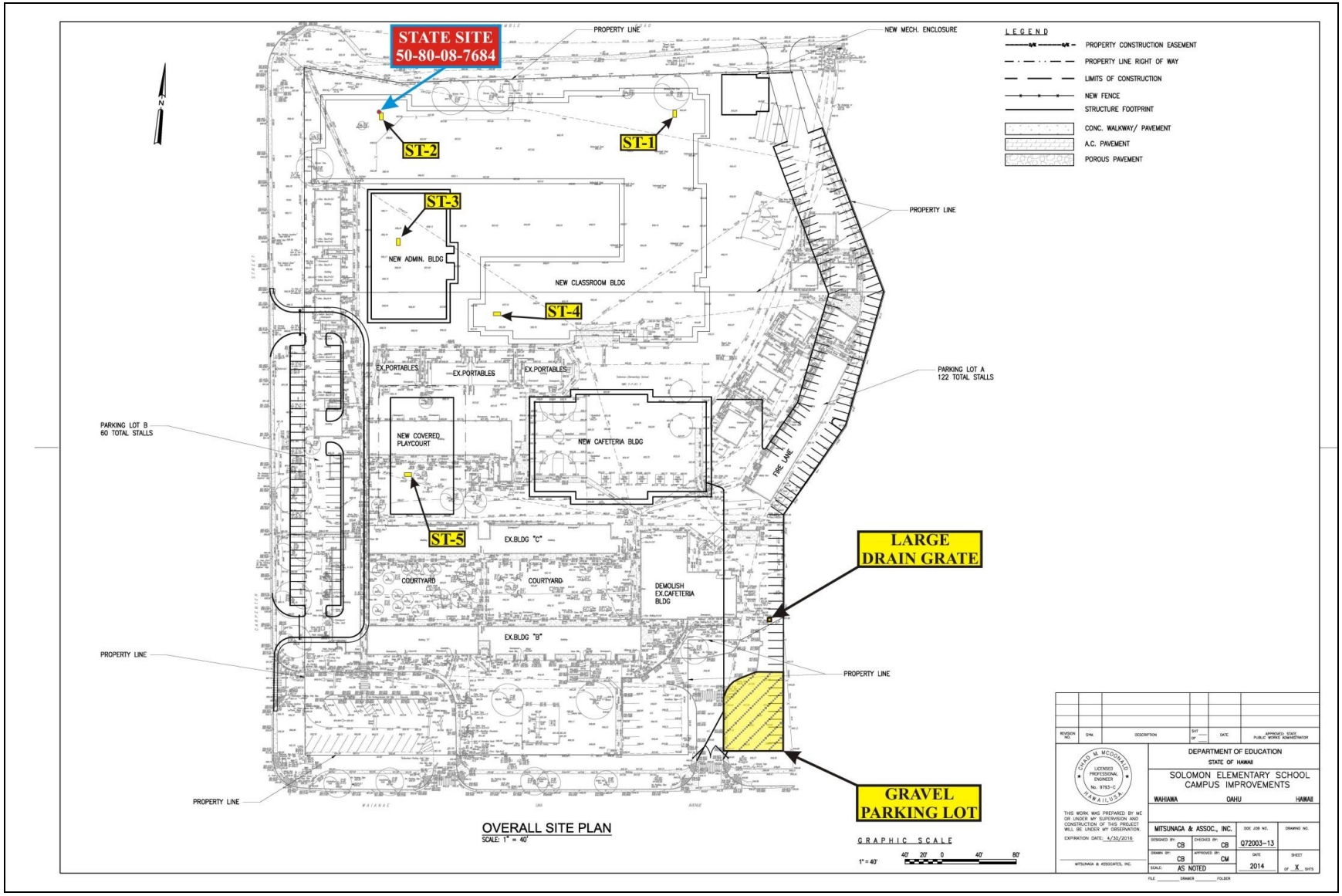

Figure 6: Plan View Drawing Showing Proposed Solomon Elementary School Campus Improvements and the Locations of Stratigraphic Trench 1 through Stratigraphic Trench 5.

STRATIGRAPHIC EXCAVATIONS

To supplement the pedestrian survey, a total of five stratigraphic trenches were manually excavated on the building footprints for the reconfigured parking areas, reconfigured driveways, on-site utility reconfigurations as necessary, on-site storm-water management facilities, and landscaping (see Figure 6). No Traditional artifacts were encountered during excavation.

STRATIGRAPHIC TRENCH 1 (ST-1)

Stratigraphic Trench 1 (ST-1) (1.5 x 0.5 x 0.40 m) was oriented on an east/west axis (000/180°). Stratigraphic Trench 1 was placed within the internal northeast corner of a new classroom (Figure 7; see Figure 6) with the archaeological purpose of identifying historic properties in subsurface context. The location selected as the locus of ST-1 was topographically flat, which suggested the possibility that subsurface deposits may contain habitation remnants (*i.e*. midden, charcoal, etc.). The surface of ST-1 consisted of a manicured lawn and was sloped downward from north to south. Two stratigraphic layers were encountered in ST-1 (Figures 8 and 9). Given the absence of pre- and post-Contact cultural materials throughout ST-1, and that Layer II was interpreted as a naturally occurring deposit, excavation of ST-1 was terminated.

> Layer I (0-10 cmbs) consisted of semi-compacted dark reddish brown (5YR 3/3, dry) silty clay. Grass roots and Monkey Pod Tree roots present throughout Layer I. Modern basalt construction base course, basalt gravel, and vitreous ceramic utility pipe sherds were observed in Layer I. Layer I exhibited a solid lower boundary. The presence of the three types of Modern cultural material combined with the solid lower boundary suggests that Layer I is a local soil mixed with Modern construction material. No Traditional or Historic cultural materials were encountered in Layer I.
>
> Layer II (10-40 cmbs) consisted of compact dark reddish brown (5YR 3/4, dry) silty clay with a few Monkey Pod tree roots. No Traditional or Historic artifacts were encountered in Layer II. Layer II was interpreted as a natural stratum.

STRATIGRAPHIC TRENCH 2 (ST-2)

Stratigraphic Trench 2 (ST-2) (1.0 x 0.5 x 0.25 m) was oriented on an east/west axis (000/180°). Stratigraphic Trench 2 was placed within the internal northwest corner of a new classroom (Figure 10; see Figure 6) with the archaeological purpose of identifying historic properties in subsurface context. The location selected as the locus of ST-2 was topographically flat, which suggested the possibility that subsurface deposits may contain habitation remnants (*i.e*. midden, charcoal, etc.). The surface of ST-2 consisted of a manicured lawn. Two stratigraphic layers were encountered in ST-2 (Figures 11 and 12). State Site 50-80-08-7684,

Figure 7: Photographic Over View of Stratigraphic Trench1, Pre-Excavation. View to Southwest.

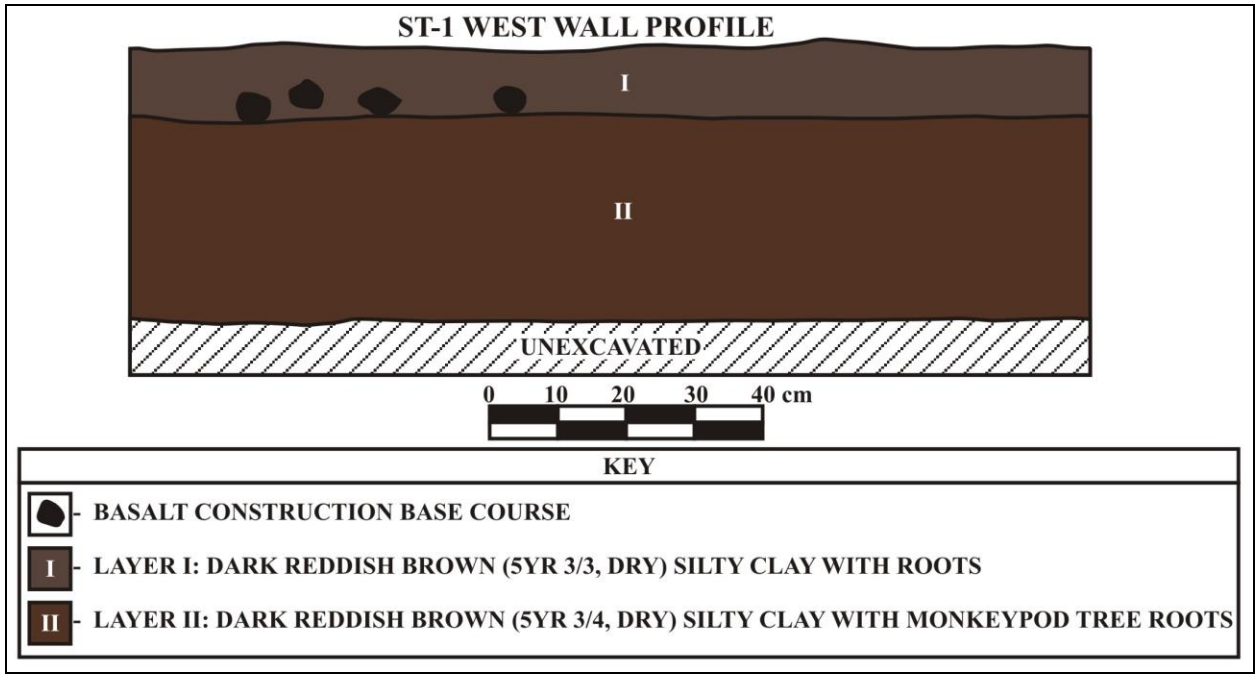

Figure 8: Stratigraphic Trench 1 West Wall Profile.

Figure 9: Photographic View of Stratigraphic Trench 1 West Wall Profile. View to West.

Figure 10: Photographic Over View of Stratigraphic Trench 2, Pre-Excavation. View to Southeast.

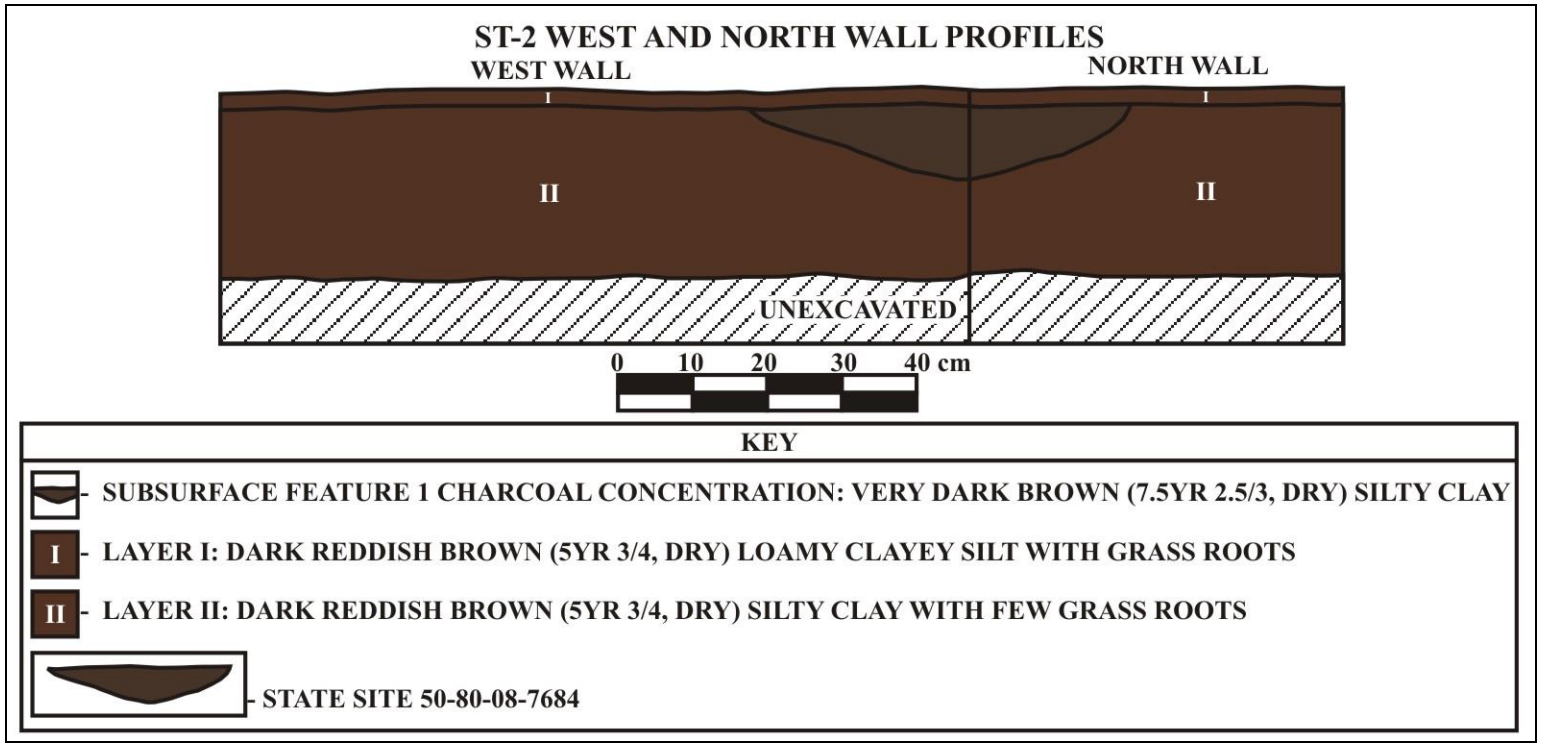

Figure 11: Stratigraphic Trench 2 West Wall Profile.

Figure 12: Photographic View of Stratigraphic Trench 2 West Wall Profile. View to West.

which consisted of charcoal concentration interpreted as clean out from a thermal feature, was newly identified within Layer II. Using conventional radiocarbon age analysis, the charcoal concentration yielded a conventional radiocarbon age of 210 + 30 B.P. As no additional Traditional or Historic cultural materials were encountered, the excavation of ST-2 was terminated.

> Layer I (0-2 cmbs) consisted of semi-compacted dark reddish brown (5YR 3/4, dry) loamy clayey silt with grass roots. Layer I exhibited a solid lower boundary. One piece of Modern fabric was present within Layer I. No Traditional or Historic cultural materials were encountered in Layer I. Layer I was interpreted as a natural stratum.
>
> Layer II (2-25 cmbs) consisted of compact dark reddish brown (5YR 3/4, dry) loamy clay with a few grass roots. State Site 50-80-08-7684, a charcoal concentration, was identified in the upper portion of Layer II (see Figures 11 and 12). All cultural material was collected. No other additional cultural materials were encountered in Layer II.

STRATIGRAPHIC TRENCH 3 (ST-3)

Stratigraphic Trench 3 (ST-3) (1.0 x 0.5 x 0.34 m) was oriented on an east/west axis (0/180°). Stratigraphic Trench 3 was placed on the proposed location site of the new Administration Building (Figure 13; see Figure 6). The location selected as the locus of ST-3 was topographically flat, which suggested the possibility that subsurface deposits may contain habitation remnants (*i.e*. midden, charcoal, etc.). The surface of ST-3 consisted of a manicured lawn containing weeds. Three stratigraphic layers were encountered in ST-3 (Figures 14 and 15). Stratigraphic Trench 3 excavation was terminated due to reaching Layer III, which was interpreted as a naturally occurring, culturally sterile, stratum.

> Layer I (0-10 cmbs) consisted of semi-compacted dark reddish brown (5YR 3/4, dry) loamy clayey silt with grass roots. Layer I exhibited a solid lower boundary. Modern cultural material encountered within Layer I included one white plastic bead and angular basalt base course. Possible Historic artifacts included low grade concrete chunks. No Traditional cultural materials were encountered in Layer I. Layer I was interpreted as a local fill deposit containing possible Historic and Modern construction materials. All cultural material was collected.
>
> Layer II (10-20 cmbs) consisted of compact dark reddish brown (5YR 3/4, dry) silty clay with a few grass roots. Layer II exhibited a solid lower boundary. Modern cultural materials encountered within Layer II included: basalt construction base course. Historic materials identified in Layer II included:

Figure 13: Photographic Over View of Stratigraphic Trench 3, Pre-Excavation. View to West.

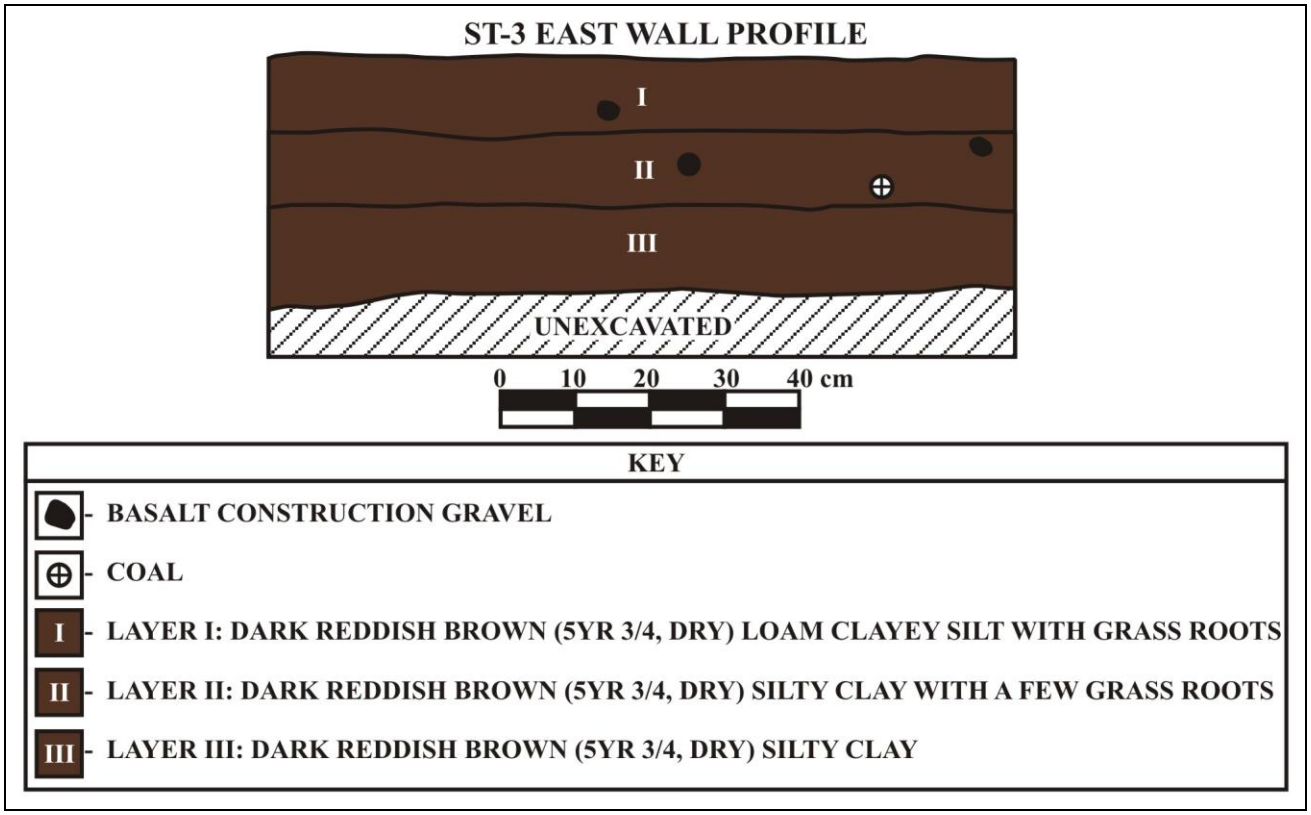

Figure 14: Stratigraphic Trench 3 West Wall Profile.

Figure 15: Photographic View of Stratigraphic Trench 3 West Wall Profile. View to West.

coal, one ferrous metal wire nail, one ferrous metal washer, two non-diagnostic clear glass sherds, and low grade concrete chunks. Layer II was interpreted as a local fill deposit containing Historic and Modern construction material. All cultural material was collected. No Traditional cultural materials were encountered in Layer II.

Layer III (20-34 cmbs) consisted of a compact dark reddish brown (5YR 3/4, dry) silty clay with less than 1mm basalt pebbles. These basalt pebbles are too small to be construction related and they are not shotgun shell buckshot or cinder. No historic properties were identified within Layer III and Layer III was interpreted as a natural stratum.

STRATIGRAPHIC TRENCH 4 (ST-4)

Stratigraphic Trench 4 (ST-4) (1.0 x 0.5 x 0.25 m) was oriented on a north/south axis (90/270°). Stratigraphic Trench 4 was placed within the interior of a new classroom building in the southwest corner (Figure 16; see Figure 6). The location selected as the locus of ST-4 was topographically flat, which suggested the possibility that subsurface deposits may contain habitation remnants (*i.e*. midden, charcoal, etc.). The surface of ST-4 consisted of a manicured lawn and weeds. Two stratigraphic layers were encountered in ST-4 (Figures 17 and 18). Stratigraphic Trench 4 excavation was terminated due to reaching Layer II, which was interpreted as a naturally occurring, culturally sterile, stratum.

Layer I (0-13 cmbs) consisted of semi-compacted dark reddish brown (5YR 3/4, dry) loamy clayey silt with grass roots. Layer I exhibited a solid lower boundary. Cultural material encountered within Layer I included limestone pebbles, basalt construction gravel, and one piece of coal. No Traditional cultural materials were encountered in Layer I. Layer I was interpreted as a local fill deposit containing possible Historic and Modern construction materials. All cultural material was collected.

Layer II (13-25 cmbs) consisted of a compact dark reddish brown (5YR 3/4, dry) silty clay with less than 1mm basalt pebbles. These basalt pebbles are too small to be construction related and they are not shotgun shell buckshot or cinder. No historic properties were identified within Layer II and Layer II was interpreted as a natural stratum.

STRATIGRAPHIC TRENCH 5 (ST-5)

Stratigraphic Trench 5 (ST-5) (1.0 x 0.5 x 0.30 m) was oriented on a north/south axis (90/270°). Stratigraphic Trench 5 was placed on the site of the new playcourt (Figure 19; see Figure 6). This location selected as the locus of ST-5 exhibited a slight northwest to southeast downslope, which suggested the possibility that subsurface deposits may contain habitation

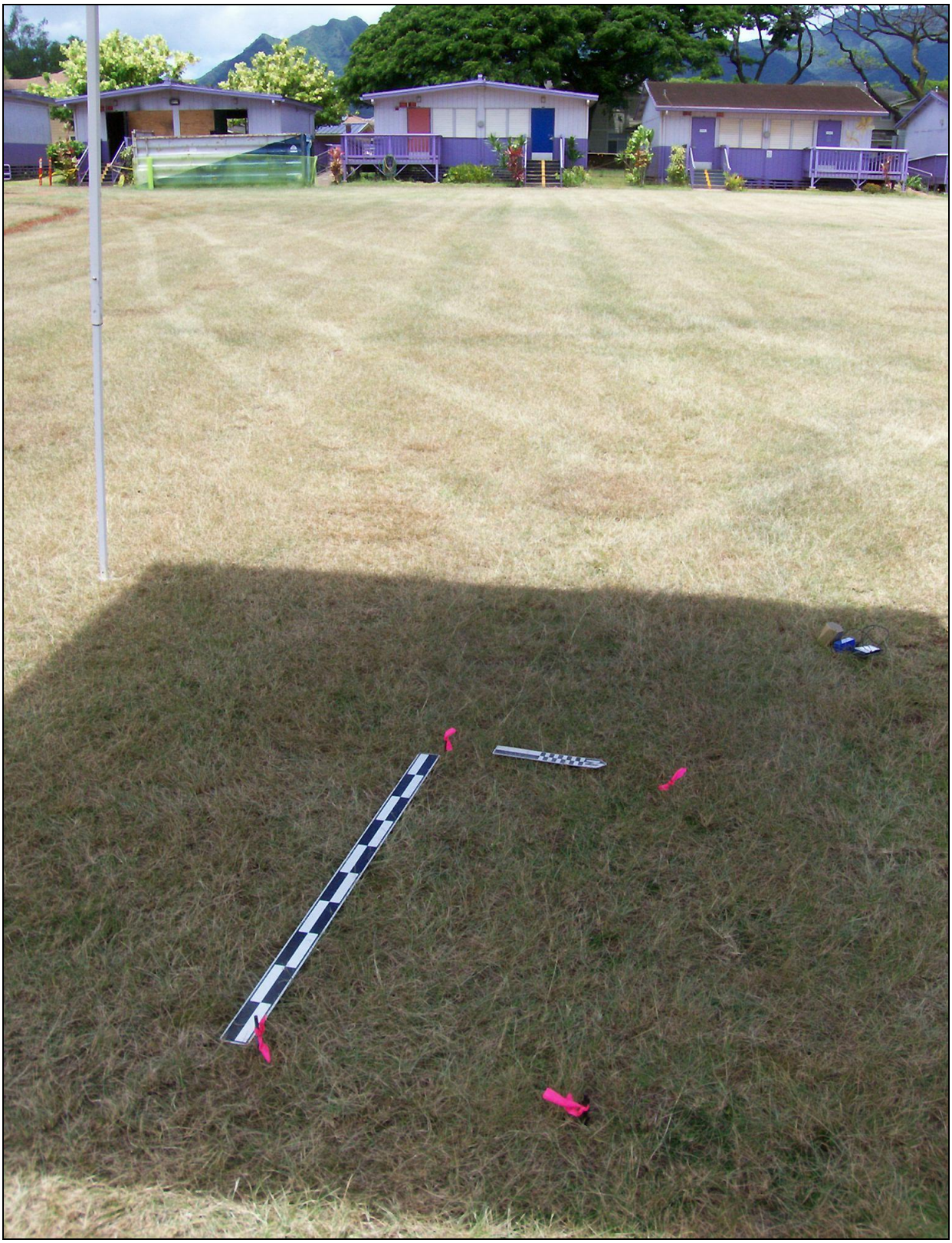

Figure 16: Photographic Over View of Stratigraphic Trench 4, Pre-Excavation. View to Southwest.

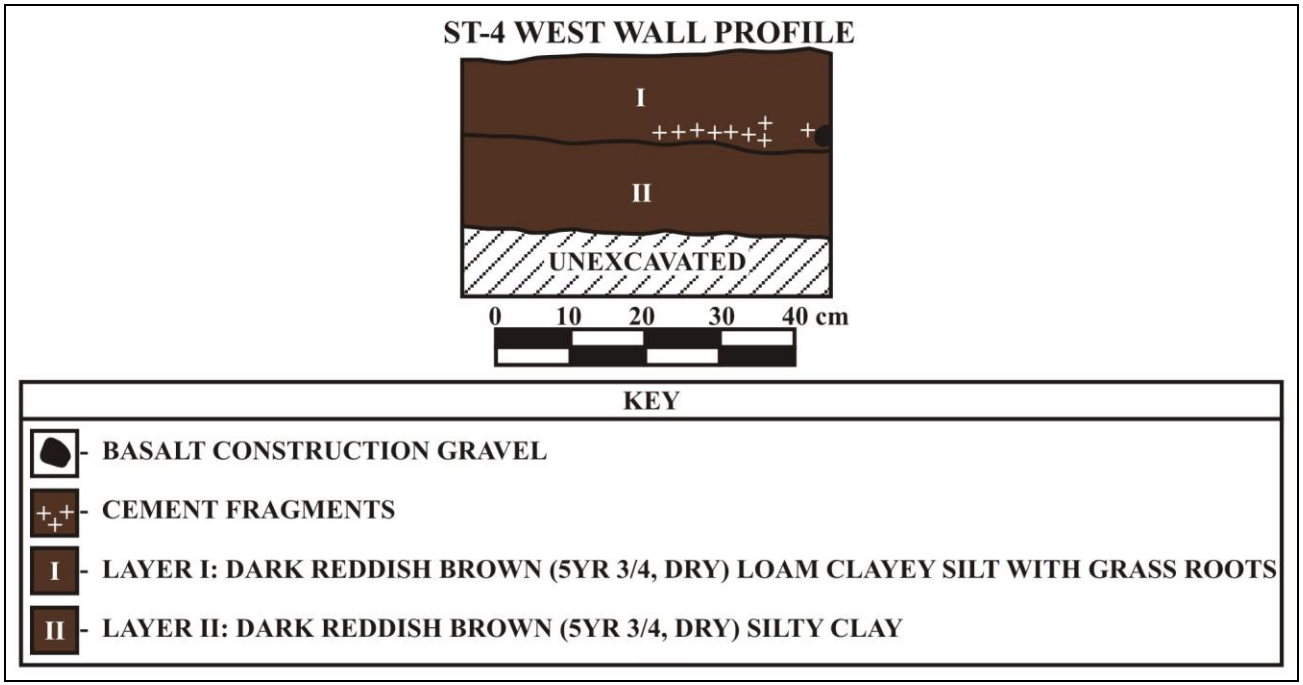

Figure 17: Stratigraphic Trench 4 West Wall Profile.

Figure 18: Photographic View of Stratigraphic Trench 4 West Wall Profile. View to West.

Figure 19: Photographic Over View of Stratigraphic Trench 5, Pre-Excavation. View to Northeast.

remnants (*i.e*. midden, charcoal, etc.). The surface of ST-5 consisted of a manicured lawn and weeds. Three stratigraphic layers were encountered in ST-5 (Figures 20 and 21). Stratigraphic Trench 5 excavation was terminated due the absence of cultural materials.

> Layer I (0-8 cmbs) consisted of semi-compacted dark reddish brown (5YR 3/3, dry) loamy clayey silt with grass roots. Layer I exhibited a solid lower boundary. Historic cultural material encountered within Layer I included concrete fragments, one limestone pebble, and one bent ferrous metal wire nail with a round head and a round shaft. Modern cultural material present in ST-5 included basalt construction base course. No Traditional or Historic cultural materials were encountered in Layer I. Layer I was interpreted as a local fill deposit containing possible Historic and Modern construction materials. All cultural material was collected.
>
> Layer II (8-20 cmbs) consisted of very dark brown (7.5YR 2.5/2, dry) silty clay with few weed roots. Layer II exhibits a solid lower boundary. Possible Historic cultural materials identified in Layer II included concrete fragments and one ferrous metal wire nail with a round shaft. Modern cultural material consisted of solidified roofing tar. Layer II was interpreted as a local fill deposit containing possible Historic and Modern construction materials. All cultural material was collected.
>
> Layer III (20-30 cmbs) consisted of compact dark reddish brown (2.5YR 2.5/4, dry) silty clay. No cultural materials were observed within Layer III. Layer III was interpreted as a natural stratum

RADIOCARBON ANALYSIS

One sample of carbonized wood (charcoal) was submitted to Beta Analytic, Inc. for radiocarbon analysis (see Appendix A). The sample was collected from a shallow bowl-shaped charcoal concentration, State Site 50-80-08-7684, located in Layer II of ST-2. The sample was collected to obtain feature chronology. The sample was not submitted for wood identification due the size of the sample, and due to time and monetary constraints. One charcoal sample was collected from a charcoal concentration (State Site 50-80-08-7684) within Layer II in ST-2. Using conventional radiocarbon age analysis, the charcoal concentration yielded a conventional radiocarbon age of 210 + 30 B.P., placing the origin of the charcoal concentration firmly in the late pre-Contact Period (Table 1; see Appendix A). When calibrated, the statistically most likely date span is A.D. 1630 to 1670 (50.6%) at 1 Sigma and A.D. 1620 to 1680 (55.9 %) at 2 Sigma.

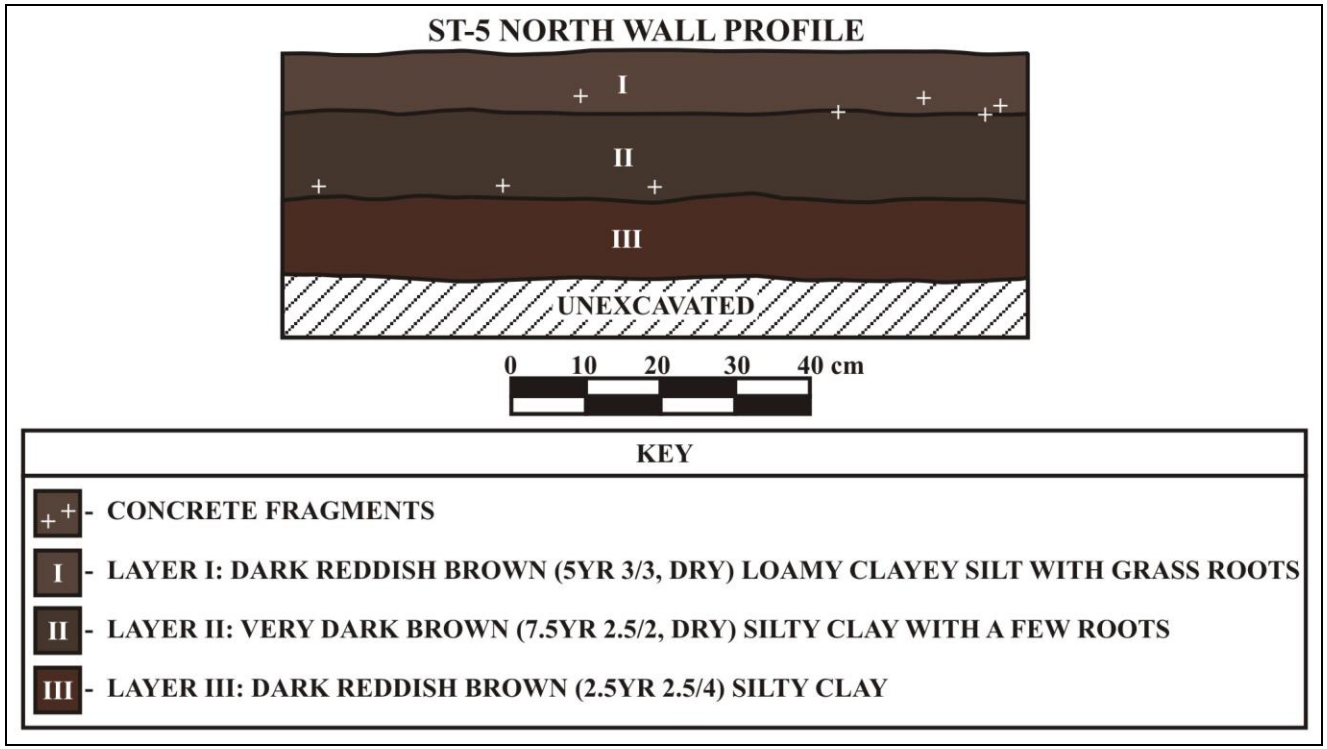

Figure 20: Stratigraphic Trench 5 North Wall Profile.

Figure 21: Photographic View of Stratigraphic Trench 5 North Wall Profile. View to North.

Table 1: Radiocarbon Data from Charcoal Sample obtained from State Site 50-80-08-7684 at Intercept 260 ±30 BP.

Sigma	Age Range (A.D.)	Probability
1	1530-1550	11.2%
1	1630-1670	50.6%
1	1780-1800	6.5%
2	1520-1600	27.0%
2	1620-1680	55.9%
2	1770-1810	11.2%
2	1930-1950	1.3%

DISCUSSION AND SUMMARY

Archaeological Inventory Survey of the Solomon Elementary School campus project area led to the identification of one historic property, State Site 50-80-08-7684. State Site 50-80-08-7684 which consisted of a shallow, bowl-shaped charcoal concentration, interpreted as clean out from a thermal feature, within Layer II of Stratigraphic Trench 2. The charcoal concentration yielded a conventional radiocarbon age of 210 + 30 B.P. No additional architectural features or artifacts were identified on the ground surface or in subsurface contexts. As no associated artifacts were present, the function of the feature cannot be firmly established.

SIGNIFICANCE ASSESSEMENTS

During the Archaeological Inventory Survey of the Solomon Elementary School campus project area, State Site 50-80-08-7684 (a shallow, bowl-shaped charcoal concentration) was newly identified. State Site 50-80-08-7684 was evaluated for significance in accordance with the National Historic Preservation Act of 1966 and the criteria established by the Department of the Interior, National Park Service, for eligibility for the National Register for Historic Properties.

In order for a historic property, to be considered significant, it must possess integrity of location, design, setting, materials, workmanship, feeling, and association, and meet one or more of the following criteria:

Criterion a: Be associated with events that have made an important contribution to the broad patterns of our history;

Criterion b: Be associated with the lives of persons important in our past ;

Criterion c: Embody the distinctive characteristics of a type, period, or method of construction; represent the work of a master; or possess high artistic value;

Criterion d: Have yielded, or is likely to yield, information important for research on prehistory or history; or

Criterion 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 identify.

State Site 50-80-08-7684 has been evaluated in accordance with criteria established for the Hawai`i State Register of Historic Places (HAR§13-276) and found to be significant under Criterion "d" (for information content).

CONCLUSION AND RECOMMENDATIONS

During the survey, one site State Site 50-80-08-7684, consisting of a shallow bowl-shaped charcoal concentration, was identified within Layer II in ST-2. Based on context and the absence of any associated features or artifacts, the charcoal concentration was interpreted as clean out from a thermal feature. One charcoal sample was collected from the charcoal concentration, which yielded a conventional radiocarbon age of 210 + 30 B.P. State Site 50-80-08-7684 has been evaluated in accordance with the federal criteria established for eligibility to the National Register of Historic Places and found to be significant under Criterion "d" (for information content). As sufficient information has been obtained from State Site 50-80-08-7684 during the current AIS, no additional archaeological work is recommended for the proposed undertaking.

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APPENDIX A: RADIOCARBON DATA

BETA ANALYTIC INC.
DR. M.A. TAMERS and MR. D.G. HOOD
4985 S.W. 74 COURT
MIAMI, FLORIDA, USA 33155
PH: 305-667-5167 FAX:305-663-0964
beta@radiocarbon.com

REPORT OF RADIOCARBON DATING ANALYSES

Dr. Robert L. Spear — Report Date: 8/7/2014

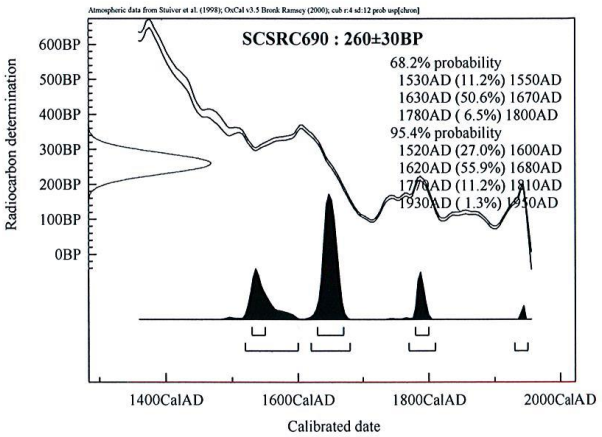
Scientific Consultant Services, Incorporated — Material Received: 8/1/2014

Sample Data	Measured Radiocarbon Age	13C/12C Ratio	Conventional Radiocarbon Age(*)
Beta - 386711	210 +/- 30 BP	-22.0 o/oo	260 +/- 30 BP

SAMPLE : SCSRC690
ANALYSIS : AMS-Standard delivery
MATERIAL/PRETREATMENT : (charred material): acid/alkali/acid
2 SIGMA CALIBRATION : Cal AD 1525 to 1555 (Cal BP 425 to 395) and Cal AD 1630 to 1665 (Cal BP 320 to 285) and Cal AD 1780 to 1795 (Cal BP 170 to 155)

Dates are reported as RCYBP (radiocarbon years before present, "present" = AD 1950). By international convention, the modern reference standard was 95% the 14C activity of the National Institute of Standards and Technology (NIST) Oxalic Acid (SRM 4990C) and calculated using the Libby 14C half-life (5568 years). Quoted errors represent 1 relative standard deviation statistics (68% probability) counting errors based on the combined measurements of the sample, background, and modern reference standards. Measured 13C/12C ratios (delta 13C) were calculated relative to the PDB-1 standard.

The Conventional Radiocarbon Age represents the Measured Radiocarbon Age corrected for isotopic fractionation, calculated using the delta 13C. On rare occasion where the Conventional Radiocarbon Age was calculated using an assumed delta 13C, the ratio and the Conventional Radiocarbon Age will be followed by "*". The Conventional Radiocarbon Age is not calendar calibrated. When available, the Calendar Calibrated result is calculated from the Conventional Radiocarbon Age and is listed as the "Two Sigma Calibrated Result" for each sample.


Atmospheric data from Stuiver et al. (1998); OxCal v3.5 Bronk Ramsey (2000); cub r:4 sd:12 prob usp[chron]
SCSRC690 : 260±30BP
68.2% probability
1530AD (11.2%) 1550AD
1630AD (50.6%) 1670AD
1780AD (6.5%) 1800AD
95.4% probability
1520AD (27.0%) 1600AD
1620AD (55.9%) 1680AD
1770AD (11.2%) 1810AD
1930AD (1.3%) 1950AD
Radiocarbon determination
600BP
500BP
400BP
300BP
200BP
100BP
0BP
1400CalAD
1600CalAD
1800CalAD
2000CalAD
Calibrated date

BETA

BETA ANALYTIC INC.

DR. M.A. TAMERS and MR. D.G. HOOD

4985 S.W. 74th COURT
MIAMI, FLORIDA USA 33155
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E-MAIL: beta@radiocarbon.com
WEB SITE: http://www.radiocarbon.com

RADIOCARBON SAMPLE DATA SHEET

Please contact us at any time for advice, assistance or discussion of results.

SUBMITTER NAME: DR. ROBERT L. SPEAR **DATE:** 29 JULY 2014

ADDRESS: 1347 KAPIOLANI BLVD. SUITE 408

HONOLULU, HI 96814

TELEPHONE: 808-597-1182 **FAX:** 808-597-1193 **E-MAIL:** bob@scshawaii.com

METHOD OF PAYMENT: PURCHASE ORDER ____/ CREDIT CARD ____/ CHECK ____ / BANK - WIRE TRANSFER ____

OTHER (SPECIFY) _____ **PURCHASE ORDER #** _____

CREDIT CARD #: _____ **EXP. DATE** MM/YY _____ **AUTH. CODE** _____

ZIP CODE TO WHERE YOUR CREDIT CARD COMPANY SENDS YOUR BILL: _____

YOUR SAMPLE CODE NUMBER: S | C | S | R | C | 6 | 9 | 0 | | | | | | | | PROJECT 1563

PLEASE CHOOSE ≤ 12 INITIAL CHARACTERS TO APPEAR ON THE DATA REPORT SHEET — ADDITIONAL LABELING IF NEEDED

INSTRUCTIONS TO LABORATORY

TECHNIQUE:	☑ AMS	☐ RADIOMETRIC
DELIVERY SERVICE:	☑ STANDARD 20-30 BUSINESS DAYS	☐ STANDARD 20-30 BUSINESS DAYS
	☐ ADVANCE within 14 BUSINESS DAYS	☐ ADVANCE within 14 BUSINESS DAYS
	☐ PRIORITY within 6 BUSINESS DAYS	☐ PRIORITY within 6 BUSINESS DAYS
	☐ TIME-GUIDE 2-3 BUSINESS DAYS	☐ TIME-GUIDE 2-3 BUSINESS DAYS

ISOTOPE RATIOS 13C/12C is included in the analysis price

☐ 15N/14N – bones only ratio analysis (diet indicator for bones)

COMPLEX / NON-STANDARD SERVICES ADDITIONAL FEES APPLY

- ☐ **EXTENDED COUNTING** – RADIOMETRIC ANALYSIS ONLY – enhanced / optimal precision
- ☐ **MICRO-SAMPLE AMS COUNTING** – AMS ONLY – 100-300 micrograms final carbon
- ☐ **NON-BURNED BONE DATING – COLLAGEN EXTRACTION REQUIRED** – AMS ONLY
- ☐ **CREMATED / BURNED BONE DATING – CARBONATE EXTRACTION REQUIRED** – AMS ONLY
- ☐ **CELLULOSE EXTRACTION** – Non-burned wood and textiles with extreme contamination
- ☐ **SOLVENT EXTRACTIONS** – AMS ANALYSIS ONLY – contamination by varnishes, preservatives, oils, tar, etc.

SAMPLE MATERIAL TYPE: Wood Charcoal **SAMPLE WEIGHT:** 0.4g

FOR CARBONATE SAMPLES: MARINE____ **(Delta-R =** _____**+/-** _____ **) or FRESH WATER** _____

For Marine carbonates, visit http://calib.qub.ac.uk/marine to get the Delta-R value for the general geographical region of your site.

GENERAL GEOGRAPHIC LOCATION: _____

(REQUIRED FOR CALIBRATION OF CARBONATE SAMPLES – NOT REQUIRED FOR CALIBRATION OF ORGANIC SAMPLES) (OVER)

Appendix C
Cultural Impact Assessment

SCS Project Number 1563-CIA-1

A CULTURAL IMPACT ASSESSMENT FOR THE SOLOMON ELEMENTARY SCHOOL CAMPUS IMPROVEMENTS PROJECT SCHOFIELD BARRACKS MILITARY RESERVATION WAI`ANAE UKA AHUPUA`A, WAHIAWĀ DISTRICT ISLAND OF O`AHU [TMK (1) 7-7-001:007]

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INTRODUCTION

At the request of PBR & Associates Hawaii, Inc., Scientific Consultant Services, Inc. (SCS) prepared a Cultural Impact Assessment (CIA) for the proposed improvements to Solomon Elementary School. The approximately 9.289 acre elementary school campus is situated on land owned by the United States and leased to the State of Hawai`i (Department of Education), located in Wai`anae Uka Ahupua`a, `Ewa District, Island of O`ahu [TMK: (1) 7-7-001:007] (Figures 1 through 3).

The Solomon Elementary School was constructed in 1968 and is named after First Sargent Samuel K. Solomon, a Vietnam veteran who was killed by a sniper as he removed critically wounded soldiers from the battlefield. The proposed improvements to Solomon Elementary School are in response to a one-time Department of Defense grant program which will fund the construction, renovation, repair, or expansion of public schools located on military installations. The proposed improvements to Solomon Elementary School will include the construction of new two-story school buildings, followed by the demolition of existing buildings. Site improvements will include reconfigured parking areas, reconfigured driveways, on-site utility reconfigurations as necessary, on-site storm-water management facilities, and landscaping. All of the proposed improvements will be located within the existing site boundaries.

