Department of Business, Economic Development, and Tourism

LEGAL AD DATE: APRIL 15, 2016

REQUEST FOR PROPOSALS
No. RFP-16-018-HBI

The Department of Business, Economic Development, and Tourism (DBEDT) is leading the State's Hawaii Broadband Initiative (HBI) with the intent to make landing a new transpacific fiber optic cable in Hawaii less expensive and quicker than the current options. To aid in this effort, DBEDT seeks assistance in working with the private sector to procure, finance and/or operate a State-sponsored carrier neutral landing station(s) (the "Project") to best leverage $25,000,000 of reimbursable general obligation bond funding through a public-private partnership.

SEALED OFFERS
FOR

STRUCTURING SERVICES TO CREATE A BROADBAND INFRASTRUCTURE PUBLIC-PRIVATE PARTNERSHIP

STATE OF HAWAII
DEPARTMENT OF BUSINESS, ECONOMIC DEVELOPMENT, AND TOURISM

WILL BE RECEIVED UP TO 4:00 P.M. (HST) ON

MAY 18, 2016

IN THE STRATEGIC INDUSTRIES DIVISION (SID) CONTRACTS OFFICE, 235 S. BERETANIA ST., 5TH FLOOR, ROOM 502, HONOLULU, HAWAII 96813. PLEASE DIRECT QUESTIONS RELATING TO THIS SOLICITATION TO MS. SUSAN GRAY-ELLIS AT SUSAN.GRAY-ELLIS@HAWAII.GOV

This solicitation may be obtained from the DBEDT/SID/CONTRACTS OFFICE. Please call Susan Gray-Ellis as 808-587-9002 to make pick up arrangements. There will be a five cent ($0.05) per page charge for copies. This solicitation may be also be accessed via the following URL: http://spo.hawaii.gov/for-vendors/bidding-opportunities/

/s/
LUIS P. SALAVERIA
DIRECTOR, DEPARTMENT OF BUSINESS, ECONOMIC DEVELOPMENT, AND TOURISM

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SECTION ONE: INTRODUCTION, TERMS AND ACRONYMS, KEY DATES

1.1 INTRODUCTION

The Department of Business, Economic Development, and Tourism (DBEDT) is leading the State's Hawaii Broadband Initiative (HBI) with the intent to make landing a new transpacific fiber optic cable in Hawaii less expensive and quicker than the current options. To aid in this effort, DBEDT seeks assistance in working with the private sector to procure, finance and/or operate a State-sponsored carrier neutral landing station(s) (the "Project") to best leverage $25,000,000 of reimbursable general obligation bond funding through a public-private partnership.

DBEDT seeks to contract for an agent to assist in structuring a broadband infrastructure public-private partnership. This agent (the "Structuring Agent") will represent the State in the business structuring and financing of the project, potentially precluding its direct participation as a project partner. By representing the State, the Structuring Agent will provide facilitation, advisory, and management services and serve the interests of the State.

The Structuring Agent will represent the State in structuring a broadband infrastructure public-private partnership. A key requirement is assisting the State in the selection of a partnership model as well as the Project Partner(s). The broadband infrastructure public-private partnership should:

1) Deliver, at a minimum, one (1) carrier neutral landing station;
2) Encourage more transpacific submarine cable landings in Hawaii;
3) Leverage $25M reimbursable general obligation bond funding;
4) Have a revenue model that supports the reimbursable general obligation bond funding;
5) Provide the State additional broadband capacity;
6) Leverage the State's resources (facilities, resources, policy making, etc); and
7) Other reasonable objectives as defined by the State.

1.2 CANCELLATION

The Request for Proposals (RFP) may be cancelled and any or all proposals rejected in whole or in part, without liability to the State, when it is determined to be in the best interest of the State.

1.3 TERMS AND ACRONYMS USED THROUGHOUT THE SOLICITATION

AG	=	Attorney General
BAFO	=	Best and final offer
CPO	=	Chief Procurement Officer
DBEDT	=	Department of Business, Economic Development, and Tourism
GCs	=	General Conditions, issued by the Department of the Attorney General

GET	=	General Excise Tax
GP	=	General Provisions
HAR	=	Hawaii Administrative Rules
HCE	=	Hawaii Compliance Express
HOPA	=	Head of the Purchasing Agency
HRS	=	Hawaii Revised Statutes
HSEO	=	Hawaii State Energy Office
HST	=	Hawaii Standard Time
Offeror	=	Any individual, partnership, firm, corporation, joint venture or other entity submitting directly, or through a duly authorized representative or agent, a bid for the goods and/or services contemplated in this RFP
Procurement Officer	=	The contracting officer for the State of Hawaii, State Procurement Office
RFP	=	Request for Proposals
SID	=	Strategic Industries Division
SPO	=	State Procurement Office
State	=	State of Hawaii, including its departments, agencies, and political subdivisions

1.4 REGISTRATION

All interested Offerors are requested to register. If you do not register, any applicable addenda will not be sent to you, and you will be responsible for obtaining any applicable addenda through the State Procurement Office website by the submittal deadline.

Send registration by email to Susan Gray-Ellis:

Email: susan.gray-ellis@hawaii.gov

Provide the following information:

- ☐ Name of Company
- ☐ Name of Contact Person
- ☐ Solicitation Number
- ☐ Mailing Address
- ☐ Telephone Number
- ☐ Email Address

1.5 RFP SCHEDULE AND SIGNIFICANT DATES

The schedule represents the State's best estimate of the schedule that will be followed. All times indicated are Hawaii Standard Time (HST). If a component of this schedule, such as "Proposal Due date/time" is delayed, the rest of the schedule will likely be shifted by the same number of days. Any change to the RFP Schedule and Significant Dates shall be reflected in and issued in an addendum.

The approximate schedule is as follows:

Release of Request for Proposals	April 15, 2016
Registration Deadline and Deadline to receive written inquiries	April 21, 2016
Issuance of response to written inquiries (if applicable)	April 28, 2016
Preproposal Conference	May 5, 2016 9:00 A.M. HST
Proposals Due (date/time)	May 18, 2016 4:00 P.M. HST
Proposal review period	June 3, 2016 (estimate)
Optional discussion with priority-listed Offerors	May 31 – June 1, 2016 (estimate)
Best and Final Offer deadline (if necessary)	June 9, 2016 (estimate)
Notice of Award	June 20, 2016 (estimate)
Contract Start Date	August 1, 2016 (estimate)

1.6 QUESTIONS AND ANSWERS PRIOR TO OPENING OF PROPOSALS

All questions shall be submitted in writing and directed to:
Susan Gray-Ellis, email: susan.gray-ellis@hawaii.gov.

Questions must be submitted by the due date specified in SECTION 1.5, *RFP Schedule and Significant Dates,* as may be amended.

The State will respond to questions through Addenda/Amendments by the date specified in SECTION 1.5, *RFP Schedule and Significant Dates,* as may be amended.

1.7 PRE-PROPOSAL CONFERENCE AND ADDENDA

A non-mandatory pre-proposal conference will be held at the Department of Business, Economic Development, and Tourism, 250 S. Hotel Street, Honolulu, Hawaii. Attendance for the pre-proposal conference is not mandatory. The date for the conference is Thursday, May 5, 2016 at 9:00 am (HST). A conference call dial-in will also be available. This meeting will be for the purpose of reviewing item specification and the familiarization of this solicitation.

Offerors are advised that anything discussed at the pre-proposal conference does not change any part of this solicitation. All changes and/or clarifications to this solicitation shall be done on the form of written addendum.

Potential offerors are advised to contact Ms. Susan Gray-Ellis by email at susan.gray-ellis@hawaii.gov, to insure that offeror's name, address, telephone, email and facsimile number(s) are on record for addenda distribution. The State shall not be responsible for distribution of addenda to those potential offerors who have not provided this information to DBEDT.

1.8 PROPOSAL SUBMISSION

The unbound original proposal marked "Original" plus four (4) bound copies marked "COPY" (total of 5 sets) of the Proposal, plus one (1) CD or DVD, shall be submitted in a sealed package or envelope to:

State of Hawaii, Department of Business, Economic Development, and Tourism
SID Contracts Office
Attn: Susan Gray-Ellis
235 S. Beretania St., 5th Floor, Room 502
Honolulu, Hawaii 96813

"Solicitation No. RFP-16-018-HBI" shall be referenced on the outside of the sealed package or envelope.

NO facsimiles and/or emails of the proposal packet shall be accepted.

SECTION TWO: BACKGROUND AND SCOPE OF WORK

2.1 BACKGROUND

The Department of Business, Economic Development, and Tourism (DBEDT) is leading the State's Hawaii Broadband Initiative (HBI) with the intent to make landing a new transpacific fiber optic cable in Hawaii less expensive and quicker than the current options. To aid in this effort, DBEDT seeks assistance in working with the private sector to procure, finance and/or operate a State-sponsored carrier neutral landing station(s) (the "Project") to best leverage $25,000,000 of reimbursable general obligation bond funding through a public-private partnership.

In 2012, DBEDT entered into a Memorandum of Understanding with the Applied Research Laboratory at the University of Hawaii for the purpose of conducting planning and pre-engineering studies of potential transpacific submarine fiber optic cable landing stations statewide. The Applied Research Laboratory at the University of Hawaii then commissioned the study to the John Hopkins University Applied Physics Laboratory (JHU/APL). The resulting study may be found in Exhibit 1: JHU/APL Transpacific System Concept Document.

In 2015, Act 143, Session Laws of Hawaii 2015, made appropriations for a Hawaii Resilience and Sustainability strategy for various essential infrastructure, with emphasis on broadband. Section 2 of the Act finds that the benefits of broadband include: (1) rapid access of information; (2) accelerating business development; (3) connecting first responders more efficiently; (4) creating telemedicine opportunities for the healthcare industry; (5) enhancing educational resources; (6) improving communications networks; (7) enhancing telecommuting; and (8) enabling smart grid technology. The Act also authorized up to $25M in reimbursable general obligation bond funds to be issued by the Department of Budget and Finance and expended by DBEDT.

DBEDT seeks to contract for an agent to assist in structuring a broadband infrastructure public-private partnership. This agent (the "Structuring Agent") will represent the State in the business structuring and financing of the project, potentially precluding its direct participation as a project partner. By representing the State, the Structuring Agent will provide facilitation, advisory, and management services and serve the interests of the State.

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5) Provide the State additional broadband capacity;
6) Leverage the State's resources (facilities, resources, policy making, etc); and
7) Other reasonable objectives as defined by the State.

The Project consists of two (2) phases.

Phase I. Planning and preparation of the RFP for a broadband infrastructure public-private partnership with the Project Partner(s). Issuing the RFP and negotiating and awarding of contract, if applicable.

Phase II. Managing and financing the broadband infrastructure public-private partnership to meet the State's objectives.

2.2 SCOPE OF WORK

All services for DBEDT shall be in accordance with this RFP, including its attachments and any addenda.

Phase I Activities:

I-1. Develop an overall strategic plan for structuring a broadband infrastructure public-private partnership;

- a. Subcontract for additional services including, but not limited to, consultants, technical advisors, and/or legal advisors;
- b. Solicit market feedback and conduct market assessments, including supply and demand for broadband in Hawaii;

I-2. Develop public-private partnership structures for the Project, including operating, revenue, and financing models, and assist the State in determining the optimal structure;

- a. Advise the State on areas of industry specific knowledge that affect the financing and marketing of the State's infrastructure;

I-3. Prepare solicitation documents, pursuant to section 103D HRS, outlining the State's intentions and objectives related to the Project to select Project Partner(s);

I-4. Assist the RFP process, pursuant to section 103D HRS, including acting as the lead with the potential Project Partner(s) and their professionals, if applicable;

- a. Provide advice on negotiating strategies and tactics that will result in the most favorable commercial arrangement and transaction structure, if applicable;
- b. Provide technical assistance in the selection and assist in the negotiations of transaction documentation and agreements, if applicable;

I-5. Prepare and deliver presentations designed to facilitate an understanding of the Project and its implications;

I-6. Advise and assist the State with legislation (if necessary); and

I-7. Other activities, as identified in the Offeror's proposal.

Phase II Activities:

II-1. Assist the State with securing financing for the Project;

a. Provide structuring advice, market conditions and pricing information on proposed Project structures;

b. Assist with reimbursable general obligation bond financing;

c. Assist with other financing, if applicable;

II-2. Perform management functions for the selected Project Partner(s);

a. Facilitate and document a clear path from Project inception to the delivery of the Project to the State;

b. Act as the lead for the State with the Project Partner(s);

II-3. Provide project management for the entire project;

a. Review and catalog all State materials necessary to provide thorough diligence for the Project;

b. Develop Project performance measurements and standards;

c. Monitor the Project's status and provide informed regular reports to the State;

d. Assess any potential commercial and financing risk and advise on corrective actions necessary to address the State's objectives throughout Phase II of the project; and

II-4. Other activities, as identified in the Offeror's proposal.

2.3 SUCCESSION OF ADDITIONAL CONTRACTORS

In the event the State chooses to contract with another vendor to provide the services of the Contractor at the end of this contract term or upon cancellation of the contract, or if the State contracts with one or more additional administrators, the Contractor must provide reasonable transition assistance to the State and cooperation with one or more contractors. Under no circumstances will the existing Contractor have any right to compensation for investments or other expenditures that were undertaken pursuant to, or in anticipation of, an extension of the contract.

2.4 GENERAL RESPONSIBILITY TO COMPLY WITH STATE REQUIREMENTS

Unless otherwise provided in this RFP, the Contractor will be responsible for obtaining all official licenses, approvals, clearances and similar authorizations required by any local, state, or federal agency for the work required in this RFP.

2.5 HAWAII DEPARTMENT OF BUSINESS, ECONOMIC DEVELOPMENT, AND TOURISM'S RESPONSIBILITIES

1) Provide direction and guidance as requested.
2) Provide relevant information in a timely manner.
3) Pay invoices in a timely fashion upon verification of satisfactory performance.

4) Maintain an oversight and advisory role for each of the tasks outlined above.

2.6 COMPENSATION

1) The award shall be made on a firm, fixed fee in the best interest of the State, including all taxes. All necessary expenses including contingencies shall be included in the fixed fee and detailed in the budget sheet. Travel is to be paid on a reimbursable basis and should be identified in the proposed budget as a separate category. All assumptions should also be identified. Amount of each payment shall be consistent with the timeline and budget sheet for services performed during the period.
2) Only proposals priced at or below $375,000 for Phase I shall be considered.
3) The Contractor will document all expenses and expenditures in relation to this project.
4) The Contractor shall perform all of the above requirements within but not to exceed the amount specified by contract.

2.7 TERM OF CONTRACT

The solicitation shall be for a three-year contract. The period of performance for this contract shall begin approximately on August 1, 2016 and end on July 31, 2019.

Unless terminated, the Contractor and the State may extend the term of the contract for two (2), 12-month periods or portions thereof without the necessity of re-soliciting, upon mutual agreement in writing at least thirty (30) days prior to the expiration of the contract, contingent upon the appropriation and availability of funds. The contract price paid to the Contractor for the extended period(s) shall remain the same or as described in the proposal.

2.8 LEGISLATIVE CHANGES

The State reserves the right to amend the requirements of the Contractor in response to legislative changes and regulatory changes that affect this RFP.

2.9 CONTRACT ADMINISTRATOR

For the purposes of this solicitation, Susan Gray-Ellis, Contracting Specialist, 808-587-9002, or another authorized representative, is designated the Contract Administrator.

SECTION THREE: PROPOSAL SUBMISSION AND CONTENT

3.1 OFFEROR'S AUTHORITY TO SUBMIT AN OFFER

The State will not participate in determinations regarding an Offeror's authority to sell a product or service. If there is a question or doubt regarding an Offeror's right or ability to obtain and sell a product or service, the Offeror shall resolve that question prior to submitting a proposal.

3.2 REQUIRED REVIEW

3.2.1 Before submitting a proposal, each Offeror must thoroughly and carefully examine this RFP, any attachment, addendum, and other relevant document, to ensure Offeror understands the requirements of the RFP. Offeror must also become familiar with State, local and Federal laws, statutes, ordinances, rules, and regulations that may in any manner affect cost, progress, or performance of the work required.

3.2.2 Should Offeror find defects and questionable or objectionable items in the RFP, Offeror shall notify DBEDT in writing prior to the deadline for written questions as stated in SECTION 1.5 RFP *Schedule and Significant Dates*, as may be amended. This will allow the issuance of any necessary corrections and/or amendments to the RFP by addendum, and mitigate reliance on a defective solicitation and exposure of proposal(s) upon which award could not be made.

3.3 PROPOSAL PREPARATION COSTS

Any and all costs incurred by the Offeror in preparing or submitting a proposal shall be the Offeror's sole responsibility whether or not any award results from this RFP. The State shall not reimburse such costs.

3.4 TAX LIABILITY

3.4.1 Work to be performed under this solicitation is a business activity taxable under HRS Chapter 237, and if applicable, taxable under HRS Chapter 238. Contractor is advised that it is liable for the Hawaii GET at the current 4.5% for sales made on Oahu, and at the 4% rate for the islands of Hawaii, Maui, Molokai, and Kauai. If, however, an Offeror is a person exempt by the HRS from paying the GET and therefore not liable for the taxes on this solicitation, Offeror shall state its tax exempt status and cite the HRS chapter or section allowing the exemption.

3.4.2 Federal I.D. Number and Hawaii General Excise Tax License I.D. Offeror shall submit its current Federal I.D. No. and Hawaii General Excise Tax License I.D. number in the space provided on Offer Form, page OF-1, thereby attesting that the Offeror is doing business in the State and that Offeror will pay such taxes on all sales made to the State.

3.5 PROPERTY OF STATE

All proposals become the property of the State of Hawaii.

3.6 CONFIDENTIAL INFORMATION

3.6.1 If an Offeror believes that any portion of a proposal, offer, specification, protest, or correspondence contains information that should be withheld from disclosure as confidential, then the Offeror shall inform the Procurement Officer named on the cover of this RFP in writing and provide the Procurement Officer with justification to support the Offeror's confidentiality claim. Price is not considered confidential and will not be withheld.

3.6.2 An Offeror shall request in writing nondisclosure of information such as designated trade secrets or other proprietary data Offeror considers to be confidential. Such requests for nondisclosure shall accompany the proposal, be clearly marked, and shall be readily separable from the proposal in order to facilitate eventual public inspection of the non-confidential portion of the proposal.

3.6.3 Pursuant to Section 3-122-58 HAR, the head of the purchasing agency (HOPA) or designee shall consult with the Attorney General and make a written determination in accordance with Chapter 92F, HRS. If the request for confidentiality is denied, such information shall be disclosed as public information, unless the Offeror appeals the denial to the Office of Information Practices in accordance with Section 92F-15.5, HRS.

3.7 EXCEPTIONS

Should Offeror take any exception to the terms, conditions, specifications, or other requirements listed in the RFP, Offeror shall list such exceptions the Exceptions section of the Offeror's proposal (see SECTION 3.10.1.f). Offeror shall reference the RFP SECTION where exception is taken, a description of the exception taken, and the proposed alternative, if any. If none, state so in the Exceptions section of the Offeror's proposal. The State reserves the right to accept or reject any exceptions.

No exceptions to the requirements of the AG General Conditions shall be considered.

3.8 PROPOSAL OBJECTIVES

3.8.1 One of the objectives of this RFP is to make proposal preparation simple and efficient, while giving Offerors ample opportunity to highlight their proposals. The evaluation process must also be manageable and effective.

3.8.2 Proposals shall be prepared in a straightforward and concise manner, in a format that is reasonably consistent and appropriate for the purpose. Emphasis will be on completeness, clarity, and content.

3.8.3 When an Offeror submits a proposal, it shall be considered a complete plan for accomplishing the tasks described in this RFP and any supplemental tasks the Offeror has identified as necessary to successfully complete the obligations outlined in this RFP.

3.8.4 The proposal shall describe in detail the Offeror's ability and availability of services to meet the goals and objectives of this RFP as stated in SECTION 2.2 SCOPE OF WORK.

3.8.5 Offeror shall submit a proposal that includes an overall strategy, timeline, and plan for the work proposed as well as expected results and possible shortfalls. Other activities in additional to those identified SECTION 2.2 SCOPE OF WORK should be addressed in the proposal.

3.9 PROPOSAL FORMS

To be considered responsive, the Offeror's proposal shall respond to and include all items specified in this RFP and any subsequent addendum. Any proposal offering any other set of terms and conditions that conflict with the terms and conditions provided in the RFP or in any subsequent addendum may be rejected without further consideration.

3.9.1 Proposal Transmittal Letter (Attachment 1). Include a transmittal letter to confirm that the Offeror shall comply with the requirements, provisions, terms, and conditions specified in this RFP.

The Contractor represents that neither the Contractor, nor any employee or agent of the Contractor, presently has any interest, and promises that no such interest, direct or indirect, shall be acquired, that would or might conflict in any manner or degree with the Contractor's performance of this contract. Should any conflicts exist it should be disclosed with the form.

3.9.2 Qualifications Questionnaire (Attachment 2)

3.9.3 Corporate Resolution (Attachment 3)

3.9.4 Offer Form, Page OF-1 (Attachment 4). Offer Form, OF-1 is required to be completed using Offeror's exact legal name as registered with the Department of Commerce and Consumer Affairs, if applicable, in the appropriate space on Offer Form, OF-1 (SECTION SEVEN, Attachment 4). Failure to do so may delay proper execution of the contract.

The Offeror's authorized signature on the Transmittal Letter and Offer Form, OF-1 shall be an original signature in ink, which shall be required before an award, if any, can be made. If unsigned or the affixed signature is a facsimile or a photocopy, the offer shall automatically be rejected unless accompanied by other material containing an original signature, indicating the Offeror's intent to be bound.

3.9.5 Offer Form, Page OF-2 (Attachment 5). Pricing shall be submitted on Offer Form OF-2 (SECTION SEVEN, Attachment 5). The price shall be the all-inclusive cost, including the GET, to the State. No other costs will be honored. Any unit prices shall be inclusive.

3.9.6 Certificate of Vendor Compliance or proof that one has been applied for. (SECTION 5.4.)

3.9.7 If Subcontractor(s) will be used, append a statement to the transmittal from each subcontractor, signed by an individual authorized to legally bind the subcontractor and stating:

a) The general scope of work to be performed by the subcontractor; and

b) The subcontractor's willingness to perform the indicated work.

3.10 PROPOSAL CONTENTS

3.10.1 The Proposal must be organized into sections, following the exact format using all titles, subtitles, and numbering, with tabs separating each section described below. Each section must be addressed individually and pages must be numbered:

a) Table of Contents

b) All forms listed in Section 3.9 Proposal Forms

c) Offeror Background, Organization and Staffing

Offeror Background. The Offeror must provide the following information relative to the past five (5) years (or the number of years the Offeror has been in business, whichever is less):

1) Whether the Offeror has had a contract terminated for default or cause. If so, the Offeror must submit full details, including other party's name and reason therefor. If none, so state.

2) Whether the Offeror has had judgments or pending lawsuits or actions; adverse contract actions, suspension, imposition of penalties, or other actions relating to failure to perform or deficiencies in fulfilling contractual obligations against Offeror's firm. If none, so state.

Offeror Organization and Staffing. The Offeror must provide the following information:

1) Organizational charts of proposed personnel and their job titles and responsibilities. The chart must describe the management approach and a detailed narrative describing who the key personnel are and how the key personnel's experience and educational background will enable them to successfully complete the requested services. The State reserves the right to disqualify any potential Offeror that changes key personnel assigned to perform the responsibilities, prior to the execution of the contract.

2) Resumes of all proposed personnel, which should include information relating to each person's experience, education, and skills (including, but not limited to, specific degrees, dates, names of employers, and education institutions). Each resume shall be no more than three (3) pages in length.

d) Proposal, including an overall strategy, work plan, timeline, proposed deliverables and budget sheet.

e) Pricing. See SECTION SEVEN, Attachment 5, Offer Form OF-2.

f) Exceptions

3.10.2 Offerors shall provide all of the information requested in this RFP in the order specified above.

3.11 PROPOSAL SUBMISSION

See SECTION 1.7.

3.12 RECEIPT AND REGISTER OF PROPOSALS

3.12.1 Proposals will be received and receipt verified by two or more procurement officials on or after the date and time specified in SECTION ONE, or as amended.

3.12.2 The register of proposals and proposals of the Offeror(s) shall be open to public inspection upon posting of award pursuant to section 103D-701, HRS.

3.13 MODIFICATION PRIOR TO SUBMITTAL DEADLINE OR WITHDRAWAL OF OFFERS

3.13.1 The Offeror may modify or withdraw a proposal before the proposal due date and time.

3.13.2 Any change, addition, deletion of attachment(s) or data entry of an Offer must be made prior to the deadline for submittal of offers.

3.14 MISTAKES IN PROPOSALS

3.14.1 Mistakes shall not be corrected after award of contract.

3.14.2 When the Procurement Officer knows or has reason to conclude before award that a mistake has been made, the Procurement Officer should request the Offeror to confirm the proposal. If the Offeror alleges mistake, the proposal may be corrected or withdrawn pursuant to this section.

a) Once discussions are commenced or after best and final offers are requested, any priority-listed Offeror may freely correct any mistake by modifying or withdrawing the proposal until the time and date set for receipt of best and final offers.

b) If discussions are not held, or if the best and final offers upon which award will be made have been received, mistakes shall be corrected to the intended correct offer whenever the mistake and the intended correct offer are clearly evident on the face of the proposal, in which event the proposal may not be withdrawn.

c) If discussions are not held, or if the best and final offers upon which award will be made have been received, an Offeror alleging a material mistake of fact which makes a proposal non-responsive may be permitted to withdraw the proposal if: the mistake is clearly evident on the face of the proposal but the intended correct offer is not; or the Offeror submits evidence which clearly and convincingly demonstrates that a mistake was made.

3.14.3 Technical irregularities are matters of form rather than substance evident from the proposal document, or insignificant mistakes that can be waived or corrected without prejudice to other Offerors; that is, when there is no effect on price,

quality, or quantity. If discussions are not held or if best and final offers upon which award will be made have been received, the Procurement Officer may waive such irregularities or allow an Offeror to correct them if either is in the best interest of the State. Examples include the failure of an Offeror to: return the number of signed proposals required by the request for proposals; sign the proposal, but only if the unsigned proposal is accompanied by other material indicating the Offeror's intent to be bound; or to acknowledge receipt of an amendment to the request for proposal, but only if it is clear from the proposal that the Offeror received the amendment and intended to be bound by its terms; or the amendment involved had no effect on price, quality or quantity.

3.15 NO LATE SUBMITTALS AFTER DEADLINE

Proposals received after the due date and time will be marked late and ineligible for this solicitation. The SID Contracts Office time stamp will be used as the official time. Offerors are cautioned to make prior arrangements to ensure timely delivery prior to the due date and time as no late submittals will be accepted.

SECTION FOUR: EVALUATION CRITERIA

Evaluation criteria and the associated scoring are listed below. The award will be made to the responsible Offeror whose proposal is determined to be the most advantageous to the State based on the evaluation criteria listed in this section.

The Procurement Officer, or an evaluation committee of at least three (3) qualified State employees selected by the Procurement Officer, shall evaluate proposals. The evaluation will be based on the proposal contents (SECTION THREE) and on the evaluation criteria (SECTION FOUR) of this RFP.

4.1 EVALUATION OF MANDATORY REQUIREMENTS (PART 1, Pass/No Pass)

The DBEDT Procurement Officer or his/her designee shall evaluate each submission to ensure the proposal meets the general requirements as specified herein. No points shall be assigned for these requirements. The purpose of this phase is to determine whether an Offeror's proposal is sufficiently responsive to the RFP to permit a complete evaluation. Each proposal will be reviewed for responsiveness. Failure to meet the mandatory requirements ("no pass") shall be grounds for deeming the proposal non-responsive to the RFP and shall result in non-consideration of the proposal. Proposals meeting the mandatory requirements ("pass") of Part 1 will be considered in Part 2.

Technical and/or non-substantive omissions may be waived by the DBEDT Procurement Officer or their designee.

The proposal shall be organized in the exact prescribed format using all titles, subtitles, and numbering, with each section being tabbed and separated into sections as listed below. Offeror shall include, without limitation, all of the information requested in this RFP in the order specified and pages must be numbered.

Mandatory Requirements for the Proposal (See SECTION 3.10 Proposal Contents)

1) All forms listed in SECTION 3.9 Proposal Forms
    a. Offeror indication that it does not have a conflict of interest as evidenced by a statement in Proposal Transmittal Letter, and/or if a conflict exists, it is disclosed appropriately. The State, at its sole discretion, may deem a submission as "No Pass" based on a conflict of interest.
2) Pricing not to exceed $375,000 in Phase I

4.2 PROPOSAL EVALUATION CRITERIA (PART 2, 150 TOTAL POSSIBLE POINTS)

The evaluation committee shall evaluate the Offeror's proposal against requirements specified in this RFP. The total number of points used to score proposals is 150. Proposals must score a minimum of 90 points for further award consideration. Proposals scoring less than 90 points shall not be considered for project award.

Proposals will be evaluated against the following criteria and points:

1) Offeror's Approach and Comprehensiveness of Proposal (50 points)

   The evaluation committee will evaluate the Offeror's approach and comprehensives of the proposal, as it relates to the services requested in Section 2.2 Scope of Work, based on the following:

   a) The proposed Phase I activities (including an overall strategy, work plan, timeline, proposed deliverables and budget sheet). – 25 points

   b) The proposed Phase II activities (including an overall strategy, work plan, timeline, proposed deliverables and budget sheet). – 25 points

2) Past performance on projects of similar scope for public agencies or private industry (30 points)

   a) List and description of services provided in past five (5) years related to this submittal, including at least two (2) jobs in the preceding year. – 10 points

   b) Demonstrated ability to meet budget and schedule requirements. – 10 points

   c) Examples of projects for other entities within the State of Hawaii other than government agencies. – 3 points

   d) Examples of projects for federal, state, and/or local governments. – 4 points

   e) Three (3) positive references from current clients. – 3 points

3) Understanding the Contractor's role and the State's needs (20 points)

   a) Demonstrated understanding of all aspects of the State's telecommunication environment. – 10 points

   b) Demonstrated a thorough understanding of the purpose and scope of the Contractor's responsibilities as related to the requirements of this RFP. – 10 points

4) Offeror Background, Organization and Staffing (35 points)

   a) Offeror has not terminated or failed to complete a contract in the last five (5) years. –5 points

   Offeror's proposed organization and staffing resources will be evaluated to assess the Offeror's capability and commitment to carry out the duties and responsibilities of this RFP.

   The evaluation committee will evaluate the key management personnel and supporting personnel proposed for this Contractor's responsibilities, based on experiences listed under the individual resumes.

   NOTE: If there are any changes in key personnel and/or staffing after the discussions and prior to submitting the BAFO, the Offeror must notify the State immediately. The State may choose to reevaluate the Offeror's proposal which may result in its removal from the Priority Listed Offerors.

   Specifically, proposals will be evaluated based on the following criteria:

c) Organization of personnel assigned to the project (including professional background and years of hands-on experience with similar types of projects or programs). – 15 points

d) Stated roles and responsibilities of all personnel assigned to the project. – 15 points

5) Competitiveness and reasonableness of price (15 points)

The Offeror's proposed cost will be scored using a numerical rating system. Of the qualifying proposals scored in Part 2, the one with the lowest hourly price will be awarded the maximum possible points for this component. Other proposals will be awarded points for this component equal to the lowest proposed hourly price multiplied by the maximum possible points for this component, divided by the Offeror's proposed (higher) hourly price.

In addition, the cost proposal must address any non-required scope of work, in which the Offeror chooses to provide within its proposal, as a separate cost from the hourly cost proposal.

a) Competitiveness and reasonableness of price for Phase I. – 7.5 points

b) Competitiveness and reasonableness of price for Phase II. – 7.5 points

SPO formula for scoring price:

Lowest price ($) * ___ points (maximum no. of points) / Offeror's Proposal ($) Amount

SECTION FIVE: CONTRACTOR SELECTION AND CONTRACT AWARD

5.1 DISCUSSION WITH PRIORITY LISTED OFFERORS

The State may invite priority listed Offerors to discuss their proposals to ensure thorough, mutual understanding. The State in its sole discretion shall schedule the time and location for these discussions, generally within the timeframe indicated in SECTION 1.5. RFP Schedule and Significant Dates. The State may also conduct discussions with priority listed Offerors to clarify issues regarding the proposals before requesting Best and Final Offers, if necessary. However, proposals may be accepted without such discussions at the discretion of the State.

5.1.1. Proposals shall be classified initially as acceptable, potentially acceptable or unacceptable. Discussion may be conducted with priority-listed Offerors who submit proposals determined to be acceptable or potentially acceptable of being selected for award. The object of these discussions is to clarify issues regarding the priority listed Offeror's proposals before a best and final offer, if necessary. Priority-listed Offerors may be required to give oral presentations to ensure a thorough, mutual understanding of each proposal. A priority-listed Offeror that is requested to make a presentation and fails to make the presentation on the schedule date to the Procurement Officer or Evaluation Committee shall not be considered for the final award. Any and all cost incurred by a priority-listed Offeror in making the presentation shall be the priority-listed Offeror's sole responsibility and shall not be reimbursed by the State.

5.1.2. If during discussions, there is a need for any substantial clarification or change in the RFP, the RFP shall be amended by an addendum to incorporate such clarification or change. Addenda to the RFP shall be distributed to the priority-listed Offerors who submit acceptable or potentially acceptable proposals.

5.1.3. Following any discussions, the priority listed Offerors will be invited to submit their BAFO, if required. The Procurement Officer or evaluation committee reserves the right to have additional rounds of discussions with the priority listed Offerors prior to the submission of the BAFO, if necessary.

5.1.4. The date and time for the priority listed Offerors to submit their BAFO, if any, will be indicated via an addendum to the priority listed Offerors only. If a priority listed Offeror does not submit a notice of withdrawal or a BAFO, the priority listed Offeror's immediately previous offer shall be construed as its BAFO. BAFOs shall be submitted only once unless it is determined in writing by the Chief Procurement Officer or the HOPA to be in the best interest of the State to conduct additional discussions or require another BAFO.

5.2 AWARD OF CONTRACT

Method of Award. Award will be made to one or more responsible Offeror(s) whose proposals are determined to be the most advantageous to the State based on the evaluation criteria set forth in the RFP. Awards may be made to different vendors for Phase I and Phase II. An award may be made for Phase I only or Phase II only at the discretion of the State.

5.3 RESPONSIBILITY OF OFFERORS

Offeror is advised that in order to be awarded a contract under this solicitation, Offeror will be required to be compliant with all laws governing entities doing business in the State, including the following chapters and pursuant to HRS §103D-310(c):

1) Chapter 237, General Excise Tax Law;
2) Chapter 383, Hawaii Employment Security Law;
3) Chapter 386, Worker's Compensation Law;
4) Chapter 392, Temporary Disability Insurance;
5) Chapter 393, Prepaid Health Care Act; and
6) §103D-310(c), Certificate of Good Standing for entities doing business in the State.

The State will verify compliance on Hawaii Compliance Express (HCE).

Hawaii Compliance Express. HCE is an electronic system that allows vendors/contractors/service providers doing business with the State to quickly and easily demonstrate compliance with applicable laws. It is an online system that replaces the necessity of obtaining paper compliance certificates from the Department of Taxation, Federal Internal Revenue Service; Department of Labor and Industrial Relations, and Department of Commerce and Consumer Affairs.

Vendors/contractors/service providers should register with HCE prior to submitting an offer at https://vendors.ehawaii.gov. The annual registration fee is $12.00 and the 'Certificate of Vendor Compliance' is accepted for the execution of contract and final payment.

Timely Registration on HCE. Vendors/contractors/service providers are advised to register on HCE as soon as possible. If a vendor/contractor/service provider is not compliant on HCE at the time of award, an Offeror may not receive the award. The State reserves the right to move on to the next responsive, responsible Offeror.

5.4 PROPOSAL AS PART OF THE CONTRACT

This RFP and all or part of the successful proposal may be incorporated into the contract.

5.5 PUBLIC EXAMINATION OF PROPOSALS

Except for confidential portions, the proposals shall be made available for public inspection upon posting of award pursuant to HRS §103D-701.

If a person is denied access to a State procurement record, the person may appeal the denial to the office of information practices in accordance with HRS §92F-15.5.

5.6 DEBRIEFING

Pursuant to HAR §3-122-60, a non-selected Offeror may request a debriefing to understand the basis for award.

A written request for debriefing shall be made within three (3) working days after the posting of the award of the contract. The Procurement Officer or designee shall hold the debriefing within seven (7) working days to the extent practicable from the receipt date of written request.

Any protest by the requestor following a debriefing shall be filed within five (5) working days, as specified in HAR §103D-303(h).

5.7 PROTEST PROCEDURES

Pursuant to HRS §103D-701 and HAR §3-126-3, an actual or prospective Offeror who is aggrieved in connection with the solicitation or award of a contract may submit a protest. Any protest shall be submitted in writing to the Procurement Officer at:

Mr. Luis P. Salaveria
Director
Department of Business, Economic Development, and Tourism
235 S. Beretania Street, 5th Floor
Honolulu, HI 96813

A protest shall be submitted in writing within five (5) working days after the aggrieved person knows or should have known of the facts giving rise thereto; provided that a protest based upon the content of the solicitation shall be submitted in writing prior to the date set for receipt of offers; further provided that a protest of an award or proposed award shall be submitted within five (5) working days after the posting of award or if requested, within five (5) working days after the procurement officer's debriefing was completed.

The notice of award, if any, resulting from this solicitation shall be posted on the Procurement Awards, Notices and Solicitations, which is available on the SPO website: http://www.hawaii.gov/spo2/source/.

5.8 APPROVALS

Any agreement arising out of this solicitation may be subject to the approval of the Department of the Attorney General, and to all further approvals, including the approval of the Governor, as required by statute, regulation, rule, order, or other directive.

5.9 CONTRACT EXECUTION

The successful Offeror receiving award shall enter into a formal written contract. No performance or payment bond is required for this contract.

No work is to be undertaken by the Contractor prior to the effective date of contract. The State of Hawaii is not liable for any work, contract, costs, expenses, loss of profits, or any damages whatsoever incurred by the Contractor prior to the official starting date.

If an option to extend is mutually agreed upon, the Contractor shall be required to execute a supplement to the contract for the additional extension period.

5.10 INSURANCE

5.10.1 Prior to the contract start date, the Contractor shall procure at its sole expense and maintain insurance coverage acceptable to the State in full force and effect throughout the term of the contract. The Offeror shall provide proof of insurance for the following minimum insurance coverage(s) and limit(s) in order to be awarded a contract. The type of insurance coverage is listed as follows:

a) Commercial General Liability Insurance

Commercial general liability insurance coverage against claims for bodily injury and property damage arising out of all operations, activities or contractual liability by the Contractor, its employees and subcontractors during the term of the contract. This insurance shall include the following coverage and limits specified or required by any applicable law: bodily injury and property damage coverage with a minimum of $1,000,000 per occurrence; personal and advertising injury of $1,000,000 per occurrence; broadcasters' liability insurance of $1,000,000 per occurrence; and with an aggregated limit of $2,000,000. The commercial general liability policy shall be written on an occurrence basis and the policy shall provide legal defense costs and expenses in addition to the limits of liability stated above. The Contractor shall be responsible for payment of any deductible applicable to this policy.

b) Automobile Liability Insurance

Automobile liability insurance covering owned, non-owned, leased, and hired vehicles with a minimum of $1,000,000 for bodily injury for each person, $1,000,000 for bodily injury for each accident, and $1,000,000 for property damage for each accident.

c) Professional Liability insurance for limit of not less than $1,000,000 per occurrence $2,000,000 in the aggregate.

d) Appropriate levels of per occurrence insurance coverage for workers' compensation and any other insurance coverage required by Federal or State law.

5.10.2 The Contractor shall deposit with the DBEDT, on or before the effective date of the contract, certificate(s) of insurance necessary to satisfy the DBEDT that the provisions of the contract have been complied with, and to keep such insurance in effect and provide the certificate(s) of insurance to the DBEDT during the entire term of the contract. Upon request by the DBEDT or SPO, the Contractor shall furnish a copy of the policy or policies.

5.10.3 The Contractor will immediately provide written notice to the SPO and the contracting department or agency should any of the insurance policies evidenced on its Certificate of Insurance form be cancelled, limited in scope, or not renewed upon expiration.

5.10.4 The certificates of insurance shall contain the following clauses:

a) "The State of Hawaii is added as an additional insured with respect to operations performed for the State of Hawaii."

b) “It is agreed that any insurance maintained by the State of Hawaii will apply in excess of, and not contribute to, insurance provided by this policy.”

5.10.5 Failure of the Contractor to provide and keep in force such insurance shall constitute a material default under the contract, entitling the State to exercise any or all of the remedies provided in the contract (including without limitation terminating the contract). The procuring of any required policy or policies of insurance shall not be construed to limit the Contractor’s liability hereunder, or to fulfill the indemnification provisions of the contract. Notwithstanding said policy or policies of insurance, the Contractor shall be responsible for the full and total amount of any damage, injury, or loss caused by the Contractor’s negligence or neglect in the provision of services under the contract.

5.11 PAYMENT

Incremental payments shall be made to the awarded Contractor on a fixed-fee basis, upon receipt of reports that meet the expectations of the tasks listed in the Scope of Work. The receipt of quarterly reports shall be due based on the timeline submitted by the Contractor in the proposal, or as amended.

5.12 CONTRACT INVALIDATION

If any provision of the contract is found to be invalid, such invalidation will not be construed to invalidate the entire contract.

SECTION SIX: SPECIAL PROVISIONS

6.1 OFFER GUARANTY

A proposal security deposit is NOT required for this RFP.

6.2 CERTIFICATION OF OFFEROR CONCERNING WAGES, HOURS AND WORKING CONDITIONS OF EMPLOYEES SUPPLYING SERVICES *(include as applicable).*

All Offerors for service contracts shall comply with section 103-55, Hawaii Revised Statutes, which provides as follows:

Wages, hours, and working conditions of employees of Contractor supplying services: Before any prospective Offeror is entitled to submit any offer for the performance of any contract to supply services in excess of $25,000 to any governmental agency, Offeror shall certify that the services to be performed will be performed under the following conditions:

Wages: The services to be rendered shall be performed by employees paid at wages or salaries not less than the wages paid to public officers and employees for similar work.

Compliance with labor laws: All applicable laws of the Federal and State governments relating to workers compensation, unemployment compensation, payment of wages, and safety will be fully complied with.

No contract to perform services for any governmental contracting agency in excess of $25,000 shall be granted unless all the conditions of this section are met. Failure to comply with the conditions of this section during the period of the contract to perform services shall result in cancellation of the contract.

It shall be the duty of the governmental contracting agency awarding the contract to perform services in excess of $25,000 to enforce this section.

This section shall apply to all contracts to perform services in excess of $25,000, including contracts to supply ambulance service and janitorial service.

This section shall not apply to:

1) Managerial, supervisory, or clerical personnel.
2) Contracts for supplies, materials, or printing.
3) Contracts for utility services.
4) Contracts to perform personal services under paragraphs (2), (3), (12), and (15) of section 76-16, paragraphs (7), (8), and (9) of section 46-33, and paragraphs (7), (8), and (12) of section 76-77, Hawaii Revised Statutes, (HRS).
5) Contracts for professional services.
6) Contracts to operate refreshment concessions in public parks, or to provide food services to educational institutions.
7) Contracts with nonprofit institutions.

