STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS

ADDENDUM NO. 1

FOR

KAILUA ROAD
TRAFFIC INTERSECTION IMPROVEMENTS ON KAILUA ROAD,
VICINITY OF ULUOA STREET AND ULUMANU DRIVE
DISTRICTS OF KOOLAUPOKO
ISLAND OF OAHU
PROJECT NO. 61D-01-23

January 11, 2024

This Addendum shall make the following amendments to the Bid Documents:

A. SOLICITATION OFFER DUE DATE & TIME

1. The Solicitation Offer Due Date & Time is hereby corrected from "01/18/2024 12:00 AM" to "**01/18/2024 2:00 PM**".

B. NOTICE TO BIDDERS

1. Delete **NOTICE TO BIDDERS** in its entirety and replace with attached **NOTICE TO BIDDERS** dated r1/11/2024.

C. SPECIAL PROVISIONS

1. Delete **SECTION 623 – TRAFFIC SIGNAL SYSTEM** dated 10/03/2023 in its entirety and replace with attached **SECTION 623 – TRAFFIC SIGNAL SYSTEM** dated r1/11/2024.

2. Delete **SECTION 627 – TRAFFIC MONITORING AND SIGNAL CONTROL SYSTEM** dated 12/06/2023 in its entirety and replace with attached **SECTION 627 – TRAFFIC MONITORING AND SIGNAL CONTROL SYSTEM** dated r1/11/2024.

3. Add and make a part of the Specifications the attached **SECTION 647 – FIBER OPTION CABLE** dated r1/11/2024.

D. PROPOSAL SCHEDULE

1. Delete **PROPOSAL SCHEDULE** dated 12/13/2023 in its entirety and replace with attached **PROPOSAL SCHEDULE** dated r1/11/2024.

E. PLANS:

1. Delete Plan Sheet No. **1** – Title Sheet and replace with attached Plan Sheet No. **ADD. 1** – TITLE SHEET.

2. Delete Plan Sheet No. **4** – General Notes & Legend – 3 and replace with attached Plan Sheet No. **ADD. 4** – General Notes & Legend – 3.

3. Delete Plan Sheet No. **27** – Curb Ramp Details – 2 and replace with the attached Plan Sheet No. **ADD. 27** – Curb Ramp Details – 2.

4. Delete Plan Sheet No. **30** – Curb Ramp Details – 5 and replace with the attached Plan Sheet No. **ADD. 30** – Curb Ramp Details – 5.

5. Delete Plan Sheet No. **33** – Curb Ramp Details – 8 and replace with the attached Plan Sheet No. **ADD. 33** – Curb Ramp Details – 8.

6. Delete Plan Sheet No. **39** – Paving Notes & Details and replace with the attached Plan Sheet No. **ADD. 39** – Paving Notes & Details.

7. Delete Plan Sheet No. **40** – Paving Plan and replace with the attached Plan Sheet No. **ADD. 40** – Paving Plan.

8. Delete Plan Sheet No. **66** – Drilled Shaft Foundation Details and replace with the attached Plan Sheet No. **ADD. 66** – Drilled Shaft Foundation Details.

9. Add and make a part of the Plans the attached Plan Sheet No. **ADD. 66S-1.**

10. Delete Plan Sheet No. **67** – Boring Log – 1 and replace with the attached Plan Sheet No. **ADD. 67** – Boring Log – 1.

11. Delete Plan Sheet No. **68** – Boring Log – 2 and replace with the attached Plan Sheet No. **ADD. 68** – Boring Log – 2.

12. Delete Plan Sheet No. **81** – Uluoa Power and Street Light Plan and replace with the attached Plan Sheet No. **ADD. 81** – Uluoa Power and Street Light Plan.

The following is provided for information.

F. PRE-BID MEETING MINUTES

1. The attached PRE-BID MEETING MINUTES and ATTENDANCE SHEET dated December 28, 2023, is provided for information.

G. GEOTECHNICAL ENGINEERING REPORT FOR KAILUA ROAD INTERSECTION IMPROVEMENTS

1. The attached GEOTECHNICAL ENGINEERING REPORT FOR KAILUA ROAD INTERSECTION IMPROVEMENTS, dated December 22, 2023, is provided for information.

H. RESPONSES TO REQUEST FOR INFORMATION (RFI'S/QUESTIONS)

1. The attached Responses to Request for Information is provided for information.

Please acknowledge receipt of this Addendum No. 1 by recording the date of its receipt in the space provided on Page P-4 of the Proposal.

ROBIN K. SHISHIDO
Deputy Director of Transportation for Highways

NOTICE TO BIDDERS
Hawaii Revised Statutes (HRS),
Chapter 103D

SEALED BIDS for KAILUA ROAD, TRAFFIC INTERSECTION IMPROVEMENTS ON KAILUA ROAD, VICINITY OF ULUOA STREET AND ULUMANU DRIVE, DISTRICT OF KOOLAUPOKO, ISLAND OF OAHU, PROJECT NO. 61D-01-23, will begin as advertised in HIePRO. Bidders shall register and submit complete bids through HIePRO only. Refer to the following HIePRO link for important information on registering: https://hiepro.ehawaii.gov/welcome.html.

Plans, specifications, proposal, and other documents designated or incorporated by reference shall be available in HIePRO.

DEADLINE TO SUBMIT BIDS is January 18, 2024, at 2:00 p.m., Hawaii Standard Time (HST). **Bidders shall submit and upload the complete proposal to HIePRO prior to the bid opening date and time. Proposals received after said due date and time shall not be considered. Any additional support documents explicitly designated as confidential and/or proprietary shall be uploaded as a separate file to HIePRO. Do not include confidential and/or proprietary documents with the proposal. The record of each bidder and respective bid shall be open to public inspection. FAILURE TO UPLOAD THE PROPOSAL TO HIePRO SHALL BE GROUNDS FOR REJECTION OF THE BID.**

The scope of work consists of signalizing the intersections of Kailua Road and Uluoa Street, and Kailua Road and Ulumanu Drive, including but not limited to the installation of Type II traffic signal poles, Type I traffic signal poles, interconnect ducts, pedestrian push button assemblies, traffic signal boxes, and traffic loops along Kailua Road from Waimanlo Junction to Ulumanu Drive; construction of sidewalk curb extensions or bulb-outs,

sidewalk curb ramps, sidewalk and pavement reconstruction; striping and signage; and work zone traffic control. The estimated cost of construction is between $5,000,000 and $5,500,000.

To be eligible for award, bidders shall possess a valid State of Hawaii General Engineering "A" license at the time of bidding. Bidder's attention is also directed to Section 627.01 of the Special Provisions regarding additional bidder's qualification.

Due to the intricate nature of HDOT's CCTV and fiber optic cable system, the Bidder's CCTV supplier and fiber optic cable installer shall have previous experience working with the City and County of Honolulu or HDOT's existing CCTV system for at least three (3) previous projects. Written documentation confirming previous experience working on either CCTV systems or fiber systems shall be submitted to the Project Manager before January 25, 2024, at 3:30 PM (within five (5) working days after bid opening).

A pre-bid conference is scheduled for Pre-bid meeting December 28, 2023, at 2:00 p.m., HST, on Microsoft Teams. Due to the impacts of COVID 19, the pre-bid meeting will be conducted virtually. Contract Mr. Reid Tokuhara, Project Manager, at (808) 692-7691, or by email at reid.tokuhara@hawaii.gov, at minimum of 48-hours prior to the scheduled pre-bid meeting to obtain the link for the pre-bid meeting. All prospective bidders and/or their respective representatives are encouraged to attend, however, attendance is not mandatory. All information presented at the pre-bid conference is provided for clarification and information only. Any amendments to the bid documents shall be made by formal addendum and posted in HIePRO.

All Request for Information (RFI) questions and substitution requests shall be submitted via HIePRO **no later than January 2, 2024, at 2:00 p.m., HST.** RFI questions received after the stated deadline will not be addressed. Verbal RFI questions will not receive a response. All responses to RFI questions shall be issued by formal addendum and posted in HIePRO.

Apprenticeship Preference. A 5% bid adjustment for bidders that are party to apprenticeship agreements pursuant to HRS §103-55.6 is applicable to this project.

Employment of State Residents on Construction Procurement Contracts. Compliance with HRS §103B-3 is a requirement for this project whereby a minimum of 80% of the bidder's work force on this project shall consist of Hawaii residents.

Campaign contributions by State and County Contractors. Contractors are hereby notified of the applicability of HRS §11-355 which states that campaign contributions are prohibited from specified State or county government contractors during the term of the contract if the contractors are paid with funds appropriated by a legislative body. For more information, contact the Campaign Spending Commission at (808) 586-0285.

Protests. Any protest of this solicitation shall be submitted in writing to the Director of Transportation, in accordance with HRS §103D-701 and Hawaii Administrative Rules §3-126.

The Equal Employment Opportunity Regulations of the Secretary of Labor implementing Executive Order 11246, as amended, shall be complied with on this project.

The U.S. Department of Transportation Regulation entitled "Nondiscrimination in Federally-Assisted Programs of the U.S. Department of Transportation," Title 49, Code of Federal Regulations (CFR), Part 21 is applicable to this project. Bidders are hereby notified that the Department of Transportation will affirmatively ensure that the contract entered into pursuant to this advertisement will be awarded to the lowest responsible bidder without discrimination on the grounds of race, color, national origin or sex (as directed by 23 CFR Part 200).

Driving While Impaired (DWI) Education. HDOT encourages all organizations contracted with the DOT to have an employee education program preventing DWI. DWI is defined as operating a motor vehicle while impaired by alcohol or other legal or illegal

substances. HDOT promotes this type of program to accomplish our mission to provide a safe environment for motorists, bicyclists and pedestrians utilizing our State highways, and expects its contractors to do so as well.

For additional information, contact Reid Tokuhara, Project Manager, by phone at (808) 692-7691, by fax at (808) 692-7690 or email at reid.tokuhara@hawaii.gov address.

The State reserves the right to reject any or all proposals and to waive any defects in said proposals in the best interest of the public.

ROBIN K. SHISHIDO
Deputy Director of Transportation for Highways

Posted on HIePRO: January 11, 2024

SECTION 623 - TRAFFIC SIGNAL SYSTEM

Make the following amendments to said Section:

(I) Amend **623.01 Description** from lines 4 to 95 to read as follows:

"623.01 Description. This work includes furnishing labor, materials, tools, machinery, and equipment necessary to modify or install and construct an operating traffic signal system, including trenching, excavation and backfill, asphalt concrete pavement, aggregate base course, and aggregate subbase course, complete in place according to the contract.

The traffic signal system includes:

(1) trenching, structural excavating, backfilling, restoring work, and installing pullboxes;

(2) providing a complete and operating traffic signal system with controller, firmware, cabinet, auxiliary and support equipment, vehicle detectors, signal standards, traffic signals and appurtenances, signal head mounting, back plates for all mast arm mounted traffic signal heads, emergency vehicle preemption optical receivers, concrete foundations, cables, wiring, cleaning and adjusting signal heads, painting and restoration work.

(4) coordinating work and arranging for inspection of work with the Engineer and other agencies as required.

(4) turning over to HDOT a complete and operating traffic signal system according to the contract.

Furnish and install the incidental parts that the contract does not show and that are necessary to complete the traffic signal system as though such parts were in the contract.

Electrical equipment shall conform to the NEMA Standards and this contract. Material and workmanship shall conform to the "National Electric Code", (the Code); General Order Nos. 6 and 10 of the Hawaii Public Utilities Commission; the standards of the ASTM; the ANSI; Local Joint Pole Agreement; local power company rules; and local ordinances that may apply.

Definitions.

(1) Actuation - Operation of any type of detector.

(2) Clearance Interval - Length of time of display of signal indication following right-of-way interval.

(3) Detector for Traffic Actuation - Device that pedestrians or vehicles can register their presence with traffic-actuated controller.

(4) Extendible Portion - That part of green interval that follows initial portion.

(5) Extension Limit - Maximum time that traffic phase may retain right-of-way after actuation on another traffic phase, after timimg out initial portion.

(6) Flashing Feature - Feature incorporated to stop normal signal operation and cause flashing of predetermined combination of signal lights.

(7) Initial Portion - Part of green interval that is timed-out or separately controlled by traffic-actuated controller before extendible portion of interval takes effect.

(8) Interval - Several divisions of time cycle during which signal indications do not change.

(9) Interval Sequence - Order of appearance of signal indications during successive intervals of time cycle.

(10) Magnetic Vehicle Detector - Detector actuated by movement of vehicle passing through magnetic field.

(11) Major Street - Roadway approach or approaches at intersection normally carrying greater volume of vehicular traffic.

(12) Manual Operation - Operation of signal controller by hand-operated switch.

(13) Minimum Period - In semi-traffic-actuated controllers, shortest time for which right-of-way will be given to approaches not having detectors.

(14) Minor Movement Interval - Auxiliary phase added to controller phase (parent phase) and modified by auxiliary movement controller.

(15) Minor Street - Roadway approach or approaches at intersection normally carrying smaller volume of vehicular traffic.

(16) Non-Parent Phase - Controller phase not modified by auxiliary controlunit.

(17) Parent Phase - Controller phase modified by auxiliary control unit.

(18) Passage Period - Time allowed for vehicle to travel at selected speed from detector to nearest point of conflicting traffic.

(19) Pedestrian Detector - Detector, usually of push-button type, installed near roadway and operated by hand.

(20) Pressure-Sensitive Vehicle Detector - Detector installed in roadway, actuated by pressure of vehicle passing over its surface.

(21) Pre-Timed Controller - Automatic control device for supervising operation of traffic control signals in accordance with pre-timed cycle and divisions.

(22) Recall Switch - Manually operated switch in actuated controller to provide for automatic return of right-of-way to street.

(23) Right-of-Way - Privilege of immediate use of highway.

(24) Signal Indication - Illumination of traffic signal lens or equivalent device, or of combination of several lenses or equivalent devices.

(25) Time Cycle - Number of seconds required for one complete revolution of timing dial or complete sequence of signal indications.

(26) Traffic-Actuated Controller - Digital control device for supervising operation of traffic control signals in accordance with varying demands of traffic as registered with controller by loop detectors or pedestrian push buttons.

(27) Traffic Phase - Part of cycle allocated to traffic movements receiving right-of-way or to combinations of traffic movements receiving right-of-way simultaneously during one or more intervals.

(28) Unit Extension - Minimum time, during extendible portion, for which right-of-way must remain on traffic phases following actuation on that phase, subject to extension limit"

(III) Amend **623.02 Materials** by adding the following after line 132:

"Pedestrian Signal Push Button with Integral Sign 770.12"

(IV) Amend **Subsection 623.03(C)(7)** from lines 255 to 258 to read as follows:

"(7) Conduits. Lay polyvinyl chloride (PVC) conduits carefully in trenches prepared to receive conduits. Concrete encase PVC Schedule 40 conduits."

(V) Amend Section **623.04 Measurement** and **623.05 Payment** from lines 578 to 594 to read as follows:

"623.04 Measurement. The Engineer will not measure firmware for controller, for payment.

(A) The Engineer will measure the controller assembly, foundation for traffic signal controller, traffic signal standard, foundation for traffic signal standard, pedestrian or traffic signal assembly, pedestrian pushbutton, pullbox, loop detector sensing unit, and emergency vehicle preemption receiver per each in accordance with the contract documents.

(B) The Engineer will measure traffic signal ductline, conductors, and EVP cable per linear foot in accordance with the contract documents.

623.05 Payment. The Engineer will pay for the accepted controller assembly at the contract unit price per each complete in place. The price includes full compensation for submitting the equipment list and drawing; furnishing and mounting the controller cabinet; furnishing, assembling, wiring, firmware, and housing the controller and auxiliary equipment; painting the controller cabinet; testing; providing turn-on service; submitting warranty; and furnishing equipments, tools, labor, materials and other incidentals necessary to complete the work.

The Engineer will pay for the accepted traffic signal standard at the contract unit price per each complete in place. The price includes full compensation for submitting the equipment list and drawing; furnishing and installing the traffic signal standard; wiring; bonding and grounding; testing; providing turn-on service; submitting warranty; and furnishing equipments, tools, labor, materials, and other incidentals necessary to complete the work.

The Engineer will pay for the accepted foundation for controller cabinet and traffic signal standard at the contract unit price per each complete in place. The price includes full compensation for excavating and backfilling; forming; furnishing and placing the reinforcing steel; mixing, placing, and curing the concrete; furnishing and setting the anchor bolts; restoring the pavement; and furnishing equipments, tools, labor, materials and other incidentals necessary to complete the work.

The Engineer will pay for the accepted pedestrian and traffic signal assembly at the contract unit price per each complete in place. The price

includes full compensation for submitting the equipment list and drawing; assembling the signal heads; wiring; bonding and grounding; painting the signal head mounting; testing; providing turn-on service; submitting warranty; and furnishing equipments, tools, labor, materials and other incidentals necessary to complete the work.

The Engineer will pay for the accepted emergency vehicle preemption (EVP) optical receiver at the contract unit price per each complete in place. The price includes full compensation for submitting the equipment list and drawing; assembling the EVP; wiring; bonding and grounding; testing; providing turn-on service; submitting warranty; and furnishing equipments, tools, labor, materials and other incidentals necessary to complete the work.

The Engineer will pay for the accepted pedestrian piezo electric pushbutton with instruction sign at the contract unit price per each complete in place. The price includes full compensation for submitting the equipment list and drawing; furnishing and installing the pedestrian pushbutton with the instruction sign; wiring; bonding and grounding; testing; providing turn-on service; submitting warranty; and furnishing equipments, tools, labor, materials and other incidentals necessary to complete the work.

The Engineer will pay for the accepted traffic signal ductline at the contract unit price per linear foot complete in place. The price includes full compensation for saw cutting; trenching; excavating and backfilling, including asphalt concrete pavement, aggregate base course and aggregate subbase course for trench repair; concrete curb and/or gutter and concrete sidewalk repair; furnishing, installing, bonding, and grounding the conduits and interconnect subducts; and furnishing equipments, tools, labor, materials and other incidentals necessary to complete the work.

The Engineer will pay for the accepted pullbox at the contract unit price per each complete in place. The price includes full compensation for submitting the equipment list and drawing; furnishing and installing the pullbox at the designated locations; saw cutting; excavating and backfilling; restoration of concrete sidewalks, asphalt concrete pavement and landscaping; coating the frames and covers; and furnishing equipments, tools, labor, materials and other incidentals necessary to complete the work.

The Engineer will pay for the accepted traffic signal and EVP cables at the contract unit price per linear foot complete in place. The price includes full compensation for furnishing, installing, splicing, and taping the cable; making the connections; providing turn-on service; and furnishing equipments, tools, labor, materials and other incidentals necessary to complete the work.

The Engineer will pay for the accepted loop detector sensing unit at the contract unit price per each complete in place. The price includes full

compensation for saw cutting; cleaning and blowing the saw cut area; furnishing and inserting the loop cable; splicing in the pullbox; filling the saw cut groove with epoxy sealer or hot applied rubberized sealant; and furnishing equipments, tools, labor, materials and other incidentals necessary to complete the work.

The Engineer will consider full compensation for additional materials and labor not specifically shown or called for that are necessary to complete the work incidental to the various contract items in the proposal.

The Engineer will pay for each of the following pay items when included in the proposal schedule:

Pay Item	**Pay Unit**
_____Controller Assembly with Firmware _____	Each
Type _____ Traffic Signal Standard _____	Each
Foundation for _____	Each
_____ Signal Assembly _____	Each
EVP Optical Receiver with _____	Each
Pedestrian Pushbutton with Instruction Sign	Each
Traffic Signal Ductline _____	Lin. Ft.
_____Type _____ Pullbox	Each
No. _____, _____ Cable	Lin. Ft.
EVP Cable	Lin. Ft.
Loop Detector Sensing Unit (6 Ft. x 6 Ft.) _____ Loops	Each

Payment shall be full compensation for the work prescribed in this section and the contract documents. The Engineer shall consider additional materials and labor not specifically shown or called for that are necessary to complete the work as incidental to the various contract items in the proposal schedule."

END OF SECTION 623

Make the following section part of the Standard Specifications:

"SECTION 627 – TRAFFIC MONITORING AND SIGNAL CONTROL SYSTEM

627.01 DESCRIPTION. This section shall consist of all work and materials necessary to complete a fully operational CCTV and signal control system for traffic control and surveillance of various sites shown on the plans. The work shall involve coordinating all equipment and labor necessary to incorporate and integrate the two new signalized intersections into HDOT's H-3 Traffic Operations Center (TOC) and/or City's Joint Traffic Management Center (JTMC) systems, using Internet Protocol (IP) based communications. The expanded CCTV and signal control system will assist operators at the TOC and/or JTMC to monitor traffic conditions, mitigate traffic congestion, and set the appropriate traffic plans which best suits and improves the traffic progression along Oahu's busiest arterials.

The CCTV and signal control system shall consist of remotely controlled color cameras, remote video switching, IP communications system, cellular modems and a fiber optic interconnect system. The local traffic signal control system will send control data transmitted over two single-mode fibers through a 100/1000/10000base T/FX IP switch. At the Uluoa intersection a cellular modem will transmit the control data to a traffic signal central server located at the JTMC. In addition, the traffic surveillance CCTV cameras will be connected directly to a cellular modem and video data will be transmitted to the TOC servers.

All CCTV camera equipment shall be identical and/or compatible with the City's and HDOT's existing CCTV system in terms of hardware and software.

Due to the intricate nature of HDOT's CCTV and fiber optic cable system, the Bidder's CCTV supplier shall have previous experience working with the City and County of Honolulu or HDOT's existing CCTV system for at least three (3) previous projects. Written documentation confirming previous experience working on either CCTV systems or fiber systems shall be submitted to the project Manager before January 25, 2024, at 3:30 PM (within five (5) working days after bid opening).

The CCTV firm shall be responsible for testing all fiberoptic hardware and cables to provide a documented optical budget loss analysis for each link to and from a hub station. The CCTV supplier will be responsible for all hookup, assignments, dedication, testing, matching, and splicing of the fiberoptic cables. All fiberoptic splice points shall have pigtails on all fiberoptic members which attach to fiberoptic hardware and components with SC-connectors. Six strands of the same buffer tube shall be jumpered color for color using a SC-connectors fiber optic patch panel. Patch cords shall be provided for the six strands connected to the patch panel. All remaining fiber optic strands shall be fusion spliced color for color. The CCTV supplier shall be fully responsible for all splices, budget loss, attenuators, appropriate fiber hardware, accessories, and pigtail connections for a fully operational system. All other hardware, equipment, and labor necessary shall be considered incidental.

The firm shall track and document the installation data and tension measurements when installing the fiberoptic cables. Any tension measurements which exceeds the manufacturer's recommendations will be considered means for the cable rejection. The Fiberoptic Contractor shall be fully responsible for the quality and integrity of the installed cable and the operability of the final fiberoptic cable product. The Fiberoptic Cable Contractor shall be responsible for testing all fiber optic strands and to provide a documented optical budget loss analysis report showing the acceptable budget losses from one end to the other end of all fiber optic strands.

627.02 TRAFFIC SIGNAL CONTROL SYSTEM. For bidding purposes, the CCTV Supplier shall furnish and install all the necessary items to provide traffic signal control from the JTMC, to all three traffic signal controllers, utilizing HDOT's existing central server. All other equipment necessary to complete a fully operational system will be considered incidental.

The traffic signal controller will communicate with the JTMC over an Ethernet network.

The Contractor shall at each new signalized intersection furnish and install, but not limited to, the following items:

(A) Traffic Signal Central Server. The Contractor shall furnish and install the necessary licenses that will allow the two new signalized intersections to communicate and work with HDOT's traffic signal central server.

(B) CCTV Cabinet. A CCTV cabinet with foundation shall be provided at each new signalized intersection. All cabinet shall be furnished assembled and configured with the components stated below:

Cabinet shall be a Traffic Signal 332LS anodized aluminum cabinet with a 19" rack, 50 amp circuit breaker, surge-protected, and thermo-control fan.

Each Model 332LS Cabinet shall meet the following additional requirements:

(1) Provide Best Lock (C&C of Honolulu keyed) Security Tumbler Door locks of solid brass rim and include 4 keys.
(2) A rack mounted 6 outlet surge protector power strip
(3) A 19 inch pull out shelf
(4) Remote data port with monitor and control, Stand Alone, all connectors and cables included
(5) Rack Mounted 72 fiber optic Splice Capacity Tray
(6) Rack Mounted 72 fiber optic SC jumper connector

Surge Protection: Contractor shall install a 120V AC, 3-wire, 20 Amp inline surge protection device. The surge protection device will have an operating temperature of -40 to 85 degree C, maximum surge current of 30,000 amps

and surge voltage of 10,000 volts, 138 Volts for clamping voltage, power indicator, open circuit for fail safe operation, and protection shall be between line to neutral, line to ground, ground to neutral.

Furnish and install power cables from existing traffic signal meter or new Hawaiian Electric service point.

(C) Hardened Ethernet Switch. The network managed Layer 2, with light Layer 3 managed switch is a hardened DIN-rail mounted managed PoE++ Ethernet switch equipped with 12 gigabit PoE++ ports along with 360W power and IEEE 802.3.bt protocol support and 4 dual rate 1G/10G SFP ports. The managed switch shall be optically and electrically compatible with any IEEE 802.3 compliant Ethernet devices. The managed Ethernet switch will provide transmission of eight 100/1000 BASE-TX and four 1/10G FX ports. The managed Ethernet switches shall be environmentally hardened units, designed for roadside operating environments, and are available for use with either conventional CAT 6 copper or optical transmission media. CAT 6 cables shall be provided between the switch and the traffic signal controllers. The twelve electrical ports support the 10/100/1000 Mbps Ethernet IEEE 802.3 protocol, auto-negotiating, and auto-MDI/MDIX, four 1/10G FX ports are configurable for copper or fiber media for use with multimode or single mode optical fiber, selected by optional SFP modules, plug-and-play design, and no electrical or optical adjustments required. LED indicators for monitoring the operating status of the managed switch and network and is either DIN-rail or wall mountable.

The hardened managed Ethernet switch shall meet the following minimum requirements:

(1) Layer 2 with light Layer 3 managed switch
(2) Layer 3 Features at a minimum includes IP Packet Routing (64 hardware routes, Static routing, RIP v1/v2, OSPF v2) and Routing Redundancy
(3) Transmission of 4 channels of 1/10G over one or two single-mode fibers respectively.
(4) Transmission of 12 channels of 10/100/1000 Mbps over Cat-6 cable.
(5) 2 – Hardened Single (LC), 1 Gigabit, 40 Km SFP modules.
(6) 2 – Hardened Duplex (LC), 1 Gigabit, 40 Km SFP modules.
(7) 2 – Hardened Duplex (LC), 10 Gigabit, 40 Km SFP modules (1310 nm).
(8) Up to 90W per PoE port, with a power budget of 360 Watts. Compliance to IEEE 802.3bt type 4.
(9) Shall support the Ethernet data IEEE 802.3 protocol using Auto-negotiating for port speed and duplex.
(10) Provide power, link speed, and fiber port status indicating LED's for monitoring system operation.

(11) Provide 2 - alarm contact closure.
(12) Power Supply: 480W / 10A DIN Rail, 48VDC Industrial Power Supply, similar to NDR-480-48 or equal
(13) Serial connection with cable for local management of the device.
(14) Shall operate in an environment with relative humidity of 5% to 95% (non-condensing).
(15) Shall operate in an environment with ambient temperature range of –40° C to +75° C without the assistance of fan-forced cooling.
(16) Shall be DIN rail mountable.
(17) Lifetime manufactures warranty.