The Constitution of the State of Hawai`i clearly states the duty of the State and its agencies is to preserve, protect, and prevent interference with the traditional and customary rights of Native Hawaiians. Article XII, Section 7 (2000) requires the State to "protect all rights, customarily and traditionally exercised for subsistence, cultural and religious purposes and possessed by *ahupua`a* tenants who are descendants of Native Hawaiians who inhabited the Hawaiian Islands prior to 1778." In spite of the establishment of the foreign concept of private ownership and western-style government, Kamehameha III (Kauikeaouli) preserved the peoples traditional right to subsistence. As a result in 1850, the Hawaiian Government confirmed the traditional access rights to Native Hawaiian *ahupua`a* tenants to gather specific natural resources for customary uses from undeveloped private property and waterways under the Hawaiian Revised Statutes (HRS) 7-1. In 1992, the State of Hawai`i Supreme Court, reaffirmed HRS 7-1 and expanded it to include, "native Hawaiian rights…may extend beyond the *ahupua`a* in which a Native Hawaiian resides where such rights have been customarily and traditionally exercised in this manner" (Pele Defense Fund v. Paty, 73 Haw.578, 1992).

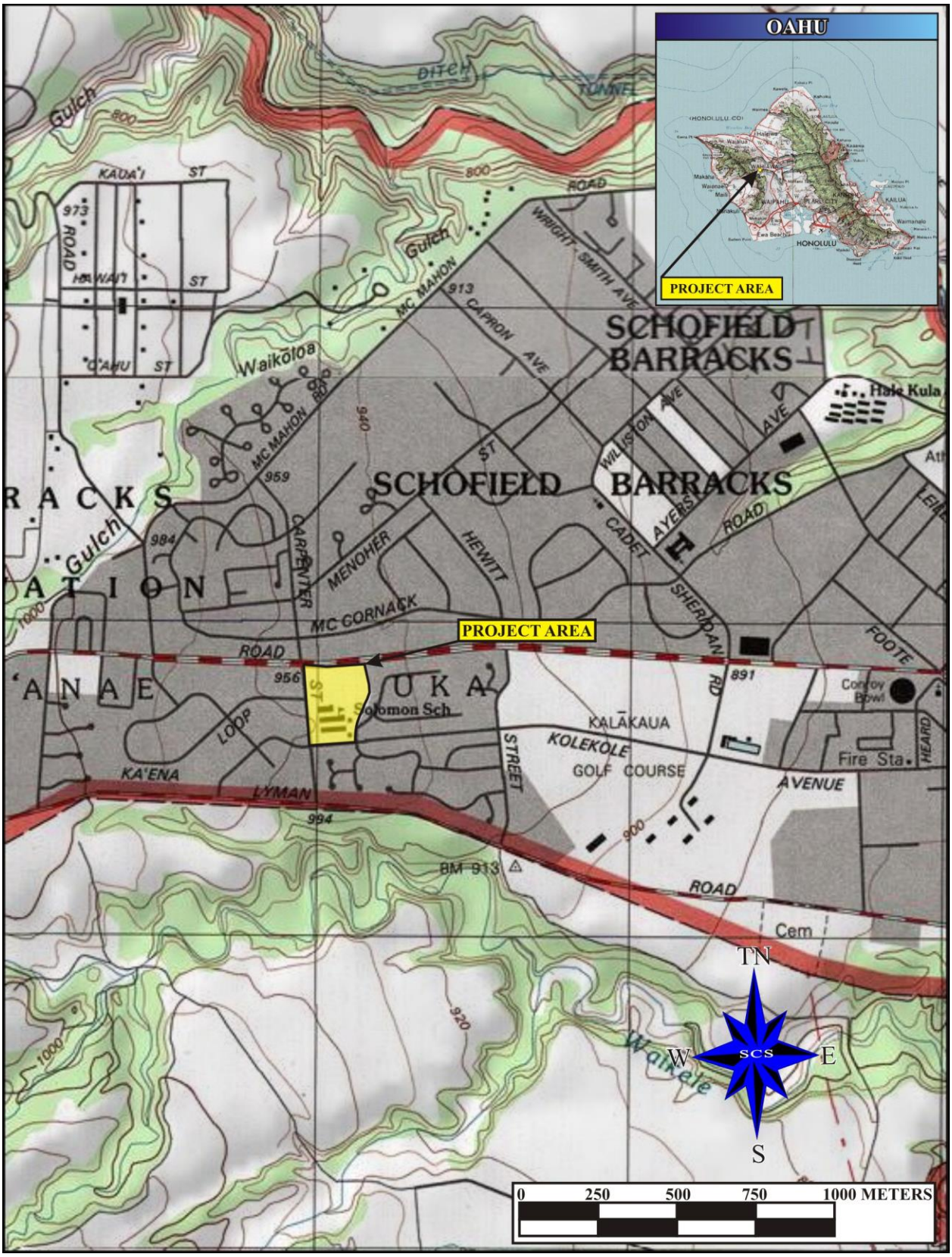

Figure 1: USGS Quadrangle (Schofield Barracks 1998) Map Showing Project Area Location.

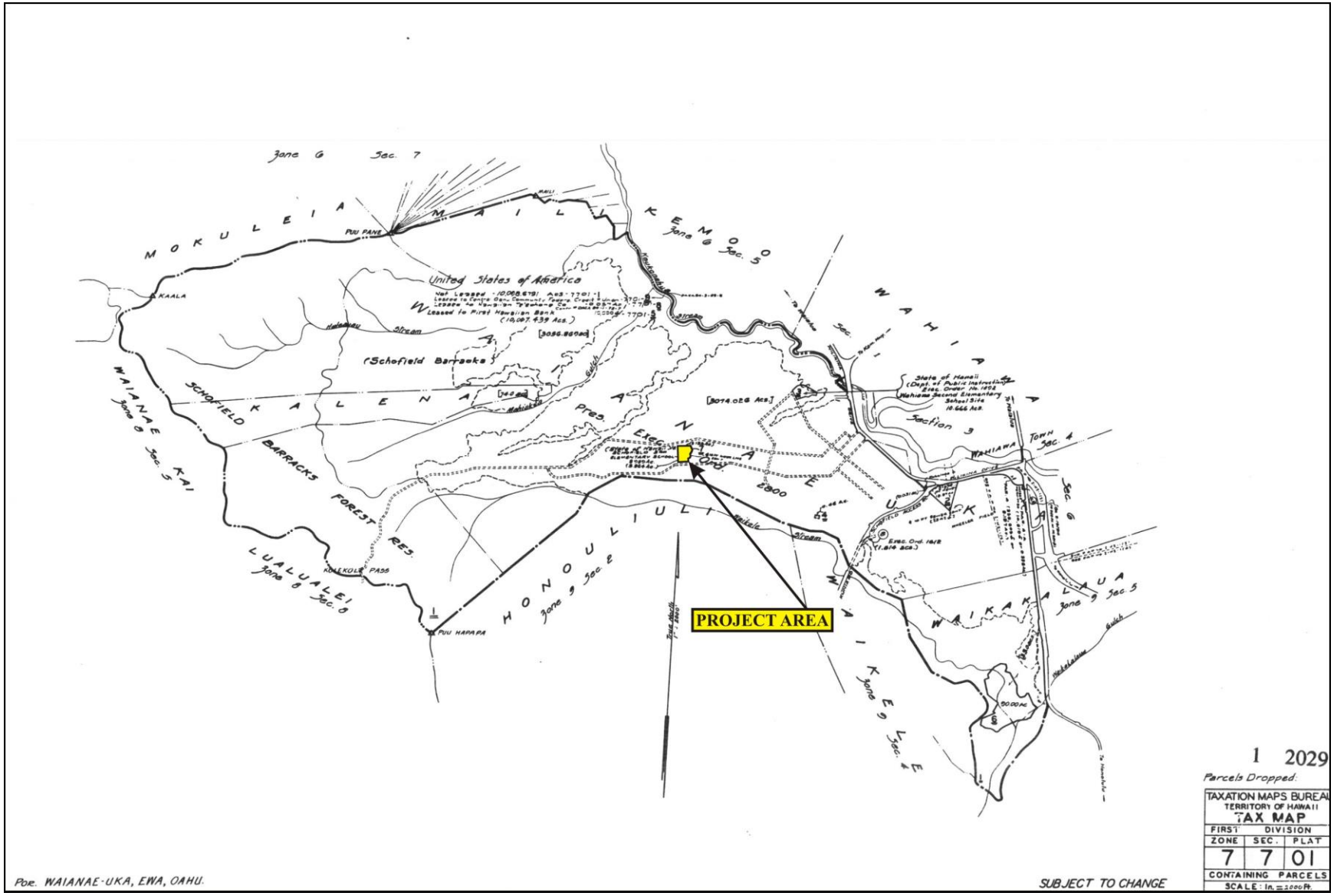

Figure 2: Tax map Key [TMK: (1) 7-7-001] Showing Project Area Location.

Figure 3: Google Earth Image (Aerial imagery from Google, Digital Globe dated 1/29/2013) Showing Project Area Location.

Act 50, enacted by the Legislature of the State of Hawai`i (2000) with House Bill (HB) 2895, relating to Environmental Impact Statements, proposes that:

> …there is a need to clarify that the preparation of environmental assessments or environmental impact statements should identify and address effects on Hawaii's culture, and traditional and customary rights… [H.B. NO. 2895].

Articles IX and XII of the state constitution, other state laws, and the courts of the State impose on government agencies a duty to promote and protect cultural beliefs and practices, and resources of Native Hawaiians as well as other ethnic groups. Act 50 also requires state agencies and other developers to assess the effects of proposed land use or shore line developments on the "cultural practices of the community and State" as part of the HRS Chapter 343 (2001) environmental review process.

It also re-defined the definition of "significant effect" to include "the sum of effects on the quality of the environment including actions impact a natural resource, limit the range of beneficial uses of the environment, that are contrary to the State's environmental policies . . . or adversely affect the economic welfare, social welfare or cultural practices of the community and State" (H.B. 2895, Act 50, 2000). Cultural resources can include a broad range of often overlapping categories, including places, behaviors, values, beliefs, objects, records, stories, etc. (H.B. 2895, Act 50, 2000).

Thus, Act 50 requires that an assessment of cultural practices and the possible impacts of a proposed action be included in Environmental Assessments and Environmental Impact Statements, and to be taken into consideration during the planning process. As defined by the Hawaii State Office of Environmental Quality Control (OEQC), the concept of geographical expansion is recognized by using, as an example, "the broad geographical area, e.g. district or *ahupua`a*" (OEQC 2012). It was decided that the process should identify 'anthropological' cultural practices, rather than 'social' cultural practices. For example, *limu* (edible seaweed) gathering would be considered an anthropological cultural practice, while a modern-day marathon would be considered a social cultural practice.

Therefore, the purpose of a Cultural Impact Assessment is to identify the possibility of on-going cultural activities and resources within a project area, or its vicinity, and then assessing the potential for impacts on these cultural resources. The CIA is not intended to be a document

of in depth archival-historical land research, or a record of oral family histories, unless these records contain information about specific cultural resources that might be impacted by a proposed project.

According to the Guidelines for Assessing Cultural Impacts established by the Hawaii State Office of Environmental Quality Control (OEQC 2012):

> The types of cultural practices and beliefs subject to assessment may include subsistence, commercial, residential, agricultural, access-related, recreational, and religions and spiritual customs. The types of cultural resources subject to assessment may include traditional cultural properties or other types of historic sites, both manmade and natural, which support such cultural beliefs.

The meaning of "traditional" was explained in *National Register Bulletin*:

> Traditional in this context refers to those beliefs, customs, and practices of a living community of people that have been passed down through the generations', usually orally or through practice. The traditional cultural significance of a historic property then is significance derived from the role the property plays in a community's historically rooted beliefs, customs, and practices. . . . [Parker and King 1990:1]

METHODOLOGY

This Cultural Impact Assessment was prepared as much as possible in accordance with the suggested methodology and content protocol in the Guidelines for Assessing Cultural Impacts (OEQC 2012: 11-13). In outlining the "Cultural Impact Assessment Methodology," the OEQC (2012:11) states that:

> "…information may be obtained through scoping, community meetings, ethnographic interviews and oral histories…"

This report contains archival and documentary research, as well as communication with organizations having knowledge of the project area, its cultural resources, and its practices and beliefs. An example letter of inquiry is presented in Appendix A and copies of the posted legal notice and the affidavit are presented in Appendix B. An example of the follow-up letter of inquiry is presented in Appendix C. The response to the letters of inquiry is presented in Appendix D. This CIA was prepared in accordance with the suggested methodology and content

protocol provided in the Guidelines for Assessing Cultural Impacts (OEQC 2012:13), whenever possible. The assessment concerning cultural impacts may include, but not be limited to:

A. A discussion of the methods applied and results of consultation with individuals and organizations identified by the preparer as being familiar with cultural practices and features associated with the project area, including any constraints or limitations which might have affected the quality of the information obtained.

B. A description of methods adopted by the preparer to identify, locate, and select the persons interviewed, including a discussion of the level of effort undertaken.

C. Ethnographic and oral history interview procedures, including the circumstances under which the interviews were conducted, and any constraints or limitations which might have affected the quality of the information obtained.

D. Biographical information concerning the individuals and organizations consulted, their particular expertise, and their historical and genealogical relationship to the project area, as well as information concerning the persons submitting information or interviewed, their particular knowledge and cultural expertise, if any, and their historical and genealogical relationship to the project area.

E. A discussion concerning historical and cultural source materials consulted, the institutions and repositories searched and the level of effort undertaken. This discussion should include, if appropriate, the particular perspective of the authors, any opposing views, and any other relevant constraints, limitations or biases.

F. A discussion concerning the cultural resources, practices and beliefs identified, and, for resources and practices, their location within the broad geographical area in which the proposed action is located, as well as their direct or indirect significance or connection to the project site.

G. A discussion concerning the nature of the cultural practices and beliefs, and the significance of the cultural resources within the project area affected directly or indirectly by the proposed project.

H. An explanation of confidential information that has been withheld from public disclosure in the assessment.

I. A discussion concerning any conflicting information in regard to identified cultural resources, practices and beliefs.

J. An analysis of the potential effect of any proposed physical alteration on cultural resources, practices or beliefs; the potential of the proposed action to isolate cultural resources, practices or beliefs from their setting; and the potential of the proposed action to introduce elements which may alter the setting in which cultural practices take place.

K. A bibliography of references, and attached records of interviews which were allowed to be disclosed.

If ongoing cultural activities and/or resources are identified within the project area, assessments of the potential effects on the cultural resources in the project area and recommendations for mitigation of these effects can be proposed.

ARCHIVAL RESEARCH

Archival research focused on a historical documentary study involving both published and unpublished sources. These sources included legendary accounts of native and early foreign writers; early historical journals and narratives; historic maps; land records, such as Land Commission Awards, Royal Patent Grants, and Boundary Commission records; historic accounts; and previous archaeological reports.

INTERVIEW METHODOLOGY

Interviews are conducted in accordance with Federal and State laws and guidelines when knowledgeable individuals are able to identify cultural practices in, or in close proximity to, the project area. If they have knowledge of traditional stories, practices and beliefs associated with a project area or if they know of historical properties within the project area, they are sought out for additional consultation and interviews. Individuals who have particular knowledge of traditions passed down from preceding generations and a personal familiarity with the project area are invited to share their relevant information concerning particular cultural resources. Often people are recommended for their expertise, and indeed, organizations, such as Hawaiian Civic Clubs, the Island Branch of Office of Hawaiian Affairs (OHA), historical societies, Island Trail clubs, and Planning Commissions are depended upon for their recommendations of suitable informants. These groups are invited to contribute their input and suggest further avenues of inquiry, as well as specific individuals to interview. It should be stressed again that this process does not include formal or in-depth ethnographic interviews or oral histories as described in the OEQC's *Guidelines for Assessing Cultural Impacts* (2012). The assessments are intended to identify potential impacts to ongoing cultural practices, or resources, within a project area or in its close vicinity.

If knowledgeable individuals are identified, personal interviews are sometimes taped and then transcribed. These draft transcripts are returned to each of the participants for their review and comments. After corrections are made, each individual signs a release form, making the interview available for this study. When telephone interviews occur, a summary of the

information is usually sent for correction and approval, or dictated by the informant and then incorporated into the document. If no cultural resource information is forthcoming and no knowledgeable informants are suggested for further inquiry, interviews are not conducted.

ENVIRONMENTAL SETTING

The project area consists of a developed property containing the existing Solomon Elementary School, which was built in 1968. Solomon Elementary School is located within the southern portion of the Schofield Barracks Military Reservation. The project area situated in the interior of the south-central portion of the island of O`ahu and positioned on the slopes of the Schofield Plateau, "…which was formed by the lavas from the Koolau Range banking against the older Waianae Range" (Armstrong 1980:12; Stearns 1966:79). The project area is located approximately 3,219 m (2 miles) northwest of Wheeler Air Force Base, approximately 15, 289 m (9.5 miles) inland and approximately 14, 484 m (9 miles) northwest of the Pearl Harbor. The project area is situated at approximately 940 to 1,000 feet above mean sea level (amsl).

LOCATION

The project area is bounded by Carpenter Street on the west, by Wai`anae Uka to the south, by military family housing to the east, and by Trimble Road to the East. Topographically, the northern portion of the project area is relatively flat, while the southern half is sloped downward approximately 10 degrees, from the northwest to the southeast. As the project area is a built environment, it has been subjected to extensive modifications. There are multiple manhole covers and access ports throughout the project area, indicating that subsurface modifications are also quite extensive. In addition, there are existing water and sewer lines throughout the property. The only area where manholes or access ports were not observed was the open field located in the northern half of the project area.

Surface modifications within the project area also include existing multiple concrete buildings and wooden portables. Other existing structures located in the project area include metal containers and metal fences. There are several existing small gardens which are used to support the school cafeteria. One of the gardens, which currently contains sweet potatoes, is on the site of the proposed Parking Lot B.

CLIMATE

Temperatures in the project area can range from as low as the mid-40s during the winter months to as high as the low 90s during the summer (Armstrong 1980:58). During the summer

months the project area is quite dry, primarily during the months of June and July, while the winter months can bring as much approximately 15 to 25 inches of rainfall annually (*ibid*:56).

SOILS

According to Foote *et al*. (1972: Sheet Map 40), soils within the project area are comprised of the Kunia Soil Series, specifically Kunia silty clay (KyA). Kunia Soils, derived from alluvium, are known to occur within the foothills of the Wai`anae Mountain Range in the Schofield Barracks area on the Island of O`ahu (*ibid*: 77). The well-drained KyA soils occur on 0 to 3 percent slopes and exhibit moderate permeability, slow runoff, and very slight erosion hazard. The KyA soils are utilized for the commercial production of sugarcane and pineapple, and found in residential areas and military installations (*ibid*: 88).

VEGETATION

The vegetation within the project area reflects an artificially landscaped area, within a built environment, dominated by exotic and native species, used for ornamental purposes. Vegetation within the project area includes: manicured lawns, Monkeypod Tree (*Albizia saman*), Money Tree (*Dracaena marginata*), Autograph Tree (*Clusia rosea*), Octopus Tree (*Schefflera actinophylla*), Plumeria (*Plumeria spp*.), Coconut Palm Tree (*Cocos nucifera*), hibiscus (*Hibiscus spp*.), Fiddlewood (*Citharexylum spinosum*), Wedelia (*Complaya trilobata*); sweet potato (*Ipomoea batatas*); plantain weed (*Plantago major*); red and green *ti* plants (*Cordyline fruticosa*); aloe (*Aloe vera*), and torch ginger (*Etlingera elatior*).

CULTURAL AND HISTORICAL CONTEXT

The island of O`ahu ranks third in size of the eight main islands in the Hawaiian Archipelago. The Wai`anae and Ko`olau Mountain ranges were formed by two volcanoes. Through the millennia the constant force of water carved fertile amphitheater-headed valleys and rugged passes eroded at lower elevations providing access from one side of the island to another (Macdonald and Abbott 1970).

TRADITIONAL AND HISTORICAL SETTING

PAST POLITICAL BOUNDARIES

Traditionally, the division of land into districts (*moku*) and sub-districts (*`ili*) was said to be performed by a ruling chief, who was chosen by the islands' chiefs to be the *mō`īho`oponopono o ke aupuni* (administrator of the government; Kamakau 1991). Land was

considered the property of the king or *ali`i `ai moku* (literally, the *ali`i* who eats the island/district), which he held in trust for the gods. The title of *ali`i `ai moku* ensured rights and responsibilities to the land, but did not confer absolute ownership. The king kept the parcels he wanted, his higher chiefs received large parcels from him and, in turn, distributed smaller parcels to lesser chiefs. The *maka`āinana* (commoners) worked the individual plots of land.

In general, several terms, such as *moku*, *ahupua`a*, *`ili* or *`ili` āina* were used to delineate various land sections on all the islands. A district (*moku*) contained smaller land divisions (*ahupua`a*) that customarily continued inland from the ocean and upland into the mountains. Extended household groups living within the *ahupua`a* were therefore able to harvest from both the land and the sea. Ideally, this situation allowed each *ahupua`a* to be self-sufficient by supplying needed resources from different environmental zones (Lyons 1875:111). The *`ili `āina* or *`ili* were smaller land divisions next in importance to the *ahupua`a* and were administered by the chief who controlled the *ahupua`a* in which it was located (Lyons 1875:33; Lucas 1995:40). The *mo`o`āina* were narrow strips of land within an *`ili*. The land holding of a tenant or *hoa `āina* residing in an *ahupua`a* was called a *kuleana* (Lucas 1995:61). The present project area is located in Wai`anae Uka Ahupua`a.

As a single land division, the *ahupua`a* of Wai`anae was unusual in that it crossed over the entire Wai`anae Mountain Range, the inland plateau of O`ahu and a third mountain slope on the leeward side of the Ko`olau Mountain Range. The historic era boundaries separating Wai`anae Kai and Wai`anae Uka are delineated at the summits of the central Wai`anae range. At least two significant landforms occur at the summit boundary: Mount Ka`ala, the highest peak on O`ahu, and Kolekole Pass, a prominent dip in the Wai`anae mountain range. Kolekole Pass provided an accessible, lowland passage between Wai`anae Kai and Wai`anae Uka. The fission of various Hawaiian *ahupua`a*, such as Wai`anae Uka and Wai`anae Kai, were a common occurrence during pre-Contact (pre-1778) Period and especially in the post-Contact Period (Cordy 1994:17).

The separation of the Wai`anae Ahupua`a into two portions may have transpired during the post-Contact Period as a result of land subdivisions during the Māhele (ca. 1840s). Some *ahupua`a* may have been subdivided during this time so that land could be allocated to a number of chiefs or *konohiki* or for the sole purpose of public sale (*ibid*). Wai`anae Uka Ahupua`a and Wahiawa Ahupua`a, located to the north, are within the present day District of Wahiawa, while Wai`anae-Kai and several other leeward *ahupua`a* are part of the Wai`anae District. Similar to

the fission of *ahupua`a*, island districts were also subdivided or new ones became developed, mainly for political reasons or matters of convenience (Coulter 1935:214).

In accordance with Act 84 of the Session Laws of 1909, the Districts of `Ewa and Wai`anae were created [in 1859 both district areas were in the `Ewa District (*ibid*: 216)] and Wai`anae Uka Ahupua`a was placed in the Waialua District (*ibid*: 220). The year 1909 was also when Schofield Barracks Military Reservation began to be constructed (Pukui *et al*. 1974:210). In 1913 a new district named Wahiawa was created to include the *ahupua`a* of Wahiawa and Wai`anae Uka (Coulter 1935:221).

TRADITIONAL SETTLEMENT PATTERNS

Archaeological settlement pattern data suggests that initial colonization and occupation of the Hawaiian Islands first occurred on the windward shoreline areas of the main islands between A. D. 850 and 1100, with populations eventually settling in drier leeward areas during later periods (Kirch 2011). Although coastal settlement was dominant, Native Hawaiians began cultivating and living in the upland *kula* (plains) zones. Greater population expansion to inland areas began around the 14th century and continued through the 16th century. Large scale, or intensive, agriculture was implemented in association with habitation, religious, and ceremonial activities.

The Hawaiian economy was based on agricultural production and marine exploitation, as well as raising livestock and collecting wild plants and birds. Extended household groups settled in various *ahupua`a*. During the pre-Contact Period, there were primarily two types of agriculture, wetland and dry land, both of which were dependent upon geography and physiography. River valleys provided ideal conditions for wetland *kalo* (*Colocasia esculenta*) agriculture that incorporated pond fields and irrigation canals. Other cultigens, such as *kō* (sugar cane, *Saccharum officinaruma*) and *mai`a* (banana, *Musa* sp.), were also grown and, where appropriate, such crops as *`uala* (sweet potato, *Ipomoea batatas*) were produced. This was the typical agricultural pattern seen during the pre-Contact Period on all the Hawaiian Islands (Kirch and Sahlins 1992, Vol. 1:5, 119; Kirch 1985).

PRE-CONTACT (PRE-1778 A.D.)

Traditional and historical accounts portray the central plateau of O`ahu as being an important birthplace and population center for the Hawaiian chiefs (*ali`i*).The birthing place of Kukaniloko is located on the north side of Kaukonahua Stream in present day Wahiawa Ahupua`a, or what was once within Kamananui Ahupua`a, in the District of Waialua (Kirch and

Sahlins 1992, Vol.1:19). Kukaniloko is said to have represented one of two famous *ali`i* birth places in Hawai`i, with Holoholoku on Kaua`i being the other (Kamakau 1992:38). Kukaniloko was originally established as a birth place by the chief Nanakaoko and his wife Kahihiokalani for the birth of their son Kapawa (Fornander 1980:20), which based on genealogical lines, may have transpired during the 1300s (Yent 1995). The royal lineage of Nanakaoko was appropriated by his father, who represented one of several families initially settling the Hawaiian Islands from southern origins (Fornander 1919, Vol.6:247). This family consisted of three main branches named Nanakaoko, Nanakulei, and Nanamaoa, all of whom lived in central O`ahu at Wahiawa and Lihue (*ibid*).

Since the creation of Kukaniloko as an important *ali`i* birthplace, the *ali`i* subsequently born there were considered "born in the purple" and they "enjoyed the distinction, privileges, and tabus which that fact conferred" (*ibid*). These chiefs were also regarded as the *akua* of the land as well as *ali`i kapu* (Kamakau 1992:53). Some of the many distinguished *ali`i* born at the birth place includes the chiefess Kukaniloko, a high chiefess of O`ahu for whom the stone is named (Fornander 1980:Vol.11:20), her daughter Kalai-manuia, and the "wise, firm, and judicious chief" of O`ahu, Ma`ili-kukahi (*ibid*: 89), among many others. The *ali`i mo `i* Ma`ili-kukahi was known as a benevolent chief whose *kulanakauhale* or "village" (Pukui and Elbert 1981:165) included the land between Oahunui and Halahape in Waialua (Kamakau 1991:55). He was considered to be a "religious chief" who refused to conduct human sacrifices; such was "the way of Kukaniloko chiefs" (*ibid*).

The significance of Kukaniloko as a birthplace for *ali`i* was perpetuated into the early post-Contact Period. According to Kamakau (1991:38), Kamehameha I brought Keopuolani to Kukaniloko to give birth to their son Liholiho. However, Keopuolani left Kukaniloko without giving birth. A slightly different story is accounted by Fornander (1969: Vol.2:21) in which he states that Keopuolani was not able to go to Kukaniloko because she was too ill.

After the birth of an *ali`i*, the child was taken into the *waihau heiau*, Ho`olonopahu, located "a furlong and a half" to the south of Kukaniloko (Kamakau 1991:38). With the help of 48 chiefs, the navel cord of the child was cut in the *heiau*. The birth of an *ali`i* was announced by beating the sacred drum Hawea, located to the west of Kukaniloko (*ibid*). Kukaniloko was also considered a *pu `uhonua*, or place of refuge, where a person could be saved after committing murder (`Ī`ī 1959:138).

WAHI PANA (LEGENDARY PLACES)

Mount Ka`ala, located on the *mauka* boundary of Wai`anae Uka, is also accounted for in Hawaiian myth as being close to the home of the goddess Kaiona. Kaiona was known as the "lady of sunshine" and, according to Mrs. Mary Kawena Pukui; the goddess was kind and never harmed anyone (Pukui in Sterling and Summers 1978:133). A pond at the top of Mount Ka`ala is believed to have been guarded by the *mo`o* Kamaoha (McAllister 1933:133).

The project area is located in an area once known as Lihu`e, which served as one of the main residential areas of the O`ahu *ali`i,* between 1400 and 1500 A.D. The place name “Lihu`e”, translated as "cold chill" (Pukui *et al.* 1974:132), was regarded as once being the home of a mythical figure named Kaupe. Kaupe was a legendary "cannibal dog-man" who was notorious for overthrowing the government of Ka-hanai-a-keakua (reared by gods) and ruled the land from Nu`uanu (Beckwith 1970:345). Kaupe ate people from O`ahu and Maui but never attacked high chiefs. He was finally killed by a Hawai`i chief who had learned the prayer for killing an enemy (*ibid*).

The Kolekole Stone (McAllister Site 214; Figure 4) is located just above the pass and it was the only site recorded by McAllister (1933) that the Bishop Museum was able to relocate during their late 1970s survey (Rosendahl 1977: vol. 2:35). The Kolekole Stone was known as a place where students of warfare would practice *lua* fighting (Stokes in Sterling and Summers

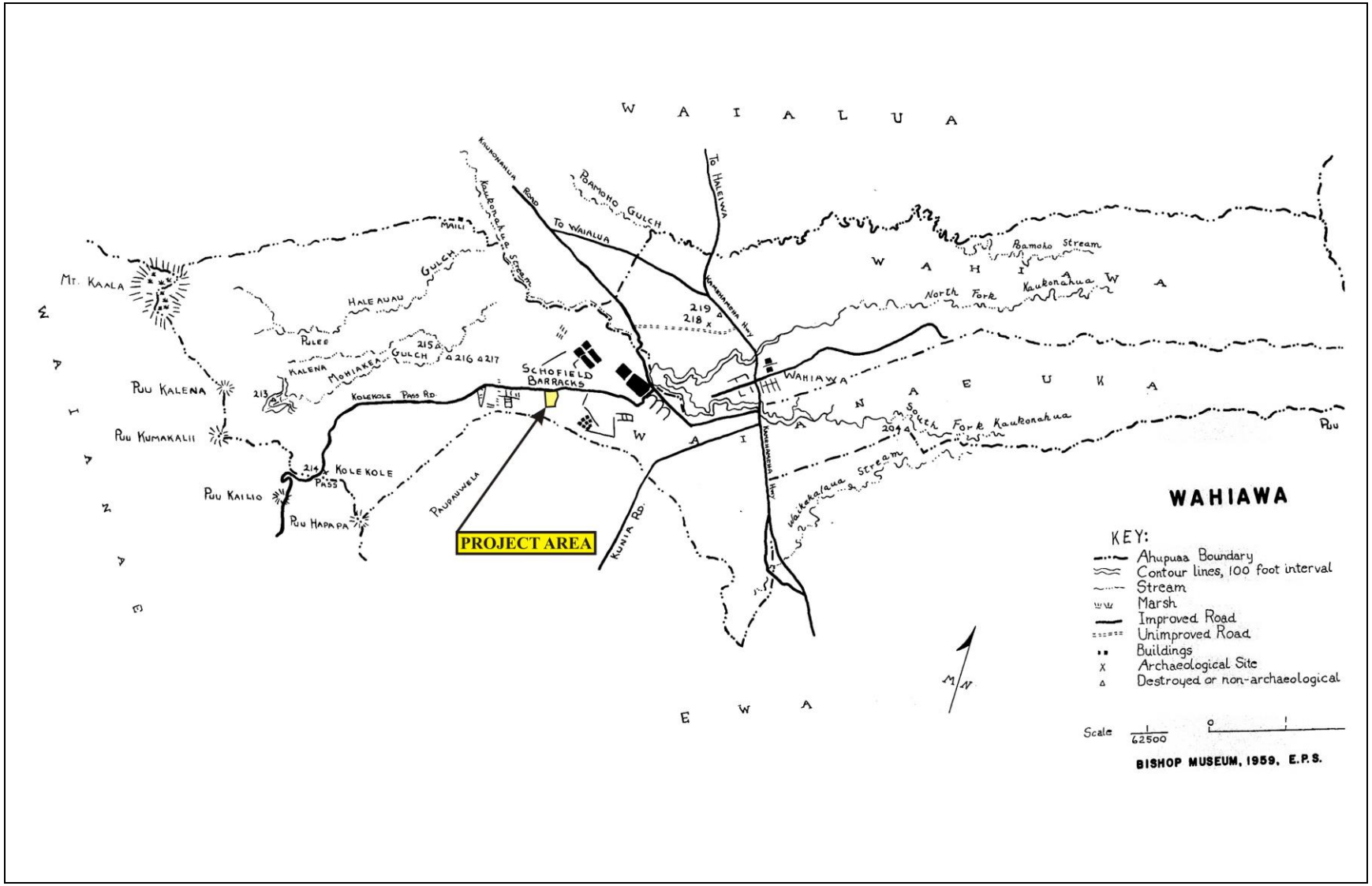

Figure 4: Wahiawa (Wai`anae Uka) District Map (Sterling and Summers 1978) Showing Project Area Location.

1974:135). *Lua* was a fighting technique that included bone breaking, dislocating joints, and provoking pain by pressing on nerve centers (Pukui and Elbert 1981:213). Stokes asserts that the *lua* students would wait for passing victims to practice their combat techniques on the "plains of Leilehua" (*ibid*). Leilehua was a historic-era name of the western plains of the central plateau of O`ahu, which included Wai`anae Uka (Tomanari-Tuggle 1994:14).

The Kolekole Stone is said to represent the female guardian of the pass named Kolekole (McAllister 1933:134). The stone contains ribbed depressions on its sides which may have formed a drainage of sorts ascending from a basin in the top of the stone (*ibid*: 14). McAllister discredits a story that the stone was used as a platform for decapitating people, as he believed that such a story was started as a joke (*ibid*).

POPULATION CENTERS

Wahiawa, Halemano, and Lihu`e are mentioned by Kamakau as being chiefly settlements on the central plateau associated with the *loa li`i* (Kamakau 1991:40). These chiefs were considered to be gods that resembled men and they were classified as such because they "lived there continually and guarded their *kapu* (from whom a 'guaranteed' chief might be obtained, *loa`a*)" (*ibid*). Other chiefly settlements, including Oahunui and Kukaniloko, are also mentioned in legends and historical accounts.

Wahiawa, a traditionally named population center (Kamakau 1991:40) and historic *ahupua`a* that borders the Schofield Barracks Military Reservation (SBMR), is literally translated as "place of noise" apparently because rough seas could be heard there (Pukui *et al.* 1974:218). The suggested origin of these rough seas is along the Waialua coast, as is described in the legend of Hi`iaka's journey when she crosses over the region. In a portion of a chant translated in Henry *et al.* (1992:4), Hi`iaka hears the noise of the waves in Wahiawa:

At Waialua is the great voiced ocean
Heard to the uplands of Lihu`e,
Rumbling atop Wahiawa,
Deafening is the voice of the sea,
It is a deafening voice,
Indeed the ocean has a voice

The settlement of Halemano, also referred to as Helemano on United States Geological Survey Topographic maps or Halemanu (McAllister 1933:137), was at one time associated with a cannibalistic chief known as `Aikanaka ("man eater"), Kalo`aikanaka, Kalo, or

Keali`i`aikanaka (*ibid*). `Aikanaka's people lived in the area of "Halemanu" in Pa`ala`a, not far from `Aikanaka's house and ceremonial feasting grounds where human flesh was cooked and eaten (McAllister 1933:137, Beckwith 1970:340-341). `Aikanaka's people "were darker than the Hawaiians, with a different speech and no tapu laws" (Beckwith 1970:341). Some suggested that `Aikanaka's people were foreigners who came from the "South Seas" and after being driven out of Kaua`i, and then Mokule`ia and Waialua, they settled in the upper lands of Helemanu (*ibid*: 342; McAllister 1933:138; and Sterling and Summers 1978:111). Beckwith (1970:341) attributes a narrow ridge near Kukaniloko as being a place where "the last cannibals of Oahu took their stand and seized upon victims for their cannibal feasts."

A settlement referred to as Oahunui was apparently named for the chief Oahunui who once resided there. The settlement of Oahunui was located in proximity to the legendary Oahunui Stone, which may have been near the east fork of Kaukonahua Stream or along the nearby Waiakakalaua Stream to the south of Wai`anae Uka. The Oahunui Stone allegedly embodies the chief Oahunui at the place where he was murdered. The chief Oahunui was known to have been a friend and contemporary of the cannibalistic chief `Aikanaka, from whom he acquired a taste for human flesh (Sterling and Summers 1978:111). According to legend, Oahunui was killed after he arranged his brother-in-law, Lehuanui, to be absent from the village while he ate Lehuanui's two chiefly sons. Upon returning to Oahunui and discovering the deaths of his sons, Lehuanui killed Oahunui, Oahunui's wife (for allowing the murders), and any servants who complied with the killing of his sons. It is believed that each of these individuals turned to stone along the banks of Kaukonahua or Waiakakalaua Stream. In the 1890s, people from Honolulu would ride out to Oahunui and walk around the stone (McAllister 1933:132). Thus, it was contended that "no one could say that he had been entirely around the island of Oahu unless he had been around this stone" (*ibid*).

A settlement referenced as Lihu`e was inhabited by a long line of chiefs, According to Fornander (1969 Vol.2-85), the inland location of Lihu`e was too remote and distant from the sea for the chiefess Kelea, the Maui wife of the chief Lo-Lale:

> For several years Kelea lived with Lo-Lale at Lihue, and bore him three children...but the inland situation of Lihue, at the foot of the Ka`ala mountains, and far from the sea, became wearisome and monotonous to the gay and volatile temper of Kelea (*ibid*).

The actual location of Lihu`e on the central plateau of O`ahu differs among various historic accounts, Fornander (in Sterling and Summers 1978:136) describes Lihu`e as being on

the "uplands of the Wai`anae side of Wahiawa" and that it included "Kalena on the plains of Hale`au`au". A land survey conducted in1850 similarly refers to the *`ili* of Kalena as being in the district of Lihu`e (Department of Interior, Document 255). In contrast, other accounts given in Sterling and Summers (1978) describe Lihu`e as being in `Ewa just south of Maunaauna and the place name Lihu`e is labeled as an *`ili* south of Maunaauna on an 1881 Hawaiian Government Survey map.

An "ancient Kahua Maika" *(ulu maika* field) once existed at a place called Kokoloea, Lihu`e, where Kuali`i was victorious. The `Ewa chiefs however, made another effort to retrieve their fortunes, and fought a second battle with Kuali`i at Malamanui and Paupauwela, in which they were worsted and the authority of Kuali`i as *Mō`ī* (monarch) of O`ahu finally secured and acknowledged. Kuali`i and his warriors battled against the chiefly factions of `Ewa and Waialua sometime during the middle to late 1600s (Tomonari-Tuggle 1994:13).

Another famous battle between the Maui chiefdom under Kahekili and the O`ahu chiefdom under Kahahana occurred in the Wai`anae Mountain Range, and at one point in proximity to Kolekole Pass on the western boundary of Wai`anae Uka. Under the direction of Kahekili's warrior Kahahawai, a battle at Niuhelewai was fought between the two factions. Afterwards, both forces retreated to the mountains of Wai`anae. That evening a crafty battle plan was ordered by Kahahawai, which lead to a successful defeat of the O`ahu forces:

> They were well supplied with war implements and other things necessary for the destruction of their enemies. So Kahahawai told them to prepare torches. When these were ready they went one evening to the top of a hill which was near to the rendezvous of the enemies where they lighted their torches. After the torches were lit they moved away to a cliff called Kolekole and hid themselves there, leaving their torches burning at the former place until they [the torches] died out. The enemies thought that Kahahawai and his men had gone off to sleep. They therefore made a raid on the men of Kahahawai. But Kahahawai and his men arose and destroyed all the people who were asleep on the hills and the mountains of Kaala. Thus, the enemies were annihilated, none escaping. Those who raided the torch encampment were captured, there being no avenue for escape from death and destruction by Kahahawai and his men." (Sterling and Summers 1978:135).

SUBSISTENCE RESOURCES

E.S. Craighill Handy and Elizabeth G. Handy (1972) characterize the central plateau of O`ahu as extraordinary because it represents the most level landscape on the island at such a high

elevation (*ibid*: 465). As is evidenced by an abundance of *lo`i* or irrigated taro fields "northwest of the present town of Wahiawa," Handy and Handy contend that the Wahiawa region once had a sizable population (*ibid*: 464). Sweet potato and yams were also cultivated in the general region, with Wahiawa being known as one of only a few known irrigated sweet potato fields (*ibid*). Although there was some taro cultivated in the valleys of Wai`anae Uka, sweet potato, grown on *kula* lands, is claimed by Handy (1940:75) as being the main vegetable crop in the *ahupua`a*. Handy and Handy (1972:465) also speculate that Wai`anae Uka residents probably received most of their fish from Wai`anae Kai which was well known for its deep-sea fishery. Freshwater fish were obtained from the streams bisecting the central plateau, as is suggested by a historic reference to a "fishing place" at a locality called Paka (Tomonari-Tuggle 1994:11).

A local informant, Hookala, remembered the presently existing swamp at the top of Mount Ka`ala as being a fishpond, which McAllister called Luakini Fishpond (McAllister 1933: 133). Hookala mentioned that his father used to obtain fish from the pond at Ka`ala, and back then it was stocked with shore fish, *hinalea, wuwoa,* a kind of mullet and others (*ibid*).

TRANSPORTATION ROUTES

John Papa `Ī`ī (1959) described at least four trail sections that crossed through different portions of Wai`anae Uka. Although`Ī`ī observes that these trails were in use during the post-Contact Period, it is likely that some were used during the pre-Contact period. The main travel route in central O`ahu extended in a roughly north-south direction between the north and south shores of O`ahu.

Two additional trails in Wai`anae Uka (or close by) extended to the east and west of the main trail. One of these spur trails connected to the place name Oahunui (*ibid*: 99) which was located somewhere near the south fork of the Kaukonahua Stream or nearby Waikakalaua Stream, in proximity to the legendary Oahunui Stone. The trail to Oahunui was probably the same travel route used during the 1890s by people from Honolulu who would ride out to Oahunui and walk around the stone (McAllister 1933:132). The other trail that extended to the west of the main trail is said to have begun at Kukaniloko from which point it crossed through Wai`anae Uka and ascended over Kolekole Pass (`Ī`ī 1959:96-97).

John Papa `Ī`ī (*ibid*) tells of a "long cliff trail called Elou" that passed over Mount Ka`ala to eastern Wai`anae from Kaukonahua Gulch. The Elou Cliff trail was described as running through Hale`au`au and Kalena in Wai`anae Uka (*ibid*).

POST-CONTACT PERIOD (POST-1778)

Following the first western contact to Hawai`i (*ca.* 1778), the onslaught of foreigners to the Hawaiian Islands brought a series of transformations to the natural and cultural landscapes throughout the island chain.

Victualing to the foreign shippers necessitated an increase in surplus of traditional crops (taro, sweet potato, and bananas) and the introduction of new western crops, such as Irish potato, cabbage, watermelon, and squash (Cuddihy and Stone 1990:37).

The establishment of mission stations in Waialua, Wai`anae and `Ewa resulted in improved roadways, such as the traditional route across the central plateau and across Kolekole Pass. In 1837 Reverend Emerson, pastor of the Waialua mission station, reported that the traditional Kolekole Pass trail was converted to a more traversable horse trail:

> During the year past, a number of patches of road have been made, which considerably facilitate our access to some remote parts of the station and to Waianae. The pali between Waialua and Waianae, which formerly rendered the latter place inaccessible from Waialua except on foot, has been so improved that a horse can be rode up and down without difficulty (Emerson 1837: Missionary Letters).

The over-harvesting of sandalwood and the taking of other timber for whaling ships to "fuel the boilers that rendered whale blubber into oil" (Cuddihy and Stone 1990:38) resulted in the destruction of many native trees. The central plateau of O`ahu was often exploited for its sandalwood by the O`ahu chiefs, commonly to satisfy debts to the King (Kamakau 1992:251-252). Wahiawa in particular was famous for its large sandalwood trees (*ibid*: 207). The virtual devastation of most of the sandalwood forest was swiftly facilitated when the trees became more rare and the method of locating them was to burn the forest and identify a tree by the burning fragrance of sandalwood (Bishop in Tomonari-Tuggle 1994:17).

Foreign diseases probably had the most adverse effect on the native Hawaiian population. Reverend Artemis Bishop (1849: Missionary Letters) described a measles epidemic that devastated the Wai`anae and `Ewa native communities between 1848 and 1849:

> The past has been a year of trials and sorrows among my people in passing through scenes of sickness and death, beyond what I had

> ever witnessed... how strikingly their former athletic frames and warlike habits contrast with their present enfeebled and effeminate bodies.
>
> Middle of October the measles broke out and spread like wildfire...burning the dead was the great work, all other occupations were suspended and people staggered about like walking corpses.

LAND TENURE

Another conspicuous effect of the ever-growing influence of foreigners in Hawai`i was the systematic division of lands, called by some the "Māhele," or "great division." The Land Commission oversaw land divisions of three groups, Crown Lands (for the King), Konohiki Lands and Government Lands, all of which were "subject to the rights of native tenants" (Chinen 1958). With the exception of the *`ili* of Kalena, the *ahupua`a* of Wai`anae Uka was designated as Crown Lands and no *kuleana* were claimed.

Kalena `Ili was a narrow tract of land (approximately 533 acres) that extended from near the 1000-foot elevation to the steep mountain peaks of the Wai`anae Range. At an unknown date, prior to Pahoa's death (ca.1848), half of Kalena `Ili (266.3 acres) was granted to him as Land Commission Award No. 16 (Records of the Board of Commissioners to Quiet and Titles). The remaining half of Kalena `Ili was granted to John Meek (Landrum *et al*. 1994:30).

In 1851 Pahoa's half of Ka`ena was conveyed to Rev. Artemis Bishop as Land Grant No. 527. In addition to being pastor of the `Ewa and Wai`anae mission stations, Rev. Bishop participated in many "surveying expeditions," which he emphasizes was done primarily for exercise (Bishop 1851: Missionary Letters). Bishop's survey data of Kalena, consisting of boundary descriptions and a corresponding sketch map, provides a hint that traditional practices were maintained in Kalena during this period; he wrote:

> I can devise no method to divide the land without spoiling its value. The lower part is a ravine and contains taro patches for 4 or 5 families. The Upper part is stony and mountainous and is only fit for pasture (Department of the Interior Document 255).