SECTION SEVEN: ATTACHMENTS AND EXHIBITS

Attachment 1:	Proposal Transmittal Letter
Attachment 2:	Qualifications Questionnaire
Attachment 3:	Corporate Resolution
Attachment 4:	OFFER FORM, OF-1
Attachment 5:	OFFER FORM, OF-2
Exhibit 1:	JHU/APL Transpacific System Concept Document
Exhibit A:	103D GENERAL CONDITIONS
Exhibit B:	OVERVIEW OF THE RFP PROCESS
Exhibit C:	STATE OF HAWAII – SPECIAL CONDITIONS
Exhibit D:	GENERAL PROVISIONS FOR GOODS AND SERVICES

To be submitted on Offeror's official business letterhead

PROPOSAL
TRANSMITTAL LETTER
STRUCTURING SERVICES TO CREATE A BROADBAND INFRASTRUCTURE P3

SOLICITATION No. RFP-16-018-HBI
Department of Business, Economic Development, and Tourism
DBEDT/SID/Contracts Office
235 S. Beretania St., 5th Floor, Room 502
Honolulu, Hawaii 96813

The undersigned has carefully read and understands the terms, conditions and requirements specified in the Request for Proposal attached hereto and hereby submits the following proposal to perform the work specified herein, all in accordance with the true intent and meaning thereof.

The undersigned acknowledges receipt of any addendum issued by the Department of Business, Economic Development, and Tourism by recording in the space below the date of receipt:

Addendum No. 1 _____ Addendum No. 2 _____ Addendum No. 3 _____

Addendum No. 4 _____ Addendum No. 5 _____

The undersigned hereby certifies that the proposal hereby attached has been carefully checked and is submitted as correct.

Respectfully submitted,

_____
Exact Legal Name of Offeror (company name)

_____
Authorized signature (attach corporate resolution or evidence of authorization to bind)

_____
Title

_____
Date

_____
Street Address

_____
City, STATE, Zip Code

_____
Telephone No.

_____
Mailing Address (if different from street address)

State of Hawaii General Excise Tax (GET) License Number: _____

Federal Taxpayer Identification Number: _____

Type of Organization:
_____Individual _____ Partnership _____ Corporation _____ Joint Venture

Jurisdiction where Offeror is organized: Hawaii _____ Other: _____

If Offeror is a "dba" or a division of a corporation, furnish the exact legal name of the corporation under which the contract, if awarded, will be executed:

CONFLICT OF INTEREST:

By signature above, the Contractor represents that neither the Contractor, nor any employee or agent of the Contractor, presently has any interest, and promises that no such interest, direct or indirect, shall be acquired, that would or might conflict in any manner or degree with the Contractor's performance of this contract.

Conflict of Interest Yes_____ No_____

If yes, attach list of conflict(s)

PREFERENCES:

No preferences apply to this solicitation.

QUALIFICATIONS QUESTIONNAIRE

1. How many years has your organization been in business under your present business name?

2. How many years' experience in this field of work has your organization had?

3. Show the five most recent projects your organization has completed in the past five (5) years that are related to this project. Include at least two (2) projects accomplished during the preceding calendar year.

Name of project owner and contact information	Project Description (Note for which Projects your organization was prime contractor)	Project period (dates)	Contract amount	Were project objectives met within budget and schedule

4. For what entities within the State of Hawaii other than government agencies have you performed work?

Name of project owner and contact information	Project Description (Note for which Projects your organization was prime contractor)	Project period (dates)	Contract amount	Comments

5. For what State departments and county agencies of the State of Hawaii have you performed work?

Name of project owner and contact information	Project Description (Note for which Projects your organization was prime contractor)	Project period (dates)	Contract amount	Comments

6. Have you performed work for the U.S. Government? If so, list.

Name of project owner and contact information	Project Description (Note for which Projects your organization was prime contractor)	Project period (dates)	Contract amount	Comments

7. Have you ever performed any work for any other governmental agencies outside the State of Hawaii? If so, list.

Name of project owner and contact information	Project Description (Note for which Projects your organization was prime contractor)	Project period (dates)	Contract amount	Comments

8. List a minimum of three references for work performed similar to this project.

Company	Project Description (Note for which Projects your organization was prime contractor)	Contact Person	Phone	Email address

CORPORATE RESOLUTION

Attach here:

1. Corporate resolution or written authorization of Offeror's representative to sign this proposal here.

OFFER FORM
OF-1

STRUCTURING SERVICES TO CREATE A BROADBAND INFRASTRUCTURE PUBLIC-PRIVATE PARTNERSHIP

STATE OF HAWAII
DEPARTMENT OF BUSINESS, ECONOMIC DEVELOPMENT & TOURISM
RFP-16-018-HBI

Ms. Susan Gray-Ellis
Department of Business, Economic Development & Tourism
State of Hawaii
Honolulu, Hawaii 96813

Dear Ms. Gray-Ellis:

The undersigned has carefully read and understands the terms and conditions specified in the Special Provisions attached hereto, and in the General Conditions, by reference made a part hereof and available upon request; and hereby submits the following offer to perform the work specified herein, all in accordance with the true intent and meaning thereof. The undersigned further understands and agrees that by submitting this offer, 1) he/she is declaring his/her offer is not in violation of Chapter 84, Hawaii Revised Statutes, concerning prohibited State contracts, and 2) he/she is certifying that the price(s) submitted was (were) independently arrived at without collusion.

Offeror is:

☐ Sole Proprietor ☐ Partnership ☐ *Corporation ☐ Joint Venture
☐ Other _____
*State of incorporation: _____

Hawaii General Excise Tax License I.D. No. _____

Federal I.D. No. _____

Payment address (other than street address below): _____
City, State, Zip Code: _____

Business address (street address): _____
City, State, Zip Code: _____

Respectfully submitted:

Date: _____ **(x)** _____
Authorized (Original) Signature

Telephone No.: _____

_____
Name and Title (Please Type or Print)

Fax No.: _____

E-mail Address: _____

** _____
Exact Legal Name of Company (Offeror)

******If Offeror is a “dba” or a “division” of a corporation, furnish the exact legal name of the corporation under which the awarded contract will be executed:

_____

Attachment 5

OFFER FORM
OF-2

STRUCTURING SERVICES TO CREATE A BROADBAND INFRASTRUCTURE PUBLIC-PRIVATE PARTNERSHIP

Total contract cost for accomplishing the development and delivery of these services.

$_____

Pricing shall include labor, materials, supplies, all applicable taxes, and any other costs incurred to provide the specified services

Offeror _____
(Name of Company)

Exhibit 1

JHU/APL Transpacific System Concept Document

(See attachment)

EXHIBIT A

103D GENERAL CONDITIONS

(See attachment)

EXHIBIT B

OVERVIEW OF THE RFP PROCESS

1. **The RFP is issued pursuant to Subchapter 6 of HAR Chapter 3-122, implementing HRS §103D-303.**

2. **The procurement process begins with the issuance of the RFP and the formal response to any written questions or inquiries regarding the RFP. Changes to the RFP will be made only by Addendum.**

3. **The register of proposals and Offerors' proposals shall be open to public inspection after posting of the award.**

   All proposals and other material submitted by Offerors become the property of the State and may be returned only at the State's option.

4. **The Procurement Officer, or an evaluation committee approved by the Procurement Officer, shall evaluate the proposals in accordance with the evaluation criteria in Section Four.**

5. **Proposals may be accepted on evaluation without discussion. However, if deemed necessary, prior to entering into discussions, a "priority list" of responsible Offerors submitting acceptable and potentially acceptable proposals shall be generated. The priority list may be limited to a minimum of three responsible Offerors who submitted the highest-ranked proposals. The objective of these discussions is to clarify issues regarding the Offeror's proposal before the BAFO is tendered.**

6. **If during discussions there is a need for any substantial clarification or change in the RFP, the RFP shall be amended by an addendum to incorporate such clarification or change. Addenda to the RFP shall be distributed only to priority listed Offerors who submit acceptable or potentially acceptable proposals.**

7. **Following any discussions, Priority Listed Offerors will be invited to submit their BAFO, if required. The Procurement Officer or an evaluation committee reserves the right to have additional rounds of discussions with the top three (3) Priority Listed Offerors prior to the submission of the BAFO.**

8. **The date and time for Offerors to submit their BAFO, if any, is indicated in Section 1.5, RFP Schedule and Significant Dates. If Offeror does not submit a notice of withdrawal or a BAFO, the Offeror's immediate previous offer shall be construed as its BAFO.**

9. **After receipt and evaluation of the BAFOs in accordance with the evaluation criteria in Section Four, the Procurement Officer or an evaluation committee will make its recommendation. The Procurement Officer will award the contract to the Offeror whose proposal is determined to be the most advantageous to the State taking into consideration price and the evaluation factors set forth in Section Four.**

10. The contents of any proposal shall not be disclosed during the review, evaluation, or discussion. Once award notice is posted, all proposals, successful and unsuccessful, become available for public inspection. Those sections that the Offeror and the State agree are confidential and/or proprietary should be identified by the Offerors and shall be excluded from access.

11. The Procurement Officer or an evaluation committee reserves the right to determine what is in the best interest of the State for purposes of reviewing and evaluating proposals submitted in response to the RFP. The Procurement Officer or an evaluation committee will conduct a comprehensive, fair and impartial evaluation of proposals received in response to the RFP.

12. The RFP, any addenda issued, and the successful Offeror's proposal shall become a part of the contract. All proposals shall become the property of the State of Hawaii.

EXHIBIT C
SPECIAL CONDITIONS

As a supplement to Paragraph 16 of the General Conditions regarding CONTRACTOR's cost and expenses:

TRAVEL GUIDELINES

Authorized travel will be reimbursable by the STATE for arrival and departure no more than twelve hours prior to and after the agreed upon work schedule.

Hotel Arrangements

The following recommended hotel is authorized by the STATE for business-related travel:

Executive Centre Hotel (www.astonexecutivecentre.com)
1088 Bishop Street
Honolulu, HI 96813
Phone: 1-800-949-3932/(808) 539-3000 (Main Reservation Desk)

Any charges that are not applicable to the STATE business or any costs in excess of what the STATE deems to be authorized and reasonable expenses (e.g., selecting another hotel, extending the length of stay for personal reasons) shall be the responsibility of the CONTRACTOR.

If rooms are not available at the Executive Centre Hotel during required travel dates, prior STATE approval must be obtained before making alternate reservations at other State-approved hotels or comparably priced hotels on the island of Oahu.

All reimbursements for hotel accommodations must be supported by original hotel bill showing a $0.00 balance due (original receipt acceptable if reservation and payment is being made through the internet) to ensure that payment was made. Reimbursement will not be made on recreational expenses and other nonbusiness related items.

Car Rental

If reservations are made at the Executive Centre Hotel, prior STATE approval must be obtained for car rentals.

If transportation to and from the airport upon arrival and departure is via taxi, no reimbursement for tips will be made and all reimbursements must be supported by an original taxi receipt.

If transportation is via car rental, reasonably priced rental reservations should be made under the following conditions:

1. No car insurance shall be reimbursable by the STATE.
2. Types of car rentals will be permissible under the following guidelines:
    - Compact car for 1-2 passengers
    - Midsize car for 3-4 passengers
3. Original car rental agreement and receipt for payment is required to receive reimbursement of car rental related expenses.

Airfare

All airfare arrangements must be made utilizing the most direct and cost efficient route. Any charges that are not applicable to the STATE business, including but not limited to, any additional costs relating to personal stopovers and preferential upgrades to flight accommodations will not reimbursed. Original receipt of payment is required to receive reimbursement for airfare accommodations.

Meal Claims

Meal expenses incurred during authorized STATE related business travel are reimbursable up to a maximum of $60.00/day. All reimbursements for meals should be identified separately and included in the original bill for reimbursement on an official company letterhead/invoice ("invoice"). Reimbursement will not be made for alcoholic beverages and tips related to meal expenses.

Travel Reimbursement Claims

Please include your bill for travel reimbursement with the address listed on the contract and supported by all applicable original receipts as listed above.

Please submit an original plus three copies of reimbursement invoice with supporting documentation.

EXHIBIT D

GENERAL PROVISIONS FOR GOODS AND SERVICES
HAWAII REVISED STATUTES (HRS) CHAPTER 103D

(Updated 4/20/2013)

Attached are the General Provisions, dated April 2013, which are made a part of all offers in response to the solicitation for goods and services. These provisions are in addition to the special provisions provided in the individual solicitations.

Offerors are cautioned to read and understand all the terms and conditions contained in the General Provisions as these provisions will also be made part of the contract for goods and services.

GENERAL PROVISIONS
FOR
GOODS AND SERVICES

1. **DEFINITIONS OF TERMS**

Terms as used in these General Provisions, unless the context requires otherwise, shall have the following meaning:

a. BID
Bid means any offer submitted in competitive sealed bidding or in the second phase of multi-step bidding.

b. BID PROPOSAL GUARANTY OR SECURITY
The security when required, furnished by an offeror with his offer to ensure that the offeror will enter into the contract with the STATE and execute the required contract and payment bonds covering the work contemplated, if his offer is accepted.

c. CONTRACT
Contract means the combination of the solicitation, including the instructions to offerors, the specifications or scope of work, the special provisions, and the general terms and conditions; the offer and any best and final offers; and any amendments to the solicitation or to the contract; and any terms implied by law.

d. CONTRACT BOND
The approved form of security furnished by the CONTRACTOR and his surety or sureties or by the CONTRACTOR alone, to ensure completion and satisfactory performance of the contract in accordance with the terms of the contract and to guarantee full payment of all claims for labor, materials and supplies furnished, used or incorporated in the work.

e. CONTRACTOR
An individual, partnership, firm, corporation, joint venture or other legal entity undertaking the execution of work under the terms of the contract with the STATE and acting directly or through his, their or its agents, employees or sub-contractors.

f. DAYS
Days mean calendar days unless otherwise specified.

g. GENERAL CONDITIONS
General Conditions issued by the Department of the Attorney General of the State of Hawaii, referred to as Form AG-008, as revised, and included in solicitations by reference. The applicable revised Form AG-008, which is included by reference, is the form dated and in effect at the date the solicitation is issued.

h. GENERAL PROVISIONS
General Provisions are standard terms and conditions.

i. HAR
Hawaii Administrative Rules

j. HEAD OF THE PURCHASING AGENCY

The head of any agency with delegated procurement authority by law or from a chief procurement officer of this STATE to enter into and, administer contracts.

k. HRS
Hawaii Revised Statutes

l. IFB
Invitation for Bids

m. OFFER
An offer means a bid or proposal as defined in sections 1a and 1p, in response to any solicitation.

n. OFFEROR
Any individual, partnership, firm, corporation, joint venture or other legal entity, submitting directly or through a duly authorized representative or agent, an offer for the work or services contemplated in response to a solicitation as defined in 1s.

o. PROCUREMENT OFFICER
Procurement officer means the person with procurement delegation duly authorized to enter into and administer contracts and make written determinations with respect to the contract. The term includes an authorized representative acting within the limits of authority. The delegated authority is received from the chief procurement officer directly or through the head of a purchasing agency or designee to the procurement officer.

p. PROPOSAL
A proposal means any offer submitted in response to any solicitation, except a bid as defined in section 1a.

q. PURCHASING AGENCY
Purchasing agency means any governmental body which is authorized by law or rules, or by way of delegation to enter into contracts for procurement of goods, services, or construction.

r. RFQ
Request for Quotes

s. RFP
Request for Proposals

t. SOLICITATION
Solicitation means an invitation for bids (“IFB”), used in the competitive sealed bidding process, a request for quotes (“RFQ”) used in the small purchases process, or a request for proposals (“RFP”), used in the competitive sealed proposal process for the purpose of obtaining quotes, bids or proposals to perform a STATE contract.

u. SPECIAL PROVISIONS
The terms and conditions pertaining to the specific solicitation in which they are contained and in addition to these General Provisions; including but not limited to terms and conditions describing the preparation of solicitations, evaluation of offers, determination of award, plus those applicable to performance by the CONTRACTOR.

Additions or revisions to the General Provisions, which shall be considered a part of the General Provisions, setting forth conditions or requirements applicable to the particular project or contract under consideration shall be included in the Special Provisions. Should any Special Provisions conflict with these General Provisions, said Special Provisions shall govern.

v. SPECIFICATIONS
A description of what the purchasing agency requires and, consequently, what an offeror must offer to be considered for award.

w. STATE
STATE means the remaining departments of the executive branch and all governmental bodies administratively attached to it, excluding the judiciary, the legislature, the department of education, University of Hawaii, the division of community hospitals, and the office of Hawaiian affairs, except where specifically included in any particular solicitation.

x. SURETY
The individual, firm, partnership or corporation other than the CONTRACTOR, which executes a bond with and for the CONTRACTOR to ensure the CONTRACTOR's acceptable performance of the contract.

y. WORK
The furnishing by the CONTRACTOR of all labor, services, materials, equipment, and other incidentals necessary for the satisfactory performance of the contract.

2. **COMPETENCY OF OFFEROR**

Prospective offeror must be capable of performing the work for which offers are being called. Either before or after the deadline for an offer, the purchasing agency may require offeror to submit answers to questions regarding facilities, equipment, experience, personnel, financial status or any other factors relating to the ability of the offeror to furnish satisfactorily the goods or services being solicited by the STATE. Any such inquiries shall be made and replied to in writing; replies shall be submitted over the signatures of the person who signs the offer. Any offeror who refuses to answer such inquiries will be considered non-responsive.

The purchasing agency reserves the right to visit an offeror's place of business to inspect its facilities and equipment and to observe its methods of operation in order to facilitate evaluation of performance capabilities.

3. **OFFER INCORPORATES SOLICITATION**

The solicitation, including the AG's General Conditions, Specifications, General Provisions and any Special Provisions, and other documents referenced in or attached to the solicitation shall be considered a part of the offer whether attached to the solicitation or not at the time of its submission. Such documents shall not be altered in any way when the proposal is submitted and any alterations so made by the offeror may be cause for rejection of the offer.

4. **PREPARATION OF OFFER**

An offeror may submit only one offer in response to a solicitation. If an offeror submits more than one offer in response to a solicitation, then all such offers shall be rejected. Similarly, an offeror may submit only one offer for each line item (if any) of a solicitation. If an offeror submits more than one offer per line item, then all offers for that line item shall be rejected.

Competing subsidiary or jointly-owned companies may submit bids or proposals and these may be accepted for evaluation and award if such companies submit with their bids or proposals a certificate of non-collusion, sworn to before a notary, which acknowledges that the offer is without collusion.
Unless otherwise specified in the solicitation, all prices shall include applicable Federal, state and local taxes. Any illegible or otherwise unrecognizable price offer shall cause automatic rejection of the offer.

Offers submitted in response to an IFB or RFP shall be signed in ink in the space provided on the bid or proposal page by (1) the owner of a sole proprietorship, (2) one or more members of a partnership, (3) one or more members or officers of each firm representing a joint venture, (4) one or more officers of a corporation, or (5) an agent of the offeror duly authorized to submit offers on the offeror's behalf.

5. **LATE OFFERS, LATE WITHDRAWALS, AND LATE MODIFICATIONS**

Any notice of withdrawal, notice of modification of an offer with the actual modification, or any offer received at the place designated for receipt and opening of an offer after the time and date set for receipt and opening of offers is late. A late offer, late modification, or late withdrawal shall not be considered late if received before contract award and would have been timely but for the action or inaction of personnel within the procurement activity. A late offer or late modification that will not be considered for award shall be returned to the bidder unopened as soon as practicable and accompanied by a letter from the procurement activity stating the reason for its return. A late withdrawal request shall be responded to with a statement of the reason for non-acceptance of the withdrawal.

6. **DISQUALIFICATION OF OFFERORS**

An offeror shall be disqualified and his offer automatically rejected for any one of the following reasons: proof of collusion, in which case, all offers involved in the collusive action will be rejected and any participant to such collusion will be barred from future solicitations until reinstated; or offeror's delivery of the offer after the deadline specified in the public notice calling for offers, or as amended, except as allowed in Section 3-122-29 (1), HAR.

An offeror may be disqualified and his offer rejected for any one or more of the following reasons: offeror's lack of responsibility and cooperation as shown by past work or services; offeror's being in arrears on existing contracts with the STATE or having defaulted on previous contracts; offeror's lack of proper equipment and/or sufficient experience to perform the work contemplated; offeror does not possess proper license to cover the type of work contemplated, if required; or offeror's failure to pay, or satisfactorily settle, all bills overdue for labor and material on former STATE contracts at the time of issuance of solicitation.

7. **IRREGULAR OFFERS**

Offers will be considered irregular and shall be rejected for the following reasons including but not limited to the following: if the offer is unsigned by the offeror, unless otherwise specified in the solicitation; if the required offer guaranty received separately from the offer is not identifiable as guaranty for a specific offer, or is received after the date and time set for the opening; if the required offer guaranty is not in accordance with the solicitation; if the offeror or surety fails to sign the surety bond submitted as offer guaranty; if offeror fails to use the surety bond form furnished by the STATE or identical wording contained in the said form when submitting a surety bond as proposal guaranty; if the offer shows any non-compliance with applicable law or contains any unauthorized additions or deletions, conditioned, incomplete, or irregular or is in anyway making the

proposal incomplete, indefinite, or ambiguous as to its meaning; or unbalanced offers in which the price for any item is obviously out of proportion to the prices for other items.

8. **STANDARDS OF CONDUCT**

All offerors should be certain that their offer is not in violation of HRS §84-15. This section provides as follows:

a. A state agency shall not enter into any contract to procure or dispose of goods or services, or for construction, with a legislator, an employee, or a business in which a legislator or an employee has a controlling interest, involving services or property of a value in excess of $10,000 unless:

(1) The contract is awarded by competitive sealed bidding pursuant to section 1O3D-3O2;

(2) The contract is awarded by competitive sealed proposal pursuant to section 103D-3O3; or

(3) The agency posts a notice of its intent to award the contract and files a copy of the notice with the state ethics commission at least ten days before the contract is awarded.

b. A state agency shall not enter into a contract with any person or business which is represented or assisted personally in the matter by a person who has been an employee of the agency within the preceding two years and who participated while in state office or employment in the matter with which the contract is directly concerned.

9. **CAMPAIGN CONTRIBUTIONS BY STATE AND COUNTY CONTRACTORS**

Unless otherwise specified in the solicitation, a legislative body has appropriated the funds for this contract.

Therefore, if awarded a contract in response to this solicitation, offeror agrees to comply with Section 11-205.5, HRS, which states that campaign contributions are prohibited from a State and county government contractor during the term of the contract if the contractor is paid with funds appropriated by a legislative body.

10. **ACCEPTANCE OF OFFER**

a. Acceptance of offer, if any, will be made within sixty calendar days after the opening of offers, and the prices quoted by the offeror shall remain firm for the sixty-day period. Unless otherwise provided, each individual item or group of items will be awarded to the responsive and responsible offeror whose offer complies with all the solicitation requirements. In determining the responsive and responsible offeror, offers will be evaluated not only on the amounts thereof, but on all factors relating to the satisfactory performance of the contract. Products or servicing capabilities must be of a quality and nature that will meet the needs and purposes of the intended use and must conform to all requirements prescribed in the specifications. The offeror must have the ability to perform as called for in the contract terms. The STATE shall be the sole judge of product or vendor capability. The successful vendor will be notified by letter that the offer has been accepted and that the vendor is being awarded the contract.

b. If the offer is rejected or if the vendor to whom the contract was awarded fails to enter into the contract and furnish satisfactory security, if applicable, the purchasing agency may, at their discretion, award the contract to the next lowest or remaining responsible offeror or may publish another call for offers; provided in the case of only one remaining responsible offeror, the head of a purchasing agency may negotiate with such bidder to reduce the scope of work, if available funds are exceeded, and to award the contract at a price which reflects the reduction in the scope of work.

c. The head of a purchasing agency further reserves the right to cancel the contract award at any time prior to execution of said contract by all parties, without any liability to the awardee and to any other offeror.

11. **EXECUTION OF CONTRACT**

The following subsections shall not apply to any contract in which the total amount payable to the CONTRACTOR cannot be accurately estimated at the time the contract is to be awarded:

a. In cases where the contract award equals or exceeds the dollar level specified in Section 103D-305, HRS, the STATE shall forward a formal contract to the successful offeror for execution. The contract shall be signed by the successful vendor and returned, together with a satisfactory contract bond if required, and other supporting documents, within ten days after receipt by the vendor or within such further time as the procurement officer may allow.

b. No such contract shall be considered binding upon the STATE until the contract has been fully and properly executed by all the parties thereto and the State Comptroller has, in accordance with Section 103D-309, HRS, endorsed thereon a certificate that there is an appropriation or balance of an appropriation over and above all outstanding contracts, sufficient to cover the amount required by the contract; with the exception of a multi-term contract, whereby, the State Comptroller shall only be required to certify that there is an appropriation or balance of an appropriation over and above all outstanding contracts, that is sufficient to cover the amount required to be paid under the contract during the fiscal year or remaining portion of the fiscal year of each term of the multi-year contract.

c. Pursuant to the Attorney General's General Conditions (AG-008, as revised), Section 18, in any contract involving not only STATE but supplemental funds from the Federal government, this section shall be applicable only to that portion of the contract price as is payable out of STATE. As to the portion of the contract price as is expressed in the contract to be payable out of Federal funds, the contract shall be construed to be an agreement to pay the portion to the CONTRACTOR, only out of Federal funds to be received from the Federal government. This subsection shall be liberally construed so as not to hinder or impede the STATE in contracting for any project involving financial aid from the Federal government.

12. **CONTRACT BOND**

a. The requirement for contract performance and payment bonds, if any, shall be stated in the Special Provisions of the solicitation.

b. When required by the Special Provisions, a performance bond and a payment bond shall be delivered by the CONTRACTOR to the STATE at the same time

the executed contract is delivered. Each amount of the performance and payment bonds shall not exceed fifty per cent of the amount of the contract price; provided, for contracts where contract price cannot be determined at the time of award, the amounts of the bonds shall be as stated in the solicitation.

c. The acceptable performance and payment bonds are the same as the acceptable bid or proposal security deposit specified in Section 7. If a surety bond is submitted for either the performance or payment bond, in addition to the form prescribed, a power of attorney for the surety's attorney-in-fact executing the bond shall be provided.

13. **FAILURE TO EXECUTE CONTRACT**

If the offeror to whom a contract is awarded shall fail or neglect to enter into the contract, and to furnish satisfactory security as required by Section 30 within ten days after such award or within such further time as the procurement officer may allow, the purchasing agency shall pay the amount of offeror's proposal guaranty, as required under Section 7, into the State Treasury as a realization of the STATE. The procurement officer may thereupon award the contract to the next lowest responsible offeror or may call for new offers, whichever method he may deem is in the best interest of the STATE.

14. **RETURN OF OFFER GUARANTIES**

All offer guaranties submitted as required by subchapter 24, chapter 3-122, HAR, shall be retained until the successful offeror enters into contract and furnishes satisfactory security or if the contract is not awarded or entered into, until the procurement officer's determination is made to cancel the solicitation. At such time, all offer guaranties, except surety bonds, will be returned.

15. **PAYMENT**

Section 103-10, HRS, provides that the State shall have thirty (30) calendar days after receipt of invoice or satisfactory completion of contract to make payment. For this reason, the State will reject any bid submitted with a condition requiring payment within a shorter period. Further, the State will reject any bid submitted with a condition requiring interest payments greater than that allowed by §103-10, HRS, as amended.

The State will not recognize any requirement established by the Contractor and communicated to the State after award of the contract, which requires payment within a shorter period or interest payment not in conformance with statute.

16. **DELIVERY EXTENSIONS**

In the case of contracts for the purchase of goods, the delivery date or the maximum number of days for delivery will be specified by the STATE in its solicitation requirements, and all goods must be delivered with the time specified. However, the CONTRACTOR will not be held responsible for delay due to fire, flood, riot, labor disturbances, war, shortage of transportation, act of God or other reason beyond his control, provided that he notifies the STATE of such delay and the reason therefore as soon as practicable after its occurrence and requests extension prior to the specified date of delivery. Requests for extension of time shall be accompanied by documents such as the CONTRACTOR's purchase order, manufacturer's acknowledgement, shipping manifest, and any other documents substantiating that the causes for delay were beyond the control of the CONTRACTOR. The STATE shall be the sole judge of whether such delay is truly beyond the control of the CONTRACTOR and whether extension will be granted. The STATE reserves the right to terminate the contract or to assess liquidated damages, if provided for in the contract, for delays not covered by specific authorized extension.

17. **PERSONAL LIABILITY OF PUBLIC OFFICIALS**

In carrying out any of the provisions of the contract or in exercising any power or authority granted to them by the contract, there shall be no liability upon the procurement officer or his authorized representatives, either personally or as officials of the STATE, it being understood that in such matters, they act solely as agents and representatives of the STATE.

The Johns Hopkins University
APPLIED PHYSICS LABORATORY

Enclosure to: NSAD-L-13-323
Task: JHQ04

NSAD-R-13-088

Transpacific Systems Concept Document

Revision 1.0

December 2013

The Johns Hopkins University
APPLIED PHYSICS LABORATORY

NSAD-R-13-088

Transpacific Systems Concept Document

Revision 1.0

December 2013

Prepared by:
The Johns Hopkins University Applied Physics Laboratory
11100 Johns Hopkins Road, Laurel, Maryland 20723-6099

NSAD

Disclaimer regarding permitting information:

This document is for informational purposes only. Its purpose is to inform its audience about the land use and permitting framework in place in Hawai‘i and to educate its audience about certain legal requirements and potential obstacles that could be faced in constructing and installing cable landing stations in Hawai‘i. It should not be relied on as legal advice. Further actions must be taken and legal advice must be sought for this document's audience to take steps toward executing the policies and procedures discussed in this document. The use of any particular location is for demonstration purposes only to highlight the factors that can influence or alter the requirements imposed on a developer. It cannot and does not address the unique facts and circumstances of a specific project. Developers will need to consult legal counsel to account for all updates in the law and to analyze it in terms of their specific project.

JHU/APL Study Team

Title	Name	Organization
Team Lead	D. P. Wilt	JHU/APL
Primary Author	V. B. Barnes	JHU/APL
Contributing Author	R. K. Char	JHU/APL
Contributing Author	W. Barattino	Global Broadband Solutions, LLC
Contributing Author	M. Sechrest	JHU/APL (consultant)
Contributing Author	W. S. Lauber	JHU/APL
Contributing Author	A. Dwivedi	JHU/APL
Contributing Author	B. Doshi	JHU/APL
Contributing Author	B. Tucker	JHU/APL

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EXECUTIVE SUMMARY

The Hawai‘i broadband system of systems provides broadband capabilities (voice, video, data) to support a wide variety of applications including education, health, public safety, research and innovation, entertainment, data sharing, web browsing, social networking, and public services. The broadband system of systems includes these elements:

- Submarine cable systems
- Meet-me points
- Submarine backhaul network
- Network users and user premises
- Interisland network
- Intraisland network

ES.1 CHALLENGES AND ISSUES

Challenges and issues with the current system of systems can be organized into these categories:

- Complexity
- Business and economic environment
- Capacity
- Resiliency and security

ES.1.1 COMPLEXITY

The system elements are owned by different private and public sector entities. Each entity has its own interests. Different and sometimes competing forces motivate the different entities involved. These factors affect choices and decisions in planning, management, risk assessment, operations, and investment.

To address complexity, the Hawai‘i Broadband Initiative (HBI) needs the support and participation of the broadband “megacommunity.” The megacommunity includes individual citizens, private sector organizations, and public sector governments at the federal, state, and local levels. The HBI leadership must engage the megacommunity early and often to identify public-private partnerships that will incentivize private sector business community participation and support for the overall vision. Also, the State of Hawai‘i will recover these costs over time from revenues from successful cable operators.

The State of Hawai‘i, as the Government lead for the HBI, is uniquely able to provide the required leadership and serve as a catalyst in the broadband development

effort. The Hawai‘i Broadband Initiative is ultimately intended to benefit all elements of the public and private sectors. However, the cost and risk is not necessarily borne proportionally by those receiving the benefits. The state must be involved in key decisions such as allocating land and approving permits for the landing stations and cable routes. These decisions must be made in the context of the overall initiative. It may be necessary to provide incentives to some stakeholders to obtain consensus. This is especially true when a cost or concession must be made by one party for the benefit of another or the general public. The State of Hawai‘i should begin by carefully reviewing the drivers and barriers for each stakeholder group and identifying action that can tip the balance for that stakeholder in favor of supporting and participating in the HBI.

ES.1.2 BUSINESS AND ECONOMIC ENVIRONMENT

One issue in this category is the outlay of capital for initial installation, the cost of energy and ongoing operations versus cost recovery, and potential business income. The second issue involves the time, effort, and risks associated with the full life cycle of making improvements to the broadband infrastructure. Do the potential rewards balance the risks?

To address the outlay issue, the Hawai‘i Broadband Initiative can exploit various opportunities for business development related to the use of broadband capabilities. Some key opportunities include cloud computing, e-commerce, data centers and content distribution networks, support for the Department of Defense, other national security interests, and telemedicine.

The central location of Hawai‘i in the Pacific, different peak traffic hours compared to the U.S. mainland, and high peak/average ratio make landing in Hawai‘i very attractive from an efficiency perspective. Increased capacity from regeneration makes landing in Hawai‘i even more attractive to submarine cable operators.

To the extent possible, Hawai‘i could streamline the timelines for permitting. By making the initial investment in new cable landing stations, the state can reduce the funding and timeline risks for potential new cable landings.

ES.1.3 CAPACITY

Even though the current systems provide adequate capacity today, with increased demand and system aging, the transpacific network will not have sufficient capacity in the future.

There are two primary ways to address capacity concerns: upgrade the technology used on existing cables and install additional cables. Both of these cable-provider actions could improve capacity.

ES.1.4 RESILIENCY AND SECURITY

The main security risks to the physical elements of the broadband system in Hawai‘i are intrusion, mischief, theft, and terror events. Those same risks apply as well to the cyber (computer) environment and to the energy sources that support the system components. The extent of the risk somewhat depends on the specific system and location.

Burying or sealing the cables underwater and on land will mitigate the security risk. Implementing better security at the cable landing stations will also reduce risk.

A resilient system is designed so that the damage from a disruptive force (natural or man-made) is small. If elements of the broadband system of systems are damaged in spite of protective measures, the goal is to minimize the disruption and resume operations as soon as possible, striving to maintain continuity of critical services. Also, if the force causes one or more system components to fail, there should be redundancy to satisfy most of the users from the available spare capacity.

The current submarine cable network in Hawai‘i is vulnerable to both natural and man-made (intentional and accidental) disruptive forces:

- Easily accessible beach manholes and exposed cables near beach manholes;
- High concentration (small land mass with busy shores) of shallow water activity near cables;
- Pole-mounted terrestrial fiber;
- Easily accessible cable landing stations and meet-me points;
- Heavy concentration of landing sites on the Island of Hawai‘i and O‘ahu; and
- Sparse connectivity for Maui.

Security and resiliency are intertwined. Security incidents may result in heavier damage from a given level of disruptive force. Thus, it is important to improve physical security to improve the resiliency of the network. However, systems may still fail in spite of added security. Inducing a failure in a more secure system may require a higher magnitude of disruptive force.

A second aspect of resiliency is the ability to provide a high level of service to a large fraction of users in spite of a failure. Diverse system element locations and spare capacities allow traffic to be routed around failed components.

Cable landing stations should be made more secure and resilient, particularly new cable landing stations. Secure stations should have improved protection of the ocean segment through horizontal, directionally drilled conduits or high-density polyethylene piping. The beach manhole should have its cover secured to prevent intrusion. New cable landing stations should be located at sites widely separated from existing stations.

ES.2 RECOMMENDATIONS

ES.2.1 NEW CABLE LANDING STATIONS

The analysis indicates that to achieve the desired capacity, resiliency, and security for the broadband cable networks in Hawai‘i, at least four new cable landing stations are required, one on each of the four main islands. These new cable landing stations should include strong security measures, horizontal directional drilling cable landing conduits, and secured beach manholes. Each new cable landing station should be capable of housing at least two transpacific cables. Site selection should include creating a positive business case for cable owners to land on the neighbor islands. The site assessment process included evaluating performance, cost, and schedule factors. Figure ES-1 summarizes the analysis.

Performance		$M	Cost (20m)	Schedule	
1.	Kona (NELHA)	9.4	Kona (NELHA)	1.	Kona (NELHA)
2.	Kīhei (near MRTP)	9.8	Salt Pond Park	2.	Barbers Point
3.	MCBH Kāne‘ohe	9.8	Līhu‘e		Kaka‘ako Park
4.	Kaka‘ako Park	10.9	Kaka‘ako Park		Kīhei (near MRTP)
	Līhu‘e	11.2	Makaīwa		Līhu‘e
	Salt Pond Park	13.1	Waihe‘e		Makaīwa
	Waihe‘e	13.3	Wai‘anae		PMRF
5.	PMRF	13.6	PMRF		Salt Pond Park
6.	Barbers Point	13.8/14.7	Kīhei (near MRTP)		Wai‘anae
7.	Wai‘anae	15.0	MCBH Kāne‘ohe		Waihe‘e
8.	Makaīwa	20.0	Barbers Point	3.	MCBH Kāne‘ohe

Figure ES-1 Rank-Ordered Potential Cable Landing Station Locations

The state requested detailed specifications for new cable landing stations at Kaka‘ako Park and Barbers Point, both on O‘ahu.

ES.2.2 CABLE LANDING STATION CAPITAL IMPROVEMENT PROJECT

The State of Hawai‘i has appropriated $20 million under Act 134(13), General Appropriations Act of 2013, Capital Improvement Project I.7, for “Transpacific landing stations, broadband infrastructure deployment, statewide - Plans, land acquisition, design, construction, equipment, to provide submarine transpacific cable landing stations, infrastructure improvements, and broadband infrastructure deployment improvements, statewide.”[1]

This systems concept document and the related systems specifications documents developed under the current task support operationalizing Project I.7. The Johns Hopkins University Applied Physics Laboratory (JHU/APL) recommends that a state project lead be identified, a project team formed, and a plan developed to execute the project.

ES.2.3 START EARLY FOR LONG-LEAD ITEMS

There are numerous long-lead items that Hawai‘i should pro-actively pursue to ensure success. Due to the complexity and length of the permitting process, permitting activities should begin early. JHU/APL recommends consulting with permitting agencies and starting to prepare the application materials as soon as possible. Providing a centralized or networked permitting structure could also speed the permitting process.

In addition to permitting, the state can begin to address the business case issues related to improving the broadband architecture. For instance, the state could consider incentives to encourage broadband infrastructure changes to improve security and resiliency. Hawai‘i can make the case that businesses are likely to relocate to Hawai‘i based on expanded broadband capacity and the strategic location of the state to markets in Asia.

The sooner new cable landing station contracts are awarded, the more likely it is that future submarine cable lines will land in the state.

Public-private partnerships are essential to the success of the Hawai‘i Broadband Initiative. The public part can identify areas currently not advantageous for private industry to pursue and either eliminate the reason or incentivize the development to make the situation more advantageous. Permitting and land availability are two areas where public-private partnerships can streamline the permitting and provide land that private companies can lease for a certain period of time.

[1] Neil Abercrombie, Governor of Hawai‘i , Gov. Msg No. 1234, HB200 HD1 SD1 CD1, Relating to the State Budget, Act 134 (13), page 194. http://www.capitol.hawaii.gov/session2013/bills/GM1234_.PDF

ES.2.4 ESTABLISH HAWAIʻI BROADBAND INITIATIVE MEGACOMMUNITY

A broad approach (particularly government and business working in reciprocity) is advised to fund, deploy, and operate new fiber-optic builds to achieve the goals of the Hawaiʻi Broadband Initiative. A collaborative approach is likely to decrease cumulative costs, project duration, political sensitivities, and cultural obstacles.

The recommended approach is to establish a megacommunity comprised of members from state government agencies, private investors, companies, and groups within civil society. This megacommunity would be a standing group of high-level representatives from across all areas of Hawaiʻi society to drive toward the goal of affordable ultra-high speed broadband for all citizens at affordable prices. Establishing the broadband megacommunity should leverage existing organizations. For example, from the island of Maui, the Maui Economic Development Board may be a good starting point.

JHU/APL recommends that this megacommunity be driven by a neutral, third-party umbrella organization. The megacommunity should focus on:

- Building community support for and reducing objections to the HBI projects;
- Streamlining permitting;
- Reviewing and, potentially, strengthening Hawaiʻi cable protection laws;
- Potentially, allocating land to support secure landing sites; and
- Improving education and awareness across the state.

ES.2.5 ACTIONS TO IMPROVE SECURITY AND RESILIENCY

The need was identified for a new set of cable landing stations to provide node diversity in each county in Hawaiʻi and thus prevent one or two events (or coordinated attacks) from isolating entire counties and/or affecting a large fraction of the transpacific traffic. JHU/APL recommends these priorities for additional landing sites on the neighbor islands:

- A new site on the Island of Hawaiʻi is the first priority beyond the one or two new Oʻahu sites.
- A new site on Maui is the second priority.
- A new site on Kauaʻi is the third priority.

One or more interisland cables connecting the new cable landing stations would increase the resiliency. New interisland cables would reduce the impact of failure at critical

existing stations. These cables would also help improve the resiliency of the transpacific network by adding node and link diversity and providing additional backups.

The resiliency of submarine backhaul networks can be improved by burying cables and providing diverse routes between cable landing stations (CLSs) and multiple meet-me points.

Wherever possible, the intraisland backbone and backhaul networks should have enough connectivity to allow configuring interconnected rings. This implies that large spurs in Maui and Kauaʻi counties should be transformed into rings by adding fiber links. Oʻahu and Hawaiʻi counties need relatively few additional fiber links to form self-healing rings.

Diverse routes should be encouraged between cable landing stations and meet-me points. Ideally, the links should have significant geographical separation. Remote monitoring technology should be considered for key chokepoints and vulnerable nodes, similar to that already employed at carrier central offices. Intraisland backbone links should be buried, where feasible.

JHU/APL recommends additional analysis of these factors affecting the overall resiliency:

- Resilient interconnection of the Hawaiʻi submarine cable network with the intraisland networks;
- Desired additional interisland connectivity to maximize resiliency benefits from new landing sites and transpacific cable(s);
- Resiliency of supporting infrastructures (e.g., power) and their interconnections with the submarine cable network; and
- Resiliency against cyber operations.

ES.2.6 NEAR-TERM NEXT STEPS

The following list details suggested near-term next steps:

- Establish project(s) and related support structure for new cable landing stations
- Conduct a technical review of draft request for proposal (RFP) or request for quote (RFQ)
- Conduct a technical evaluation of RFP/RFQ responses
- Prepare permit application material
- Conduct desktop study/marine survey effort for planned new cable landing stations, including characterization of and remediation options for undersea hazard areas

- Select neighbor island sites
- Specify neighbor island landing stations
- Characterize requirements for landing in a new cable landing station
- Characterize requirements for the operator of a new cable landing station
- Continue to meet with industry consortia
- Conduct resiliency-related investigations

1. INTRODUCTION

On 23 August 2011, Governor Neil Abercrombie proclaimed:

> *For Hawaii in particular, the ability of broadband technology to connect individuals, businesses and institutions between our islands and to the rest of the world instantaneously will be transformative. In order to ensure that Hawaii is globally competitive, we must begin to act now to create a 21st century Hawaii in which all our citizens have access to ultra high-speed broadband capabilities at affordable prices.*[2]

Furthermore, Governor Abercrombie set forth a goal to:

> *Reduce Hawaii's barriers to global participation by promoting greater transpacific fiber connectivity and ensure equitable access for all our islands.*[3]

The Johns Hopkins University Applied Physics Laboratory (JHU/APL) is supporting the State of Hawai'i efforts to improve broadband capabilities by providing systems engineering support through a contract with The Research Corporation of the University of Hawai'i (RCUH); Planning and Engineering Studies, Phase II; JHU/APL Task JHQ04.[4] This Systems Concept document is a contractual deliverable under that agreement and builds upon work accomplished under Phase 1, JHU/APL Task JHQ03, and a previous agreement, Contract ZA18622, JHU/APL Task JHQ01.