(D) Cellular Modem. Procure, configure, and install a single environmentally hardened cellular modem and all required accessories with static IP addresses at the Uluoa St intersection for traffic signal control system communication only. Cellular modem shall be capable of accessing the FirstNet Band 14 as well as the 5G cellular network when available. The modem shall provide communication between the fiber optic interconnect system and HDOT's traffic signal central system.

The cellular modem shall include or comply with the following:

(1) Two Ethernet LAN/WAN ports, minimum.
(2) USB 2.0 or better port.
(3) Two cellular antenna connectors with antennas and required accessories.
(4) GPS antenna connector with antenna and required accessories.
(5) Operating temperature range: -22ºF to 158ºF.
(6) Storage temperature range: -40ºF to 185ºF.
(7) Operating and storage humidity (non-condensing) ranges: 5% to 95%.
(8) Ingress protection compliant with IP64.
(9) Networking.
1. IPsec Tunnel — up to ten concurrent sessions
2. IKEv2 support (includes MOBIKE)
3. Access Control Lists
4. NAT
5. NAT-less Routing

(10) Security.
1. 802.1x authentication for Ethernet
2. Certificate support
3. Application-level gateways
4. MAC Address Filtering

Provide FirstNet cellular modem data service, including activation and monthly data service. When the Engineer has determined the project has reached completion, the Contractor shall coordinate with the Engineer to transfer the cellular service to HDOT.

(E) Fiber Optic Cable. The fiber optic cables, which will be used to transmit video and data signals, will consist of 6 or 72 single-mode fibers. See Contract Plans. Cables will be installed.

Armored loose-tube, 6 or 72 single-mode OS2 fiber optic cable suitable for overhead or underground installation. Cable shall be 8.3/125 micron loose buffer, single-mode, step index optical fiber cable containing glass of type, SMF-28e, AFL SR-15e, or approved equal, and that meets the following specifications:

(1) ITU-T G.652 (Categories A, B, C and D)
(2) IEC Specification 60793-2-50 Type B1.3
(3) TIA/EIA 492-CAAB
(4) Telecordia GR-20

All cables shall be free of material or manufacturing defects and dimensional non-uniformity that would;

(1) Interfere with the cable installation using accepted cable installation practices.
(2) Degrade the transmission performance and environmental resistance after installation.
(3) Inhibit proper connection to interfacing elements.
(4) Otherwise yield an inferior product.

(1) Mechanical and Performance Requirements. The cable shall be a rugged all dielectric armored outdoor cable containing color coded buffer tubes with 12 single mode color-coded fibers per- buffer tube, dual window (1310 nm and 1550 nm) fibers with UV acrylate coating in color coded, gel-free, loose buffer tubes.

Strand the loose buffer tubes around an all-dielectric center strength element using a reverseoscillation lay, wrapped by water blocking core separator or functional equivalent. The maximum allowable attenuation of the fiber is .35 dB/km for 1310 nm and .25 dB/km for1550 nm.

Each buffer tube shall contain a water blocking element for water-blocking protection. The water blocking elements shall be non-nutritive to fungus, electrically non-conductive. The buffer-tube shall be gel-free.

Apply water swellable tape longitudinally around the outside of the stranded tubes/fillers. The water swellable tape shall be non-nutritive to fungus, electrically non-conductive, andhomogenous. It shall also be free from dirt and foreign matter. The cable manufacturer shall be TL 9000 registered.

(2) Outer Jacket. Cables shall be all dielectric cable (with armoring) and shall be jacketed (sheathed) with black medium density polyethylene as defined by ASTM D1248, Type II, Class C, Category 4 and Grades J4, E7 and E8.

Armored cable shall have two jackets, one molded to the outside of the armor and one that floats freely within the armor and contains the buffer tubes and other fiber optic cable construction components as required.

Apply jacketing material directly over the tensile strength members to provide mechanical protection, and to serve as the primary moisture barrier.

Design cable sheath to meet or exceed the tensile criteria defined in EIA-455-89a. Ensure the jacket or sheath is free of any holes, splits, or blisters. The cable jacket shall contain no metal elements and shall be of a consistent thickness.The cable shall contain at least one ripcord under the sheath for easy sheath removal.

(3) Temperature. The shipping, storage, installation, and operating temperature range of the cableshall meet or exceed -20 °F to +155 °F (-29 °C to +60°C).

(4) Loose Buffer. Contain single-mode fibers in a loose buffer tube. The configuration shall be dimensionally sized to minimize local stresses and micro bend losses.

The optical fiber cable shall be an approved product of the U.S. Department of Agriculture, Rural Electrification Administration in accordance with the requirements of REA-PE-90, or as otherwise indicated, and shall conform to EIA/TIA-598.

Each optical fiber shall consist of a doped silica core surrounded by a concentric silica cladding.

Buffer tubes shall be polypropylene. Include fillers in the cable core to lend symmetry to the cable cross section where needed.

(5) Colors. All optical fibers shall be identifiable by standard color codes as defined in EIA/TIA-598. Each fiber shall be distinguishable, from others by means of color coding and shall conform to the following EIA/TIA sequence of colors:

1. Blue	7. Red
2. Orange	8. Black
3. Green	9. Yellow
4. Brown	10. Violet
5. Slate	11. Rose
6. White	12. Aqua

Buffer tubes containing fibers shall also be color-coded with distinct and recognizable colors according to the following sequence of colors:

1. Blue
2. Orange
3. Green
4. Brown
5. Slate
6. White

The color formulation shall be compatible with the fiber coating and be heat stable. Color formulation shall not fade or smear or be susceptible to migration and it shall not affectthe transmission characteristics of the optical fibers and shall not cause fibers to stick together.

(6) Cable Marking. The fiber optic cable outer jacket shall be marked with manufacturer's name, the year of manufacture, the words "optical fiber cable", fiber count, type of fiber, and sequential linear foot markings.

1. Repeat the markings every 3 feet.
2. The actual length of the cable shall be within -0/+1% of the length marking.
3. The marking shall be in a contrasting color to the cable jacket.
4. The marking shall be 2.5 mm in height and must be permanent weatherproof and shall not wearoff during the installation in the underground conduit system.

(7) Quality Assurance Provision. The fiber optic cable shall meet or exceed the requirements of this specification when measured in accordance with the methods of the individual requirements or the following methods as defined in EIA-455-A:

1. Fiber dimensions
2. Attenuation
3. Numerical aperture
4. Fiber proof test
5. Crush resistance
6. Cable bending
7. Tensile load
8. Impact resistance
9. Attenuation vs. Temperature

(8) Packaging. Top and bottom ends of the cable shall be available for testing.

Both ends of the cable shall be sealed to prevent the ingress of moisture. Each reel shall have a weather resistant reel tag attached identifying the reel and cable.

The reel tag shall include the following information:

1. Cable number
2. Gross Weight
3. Shipped length in meters
4. Job order number
5. Product Number
6. Date cable tested

Each cable shall be accompanied by a cable data sheet. Cable data shall include manufacturer number, billable length, bandwidth specs and measured attenuation of each fiber.

(9) Construction Requirements.

Material Sample and Certificate of Compliance. The Contractor shall submit material samples according to Subsection 106.04 – Material Sample, and any certificates of compliance according to Subsection 106.07 – Certificate of Compliance.

The Contractor shall submit a fiber optic cable pulling plan for review and approval by the Engineer prior to beginning fiber optic cable installation. The fiber optic cable pulling plan shall include:

(1) Location of start and end of pulls,

(2) Location of cable reel trailers during installation,

(3) Location of any “figure-eight” of fiber optic cable, and

(4) Location of staged equipment.

Upon completion of the work, submit an “As Built” or corrected plan showing in detail the following:

(1) Construction changes,

(2) Location and attenuation of every event along the installed fiber optic cable,

(3) Index of refraction of installed fiber,

(4) Fiber optic cable index of refraction, and

(5) Sequential fiber optic cable markings at each pullbox, cabinet, and splice closure.

The fiber optic cable Subcontractor shall install the new fiber optic cable underground in conduits as shown on the plans. The Contractor will be responsible for furnishing and pulling the new fiber in PVC ductlines using a breakaway swivel to prevent exceeding the tensile load during installation.

All fiber optic splices shall be fusion splices. Mechanical splices shall not be used. Fiber optic splice locations are permitted only at splice points where splice cabinets are shown on the plans. Fiber optic fibers shall be spliced in every splice cabinet location, and it is the responsibility of the Contractor to maintain a continuous run throughout the system. The Contractor shall leave a minimum of 20-feet of cable service loops at every cabinet and 10 feet at every pullbox.

Provide documented historical cable pulling data indicating tensile forces exerted on the cable during the installation. Any tension measurements, which exceed the manufacturer's recommendation, will be considered means for the cable rejection. The fiber optic cable Subcontractor shall be fully responsible for the quality and integrity of the installed cable and the operability of the final fiber optic cable product. All fibers shall be spliced at camera cabinets, hubs, and splice cabinets and shall have no more than 0.07 dB loss per splice based on the appropriate system operating wavelength.

The Contractor shall complete all required fiber optic splices prior to final testing and acceptance. As part of the final testing and acceptance, submit optical time domain reflectometer (OTDR) readings in both hardcopy and electronic formats (such that it can be examined using the manufacturer's OTDR software) to the Engineer for review. Testing shall be conducted on all single mode fibers at 1310 nm and 1550 nm from the beginning and end of entire run; which includes patch panels and splicing. Powermeter attenuation testing should be performed at dual wavelength, bi-directionally.

All necessary equipment and plug-in, fiber optic pigtails, fittings, splice tags, enclosures, and work to complete an operational system shall be furnished and installed by the Contractor, unless otherwise indicated, at no added cost, and will be considered included in the cost of the contract items in this Section.

(F) Interconnect Fabric Subduct.

(1) Description Raceway Innerduct shall be installed in all new and existing raceways containing 6 and 72 strand fiber optic cables. A non-metallic flexible textile raceway known as interconnect fabric subduct, which is placed within PVC conduits. The interconnect fabric subduct allows for future communication upgrades, including transitioning from multipair copper cables to fiber optic media. To further that effort and achieve maximum conduit utilization, all new and empty existing conduits containing the interconnect/fiber optic cables shall contain an interconnect fabric subduct. The interconnect fabric subduct shall consist of flexible, textile material, sometimes referred to as “fabric duct”.

(2) Fabric The interconnect fabric subduct shall consist of the following:

(a) Standard Outdoor Textile subduct: Micro (33mm), 2-inch, 3-inch and 4-inch multi-cell polyester/nylon textile subduct containing 1,250 lb polyester flat woven pull tape.

Number of cells shall be the maximum number allowed for the conduit size.

(b) Conduit Plugs: Compression-type conduit plugs with locking nuts for sealing and securing one or more textile subducts within a conduit.

(c) C. Pull Tape: The subduct pull tape shall be constructed of synthetic fiber, printed with accurate sequential footage marks and color-coded.

(d) D. Duct Water Seal: products suitable for closing underground and entrance conduit openings where subduct is installed, to prevent entry of gases, liquids, or rodents into the structure.

(3) Installation The contractor shall protect the interconnect fabric subduct from the effects of moisture, UV exposure, corrosion and physical damage during installation. The contractor shall install the interconnect fabric subduct prior to installing the new interconnect and fiber optic cables.

The contractor shall provide interconnect fabric subduct in conduits using continuous unspliced lengths of interconnect fabric subduct between pull boxes, and/or termination points as indicated on the drawings.

The contractor shall make a 2" incision, approximately 18" from the end of interconnect fabric subduct. Pull out and cut off approximately 2 feet of pull-tape. Thus, allowing the pull tape ends to retract back into the cells.

Using approximately 6 feet of pull tape, tie a non-slip knot to the incision. Then tie 3 to 6 half-hitch knots down to the end of interconnect fabric subduct. Apply black vinyl tape over all knots and the end of interconnect fabric subduct. Using a Bow Line knot tie a swivel to the end of 3 feet pull

tape. For multi-pack installations one swivel is sufficient but stagger each interconnect fabric subduct.

Using a Bow Line knot, attach the pull rope located in the rigid conduit to the other end of the swivel. Install interconnect fabric subduct - ensuring that no twist is introduced to the interconnect fabric subduct.

Provide suitable interconnect fabric subduct slack in the pull boxes, and at turns to ensure there is no kinking or binding of the product.

At locations where interconnect fabric subduct will be continuous through a pullbox, allow sufficient slack so that the interconnect fabric subduct may be secured to the side of the pullbox maintaining the minimum bending radius.

At pullboxes serving as the junction location, pull the exposed end of the interconnect fabric subduct to the far end of the pullbox, install termination bag, and secure to the pullbox.

Seal all conduit and interconnect fabric subduct entering the pullboxes to prevent entrance into the pullboxes of gases, liquids or rodents.

627.03 EXISTING TRAFFIC SIGNAL CONTROLLER FIBER INTERFACE. At the Kalanianaole Highway/Kailua Road (Waimanalo Junction) intersection, the Contractor shall install a signal controller fiber interface within the existing traffic signal cabinet. The signal controller fiber interface shall include, but not limited to, a hardened ethernet switch, (see Section 627.02(C)) and a fiber splice enclosure which shall be able to fit in the spare space within the existing traffic signal cabinet. The traffic signal controller fiber interface shall allow the existing traffic signal controller to be interconnected with the two new signals.

627.04 CCTV TRAFFIC CAMERA ASSEMBLY. The camera assemblies are for traffic monitoring and traffic signal operations at the H-3 Traffic Operations Center (TOC) and/or Joint Traffic Management Center (JTMC). The CCTV cameras shall be directly connected to the cellular modems via an outdoor rated CAT 6 Ethernet cable. Contractor shall supply two CAT 6 cables between the modem and the CCTV cameras; one as a spare. It shall be an integrated camera unit consisting of a receiver, pan & tilt, housing, and cables built as a single assembly having 360 degree of continuous pan rotation. The camera shall have full HD 1080p 30 image resolution with integral 30x optical zoom lens. The positioning device shall include true day-night with variable speed pan and tilt technology with a minimum sensitivity of 0.0 lux @30 IRE. The camera shall provide up to 5 independent output video streams configurable for H.264 and MJPEG and analog video output, electronic image stabilization, and wide dynamic range. Camera assembly shall be furnished with components assembled, complete, and a ready-to-install system. Camera system shall meet FHWA's Buy America requirement.

(A) CCTV Camera

(1) CAMERA IMAGING

(a) Image Sensor: Progressive Scan CMOS
(b) Image Size: Diagonal 6mm
(c) Image Resolution: 1920 horizontal x 1080 vertical pixels
(d) Picture Elements (total) 1920 (H) x 1440 (V)
(e) Sensitivity: Scene Illumination; F1.4 @ 50% Video
    (1) 0.4 Lux (0.04 fc) @ 1/30 shutter, color mode
    (2) 0.0025 Lux (0.00025 fc) @ ½ shutter, mono mode
(f) Day/Night Operation: Adjustable (Auto, Color and Mono Modes)
(g) Optical Zoom Range: 30x, minimum
(h) Digital Zoom: 1x to 12x in 1x increments. The camera system shall support digital zoom limit setting
(i) Auto Focus: Selectable Auto/Manual; Minimum Scene Illumination for Reliable Auto Focus shall be no more than 50% video output.
(j) Auto Iris; Selectable auto/manual; Iris shall automatically adjust to compensate for changes in scene illumination to maintain constant video level output.
(k) Electronic Image Stabilization: Shall support On/Off mode
(l) Backlight Compensation: Shall support On/Off mode
(m) White Balance: Shall support Auto/Manual mode
(n) IR Correction: Shall support On/Off mode
(o) Sharpness: Shall provide user control of increases or decreases in image sharpness through 4 user selectable settings of soft, normal, sharp and sharpest

(2) H.264/MJPEG ENCODING ENGINE

(a) The video encoding shall allow the following possible video stream configurations:
    (1) H.264 Streams: (1) 1920x1080 @ 30fps, (1) 1280x720 @ 30 fps, 720x480 @ 15 fps
    (2) MJPEG Streams: 1920x1080 @ 10 fps, 1280x720 @ 20 fps
    (3) Analog Video Output: (1).
(b) Each video encoder channel shall provide the following configurable properties;
    (1) Codec.
    (2) Video frame shall be adjustable from 30 fps to 1 fps in increments of 1 fps.
    (3) Bite Rate control
(c) Video Stream Protocols; the camera system shall support the following protocols:
    (1) RTSP/RTP; The RTSP communication shall occur over a TCP socket. RTP video packets shall be sent over UDP.
    (2) RTSP Interleaved; RTSP commands and the RTP video packets shall be transmitted over a single TCP connection.

(3) HTTP tunneling; this mode shall use two separate TCP connections for sending and the other for received data from the client over port 80

(4) RTP multicast; this mode shall send RTP video packets to the user assigned multicast destination. This mode shall be required to be enabled or disabled.

(d) Network Protocol Layers: TCP, UDP, IPv4, IGMP, ICMP, DNS, DHCP, RTP, RTSP, NTP, HTTP, HTTPS, ARP, and ONVIF Profile S as a minimum.

(3) PAN AND TILT DRIVE UNIT SPECIFICATIONS

(a) Pan Movement; 360 degrees continuous rotation.
(b) Pan Speed; Variable from 0.05 to 45 degrees/second .
(c) Pan Repeatability; +/- 0.05 degree precision.
(d) Pan Preset Speed; 180 degree movement 2.5 < Seconds.
(e) Tilt Movement; Minimum of +90 to –90 degrees.
(f) Tilt Speed; Variable from 0.05 to 45 degrees/second.
(g) Tilt Repeatability; +/- 0.05 degree precision.
(h) Tilt Preset Speed; 180 degree movement < 2.5 Seconds.
(i) Proportional Zoom Control; Positioning control shall allow variable pan/tilt. speeds based on zoom position.
(j) Home Position: Shall be a user defined point.
(k) The Inter Process Communication System (IPCS) shall not have any exposed wiring from the positioning drive to the camera head enclosure.

(4) Electrical

Operating Voltage; The camera system shall provide flexible power input as required by the installation to include:

(a) Power over Ethernet, LTPoE++.
(b) Power injector

(5) Certifications/Ratings

(a) FCC Class A.
(b) International Electrotechnical Commission (IEC) / European Conformity (CE) cover product emission and immunity requirements (CISPR) 22 24.
(c) Restriction of Certain Hazardous Substances (RoHs)

(6) Enclosure

(a) Aluminum

(b) Dust-tight
(c) Waterproof & Pressurized

(7) Controls

Shall be controllable or interoperable by a Pelco analog switcher and control System using Pelco P protocol IP protocol shall be controllable by either Pelco P or Onvif protocol.

(8) Adapter Plate

A Stainless Steel, ¼" minimum, adapter plate shall be provided to integrate the supplied camera mounting to the existing mounting.

(9) Warranty

Manufacturer's warranty period shall be three (3) years minimum.

Mount

- Outdoor type
- Aluminum or stainless steel components
- Mount cantilever style on pole shafts using straps, or on horizontal mast arm shaft
- Constructed of marine grade stainless steel
- Has cable feed-through
- Supports up to 100 lbs
- Painted White
- Wall to pole mount adapter, as required
- Provide ability to level and adjust camera to plumb

(B) Cellular Modem

Procure, configure, and install environmentally hardened cellular modems and all required accessories with static IP addresses. Cellular modems shall be capable of accessing the FirstNet Band 14 as well as the 5G cellular network when available. The modem shall provide communication between the CCTV cameras and HDOT's CCTV systems up at the H-3 TOC. A modem specifically designated for CCTV communication only will be installed for each new CCTV camera. One modem will be installed at the Uluoa St intersection and another will be installed at the Ulumanu Dr intersection.

All cellular modems shall include or comply with the following:
(1) Two Ethernet LAN/WAN ports, minimum.
(2) USB 2.0 or better port.
(3) Two cellular antenna connectors with antennas and required accessories.
(4) GPS antenna connector with antenna and required accessories.
(5) Operating temperature range: -22ºF to 158ºF.
(6) Storage temperature range: -40ºF to 185ºF.

(7) Operating and storage humidity (non-condensing) ranges: 5% to 95%.
(8) Ingress protection compliant with IP64.
(9) If wifi capable, the modem shall be able to disable the wifi capabilities.
(10) Networking.
- **(a)** IPsec Tunnel — up to ten concurrent sessions
- **(b)** IKEv2 support (includes MOBIKE)
- **(c)** Access Control Lists
- **(d)** NAT
- **(e)** NAT-less Routing

(11) Security.
- **(a)** 802.1x authentication for Ethernet
- **(b)** Certificate support
- **(c)** Application-level gateways
- **(d)** MAC Address Filtering

Provide FirstNet cellular modem data service, including activation and monthly data service to provide 24/7 video to the H-3 TOC. When the Engineer has determined the project has reached completion, the Contractor shall coordinate with the Engineer to transfer the cellular service to HDOT.

627.05 MEASUREMENT. Traffic Signal Control System and Existing Traffic Signal Controller Fiber Interface will be paid on a lump sum basis. Measurement for payment will not apply.

The Engineer will measure CCTV Traffic Camera Assembly per each, in accordance with the contract documents, complete in place.

627.06 PAYMENT. The Engineer will pay for the accepted Traffic Signal Control System, complete in place, on a lump sum basis. The price shall include furnishing and installing server licenses; CCTV cabinets, conduits and foundations; modems; switches with SFP modules; fiber optic cables and splice trays; cables; splicing; OTDR testing and furnishing results; furnishing and installing any additional items and all tools, labor, equipment, and incidentals necessary to complete the work.

The Engineer will pay for the accepted Existing Traffic Signal Controller Fiber Interface, complete in place, on a lump sum basis. The price shall include furnishing and installing the items, and all tools, labor, equipment, and incidentals necessary to complete the work.

The Engineer will pay for accepted quantities of the CCTV Traffic Camera Assembly at the contract unit price per each completed in place. The price shall include CCTV cameras; modems; cables; splicing; making the connections; testing; providing turn-on service; furnishing and installing any additional items, and all tools, labor, equipment, and incidentals necessary to complete the work.

The Engineer will pay for the FirstNet cellular modem data service activation and the three cellular modem data service monthly costs. These items will be paid for on a force account basis in accordance with Subsection 109.6 – Force Account Provisions and Compensation.

The Engineer will consider full compensation for additional materials and labor not specifically shown or called for that are necessary to complete the work incidental to the various contract items in the proposal. The Engineer will pay for each of the following pay items when included in the proposal schedule:

Pay Item	**Pay Unit**
Traffic Signal Control System	Lump Sum
Existing Traffic Signal Controller Fiber Interface	Lump Sum
CCTV Traffic Camera Assembly	Each
Cellular Modem Data Service	Force Account

END OF SECTION 627

SECTION 647 – FIBER OPTIC CABLE

647.01 Description. This section applies to the installation of fiber optic cable in accordance with the contract documents.

Due to the intricate nature of HDOT's CCTV and fiber optic cable system, the Bidder's fiber optic cable installer shall have previous experience working with the City and County of Honolulu or HDOT's existing CCTV system for at least three (3) previous projects. Written documentation confirming previous experience working on either CCTV systems or fiber systems shall be submitted to the Project Manager before January 25, 2024, at 3:30 PM (within five (5) working days after bid opening).

The Contractor and Installer shall be responsible for testing all fiber optic cables to provide a documented optical budget loss analysis for each link to and from a hub station. Only the Installer shall perform this work.

The Contractor and Installer shall be responsible for all hookup, assignments, dedication, testing, matching, and splicing of the fiber optic cables, unless otherwise indicated. Only the Installer shall perform this work.

All fiber optic splice points shall be spliced color-for-color whenever matching pairs are available. The Contractor and Installer shall be fully responsible for all splices, budget loss, attenuators, appropriate fiber hardware, accessories, and pigtail connections for a fully operational system. Only the Installer shall perform this work.

647.02 Material. The fiber optic cables will consist of single-mode fibers. Cables will be installed in existing conduits and overhead in the gain area reserved for the traffic signal systems under joint pole agreements. The Installer shall furnish and install fiber optic cable suitable, and meeting standards, for underground and aerial lashing installations. The fiber optic cables shall meet the requirements of the United States Department of Agriculture (USDA) Rural Utilities Service (RUS) 7 CFR 1755.900 and shall be included in the most current 'USDA List Of Acceptable Materials For Use On Telecommunications Systems Of RUS Borrowers'.

(A) Single-mode Fiber. The single-mode fiber utilized in the cable specified herein shall be dispersion unshifted and conform to the following specifications:

Cladding Diameter	125 µm ± 1.0 µm
Core-to-Cladding Offset	Less than 0.6 µm
Cladding Non-Circularity	Less than 1.0%
Coating Diameter	245 µm ± 10 µm
Colored Fiber Diameter	Nominal 250 µm
Attenuation Uniformity	Attenuation Uniformity No point discontinuity greater than 0.10 dB at either 1310 nm or 1550 nm
Attenuation at the Water Peak	The attenuation at 1383 ± 3 nm shall not exceed 2.1 dB/kM
Cutoff Wavelength	The cabled fiber cutoff wavelength shall be less than 1260 nm
Mode-Field Diameter 9.30 ± 0.50 µm at 1310 nm	9.30 ± 0.50 µm at 1310 nm 10.50 ± 1.00 µm at 1550 nm
Zero Dispersion Wavelength	Less than 1301.5 nm
Zero Dispersion Slope	Less than 0.092 ps/(nm2 kM)
Fiber Polarization Mode Dispersion	Less than 0.5ps/kM

The coating shall be a dual layered, UV cured acrylate applied by the fiber manufacturer. The coating shall be mechanically strippable.

(B) Fiber Specification Parameters.

Required Fiber Grade	Maximum individual fiber attenuation
Single Mode	The maximum dispersion shall be less than or equal to 3.2 ps/nmkM from 1285 to 1330 nm and shall be less than 18 ps/nm-kM at 1550 nm

The fiber manufacturer shall proof test all optical fibers to a minimum load of 0.7 GN/m2 (100 kpsi).

(C) Specifications for Outdoor Cable Construction. Optical fibers shall be inside a loose buffer tube in groups of 12. Optical fibers shall be mechanically strippable. Do not use gel filled. The fiber shall be colored with ultraviolet (UV) curable links. Each fiber shall be distinguishable by means of color coding in accordance with TIA/EIA-598- A, “Optical Fiber Cable Color Coding.”

Loose buffer tubes shall also be colored with distinct and recognizable colors in accordance with TIA/EIA-598-A, “Optical Fiber Cable Color Coding” and shall be marked Single mode. Fillers may be included in the cable core to lend symmetry to the cable cross section where needed. Cable construction shall utilize dielectric strength members.

Cable jacket shall be a PVC material that is fungus, water and UV resistant. The jacket shall be marked with the manufacturer's name, sequential meter or foot marking, month and year of manufacture,.

The maximum pulling tension shall be 2700 N (608 Ibft) during installation (short term) and 890 N (200 Ibft) long term installed.

The shipping, storage, and operating temperature range of the cable shall be -40C to +70C.

(D) Quality Assurance Provision. All cabled optical fibers > 1000 meters in length shall be 100% attenuation tested. Attenuation of each fiber shall be provided with each cable reel.

The cable manufacturer shall be ISO 9001 registered.

(E) Packaging. Top and bottom ends of the cable shall be available for testing.

Both ends of the cable shall be sealed to prevent the ingress of moisture. Each reel shall have a weather resistant reel tag attached identifying the reel and cable.

The reel tag shall include the following information:

Cable number	Gross Weight
Shipped length in meters	Job order number
Product Number	Date cable tested

A cable data sheet shall accompany each cable. Cable data shall include manufacturer number, billable length, bandwidth specs and measured attenuation of each fiber.