Bishop's sketch map denotes the locations of at least six houses. These were likely inhabited by the 4 or 5 families whom the taro patches belonged to (*ibid*). Interestingly, Rev. Bishop writes in his survey notes that the *`ili* of Kalena was in the "District of Lihue, Wai`anae, Oahu," again suggesting that the traditional place name of Lihu`e probably included the western

lands of Wai`anae Uka. It is suggested that an additional district named Lihu`e may have existed among the central plateau of O`ahu.

On June 9 of 1851, the Rev. Bishop and his wife sold the property to John Meek (Bureau of Land Conveyances, Book 17: 148), whom later acquired the entirety of Wai`anae Uka for ranch lands. As Crown Land, the remaining land of Wai`anae Uka was leased to various foreign entrepreneurs, who were in one way or another involved with cattle ranching on the central plateau of O`ahu between the years 1875 and 1887, and the initial purchase of Wai`anae Uka in 1889 by J.I. Dowsett.

Prior to its being leased, sometime during the reign of Kamehameha IV (1855- 1863), the *ahupua`a* of Wai`anae Uka was reportedly given by the King to a lawyer and legislator named Mahoe (Tomonari-Tuggle 1994:22). No records exist that confirm this land allocation. However, it is said that Mahoe's claim to Wai`anae Uka "was later lost during the overthrow of the monarchy" (*ibid*). Nedbalek (1984) suggests that Kaliikaua wanted Wai`anae Uka for his own and in exchange, he gave Mahoe a land plot in Honolulu. According to a 1900-1901 Waialua Agricultural Co. map and grant records (on microfilm in the State Division of Land Management, DLNR), the area currently considered to be a northern section of western Wai`anae Uka, between the prominent Pu`u Pane ridge and north boundary of Wai`anae Uka, was subdivided into 9 grants referred to as the Maile Grants. Tomonari-Tuggle (1994:20) compiled a summary of these leaseholds:

WAI`ANAE UKA LEASEHOLDS:

1875 - May I

• 10-year lease for the lands of Wai`anae Uka and Pouhala Uka (except for timber trees) to the heirs of John Meek, who died on January 20, 1875 and James Dowsett; lease was $500.00 per year (Liber. 43 p. 97-101).

1879 - February 1

• The Meeks transferred their lease to James I. Dowsett; on the same day, Dowsett surrendered the lease to the Crown Lands Estate (Liber. 70, p. 424).

1882 - January 14

• Crown Lands Estate awarded a 30-year lease (at $500/year*)* to Hervey E. Whitney for the lands of Wai`anae Uka, Waikakalaua, and Pouhala (Brown 1886) "as by survey by W.D. Alexander in Crown Land Book of Survey, pages 160, 161, 162. Except the timber trees and all young trees fit and proper to be raised and preserved for timber trees**".**

• On the same day, Whitney sold 1/3 of the lease to Kalakaua and 1/3 to C.H. Judd for 1.00; the lease included Nanakuli and Aiea (Liber. 76, p. 140) and Whitney and Judd sold

2,000 head of cattle called the "Meek herd" to Alexander J. Cartwright and George Galbraith for $30,000; it also appears that Whitney assigned his lease to Cartwright and Galbraith (Liber. 70, p. 428).

1887 - November 21
• Kaliikaua transferred a deed to trustees of his estate, C.H. Judd, S.M. Damon, C.P. Iaukea, and A.J. Cartwright (Liber. 105, p. 268).

1889 - March 12
• Leilehua Ranch sold at auction to James I. Dowsett for $41,500; the ranch included 20,000 acres stretching from `Ewa to about 5 or 6 miles south of Waialua, 3,000 head of cattle and other stock; was owned by Kalakaua and C.H. Judd (p.C. Advertiser 1889).

1889 - March 21
• Deed formally transferred to J.1. Dowsett; it included Kalauao Ewa, Nanakuli, Wai`anae Uka, Pouhala, Waikakalaua, Ke`elikolani taro patches at Waiawa, Kalena at Wai`anae, Aiea, as well as 2,500 to 3,000 head of cattle, 23 work horses, colts, and two mules, three ox carts and yokes, and "all that property known as Leilehua Ranch", including among other things, all "cattle branded with a crown" (Liber. 112, p. 401.).

The boundaries of the nine grants extended on their *mauka* ends from a common point on Pu`u Pane (at a "Koa tree") and terminated at their widest points along the northwest side of Hale`au`au Stream or Kaukonahua Stream to the north. These grants were acquired between 1851 and 1853, and all but one of the grants (Grant 629, purchased by Mark Ivers) was associated with Hawaiian names (Index of Grants 1916). An 1881 survey map shows the location of a dairy on the opposite (southeast) side of Iver's grant land, thus suggesting that Ivers was affiliated with cattle ranching. All nine grants were clearly designed to incorporate the resources of Hale` au` au or Kaukonahua Stream into the widest portions of each parcel.

In 1846 the east half of Waikakalaua, an 836-acre land parcel south of the present Wai`anae Uka boundaries, was conveyed to John L. Gilman (Grant 6) for the price of $1.00 (on microfilm in the State Division of Land Management, DLNR). The west half of Waikakalaua was retained as Crown Lands. A metes and bounds map of Grant 6 identifies the land immediately east of the grant, and within Wai`anae Uka, as Oahunui. A "rock at Oahunui" is shown as a boundary marker at the northeast corner of the grant.

RANCHING (CA. 1840 TO 1928)

John Meek, one of the earliest lease holders of Wai`anae Uka, was a well-known ship captain and Honolulu harbor master (*ibid*: 19). He was also a prominent O`ahu cattle rancher.

The success of Meek's ranching endeavors on the central plateau of O`ahu is elaborated in the later 1922 account:

> The days are recalled, also, when Captain Meek controlled Lihue and Wahiawa on Oahu under lease from the government. He raised thoroughbred horses, and his daughters rode the finest in the island. The Meek animals were known all over the group, especially his white horse which he called "Pu-a". His oldest daughter, Eliza, was often seen riding the horse through the streets of Honolulu garbed in a wonderful pa-u with a dozen or more followers wearing the same color of fluttering skirt garment (Taylor 1922:223 in Tomonari-Tuggle 1994: 19).

An 1881 Government Survey map shows a house labeled as "Crabbe" near Kokoloea at the center of Wai`anae Uka. This was probably a ranch house once occupied by Horatio Crabbe and his wife Elizabeth Meeks Crabbe, the daughter of John Meeks. Horatio Crabbe was also the executer of John Meek's will (*ibid*: 22). This same house was considered to be the "old Dowsett ranch house" by Alika Dowsett, the son of James Dowsett (Meek's lease partner of the land). Wai`anae Uka was part of the Meek and/or Dowsett Ranch until 1879, at which time both families relinquished the lease back to Crown Lands (*ibid*).

Kalakaua apparently named the Wai`anae Uka ranch lands "Leilehua" and in 1882, this land was the two-thirds portion of the land leased to Kalakaua and C. H. Judd (Tomonari-Tuggle 1994:20). Kalakaua and Judd built a hunting lodge in Wai`anae Uka as a retreat, where they were known to have entertained other people of influence (Nedbalek 1984: 13). This lodge was named "Malamanui" by Kalakaua and is said to have been located where the former Schofield Golf Course was located.

Malamanui is also mentioned by Papa `Ī`ī (1959:97) as being a place that the Kolekole trail passed through. In an effort to payoff some large national debts accumulated by Kalakaua as a result of his extravagant lifestyle, Leilehua Ranch was sold to the original lease holder, James I. Dowsett, and maintained as a ranch up into the early 1900s (Tomonari-Tuggle 1994:20).

During the late 1800s, when much of Wai`anae Uka was part of the Meek Dowsett`s ranch lands, the 1878 government census indicated that 19 households still existed there, including 54 males and 41 females. All but 12 of the 96 residents were reported to be of Hawaiian ethnicity, and all but two of the names were Hawaiian names (*ibid*: 24). An 1886

photograph of what appears to be Waiele Stream gulch is evidence that irrigated taro *(lo`i*) was still being cultivated in Wai`anae Uka during the late 19th century. This photograph also shows the presence of a humble residence next to the taro fields.

A 1911 "Map of Taro and Watered Lands in the Kaukonahua Gulch" (Gomes 1911) shows the locations of several, presumably 18th century historic house sites, an area of graves, and a multitude of taro lands along the banks of Kaukonahua Stream west of the Wahiawa Dam. One of these house sites appears to have been located within the present day Schofield Barracks Military Reservation, at the confluence of Mohiakea and Kaukonahua stream gulches. The area of graves indicated on the map seems to lie roughly north of the present day Wright-Smith Avenue in Schofield Barracks.

MILITARY OCCUPATION (1899 THROUGH PRESENT)

In 1899 Wai`anae Uka was formally set aside by the U.S. government as a military reservation. However, it was not until 1909 that temporary and permanent barracks were constructed on the western central plains of Wai`anae Uka and occupied by army personnel. Most of the buildings and training infrastructure initially planned for Schofield Barracks were completed during the early 1920s, after World War I. At the beginning of World War II, Schofield Barracks offered the only major training area in the Hawaiian Islands. The military base was also targeted during the infamous Japanese attack on O`ahu on December 7, 1941. Presently, the land of Wai`anae Uka is completely under U.S. military jurisdiction. The lower portion of Wai`anae Uka west of Wilikina Drive is encompassed by the Schofield Barrack's residential and operational facilities. Three training ranges *(i.e.*, Impact Area, South Range and East Range) and forest reserve land comprise the remaining portion of Wai`anae Uka.

Patricia Alvarez (1982) provides a detailed account of the history and modern events associated with the U.S. military occupation of Wai`anae Uka. The historical sequence of military use of Wai`anae Uka *(ca.* 1909-1946) began in the year 1899 when Wai`anae Uka (with the exception of Kalena `Ili) (*ibid*: 9*)* was set aside as a United States military reservation (Executive Order G. O. 147). The initial intent was that the reserve be a place for soldiers to recuperate after fighting in the Philippines (O'Hare *et al*. 1993: A-7).

The location of Wai`anae Uka was also considered to be advantageous as the "base for Oahu's mobile defense troops because of its strategic central location on the island" (Tomonari-Tuggle 1994:25). Despite the 1907 request of the Hawaiian Governor Walter Frear to reserve Wai`anae Uka for homesteading (Alvarez 1982:21), the U.S. military first occupied the central

plains of Wai`anae Uka in 1909. The pioneer group, consisting of 473 men from the 5th Cavalry Regiment, was housed in temporary and permanent structures (Tomonari-Tuggle 1994:27) in the southeast coner of modern day Schofield Barracks.

Schofield Barracks was originally called Castner Village, named after Captain Castner who initiated the construction of the barracks and associated structures (Alvarez 1982:25). In April 1909, the military settlement was formally named Schofield Barracks, in honor of a former Commanding General of the U.S. Army, Lieutenant General John M. Schofield. According to a 1910 Reservation Map of Schofield Barracks, a network of Oahu Sugar Co. ditches and associated tunnels extended across the Wai`anae side of the reservation between Waiele Stream (near a cantonment), and Hale`au`au, Kalena and Mohiakea streams to the northwest.

By 1916 several new barracks were constructed at Schofield Barracks, each of which were designed to be self-contained units and included kitchen and mess hall facilities, eight squad rooms, and an administration building. The administration building provided housing and office space for the residents, as well as reading and music rooms, and a medical examination room. The top third floor of each newly constructed barrack housed a large auditorium that had a stage and orchestra pit (*ibid*: 34).

Although a pause in construction occurred during World War I, following the declaration of war in 1917, most of the major building projects initially planned for Schofield Barracks were finished in the early 1920s (*ibid*: 42). Such projects included the construction of general officer's bungalows in 1918, the 1919 and 1923 construction of new artillery barracks for the increasing number of artillery troops at Schofield (located away from the infantry and cavalry areas), the 1920 and 1921 construction of new infantry barracks, and the addition of many officer's quarters in association with the infantry and cavalry sections (*ibid*: 43).

During the Japanese attack on O`ahu on December 7, 1941, Schofield Barracks received minimal damage in the form of bullet holes in buildings, such as Carter Hall, Upper Post storage tanks, and building T-1632. The attack gave the Post's 25th Division the distinction of being the first army unit to receive hostile fire in the war. The 25th Division units were responsible for shooting down two fighter planes, one Japanese and one American (*ibid*: 64-65).

At the beginning of World War II Schofield Barracks comprised the only major training area in the Hawaiian islands, which included artillery ranges, small arms firing ranges, and bayonet and obstacle courses (*ibid*: 69). Soon after, larger facilities were constructed to

accommodate the newly established Ranger Combat School "whose objective was to toughen the soldier for the jungle's rigors" commonly experienced in the Pacific battleground *(ibid).* By the end of World War II (this marked by the Japanese surrender in 1945) the population at Schofield Barracks decreased to just 5,000 individuals (*ibid*: 74).

Currently the Schofield Barracks Military Reservation comprises three active training ranges: the Impact Area, South Range and East Range. The Impact Area, containing approximately 2,800 acres, encompasses the lower slope of the Wai`anae Range west of the main Schofield Barracks housing and administration area. This range is the primary range for live mortar and artillery firing, but is also used for field training of squad and platoon size units, headquarters, elements and service support units. The South Range, just south of the Impact Area, is commonly used for field training of headquarters and service support units. At the time of the 2010 U.S. Census, Schofield Barracks contained a population of 16,370 (United States Census Bureau Website (http://quickfacts.census.gov/qfd/states).

PREVIOUS ARCHAEOLOGY

A number of archaeological and science-related studies have been conducted in Wai`anae Uka (McAllister 1933; Griffin and Yent 1977; Rosendahl 1977; O'Hare *et al.* 1993; McIntosh *et al.* 1994a and 1994b; and Tomonari-Tuggle 1994). Sterling and Summers (1978) provide information regarding legendary sites and some of the previously recorded archaeological sites on the Schofield Barracks Military Reservation.

Archaeological sites were observed in the western portion of Wai`anae Uka by Bishop Museum Zoologist W.A. Bryan in 1901. While on route to Hale`au`au Valley (written as "Hale o o") from a cabin to the south, Bryan observed "as many as perhaps a dozen stone enclosures, which probably were the walls of old dwellings" (Bryan 1901). Bryan describes "Hale o Temple" as being "farther down the valley" from the settlement, below a large enclosure *(ibid).* The large enclosure measured 190 ft by 100 ft and had an elevated "square place" in one of its coners (*ibid*). At a vantage point at "Hale O Temple," Bryan observed walls "a few hundred yards" down the valley that he hypothesized as being "the house of a thrifty kanaka country gentleman surrounded by his lots and pens" (*ibid*). Further up in this same valley, Bryan observed the "remains of ancient kalo ponds".

The earliest formal archaeological work in the region was done during a 1930 island-wide survey by J. Gilbert McAllister, under the auspices of the Bishop Museum. McAllister

(1933) recorded seven sites in Wai`anae Uka. All but one of these sites was located in the western portion of Wai`anae Uka, along the northeast slope of the Wai`anae mountain range.

The sites documented by McAllister (1933 in Sterling and Summers 1978:134-137) consisted of two *heiau*, and a habitation site located near Mohiakea Gulch, the "Kolekole Stone" (Site 214) near Kolekole Pass, Kumakalii Heiau (Site 213) in Pukaloa Gulch below Pu`u Kumakali`i and Pu`u Kalena, and Luakini Fishpond at the top of Mauna Ka`ala (see Figure 4). In the east portion of Wai`anae Uka, McAllister recorded the "Oahunui Stone" (Site 204), on the South Fork of Kaukonahua Gulch. McAllister (1933 in Sterling and Summers 1978: 132, 137) noted that all but three of the seven sites had been destroyed and one site, the fishpond on top of Mauna Ka`ala, was no longer an active fishpond, but a swamp. Twenty years later, Thomas McGuire contended that it was unlikely that the swamp at Mt. Ka`ala was ever a fishpond because of the lack of dykes or stone walls necessary to contain such a pond and the apparent old age of the vegetation growth in the marsh (McGuire in Sterling and Summers 1978: 132).

Of the more eminent sites recorded in the area by McAllister were the Kukaniloko birth stones and the associated Ho`olonopahu Heiau (McAllister 1933: 134-137), located in Wahiawa just north of Schofield Barracks. Unfortunately, nothing remained of Ho`olonopahu Heiau at the time of McAllister's survey and the surrounding land was planted in pineapple (*ibid*).

Three *heiau* have been recorded in Wai`anae Uka within the western portion of the SBMR. Kumakali`i Heiau was recorded as being in the upper part of "Pukaloa Gulch" (McAllister 1933: 133) at approximately the 2,200 foot contours (State Historic Preservation Division, Kapolei, files). Pukaloa Gulch, also named by Bryan (1901) in his explorations, seems to refer to present day Kumakali`i Stream valley.

Hale`au`au Heiau (McAllister Site 215) was shown by Sterling and Summers (1978) as being located on the west side of the confluence of Kalena Gulch and Mohiakea Gulch (see Figure 4). McAllister described the *heiau* to be on the side of "Pukaloa Gulch" (McAllister 1933: 133), which may be an older name for Mohiakea Gulch. However, the *heiau* name suggests an association with Hale` au` au Stream located north of Kalena and Mohiakea. This location is further supported by a McAllister (1933) photograph of Hale`au`au Heiau that exhibits a closer back drop of the Wai`anae Mountain range and road (currently called Firebreak Road) than would be expected if the site was located at Kalena and Mohiakea.

Hale`au`au Heiau (McAllister Site 215) was described by McAllister as a stepped platform with a pit feature, situated on "a natural hill on the side of the gulch" (*ibid*: 134-135). Although Hale`au`au Heiau was reportedly in better condition than the other two *heiau*, most of its features had been destroyed by artillery as the site was located on the edge of a military firing range.

The location of Kalena Gulch Heiau (McAllister Site 217) is more questionable as it was identified by McAllister as being located "in Kalena Gulch on the land of Mohiakea" (*ibid*: 134). However, Sterling and Summers (1978) shows the location of Kalena Gulch Heiau as being on the upper plateau about 100 feet to the east of the confluence of Kalena Gulch and Mohiakea Gulch (see Figure 4). McAllister (1933) reported that Kalena Gulch Heiau had been completely destroyed by artillery because it was also located on a military firing range. Local residents once claimed that an underground "tunnel" containing burials existed in Kalena Gulch Heiau (*ibid*: 134).

Thrum (1907 in McAllister 1933: 133-134) describes Kumakali`i Heiau (McAllister Site 213) as being "an important heiau in its day and of large size; visited by Kalakaua in the '70s". McAllister (*ibid*: 134) reported that Kumakali`i Heiau was dismantled and "the stones were used in the building of the Wahiawa dam "located nearly 5 miles to the east of the site". A local informant (in Tomonari-Tuggle 1994: 14) has mentioned the presence of a "navigational *heiau"*, referred to as "Kumakali`i", located at the base of Maunaauna just south of Kolekole Pass. It is possible that both of these *heiau* named "Kumakali`i" may actually refer the same. That the *heiaus* were placed in two different locations may indicate flaws in the mapping technology of the 1800 and early 1900s.

During the late 1970s, the Bishop Museum conducted a reconnaissance survey of Schofield Barracks, under contract to the U.S. Army Corps of Engineers (Rosendahl 1977). The work included a ground survey that focused on approximately 8% of the total 9,280-acre project and literature research and oral histories. The resulting report presents an inventory of nine sites, including six of the seven sites recorded by McAllister (1933), the Elou Cliff trail (State Site 50-80-08-9516) described by Papa `Ī`ī (1959:97), and two newly identified sites: a series of dryland agricultural terraces (State Site 50-80-08-9527) and a platform (State Site 50-80-08-9528) (Rosendahl 1977: vol. 2-36). Although Papa `Ī`ī's narrative seems to describe the trail as crossing over the east side of Mauna Ka`ala from Hale`au`au and Kalena, Rosendahl (1977) places State Site 50-80-08-9516 in closer proximity to the Kolekole Pass Road (map on file at the State

Historic Preservation Division, Kapolei) and Rosendahl (1977) states that the site was "destroyed probably by construction of the present road" (*ibid*).

An archaeological "surface survey" was conducted at the Wahiawa Fresh Water Park situated at the west boundary of the Schofield Barracks Military Reservation's East Range (Griffin and Yent 1977). As a result of this survey, two Historic Era sites were located adjacent to the South Fork of Kaukonahua Stream: an Oahu Railway and Land railroad bed, and a terrace complex. Griffin and Yent were uncertain whether the terrace complex was prehistoric in origin and historically modified or historic in origin (*ibid*: 2). Likewise, they speculate that either "the terraces may have been used to grow and irrigate wild taro" or they were "used to prevent erosion along the slope of the stream bank" (*ibid*).

The "Kalo ponds" observed by Bryan further up Hale`au`au Valley probably correlate with agricultural terraces, `auwai and associated house sites observed in the "Aerial Tram Valley" during an early 1980s botanical survey conducted by the Waimea Arboretum (Powell 1984 letter). On a 1954 USGS Topographical Map of the Island of Oahu, "Aerial Tram" refers to a dashed line that extends from Hale`au`au Stream valley to the peak of Mount Ka`ala. The following excerpt from Powell's letter to the Army Corp of Engineers provides a detailed summary of the Hale`au`au Valley sites (*ibid*):

> Terraces seen were of loose rock formation. To my untrained eye they seem typical of the walls observed in Waimea Valley. Most appear to be terrace retaining walls... I began counting easily noted walls on my … trek and they numbered 35. I did not count small sections or pieces, only those that were obviously untouched walls. There were 4 sites that might have more significance. They were enclosures of some sort. One was quite intact and measured approximately 10 feet. Another was slightly smaller and two of the walls were formed partially by large boulders. Walls had been constructed up to and including them. There were two auwai trenches that I counted and one that I did not have the time to clear but suspect it was as well. One of interest to me was a section along the river that was carefully walled and seemed to form a viaduct of sorts away from the river. It was leading off into an area that I did not follow.

A survey of historic buildings was undertaken at Schofield Barracks by Paul H. Rosendahl, Inc. (O'Hare *et al.* 1993). The goal of the study was "to identify and evaluate all structures with potential historic significance at the installation," including those structures that were constructed before 1942 (upon review of the report, the DLNR requested that the cut off date be 1950) (*ibid*: 1 and E-1). This work supplemented an inventory and evaluation of historic buildings in Schofield Barracks previously done by the Bishop Museum (Rosendahl 1977). A

total of 374 properties were ultimately identified at Schofield Barracks. The historic significance of the 374 sites were evaluated in accordance with four categories (Category I through IV) used by the U.S. Army. It was proposed that a number of "buildings constructed before World War 1or as a result of the 1916 construction plan" be included in the Schofield Barracks Historic District (O'Hare *et al.* 1993:7).

Four archaeological or historical studies have been conducted on the more developed portions of Wai`anae Uka in the centrally located areas of Schofield Barracks and Wheeler Army Airfield (O'Hare *et al*. 1993; McIntosh *et al.* 1994a and 1994b; and Tomonari-Tuggle 1994).

In the early 1990s, the International Archaeological Research Institute, Inc. conducted an "assessment of cultural resources" was done at Wheeler Army Airfield (Tomonari-Tuggle 1994). The study included a comprehensive compilation of the traditional and historical background and previous archaeological studies of the area. A ground survey was conducted in selected areas determined as having the least degree of ground disturbance and thus, greater probability of site preservation. Five archaeological sites were recorded in the sample areas including a remnant of the Oahu Rail and Land Company railroad and four probable military structures.

An inventory of historic properties was also undertaken and all buildings dating before 1952 were evaluated (Bouthillier in Tomonari-Tuggle 1994). Fifty-four buildings were identified and a portion of these were recommended to be designated a National Register Historic District (Tomonari-Tuggle 1994: iii).

Two separate archaeological studies were conducted by BioSystems at several parcels along the perimeter of Wheeler Army Airfield (McIntosh *et al*. 1994a) and on the south side of Kaukonahua Stream adjoining Schofield Barracks (McIntosh *et al.* 1994b). Two historic buildings and a grinding stone next to one of the buildings were identified in the Wheeler Army Airfield parcels. The grinding stone was interpreted as prehistoric in origin and because it was "out of context" (McIntosh *et al.* 1994b:27), it was recommended to be preserved elsewhere where it could be better protected.

Scientific Consultant Services, Inc. conducted three Phases of work in SBMR (Robins and Spear 1997a, 1997b, and Carson 2000). This work was primarily aimed at developing an inventory of archaeological sites and assessing site functions and was completed through detailed mapping, recording and excavation. A total of 76 traditional Hawaiian sites, 21 ranching or military sites, and four sites of undetermined function were investigated.

Scientific Consultant Services, Inc. conducted Cultural Resources Inventory Survey and Limited Testing, Phase I, of the Schofield Barracks Training Areas for the Preparation of a Cultural Resource Management Plan for U.S. Army Training Ranges And Areas, O`ahu Island, Hawai`i (TMK 7-6-01 and 7-7-01) (Robins and Spear 2002a). A total of 73 archaeological sites were identified as a result of the Inventory Survey. The site inventory consists primarily of Traditional-type Hawaiian structures that were interpreted as irrigated (pondfield) and non-irrigated (dryland) agriculture, habitation, burial, and trails. Several historic ranching and U.S. military structures are also included in the inventory. Limited testing was conducted at two Hawaiian pondfield agriculture sites (50-80-08-5392 and 5394), a permanent habitation enclosure (in Site 50-80-08-5448) and a dryland agriculture terrace (in Site 50-80-08-5427). The stratigraphy of the pondfield sites suggested the presence of at least two cultivation zones that were evidenced by alternating oxidation and reduction soils. It is posited that the field boundaries exposed on the surfaces of the pondfield sites are a later, possibly Historic Era development. Radiocarbon dating analysis of the four sites revealed a continuation of Hawaiian settlement and agricultural developments in Wai`anae Uka between the 13th and 17th centuries.

Scientific Consultant Services, Inc. also conducted Cultural Resources Inventory Survey And Limited Testing, Phase II, of the U.S. Army Schofield Barracks Training Areas for the U.S. Army Garrison Hawaii Ecosystem Management Program, Island Of O`ahu, Hawai`i (Robins and Spear 2002b). Eleven individual areas were selected for survey based on a site prediction model generated from background research of the region. A total of 19 archaeological sites were identified during the inventory survey. The site inventory consists of nine traditional Hawaiian sites interpreted as irrigated (pondfield) and non-irrigated (dryland) agriculture and habitation, one possible road section associated with ranching or military training, and eight U.S. military sites. Limited testing was conducted at one Hawaiian pondfield agriculture sites (50-80-08-5393), a permanent habitation terrace (in Site 50-80-08-5448), an *imu* (subterranean earth oven) and dryland agriculture feature (in Site 50-80-08-5423), and two temporary habitation sites (Sites 50-80-08-5431 and 5507). Radiocarbon dating analysis of the four sites revealed a continuation of Hawaiian settlement and agricultural developments in Wai`anae Uka between the 15th and 20th centuries.

In 2004, Garcia and Associates (GANDA) conducted Archaeological Surveys for the Stryker Brigade Combat Team (SBCT) U.S. Army Hawaii Schofield Barracks Hawaii (Buffum *et al*. 2004). This study focused on SBCT training facilities at Schofield Barracks

Military Reservation, Kahuku Training Area, Wheeler Army Airfield, military vehicle trails from Schofield Barracks to Dillingham Training Area and to Helemano Military Reservation, O`ahu Island, and at the Pohakuloa Training Area, Hawai`i Island. However, only the findings at the SBCT training facilities at Schofield Barracks will be discussed. No new or previously identified sites were encountered.

Scientific Consultant Services, Inc. conducted a site relocation project involving Global Positioning System (GPS)/site survey fieldwork on 48 previously identified sites within the U. S. Army's Kawailoa Training Area (KLOA) on O`ahu (Kaschko and Dega 2005). Global Positioning System coordinates were acquired from all but two sites formerly identified during Phase I and Phase II archaeological research. Global Positioning System points were taken in the approximate location of the two small, non-identified sites. All other sites were subject to GPS measurement and assessed for preservation integrity. All the sites but one, a hearth remnant on Pu`u Kapu, have retained their integrity since original recordation in 1997 and 1998. During this survey, several previously unidentified sites were located.

In 2006, Archaeological Monitoring was conducted of the Duckfield Water-line Installation at Schofield Barracks Military Reservation (Descantes 2006). During the monitoring activities no new or previously identified archaeological sites were identified. However, three historic artifacts were observed during trench excavations. These artifacts included one glass Coca Cola bottle and two horseshoes, which most likely date between the 1920s and the 1950s.

Scientific Consultant Services, Inc. conducted an Archaeological Assessment of nine locations totally 13.76 acres situated at Wheeler Army Air Field and Schofield Barracks Military Reservation, Wai`anae Ahupua`a, Wahiawā District, Island Of O`ahu [TMK: (1) 7-7-001: various] (Tome and Spear 2010). A total of six sites were identified during the assessment work; these included site TS-1, a culvert; TS-2, a pulley target system; TS-3, a wooden structure; TS-4, a concrete structure; TS-5 a historic trash dump; and TS-6, which included a culvert and six artificial excavations found in a cliff face.

Scientific Consultant Services, Inc. conducted an Archaeological Inventory Survey-level investigation of the Hale Kula Elementary School project area (Dagher and Spear 2012). No historic properties were identified.

In 2014, Scientific Consultant Services, Inc. conducted an Archaeological Inventory Survey of the current project area (Dagher and Spear 2014, in prep.). State Site 50-80-08-7684,

which consisted of charcoal concentration interpreted as clean out from a thermal feature, was newly identified within stratigraphic layer II of Stratigraphic Trench 2. Using conventional radiocarbon age analysis, the charcoal concentration yielded a conventional radiocarbon age of 210 + 30 B.P. When calibrated, the date is A.D. 1630–1670 (50.6) at 1 Sigma and A.D. 1620–1680 (55.9) at 2 Sigma.

CULTURAL IMPACT ASSESSMENT INQUIRY RESPONSE

Analysis of the potential effect of the project on cultural resources, practices or beliefs, the potential to isolate cultural resources, maintain practices or beliefs in their original setting, and the potential of the project to introduce elements that may alter the setting in which cultural practices take place is a requirement of the OEQC (No. 10, 1997). As stated earlier, this includes the cultural resources of the different groups comprising the multi-ethnic community of Hawai`i.

Consultation was sought from individuals and organizations whose jurisdiction included knowledge of the area. Consultation was sought from Dr. Kamana`opono M. Crabbe, Chief Executive Officer, Office of Hawaiian Affairs; Vincent H. Rodrigues, Cultural Historian, State Historic Preservation Division; Hawaiian Civic Club of Wahiawa; Henry Ahlo, community member; Glen Kila, community member; Pokii Magallanes, O`ahu Island Burial Council, Wai`anae District Representative; Edward H. Ayau, Hui Malama I Na Kupuna O Hawai`i Nei, and William H. Ho`ohuli, community member (see Appendix A). As a reminder, follow-up letters were sent to these same individuals and organizations approximately three weeks after the initial letters (see Appendix B). In addition, a Cultural Impact Assessment Notice was published on June 29, July 2, and July 3, 2014, in The Honolulu Star-Advertiser, and the July 2014 issue of the OHA newspaper, *Ka Wai Ola* (see Appendix C). Consultation efforts for the CIA for the proposed Solomon Elementary School resulted in responses from Mr. Henry Ahlo and Dr. Kamana`opono M. Crabbe, Chief Executive Officer, Office of Hawaiian Affairs.

Henry Ahlo

On June 17, 2014, a telephone interview was conducted with Mr. Henry Ahlo. During the course of an expansive military career, Henry Ahlo met First Sargent Samuel K. Solomon before he was killed in Vietnam. Mr. Ahlo related several legends associated with Kolekole Pass. According to Mr. Ahlo, during the construction of the road over Kolekole Pass, there was a large boulder that the engineers threw over the cliff. The next morning when the engineers returned, the rock was back in place. Mr. Ahlo stated that people were thrown over the cliff there

(Kolekole Pass) and that it was very weird there at night, as all kinds of weird noises could be heard. Mr. Ahlo went on to say that because of the breaking of the *kapu* system, Mr. Ahlo never witnessed any rituals being conducted because everyone was afraid – only the older adults conducted rituals.

Dr. Kamana`opono M. Crabbe, Chief Executive Officer, Office of Hawaiian Affairs

Dr. Kamana`opono M. Crabbe, Chief Executive Officer, Office of Hawaiian Affairs, responded in a letter dated July 22, 2014, transmitted via the US Postal Service (the letter for OHA is presented in its entirety in Appendix D). The letter states in part:

> We applaud your efforts to perform a cultural impact assessment. OHA does request assurances that should iwi kupuna or Native Hawaiian cultural or traditional deposits be identified during ground altering activities related to this project, all work will immediately cease and the appropriate agencies will be contacted pursuant to applicable law. OHA would like to be notified and consulted if burials are found.

SUMMARY

The "level of effort undertaken" to identify potential effect by a project to cultural resources, places or beliefs (OEQC 1997) has not been officially defined and is left up to the Cultural Impact Assessment investigator. A good faith effort can mean contacting agencies by letter, interviewing people who may be affected by the project or who know its history, research identifying sensitive areas and previous land use, holding meetings in which the public is invited to testify, notifying the community through the media, and other appropriate strategies based on the type of project being proposed and its impact potential. Sending inquiring letters to organizations concerning development of a piece of property that has already been totally impacted by previous activity and is located in an already developed industrial area may be a "good faith effort." However, when many factors need to be considered, such as in coastal or mountain development, a good faith effort would undoubtedly mean an entirely different level of research activity.

Historical and cultural source materials were extensively used and can be found listed in the References Cited section of this report. Such scholars as John Papa `Ī`ī; Samuel M. Kamakau; Martha Beckwith; Jon J. Chinen; Patrick Kirch, Marshall Sahlins; E.S. Craighill and Elizabeth Green Handy; Mary Kawena Puku`i, Samuel H. Elbert, and Esther Mookini; Ross

Cordy; and Elspeth Sterling, and Catherine Summers have contributed, and continue to contribute, to our knowledge and understanding of Hawai`i, past and present. The works of these and other authors were consulted and incorporated in this report where appropriate. Land use document research was supplied by the Waihona `Aina 2012 Database.

CULTURAL ASSESSMENT AND RECOMMENDATIONS

Analysis of the potential effect of the project on cultural resources, practices or beliefs, its potential to isolate cultural resources, practices or beliefs from their setting, and the potential of the project to introduce elements which may alter the setting in which cultural practices take place is a suggested guideline of the OEQC (2012). Based on the responses from those organizations and individuals contacted, there are no known areas where traditional cultural practices were conducted in the vicinity of the project area. Based on historical research and the response from those organizations and individuals contacted, it is reasonable to conclude that Hawaiian rights related to gathering, access or other customary activities within the project area will not be affected and there will be no adverse effect upon cultural practices or beliefs.

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APPENDIX A: EXAMPLE LETTER OF INQUIRY

Dear: June 13, 2014

In compliance with the statutory requirements of the Federal National Environmental Policy Act (NEPA) and with the National Historic Preservation Act (NHPA), the State of Hawai‘i Revised Statute (HRS) Chapter 343 Environmental Impact Statements Law, and in accordance with the State of Hawai`i Revised Statute (HRS) Chapter 343 Environmental Impact Statements Law, and in accordance with the State of Hawai`i Department of Health's Office of Environmental Quality Control (OEQC) Guidelines for Assessing Cultural Impacts as adopted by the Environmental Council, State of Hawai`i on November 19, 1997.

Scientific Consultant Services, Inc. (SCS) is in the process of preparing a Cultural Impact Assessment (CIA) for the proposed improvements to Solomon Elementary. The approximately 9.289 acre elementary school campus is situated on land owned by the United States and leased to the State of Hawai`i (Department of Education) , located in Wai`anae Uka Ahupua`a, Wahiawā District, Island of O`ahu [TMK: (1) 7-7-001:007].

According to the *Guidelines for Assessing Cultural Impacts* (Office of Environmental Quality Control, Nov. 1997):

> The types of cultural practices and beliefs subject to assessment may include subsistence, commercial, residential, agricultural, access-related, recreational, and religious and spiritual customs…The types of cultural resources subject to assessment may include traditional cultural properties or other types of historic sites, both man made and natural which support such cultural beliefs…

We are seeking any information that you, or other individuals, might have which may contribute to the knowledge of traditional cultural activities that were, or currently are, conducted in the vicinity of the proposed project area. We are also seeking any information pertaining to traditional cultural activities or traditional rights which may be impacted by the proposed undertaking. The results of the Cultural Impact Assessment are dependent on the response and contributions made by individuals and organizations such as yours.

Enclosed are maps showing the location of the proposed project area. Please contact me at the Scientific Consultant Services, Honolulu, office at (808) 597-1182 or via e-mail cathy@scshawaii.com) with any information or recommendations concerning this Cultural Impact Assessment.

Sincerely yours,

Cathleen Dagher
Senior Archaeologist
Enclosures (3)

APPENDIX B: LEGAL NOTICE AND AFFIDAVIT

Scientific Consultant Services, Inc. (SCS) is seeking information on cultural resources and traditional or on-going cultural activities on or near Solomon Elementary School located within Schofield Barracks, Wai`anae Uka Ahupua`a, `Ewa District, O`ahu Island, Hawai`i [TMK: (1) 7-7-001:007]. Please respond within 30 days to Cathleen Dagher at (808) 597-1182.

1563

AFFIDAVIT OF PUBLICATION

IN THE MATTER OF
Solomon Elementary School CIA (SCS Proj 1563)

STATE OF HAWAII }
} SS.
City and County of Honolulu }

Doc. Date: JUL - 3 2014 **# Pages:** 1
Notary Name: Patricia K. Reese First Judicial **Circuit**
Doc. Description: Affidavit of Publication

Patricia K. Reese JUL - 3 2014
Notary Signature Date

PATRICIA K. REESE NOTARY PUBLIC Comm. No. 86-467 STATE OF HAWAII

Scientific Consultant Services, Inc. (SCS) is seeking information on cultural resources and traditional or on-going cultural activities on or near Solomon Elementary School located within Schofield Barracks, Wai'anae Uka Ahupua'a, 'Ewa District, O'ahu Island, Hawai'i [TMK: (2) 7-7-001:007]. Please respond within 30 days to Cathleen Dagher at (808) 597-1182. (SA6642646 6/29, 7/2, 7/3/14)

Julie Clark being duly sworn, deposes and says that she is a clerk, duly authorized to execute this affidavit of Oahu Publications, Inc. publisher of The Honolulu Star-Advertiser and MidWeek, that said newspapers are newspapers of general circulation in the State of Hawaii, and that the attached notice is true notice as was published in the aforementioned newspapers as follows:

Honolulu Star-Advertiser 3 times on:
06/29, 07/02, 07/03/2014

Midweek Wed. 0 times on:

_____ times on:

And that affiant is not a party to or in any way interested in the above entitled matter.

Julie Clark

Subscribed to and sworn before me this 3RD day
of July A.D. 20 14

Patricia K. Reese, Notary Public of the First Judicial Circuit, State of Hawaii
My commission expires: Oct 07 2014

PATRICIA K. REESE NOTARY PUBLIC Comm. No. 86-467 STATE OF HAWAII

Ad # 0000642646 SP.NO.: _____ L.N.

APPENDIX C: EXAMPLE FOLLOW-UP LETTER

Dear :

This is our follow-up letter to the June 13, 2014 letter, which was in compliance with the statutory requirements of the Federal National Environmental Policy Act (NEPA), the State of Hawai‘i Revised Statute (HRS) Chapter 343 Environmental Impact Statements Law, and in accordance with the State of Hawai‘i Revised Statute (HRS) Chapter 343 Environmental Impact Statements Law, and in accordance with the State of Hawai`i Department of Health’s Office of Environmental Quality Control (OEQC) Guidelines for Assessing Cultural Impacts as adopted by the Environmental Council, State of Hawai`i on November 19, 1997.

Scientific Consultant Services, Inc. (SCS) is in the process of preparing a Cultural Impact Assessment (CIA) pertaining to the proposed improvements to Solomon Elementary School. The approximately 9.289 acre elementary school campus is situated on land owned by the United States and leased to the State of Hawai`i (Department of Education) , located in Wai`anae Uka Ahupua`a, Wahiawā District, Island of O`ahu [TMK: (1) 7-7-001:007].

According to the *Guidelines for Assessing Cultural Impacts* (Office of Environmental Quality Control, Nov. 1997):

> The types of cultural practices and beliefs subject to assessment may include subsistence, commercial, residential, agricultural, access-related, recreational, and religious and spiritual customs…The types of cultural resources subject to assessment may include traditional cultural properties or other types of historic sites, both man-made and natural which support such cultural beliefs…

We are seeking any information that you or other individuals have which might contribute to the knowledge of traditional cultural activities that were, or are currently, conducted in the vicinity of the elementary school. We are also asking for any information pertaining to traditional cultural activities or traditional rights which may be impacted by the proposed improvements at the school. The results of the cultural impact assessment are dependent on the response and contributions made by individuals, such as you.

Please contact me at the Scientific Consultant Services, office, Honolulu, at (808) 597-1182 or via e-mail (cathy@scshawaii.com) with any information or recommendations concerning this Cultural Impact Assessment.

Sincerely yours,

Cathleen Dagher
Senior Archaeologist

Cc:

APPENDIX D: RESPONSE

STATE OF HAWAI'I
OFFICE OF HAWAIIAN AFFAIRS
737 IWILEI ROAD, SUITE 200
HONOLULU, HAWAI'I 96817

HRD14/6981B

July 22, 2014

Cathleen Dagher – Senior Archaeologist
Scientific Consultation Services, Inc.
1347 Kapi'olani Blvd., Suite 408
Honolulu, HI 96814

Re: Cultural Impact Assessment
Proposed Property Improvements on Solomon Elementary School
Waialua Ahupua'a, Wahiawa District, O'ahu Island
Tax Map Key: (1) 7-7-001:007

Aloha e Cathleen Dagher,

The Office of Hawaiian Affairs (OHA) is in receipt of your June 13, 2014 and July 3, 2014 letters initiating consultation and seeking comments ahead of a cultural impact assessment (assessment) for the proposed project improvements to the Solomon Elementary School located in the Waihiawa district. OHA has no comment specific to the above proposed project at this time.

We applaud your efforts to perform a cultural impact assessment. OHA does request assurances that should iwi kūpuna or Native Hawaiian cultural or traditional deposits be identified during ground altering activities related to this project, all work will immediately cease and the appropriate agencies will be contacted pursuant to applicable law. OHA would like to be notified and consulted if burials are found.

Thank you for initiating consultation at this early stage. Should you have any questions, please contact Kathryn Keala at 594-0272 or kathyk@oha.org.

'O wau iho nō me ka 'oia'i'o,

Kamana'opono M. Crabbe, Ph.D.
Ka Pouhana, Chief Executive Officer
Office of Hawaiian Affairs

KMC:kk

Appendix D
National Historic Preservation Act
Section 106 & HRS 6E Compliance

DEPARTMENT OF THE ARMY
US ARMY INSTALLATION MANAGEMENT COMMAND, PACIFIC REGION
HEADQUARTERS, UNITED STATES ARMY GARRISON, HAWAII
851 WRIGHT AVENUE, WHEELER ARMY AIRFIELD
SCHOFIELD BARRACKS, HAWAII 96857-5000

REPLY TO
ATTENTION OF:

MAR 1 7 2014

Office of the Garrison Commander

Mr. William Aila
State Historic Preservation Officer
601 Kamokila Boulevard, Kakuhihewa Building, Room 555
Kapolei, Hawai'i 96707

Dear Mr. Aila:

I am writing to open consultation with your office pursuant to Section 106 of The National Historic Preservation Act (NHPA) of 1966, as amended (16 USC 470f), to request a *determination of eligibility* under the National Register of Historic Places (NRHP) for Solomon Elementary School (School). The School is located in Schofield Barracks (SB) on the central plateau of O'ahu. The Tax Map Key is (1) 7-7-01:007. This area was an important population center and birth place for the Hawaiian royalty, before ranching and military use. When SB was originally built in 1909, this area contained officers' quarters from 1909 to 1931. It became an open field called 'Lightning Field', between 1946 and 1962. The State of Hawai'i, Department of Education (DOE), began leasing the parcel from the Army between 1967 and 1973. Five concrete and 20 portable classroom buildings were built on nine acres between 1968 and 1994. It is bounded by Kolekole Avenue, Carpenter Street, and Trimble Road. The SB National Register Historic District, listed in 1998, is located about 1000 feet away. The Richardson Swimming Pool, determined eligible in 2012, is about 4000 feet away. (See enclosures.)