The initial contract (JHU/APL Task JHQ01) with RCUH resulted in preliminary observations and recommendations, summarized in the following list.

- The combination of the challenging business environment in Hawai'i and improvements in fiber optics technology has led some cable companies to bypass Hawai'i.
- The existing network infrastructure is vulnerable to human and environmental threats. There are several network nodes where failure or sabotage can severely disrupt broadband capabilities.

[2] Executive Memorandum, Hawai'i Broadband Initiative, issued on August 23, 2011. http://manage.hawaii.gov/gov/broadband-executive-memo
[3] Ibid
[4] JHU/APL AD-43031. JHU/APL Proposal entitled, "Planning and Engineering Studies – Phase II".

- As cables age and demand for broadband services increases, the transpacific capacity will become insufficient.
- To address these challenges, we recommended that the state:
  - Foster opportunities that lead to increased transpacific capabilities;
  - Engage early and often with stakeholders to build support and mitigate opposition to new cable landing stations and more broadband capacity;
  - Establish public-private partnerships to fund the system improvements;
  - Encourage system owners and operators to improve security, resiliency, and redundancy of the architecture to reassure customers and improve service; and
  - Help jumpstart the improvements by constructing new cable landing stations.

In the current contract with RCUH, JHU/APL pursued additional analysis in new areas and refined some of the recommendations from the initial contract's work. **Phase 1 of JHU/APL's current contract with RCUH focused on these six tasks**:

1. Perform analysis to establish the criticality of Hawai‘i as a node on the global fiber infrastructure.
2. Define recommended functional, performance, operational, and security requirements for transpacific cables and their landing stations.
3. Conduct a landing station site selection comparison and ranking of those potential sites (preliminary).
4. Develop a provisional summary of permits required for construction of cable landing stations at selected sites (partial).
5. Develop a network architecture that identifies potential points of connection for new cables to Hawai‘i existing fiber optic cable systems (preliminary).
6. Develop recommendations for next steps in the HBI (Hawai‘i Broadband Initiative), including recommendations for items in the next Capital Improvement Project (CIP) budget cycle (preliminary).

Phase 2 of JHU/APL's current contract with RCUH included the following six tasks:

1. Conduct a final landing station site analysis and recommendation, and conduct a comparison and ranking of those potential sites.
2. Conduct pre-engineering studies for selected sites.
3. Develop a final provisional summary of permits required for construction of cable landing stations at selected sites.
4. Provide design recommendations for construction of cable landing stations at candidate sites.

5. Develop a final network architecture that identifies potential points of connection for new cables to the Hawai'i existing fiber optic cable systems.
6. Develop final recommendations for next steps in the HBI, including recommendations for items in the next CIP budget cycle.

In Phase 1, JHU/APL delivered the preliminary Systems Concept in the form of an annotated slide deck. That slide deck highlighted the concepts emerging from the work across all six Phase 1 areas. This document updates the concepts based on work in all task areas in both Phase 1 and Phase 2.

1.1 IDENTIFICATION

This document is titled *Transpacific Systems Concept Document*. It satisfies the JHQ04 deliverable Transpacific System Concept Document (Phase II).

1.2 DOCUMENT OVERVIEW

The document is arranged as the preliminary slide deck was arranged:

Chapter 2: Overview and Background

Chapter 3: Challenges/Issues. The challenges/issues are divided into four main categories: Complexity, Business and Economic Environment, Capacity, and Security and Resiliency. For each category, the material describes the nature of the challenge or issue and how to address it.

Chapter 4: Architecture Summary

Chapter 5: Recommendations and Next Steps

Appendix A lists references. Appendix B lists acronyms and abbreviations.

1.3 SYSTEMS ENGINEERING APPROACH

This effort follows the JHU/APL approach to systems engineering. The Laboratory has been developing systems for government sponsors for more than 70 years. Figure 1-1 depicts the JHU/APL approach to systems engineering.[5]

[5] APL Technical Digest volume 31, issue 1. APL Applied Systems Engineering – Part II: Guest Editors' Introduction, 2012.

Figure 1-1 Johns Hopkins University Applied Physics Laboratory Systems Engineering Approach

The first three phases apply to the JHU/APL systems engineering effort in support of the Hawai'i Broadband Initiative:

1. *Critical needs: Operational data collection or mission analysis may reveal a need to achieve new capabilities.*
2. *Capability assessment: Once a need is recognized, it is always prudent to determine whether presently available systems and operational capabilities could be leveraged to meet the need by application of new tactics or procedures, for example.*
3. *Concept exploration: Candidate concepts and corresponding models and analyses are developed. Next, technology readiness and alternative systems approaches are explored, and critical experiments and studies of new features of the system design are conducted.*[6]

The other systems engineering phases shown are not part of the current effort.

JHU/APL's approach has been to:

- Start by scoping the problem. This effort is related to ongoing parallel efforts for the Hawai'i Broadband Initiative. The Overview and Background chapter clarifies the components that make up the broadband system of systems and

[6] Ibid.

illustrate JHU/APL's focus on the submarine cable systems and connections to the meet-me points.

- Continue to characterize the current situation. Using models, JHU/APL has built on prior work to further describe the current situation.
- From that analysis, describe these major issue and challenge areas: complexity, business and economic environment, capacity, and security and resiliency. The issues and challenges also help to motivate improvements.
- Define high-level concepts to address each challenge area, and describe, at a high level, the desired end state and a recommended approach to get there.

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2. OVERVIEW AND BACKGROUND

2.1 IMPORTANCE OF BROADBAND IN HAWAIʻI

The late Senator Daniel K. Inouye (D-HI) explained why broadband is important during a hearing in 2008 before the Senate Committee on Science, Commerce, and Transportation.

> *Broadband matters because broadband communications have become the great economic engine of our time. Broadband deployment drives opportunities for business, education, and healthcare. It provides widespread access to information that can change the way we communicate with one another and improve the quality of our lives.*
>
> *This is why our discussion today is not about pipes and providers. It is about people; our citizens stand to gain the most from universal broadband adoption. By some estimates, universal broadband adoption would add $500 billion to the U.S. economy and create more than a million new jobs.*
>
> *Add to this hundreds of millions of dollars in savings through e-government and telemedicine initiatives and untold riches we can reap by tapping the genius of web-based entrepreneurs in every corner of this country. The case for better broadband is clear.*[7]

Governor Abercrombie launched the HBI in August 2011. The initiative builds on conclusions and recommendations from the 2008 Hawaiʻi Broadband Task Force Final Report. The Hawaiʻi Broadband Task Force reported that

> *Broadband is critical infrastructure for Hawaiʻi's 21st century advancement in education, health, public safety, research & innovation, economic diversification and public services. One national study estimated the positive economic impact of advanced broadband in Hawaiʻi at $578 million per year.*[8]

[7] Senator Daniel K. Inouye, at September 16, 2008 hearing, US Senate Committee on Science, Commerce, and Transportation, Why Broadband Matters.
[8] Hawaiʻi Broadband Task Force Final Report, 2008.

The Hawai'i Broadband Strategic Plan established this three-part vision, each with a specific goal:[9]

- Availability
  - Goal 1: Ensure availability of broadband to all Hawai'i residents at affordable prices.
- Adoption – Digital Literacy and Internet Use
  - Goal 2: Eliminate the digital divide and promote broadband adoption.
- Application – Broadband Applied for Economic Growth
  - Goal 3: Promote broadband industries and applications for economic development.

This systems concept primarily focuses on the availability goal.

2.2 SYSTEM OF SYSTEMS

The term "system of systems" refers to a set of systems. Each one operates and is managed independently. The systems are heterogeneous; that is, they perform different functions and are made up of different components. Typically, each system is complex, and the systems are geographically distributed and evolutionary. When the system of systems is collaboratively integrated, it provides new capabilities beyond those available from any of its components acting alone.

In this case, the Hawai'i broadband system of systems provides broadband capabilities (voice, video, data) to support a wide variety of applications including education, health, public safety, research and innovation, entertainment, data sharing, web browsing, social networking, e-commerce, and public services.

The broadband system of systems includes these elements, as shown in Figure 2-1:

- Submarine cable systems
- Meet-me points
- Submarine backhaul network
- Network users and user premises
- Interisland network
- Intraisland network

[9] Hawai'i Department of Commerce and Consumer Affairs (2012). Hawai'i Broadband Strategic Plan. December, 2012.

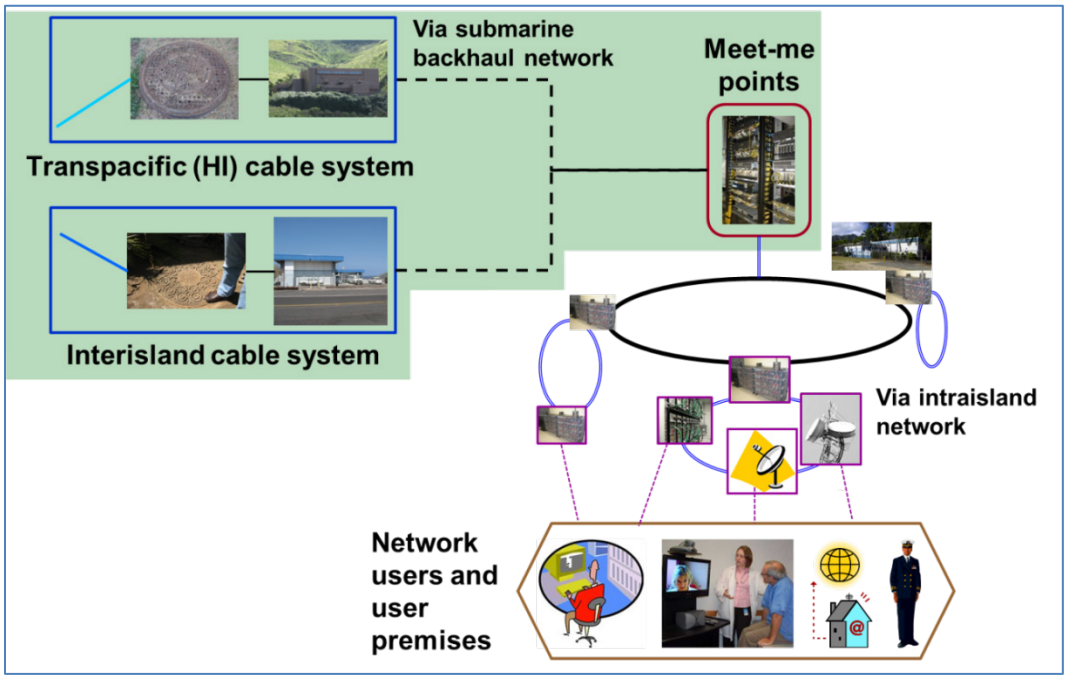

Figure 2-1 Hawai‘i Broadband System of Systems

Subsequent sections describe each major element. This work focused on the elements highlighted in green: transpacific (HI) cable systems, interisland cable systems, submarine backhaul network, and the connections to the meet-me points. In this work, the label “transpacific (HI) cable system” (i.e., with HI in parentheses as a qualifier) means only the under-the-ocean (submarine) cables that land in Hawai‘i. The term without HI in parentheses refers to all transpacific cables, including those that bypass Hawai‘i.

2.2.1 Submarine Cable Systems

The first major elements are the transpacific and interisland submarine cable systems (see Figure 2-2).

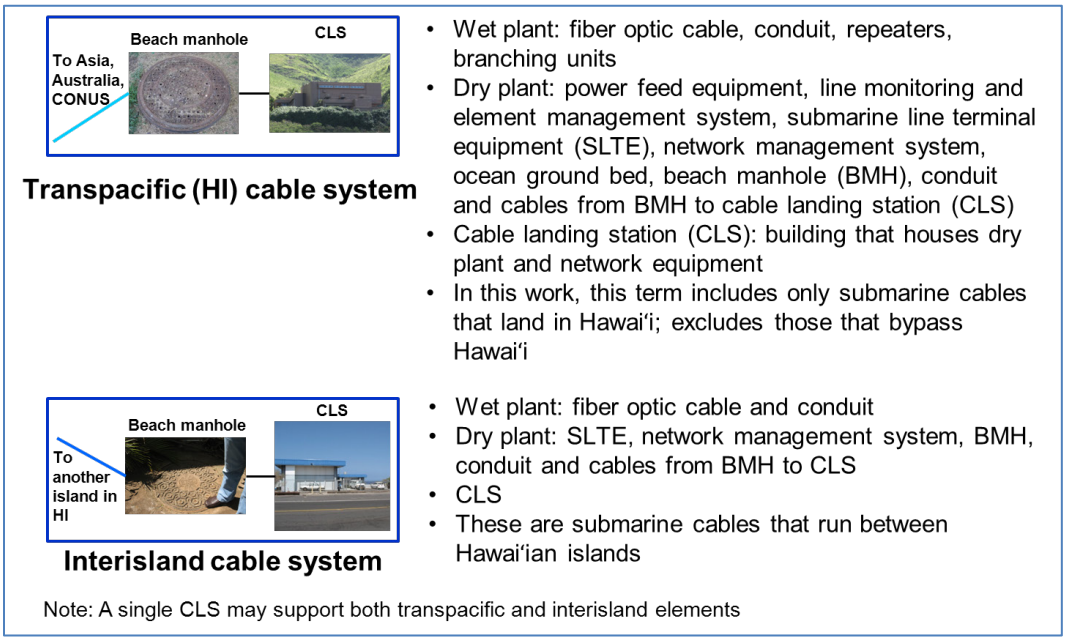

Figure 2-2 Submarine Cable Systems

The transpacific (HI) cable system includes:

- Wet plant: fiber optic cable, conduit, repeaters, branching units
- Dry plant: power feed equipment, line monitoring, and element management system, submarine line terminal equipment (SLTE), network management system, ocean ground bed, beach manhole (BMH), conduit and cables from BMH to cable landing station (CLS)
- CLS: building that houses dry plant and network equipment

The interisland cable system is made up of the submarine cables that run between the islands of Hawai'i. This system is a little simpler because the distances it covers are shorter. The interisland cable system includes:

- Wet plant: fiber optic cable and conduit
- Dry plant: submarine line terminal equipment, network management system, BMH, conduit and cables from BMH to CLS
- Cable landing stations.

Note that some stations may support both transpacific and interisland elements.

2.2.2 Meet-Me Points

The next element is a meet-me point (sometimes called an interconnect point or carrier hotel); see Figure 2-3. The limited work in this area addressed only the backhaul connections to the meet-me-points.

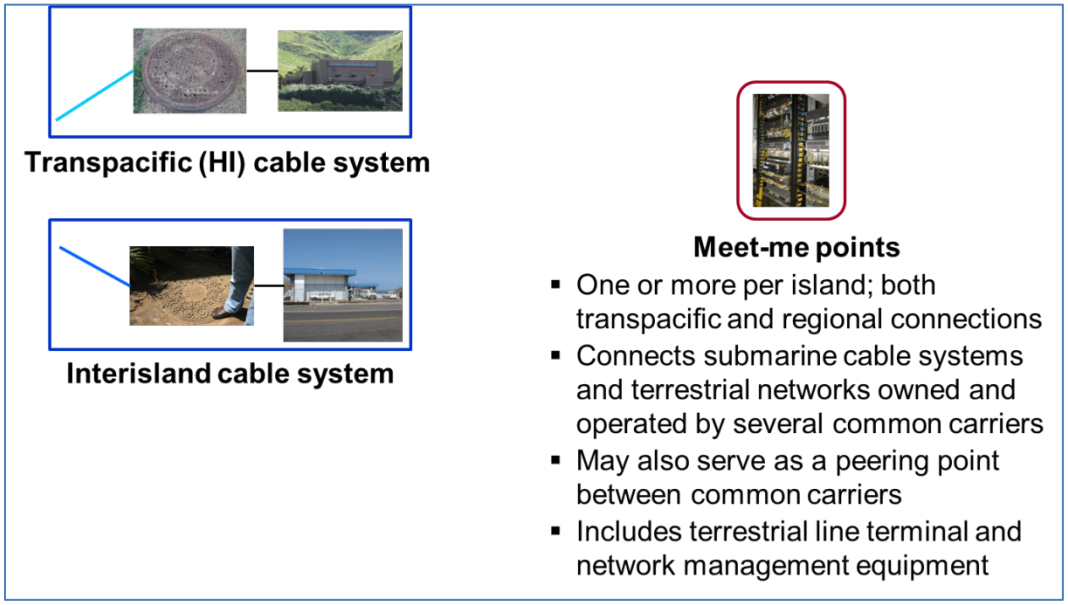

Figure 2-3 Meet-Me Points

A meet-me point connects submarine cable systems and terrestrial networks owned and operated by several common carriers. There is one or more meet-me point on each island that has a submarine cable landing.

Typically, a meet-me point includes both transpacific and regional (interisland) connections. A meet-me point may also serve as a peering point between common carriers. (A peering point is where interconnection of administratively separate Internet networks for the purpose of exchanging traffic between the customers of each network occurs.) Equipment housed in a meet-me point includes terrestrial line terminals and network management systems.

2.2.3 Submarine Backhaul Network

Next, the dashed line shown in Figure 2-4 represents the submarine backhaul network. The submarine backhaul network connects a cable landing station to a meet-me point.

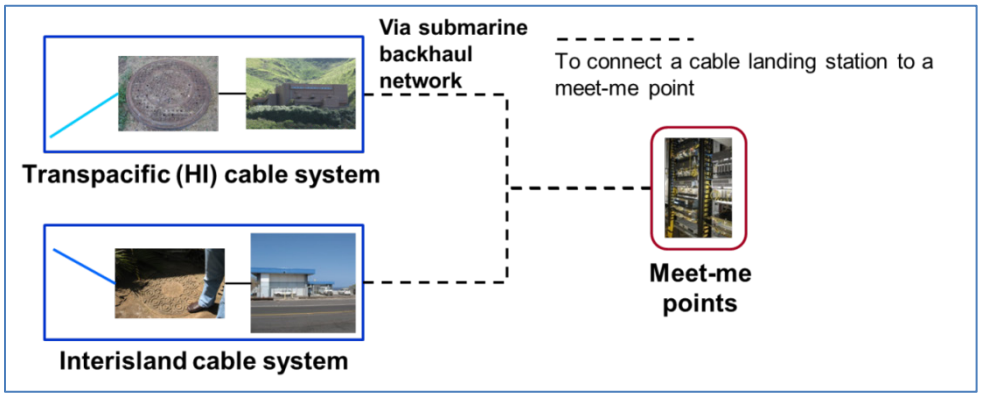

Figure 2-4 Submarine Backhaul Network Connects CLS to a Meet-Me Point

2.2.4 Network Users and User Premises

There are many network users located in a variety of places. Figure 2-5 groups the users into three broad categories: data centers; community anchor institutions such as hospitals, libraries, and schools; and business, government, and residential customers. Each user subscribes to broadband services according to their requirements. Each user receives those services at their own premises.

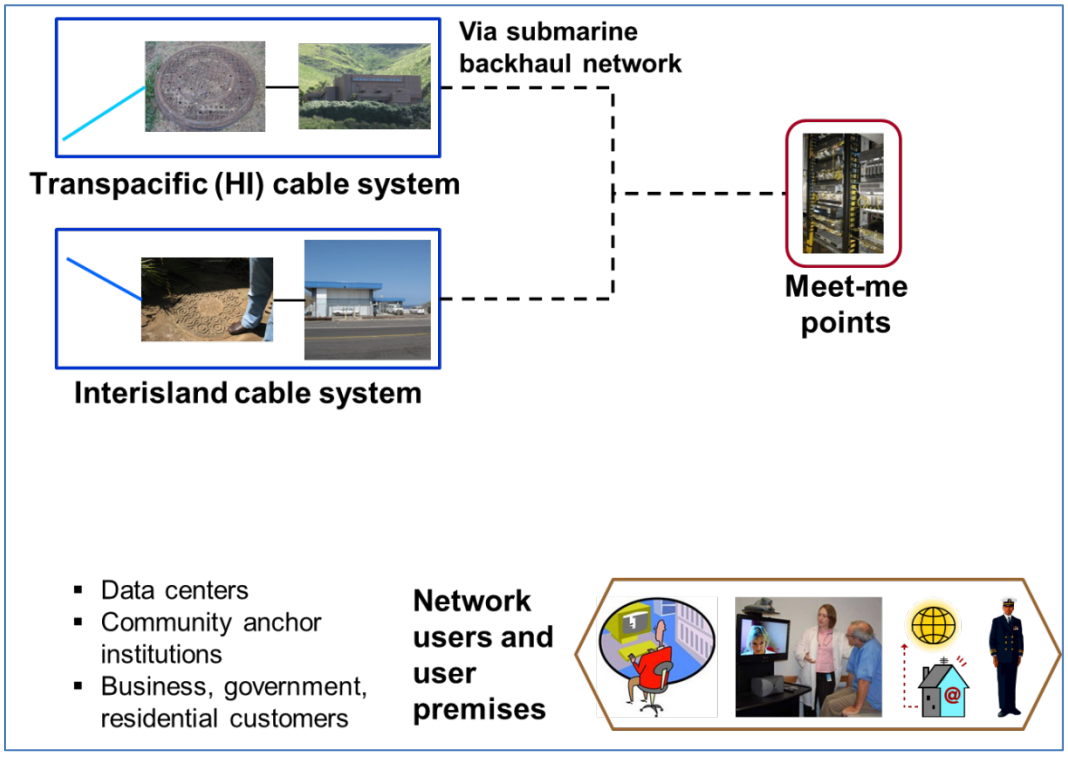

Figure 2-5 Network Users and User Premises

2.2.5 Intraisland Network

Figure 2-6 adds the intraisland network that connects the meet-me point to the users. This network includes the carrier central offices, the backbone network, terrestrial backhaul network, access aggregation points, and access technologies and networks to go the "last mile" to reach the user. Analysis of this element of the system of systems was outside the scope of work.

The carrier central offices are shown as racks and a building. Traditionally, the carrier central office is where customer copper wire terminates to obtain wire line voice service. Other functions have been added in modern carrier central offices. Voice traffic on cable and fiber to the premises may terminate here.

The heavy black oval represents the backbone. The backbone provides island-wide connectivity between terrestrial backhaul networks.

The blue ovals with double lines represent the terrestrial backhaul network. The terrestrial backhaul connects smaller carrier central offices and access aggregation points to the backbone. Usually this is a local ring or mesh network in a small part of an island.

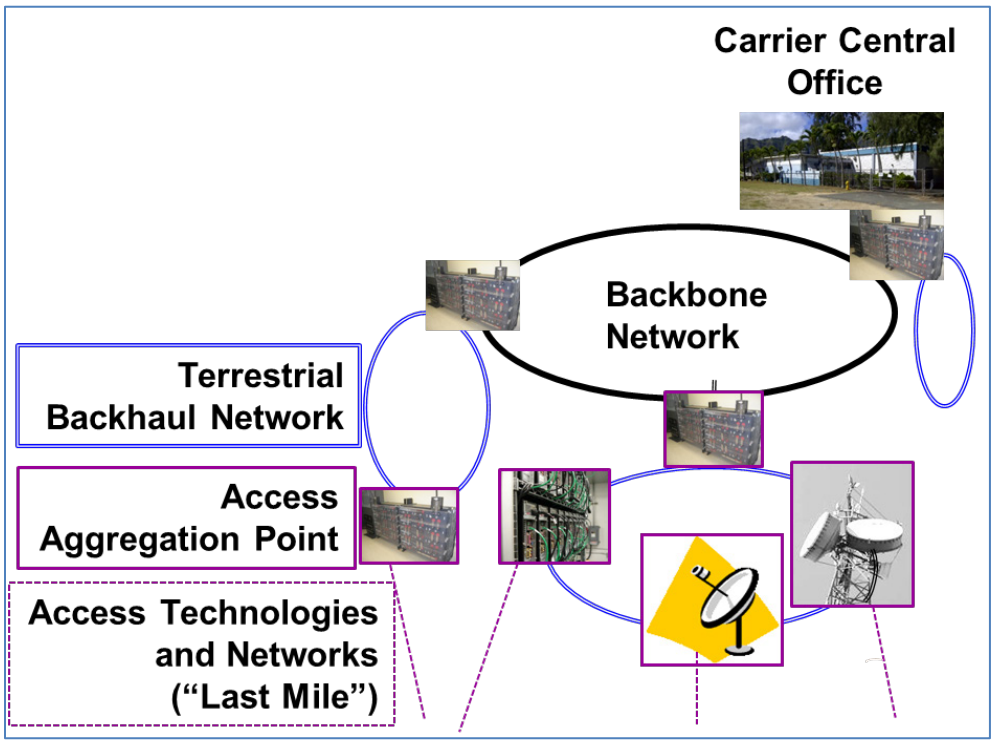

Figure 2-6 Intraisland Network Connects Meet-Me Points to Users

The images in the purple boxes represent access aggregation points. These are nodes where the access network terminates on the network side. An access aggregation point may be a small carrier central office or a cellular base station, for example.

The access technologies and networks (the "Last Mile") are shown as purple dotted lines. The "last mile" connects network users and the user premises to access aggregation points. Technologies used include wire line (e.g., copper line and xDSL, fiber to the premises, coax, and hybrids) and wireless (e.g., microwave, satellite, cellular, Wi-Fi, and wide-area Wi-Fi).

3. CHALLENGES/ISSUES

Challenges and issues with the current system of systems can be organized into these categories:

- Complexity
- Business and economic environment
- Capacity
- Resiliency and security

For each category, a summary figure will be provided that shows the elements in the system of systems on which JHU/APL focused: transpacific and interisland cable systems, submarine backhaul network, and connections to meet-me points. Red, yellow, or green highlights will give a high-level, rough order indication of the degree of concern in that challenge/issue category. The summary figure will also identify key points of concern and how the concerns might be addressed.

Subsequent figures and/or text will highlight the major aspects of the issues in each category and how to address the issues. Some sections identify the desired "vision" or opportunities that may help to promote broadband improvements.

3.1 COMPLEXITY

Section 2.2 identified many technologies, systems, and locations. The system elements are owned by different private and public sector entities. Each entity has its own interests.

Different and sometimes competing forces motivate the different entities involved. These factors affect choices and decisions in planning, management, risk assessment, operations, and investment.

In Figure 3-1, all four elements are highlighted in yellow to highlight that there is moderate concern about how complexity issues will challenge efforts to improve the broadband situation.

To address complexity, the HBI needs the support and participation of the broadband "megacommunity." The megacommunity includes individual citizens, private sector organizations, and public sector governments at the federal, state, and local levels. The HBI leadership must engage the megacommunity early and often. A key aspect of this is to identify public-private partnerships to incentivize private sector business community

participation and support for the overall vision. Also, the State of Hawai'i will recover these costs over time from revenues from successful cable operators.

The State of Hawai'i is uniquely able to provide the required leadership and serve as a catalyst in the broadband development effort. The HBI is ultimately intended to benefit all elements of the public and private sectors. However, the cost and risk is not necessarily borne proportionally by those receiving the benefits. The state must be involved in key decisions such as allocating land and approving permits for the landing stations and cable routes. These decisions must be made in the context of the overall initiative. It may be necessary to provide incentives to some stakeholders to obtain consensus. This is especially true when a cost or concession must be made by one party for the benefit of another or the general public. The State of Hawai'i should begin by carefully reviewing the drivers and barriers for each stakeholder group and identifying action that can tip the balance for that stakeholder in favor of supporting and participating in the HBI.

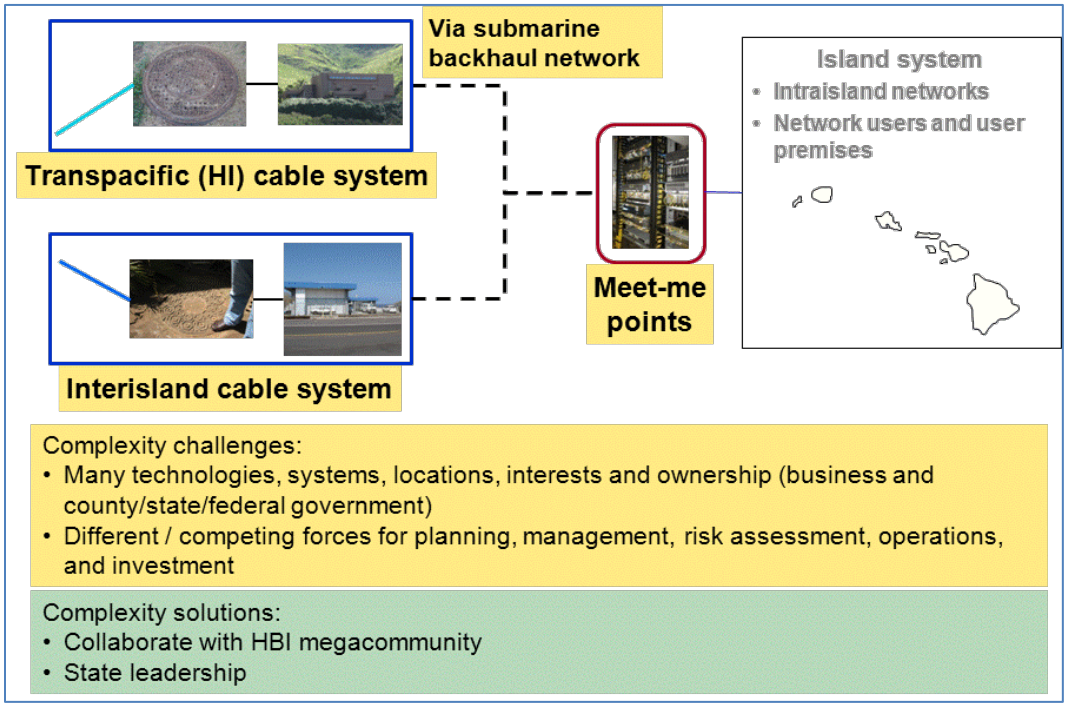

Figure 3-1 Challenges: Complexity

3.1.1 Complexity Challenge: Many Technologies, Systems, Locations, Interests, and Ownership

Implementing the HBI is a complex problem involving many interrelated elements. The left-hand column of Figure 3-2 deals with the main elements involved in providing the

infrastructure. The right-hand column deals with elements related to using, overseeing, or the impacts of the broadband infrastructure.

HBI involves multiple technologies relating to terrestrial and submarine cable systems, Internet protocol (IP) and wireless networks, and all the components included in those systems. Interoperability among the diverse technologies poses technical and operational challenges. Some of the technologies change rapidly, rendering equipment obsolete within a relatively short lifetime. An investment today may be replaced in less than its projected working lifetime due to increasing bandwidth available from new technologies at lower cost to operate.

The broadband capability will be delivered via a system of systems. These include the basic cables and associated switches, routers, and amplifiers; backbone and backhaul networks; and wireline and wireless access networks. No single organization owns, develops, manages, or operates all of these systems, but they must work together to achieve the HBI vision. The stakeholders recognize they are part of a bigger system; however, there is no governance structure in place to manage it and its success is dependent upon the voluntary cooperation of the participants.

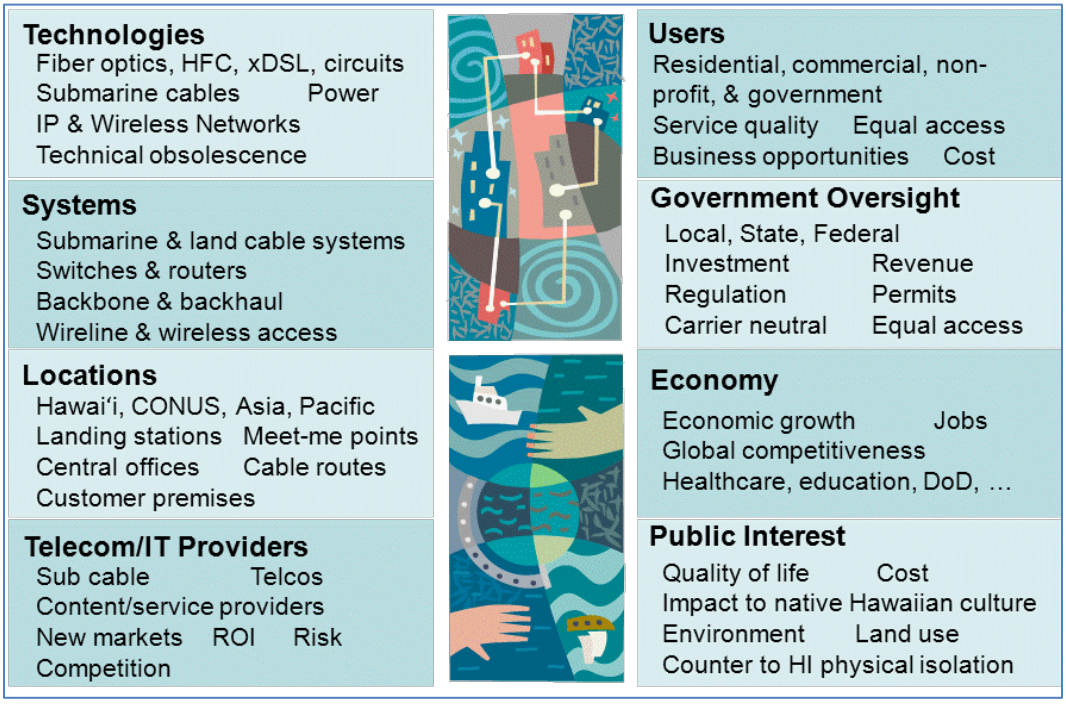

Figure 3-2 Many Interrelated Elements in the Broadband Picture

The Hawai'i broadband capability involves a diversity of locations, each with its own economic, regulatory, natural environment, and public impact issues. Governments at the

federal, state, and local level are involved, each with their own concerns about investment, revenue, regulation, permitting, and equal treatment of providers and customers. Inherent competing interests exist among levels of government and divisions of government leading to a resistance to change. Government is also a major consumer of networking services.

The participation and cooperation of many elements of the IT/telecommunications business community are required. Submarine cable companies, telephone, and cable service providers are first tier participants. Other businesses that use the broadband infrastructure for delivering content and services must also be engaged. Businesses must see opportunities for new markets and return on investment sufficient to motivate overcoming risk and competition.

The Hawai‘i economy is of interest to all stakeholders. The HBI is intended to provide the digital infrastructure necessary for Hawai‘i to be competitive in the global marketplace, leading to economic growth and new jobs. Many industries, such as defense, healthcare, and education, are highly dependent on the networking infrastructure. Success in these industries will require a modern, high-capacity networking infrastructure. These industries will benefit from investments made by the government and the network providers.

Beyond the specific interests noted, there are other issues of concern to the general public. How will broadband investments (or lack of investments) affect the overall quality of life? Will the investments result in additional costs to taxpayers, or will they be covered by user fees? What impact will the development, landing stations, and cable routes have on the environment? Are there land use issues or impacts to sacred lands?

The complexity of HBI results from the interaction of all these elements and the need to find a balanced approach that addresses the sometimes competing needs of various stakeholders.

3.1.2 Complexity Challenge: Competing Forces

Many forces are competing to either drive the HBI concept forward or to slow its progress. Figure 3-3 indicates the forces working on four of the major stakeholder groups.

Citizens will see value in improved Internet service, which provides better access to entertainment, information, education, businesses, and other services. However, they may not be willing to voluntarily pay their share of the cost for access, and they may resist plans that require cable rights of way on residential and public lands. Business users will likewise benefit from better local and world-wide connectivity, but this benefit must clearly

exceed the cost of service. They will not risk investment unless a clear return on investment can be confidently demonstrated.

The State of Hawai'i expects to benefit from economic growth spurred by the HBI. Improved Internet service will help retain and attract high-value industry and government activities in defense, health care, data centers, higher education, and other areas. In a world where many knowledge workers can work from anywhere with an Internet connection, Hawai'i offers a wonderful environment to attract skilled workers. The barriers include the risk of making an initial investment that is not recovered if the projected benefits to the economy and corresponding increase in tax revenues do not materialize. Another barrier is the general resistance to changes to the status quo that occurs in any project involving many stakeholders and long-term commitment before results are seen.

	Drivers	BARRIERS
Citizen & Business Users	• High speed Internet service • Entertainment, world connectivity, business opportunities • High-value jobs	• Environmental, cultural impact • Cost & risk of loss • Resistance to change
State	• Economic growth • Attracts high value business (DoD, NOAA, healthcare, data centers, higher education, ...)	• Risk of non-recovered cost • Resistance to change
Local Service Providers	• More and better services to offer, producing higher revenue • Revenue from submarine cable operators for backup links	• New construction for connecting to new landing sites • Cost to achieve resiliency to match global expectations
Submarine Cable Operators	• Hawai'i revenue • Higher capacity / lower cost via regeneration in Hawai'i • Government incentives • Higher utilization from varying peak traffic hours across regions	• Difficult permitting process • Environmental regulations • Longer cable route thru Hawai'i • Natural disaster risk

Figure 3-3 Many Competing Forces

The prospect of offering more and better services and thereby increasing revenues is an incentive for local telecommunications service providers. Affordable high-speed broadband enables many new and improved services to residential customers. The telecommunications service providers may also derive new revenue by providing backup services to the new submarine cable operators. When a submarine cable fails, interisland networks can provide a backup capability to reroute signals to a different submarine cable to avoid complete loss of service. The barriers to local service providers are primarily cost related. Local service providers must provide the backhaul connection to new cable landing

sites, and they must invest in their networks to upgrade their architecture with redundant connections to improve resiliency.

Submarine cable operators have an opportunity to increase revenues by providing more and better services to Hawai'i. The Hawai'i connection provides a regeneration capability that allows increasing capacity over their transpacific cables. However, even with the anticipated government incentives, cable operators will face a difficult permitting process and complex environmental regulations that must be addressed. The benefit of regeneration in Hawai'i comes at the cost of a longer transpacific route. The risk of natural disasters from hurricanes, volcanos, earthquakes, and tsunamis must be factored in.

The figure includes only a partial list of stakeholders. Other stakeholder groups include the Federal Government, non-profit organizations, specific industries such as health care and finance, and specific government groups such as education, public health, and public safety. As the planning and implementation proceeds, the drivers and barriers impacting each stakeholder group need to be identified in detail. Ultimately, each stakeholder will agree to move forward if the drivers are more compelling than the barriers.

3.1.3 Complexity Solution: Collaboration

The success of the HBI is critically dependent upon the support and participation of the broadband "megacommunity." As shown in Figure 3-4, the megacommunity includes individual citizens, private sector organizations, and public sector governments at the federal, state, and local levels. The private sector community includes the private sector business community as well as the non-profit community. The businesses are of two basic types: telecommunications and information technology providers that build and operate the digital infrastructure and commercial enterprises that use the infrastructure. The providers are also users. Non-profits can include education, health care, and other community service providers as well as advocacy groups.

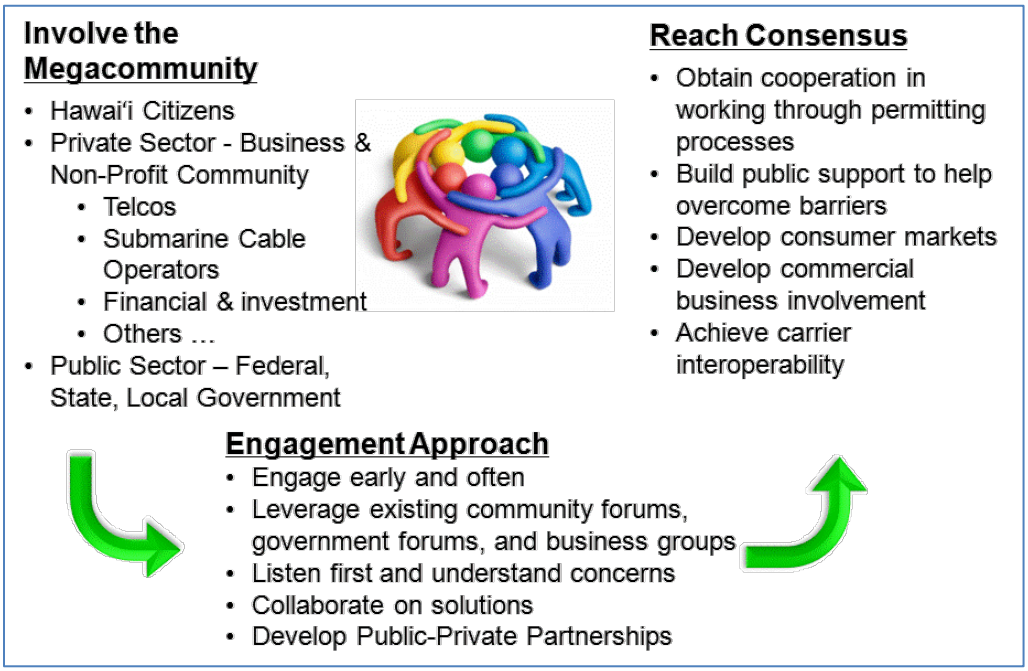

Figure 3-4 Collaboration: A Silver Bullet?

The HBI leadership must engage the megacommunity early and often. It should leverage existing business and community forums to the extent possible. For example, from the island of Maui, the Maui Economic Development Board may be a good starting point. The initiative must first listen and understand stakeholder objectives and concerns. It should identify the specific drivers and barriers for each stakeholder group. Ultimately, each party will participate if there is something in it for them and that something is worth more than the "cost" of what the party is giving up. Once the motivations are understood, the HBI leadership must take the lead in building a consensus for a specific course of action that is perceived as beneficial and fair to all. It is important to keep everyone involved and well-informed throughout the process.

A key aspect of this is to identify public-private partnerships to incentivize private sector business community participation and support for the overall vision. An example of this is to have the State of Hawai'i make the initial investment to build new cable landing sites to lower the buy-in cost and reduce schedule delays for cable operators. The state is will recover these costs over time from revenues from successful cable operators. This allows the state to take the risk of the investment and to pay any extra costs that will not result in direct benefit to the private investor. For example, it is in the public's benefit to have landing stations strategically placed to provide diversity against natural disasters and malicious attacks. A specific submarine cable company will be inclined to pick the lowest cost location and will be reluctant to pay the extra cost of any landing station that meets

the larger diversity goal. A public-private partnership could be used to allow the state to cover the extra cost of establishing the landing site in a location consistent with the geographic diversity goals.

3.1.4 Complexity Solution: State Leadership

Delivering high-speed broadband to Hawai‘i is a complex activity requiring the cooperation of many stakeholders with competing interests. It involves a complex system of systems which by its nature means that no single entity is in a position to direct or manage the planning, implementation, and operation of the envisioned broadband capability. No stakeholder can succeed without the support of many other stakeholders. Strong leadership is required to establish a plan and mediate the competing interests.

The State of Hawai‘i is uniquely able to provide the required leadership and serve as a catalyst in the broadband development effort. The HBI is ultimately intended to benefit all elements of the Hawai‘i public and private sectors. However, the cost and risk is not necessarily borne proportionally by those receiving the benefits. The state must be involved in key decisions such as allocating land and approving permits for the landing stations and cable routes. These decisions must be made in the context of the overall initiative. It may be necessary to provide incentives to some stakeholders to obtain consensus. This is especially true when a cost or concession must be made by one party for the benefit of another or the general public. The State of Hawai‘i should begin by carefully reviewing the drivers and barriers for each stakeholder group and identifying action that can tip the balance for that stakeholder in favor of supporting and participating in the HBI.

3.2 BUSINESS AND ECONOMIC ENVIRONMENT

The second challenge or issue area is the business and economic environment, referring specifically to the regulations, permits, costs, and business risks associated with improving broadband elements in Hawai‘i.

As Figure 3-5 shows, one issue in this category is the outlay of capital for initial installation, the cost of energy and ongoing operations versus cost recovery, and potential business income. The second issue involves the time, effort, and risks associated with the full life cycle of making improvements to the broadband infrastructure. Do the potential rewards balance the risks?