647.03 Construction Requirements.

(A) Drawings. The Contractor shall submit a fiber optic cable-pulling drawings for review and acceptance by the Engineer prior to beginning fiber optic cable installation. Do not install fiber optic cable without the Engineer's acceptance of the pulling drawings. The fiber optic cable pulling drawings shall include:

(1) Location of start and end of pulls,

(2) Location of cable reel trailers during installation,

(3) Location of any "figure-eight" of fiber optic cable, and

(4) Location of staged equipment.

Upon completion of the work, submit an ‘As Built’ in accordance with Subsection 108.13(B) – Pre-Final Inspection and Section 648 – Field Posted Drawings including in detail the following:

(1) Location and attenuation of every event along the installed fiber optic cable,

(2) Index of refraction of installed fiber,

(3) Fiber optic cable index of refraction, and

(4) Sequential fiber optic cable markings at each pullbox, cabinet, and splice closure.

(B) Excavation and Backfill. Excavation and backfill shall conform to Section 206A - Excavation and Backfill for Miscellaneous Facilities.

The Contractor and Installer shall be responsible for the repair of any damage to pavements, sidewalks and other improvements. Place the material from the excavation to prevent damage and obstruction to vehicular and pedestrian traffic and interference with surface drainage.

(C) Fiber Optic Cable. The Installer shall install the new fiber optic cable overhead on existing power poles and underground in conduits as shown in the contract documents. The Contractor and Installer will be responsible for all work and equipment required to install the messenger cable (when there is not already existing messenger cable) on existing joint poles for the overhead portion of the fiber installation. For the underground portion, the Installer will be responsible for furnishing and pulling the new fiber in ductlines using a breakaway swivel to prevent exceeding the tensile load during installation.

All fiber optic splices shall be fusion splices. Do not use mechanical splices. Fiber optic splice locations are permitted only at splice points where splice cabinets are shown on the plans. Fiber optic fibers shall be spliced in every splice cabinet location, and it is the responsibility of the Contractor and Installer to maintain a continuous run throughout the system. The Installer shall leave a minimum of 20-feet of cable service loops at every cabinet or splice location, or utilize aerial cable snowshoes for overhead storage.

Provide documented historical cable pulling data indicating tensile forces exerted on the cable during the installation. Any tension measurements, which exceed the manufacturer's recommendation, will be considered means for the cable rejection. The Contractor and Installer shall be fully responsible for the quality and integrity of the installed cable and the operability of the final fiber optic cable product.

All fibers shall be spliced at camera cabinets, hubs, and splice cabinets and shall have no more than 0.07 dB loss per splice based on the appropriate system operating wavelength.

The Installer shall complete all required fiber optic splices prior to final testing and acceptance. As part of the final testing and acceptance, submit optical time domain reflectometer (OTDR) readings in both hardcopy and electronic formats (such that it can be examined using the manufacturer's OTDR software) to the Engineer for review. Testing shall be conducted on all single mode fibers at 1310nm and 1550nm. Power meter attenuation testing should be performed at dual wavelength, bi-directionally.

All necessary equipment and plug-in, fiber optic pigtails, fittings, enclosures, and work to complete an operational system shall be furnished and installed by the Installer, unless otherwise indicated, at no increase in contract price or contract time.

(D) Services Provided By The County. The City and County of Honolulu, Department of Transportation Services (DTS) will be responsible for all splices and connections in DTS pullboxes and DTS cabinet locations where indicated in the contract documents.

The Contractor and Installer shall be responsible for the following:

(1) Arrange for phases of work with DTS or as specified by the Engineer.

(2) Give at least seven calendar days of advance notice to DTS when phases of the work require its services.

(E) Restoring Pavements and Other Improvements. Restore the existing pavements and other improvements such as driveways, sidewalks, curbs and gutters disturbed by excavation to their original condition in accordance with the contract documents. Materials used for restoration work shall be equal to or better in quality than the materials the Contractor will replace, and matching in thickness, texture, and color whenever applicable. The grades of the restored surfaces shall conform to the existing grades.

(F) Warranty. Materials and equipment installed for permanent construction shall be new. The contract contemplates the use of first-class material and equipment throughout the performance of the contract.

Secure from the manufacturer(s), a warranty or warranties guaranteeing equipment from defects in materials, design and workmanship for not less than 12 months from the date of acceptance.

When requiring adjustments or repairs during the warranty period, adjust or repair the existing unit within 24 hours from the time of notification.

When requiring repairs during the warranty period that cannot be repaired within the initial 24 hours, replace the existing unit with an accepted temporary operational replacement unit within 24 hours from the time of notification. The accepted temporary operational replacement shall remain in operation satisfactorily until the Installer can correct the problem in a manner acceptable to the Engineer or install a new unit. However, installation of the new, identical non-defective unit shall be completed within 30 days from the time of notification.

647.04 Method of Measurement. Fiber optic cables will be paid on a lump sum basis. Measurement for payment will not apply.

647.05 Basis of Payment. The Engineer will pay for the accepted fiber optic cables on a contract lump sum basis. Payment will be full compensation for the work prescribed in this section and the contract documents.

The Engineer will pay for the following pay item when included in the proposal schedule:

Pay Item	**Pay Unit**
Fiber Optic Cable	Lump Sum

END OF SECTION 647

PROPOSAL SCHEDULE					
ITEM NO.	**ITEM**	**APPROX. QUANTITY**	**UNIT**	**UNIT PRICE**	**AMOUNT**
201.0400	Clearing and Grubbing	L.S.	L.S.	L.S.	$_____
202.0420	Removal of Existing Traffic Signs	L.S.	L.S.	L.S.	$_____
202.0050	Removal of Existing Curb and Gutter	L.S.	L.S.	L.S.	$_____
202.0030	Removal of Existing Sidewalk	L.S.	L.S.	L.S.	$_____
202.0430	Removal of Existing Grassed Median	L.S.	L.S.	L.S.	$_____
202.0440	Removal of Existing Pavement	L.S.	L.S.	L.S.	$_____
209.0100	Installation, Maintenance, Monitoring, and Removal of BMP	L.S.	L.S.	L.S.	$_____
209.0200	Additional Water Pollution, Dust, and Erosion Control	F.A.	F.A.	F.A.	$ 50,000.00
212.0100	Archaeological Monitoring	F.A.	F.A.	F.A.	$ 100,000.00
301.0400	Hot Mix Asphalt Base Course	L.S.	L.S.	L.S.	$_____
401.0400	Asphalt Concrete Pavement Mix No. IV	135	S.Y.	$ _____	$_____
415.0400	Cold Planing of Existing Pavement	370	S.Y.	$ _____	$_____
607.0400	Green Vinyl Coated Chain Link Fence	60	L.F.	$ _____	$_____
617.0400	Imported Planting Soil	L.S.	L.S.	L.S.	$_____
619.0400	Arborist Services	F.A.	F.A.	F.A.	$ 50,000.00

PROPOSAL SCHEDULE					
ITEM NO.	**ITEM**	**APPROX. QUANTITY**	**UNIT**	**UNIT PRICE**	**AMOUNT**
621.0001	Street Light Sawcut, Trench, Excavation, and Backfill	400	L.F.	$ _____	$_____
621.0002	HECO Sawcut, Trench, Excavation and Backfill	150	L.F.	$ _____	$_____
621.0003	HECO Metering Equipment	2	Each	$ _____	$_____
621.0004	1-3” HECO Concrete Encased Conduit	100	L.F.	$ _____	$_____
621.0005	1-2” Secondary Concrete Encased Conduit	50	L.F.	$ _____	$_____
621.0006	1-1.5” Street Light Concrete Encased Conduit	400	L.F.	$ _____	$_____
621.0007	2’ x 4’ HECO Handhole	2	Each	$ _____	$_____
621.0008	State Street Light Standard, Base, and Single Arm and 120W Luminaire	8	Each	$ _____	$_____
621.0009	State Street Light Standard, Base, and Dual Arm and 120W Luminaire	1	Each	$ _____	$_____
621.0010	Street Light Conductors	400	L.F.	$ _____	$_____
621.0011	Secondary Cables 2#8, #8 Gnd XHHW CU Cable	50	L.F.	$ _____	$_____
621.0012	Service Cables 3#2, #8 Gnd XHHW CU Cable	10	L.F.	$ _____	$_____
621.0013	Hawaiian Electric Co. Charges	F.A.	F.A.	F.A.	$ 20,000.00

PROPOSAL SCHEDULE					
ITEM NO.	**ITEM**	**APPROX. QUANTITY**	**UNIT**	**UNIT PRICE**	**AMOUNT**
623.1000	Furnish and Install Controller Assembly with Firmware (Model 2070 Traffic Signal Controller Unit, Type 332A Cabinet and Auxiliary Equipment)	2	Each	$ _____	$_____
623.2001	Type I Traffic Signal Standard, H=8 Ft	2	Each	$ _____	$_____
623.2002	Type I Traffic Signal Standard, H=10 Ft	12	Each	$ _____	$_____
623.2003	Type II Traffic Signal Standard With 30-Foot Mast Arm	4	Each	$ _____	$_____
623.2011	Foundation For Type I Signal Standard	14	Each	$ _____	$_____
623.2012	Foundation For Type II Signal Standard	4	Each	$ _____	$_____
623.2013	Foundation For Controller Cabinet	2	Each	$ _____	$_____
623.3001	Traffic Signal Assembly, (1-Way, 12-Inch, 1-3 Section Vertical With Type Tp-1w Mounting)	9	Each	$ _____	$_____
623.3002	Traffic Signal Assembly, (1-Way, 12-Inch, 1-3 Section Vertical With Type B-1w Mounting)	3	Each	$ _____	$_____
623.3003	Traffic Signal Assembly, (1-Way, 12-Inch, 1-3 Section Vertical With Type Ma-1w(1) Mounting)	8	Each	$ _____	$_____
623.3004	Traffic Signal Assembly, (1-Way, 12-Inch, 1-3 Section Vertical, Programmable Visibility Head With Type With Type Tp-1w Mounting)	2	Each	$ _____	$_____

PROPOSAL SCHEDULE					
ITEM NO.	**ITEM**	**APPROX. QUANTITY**	**UNIT**	**UNIT PRICE**	**AMOUNT**
623.3005	Traffic Signal Assembly, (1-Way, 12-Inch, 1-3 Section Vertical, Programmable Visibility Head With Type Ma-1w(1) Mounting)	1	Each	$ _____	$_____
623.3006	Traffic Signal Assembly, (2-Way, 12-Inch, 1-3 Section Vertical with Type TP-2w Mounting)	1	Each	$ _____	$_____
623.3011	Evp Optical Receiver With Mast Arm Mounting	4	Each	$ _____	$_____
623.3012	Evp Optical Receiver With Top Of Pole Mounting	3	Each	$ _____	$_____
623.3021	Pedestrian Signal Assembly, (1-Way, 12-Inch, One Vertical With Type B-1w Mounting)	2	Each	$ _____	$_____
623.3022	Pedestrian Signal Assembly, (1-Way, 12-Inch, One Vertical With Type C-1w Mounting)	7	Each	$ _____	$_____
623.3023	Pedestrian Signal Assembly, (2-Way, 12-Inch, One Vertical With Type C-2w Mounting)	1	Each	$ _____	$_____
623.3024	Pedestrian Signal Assembly, (1-Way, 12-Inch, One Vertical With Type Tp-1w Mounting)	1	Each	$ _____	$_____
623.3025	Pedestrian Signal Assembly, (2-Way, 12-Inch, One Vertical With Type Tp-2w Mounting)	1	Each	$ _____	$_____
623.4001	Pedestrian Push Button With Instruction Sign	13	Each	$ _____	$_____
623.5001	Traffic Signal Ductline, One 2-Inch Conduit, Sch 40 Pvc, Concrete Encased	50	L.F.	$ _____	$_____

PROPOSAL SCHEDULE					
ITEM NO.	**ITEM**	**APPROX. QUANTITY**	**UNIT**	**UNIT PRICE**	**AMOUNT**
623.5002	Traffic Signal Ductline, Two 2-Inch Conduit, Sch 40 Pvc, Concrete Encased	2,600	L.F.	$ _____	$_____
623.5003	Traffic Signal Ductline, Four 2-Inch Conduit, Sch 40 Pvc, Concrete Encased	400	L.F.	$ _____	$_____
623.5004	Traffic Signal Ductline, Five 2-Inch Conduit, Sch 40 Pvc, Concrete Encased	250	L.F.	$ _____	$_____
623.5005	Traffic Signal Ductline, Six 2-Inch Conduit, Sch 40 Pvc, Concrete Encased	200	L.F.	$ _____	$_____
623.5006	Traffic Signal Ductline, Seven 2-Inch Conduit, Sch 40 Pvc, Concrete Encased	125	L.F.	$ _____	$_____
623.5007	Traffic Signal Ductline, Eight 2-Inch Conduit, Sch 40 Pvc, Concrete Encased	125	L.F.	$ _____	$_____
623.5008	Traffic Signal Ductline, Four 2-Inch Conduit And Two 3-Inch Conduit, Sch 40 Pvc, Concrete Encased	10	L.F.	$ _____	$_____
623.5009	Traffic Signal Ductline, Four 2-Inch Conduit And Three 3-Inch Conduit, Sch 40 Pvc, Concrete Encased	10	L.F.	$ _____	$_____
623.6001	Type A Pullbox	3	Each	$ _____	$_____
623.6002	Type B Pullbox	31	Each	$ _____	$_____
623.6003	Type C Pullbox	2	Each	$ _____	$_____

PROPOSAL SCHEDULE					
ITEM NO.	**ITEM**	**APPROX. QUANTITY**	**UNIT**	**UNIT PRICE**	**AMOUNT**
623.6004	Replace Type B Pullbox	2	Each	$ _____	$_____
623.7001	No. 14, 2-Conductor Loop Detector Lead-In Cable	8,600	L.F.	$ _____	$_____
623.7002	No. 14, 26-Conductor Traffic Control Cable	2,000	L.F.	$ _____	$_____
623.7003	No. 8, 3-Conductor Power Cable	100	L.F.	$ _____	$_____
623.7004	EVP Cable	1,300	L.F.	$ _____	$_____
623.8001	Loop Detector Sensing Unit (6 Ft X 6 Ft) Two Loops	16	Each	$ _____	$_____
623.8002	Loop Detector Sensing Unit (6 Ft X 6 Ft) Four Loops	6	Each	$ _____	$_____
623.8003	Loop Detector Sensing Unit (6 Ft X 6 Ft) Six Loops	3	Each	$ _____	$_____
627.1000	Traffic Signal Control System	L.S.	L.S.	L.S.	$_____
627.1001	Existing Traffic Signal Control Fiber Interface	L.S.	L.S.	L.S.	$_____
627.1002	CCTV Traffic Camera Assembly	2	Each	$ _____	$_____
627.1003	Cellular Modem Data Service	F.A.	F.A.	F.A.	$ 4,000.00
629.0401	4-inch Pavement Striping (Tape, Type I or Thermoplastic)	300	L.F.	$ _____	$_____
629.0402	4-inch Pavement Striping (Tape, Type III or Thermoplastic)	1,350	L.F.	$ _____	$_____

PROPOSAL SCHEDULE					
ITEM NO.	**ITEM**	**APPROX. QUANTITY**	**UNIT**	**UNIT PRICE**	**AMOUNT**
629.0403	6-inch Pavement Striping (Tape, Type II or Thermoplastic)	3,100	L.F.	$ _____	$_____
629.0404	6-inch Pavement Striping (Tape, Type III or Thermoplastic)	440	L.F.	$ _____	$_____
629.0405	8-inch Pavement Striping (Tape, Type I or Thermoplastic)	340	L.F.	$ _____	$_____
629.0406	12-inch Pavement Striping (Tape, Type III or Thermoplastic)	245	L.F.	$ _____	$_____
629.0407	Crosswalk Marking (Tape, Type III or Thermoplastic)	24	Lane	$ _____	$_____
629.0408	Pavement Arrow (Tape, Type III or Thermoplastic)	20	Each	$ _____	$_____
629.0409	Pavement Symbol (Paint, Tape, Type I, or Thermoplastic)	4	Each	$ _____	$_____
629.0410	Type “C” Pavement Marker	86	Each	$ _____	$_____
629.0411	Type “D” Pavement Marker	7	Each	$ _____	$_____
629.0412	Type “H” Pavement Marker	42	Each	$ _____	$_____
629.0413	Temporary Construction Zone Markings	L.S.	L.S.	L.S.	$_____
629.0414	Curb, 4-inch Markings (Paint) (250 L.F.)	L.S.	L.S.	L.S.	$_____
630.0400	Street Name Sign on Traffic Signal Mast Arm	4	Each	$ _____	$_____
631.0300	Regulatory Sign (10 Square Feet or Less) with post	6	Each	$ _____	$_____

PROPOSAL SCHEDULE					
ITEM NO.	**ITEM**	**APPROX. QUANTITY**	**UNIT**	**UNIT PRICE**	**AMOUNT**
631.0400	Warning Sign (10 Square Feet or Less) with post	1	Each	$ _____	$_____
632.0400	Type II Object Marker	7	Each	$ _____	$_____
634.0400	Portland Cement Concrete Sidewalk	615	S.Y.	$ _____	$_____
638.0401	Curb, Type 2D	30	L.F.	$ _____	$_____
638.0402	Curb and Gutter, Type 2DG	600	L.F.	$ _____	$_____
639.0401	Curb, Type 6	1,500	L.F.	$ _____	$_____
639.0402	Curb, 4-inch	250	L.F.	$ _____	$_____
641.0400	Hydro-mulch Seeding	L.S.	L.S.	L.S.	$_____
643.0100	Maintenance of Existing Landscape Areas	F.A.	F.A.	F.A.	$ 25,000.00
645.1000	Traffic Control	L.S.	L.S.	L.S.	$_____
645.2000	Additional Police Officers And/or Additional Control Device	F.A.	F.A.	F.A.	$ 50,000.00
648.0100	Field-Posted Drawings	L.S.	L.S.	L.S.	$_____
650.0401	Curb Ramp, Type “A”	7	Each	$ _____	$_____
650.0402	Curb Ramp, Type “C”	2	Each	$ _____	$_____

PROPOSAL SCHEDULE					
ITEM NO.	**ITEM**	**APPROX. QUANTITY**	**UNIT**	**UNIT PRICE**	**AMOUNT**
650.0403	Curb Ramp, Type Combination	2	Each	$ _____	$_____
650.0404	Detectable Warning Mat	13	Each	$ _____	$_____
699.1000	Mobilization (Not to Exceed 6 Percent of the Sum of All Items Excluding the Bid Price of this Item)	L.S.	L.S.	L.S.	$_____
Sum of All Items ……					$ _____
NOTE: Bidders must complete all unit prices and amounts. Failure to do so may be grounds for rejection of bid.					

INDEX TO DRAWINGS	
SHEET NO.	DESCRIPTION
1	TITLE SHEET
2	STANDARD PLANS SUMMARY
3-7	GENERAL NOTES & LEGEND
8-10	WATER POLLUTION & EROSION CONTROL NOTES
11-12	WATER POLLUTION & EROSION CONTROL PLAN
13	SURVEY CONTROL PLANS
14-17	DEMOLITION PLANS
18-22	ROADWAY IMPROVEMENT PLANS
23-25	TYPICAL CURB RAMP NOTES & DETAILS
26-33	CURB RAMP DETAILS
34	SIGNAGE & STRIPING NOTES
35-38	SIGNAGE & STRIPING PLANS
39	PAVING NOTES & DETAILS
40	PAVING PLAN
41-42	MISCELLANEOUS DETAILS
43	MAINTENANCE OF TRAFFIC PLAN
44	TRAFFIC CONTROL NOTES
45-60	TRAFFIC CONTROL PLANS
61-64	DETOUR PLANS
65-66	TRAFFIC SIGNAL FOUNDATION DETAILS
67-68	BORING LOG
69	TRAFFIC SIGNAL DESIGN NOTES
70-75	TRAFFIC SIGNAL DESIGN PLANS
76-77	TRAFFIC SIGNAL DETAILS
78-80	ELECTRICAL NOTES
81-82	ELECTRICAL PLANS
83-87	ELECTRICAL DETAILS

STATE OF HAWAII

DEPARTMENT OF TRANSPORTATION

HIGHWAYS DIVISION

OAHU, HAWAII

PLANS FOR

KAILUA ROAD
INTERSECTION IMPROVEMENTS

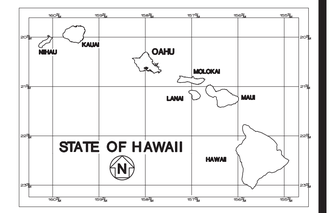
VICINITY OF ULUOA STREET AND ULUMANU DRIVE

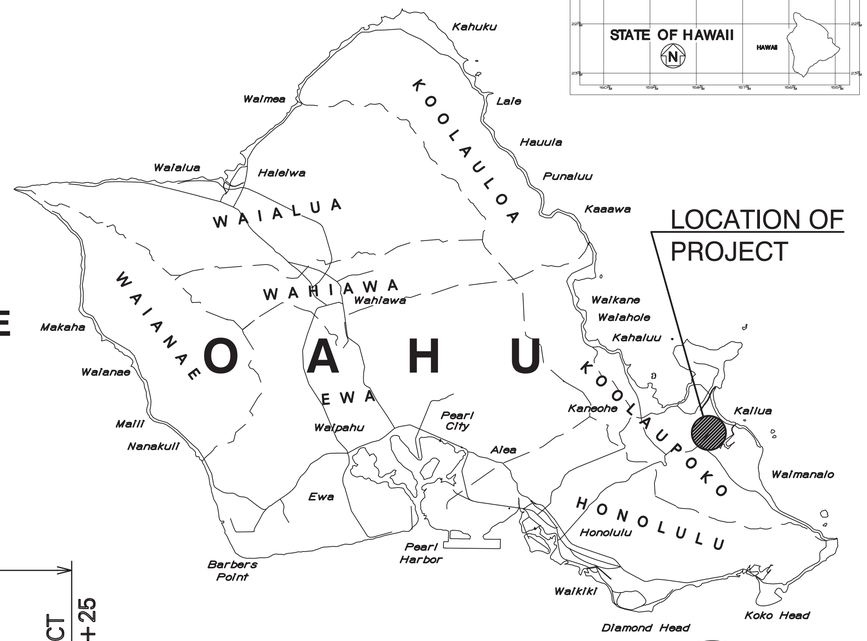
PROJECT NO. 61D-01-23

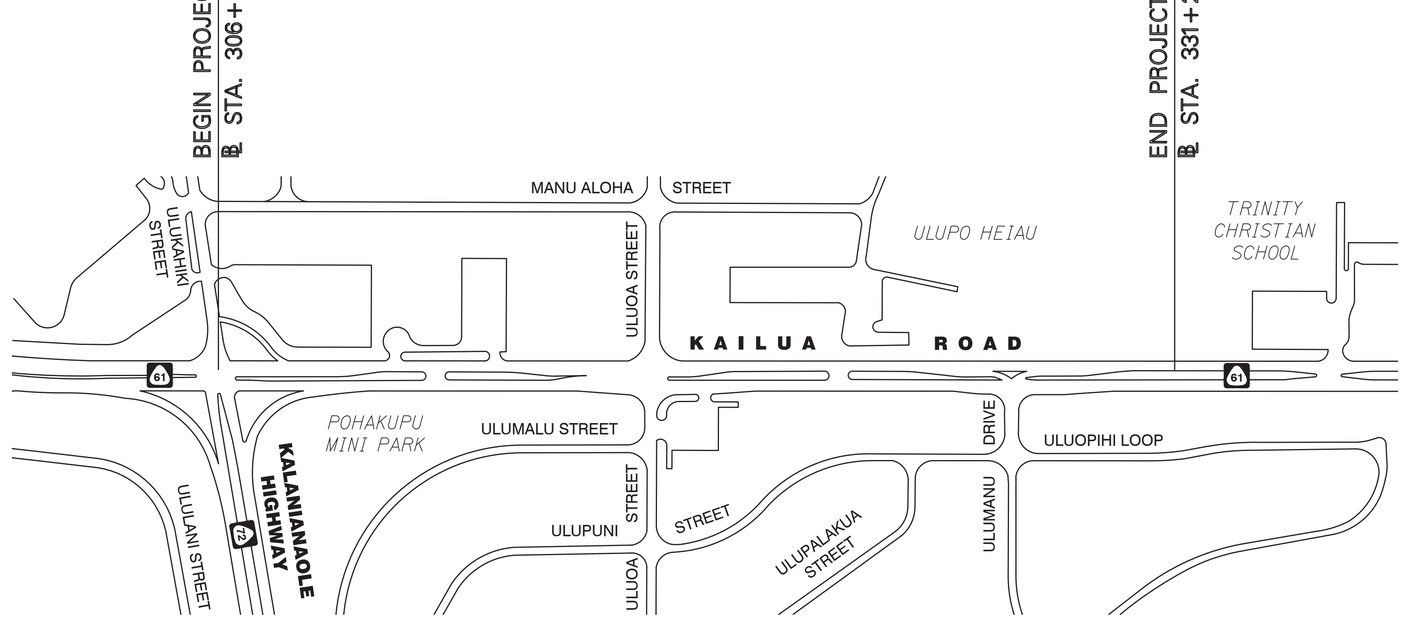
DISTRICT OF KOOLAUPOKO
ISLAND OF OAHU

FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	61D-01-23	2024	ADD. 1	87

2023/CP-179







MILE POST 9.49 TO MILE POST 9.96

LAYOUT PLAN

LENGTH OF PROJECT. . . . . .0.5 MILES

COMMUNITY PLANNING & ENGINEERING, INC.
DESIGNED BY

HWY-TO
MANAGED BY

(808) 692-7691
PHONE

DECEMBER 2023
DATE

ORIGINAL PLAN	SURVEY PLOTTED BY	DATE
	DRAWN BY	
NOTE BOOK	TRACED BY	
	DESIGNED BY	
	QUANTITIES BY	
N.	CHECKED BY	

DATE	REVISION
1/11/24	⚠1 Removed CC℄H Approval Block

DEPARTMENT OF TRANSPORTATION
STATE OF HAWAII
APPROVED:
Nov 3, 2023
DIR. OF TRANSPORTATION — DATE

ADD. 1

P:\Land Projects\DOT IDIO - 2022\Traffic Operations Task\PAO 2 Kailua TrafSig PSE\Drawings\01 Title Sheet.dwg, 1/4/2024 4:20:03 PM

FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	61D-01-23	2024	ADD. 4	87

CONSTRUCTION NOTES FOR WORK WITHIN CITY RIGHT-OF-WAY

1. All applicable construction work shall be done in accordance with the Standard Specifications for Public Works Construction, September 1986 and Standard Details for Public Works Construction, September 1984, as amended, of the Department of Public Works, City and County of Honolulu and the Counties of Kauai, Maui and Hawaii.

2. The underground pipes, cables or ductlines known to exist by the Engineer from his search of records are indicated on the plans. The Contractor shall verify the locations and depths of the facilities and exercise proper care in excavating in the area. Wherever connections of new utilities to existing utilities are shown on the plans, the Contractor shall expose the existing lines at the proposed connections to verify their locations and depths prior to excavation for the new lines.

3. No Contractor shall perform any construction operation so as to cause falling rocks, soil or debris in any form to fall, slide or flow into existing City drainage systems, adjoining properties, streets, or natural watercourses. Should such violations occur, the Contractor may be cited and the Contractor shall immediately make any remedial actions necessary.

4. The General Contractor/Developer/Owner of the project shall be responsible for conformance with applicable provisions of the Hawaii Administrative Rules, Title 11, Chapter 54, "Water Quality Standards," and Title 11, Chapter 55, "Water Pollution Control", as well as Chapter 18A of the Revised Ordinances of Honolulu, as amended. Best Management Practices shall be employed at all times during construction.

