ALA WAI ALTERNATIVES ANALYSIS

APPENDIX D:

EVALUATION MATRIX

Honolulu COMPLETE STREETS

ALA PONO
an Ala Wai crossing

MEMORANDUM

To: Dr. Nicola Szibbo, MCP, PhD

From: Dr. Drusilla van Hengel, PhD and Lauren Squires

Date: March 1, 2019

Subject: Ala Wai Crossing Alternatives Analysis – Evaluation Matrix Summary and Results

KEY FINDINGS

- A new crossing at University Avenue aligns most closely with the needs and goals of the community as established in the Purpose and Need document
- Public input favors a new crossing at University Avenue over other alternatives
- While improvements to existing crossings may improve conditions for people walking and bicycling, they do not enhance connectivity to the same degree as a new crossing
- Non-bridge alternatives including an aerial tram and aquabus offer unique features such as landmark quality but are costly in the long term and less efficient in terms of travel time and convenience
- Seeking a distinct visual form that minimizes impacts to views, a concrete arch bridge design type emerged as the most desirable and feasible alternative for a new bridge crossing of the canal.

THE EVALUATION MATRIX PROCESS

The Evaluation Matrix is derived from the Purpose and Need statement.[1] It is the culmination of the project team's evaluation of crossing alternatives for people walking and bicycling across the Ala Wai Canal (the canal). A variety of alternatives, including no-build, improvements to existing crossings, new bridge, and non-bridge options, were considered during the evaluation process. Alignments or crossing locations were evaluated as well as bridge design types. Evaluation metrics were selected based on their ability to assess an alternative's alignment with and satisfaction of the goals and needs expressed by the community.

Alternatives Evaluated

The Evaluation Matrix assessed the following alternatives for a new or improved crossing of the Ala Wai Canal for people walking or bicycling:

- No-Build
- Improvements to the Ala Moana Boulevard bridge
- Improvements to the Kalakaua Avenue bridge
- Improvements to the McCully Street bridge

[1] The Ala Wai Crossing Alternatives Analysis Purpose and Need Statements is included as an appendix to this document.

- A new bridge at the University Avenue alignment
- A new bridge in the vicinity of the Ala Wai Golf Course
- An aerial tram across the canal
- An aquabus across the canal
- A bicycle and pedestrian tunnel at the University Avenue alignment

Bridge design types evaluated for new bridge alternatives:

- Low-Profile Girder Bridge
- Steel Tied-Arch Bridge
- Concrete Cable-Stayed Bridge
- Concrete Tied-Arch Bridge
- Steel Lenticular Truss Bridge

Evaluation Matrix Development

The Evaluation Matrix is designed to capture the differences between alternatives across a range of primary needs as identified in the Purpose and Need statement. Each primary project need was assessed with one or more evaluation metrics selected based on available data, suitability, and ease of understanding.

In order to preserve a simple and consistent methodology, each metric was scored in terms of its relative alignment with stated needs, using scores ranging from 0-2. Each evaluation metric is supported by data-driven analysis to compare the benefits and impacts of each crossing alternative.

With all evaluation metrics selected, the project team weighted each metric according to its relative importance to overall project and community's needs. Public preference was given the strongest weighting to ensure that direct feedback from the community was adequately considered.

Purpose and Need

The seven primary goals identified for the project in the Purpose and Need Statement were the basis for the evaluation metric selection. Additional metrics were selected to evaluate alternative performance in the areas of public input, implementation, and potential environmental impacts. This resulted in a set of ten primary needs to be evaluated:

- **Complete Streets Connectivity:** The project must fulfill the need for expanded connectivity for people walking and bicycling between key destinations in the study area.
- **Travel Time and Convenience:** The project must improve travel times and convenience for people crossing the Ala Wai Canal by bike and foot.
- **Sustainable Mobility and Public Health:** The project must encourage the use of sustainable and active transportation modes in order to improve environmental and public health conditions in the study area.
- **Safety from Traffic:** The project must reduce the exposure of people walking and bicycling to high-crash locations and provide a low-crash link across the canal improving public safety for all and reducing the number of crashes in the study area.