Three of four elements are highlighted in red to indicate that there is high concern about how the business and economic environment challenges the efforts needed to improve the broadband situation.

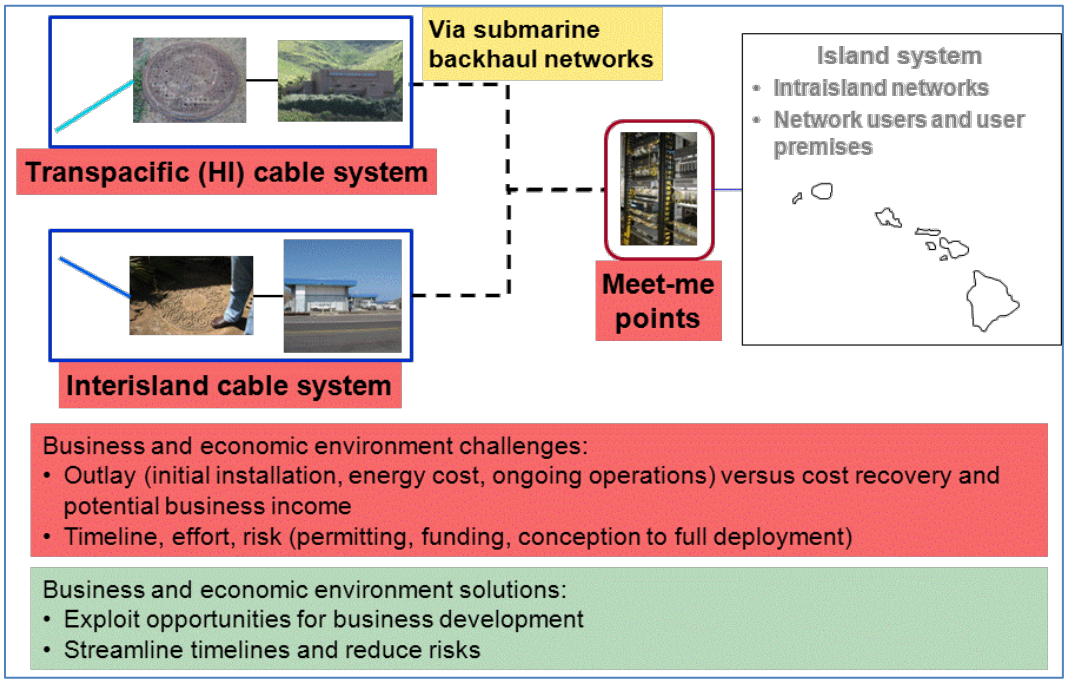

Figure 3-5 Challenges: Business and Economic Environment

To address the outlay issue, HBI can exploit various opportunities for business development related to the use of broadband capabilities. Some key opportunities include cloud computing, e-commerce, data centers and content distribution networks, support for DoD/national security, and telemedicine.

The central location of Hawai‘i in the Pacific, different peak traffic hours compared to the U.S. mainland, and high peak/average ratio make landing in Hawai‘i very attractive from an efficiency perspective. Increased capacity from regeneration makes landing in Hawai‘i even more attractive to submarine cable operators.

To the extent possible, Hawai‘i could streamline the timelines for permitting. By making the initial investment in new cable landing stations, the state can reduce the funding and timeline risks for potential new cable landings.

3.2.1 Business and Economic Environment: Hawai‘i Use of Internet

Figure 3-6 shows that, currently, a large percentage (about 90%) of Hawai‘i households can get broadband connections. About 75% subscribe to broadband, higher than the national average. Like in the rest of the United States, most subscriptions are at the lower end of the broadband range. About 60% have a connection speed (download speed) greater than 4 Mbps. Less than 10% have a connection speed exceeding 20 Mbps.

The connection speed and per user data volume in Hawai‘i are well below that of the world leaders like South Korea. However, successful implementation of HBI could change that quickly.

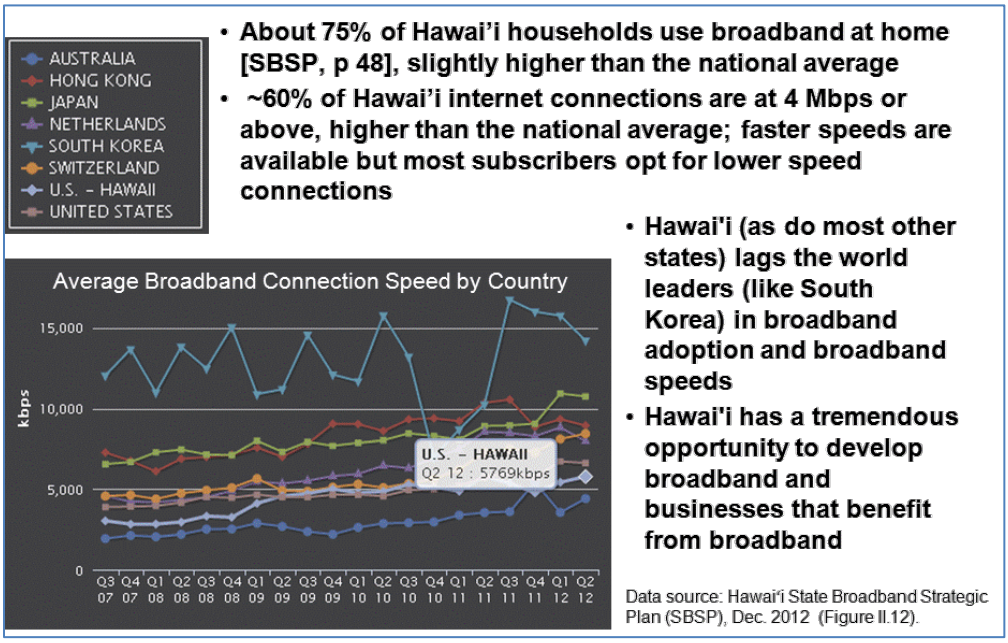

Figure 3-6 Hawai‘i Use of Internet Is Below International Leaders

The location of Hawai‘i makes landing broadband cables in Hawai‘i attractive for business reasons. Increased capacity from regeneration makes landing in Hawai‘i even more attractive to submarine cable operators.

The above factors also make it attractive for data centers and content distribution networks to locate in Hawai‘i.

3.2.2 Business and Economic Environment: Opportunities

Figure 3-7 shows that Hawai‘i has a very diverse set of existing and potential broadband customers. The items in bold represent potential new business growth areas or areas where new networking technologies may provide critical capabilities for important missions (e.g., defense or health care). Many of these have mission-critical communication needs requiring high data rates, as indicated in the right-hand column of the figure. Some high data rate applications warrant premium pricing as long as the capacity, latency, reliability, resiliency, and security needs are met. Expansion in any of the applications shown may bring new jobs.

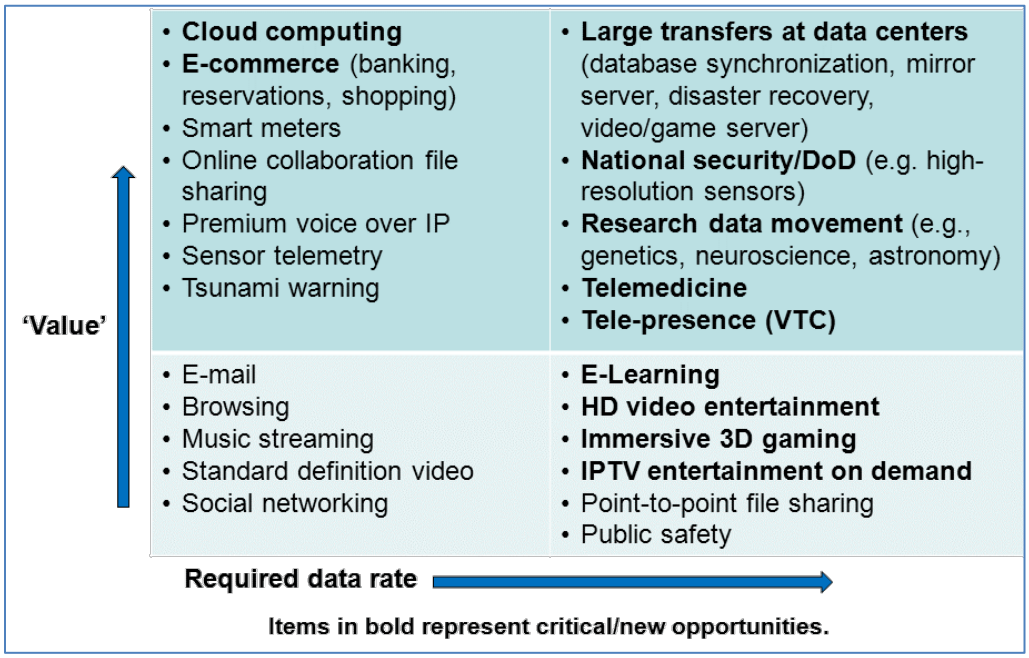

Figure 3-7 Great Opportunities for Business Development

Premium applications are shown in the upper row of the figure and include:

- National security/DoD: High resolution sensors, command and control, video-teleconferencing (VTC), low data rate sensors
- Other federal, state, and local government agencies: e-Government, VTCs, cloud computing, sensors, public safety
- Universities, research centers, hospitals, etc.: High resolution images, telemedicine, collaboration, research data transfers, VTC, e-Learning
- Hospitality industry, conferences: Guest Internet access, promotional sites, VTC, electronic entertainment

The geographical location of Hawai'i offers a great advantage where network utilization can be enhanced by catering to the network needs of various time zones. Data centers and content servers (e.g., Amazon, Google, Netflix) may find Hawai'i an attractive location if it provides a robust communications infrastructure.

Full penetration of high speed broadband will encourage and enable more enterprise customers located in the high value/high data rate quadrant, thus supporting a higher price structure for telecommunications companies and submarine cable operators. It will also enable innovation and business generation from broadband connectivity to the residences, community anchor institutions, and public places.

3.2.3 Business and Economic Environment: Economics for Cable Landing Station Operator

The costs associated with establishing a new cable landing station are high. Potential CLS operators may be deterred by the initial outlay required versus when they could expect to see a return on that investment. If the state builds the CLS, it should be able to recoup the cost through long-term lease or lease-to-purchase arrangements with the third-party CLS operator.

The cost to establish a new landing station includes required drilling, conduit, and building development on the proposed sites. The CLS operator would be expected to receive most revenue from the submarine cable owners and local telecommunications operators. The CLS operator's revenue would likely be proportional to the number of submarine cable operators that use the CLS. The state would, in turn, receive payment from the CLS operator.

3.2.4 Business and Economic Environment Challenge: Permitting

Permitting poses a challenge to installing new cable landing stations and landing new cable systems within the state. The State of Hawai'i is referred to as the "Endangered Species Capital of the World" with 377 Hawai'i species, 58 animals and 319 plants, listed as endangered by federal authorities. It is also among the largest extinct species sites of the world, with an estimated 271 birds, snails, insects, and plants that have gone extinct since European contact was first made in 1778. Due to these two facts, among others, Hawai'i is strongly in favor of thorough environmental reviews for any proposed action or development within the islands. This commitment manifests itself in an intense and exhaustive review of surveys and documentation necessary to comply satisfactorily with the Hawai'i Environmental Policy Act (HEPA). All efforts are made to inform as many parties within the state of any new action and to receive their approvals before that action is undertaken.

As shown in Figure 3-8, the permitting effort for a site on O'ahu is likely to cost at least $1.13 million and take 2.4 years per site to receive approvals on 12–15 permits. This chart reflects the range of potential time required to complete the HEPA and other permitting processes. Solid bars indicate the minimum time expected for that particular process to take in the current system, while the transparent bars demonstrate the range of potential worst-case scenarios where permitting and the project could be delayed.

The HEPA process requires the approval of a draft and final Environmental Assessment (EA) and potentially an Environmental Impact Statement (EIS) demonstrating that the effect on the surrounding environment will be minimized. Every new potential cable landing site needs to complete a cable route survey, archaeological survey, terrestrial

flora study, marine biological study, hazardous site database search, and a horizontal directional drilling study to submit the draft EA. Nearly all other permits cannot be started until final EA/EIS approval is given.

The HEPA process and related compliance with the National Environmental Policy Act (NEPA) require extensive studies and consultations and come with a great deal of risk and uncertainty. Consider two examples.

First and most recently, a project that pumps seawater to create air conditioning was able to obtain all necessary state level permits and approvals in under 3 years, but the company's federal EIS is entering year five. This is because other agencies commenting on the EIS have found its mitigation and construction requirements unsatisfactory, so the company has been forced to redesign part of the project. The HBI projects do not threaten the environment as drastically as that seawater project, but this example illustrates that other agencies' input into the EIS process can delay that process. Therefore, early consultation with resources agencies has been highly recommended and will prove crucial to an expeditious HEPA/NEPA process.

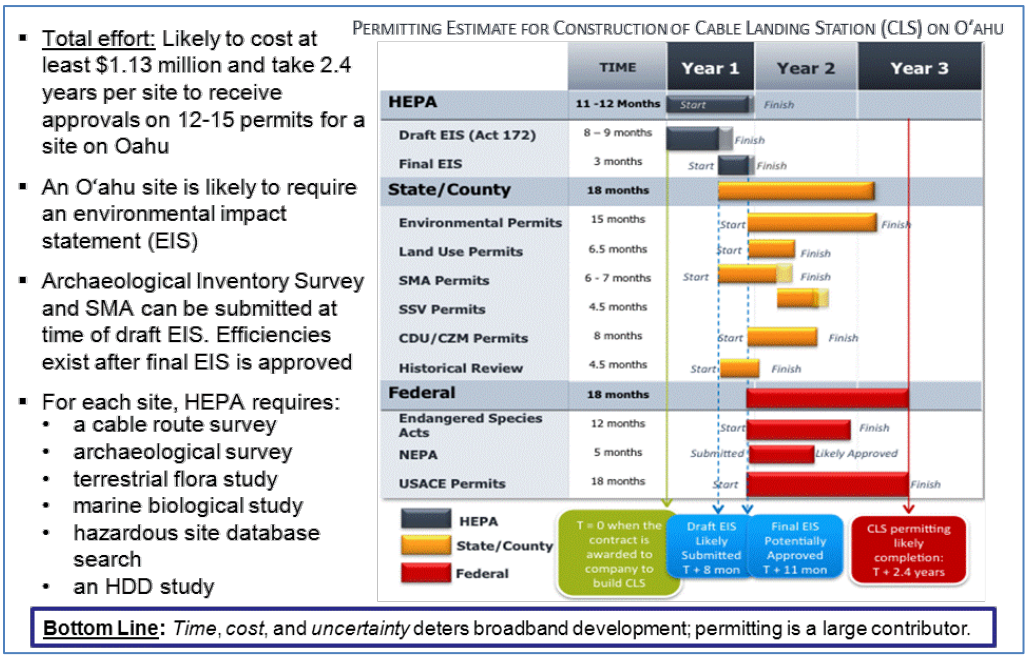

Figure 3-8 Government Permitting: A Long, Rocky Road on O'ahu

Second, it took one local telecom company 7 years and 117 permits to land an interisland cable with terrestrial links for seven landing sites across five islands in Hawai'i.

For this large multi-site, multi-island project, the permit list included four Federal permits, 15 state permits, 94 county permits, as well as four Marine Surveys.

This native Hawaiian company, despite familiarity with the state and the concerns of the local communities, needed 3 years for final EA approval and 4 more for all other county/state/federal permits before construction began on this large project. The 700-page draft EA took 2.5 years to complete, requiring the company to consult with 800 agencies, organizations, and individuals, hold 100 informal meetings, and contract with seven different companies to conduct the studies and author the chapters.

The existence of such case studies, alongside the wide range of potential time and effort required before putting shovel to soil, act as disincentives for telecommunications companies to initiate projects connecting Hawai‘i to the world and encourages them to avoid such pitfalls altogether.

The estimate for permitting at the NELHA location on the Island of Hawai‘i is shorter than that in O‘ahu, particularly if certain O‘ahu sites that are known to trigger the EIS process are selected. NELHA has a streamlined permitting process in comparison, due to the fact that the site has received approval from the County of Hawai‘i that it can receive de facto permitting from previous conservation district units and special management area applications submitted (see Figure 3-9).

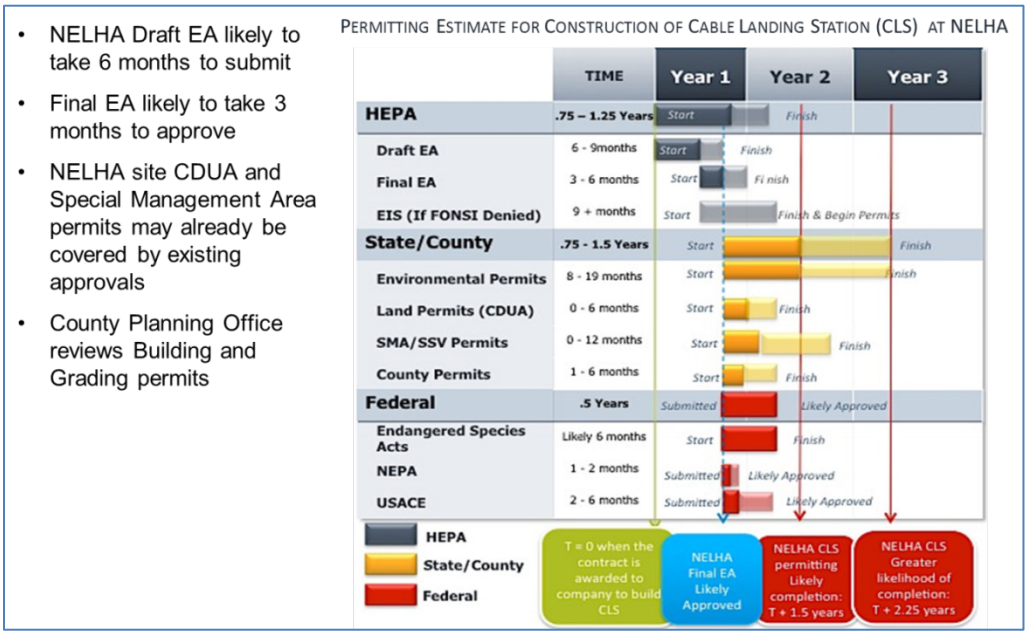

Figure 3-9 Government Permitting: Shorter Timeline for NELHA

The last NELHA permit reviewed was submitted as an EA for the Ocean Thermal Energy Conversion (OTEC) Technology Research, Development, and Demonstration Facility Keāhole, North Kona, Hawai‘i to the Office of Environmental Quality Control in July 2012. The assessment appears to have been started by various consultants to the EA process at least in January 2012, indicating a duration of at least 6 months. According to a conversation with NELHA employees, they support this timeframe and state that it is likely that a draft EA will not take longer than 6 months. That said, there is some indication that funding and contracting to complete the OTEC draft EA started well before January 2012, quite possibly a couple of years before that date. Five different companies worked to produce the EA, after consulting with over 72 different individuals about the project, ranging from state executive branch officials to private companies in the area. The draft EA review process took place from July to the end of September 2012, which provides an example of duration for the final EA approval. It is unlikely that NELHA would need an EIS, although some previous EIS were developed for NELHA in the 1970s and 1980s. JHU/APL has a solid level of confidence that all NELHA permitting can be completed within 1.5 years and high confidence that it can be completed in 2.25 years. All durations listed for state/county/federal permitting have been pulled from research conducted in support of O‘ahu sites. It is possible that the durations for NELHA permits in these areas may be shorter than what is listed. The list of permits necessary for previous permitting at NELHA includes: Draft EA; Final EA; Conservation District Use Application (CDUA); Building and Grading permits; Grading [National Pollutant Discharge Elimination System (NPDES) Stormwater]; Dispose Domestic Wastewater - Individual wastewater permit; Dispose Seawater [Underground Injection Control (UIC) Permit]; and Clean Water Act and Special Management Area permit.

3.3 CAPACITY

The third challenge/issue area is capacity. “Capacity” refers to the total amount of broadband traffic that the deployed elements are equipped to handle. “Lit” capacity is that which is used; “dark” or “unlit” capacity is currently available but not used.

Even though the current systems provide adequate capacity today, Figure 3-10 summarizes the results of the analysis; with increased demand and system aging, the transpacific network will not have sufficient capacity in the future.

Three of the four elements are highlighted in yellow to indicate that there is moderate concern about how capacity issues challenge meeting the broadband goals in Hawai‘i. Only the interisland cable systems seem to have adequate capacity for the foreseeable future.

There are two primary ways to address capacity concerns: upgrade the technology used on existing cables and install additional cables. Both of these cable-provider actions could improve capacity.

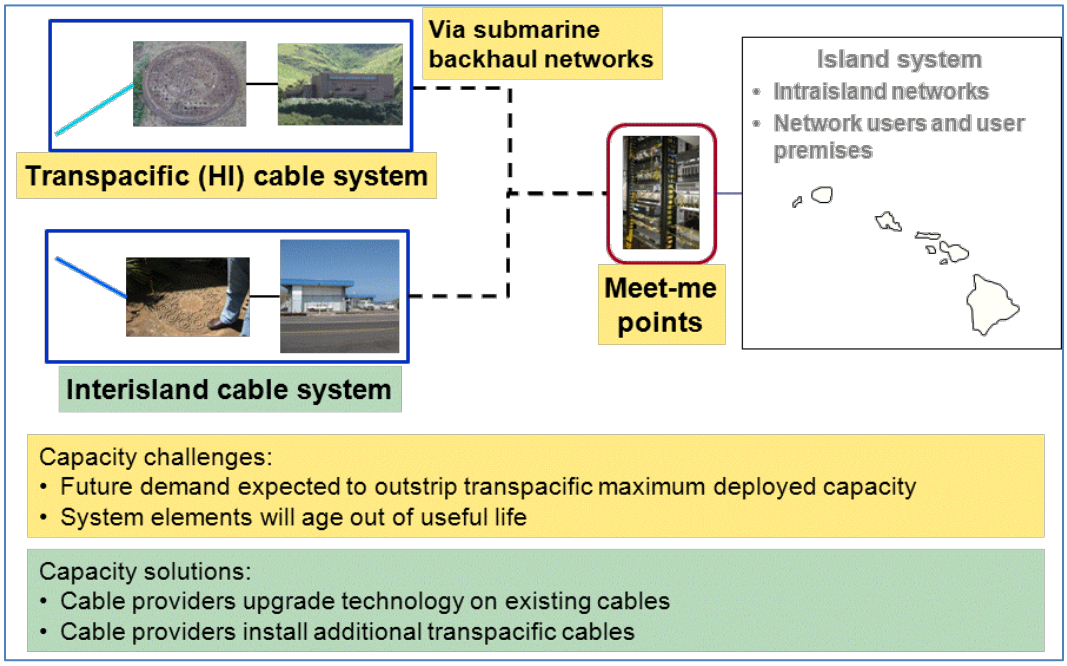

Figure 3-10 Challenges: Capacity

Submarine cable technology continues to advance rapidly. Where once transpacific cables required landing in Hawai‘i to obtain adequate signal quality and transpacific bandwidth capacity, newer technologies now enable very high bandwidth direct connections from the continental U.S. (CONUS) to countries in the Far East, particularly Japan, Taiwan, and Korea.

In particular, cables like Transpacific Express, TGN-Pacific, and Unity are providing total bandwidths of 5 to 8 terabits per second from CONUS to the Far East without any landing in Hawai‘i. The most recent technological advances are enabling cables approaching three fiber pairs with 10 terabits of capacity per fiber pair over transpacific distances, again without requiring a mid-span regeneration in Hawai‘i.

Additional factors leading new cable consortia to avoid Hawai‘i landings include the drive for low signal latency (the delay for the signal to pass over the cable) to satisfy the needs of latency-sensitive consumers such as the financial sector and the desire to minimize cable cost by avoiding the additional path length and landing equipment. In addition, there

is the lengthy and difficult permitting process associated with landing a new cable in Hawai'i.

3.3.1 Capacity Challenge: Increase in Demand

Figure 3-11 shows that, based on realistic traffic growth assumptions, all existing transpacific Hawai'i cable systems will run out of capacity by 2020, even after their capacities have been increased through terminal upgrades.

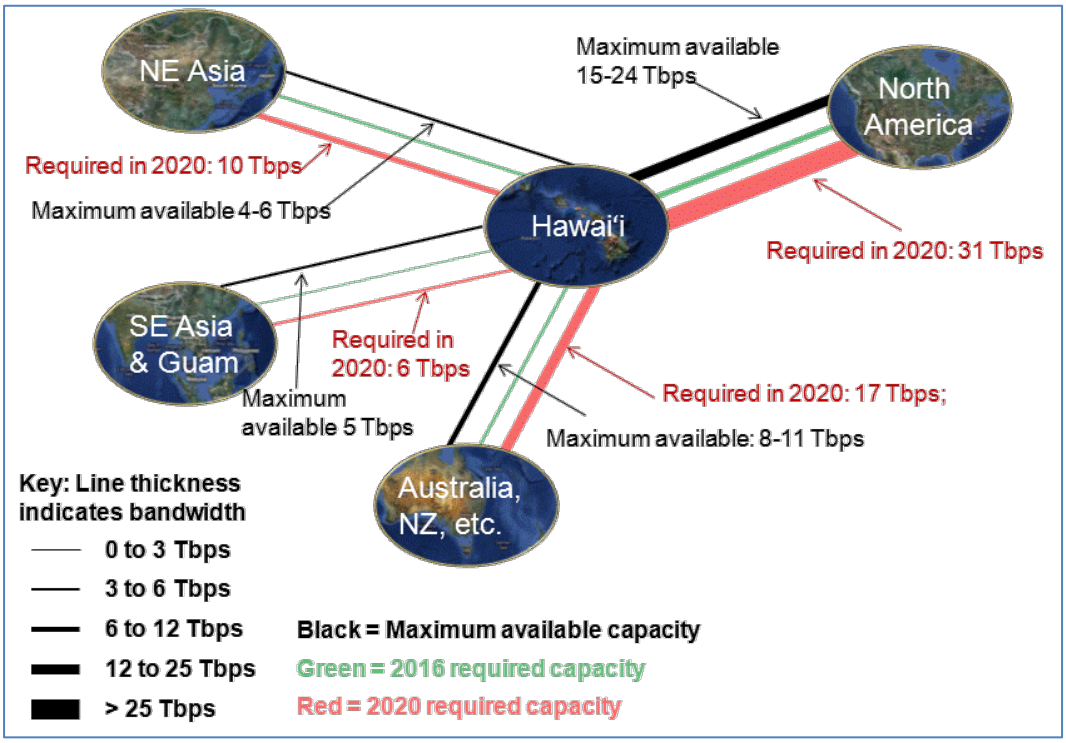

Figure 3-11 By 2020, Required Capacity Will Outstrip Available Capacity

Estimates were made about current lit capacities on the four paths connecting Hawai'i to North America, Australia/New Zealand, Southeast Asia/Guam, and Northeast Asia. The estimates about maximum potential capacity were made based on the cable capacity upgrade announcements made recently for existing cables.

Future demands for lit capacity were calculated as follows:

- Hawai'i traffic per user is assumed to grow faster as a result of HBI and assumed to be at par with the world leaders (e.g., South Korea) by the 2016–2018 timeframe. This implies traffic growth at a rate of 45% to 55% compound annual growth rate (CAGR) during the first 3–5 years of the initiative.

- After 2018, the demand for lit capacity from Hawai'i traffic is assumed to grow at 30% CAGR per year.[10]
- Lit capacity demand for all other traffic is assumed to grow at 30% CAGR.

Figure 3-11 shows the required capacities in 2020 and available capacities after upgrades on the four links of interest. On all links, the required lit capacity exceeds the maximum available capacity even with optimistic assumptions about capacity upgrades.

Note: Even without the HBI stimulated additional 15–25% CAGR for a few years (thus assuming all traffic growths at 30% CAGR throughout), all of these transpacific Hawai'i systems will run out of capacity by 2020. On the other three links, the impact of the additional growth in Hawai'i traffic is negligible compared to other traffic, so the numbers will not change significantly.

Figure 3-12 shows the new capacity needed on the Hawai'i ⇔ U.S. Mainland (H ⇔ U) link to satisfy the demand growth and to compensate for the age-related losses of cable systems starting in 2025.

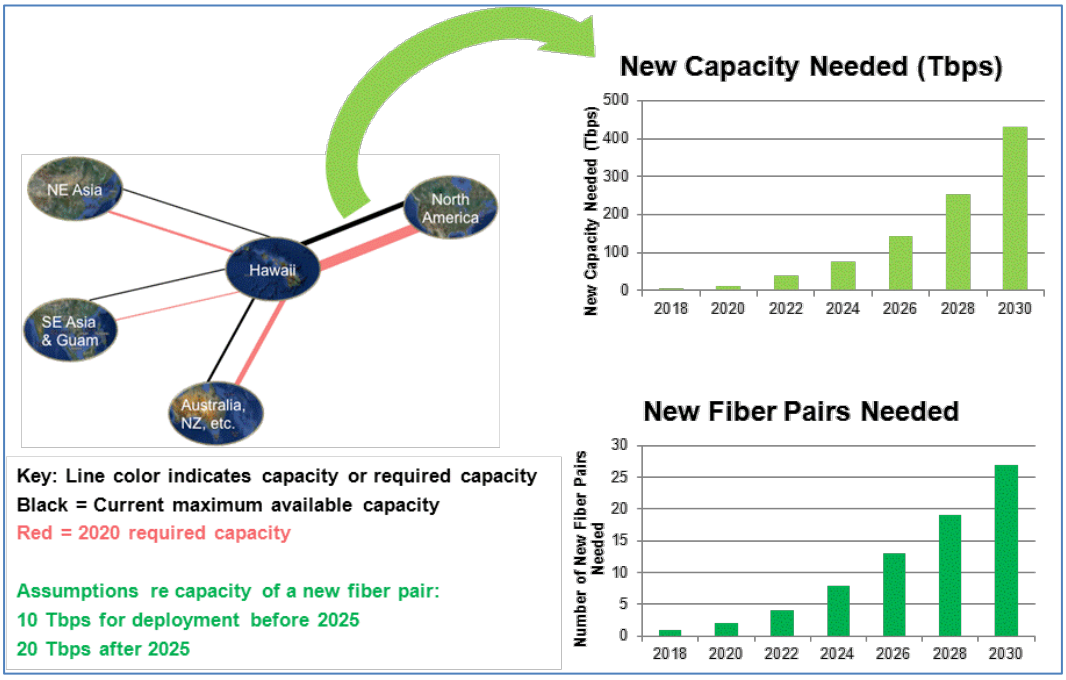

Figure 3-12 Additional Cables to Improve Transpacific Capacity

[10] This is consistent with the range of the growth rate seen in transpacific traffic and is expected to continue in the future. http://www.telegeography.com/research-services/global-bandwidth-research-service/

As mentioned earlier, JHU/APL assumes that successful implementation of HBI will result in Hawai‘i broadband penetration and per user traffic reaching the world leader (e.g., South Korea) level by 2016–2018 and then will grow at 30% CAGR. Other traffic passing Hawai‘i is assumed to grow at 30% CAGR starting now. With this growth, the H ⇔U system will run out of capacity between 2017 and 2019, depending on the value of the maximum capacity resulting from capacity upgrades (JHU/APL has calculated this to be between 15 and 24 Tbps). If the maximum capacity is 15 Tbps, it will be exhausted by 2017; 24 Tbps will be exhausted by 2020. The growth beyond that will be satisfied with new cable systems.

The upper bar chart shows the required new capacity in Tbps assuming that current systems will give a maximum of 15 Tbps. The lower chart shows the number of new fiber pairs needed, assuming that the systems deployed prior to 2025 provide 10 Tbps per fiber pair and the ones after 2025 provide 20 Tbps per fiber pair. A rate of 10 Tbps per fiber pair is achievable now. The assumption about 20 Tbps per fiber pair after 2025 is speculative, and the real number could be lower or higher. Note that these charts account for the significant drop in the capacity of the currently deployed cable systems due to age-related decommissioning of the currently-deployed cable systems after 2025.

If the current systems are upgraded to provide 24 Tbps instead of 15 Tbps, the required new capacity will be reduced by 9 Tbps between 2020 and 2025; one less fiber pair will be needed, compared to those shown in the charts. After 2025, the numbers are the same as the charts in the figure.

Figure 3-13 shows that interisland cable systems have enough capacity for the foreseeable future. The figure does not include the interisland portion of Southern Cross transpacific cable system between O‘ahu and Hawai‘i.

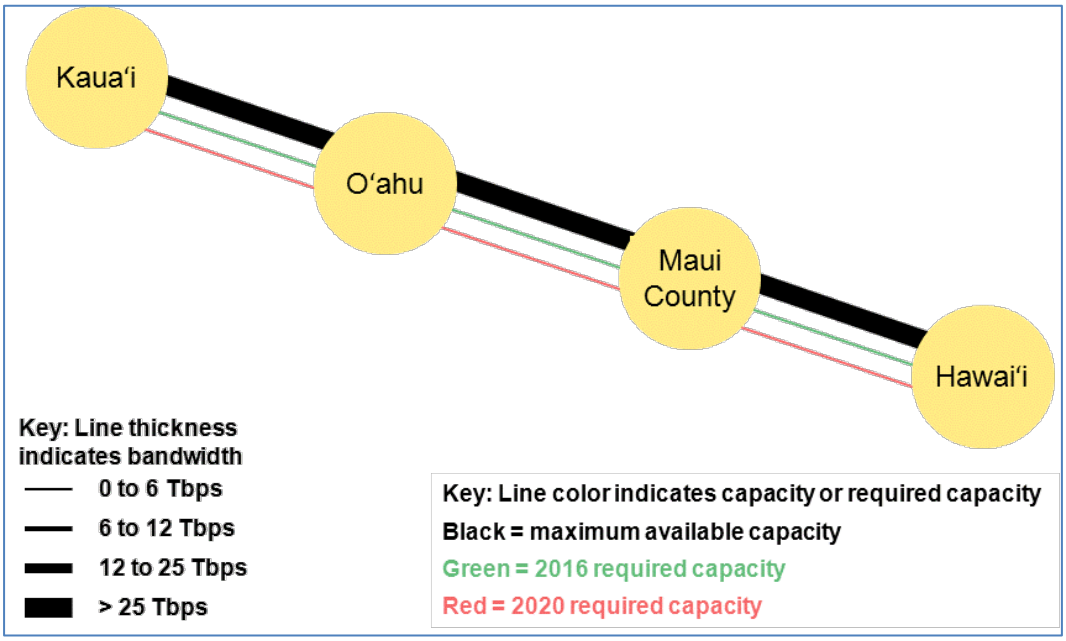

Figure 3-13 Interisland Cables Adequate for Foreseeable Future

Because interisland cables do not use repeaters (with the exception of the Southern Cross interisland link), they can carry a larger number of fiber pairs. Current interisland cables together have over 40 pairs on each of the links, shown in Figure 3-13. While the current demand requires a very small fraction of the full capacity to be lit today, the potential maximum capacity obtained by lighting all fibers and upgrading the terminal equipment is over 25 Tbps for each of the three links.

The capacity required on any link in the interisland cable systems is relatively small, and the required capacity will not exceed the maximum potential capacity, even in 2030, as long as there is no failure.

As will be seen later, the concentration of capacity and lack of diversity in cable landing sites makes a Hawai'i interisland cable system very vulnerable to natural and man-made failures.

3.3.2 Capacity Challenge: Aging Cables

The diagram on the left in Figure 3-14 begins with the state of transpacific cables in 2012, and the right depicts when each of the cables currently landing in Hawai'i reaches the end of its design lifetime (25 years is the industry standard). Each line is drawn with a width proportional to the cable capacity.

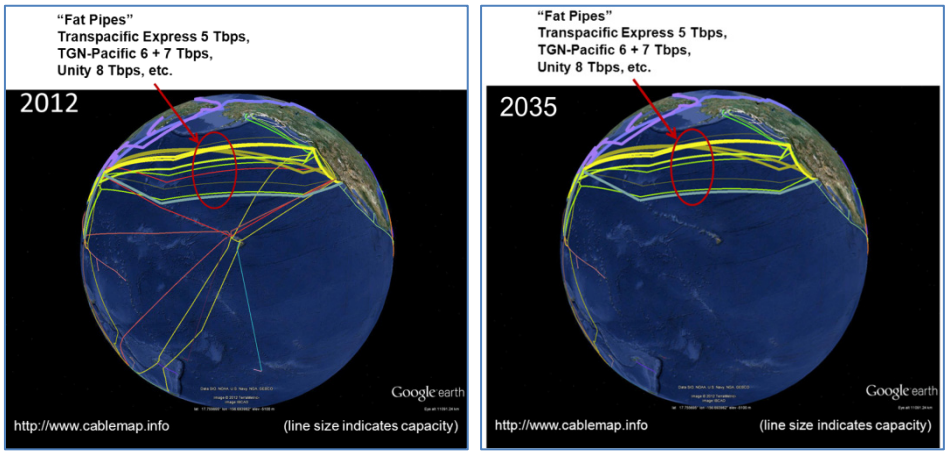

Figure 3-14 Transpacific Cables: Adequate Today, Aged Tomorrow

Two of the cables landing in Hawai'i will reach their end-of-life around 2025, and the remaining cables will reach their end-of-life around 2035. For Hawai'i to realize the economic and social benefits of broadband, new cables need to include Hawai'i as a landing point in their designs.

3.3.3 Capacity Solution: New Technology

Figure 3-15 shows that new terminal technologies allow major increases in the capacities of currently deployed submarine cables. Discussion of the details of these technologies is outside the scope of this document, but it notes several technologies that can be used to improve the capacities of existing fiber, including quadrature phase shift keying (QPSK), frequency division multiplexing (FDM), and forward error correction (FEC).

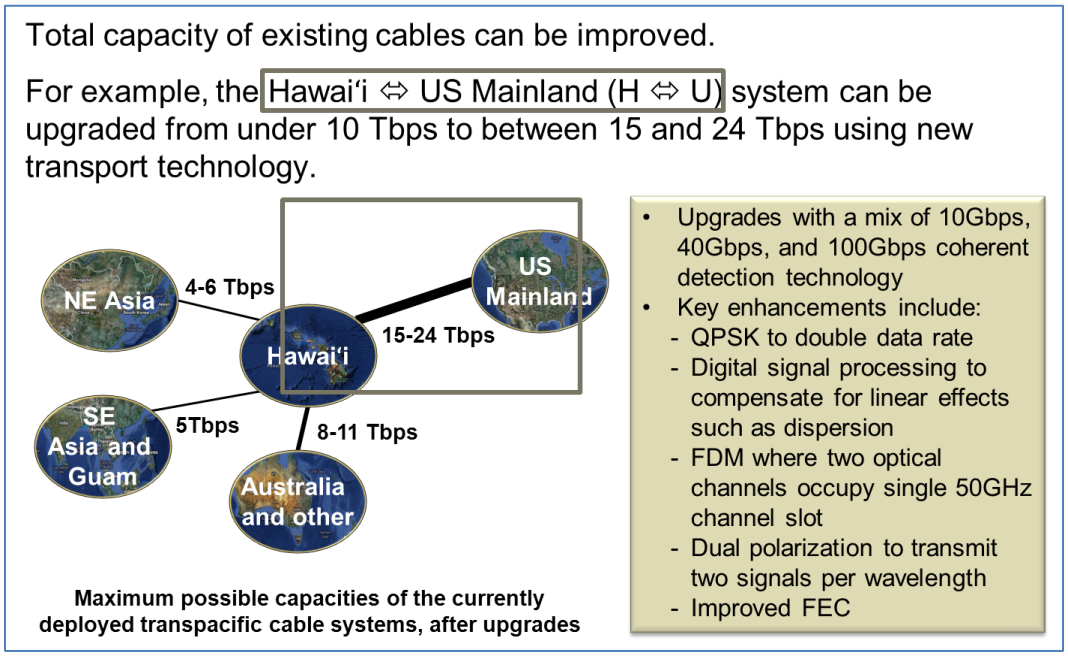

Figure 3-15 Technology Can Improve Capacity

For example, the total capacity of the Hawai'i to U.S. Mainland (H ⇔ U) systems can be upgraded from under 10 Tbps to between 15 and 24 Tbps. The capacities of other systems landing in Hawai'i could also be increased to the ranges shown on links in the figure. These are upgrades that have already been announced by the cable operators.

The maximum capacity available from the currently deployed system will start declining after 2025 due to cable system aging and decommissioning. By 2028, this drop will leave 7–8 Tbps of usable capacity on the H ⇔ U system. Similar losses in the maximum capacity will occur in other systems landing in Hawai'i.

3.4 SECURITY AND RESILIENCY

There are two major aspects of the last challenge/issue area: security and resiliency against disruptive forces. Figure 3-16 summarizes the security concerns and solutions. Figure 3-17 summarizes the resiliency concerns and solutions.

JHU/APL efforts focused on the physical aspects of security. "Security" in this sense refers to the quality or state of protection against risks to the broadband system of systems from physical attacks and accidents. Detailed analysis of cyber security and associated risks are outside the scope of this task.

The main security risks to the physical elements, shown in Figure 3-16, are intrusion, mischief, theft, and terror events. Those same risks apply as well to the cyber

(computer) environment and to the energy sources that support the system components. The extent of the risk somewhat depends on the specific system and location. However, JHU/APL has judged the security risks to be significant for the transpacific and interisland cable systems and to the submarine backhaul networks; the security risks to the meet-me points are not as high.

Burying or sealing the cables underwater and on land will mitigate the security risk. Implementing better security at the cable landing stations will also reduce risk.

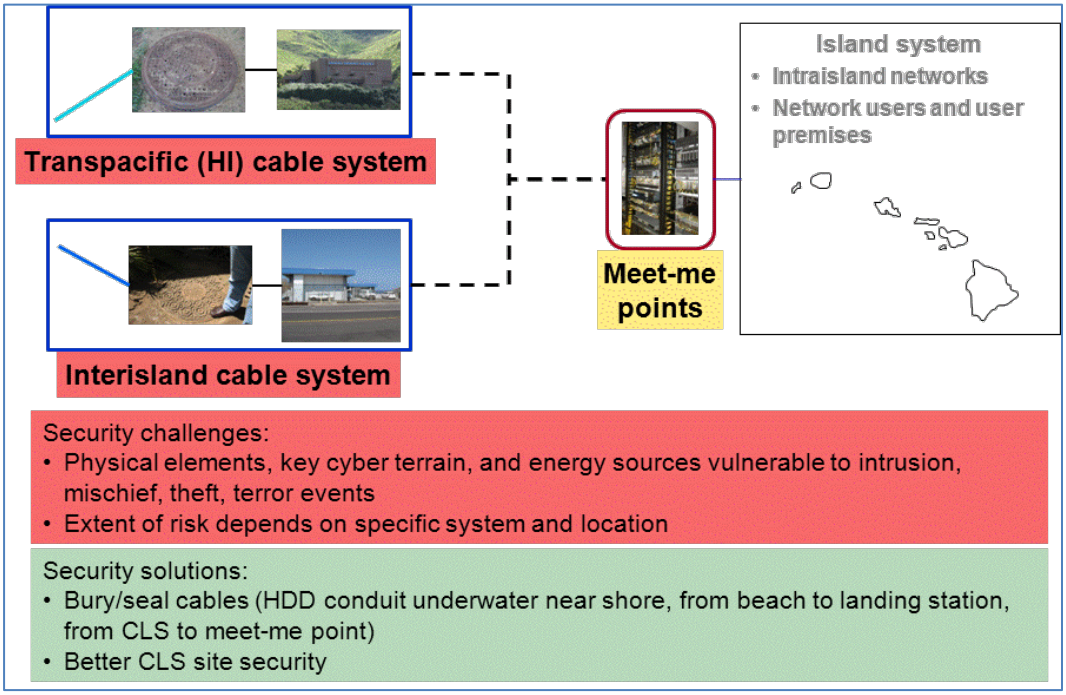

Figure 3-16 Challenges: Security

Resilience is defined by the Department of Homeland Security (DHS) as "The ability to resist, absorb, recover from, or successfully adapt to adversity or a change in conditions".[11] A resilient system is designed so that the damage from a disruptive force (natural or man-made) is small. Also, if the force causes one or more system components to fail, there should be redundancy to satisfy most of the users from the available spare capacity.