   The General Contractor/Developer/Owner of the project shall obtain National Pollutant Discharge Elimination System (NPDES) Permit coverage(s) for the following:

   A. Storm water discharges associated with construction activities that disturb one (1) acre or more, and

   B. Discharges of hydrotesting effluent, dewatering effluent, and well drilling effluent to State waters.

   In accordance with State law, all discharges related to project construction or operations are required to comply with State Water Quality Standards (Hawaii Administrative Rules, Chapter 11-54). Best Management Practices shall be used to minimize or prevent the discharge of sediment, debris, and other pollutants to State waters. Permit coverage is available from the Department of Health, Clean Water Branch at http://health.hawaii.gov/cwb. The Owner/Developer/Contractor is responsible for obtaining other Federal, State, or local authorizations as required by law.

5. For non-City projects, the Contractor shall notify the Civil Engineering Branch, D.P.P. at 768-8084 to arrange for inspectional services and submit two (2) sets of approved Construction Plans seven (7) days prior to commencement of construction work. For City projects, the Contractor shall coordinate inspectional services with the responsible City agency.

6. Confined Space

   For entry by City personnel, including inspectors, into a permit required confined space as defined in 29 CFR Part 1910.146(b), the Contractor shall be responsible for providing:

   A. All safety equipment required by the confined space regulations applicable to all parties other than the construction industry, to include, but not limited to, the following:

      (1) Full body harnesses for up to two personnel.
      (2) Lifeline and associated clips.
      (3) Ingress/egress and fall protection equipment.
      (4) Two-way radios (walkie-talkies) if out of line-of-sight.
      (5) Emergency (escape) respirator (10 minute duration).
      (6) Cellular telephone to call for emergency assistance.
      (7) Continuous gas detector (calibrated) to measure oxygen, hydrogen sulfide, carbon monoxide and flammables (capable of monitoring at a distance of least 20-feet away.)
      (8) Personal multi-gas detector to be carried by inspector.

   B. Continuous forced air ventilation adequate to provide safe entry conditions.

   C. One attendant/rescue personnel topside (two, if conditions warrant it).

8. Pursuant to Chapter 6E, HRS, in the event any artifacts or human remains are uncovered during construction operations, the Contractor shall immediately suspend work and notify the Honolulu Police Department, and the State Department of Land and Natural Resources-Historic Preservation Division (692-8015). In addition, for non-City projects, the Contractor shall inform the Civil Engineering Branch, Department of Planning and Permitting (768-8084); and for City projects, notify the responsible City agency.

9. For projects abutting State Highways' rights-of way, the Owner or his authorized representative shall notify the State Department of Transportation, Highways Division, Oahu District, Drainage Discharge Unit at 831-6793 for an assessment of State Highways permit requirements.

10. For Bench Mark, see Sheet 13.

APPROVALS:

CHIEF, CIVIL ENGINEERING BRANCH, D.P.P. DATE

DIRECTOR, DEPARTMENT OF PLANNING AND PERMITTING CITY & COUNTY OF HONOLULU DATE

ORIGINAL PLAN | SURVEY PLOTTED BY | DRAWN BY | TRACED BY | DESIGNED BY | QUANTITIES BY | CHECKED BY | DATE | NOTE BOOK | No.

DATE	REVISION
1/11/24	⚠ Revised Note 4; Removed Note 6; Added CC&H Approval Block

FRANK J. CAMACHO JR. LICENSED PROFESSIONAL ENGINEER No. 14908-C HAWAII, U.S.A.

THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION. CONSTRUCTION OF THIS PROJECT WILL BE UNDER MY OBSERVATION. LICENSE EXPIRATION DATE: 04/30/24

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

GENERAL NOTES & LEGEND - 2

KAILUA ROAD INTERSECTION IMPROVEMENTS
Vicinity of Uluoa Street and Ulumanu Drive
Project No. 61D-01-23

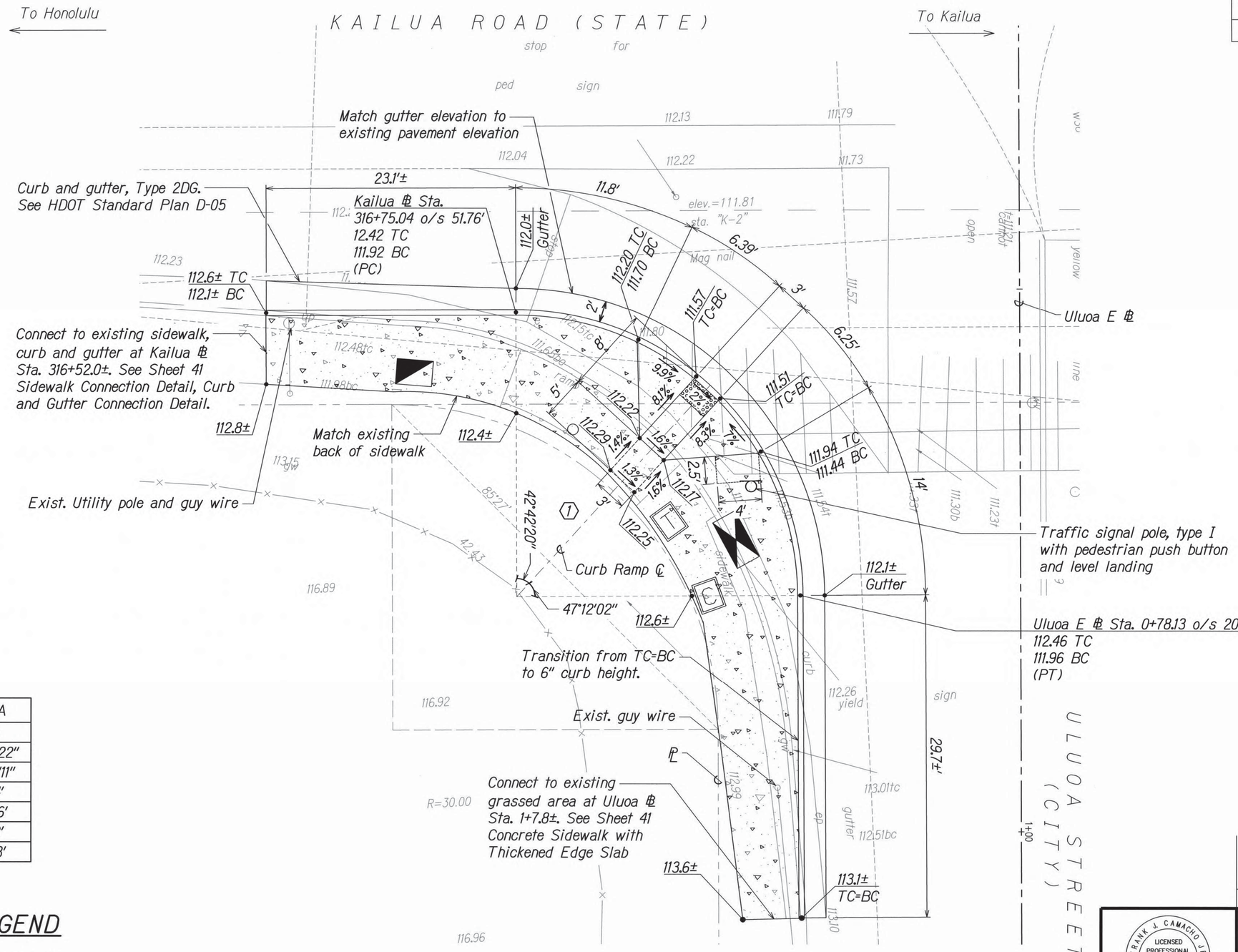
Scale: N/A Date: DEC, 2023

SHEET No. 2 OF 5 SHEETS

ADD. 4

P:\Land Projects\DOT IDIQ - 2022\Traffic Operations Task\PAO 2 Kailua TrafSig PSE\Drawings\04 General Notes & Legend - 2.dwg, 1/4/2024 4:20:08 PM

FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	61D-01-23	2024	ADD.27	87



CURVE DATA	
CURVE	1
△	89°54'22"
△/2	44°57'11"
R	26.4'
T	26.36'
Ch	37.3'
L	41.43'

LEGEND

- Concrete area
- Grassed area
- Pedestrian detectable warning

KAILUA ROAD AND ULUOA STREET INTERSECTION SOUTHEAST SIDEWALK PLAN

APPROVED:

CHIEF, CIVIL ENGINEERING BRANCH, D.P.P. DATE
(FOR CONSTRUCTION IN CITY RIGHT-OF-WAY ONLY)

DATE	REVISION
1/11/24	1 Revised Curb Ramps

F. FRANK J. CAMACHO JR. ★ LICENSED PROFESSIONAL ENGINEER No. 14908-C ★ HAWAII, U.S.A.

THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION. CONSTRUCTION OF THIS PROJECT WILL BE UNDER MY OBSERVATION. LICENSE EXPIRATION DATE: 04/30/24

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

CURB RAMP DETAILS - 2

KAILUA ROAD INTERSECTION IMPROVEMENTS
Vicinity of Uluoa Street and Ulumanu Drive
Project No. 61D-01-23

Scale: 1" = 5' Date: DEC, 2023

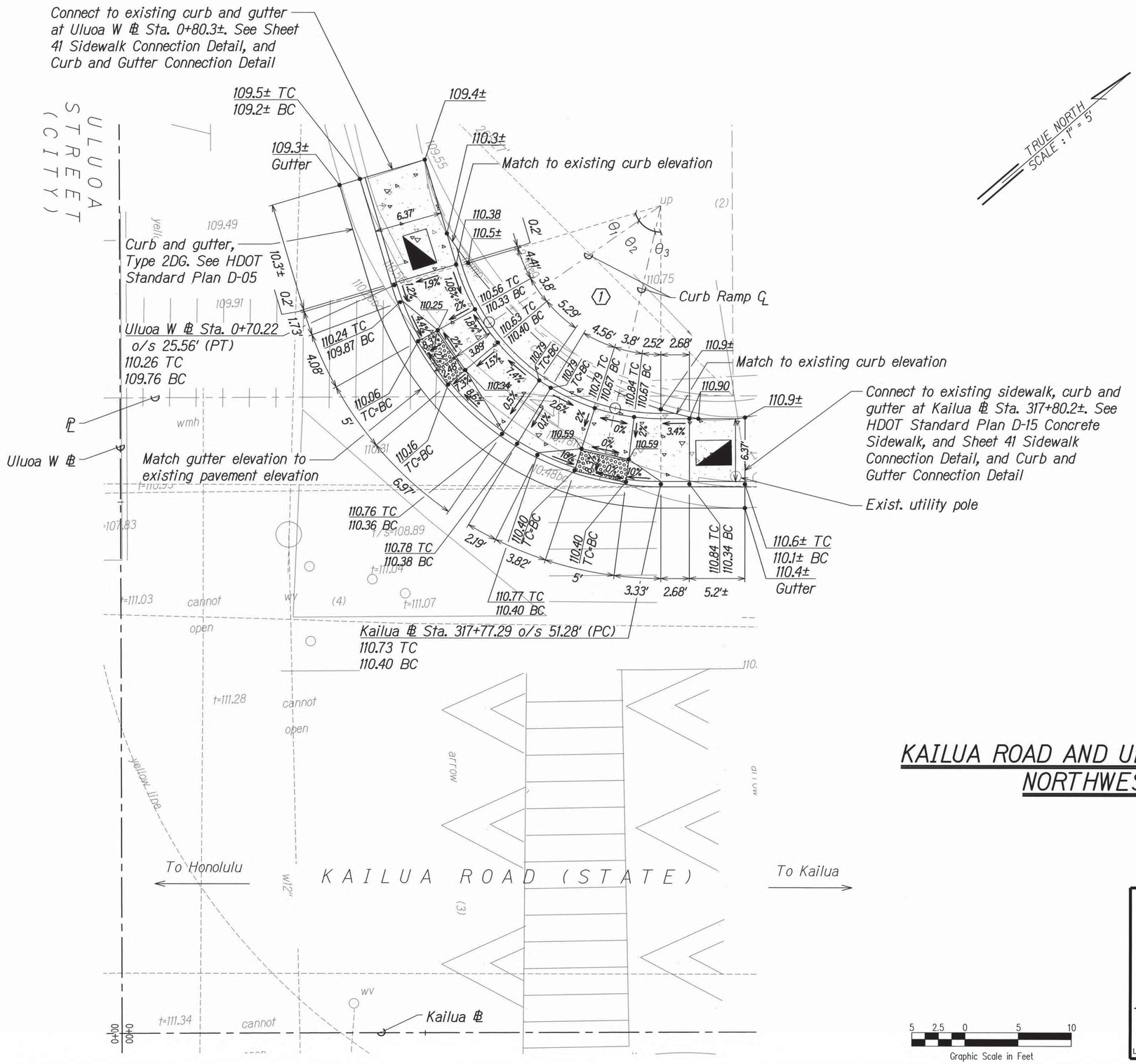
SHEET No. 2 OF 8 SHEETS

ADD. 27

ORIGINAL PLAN | NOTE BOOZ | SURVEY PLOTTED BY | DRAWN BY | TRACED BY | DESIGNED BY | QUANTITIES BY | CHECKED BY | DATE | No.

P:\Land Projects\DOT IDIQ - 2022\Traffic Operations Task\PAO.2 Kailua TrafSig PSE\Drawings\27 Curb Ramp Details - 2.dwg, 1/4/2024 4:20:15 PM

FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	61D-01-23	2024	ADD.30	87



LEGEND

Concrete area

Pedestrian detectable warning

CURVE DATA	
CURVE	⟨1⟩
△	73°23'04"
△/2	36°41'32"
R	26.4'
T	19.67'
C	31.55'
L	33.81'

θ_1 = 18°02'06"
θ_2 = 42°42'23"
θ_3 = 12°39'15"

APPROVED:

CHIEF, CIVIL ENGINEERING BRANCH, D.P.P. (FOR CONSTRUCTION IN CITY RIGHT-OF-WAY ONLY) DATE

KAILUA ROAD AND ULUOA STREET INTERSECTION
NORTHWEST SIDEWALK PLAN

DATE	REVISION
1/11/24	⚠ Revised Curb Ramps

Graphic Scale in Feet: 5 2.5 0 5 10

FRANK J. CAMACHO JR. LICENSED PROFESSIONAL ENGINEER No. 14908-C HAWAII, U.S.A.

THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION. CONSTRUCTION OF THIS PROJECT WILL BE UNDER MY OBSERVATION. LICENSE EXPIRATION DATE: 04/30/24

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

CURB RAMP DETAILS - 5

KAILUA ROAD INTERSECTION IMPROVEMENTS
Vicinity of Uluoa Street and Ulumanu Drive
Project No. 61D-01-23

Scale: 1" = 5' Date: DEC, 2023

SHEET No. 5 OF 8 SHEETS

ADD. 30

ORIGINAL PLAN | SURVEY PLOTTED BY | DRAFTED BY | TRACED BY | DESIGNED BY | QUANTITIES BY | CHECKED BY | DATE | NOTE BOOK | No.

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FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	61D-01-23	2024	ADD.33	87

LEGEND

- Concrete area
- Grassed area
- Pedestrian detectable warning

CURVE DATA	
CURVE	⟨1⟩
△	83°30'36"
△/2	41°45'18"
R	26.4'
T	23.57'
Ch	35.16'
L	38.48'

θ_1 = 12°19'48"
θ_2 = 55°49'53"
θ_3 = 23°56'32"

TRUE NORTH
SCALE : 1" = 5'

KAILUA ROAD (STATE)

To Honolulu

To Kailua

Kailua ℄

Ulumanu ℄

ULUMANU DRIVE (CITY)

Kailua ℄ Sta. 327+24.45 o/s 41.75' (PC)
100.59 TC
100.09 BC

53.6'±

Curb and gutter, Type 2DG
See HDOT Standard Plan D-05

99.4±
Gutter

99.6± TC
99.1± BC

Exist. metal box

Connect to existing sidewalk, curb and gutter at Kailua ℄ Sta 327+77.5±. See HDOT Standard Plan D-15 Concrete Sidewalk, and Sheet 41 Sidewalk Connection Detail, and Curb and Gutter Connection Detail

100.0±

Traffic signal pole, type I with pedestrian push button and level landing

Traffic signal pole, type II with pedestrian push button and level landing

Curb Ramp ℄

Curb Ramp ℄

Match to existing back of sidewalk

Exist. utility pole and guy wire

Ulumanu ℄ Sta.
0+64.87
o/s 23.27' (PT)
100.50 TC
100.00 BC

100.46 TC
99.96 BC

98.9±
Gutter

99.2± TC
98.7± BC

100.0±

Connect to existing sidewalk and grassed area at Ulumanu ℄ Sta 0+79.5±. See Sheet 41 Sidewalk Connection Detail, and Concrete Sidewalk with Thickened Edge Slab

Grassed area
See Sheet 41

Connect to existing curb and gutter at Ulumanu ℄ Sta 0+89.2±. See Sheet 41 Curb and Gutter Connection Detail

Graphic Scale in Feet
5 2.5 0 5 10

APPROVED:

CHIEF, CIVIL ENGINEERING BRANCH, D.P.P. (FOR CONSTRUCTION IN CITY RIGHT-OF-WAY ONLY) DATE

KAILUA ROAD AND ULUMANU DRIVE INTERSECTION NORTHEAST BULB OUT

DATE	REVISION
1/11/24	⚠ Revised Curb Ramps

FRANK J. CAMACHO JR. LICENSED PROFESSIONAL ENGINEER No. 14908-C HAWAII, U.S.A.

THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION. CONSTRUCTION OF THIS PROJECT WILL BE UNDER MY OBSERVATION. LICENSE EXPIRATION DATE: 04/30/24

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

CURB RAMP DETAILS - 8

KAILUA ROAD INTERSECTION IMPROVEMENTS
Vicinity of Uluoa Street and Ulumanu Drive
Project No. 61D-01-23

Scale: 1" = 5' Date: DEC, 2023

SHEET No. 8 OF 8 SHEETS

ADD. 33

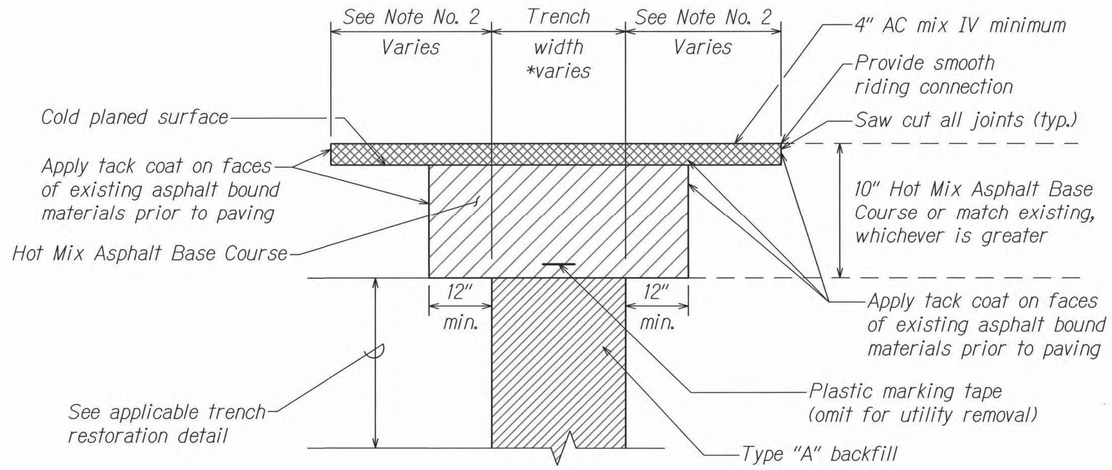
ORIGINAL PLAN | SURVEY PLOTTED BY | DRAWN BY | TRACED BY | DESIGNED BY | QUANTITIES BY | CHECKED BY | DATE | NOTE BOOK | No.

P:\Land Projects\DOT IDIQ - 2022\Traffic Operations Task\PAO 2 Kailua TrafSig PSE\Drawings\33 Curb Ramp Details - 8.dwg, 1/4/2024 4:20:29 PM

FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	61D-01-23	2024	ADD.39	87

NOTES

1. Tack coat faces of existing asphalt bound materials prior to filling excavation with new asphalt bound materials.
2. For trench restoration on State-owned Right of Way:
   a. If the trench is aligned perpendicular to the direction of travel or skewed at angles of 45 degrees or greater to longitudinal direction of the roadway, repave 6 feet on each side of the trench.
   b. If the trench is aligned parallel to the direction of travel or skewed at angle of less than 45 degrees to the longitudinal direction of roadway, repave to the edge of lane in which edge of trench is located. Repave to the edge of gutter if less than 2-ft from the edge of trench to the edge of gutter.
3. All work performed shall be subject to inspection by the State and shall be to the State's satisfaction.
4. Construct the trench restoration in accordance with the Hawaii Standard Specifications for Road and Bridge Construction (2005) and its Special Provisions, and the Specification of Installation of Miscellaneous Improvements within State Highways.
5. Pavement Smoothness for HDOT roadways - Applicable to areas where the trench activities require shoring, sheet piling and dewatering or as directed by the District Engineer.
   a. Obtain a profile of the existing roadway that is to have a new surface as a result of the restoration of the trench excavation and submit the profile to the District Engineer before any work for trench excavation begins.
   b. Obtain a profile of the roadway surface after the roadway surface has been repaved and submit the profile to the District Engineer. The profile of the roadway surface after repaving shall be equal to or smoother than the profile obtained before trench excavation began.
   c. The distance from the paved surface to the testing edge of a ten-foot long straight edge between two points of contact shall not exceed 3/16 inch.
6. Place all unbound materials in the trench as follows:
   a. Compaction by water jetting or ponding is not permitted.
   b. All unbound materials, except the permeable base and ASTM C-33 Size 67:
      - Place material in accordance with Sections 204, 206, 603, 624 and 625 of the Hawaii Standard Specifications for Road and Bridge Construction (2005).
      - Take one compaction test per lift for 300 lineal feet of trench. Submit compaction test results to the District Engineer.
   c. Permeable Base
      - Place permeable material in uniform horizontal layer not exceeding 9 inches in compacted thickness.
      - Compact each layer with 8 passes of a vibrating plate compactor. Use hand tamper if trench is too narrow to accommodate the vibrating plate compactor.
      - If an existing layer of permeable base is encountered, provide new permeable base to match the existing permeable base thickness and depth and provide a geotextile permeable separator.
   d. ASTM C-33 Size 67:
      - Material placed under water need not be compacted.
      - Material placed above water:



TYPICAL TRENCH PAVEMENT SECTION (STATE/CITY)

1 / 40 39

Not to Scale

APPROVED:

CHIEF, CIVIL ENGINEERING BRANCH, D.P.P. (FOR CONSTRUCTION IN CITY RIGHT-OF-WAY ONLY) DATE

DATE	REVISION
1/11/24	⚠ Revised Detail Name

FRANK J. CAMACHO JR. ★ LICENSED PROFESSIONAL ENGINEER No. 14908-C ★ HAWAII, U.S.A.

THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION. CONSTRUCTION OF THIS PROJECT WILL BE UNDER MY OBSERVATION. LICENSE EXPIRATION DATE: 04/30/24

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

PAVING NOTES & DETAILS

KAILUA ROAD INTERSECTION IMPROVEMENTS
Vicinity of Uluoa Street and Ulumanu Drive
Project No. 61D-01-23

Scale: N/A Date: DEC, 2023

SHEET No. 1 OF 1 SHEETS

ADD. 39

ORIGINAL PLAN | NOTE BOOK | SURVEY PLOTTED BY | DRAWN BY | TRACED BY | DESIGNED BY | QUANTITIES BY | CHECKED BY | DATE | No.

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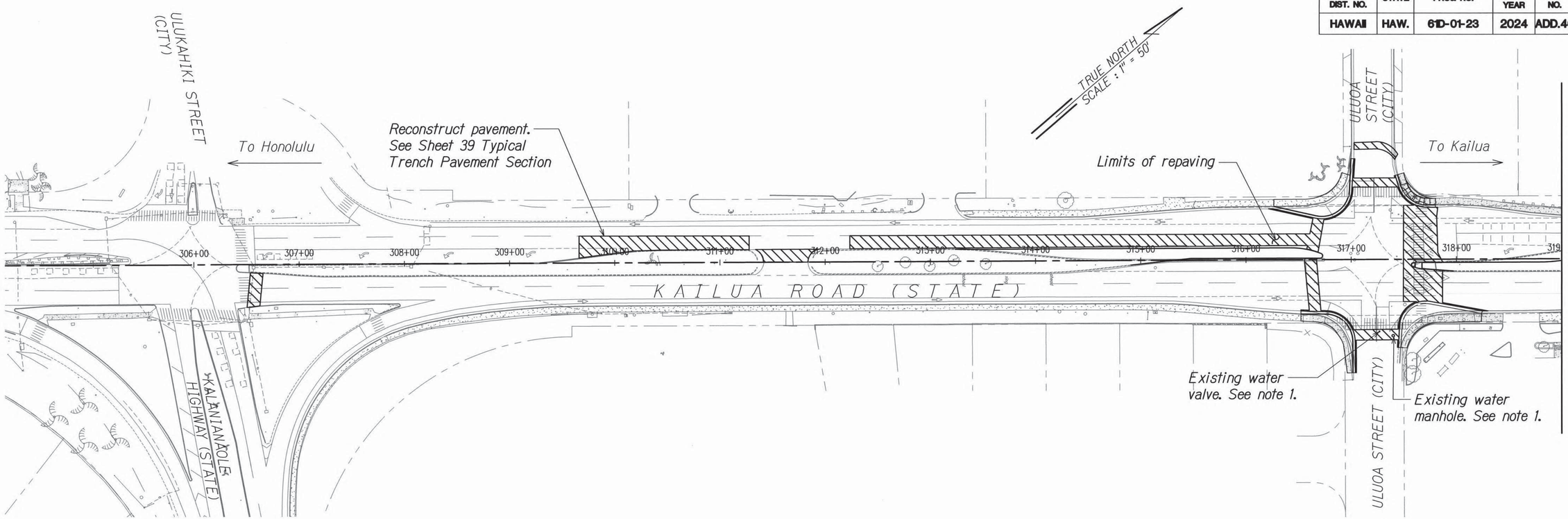
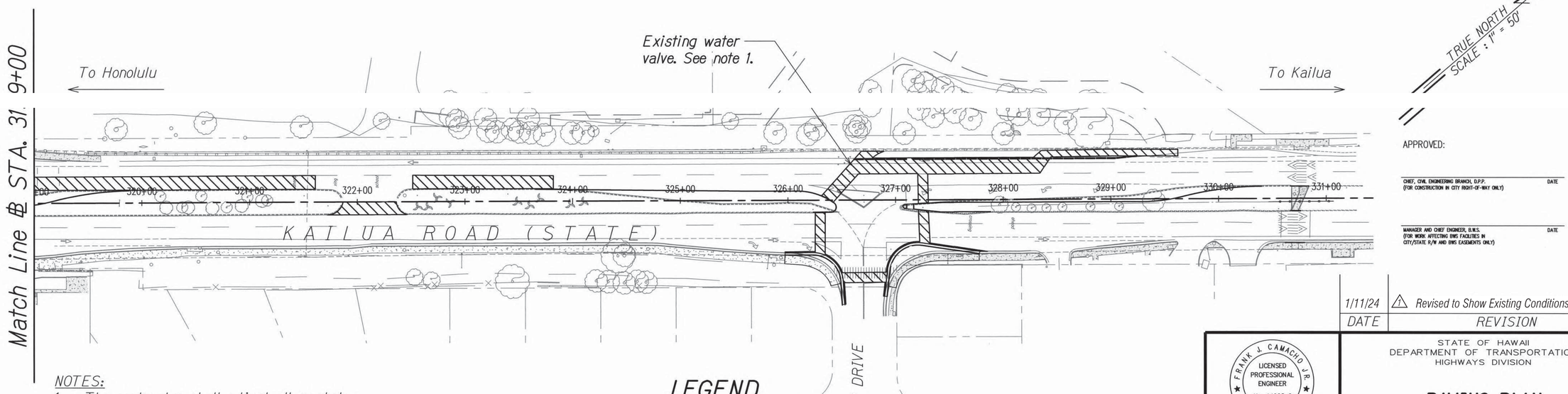
FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	61D-01-23	2024	ADD.40	87





APPROVED:

CHIEF, CIVIL ENGINEERING BRANCH, D.P.P. (FOR CONSTRUCTION IN CITY RIGHT-OF-WAY ONLY) DATE

MANAGER AND CHIEF ENGINEER, B.W.S. (FOR WORK AFFECTING BWS FACILITIES IN CITY/STATE R/W AND BWS EASEMENTS ONLY) DATE

ORIGINAL PLAN

SURVEY PLOTTED BY	DATE
DRAWN BY	
TRACED BY	
DESIGNED BY	
QUANTITIES BY	
CHECKED BY	

NOTE BOOK

NOTES:

1. The contractor shall adjust all manhole frames, valve boxes, and meter boxes within the reconstructed or resurfaced areas. The Contractor shall be responsible for and meter boxes to facilitate the adjustments

LEGEND

Repaving

Graphic Scale in Feet

DATE	REVISION
1/11/24	⚠ Revised to Show Existing Conditions

FRANK J. CAMACHO JR. ★ LICENSED PROFESSIONAL ENGINEER No. 14908-C ★ HAWAII, U.S.A.