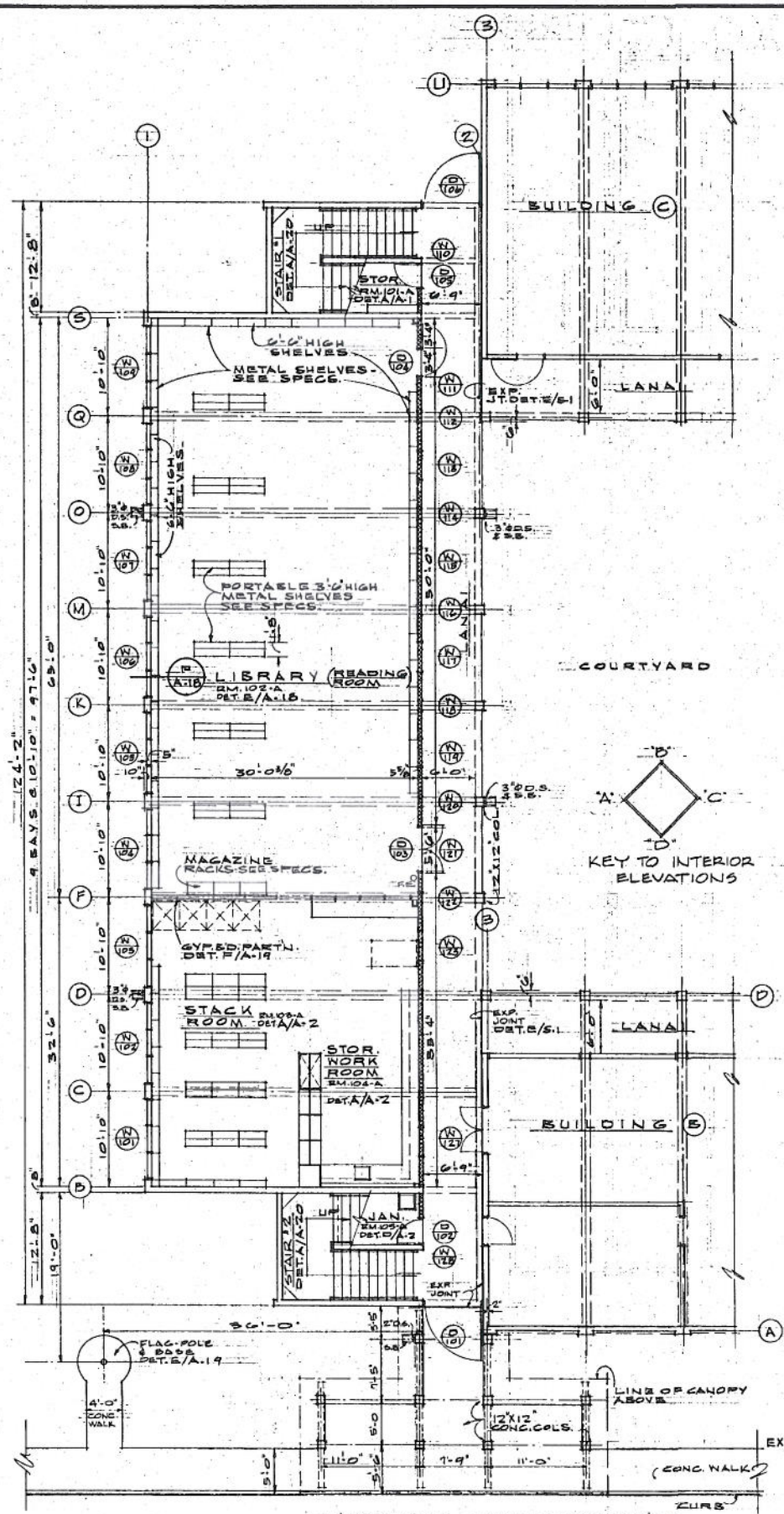
Staff from your office and the Directorate of Public Works (DPW) met at the School on 9/10/2013. A consensus was reached that the School is not eligible since it is less than 50 years old, does not have a distinctive architectural style, and is not associated with significant events or persons. The site has been repeatedly excavated throughout the years since the original construction of the installation. The houses were removed and the site was an open field until the School was built. Therefore remnant archaeological deposits would no longer exist within this site.

We ask for your concurrence that Solomon Elementary School and the grounds are *not eligible* for listing on the NRHP. The DOE proposes to demolish the School and construct new buildings. If you have any questions, please do not hesitate to call the point of contact, Susan Tasaki, at (808) 656-3087 at DPW.

Sincerely,

Daniel W. Whitney
Colonel, US Army
Commanding

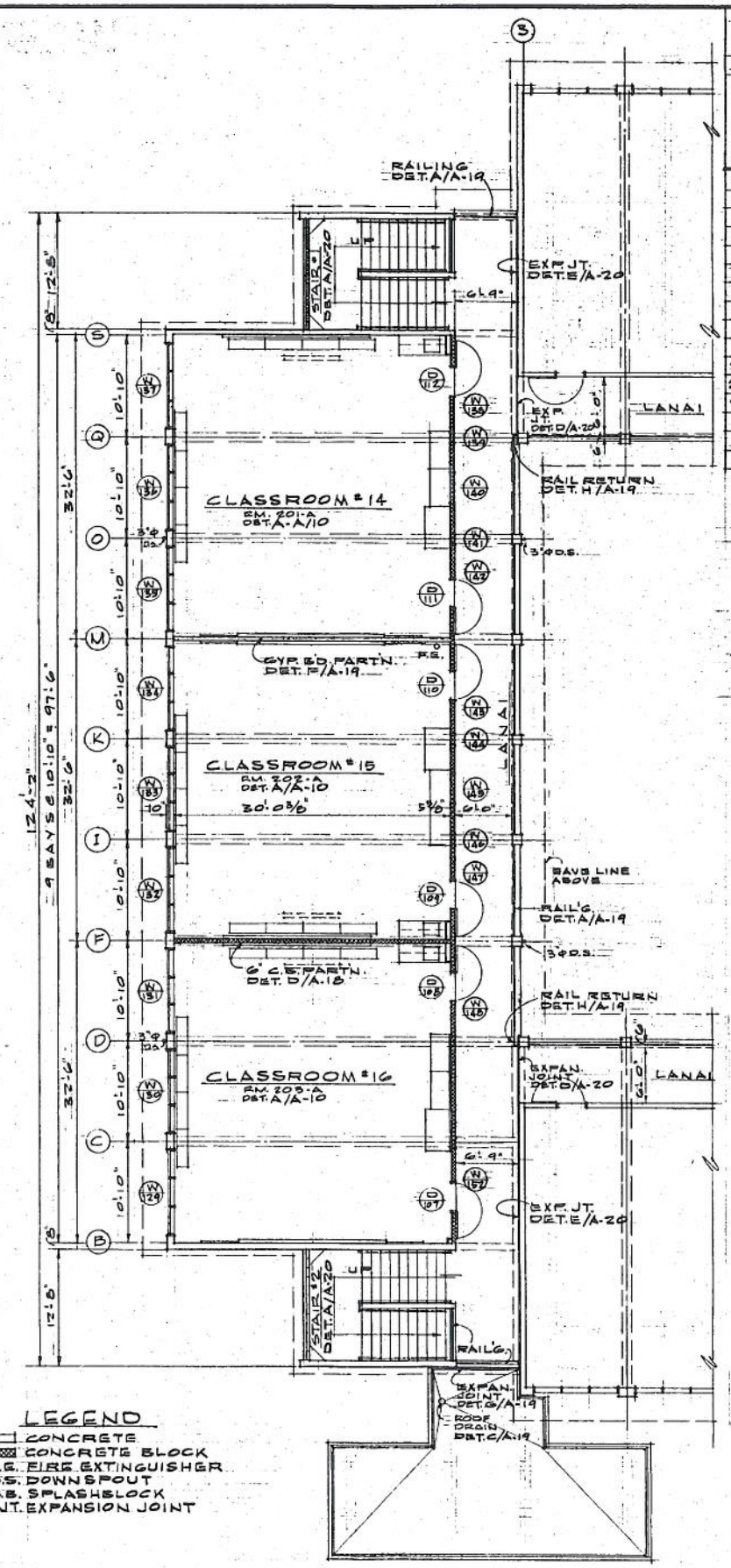
Enclosures



FIRST FLOOR PLAN

SCALE: 1/8" = 1'-0"

NOTE: SEE SHT. A-3 FOR REFLECTED CEILING PLAN



SECOND FLOOR PLAN

SCALE: 1/8" = 1'-0"

NOTE: FOR WINDOW SCHEDULE SEE SHT. A-37
FOR DOOR SCHEDULE SEE SHT. A-36

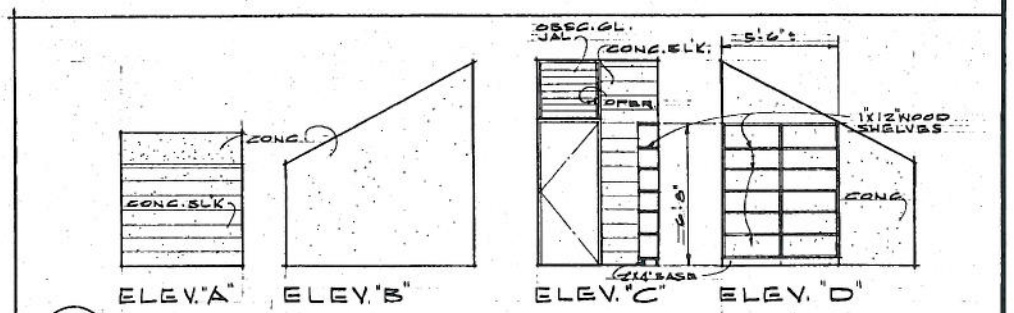
LEGEND
- CONCRETE
- CONCRETE BLOCK
- F.E. FIRE EXTINGUISHER
- D.S. DOWNSPOUT
- S.B. SPLASHBLOCK
- EXP. JT. EXPANSION JOINT

ROOM FINISH SCHEDULE

ROOM NO.	ROOM NAME	FLOOR: EXP. CONC.	FLOOR: ASPH. TILE	BASE: VINYL	WAINSCOT	WALLS: ARCH. CONC.	WALLS: HOL. CONC. BLK.	WALLS: GYP. BD.	CEILING: EXP. CONC.	CEILING: ACOUSTIC TILE	SIGN: NO. REQ'D.	SIGN: LETTERING REQ'D	REMARKS
101-A	STORAGE	●				●	●		●		1	STORAGE	UNPAINTED
102-A	LIBRARY		●	●		●	●	●	●	●	2	LIBRARY	
103-A	STACK RM.		●	●		●	●	●	●	●	—		
104-A	STOR.-WORK RM.		●	●		●	●	●	●	●	—		
105-A	JANITOR	●				●	●		●		1	JANITOR	UNPAINTED
	LANAI	●					●		●		1	FIRE EXTINGUISHER INSIDE	
	STAIR #1	●				●			●		—		
	STAIR #2	●				●			●		—		
201-A	CLASSROOM #14		●	●		●	●	●	●	●	2	A-14	
202-A	CLASSROOM #15		●	●		●	●	●	●	●	2	A-15	
203-A	CLASSROOM #16		●	●		●	●	●	●	●	2	A-16	
	LANAI	●					●		●		1	FIRE EXTINGUISHER INSIDE	
											1	BUILDING "A"	BUILDING SIGN

SUMMARY OF GROSS AREAS

BLDG. "A" - 2 - STORIES	6127 ♯
STAIRS (2)	828 ♯
LANAIS (1/2 OF 1684 ♯)	842 ♯
	7,797 ♯
BLDG. "B" - 2 - STORIES	17,546 ♯
KINDERGARTEN TOILETS.	333 ♯
STAIRS (2)	828 ♯
SWITCH ROOM	114 ♯
MAIN LANAIS (1/2 OF 4350 ♯)	2,175 ♯
KINDERGARTEN LANAIS (1/2 OF 522 ♯)	261 ♯
	21,257 ♯
BLDG. "C" - 2 - STORIES	15,531 ♯
STAIRS (2)	828 ♯
LANAIS (1/2 OF 3704)	1,852 ♯
	18,211 ♯
BLDG. "D" KITCHEN	2,600 ♯
CAFETORIUM	4,853 ♯
LANAIS (1/2 OF 1290)	645 ♯
	8,098 ♯
TOTAL GROSS AREA	55,363 ♯
ALLOWABLE GROSS AREA	56,676 ♯



A / A-1 STORAGE RM. 101-A (RM. 104-S, RM. 111-C & RM. 112-C SIMILAR)
SCALE: 1/4" = 1'-0"

JOHN H. McAULIFFE, JR. REGISTERED PROFESSIONAL ARCHITECT No. 542 HAWAII U.S.A.

THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION

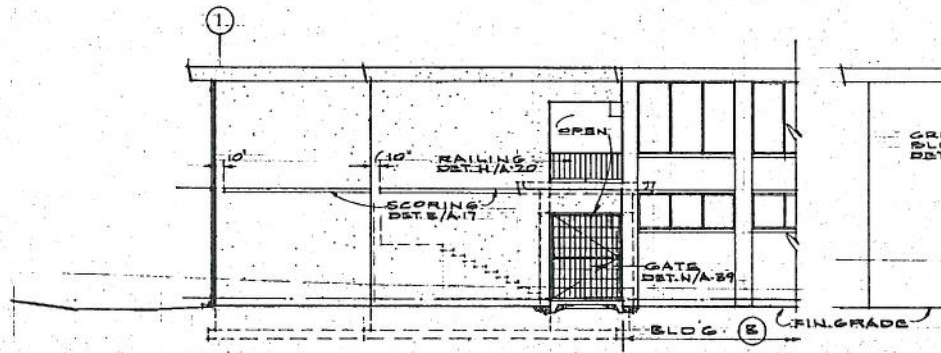
PROJECT HAWAII 64-C-201-B14

STATE OF HAWAII
DEPARTMENT OF EDUCATION — DEPARTMENT OF ACCOUNTING & GENERAL SERVICES

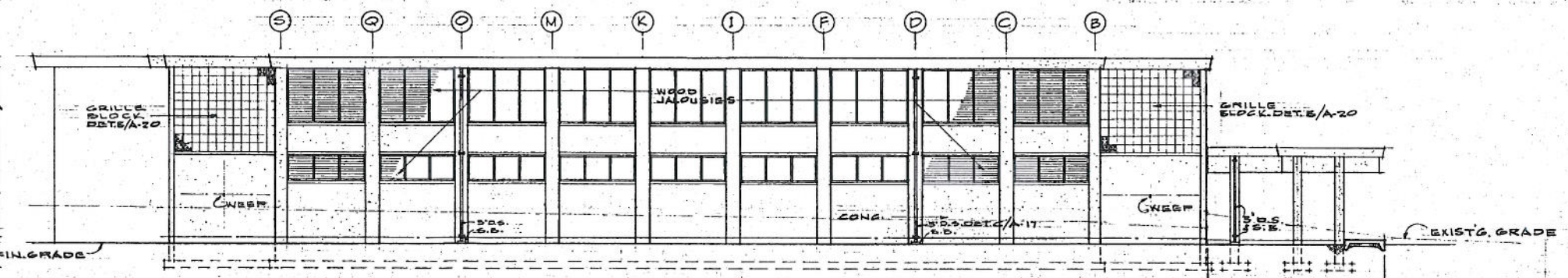
SCHOFIELD 3rd ELEMENTARY SCHOOL
SCHOFIELD BARRACKS, OAHU, HAWAII
FIRST INCREMENT

BLDG. "A", 1/8" SC. 1ST. & 2ND FLOOR PLAN
LIBRARY & CLASSRMS, PASSENGER LOADING

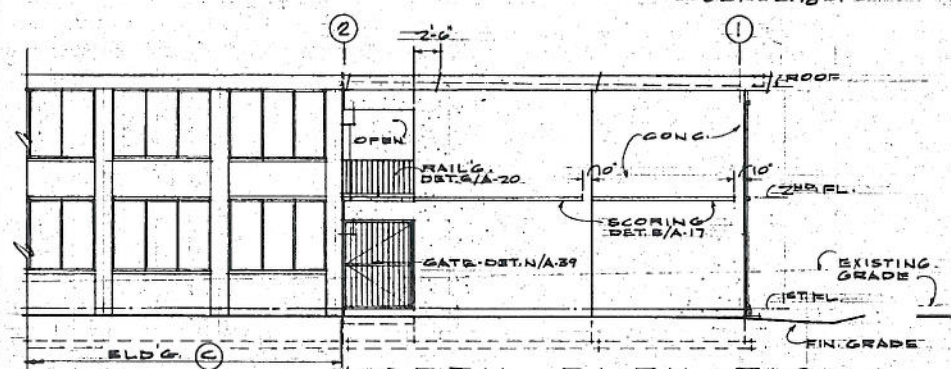
DESIGN: J.H.M.	JOHN H. McAULIFFE, JR. - A.I.A. ARCHITECT ARTHUR Y. AKINAKA CIVIL ENGR. SHIMAZU, SHIMABUKURO & FUKUDA, INC. STRUCT. ENGR. DOUGLAS V. MACMAHON ELEC. ENGR. FARUK KONUK MECH. ENGR.	A-1
DRAWN: H.F.M. & G.C.		SHEET 8 OF 89 SHEETS
CHECKED: H.F.M.		
SCALE: 1/8" = 1'-0"		
DATE: MAR. 1967	JOB NO. 02-16-5008.2 FILE 5 DRAW 12 FOLDER 1A	



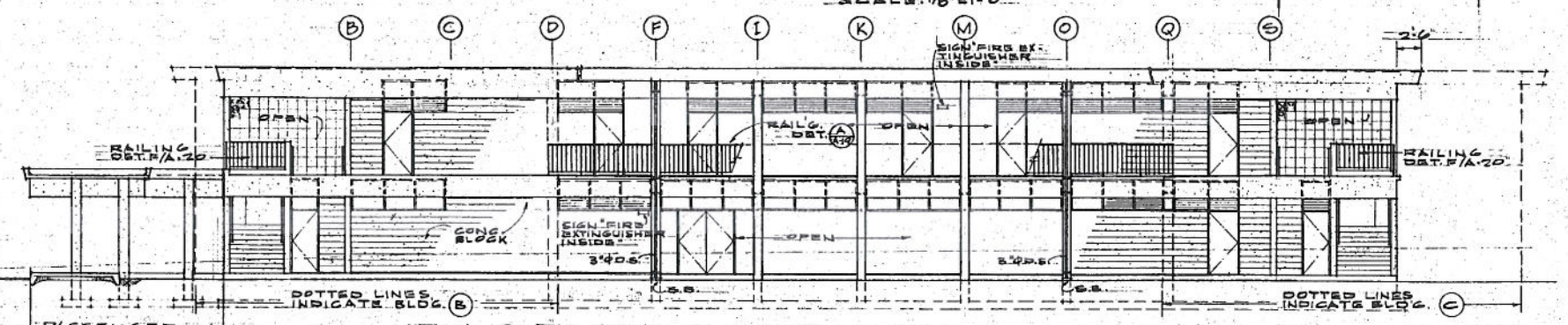
SOUTH ELEVATION
SCALE: 1/8"=1'-0"



WEST ELEVATION
SCALE: 1/8"=1'-0"

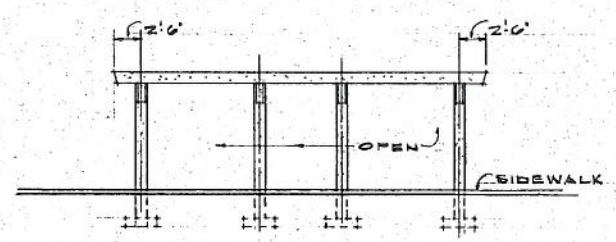


NORTH ELEVATION
SCALE: 1/8"=1'-0"

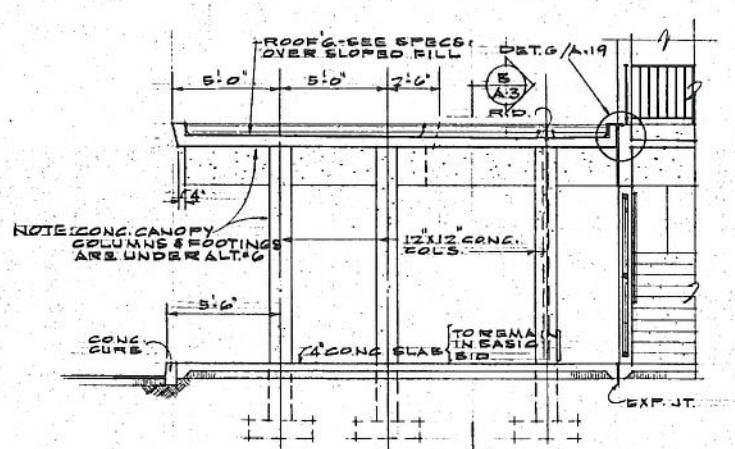


EAST ELEVATION
SCALE: 1/8"=1'-0"

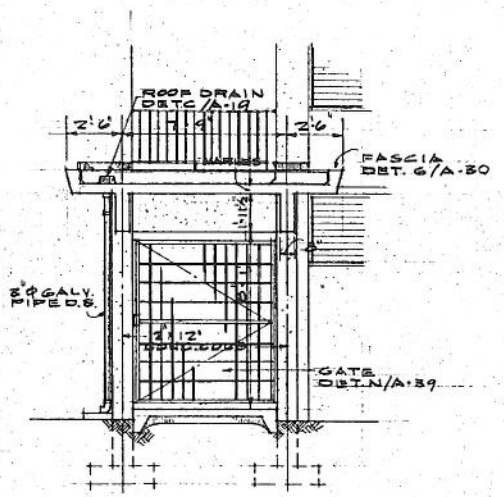
NOTE: ELEVATION TAKEN AT PLANE OF EXPANSION JOINT



SOUTH ELEVATION
PASSENGER LOADING
SCALE: 1/8"=1'-0"

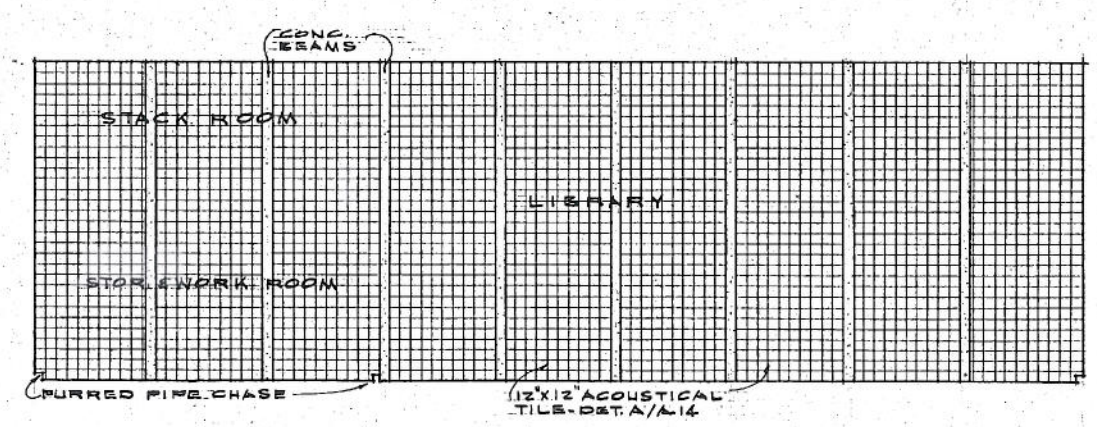


LONGITUDINAL SECTION



SECTION B/A-3

A/A-3 PASSENGER LOADING SECTIONS
SCALE: 1/4"=1'-0"



REFLECTED CEILING PLAN
SCALE: 1/8"=1'-0"

JOHN H. McAULIFFE, JR. REGISTERED PROFESSIONAL ARCHITECT No. 543 HAWAII U.S.A.

THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION

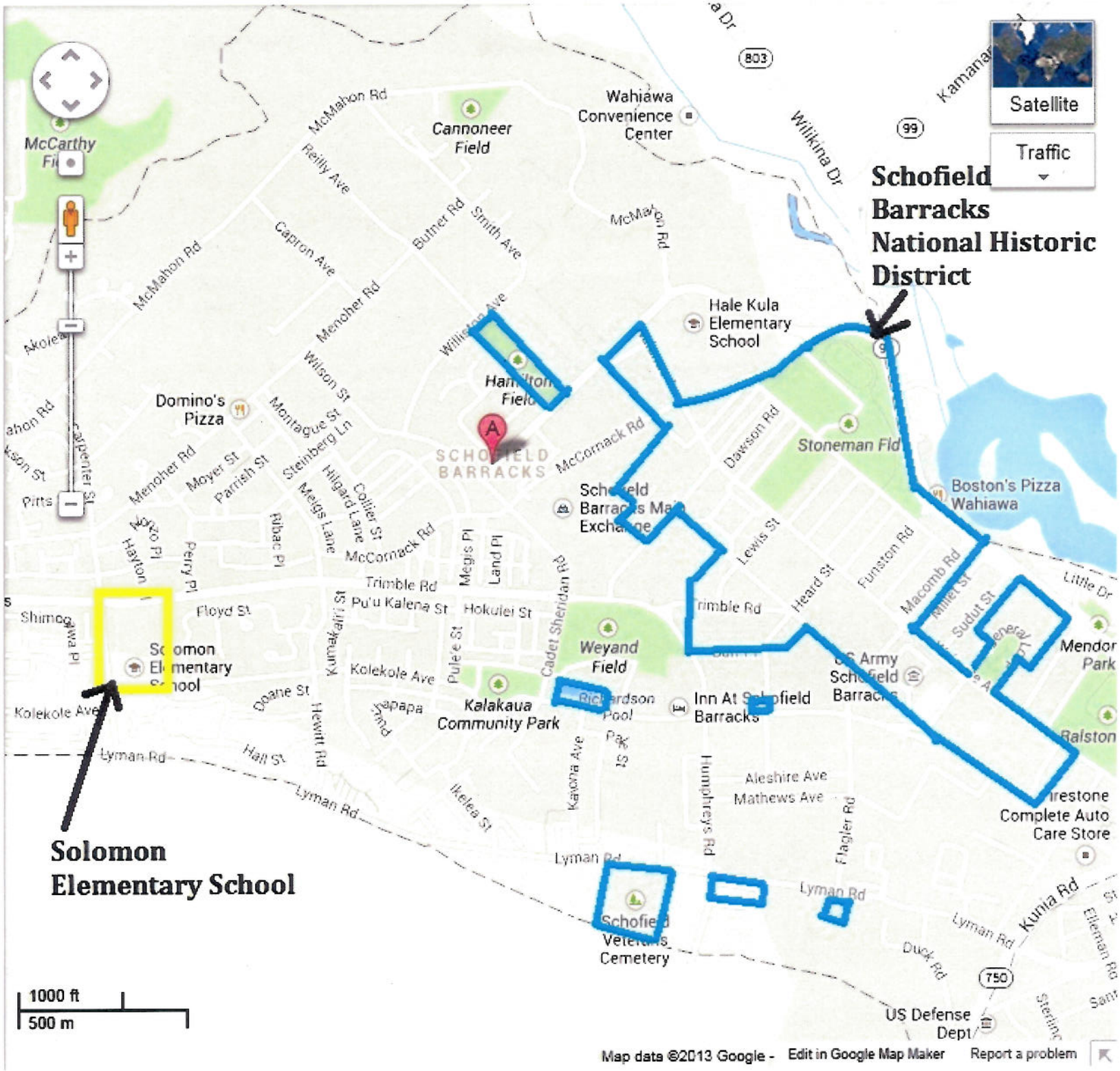
PROJECT HAWAII 64-C-201-B14

STATE OF HAWAII
DEPARTMENT OF EDUCATION—DEPARTMENT OF ACCOUNTING & GENERAL SERVICES

SCHOFIELD 3rd ELEMENTARY SCHOOL
SCHOFIELD BARRACKS, OAHU, HAWAII
FIRST INCREMENT

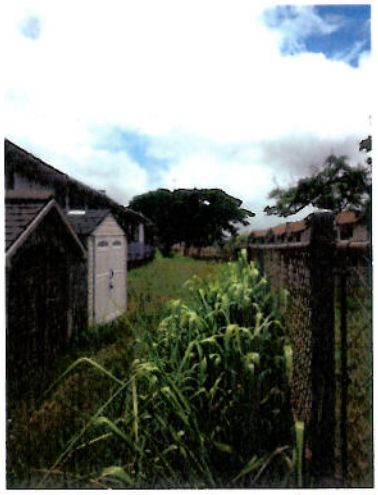
BLDG. "A" & PASSENGER LOADING
1/8" sc. EXTERIOR ELEVATIONS

DESIGN: J. H. M.	JOHN H. McAULIFFE, JR.—A.I.A. ARCHITECT ARTHUR Y. AKINAKA CIVIL ENGR. SHIMAZU, SHIMABUKURO & FUKUDA, INC. STRUCT. ENGR. DOUGLAS V. MACMAHON ELEC. ENGR. FARUK KONUK MECH. ENGR.	A-3
DRAWN: H. P. M.		SHEET 10 OF 89 SHEETS
CHECKED: H. P. M.		
SCALE: AS SHOWN		
DATE: MAR. 1967	JOB NO. 12-16-5018.2 FILE 5 DRAW 12 FOLDER 1A	


Schofield Barracks National Historic District
Solomon Elementary School
Satellite
Traffic
McCarthy Fi
McMahon Rd
Cannoneer Field
Wahiawa Convenience Center
Wilikina Dr
Kamanai
803
99
Reilly Ave
Butner Rd
Smith Ave
Capron Ave
Menoher Rd
Wilson St
Williston Ave
Hamilton Field
Hale Kula Elementary School
Domino's Pizza
Montague St
Steinberg Ln
SCHOFIELD BARRACKS
McCormack Rd
Dawson Rd
Stoneman Fld
Boston's Pizza Wahiawa
Menoher Rd
Moyer St
Parrish St
Hilgard Lane
Collier St
Meigs Lane
Schofield Barracks Main Exchange
Lewis St
Funston Rd
Macomb Rd
Little Dr
Hayton
Perry Pl
Ribac Pl
Trimble Rd
Pu'u Kalena St
Hokulei St
Meigs Pl
Land Pl
Cadet Sheridan Rd
Heard St
Millet St
Sudut St
Shimoda Pl
Floyd St
Kunia Pl
Pulele St
Weyand Field
Mendor Park
Kolekole Ave
Oopane St
Hewitt Rd
Kalakaua Community Park
Richardson Pool
Inn At Schofield Barracks
U.S. Army Schofield Barracks
Ralston
Lyman Rd
Hall St
Ikelea St
Kacha Ave
Humphreys Rd
Aleshire Ave
Mathews Ave
Flagler Rd
Firestone Complete Auto Care Store
Schofield Veterans Cemetery
Kunia Rd
Duck Rd
750
US Defense Dept
1000 ft
500 m
Map data ©2013 Google - Edit in Google Map Maker Report a problem

ENCLOSURES

1. View of courtyard between Buildings B (left) and C (right) from the cafetorium.



2. View northeast along the easternmost property line.

3. View from playcourts through courtyard between Bldgs C (left) and E (right). Portables P13-15 visible on the right.

4. Portables P1 through P9.

5. Play structure at northeast corner of playfield.

6. View of playcourts. Building C and the cafetorium are visible in the background.

Site Photographs
Solomon Elementary School Improvements

State of Hawai'i Department of Education — Schofield Barracks, Island of O'ahu

Photos taken on July 2, 2013 by PBR HAWAII & Associates, Inc.

PBR HAWAII & ASSOCIATES, INC.

7. Looking southeast over playcourts from pavilion.

8. Looking east through pavilion to play structure and portables.

9. Portable P15.

10. Large trees along Trimble Road boundary of school.

11. Large trees along Trimble Road boundary of school. Picnic tables are outside the school fence line.

12. Looking east over playfields.

Site Photographs

Solomon Elementary School Improvements

State of Hawai'i Department of Education — Schofield Barracks, Island of O'ahu

PBR HAWAII & ASSOCIATES, INC.

Photos taken on July 2, 2013 by PBR HAWAII & Associates, Inc.

13. Looking north along Carpenter Street boundary fence.

14. Looking south along Carpenter Street boundary fence.

15. Possibly cultivated vegetation near Carpenter Street entrance.

16. Courtyard between Building C (right) and E (left).

17. Pedestrian entrance from Carpenter Street.

Site Photographs

Solomon Elementary School Improvements

State of Hawai'i Department of Education — Schofield Barracks, Island of O'ahu

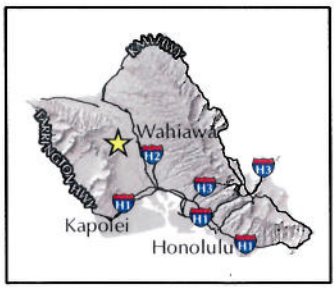
PBR HAWAII & ASSOCIATES, INC.

Photos taken on July 2, 2013 by PBR HAWAII & Associates, Inc.

PDF - Q:\Oahu\Solomon Elementary\PDF\Sec 106 Proposed APE
Path: Q:\Oahu\Solomon Elementary\GIS\Project\Solomon El Sec 106 APE.mxd

LEGEND

Proposed Area of Potential Effect



Regional Location

Solomon Elementary School Improvements

State of Hawai'i Department of Education

Schofield Barracks, Island of O'ahu

North

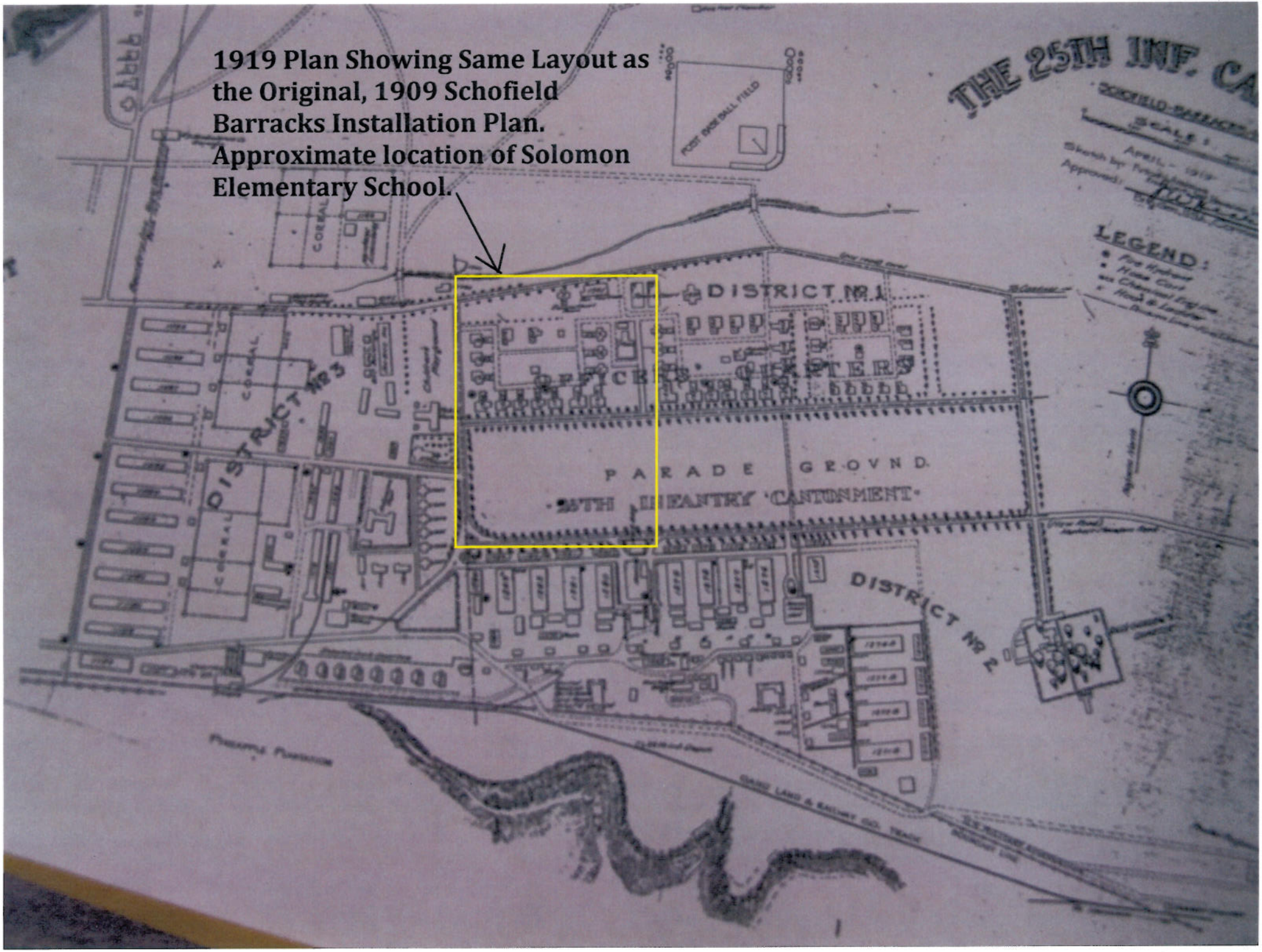
Linear Scale (feet)

0 50 100 200

PBR HAWAII & ASSOCIATES, INC.

Source: Pictometry (2013); City and County of Honolulu (2013)

Disclaimer: This graphic has been prepared for general planning purposes only and should not be used for boundary interpretations or other spatial analysis.


1919 Plan Showing Same Layout as the Original, 1909 Schofield Barracks Installation Plan. Approximate location of Solomon Elementary School.
THE 25TH INF. CA
LEGEND:
DISTRICT Nº 1
OFFICERS QUARTERS
PARADE GROUND
25TH INFANTRY CANTONMENT
DISTRICT Nº 2
DISTRICT Nº 3
CORRAL
POST BASE BALL FIELD

NEIL ABERCROMBIE
GOVERNOR OF HAWAII

WILLIAM J. AILA, JR.
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

JESSE K. SOUKI
FIRST DEPUTY

WILLIAM M. TAM
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

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES

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

DATE: March 20, 2014

LOG: 2014.01240
DOC: 1403AB65

TO: Daniel W. Whitney, Colonel
Department of the Army
US Army Installation Management Command, Pacific Region
Headquarters, United State Army Garrison, Hawaii
851 Wright Avenue, Wheeler Army Airfield
Schofield Barracks, HI 96857-5000

SUBJECT: **National Historic Preservation Act (NHPA) Section 106 Consultation**
Project: National Register DOE – Solomon Elementary School
Owner Name: Department of the Army
Address: 1701 Wilikina Drive – Schofield Barracks
Tax Map Key: (1) 7-7-001:007

Date Received by SHPD: March 19, 2014

Description of Project/Undertaking: The project consists of making a determination of eligibility for the National Registers of Historic Places for Solomon Elementary School.

Area of Potential Effect (APE): Parcel

Description of Resource: Solomon Elementary School is located in Schofield Barracks on the central plain of Oahu. This area was an important population center and birth place for the Hawaiian royalty before ranching and military use. When SB was originally built in 1909, this area contained officers' quarters from 1909 to 1931. It became an open field called 'Lightning Field' between 1946 and 1962. The State of Hawaii Department of Education began leasing the parcel from the Army between 1967 and 1973. The school consists of five concrete buildings and 20 portables that were constructed between 1968 and 1994. The school is bounded by Kolekole Avenue, Carpenter Street and Trimble Road.

Eligibility: Based on the information provided, SHPD concurs that Solomon Elementary School is not eligible for the National Register of Historic Places as it lacks the historical significance or design distinction necessary for listing.

Documentation Received: Plans and photos

Any questions should be addressed to Anna Broverman, SHPD Architectural Historian at Anna.E.Broverman@hawaii.gov

Mahalo for the opportunity to comment.

Mike Gushard
Acting Architecture Branch Chief, Hawaii Historic Preservation Division

Appendix E
Army Corps of Engineers Traffic Engineering Study – Site 4B

CORPS OF ENGINEERS
TRAFFIC ENGINEERING STUDIES
VARIOUS LOCATIONS

SITE 4B - SCHOFIELD BARRACKS & WHEELER ARMY AIR FIELD SCHOOLS

I. Introduction

A. Project Description

The purpose of this report is to analyze existing traffic congestion at the schools within Schofield Barracks and Wheeler Army Air Field (AAF), and recommend traffic mitigation measures, as necessary. The schools in this study were identified by the Directorate of Public Works (DPW), U. S. Army Garrison-Hawaii. The schools are depicted on Figure 1:

1. Wheeler Elementary School
2. Wheeler Middle School
3. Hale Kua Elementary School
4. Solomon Elementary School

B. Scope of the Study

This report presents the findings and recommendations of the study. The scope of this study includes:

1. Turning movement traffic count and pedestrian count surveys during the AM, and after-school peak hours of traffic at the following intersections in the vicinity of Wheeler Elementary and Middle Schools:
   - Wright Avenue and Leilehua Road/Whiteman Road
   - Wright Avenue and Old Kamehameha Highway/Robbins Road
   - Old Kamehameha Highway and Leilehua Road/Wheeler Middle School Driveway
   - Eastman Road and Leilehua Road
2. Turning movement traffic count and pedestrian count surveys during the AM, and after-school peak hours of traffic at the following intersections in the vicinity of Hale Kua Elementary School:
   - Ayres Avenue and McMahon Road
   - Ayres Avenue and Waianae Avenue

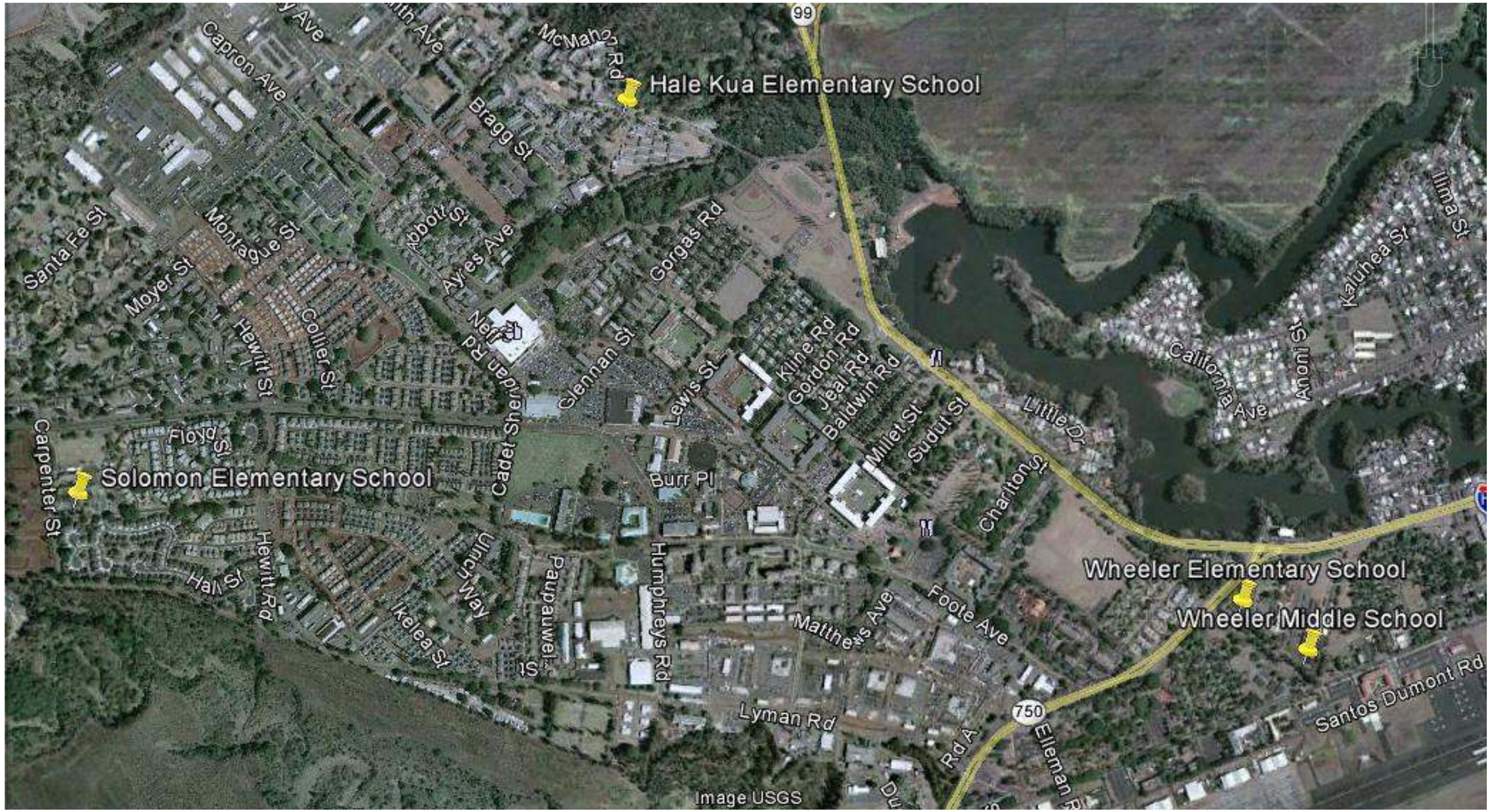


Figure 1. Location Map

3. Turning movement traffic count and pedestrian count surveys during the AM, and after-school peak hours of traffic at the following intersections in the vicinity of Solomon Elementary School:
   - Carpenter Street and Waianae Uka Street
   - Trimble Road and Carpenter Street
4. An evaluation of existing traffic and pedestrian conditions.
5. The development and evaluation of alternative traffic improvements, which would mitigate the traffic impacts identified in this study.

C. Methodology

The highway capacity analysis, performed for this study, is based upon procedures presented in the Highway Capacity Manual (HCM), published by the Transportation Research Board. HCM defines Level of Service (LOS) as "a quality measure describing operational conditions within a traffic stream". Several factors may be included in determining LOS, such as: speed, travel time, freedom to maneuver, traffic interruptions, driver comfort, and convenience. LOS's "A", "B", and "C" are considered satisfactory Levels of Service. LOS "D" is generally considered the minimum acceptable operating Level of Service. LOS "E" is an undesirable condition, and LOS "F" is an unacceptable condition. Intersection LOS is primarily based upon average delay (d) in seconds per vehicle. Table 1 summarizes the LOS criteria.

Table 1. Intersection Level of Service Criteria (HCM)

LOS	Signalized Intersections		Unsignalized Intersections	
	d	**Description**	***d***	**Description**
A	$d \leq 10$	Few stops, little or no delay	$d \leq 10$	Little or no delays
B	$10 < d \leq 20$	Good progression, short cycle lengths	$10 < d \leq 15$	Short delays
C	$20 < d \leq 35$	Cycle failures begin to occur, i.e., vehicles stop at more than one red phase	$15 < d \leq 25$	Average delays
D	$35 < d \leq 55$	Noticeable number of cycle failures, unfavorable progression	$25 < d \leq 35$	Long delays
E	$55 < d \leq 80$	Frequent cycle failures, poor progression, long delays	$35 < d \leq 50$	Very long delays
F	$d > 80$	Over saturation, many cycle failures, high delays	$d > 50$	Extreme delays

Synchro is a traffic analysis software that was developed by the Trafficware Corporation of Albany, California. Synchro is an intersection analysis program that is based upon HCM methodology. Synchro was used to calculate Levels of Service for the intersections in the study area.

SimTraffic is a microscopic traffic simulation software that was also developed by the Trafficware Corporation. Microscopic traffic simulation is a stochastic process, which can analyze the interactions of individual vehicles as they pass through the roadway network. SimTraffic was used to analyze the vehicle queuing, delay, and overall traffic operations. The results of ten (10) simulations were averaged to determine the operational parameters of the road network.

II. Wheeler Elementary and Middle Schools

A. Existing Conditions

1. Roadways

Wright Avenue is a two-lane, two-way, divided roadway, between Lyman Road and Leilehua Road, with parking on both sides of the roadway. East of Leilehua Road, Wright Avenue becomes a two-lane, two-way, undivided roadway. East of Old Kamehameha Highway, parking on Wright Avenue is prohibited. The wide median on Wright Avenue facilitates the through and left-turn movements from Leilehua Road and Whiteman Road by providing a median refuge area for one vehicle that crosses or turns left onto Wright Avenue. HCM describes these movements as a two-stage gap acceptance analysis, i.e., a vehicle will proceed into the median refuge during an acceptable gap in traffic approaching from the left, then complete the maneuver during an acceptable gap in traffic approaching from the right.