[11] U.S. Department of Homeland Security (DHS). (2009), *National Infrastructure Protection Plan (NIPP)*. http://www.dhs.gov/xlibrary/assets/NIPP_Plan.pdf.

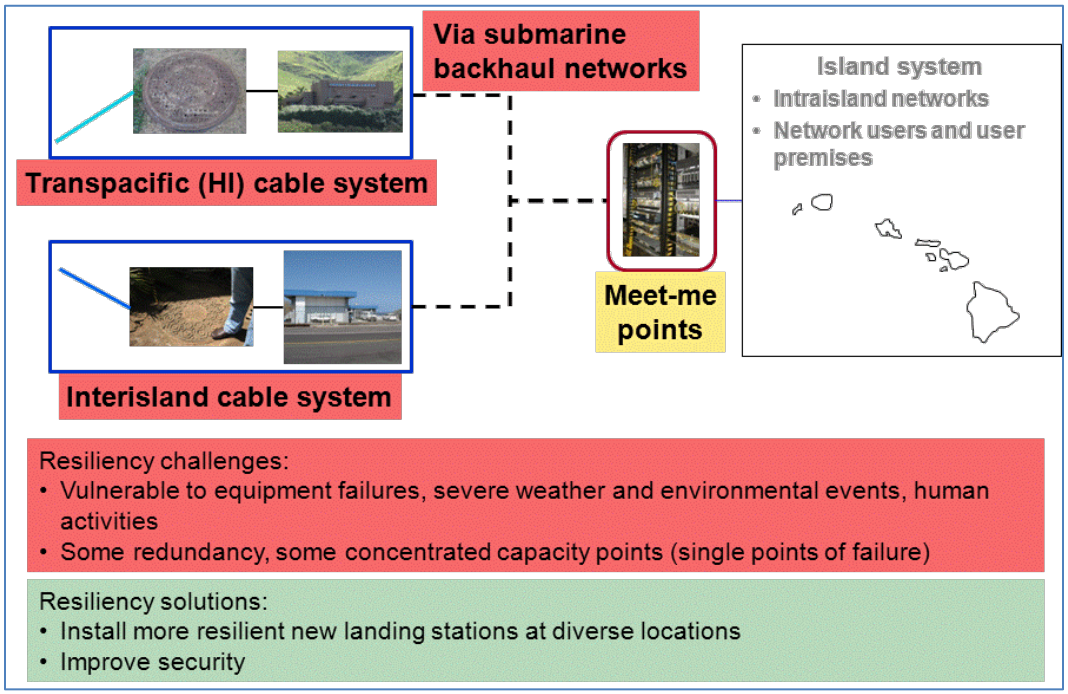

Figure 3-17 Challenges: Resiliency

If elements of the broadband system of systems are damaged in spite of protective measures, the goal is to minimize the disruption and resume operations as soon as possible, striving to maintain continuity of critical services. A strategy of community resilience seeks "to manage risks by building the skills and capabilities to do three things: (1) maintain continuity of function in the face of chronic disturbances, (2) develop the means for graceful degradation of function when placed under severe stress, and (3) sustain the ability to quickly recover to a desired level of functionality when extreme events overwhelm mitigation measures."[12] In this way, the ultimate goal of resiliency is to maintain the greatest amount of normalcy despite one or more disruptive natural or man-made forces.

The current submarine cable network in Hawai'i is vulnerable to both natural and man-made (intentional and accidental) disruptive forces:

- Easily accessible beach manholes and exposed cables near BMHs
- High concentration (small land mass with busy shores) of shallow water activity near cables
- Pole-mounted terrestrial fiber [e.g., between CLS and meet-me point (MMP)]
- Easily accessible CLSs and MMPs

[12] Stephen E. Flynn and Sean P. Burke, *Critical Transportation Infrastructure and Societal Resilience*, March 2012.

- Heavy concentration of landing sites on the Island of Hawai‘i and O‘ahu
- Sparse connectivity for Maui

Security and resiliency are intertwined. The security issues identified above may result in heavier damage from a given level of disruptive force. Thus, it is important to improve physical security to improve the resiliency of the network. However, systems may still fail in spite of added security. Inducing a failure in a more secure system may require a higher magnitude of disruptive force.

A second aspect of resiliency is the ability to provide a high level of service to a large fraction of users in spite of a failure. Diversity and spare capacities allow traffic to be routed around failed components.

3.4.1 Security and Resiliency Challenge: Vulnerability of Current CLSs

Cable landing stations in Hawai‘i have many vulnerabilities based upon site surveys across the four main islands. Figure 3-18 illustrates the issues noted previously.

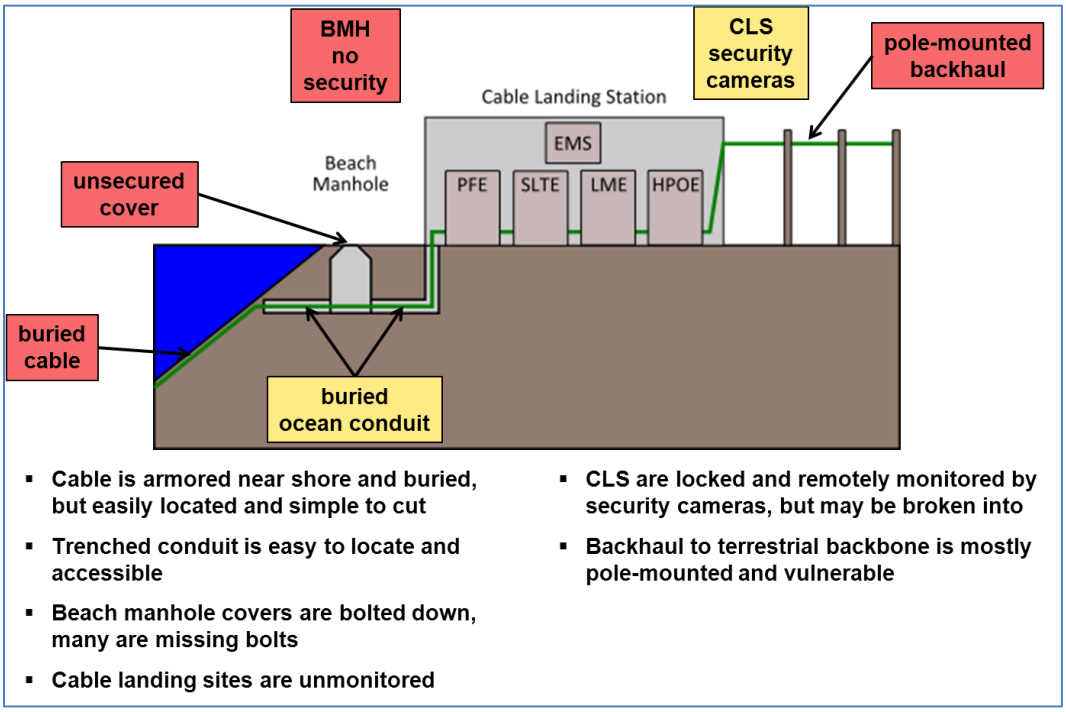

Figure 3-18 Existing Cable Landing Stations Are Vulnerable

Starting from the ocean (at left), most of the cable landings in Hawai‘i use buried cables coming into the cable landing stations. In several locations, it is noted that the buried submarine cables are actually exposed due to erosion or inadequate burial.

Sandwich Isles Communications, Inc. is a notable exception – for its interisland cables, it has used horizontal directional drilling (HDD) to 60-foot depth to avoid the issues associated with laying cables across beach areas. A side benefit of Sandwich Isles HDD is additional security against natural and man-made disruptive forces. JHU/APL proposes HDD to 20-meter water depth for the new cable landing stations.

Leaving the beach area, the cables run in buried conduit to the beach manhole and from the beach manhole to the cable landing station. The locations of the conduits are easily determined from publicly available maps and the location of the beach manhole. The beach manholes have bolts that can be easily removed, and in many cases, the bolts are missing. Only the weight of the manhole cover prevents access.

The area around the beach manhole is public beach or coastal area, usually open to the public. There is no monitoring of any type in the beach manhole area.

The cable landing stations are usually unmanned but do have security cameras and intrusion sensors, which provide notification of security problems.

Finally, for traffic that originates or terminates in Hawai‘i, the “backhaul,” or connection to the fiber backbone, in Hawai‘i is usually pole-mounted fiber, easily visible coming out of the cable landing station area.

Overall, JHU/APL estimates that a relatively low level of disruptive effort may disable one of the existing CLSs. Depending on which CLS is affected, this could isolate one or more islands and disrupt significant transpacific traffic.

3.4.2 Security and Resiliency Solution: More Secure and Resilient CLSs

Figure 3-19 illustrates some of the actions that may be taken to improve the security/resiliency of cable landing stations. These would be appropriate for the new cable landing stations, and some of them may be appropriate for existing landing stations.

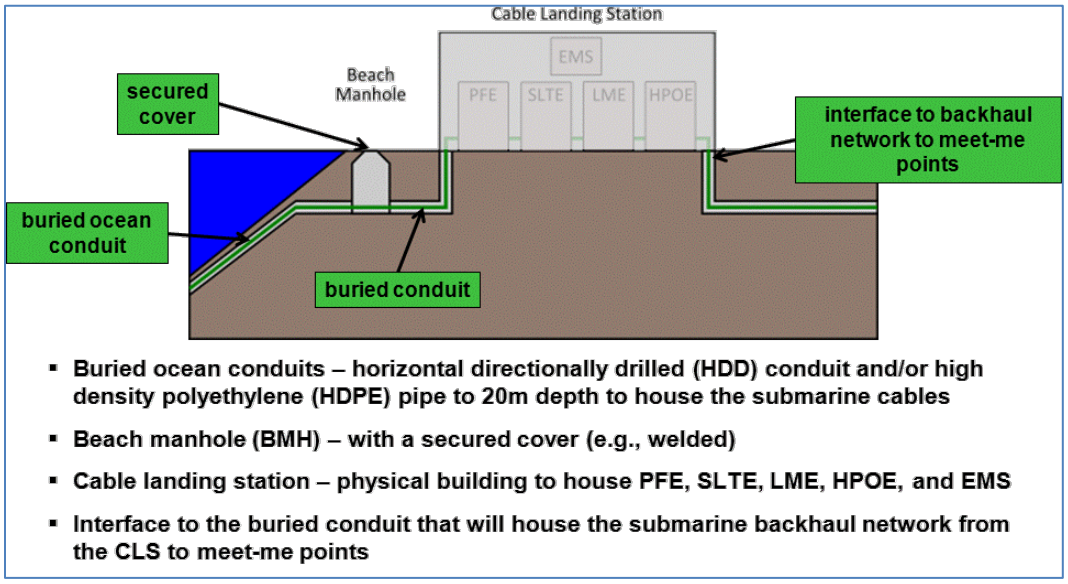

Figure 3-19 Secure, Resilient Cable Landing Station Facility

Compared to existing transpacific landing stations in O'ahu, a facility with the features shown would be significantly more secure and resilient. Such a site would have improved protection of the ocean segment through HDD conduits or high-density polyethylene (HDPE) piping laid on the ocean floor. The beach manhole would have its cover welded shut or otherwise secured to prevent intrusion. While not a part of the current project, the backhaul from the CLS to the Hawai'i terrestrial network should be buried and have diverse paths to meet-me points.

In the analysis, JHU/APL assumes that all new landing sites (underwater segment, BMH, BMH-to-CLS fiber, and CLS) are designed as shown in Figure 3-19 and hence can sustain a much larger disruptive force than any of the existing sites can. For quantitative analysis, JHU/APL has assumed that a site built with the improvements would be four times more resilient (i.e., require four times more effort to disrupt) than any current site.

3.4.3 Security and Resiliency Challenge: Lack of Adequate Diversity in Existing Cable Landing Station Locations

Figure 3-20 illustrates the routes and landing stations for transpacific cables that currently land in Hawai'i. There are a total of four landing stations for the six cables that serve the islands. Approximately 90% of Hawai'i traffic originates or terminates in CONUS, making the transpacific connectivity critical for Hawai'i consumers. Currently, the transpacific cables between Oceania and CONUS land in Hawai'i. A significant portion of

the cables between Asia and CONUS also land in Hawai‘i. Thus, a disruption of cables in Hawai‘i can have wide-ranging effects.

Three of the Hawai‘i transpacific cable landing stations are on the western shore of O‘ahu and the fourth is at Spencer Beach on the Island of Hawai‘i. The three landing stations on O‘ahu carry approximately 75% of the total transpacific capacity of these cables, and the single landing station on Hawai‘i carries approximately 25%. The fractions of Hawai‘i traffic that pass through these landing stations are similar.

The three transpacific landing stations on O‘ahu are within 15 miles of each other, and two of them are within 5 miles of each other.

The loss of one of these landing stations would result in the loss of roughly 25% of the transpacific capacity passing through the islands, and the close proximity of the three landing stations on O‘ahu suggests the loss of more than one is a serious possibility. If all three of the O‘ahu stations were lost, 75% of the transpacific capacity passing through Hawai‘i would be lost. If all four westward-facing cable landing stations were lost, then Hawai‘i would no longer have a high-bandwidth connection to the outside world.

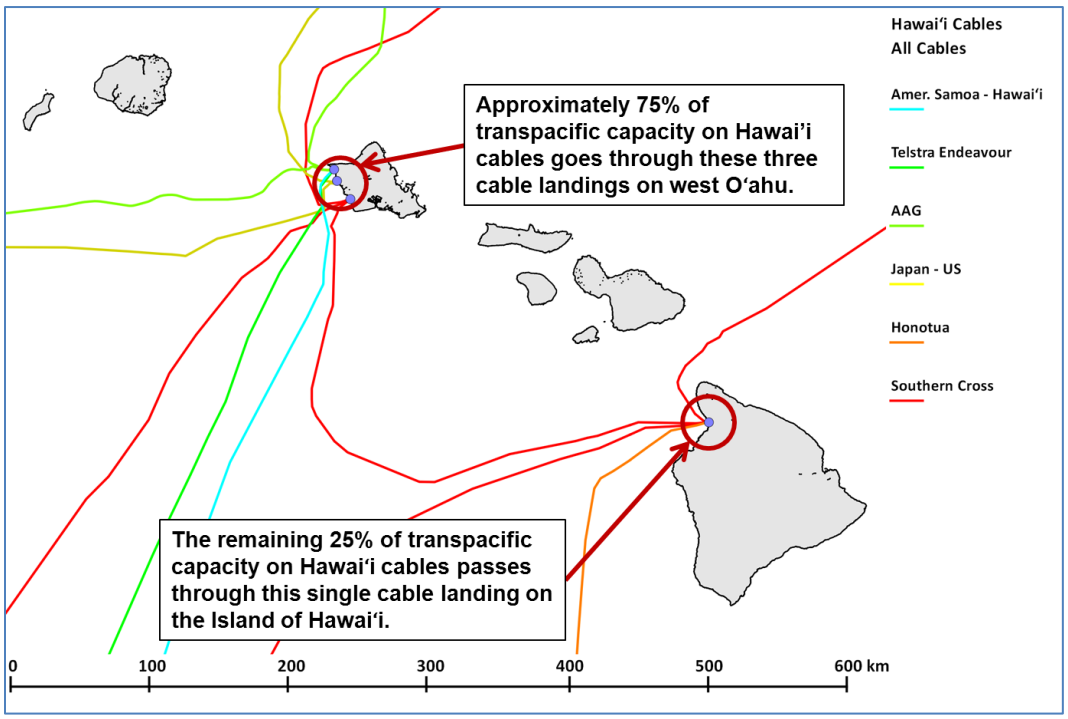

Figure 3-20 One Event Can Severely Disrupt Service: Transpacific (HI)

The submarine backhaul in Hawai‘i has poor resiliency due to pole-mounted fiber and a lack of diversity in routes from the CLSs to meet-me points.

Intraisland backbone networks have many nodes with very sparse connectivity, not allowing even simple ring architectures. One failure can cause major disconnections.

Figure 3-21 shows the interisland submarine cable network. Earlier, it was seen that the transpacific cable landing sites and cable landing stations are easily accessible and hence vulnerable to man-made and natural events. Problems similar to those identified above for the transpacific traffic apply to the interisland traffic as well because the transpacific CLSs also support interisland connectivity.

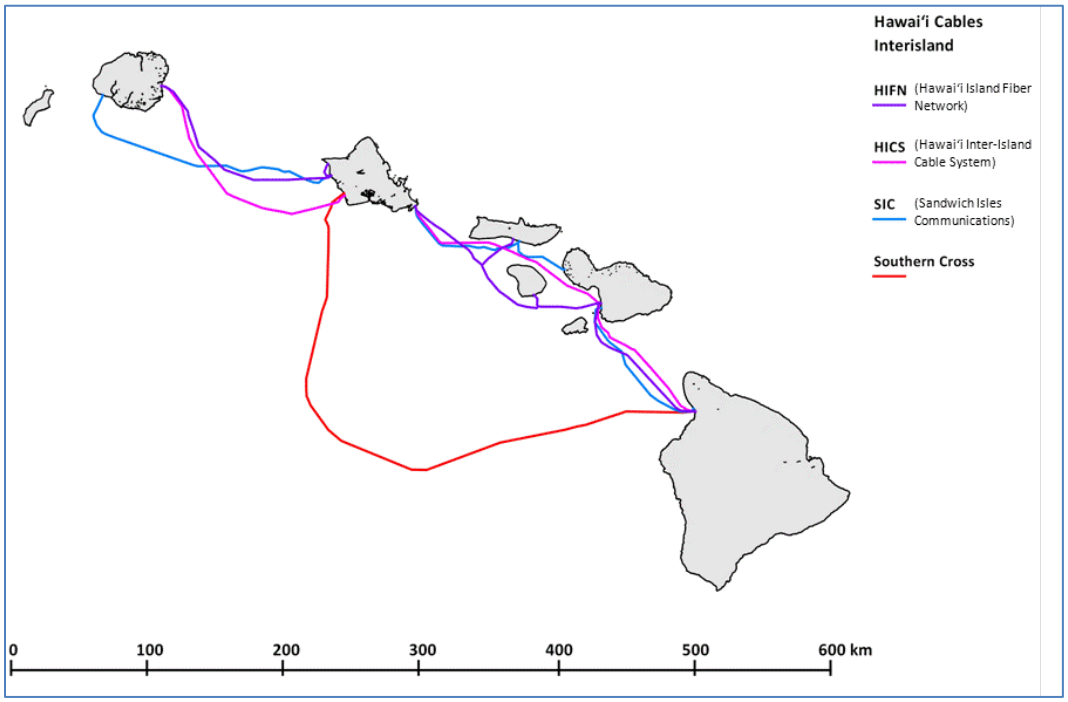

Figure 3-21 One Event Can Severely Disrupt Service: Interisland

A failure at the single cable landing area on the Island of Hawai‘i (Kawaihae/Spencer Beach) will isolate that island completely. Failure at the Sandy Beach CLS on O‘ahu will separate Kaua‘i and O‘ahu from the other two counties, except via the interisland portion of Southern Cross transpacific cable. Failure at Kīhei in Maui will leave the Island of Hawai‘i connected to other islands and the rest of the world by Southern Cross only.

The frequency of some disruptive forces has been high, and many are rising worldwide. The occurrence of natural forces[13] and accidents (e.g., hurricanes, tsunamis, ship anchors, and fishing nets) as well as man-made intentional forces (e.g., cable cuts for theft and malice) are increasing.

3.4.4 Security and Resiliency Solution: New Cable Landing Stations

Figure 3-22 illustrates the existing landing stations and potential new locations. The map indicates which sites were evaluated as potential, diverse, resilient, and secure transpacific cable landing sites.

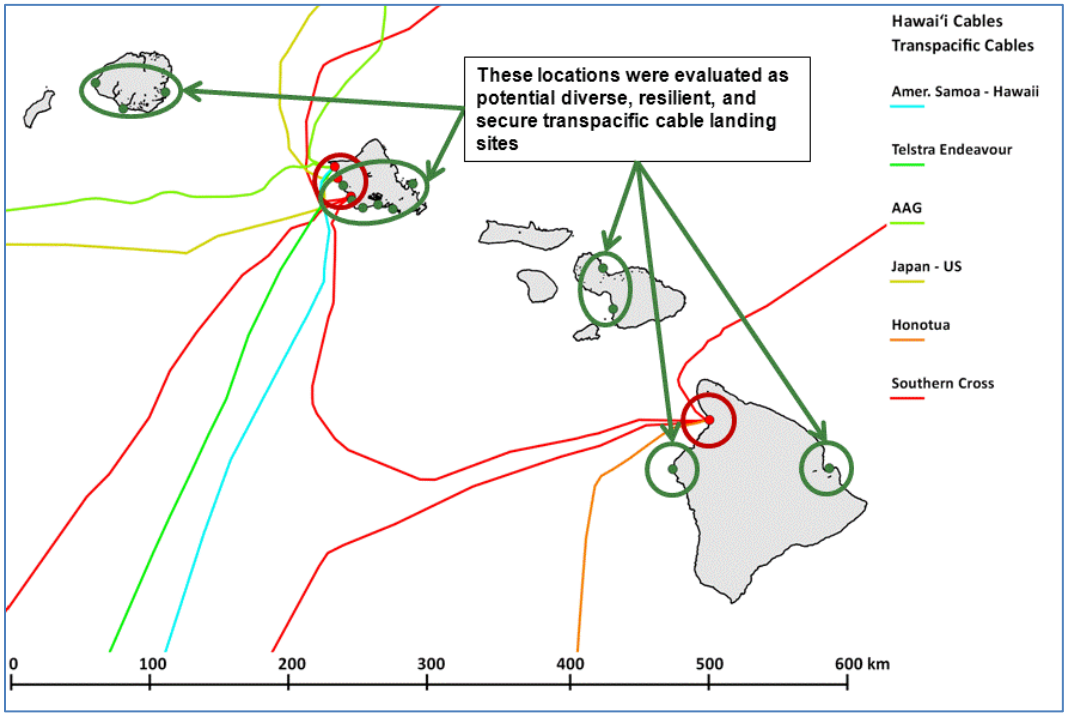

Figure 3-22 New, Diverse Cable Landing Station Locations Would Increase Capacity and Improve Resiliency

The potential sites for new cable landing stations were evaluated against a comprehensive set of criteria that include feasibility, diversity, security, resiliency, and cost. The potential sites are envisioned to be physically diverse from the existing sites and to have improved security. As a result, they should bring new resiliency and reliability into the state's network.

[13] See http://www.emdat.be/natural-disasters-trends, for example

Figure 3-23 summarizes the detailed analysis of resiliency against natural and man-made forces. The width of symbols suggests the level of vulnerability (not necessarily to scale, wider implying a greater susceptibility) (red) to natural disasters and accidents and intentional physical attacks in the current network and the reduction in vulnerability (green) to those natural and intentional disasters for traffic in each county as various new resilient sites are added. The results for natural and accidental events are presented at the top of each cell. The bottoms of the cells show the results for malicious actions.

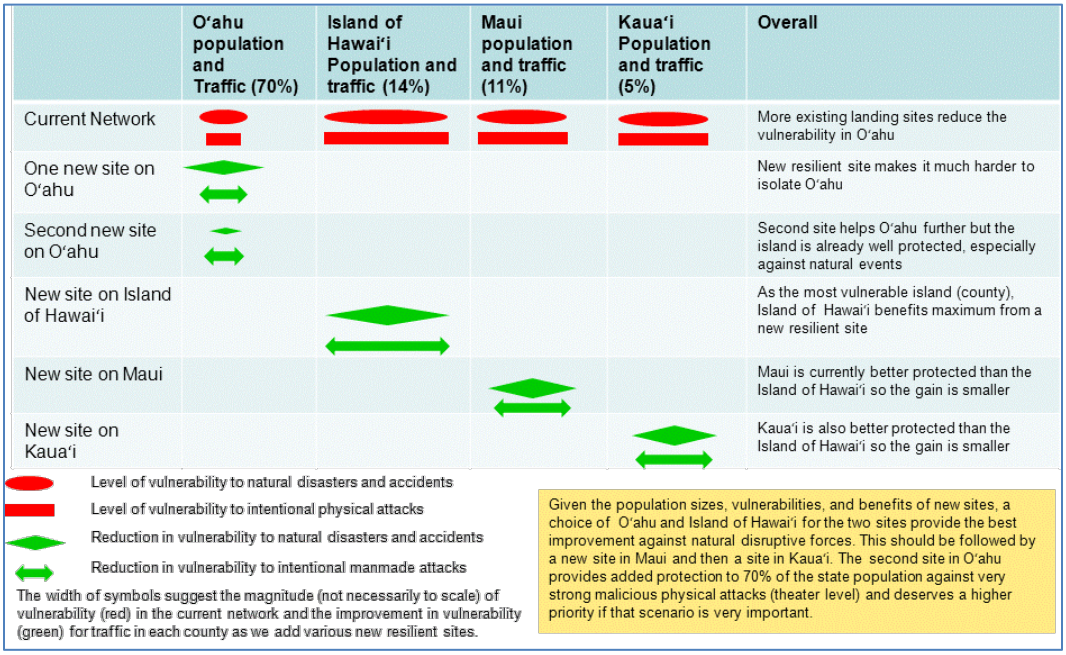

Figure 3-23 Summary of Resiliency Analysis

Given the population sizes, vulnerabilities, and benefits of new sites, one new resilient site (with HDD, secured BMH, buried terrestrial fiber, tightly controlled CLS, and MMP) on O'ahu and one on the island of Hawai'i would result in a major improvement in the submarine cable network's resiliency against low, moderate, and high magnitude disruptive forces (natural or man-made, accidental or malicious). The improvement would be in multiple dimensions: the state population unaffected, connectivity retained, and transpacific traffic unaffected.

An additional new landing site in Maui would improve the Hawai'i network resiliency further against low and moderate forces by protecting Maui traffic and 11% of the state population. A new landing site in Kaua'i would also improve the resiliency further against low and moderate forces but for a smaller population (5%).

A second new landing site in O‘ahu provides added protection to 70% of the state population against very high magnitude disruptive forces (e.g., a theater-level malicious event or a rare natural event of extreme force and geographical spread) and deserves a higher priority if that scenario is very important.

4. ARCHITECTURE SUMMARY

4.1 NETWORK TOPOLOGY

Figure 4-1 summarizes key suggestions on the desired topology, interconnections, and approaches to achieve the HBI resiliency and security goals. For transpacific, interisland, and intraisland networks to collectively offer a seamless, efficient, and resilient service environment that will attract and nurture the most demanding enterprises, telecom operators and cable operators must move in these directions.

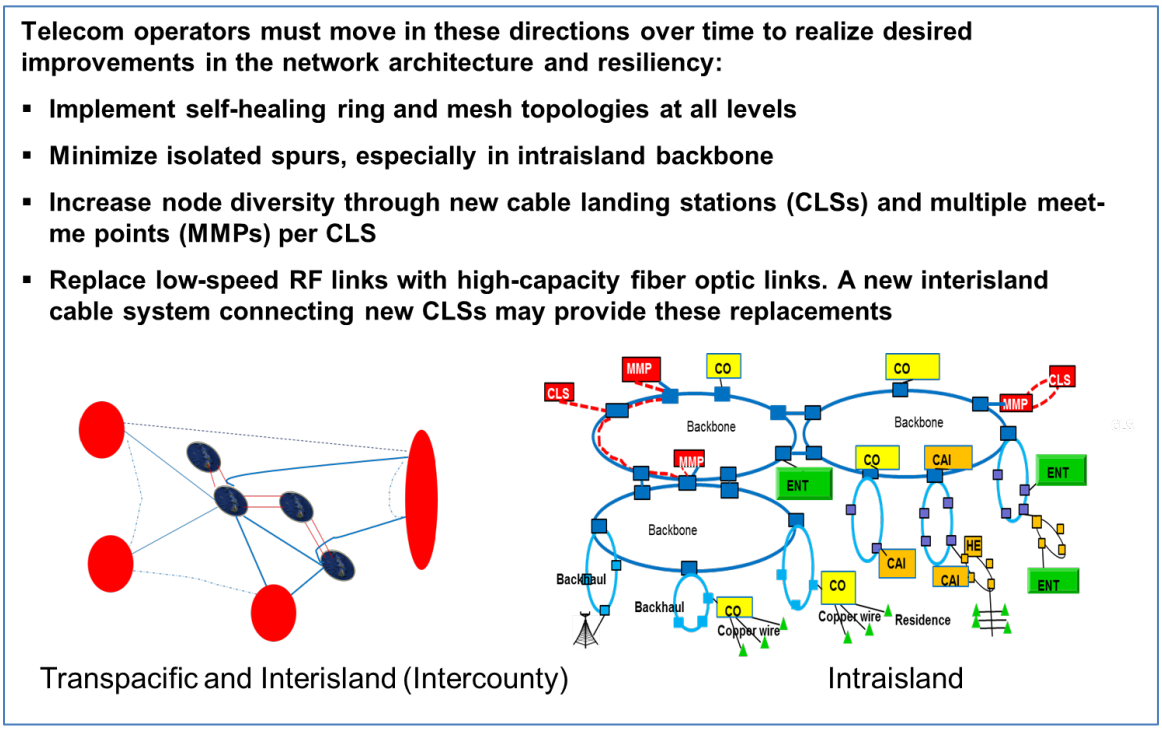

Figure 4-1 Topology and Interconnections in Networks

- The transpacific network, interisland network, submarine backhaul, and intraisland backbone and backhaul should each consist of self-healing rings, which allow traffic to travel from site to site over two diverse paths, (with additional links to form a richer mesh for the most critical traffic). In addition, interconnections among these networks should permit mutual backups where appropriate.
- It is possible that the economics, terrain, volcanic activity, or some other obstacle may prevent fiber links in some parts of each county, thus preventing completion of some rings. Such spurs should be minimized and critical traffic (e.g., CLS ⇔ MMP) should not be carried on a spur.

- Even with interconnected self-healing rings, the network could be vulnerable if there is not enough node (CLS, MMP) diversity in each county. This lack of diversity forces one node (e.g., Kawaihae/Spencer Beach in Hawai'i County) to be the only connection among multiple rings, and its failure separates those rings from each other. Thus, it is important to have geographically separated CLSs in each county and, for further resiliency, have multiple MMPs for each CLS. These will allow rings to be connected at several nodes and provide the desired resiliency.
- Currently, many radio links between islands provide backup for interisland cables. However, with HBI-driven demand growth and much higher capacity requirements, radio links will not provide the required backup capacity. It will be important to provide fiber optic backup instead. A new interisland cable system connecting the new set of CLS can provide such high capacity backups. Together, the new CLSs and cable system will provide node and link diversity.

4.2 USE OF TECHNOLOGY

JHU/APL has observed that the demand growth will necessitate adding a large amount of new capacity in networks serving Hawai'i. Simultaneously, technology enhancements are offering higher capacities from the same media, more dynamic configurability, and flatter/simpler communications architectures. As new capacities are added, carriers will be motivated to take advantage of these technology advances to create more efficient, flexible, simpler, and less expensive networks of the future. Market forces and increasing demand should also motivate carriers to adopt improvements.

Most submarine fiber optic systems already deployed in transpacific networks today provide 10 Gbps per wavelength and a total capacity of less than 2 Tbps per fiber pair. Coherent detection technology, along with several other advances, allow 40-Gbps and 100-Gbps wavelengths and up to 10 Tbps per fiber pair. Importantly, these upgrades are possible on existing cable systems by upgrading only the terminals. Thus, cable owners will upgrade their current systems and obtain higher submarine capacities before building new systems.

Vendors have perfected Reconfigurable Optical Add Drop Multiplexer (ROADM) systems with some cross-connect capabilities. These systems allow dynamically configurable splits of the wavelengths. In particular, a ROADM at a CLS can split the wavelengths into multiple groups and send each group to an MMP, thus adding resiliency and keeping the CLS simple.

Communications services are converging to IP and Ethernet as a platform. Reduction of circuit-based services and increased demand will make it economical to

eliminate the synchronous optical networking (SONET) layer and carry IP/Ethernet traffic directly over wavelength. Thus, simpler pure optical rings will replace SONET-based rings in transpacific, interisland, and intraisland backbone networks. Eventually, most of the intraisland backhaul networks will also migrate to pure optical rings.

In access networks, technology advances and moving fiber closer to households allows increasing capacities from DSL and hybrid fiber-coax (HFC) networks. Next-generation cellular technologies (LTE, LTE-A, 4G, and 5G) will also offer increasing wireless access speeds. It is expected that 50- to 200-Mbps access line speeds will be possible from DSL and HFC technologies in the future. Wireless technologies will offer 100-Mbps to over 1-Gbps access speed, but the high end will be possible only in a limited contention setting.

For the foreseeable future, ubiquitous access speed over 1 Gbps will require Fiber-To-The-Premises (FTTP) solutions using Passive Optical Network (PON) technologies.

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5. RECOMMENDATIONS AND NEXT STEPS

This final section includes recommendations and identifies next steps that the state and members of the broadband community should consider.

5.1 RECOMMENDATION: NEW CABLE LANDING STATIONS

JHU/APL analysis indicates that to achieve the desired capacity, resiliency, and security for the broadband cable networks in Hawai‘i, at least four new cable landing stations are required, with one on each of the four main islands. These new cable landing stations should include strong security measures, horizontal directional drilling cable landing conduits, and secured beach manholes. Each new CLS should be capable of housing at least two transpacific cables. Site selection should include creating a positive business case for cable owners to land on the neighbor islands.

5.1.1 Potential Locations

JHU/APL identified several potential locations for new cable landing stations. At the time of the delivery of the May 2013 interim version of the system concept slides, JHU/APL focused on potential sites in O‘ahu and Hawai‘i. Over the next few months, those analyses were refined and expanded the effort to identify candidate sites on Maui and Kaua‘i. The sites included locations on O‘ahu, the Island of Hawai‘i, Kaua‘i, and Maui:

- O‘ahu
  - Barbers Point
  - Kaka‘ako Park
  - MCBH Kāne‘ohe
  - Hickam AFB*
  - Wai‘anae**
  - Makaīwa Park**
- Island of Hawai‘i
  - Kona – Natural Energy Laboratory of Hawai‘i Authority (NELHA)
  - Hilo*
- Kaua‘i
  - Pacific Missile Range Facility (PMRF)
  - Hanapēpē – Salt Pond Park
  - Līhu‘e – Ahukini Rec. Pier

- Maui
  - Kīhei – near Maui Research & Technology Park (MRTP)
  - Waiheʻe Beach Park

Notes:
*Hickam AFB and Hilo were considered, but are not recommended for further consideration.
** A preliminary analysis of these sites was conducted at the state's request.

Figure 5-1 through Figure 5-4 show the locations on maps of each island. Figure 5-1 shows the locations of the current landing sites on Oʻahu (red pins), as well as the potential new sites that have been evaluated (yellow pins).

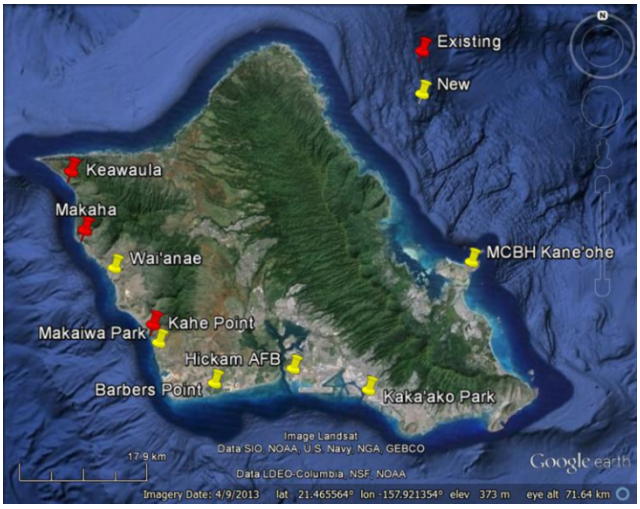

Figure 5-1 Oʻahu Landing Sites

In most cases, the analysis assumes that the new site would include a cable landing station facility 5,940 square feet in size and that the capacity at the new CLS would accommodate two transpacific cables, each having eastbound and westbound paths for a total of four cable landings.

Barbers Point is the new location for DoD Hawaiʻi facilities and the State Emergency Operations Center (EOC) and is currently being transitioned from federal to state use. There is a vacant building (Building 92) on-site, which was evaluated as a potential refit for the cable landing station. JHU/APL anticipates that as DoD Hawaiʻi occupies this site, it will build up the security infrastructure desired at the cable landing station.

Hickam AFB is part of the Joint Base Pearl Harbor/Hickam, is federally owned, and has an existing security infrastructure.

MCBH Kāneʻohe is the Marine Corps Base Hawaiʻi in Kāneʻohe, is federally owned, and is well located from the standpoint of being on the windward (eastern) shore of Oʻahu, well separated from the current transpacific landings. It has the advantage of an existing security perimeter. It has previously been studied by transpacific cable owners as a potential location for a landing site. It has also been proposed as the potential location for landing of an interisland power cable (the "Cable Project").

Kakaʻako Park is a state-owned facility near downtown Honolulu. It contains a park, amphitheater, and the University of Hawaiʻi medical campus. It is situated between Kewalo Marina and the Port of Honolulu. The site of interest for a CLS is Lot C near the University of Hawaiʻi Medical Campus, which is on ceded land owned and managed by the Hawaiʻi Community Development Authority (HCDA). There is no security infrastructure on site at present.

Waiʻanae and Makaīwa Park were suggested to JHU/APL by the state as potential cable landing stations and have been included in this evaluation, although not as thoroughly investigated as the other sites due to the limited time available to study them. The Waiʻanae site is located at a county-owned wastewater treatment plant near the Waiʻanae Mall. Makaīwa Park is located near the Aulani resort, on private land owned by the Campbell Estate.

On the Island of Hawaiʻi, JHU/APL evaluated two sites. As shown in Figure 5-2, the first is on Hilo Harbor, at the edge of the harbor breakwater. There is a University of Hawaiʻi Aquaculture facility on that site. JHU/APL notionally identified the University of Hawaiʻi at Hilo, a few miles from the cable landing, as a potential cable landing station location.

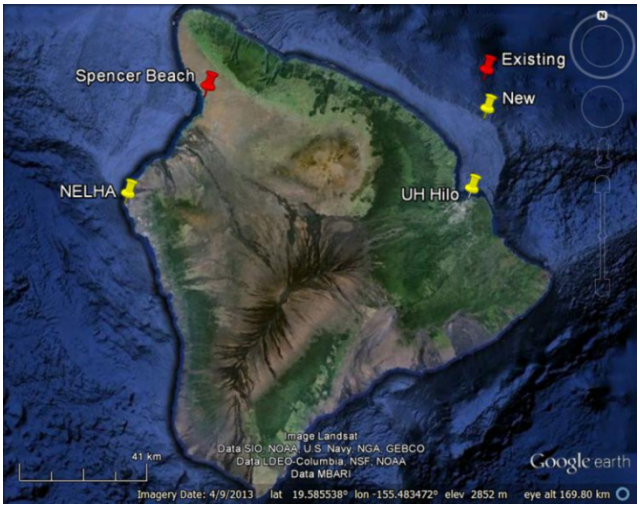

Figure 5-2 Hawai‘i Landing Sites

The Natural Energy Laboratory of Hawai‘i Authority (NELHA) at Kailua-Kona, just south of the Kona airport, is a state-owned technology park under the Department of Business, Economic Development, and Tourism (DBEDT). They have a number of existing facilities including pre-existing ocean conduits (not HDD), pre-existing terrestrial conduits, and an empty building which, if expanded, could support a cable landing station.

JHU/APL evaluated three potential sites on Kaua‘i (see Figure 5-3). The Pacific Missile Range Facility (PMRF) on the western shore of the island could potentially provide the level of security desired; however, it is rather distant from the main population of the island on the south and east shores. JHU/APL identified two other areas on state-owned land: Salt Pond State Park near Hanapēpē and Ahukini Recreation Pier near Līhu‘e.

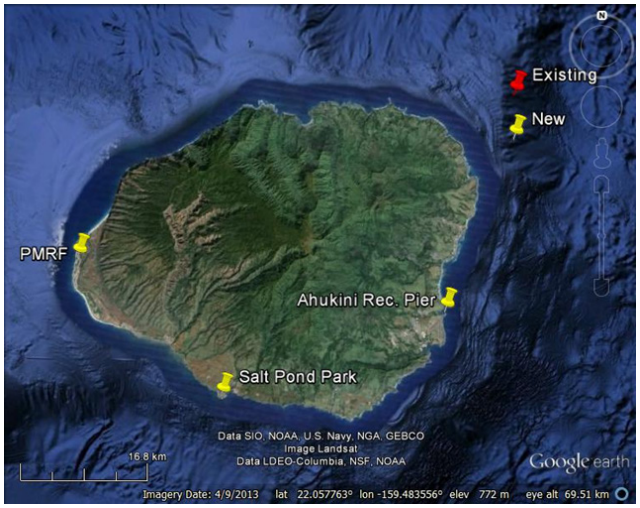

Figure 5-3 Kaua'i Landing Sites

JHU/APL evaluated two sites on Maui. Figure 5-4 shows the two sites with state-owned land that have been identified, one on the north side of the island and one on the south side of the island. On the north side, the Waihe'e Beach Park site avoids the marine mammal sanctuary and deep-water corals located to the west of Maui but has a long distance to the desired 20-meter water depth. On the south side, there is a site near the Maui Research and Technology Park (MRTP) at Kīhei that is close to existing telecom points of presence. Vacant space is available for renovation in an HTDC (High Technology Development Corporation) building, but new construction would be preferable from a security perspective.

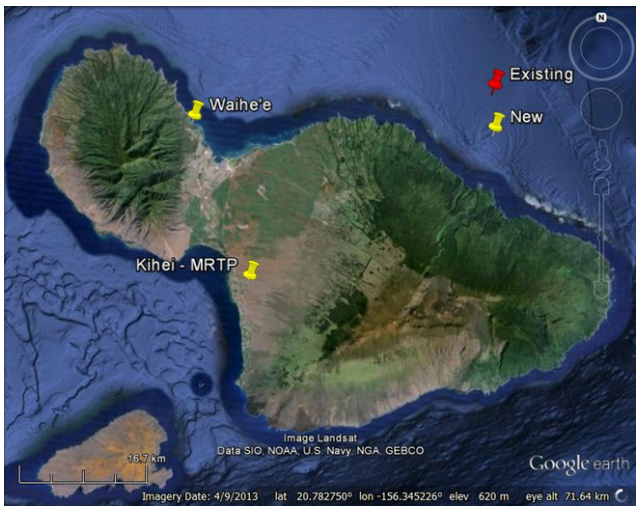

Figure 5-4 Maui Landing Sites

5.1.2 Evaluation Criteria

There are many factors to consider in selecting a site for a cable landing station. Figure 5-5 gives a high-level view of the categories considered. In each of these categories, there are a number of specific items.