THIS WORK WAS PREPARED BY ME OR UNDER MY DIRECT SUPERVISION AND WILL BE UNDER MY OBSERVATION. LICENSE EXPIRATION DATE: 04/30/24

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

PAVING PLAN

KAILUA ROAD INTERSECTION IMPROVEMENTS
Vicinity of Uluoa Street and Ulumanu Drive

Scale: 1" = 50' Date: DEC, 2023

SHEET No. 1 OF 1 SHEETS

ADD. 40

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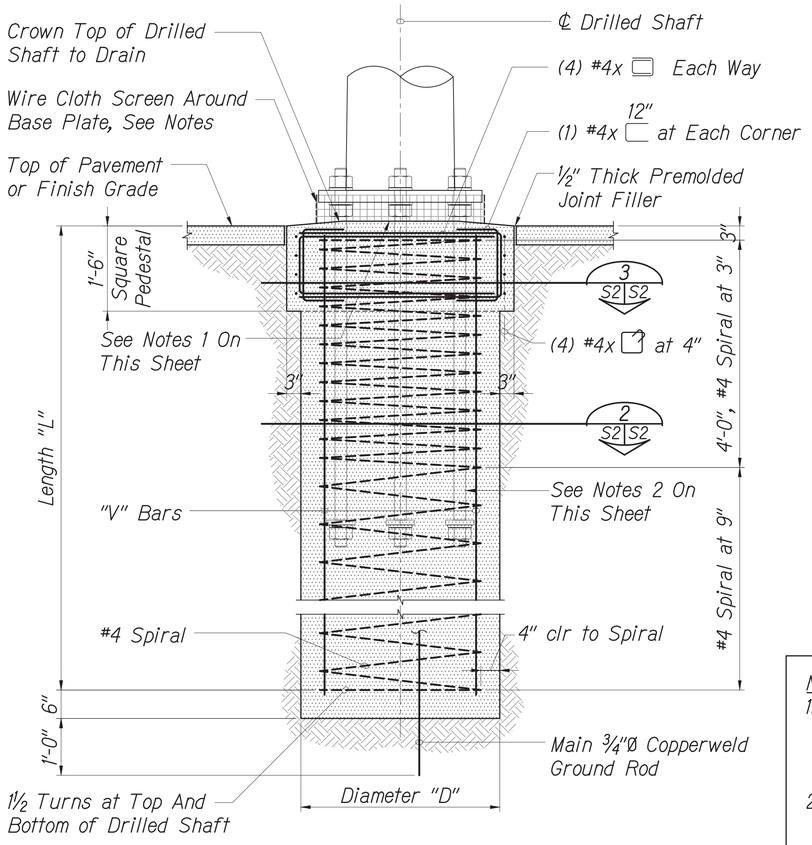
FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	61D-01-23	2023	ADD.66	87



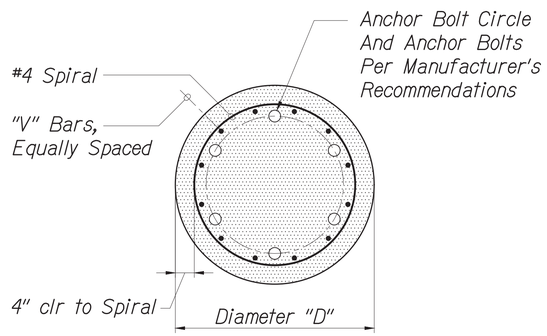
TYPE II TRAFFIC SIGNAL FOUNDATION — 1 (S2 | S2)
Scale: 3/4" = 1'-0"

Construction Tolerance Note:
Anchor Bolts Shall be Installed With Misalignments of Less Than 1:40 From Vertical. After Installation, Firm Contact Shall Exist Between The Anchor Bolt Nuts, Washers, And Base Place On Any Anchor Bolt Installed In a Misaligned Position.

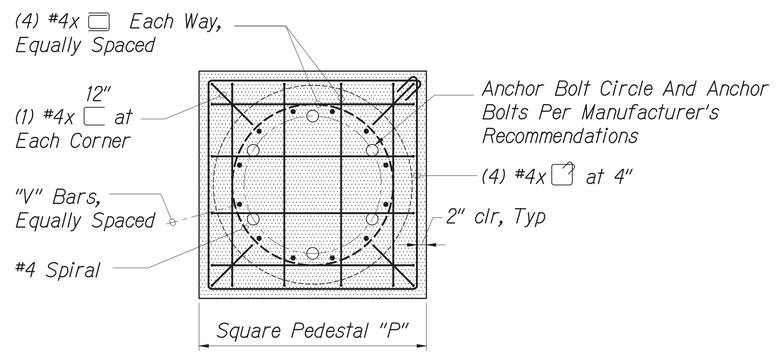
Wire Cloth Screen Notes:
a. *A Wire Cloth Screen Shall be Placed Vertically Between The Base Plate And Top of Foundation.*
b. *Wire Cloth Shall be Wrapped Horizontally Around The Base Plate With a 3" Minimum Lap.*
c. *Wire Cloth Shall be Galvanized Steel, Standard Grade, Plain Weave, 2x2 Mesh, With 0.063" Diameter Wires.*
d. *Screen Shall be Attached to The Base Plate With Stainless Steel Self-tapping ¼" Diameter Screws With Stainless Steel Washers Spaced at 9".*

Drilled Shaft Foundation Schedule					
Pole Description	Mast Arm Length	Length "L"	Diameter "D"	Pedestal "P"	"V" Bars
Type II	≤ 30'-0"	12'-0"	3'-6"	4'-0"	(12) #8

Notes:
1. *The Exposed Length of The Anchor Bolt Between The Bottom of The Leveling Nut And The Top of The Drilled Shaft Shall Not Exceed The Anchor Bolt Diameter, Typ*
2. *For Base Plate, Bolt Circle Diameter, And Size, Location, Bolt Projection Length, And Length of Anchor Bolts, Follow Manufacturer's Recommendations*



SECTION — 2 (S2 | S2)
Scale: 3/4" = 1'-0"



SECTION — 3 (S2 | S2)
Scale: 3/4" = 1'-0"

DATE	REVISION
1/11/24	⚠ Revised Foundation Schedule

BRYAN LUM
LICENSED PROFESSIONAL ENGINEER
No. 14345-S
HAWAII, USA
SIGNATURE
THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION
Expiration date: 4/30/24

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

DRILLED SHAFT FOUNDATION DETAILS

KAILUA ROAD INTERSECTION IMPROVEMENTS
Vicinity of Uluoa Street and Ulumanu Drive
Project No. 61D-01-23

Scale: As Shown — Date: DEC, 2023

SHEET No. S2 OF 2 SHEETS

ADD.66

ORIGINAL PLAN | SURVEY PLOTTED BY | DRAWN BY | TRACED BY | DESIGNED BY | QUANTITIES BY | CHECKED BY | DATE
NOTE BOOK | No.

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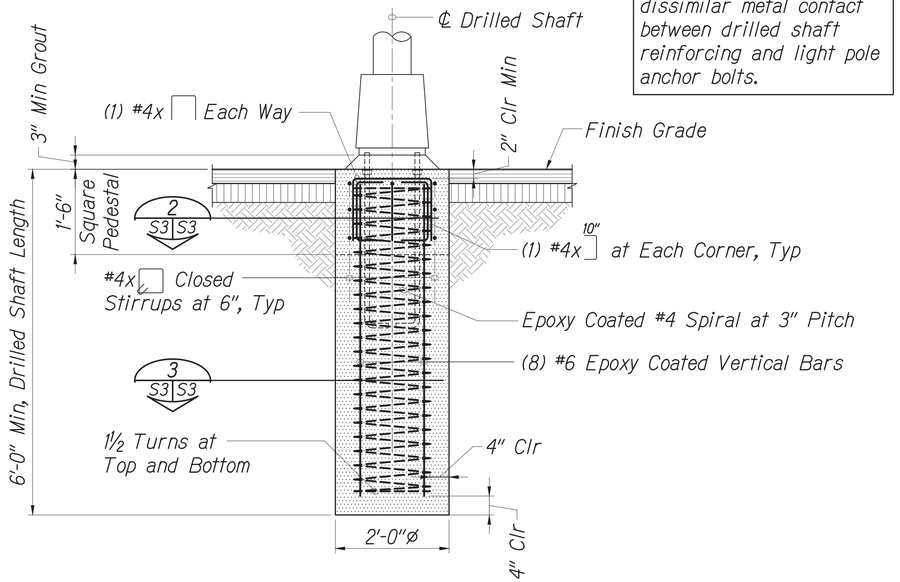
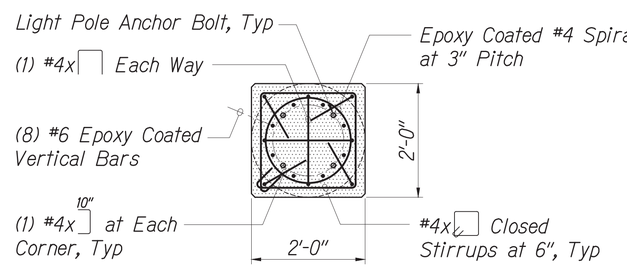
FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	61D-01-23	2023	ADD.66A	87

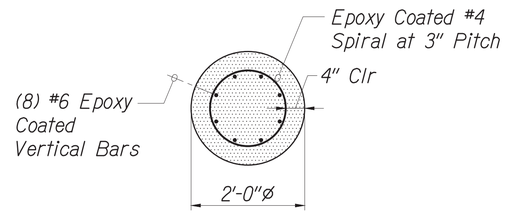
Note:
Contractor to ensure no dissimilar metal contact between drilled shaft reinforcing and light pole anchor bolts.



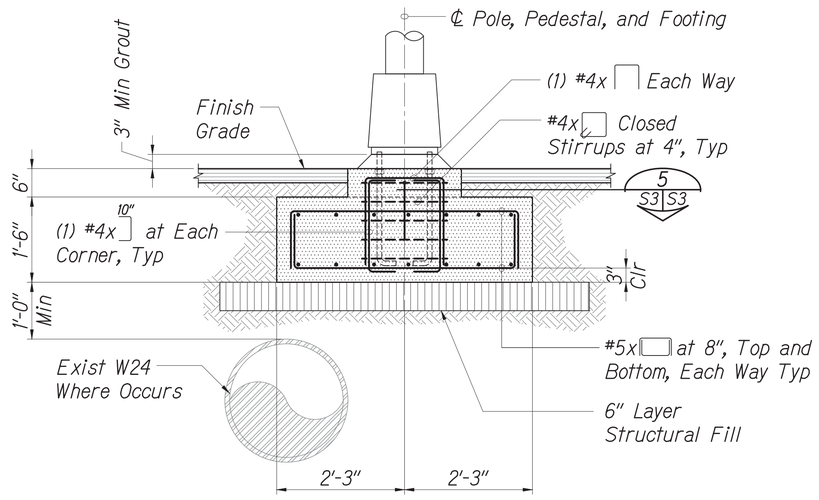
TYPICAL
TYPE I TRAFFIC SIGNAL FOUNDATION — 1 S3|S3
Scale: 3/4" = 1'-0"



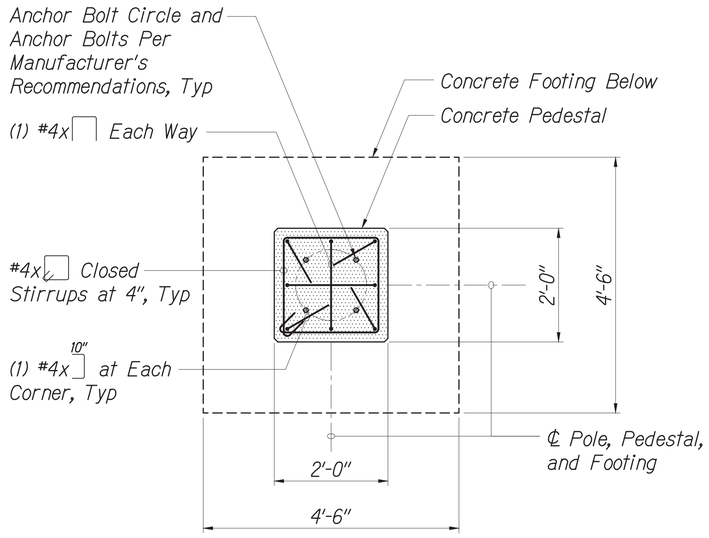
SECTION — 2 S3|S3
Scale: 3/4" = 1'-0"



SECTION — 3 S3|S3
Scale: 3/4" = 1'-0"



ALTERNATIVE
TYPE I TRAFFIC SIGNAL FOUNDATION — 4 S3|S3
Scale: 3/4" = 1'-0"



SECTION — 5 S3|S3
Scale: 3/4" = 1'-0"

DATE	REVISION
1/11/24	⚠ Added Sheet; Revised Foundation Schedule

BRYAN LUM
LICENSED PROFESSIONAL ENGINEER
No. 14345-S
HAWAII, U.S.A.
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Expiration date: 4/30/24

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

TYPE I FOUNDATION DETAILS

KAILUA ROAD INTERSECTION IMPROVEMENTS
Vicinity of Uluoa Street and Ulumanu Drive
Project No. 61D-01-23

Scale: As Shown — Date: DEC, 2023

SHEET No. S3 OF 3 SHEETS

ADD.66 S-1

ORIGINAL PLAN	SURVEY PLOTTED BY	DATE
	DRAWN BY	
NOTE BOOK	TRACED BY	
No.	DESIGNED BY	
	QUANTITIES BY	
	CHECKED BY	

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FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	61D-01-23	2024	ADD.67	87

GEOTECHNICAL NOTES:

1. A geotechnical engineering technical memorandum entitled "Kailua Road Intersection Improvements Vicinity of Uluoa Street and Ulumanu Drive" dated December 1st, 2023 has been prepared by Kokua Geotechincal LLC. A copy of the report is on file at the office of the Engineer for review by the Contractor.

2. For boring locations, see Sheets 7 & 8 of the report.

3. The information presented in the logs of borings depict the subsurface conditions encountered at that specified location and at the time of the field exploration only. Variations of subsoil conditions from those depicted in the logs of borings may occur between and beyond the borings.

4. The penetration resistance shown on the logs of borings indicate the number of blows required for the specific sampler type used. The blow counts may need to be factored to obtain the Standard Penetration Test (SPT) blow counts.

5. The data given is for general information only. Bidders shall examine the site and the boring data and draw their own conclusions therefrom as to the character of materials to be encountered. The Engineer will not assume responsibility for variations of subsoil quality or conditions other than at the boring locations shown and at the time the borings were taken.

Project: Kailua Road Intersection Improvements Project Location: Kailua, Oahu, Hawaii Project Number: 110922-00	Kokua Geotech LLC 94-974 Pakela Street, Suite 109 Waipahu, HI 96797 (808) 397-6974	Key to Log of Borings Sheet 1 of 1

Elevation (feet)	Depth (feet)	Sample Type	Sample Number	Sampling Resistance, blows/ft	U.S.C.S	Graphic Log	MATERIAL DESCRIPTION	Pocket Pen./Torvane, tsf	Water Content, %	Dry Unit Weight, pcf	Remarks and Other Tests
1	2	3	4	5	6	7	8	9	10	11	12

COLUMN DESCRIPTIONS

1 Elevation (feet): Elevation (MSL, feet).
2 Depth (feet): Depth in feet below the ground surface.
3 Sample Type: Type of soil sample collected at the depth interval shown.
4 Sample Number: Sample identification number.
5 Sampling Resistance, blows/ft: Number of blows to advance driven sampler one foot (or distance shown) beyond seating interval using the hammer identified on the boring log.
6 U.S.C.S: Type of material encountered.
7 Graphic Log: Graphic depiction of the subsurface material encountered.
8 MATERIAL DESCRIPTION: Description of material encountered. May include consistency, moisture, color, and other descriptive text.
9 Pocket Pen./Torvane, tsf: the reading from Poecket Penetrometer or Torvane.
10 Water Content, %: Water content of the soil sample, expressed as percentage of dry weight of sample.
11 Dry Unit Weight, pcf: Dry weight per unit volume of soil sample measured in laboratory. in pounds per cubic foot.
12 Remarks and Other Tests: Other Tests

FIELD AND LABORATORY TEST ABBREVIATIONS

CHEM: Chemical tests to assess corrosivity
COMP: Compaction test
CONS: One-dimensional consolidation test
LL: Liquid Limit, percent
PI: Plasticity Index, percent
SA: Sieve analysis (percent passing No. 200 Sieve)
UC: Unconfined compressive strength test, Qu, in ksf
WA: Wash sieve (percent passing No. 200 Sieve)

MATERIAL GRAPHIC SYMBOLS

Asphaltic Concrete (AC)
Basalt Rock Formation
Boulders
Fat CLAY, CLAY w/SAND, SANDY CLAY (CH)
Silty GRAVEL (GM)
Silty SAND (SM)

TYPICAL SAMPLER GRAPHIC SYMBOLS

Auger sampler
Bulk Sample
3-inch-OD California w/ brass rings
CME Sampler
Grab Sample
HQ Coring
3-inch OD Modified California w/ brass liners
Pitcher Sample
PQ Coring
Probing w/Pointed Tip
2-inch-OD unlined split spoon (SPT)
Shelby Tube (Thin-walled, fixed head)

OTHER GRAPHIC SYMBOLS

Water level (at time of drilling, ATD)
Water level (after waiting)
Minor change in material properties within a stratum
Inferred/gradational contact between strata
Queried contact between strata

GENERAL NOTES

1: Soil classifications are based on the Unified Soil Classification System. Descriptions and stratum lines are interpretive, and actual lithologic changes may be gradual. Field descriptions may have been modified to reflect results of lab tests.
2: Descriptions on these logs apply only at the specific boring locations and at the time the borings were advanced. They are not warranted to be representative of subsurface conditions at other locations or times.

PLATE A-0.1

Project: Kailua Road Intersection Improvements Project Location: Kailua, Oahu, Hawaii Project Number: 110922-00	Kokua Geotech LLC 94-974 Pakela Street, Suite 109 Waipahu, HI 96797 (808) 397-6974	Log of Boring No. 1 Sheet 1 of 1

Date(s) Drilled 11/27/23	Logged By CH	Checked By AJF
Drilling Method CF Auger	Drill Bit Size/Type 4-inch Solid Stem Auger	Total Depth of Borehole 21.5 feet
Drill Rig Type Mobile B-53	Drilling Contractor Kokua Geotech LLC	Approximate Surface Elevation +103 feet MSL*
Groundwater Level and Date Measured Not Encountered	Sampling Method(s) MCS & SPT	Hammer Data 140 lbs. with 30-inch drop
Borehole Backfill Soil Cuttings, Gravel, and AC Patch	Location See Site Plan (Plate 2.1)	

Elevation (feet)	Depth (feet)	Sample Type	Sample Number	Sampling Resistance, blows/ft	U.S.C.S	Graphic Log	MATERIAL DESCRIPTION	Pocket Pen./Torvane, tsf	Water Content, %	Dry Unit Weight, pcf	Remarks and Other Tests
103	0				GM		8-inch ASPHALTIC CONCRETE				
			1	25	CH		Grayish brown SILTY GRAVEL with some sand, medium dense, moist (base material)	3.0	32	90	Sw = 2.1%
			2	10			Reddish brown SILTY CLAY with some sand and gravel (coralline), stiff, moist (fill)		31		
98	5		3	19	CH		Reddish brown to brown SILTY CLAY with some sand and a little grave, stiff, moist (alluvium)	2.5	38	78	UC= 1.8ksf
93	10		4	11			grades to very stiff		39		LL=59, PI=32
88	15		5	29	CH		Reddish brown with multi-color mottling SILTY CLAY with some sand and decomposed gravel, very stiff, moist (alluvium)	3.5	44	80	
83	20		6	10			grades to stiff		51		
78	25						Boring terminated at approximately 21.5 feet below the existing ground surface *Elevations of borings estimated from Google Earth imagery				

PLATE A-1

Project: Kailua Road Intersection Improvements Project Location: Kailua, Oahu, Hawaii Project Number: 110922-00	Kokua Geotech LLC 94-974 Pakela Street, Suite 109 Waipahu, HI 96797 (808) 397-6974	Log of Boring No. 2 Sheet 1 of 1

Date(s) Drilled 11/27/23	Logged By CH	Checked By AJF
Drilling Method CF Auger	Drill Bit Size/Type 4-inch Solid Stem Auger	Total Depth of Borehole 8.5 feet
Drill Rig Type Mobile B-53	Drilling Contractor Kokua Geotech LLC	Approximate Surface Elevation +102 feet MSL*
Groundwater Level and Date Measured Not Encountered	Sampling Method(s) MCS & SPT	Hammer Data 140 lbs. with 30-inch drop
Borehole Backfill Soil Cuttings, Gravel, and AC Patch	Location See Site Plan (Plate 2.1)	

Elevation (feet)	Depth (feet)	Sample Type	Sample Number	Sampling Resistance, blows/ft	U.S.C.S	Graphic Log	MATERIAL DESCRIPTION	Pocket Pen./Torvane, tsf	Water Content, %	Dry Unit Weight, pcf	Remarks and Other Tests
102	0				GM		8-inch ASPHALTIC CONCRETE				
			1	39/9" +10/0" Ref.	CH		Grayish brown SILTY GRAVEL with some sand, medium dense, moist (base material)	2.0	34	100	
			2	29/0" Ref.			Light brown SILTY CLAY with some sand and gravel, stiff, moist (fill)		--		
97	5		3	72	CH		Gray BOULDER, hard (alluvium) Brown SILTY CLAY with some sand and gravel, hard, moist (alluvium)		31		
			4	29/0" Ref.			Gray BOULDER, hard (alluvium)		--		
92	10						Boring terminated at approximately 7.0 feet below the existing ground surface on an apparent hard boulder				
87	15										
82	20										
77	25										

PLATE A-2

ORIGINAL PLAN
NOTE BOOK
SURVEY PLOTTED BY
DRAWN BY
TRACED BY
DESIGNED BY
QUANTITIES BY
CHECKED BY
DATE
No.

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

BORING LOG - 1

KAILUA ROAD INTERSECTION IMPROVEMENTS
Vicinity of Uluoa Street and Ulumanu Drive
Project No. 61D-01-23

Scale: N/A Date: DEC, 2023

1/11/24	⚠ Replaced Boring Logs
DATE	REVISION

SHEET No. 1 OF 2 SHEETS

ADD. 67

P:\Land Projects\DOT IDIQ - 2022\Traffic Operations Task\PAO 2 Kailua Trafsig PSE\Drawings\67 Boring Log 1.dwg, 1/4/2024 4:20:47 PM

FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	61D-01-23	2024	ADD.68	87

GEOTECHNICAL NOTES:

1. A geotechnical engineering technical memorandum entitled "Kailua Road Intersection Improvements Vicinity of Uluoa Street and Ulumanu Drive" dated December 1st, 2023 has been prepared by Kokua Geotechincal LLC. A copy of the report is on file at the office of the Engineer for review by the Contractor.

2. For boring locations, see Sheets 7 & 8 of the report.

3. The information presented in the logs of borings depict the subsurface conditions encountered at that specified location and at the time of the field exploration only. Variations of subsoil conditions from those depicted in the logs of borings may occur between and beyond the borings.

4. The penetration resistance shown on the logs of borings indicate the number of blows required for the specific sampler type used. The blow counts may need to be factored to obtain the Standard Penetration Test (SPT) blow counts.

5. The data given is for general information only. Bidders shall examine the site and the boring data and draw their own conclusions therefrom as to the character of materials to be encountered. The Engineer will not assume responsibility for variations of subsoil quality or conditions other than at the boring locations shown and at the time the borings were taken.

Project: Kailua Road Intersection Improvements
Project Location: Kailua, Oahu, Hawaii
Project Number: 110922-40

Kokua Geotech LLC
94-974 Pakela Street, Suite 109
Waipahu, HI 96797
(808) 397-6974

Log of Boring No. 3
Sheet 1 of 1

Date(s) Drilled: 11/28/23	Logged By: CH	Checked By: AJF
Drilling Method: CF Auger	Drill Bit Size/Type: 4-inch Solid Stem Auger	Total Depth of Borehole: 13.5 feet
Drill Rig Type: Mobile B-53	Drilling Contractor: Kokua Geotech LLC	Approximate Surface Elevation: +88 feet MSL*
Groundwater Level and Date Measured: Not Encountered	Sampling Method(s): MCS & SPT	Hammer Data: 140 lbs. with 30-inch drop
Borehole Backfill: Soil Cuttings, Gravel, and AC Patch	Location: See Site Plan (Plate 2.2)	

Elevation (feet)	Depth (feet)	Sample Type	Sample Number	Sampling Resistance, blows/ft	U.S.C.S	Graphic Log	MATERIAL DESCRIPTION	Pocket Pen./Torvane, tsf	Water Content, %	Dry Unit Weight, pcf	Remarks and Other Tests
88	0						8-inch ASPHALTIC CONCRETE				
					GM		Grayish brown SILTY GRAVEL with some sand, medium dense, mois: (base material)				
					SM						
			1	14	CH		Brownish tan SILTY SAND with some gravel, medium dense, mois: (fill)		8	131	
			2	15			Brownish tan SILTY CLAY with some sand, gravel, and cobbles, very stiff, moist (fill)		14		
83	5				CH		Brown SILTY CLAY with some sand and a little gravel, stiff, moist (alluvium)				
			3	9				1.5	26	100	Sw.= 8.9%
78	10		4	11					21		
			5	15/0" Ref.			Grayish brown BASALT, moderately weathered, hard (basalt rock formation)		--		
73	15						Boring terminated at approximately 13.5 feet below the existing ground surface on apparent hard basalt rock formation				
68	20										
63	25										

PLATE A-3

Project: Kailua Road Intersection Improvements
Project Location: Kailua, Oahu, Hawaii
Project Number: 110922-40

Kokua Geotech LLC
94-974 Pakela Street, Suite 109
Waipahu, HI 96797
(808) 397-6974

Log of Boring No. 4
Sheet 1 of 1

Date(s) Drilled: 11/28/23	Logged By: CH	Checked By: AJF
Drilling Method: CF Auger	Drill Bit Size/Type: 4-inch Solid Stem Auger	Total Depth of Borehole: 15.3 feet
Drill Rig Type: Mobile B-53	Drilling Contractor: Kokua Geotech LLC	Approximate Surface Elevation: +91 feet MSL*
Groundwater Level and Date Measured: Not Encountered	Sampling Method(s): MCS & SPT	Hammer Data: 140 lbs. with 30-inch drop
Borehole Backfill: Soil Cuttings, Gravel, and AC Patch	Location: See Site Plan (Plate 2.2)	

Elevation (feet)	Depth (feet)	Sample Type	Sample Number	Sampling Resistance, blows/ft	U.S.C.S	Graphic Log	MATERIAL DESCRIPTION	Pocket Pen./Torvane, tsf	Water Content, %	Dry Unit Weight, pcf	Remarks and Other Tests
91	0						8-inch ASPHALTIC CONCRETE				
					GM		Grayish brown SILTY GRAVEL with some sand, medium dense, mois: (base material)				
					SM						
			1	10	CH		Brownish gray SILTY SAND with some gravel, medium dense, mois: (fill)		14	110	
			2	23			Reddish brown SILTY CLAY with some sand and gravel, hard, moist (alluvium)		30		LL=57, PI=28
86	5										
			3	12					27		
81	10		4	17					33		
			5	30/3" Ref.			Grayish brown BASALT, highly to moderately weathered, hard (basalt rock formation)		--		
76	15						Boring terminated at approximately 15.3 feet below the existing ground surface on apparent hard basalt rock formation				
71	20										
66	25										

PLATE A-4

ORIGINAL PLAN
NOTE BOOK
SURVEY PLOTTED BY DATE
DRAWN BY
TRACED BY
DESIGNED BY
QUANTITIES BY
CHECKED BY
No.