Old Kamehameha Highway is a one-lane, one-way (northbound) local roadway, which fronts Wheeler Middle School and Wheeler Elementary School. Old Kamehameha Highway intersects Wright Avenue at an unsignalized four-legged intersection, opposite Robbins Road.

A parking lot is located in a triangular block bounded by Old Kamehameha Highway, Wright Avenue and Leilehua Road (hereinafter referred to as triangle parking lot). The one-way (northbound) aisle in the triangle parking lot is located at the intersection of Old Kamehameha Highway, Wright Avenue, and Robbins Road.

Leilehua Road is a two-way, two-lane roadway between Wright Avenue and Old Kamehameha Highway. Leilehua Road is stop-controlled at its four-legged intersection with Wright Avenue, opposite Whiteman Road. Leilehua Road is stop-controlled at its Tee-intersection with Old Kamehameha Highway, immediately north of the Wheeler Middle School Driveway on Old Kamehameha Highway.

Eastman Road is a two-way, two-lane roadway, which is located to the west of and parallel to Old Kamehameha Highway. Eastman Road intersects Leilehua Road at

an unsignalized Tee-intersection, immediately to the south of the triangle parking lot driveway on Leilehua Road.

2. Field Investigation

The field investigation was conducted in the vicinity of Wheeler Schools on January 18 and 19, 2012 between the hours of 6:30 AM and 8:30 AM from 1:00 PM to 3:00 PM. The field investigation was conducted prior to the construction of a parking lot between Old Kamehameha Highway and Eastman Road (hereinafter referred to at the Eastman Road Parking Lot). The traffic data are presented in the Appendix.

3. Existing AM Peak Hour Traffic

The AM peak hour of traffic occurred between the hours of 7:00 AM and 8:00 AM with about 500 vehicles per hour (vph) entering the Wheeler Schools via Old Kamehameha Highway Leilehua Road and the triangle parking lot fronting Wheeler Middle School, and about 240 vph exiting the Wheeler Schools via Leilehua Road. The temporary exit onto Kunia Road was not included in the field investigation. During the field investigation, Wheeler Middle School classes began at 7:45 AM, while Wheeler Elementary School classes began at 7:55 AM.

Robbins Road operated at LOS "D" at Wright Avenue, during the AM peak hour of traffic. Queuing was observed on Old Kamehameha Highway, which extended from the Wheeler Middle School Driveway back to Wright Avenue. About 100 vph entered the triangle parking lot from Wright Avenue and Robbins Road to drop off passengers.

Northbound Whiteman Road and southbound Leilehua Road operated at LOS "D" at Wright Avenue, during the AM peak hour of traffic. Long queues were observed on southbound Leilehua Road and Eastman Road.

The intersection of Old Kamehameha Highway and the Wheeler Middle School Driveway operated at LOS "A". Queues on Old Kamehameha Highway were observed to occasionally back up to Wright Avenue. Queuing on Old Kamehameha Highway was a result of students being dropping off at Wheeler Middle School and the heavy volume of pedestrians crossing the one lane roadway. Motorists stopped in the center of the roadway to drop off passengers, which prevented through traffic from passing on the left. School buses turned right from Old Kamehameha Highway into the Wheeler Middle School Driveway to drop off students within the school grounds.

The intersection of Old Kamehameha Highway and Leilehua Road operated as a three-way stop intersection, in absence of traffic controls at the intersection. More than 50 percent of the traffic on Old Kamehameha Highway continued north toward Wheeler Elementary School and the Kunia Road exit. The existing AM peak hour traffic volumes within the study area are depicted on Figure 2.

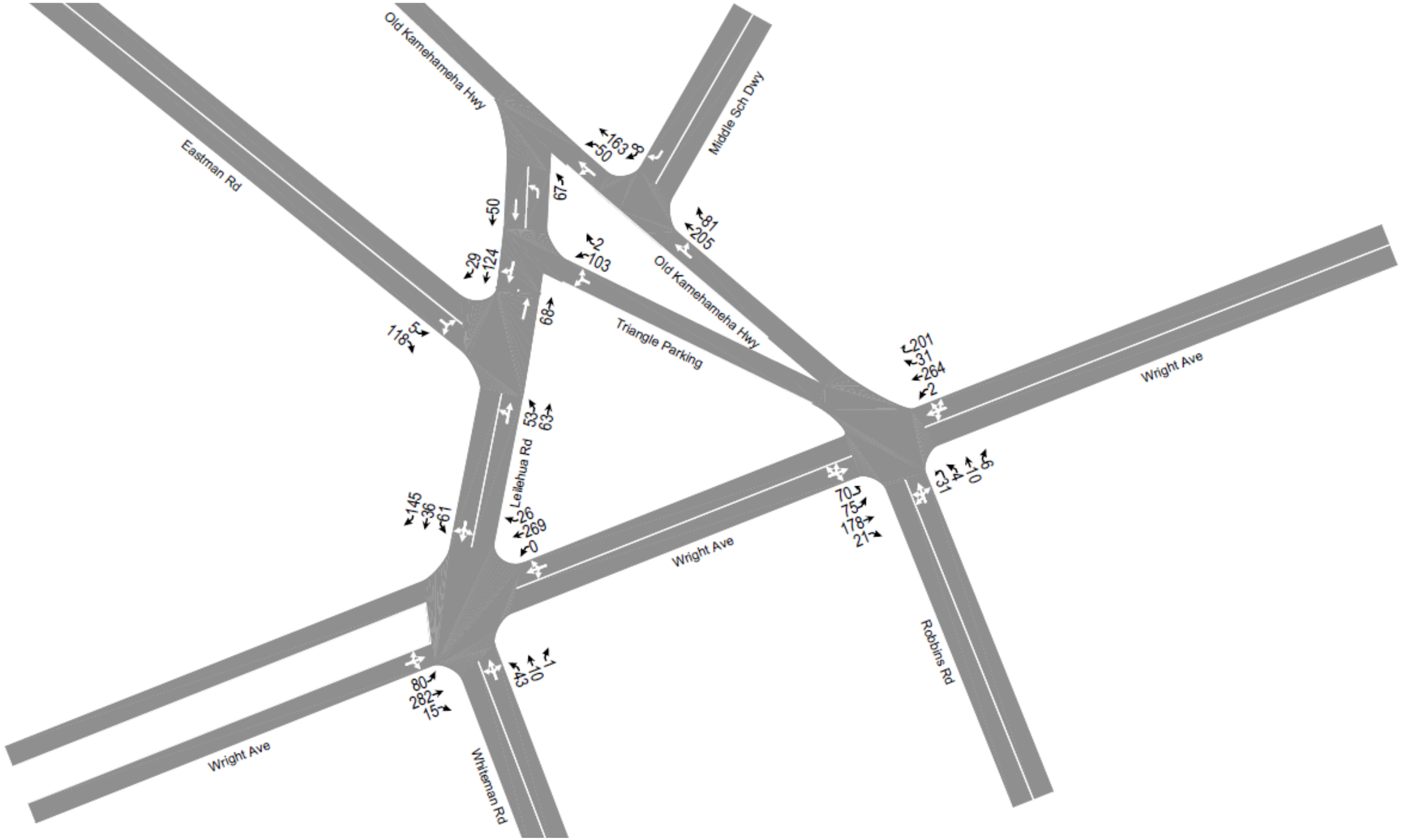


Figure 2. Existing AM Peak Hour Traffic - Wheeler Schools

4. Existing After-School Peak Hour Traffic

The after-school peak hour of weekday traffic in the vicinity of the Wheeler Schools occurred between 2:00 PM and 3:00 PM with about 240 vph entering the Wheeler Schools and about 220 vph exiting the Wheeler Schools. During the field investigation, Wheeler Elementary School ended at 2:05 PM, while Wheeler Middle School ended at 2:30 PM.

Prior to the after-school peak hour of traffic, vehicles were parked on the grassy areas waiting to pick up students. Most parents/guardians parked on the grassy area across from Wheeler Elementary School, crossed Old Kamehameha Highway, and walked their children back across Old Kamehameha Highway to their parked vehicles. The heavy pedestrian traffic crossing Old Kamehameha Highway extended along the entire frontage of Wheeler Elementary School, which resulted in stop-and-go traffic flow. Most of the Middle School students crossed Old Kamehameha Highway to parked vehicles. The recently constructed Eastman Road Parking is fenced along Old Kamehameha Highway, which limited pedestrian traffic to and from the Elementary School to the fence openings.

The intersections in the study area operated at satisfactory Levels of Service, i.e., LOS "C" or better, during the after-school peak hour of traffic. Long queues were again observed on southbound Leilehua Road at Wright Avenue. Figure 3 depicts the existing PM peak hour traffic volumes within the study area.

B. Alternatives Analysis

1. Traffic Management

Traffic management employs techniques that includes restriction of traffic during peak periods of traffic, while minimizing the need for physical improvements, such as road widening and traffic signalization. A sign is posted on Old Kamehameha Highway, which restricts traffic north of Leilehua Road to school buses only. The purpose of the restriction is to minimize conflicts between vehicles and pedestrians crossing Old Kamehameha Highway along the Wheeler Elementary School frontage. The Military Police also prevented drop-off and pick-up traffic on Old Kamehameha Highway between Wright Avenue and Leilehua Road, as well as parking on grassy areas fronting Wheeler Middle School. The restrictions were enforced at the beginning of the Spring 2013 Semester for the Wheeler Schools after the New Year holidays.

However, because of parents' complaints were received by the State of Hawaii Department of Education and the U. S. Army Military Police, all the restrictions were lifted, with the exception of no parking on grassy areas. Illegal parking on grassy areas continued unless there was U. S. Army Military Police presence.

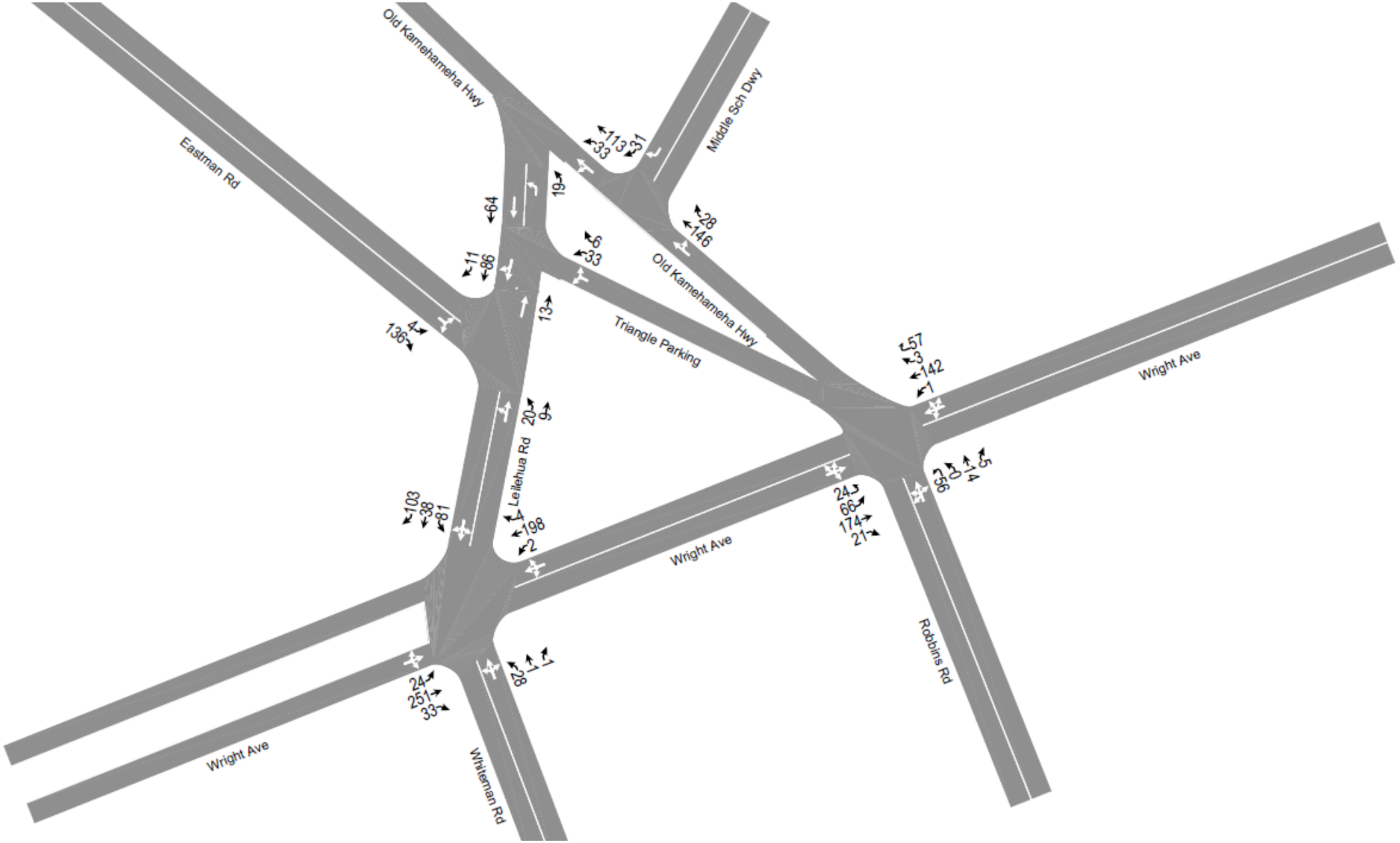


Figure 3. Existing PM Peak Hour Traffic - Wheeler Schools

2. Roadway Improvements

There are three (3) entry lanes (Leilehua Road, triangle parking lot, and Old Kamehameha Highway) to the Wheeler Schools area from Wright Avenue and only one (1) exit lane (Leilehua Road). There are five (5) closely spaced intersections on Leilehua Road between Wright Avenue and Old Kamehameha Highway, and on Old Kamehameha Highway at the Wheeler Middle School Driveway. The proposed traffic improvements at the Wheeler Schools, depicted on Figure 4, follow:

- Realign Leilehua Road to intersect Old Kamehameha Highway opposite the Wheeler Middle School Driveway.

  The Leilehua Road realignment would combine two Tee-intersections into one four-legged intersection. The realigned Leilehua Road would provide direct access from Wright Avenue into Wheeler Middle School, thereby avoiding the drop-off area on Old Kamehameha Highway. Old Kamehameha Highway should be stop-controlled at Leilehua Road, yielding the right-of-way to Leilehua Road and the Wheeler Middle School Driveway. The crossing guard at the Old Kamehameha Highway crosswalk, between Wheeler Middle School and the triangle parking lot, should be posted at the realigned intersection to stop traffic on all approaches and permit pedestrian crossings in all directions.

- Reverse the traffic flow in triangle parking lot from northbound to southbound; restripe the angled stalls in the triangle parking lot in the southbound direction; install pavement markings and widen the pavement, as necessary, to provide a drop-off/pick-up lane on the left side of the parking aisle; and construct a curbed median between Old Kamehameha Highway and the triangle parking lot aisle from Wright Avenue to Leilehua Road.

  Reversing the traffic flow in the triangle parking lot would provide another exit onto Wright Avenue and form a one way couplet with Old Kamehameha Highway between Wright Avenue and Leilehua Road. The triangle parking lot is primarily a drop-off/pick-up area for Wheeler Middle School. Reversing the direction of the parking aisle would provide an additional egress lane onto Wright Avenue, and divert traffic from the Eastman Road and Leilehua Road. The curbed median would provide a pedestrian refuge area for the drop-off/pick-up lane and prevent illegal parking on the grassy area.

- Realign Eastman Road to intersect Leilehua Road opposite the triangle parking lot driveway.

  The Eastman Road realignment would combine two Tee-intersections into one four-legged intersection. The Eastman Road realignment would encourage use of the triangle parking lot to exit the area. The realigned Eastman Road should be stop-controlled at Leilehua Road, yielding the right-of-way to Leilehua Road.

- Construct a 100-foot long exclusive left-turn storage lane on eastbound Wright Avenue at Leilehua Road.

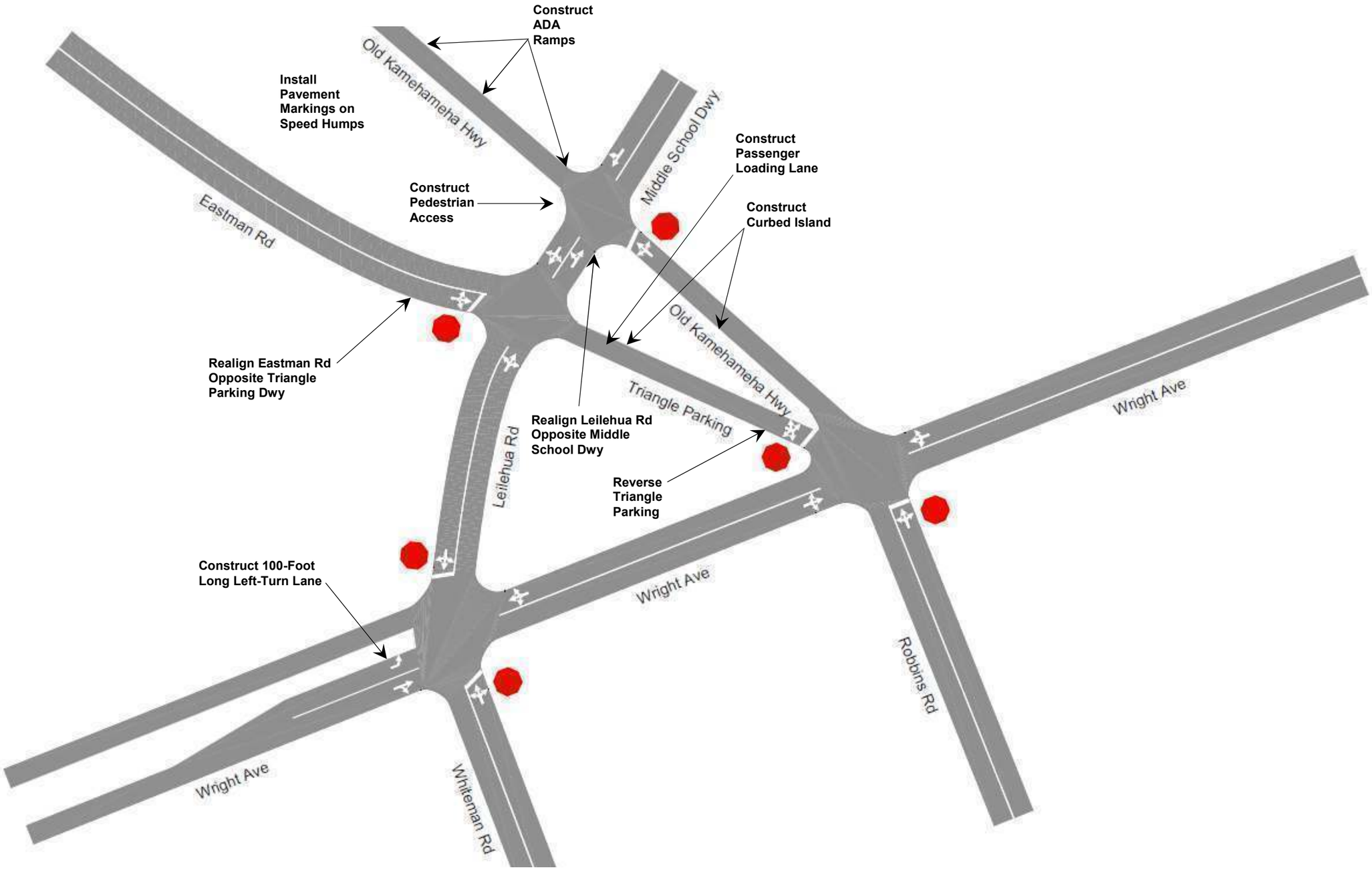


Figure 4. Wheeler Schools Traffic Improvements

3. Eastman Road Parking Lot Improvements

The following improvements are recommended in the recently constructed Eastman Road Parking Lot between Old Kamehameha Highway and Eastman Road:

- Construct an Americans with Disabilities Act (ADA)-compliant crosswalk across the north leg of Old Kamehameha Highway at the realigned intersection with Leilehua Road.
- Construct an ADA-compliant pedestrian access between the southeast corner of the Eastman Road Parking and the intersection of Leilehua Road and Old Kamehameha Highway.
- Construct ADA-compliant wheelchair ramps at the existing crosswalks on Old Kamehameha Highway, as necessary.
- Install pavement markings on the speed humps within the Eastman Road Parking Lot, in accordance with Section 3B.25 of the Manual on Uniform Traffic Control Devices (MUTCD), 2009.

4. Traffic Analysis With the Proposed Improvements

Northbound Robbins Road is expected to continue to operate at LOS "D" at Wright Avenue, during the AM peak hour of traffic with the proposed improvements. The other intersections within the study area of Wheeler Elementary and Middle Schools are expected to operate at satisfactory Level of Service with the proposed improvements. Figures 5 and 6 depict the proposed traffic improvements and the revised traffic circulation, during the AM and after-school peak hours of traffic, respectively.

III. Solomon Elementary School

A. Existing Conditions

1. Roadways

Trimble Road is a two-way, four-lane, divided roadway. Trimble Road provides exclusive left-turn storage lanes in both directions at Carpenter Street. Trimble Road is signalized at Carpenter Street with a two-phase operation.

Carpenter Street is a two-way, two-lane roadway between Lyman Road and McMahon Road. On-street parking is not permitted on the east side of Carpenter Street between Waianae Uka Street and Trimble Road.

Waianae Uka Street is a two-way, two-lane roadway in the vicinity of Solomon Elementary School. On street parking is not permitted on the north side of Waianae Uka Street, fronting Solomon Elementary School. Waianae Uka intersects Carpenter Street at a three-way stop Tee-intersection.

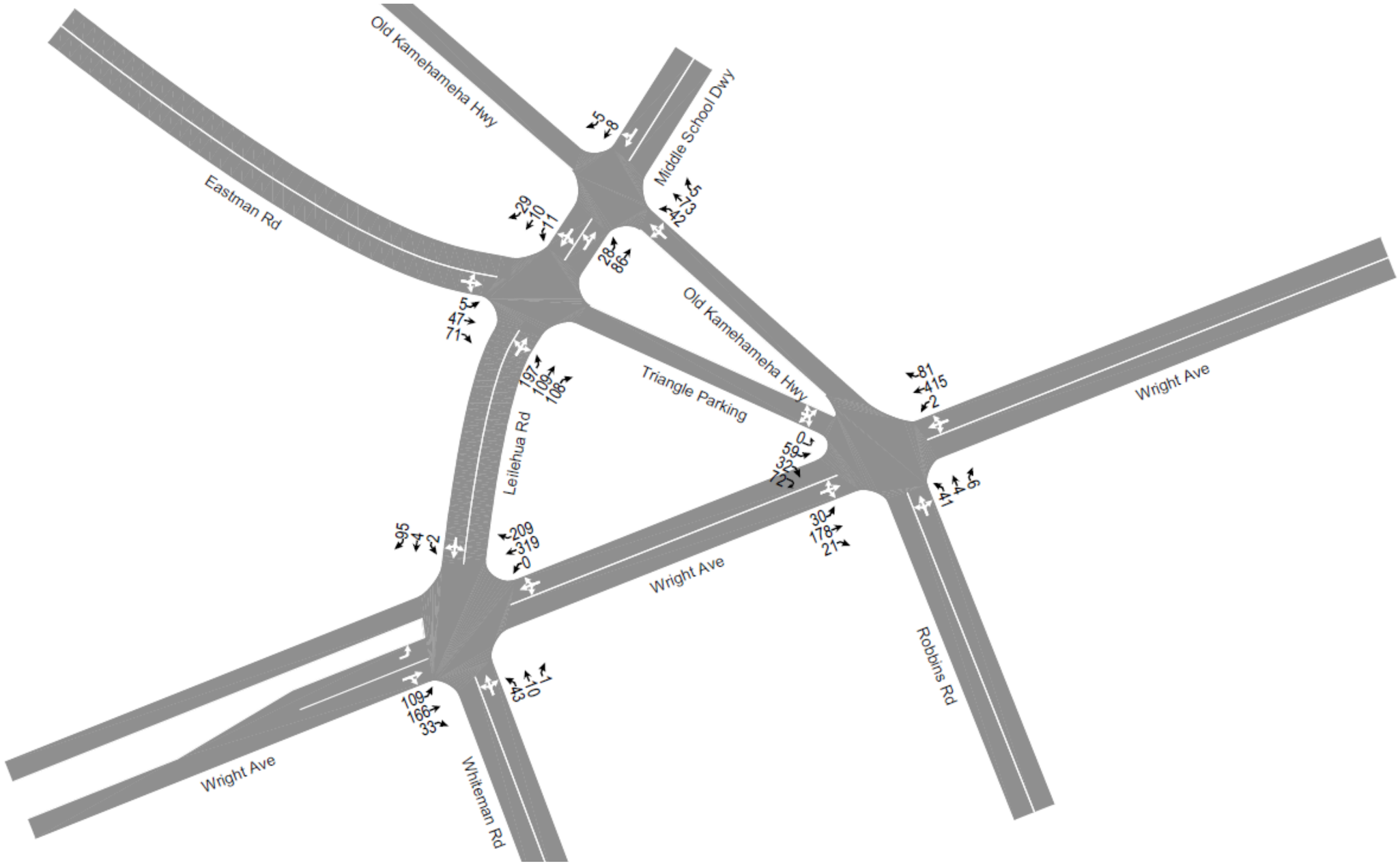


Figure 5. AM Peak Hour Traffic With Improvements - Wheeler Schools

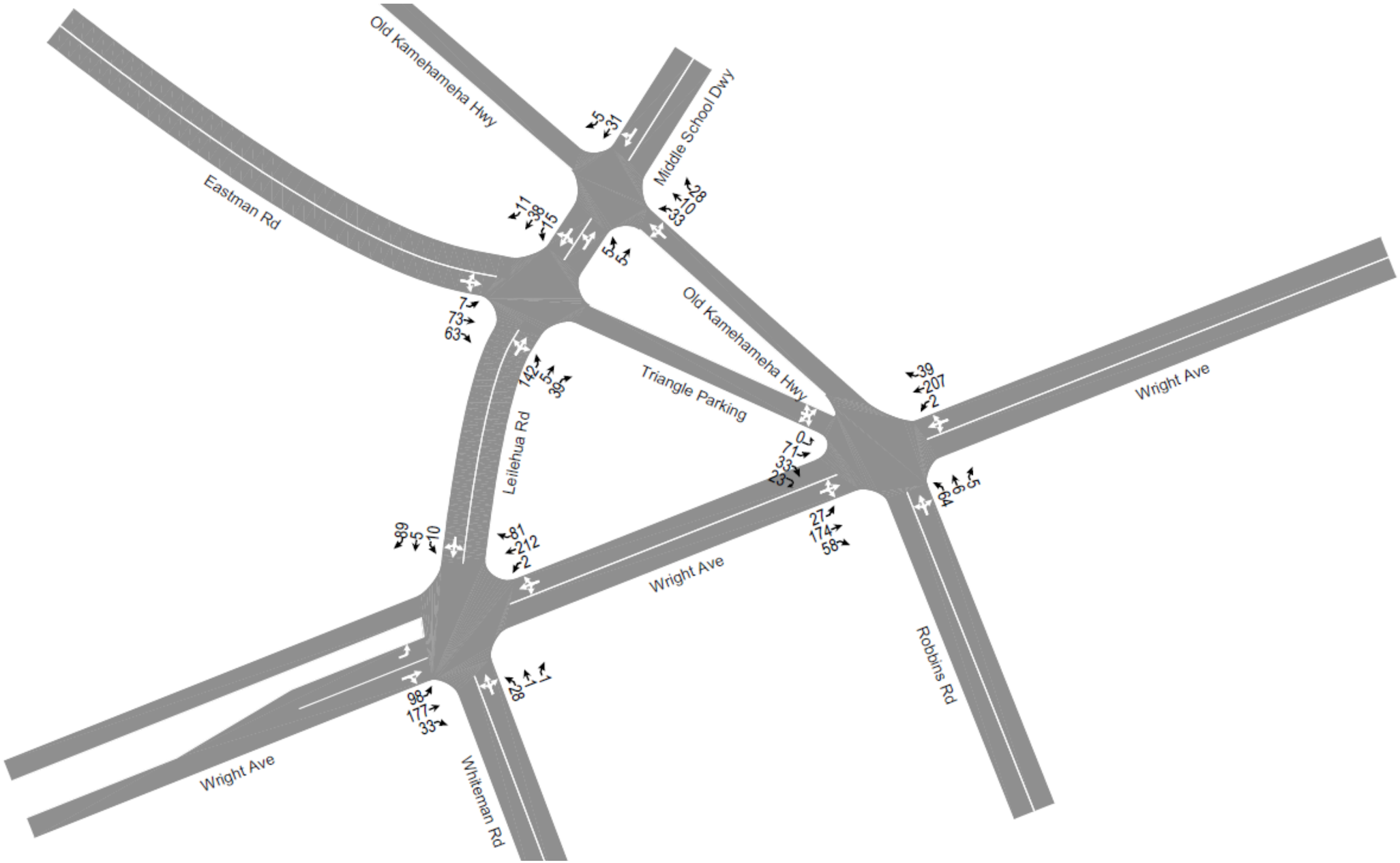


Figure 6. PM Peak Hour Traffic With Improvements - Wheeler Schools

The drop-off and pick-up operations before and after school occurred within the Solomon Elementary School parking lot. Vehicles entered from Waianae Uka Street and exited onto Carpenter Street. Drop-off and pick-up operations also occurred along the Carpenter Street frontage of Solomon Elementary School. The grass shoulder on the south side of Trimble Road, along the school frontage, was used as a parking area for parents who walked their children to and from classes.

2. Field Investigation

The field investigation was conducted in the vicinity of Solomon Elementary School on December 1-2, 2011 between the hours of 6:30 AM and 8:30 AM from 1:00 PM to 4:00 PM. The traffic data are presented in the Appendix.

3. Existing AM Peak Hour Traffic

The eastbound lanes of Trimble Road were closed to traffic for Physical Training (PT) from 6:30 AM to 7:45 AM. The westbound lanes of Trimble Road were converted to a two-way, two-lane roadway. Trimble Road was analyzed as a two-way, two-lane roadway at Carpenter Street, during the AM peak hour of traffic.

The AM peak hour of traffic at the intersection of Trimble Road and Carpenter Street occurred between 7:00 AM and 8:00 AM with a total of 687 vehicles per hour (vph) entering the intersection.

Over 300 pedestrians crossed the east leg of Trimble Road from 7:15 AM to 8:15 AM. The crosswalks on the east leg of Trimble Road and the south leg of Carpenter Street were controlled by crossing guards. "Right-turn on Red" traffic movements were prohibited on all approaches to the intersection from 7:00 AM to 9:00 AM. The left-turn movements on all approaches conflicted with the pedestrian crossings.

The AM peak hour of traffic at the intersection of Carpenter Street and Waianae Uka Street occurred between 7:15 AM and 8:15 AM with a total of 930 vehicles per hour (vph) entering the intersection.

The intersections of Trimble Road at Carpenter Street and Carpenter Street at Waianae Uka Street operated at satisfactory Levels of Service, during the existing AM peak hour of traffic.

4. Existing After-School Peak Hour Traffic

The after-school hour of weekday traffic occurred between 1:45 PM and 2:45 PM. The intersection of Trimble Road and Carpenter Street carried a total of about 1,000 vph. About 340 pedestrians crossed the east leg of Trimble Road during the after-school peak hour of traffic. The crosswalks on the east leg of Trimble Road and the south leg of Carpenter Street were controlled by crossing guards. "Right-turn on Red" traffic movements were prohibited on all approaches to the intersection from 1:00 PM to 4:00 PM. The left-turn movements on all approaches conflicted with the pedestrian crossings.

The intersection of Trimble Road at Carpenter Street and Carpenter Street at Waianae Uka Street operated at satisfactory Levels of Service, during the existing after-school peak hour of traffic. The existing AM and PM peak hour traffic volumes in the vicinity of Solomon Elementary School are depicted on Figure 7.

B. Alternative Improvements

1. Intersection of Trimble Road and Carpenter Street

The alternatives analysis consisted of various traffic signal timing and phasing plans for the intersection of Trimble Road and Carpenter Street. The primary concern was the safety of parents and students crossing Trimble Road before and after school. The analysis was documented in a memorandum from The Traffic Management Consultant to Lyon as part of the basis of design for various intersections in Schofield Barracks, which included Trimble Road and Carpenter Street (Project: FEWR RP000461J).

Alternative 3 was recommended, which consisted of adding a third pedestrian-only phase to the existing two-phase operation. Pedestrian crossing on all legs of the intersection would only be permitted during the pedestrian-only phase. Alternative 3 eliminates all vehicle-pedestrian conflicts by providing separate phases for vehicular traffic and pedestrian traffic. Alternative 3 is in the design phase at this writing.

2. Off-Site Parking

An off-site parking lot should be constructed along the school frontage on the south side of Trimble Road. The off-site parking area would provide a stabilized parking surface for parents who currently park their vehicles and walk their children to and from classes. Figure 8 depicts the proposed parking lot.

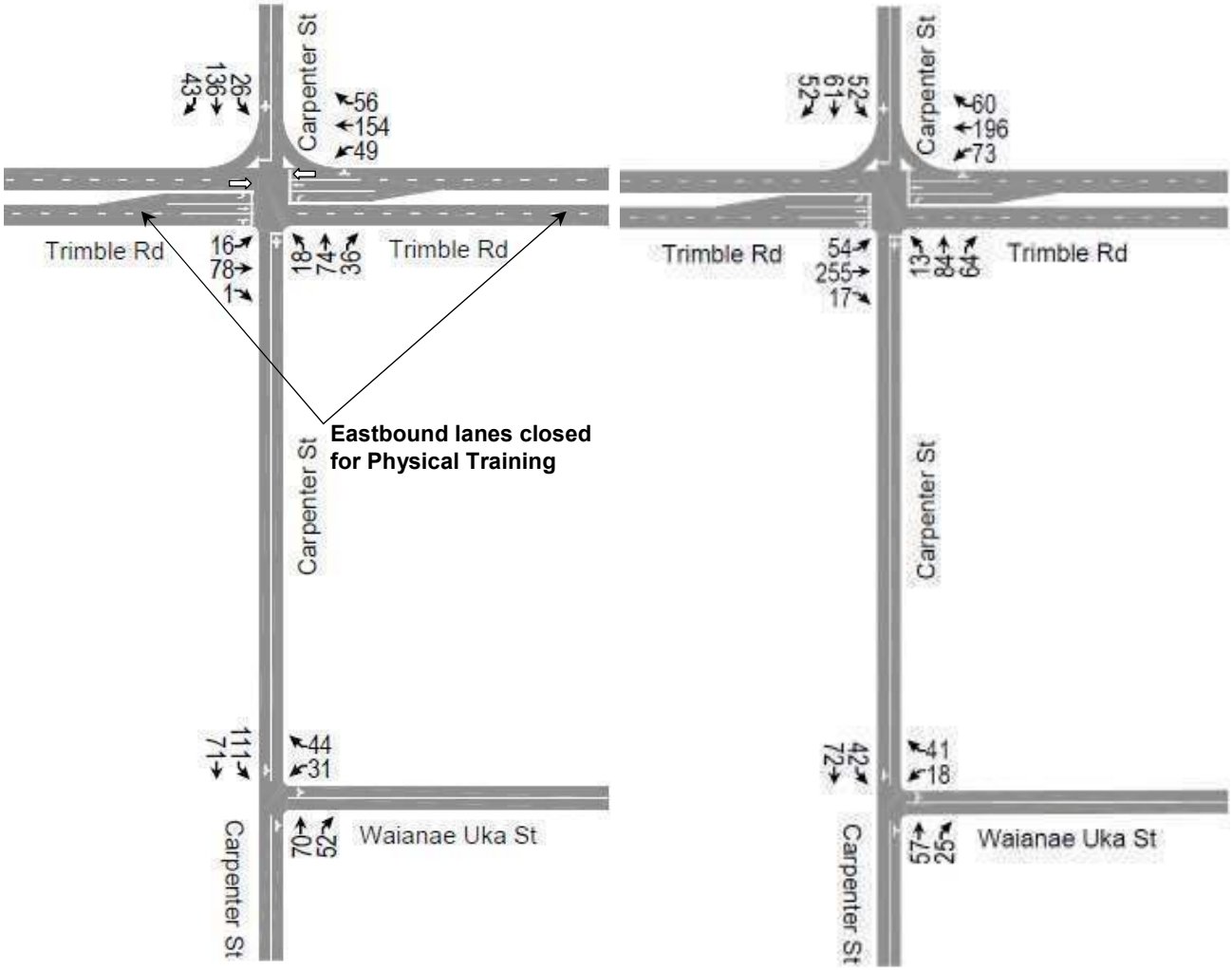
IV. Hale Kua Elementary School

A. Existing Conditions

1. Roadways

Ayres Avenue is a two-way, two-lane roadway between McCornack Road and Cadet Sheridan Road. Fronting Hale Kua Elementary School, the walkway on the south side of Ayres Avenue consists of a 4±foot wide paved shoulder without curbs. Ayres Avenue is unsignalized at its intersection with McMahon Road, opposite the Hale Kua Elementary School Driveway. Ayres Avenue intersects Waianae Avenue at a four-way stop-controlled intersection.

An off-site parking lot is located on the north side of Ayres Avenue between McMahon Road and McCornack Road (McNair Gate). The parking lot is utilized by parents dropping off and picking up students and the school staff. A mid-block crosswalk is located on Ayres Avenue at the parking lot.



Existing AM Peak Hour Traffic **Existing PM Peak Hour Traffic**

Figure 7. Existing Peak Hour Traffic - Solomon Elementary School

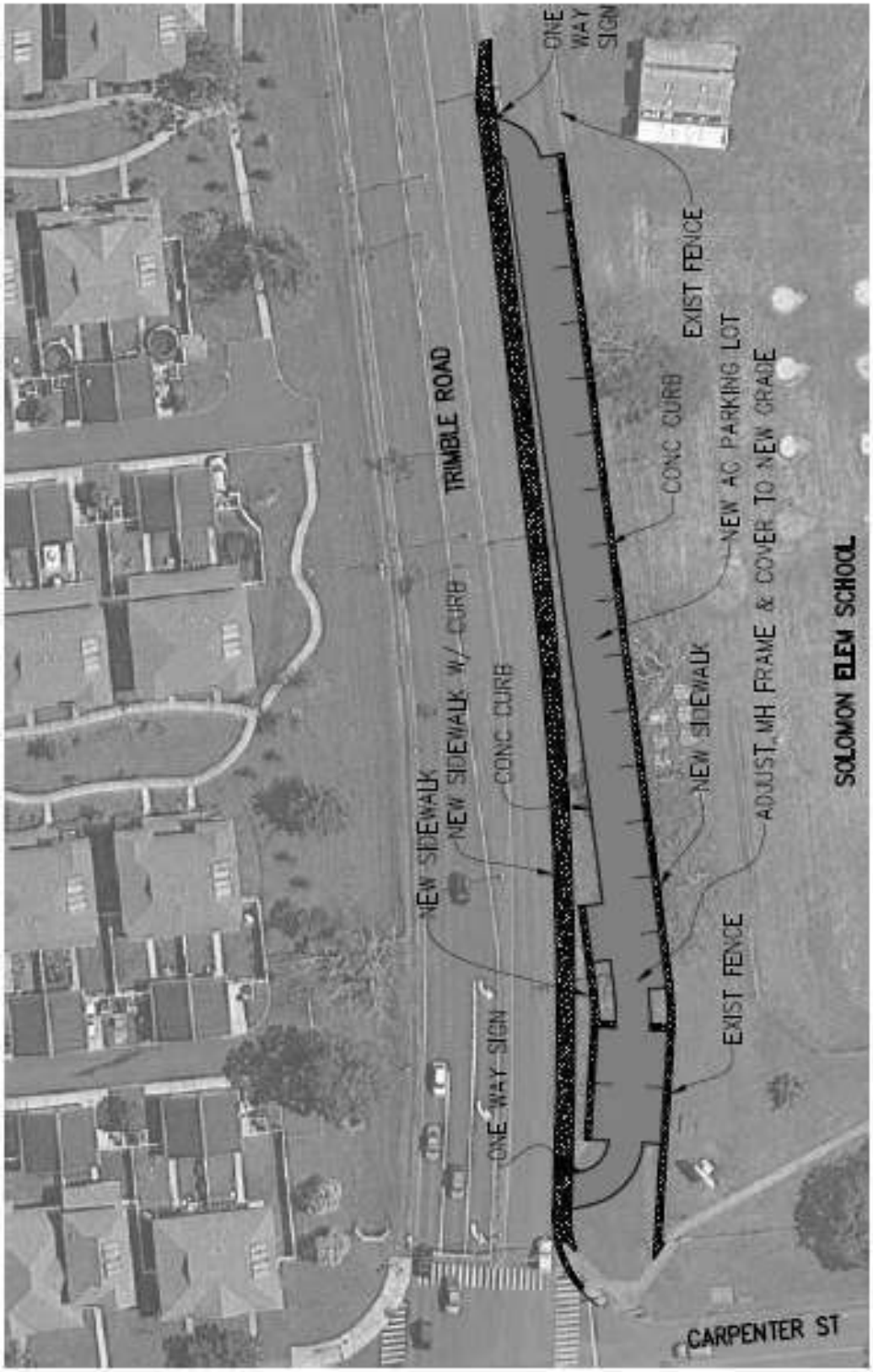


Figure 8. Solomon Elementary School Off-Site Parking

McMahon Road is a two-way, two lane roadway that loops around the eastern perimeter of Schofield Barracks. McMahon Road intersects Ayres Avenue at a "three-corner" intersection, opposite the Hale Kua Elementary School Driveway, i.e., a triangular island separates the east leg of McMahon Road (the left-turn movement to and right-turn movement from Ayres Avenue) and the west leg of McMahon Road (the left-turn movement from and right-turn movement to Ayres Avenue). The island creates an unsignalized intersection at the apex (north corner) of the triangle between the east (yield control) and west legs of McMahon Road. The left-turn movement from McMahon Road at the apex of the "three-corner" intersection has a limited sight distance of vehicles turning left from Ayres Avenue onto the west leg of McMahon Road. The triangular island also partially blocks the direct through maneuver from the east leg of McMahon Road into Hale Kua Elementary School, creating a fourth intersection with Ayres Avenue.

Waianae Avenue is a two-way, two-lane roadway in the vicinity of Hale Kua Elementary School. Waianae Avenue is stop-controlled at its four-way stop intersection with Ayres Avenue.

A parking lot on the north leg of the intersection of Ayres Avenue and Waialae Avenue is also available to parents walking students to and from Hale Kua Elementary School.

2. Field Investigation

The field investigation was conducted in the vicinity of Hale Kua Elementary School on November 29 and 30, 2011 between the hours of 6:30 AM and 8:30 AM and from 1:00 PM to 4:00 PM. The traffic data are presented in the Appendix.

3. Existing AM Peak Hour Traffic

Vehicular traffic flows on McMahon Road, Ayres, Avenue, and Waianae Avenue were interrupted occasionally by PT exercises between 6:45 AM and 7:30 AM. The AM peak hour of traffic occurred between 7:15 AM and 8:15 AM with about 760 vph entering the intersection of Ayres Avenue and McMahon Road, and about 650 vph entering the intersection of Ayres Avenue and Waianae Avenue.

The east and west legs of McMahon Road operated at LOS "B" at Ayres Avenue, respectively, during the AM peak hour of traffic. The intersection of Ayres Avenue and Waianae Road operated at LOS "B". Long vehicular queues were observed on Ayres Avenue and Waianae Avenue, due the crossing guards at the pedestrian crossing at the intersection. The existing AM peak hour traffic volumes within the study area are depicted on Figure 9.

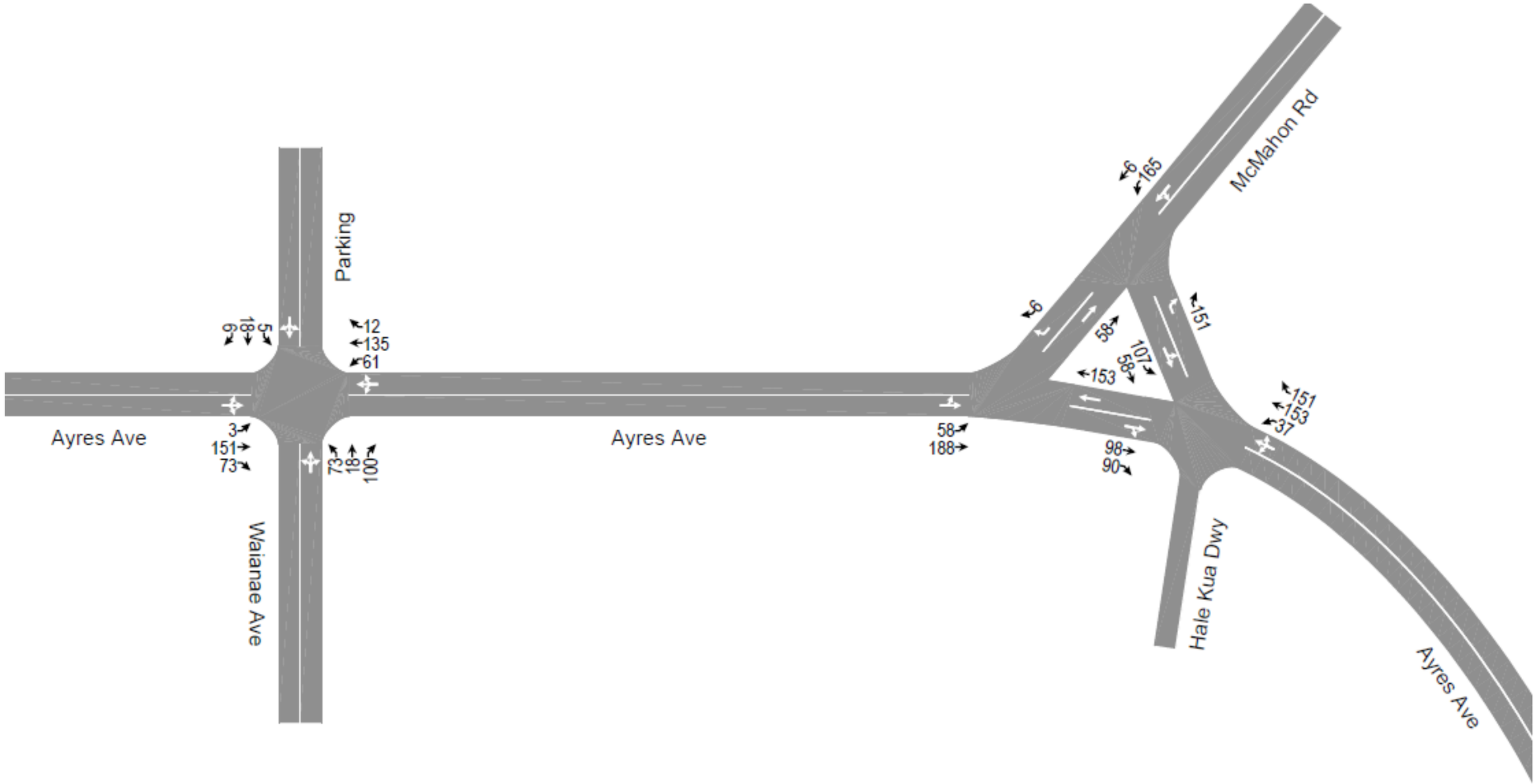


Figure 9. Existing AM Peak Hour Traffic - Hale Kua Elementary School

A pedestrian traffic count also was conducted on Ayres Avenue at an off-site parking lot. About 140 pedestrians were observed crossing Ayres Avenue, during the AM peak hour of traffic, between the parking lot and Hale Kua Elementary School. The pedestrian crossing was controlled by a crossing guard.