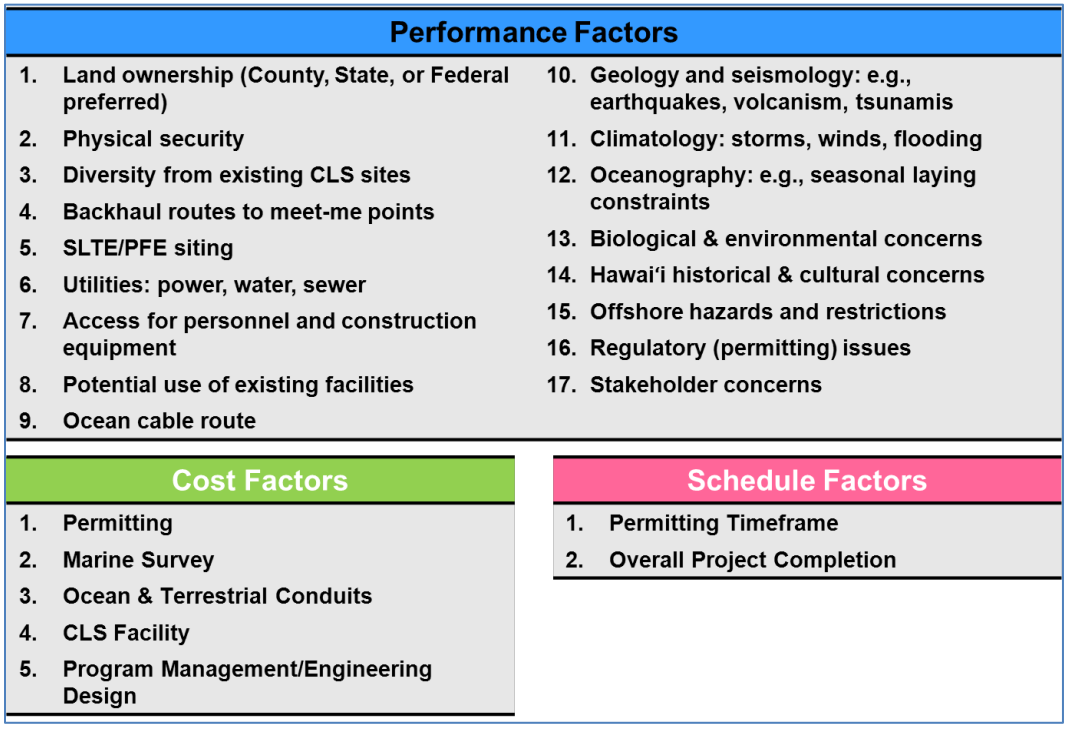

Figure 5-5 Site Evaluation Factors

For example, under performance factor 5, submarine line termination equipment (SLTE) and power feed equipment (PFE) siting, JHU/APL considers the distance from the beach manhole to the power feed equipment and the distance from the beach manhole to the submarine line termination equipment as separate items due to the fact that the power feed and the line termination equipment may be located separately. This might be necessary, for example, if the line termination is located several miles from the beach manhole. In that situation, it might be preferred to have the power feed nearer to the beach to avoid running high voltage lines over a long terrestrial path. This is just one example of many.

Altogether, there are 45 criteria that each landing site has been evaluated against. For each of the criteria, JHU/APL assigned a weight and set criteria to score the site over a range of 0 to 3. Approximately 83% of the overall weight is on categories related to performance, and 17% of the overall weight is on categories related to schedule. A weighted

score is calculated for each category, and an overall weighted score is calculated for each site.

5.1.3 Site Analysis Summary

This section summarizes the results of analyzing each potential cable landing site location to investigate and prioritize landing sites on Oʻahu, the Island of Hawaiʻi, Maui, and Kauaʻi.

The State of Hawaiʻi has appropriated $20 million under Act 134(13), General Appropriations Act of 2013, Capital Improvement Project I.7, "Transpacific landing stations, broadband infrastructure deployment, statewide - Plans, land acquisition, design, construction, equipment, to provide submarine trans-pacific cable landing stations, infrastructure improvements, and broadband infrastructure deployment improvements, statewide."[14]

Several sites were evaluated as potential locations for new, diverse carrier-neutral CLSs. Originally, nine sites were recommended for consideration: three on Oʻahu, three on Kauaʻi, two on Maui, and one on the Island of Hawaiʻi. DBEDT, via RCUH asked JHU/APL to review two more sites on Oʻahu (Waiʻanae and Makaīwa Park). Preliminary analysis has been completed for those two additional sites and is included within this report; complete analysis would require additional time and resources.

Performance for each site was scored as a weighted combination of 17 factors. Some factors were further decomposed into related sub-factors. Preliminary cost and schedule estimates were produced for each site. Cost differences between sites were mostly due to the estimated lengths of ocean and terrestrial conduits. Schedule estimates address the anticipated time required to secure appropriate permits for each site.

On 31 July 2013, JHU/APL briefed the State of Hawaiʻi on the results of these evaluations of potential locations for vendor-neutral, diverse, secure, and resilient transpacific cable landing stations in the state. The objective of the briefing was to present the CLS site evaluation results and recommendations to provide the State of Hawaiʻi and stakeholders sufficient information to make a decision on the first two (of four total) sites to be developed. Subsequent to the July meeting, JHU/APL continued to refine the site evaluations. This section summarizes the final site analysis results. Details are provided for each site in Section 5.1.4.

[14] Neil Abercrombie, Governor of Hawaiʻi , Gov. Msg No. 1234, HB200 HD1 SD1 CD1, Relating to the State Budget, Act 134 (13), page 194. http://www.capitol.hawaii.gov/session2013/bills/GM1234_.PDF

Performance		$M	Cost (20m)	Schedule	
1.	Kona (NELHA)	9.4	Kona (NELHA)	1.	Kona (NELHA)
2.	Kīhei (near MRTP)	9.8	Salt Pond Park	2.	Barbers Point
3.	MCBH Kāneʻohe	9.8	Līhuʻe		Kakaʻako Park
4.	Kakaʻako Park	10.9	Kakaʻako Park		Kīhei (near MRTP)
	Līhuʻe	11.2	Makaīwa		Līhuʻe
	Salt Pond Park	13.1	Waiheʻe		Makaīwa
	Waiheʻe	13.3	Waiʻanae		PMRF
5.	PMRF	13.6	PMRF		Salt Pond Park
6.	Barbers Point	13.8/14.7	Kīhei (near MRTP)		Waiʻanae
7.	Waiʻanae	15.0	MCBH Kāneʻohe		Waiheʻe
8.	Makaīwa	20.0	Barbers Point	3.	MCBH Kāneʻohe

Figure 5-6 Potential CLS Locations Ranked According to Performance, Cost, and Schedule Criteria

The data presented in Figure 5-6 summarizes the performance scores, cost estimates, and anticipated schedules to secure the permits required for the sites evaluated. Each column rank orders the sites according to the values. Sites are sorted on performance from highest to lowest; sites with the same score are grouped and listed alphabetically. Sites are sorted on cost from lowest to highest. Sites are sorted on schedule from shortest to longest; sites with the same schedule are grouped and listed alphabetically.

5.1.3.1 Performance Scores

The "stoplight" chart in Figure 5-7 shows the performance factor scoring for each of the 11 sites evaluated (Hickam AFB and Hilo are removed from this chart). The performance factors are listed in order of total weight from highest to lowest. A score below 1.5 is shown as red, between 1.5 and 2.5 is shown as yellow, and 2.5 and higher is shown as green.

	Oahu Barbers Pt	Oahu Kaka'ako	Oahu Kāne'ohe	O'ahu Wai'anae	O'ahu Makaīwa	Hawaii NELHA	Maui Waihe'e	Maui Kihei	Kaua'i PMRF	Kaua'i Līhu'e	Kaua'i Salt Pond
Ownership	2.0	3.0	3.0	3.0	0.0	3.0	3.0	2.0	2.0	3.0	3.0
Security	1.0	0.0	3.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CLS diversity	1.0	2.0	3.0	0.0	0.0	3.0	3.0	3.0	3.0	3.0	3.0
Regulatory	2.0	2.0	1.0	2.0	2.0	3.0	2.0	2.0	2.0	2.0	2.0
Cultural	2.0	2.7	0.7	2.0	2.0	3.0	2.0	2.3	2.0	2.0	2.0
Offshore hazards	2.8	2.3	2.9	2.7	2.8	3.0	2.8	2.9	3.0	3.0	3.0
Stakeholder	2.0	2.0	2.0	2.0	2.0	3.0	2.0	3.0	2.0	2.0	2.0
Utilities	1.4	2.0	1.4	1.4	1.4	2.6	1.4	1.4	1.4	1.4	1.4
Geology	3.0	2.9	3.0	2.3	3.0	2.5	3.0	3.0	3.0	3.0	3.0
Biology	2.3	2.3	2.3	2.3	2.3	2.3	2.3	1.8	2.3	2.3	2.3
Climatology	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.0	2.8	2.8
Ocean segment	1.3	2.3	2.3	1.0	1.0	3.0	2.3	2.5	2.5	2.8	2.8
PFE/SLTE Siting	1.5	2.8	1.8	2.8	2.8	1.5	2.8	0.8	2.8	2.8	1.8
Backhaul	2.0	2.0	1.0	1.0	1.0	2.0	1.0	3.0	1.0	1.0	1.0
Existing facility	1.0	0.0	0.0	0.0	0.0	2.0	0.0	3.0	0.0	0.0	0.0
Access	3.0	3.0	3.0	3.0	3.0	3.0	2.0	3.0	2.0	2.0	1.0
Oceanography	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Overall	1.9	2.1	2.2	1.8	1.6	2.5	2.1	2.2	2.0	2.1	2.1

Figure 5-7 Site Evaluations: Performance Stoplight Chart

Table 5-1 summarizes the performance factor evaluations, listing the potential locations in descending order of the overall performance score.

Table 5-1 CLS Ranking by Weighted Performance

Rank	Island	Site	Performance Rating
1	Hawai'i	Kona (NELHA)	2.5
2	Maui	Kīhei (near MRTP)	2.3
3	O'ahu	MCBH-Kāne'ohe	2.2
4	O'ahu	Kaka'ako Park	2.1
4	Kaua'i	Līhu'e (Ahukini Rec Pier)	2.1
4	Kaua'i	Salt Pond Park	2.1
4	Maui	Waihe'e	2.1
5	Kaua'i	PMRF	2.0
6	O'ahu	Barbers Point	1.9

Rank	Island	Site	Performance Rating
7	O‘ahu	Wai‘anae	1.8
8	O‘ahu	Makaīwa	1.6

In the overall scores for performance evaluation, NELHA on the Island of Hawai‘i stands out. A challenge for all sites on islands other than O‘ahu is building an attractive business case for cable owners to land in those locations.

5.1.3.2 Cost Scores

Rough Order of Magnitude (ROM) pricing was generated for each candidate landing site. The components of the ROM pricing are listed below. In the estimates, some costs are fixed for all sites; they are so marked. Others vary based on the parameters identified.

- **Marine Survey** based on 3 days of vessel time (mobilization – 1 day; survey – 1 day; demobilization – 1 day); and data reduction and documentation. Assumed fixed cost for all sites = $200,000.
- **Project Management and Engineering** staffing. Assumed fixed cost for all sites = $1,500,000.
- **Permitting** costs based on Environmental Assessment (additional cost if Environmental Impact Statement is required). Assumed fixed cost for all sites = $1,000,000. Note: Following the state’s selection of specific sites, this was further refined to $1.3 million for those sites.
- **Horizontal Directional Drilling** normally with two conduits from BMH to 20-meter water depth:
  - Includes excavation of bore pits, dive support, and drilling.
  - Cost is $1,166 per foot ($3,825 per meter) for 16-inch HDPE conduit with four subducts to support two transpacific cable landings.
- **Trenching** with subducts from BMH to CLS:
  - Price based on 1/2 of distance being in asphalt areas.
  - Trenching cost of $188 per foot ($617 per meter) will support multiple conduits.
  - Conduit cost of $7 per foot ($23 per meter) for each 4-inch diameter with three 1.5-inch subducts; normally plan for two conduits in and two conduits out (total of four) at each site.

- **Cable Landing Station** (renovation of existing space or new construction):
  - Potential to withstand hurricane force winds (Category 5)
  - Estimates based on interactions with Building Contractors and 2013 National Building Cost Manual (NBCM) adjusted for construction in Hawai‘i
  - Sized for two transpacific cables; each cable capable of two to four fiber pairs; each fiber pair capable of 100 wavelengths (λ) x 100 Gbps
  - Sized for four cable landings (normally 5,940 square feet)

Figure 5-8 and Figure 5-9 illustrate the use of the ROM pricing methodology supposing a new cable landing station at the Pacific Missile Range Facility (PMRF) on Kaua‘i as the example. Two distances are critical in the pricing. The first is the distance from the BMH to the 20-meter water depth for the installation of the conduit with horizontal directional drilling. For PMRF, this distance is determined as 3,366 feet (1,026 meters). The second is the distance from the BMH to the site of the CLS, and this distance is currently estimated as 11,088 feet (3,380 meters). The location of a CLS at this site is notional. With these distances, the ROM pricing for all components of the pricing methodology is assembled next.

Figure 5-8 Example of Costing: PMRF Landing Distances

As discussed previously, the baseline includes HDD conduit with four subducts to support two transpacific cable landings. For the distance of 1,026 meters for PMRF, the cost for the HDD conduit with four subducts is $3.9 million. Next, the cost of terrestrial

trenching with two 4-inch conduits, with each conduit having three 1.5-inch subducts, is calculated as $2.4 million based on a distance of 11,088 feet from the beach manhole to the CLS. The CLS cost has the following components: engineering, site preparation, the CLS structure, and the internal facility upgrades required to meet the construction specifications. For the CLS, the ROM cost is $4.6 million. Adding all ROM cost components results in an estimated cost of $13.6 million for the PMRF landing.

Cost of HDD Conduit from BMH to 20m Water Depth

HDD Distance		ROM Cost	
(m)	(ft)	Cost/ft	Cost
1,026	3,366	1166	$ 3,924,874

Cost of Trenching with 4 x 4" Ducts from BMH to CLS

BMH to CLS	Trenching $/ft	Cost of Trench & Conduits	
Distance (ft):		Conduit $/ft	4
11088	$ 188	$ 7	$ 2,395,008

Facility Cost

Item	Cost	Source
Engineering	$ 100,000	APL
Site Prep	$ 278,772	NBCM
CLS Structure	$ 670,750	NBCM
Facility Upgrade	$ 3,564,000	DRF $600/ft
Total	$ 4,613,522	

Total Costs

PMO/Engr Dsn	$ 1,500,000
Permitting	$ 1,000,000
Marine Survey	$ 200,000
HDD Conduits	$ 3,924,874
Terrestrial Conduit	$ 2,395,008
CLS Facility	$ 4,613,522
Total	$ 13,633,404

Figure 5-9 Example of Costing: PMRF Landing All Cost Elements

Table 5-2 summarizes the cost estimates, listing the potential locations in ascending order of the estimated cost.

Table 5-2 CLS Ranking by Estimated Cost

Rank	Island	Site	Estimated Cost ($M)
1	Hawai‘i	Kona (NELHA)	9.4
2	Maui	Salt Pond Park	9.8
3	O‘ahu	Līhu‘e	9.8
4	O‘ahu	Kaka‘ako Park	10.9

Rank	Island	Site	Estimated Cost ($M)
5	Oʻahu	Makaīwa	11.2
6	Maui	Waiheʻe	13.1
7	Kauaʻi	Waiʻanae	13.3
8	Kauaʻi	PMRF	13.6
9	Oʻahu	Kīhei (near MRTP)	13.8/14.7
10	Oʻahu	MCBH Kāneʻohe	15.0
11	Oʻahu	Barbers Point	20.0

5.1.3.3 Schedule Scores

The schedule estimate differences are driven by the time it is likely to take to acquire the permits necessary to build a CLS at the proposed site. For most sites, the original estimate is 54 months; note that subsequent analysis for the two sites selected on Oʻahu shortened this timeline somewhat (see Section 5.1.6.3). For NELHA, the estimate is shorter—30 months—because the site has received approval from the County of Hawaiʻi that it can receive de facto permitting from previous conservation district units and special management area applications submitted. For MCBH Kāneʻohe, the estimate is longer—60 months—because the site has both environmental and cultural issues.

5.1.4 Pre-Decisional Site Analysis Details

This section provides details of the site analysis results. The information in this section is what was presented to the state in July 2013, reflecting HDD to 20-meter depth at most sites. Sites are organized according to island: Oʻahu, Hawaiʻi, Maui, and Kauaʻi. The analysis details include the performance rating, pertinent distances, schedule estimate, and cost estimate. Pros and cons are listed for each site, along with images that portray the site's general location and potential facility structure to be re-used. If there is no strong candidate for using a building at the proposed site, the second image depicts a notional location where the facility may be built.

5.1.4.1 O‘ahu: Barbers Point Landing

In the Barbers Point area (Figure 5-10), there is Kalaeloa Airport, a joint civil-military regional airport of the State of Hawai‘i. Directly to the south of the airport is the U.S. Coast Guard Air Station at Barbers Point. Directly to the north of the airport is a mixed-use area administered by the state through the Hawai‘i Community Development Authority. Site ownership is retained by the Federal Naval Facilities Engineering Command (NAVFAC) organization; the property is being operated by the state.

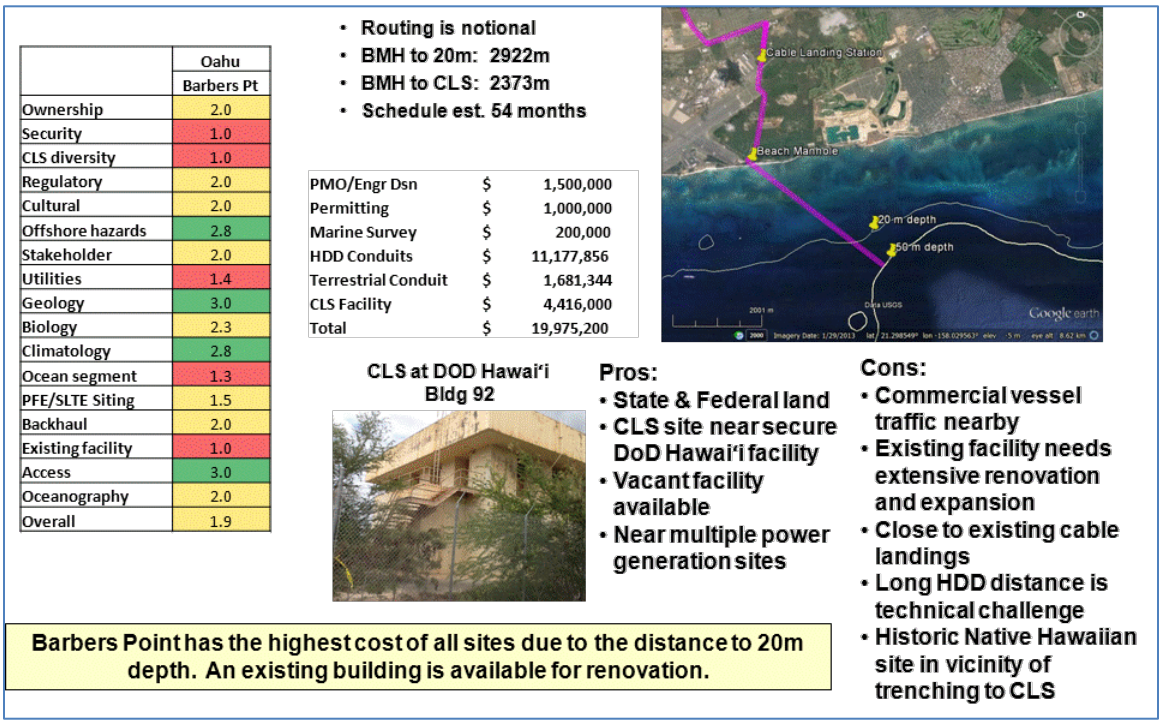

Figure 5-10 O‘ahu: Barbers Point Landing

Barbers Point scores low on the security category (based upon the current security at the site) and the CLS diversity category (based upon its proximity to the existing cable landing stations on the west side of O‘ahu). It also scores low on the utilities category based upon the overhead power service in the area and the degraded nature of the aged Federal facilities. It has a facility on site, Building 92, which could potentially be renovated to provide a cable landing station; however, major renovations and expansion are required. A drawback of the Barbers Point site is the long buried cable segment, with a conduit length of 2,922 meters, to 20-meter depth, which results in the high estimated HDD cost. There is also a considerable distance from the beach manhole to the existing Building 92, which results in a relatively high trenching cost.

Barbers Point is near several power generation facilities; however, the power infrastructure in the former Federal facility needs renovation according to Hawaiian Electric Company and NAVFAC representatives. There is commercial vessel traffic coming into the Barbers Point/Campbell Industrial Park area to the west, as well as commercial vessel anchoring.

The Hunt Building near the corner of Coral Sea Road and Franklin Roosevelt Road provides another option for the CLS. The building is privately owned, about 6,000 square feet in size, and has three conduits (originally deployed by the Navy with one conduit occupied by a cable) that extend over a mile to White Plains beach. The University of Washington Applied Physics Laboratory occupied the building until recently and used the cable for underwater data collection.

5.1.4.2 O‘ahu: Kaka‘ako Park Landing

Kaka‘ako Park (Figure 5-11) is situated between the Kewalo Basin on the east and the Port of Honolulu on the west. As directed, JHU/APL evaluated two options: the base Kaka‘ako Park option is for a standard-sized 5,940 square foot facility with capacity for two transpacific cables and the Kaka‘ako Park 2X (twice the size) sized option (see Section 5.1.6.1) doubles the facility size and cable capacity.

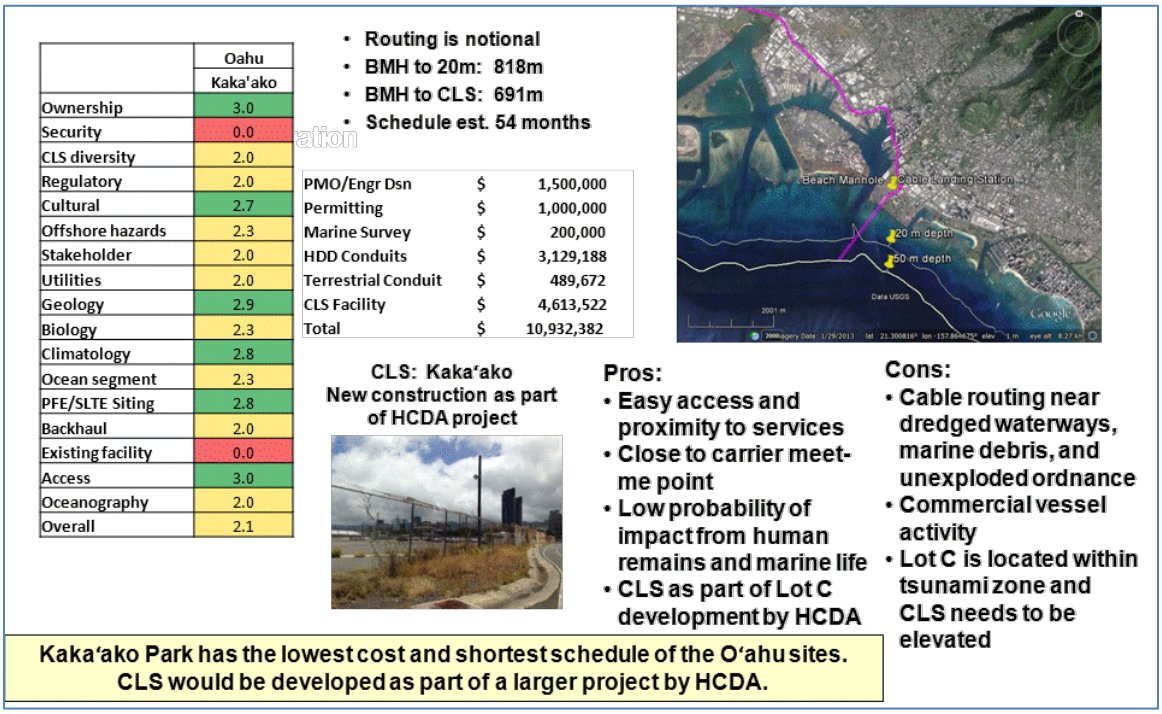

Figure 5-11 O‘ahu: Kaka‘ako Park Landing

Kaka‘ako Park is state-owned and includes an amphitheater, the University of Hawai‘i Medical Campus, and the University of Hawai‘i Kewalo Marine Laboratory. The site is ash landfill and has no known ancient Hawaiian remains or historical or cultural artifacts. The State Historical Preservation Office has mentioned a potential concern over preservation of recent historical artifacts such as the old seawall. There is no sandy beach area, and the waterfront is rock fill; therefore, there are no known issues with monk seal or sea turtle beaching areas.

The Kewalo Marine Laboratory or warehouse was originally considered as a cable landing station; however, those locations appear to lie within the tsunami evacuation zone. The University of Hawai‘i UH Medical Campus is outside the evacuation zone, and it or the surrounding area may offer a site for a cable landing station. In discussions with the Hawai‘i Community Development Authority (HCDA), JHU/APL identified Lot C near the

Medical Campus as a suitable location on-site. It is located within the tsunami evacuation zone; however, HCDA suggests that the CLS could be elevated to an upper level of a planned parking structure. An alternative may be to locate the power feed equipment at Kaka‘ako and to have the submarine line termination equipment at the DRFortress data center and meet-me point. For purposes of the current comparison, JHU/APL assumed a cable landing station at Kaka‘ako on Lot C. The proposed CLS site on Lot C is on ceded land owned and managed by HCDA.

The Kewalo Marine Laboratory site has some deep-water pipes used to obtain very pure and cold seawater for research purposes. A sewage pumping station and outfall pipe, and the proposed Honolulu Seawater Air Conditioning project with its intake and outtake pipes, are also in the Lot C area and would need to be accommodated in the detailed plans.

In the evaluation, Kaka‘ako scored low on the security category, as a park site that is open to the public. The HDD distance and CLS location are advantages, as well as the downtown location, which means there is buried infrastructure for backhaul and power. The Honolulu Harbor to the west is a dredged area with marine traffic, and it appears that the Kewalo Basin on the east side may also be dredged.

Overall, the base Kaka‘ako Park option appears to be the lowest cost of O‘ahu sites, most particularly due to the short HDD and terrestrial trenching distances.

5.1.4.3 O‘ahu: MCBH Kāne‘ohe Landing

The Marine Corps Base Hawai‘i (MCBH) at Kāne‘ohe (Figure 5-12) is well situated from a physical diversity standpoint, being on the windward (eastern) side of O‘ahu. It is a Federal facility and is growing. The original concept was to place the cable landing on the northern beach area between Mokapu and Pyramid Rock; however, this location has several serious disadvantages. Placing a landing on the far side of the airport would present an issue with disrupting operations while the cable conduits were installed. Placing a landing along the north-side golf course/beach area would involve serious issues with ancient Hawaiian remains because that area was used for many burials. Both locations would involve trenching a considerable distance to reach the beach. After considering the issues, JHU/APL has opted to suggest a cable landing at the beach on the eastern side of the peninsula, as shown. This area is believed to potentially have fewer issues with remains and marine life and has a similar distance to reach the 20-meter contour, as compared with the northern beach.

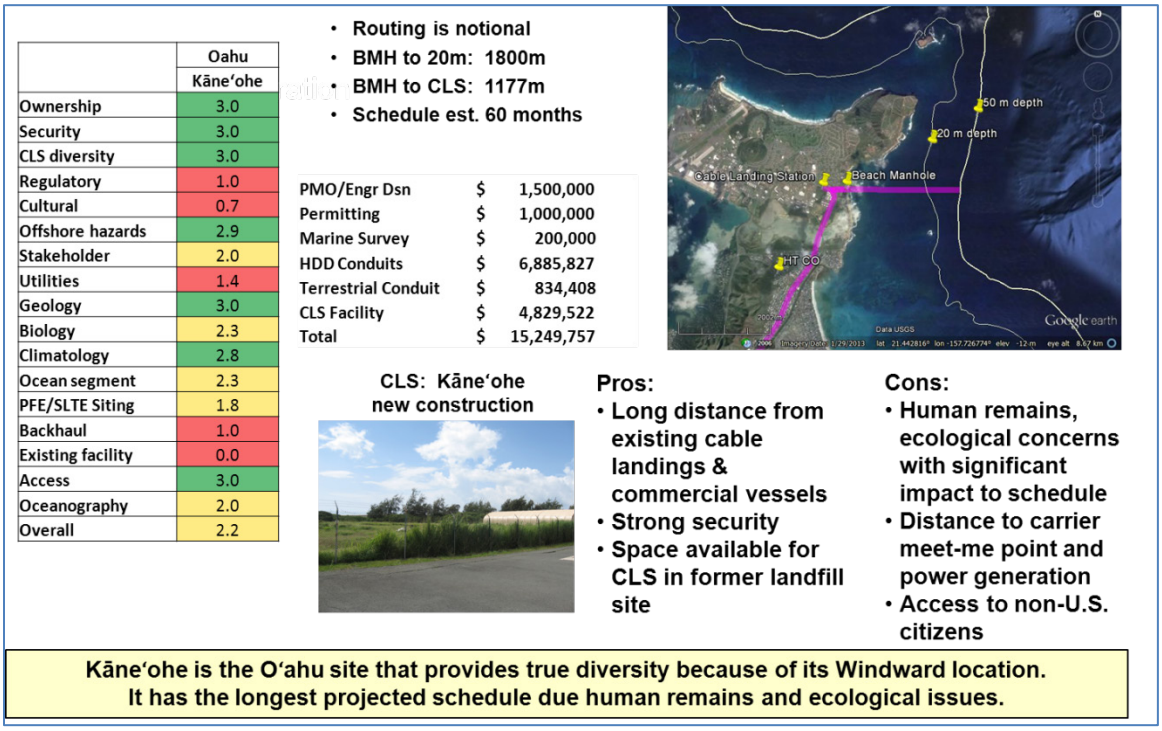

Figure 5-12 O‘ahu: MCBH Kāne‘ohe Landing

Regarding the evaluation categories, the advantage Kāne‘ohe has in physical diversity is matched by the disadvantage of bringing submarine backhaul to carrier meet-me points. There is a single commercial power feed into the base through the front gate, and a single communications route out of the base through the back gate. The state was

offered a portion of Building 212 on the site as a cable landing station location, but it was concluded that it will not be suitable due to its small size. JHU/APL recommends new construction near to the proposed cable landing site. One other factor is that as an active military base, access to potential non-U.S. citizen owners of transpacific cables is limited.

For any construction project on Kāneʻohe, cultural issues, permitting delays, and construction delays are likely to impede the process of building a landing station. Accordingly, this site scores low on the cost and schedule categories. Nevertheless, MCBH Kāneʻohe is so well suited from a security and diversity standpoint that it scored well in the evaluations.

5.1.4.4 Oʻahu: Waiʻanae Landing

The wastewater treatment plant in Waiʻanae (Figure 5-13) was suggested to JHU/APL as a potential cable landing station site. The wastewater treatment plant is County-owned land. Due to its non-diverse location on the Waiʻanae coast, within 4 miles of the existing landing station at Mākaha and 5 miles of the existing landing station at Kahe Point, it was originally not included in the evaluations.

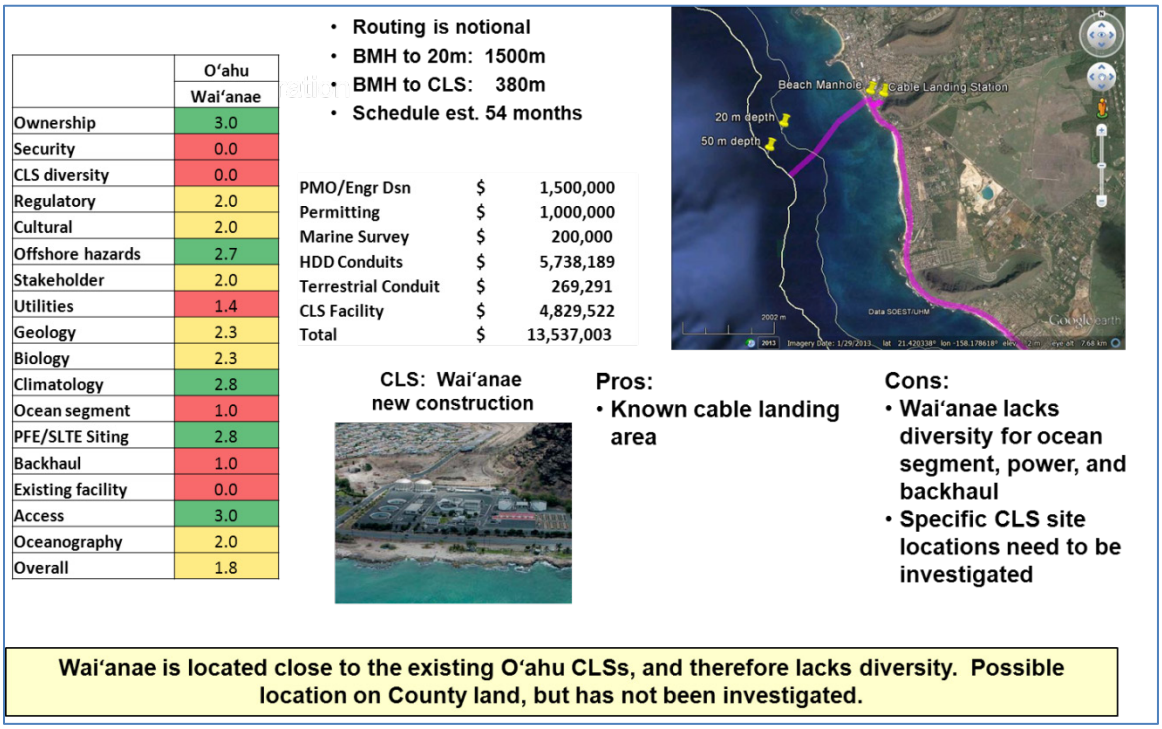

Figure 5-13 Oʻahu: Waiʻanae Landing

Based upon available data, JHU/APL scored the Waiʻanae site and estimated costs for new CLS construction at that site.

5.1.4.5 Oʻahu: Makaīwa Landing

Makaīwa Park (Figure 5-14), near the Kahe Point power plant, was recently suggested as a potential cable landing station site. The Park is privately owned, as part of the Campbell Estate. Due to its non-diverse location on the Waiʻanae coast, within 1 mile of the existing landing station at Kahe Point, and its location on private land, it was originally not included in the evaluations.

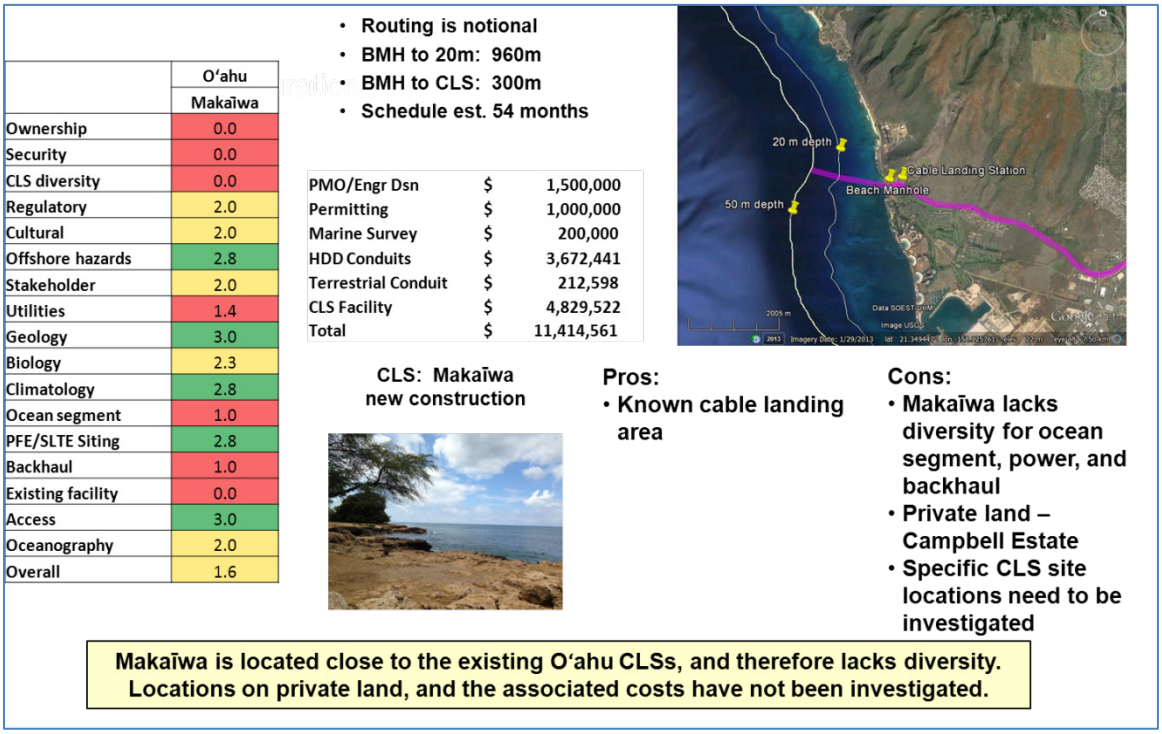

Figure 5-14 Oʻahu: Makaīwa Landing

Based upon available data, JHU/APL scored the Makaīwa Park site and estimated costs for new CLS construction at that site.

5.1.4.6 Hawai'i: Kona (NELHA) Landing

The Natural Energy Laboratory of Hawai'i Authority (NELHA), a state agency attached to the Department of Business and Economic Development and Tourism, operates an ocean science and technology park in the Kailua-Kona area of the Island of Hawai'i (Figure 5-15). The laboratory is sited on a 200 year old lava flow and thus has minimal cultural and human remains issues. One of the key features of the site is access to the steepest bathymetric offshore slopes in Hawai'i. NELHA operates several deep-ocean seawater pumping facilities providing pure, cold seawater to clients on the campus. NELHA has unused pipes, in particular an 18-inch pipe that extends to 20-meter depth, which it can provide for a cable landing station.

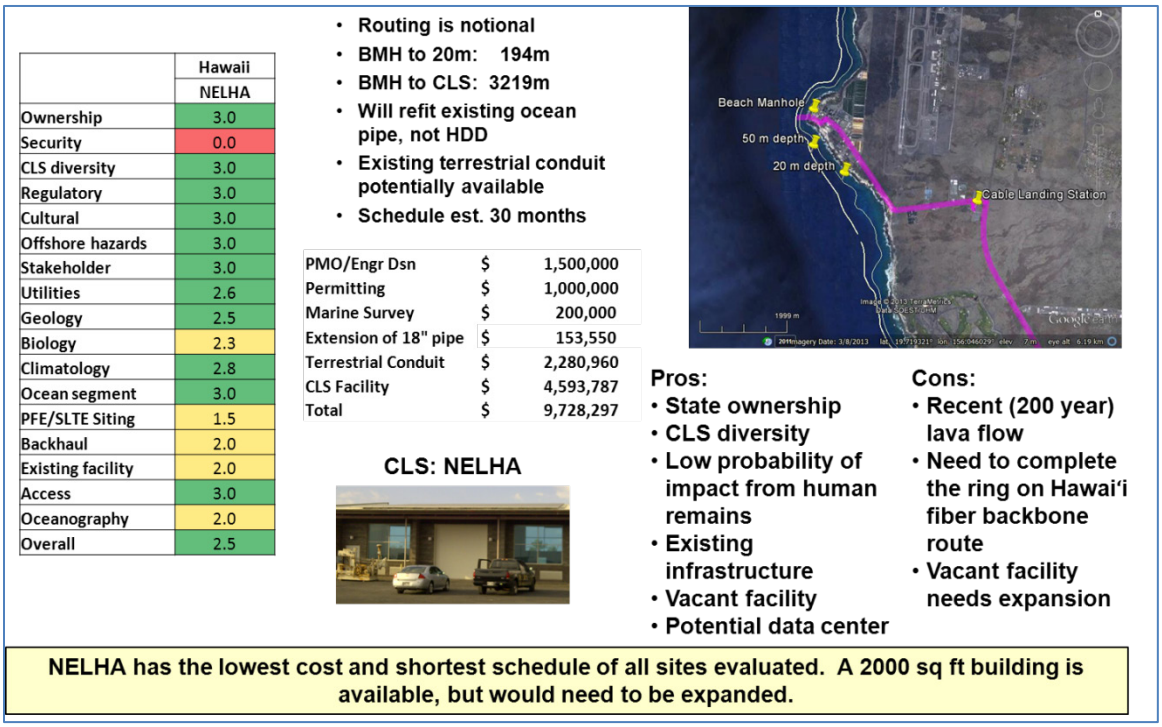

Figure 5-15 Hawai'i: Kona (NELHA) Landing

As a consequence of the steep offshore slope, NELHA has a very short distance to reach 20-meter depth. JHU/APL recommends fitting the existing pipe with cement encasement for NELHA.

NELHA is open to the public and includes a public beach. There is a fenced area around the main offices and a guard station at the entry (not normally manned). The notional cable landing site could be located within the fenced area.

NELHA has a vacant building, 2,200 square feet, near the entrance to offer as a landing station. JHU/APL anticipates additional construction would be needed to meet the size requirements for the cable landing station.

NELHA has several trenched conduits that pass from the main office area to the area near the vacant building offered as a cable landing station. Those conduits contain power and telecommunications fiber laid by Hawaiian Telcom and TW Telecom. Whether vacant conduits may be used for a cable landing should be investigated.; however, in cost estimates, JHU/APL is conservatively assuming new trenching will be required.

As with all sites on the Island of Hawai'i, the completion of the ring topology is an important step for resiliency of the network.

5.1.4.7 Maui: Waihe'e Landing

Waihe'e (Figure 5-16) is on the northern part of Maui. It is state-owned park land near a Hawaiian homeland area and public golf course. One clear drawback is the length of the buried cable segment HDD conduit.

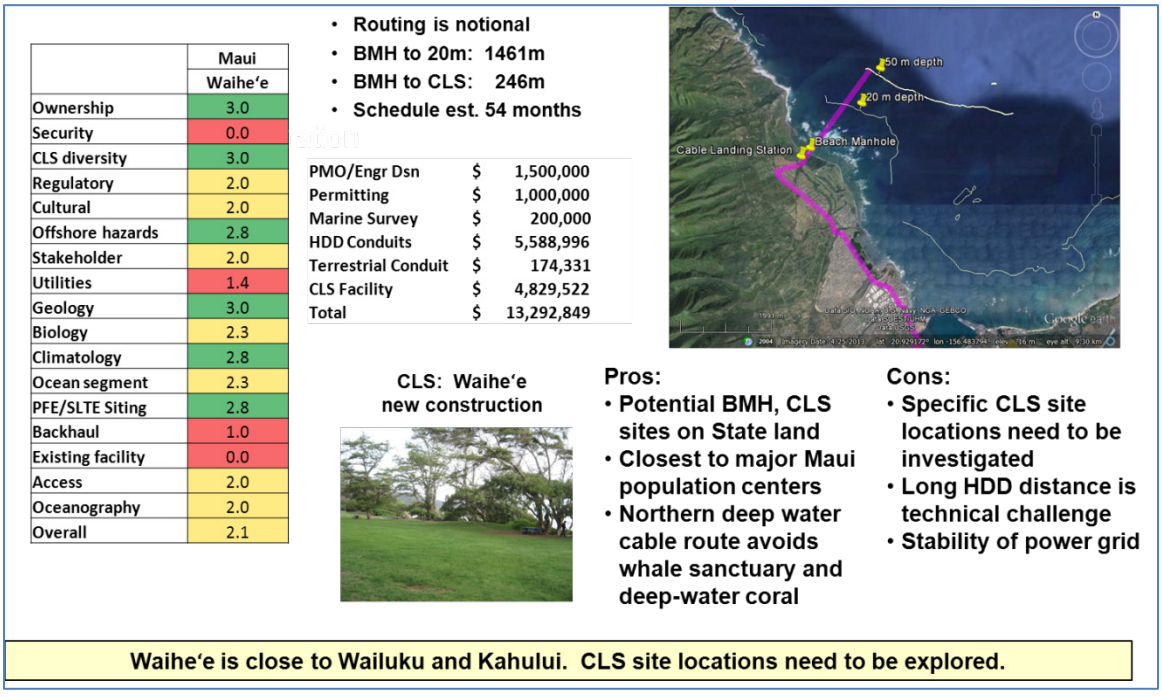

Figure 5-16 Maui: Waihe'e Landing

5.1.4.8 Maui: Kīhei (near Maui R&T Park) Landing

The Maui Research and Technology (R&T) Park (MRTP) is on the western shore of Maui. Maui R&T Park is a state-owned property in Kīhei, developed as a technology incubator. It has the Maui High Performance Computing Center on-site, as well as points of presence (PoPs) for Hawaiian Telcom and TW Telecom. The potential CLS site evaluated is at the new Maui County Police Station at the southern end of the Park (Figure 5-17).