- **Public Process Input:** The project must align with the preferences of the community as expressed throughout the public process associated with the project.
- **Vibrant Canal:** The project must bolster the economic vitality of the study area by creating a landmark character, bolstering public life and commercial activity in the area.
- **Affordable Access:** The project must serve the elderly, young and low income populations of Honolulu to provide lower cost transportation options for the people who need affordable alternatives the most and are most likely to walk or bike.
- **Non-Motorized Emergency Evacuation and Public Safety:** The project must enhance tsunami evacuation by foot or bicycle and create more foot traffic in the study area to enhance public safety through consistent on-street activity.
- **Implementation:** The project must be implementable with an achievable capital and operational cost as well as a reasonable design and construction time.
- **Potential Environmental Impacts:** The project must avoid and/or mitigate any potential environmental impacts including direct impacts to parks, residences, business properties, and other environmental, cultural, and historic resources.

Evaluation Metric Selection

Evaluation metrics were selected based on their ability to assess the relationship between study alternatives and the ten primary needs identified above. Some primary needs were assessed with multiple metrics in order to better capture the differences between alternatives.

Evaluation Matrix Scoring

All metrics were scored on a scale of 0 to 2, with 2 representing maximum satisfaction of the associated need and zero representing poor satisfaction of that need.

Evaluation Matrix Weighting

Raw scores were weighted according to the relative importance of each primary need. Metrics related to public process input were weighted highly due to the importance of satisfying that need. Complete street connectivity and traffic safety metrics were also weighted highly as improved connectivity and the comfort of people walking and bicycling are key goals of the project. Following weighting, the metric scores were summed to a final score ranging from 0 to 100, with 100 representing an alternative that perfectly satisfies all primary needs.

Bridge Alignment: Summary Findings

Completion of the evaluation matrix process yielded the following alternative rankings, in descending order:

1. New bicycle / pedestrian bridge at University Avenue (95 points)
2. New bicycle / pedestrian bridge at Ala Wai Golf Course (74 points)
3. New bicycle / pedestrian tunnel at University Avenue (58 points)
4. Improvements to the McCully Street bridge (51 points)
5. Improvements to the Kalakaua Avenue bridge (43 points)
6. Improvements to the Ala Moana Boulevard bridge (43 points)

7. Aquabus across the canal (26 points)
8. No-build (20 points)
9. Aerial tram across the canal (19 points)

While tunnels and trams have the potential to impact the use of park facilities adjacent to the canal, a crossing at the University Avenue alignment can avoid changing existing use of both the park facilities and the canal itself. It will not require piers or structural components to be placed in the canal and therefore does not need to impact recreational or other uses of the existing facility.

The Golf Course alignment for a bridge also offers strong connectivity, but is more expensive to implement and has greater potential for environmental impacts. The more difficult geometry of the potential Golf Course bridge is likely to require structural components which impact the use of the canal. It may also require reconfiguration of the Ala Wai Golf Course to accommodate the new structure.

Improvements to existing crossings scored well in terms of cost and environmental impacts, but did not offer the same degree of increased connectivity and improved travel times as the new connections.

Bridge Type: Summary Findings

In addition to evaluating alignment or crossing location alternatives, the project team also evaluated five bridge design types based on the goals and needs expressed by the community. Bridge types were also evaluated based on implementation and feasibility considerations in order to deliver a project within the desired timeframe and budget.