4. Existing After-School Peak Hour Traffic

The after-school hour of weekday traffic occurred between 1:45 PM and 2:45 PM, with about 550 vph entering the intersection of Ayres Avenue and McMahon Road, and about 690 vph entering the intersection of Ayres Avenue and Waianae Avenue.

McMahon Road operated at LOS "B" at Ayres Avenue, during the after-school peak hour of traffic. Long queues were observed on Ayres Avenue due to the heavy volume of pedestrians crossing the west leg of Ayres Road at McMahon Road. The intersection of Ayres Avenue and Waianae Road operated at LOS "A". Figure 10 depicts the existing after-school peak hour traffic.

B. Traffic Improvements

The intersections within the study area of Hale Kua Elementary School operated at satisfactory Levels of Service. Figure 11 depicts the following improvements, which are recommended in the vicinity of Hale Kua Elementary School:

1. Realign McMahon Road to intersect Ayres Avenue opposite the Hale Kua Elementary School Driveway to form a four-legged intersection. Realigning McMahon Road to intersect Ayres Avenue at a four-legged intersection, opposite the entry driveway to Hale Kua Elementary School, would reduce the number of intersections (points of conflict) from four to one.

2. Construct a new 8-foot wide sidewalk with curbs and gutters along the south side of Ayres Avenue from the mid-block crosswalk at the off-site parking lot to McMahon Road.

3. During the peak periods of traffic, crossing guards should limit pedestrian crossing times to a <u>maximum</u> of about 30 seconds; and permit traffic flow for a <u>minimum</u> of about 30 seconds. The crossing guard controlling traffic and pedestrian flows on 60±second "cycle lengths" would emulate a pedestrian traffic signal operation, and regulate the flow of traffic, as well as safe pedestrian crossings.

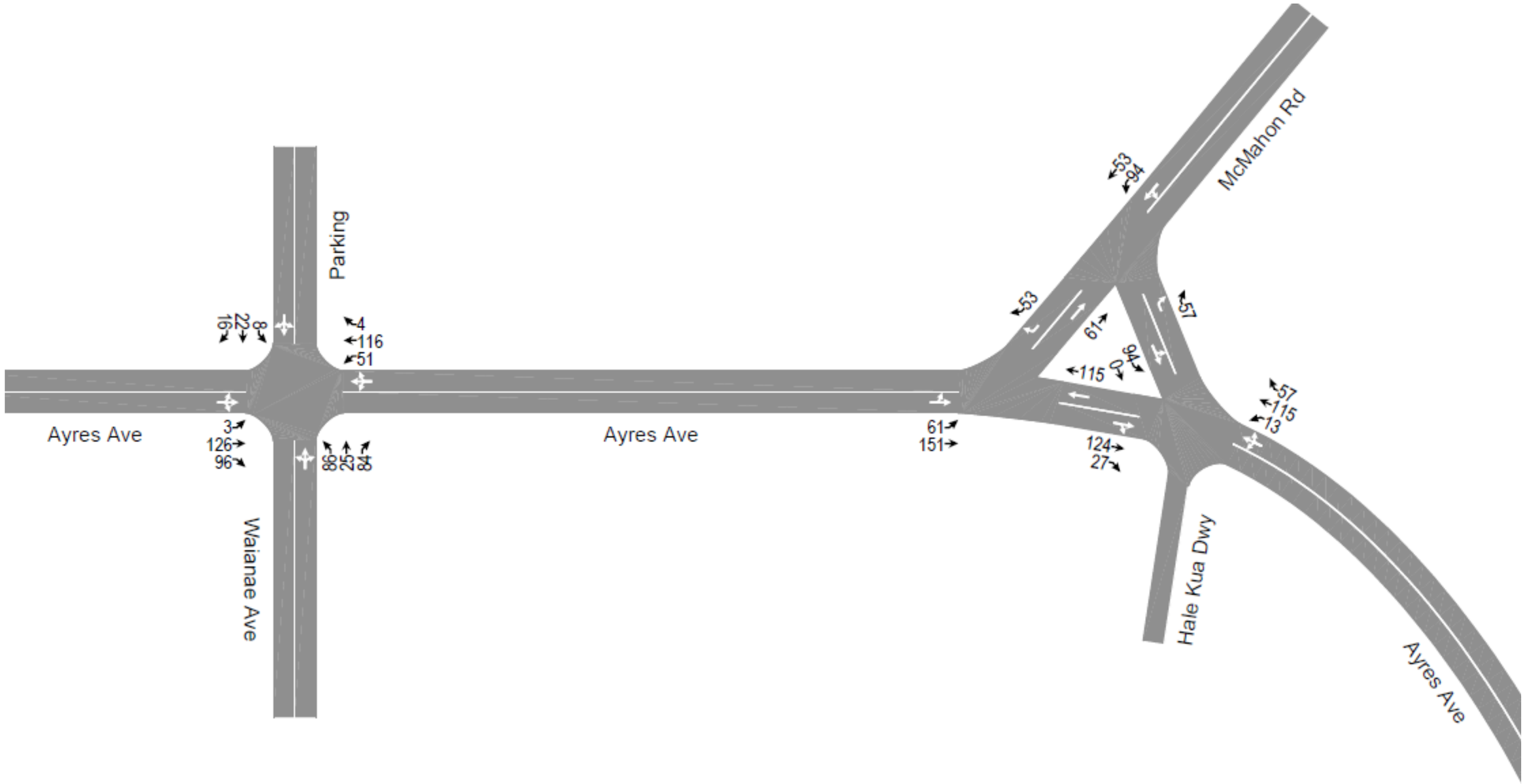


Figure 10. Existing PM Peak Hour Traffic - Hale Kua Elementary School

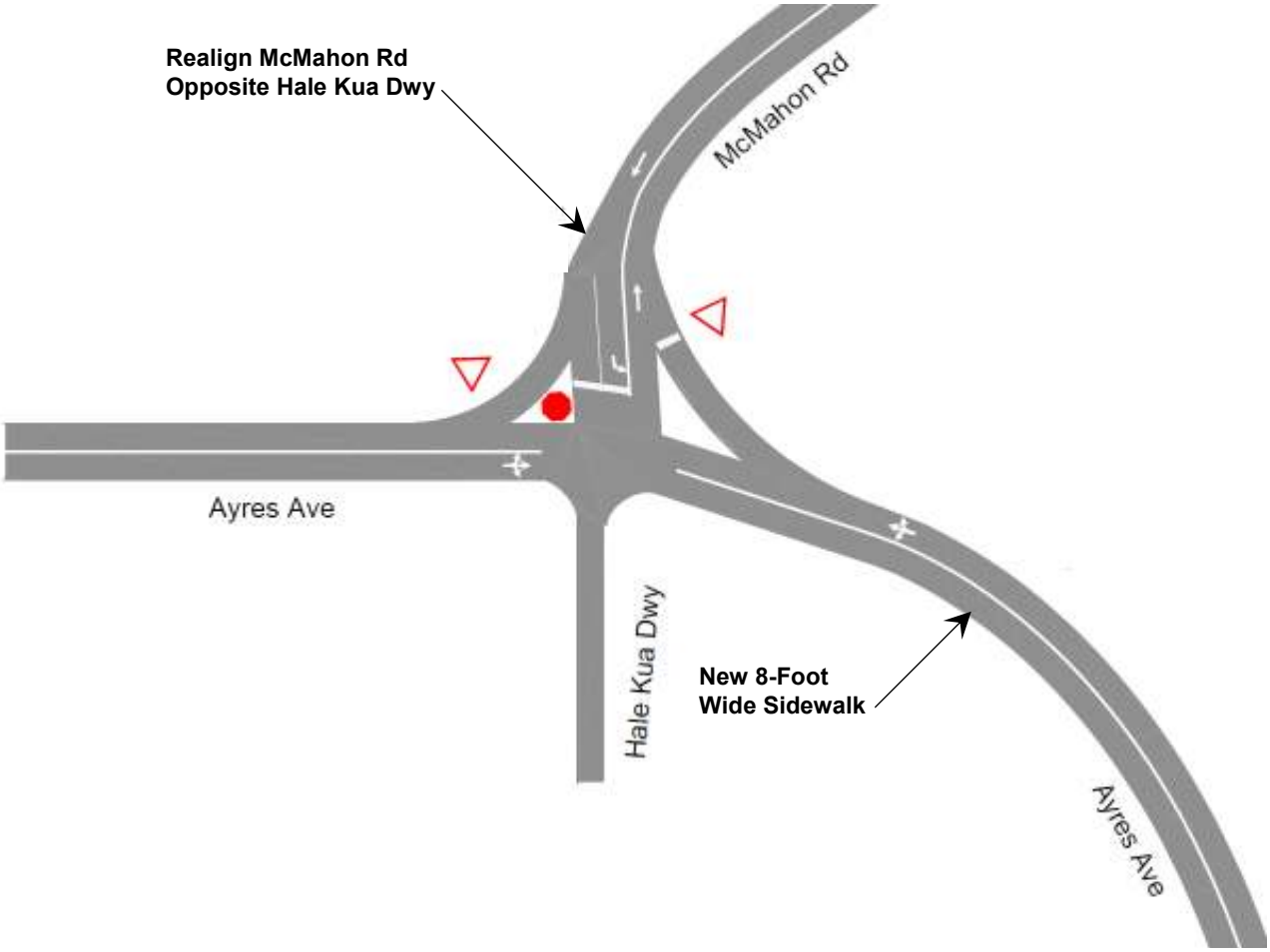


Figure 11. Proposed Improvements - Hale Kua Elementary School

V. Recommendations and Conclusions

A. Recommendations

The following improvements (total estimated construction costs) are recommended to improve pedestrian safety and to mitigate the existing traffic congestion at the study schools. The estimated construction cost breakdown is attached.

1. Wheeler Elementary and Middle Schools ($187,800)

- Realign Eastman Road to intersect Leilehua Road opposite the triangle parking lot driveway.
- Realign Leilehua Road to intersect Old Kamehameha Highway opposite the Wheeler Middle School Driveway.
- Reverse the traffic flow in the triangle parking lot from northbound to southbound; restripe the angled stalls in the triangle parking lot in the southbound direction; install pavement markings and widen the pavement, as necessary, to provide a drop-off/pick-up lane on the left side of the triangle parking lot aisle; and construct a curbed median between Old Kamehameha Highway and the triangle parking lot aisle from Wright Avenue to Leilehua Road.
- Construct a 100-foot long exclusive left-turn storage lane on eastbound Wright Avenue at Leilehua Road.
- Construct a pedestrian access between the southeast corner of the Eastman Road Parking Lot and the intersection of Leilehua Road and Old Kamehameha Highway, in accordance with the Americans with Disabilities Act (ADA). Construct an ADA-compliant crosswalk across the north leg of Old Kamehameha Highway at Leilehua Road. Construct ADA-compliant wheelchair ramps at the crosswalks on Old Kamehameha Highway, as necessary. Install pavement markings on the speed humps in the Eastman Road Parking Lot, in accordance with the MUTCD.
- Instruct crossing guards at unsignalized crosswalks to limit pedestrian crossing times to a <u>maximum</u> of about 30 seconds, and permit traffic flow for a <u>minimum</u> of about 30 seconds.

2. Solomon Elementary School ($184,100)

- Revise the traffic signal timing and phasing to include a third pedestrian-only phase to the existing two-phase operation.
- An off-site parking lot should be constructed on the south side of Trimble Road along the Solomon Elementary School frontage. The off-site parking would provide a parking area for parents who walk their children to and from classes.
- Instruct crossing guards at unsignalized crosswalks to limit pedestrian crossing times to a <u>maximum</u> of about 30 seconds, and permit traffic flow for a <u>minimum</u> of about 30 seconds.

3. Hale Kua Elementary School ($147,550)

- Realign McMahon Road to intersect Ayres Avenue opposite the Hale Kua Elementary School Driveway.
- Construct a new 8-foot wide sidewalk with curb and gutter on the south side of Ayres Avenue from the mid-block crosswalk at the off-site parking lot to McMahon Road.
- Instruct crossing guards at unsignalized crosswalks to limit pedestrian crossing times to a maximum of about 30 seconds, and permit traffic flow for a minimum of about 30 seconds.

B. Conclusions

The common concerns at the elementary schools in this study include drop-off operations before school, pick-up operations after school, pedestrian safety, and traffic congestion. The multiple intersections at Wheeler Schools and at Hale Kua Elementary School create closely spaced points of conflicts, while Solomon Elementary School is located within a more conventional grid street network. Off-site parking lots are provided at Wheeler Schools and at Hale Kua Elementary School for parents who walk their children to and from classes, while Solomon Elementary School parents park on the street, then walk their children to and from classes. Solomon Elementary School and Hale Kua Elementary School permit drop-off operations within school parking lots, while Wheeler Elementary and Middle Schools parents drop-off children curbside on Old Kamehameha Highway. Large numbers of students and parents walk to and from Hale Kua Elementary School and Solomon Elementary School, while Wheeler Schools students rely on bus transportation and private vehicles. Long vehicle queues and delays at unsignalized crosswalks are caused by the crossing guards, who permit extended pedestrian crossing times and short periods for traffic flow.

The realignment of various intersections at Wheeler Middle School and at Hale Kua Elementary School will simplify traffic operations and reduce the potential vehicular conflicts, as well as the number of conflicts between vehicles and pedestrians. An off-site parking lot at Solomon Elementary School will remove the drop-off and pick-up congestion from Carpenter Street. Finally, regulating the crossing guards pedestrian crossing times and the vehicular flow times will reduce much of the traffic congestion in and around the elementary schools.

TRAFFIC ENGINEERING STUDIES
VARIOUS LOCATIONS

SITE 4B – SCHOFIELD BARRACKS & WHEELER ARMY AIR FIELD SCHOOLS

APPENDIX A

TRAFFIC COUNT DATA

Study Name: Wright Ave Old Kamehameha Hwy Robbins Rd

Vehicular Traffic

		Wright Ave Eastbound Street				Wright Ave Westbound Street				Robbins Rd Northbound Street				
Date: 1/18/12		Left-Turn to	Left-Turn to					Right-Turn to	Right-Turn to		Through to	Through to Old		
Start	End	Parking	Old Kam Hwy	Through	Right-Turn	Left-Turn	Through	Parking	Old Kam Hwy	Left-Turn	Parking	Kam Hwy	Right-Turn	Total	Hrly
6:30	6:45	1	4	31	8	2	61	3	12	5	0	1	0	128	
6:45	7:00	5	9	27	4	1	60	2	22	2	1	0	1	134	
7:00	7:15	5	9	38	2	0	68	6	44	4	1	1	1	179	
7:15	7:30	30	32	35	6	1	77	11	44	3	0	1	2	242	683
7:30	7:45	33	22	50	5	1	70	9	71	9	3	4	2	279	834
7:45	8:00	2	12	55	8	0	49	5	42	15	0	4	1	193	**893**
8:00	8:15	3	8	61	8	2	52	6	9	7	1	0	0	157	871
8:15	8:30	2	8	35	7	2	51	0	7	14	0	1	1	128	757
Date:	1/17/12														
13:00	13:15	0	1	38	6	0	57	0	1	11	0	1	0	115	
13:15	13:30	1	5	31	7	0	52	1	12	17	0	1	1	128	
13:30	13:45	3	3	35	11	0	37	2	17	14	1	3	0	126	
13:45	14:00	4	11	24	8	1	50	2	38	9	0	4	0	151	520
14:00	14:15	7	12	41	16	0	39	0	29	14	0	5	1	164	569
14:15	14:30	5	20	47	17	0	26	2	16	14	0	4	0	151	592
14:30	14:45	6	25	35	17	1	34	0	11	16	0	3	3	151	617
14:45	15:00	6	9	51	8	0	43	1	1	12	0	2	1	134	600
AM Peak Hour															
7:00	8:00	70	75	178	21	2	264	31	201	31	4	10	6	893	
Peak Hour Factor		0.53	0.85	0.89	1.05	0.50	0.94	0.86	0.71	0.86	0.33	0.63	0.75	0.80	
After School Peak Hour															
14:00	15:00	24	66	174	58	1	142	3	57	56	0	14	5	600	
Peak Hour Factor		0.86	1.38	1.06	0.91	N/A	0.91	N/A	0.49	1.00	N/A	0.70	1.25	0.91	

Pedestrian, Bicycles in Crosswalk

Date:	1/18/12	Wright Ave	Wright Ave	Robbins Rd	Old Kamehameha Hwy		
Start	End	West Leg	East Leg	South Leg	North Leg	Total	Hrly
6:30	6:45	1	9	8	2	20	
6:45	7:00	0	0	2	2	4	
7:00	7:15	0	0	1	3	4	
7:15	7:30	0	5	0	7	12	40
7:30	7:45	0	10	2	1	13	33
7:45	8:00	0	9	7	2	18	47
8:00	8:15	0	0	0	1	1	44
8:15	8:30	0	0	0	0	0	32
Date:	1/17/12						
13:00	13:15	1	0	0	0	1	
13:15	13:30	0	0	0	0	0	
13:30	13:45	0	2	0	0	2	
13:45	14:00	0	1	1	1	3	6
14:00	14:15	0	1	0	0	1	6
14:15	14:30	0	1	0	1	2	8
14:30	14:45	0	9	0	4	13	19
14:45	15:00	0	0	2	4	6	22
AM Peak Hour							
7:00	8:00	0	24	10	13	47	
After School Peak Hour							
14:00	15:00	0	11	2	9	22	

Study Name: Wright Ave Leilehua Rd Whiteman Rd

Vehicular Traffic

		Wright Ave Eastbound			Wright Ave Westbound			Whiteman Rd Northbound			Leilehua Rd Southbound				
Date:	1/18/12														
Start	End	Left-Turn	Through	Right-Turn	Left-Turn	Through	Right-Turn	Left-Turn	Through	Right-Turn	Left-Turn	Through	Right-Turn	Total	Hrly Total
6:30	6:45	4	37	4	0	65	1	6	0	0	6	1	6	130	
6:45	7:00	6	43	1	0	59	3	8	0	0	3	1	6	130	
7:00	7:15	9	46	2	0	67	4	4	0	0	8	2	8	150	
7:15	7:30	21	94	2	0	71	9	8	0	0	9	3	44	261	671
7:30	7:45	28	89	7	0	71	9	20	5	0	20	17	52	**318**	859
7:45	8:00	8	53	4	0	60	4	11	3	1	24	12	31	211	940
8:00	8:15	2	67	5	0	58	1	8	1	0	10	2	10	164	**954**
8:15	8:30	0	51	5	0	65	0	10	0	0	2	1	8	142	835
Date:	1/17/12														
13:00	13:15	3	39	6	0	68	0	9	0	0	6	1	1	133	
13:15	13:30	3	39	3	0	69	0	7	0	0	4	3	2	130	
13:30	13:45	3	47	1	0	51	0	5	0	2	3	0	4	116	
13:45	14:00	22	44	2	0	54	4	3	0	0	4	2	7	142	521
14:00	14:15	10	52	8	0	49	1	6	1	0	23	15	17	182	570
14:15	14:30	8	66	7	0	38	2	2	0	0	20	9	24	176	616
14:30	14:45	4	65	13	0	49	1	9	0	1	21	9	42	214	714
14:45	15:00	2	57	5	2	54	0	11	0	0	15	4	18	168	**740**
AM Peak Hour															
7:00	8:00	66	282	15	0	269	26	43	8	1	61	34	135	940	
Peak Hour Factor		0.59	0.79	0.54	N/A	0.95	0.72	0.54	0.40	N/A	0.76	0.50	0.65	0.74	
After School Peak Hour															
14:00	15:00	24	240	33	2	190	4	28	1	1	79	37	101	740	
Peak Hour Factor		1.50	0.92	0.63	N/A	0.97	1.00	0.78	N/A	0.25	0.94	1.03	0.60	0.86	

Pedestrian, Bicycles in Crosswalk

Date:	1/18/12	Wright Ave	Wright Ave	Whiteman Rd	Leilehua Rd		
Start	End	West Leg	East Leg	South Leg	North Leg	Total	Hrly Total
6:30	6:45	1	0	9	3	13	
6:45	7:00	0	0	3	4	7	
7:00	7:15	0	0	1	4	5	
7:15	7:30	5	0	0	7	12	37
7:30	7:45	0	0	0	1	1	25
7:45	8:00	0	0	0	1	1	19
8:00	8:15	0	0	1	0	1	15
8:15	8:30	0	0	0	0	0	3
Date:	1/17/12						
13:00	13:15	0	0	0	0	0	
13:15	13:30	0	0	2	0	2	
13:30	13:45	0	0	1	0	1	
13:45	14:00	0	0	0	2	2	5
14:00	14:15	0	0	3	0	3	8
14:15	14:30	0	0	1	0	1	7
14:30	14:45	0	0	0	11	11	17
14:45	15:00	10	0	3	0	13	28
AM Peak Hour							
7:15	8:15	5	0	1	9	15	
After School Peak Hour							
14:00	15:00	10	0	7	11	28	

Study Name Old Kam Hwy Wheeler Middle School

Vehicular Traffic

Date:	1/19/12	Leilehua Rd Eastbound			Wheeler Middle School Dwy Westbound			Old Kamehameha Hwy Northbound			Old Kamehameha Hwy Southbound				
Start	End	Left-Turn	Through	Right-Turn	Left-Turn	Through	Right-Turn	Left-Turn	Through	Right-Turn	Left-Turn	Through	Right-Turn	Total	Hrly Total
6:30	6:45	0	0	0	0	1	0	1	10	9	0	0	0	21	
6:45	7:00	3	1	0	0	1	0	1	7	20	0	0	0	33	
7:00	7:15	7	1	0	0	1	0	6	28	16	0	0	0	59	
7:15	7:30	19	0	0	0	0	0	21	23	28	0	0	0	91	204
7:30	7:45	21	1	0	0	3	0	10	64	21	0	0	0	120	303
7:45	8:00	12	3	0	0	4	0	4	44	14	0	0	0	81	**351**
8:00	8:15	2	0	0	0	2	0	2	12	6	0	0	0	24	316
8:15	8:30	2	2	0	0	4	0	3	6	3	0	0	0	20	245
Date:	1/19/12														
13:15	13:30	0	0	0	0	1	0	0	15	2	0	0	0	18	
13:30	13:45	4	0	0	0	1	0	0	24	4	0	0	0	33	
13:45	14:00	10	0	0	0	2	0	6	33	3	0	0	0	54	
14:00	14:15	3	1	0	0	2	1	8	32	5	0	0	0	52	157
14:15	14:30	3	1	0	0	4	0	4	18	10	0	0	0	40	179
14:30	14:45	7	0	0	0	9	0	7	14	7	0	0	1	45	**191**
14:45	15:00	4	0	0	0	9	0	7	7	3	0	0	0	30	167
15:00	15:15	0	0	0	0	13	0	0	7	7	0	0	0	27	142
AM Peak Hour															
7:00	8:00	59	5	0	0	8	0	41	159	79	0	0	0	351	
Peak Hour Factor		0.70	1.25	N/A	N/A	0.67	N/A	1.03	0.62	0.94	N/A	N/A	N/A	0.73	
After School Peak Hour															
14:00	15:00	17	2	0	0	24	1	26	71	25	0	0	1	167	
Peak Hour Factor		0.43	N/A	N/A	N/A	3.00	N/A	1.08	0.54	2.08	N/A	N/A	N/A	0.77	

Pedestrian, Bicycles in Crosswalk

Date:	1/19/12	Leilehua Rd West Leg	Middle School Dwy East Leg	Old Kamehameha Hwy North Leg	Old Kamehameha Hwy South Leg		
Start	End	Pedestrians	Pedestrians	Pedestrians	Pedestrians	Total	Hrly Total
6:30	6:45	0	0	0	1	1	
6:45	7:00	0	0	0	5	5	
7:00	7:15	0	1	1	16	18	
7:15	7:30	0	0	1	73	74	98
7:30	7:45	1	8	2	77	88	185
7:45	8:00	0	13	3	13	29	209
8:00	8:15	0	3	0	5	8	199
8:15	8:30	0	0	1	2	3	128
13:15	13:30	0	4	3	1	8	
13:30	13:45	2	2	0	4	8	
13:45	14:00	0	2	0	2	4	
14:00	14:15	0	11	0	0	11	31
14:15	14:30	2	6	0	3	11	34
14:30	14:45	36	12	5	110	163	189
14:45	15:00	1	3	1	9	14	199
15:00	15:15	1	1	4	14	20	208
AM Peak Hour							
7:00	8:00	1	22	7	179	209	
After School Peak Hour							
14:00	15:00	39	32	6	122	199	

Study Name Leilehua Rd Wheeler Middle School Parking

Vehicular Traffic

		Eastman Rd to Parking			Eastman Rd from Parking			Leilehua Rd to Old Kam Hwy			From Old Kam Hwy to Leilehua Rc				
Date:	1/19/12	Eastbound			Westbound			Northbound			Southbound				
Start	End	Left-Turn	Through	Right-Turn	Left-Turn	Through	Right-Turn	Left-Turn	Through	Right-Turn	Left-Turn	Through	Right-Turn	Total	Hrly Total
6:30	6:45	0	0	0	3	3	0	4	0	0	0	2	0	12	
6:45	7:00	1	0	1	3	2	0	4	3	0	0	2	0	16	
7:00	7:15	0	0	7	7	6	0	5	8	0	0	6	0	39	
7:15	7:30	2	0	18	28	7	2	16	18	3	0	20	1	115	182
7:30	7:45	2	0	38	36	7	0	21	21	0	0	13	1	**139**	309
7:45	8:00	1	0	55	7	5	0	11	13	0	0	7	2	101	**394**
8:00	8:15	1	0	14	2	1	0	6	1	0	0	5	1	31	386
8:15	8:30	1	0	10	2	2	0	1	3	0	0	4	2	25	296
Date:	1/19/12														
13:15	13:30	0	0	8	2	1	0	2	0	0	0	1	0	14	
13:30	13:45	1	0	5	2	2	0	3	3	0	0	1	0	17	
13:45	14:00	0	0	7	0	1	0	9	12	1	1	2	0	33	
14:00	14:15	1	0	56	1	1	0	6	3	0	0	3	3	74	138
14:15	14:30	2	0	32	1	3	1	7	2	0	0	7	2	57	181
14:30	14:45	0	0	37	21	0	1	2	3	0	0	31	1	**96**	260
14:45	15:00	1	0	11	5	1	1	0	1	0	0	17	0	37	**264**
15:00	15:15	0	0	11	5	0	0	1	0	0	0	14	0	31	221
AM Peak Hour															
7:00	8:00	5	0	118	78	25	2	53	60	3	0	46	4	394	
Peak Hour Factor		0.63	ec	0.78	0.54	0.89	#DIV/0!	0.63	0.71	#DIV/0!	#DIV/0!	0.88	1.00	0.71	
After School Peak Hour															
14:00	15:00	4	0	136	28	5	3	15	9	0	0	58	6	264	
Peak Hour Factor		N/A	N/A	0.92	0.33	N/A	0.75	1.88	0.75	N/A	N/A	0.47	1.50	0.69	

Pedestrian, Bicycles in Crosswalk

		Eastman Rd to Parking	Eastman Rd from Park	Leilehua Rd to Old Kar	From Old Kam Hwy to Leilehua Rd.		
Date:	1/19/12	West Leg	East Leg	South Leg	North Leg	Total	Hrly
Start	End						
6:30	6:45	0	0	0	0	0	
6:45	7:00	0	1	0	0	1	
7:00	7:15	2	0	0	3	5	
7:15	7:30	0	7	2	2	11	17
7:30	7:45	0	2	0	0	2	19
7:45	8:00	0	0	0	0	0	18
8:00	8:15	0	0	0	0	0	13
8:15	8:30	0	0	0	0	0	2
Date:	1/19/12						
13:15	13:30	0	1	0	0	1	
13:30	13:45	0	2	0	0	2	
13:45	14:00	0	0	0	0	0	
14:00	14:15	0	0	0	0	0	3
14:15	14:30	0	0	0	0	0	2
14:30	14:45	0	28	11	5	44	44
14:45	15:00	0	2	0	0	2	46
15:00	15:15	0	1	5	1	7	53
AM Peak Hour							
7:00	8:00	2	9	2	5	18	
After School Peak Hour							
14:00	15:00	0	30	11	5	46	

Study Name Carpenter St Waianae Uka St

Vehicular Traffic

		Waianae Uka Street Westbound		Carpenter Street Northbound		Carpenter Street Southbound			
Start	End	Left-Turn	Right-Turn	Through	Right-Turn	Left-Turn	Through	Total	Hrly
Date:	12/2/11								
6:30	6:45	2	1	9	2	10	6	30	
6:45	7:00	9	21	7	5	5	3	50	
7:00	7:15	3	7	5	3	9	4	31	
7:15	7:30	4	8	5	13	25	15	70	181
7:30	7:45	9	10	16	17	21	13	86	237
7:45	8:00	10	13	23	18	38	28	130	317
8:00	8:15	8	13	26	4	27	15	93	**379**
8:15	8:30	3	7	16	5	10	17	58	367
Date:	12/2/11								
13:00	13:15	4	5	25	2	11	16	63	
13:15	13:30	3	8	15	8	10	15	59	
13:30	13:45	0	11	14	2	14	10	51	
13:45	14:00	1	15	15	6	12	20	69	242
14:00	14:15	7	10	7	7	14	21	66	245
14:15	14:30	2	8	23	9	7	17	66	252
14:30	14:45	8	8	13	3	9	14	55	256
14:45	15:00	5	12	23	7	14	28	89	276
15:00	15:15	2	5	20	10	20	24	81	291
15:15	15:30	1	11	26	9	20	21	88	313
15:30	15:45	3	17	16	6	16	19	77	**335**
15:45	16:00	2	6	17	1	8	21	55	301
AM Peak Hour									
7:15	8:15	31	44	70	52	111	71	379	
Peak Hour Factor		0.78	0.85	0.76	0.72	0.73	0.63	0.73	
After School Peak Hour									
13:45	14:45	18	41	58	25	42	72	256	
Peak Hour Factor		4.50	0.68	0.97	1.04	0.88	0.90	0.93	

Pedestrian, Bicycles in Crosswalk

		East Leg	South Leg	North Leg		
Start	End	Waianae Uka Street	Carpenter Street	Carpenter Street	Total	Hrly
Date:	12/2/11					
6:30	6:45	0	2	0	2	
6:45	7:00	10	2	1	13	
7:00	7:15	8	7	0	15	
7:15	7:30	7	11	1	19	49
7:30	7:45	10	0	13	23	70
7:45	8:00	5	2	40	47	104
8:00	8:15	5	0	4	9	98
8:15	8:30	1	0	3	4	83
Date:	12/2/11					
13:00	13:15	1	0	0	1	
13:15	13:30	0	0	2	2	
13:30	13:45	1	0	1	2	
13:45	14:00	0	0	11	11	16
14:00	14:15	15	4	60	79	94
14:15	14:30	4	2	21	27	119
14:30	14:45	3	0	0	3	120
14:45	15:00	1	0	2	3	112
15:00	15:15	1	1	0	2	35
15:15	15:30	3	6	0	9	17
15:30	15:45	0	0	3	3	17
15:45	16:00	0	3	5	8	22
AM Peak Hour						
7:15	7:30	27	13	58	98	
PM Peak Hour						
13:45	14:00	22	6	92	120	

Study Name Trimble Rd Carpenter St

Vehicular Traffic

		Trimble Road Eastbound			Trimble Road Westbound			Carpenter Street Northbound			Carpenter Street Southbound				
Start	End	Left-Turn	Through	Right-Turn	Left-Turn	Through	Right-Turn	Left-Turn	Through	Right-Turn	Left-Turn	Through	Right-Turn	Total	Hrly
Date:	12/2/11														
6:30	6:45	4	19	3	2	46	8	3	3	1	4	15	13	121	
6:45	7:00	2	11	2	4	67	13	4	12	4	5	6	3	133	
7:00	7:15	1	12	0	4	32	11	3	6	4	6	8	4	91	
7:15	7:30	4	19	0	6	44	6	3	10	7	7	30	12	148	493
7:30	7:45	5	16	0	17	41	17	2	21	4	8	37	9	177	549
7:45	8:00	6	31	1	22	37	22	10	37	21	5	61	18	**271**	687
8:00	8:15	6	27	4	10	54	26	7	53	15	10	19	13	244	**840**
8:15	8:30	4	65	6	13	62	23	5	19	7	12	13	9	238	930
Date:	12/2/11														
13:00	13:15	14	43	6	19	66	9	8	15	9	14	13	18	234	
13:15	13:30	13	55	9	19	51	10	8	14	15	19	7	14	234	
13:30	13:45	11	34	3	15	43	8	0	14	9	12	16	7	172	
13:45	14:00	28	44	5	35	40	14	5	15	9	18	31	16	260	900
14:00	14:15	15	62	6	25	37	13	2	24	16	11	11	10	232	898
14:15	14:30	10	53	3	8	38	21	3	26	24	20	11	9	226	890
14:30	14:45	35	39	1	13	31	27	2	19	12	12	15	13	219	937
14:45	15:00	8	57	12	16	32	19	3	22	8	27	26	15	245	922
15:00	15:15	14	79	14	23	40	23	5	16	16	19	23	16	**288**	978
15:15	15:30	15	71	5	19	44	27	1	26	14	26	25	14	287	1039
15:30	15:45	7	70	11	15	39	15	10	16	12	20	18	11	244	**1064**
15:45	16:00	5	61	11	17	49	21	3	11	10	26	14	11	239	1058
AM Peak Hour															
7:00	8:00	16	78	1	49	154	56	18	74	36	26	136	43	687	
Peak Hour Factor		0.67	0.63	0.25	0.56	1.04	0.64	0.45	0.50	0.43	1.30	0.56	0.60	0.63	
After School Peak Hour															
13:45	14:45	88	198	15	81	146	75	12	84	61	61	68	48	937	
Peak Hour Factor		0.79	1.13	0.75	0.58	0.91	1.34	0.60	1.40	1.69	0.85	0.55	0.75	0.90	

Pedestrian, Bicycles in Crosswalk

Start	End	West Leg Trimble Road	East Leg Trimble Road	South Leg Carpenter Street	North Leg Carpenter Street	Total	Hrly
Date:	12/2/11						
6:30	6:45	0	3	11	0	14	
6:45	7:00	0	10	619	4	633	
7:00	7:15	0	7	449	8	464	
7:15	7:30	11	24	202	9	246	1357
7:30	7:45	0	55	69	3	127	1470
7:45	8:00	0	177	49	0	226	1063
8:00	8:15	0	54	8	4	66	665
8:15	8:30	0	1	7	0	8	427
Date:	12/2/11						
13:00	13:15	0	0	0	0	0	
13:15	13:30	1	0	0	0	1	
13:30	13:45	0	4	0	0	4	
13:45	14:00	0	64	0	0	64	69
14:00	14:15	0	299	12	0	311	380
14:15	14:30	0	83	0	0	83	462
14:30	14:45	0	5	4	0	9	467
14:45	15:00	0	1	0	0	1	404
15:00	15:15	2	2	3	0	7	100
15:15	15:30	0	10	2	3	15	32
15:30	15:45	0	4	2	0	6	29
15:45	16:00	0	2	0	0	2	30
AM Peak Hour							
7:00	8:00	11	263	769	20	1063	
After School Peak Hour							
13:45	14:45	0	451	16	0	467	

Study Name Ayres Ave McMahon Rd

Vehicular Traffic

		Ayres Avenue Eastbound			Ayres Avenue Westbound			Hale Kua Elementary Dwy Northbound			McMahon Road Southbound				
Start	End	Left-Turn	Through	Right-Turn	Left-Turn	Through	Right-Turn	Left-Turn	Through	Right-Turn	Left-Turn	Through	Right-Turn	15-Min Total	Hourly Total
Date:	11/29/11														
6:30	6:45	11	26	0	8	26	33	0	0	0	10	6	0	120	
6:45	7:00	6	20	3	10	21	28	0	0	0	9	7	0	104	
7:00	7:15	7	18	7	8	16	24	0	0	0	18	7	1	106	
7:15	7:30	9	34	25	6	40	39	0	0	0	10	14	0	177	507
7:30	7:45	12	29	37	13	40	26	0	0	0	45	18	0	220	607
7:45	8:00	5	14	18	14	36	41	0	0	0	27	13	4	172	675
8:00	8:15	32	21	10	4	37	45	0	0	0	25	13	2	189	758
8:15	8:30	12	12	1	0	41	20	6	0	0	15	22	0	129	710
Date:	11/29/11														
13:00	13:15	10	16	1	1	35	12	0	0	2	12	0	10	99	
13:15	13:30	12	19	4	2	19	8	0	0	0	8	0	20	92	
13:30	13:45	16	29	5	2	25	13	0	0	0	14	0	6	110	
13:45	14:00	17	42	6	6	26	9	0	0	3	12	0	7	128	429
14:00	14:15	15	39	2	0	25	14	0	0	0	21	0	5	121	451
14:15	14:30	15	22	11	4	35	24	0	0	0	32	0	19	162	521
14:30	14:45	14	21	8	3	29	10	0	0	1	29	0	22	137	**548**
14:45	15:00	18	11	3	2	17	17	0	0	0	13	0	9	90	510
15:00	15:15	13	25	5	0	26	15	0	0	0	14	0	14	112	501
15:15	15:30	8	16	9	1	21	12	0	0	0	19	0	20	106	445
15:30	15:45	14	23	7	4	23	12	1	0	0	18	0	21	123	431
15:45	16:00	15	25	9	3	38	13	0	0	0	21	0	10	134	475
AM Peak Hour Traffic															
7:15	8:15	58	98	90	37	153	151	0	0	0	107	58	6	758	
Peak Hour Factor		1.21	0.84	0.61	0.71	0.96	1.45	N/A	N/A	N/A	0.59	0.81	N/A	0.86	
After School Peak Hour															
13:45	14:45	61	124	27	13	115	57	0	0	4	94	0	53	548	
Peak Hour Factor		1.02	1.41	0.61	0.81	0.82	0.59	N/A	N/A	N/A	0.73	N/A	0.70	0.85	

Pedestrian Traffic
Crossing Street

Start	End	Ayres Avenue West Leg	Ayres Avenue East Leg	Hale Kua Elementary D South Leg	McMahon Road North Leg	15-Min Total	Hourly Total
Date:	11/29/11						
6:30	6:45	6	2	1	0	9	
6:45	7:00	13	2	25	0	40	
7:00	7:15	20	0	15	0	35	
7:15	7:30	17	0	8	0	25	109
7:30	7:45	58	2	0	0	60	160
7:45	8:00	58	27	0	4	89	209
8:00	8:15	3	3	1	0	7	181
8:15	8:30	5	0	2	0	7	163
Date:	11/29/11						
13:00	13:15	0	0	0	0	0	
13:15	13:30	0	0	0	0	0	
13:30	13:45	5	1	0	0	6	
13:45	14:00	8	8	0	0	16	22
14:00	14:15	66	38	7	0	111	133
14:15	14:30	145	21	9	0	175	308
14:30	14:45	9	6	9	0	24	326
14:45	15:00	0	0	0	0	0	310
15:00	15:15	0	0	0	0	0	199
15:15	15:30	6	0	0	0	6	30
15:30	15:45	1	0	0	0	1	7
15:45	16:00	13	0	0	0	13	20
AM Peak Hour Traffic							
7:15	8:15	136	32	9	4	181	
After School Peak Hour							
13:45	14:45	228	73	25	0	326	

Study Name Ayres Ave Waianae Ave

Vehicular Traffic

		Ayres Avenue Eastbound			Ayres Avenue Westbound			Waianae Ave Northbound			Parking Southbound			15-Min	Hourly
Start	End	Left-Turn	Through	Right-Turn	Left-Turn	Through	Right-Turn	Left-Turn	Through	Right-Turn	Left-Turn	Through	Right-Turn	Total	Total
Date:	11/30/11														
6:30	6:45	0	29	28	8	25	1	14	1	9	0	0	0	115	
6:45	7:00	0	21	24	5	22	1	6	0	10	0	1	0	90	
7:00	7:15	0	23	9	10	12	1	7	2	11	0	0	1	76	
7:15	7:30	0	49	17	14	31	6	10	0	24	0	0	0	151	432
7:30	7:45	2	45	14	20	29	1	9	9	30	1	3	0	163	480
7:45	8:00	1	26	14	11	29	3	16	3	11	4	12	4	134	524
8:00	8:15	0	31	28	16	46	2	38	6	35	0	3	2	207	655
8:15	8:30	1	15	22	15	52	2	45	6	11	1	1	0	171	675
Date:	11/29/11														
13:00	13:15	0	18	40	8	42	2	25	7	9	1	3	1	156	
13:15	13:30	1	20	32	16	22	2	23	12	16	1	4	0	149	
13:30	13:45	2	35	27	4	24	3	16	8	16	2	3	3	143	
13:45	14:00	1	33	20	5	25	3	19	12	28	5	1	6	158	606
14:00	14:15	1	41	22	4	23	0	24	4	20	0	3	7	149	599
14:15	14:30	0	23	32	22	28	1	22	4	21	2	15	3	173	623
14:30	14:45	1	29	22	20	40	0	21	5	15	1	3	0	157	637
14:45	15:00	0	16	18	8	21	2	20	9	15	0	4	2	115	594
15:00	15:15	1	28	17	8	31	0	15	4	16	2	4	0	126	571
15:15	15:30	0	24	19	19	22	1	18	11	7	1	6	0	128	526
15:30	15:45	0	31	28	19	22	1	19	4	15	0	10	0	149	518
15:45	16:00	3	29	24	12	38	1	33	3	17	3	6	1	170	573
AM Peak Hour Traffic															
7:15	8:15	3	151	73	61	135	12	73	18	100	5	18	6	655	
Peak Hour Factor		N/A	1.22	0.65	0.95	0.73	1.50	0.48	0.75	0.71	N/A	1.50	0.75	0.79	
After School Peak Hour															
13:45	14:45	3	126	96	51	116	4	86	25	84	8	22	16	637	
Peak Hour Factor		N/A	1.37	0.75	0.58	1.04	1.00	0.98	1.56	1.00	1.00	0.37	1.33	0.92	

Pedestrian Traffic
Crossing Street

Start	End	Ayres Avenue West Leg	Ayres Avenue East Leg	Waianae Ave South Leg	Parking North Leg	15-Min Total	Hourly Total
Date:	11/29/11						
6:30	6:45	1	2	3	0	6	
6:45	7:00	0	2	17	4	23	
7:00	7:15	0	6	53	0	59	
7:15	7:30	3	18	34	3	58	146
7:30	7:45	0	109	96	0	205	345
7:45	8:00	0	132	168	0	300	622
8:00	8:15	0	11	14	0	25	588
8:15	8:30	0	9	5	0	14	544
Date:	11/29/11						
13:00	13:15	0	0	0	1	1	
13:15	13:30	0	1	0	0	1	
13:30	13:45	0	12	3	1	16	
13:45	14:00	0	36	41	9	86	104
14:00	14:15	0	140	69	13	222	325
14:15	14:30	0	181	143	29	353	677
14:30	14:45	0	15	12	1	28	689
14:45	15:00	0	2	1	0	3	606
15:00	15:15	0	0	4	0	4	388
15:15	15:30	0	1	1	1	3	38
15:30	15:45	0	2	7	1	10	20
15:45	16:00	1	5	13	1	20	37
AM Peak Hour Traffic							
7:15	8:15	3	270	312	3	588	
After School Peak Hour							
13:45	14:45	0	372	265	52	689	

TRAFFIC ENGINEERING STUDIES
VARIOUS LOCATIONS

SITE 4B – SCHOFIELD BARRACKS & WHEELER ARMY AIR FIELD SCHOOLS

APPENDIX B

CAPACITY ANALYSIS WORKSHEETS

EXISTING TRAFFIC CONDITIONS

Intersection	
Intersection Delay, s/veh	10.1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	80	282	15	0	269	26	43	10	1	61	36	145
Conflicting Peds, #/hr	9	0	1	1	0	9	5	0	0	0	0	5
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	75	75	75	75	75	75	75	75	75	75	75	75
Heavy Vehicles, %	1	1	1	1	1	1	1	1	1	1	1	1
Mvmt Flow	107	376	20	0	359	35	57	13	1	81	48	193

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	398	0	0	401	0	0	1106	1002	400	993	995	390
Stage 1	-	-	-	-	-	-	604	604	-	381	381	-
Stage 2	-	-	-	-	-	-	502	398	-	612	614	-
Follow-up Headway	2.209	-	-	2.209	-	-	3.509	4.009	3.309	3.509	4.009	3.309
Pot Capacity-1 Maneuver	1166	-	-	1163	-	-	189	243	652	225	246	661
Stage 1	-	-	-	-	-	-	487	489	-	643	615	-
Stage 2	-	-	-	-	-	-	553	605	-	482	484	-
Time blocked-Platoon, %		-	-		-	-						
Mov Capacity-1 Maneuver	1157	-	-	1154	-	-	106	212	644	195	215	653
Mov Capacity-2 Maneuver	-	-	-	-	-	-	187	306	-	301	322	-
Stage 1	-	-	-	-	-	-	427	429	-	564	612	-
Stage 2	-	-	-	-	-	-	356	602	-	408	425	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	1.8	0	32	30.6
HCM LOS			D	D