1/11/24 — ⚠ Replaced Boring Logs
DATE — REVISION

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

BORING LOG - 2

KAILUA ROAD INTERSECTION IMPROVEMENTS
Vicinity of Uluoa Street and Ulumanu Drive
Project No. 61D-01-23

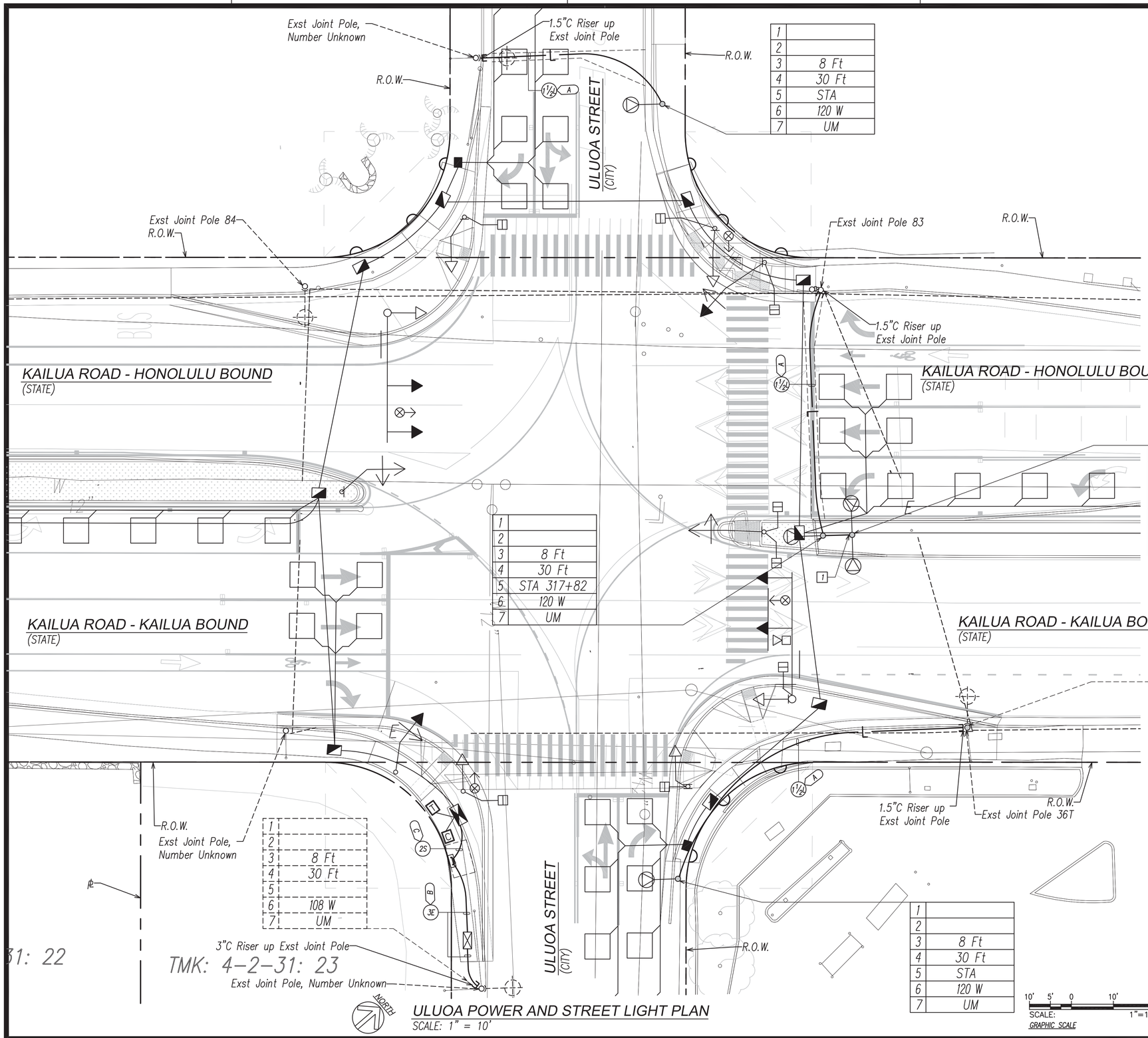
Scale: N/A — Date: DEC, 2023

SHEET No. 2 OF 2 SHEETS

ADD. 68

P:\Land Projects\DOT IDIQ - 2022\Traffic Operations Task\PAO 2 Kailua TrafSig PSEL\Drawings\68 Boring Log 2.dwg, 1/4/2024 4:20:52 PM

FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	61D-01-23	2024	ADD. 81	87



1	
2	
3	8 Ft
4	30 Ft
5	STA
6	120 W
7	UM

1	
2	
3	8 Ft
4	30 Ft
5	STA 317+89
6	120 W
7	UM

1	
2	
3	8 Ft
4	30 Ft
5	STA 317+82
6	120 W
7	UM

1	
2	
3	8 Ft
4	30 Ft
5	
6	108 W
7	UM

1	
2	
3	8 Ft
4	30 Ft
5	STA
6	120 W
7	UM

1	
2	JP 36T
3	8 Ft
4	30 Ft
5	
6	108 W
7	UM

Notes:

1. Provide $1\frac{1}{2}$"C and Wiring Between Light Pole Bases.
2. Provide Select Granular Bedding Beneath Handholes Shall Be Placed In Relatively Uniform Lifts No Greater Than Eight (8) Inches In Loose Thickness, Moisture Conditioned To Optimum Moisture Content, And Uniformly Compacted To At Least Ninety (90) Percent Of The Maximum Dry Density (ASTM D1557–02). Contractor To Schedule With Owner's Geotechnical Inspector For Compaction And Bedding Installation. Pullbox/Handholes To Be Installed Flush With Walkway.

Chief, Civil Engineering Branch — Date
Department of Planning & Permitting
City & County of Honolulu
(FOR CONSTRUCTION IN CITY RIGHT-OF-WAY ONLY)

Program Administrator, Mechanical/Electrical — Date
Department of Design and Construction
City & County of Honolulu
(FOR CONSTRUCTION IN CITY RIGHT-OF-WAY ONLY)

DATE	REVISION
1/11/24	⚠ Revised to Show Existing Conditions

GEORGE D. TAKASE
LICENSED PROFESSIONAL ENGINEER
No. 13741-E
HAWAII, U.S.A.

THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION AND CONSTRUCTION OF THIS PROJECT WILL BE UNDER MY OBSERVATION.

SIGNATURE — April 30, 2024 EXPIRATION DATE OF THE LICENSE

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

ULUOA POWER AND STREET LIGHT PLAN

KAILUA ROAD INTERSECTION IMPROVEMENTS
Vicinity of Uluoa Street and Ulumanu Drive
Project No. 61D-01-23

Scale: As Noted — Date: DEC, 2023

SHEET No. E-04 OF 10 SHEETS

ADD. 81

ORIGINAL PLAN	SURVEY PLOTTED BY	DATE
	DRAWN BY	
NOTE BOOK	TRACED BY	
	DESIGNED BY	
	QUANTITIES BY	
No.	CHECKED BY	

Z:\ACAD\PROJECTS\223057\E004 DIST1. 12/29/2023 9:40AM Rsilva

PRE-BID MEETING MINUTES

Project: Kailua Road Intersection Improvements, vicinity of Uluoa Street and Ulumanu Drive
Project No. 61D-01-23
District of Koolaupoko
Island of Oahu

Subject: Non-mandatory Pre-bid Conference

Date/Time: December 28, 2023 / 2:00 PM

Held: Virtually via Microsoft Teams

Present: See attached lists of attendees

Discussed:

A. Reid Tokuhara opens meeting at 2:00 P.M.:

1. Introductions.
2. Pre-bid conference is non-mandatory and is intended for clarification prior to bidding.
3. See attached list of attendees.
4. Any discrepancies will be addressed by addendum.
5. Bidders had until January 2, 2024 at 2:00 P.M. to submit any questions.
6. The minutes and agenda to this meeting will be included in an Addendum.
7. Bid opening is scheduled for January 18, 2024 at 2:00 P.M.
8. Geotechnical Engineering Exploration for Kailua Road Intersection Improvements, Vicinity of Uluoa Street and Ulumanu Drive dated December 22, 2023 will be included in an Addendum.
9. Removal of raised crosswalks will be done immediately after the activation of the signals, as also stated in the plans.

B. Open discussion to prospective bidders:

No comments were received from the prospective bidder.

Meeting Adjourned at 2:05 P.M.

Prepared by: Reid Tokuhara

Pre-Bid Meeting Attendance List
Kailua Road Intersection Improvements, vicinity of Uluoa Street and Ulumanu Drive, Project No. 61D-01-23
December 28, 2023 at 2:00pm

NAME	Organization
1 Reid Tokuhara	HDOT - HWY
2 Steven Yoshida	HDOT - HWY
3 Frank Camacho	Community Planning and Engineering, Inc.
4 Juanita Wolfgramm	Community Planning and Engineering, Inc.
5 Joshua Ramelb	Community Planning and Engineering, Inc.
6 Zey Tong	ICX Transportation Group
7 Jason Ames	Grace Pacific LLC
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GEOTECHNICAL ENGINEERING EXPLORATION

KAILUA ROAD INTERSECTION IMPROVEMENTS
VICINITY OF ULUOA STREET AND ULUMANU DRIVE
KAILUA, OAHU, HAWAII

DECEMBER 22, 2023

Prepared for:
COMMUNITY PLANNING AND ENGINEERING, INC.

PROJECT NO. 110922-00

Kokua Geotech LLC
Soil and Foundation Engineering

December 22, 2023
Project No. 110922-00

Community Planning and Engineering, Inc.
1286 Queen Emma Street
Honolulu, HI 96813

Attention: Mr. Frank J. Camacho

Subject: **Geotechnical Engineering Exploration**
Kailua Road Intersection Improvements
Vicinity of Uluoa Street and Ulumanu Drive
Kailua, Oahu, Hawaii

Dear **Mr. Camacho**:

We are pleased to submit this report entitled "Geotechnical Engineering Exploration, Kailua Road Intersection Improvements, Vicinity of Uluoa Street and Ulumanu Drive, Kailua, Oahu, Hawaii" prepared for the design of the project.

The purpose of our field exploration and this report was to observe and evaluate the general subsurface conditions at accessible locations at the project site to formulate geotechnical recommendations to assist in the design of the project. Our work was performed in general accordance with the scope of services outlined in our fee proposal dated November 10, 2022.

Our findings and recommendations are summarized as follows:

1. Our field exploration generally encountered pavement structures consisting of about 8 inches of asphaltic concrete and 4 inches of base material overlying surface fill materials, alluvial soils, and hard basalt rock formation extending down to the maximum depth explored of about 21.5 feet below the existing ground surface. The surface fill materials were encountered to depths ranging from about 2 to 5 feet below the existing ground surface and generally consisted of stiff to very stiff silty clay and medium dense silty sand with some gravel.

   Alluvial soils were encountered underlying the surface fill materials to depths ranging from about 12 feet to the maximum depth explored of about 21.5 feet below the existing ground surface in Boring No. 1 and generally consisted of stiff to hard silty clay with some sand and gravel. In addition, boulders were encountered within the alluvial soil deposits in Boring No. 2 at depths of about 2 and 6 feet below the existing ground surface.

Hard basalt rock formation was encountered underlying the alluvial soils in Boring Nos. 3 and 4 only, and extended down to the maximum depth explored in these boring of about 15.3 feet.

2. We did not encounter groundwater in the borings at the time of our field exploration. However, it should be noted that groundwater levels are subject to change due to rainfall, time of year, seasonal precipitation, surface water runoff, and other factors. In addition, subterranean seepage may be encountered during construction due to high rainfall in the area, sloping terrain and relict structure in the alluvial soils and basalt rock formation encountered.

3. Based on the loading demands provided by the project structural engineer and the subsurface soil conditions encountered at the site, we believe the new traffic signal structures may be supported by a deep foundation system consisting of cast-in-place concrete drilled shafts.

4. Based on the bolt circle diameter and the square bearing plate dimensions, we envision that drilled shaft foundations with minimum diameters of 24 and 42 inches may be used to support the new Type 1 and Type 2 traffic signal structures, respectively.

5. In general, we recommend installing 24-inch diameter drilled shaft foundations with minimum embedment lengths of 6 feet below the design finished grade to support the new Type 1 traffic signal structures planned for the project.

   In addition, we recommend installing 42-inch diameter drilled shaft foundations with minimum embedment lengths of 12 feet below the design finished grade to support the new Type 2 traffic signal structures planned for the project. The project structural engineer should verify the drilled shaft structural capacity for the calculated induced stresses.

6. It should be noted that cobbles, boulders, and hard basalt rock formation may be encountered within the depth of the drilled shafts. Therefore, some difficult drilling conditions may be expected. The drilled shaft subcontractor should have the appropriate equipment and tools to drill through these types of natural obstructions, where encountered. The drilled shaft subcontractor should demonstrate that the proposed drilling equipment will be capable of installing the drilled shafts to the recommended depths and dimensions.

7. The construction plans and specifications for the project should be forwarded to us for review to determine whether the recommendations contained in this report are adequately reflected in those documents. If this review is not made, Kokua

Geotech LLC cannot assume responsibility for misinterpretation of our recommendations.

8. Kokua Geotech LLC should also be retained to monitor the drilled shaft installation work and other aspects of earthwork construction to determine whether the recommendations of this report are followed. The recommendations presented herein are contingent upon such observations.

   If the actual exposed subsurface soil conditions encountered during construction differ from those assumed or considered in this report, Kokua Geotech LLC should be contacted to review and/or revise the geotechnical recommendations presented herein.

Detailed discussion of our findings and geotechnical engineering recommendations are contained in the body of this report. We appreciate the opportunity to be of service for this project. Should you have any questions concerning this report, please contact our office.

Very truly yours,

Kokua Geotech LLC

Xiaobin (Tim) Lin, P.E.
President

TABLE OF CONTENTS

GEOTECHNICAL ENGINEERING EXPLORATION
KAILUA ROAD INTERSECTION IMPROVEMENTS
VICINITY OF ULUOA STREET AND ULUMANU DRIVE
KAILUA, OAHU, HAWAII

SECTION 1.0 INTRODUCTION

We have performed a geotechnical engineering exploration for the *Kailua Road Intersection Improvements* project in Kailua on the Island of Oahu, Hawaii. The location of the project and general vicinity are shown on the Project Location Map, Plate 1.

The purpose of our exploration was to observe and evaluate the general subsurface conditions at accessible locations at the project site to formulate geotechnical recommendations to assist in the design of the project. This report summarizes the findings and presents our geotechnical recommendations resulting from our site reconnaissance, field exploration, laboratory testing, and engineering analyses for the project. The findings and recommendations presented herein are subject to the limitations noted at the end of this report.

1.1 PROJECT CONSIDERATIONS

The project generally involves traffic improvements at two intersections along Kailua Road in Kailua on the Island of Oahu, Hawaii. In general, the planned intersection improvements along Kailua Road are at Uluoa Street and Ulumanu Drive and generally involve the installation of new traffic signal systems. Layouts of the project sites are shown on the Site Plans, Plates 2.1 and 2.2.

Based on the information provided, we understand the new traffic signal systems will generally consist of traffic signals, underground ducts, poles, foundations, interconnect, controller hardware and other appurtenant equipment, such as CCTV camera(s). It is our understanding that Type 1 traffic signal structures and Type 2 traffic signal structures with 30-foot mast arms are planned for the intersections. The project structural engineer provided the following preliminary structural loading information for the foundation design analyses of the new traffic signal pole structures.

PRELIMINARY STRUCTURAL LOADING INFORMATION	
Type 1 Traffic Signal Structure	
Axial Load (y-direction)	0.2 kips
Horizontal Load (z-direction)	1 kips
Overturning Moment (z-direction)	6 kip-feet
Torsion (z-direction)	0.7 lb-feet
Type 2 Traffic Signal Structure with 30-foot Mast Arm	
Axial Load (y-direction)	3 kips
Horizontal Load (z-direction)	6 kips
Overturning Moment (z-direction)	22 kip-feet
Overturning Moment (x-direction)	99 kip-feet
Torsion (z-direction)	67 kip-feet

1.2 PURPOSE AND SCOPE OF WORK

The purpose of our services was to generally explore and evaluate the subsurface soil conditions at accessible locations at the project site to provide geotechnical recommendations to assist in the design of the project. The work was performed in general accordance with our fee proposal dated November 10, 2022. The scope of work for this exploration included the following items:

1. Research and review of available in-house soils boring data and other information for the project.

2. Coordination of boring stake-out and utility clearances at the proposed boring locations by our field engineer.

3. Mobilization and demobilization of a truck-mounted drill rig and two operators to the project site and back.

4. Drilling and sampling of four boreholes extending to depths ranging from about 8.5 to 21.5 feet below the existing ground surface.

5. Coordination of the field exploration and logging of the borings by our field engineer.

6. Laboratory testing of selected soil samples obtained during the field exploration as an aid in classifying the materials and evaluating their engineering properties.

7. Analyses of the field and laboratory data to formulate geotechnical recommendations to assist in the design of the project.

8. Preparation of this report summarizing our work on the project and presenting our findings and recommendations.

9. Coordination of our overall work on the project by our senior engineer.

10. Quality assurance and client/design team consultation by our principal engineer.

11. Miscellaneous work efforts such as drafting, word processing, and clerical support.

Detailed descriptions of our field exploration methodology are presented in the following section and the Logs of Borings are presented in Appendix A. Results of the laboratory tests performed are presented in Appendix B.

END OF INTRODUCTION

SECTION 2.0 SITE CHARACTERIZATION AND FINDINGS

2.1 GENERAL SITE GEOLOGY

The project site is generally located on the southeastern flank of the Koolau Volcano on the Island of Oahu. Based on the geologic maps of the Island of Oahu (Stearns, 1939 and Sherrod and others, 2007), the general area of the project site is underlain by Honolulu Volcanics Training School Lava Flows (Qol) and Older Alluvium (QTao). In general, the rocks associated with Qol are generally characterized by flows of jointed, dense vesicular basalt with interbedded thin clinker layers. In-situ weathering of these lava flows has occurred, forming a mantle of residual and saprolitic soils overlying the top of the basalt rock formation.

In general, saprolite is composed mainly of silty material that may exhibit a relict structure (vesicles, joints, etc.) from its parent rock, while residual soil tends to be more clayey and is usually "structureless." Both residual and saprolitic soils are typical of the tropical weathering of volcanic rocks. The residual and saprolitic soils grade to basaltic rock formation with increased depth.

Erosional processes in the mountainous regions of Hawaii are dominated by the detachment of soil and rock masses from the valley walls which are transported downslope toward the axis of the valley primarily by gravity as colluvium. Colluvial accumulations often consist of material that is generally deposited by gravity fall, rain wash and mudflow. Once these materials reach the stream in the central portion of the valley, alluvial processes become dominant, and the sediments are transported and deposited as alluvium.

In general, all the big valleys in Hawaii have flat floors built by alluvium deposited by their streams. Stream flows in Hawaii are intermittent and flashy, such that the stream flows transmit large volumes of water for very short duration. Because of this, transport of sediments is intermittent, and the bulk of the stream's hydraulic load consists of a poorly-sorted mixture of boulders, cobbles, gravel, sands, and fines. When the erosional base levels change, these sediment loads are left as deposits.

The surface soils underlying the project site are classified as Pohakupu Silty Clay Loam (PkB) by the U.S. Soil Conservation Service in their publication "Soil Survey of Islands of Kauai, Oahu, Maui, Molokai and Lanai, State of Hawaii" (1972). The PkB soil type is described as dark reddish brown, sticky, plastic clay that formed in old alluvium derived from basic igneous rock. PkB is also described as having a moderate shrink-swell potential and a high shear strength. Mass grading work and development along Kailua Road have brought the project site to its present form.

2.2 SITE DESCRIPTION

The project site is located along Kailua Road at the intersections with Uluoa Street and Ulumanu Drive in Kailua on the Island of Oahu, Hawaii. In general, Kailua Road at these intersections is an existing four-lane divided roadway with two lanes in each direction along with several turning lanes, center median, and pedestrian walkways.

Based on our field observations, the project site appears to generally slope down from the southwest to the northeast. A topographic survey plan was not provided at the time this report was prepared. Based on Google Earth imagery, we anticipate existing ground surface elevations at the project site to range from about +104 to +90 feet Mean Sea Level (MSL) at the southwestern and northeastern portions of the project site, respectively.

At the time of our field exploration, portions of the site were generally covered by asphaltic concrete pavements, concrete walkways, and mown lawn grass. Exposed surface soils at the project site generally consisted of brown silty clay with varying amounts of sand and gravel.

2.3 FIELD EXPLORATION

We explored the subsurface conditions at the project site by drilling and sampling four borings, designated as Boring Nos. 1 through 4, extending to depths ranging from about 8.5 to 21.5 feet below the existing ground surface. The borings were drilled utilizing a truck-mounted drill rig equipped with continuous flight augers. The approximate boring locations are shown on the Site Plans, Plates 2.1 and 2.2.

Our engineer monitored the drilling operations on a near continuous (full-time) basis and classified the materials encountered in the borings by visual and textural examination in the field in general accordance with ASTM D2488. These classifications were further reviewed visually and by testing in the laboratory. Soils were classified in general accordance with ASTM D2487 and the Unified Soil Classification System.

Soil samples were obtained in general accordance with ASTM D1586 by driving a 2-inch OD standard penetration sampler with a 140-pound hammer falling 30 inches. In addition, relatively undisturbed soil samples were obtained in general accordance with ASTM D3550 by driving a 3-inch OD Modified California sampler using the same hammer and drop. The blow counts needed to drive the sampler the second and third 6 inches of an 18-inch drive are shown as the "Sampling Resistance" on the Logs of Borings at the appropriate sample depths. The blow counts may need to be factored to obtain the Standard Penetration Test (SPT) blow counts.

Pocket penetrometer tests were performed on selected cohesive soil samples retrieved in the field. The pocket penetrometer test provides an indication of the unconfined compressive strength of the sample. Pocket penetrometer test results are summarized on the Logs of Borings at the appropriate sample depths.

2.4 SUBSURFACE CONDITIONS

Our borings generally encountered pavement structures consisting of about 8 inches of asphaltic concrete and 4 inches of base material overlying surface fill materials, alluvial soils, and hard basalt rock formation extending down to the maximum depth explored of about 21.5 feet below the existing ground surface. The surface fill materials were encountered to depths ranging from about 2 to 5 feet below the existing ground surface and generally consisted of stiff to very stiff silty clay and medium dense silty sand with some gravel.

Alluvial soils were encountered underlying the surface fill materials to depths ranging from about 12 feet to the maximum depth explored of about 21.5 feet below the existing ground surface in Boring No. 1 and generally consisted of stiff to hard silty clay with some sand and

gravel. In addition, boulders were encountered within the alluvial soil deposits in Boring No. 2 at depths of about 2 and 6 feet below the existing ground surface.

Hard basalt rock formation was encountered underlying the alluvial soils in Boring Nos. 3 and 4 only, and extended down to the maximum depth explored in these boring of about 15.3 feet. We did not encounter groundwater in the borings at the time of our field exploration. However, it should be noted that groundwater levels are subject to change due to rainfall, time of year, seasonal precipitation, surface water runoff, and other factors. Graphic representations of the materials encountered are presented on the Logs of Borings, Appendix A.

2.5 LABORATORY TESTING

Moisture Content (ASTM D2216) and Unit Weight (ASTM D2937) determinations were performed on selected samples as an aid in the classification and evaluation of soil properties. The test results are presented on the Logs of Borings at the appropriate sample depths.

Two Atterberg Limits tests (ASTM D4318) were performed on selected soil samples to evaluate the liquid and plastic limits. The samples tested generally had high Plasticity Indexes (PIs) of about 28 and 32 and plotted as high plasticity clay (CH) on a Standard Plasticity Chart. The test results are summarized on the Logs of Borings at the appropriate sample depths. Graphic presentations of the Atterberg Limits test results are provided on Plate B-1.

Two one-inch Ring Swell tests were performed on relatively undisturbed (natural) and remolded samples to evaluate the swelling potential of the on-site soils. Swell test results of about 2.1 and 8.9 percent were observed for the relatively undisturbed (natural) and remolded samples, respectively, indicating the on-site soils have a moderately high to high swelling potential when subjected to moisture fluctuations. The Ring Swell test results are summarized on Plate B-2.

One Unconfined Compression test (ASTM D2166) was performed on a selected in-situ cohesive soil sample to evaluate the unconfined compressive strength of the soil. The test

resulted in an unconfined compressive strength of about 1.8 kips per square foot (ksf). The Unconfined Compression test results are presented on Plate B-3.

2.6 SEISMIC DESIGN CONSIDERATIONS

Based on the International Building Code, 2018 Edition (IBC 2018) and American Society of Civil Engineers Standard ASCE/SEI 7-16 (ASCE 7-16), the project site may be subject to seismic activity, and seismic design considerations will need to be addressed. Based on the subsurface materials encountered at the project site and the geologic setting of the area, we anticipate the project site may be classified from a seismic analysis standpoint as being a "Stiff Soil Profile" site corresponding to a Site Class D soil profile type based on Chapter 20 of ASCE 7-16.

Based on Site Class D, the following seismic design parameters were estimated and may be used for seismic analysis of the project.

SUMMARY OF SEISMIC DESIGN PARAMETERS	
Mapped MCE Spectral Response Acceleration, S_S	0.552g
Mapped MCE Spectral Response Acceleration, S_1	0.155g
Site Class	D
Site Coefficient, F_a	1.358
Site Coefficient, F_v	2.291
Design Spectral Response Acceleration, S_{DS}	0.500g
Design Spectral Response Acceleration, S_{D1}	0.236g
Peak Ground Acceleration, PGA	0.254g
Site Modified Peak Ground Acceleration, PGA_M	0.342g

Based on the subsurface conditions encountered, the phenomenon of soil liquefaction is not a design consideration for this project site.