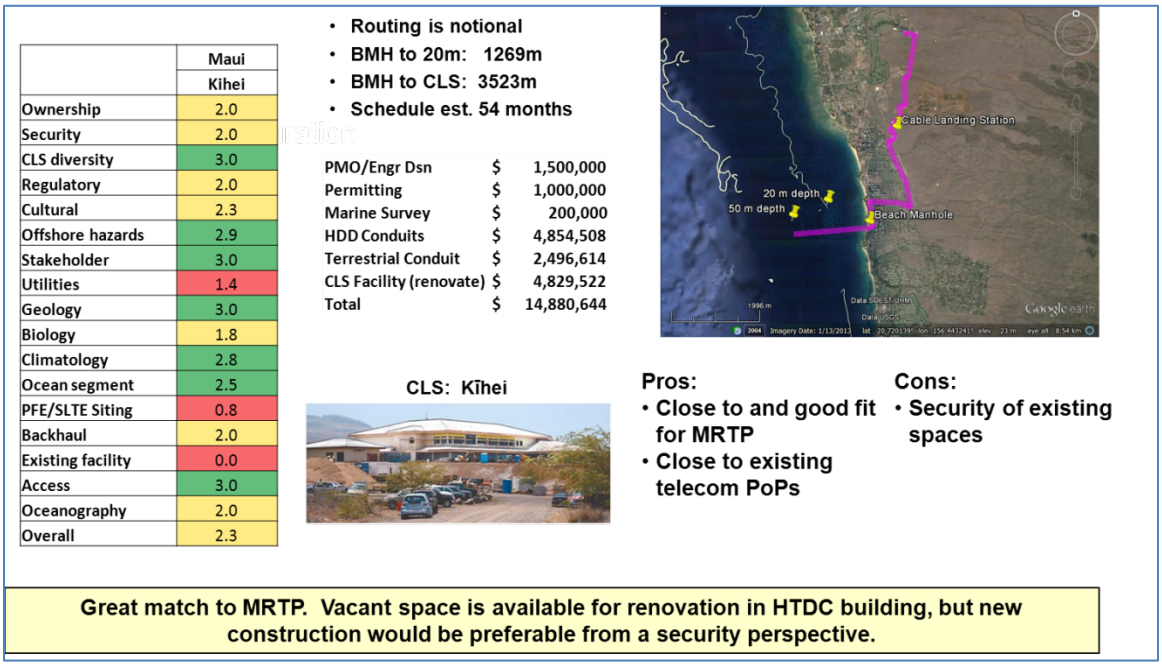

Figure 5-17 Maui: Kīhei (Near Maui R&T Park) Landing

The main drawback of the MRTP is the long distance from the Park to suitable beach landing sites and the path for the ocean segment which transits the marine-mammal sanctuary and an area cited as having rare deep-water corals. The cost of the long terrestrial path may be mitigated if there are existing terrestrial conduits available.

5.1.4.9 Kaua'i: PMRF Landing

The Pacific Missile Range Facility (PMRF) is situated on the western shore of Kaua'i (Figure 5-18). One drawback of the PMRF landing on Kaua'i is the distance of the site from commercial meet-me points. In addition, the entire PMRF facility is within the tsunami evacuation zone, although there may be nearby locations under state or federal ownership where a cable landing station could be located.

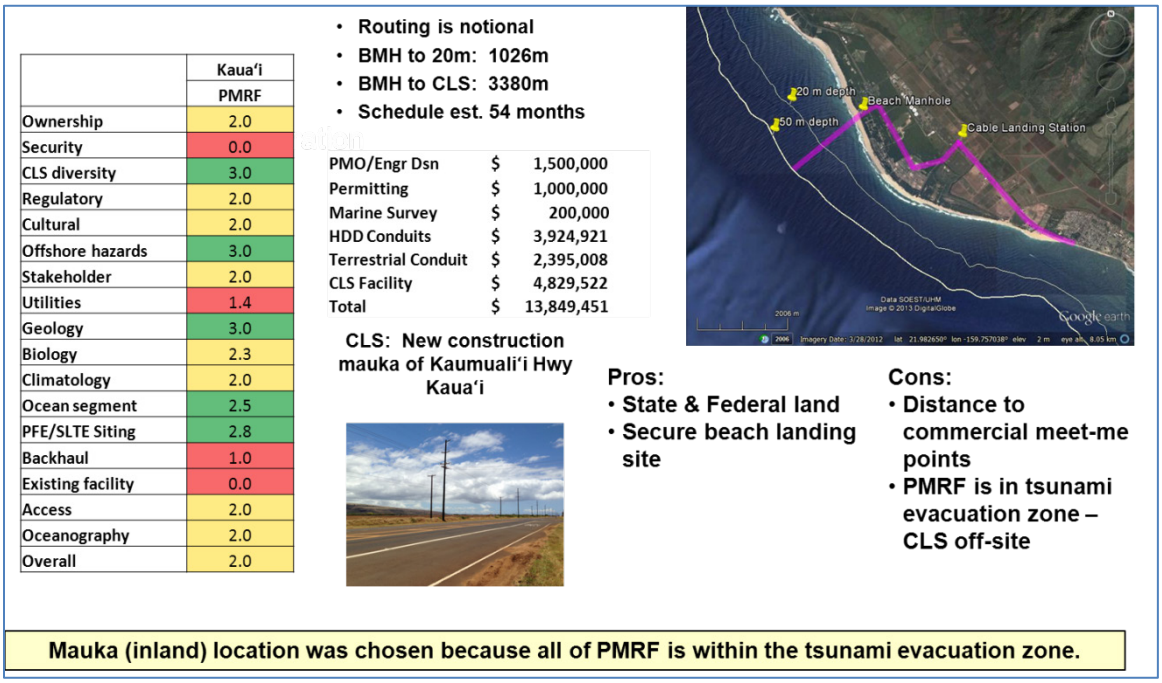

Figure 5-18 Kaua'i: PMRF Landing

5.1.4.10 Kaua‘i: Līhu‘e (Ahukini Recreation Pier) Landing

Līhu‘e is on the eastern shore of Kaua‘i. Ahukini Recreation Pier is located just off the Līhu‘e airport (Figure 5-19) in a state-owned public park with minimal security. The site is within a short distance of the Līhu‘e meet-me points. The tsunami evacuation zone is not an issue.

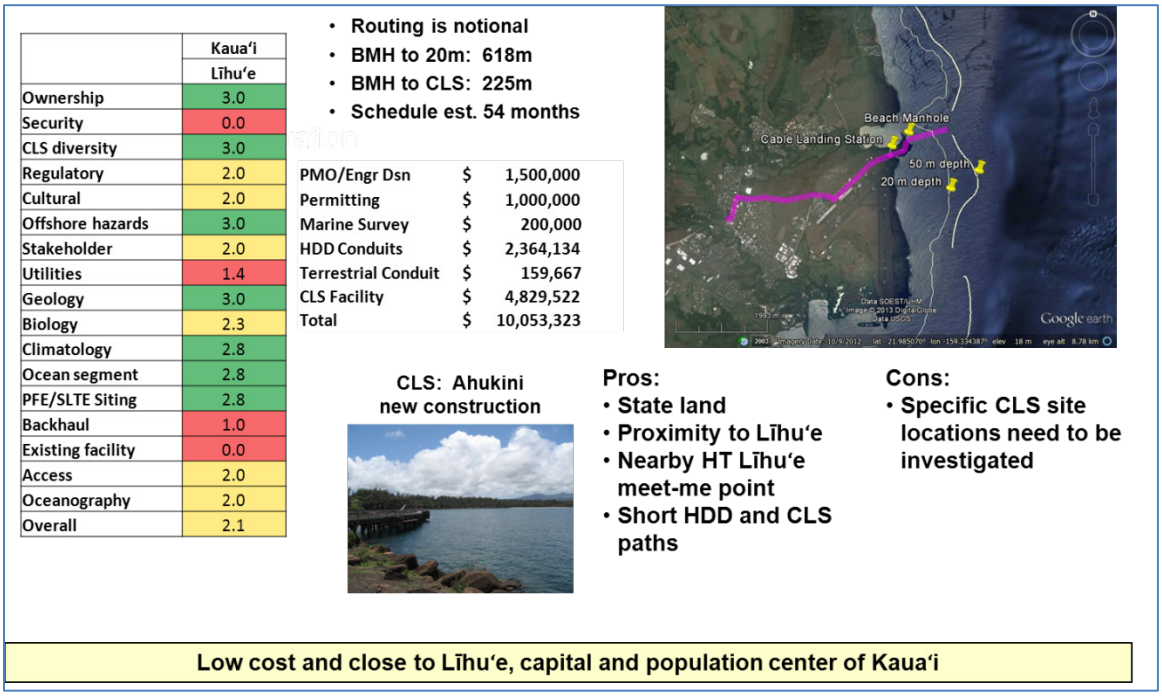

Figure 5-19 Kaua‘i: Līhu‘e (Ahukini Recreation Pier) Landing

5.1.4.11 Kaua‘i: Salt Pond Park Landing

The state-owned Salt Pond Park (Figure 5-20) area is on the southern shore of Kaua‘i. The site evaluated is near the Hanapēpē meet-me point. The length of the buried cable segment HDD conduit is reasonable, assuming the beach manhole can be located on the peninsula on the far side of the airport. The peninsula is in the tsunami evacuation zone, but there appears to be state-owned land outside that zone to locate a cable landing station. Salt Pond is a public park with a regional airport and has light security. Port Allen, nearby, has fossil power generation and some commercial vessel traffic.

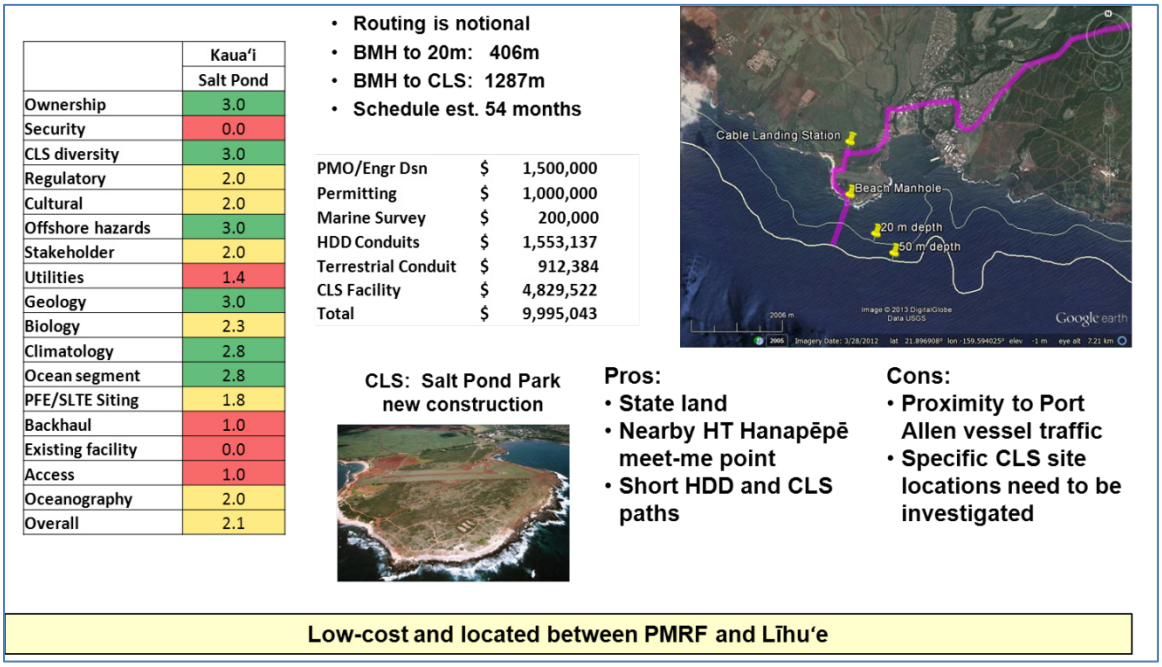

Figure 5-20 Kaua‘i: Salt Pond Park Landing

5.1.5 Site Selection Decision

Based on information presented by JHU/APL in July 2013, on 1 October 2013, the Hawai‘i State Department of Business, Economic Development, & Tourism (DBEDT) directed that pre-engineering specifications should be completed for two new cable landing stations:

- Kaka‘ako Park. 12,600-square foot facility with capacity for four transpacific cables; JHU/APL labels this CLS “Kaka‘ako Park 2X”
- Barbers Point/Kalaeloa (Building 92). 6,300-square foot facility with capacity for two transpacific cables.

5.1.6 Post-Decisional Site Analysis Details

This section provides the final site analysis results for the two sites selected by the state. The updated analysis reflects:

- Capacity of CLS at Kakaʻako Park twice what was originally estimated
- Location of the BMH inside a new construction building on Lot C at Kakaʻako Park
- Routing around problematic areas, where possible
- Permitting estimates based on specific locations, as much as possible
- Cost estimates using better information for the location and size of the facilities, planned renovation, conduit lengths, and construction/renovation costs

5.1.6.1 O‘ahu: Kaka‘ako Park 2X Sized Landing

The capacity (four transpacific cable landings) of the Kaka‘ako Park 2X Sized CLS (Figure 5-21) is twice that of the base option. The facility is sized to be 12,600 square feet. The cost for a new facility is estimated based on general office-masonry figures from the NBCM. Appropriate parts of the facility would be upgraded for backup power, fire suppression, and equipment staging. A beach manhole closet would be placed inside the CLS. As a risk reducer for potential cable owners, it is important to fully characterize the marine environment where debris and unexploded ordnance may be found and explore remediation options. The schedule estimate is based on 28 months for permitting, plus 18 months for construction.

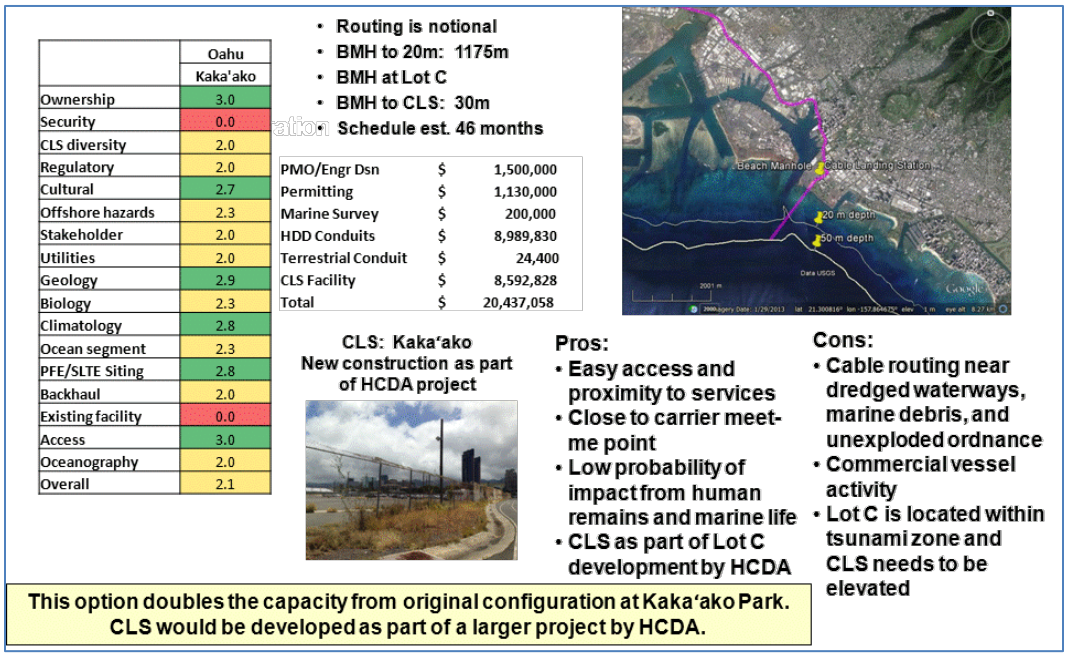

Figure 5-21 O‘ahu: New Kaka‘ako Park 2X Sized CLS (Twice the Capacity as the Base Kaka‘ako Park)

5.1.6.2 O‘ahu: Barbers Point Landing

Figure 5-22 reflects the updated analysis for a new CLS at Barbers Point. Facility costs include Building 92 cleanup, renovation, and additional space. The renovation costs are based on NBCM figures for light industrial construction. As with Kaka‘ako Park, the schedule estimate is based on 28 months for permitting, plus 18 months for construction.

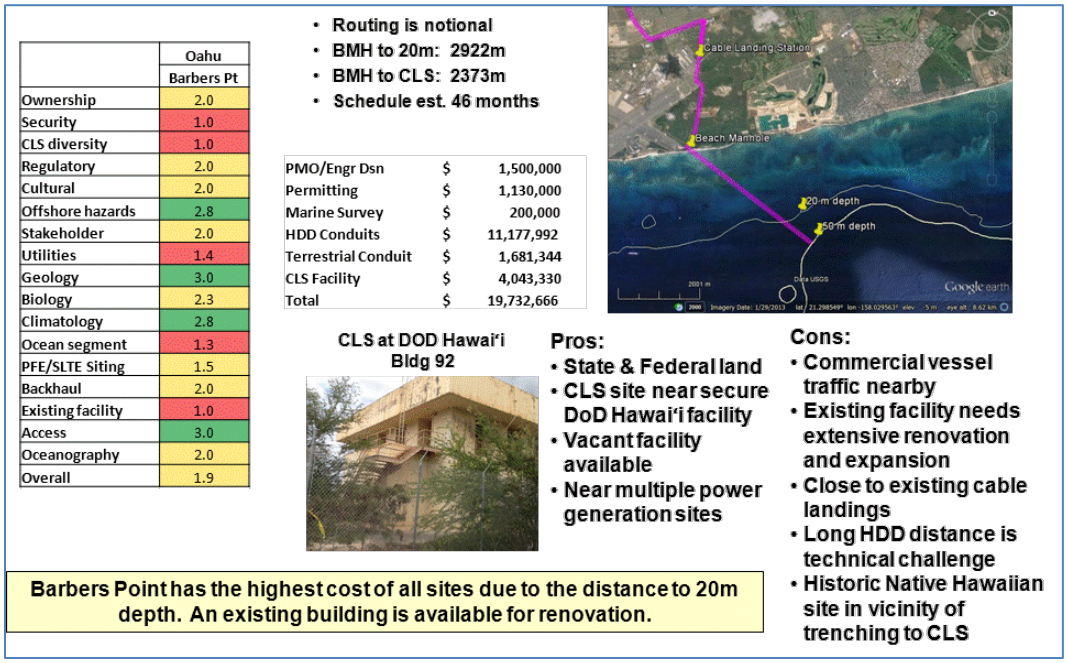

Figure 5-22 O‘ahu: New Barbers Point CLS

5.1.6.3 Permitting Summary

Figure 5-23 summarizes the permits that would be needed for CLS development at Kaka‘ako Park and Barbers Point. Because this proposed project would use state funds, it must comply with the Hawai‘i Environmental Policy Act by preparing at least an environmental assessment and potentially an environmental impact statement. Several state officials have suggested that an EIS will be necessary. These normally take from 6 months to 1 year and cost an average of $1 million each, or more.

The proposed sites are located on territory subject to certain special regulatory programs. Specifically, they are in special management areas (SMAs) under the coastal zone management (CZM) law and community development districts under the authority of the Hawai‘i Community Development Authority.

To address the SMA program first, the coastal zone management law requires use approvals for construction in designated SMAs. The entirety of the Kaka‘ako site is within an SMA, and a small portion of the Barbers Point/Kalaeloa site contains SMA land. The State Office of Planning (OP) administers these permits and has approximately 6.5 months to review applications and make a decision. The fee is $200 per application. In addition to a use approval, the CZM law imposes a variance requirement to construct within the shoreline. The State OP has approximately 4 months to review and decide on these permits, which usually cost $200 each, but the fees are waived for state applications.

Community Development District requirements authorized the HCDA to promulgate rules for development in defined community development districts, including Kaka‘ako and Barbers Point/Kalaeloa. Those rules supplant any other authority for purposes of zoning. The rules in place require permits for development projects such as these, but they follow different processes for each district. The Kaka‘ako rules allow HCDA approximately 6.5 months to review and decide on development permits. The Barbers Point/Kalaeloa rules allow HCDA from under 1 month to approximately 6 months to review and decide on a permit, depending on the intensity and complexity level of the project. The cost for each of these applications is $20.

Once all discretionary permits are obtained, the developer would apply for the requisite building permits from the City and County of Honolulu Department of Permitting and Planning. To obtain these requires only complying with building codes and paying the fee according to the fee table. That fee will adjust according to the size of the project.

Section 106 of the National Historic Preservation Act is carried out by the State Historic Preservation Division (SHPD) of the Department of Land and Natural Resources (DLNR). It requires consultation with the SHPD to determine the extent of study and documentation needed to comply with the law. The process can be reasonably short if the SHPD determines limited study and mitigation are required, but it can also be extensive and expensive if SHPD determines greater study and mitigation efforts are necessary. It is important to note that SHPD will decide how the applicant will comply, and the applicant bears the cost of compliance efforts.

On the water side of the projects, the developer will have to comply on the federal level with the Clean Water Act, the Rivers and Harbors Act, the Coastal Zone Management Law, the Endangered Species Act, and the National Environmental Policy Act, as well as on the state level with the property rights of the state and the conservation district regime.

All land under the ocean from the shore to 3 miles out belongs to the State of Hawai‘i and has been classified as conservation district. These two statuses require the developer to gain regulatory permission to use the conservation district land and the

property right to use that land. The first requires applying for a Conservation District Use Approval (CDUA) from the DLNR Office of Coastal and Conservation Lands (OCCL). OCCL has 120 days to process the application at a cost of approximately $2,750 to the applicant. Only after a CDUA is approved can the developer seek the right to use the property from the state. The Land Division of the DLNR negotiates transfers of property rights from the state to other state entities or private parties. That process can take from 6 months to 2 years.

Complying with the Endangered Species Act requires consulting with the various natural resources agencies to obtain concurrence from each that appropriate measures are planned to address any threatened or endangered species potentially affected by the projects. This process can take 1 year but depends on whether the sites potentially impact listed species. Early consultation is recommended and can be facilitated and assisted by points of contact within the resources agencies.

The Clean Water Act prohibits the discharge of pollutants, including storm water runoff from constructions sites and dredged or fill material. The projects will require both a Section 402 NPDES permit for the storm water runoff from the construction sites and a Section 404 permit for the dredged material from the horizontal directional drilling. Hawai‘i Department of Health Clean Water Branch (CWB) administers the NPDES permit and previously had general permits available that would abbreviate the process, but they have lapsed and the CWB has not yet renewed them. Accordingly, the developer will have to apply for and receive an individual permit, the process for which can be approximately 11 months. The U.S. Army Corps of Engineers administers the Section 404 permits, and they issue nationwide permits for some activities for which these projects may qualify. The process requires the developer to apply for these nationwide permits, for which the Corps will either confirm they qualify or will deny them for not meeting the conditions set by the nationwide permits. If the projects do not qualify, then the Corps will process the applications for individual permits. Applicants for nationwide permits may begin work on the project if the Corps has not acted on the application within 45 days, but if they begin work and ultimately do not qualify for nationwide permits, they will face enforcement actions for the violations committed by beginning after the 45 day period and before receiving an individual permit. It has been recommended to frontload the work required for a nationwide permit, such as obtaining a Section 106 National Historic Preservation Act (NHPA) concurrence and a water quality certification, to accelerate the process.

The Corps will prepare the documents required to comply with the National Environmental Policy Act through developing an environmental assessment or environmental impact statement. Nationwide permits have already undergone this process, so if the projects qualify for those permits, the Corps will bear the cost of documenting that fact to comply with NEPA. If, however, the projects do not qualify for the nationwide

permits, then the applicant will bear the cost of a full EIS but not for an environmental assessment. The NEPA process timeframe and cost depends on the type of document required, an EA or an EIS. At the high end, a full EIS can take approximately 5 months and cost approximately $1 million dollars per statement.

Structures in U.S. waters require a permit from the Corps under Section 10 of the Rivers and Harbors Act. Some nationwide permits will satisfy both clean Water Act Section 404 and this requirement, but the Corps will consider and process the application for all permits it administers, including a determination of which are necessary. Accordingly, the two potential permits required from the Corps will be handled in the same application.

All of the preceding federal permits require obtaining two state-administered federal requirements. First, the developer will have to obtain a Clean Water Act Section 401 water quality certification from the state Department of Health Clean Water Branch. Second, the developer will have to obtain a coastal zone management consistency concurrence from the State Office of Planning. These two permissions are required prior to being granted all the federal permits described previously.

The Kakaʻako site requires all the permits in Figure 5-23, but the following factors indicate a potentially shorter timeframe and lower cost:

- Land that is predominantly fill material means lower likelihood of encountering historic preservation issues, leading to saved time and cost from reduced study and mitigation requirements.
- Ownership by HCDA should shorten the time for obtaining rights and provides an institutional expertise with the Hawaiʻi permitting system.
- Lack of beach area should mean fewer environmental degradation issues and less chance of encountering protected species.

Total potential cost and time for permitting at Kakaʻako Park is ~$1.13 million over the course of 28 months.

- **Total Effort Kaka'ako: Likely to cost $1.13 million over the course of 2.4 years to receive approval on 12-14 permits in scope.**
- **Total Effort Barbers Point: Likely to cost $1.13 million over the course of 2.4 years to receive approval on 13-15 permits in scope.**

Permits (# Needed)	Authority	Agency	Best Estimate Time	Cost	Gov.	Req.
State EIS	HRS Ch. 343	Governor/OEQC	Approx. 11 months	$500K+	State	Y
SMA Permit	HRS 205A – 21 et seq.	State OP	Approx. 6.5 months	$400	State	Y
SSV Permit	HRS 205A - 41 et seq.	City & County/DPP	Approx. 4 months	$400 (waived)	County	Y
Kaka'ako Community Development District Permit	HAR 15-23	HCDA	Approx. 6.5 months	$20	State	Y
Kalaeloa Community Development District Permit	HAR 15-215	HCDA	Approx. 6 months	$20	State	Y
Building Permits	Several, structure dependent	City & County/DPP/BD	Approx. 6 months	Approx. $125K	County	Y
Historic Review	Section 106 of NHPA (1) / HRS Ch. 6E (1)	USACE and SHPD	Approx. 4.5 months	$675-$2300	State	Y
Section 404 of CWA	33 CFR Parts 320-332	USACE	Approx. 1.5 years	$100	Federal	Y
Section 402 of CWA	33 CFR Parts 320-332	USACE	Approx. 11 months	$1,500	Federal	Y
Section 401 of CWA	33 USC §1341 / HAR 11-54	SDOH/CWB	Approx. 1.25 years	$1,150 +	State	Y
Section 10 of RHA	33 U.S.C. 403	USACE	Approx. 5.5. months	$100	Federal	Y
BLNR Right of Entry (Barber's Point ONLY)	HAR §13-221-35	DLNR	Approx. .5 month	$.10/per sq. ft. every 2 hours	State	Y
CDU Permit	HAR 13-5	DLNR-OCCL	Approx. 8 months	$2750	State	Y
CZM Consistency	HRS 205A	DBEDT-OP	Approx. 3 months	$0	State	Y
Endangered Species Review	Title 50 of CFR, ESA Sec. 7 / MMPA / HRS Ch. 195D	USFWS/NMFS, NOAA and DLNR/DOFAW	Approx. 12 months	$25	State, Federal	possibly
Federal EIS/NEPA	42 USC §§4321-4347	USACE/EPA/CEQ	Approx. 5 months	$500K+	Federal	Y
Special Activities Permit	HRS 187A - 6	DLNR/DAR	Approx. 2.5 months	$50	State	possibly

Figure 5-23 Relevant Permits for New CLSs

The Barbers Point site requires all the permits in Figure 5-23, but the following factors indicate a potentially longer timeframe and higher cost:

- Negotiating rights to the federally-owned land required for this site can be lengthy, and the cost of said rights or acquiring the site entirely can be high.
- Reclamation efforts by DoD may be costly and potentially add schedule delays.
- Beach area indicates a higher potential for environmental degradation issues and an impact on protected species, adding time and cost for consultation and mitigation.
- EPA Hazardous Waste site (with possible underground storage tank) is located at Chang Chow Properties (986 Valkenburgh Street, Honolulu) near potential CLS/cable route.

Total potential cost and time for permitting at Barbers Point is ~$1.13 million over the course of 28 months.

5.1.6.4 Resiliency Impact of Site Selection

The selection of two new landing sites on O'ahu would add significantly to the resilience of the Hawai'i submarine cable network against high to very high magnitude

natural or man-made disruptive forces. This would make it extremely difficult to isolate O'ahu. The second site mainly protects against intentional man-made events by well-resourced and highly sophisticated actors.

The resiliency of the Island of Hawai'i traffic and of the network as a whole would still remain poor against the more likely low to moderate magnitude disruptive force. See Section 5.5 for suggestions to improve resiliency.

5.2 RECOMMENDATION: ESTABLISH CLS CAPITAL IMPROVEMENT PROJECT

The State of Hawai'i has appropriated $20 million under Act 134(13), General Appropriations Act of 2013, Capital Improvement Project I.7, for "Transpacific landing stations, broadband infrastructure deployment, statewide - Plans, land acquisition, design, construction, equipment, to provide submarine trans-pacific cable landing stations, infrastructure improvements, and broadband infrastructure deployment improvements, statewide."[15] Act 134 (13) is also known as HB200 HD1 SD1 CD1.

DoD Hawai'i is identified as the expending Agency in Act 134 (13); however, it is JHU/APL understanding that the funds may be transferred to another state agency better positioned to lead, organize, and operationalize the capital improvement project. One candidate agency may be DBEDT, which oversees the HCDA. HCDA has responsibility for the redevelopment activities at Kaka'ako and Kalaeloa/Barbers Point.

This systems concept document and the related systems specifications documents developed under the current task support operationalizing Project I.7. JHU/APL recommends that a state project lead be identified, a project team formed, and a plan developed to execute the project.

5.3 RECOMMENDATION: START EARLY FOR LONG-LEAD ITEMS

There are numerous long-lead items that Hawai'i should pro-actively pursue to ensure HBI mission success. Due to the complexity and length of the permitting process, permitting activities should begin early. JHU/APL recommends consulting with permitting agencies and starting to prepare the application materials as soon as possible.

Providing a centralized or networked permitting structure could also speed the permitting process. Hawai'i is not the only state that vies for submarine cables to land on

[15] Neil Abercrombie, Governor of Hawai'i , Gov. Msg No. 1234, HB200 HD1 SD1 CD1, Relating to the State Budget, Act 134 (13), page 194. http://www.capitol.hawaii.gov/session2013/bills/GM1234_.PDF

its shores. On the West coast of the United States, California, Oregon, and Washington all compete for cables to land, but Oregon appears to be leading the way in submarine broadband cable permitting.

Oregon can permit a new cable in its waters in approximately 6 months. That includes acquiring an easement from the Oregon Department of State Lands (DSL) and a removal/fill permit from the U.S. Army Corps of Engineers and the Oregon DSL. Part of this efficiency comes from the use of a regulation written specifically for submarine cables, which requires meeting with state agencies before submitting an application to discuss routes, alternatives, and factors affecting cable installation. Another part of this efficiency is the common practice of conferring with the Oregon Fishermen's Cable Committee (OFCC) to determine the best route. The OFCC uses its expert knowledge of the terrain and the applicable laws and regulations (such as the presence of essential fish habitats or marine sanctuaries) to avoid complications. Also contributing to this efficiency is the use of statewide planning goals that define standards for use of ocean resources and land, with which state rules and actions must comply.

In a similar vein, Oregon also established a territorial sea plan that prescribes rules and policies for using the Oregon territorial sea and its resources, such as its sea floor. For instance, all cables must be buried along the length of the Oregon territorial sea floor. These elements, however, contribute exclusively to laying cables in the Oregon territorial sea.

The construction of an upland cable landing station is not affected by these, and a separate state agency, the Oregon Department of Parks and Recreation, regulates activities within the Oregon coastline. While separate permits and other approvals would be required for constructing a cable landing station upland from the shore and burying cable under the beach, efficiencies in the permitting process remain. Those efficiencies stem from the state's use of a networked regulatory scheme wherein local governments are required to create comprehensive land use plans and state agencies must be sure their policies, actions, and rules comply with those plans. In addition, environmental assessment of a proposed project is built into permit reviews; Oregon does not have an environmental policy act like HEPA or NEPA.

When it comes to regulating submarine cables, Oregon excels because it regulates the issue directly and coordinates well across state agencies and federal agencies. When it comes to regulating land use generally, Oregon has established a business friendly networked permitting system that relies on comprehensive and coordinate land use plans.

In addition to permitting, the state can begin to address the business case issues related to improving the broadband architecture. For instance, the state could consider

incentives to encourage broadband infrastructure changes to improve security and resiliency. Hawai‘i can make the case that businesses are likely to relocate to Hawai‘i based on expanded broadband capacity and the strategic location of the state to markets in Asia.

The sooner that new CLS contracts are awarded, the more likely it is that future submarine cable lines will land in the state.

Public-private partnerships (PPPs) are essential to the success of HBI. The public part can identify areas currently not advantageous for private industry to pursue and either eliminate the reason or incentivize the development to make the situation more advantageous. For HBI, permitting and land availability are two areas where PPPs can streamline the permitting and provide land that private companies can lease for a certain period of time.

5.4 RECOMMENDATION: ESTABLISH HAWAI‘I BROADBAND INITIATIVE MEGACOMMUNITY

Big challenges require big solutions. Big solutions necessitate an inclusive approach to build the digital society of the future. A broad approach (particularly government and business working in reciprocity) is necessary to fund, deploy, and operate new fiber-optic builds to achieve the goals of the HBI. A collaborative approach is likely to decrease cumulative costs, project duration, political sensitivities, and cultural obstacles

The recommended approach is to establish an HBI megacommunity, focused on achieving HBI, comprised of members from state government agencies, private investors, companies, and groups within civil society. The HBI megacommunity would be a standing group of high-level representatives from across all areas of Hawai‘i society to drive toward the goal of affordable ultra-high speed broadband for all citizens at affordable prices. Given its importance to the future well-being of Hawai‘i citizens, a group with a focused mandate to fulfill HBI should lay claim to moving this effort forward.

JHU/APL recommends that the HBI megacommunity be driven by a neutral, third-party umbrella organization, with an honest broker designated to spearhead efforts as project manager (PM). JHU/APL also recommends that this PM be familiar with the concerns of the local communities and interest groups throughout the state. JHU/APL believes it is best for the HBI megacommunity to leverage existing groups such as the Maui Economic Development Board and to come together in a series of forums and working group meetings throughout the process, with a primary emphasis on grassroots community outreach.

The megacommunity should focus on:

- Building community support for and reducing objections to the HBI projects;
- Streamlining permitting;
- Reviewing and, potentially, strengthening Hawai‘i cable protection laws;
- Potentially, allocating land to support secure landing sites; and
- Improving education and awareness across the state.

Consistent, responsive outreach is necessary to support permitting activities and overall goodwill in support of this project. From other permitting applications reviewed, it is clear that early and frequent community outreach can lessen the impact of various permit comment periods and speed up the deployment process across the State of Hawai‘i.

5.5 RECOMMENDATION: ACTIONS TO IMPROVE SECURITY AND RESILIENCY

Previously discussed was the need for a new set of CLSs to provide node diversity in each county in Hawai‘i and thus prevent one or two events (or coordinated attacks) from isolating entire counties and/or affecting a large fraction of the transpacific traffic. In this section, additional recommendations are made to improve the security and resiliency of the interisland and intraisland components of the Hawai‘i broadband network.

Figure 5-24 illustrates priorities for additional landing sites on neighbor islands. The figure shows (green circle) the two new CLSs the state has identified on O‘ahu. A new site on the Island of Hawai‘i (yellow circle) is the first priority beyond the two new O‘ahu sites. A new site on Maui is the second priority (orange circle). A new site on Kaua‘i is the third priority (red circle).

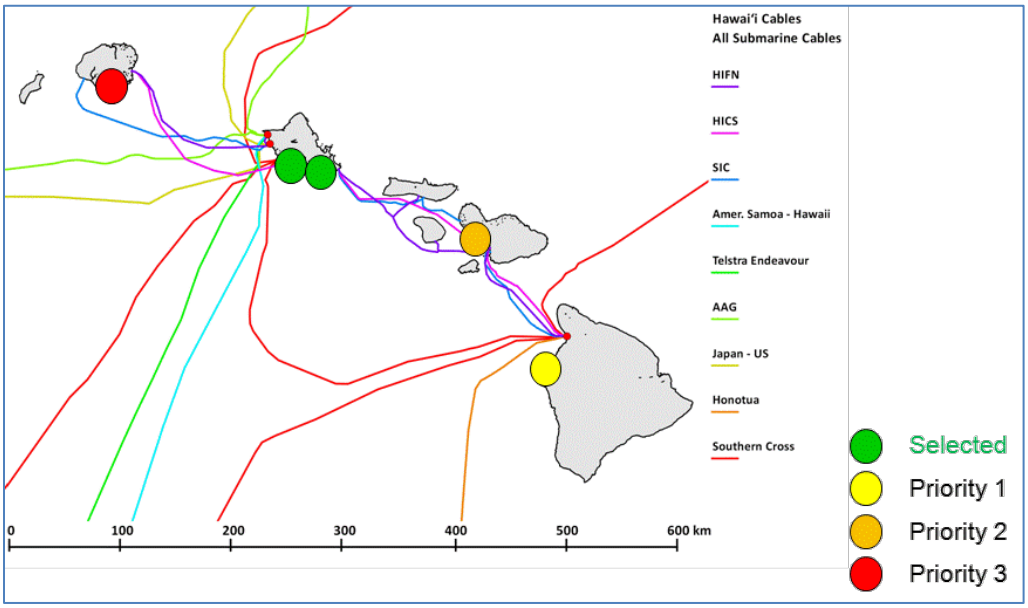

Figure 5-24 Consider Additional Landing Sites on Neighbor Islands

One or more interisland cables connecting new CLSs would increase the resiliency. New interisland cables would reduce the impact of failure at Spencer Beach and of simultaneous failures at Spencer Beach and Sandy Beach. These cables would also help improve the resiliency of the transpacific network by adding node and link diversity and providing additional backups.

The resiliency of submarine backhaul networks can be improved by burying cables and providing diverse routes between CLSs and multiple meet-me points.

Wherever possible, the intraisland backbone and backhaul networks should have enough connectivity to allow configuring interconnected rings. This implies that large spurs in Maui and Kaua‘i counties should be transformed into rings by adding fiber links. O‘ahu and Hawai‘i counties need relatively few additional fiber links to form self-healing rings.

Diverse routes (redundant links creating a ring or richer mesh) should be encouraged between CLSs and MMPs. Ideally, the links should have significant geographical separation. Where that is not feasible, the links should be on the opposite sides of roads. Remote monitoring technology should be considered for key chokepoints and vulnerable nodes, similar to that already employed at carrier central offices. Intraisland backbone links should be buried, where feasible.

Work to date has focused on the characterization of the resiliency of the Hawai‘i submarine cable network (up to the CLSs) against natural events, accidents, and malicious physical attacks and the improvement of resiliency due to adding new resilient landing

sites and transpacific cables. Several critical aspects of resiliency have not been studied. JHU/APL recommends additional analysis of these factors affecting the overall resiliency:

- Resilient interconnection of the Hawai‘i submarine cable network with the intraisland network;
  - Resilient connection between BMH and MMP so the backhaul does not remain a weak link.
  - Diversity in the interconnect network so the traffic from any service provider in an island can reach an MMP and then reach any CLS on that island.
    - This would allow simple preplanned rerouting in the event of a failure on one or more cable systems.
    - Ideally, a resilient network should be designed interconnecting all MMPs and all CLSs on an island to allow any MMP to any CLS connectivity, using other MMPs as via, if necessary.
- Desired additional interisland connectivity to maximize resiliency benefits of new landing sites and transpacific cable(s);
- Resiliency of supporting infrastructures (e.g., power) and their interconnections with the submarine cable network; and
- Resiliency against cyber operations.

5.6 NEAR-TERM NEXT STEPS

This section lists near-term next steps for which the state may need assistance to maintain momentum:

- Establish project(s) and related support structure for new CLSs
- Technical review of draft request for proposal (RFP) or request for quote (RFQ)
- Technical evaluation of RFP/RFQ responses
- Preparation of permit application material
- Desktop study/marine survey effort for planned new CLSs, including characterization of and remediation options for undersea hazard areas
- Select neighbor island sites
- Specify neighbor island landing stations
- Characterize requirements for landing in new CLS
- Characterize requirements for operator of new CLS
- Continue to meet with industry consortia
- Additional resiliency-related analysis

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APPENDIX A. REFERENCES

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APPENDIX B. ABBREVIATIONS AND ACRONYMS

2X	Twice the size
4G	Fourth generation of mobile phone mobile communications technology
5G	Fifth generation of mobile phone mobile communications technology
AFB	Air Force base
BMH	Beach manhole
CAGR	Compound annual growth rate
CDUA	Conservation District Use Application
CIP	Capital Improvement Project
CLS	Cable landing station
CONUS	Continental United States
CWB	Clean Water Branch
CZM	Coastal zone management
DBEDT	Department of Business, Economic Development, and Tourism
DHS	Department of Homeland Security
DLNR	Department of Land and Natural Resources
DoD	Department of Defense
DRF	DR Fortress
DSL	Digital subscriber line
EA	Environmental Assessment
EIS	Environmental Impact Statement
EOC	Emergency Operations Center
FDM	Frequency division multiplexing
FEC	Forward error correction
ft	Foot or feet
FTTP	Fiber-To-The-Premises
Gbps	Gigabits per second
HBI	Hawai‘i Broadband Initiative
HCDA	Hawai‘i Community Development Authority
HDD	Horizontal directional drilling
HDPE	High-density polyethylene
HEPA	Hawai‘i Environmental Policy Act
HFC	Hybrid fiber-coax
HI	Hawai‘i
HTDC	High Technology Development Corporation
IP	Internet protocol
IT	Information technology
JHU	Johns Hopkins University

JHU/APL	Johns Hopkins University/Applied Physics Laboratory
LOE	Level of effort
LTE	Long Term Evolution, a telephone and mobile broadband communications standard
LTE-A	LTE-Advanced
m	Meter
M	Million
Mbps	Megabits per second
MCBH	Marine Corps Base Hawai‘i
MMP	Meet-me point
MRTP	Maui Research and Technology Park
NAVFAC	Naval Facilities Engineering Command
NBCM	National Building Cost Manual
NE	Northeast
NELHA	Natural Energy Laboratory of Hawai‘i Authority
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NIPP	National Infrastructure Protection Plan
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System
NZ	New Zealand
OCCL	Office of Coastal and Conservation Lands
OP	Office of Planning
OTC	Ocean Thermal Energy Conversion
PFE	Power feed equipment
PM	Project manager
PMO	Project management office
PMRF	Pacific Missile Range Facility
PON	Passive Optical Network
PoP	Point of presence
PPP	Public-private partnership
QPSK	Quadrature phase shift keying
R&T	Research and Technology
RC-UH	Research Corporation of the University of Hawai‘i
RFP	Request for proposal
RFQ	Request for quote
ROADM	Reconfigurable Optical Add Drop Multiplexer
ROI	Return on investment
ROM	Rough order of magnitude
SE	Southeast

SHPD	State Historic Preservation Division
SLTE	Submarine line terminal equipment
SMA	Special Management Area
SONET	Synchronous optical networking
Tbps	Terabits per second
TW	Time Warner
U.S., US, or USA	United States of America
UH	University of Hawai‘i
UIC	Underground Injection Control
VTC	Video-teleconferencing
WiFi	Wireless fidelity
xDSL	Digital subscriber line; “x” signifies that there are various flavors of DSL

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NATIONAL SECURITY ANALYSIS DEPARTMENT

THE JOHNS HOPKINS UNIVERSITY • APPLIED PHYSICS LABORATORY
11100 Johns Hopkins Road, Laurel, Maryland 20723-6099

EXHIBIT A

GENERAL CONDITIONS

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1. Coordination of Services by the STATE. The head of the purchasing agency ("HOPA") (which term includes the designee of the HOPA) shall coordinate the services to be provided by the CONTRACTOR in order to complete the performance required in the Contract. The CONTRACTOR shall maintain communications with HOPA at all stages of the CONTRACTOR'S work, and submit to HOPA for resolution any questions which may arise as to the performance of this Contract. "Purchasing agency" as used in these General Conditions means and includes any governmental body which is authorized under chapter 103D, HRS, or its implementing rules and procedures, or by way of delegation, to enter into contracts for the procurement of goods or services or both.