Minor Lane / Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	204	1157	-	-	1154	-	-	451
HCM Lane V/C Ratio	0.353	0.092	-	-	-	-	-	0.715
HCM Control Delay (s)	32	8.427	0	-	0	-	-	30.6
HCM Lane LOS	D	A	A		A			D
HCM 95th %tile Q(veh)	1.5	0.304	-	-	0	-	-	5.593

Notes

~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

Intersection	
Intersection Delay, s/veh	3.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBR	SEL	SER
Vol, veh/h	155	178	21	2	264	232	10	6	0	0
Conflicting Peds, #/hr	13	0	10	10	0	13	0	24	24	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	None	-	-
Storage Length	-	-	-	-	-	-	0	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	0	-	0	-
Grade, %	-	0	-	-	0	-	0	-	0	-
Peak Hour Factor	80	80	80	80	80	80	80	80	80	80
Heavy Vehicles, %	1	1	1	1	1	1	1	1	1	1
Mvmt Flow	194	222	26	2	330	290	12	8	0	0

Major/Minor	Major1			Major2			Minor1	
Conflicting Flow All	620	0	0	273	0	0	1127	273
Stage 1	-	-	-	-	-	-	647	-
Stage 2	-	-	-	-	-	-	480	-
Follow-up Headway	2.209	-	-	2.209	-	-	3.509	3.309
Pot Capacity-1 Maneuver	965	-	-	1296	-	-	227	768
Stage 1	-	-	-	-	-	-	523	-
Stage 2	-	-	-	-	-	-	624	-
Time blocked-Platoon, %		-	-		-	-		
Mov Capacity-1 Maneuver	955	-	-	1282	-	-	167	744
Mov Capacity-2 Maneuver	-	-	-	-	-	-	167	-
Stage 1	-	-	-	-	-	-	391	-
Stage 2	-	-	-	-	-	-	615	-

Approach	EB	WB	NB
HCM Control Delay, s	4.3	0	31.9
HCM LOS			D

Minor Lane / Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR
Capacity (veh/h)	191	955	-	-	1282	-	-
HCM Lane V/C Ratio	0.304	0.203	-	-	0.002	-	-
HCM Control Delay (s)	31.9	9.727	0	-	7.814	0	-
HCM Lane LOS	D	A	A		A	A	
HCM 95th %tile Q(veh)	1.22	0.758	-	-	0.006	-	-

Notes

~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

Intersection	
Intersection Delay, s/veh	4.8

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Vol, veh/h	103	2	68	0	0	50
Conflicting Peds, #/hr	0	0	0	0	0	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	71	71	71	71	71	71
Heavy Vehicles, %	1	1	1	1	1	1
Mvmt Flow	145	3	96	0	0	70

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	166	96	0	0	96	0
Stage 1	96	-	-	-	-	-
Stage 2	70	-	-	-	-	-
Follow-up Headway	3.509	3.309	-	-	2.209	-
Pot Capacity-1 Maneuver	827	963	-	-	1504	-
Stage 1	930	-	-	-	-	-
Stage 2	955	-	-	-	-	-
Time blocked-Platoon, %			-	-		-
Mov Capacity-1 Maneuver	827	963	-	-	1504	-
Mov Capacity-2 Maneuver	827	-	-	-	-	-
Stage 1	930	-	-	-	-	-
Stage 2	955	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	10.3	0	0
HCM LOS	B		

Minor Lane / Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	829	1504	-
HCM Lane V/C Ratio	-	-	0.178	-	-
HCM Control Delay (s)	-	-	10.3	0	-
HCM Lane LOS			B	A	
HCM 95th %tile Q(veh)	-	-	0.646	0	-

Notes

~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

Intersection	
Intersection Delay, s/veh	4.4

Movement	NBL	NBT	SBT	SBR	SEL	SER
Vol, veh/h	53	63	124	29	5	118
Conflicting Peds, #/hr	2	0	0	2	2	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	71	71	71	71	71	71
Heavy Vehicles, %	1	1	1	1	1	1
Mvmt Flow	75	89	175	41	7	166

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	220	0	-	0	438	202
Stage 1	-	-	-	-	200	-
Stage 2	-	-	-	-	238	-
Follow-up Headway	2.209	-	-	-	3.509	3.309
Pot Capacity-1 Maneuver	1355	-	-	-	578	841
Stage 1	-	-	-	-	836	-
Stage 2	-	-	-	-	804	-
Time blocked-Platoon, %		-	-	-		
Mov Capacity-1 Maneuver	1353	-	-	-	540	836
Mov Capacity-2 Maneuver	-	-	-	-	540	-
Stage 1	-	-	-	-	833	-
Stage 2	-	-	-	-	754	-

Approach	NB	SB	SE
HCM Control Delay, s	3.6	0	10.6
HCM LOS			B

Minor Lane / Major Mvmt	NBL	NBT	SELn1	SBT	SBR
Capacity (veh/h)	1353	-	818	-	-
HCM Lane V/C Ratio	0.055	-	0.212	-	-
HCM Control Delay (s)	7.816	0	10.6	-	-
HCM Lane LOS	A	A	B		
HCM 95th %tile Q(veh)	0.175	-	0.798	-	-

Notes

~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

Intersection	
Intersection Delay, s/veh	9.3
Intersection LOS	A

Movement	SBL	SBR	SEL	SET	NWT	NWR
Vol, veh/h	0	8	0	0	205	81
Peak Hour Factor	0.73	0.73	0.73	0.73	0.73	0.73
Heavy Vehicles, %	1	1	1	1	1	1
Mvmt Flow	0	11	0	0	281	111
Number of Lanes	0	1	0	0	1	0

Approach	SB	NW
Opposing Approach		
Opposing Lanes	0	0
Conflicting Approach Left	NW	
Conflicting Lanes Left	1	0
Conflicting Approach Right		SB
Conflicting Lanes Right	0	1
HCM Control Delay	7.2	9.4
HCM LOS	A	A

Lane	NWLn1	SBLn1
Vol Left, %	0%	0%
Vol Thru, %	72%	0%
Vol Right, %	28%	100%
Sign Control	Stop	Stop
Traffic Vol by Lane	286	8
LT Vol	205	0
Through Vol	81	8
RT Vol	0	0
Lane Flow Rate	392	11
Geometry Grp	1	1
Degree of Util (X)	0.41	0.013
Departure Headway (Hd)	3.767	4.119
Convergence, Y/N	Yes	Yes
Cap	960	874
Service Time	1.773	2.119
HCM Lane V/C Ratio	0.408	0.013
HCM Control Delay	9.4	7.2
HCM Lane LOS	A	A
HCM 95th-tile Q	2	0

Notes

~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

Intersection	
Intersection Delay, s/veh	9.1
Intersection LOS	A

Movement	NBL	NBR	SET	SER	NWL	NWT
Vol, veh/h	67	0	0	0	50	163
Peak Hour Factor	0.73	0.73	0.73	0.73	0.73	0.73
Heavy Vehicles, %	1	1	1	1	1	1
Mvmt Flow	92	0	0	0	68	223
Number of Lanes	1	0	0	0	0	1

Approach	NB	NW
Opposing Approach		
Opposing Lanes	0	0
Conflicting Approach Left		NB
Conflicting Lanes Left	0	1
Conflicting Approach Right	NW	
Conflicting Lanes Right	1	0
HCM Control Delay	8.4	9.3
HCM LOS	A	A

Lane	NBLn1	NWLn1
Vol Left, %	100%	23%
Vol Thru, %	0%	77%
Vol Right, %	0%	0%
Sign Control	Stop	Stop
Traffic Vol by Lane	67	213
LT Vol	0	163
Through Vol	0	0
RT Vol	67	50
Lane Flow Rate	92	292
Geometry Grp	1	1
Degree of Util (X)	0.122	0.334
Departure Headway (Hd)	4.775	4.125
Convergence, Y/N	Yes	Yes
Cap	755	861
Service Time	2.775	2.204
HCM Lane V/C Ratio	0.122	0.339
HCM Control Delay	8.4	9.3
HCM Lane LOS	A	A
HCM 95th-tile Q	0.4	1.5

Notes

~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

Intersection	
Intersection Delay, s/veh	5.6

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	24	251	33	2	198	4	28	1	1	81	38	103
Conflicting Peds, #/hr	11	0	7	7	0	11	10	0	0	0	0	10
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	86	86	86	86	86	86	86	86	86	86	86	86
Heavy Vehicles, %	1	1	1	1	1	1	1	1	1	1	1	1
Mvmt Flow	28	292	38	2	230	5	33	1	1	94	44	120

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	245	0	0	340	0	0	706	627	332	625	643	254
Stage 1	-	-	-	-	-	-	377	377	-	247	247	-
Stage 2	-	-	-	-	-	-	329	250	-	378	396	-
Follow-up Headway	2.209	-	-	2.209	-	-	3.509	4.009	3.309	3.509	4.009	3.309
Pot Capacity-1 Maneuver	1327	-	-	1225	-	-	352	401	712	399	393	787
Stage 1	-	-	-	-	-	-	647	618	-	759	704	-
Stage 2	-	-	-	-	-	-	686	702	-	646	606	-
Time blocked-Platoon, %		-	-		-	-						
Mov Capacity-1 Maneuver	1315	-	-	1214	-	-	265	383	700	382	376	773
Mov Capacity-2 Maneuver	-	-	-	-	-	-	375	461	-	478	458	-
Stage 1	-	-	-	-	-	-	625	597	-	733	697	-
Stage 2	-	-	-	-	-	-	537	695	-	621	585	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.6	0.1	15.3	16.2
HCM LOS			C	C

Minor Lane / Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	383	1315	-	-	1214	-	-	576
HCM Lane V/C Ratio	0.091	0.021	-	-	0.002	-	-	0.448
HCM Control Delay (s)	15.3	7.797	0	-	7.971	0	-	16.2
HCM Lane LOS	C	A	A		A	A		C
HCM 95th %tile Q(veh)	0.299	0.065	-	-	0.006	-	-	2.303

Notes

~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

Intersection	
Intersection Delay, s/veh	3.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBR	SEL	SER
Vol, veh/h	101	174	58	2	148	98	14	5	0	0
Conflicting Peds, #/hr	9	0	2	2	0	9	9	11	11	9
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	None	-	-
Storage Length	-	-	-	-	-	-	0	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	0	-	0	-
Grade, %	-	0	-	-	0	-	0	-	0	-
Peak Hour Factor	91	91	91	91	91	91	91	91	91	91
Heavy Vehicles, %	1	1	1	1	1	1	1	1	1	1
Mvmt Flow	111	191	64	2	163	108	15	5	0	0

Major/Minor	Major1			Major2			Minor1	
Conflicting Flow All	270	0	0	266	0	0	677	243
Stage 1	-	-	-	-	-	-	456	-
Stage 2	-	-	-	-	-	-	221	-
Follow-up Headway	2.209	-	-	2.209	-	-	3.509	3.309
Pot Capacity-1 Maneuver	1299	-	-	1304	-	-	420	798
Stage 1	-	-	-	-	-	-	640	-
Stage 2	-	-	-	-	-	-	818	-
Time blocked-Platoon, %		-	-		-	-		
Mov Capacity-1 Maneuver	1289	-	-	1294	-	-	371	785
Mov Capacity-2 Maneuver	-	-	-	-	-	-	371	-
Stage 1	-	-	-	-	-	-	570	-
Stage 2	-	-	-	-	-	-	810	-

Approach	EB	WB	NB
HCM Control Delay, s	2.4	0.1	16.8
HCM LOS			C

Minor Lane / Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR
Capacity (veh/h)	388	1289	-	-	1294	-	-
HCM Lane V/C Ratio	0.212	0.086	-	-	0.002	-	-
HCM Control Delay (s)	16.8	8.056	0	-	7.787	0	-
HCM Lane LOS	C	A	A		A	A	
HCM 95th %tile Q(veh)	0.793	0.282	-	-	0.005	-	-

Notes

~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

Intersection	
Intersection Delay, s/veh	3.2

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Vol, veh/h	33	6	13	0	0	64
Conflicting Peds, #/hr	11	5	0	30	30	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	69	69	69	69	69	69
Heavy Vehicles, %	1	1	1	1	1	1
Mvmt Flow	48	9	19	0	0	93

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	123	60	0	0	30	0
Stage 1	30	-	-	-	-	-
Stage 2	93	-	-	-	-	-
Follow-up Headway	3.509	3.309	-	-	2.209	-
Pot Capacity-1 Maneuver	875	1008	-	-	1589	-
Stage 1	995	-	-	-	-	-
Stage 2	933	-	-	-	-	-
Time blocked-Platoon, %			-	-		-
Mov Capacity-1 Maneuver	845	974	-	-	1549	-
Mov Capacity-2 Maneuver	845	-	-	-	-	-
Stage 1	986	-	-	-	-	-
Stage 2	910	-	-	-	-	-

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

Minor Lane / Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	863	1549	-
HCM Lane V/C Ratio	-	-	0.065	-	-
HCM Control Delay (s)	-	-	9.5	0	-
HCM Lane LOS			A	A	
HCM 95th %tile Q(veh)	-	-	0.21	0	-

Notes

~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

Intersection	
Intersection Delay, s/veh	5.9

Movement	NBL	NBT	SBT	SBR	SEL	SER
Vol, veh/h	20	9	86	11	4	136
Conflicting Peds, #/hr	2	0	0	2	2	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	69	69	69	69	69	69
Heavy Vehicles, %	1	1	1	1	1	1
Mvmt Flow	29	13	125	16	6	197

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	146	0	-	0	209	140
Stage 1	-	-	-	-	138	-
Stage 2	-	-	-	-	71	-
Follow-up Headway	2.209	-	-	-	3.509	3.309
Pot Capacity-1 Maneuver	1442	-	-	-	782	911
Stage 1	-	-	-	-	891	-
Stage 2	-	-	-	-	954	-
Time blocked-Platoon, %		-	-	-		
Mov Capacity-1 Maneuver	1440	-	-	-	760	906
Mov Capacity-2 Maneuver	-	-	-	-	760	-
Stage 1	-	-	-	-	887	-
Stage 2	-	-	-	-	931	-

Approach	NB	SB	SE
HCM Control Delay, s	5.2	0	10.2
HCM LOS			B

Minor Lane / Major Mvmt	NBL	NBT	SELn1	SBT	SBR
Capacity (veh/h)	1440	-	901	-	-
HCM Lane V/C Ratio	0.02	-	0.225	-	-
HCM Control Delay (s)	7.551	0	10.2	-	-
HCM Lane LOS	A	A	B		
HCM 95th %tile Q(veh)	0.062	-	0.863	-	-

Notes

~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

Intersection	
Intersection Delay, s/veh	8.1
Intersection LOS	A

Movement	SBL	SBR	SEL	SET	NWT	NWR
Vol, veh/h	0	31	0	0	146	28
Peak Hour Factor	0.73	0.73	0.73	0.73	0.73	0.73
Heavy Vehicles, %	1	1	1	1	1	1
Mvmt Flow	0	42	0	0	200	38
Number of Lanes	0	1	0	0	1	0

Approach	SB	NW
Opposing Approach		
Opposing Lanes	0	0
Conflicting Approach Left	NW	
Conflicting Lanes Left	1	0
Conflicting Approach Right		SB
Conflicting Lanes Right	0	1
HCM Control Delay	7	8.3
HCM LOS	A	A

Lane	NWLn1	SBLn1
Vol Left, %	0%	0%
Vol Thru, %	84%	0%
Vol Right, %	16%	100%
Sign Control	Stop	Stop
Traffic Vol by Lane	174	31
LT Vol	146	0
Through Vol	28	31
RT Vol	0	0
Lane Flow Rate	238	42
Geometry Grp	1	1
Degree of Util (X)	0.258	0.044
Departure Headway (Hd)	3.895	3.731
Convergence, Y/N	Yes	Yes
Cap	925	943
Service Time	1.907	1.821
HCM Lane V/C Ratio	0.257	0.045
HCM Control Delay	8.3	7
HCM Lane LOS	A	A
HCM 95th-tile Q	1	0.1

Notes

~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

Intersection	
Intersection Delay, s/veh	8.1
Intersection LOS	A

Movement	NBL	NBR	SET	SER	NWL	NWT
Vol, veh/h	19	0	0	0	33	113
Peak Hour Factor	0.77	0.77	0.77	0.77	0.77	0.77
Heavy Vehicles, %	1	1	1	1	1	1
Mvmt Flow	25	0	0	0	43	147
Number of Lanes	1	0	0	0	0	1

Approach	NB	NW
Opposing Approach		
Opposing Lanes	0	0
Conflicting Approach Left		NB
Conflicting Lanes Left	0	1
Conflicting Approach Right	NW	
Conflicting Lanes Right	1	0
HCM Control Delay	7.7	8.1
HCM LOS	A	A

Lane	NBLn1	NWLn1
Vol Left, %	100%	23%
Vol Thru, %	0%	77%
Vol Right, %	0%	0%
Sign Control	Stop	Stop
Traffic Vol by Lane	19	146
LT Vol	0	113
Through Vol	0	0
RT Vol	19	33
Lane Flow Rate	25	190
Geometry Grp	1	1
Degree of Util (X)	0.031	0.211
Departure Headway (Hd)	4.45	4.005
Convergence, Y/N	Yes	Yes
Cap	795	897
Service Time	2.533	2.023
HCM Lane V/C Ratio	0.031	0.212
HCM Control Delay	7.7	8.1
HCM Lane LOS	A	A
HCM 95th-tile Q	0.1	0.8

Notes

~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	16	78	1	49	154	56	18	74	36	26	136	43
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	120		0	120		0	0		0	0		0
Storage Lanes	0		0	0		0	0		0	0		0
Taper Length (ft)	100			100			100			100		
Satd. Flow (prot)	0	1839	0	0	1760	0	0	1723	0	0	1797	0
Flt Permitted		0.930			0.884			0.914			0.962	
Satd. Flow (perm)	0	1723	0	0	1572	0	0	1586	0	0	1731	0
Right Turn on Red			No			No			No			No
Satd. Flow (RTOR)												
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		447			475			858			278	
Travel Time (s)		10.2			10.8			19.5			6.3	
Confl. Peds. (#/hr)	4		9	9		4	1		48	48		1
Peak Hour Factor	0.67	0.63	0.25	0.56	1.00	0.64	0.45	0.50	0.43	1.00	0.53	0.60
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	152	0	0	330	0	0	272	0	0	355	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			2			4			4	
Permitted Phases	2			2			4			4		
Detector Phase	2	2		2	2		4	4		4	4	
Switch Phase												
Minimum Initial (s)	25.0	25.0		25.0	25.0		10.0	10.0		10.0	10.0	
Minimum Split (s)	30.0	30.0		30.0	30.0		27.0	27.0		27.0	27.0	
Total Split (s)	35.0	35.0		35.0	35.0		30.0	30.0		30.0	30.0	
Total Split (%)	53.8%	53.8%		53.8%	53.8%		46.2%	46.2%		46.2%	46.2%	
Yellow Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0		1.0	1.0	
Lost Time Adjust (s)		0.0			0.0			0.0			0.0	
Total Lost Time (s)		5.0			5.0			5.0			5.0	
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	Max	Max		Max	Max		None	None		None	None	
Act Effct Green (s)		30.3			30.3			18.4			18.4	
Actuated g/C Ratio		0.52			0.52			0.31			0.31	
v/c Ratio		0.17			0.41			0.55			0.65	
Control Delay		9.8			12.1			20.8			23.3	
Queue Delay		0.0			0.0			0.0			0.0	
Total Delay		9.8			12.1			20.8			23.3	
LOS		A			B			C			C	
Approach Delay		9.8			12.1			20.8			23.3	
Approach LOS		A			B			C			C	
Queue Length 50th (ft)		30			76			78			106	
Queue Length 95th (ft)		43			147			66			90	
Internal Link Dist (ft)		367			395			778			198	
Turn Bay Length (ft)												
Base Capacity (vph)		887			809			680			742	
Starvation Cap Reductn		0			0			0			0	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Spillback Cap Reductn		0			0			0			0	
Storage Cap Reductn		0			0			0			0	
Reduced v/c Ratio		0.17			0.41			0.40			0.48	

Intersection Summary

Area Type: Other
Cycle Length: 65
Actuated Cycle Length: 58.8
Natural Cycle: 60
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.65
Intersection Signal Delay: 17.5 Intersection LOS: B
Intersection Capacity Utilization 46.0% ICU Level of Service A
Analysis Period (min) 15

Splits and Phases: 3: Carpenter St & Trimble Rd

Intersection	
Intersection Delay, s/veh	8.9
Intersection LOS	A

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Vol, veh/h	31	44	70	52	111	71
Peak Hour Factor	0.78	0.85	0.76	0.72	0.73	0.63
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	40	52	92	72	152	113
Number of Lanes	1	0	1	0	0	1

Approach	WB	NB	SB
Opposing Approach		SB	NB
Opposing Lanes	0	1	1
Conflicting Approach Left	NB		WB
Conflicting Lanes Left	1	0	1
Conflicting Approach Right	SB	WB	
Conflicting Lanes Right	1	1	0
HCM Control Delay	8.2	8.2	9.5
HCM LOS	A	A	A

Lane	NBLn1	WBLn1	SBLn1
Vol Left, %	0%	41%	61%
Vol Thru, %	57%	0%	39%
Vol Right, %	43%	59%	0%
Sign Control	Stop	Stop	Stop
Traffic Vol by Lane	122	75	182
LT Vol	70	0	71
Through Vol	52	44	0
RT Vol	0	31	111
Lane Flow Rate	164	92	265
Geometry Grp	1	1	1
Degree of Util (X)	0.191	0.117	0.319
Departure Headway (Hd)	4.177	4.605	4.456
Convergence, Y/N	Yes	Yes	Yes
Cap	861	781	813
Service Time	2.189	2.617	2.456
HCM Lane V/C Ratio	0.19	0.118	0.326
HCM Control Delay	8.2	8.2	9.5
HCM Lane LOS	A	A	A
HCM 95th-tile Q	0.7	0.4	1.4

Notes

~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

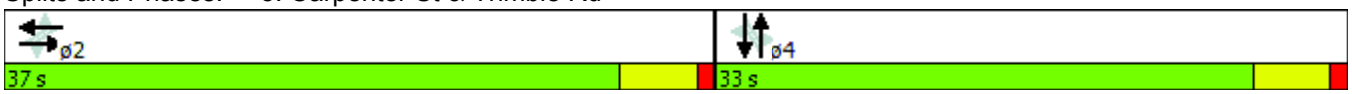
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	54	255	17	73	196	60	13	84	64	52	61	52
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	120		0	120		0	0		0	0		0
Storage Lanes	1		0	1		0	0		0	0		0
Taper Length (ft)	100			100			100			100		
Satd. Flow (prot)	1770	3501	0	1770	3387	0	0	1538	0	0	1780	0
Flt Permitted	0.582			0.584				0.966			0.903	
Satd. Flow (perm)	1084	3501	0	1080	3387	0	0	1492	0	0	1544	0
Right Turn on Red			No			No			No			No
Satd. Flow (RTOR)												
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		447			475			858			278	
Travel Time (s)		10.2			10.8			19.5			6.3	
Confl. Peds. (#/hr)			7	7					339	339		
Peak Hour Factor	1.00	1.00	1.00	0.54	1.00	0.75	1.00	1.00	1.00	1.00	0.46	0.81
Shared Lane Traffic (%)												
Lane Group Flow (vph)	54	272	0	135	276	0	0	161	0	0	249	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			2			4			4	
Permitted Phases	2			2			4			4		
Detector Phase	2	2		2	2		4	4		4	4	
Switch Phase												
Minimum Initial (s)	25.0	25.0		25.0	25.0		10.0	10.0		10.0	10.0	
Minimum Split (s)	30.0	30.0		30.0	30.0		27.0	27.0		27.0	27.0	
Total Split (s)	37.0	37.0		37.0	37.0		33.0	33.0		33.0	33.0	
Total Split (%)	52.9%	52.9%		52.9%	52.9%		47.1%	47.1%		47.1%	47.1%	
Yellow Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0		1.0	1.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0			0.0			0.0	
Total Lost Time (s)	5.0	5.0		5.0	5.0			5.0			5.0	
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	Max	Max		Max	Max		None	None		None	None	
Act Effct Green (s)	32.8	32.8		32.8	32.8			17.3			17.3	
Actuated g/C Ratio	0.55	0.55		0.55	0.55			0.29			0.29	
v/c Ratio	0.09	0.14		0.23	0.15			0.38			0.56	
Control Delay	8.8	8.1		10.0	8.1			19.0			22.9	
Queue Delay	0.0	0.0		0.0	0.0			0.0			0.0	
Total Delay	8.8	8.1		10.0	8.1			19.0			22.9	
LOS	A	A		B	A			B			C	
Approach Delay		8.2			8.8			19.0			22.9	
Approach LOS		A			A			B			C	
Queue Length 50th (ft)	10	27		28	28			45			74	
Queue Length 95th (ft)	27	47		32	47			88			59	
Internal Link Dist (ft)		367			395			778			198	
Turn Bay Length (ft)	120			120								
Base Capacity (vph)	591	1908		588	1846			699			724	
Starvation Cap Reductn	0	0		0	0			0			0	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Spillback Cap Reductn	0	0		0	0			0			0	
Storage Cap Reductn	0	0		0	0			0			0	
Reduced v/c Ratio	0.09	0.14		0.23	0.15			0.23			0.34	

Intersection Summary

Area Type: Other
Cycle Length: 70
Actuated Cycle Length: 60.1
Natural Cycle: 60
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.56
Intersection Signal Delay: 13.1 Intersection LOS: B
Intersection Capacity Utilization 77.4% ICU Level of Service D
Analysis Period (min) 15

Splits and Phases: 3: Carpenter St & Trimble Rd



Intersection	
Intersection Delay, s/veh	7.7
Intersection LOS	A

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Vol, veh/h	18	41	57	25	42	72
Peak Hour Factor	1.00	0.68	0.97	1.00	0.88	0.90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	18	60	59	25	48	80
Number of Lanes	1	0	1	0	0	1

Approach	WB	NB	SB
Opposing Approach		SB	NB
Opposing Lanes	0	1	1
Conflicting Approach Left	NB		WB
Conflicting Lanes Left	1	0	1
Conflicting Approach Right	SB	WB	
Conflicting Lanes Right	1	1	0
HCM Control Delay	7.4	7.5	8
HCM LOS	A	A	A

Lane	NBLn1	WBLn1	SBLn1
Vol Left, %	0%	31%	37%
Vol Thru, %	70%	0%	63%
Vol Right, %	30%	69%	0%
Sign Control	Stop	Stop	Stop
Traffic Vol by Lane	82	59	114
LT Vol	57	0	72
Through Vol	25	41	0
RT Vol	0	18	42
Lane Flow Rate	84	78	128
Geometry Grp	1	1	1
Degree of Util (X)	0.093	0.088	0.149
Departure Headway (Hd)	3.987	4.04	4.21
Convergence, Y/N	Yes	Yes	Yes
Cap	890	893	847
Service Time	2.054	2.04	2.262
HCM Lane V/C Ratio	0.094	0.087	0.151
HCM Control Delay	7.5	7.4	8
HCM Lane LOS	A	A	A
HCM 95th-tile Q	0.3	0.3	0.5

Notes

~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

Intersection	
Intersection Delay, s/veh	1.3

Movement	EBL	EBT	WBT	WBR	SWL	SWR
Vol, veh/h	58	188	153	0	0	6
Conflicting Peds, #/hr	4	0	0	4	0	136
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	86	86	86	86	86	86
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	67	219	178	0	0	7

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	314	0	-	0	667	318
Stage 1	-	-	-	-	314	-
Stage 2	-	-	-	-	353	-
Follow-up Headway	2.218	-	-	-	3.518	3.318
Pot Capacity-1 Maneuver	1246	-	-	-	424	723
Stage 1	-	-	-	-	741	-
Stage 2	-	-	-	-	711	-
Time blocked-Platoon, %		-	-	-		
Mov Capacity-1 Maneuver	1242	-	-	-	313	639
Mov Capacity-2 Maneuver	-	-	-	-	313	-
Stage 1	-	-	-	-	657	-
Stage 2	-	-	-	-	592	-

Approach	EB	WB	SW
HCM Control Delay, s	1.9	0	10.7
HCM LOS			B

Minor Lane / Major Mvmt	EBL	EBT	WBT	WBR	SWLn1
Capacity (veh/h)	1242	-	-	-	639
HCM Lane V/C Ratio	0.054	-	-	-	0.011
HCM Control Delay (s)	8.065	0	-	-	10.7
HCM Lane LOS	A	A			B
HCM 95th %tile Q(veh)	0.172	-	-	-	0.033

Notes

~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

Intersection	
Intersection Delay, s/veh	4.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	0	98	90	37	153	151	0	0	0	107	58	0
Conflicting Peds, #/hr	4	0	0	0	0	4	0	0	0	9	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	86	86	86	86	86	86	86	86	86	86	86	86
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	114	105	43	178	176	0	0	0	124	67	0

Major/Minor	Major1			Major2						Minor2		
Conflicting Flow All	362	0	0	219	0	0				527	580	279
Stage 1	-	-	-	-	-	-				361	361	-
Stage 2	-	-	-	-	-	-				166	219	-
Follow-up Headway	2.218	-	-	2.218	-	-				3.518	4.018	3.318
Pot Capacity-1 Maneuver	1197	-	-	1350	-	-				512	426	760
Stage 1	-	-	-	-	-	-				705	626	-
Stage 2	-	-	-	-	-	-				863	722	-
Time blocked-Platoon, %		-	-		-	-						
Mov Capacity-1 Maneuver	1193	-	-	1346	-	-				484	# 0	752
Mov Capacity-2 Maneuver	-	-	-	-	-	-				484	# 0	-
Stage 1	-	-	-	-	-	-				671	# 0	-
Stage 2	-	-	-	-	-	-				857	# 0	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0.8	17.2
HCM LOS			C

Minor Lane / Major Mvmt	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	1193	-	-	1346	-	-	484
HCM Lane V/C Ratio	-	-	-	0.032	-	-	0.396
HCM Control Delay (s)	0	-	-	7.763	0	-	17.2
HCM Lane LOS	A			A	A		C
HCM 95th %tile Q(veh)	0	-	-	0.099	-	-	1.874

Notes

~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

Intersection	
Intersection Delay, s/veh	0

Movement	NBL	NBR	NET	NER	SWL	SWT
Vol, veh/h	0	151	58	0	165	6
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Yield	Yield	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	86	86	86	86	86	86
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	176	67	0	192	7

Major/Minor	Major1		Minor2	
Conflicting Flow All	0	0	67	67
Stage 1	-	-	0	0
Stage 2	-	-	67	67
Follow-up Headway	-	-	3.518	4.018
Pot Capacity-1 Maneuver	-	-	938	824
Stage 1	-	-	-	-
Stage 2	-	-	956	839
Time blocked-Platoon, %	-	-		
Mov Capacity-1 Maneuver	-	-	938	# 0
Mov Capacity-2 Maneuver	-	-	938	# 0
Stage 1	-	-	-	# 0
Stage 2	-	-	956	# 0

Approach	NE	SW
HCM Control Delay, s	0	+
HCM LOS		-

Minor Lane / Major Mvmt	NET	NERSWLn1	
Capacity (veh/h)	-	-	+
HCM Lane V/C Ratio	-	-	+
HCM Control Delay (s)	-	-	+
HCM Lane LOS			+
HCM 95th %tile Q(veh)	-	-	+

Notes
~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

Intersection	
Intersection Delay, s/veh	10.8
Intersection LOS	B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	3	151	73	61	135	12	73	18	100	5	18	6
Peak Hour Factor	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	4	191	92	77	171	15	92	23	127	6	23	8
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay	10.9	11	10.7	9
HCM LOS	B	B	B	A

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	38%	1%	29%	17%
Vol Thru, %	9%	67%	65%	62%
Vol Right, %	52%	32%	6%	21%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	191	227	208	29
LT Vol	18	151	135	18
Through Vol	100	73	12	6
RT Vol	73	3	61	5
Lane Flow Rate	242	287	263	37
Geometry Grp	1	1	1	1
Degree of Util (X)	0.338	0.382	0.367	0.058
Departure Headway (Hd)	5.04	4.787	5.016	5.652
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	704	741	708	638
Service Time	3.14	2.881	3.113	3.652
HCM Lane V/C Ratio	0.344	0.387	0.371	0.058
HCM Control Delay	10.7	10.9	11	9
HCM Lane LOS	B	B	B	A
HCM 95th-tile Q	1.5	1.8	1.7	0.2

Notes

~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

Intersection	
Intersection Delay, s/veh	2.8

Movement	EBL	EBT	WBT	WBR	SWL	SWR
Vol, veh/h	61	151	115	0	0	53
Conflicting Peds, #/hr	4	0	0	4	0	136
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	72	178	135	0	0	62

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	271	0	-	0	592	275
Stage 1	-	-	-	-	271	-
Stage 2	-	-	-	-	321	-
Follow-up Headway	2.218	-	-	-	3.518	3.318
Pot Capacity-1 Maneuver	1292	-	-	-	469	764
Stage 1	-	-	-	-	775	-
Stage 2	-	-	-	-	735	-
Time blocked-Platoon, %		-	-	-		
Mov Capacity-1 Maneuver	1288	-	-	-	346	675
Mov Capacity-2 Maneuver	-	-	-	-	346	-
Stage 1	-	-	-	-	687	-
Stage 2	-	-	-	-	611	-

Approach	EB	WB	SW
HCM Control Delay, s	2.3	0	10.9
HCM LOS			B

Minor Lane / Major Mvmt	EBL	EBT	WBT	WBR	SWLn1
Capacity (veh/h)	1288	-	-	-	675
HCM Lane V/C Ratio	0.056	-	-	-	0.092
HCM Control Delay (s)	7.96	0	-	-	10.9
HCM Lane LOS	A	A			B
HCM 95th %tile Q(veh)	0.177	-	-	-	0.304

Notes

~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

Intersection	
Intersection Delay, s/veh	2.9

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	0	124	27	13	115	57	0	0	0	94	0	0
Conflicting Peds, #/hr	4	0	0	0	0	4	0	0	0	9	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	85	85	85	85	85	85	85	85	85	85	85	85
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	146	32	15	135	67	0	0	0	111	0	0

Major/Minor	Major1			Major2						Minor2		
Conflicting Flow All	211	0	0	178	0	0				370	386	182
Stage 1	-	-	-	-	-	-				208	208	-
Stage 2	-	-	-	-	-	-				162	178	-
Follow-up Headway	2.218	-	-	2.218	-	-				3.518	4.018	3.318
Pot Capacity-1 Maneuver	1360	-	-	1398	-	-				630	548	861
Stage 1	-	-	-	-	-	-				827	730	-
Stage 2	-	-	-	-	-	-				867	752	-
Time blocked-Platoon, %		-	-		-	-						
Mov Capacity-1 Maneuver	1355	-	-	1393	-	-				613	0	852
Mov Capacity-2 Maneuver	-	-	-	-	-	-				613	0	-
Stage 1	-	-	-	-	-	-				811	0	-
Stage 2	-	-	-	-	-	-				860	0	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0.5	12.2
HCM LOS			B

Minor Lane / Major Mvmt	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	1355	-	-	1393	-	-	613
HCM Lane V/C Ratio	-	-	-	0.011	-	-	0.18
HCM Control Delay (s)	0	-	-	7.613	0	-	12.2
HCM Lane LOS	A			A	A		B
HCM 95th %tile Q(veh)	0	-	-	0.033	-	-	0.654

Notes

~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

Intersection	
Intersection Delay, s/veh	0

Movement	NBL	NBR	NET	NER	SWL	SWT
Vol, veh/h	0	57	61	0	94	53
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Yield	Yield	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	0	67	72	0	111	62

Major/Minor	Major1		Minor2	
Conflicting Flow All	0	0	72	72
Stage 1	-	-	0	0
Stage 2	-	-	72	72
Follow-up Headway	-	-	3.518	4.018
Pot Capacity-1 Maneuver	-	-	932	818
Stage 1	-	-	-	-
Stage 2	-	-	951	835
Time blocked-Platoon, %	-	-		
Mov Capacity-1 Maneuver	-	-	932	# 0
Mov Capacity-2 Maneuver	-	-	932	# 0
Stage 1	-	-	-	# 0
Stage 2	-	-	951	# 0

Approach	NE	SW
HCM Control Delay, s	0	+
HCM LOS		-

Minor Lane / Major Mvmt	NET	NER	SWLn1
Capacity (veh/h)	-	-	+
HCM Lane V/C Ratio	-	-	+
HCM Control Delay (s)	-	-	+
HCM Lane LOS			+
HCM 95th %tile Q(veh)	-	-	+

Notes
~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

Intersection	
Intersection Delay, s/veh	9.6
Intersection LOS	A

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	3	126	96	51	116	4	86	25	84	8	22	16
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	3	137	104	55	126	4	93	27	91	9	24	17
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay	9.7	9.6	9.8	8.5
HCM LOS	A	A	A	A

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	44%	1%	30%	17%
Vol Thru, %	13%	56%	68%	48%
Vol Right, %	43%	43%	2%	35%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	195	225	171	46
LT Vol	25	126	116	22
Through Vol	84	96	4	16
RT Vol	86	3	51	8
Lane Flow Rate	212	245	186	50
Geometry Grp	1	1	1	1
Degree of Util (X)	0.284	0.309	0.253	0.07
Departure Headway (Hd)	4.827	4.555	4.908	5.051
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	740	785	727	702
Service Time	2.891	2.613	2.971	3.133
HCM Lane V/C Ratio	0.286	0.312	0.256	0.071
HCM Control Delay	9.8	9.7	9.6	8.5
HCM Lane LOS	A	A	A	A
HCM 95th-tile Q	1.2	1.3	1	0.2

Notes

~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

TRAFFIC ENGINEERING STUDIES
VARIOUS LOCATIONS

SITE 4B – SCHOFIELD BARRACKS & WHEELER ARMY AIR FIELD SCHOOLS

APPENDIX C

CAPACITY ANALYSIS WORKSHEETS

WITH IMPROVEMENTS

Intersection	
Intersection Delay, s/veh	3.6

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	109	166	33	0	319	209	43	10	1	2	4	95
Conflicting Peds, #/hr	9	0	1	1	0	9	5	0	0	0	0	5
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	100	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	86	86	86	86	86	86	86	86	86	86	86	86
Heavy Vehicles, %	1	1	1	1	1	1	1	1	1	1	1	1
Mvmt Flow	127	193	38	0	371	243	50	12	1	2	5	110

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	619	0	0	236	0	0	1026	1090	226	974	987	506
Stage 1	-	-	-	-	-	-	471	471	-	497	497	-
Stage 2	-	-	-	-	-	-	555	619	-	477	490	-
Follow-up Headway	2.209	-	-	2.209	-	-	3.509	4.009	3.309	3.509	4.009	3.309
Pot Capacity-1 Maneuver	966	-	-	1337	-	-	214	216	816	232	248	568
Stage 1	-	-	-	-	-	-	575	561	-	557	546	-
Stage 2	-	-	-	-	-	-	518	482	-	571	550	-
Time blocked-Platoon, %		-	-		-	-						
Mov Capacity-1 Maneuver	959	-	-	1327	-	-	151	186	807	200	213	561
Mov Capacity-2 Maneuver	-	-	-	-	-	-	256	309	-	367	386	-
Stage 1	-	-	-	-	-	-	497	485	-	481	544	-
Stage 2	-	-	-	-	-	-	409	480	-	479	475	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	3.3	0	22.5	13.4
HCM LOS			C	B

Minor Lane / Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	268	959	-	-	1327	-	-	545
HCM Lane V/C Ratio	0.234	0.132	-	-	-	-	-	0.215
HCM Control Delay (s)	22.5	9.325	-	-	0	-	-	13.4
HCM Lane LOS	C	A			A			B
HCM 95th %tile Q(veh)	0.887	0.455	-	-	0	-	-	0.812

Notes

~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

Intersection	
Intersection Delay, s/veh	5.4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBR	SEL	SER
Vol, veh/h	30	178	21	2	415	81	4	6	59	32
Conflicting Peds, #/hr	0	0	10	10	0	0	0	24	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	None	-	-
Storage Length	-	-	-	-	-	-	0	-	0	-
Veh in Median Storage, #	-	0	-	-	0	-	0	-	0	-
Grade, %	-	0	-	-	0	-	0	-	0	-
Peak Hour Factor	92	80	80	80	80	92	92	80	92	92
Heavy Vehicles, %	1	1	1	1	1	1	1	1	1	1
Mvmt Flow	33	222	26	2	519	88	4	8	64	35

Major/Minor	Major1			Major2			Minor1		Minor2	
Conflicting Flow All	607	0	0	273	0	0	949	270	899	587
Stage 1	-	-	-	-	-	-	325	-	568	-
Stage 2	-	-	-	-	-	-	624	-	331	-
Follow-up Headway	2.209	-	-	2.209	-	-	3.509	3.309	3.509	3.309
Pot Capacity-1 Maneuver	976	-	-	1296	-	-	241	771	261	511
Stage 1	-	-	-	-	-	-	690	-	509	-
Stage 2	-	-	-	-	-	-	475	-	684	-
Time blocked-Platoon, %		-	-		-	-				
Mov Capacity-1 Maneuver	956	-	-	1285	-	-	170	749	244	501
Mov Capacity-2 Maneuver	-	-	-	-	-	-	170	-	244	-
Stage 1	-	-	-	-	-	-	649	-	489	-
Stage 2	-	-	-	-	-	-	364	-	640	-

Approach	EB	WB	NB	SE
HCM Control Delay, s	1	0	30.8	23
HCM LOS			D	C

Minor Lane / Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SELn1
Capacity (veh/h)	195	956	-	-	1285	-	-	340
HCM Lane V/C Ratio	0.289	0.034	-	-	0.002	-	-	0.419
HCM Control Delay (s)	30.8	8.899	0	-	7.807	0	-	23
HCM Lane LOS	D	A	A		A	A		C
HCM 95th %tile Q(veh)	1.145	0.106	-	-	0.006	-	-	2

Notes

~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

Intersection	
Intersection Delay, s/veh	7.6

Movement	NBL	NBT	NBR	SBL	SBT	SBR	SEL	SET	SER	NWL	NWT	NWR
Vol, veh/h	28	86	0	0	8	5	0	0	0	42	73	5
Conflicting Peds, #/hr	7	0	179	179	0	7	22	0	1	1	0	22
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	73	92	73	92	92	92	92	73	73	73	73	92
Heavy Vehicles, %	1	1	1	1	1	1	1	1	1	1	1	1
Mvmt Flow	38	93	0	0	9	5	0	0	0	58	100	5

Major/Minor	Major1			Major2						Minor1		
Conflicting Flow All	14	0	0	115	0	0				203	206	294
Stage 1	-	-	-	-	-	-				192	192	-
Stage 2	-	-	-	-	-	-				11	14	-
Follow-up Headway	2.209	-	-	2.209	-	-				3.509	4.009	3.309
Pot Capacity-1 Maneuver	1611	-	-	1480	-	-				788	692	748
Stage 1	-	-	-	-	-	-				843	743	-
Stage 2	-	-	-	-	-	-				1015	886	-
Time blocked-Platoon, %		-	-		-	-						
Mov Capacity-1 Maneuver	1371	-	-	1259	-	-				635	# 0	621
Mov Capacity-2 Maneuver	-	-	-	-	-	-				635	# 0	-
Stage 1	-	-	-	-	-	-				799	# 0	-
Stage 2	-	-	-	-	-	-				864	# 0	-

Approach	NB	SB	NW
HCM Control Delay, s	2.2	0	12.6
HCM LOS			B

Minor Lane / Major Mvmt	NBL	NBT	NBR	NWLn1	SBL	SBT	SBR
Capacity (veh/h)	1371	-	-	634	1259	-	-
HCM Lane V/C Ratio	0.028	-	-	0.257	-	-	-
HCM Control Delay (s)	7.701	0	-	12.6	0	-	-
HCM Lane LOS	A	A		B	A		
HCM 95th %tile Q(veh)	0.086	-	-	1.02	0	-	-

Notes

~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

Intersection	
Intersection Delay, s/veh	4.9

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	5	47	71	0	0	0	197	109	108	11	10	29
Conflicting Peds, #/hr	5	0	2	2	0	5	2	0	9	9	0	2
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	71	71	71	71	71	71	71	71	71	71	71	71
Heavy Vehicles, %	1	1	1	1	1	1	1	1	0	1	1	1
Mvmt Flow	7	66	100	0	0	0	277	154	152	15	14	41

Major/Minor	Minor2						Major1			Major2		
Conflicting Flow All	855	931	49				60	0	0	306	0	0
Stage 1	70	70	-				-	-	-	-	-	-
Stage 2	785	861	-				-	-	-	-	-	-
Follow-up Headway	3.509	4.009	3.309				2.209	-	-	2.209	-	-
Pot Capacity-1 Maneuver	330	268	1022				1550	-	-	1260	-	-
Stage 1	955	839	-				-	-	-	-	-	-
Stage 2	451	374	-				-	-	-	-	-	-
Time blocked-Platoon, %								-	-		-	-
Mov Capacity-1 Maneuver	252	# 0	1010				1538	-	-	1251	-	-
Mov Capacity-2 Maneuver	252	# 0	-				-	-	-	-	-	-
Stage 1	940	# 0	-				-	-	-	-	-	-
Stage 2	350	# 0	-				-	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	10.4	3.7	1.7
HCM LOS	B		

Minor Lane / Major Mvmt	NBL	NBT	NBR	EBLn1	SBL	SBT	SBR
Capacity (veh/h)	1538	-	-	843	1251	-	-
HCM Lane V/C Ratio	0.18	-	-	0.206	0.012	-	-
HCM Control Delay (s)	7.855	0	-	10.4	7.914	0	-
HCM Lane LOS	A	A		B	A	A	
HCM 95th %tile Q(veh)	0.658	-	-	0.769	0.038	-	-