END OF SITE CHARACTERIZATION AND FINDINGS

SECTION 3.0 DISCUSSION AND RECOMMENDATIONS

Based on the results of our field exploration, the project site is generally underlain by pavement structures consisting of about 8 inches of asphaltic concrete and 4 inches of base material overlying surface fill materials, alluvial soils, and hard basalt rock formation extending down to the maximum depth explored of about 21.5 feet below the existing ground surface. The surface fill materials were encountered to depths ranging from about 2 to 5 feet below the existing ground surface and generally consisted of stiff to very stiff silty clay and medium dense silty sand with some gravel.

Alluvial soils were encountered underlying the surface fill materials to depths ranging from about 12 feet to the maximum depth explored of about 21.5 feet below the existing ground surface in Boring No. 1 and generally consisted of stiff to hard silty clay with some sand and gravel. In addition, boulders were encountered within the alluvial soil deposits in Boring No. 2 at depths of about 2 and 6 feet below the existing ground surface.

Hard basalt rock formation was encountered underlying the alluvial soils in Boring Nos. 3 and 4 only, and extended down to the maximum depth explored in these boring of about 15.3 feet. We did not encounter groundwater in the borings at the time of our field exploration. However, it should be noted that groundwater levels are subject to change due to rainfall, time of year, seasonal precipitation, surface water runoff, and other factors. In addition, subterranean seepage may be encountered during construction due to high rainfall in the area, sloping terrain and relict structure in the alluvial soils and basalt rock formation encountered.

Based on the loading demands provided by the project structural engineer and the subsurface soil conditions encountered at the site, we believe the new traffic signal structures may be supported by a deep foundation system consisting of cast-in-place concrete drilled shafts. Detailed discussion of these items and our geotechnical recommendations for design of drilled shaft foundations and other geotechnical aspects of the project are further discussed in the following sections.

3.1 DRILLED SHAFT FOUNDATIONS

In order to develop the required bearing and lateral load resistances, we believe the new traffic signal structures may be supported by a deep foundation system consisting of cast-in-place concrete drilled shafts. In general, drilled shaft foundations are constructed by drilling a hole down into the bearing strata, placing reinforcing steel, and then pumping high slump concrete to fill up the hole. The result is a cast-in-place concrete drilled shaft for foundation support.

Based on the bolt circle diameter and the square bearing plate dimensions, we envision that drilled shaft foundations with minimum diameters of 24 and 42 inches may be used to support the new Type 1 and Type 2 traffic signal structures, respectively. Detailed discussions and recommendations for foundation design are presented in the following subsections.

3.1.1 LATERAL LOAD RESISTANCE

The lateral load resistance of drilled shafts is a function of the stiffness of the surrounding soil, the stiffness of the drilled shaft, allowable deflection at the top of the drilled shaft, and the induced moment in the drilled shaft. The lateral load analyses were performed using the program LPILE, which is a microcomputer adaptation of a finite difference, laterally loaded deep foundation program originally developed at the University of Texas at Austin.

The program solves for deflection and bending moment along a deep foundation under lateral loads as a function of depth. The analysis was carried out with the use of non-linear "p-y" curves to represent soil moduli. The lateral deflection was then computed using the appropriate soil moduli at various depths.

Based on the provided preliminary structural loads and the anticipated subsurface soil conditions at each site, we performed the lateral load analyses for the above drilled shaft foundations. The results of our analyses are summarized in the tables below.

In general, we recommend installing 24-inch diameter drilled shaft foundations with minimum embedment lengths of 6 feet below the design finished grade to support the

new Type 1 traffic signal structures planned for the project. In addition, we recommend installing 42-inch diameter drilled shaft foundations with minimum embedment lengths of 12 feet below the design finished grade to support the new Type 2 traffic signal structures planned for the project. The project structural engineer should verify the drilled shaft structural capacity for the calculated induced stresses.

FOUNDATION ANALYSES FOR TYPE 1 TRAFFIC SIGNAL POLE STRUCTURE				
Minimum Drilled Shaft Diameter (inches)	**Minimum Drilled Shaft Length** (feet)	**Lateral Deflection** (inches)	**Maximum Induced Moment** (kip-foot)	**Depth to Maximum Moment** (feet)
24	6	0.1	6.4	1.6

FOUNDATION ANALYSES FOR TYPE 2 TRAFFIC SIGNAL POLE STRUCTURE WITH 30-FOOT MAST ARM				
Minimum Drilled Shaft Diameter (inches)	**Minimum Drilled Shaft Length** (feet)	**Lateral Deflection** (inches)	**Maximum Induced Moment** (kip-foot)	**Depth to Maximum Moment** (feet)
42	12	0.3	108.3	3.5

3.1.2 FOUNDATION SETTLEMENT

Settlement of the drilled shaft foundations will result primarily from elastic compression of the shaft member and subgrade response. We estimate the total settlement of the drilled shaft supported foundations to be 0.5 inches or less with differential settlements between drilled shafts not exceeding about one half of the total settlement. We believe these settlements are essentially elastic and should occur as the loads are applied.

3.1.3 DRILLED SHAFT CONSTRUCTION CONSIDERATIONS

In general, the performance of drilled shafts depends significantly upon the contractor's method of installation and construction procedures. The load bearing capacities of the drilled shafts depend, to a significant extent, on the friction between the shaft and the surrounding soils. Therefore, proper construction techniques, especially during the drilling operations, are important. The contractor should exercise care in drilling the shaft holes and placing concrete into the drilled holes.

It should be noted that cobbles, boulders, and hard basalt rock formation may be encountered within the depth of the drilled shafts. Therefore, some difficult drilling conditions may be expected. The drilled shaft subcontractor should have the appropriate equipment and tools to drill through these types of natural obstructions, where encountered. The drilled shaft subcontractor should demonstrate that the proposed drilling equipment will be capable of installing the drilled shafts to the recommended depths and dimensions.

Based on the estimated lengths of the drilled shafts, groundwater is generally not expected in the drilled hole during the shaft installation. However, concrete placement by tremie method is recommended during construction of the drilled shafts in lieu of free fall method. This is to reduce the potential for concrete from striking the steel reinforcement cage or shaft sidewalls during concrete placement.

A low-shrink concrete mix with high slump (7 to 9-inch slump range) should be used to provide close contact between the drilled shaft and the surrounding soils. Due to factors such as seasonal rainfall and perched water, groundwater may be encountered in the drilled hole. The concrete should be placed in a suitable manner to reduce the potential for segregation of the aggregates from the concrete mix. In addition, the concrete should be placed promptly after drilling (within 24 hours after drilling of the holes) to reduce the potential for softening of the sides of the drilled hole.

We recommend a specialty contractor experienced in the construction of drilled shaft foundations (minimum five projects) perform the installation of the drilled shafts. Due to the specialized nature of the drilled shaft foundation construction, observation and testing of the drilled shaft foundation system should be designated as a "Special Inspection" item. Therefore, a Kokua Geotech LLC representative (Special Inspector) should be present to observe the geotechnical aspects of the drilled shaft foundation construction.

3.2 UTILITY TRENCHES

We anticipate that new underground utility lines may be required for the project. As discussed above, all excavations should be made in accordance with applicable Occupational Safety and Health Administration (OSHA) and state regulations. The contractor should determine the method and equipment to be used for utility trench excavation, subject to practical limits and safety considerations. In addition, the trench excavations should comply with the applicable federal, state, and local safety requirements. The contractor should be responsible for trench shoring design and installation.

Based on our borings, trench excavations will likely encounter surficial fill materials and alluvial soils generally consisting of stiff to hard silty clay and medium dense silty sand with some gravel. In addition, cobbles, boulders, and basalt rock formation may be encountered within the depth of the excavations. It is anticipated that most of the material may be excavated with normal heavy excavation equipment. However, deep excavations and excavations encountering boulders may require the use of hoerams.

In general, we recommend providing granular bedding consisting of 6 inches of open-graded gravel, such as No. 3 Fine gravel (ASTM C33, No. 67 gradation), under the pipes for uniform support. In addition, open-graded gravel (ASTM C33, No. 67 gradation) should also be used for the initial trench backfill up to about 12 inches above the pipes to provide adequate support around the pipes. It is critical to use a free-draining material, such as open-graded gravel, to reduce the potential for formation of voids below the haunches of pipes and to provide

adequate support for the sides of the pipes. Improper trench backfill could result in backfill settlement and pipe damage.

Trench subgrades should firm and unyielding prior to placing the minimum 6-inch thick layer of open-graded gravel below the pipes. Soft and/or loose materials encountered at the bottom of trench excavations should be over-excavated to expose the underlying firm materials. The over-excavation should be backfilled with general fill materials compacted to a minimum of 90 percent relative compaction. Before the placement of bedding material, a Kokua Geotech LLC representative should observe the excavated trench bottom to confirm that firm materials are exposed at the bottom of the trench.

Trench backfill material above the open-graded gravel may consist of general fill materials (on-site soils with rock fragments less than 3 inches in largest dimension). The backfill should be placed in maximum 8-inch level loose lifts and mechanically compacted to no less than 90 percent relative compaction to reduce the potential for appreciable future ground subsidence. The upper 2 feet below the finished grade in areas subjected to vehicular traffic should be compacted to a minimum of 95 percent relative compaction.

Relative compaction refers to the in-place dry density of soil expressed as a percentage of the maximum dry density of the same soil determined in accordance with ASTM D1557. Optimum moisture is the water content (percentage by dry weight) corresponding to the maximum dry density.

3.3 SITE DRAINAGE CONSIDERATIONS

The drainage condition around the new traffic signal structures is critical to maintaining proper foundation performance because ponded water could cause subsurface soil saturation and subsequent heaving or loss of strength. Finished grades outside the new structures should be sloped to shed water away from the slabs and foundations and to reduce the potential for ponding around the structure.

Drainage systems and finished grades for the project site should be designed by a Licensed Civil Engineer so that surface runoff is directed away from the structures. Drainage swales should be provided as soon as possible and should be maintained to drain surface water runoff away from the foundations.

3.4 DESIGN REVIEW AND CONSTRUCTION OBSERVATION SERVICES

The construction plans and specifications for the project should be forwarded to us for review to determine whether the recommendations contained in this report are adequately reflected in those documents. If this review is not made, Kokua Geotech LLC cannot assume responsibility for misinterpretation of our recommendations.

Kokua Geotech LLC should also be retained to monitor the drilled shaft foundation installation operations and other aspects of earthwork construction to determine whether the recommendations of this report are followed. The recommendations presented herein are contingent upon such observations. If the actual exposed subsurface soil conditions encountered during construction differ from those assumed or considered in this report, Kokua Geotech LLC should be contacted to review and/or revise the geotechnical recommendations presented herein.

END OF DISCUSSION AND RECOMMENDATIONS

SECTION 4.0 LIMITATIONS

This report has been prepared for the exclusive use of Community Planning and Engineering, Inc. and their project consultants for specific application to the design of the *Kailua Road Intersection Improvements, Vicinity of Uluoa Street and Ulumanu Drive* project in accordance with generally accepted geotechnical engineering principles and practices. No warranty is expressed or implied. If any part of the project concept is altered or if subsurface conditions differ from those described in this report, then the information presented herein shall be considered invalid, unless the changes are reviewed, and any supplemental or revised recommendations issued in writing by Kokua Geotech LLC.

The analyses and report recommendations are based in part upon information obtained from the field borings and the assumption that subsurface conditions do not vary significantly from those observed in the borings. Variations of the subsurface conditions between and beyond the field borings may occur, and the nature and extent of these variations may not become evident until construction is underway. If variations then appear evident, Kokua Geotech LLC should be notified so that we can re-evaluate the recommendations presented herein.

The owner/client should be aware that unanticipated soil conditions are commonly encountered. Unforeseen subsurface conditions, such as perched groundwater, soft deposits, hard layers or cavities, may occur in localized areas and may require additional probing or corrections in the field (which may result in construction delays) to attain a properly constructed project. Therefore, a sufficient contingency fund is recommended to accommodate these possible extra costs.

The field boring locations indicated herein are approximate, having been estimated by taping from visible features shown on the Traffic Signal Plan transmitted by Community Planning and Engineering, Inc. on October 6, 2023. A topographic survey plan was not provided at the time this report was prepared. Elevations of the borings were estimated from Google Earth imagery.

The field boring locations and elevations should be considered accurate only to the degree implied by the methods used.

The stratification breaks shown on the graphic representations of the borings depict the approximate boundaries between soil types and, as such, may denote a gradual transition. We did not encounter groundwater in the borings at the time of our field exploration. However, it should be noted that groundwater levels are subject to change due to rainfall, time of year, seasonal precipitation, surface water runoff, and other factors. These data have been reviewed and interpretations made in the formulation of this report.

This report has been prepared solely for the purpose of assisting the design engineers in the design of the project. Therefore, this report may not contain sufficient data, or the proper information, to serve as a basis for detailed construction cost estimates.

This geotechnical engineering exploration conducted at the project site was not intended to investigate the potential presence of hazardous materials existing at the project site. It should be noted that the equipment, techniques, and personnel used to conduct a geo-environmental exploration differ substantially from those applied in geotechnical engineering.

END OF LIMITATIONS

CLOSURE

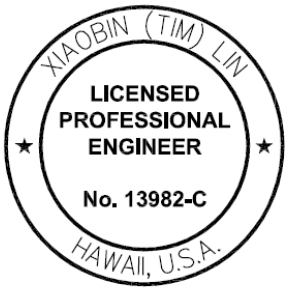
The following plates and appendices are attached and complete this report:

This report concludes our scope of work outlined in our fee proposal dated November 10, 2022. If you have any questions regarding this report or if any part of the report is not clear, please contact our office.

Respectfully submitted,

Kokua Geotech LLC

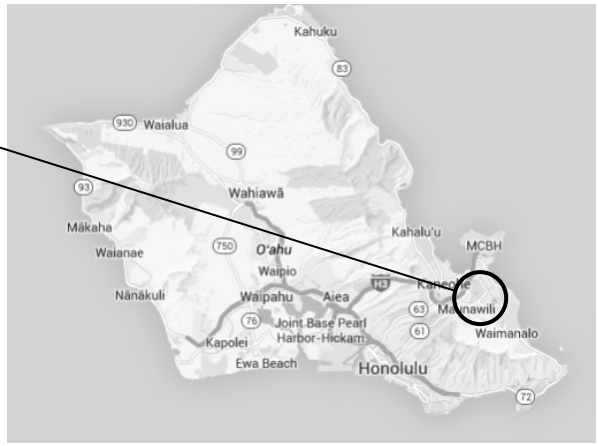
Xiaobin (Tim) Lin, P.E.
President

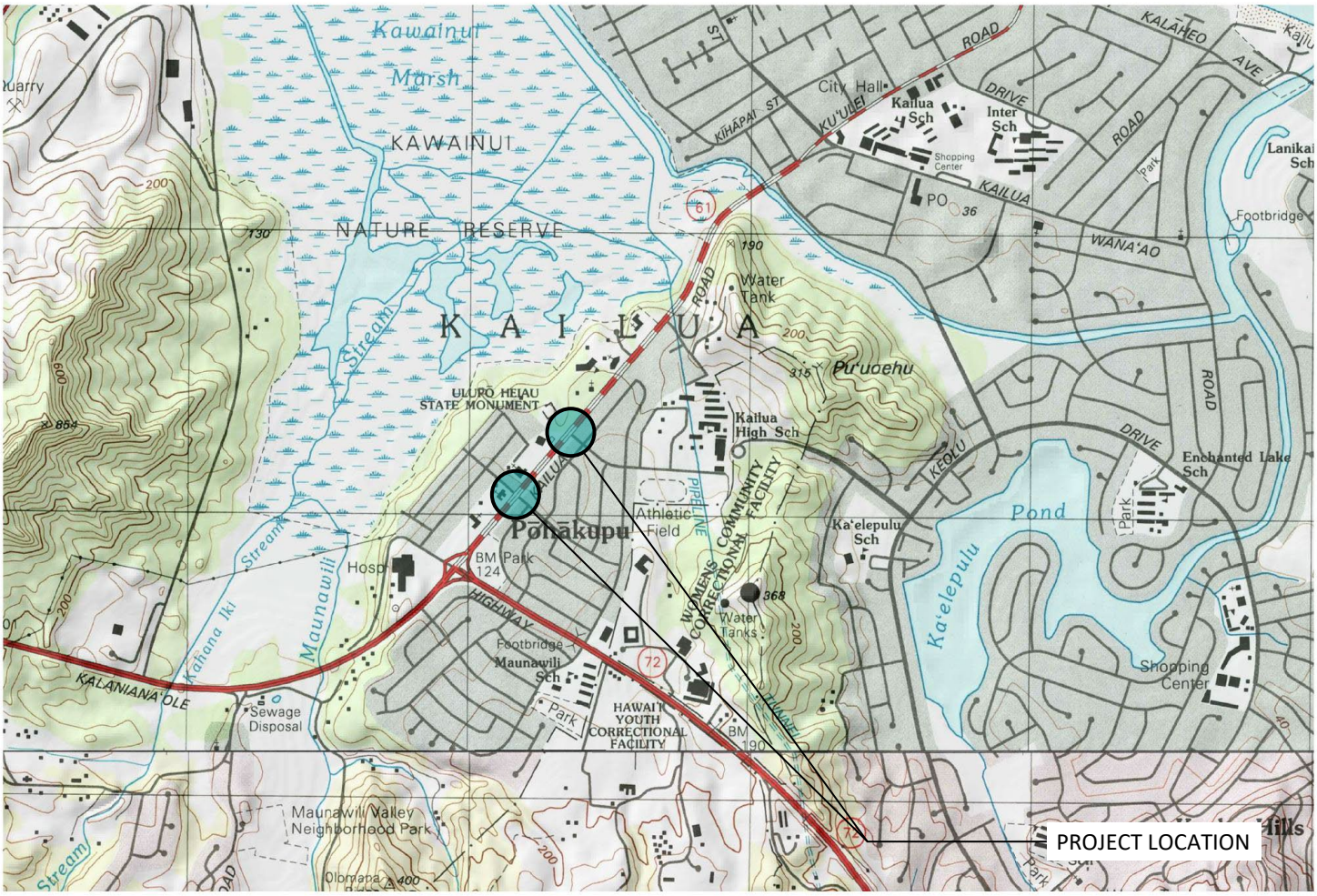


THIS WORK WAS PREPARED BY
ME OR UNDER MY SUPERVISION.
(MY LICENSE EXPIRES 4/30/2024)

PLATES

GENERAL PROJECT LOCATION





Mercator Projection
WGS84
UTM Zone 4Q
CALTOPO

1 2 3km
0.5 1.0 1.5 mi
Scale **1:18370** 1 inch = 1531 feet

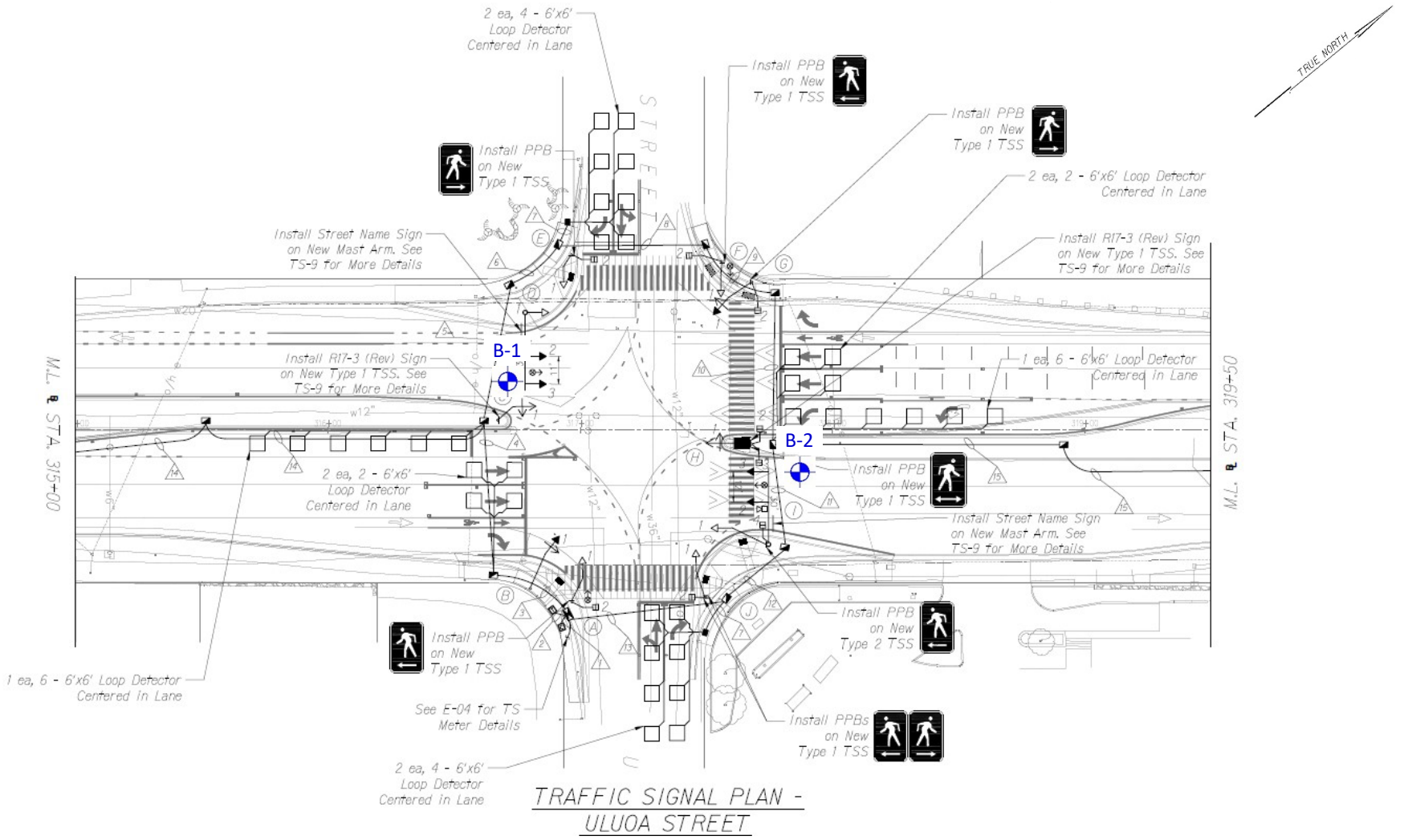
MN 9.5º

PROJECT LOCATION MAP

KAILUA ROAD INTERSECTION IMPROVEMENTS
VICINITY OF ULUOA STREET AND ULUMANU DRIVE
KAILUA, OAHU, HAWAII

Kokua Geotech LLC
Soil and Foundation Engineering

PROJECT NO.: 110922-00	**PLATE** 1
DATE: DECEMBER 2023	



TRAFFIC SIGNAL PLAN - ULUOA STREET

REFERENCE: TRAFFIC SIGNAL PLAN – ULUOA STREET TRANSMITTED BY COMMUNITY PLANNING AND ENGINEERING INC. ON OCTOBER 6, 2023

APPROXIMATE BORING LOCATION

SITE PLAN – 1

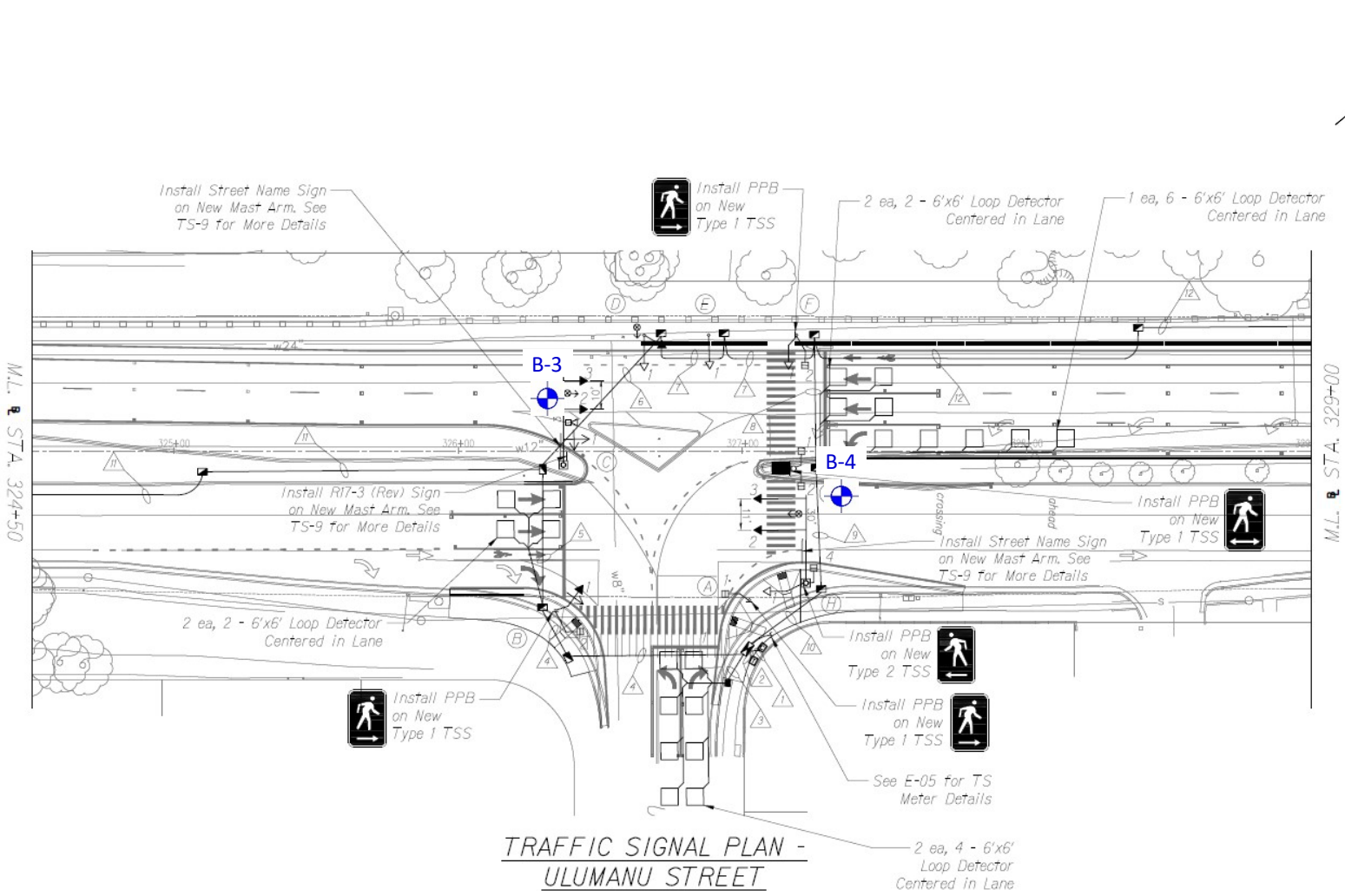
KAILUA ROAD INTERSECTION IMPROVEMENTS
VICINITY OF ULUOA STREET AND ULUMANU DRIVE
KAILUA, OAHU, HAWAII

PROJECT NO.: 110922-00

DATE: DECEMBER 2023

PLATE
2.1

Kokua Geotech LLC
Soil and Foundation Engineering



REFERENCE: TRAFFIC SIGNAL PLAN – ULUOA STREET TRANSMITTED BY COMMUNITY PLANNING AND ENGINEERING INC. ON OCTOBER 6, 2023

APPROXIMATE BORING LOCATION

Kokua Geotech LLC
Soil and Foundation Engineering

SITE PLAN – 2

KAILUA ROAD INTERSECTION IMPROVEMENTS
VICINITY OF ULUOA STREET AND ULUMANU DRIVE
KAILUA, OAHU, HAWAII

PROJECT NO.: 110922-00	**PLATE**
DATE: DECEMBER 2023	**2.2**

APPENDIX A

Project: **Kailua Road Intersection Improvements** Project Location: **Kailua, Oahu, Hawaii** Project Number: **110922-00**	**Kokua Geotech LLC** 94-974 Pakela Street, Suite 109 Waipahu, HI 96797 (808) 397-6974	Key to Log of Borings Sheet 1 of 1

Elevation (feet)	Depth (feet)	Sample Type	Sample Number	Sampling Resistance, blows/ft	U.S.C.S	Graphic Log	MATERIAL DESCRIPTION	Pocket Pen./Torvane, tsf	Water Content, %	Dry Unit Weight, pcf	Remarks and Other Tests
1	2	3	4	5	6	7	8	9	10	11	12

COLUMN DESCRIPTIONS

1. Elevation (feet): Elevation (MSL, feet).
2. Depth (feet): Depth in feet below the ground surface.
3. Sample Type: Type of soil sample collected at the depth interval shown.
4. Sample Number: Sample identification number.
5. Sampling Resistance, blows/ft: Number of blows to advance driven sampler one foot (or distance shown) beyond seating interval using the hammer identified on the boring log.
6. U.S.C.S: Type of material encountered.
7. Graphic Log: Graphic depiction of the subsurface material encountered.
8. MATERIAL DESCRIPTION: Description of material encountered. May include consistency, moisture, color, and other descriptive text.
9. Pocket Pen./Torvane, tsf: the reading from Poecket Penetrometer or Torvane.
10. Water Content, %: Water content of the soil sample, expressed as percentage of dry weight of sample.
11. Dry Unit Weight, pcf: Dry weight per unit volume of soil sample measured in laboratory, in pounds per cubic foot.
12. Remarks and Other Tests: Other Tests

FIELD AND LABORATORY TEST ABBREVIATIONS

CHEM: Chemical tests to assess corrosivity
COMP: Compaction test
CONS: One-dimensional consolidation test
LL: Liquid Limit, percent
PI: Plasticity Index, percent
SA: Sieve analysis (percent passing No. 200 Sieve)
UC: Unconfined compressive strength test, Qu, in ksf
WA: Wash sieve (percent passing No. 200 Sieve)

MATERIAL GRAPHIC SYMBOLS


Asphaltic Concrete (AC)


Basalt Rock Formation


Boulders


Fat CLAY, CLAY w/SAND, SANDY CLAY (CH)


Silty GRAVEL (GM)


Silty SAND (SM)

TYPICAL SAMPLER GRAPHIC SYMBOLS


Auger sampler


Bulk Sample


3-inch-OD California w/ brass rings


CME Sampler


Grab Sample


HQ Coring


3-inch OD Modified California w/ brass liners


Pitcher Sample


PQ Coring


Probing w/Pointed Tip


2-inch-OD unlined split spoon (SPT)


Shelby Tube (Thin-walled, fixed head)

OTHER GRAPHIC SYMBOLS


Water level (at time of drilling, ATD)


Water level (after waiting)


Minor change in material properties within a stratum

Inferred/gradational contact between strata

Queried contact between strata

GENERAL NOTES

1: Soil classifications are based on the Unified Soil Classification System. Descriptions and stratum lines are interpretive, and actual lithologic changes may be gradual. Field descriptions may have been modified to reflect results of lab tests.
2: Descriptions on these logs apply only at the specific boring locations and at the time the borings were advanced. They are not warranted to be representative of subsurface conditions at other locations or times.