2. Relationship of Parties: Independent Contractor Status and Responsibilities, Including Tax Responsibilities.

   a. In the performance of services required under this Contract, the CONTRACTOR is an "independent contractor," with the authority and responsibility to control and direct the performance and details of the work and services required under this Contract; however, the STATE shall have a general right to inspect work in progress to determine whether, in the STATE'S opinion, the services are being performed by the CONTRACTOR in compliance with this Contract. Unless otherwise provided by special condition, it is understood that the STATE does not agree to use the CONTRACTOR exclusively, and that the CONTRACTOR is free to contract to provide services to other individuals or entities while under contract with the STATE.

   b. The CONTRACTOR and the CONTRACTOR'S employees and agents are not by reason of this Contract, agents or employees of the State for any purpose, and the CONTRACTOR and the CONTRACTOR'S employees and agents shall not be entitled to claim or receive from the State any vacation, sick leave, retirement, workers' compensation, unemployment insurance, or other benefits provided to state employees.

   c. The CONTRACTOR shall be responsible for the accuracy, completeness, and adequacy of the CONTRACTOR'S performance under this Contract. Furthermore, the CONTRACTOR intentionally, voluntarily, and knowingly assumes the sole and entire liability to the CONTRACTOR'S employees and agents, and to any individual not a party to this Contract, for all loss, damage, or injury caused by the CONTRACTOR, or the CONTRACTOR'S employees or agents in the course of their employment.

   d. The CONTRACTOR shall be responsible for payment of all applicable federal, state, and county taxes and fees which may become due and owing by the CONTRACTOR by reason of this Contract, including but not limited to (i) income taxes, (ii) employment related fees, assessments, and taxes, and (iii) general excise taxes. The CONTRACTOR also is responsible for obtaining all licenses, permits, and certificates that may be required in order to perform this Contract.

   e. The CONTRACTOR shall obtain a general excise tax license from the Department of Taxation, State of Hawaii, in accordance with section 237-9, HRS, and shall comply with all requirements thereof. The CONTRACTOR shall obtain a tax clearance certificate from the Director of Taxation, State of Hawaii, and the Internal Revenue Service, U.S. Department of the Treasury, showing that all delinquent taxes, if any, levied or accrued under state law and the Internal Revenue Code of 1986, as amended, against the CONTRACTOR have been paid and submit the same to the STATE prior to commencing any performance under this Contract. The CONTRACTOR shall also be solely responsible for meeting all requirements necessary to obtain the tax clearance certificate required for final payment under sections 103-53 and 103D-328, HRS, and paragraph 17 of these General Conditions.

   f. The CONTRACTOR is responsible for securing all employee-related insurance coverage for the CONTRACTOR and the CONTRACTOR'S employees and agents that is or may be required by law, and for payment of all premiums, costs, and other liabilities associated with securing the insurance coverage.

g. The CONTRACTOR shall obtain a certificate of compliance issued by the Department of Labor and Industrial Relations, State of Hawaii, in accordance with section103D-310, HRS, and section 3-122-112, HAR, that is current within six months of the date of issuance.

h. The CONTRACTOR shall obtain a certificate of good standing issued by the Department of Commerce and Consumer Affairs, State of Hawaii, in accordance with section 103D-310, HRS, and section 3-122-112, HAR, that is current within six months of the date of issuance.

i. In lieu of the above certificates from the Department of Taxation, Labor and Industrial Relations, and Commerce and Consumer Affairs, the CONTRACTOR may submit proof of compliance through the State Procurement Office's designated certification process.

3. Personnel Requirements.

a. The CONTRACTOR shall secure, at the CONTRACTOR'S own expense, all personnel required to perform this Contract.

b. The CONTRACTOR shall ensure that the CONTRACTOR'S employees or agents are experienced and fully qualified to engage in the activities and perform the services required under this Contract, and that all applicable licensing and operating requirements imposed or required under federal, state, or county law, and all applicable accreditation and other standards of quality generally accepted in the field of the activities of such employees and agents are complied with and satisfied.

4. Nondiscrimination. No person performing work under this Contract, including any subcontractor, employee, or agent of the CONTRACTOR, shall engage in any discrimination that is prohibited by any applicable federal, state, or county law.

5. Conflicts of Interest. The CONTRACTOR represents that neither the CONTRACTOR, nor any employee or agent of the CONTRACTOR, presently has any interest, and promises that no such interest, direct or indirect, shall be acquired, that would or might conflict in any manner or degree with the CONTRACTOR'S performance under this Contract.

6. Subcontracts and Assignments. The CONTRACTOR shall not assign or subcontract any of the CONTRACTOR'S duties, obligations, or interests under this Contract and no such assignment or subcontract shall be effective unless (i) the CONTRACTOR obtains the prior written consent of the STATE, and (ii) the CONTRACTOR'S assignee or subcontractor submits to the STATE a tax clearance certificate from the Director of Taxation, State of Hawaii, and the Internal Revenue Service, U.S. Department of Treasury, showing that all delinquent taxes, if any, levied or accrued under state law and the Internal Revenue Code of 1986, as amended, against the CONTRACTOR'S assignee or subcontractor have been paid. Additionally, no assignment by the CONTRACTOR of the CONTRACTOR'S right to compensation under this Contract shall be effective unless and until the assignment is approved by the Comptroller of the State of Hawaii, as provided in section 40-58, HRS.

a. Recognition of a successor in interest. When in the best interest of the State, a successor in interest may be recognized in an assignment contract in which the STATE, the CONTRACTOR and the assignee or transferee (hereinafter referred to as the "Assignee") agree that:

(1) The Assignee assumes all of the CONTRACTOR'S obligations;

(2) The CONTRACTOR remains liable for all obligations under this Contract but waives all rights under this Contract as against the STATE; and

(3) The CONTRACTOR shall continue to furnish, and the Assignee shall also furnish, all required bonds.

b. Change of name. When the CONTRACTOR asks to change the name in which it holds this Contract with the STATE, the procurement officer of the purchasing agency (hereinafter referred to as the "Agency procurement officer") shall, upon receipt of a document acceptable or satisfactory to the

Agency procurement officer indicating such change of name (for example, an amendment to the CONTRACTOR'S articles of incorporation), enter into an amendment to this Contract with the CONTRACTOR to effect such a change of name. The amendment to this Contract changing the CONTRACTOR'S name shall specifically indicate that no other terms and conditions of this Contract are thereby changed.

c. Reports. All assignment contracts and amendments to this Contract effecting changes of the CONTRACTOR'S name or novations hereunder shall be reported to the chief procurement officer (CPO) as defined in section 103D-203(a), HRS, within thirty days of the date that the assignment contract or amendment becomes effective.

d. Actions affecting more than one purchasing agency. Notwithstanding the provisions of subparagraphs 6a through 6c herein, when the CONTRACTOR holds contracts with more than one purchasing agency of the State, the assignment contracts and the novation and change of name amendments herein authorized shall be processed only through the CPO's office.

7. Indemnification and Defense. The CONTRACTOR shall defend, indemnify, and hold harmless the State of Hawaii, the contracting agency, and their officers, employees, and agents from and against all liability, loss, damage, cost, and expense, including all attorneys' fees, and all claims, suits, and demands therefore, arising out of or resulting from the acts or omissions of the CONTRACTOR or the CONTRACTOR'S employees, officers, agents, or subcontractors under this Contract. The provisions of this paragraph shall remain in full force and effect notwithstanding the expiration or early termination of this Contract.

8. Cost of Litigation. In case the STATE shall, without any fault on its part, be made a party to any litigation commenced by or against the CONTRACTOR in connection with this Contract, the CONTRACTOR shall pay all costs and expenses incurred by or imposed on the STATE, including attorneys' fees.

9. Liquidated Damages. When the CONTRACTOR is given notice of delay or nonperformance as specified in paragraph 13 (Termination for Default) and fails to cure in the time specified, it is agreed the CONTRACTOR shall pay to the STATE the amount, if any, set forth in this Contract per calendar day from the date set for cure until either (i) the STATE reasonably obtains similar goods or services, or both, if the CONTRACTOR is terminated for default, or (ii) until the CONTRACTOR provides the goods or services, or both, if the CONTRACTOR is not terminated for default. To the extent that the CONTRACTOR'S delay or nonperformance is excused under paragraph 13d (Excuse for Nonperformance or Delay Performance), liquidated damages shall not be assessable against the CONTRACTOR. The CONTRACTOR remains liable for damages caused other than by delay.

10. STATE'S Right of Offset. The STATE may offset against any monies or other obligations the STATE owes to the CONTRACTOR under this Contract, any amounts owed to the State of Hawaii by the CONTRACTOR under this Contract or any other contracts, or pursuant to any law or other obligation owed to the State of Hawaii by the CONTRACTOR, including, without limitation, the payment of any taxes or levies of any kind or nature. The STATE will notify the CONTRACTOR in writing of any offset and the nature of such offset. For purposes of this paragraph, amounts owed to the State of Hawaii shall not include debts or obligations which have been liquidated, agreed to by the CONTRACTOR, and are covered by an installment payment or other settlement plan approved by the State of Hawaii, provided, however, that the CONTRACTOR shall be entitled to such exclusion only to the extent that the CONTRACTOR is current with, and not delinquent on, any payments or obligations owed to the State of Hawaii under such payment or other settlement plan.

11. Disputes. Disputes shall be resolved in accordance with section 103D-703, HRS, and chapter 3-126, Hawaii Administrative Rules ("HAR"), as the same may be amended from time to time.

12. Suspension of Contract. The STATE reserves the right at any time and for any reason to suspend this Contract for any reasonable period, upon written notice to the CONTRACTOR in accordance with the provisions herein.

a. Order to stop performance. The Agency procurement officer may, by written order to the CONTRACTOR, at any time, and without notice to any surety, require the CONTRACTOR to stop all or any part of the performance called for by this Contract. This order shall be for a specified

period not exceeding sixty (60) days after the order is delivered to the CONTRACTOR, unless the parties agree to any further period. Any such order shall be identified specifically as a stop performance order issued pursuant to this section. Stop performance orders shall include, as appropriate: (1) A clear description of the work to be suspended; (2) Instructions as to the issuance of further orders by the CONTRACTOR for material or services; (3) Guidance as to action to be taken on subcontracts; and (4) Other instructions and suggestions to the CONTRACTOR for minimizing costs. Upon receipt of such an order, the CONTRACTOR shall forthwith comply with its terms and suspend all performance under this Contract at the time stated, provided, however, the CONTRACTOR shall take all reasonable steps to minimize the occurrence of costs allocable to the performance covered by the order during the period of performance stoppage. Before the stop performance order expires, or within any further period to which the parties shall have agreed, the Agency procurement officer shall either:

(1) Cancel the stop performance order; or

(2) Terminate the performance covered by such order as provided in the termination for default provision or the termination for convenience provision of this Contract.

b. Cancellation or expiration of the order. If a stop performance order issued under this section is cancelled at any time during the period specified in the order, or if the period of the order or any extension thereof expires, the CONTRACTOR shall have the right to resume performance. An appropriate adjustment shall be made in the delivery schedule or contract price, or both, and the Contract shall be modified in writing accordingly, if:

(1) The stop performance order results in an increase in the time required for, or in the CONTRACTOR'S cost properly allocable to, the performance of any part of this Contract; and

(2) The CONTRACTOR asserts a claim for such an adjustment within thirty (30) days after the end of the period of performance stoppage; provided that, if the Agency procurement officer decides that the facts justify such action, any such claim asserted may be received and acted upon at any time prior to final payment under this Contract.

c. Termination of stopped performance. If a stop performance order is not cancelled and the performance covered by such order is terminated for default or convenience, the reasonable costs resulting from the stop performance order shall be allowable by adjustment or otherwise.

d. Adjustment of price. Any adjustment in contract price made pursuant to this paragraph shall be determined in accordance with the price adjustment provision of this Contract.

13. Termination for Default.

a. Default. If the CONTRACTOR refuses or fails to perform any of the provisions of this Contract with such diligence as will ensure its completion within the time specified in this Contract, or any extension thereof, otherwise fails to timely satisfy the Contract provisions, or commits any other substantial breach of this Contract, the Agency procurement officer may notify the CONTRACTOR in writing of the delay or non-performance and if not cured in ten (10) days or any longer time specified in writing by the Agency procurement officer, such officer may terminate the CONTRACTOR'S right to proceed with the Contract or such part of the Contract as to which there has been delay or a failure to properly perform. In the event of termination in whole or in part, the Agency procurement officer may procure similar goods or services in a manner and upon the terms deemed appropriate by the Agency procurement officer. The CONTRACTOR shall continue performance of the Contract to the extent it is not terminated and shall be liable for excess costs incurred in procuring similar goods or services.

b. CONTRACTOR'S duties. Notwithstanding termination of the Contract and subject to any directions from the Agency procurement officer, the CONTRACTOR shall take timely, reasonable, and

necessary action to protect and preserve property in the possession of the CONTRACTOR in which the STATE has an interest.

c. Compensation. Payment for completed goods and services delivered and accepted by the STATE shall be at the price set forth in the Contract. Payment for the protection and preservation of property shall be in an amount agreed upon by the CONTRACTOR and the Agency procurement officer. If the parties fail to agree, the Agency procurement officer shall set an amount subject to the CONTRACTOR'S rights under chapter 3-126, HAR. The STATE may withhold from amounts due the CONTRACTOR such sums as the Agency procurement officer deems to be necessary to protect the STATE against loss because of outstanding liens or claims and to reimburse the STATE for the excess costs expected to be incurred by the STATE in procuring similar goods and services.

d. Excuse for nonperformance or delayed performance. The CONTRACTOR shall not be in default by reason of any failure in performance of this Contract in accordance with its terms, including any failure by the CONTRACTOR to make progress in the prosecution of the performance hereunder which endangers such performance, if the CONTRACTOR has notified the Agency procurement officer within fifteen (15) days after the cause of the delay and the failure arises out of causes such as: acts of God; acts of a public enemy; acts of the State and any other governmental body in its sovereign or contractual capacity; fires; floods; epidemics; quarantine restrictions; strikes or other labor disputes; freight embargoes; or unusually severe weather. If the failure to perform is caused by the failure of a subcontractor to perform or to make progress, and if such failure arises out of causes similar to those set forth above, the CONTRACTOR shall not be deemed to be in default, unless the goods and services to be furnished by the subcontractor were reasonably obtainable from other sources in sufficient time to permit the CONTRACTOR to meet the requirements of the Contract. Upon request of the CONTRACTOR, the Agency procurement officer shall ascertain the facts and extent of such failure, and, if such officer determines that any failure to perform was occasioned by any one or more of the excusable causes, and that, but for the excusable cause, the CONTRACTOR'S progress and performance would have met the terms of the Contract, the delivery schedule shall be revised accordingly, subject to the rights of the STATE under this Contract. As used in this paragraph, the term "subcontractor" means subcontractor at any tier.

e. Erroneous termination for default. If, after notice of termination of the CONTRACTOR'S right to proceed under this paragraph, it is determined for any reason that the CONTRACTOR was not in default under this paragraph, or that the delay was excusable under the provisions of subparagraph 13d, "Excuse for nonperformance or delayed performance," the rights and obligations of the parties shall be the same as if the notice of termination had been issued pursuant to paragraph 14.

f. Additional rights and remedies. The rights and remedies provided in this paragraph are in addition to any other rights and remedies provided by law or under this Contract.

14. Termination for Convenience.

a. Termination. The Agency procurement officer may, when the interests of the STATE so require, terminate this Contract in whole or in part, for the convenience of the STATE. The Agency procurement officer shall give written notice of the termination to the CONTRACTOR specifying the part of the Contract terminated and when termination becomes effective.

b. CONTRACTOR'S obligations. The CONTRACTOR shall incur no further obligations in connection with the terminated performance and on the date(s) set in the notice of termination the CONTRACTOR will stop performance to the extent specified. The CONTRACTOR shall also terminate outstanding orders and subcontracts as they relate to the terminated performance. The CONTRACTOR shall settle the liabilities and claims arising out of the termination of subcontracts and orders connected with the terminated performance subject to the STATE'S approval. The Agency procurement officer may direct the CONTRACTOR to assign the CONTRACTOR'S right, title, and interest under terminated orders or subcontracts to the STATE. The CONTRACTOR must still complete the performance not terminated by the notice of termination and may incur obligations as necessary to do so.

c. Right to goods and work product. The Agency procurement officer may require the CONTRACTOR to transfer title and deliver to the STATE in the manner and to the extent directed by the Agency procurement officer:

(1) Any completed goods or work product; and

(2) The partially completed goods and materials, parts, tools, dies, jigs, fixtures, plans, drawings, information, and contract rights (hereinafter called "manufacturing material") as the CONTRACTOR has specifically produced or specially acquired for the performance of the terminated part of this Contract.

The CONTRACTOR shall, upon direction of the Agency procurement officer, protect and preserve property in the possession of the CONTRACTOR in which the STATE has an interest. If the Agency procurement officer does not exercise this right, the CONTRACTOR shall use best efforts to sell such goods and manufacturing materials. Use of this paragraph in no way implies that the STATE has breached the Contract by exercise of the termination for convenience provision.

d. Compensation.

(1) The CONTRACTOR shall submit a termination claim specifying the amounts due because of the termination for convenience together with the cost or pricing data, submitted to the extent required by chapter 3-122, HAR, bearing on such claim. If the CONTRACTOR fails to file a termination claim within one year from the effective date of termination, the Agency procurement officer may pay the CONTRACTOR, if at all, an amount set in accordance with subparagraph 14d(3) below.

(2) The Agency procurement officer and the CONTRACTOR may agree to a settlement provided the CONTRACTOR has filed a termination claim supported by cost or pricing data submitted as required and that the settlement does not exceed the total Contract price plus settlement costs reduced by payments previously made by the STATE, the proceeds of any sales of goods and manufacturing materials under subparagraph 14c, and the Contract price of the performance not terminated.

(3) Absent complete agreement under subparagraph 14d(2) the Agency procurement officer shall pay the CONTRACTOR the following amounts, provided payments agreed to under subparagraph 14d(2) shall not duplicate payments under this subparagraph for the following:

(A) Contract prices for goods or services accepted under the Contract;

(B) Costs incurred in preparing to perform and performing the terminated portion of the performance plus a fair and reasonable profit on such portion of the performance, such profit shall not include anticipatory profit or consequential damages, less amounts paid or to be paid for accepted goods or services; provided, however, that if it appears that the CONTRACTOR would have sustained a loss if the entire Contract would have been completed, no profit shall be allowed or included and the amount of compensation shall be reduced to reflect the anticipated rate of loss;

(C) Costs of settling and paying claims arising out of the termination of subcontracts or orders pursuant to subparagraph 14b. These costs must not include costs paid in accordance with subparagraph 14d(3)(B);

(D) The reasonable settlement costs of the CONTRACTOR, including accounting, legal, clerical, and other expenses reasonably necessary for the preparation of settlement claims and supporting data with respect to the terminated portion of the Contract and for the termination of subcontracts thereunder, together with reasonable storage, transportation, and other costs incurred in connection with the protection or disposition of property allocable to the terminated portion of this Contract. The total sum to be paid the CONTRACTOR under this subparagraph shall not exceed the

total Contract price plus the reasonable settlement costs of the CONTRACTOR reduced by the amount of payments otherwise made, the proceeds of any sales of supplies and manufacturing materials under subparagraph 14d(2), and the contract price of performance not terminated.

(4) Costs claimed, agreed to, or established under subparagraphs 14d(2) and 14d(3) shall be in accordance with Chapter 3-123 (Cost Principles) of the Procurement Rules.

15. Claims Based on the Agency Procurement Officer's Actions or Omissions.

a. Changes in scope. If any action or omission on the part of the Agency procurement officer (which term includes the designee of such officer for purposes of this paragraph 15) requiring performance changes within the scope of the Contract constitutes the basis for a claim by the CONTRACTOR for additional compensation, damages, or an extension of time for completion, the CONTRACTOR shall continue with performance of the Contract in compliance with the directions or orders of such officials, but by so doing, the CONTRACTOR shall not be deemed to have prejudiced any claim for additional compensation, damages, or an extension of time for completion; provided:

(1) Written notice required. The CONTRACTOR shall give written notice to the Agency procurement officer:

(A) Prior to the commencement of the performance involved, if at that time the CONTRACTOR knows of the occurrence of such action or omission;

(B) Within thirty (30) days after the CONTRACTOR knows of the occurrence of such action or omission, if the CONTRACTOR did not have such knowledge prior to the commencement of the performance; or

(C) Within such further time as may be allowed by the Agency procurement officer in writing.

(2) Notice content. This notice shall state that the CONTRACTOR regards the act or omission as a reason which may entitle the CONTRACTOR to additional compensation, damages, or an extension of time. The Agency procurement officer, upon receipt of such notice, may rescind such action, remedy such omission, or take such other steps as may be deemed advisable in the discretion of the Agency procurement officer;

(3) Basis must be explained. The notice required by subparagraph 15a(1) describes as clearly as practicable at the time the reasons why the CONTRACTOR believes that additional compensation, damages, or an extension of time may be remedies to which the CONTRACTOR is entitled; and

(4) Claim must be justified. The CONTRACTOR must maintain and, upon request, make available to the Agency procurement officer within a reasonable time, detailed records to the extent practicable, and other documentation and evidence satisfactory to the STATE, justifying the claimed additional costs or an extension of time in connection with such changes.

b. CONTRACTOR not excused. Nothing herein contained, however, shall excuse the CONTRACTOR from compliance with any rules or laws precluding any state officers and CONTRACTOR from acting in collusion or bad faith in issuing or performing change orders which are clearly not within the scope of the Contract.

c. Price adjustment. Any adjustment in the price made pursuant to this paragraph shall be determined in accordance with the price adjustment provision of this Contract.

16. Costs and Expenses. Any reimbursement due the CONTRACTOR for per diem and transportation expenses under this Contract shall be subject to chapter 3-123 (Cost Principles), HAR, and the following guidelines:

a. Reimbursement for air transportation shall be for actual cost or coach class air fare, whichever is less.

b. Reimbursement for ground transportation costs shall not exceed the actual cost of renting an intermediate-sized vehicle.

c. Unless prior written approval of the HOPA is obtained, reimbursement for subsistence allowance (i.e., hotel and meals, etc.) shall not exceed the applicable daily authorized rates for inter-island or out-of-state travel that are set forth in the current Governor's Executive Order authorizing adjustments in salaries and benefits for state officers and employees in the executive branch who are excluded from collective bargaining coverage.

17. Payment Procedures; Final Payment; Tax Clearance.

a. Original invoices required. All payments under this Contract shall be made only upon submission by the CONTRACTOR of original invoices specifying the amount due and certifying that services requested under the Contract have been performed by the CONTRACTOR according to the Contract.

b. Subject to available funds. Such payments are subject to availability of funds and allotment by the Director of Finance in accordance with chapter 37, HRS. Further, all payments shall be made in accordance with and subject to chapter 40, HRS.

c. Prompt payment.

(1) Any money, other than retainage, paid to the CONTRACTOR shall be disbursed to subcontractors within ten (10) days after receipt of the money in accordance with the terms of the subcontract; provided that the subcontractor has met all the terms and conditions of the subcontract and there are no bona fide disputes; and

(2) Upon final payment to the CONTRACTOR, full payment to the subcontractor, including retainage, shall be made within ten (10) days after receipt of the money; provided that there are no bona fide disputes over the subcontractor's performance under the subcontract.

d. Final payment. Final payment under this Contract shall be subject to sections 103-53 and 103D-328, HRS, which require a tax clearance from the Director of Taxation, State of Hawaii, and the Internal Revenue Service, U.S. Department of Treasury, showing that all delinquent taxes, if any, levied or accrued under state law and the Internal Revenue Code of 1986, as amended, against the CONTRACTOR have been paid. Further, in accordance with section 3-122-112, HAR, CONTRACTOR shall provide a certificate affirming that the CONTRACTOR has remained in compliance with all applicable laws as required by this section.

18. Federal Funds. If this Contract is payable in whole or in part from federal funds, CONTRACTOR agrees that, as to the portion of the compensation under this Contract to be payable from federal funds, the CONTRACTOR shall be paid only from such funds received from the federal government, and shall not be paid from any other funds. Failure of the STATE to receive anticipated federal funds shall not be considered a breach by the STATE or an excuse for nonperformance by the CONTRACTOR.

19. Modifications of Contract.

a. In writing. Any modification, alteration, amendment, change, or extension of any term, provision, or condition of this Contract permitted by this Contract shall be made by written amendment to this Contract, signed by the CONTRACTOR and the STATE, provided that change orders shall be made in accordance with paragraph 20 herein.

b. No oral modification. No oral modification, alteration, amendment, change, or extension of any term, provision, or condition of this Contract shall be permitted.

c. Agency procurement officer. By written order, at any time, and without notice to any surety, the Agency procurement officer may unilaterally order of the CONTRACTOR:

(A) Changes in the work within the scope of the Contract; and

(B) Changes in the time of performance of the Contract that do not alter the scope of the Contract work.

d. Adjustments of price or time for performance. If any modification increases or decreases the CONTRACTOR'S cost of, or the time required for, performance of any part of the work under this Contract, an adjustment shall be made and this Contract modified in writing accordingly. Any adjustment in contract price made pursuant to this clause shall be determined, where applicable, in accordance with the price adjustment clause of this Contract or as negotiated.

e. Claim barred after final payment. No claim by the CONTRACTOR for an adjustment hereunder shall be allowed if written modification of the Contract is not made prior to final payment under this Contract.

f. Claims not barred. In the absence of a written contract modification, nothing in this clause shall be deemed to restrict the CONTRACTOR'S right to pursue a claim under this Contract or for a breach of contract.

g. Head of the purchasing agency approval. If this is a professional services contract awarded pursuant to section 103D-303 or 103D-304, HRS, any modification, alteration, amendment, change, or extension of any term, provision, or condition of this Contract which increases the amount payable to the CONTRACTOR by at least $25,000.00 and ten per cent (10%) or more of the initial contract price, must receive the prior approval of the head of the purchasing agency.

h. Tax clearance. The STATE may, at its discretion, require the CONTRACTOR to submit to the STATE, prior to the STATE'S approval of any modification, alteration, amendment, change, or extension of any term, provision, or condition of this Contract, a tax clearance from the Director of Taxation, State of Hawaii, and the Internal Revenue Service, U.S. Department of Treasury, showing that all delinquent taxes, if any, levied or accrued under state law and the Internal Revenue Code of 1986, as amended, against the CONTRACTOR have been paid.

i. Sole source contracts. Amendments to sole source contracts that would change the original scope of the Contract may only be made with the approval of the CPO. Annual renewal of a sole source contract for services should not be submitted as an amendment.

20. Change Order. The Agency procurement officer may, by a written order signed only by the STATE, at any time, and without notice to any surety, and subject to all appropriate adjustments, make changes within the general scope of this Contract in any one or more of the following:

(1) Drawings, designs, or specifications, if the goods or services to be furnished are to be specially provided to the STATE in accordance therewith;

(2) Method of delivery; or

(3) Place of delivery.

a. Adjustments of price or time for performance. If any change order increases or decreases the CONTRACTOR'S cost of, or the time required for, performance of any part of the work under this Contract, whether or not changed by the order, an adjustment shall be made and the Contract modified in writing accordingly. Any adjustment in the Contract price made pursuant to this provision shall be determined in accordance with the price adjustment provision of this Contract. Failure of the parties to agree to an adjustment shall not excuse the CONTRACTOR from proceeding with the Contract as changed, provided that the Agency procurement officer promptly and duly makes the provisional adjustments in payment or time for performance as may be reasonable. By

proceeding with the work, the CONTRACTOR shall not be deemed to have prejudiced any claim for additional compensation, or any extension of time for completion.

b. Time period for claim. Within ten (10) days after receipt of a written change order under subparagraph 20a, unless the period is extended by the Agency procurement officer in writing, the CONTRACTOR shall respond with a claim for an adjustment. The requirement for a timely written response by CONTRACTOR cannot be waived and shall be a condition precedent to the assertion of a claim.

c. Claim barred after final payment. No claim by the CONTRACTOR for an adjustment hereunder shall be allowed if a written response is not given prior to final payment under this Contract.

d. Other claims not barred. In the absence of a change order, nothing in this paragraph 20 shall be deemed to restrict the CONTRACTOR'S right to pursue a claim under the Contract or for breach of contract.

21. Price Adjustment.

a. Price adjustment. Any adjustment in the contract price pursuant to a provision in this Contract shall be made in one or more of the following ways:

(1) By agreement on a fixed price adjustment before commencement of the pertinent performance or as soon thereafter as practicable;

(2) By unit prices specified in the Contract or subsequently agreed upon;

(3) By the costs attributable to the event or situation covered by the provision, plus appropriate profit or fee, all as specified in the Contract or subsequently agreed upon;

(4) In such other manner as the parties may mutually agree; or

(5) In the absence of agreement between the parties, by a unilateral determination by the Agency procurement officer of the costs attributable to the event or situation covered by the provision, plus appropriate profit or fee, all as computed by the Agency procurement officer in accordance with generally accepted accounting principles and applicable sections of chapters 3-123 and 3-126, HAR.

b. Submission of cost or pricing data. The CONTRACTOR shall provide cost or pricing data for any price adjustments subject to the provisions of chapter 3-122, HAR.

22. Variation in Quantity for Definite Quantity Contracts. Upon the agreement of the STATE and the CONTRACTOR, the quantity of goods or services, or both, if a definite quantity is specified in this Contract, may be increased by a maximum of ten per cent (10%); provided the unit prices will remain the same except for any price adjustments otherwise applicable; and the Agency procurement officer makes a written determination that such an increase will either be more economical than awarding another contract or that it would not be practical to award another contract.

23. Changes in Cost-Reimbursement Contract. If this Contract is a cost-reimbursement contract, the following provisions shall apply:

a. The Agency procurement officer may at any time by written order, and without notice to the sureties, if any, make changes within the general scope of the Contract in any one or more of the following:

(1) Description of performance (Attachment 1);

(2) Time of performance (i.e., hours of the day, days of the week, etc.);

(3) Place of performance of services;

(4) Drawings, designs, or specifications when the supplies to be furnished are to be specially manufactured for the STATE in accordance with the drawings, designs, or specifications;

(5) Method of shipment or packing of supplies; or

(6) Place of delivery.

b. If any change causes an increase or decrease in the estimated cost of, or the time required for performance of, any part of the performance under this Contract, whether or not changed by the order, or otherwise affects any other terms and conditions of this Contract, the Agency procurement officer shall make an equitable adjustment in the (1) estimated cost, delivery or completion schedule, or both; (2) amount of any fixed fee; and (3) other affected terms and shall modify the Contract accordingly.

c. The CONTRACTOR must assert the CONTRACTOR'S rights to an adjustment under this provision within thirty (30) days from the day of receipt of the written order. However, if the Agency procurement officer decides that the facts justify it, the Agency procurement officer may receive and act upon a proposal submitted before final payment under the Contract.

d. Failure to agree to any adjustment shall be a dispute under paragraph 11 of this Contract. However, nothing in this provision shall excuse the CONTRACTOR from proceeding with the Contract as changed.

e. Notwithstanding the terms and conditions of subparagraphs 23a and 23b, the estimated cost of this Contract and, if this Contract is incrementally funded, the funds allotted for the performance of this Contract, shall not be increased or considered to be increased except by specific written modification of the Contract indicating the new contract estimated cost and, if this contract is incrementally funded, the new amount allotted to the contract.

24. Confidentiality of Material.

a. All material given to or made available to the CONTRACTOR by virtue of this Contract, which is identified as proprietary or confidential information, will be safeguarded by the CONTRACTOR and shall not be disclosed to any individual or organization without the prior written approval of the STATE.

b. All information, data, or other material provided by the CONTRACTOR to the STATE shall be subject to the Uniform Information Practices Act, chapter 92F, HRS.

25. Publicity. The CONTRACTOR shall not refer to the STATE, or any office, agency, or officer thereof, or any state employee, including the HOPA, the CPO, the Agency procurement officer, or to the services or goods, or both, provided under this Contract, in any of the CONTRACTOR'S brochures, advertisements, or other publicity of the CONTRACTOR. All media contacts with the CONTRACTOR about the subject matter of this Contract shall be referred to the Agency procurement officer.

26. Ownership Rights and Copyright. The STATE shall have complete ownership of all material, both finished and unfinished, which is developed, prepared, assembled, or conceived by the CONTRACTOR pursuant to this Contract, and all such material shall be considered "works made for hire." All such material shall be delivered to the STATE upon expiration or termination of this Contract. The STATE, in its sole discretion, shall have the exclusive right to copyright any product, concept, or material developed, prepared, assembled, or conceived by the CONTRACTOR pursuant to this Contract.

27. Liens and Warranties. Goods provided under this Contract shall be provided free of all liens and provided together with all applicable warranties, or with the warranties described in the Contract documents, whichever are greater.

28. Audit of Books and Records of the CONTRACTOR. The STATE may, at reasonable times and places, audit the books and records of the CONTRACTOR, prospective contractor, subcontractor, or prospective subcontractor which are related to:

a. The cost or pricing data, and

b. A state contract, including subcontracts, other than a firm fixed-price contract.

29. Cost or Pricing Data. Cost or pricing data must be submitted to the Agency procurement officer and timely certified as accurate for contracts over $100,000 unless the contract is for a multiple-term or as otherwise specified by the Agency procurement officer. Unless otherwise required by the Agency procurement officer, cost or pricing data submission is not required for contracts awarded pursuant to competitive sealed bid procedures.

If certified cost or pricing data are subsequently found to have been inaccurate, incomplete, or noncurrent as of the date stated in the certificate, the STATE is entitled to an adjustment of the contract price, including profit or fee, to exclude any significant sum by which the price, including profit or fee, was increased because of the defective data. It is presumed that overstated cost or pricing data increased the contract price in the amount of the defect plus related overhead and profit or fee. Therefore, unless there is a clear indication that the defective data was not used or relied upon, the price will be reduced in such amount.

30. Audit of Cost or Pricing Data. When cost or pricing principles are applicable, the STATE may require an audit of cost or pricing data.

31. Records Retention.

(1) Upon any termination of this Contract or as otherwise required by applicable law, CONTRACTOR shall, pursuant to chapter 487R, HRS, destroy all copies (paper or electronic form) of personal information received from the STATE.

(2) The CONTRACTOR and any subcontractors shall maintain the files, books, and records that relate to the Contract, including any personal information created or received by the CONTRACTOR on behalf of the STATE, and any cost or pricing data, for at least three (3) years after the date of final payment under the Contract. The personal information shall continue to be confidential and shall only be disclosed as permitted or required by law. After the three (3) year, or longer retention period as required by law has ended, the files, books, and records that contain personal information shall be destroyed pursuant to chapter 487R, HRS or returned to the STATE at the request of the STATE.

32. Antitrust Claims. The STATE and the CONTRACTOR recognize that in actual economic practice, overcharges resulting from antitrust violations are in fact usually borne by the purchaser. Therefore, the CONTRACTOR hereby assigns to STATE any and all claims for overcharges as to goods and materials purchased in connection with this Contract, except as to overcharges which result from violations commencing after the price is established under this Contract and which are not passed on to the STATE under an escalation clause.

33. Patented Articles. The CONTRACTOR shall defend, indemnify, and hold harmless the STATE, and its officers, employees, and agents from and against all liability, loss, damage, cost, and expense, including all attorneys fees, and all claims, suits, and demands arising out of or resulting from any claims, demands, or actions by the patent holder for infringement or other improper or unauthorized use of any patented article, patented process, or patented appliance in connection with this Contract. The CONTRACTOR shall be solely responsible for correcting or curing to the satisfaction of the STATE any such infringement or improper or unauthorized use, including, without limitation: (a) furnishing at no cost to the STATE a substitute article, process, or appliance acceptable to the STATE, (b) paying royalties or other required payments to the patent holder, (c) obtaining proper authorizations or releases from the patent holder, and (d) furnishing such security to or making such arrangements with the patent holder as may be necessary to correct or cure any such infringement or improper or unauthorized use.

34. Governing Law. The validity of this Contract and any of its terms or provisions, as well as the rights and duties of the parties to this Contract, shall be governed by the laws of the State of Hawaii. Any action at law or in equity to enforce or interpret the provisions of this Contract shall be brought in a state court of competent jurisdiction in Honolulu, Hawaii.

35. Compliance with Laws. The CONTRACTOR shall comply with all federal, state, and county laws, ordinances, codes, rules, and regulations, as the same may be amended from time to time, that in any way affect the CONTRACTOR'S performance of this Contract.

36. Conflict Between General Conditions and Procurement Rules. In the event of a conflict between the General Conditions and the procurement rules, the procurement rules in effect on the date this Contract became effective shall control and are hereby incorporated by reference.

37. Entire Contract. This Contract sets forth all of the agreements, conditions, understandings, promises, warranties, and representations between the STATE and the CONTRACTOR relative to this Contract. This Contract supersedes all prior agreements, conditions, understandings, promises, warranties, and representations, which shall have no further force or effect. There are no agreements, conditions, understandings, promises, warranties, or representations, oral or written, express or implied, between the STATE and the CONTRACTOR other than as set forth or as referred to herein.

38. Severability. In the event that any provision of this Contract is declared invalid or unenforceable by a court, such invalidity or unenforceability shall not affect the validity or enforceability of the remaining terms of this Contract.

39. Waiver. The failure of the STATE to insist upon the strict compliance with any term, provision, or condition of this Contract shall not constitute or be deemed to constitute a waiver or relinquishment of the STATE'S right to enforce the same in accordance with this Contract. The fact that the STATE specifically refers to one provision of the procurement rules or one section of the Hawaii Revised Statutes, and does not include other provisions or statutory sections in this Contract shall not constitute a waiver or relinquishment of the STATE'S rights or the CONTRACTOR'S obligations under the procurement rules or statutes.

40. Pollution Control. If during the performance of this Contract, the CONTRACTOR encounters a "release" or a "threatened release" of a reportable quantity of a "hazardous substance," "pollutant," or "contaminant" as those terms are defined in section 128D-1, HRS, the CONTRACTOR shall immediately notify the STATE and all other appropriate state, county, or federal agencies as required by law. The Contractor shall take all necessary actions, including stopping work, to avoid causing, contributing to, or making worse a release of a hazardous substance, pollutant, or contaminant, and shall promptly obey any orders the Environmental Protection Agency or the state Department of Health issues in response to the release. In the event there is an ensuing cease-work period, and the STATE determines that this Contract requires an adjustment of the time for performance, the Contract shall be modified in writing accordingly.

41. Campaign Contributions. The CONTRACTOR is hereby notified of the applicability of 11-355, HRS, which states that campaign contributions are prohibited from specified state or county government contractors during the terms of their contracts if the contractors are paid with funds appropriated by a legislative body.

42. Confidentiality of Personal Information.

a. Definitions.

"Personal information" means an individual's first name or first initial and last name in combination with any one or more of the following data elements, when either name or data elements are not encrypted:

(1) Social security number;

(2) Driver's license number or Hawaii identification card number; or

(3) Account number, credit or debit card number, access code, or password that would permit access to an individual's financial information.

Personal information does not include publicly available information that is lawfully made available to the general public from federal, state, or local government records.

"Technological safeguards" means the technology and the policy and procedures for use of the technology to protect and control access to personal information.

b. Confidentiality of Material.

(1) All material given to or made available to the CONTRACTOR by the STATE by virtue of this Contract which is identified as personal information, shall be safeguarded by the CONTRACTOR and shall not be disclosed without the prior written approval of the STATE.

(2) CONTRACTOR agrees not to retain, use, or disclose personal information for any purpose other than as permitted or required by this Contract.

(3) CONTRACTOR agrees to implement appropriate "technological safeguards" that are acceptable to the STATE to reduce the risk of unauthorized access to personal information.

(4) CONTRACTOR shall report to the STATE in a prompt and complete manner any security breaches involving personal information.

(5) CONTRACTOR agrees to mitigate, to the extent practicable, any harmful effect that is known to CONTRACTOR because of a use or disclosure of personal information by CONTRACTOR in violation of the requirements of this paragraph.

(6) CONTRACTOR shall complete and retain a log of all disclosures made of personal information received from the STATE, or personal information created or received by CONTRACTOR on behalf of the STATE.

c. Security Awareness Training and Confidentiality Agreements.

(1) CONTRACTOR certifies that all of its employees who will have access to the personal information have completed training on security awareness topics relating to protecting personal information.

(2) CONTRACTOR certifies that confidentiality agreements have been signed by all of its employees who will have access to the personal information acknowledging that:

(A) The personal information collected, used, or maintained by the CONTRACTOR will be treated as confidential;

(B) Access to the personal information will be allowed only as necessary to perform the Contract; and

(C) Use of the personal information will be restricted to uses consistent with the services subject to this Contract.

d. Termination for Cause. In addition to any other remedies provided for by this Contract, if the STATE learns of a material breach by CONTRACTOR of this paragraph by CONTRACTOR, the STATE may at its sole discretion:

(1) Provide an opportunity for the CONTRACTOR to cure the breach or end the violation; or

(2) Immediately terminate this Contract.

In either instance, the CONTRACTOR and the STATE shall follow chapter 487N, HRS, with respect to notification of a security breach of personal information.

e. Records Retention.

(1) Upon any termination of this Contract or as otherwise required by applicable law, CONTRACTOR shall, pursuant to chapter 487R, HRS, destroy all copies (paper or electronic form) of personal information received from the STATE.

(2) The CONTRACTOR and any subcontractors shall maintain the files, books, and records that relate to the Contract, including any personal information created or received by the CONTRACTOR on behalf of the STATE, and any cost or pricing data, for at least three (3) years after the date of final payment under the Contract. The personal information shall continue to be confidential and shall only be disclosed as permitted or required by law. After the three (3) year, or longer retention period as required by law has ended, the files, books, and records that contain personal information shall be destroyed pursuant to chapter 487R, HRS or returned to the STATE at the request of the STATE.