Notes

~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

Intersection	
Intersection Delay, s/veh	3.4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	98	177	33	2	212	81	28	1	1	10	5	89
Conflicting Peds, #/hr	11	0	7	7	0	11	10	0	0	0	0	10
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	100	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	86	86	86	86	86	86	86	86	86	86	86	86
Heavy Vehicles, %	1	1	1	1	1	1	1	1	1	1	1	1
Mvmt Flow	114	206	38	2	247	94	33	1	1	12	6	103

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	351	0	0	254	0	0	826	818	246	772	790	315
Stage 1	-	-	-	-	-	-	463	463	-	308	308	-
Stage 2	-	-	-	-	-	-	363	355	-	464	482	-
Follow-up Headway	2.209	-	-	2.209	-	-	3.509	4.009	3.309	3.509	4.009	3.309
Pot Capacity-1 Maneuver	1213	-	-	1317	-	-	292	312	795	318	324	728
Stage 1	-	-	-	-	-	-	581	566	-	704	662	-
Stage 2	-	-	-	-	-	-	658	631	-	580	555	-
Time blocked-Platoon, %		-	-		-	-						
Mov Capacity-1 Maneuver	1202	-	-	1305	-	-	225	277	781	288	288	715
Mov Capacity-2 Maneuver	-	-	-	-	-	-	369	410	-	445	437	-
Stage 1	-	-	-	-	-	-	522	508	-	632	655	-
Stage 2	-	-	-	-	-	-	552	624	-	518	498	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	2.6	0.1	15.5	11.7
HCM LOS			C	B

Minor Lane / Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	377	1202	-	-	1305	-	-	657
HCM Lane V/C Ratio	0.093	0.095	-	-	0.002	-	-	0.184
HCM Control Delay (s)	15.5	8.308	-	-	7.764	0	-	11.7
HCM Lane LOS	C	A			A	A		B
HCM 95th %tile Q(veh)	0.304	0.313	-	-	0.005	-	-	0.67

Notes

~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

Intersection	
Intersection Delay, s/veh	4.8

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBR	SEL	SER
Vol, veh/h	27	174	58	2	207	39	6	5	71	33
Conflicting Peds, #/hr	9	0	2	2	0	9	9	11	9	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	None	-	-
Storage Length	-	-	-	-	-	-	0	-	0	-
Veh in Median Storage, #	-	0	-	-	0	-	0	-	0	-
Grade, %	-	0	-	-	0	-	0	-	0	-
Peak Hour Factor	91	91	91	91	91	91	91	91	91	91
Heavy Vehicles, %	1	1	1	1	1	1	1	1	1	1
Mvmt Flow	30	191	64	2	227	43	7	5	78	36

Major/Minor	Major1			Major2			Minor1		Minor2	
Conflicting Flow All	279	0	0	266	0	0	586	243	561	267
Stage 1	-	-	-	-	-	-	293	-	262	-
Stage 2	-	-	-	-	-	-	293	-	299	-
Follow-up Headway	2.209	-	-	2.209	-	-	3.509	3.309	3.509	3.309
Pot Capacity-1 Maneuver	1289	-	-	1304	-	-	423	798	440	774
Stage 1	-	-	-	-	-	-	717	-	745	-
Stage 2	-	-	-	-	-	-	717	-	712	-
Time blocked-Platoon, %		-	-		-	-				
Mov Capacity-1 Maneuver	1279	-	-	1294	-	-	366	785	415	762
Mov Capacity-2 Maneuver	-	-	-	-	-	-	366	-	415	-
Stage 1	-	-	-	-	-	-	691	-	719	-
Stage 2	-	-	-	-	-	-	650	-	675	-

Approach	EB	WB	NB	SE
HCM Control Delay, s	0.8	0.1	17	14.9
HCM LOS			C	B

Minor Lane / Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SELn1
Capacity (veh/h)	383	1279	-	-	1294	-	-	467
HCM Lane V/C Ratio	0.215	0.023	-	-	0.002	-	-	0.221
HCM Control Delay (s)	17	7.882	0	-	7.787	0	-	14.9
HCM Lane LOS	C	A	A		A	A		B
HCM 95th %tile Q(veh)	0.805	0.071	-	-	0.005	-	-	0.837

Notes

~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

Intersection	
Intersection Delay, s/veh	6.8

Movement	NBL	NBT	NBR	SBL	SBT	SBR	SEL	SET	SER	NWL	NWT	NWR
Vol, veh/h	5	5	0	0	31	5	0	0	0	33	10	28
Conflicting Peds, #/hr	7	0	179	179	0	7	22	0	1	1	0	22
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	77	77	77	77	77	77	77	77	77	77	77	77
Heavy Vehicles, %	1	1	1	1	1	1	1	1	1	1	1	1
Mvmt Flow	6	6	0	0	40	6	0	0	0	43	13	36

Major/Minor	Major1			Major2						Minor1		
Conflicting Flow All	47	0	0	28	0	0				85	88	207
Stage 1	-	-	-	-	-	-				41	41	-
Stage 2	-	-	-	-	-	-				44	47	-
Follow-up Headway	2.209	-	-	2.209	-	-				3.509	4.009	3.309
Pot Capacity-1 Maneuver	1567	-	-	1592	-	-				919	804	836
Stage 1	-	-	-	-	-	-				984	863	-
Stage 2	-	-	-	-	-	-				981	858	-
Time blocked-Platoon, %		-	-		-	-						
Mov Capacity-1 Maneuver	1333	-	-	1355	-	-				759	# 0	694
Mov Capacity-2 Maneuver	-	-	-	-	-	-				759	# 0	-
Stage 1	-	-	-	-	-	-				955	# 0	-
Stage 2	-	-	-	-	-	-				835	# 0	-

Approach	NB	SB	NW
HCM Control Delay, s	3.9	0	10.7
HCM LOS			B

Minor Lane / Major Mvmt	NBL	NBT	NBR	NWLn1	SBL	SBT	SBR
Capacity (veh/h)	1333	-	-	728	1355	-	-
HCM Lane V/C Ratio	0.005	-	-	0.127	-	-	-
HCM Control Delay (s)	7.714	0	-	10.7	0	-	-
HCM Lane LOS	A	A		B	A		
HCM 95th %tile Q(veh)	0.015	-	-	0.433	0	-	-

Notes

~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

Intersection	
Intersection Delay, s/veh	7.1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	7	73	63	0	0	0	142	5	39	15	38	11
Conflicting Peds, #/hr	5	0	11	11	0	5	0	0	30	30	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	69	69	69	69	69	69	69	69	69	69	69	69
Heavy Vehicles, %	1	1	1	1	1	1	1	1	0	1	1	1
Mvmt Flow	10	106	91	0	0	0	206	7	57	22	55	16

Major/Minor	Minor2						Major1			Major2		
Conflicting Flow All	565	593	104				82	0	0	64	0	0
Stage 1	118	118	-				-	-	-	-	-	-
Stage 2	447	475	-				-	-	-	-	-	-
Follow-up Headway	3.509	4.009	3.309				2.209	-	-	2.209	-	-
Pot Capacity-1 Maneuver	488	420	953				1522	-	-	1545	-	-
Stage 1	910	800	-				-	-	-	-	-	-
Stage 2	646	559	-				-	-	-	-	-	-
Time blocked-Platoon, %								-	-		-	-
Mov Capacity-1 Maneuver	403	# 0	921				1484	-	-	1506	-	-
Mov Capacity-2 Maneuver	403	# 0	-				-	-	-	-	-	-
Stage 1	888	# 0	-				-	-	-	-	-	-
Stage 2	547	# 0	-				-	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	10.9	6	1.7
HCM LOS	B		

Minor Lane / Major Mvmt	NBL	NBT	NBR	EBLn1	SBL	SBT	SBR
Capacity (veh/h)	1484	-	-	816	1506	-	-
HCM Lane V/C Ratio	0.139	-	-	0.254	0.014	-	-
HCM Control Delay (s)	7.816	0	-	10.9	7.425	0	-
HCM Lane LOS	A	A		B	A	A	
HCM 95th %tile Q(veh)	0.482	-	-	1.008	0.044	-	-

Notes

~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

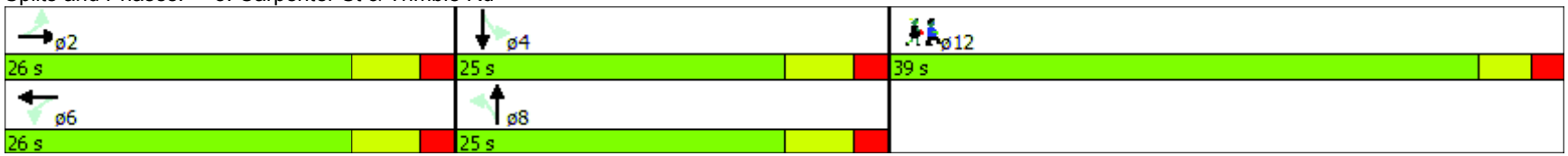
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	ø12
Lane Configurations													
Volume (vph)	16	78	1	49	154	56	18	74	36	26	136	43	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Storage Length (ft)	120		0	120		0	0		0	0		0	
Storage Lanes	0		0	0		0	0		0	0		0	
Taper Length (ft)	100			100			100			100			
Satd. Flow (prot)	0	1839	0	0	1759	0	0	1700	0	0	1797	0	
Flt Permitted		0.920			0.876			0.890			0.960		
Satd. Flow (perm)	0	1704	0	0	1555	0	0	1524	0	0	1725	0	
Right Turn on Red			No			No			No			No	
Satd. Flow (RTOR)													
Link Speed (mph)		30			30			30			30		
Link Distance (ft)		447			475			858			278		
Travel Time (s)		10.2			10.8			19.5			6.3		
Confl. Peds. (#/hr)	4		9	9		4	1		48	48		1	
Peak Hour Factor	0.67	0.63	0.25	0.56	1.00	0.64	0.45	0.50	0.43	1.00	0.53	0.60	
Shared Lane Traffic (%)													
Lane Group Flow (vph)	0	152	0	0	330	0	0	272	0	0	355	0	
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA		
Protected Phases		2			6			8			4		12
Permitted Phases	2			6			8			4			
Detector Phase	2	2		6	6		8	8		4	4		
Switch Phase													
Minimum Initial (s)	10.0	10.0		10.0	10.0		10.0	10.0		10.0	10.0		7.0
Minimum Split (s)	16.0	16.0		16.0	16.0		16.0	16.0		16.0	16.0		39.0
Total Split (s)	26.0	26.0		26.0	26.0		25.0	25.0		25.0	25.0		39.0
Total Split (%)	28.9%	28.9%		28.9%	28.9%		27.8%	27.8%		27.8%	27.8%		43%
Yellow Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0		3.0
All-Red Time (s)	2.0	2.0		2.0	2.0		2.0	2.0		2.0	2.0		2.0
Lost Time Adjust (s)		0.0			0.0			0.0			0.0		
Total Lost Time (s)		6.0			6.0			6.0			6.0		
Lead/Lag													
Lead-Lag Optimize?													
Recall Mode	None	None		None	None		None	None		None	None		None
Act Effct Green (s)		21.6			21.6			20.5			20.5		
Actuated g/C Ratio		0.32			0.32			0.31			0.31		
v/c Ratio		0.28			0.66			0.58			0.67		
Control Delay		24.6			33.6			32.0			34.2		

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	ø12
Queue Delay		0.0			0.0			0.0			0.0		
Total Delay		24.6			33.6			32.0			34.2		
LOS		C			C			C			C		
Approach Delay		24.6			33.6			32.0			34.2		
Approach LOS		C			C			C			C		
Queue Length 50th (ft)		29			73			60			81		
Queue Length 95th (ft)		87			#352			117			159		
Internal Link Dist (ft)		367			395			778			198		
Turn Bay Length (ft)													
Base Capacity (vph)		552			503			469			531		
Starvation Cap Reductn		0			0			0			0		
Spillback Cap Reductn		0			0			0			0		
Storage Cap Reductn		0			0			0			0		
Reduced v/c Ratio		0.28			0.66			0.58			0.67		

Intersection Summary

Area Type: Other
Cycle Length: 90
Actuated Cycle Length: 66.6
Natural Cycle: 90
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.67
Intersection Signal Delay: 32.2 Intersection LOS: C
Intersection Capacity Utilization 44.5% ICU Level of Service A
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 3: Carpenter St & Trimble Rd



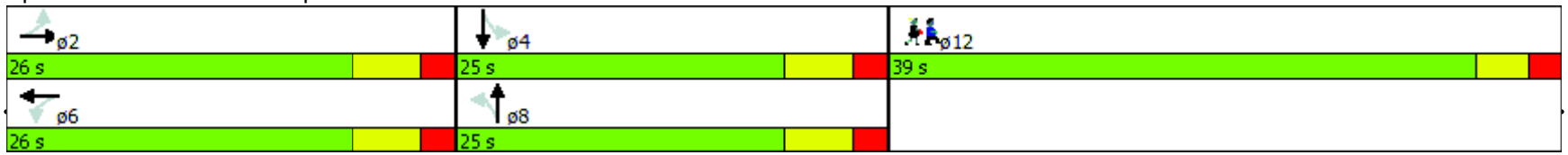
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	ø12
Lane Configurations													
Volume (vph)	54	255	17	73	196	60	13	84	64	52	61	52	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Storage Length (ft)	120		0	120		0	0		0	0		0	
Storage Lanes	1		0	1		0	0		0	0		0	
Taper Length (ft)	100			100			100			100			
Satd. Flow (prot)	1770	3500	0	1770	3387	0	0	1517	0	0	1780	0	
Flt Permitted	0.582			0.584				0.961			0.894		
Satd. Flow (perm)	1084	3500	0	1076	3387	0	0	1463	0	0	1529	0	
Right Turn on Red			No			No			No			No	
Satd. Flow (RTOR)													
Link Speed (mph)		30			30			30			30		
Link Distance (ft)		447			475			858			278		
Travel Time (s)		10.2			10.8			19.5			6.3		
Confl. Peds. (#/hr)			7	7					339	339			
Peak Hour Factor	1.00	1.00	1.00	0.54	1.00	0.75	1.00	1.00	1.00	1.00	0.46	0.81	
Shared Lane Traffic (%)													
Lane Group Flow (vph)	54	272	0	135	276	0	0	161	0	0	249	0	
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA		
Protected Phases		2			6			8			4		12
Permitted Phases	2			6			8			4			
Detector Phase	2	2		6	6		8	8		4	4		
Switch Phase													
Minimum Initial (s)	10.0	10.0		10.0	10.0		10.0	10.0		10.0	10.0		7.0
Minimum Split (s)	16.0	16.0		16.0	16.0		16.0	16.0		16.0	16.0		39.0
Total Split (s)	26.0	26.0		26.0	26.0		25.0	25.0		25.0	25.0		39.0
Total Split (%)	28.9%	28.9%		28.9%	28.9%		27.8%	27.8%		27.8%	27.8%		43%
Yellow Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0		3.0
All-Red Time (s)	2.0	2.0		2.0	2.0		2.0	2.0		2.0	2.0		2.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0			0.0			0.0		
Total Lost Time (s)	6.0	6.0		6.0	6.0			6.0			6.0		
Lead/Lag													
Lead-Lag Optimize?													
Recall Mode	None	None		None	None		None	None		None	None		None

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	ø12
Act Effct Green (s)	15.7	15.7		15.7	15.7			15.9			15.9		
Actuated g/C Ratio	0.28	0.28		0.28	0.28			0.28			0.28		
v/c Ratio	0.18	0.28		0.45	0.29			0.39			0.58		
Control Delay	25.5	22.0		30.1	22.1			27.1			31.0		
Queue Delay	0.0	0.0		0.0	0.0			0.0			0.0		
Total Delay	25.5	22.0		30.1	22.1			27.1			31.0		
LOS	C	C		C	C			C			C		
Approach Delay		22.6			24.7			27.1			31.0		
Approach LOS		C			C			C			C		
Queue Length 50th (ft)	8	20		20	21			23			38		
Queue Length 95th (ft)	58	105		70	107			146			98		
Internal Link Dist (ft)		367			395			778			198		
Turn Bay Length (ft)	120			120									
Base Capacity (vph)	480	1550		476	1500			615			643		
Starvation Cap Reductn	0	0		0	0			0			0		
Spillback Cap Reductn	0	0		0	0			0			0		
Storage Cap Reductn	0	0		0	0			0			0		
Reduced v/c Ratio	0.11	0.18		0.28	0.18			0.26			0.39		

Intersection Summary

Area Type: Other
Cycle Length: 90
Actuated Cycle Length: 56.4
Natural Cycle: 75
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.58
Intersection Signal Delay: 25.8 — Intersection LOS: C
Intersection Capacity Utilization 54.9% — ICU Level of Service A
Analysis Period (min) 15

Splits and Phases: 3: Carpenter St & Trimble Rd



Intersection	
Intersection Delay, s/veh	3.1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	58	98	90	37	153	151	0	0	0	107	58	6
Conflicting Peds, #/hr	4	0	0	0	0	4	0	0	0	9	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	Yeild	-	-	None	-	-	Yeild
Storage Length	-	-	-	-	-	-	-	-	-	0	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	86	86	86	86	86	86	86	86	86	86	86	86
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	67	114	105	43	178	176	0	0	0	124	67	7

Major/Minor	Major1			Major2						Minor2		
Conflicting Flow All	187	0	0	219	0	0				574	626	191
Stage 1	-	-	-	-	-	-				273	273	-
Stage 2	-	-	-	-	-	-				301	353	-
Follow-up Headway	2.218	-	-	2.218	-	-				3.518	4.018	3.318
Pot Capacity-1 Maneuver	1387	-	-	1350	-	-				480	401	851
Stage 1	-	-	-	-	-	-				773	684	-
Stage 2	-	-	-	-	-	-				751	631	-
Time blocked-Platoon, %		-	-		-	-						
Mov Capacity-1 Maneuver	1382	-	-	1346	-	-				428	# 0	842
Mov Capacity-2 Maneuver	-	-	-	-	-	-				428	# 0	-
Stage 1	-	-	-	-	-	-				736	# 0	-
Stage 2	-	-	-	-	-	-				704	# 0	-

Approach	EB	WB	SB
HCM Control Delay, s	1.8	0.8	9.5
HCM LOS			A

Minor Lane / Major Mvmt	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	1382	-	-	1346	-	-	428	23997
HCM Lane V/C Ratio	0.049	-	-	0.032	-	-	0.194	0.005
HCM Control Delay (s)	7.739	0	-	7.763	0	-	15.4	5.2
HCM Lane LOS	A	A		A	A		C	A
HCM 95th %tile Q(veh)	0.154	-	-	0.099	-	-	0.709	0.015

Notes

~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

Intersection	
Intersection Delay, s/veh	10.8
Intersection LOS	B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	3	151	73	61	135	12	73	18	100	5	18	6
Peak Hour Factor	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	4	191	92	77	171	15	92	23	127	6	23	8
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay	10.9	11	10.7	9
HCM LOS	B	B	B	A

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	38%	1%	29%	17%
Vol Thru, %	9%	67%	65%	62%
Vol Right, %	52%	32%	6%	21%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	191	227	208	29
LT Vol	18	151	135	18
Through Vol	100	73	12	6
RT Vol	73	3	61	5
Lane Flow Rate	242	287	263	37
Geometry Grp	1	1	1	1
Degree of Util (X)	0.338	0.382	0.367	0.058
Departure Headway (Hd)	5.04	4.787	5.016	5.652
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	704	741	708	638
Service Time	3.14	2.881	3.113	3.652
HCM Lane V/C Ratio	0.344	0.387	0.371	0.058
HCM Control Delay	10.7	10.9	11	9
HCM Lane LOS	B	B	B	A
HCM 95th-tile Q	1.5	1.8	1.7	0.2

Notes

~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

Intersection	
Intersection Delay, s/veh	3.6

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	61	124	27	13	115	57	0	0	0	94	0	53
Conflicting Peds, #/hr	4	0	0	0	0	4	0	0	0	9	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	Yeild	-	-	None	-	-	Yeild
Storage Length	-	-	-	-	-	-	-	-	-	0	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	85	85	85	85	85	85	85	85	85	85	85	85
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	72	146	32	15	135	67	0	0	0	111	0	62

Major/Minor	Major1			Major2						Minor2		
Conflicting Flow All	144	0	0	178	0	0				480	496	148
Stage 1	-	-	-	-	-	-				175	175	-
Stage 2	-	-	-	-	-	-				305	321	-
Follow-up Headway	2.218	-	-	2.218	-	-				3.518	4.018	3.318
Pot Capacity-1 Maneuver	1438	-	-	1398	-	-				545	475	899
Stage 1	-	-	-	-	-	-				855	754	-
Stage 2	-	-	-	-	-	-				748	652	-
Time blocked-Platoon, %		-	-		-	-						
Mov Capacity-1 Maneuver	1433	-	-	1393	-	-				501	0	889
Mov Capacity-2 Maneuver	-	-	-	-	-	-				501	0	-
Stage 1	-	-	-	-	-	-				838	0	-
Stage 2	-	-	-	-	-	-				701	0	-

Approach	EB	WB	SB
HCM Control Delay, s	2.2	0.5	9.4
HCM LOS			A

Minor Lane / Major Mvmt	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	1433	-	-	1393	-	-	501	2466
HCM Lane V/C Ratio	0.05	-	-	0.011	-	-	0.147	0.04
HCM Control Delay (s)	7.645	0	-	7.613	0	-	13.4	6.5
HCM Lane LOS	A	A		A	A		B	A
HCM 95th %tile Q(veh)	0.158	-	-	0.033	-	-	0.513	0.126

Notes

~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

Intersection	
Intersection Delay, s/veh	9.6
Intersection LOS	A

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	3	126	96	51	116	4	86	25	84	8	22	16
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	3	137	104	55	126	4	93	27	91	9	24	17
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay	9.7	9.6	9.8	8.5
HCM LOS	A	A	A	A

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	44%	1%	30%	17%
Vol Thru, %	13%	56%	68%	48%
Vol Right, %	43%	43%	2%	35%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	195	225	171	46
LT Vol	25	126	116	22
Through Vol	84	96	4	16
RT Vol	86	3	51	8
Lane Flow Rate	212	245	186	50
Geometry Grp	1	1	1	1
Degree of Util (X)	0.284	0.309	0.253	0.07
Departure Headway (Hd)	4.827	4.555	4.908	5.051
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	740	785	727	702
Service Time	2.891	2.613	2.971	3.133
HCM Lane V/C Ratio	0.286	0.312	0.256	0.071
HCM Control Delay	9.8	9.7	9.6	8.5
HCM Lane LOS	A	A	A	A
HCM 95th-tile Q	1.2	1.3	1	0.2

Notes

~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

TRAFFIC ENGINEERING STUDIES
VARIOUS LOCATIONS

SITE 4B – SCHOFIELD BARRACKS & WHEELER ARMY AIR FIELD SCHOOLS

APPENDIX D

COST ESTIMATES

SITE 4B COST ESTIMATE

1. ITEM V.A.1 Wheeler Elementary and Middle Schools

ITEM #			DESCRIPTION	COST	
1	LEFT TURN LANE ON WRIGHT AVE				
	A	DEMOLITION		4,200	
	B	AC PAVEMENT			
		i	EARTHWORK	5,300	
		ii	2" AC PAVEMENT	3,700	
		iii	8" BASE COURSE	5,900	
	C	CONCRETE CURB		1,400	
	D	STRIPING		2,000	
	E	SIGN		700	
			TOTAL LEFT TURN LANE		**23,200**
2	REALIGN LEILEIHUA RD				
	A	DEMOLITION		11,300	
	B	AC PAVEMENT			
		i	EARTHWORK	23,900	
		ii	2" AC PAVEMENT	17,600	
		iii	8" BASE COURSE	21,300	
	C	CONCRETE CURB		5,300	
	D	CONCRETE SIDEWALKS		9,800	
	E	EXTEND AC WALKWAY		600	
	F	REMOVE EXISTING TREES		3,800	
	G	STRIPING		3,700	
	H	NEW ONE WAY AND STOP SIGNS		2,600	
	I	RELOCATE ONE WAY SIGN		1,400	
			TOTAL REALIGN LEILEIHUA RD		**101,300**
3	CURBED ISLAND				
	A	EARTHWORK		19,200	
	B	TOPSOIL		6,400	
	C	CONCRETE CURB		4,600	
			TOTAL CURBED ISLAND		**30,200**
4	OLD KAMEHAMEHA HWY				
	A	DEMOLITION EXIST SIDEWALKS		11,400	
	B	CURB RAMPS		3,000	
	C	CONC CURB		600	
	D	SIGN		700	
	E	STRIPING		2,400	
			TOTAL OLD KAMEHAMEHA HWY		**18,100**
5	EROSION CONTROL			5,000	
			TOTAL EROION CONTROL		**5,000**
6	TRAFFIC CONTROL			10,000	
			TOTAL TRAFFIC CONTROL		**10,000**
				TOTAL	**187,800**

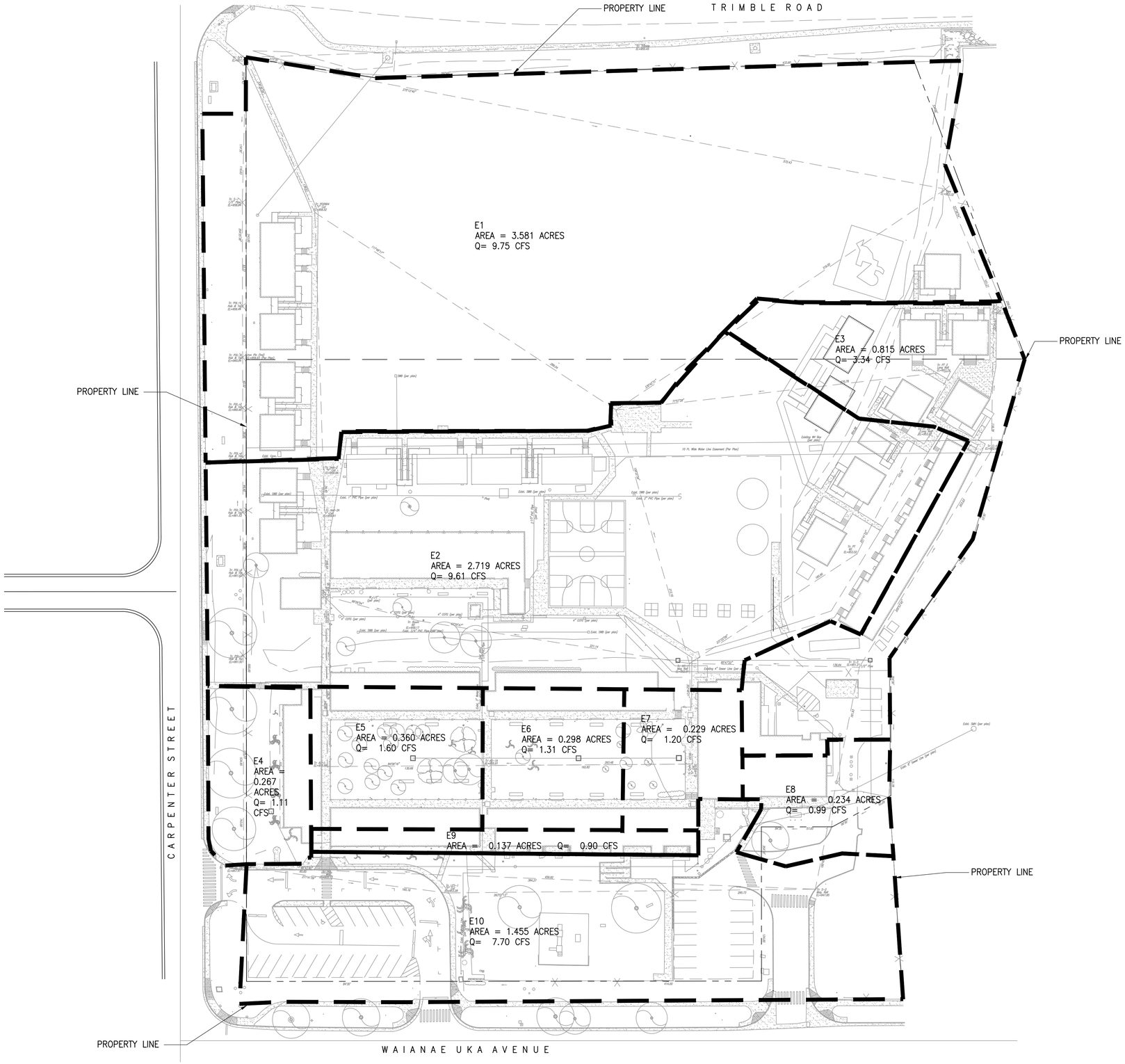
2. ITEM V.A.2 Solomon Elementary School

ITEM #				DESCRIPTION	COST	
1	NEW PARKING LOT					
	A	DEMOLISH EXIST SIDEWALK			4,000	
	B	AC PARKING LOT				
		i	EARTHWORK		29,300	
		ii	AC PAVEMENT		34,400	
		iii	BASE COURSE		32,600	
	B	NEW SIDEWALKS/DRIVEWAY APRONS			41,600	
	D	CONCRETE CURB			900	
	E	STRIPING			8,200	
	F	ONE WAY SIGN			2,100	
	G	ADJUST MH FRAME AND COVER TO NEW GRADE			1,000	
				TOTAL NEW PARKING LOT		**154,100**
2	EROSION CONTROL				5,000	
				TOTAL EROION CONTROL		**5,000**
3	TRAFFIC CONTROL				10,000	
				TOTAL TRAFFIC CONTROL		**10,000**
4	ELECTRICAL					
	A	REVISE SIGNAL TIMING AND PHASING TO INCLUDE THIRD PEDESTRIAN-ONLY PHASE			15,000	
				TOTAL ELECTRICAL		**15,000**
				TOTAL		**184,100**

3. ITEM V.A.3 Hale Kua Elementary School

1	NEW 8' WIDE SIDEWALK			
	A	EARTHWORK	8,100	
	B	CURB AND GUTTER	16,100	
	C	CONCRETE SIDEWALK	22,700	
		TOTAL NEW 8' SIDEWALK		**46,900**
2	REALIGN MCMAHON RD			
	A	REMOVE EXISTING AC CURB	900	
	B	ADDITIONAL RIGHT TURN LANE		
	i	EARTHWORK	6,300	
	ii	AC PAVEMENT	4,200	
	iii	BASE COURSE	5,000	
	C	STRIPING	5,600	
	D	RELOCATE YIELD SIGN	500	
	E	REPLACE STOP SIGN WITH YIELD SIGN	150	
	F	REMOVE SPEED LIMIT SIGN	400	
	G	RELOCATE EXISTING FENCE	3,600	
	H	NEW SIDEWALK	14,000	
		TOTAL REALIGN MCMAHON RD		**40,650**
3	EROSION CONTROL		5,000	
		TOTAL EROION CONTROL		**5,000**
4	TRAFFIC CONTROL		10,000	
		TOTAL TRAFFIC CONTROL		**10,000**
5	ELECTRICAL			
	A	REMOVE AND RELOCATE EXISTING FLASHING WARNING LIGHTS, POLE, PV POWER SYSTEM AND SIGNS ONTO NEW CONCRETE FOUNDATION, COMPLETE	30,000	
	B	STREET LIGHT LUMINARE AND BRACKET ARM, AND EXTEND EXISTING OVERHEAD CIRCUIT WIRING TO NEW LOCATION, COMPLETE	15,000	
		TOTAL ELECTRICAL		**45,000**
		TOTAL		**147,550**

Appendix F
Drainage Calculations



1 / C-3.0 **EXISTING DRAINAGE PLAN**
SCALE: 1"=40'

LEGEND

PROPERTY LINE

DRAINAGE AREA

GRAPHIC SCALE

1" = 40' 40' 20' 0 40' 80'

REVISION NO.	SYM.	DESCRIPTION	SHT ___ OF ___	DATE	APPROVED

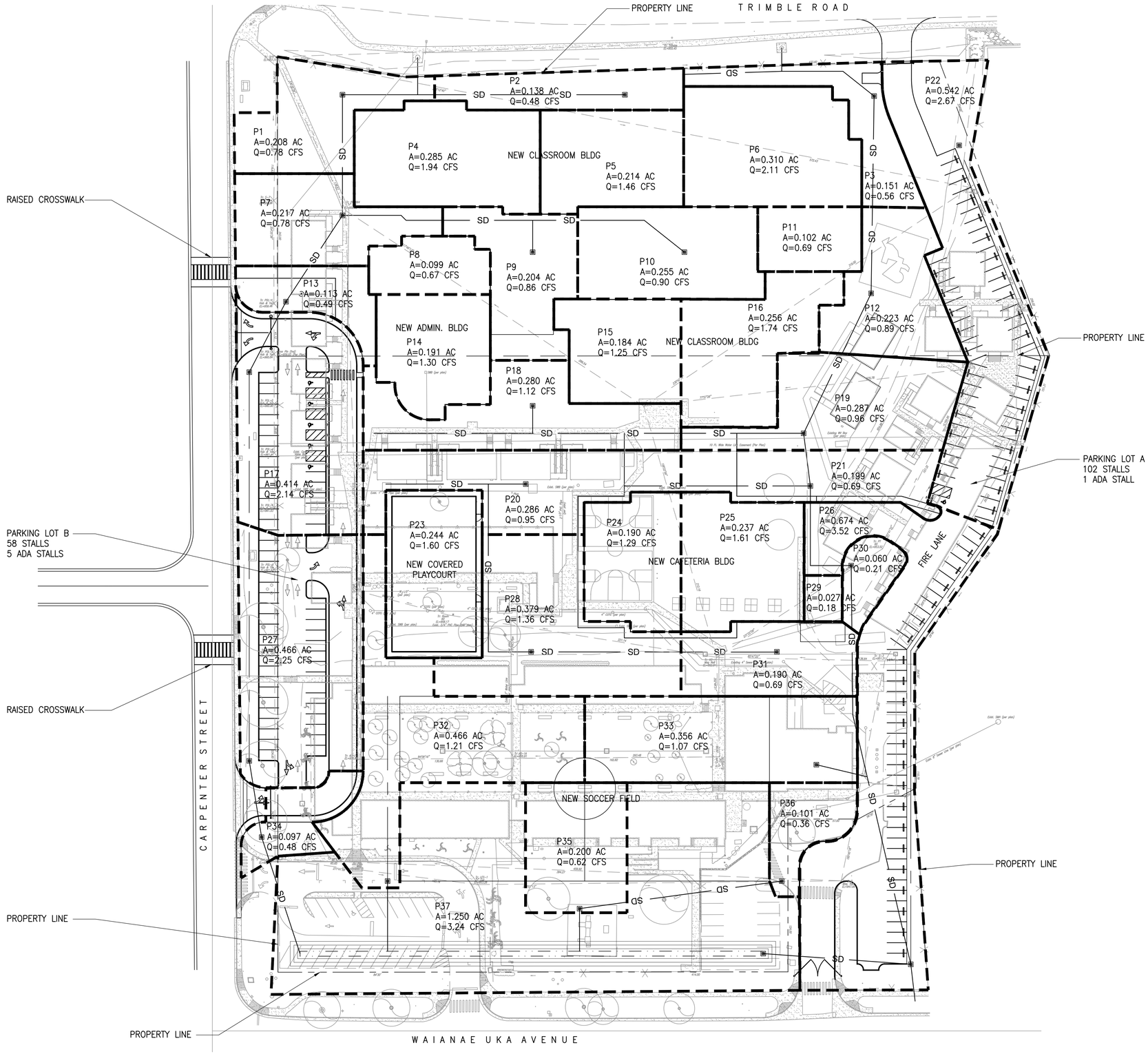
DEPARTMENT OF EDUCATION
STATE OF HAWAII

SOLOMON ELEMENTARY SCHOOL

KAPOLEI OAHU HAWAII

OVERALL SITE PLAN

MITSUNAGA & ASSOCIATES, INC.		DOE NO.	DRAWING NO.
DESIGNED BY: CB	CHECKED BY: CB	Q72003-13	C-3.0
DRAWN BY: CB	APPROVED BY: CM	DATE	SHEET XX OF X SHTS
SCALE: AS SHOWN		APRIL 23, 2014	



1 / C-3.0 PROPOSED DRAINAGE PLAN

SCALE: 1"=40'

GRAPHIC SCALE

1" = 40' 40' 20' 0 40' 80'

REVISION NO.	SYM.	DESCRIPTION	SHT ___ OF ___	DATE	APPROVED

DEPARTMENT OF EDUCATION
STATE OF HAWAII

SOLOMON ELEMENTARY SCHOOL

KAPOLEI OAHU HAWAII

PROPOSED DRAINAGE PLAN

MITSUNAGA & ASSOCIATES, INC.		DOE NO.	DRAWING NO.
DESIGNED BY: CB	CHECKED BY: CB	Q72003-13	C-3.0
DRAWN BY: CB	APPROVED BY: CM	DATE	SHEET XX
SCALE: AS SHOWN		APRIL 23, 2014	OF X SHTS

Solomon Elementary School - Flow Calculation For Each Drainage Area (10YR)

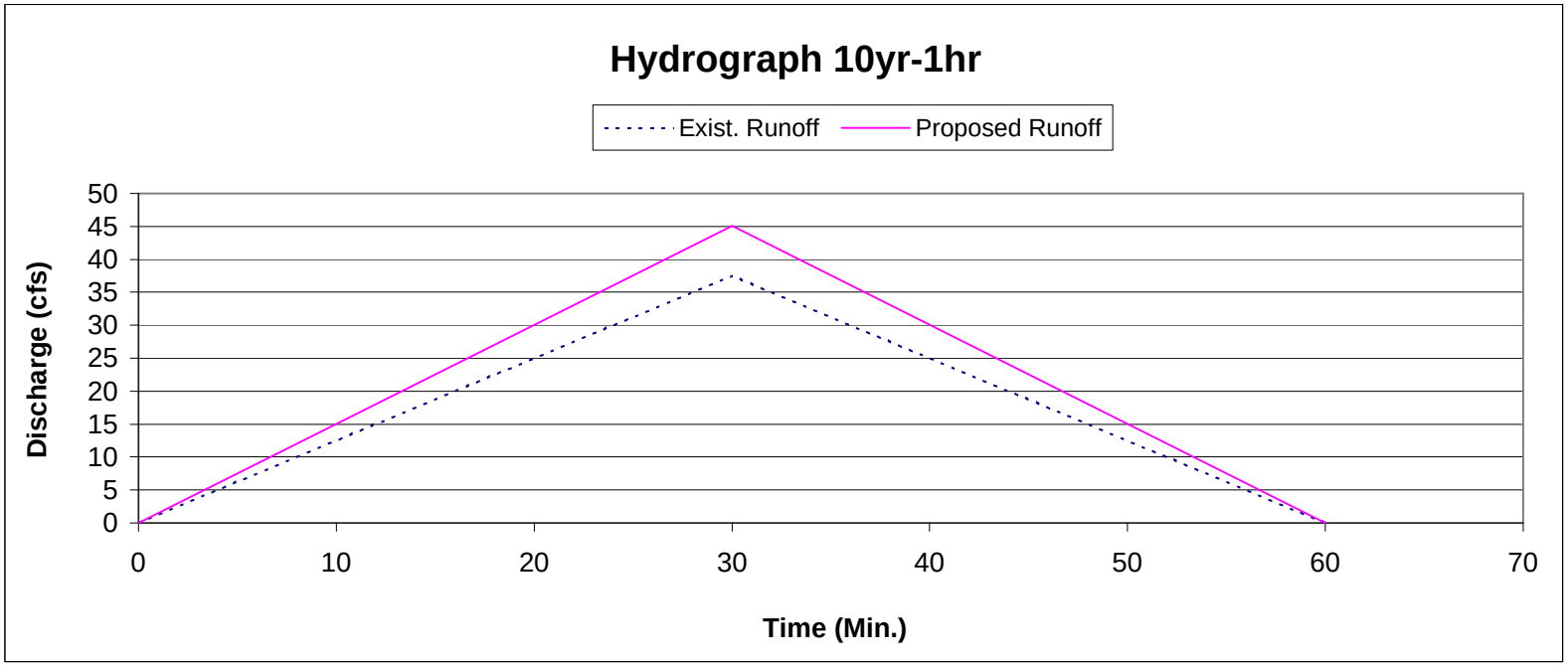
Existing Condition RFP APPENDIX DD = 2.700

AREA	LANDSCAPED AREA (ACRE)	C1	PAVED AREA (ACRE)	C2	AREA WEIGHTED C	TOTAL AREA	CORRECTION FACTOR	LENGTH	SLOPE	CORRECTED RAINFALL INTENSITY (INCH/HR)	FLOW(CFS)
E1	3.229	0.60	0.352	0.90	0.63	3.581	1.60	580	1.10%	4.32	9.75
E2	1.196	0.60	1.523	0.90	0.77	2.719	1.70	367	2.05%	4.59	9.61
E3	0.370	0.60	0.445	0.90	0.76	0.815	2.00	350	1.25%	5.40	3.34
E4	0.208	0.60	0.059	0.90	0.67	0.267	2.30	100	5.00%	6.21	1.11
E5	0.177	0.60	0.183	0.90	0.75	0.360	2.20	70	1.45%	5.94	1.60
E6	0.158	0.60	0.140	0.90	0.74	0.298	2.20	70	1.30%	5.94	1.31
E7	0.072	0.60	0.157	0.90	0.81	0.229	2.40	55	6.69%	6.48	1.20
E8	0.097	0.60	0.137	0.90	0.78	0.234	2.00	105	0.85%	5.40	0.99
E9	0.000	0.60	0.137	0.90	0.90	0.137	2.70	100	1.00%	7.29	0.90
E10	0.502	0.60	0.953	0.90	0.80	1.455	2.45	170	1.50%	6.62	7.70
TOTAL	6.009		4.086			10.095					**37.51**

Proposed Condition RFP APPENDIX DD = 2.700

AREA	LANDSCAPED AREA (ACRE)	C1	PAVED AREA (ACRE)	C2	AREA WEIGHTED C	TOTAL AREA	CORRECTION FACTOR	LENGTH	SLOPE	CORRECTED RAINFALL INTENSITY (INCH/HR)	FLOW(CFS)
P1	0.184	0.60	0.024	0.90	0.63	0.208	2.20	60	2.00%	5.94	0.78
P2	0.101	0.60	0.037	0.90	0.68	0.138	1.90	140	2.00%	5.13	0.48
P3	0.103	0.60	0.048	0.90	0.70	0.151	1.95	150	2.00%	5.27	0.56
P4	0.000	0.60	0.285	0.90	0.90	0.285	2.80	45	1.50%	7.56	1.94
P5	0.000	0.60	0.214	0.90	0.90	0.214	2.80	45	1.50%	7.56	1.46
P6	0.000	0.60	0.310	0.90	0.90	0.310	2.80	90	1.50%	7.56	2.11
P7	0.195	0.60	0.022	0.90	0.63	0.217	2.10	90	2.20%	5.67	0.78
P8	0.000	0.60	0.099	0.90	0.90	0.099	2.80	35	1.50%	7.56	0.67
P9	0.148	0.60	0.056	0.90	0.68	0.204	2.30	70	1.25%	6.21	0.86
P10	0.215	0.60	0.040	0.90	0.65	0.255	2.00	90	1.00%	5.40	0.90
P11	0.000	0.60	0.102	0.90	0.90	0.102	2.80	45	1.50%	7.56	0.69
P12	0.172	0.60	0.051	0.90	0.67	0.223	2.20	90	2.20%	5.94	0.89
P13	0.083	0.60	0.030	0.90	0.68	0.113	2.35	65	2.00%	6.35	0.49
P14	0.000	0.60	0.191	0.90	0.90	0.191	2.80	55	1.50%	7.56	1.30
P15	0.000	0.60	0.184	0.90	0.90	0.184	2.80	60	1.50%	7.56	1.25
P16	0.000	0.60	0.256	0.90	0.90	0.256	2.80	70	1.50%	7.56	1.74
P17	0.068	0.60	0.346	0.90	0.85	0.414	2.25	90	2.00%	6.08	2.14
P18	0.200	0.60	0.080	0.90	0.69	0.280	2.15	120	2.25%	5.81	1.12
P19	0.235	0.60	0.052	0.90	0.65	0.287	1.90	140	2.00%	5.13	0.96
P20	0.241	0.60	0.045	0.90	0.65	0.286	1.90	165	1.25%	5.13	0.95
P21	0.145	0.60	0.054	0.90	0.68	0.199	1.90	70	2.00%	5.13	0.69

P22	0.129	0.60	0.413	0.90	0.83	0.542	2.20	330	1.50%	5.94	2.67
P23	0.000	0.60	0.244	0.90	0.90	0.244	2.70	80	0.50%	7.29	1.60
P24	0.000	0.60	0.190	0.90	0.90	0.190	2.80	75	1.50%	7.56	1.29
P25	0.000	0.60	0.237	0.90	0.90	0.237	2.80	95	1.50%	7.56	1.61
P26	0.130	0.60	0.544	0.90	0.84	0.674	2.30	425	2.00%	6.21	3.52
P27	0.102	0.60	0.364	0.90	0.83	0.466	2.15	220	2.00%	5.81	2.25
P28	0.358	0.60	0.021	0.90	0.62	0.379	2.15	220	2.50%	5.81	1.36
P29	0.000	0.60	0.027	0.90	0.90	0.027	2.80	20	1.50%	7.56	0.18
P30	0.060	0.60	0.000	0.90	0.60	0.060	2.20	50	1.00%	5.94	0.21
P31	0.169	0.60	0.021	0.90	0.63	0.190	2.15	70	1.50%	5.81	0.69
P32	0.466	0.60	0.000	0.90	0.60	0.466	1.60	270	1.00%	4.32	1.21
P33	0.356	0.60	0.000	0.90	0.60	0.356	1.85	190	1.00%	5.00	1.07
P34	0.046	0.60	0.051	0.90	0.76	0.097	2.40	90	2.50%	6.48	0.48
P35	0.200	0.60	0.000	0.90	0.60	0.200	1.90	100	1.00%	5.13	0.62
P36	0.101	0.60	0.000	0.90	0.60	0.101	2.20	90	1.75%	5.94	0.36
P37	1.250	0.60	0.000	0.90	0.60	1.250	1.60	430	2.00%	4.32	3.24
TOTAL	5.457		4.638			10.095					**45.12**



Existing		**Proposed**	
Time (min)	Flow (cfs)	Time (min)	Flow (cfs)
0	0	0	0
30	37.51	30	45.12
60	0	60	0

Exist. Runoff Volume	67518.0 ft^3
Proposed Runoff Volume	81216.0 ft^3
Detention Voume Required	13698.0 ft^3