PLATE A-0.1

Project: **Kailua Road Intersection Improvements** Project Location: **Kailua, Oahu, Hawaii** Project Number: **110922-00**	**Kokua Geotech LLC** 94-974 Pakela Street, Suite 109 Waipahu, HI 96797 (808) 397-6974	Log of Boring No. 1 Sheet 1 of 1

Date(s) Drilled **11/27/23**	Logged By **CH**	Checked By **AJF**
Drilling Method **CF Auger**	Drill Bit Size/Type **4-inch Solid Stem Auger**	Total Depth of Borehole **21.5 feet**
Drill Rig Type **Mobile B-53**	Drilling Contractor **Kokua Geotech LLC**	Approximate Surface Elevation **+103 feet MSL***
Groundwater Level and Date Measured **Not Encountered**	Sampling Method(s) **MCS & SPT**	Hammer Data **140 lbs. with 30-inch drop**
Borehole Backfill **Soil Cuttings, Gravel, and AC Patch**	Location **See Site Plan (Plate 2.1)**	

Elevation (feet)	Depth (feet)	Sample Type	Sample Number	Sampling Resistance, blows/ft	U.S.C.S	Graphic Log	MATERIAL DESCRIPTION	Pocket Pen./Torvane, tsf	Water Content, %	Dry Unit Weight, pcf	Remarks and Other Tests
103	0						8-inch ASPHALTIC CONCRETE				
					GM		Grayish brown SILTY GRAVEL with some sand, medium dense, moist (base material)				
			1	25	CH		Reddish brown SILTY CLAY with some sand and gravel (coralline), stiff, moist (fill)	3.0	32	90	Sw.= 2.1%
			2	10					31		
98	5		3	19	CH		Reddish brown to brown SILTY CLAY with some sand and a little gravel, stiff, moist (alluvium)	2.5	38	78	UC= 1.8ksf
93	10		4	11			grades to very stiff		39		LL=59, PI=32
					CH		Reddish brown with multi-color mottling SILTY CLAY with some sand and decomposed gravel, very stiff, moist (alluvium)				
88	15		5	29				3.5	44	80	
83	20		6	10			grades to stiff		51		
							Boring terminated at approximately 21.5 feet below the existing ground surface				
78	25						*Elevations of borings estimated from Google Earth imagery				

PLATE A-1

Project: **Kailua Road Intersection Improvements** Project Location: **Kailua, Oahu, Hawaii** Project Number: **110922-00**	**Kokua Geotech LLC** 94-974 Pakela Street, Suite 109 Waipahu, HI 96797 (808) 397-6974	Log of Boring No. 2 Sheet 1 of 1

Date(s) Drilled **11/27/23**	Logged By **CH**	Checked By **AJF**
Drilling Method **CF Auger**	Drill Bit Size/Type **4-inch Solid Stem Auger**	Total Depth of Borehole **8.5 feet**
Drill Rig Type **Mobile B-53**	Drilling Contractor **Kokua Geotech LLC**	Approximate Surface Elevation **+102 feet MSL***
Groundwater Level and Date Measured **Not Encountered**	Sampling Method(s) **MCS & SPT**	Hammer Data **140 lbs. with 30-inch drop**
Borehole Backfill **Soil Cuttings, Gravel, and AC Patch**	Location **See Site Plan (Plate 2.1)**	

Elevation (feet)	Depth (feet)	Sample Type	Sample Number	Sampling Resistance, blows/ft	U.S.C.S	Graphic Log	MATERIAL DESCRIPTION	Pocket Pen./Torvane, tsf	Water Content, %	Dry Unit Weight, pcf	Remarks and Other Tests
102	0						8-inch ASPHALTIC CONCRETE				
					GM		Grayish brown SILTY GRAVEL with some sand, medium dense, moist (base material)				
			1	30/9" +10/0" Ref.	CH			2.0	34	100	
							Light brown SILTY CLAY with some sand and gravel, stiff, moist (fill)				
			2	20/0" Ref.			Gray BOULDER, hard (alluvium)		--		
					CH		Brown SILTY CLAY with some sand and gravel, hard, moist (alluvium)				
97	5		3	72					31		
			4	20/0" Ref.			Gray BOULDER, hard (alluvium)		--		
							Boring terminated at approximately 7.0 feet below the existing ground surface on an apparent hard boulder				
92	10										
87	15										
82	20										
77	25										

PLATE A-2

Project: Kailua Road Intersection Improvements Project Location: Kailua, Oahu, Hawaii Project Number: 110922-00	**Kokua Geotech LLC** 94-974 Pakela Street, Suite 109 Waipahu, HI 96797 (808) 397-6974	Log of Boring No. 3 Sheet 1 of 1

Date(s) Drilled **11/28/23**	Logged By **CH**	Checked By **AJF**
Drilling Method **CF Auger**	Drill Bit Size/Type **4-inch Solid Stem Auger**	Total Depth of Borehole **13.5 feet**
Drill Rig Type **Mobile B-53**	Drilling Contractor **Kokua Geotech LLC**	Approximate Surface Elevation **+88 feet MSL***
Groundwater Level and Date Measured **Not Encountered**	Sampling Method(s) **MCS & SPT**	Hammer Data **140 lbs. with 30-inch drop**
Borehole Backfill **Soil Cuttings, Gravel, and AC Patch**	Location **See Site Plan (Plate 2.2)**	

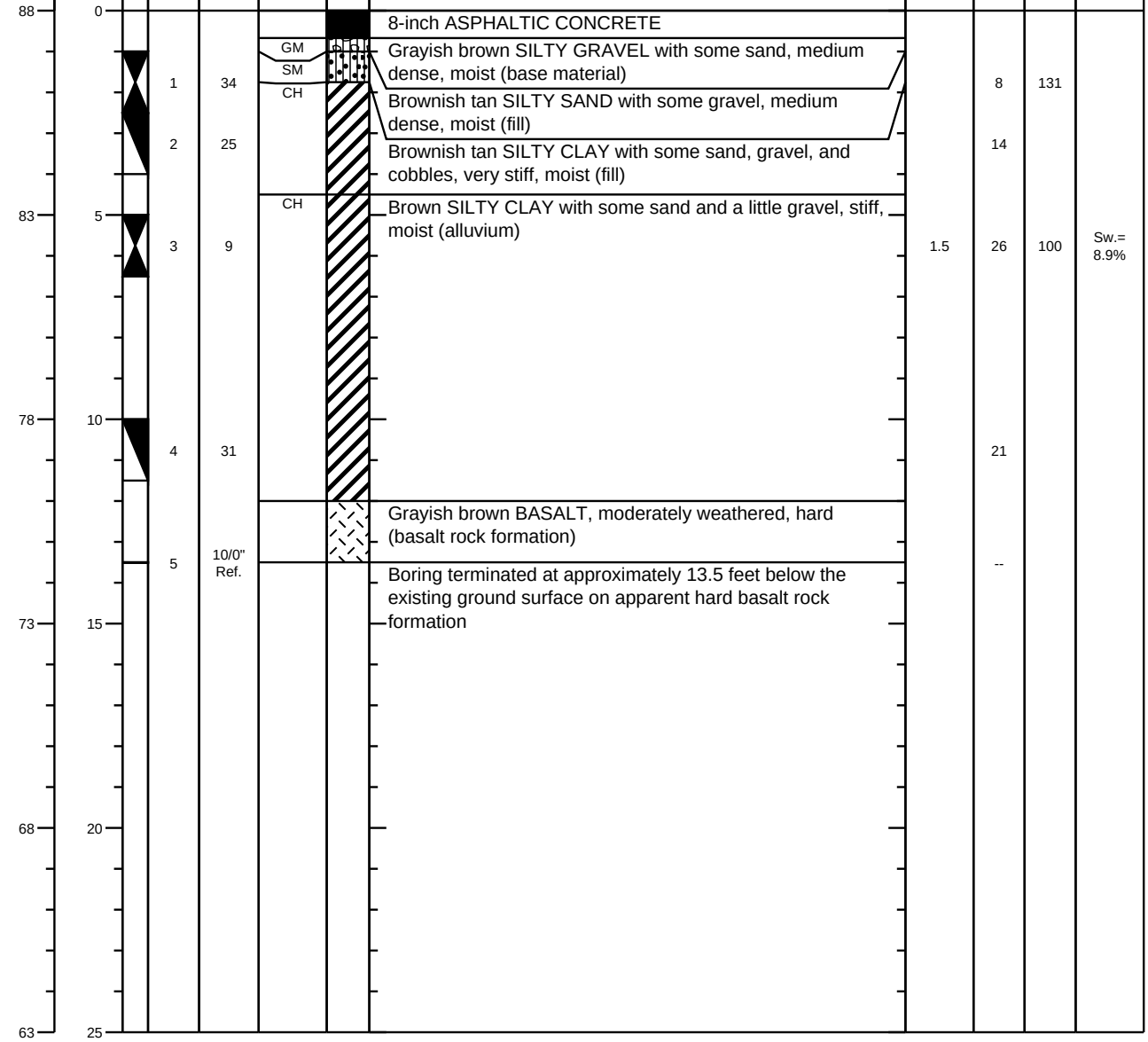


PLATE A-3

Project: **Kailua Road Intersection Improvements** Project Location: **Kailua, Oahu, Hawaii** Project Number: **110922-00**	**Kokua Geotech LLC** 94-974 Pakela Street, Suite 109 Waipahu, HI 96797 (808) 397-6974	Log of Boring No. 4 Sheet 1 of 1

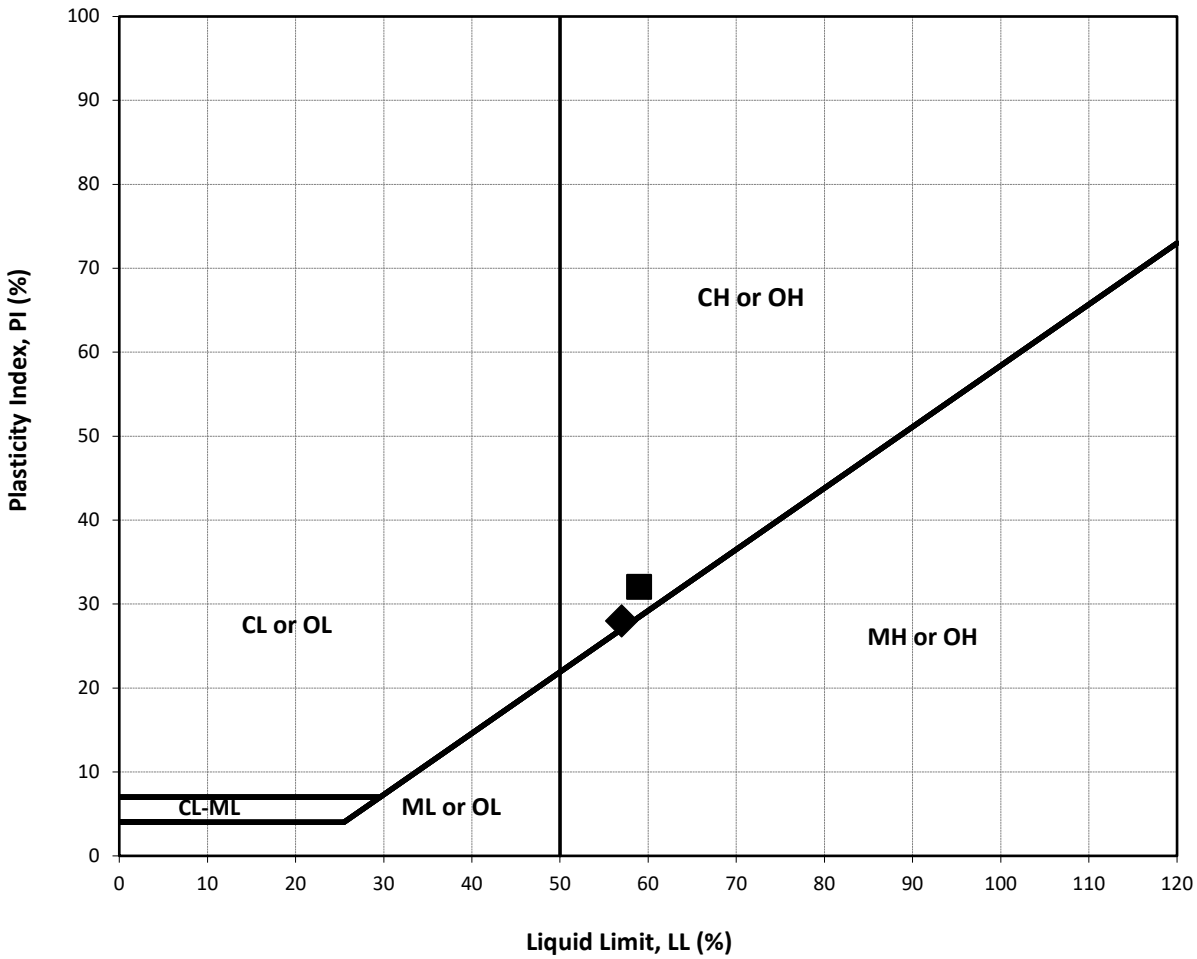
Date(s) Drilled **11/28/23**	Logged By **CH**	Checked By **AJF**
Drilling Method **CF Auger**	Drill Bit Size/Type **4-inch Solid Stem Auger**	Total Depth of Borehole **15.3 feet**
Drill Rig Type **Mobile B-53**	Drilling Contractor **Kokua Geotech LLC**	Approximate Surface Elevation **+91 feet MSL***
Groundwater Level and Date Measured **Not Encountered**	Sampling Method(s) **MCS & SPT**	Hammer Data **140 lbs. with 30-inch drop**
Borehole Backfill **Soil Cuttings, Gravel, and AC Patch**	Location **See Site Plan (Plate 2.2)**	

Elevation (feet)	Depth (feet)	Sample Type	Sample Number	Sampling Resistance, blows/ft	U.S.C.S	Graphic Log	MATERIAL DESCRIPTION	Pocket Pen./Torvane, tsf	Water Content, %	Dry Unit Weight, pcf	Remarks and Other Tests
91	0						8-inch ASPHALTIC CONCRETE				
					GM		Grayish brown SILTY GRAVEL with some sand, medium dense, moist (base material)				
			1	30	SM				14	110	
					CH		Brownish gray SILTY SAND with some gravel, medium dense, moist (fill)				
			2	23			Reddish brown SILTY CLAY with some sand and gravel, hard, moist (alluvium)		30		LL=57, PI=28
86	5		3	32					27		
81	10		4	47					33		
76	15		5	30/3" Ref.			Grayish brown BASALT, highly to moderately weathered, hard (basalt rock formation)		--		
							Boring terminated at approximately 15.3 feet below the existing ground surface on apparent hard basalt rock formation				
71	20										
66	25										

PLATE A-4

APPENDIX B

PLASTICITY CHART



Symbol	Sample	Depth (feet)	Material Description	USCS	LL	PL	PI
■	B-1	10.0 to 11.5	Reddish brown SILTY CLAY with some sand and gravel	CH	59	27	32
◆	B-4	2.5 to 4.0	Reddish brown SILTY CLAY with some sand and gravel	CH	57	29	28

SUMMARY OF ATTERBERG LIMITS (ASTM D4318) TEST RESULTS

KAILUA ROAD INTERSECTION IMPROVEMENTS
VICINITY OF ULUOA STREET AND ULUMANU DRIVE
KAILUA, OAHU, HAWAII

Kokua Geotech LLC
Soil and Foundation Engineering

PROJECT NO.: 110922-00

DATE: DECEMBER 2023

PLATE
B-1

Location	Depth (feet)	Test Type	Soil Description	Dry Density (pcf)	Moisture Contents			Ring Swell (%)
					Initial (%)	Air-Dried (%)	Final (%)	
B-1	1.0 to 2.5	Natural	Reddish brown SILTY CLAY with some sand and gravel	92.8	34.0	21.2	38.8	2.1
B-3	5.0 to 6.5	Remolded	Brown SILTY CLAY with some sand and a little gravel	100.5	22.6	12.8	28.8	8.9

Note: Samples tested were either relatively undisturbed (natural) or remolded in 2.4-inch diameter by 1-inch high rings. Samples were then air-dried overnight followed by saturating for a minimum of 24 hours under a surcharge pressure of 60 psf.

SUMMARY OF RING SWELL TEST RESULTS

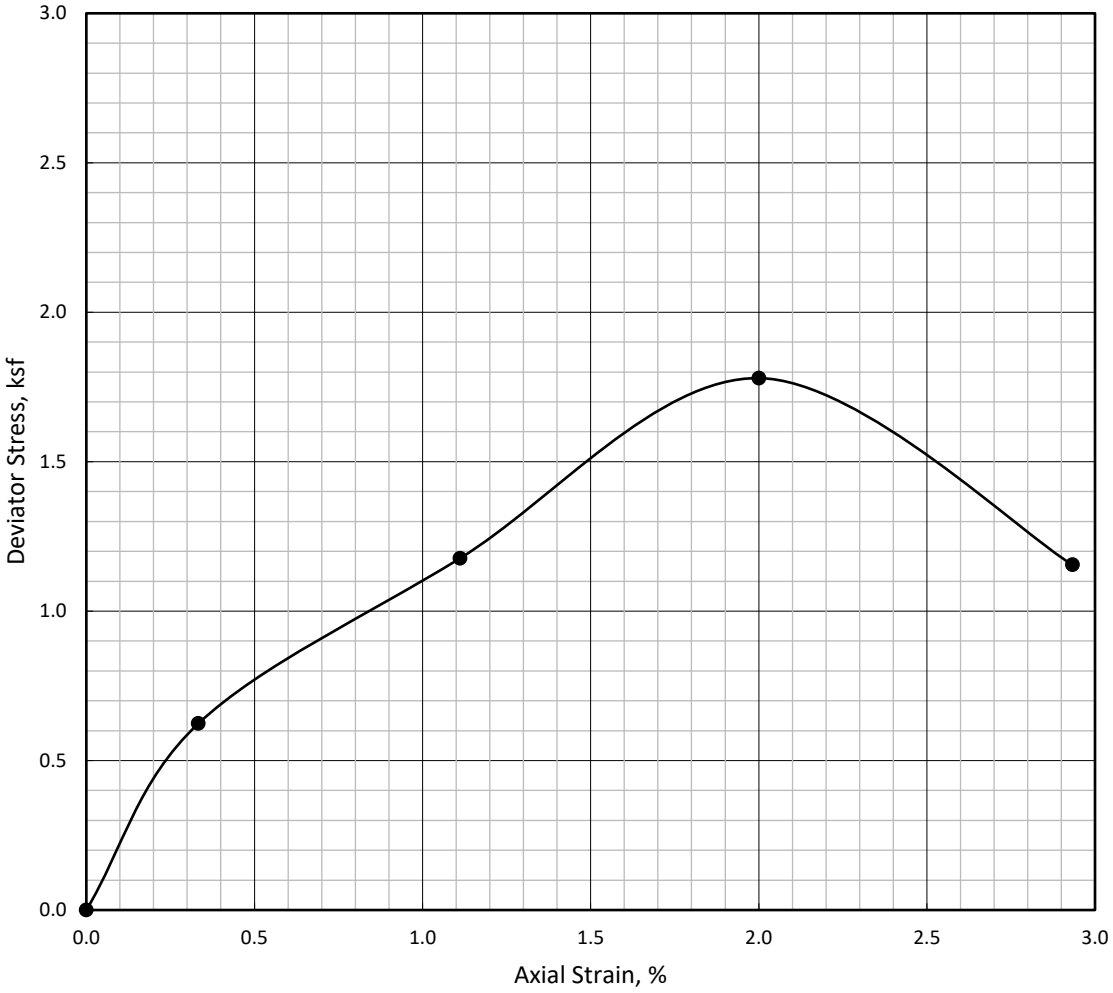
KAILUA ROAD INTERSECTION IMPROVEMENTS
VICINITY OF ULUOA STREET AND ULUMANU DRIVE
KAILUA, OAHU, HAWAII

Kokua Geotech LLC
Soil and Foundation Engineering

PROJECT NO.: 110922-00

DATE: DECEMBER 2023

PLATE
B-2



Location:	B-1
Depth:	5.0 to 6.5 feet
Description:	Reddish brown to brown SILTY CLAY w/sm sand & a little gravel
Dry Density:	77.8 pcf
Moisture:	37.5 %
Sample Diameter:	2.42 inches
Sample Length:	5.0 inches

Unconfined Compressive Strength:	1.8 ksf
Axial Strain at Failure:	2.0 %
Strain Rate:	1.04 %/min.

SUMMARY OF UNCONFINED COMPRESSION (ASTM D2166) TEST RESULTS

KAILUA ROAD INTERSECTION IMPROVEMENTS
VICINITY OF ULUOA STREET AND ULUMANU DRIVE
KAILUA, OAHU, HAWAII

Kokua Geotech LLC
Soil and Foundation Engineering

PROJECT NO.: 110922-00

DATE: DECEMBER 2023

PLATE
B-3

Responses to Request for Information (RFI'S / Questions)

Questions for solicitation: B24001205 61D-01-23 Kailua Rd. Int. Impvs, Vic. of Uluoa St. & Ulumanu Dr.
01/02/2024

1. **The "Contract Certification Date". Is that the date the contract is executed?**

No, the "Contract Certification Date" is the date that the Department of Accounting and General Services (DAGS) certifies the contract funds.

2. **The "Contract Certification Date". How are we notified of this date? Reason I am asking is the NTP is issued not more than 30 calendar days after the Contract Certification Date**

No notification will be sent to the contractor. The "Contract Certification Date" is on the Contract Certification page which is immediately after the K sheets of the contract. This is in the contract that is distributed to the contractor.

3. **Could the Project Completion Time of "180 Working Days from the Start Work Date" be extended by several months? Currently, Traffic Signal Mast Arm Poles, Traffic Cabinets, and Signal Framework have a Factory Lead Time of Approximately 25 Weeks. Also, this does not include the Equipment Submittal Review/Approval process.**

The Project Completion Time will remain at 180 Working Days. Please bid accordingly.

4. **The notice to bidders says the bid is due at 2:00 PM 1/18/24. However, the HIEPRO website says it is due Noon 1/18/24. Which is it Noon or 2:00 PM?**

HIePRO will be revised to 01/18/2024 2:00pm for Offer Due Date & Time.

5. **Spec Section 672.02(D) and 627.04(B) Cellular Modem requires Modems to be provided with "static IP addresses". Static IP Addresses are provided by the Service Provider as part of Activation. Please verify that cost of FirstNet Activation is to be included.**

FirstNet Activation costs will be paid by new item 627.1003 "Cellular Modem Data Service" force account. See Revised Special Provisions, Section 627.02(D), Section 627.04(B), and Section 627.06 for more information.

6. **Spec Section 672.02(D) and 627.04(B) Cellular Modem, Activation normally includes a Monthly Service Charge. Please state duration of FirstNet Wireless Service that should be included under this project. Example: Duration of project until project acceptance plus 1-Year?**

Once the signal is operational, monthly service charges will be paid by new item 627.1003 "Cellular Modem Data Service" force account when the signal is operational until completion of the project. See Revised Special Provisions Section 627.02(D), Section 627.04(B), and Section 627.06 for more information.

7. **Spec Section 672.02(D) calls for a "Single" Cellular Modem at the Uluoa intersection with communication to interconnect and HDOT's Traffic Signal Central System. Spec Section 627.04 and 627.04(B) refers to "Cellular Modems" with communication to HDOT's CCTV Systems at the H-3 TOC. Please confirm if we are to provide one Cellular Modem at the Uluoa intersection, or are we to provide a Cellular Modem at each of the intersections including Ulumanu and Kalanianaole Hwy./Ulukahi St. under this project.**

A total of three cellular modems will be installed for this project. See Revised Special Provisions, Section 627.02(D) and Section 627.04(B) for more information.

8. Can we get profile drawings for the electric, traffic signal and street light ductlines.

Profiles will not be provided. Please bid accordingly.

9. Noticed there is no bid item for Traffic Signal Assembly (1-Way, 12-Inch, 1-3 Section Vertical with Type TP-2W Mounting {2 Heads}) = 1 Each.

Bid Item has been added to the Proposal Schedule.