The bridges were evaluated against the following categories with the following weights:

- Operations & Maintenance (25%)
- Public Process Input (22%)
- Project Costs (15%)
- Environmental Impacts (14%)
- Structural Performance (10%)
- Constructability (5%)
- Geotechnical Performance (5%)
- Delineation & Access (4%)

Completion of the evaluation matrix process for the bridge design types yielded the following rankings:

1. Concrete Tied-Arch Bridge (82 points)
2. Concrete Cable-Stayed Bridge (77 points)
3. Steel Tied-Arch Bridge (66 points)
4. Steel Lenticular Truss Bridge (58 points)
5. Low-Profile Girder Bridge (Disqualified due to prerequisite of piers within the water)

Seeking a distinct visual form that minimizes impacts to views, the concrete tied-arch bridge design emerged as the most desirable and feasible alternative should a new bridge crossing of the canal be the preferred alternative. The cable-stayed alternative was not far behind as the runner up. Pros and cons of the primary bridge types reviewed are summarized below:

- **Arch bridge type**
  - Tagline: A bifurcated arch bridge balances a sense of openness and connection to the surrounding environment while maintaining a clear span across the canal with reduced impact to view corridors.
  - Pros: Maintains sense of openness, delineation between two-way travel, least amount of impact to view corridors while maintaining a clear span across canal (no piers in the water). Concrete will be easy to maintain.
  - Cons: Potential impact of view corridors, structural and geotechnical considerations
- **Cable-stayed bridge type**
  - Tagline: A concrete cable-stayed bridge maintains a sense of openness while creating visible landmark in the view corridor toward Diamondhead.
  - Pros: Sense of place/destination landmark, delineation for two-way travel, sense of openness, clear span over canal (no piers in the water)
  - Cons: Impacts views toward Diamondhead, geotechnical and structural considerations with cantilevered tower
- **Truss bridge type**
  - Tagline: While a steel lenticular truss bridge is visually interesting and implementable, it creates a sense of enclosure that disconnects people from the surrounding environment.
  - Pros: Visually interesting overhead bridge structure, Modern character, traditional bridge implementation
  - Cons: Sense of enclosure, lack of transparency disconnection from surrounding environment, steel difficult to maintain near salt water.

APPENDIX

Evaluation Metrics

The following list includes all selected evaluation metrics for the screening of crossing improvement alternatives and their corresponding weight in the evaluation process. Metrics are ordered by the total weight of all metrics within a category. Full details regarding analysis datasets and calculations are provided in the attached evaluation matrix.

Alternatives Evaluation Matrix

Public Process Input (22% total weight)

- Responses to question about preferred crossing alternative (22% weight)
  - *Source: Intercept and online survey feedback responses to date*

Complete Streets Connectivity (15% total weight)

- Expands the area accessible by walking and biking (5% weight)
  - *Source: Nelson\Nygaard's Analysis of Existing and Proposed Street Network*
- Expands the potential for walk and bike commuting (5% weight)
  - *Source: Nelson\Nygaard's Analysis of 2015 LEHD Commuter Data*
- Connects existing priority bicycle and pedestrian facilities (5% weight)
  - *Source: Nelson\Nygaard's Analysis of Existing and Proposed Street Network*

Travel Time and Convenience (10% total weight)

- Reduces travel times for people walking across the Ala Wai Canal (5% weight)
  - *Source: Google Maps Pedestrian Travel Times*
- Reduces travel times for people bicycling across the Ala Wai Canal (5% weight)
  - *Source: Google Maps Bicycle Travel Times*

Sustainable Mobility and Public Health (10% total weight)

- Increases sustainable transportation mode share in the study area (5% weight)
  - *Source: Nelson\Nygaard's Analysis of 2017 AirSage Mobility Data*
- Encourages physical activity (5% weight)
  - *Source: Nelson\Nygaard's Analysis of 2017 AirSage Mobility Data*

Safety from Traffic (10% total weight)

- Improves safety along high crash corridors (5% weight)
  - *Source: Nelson\Nygaard's Analysis of HIDOT Crash Data*
- Improves the safety and comfort of trips across the Ala Wai canal by bike or foot (5% weight)
  - *Source: Nelson\Nygaard's Bicycle and Pedestrian Level of Traffic Stress (LTS) Analysis of Existing and Future Network*

Implementation (10% total weight)

- Capital Cost (3% weight)
  - *Source: Nelson\Nygaard's Order of Magnitude Cost Estimates*
- Operational Cost (3% weight)
  - *Source: Nelson\Nygaard's Order of Magnitude Cost Estimates*
- Design and Construction time (2% weight)
  - *Source: Nelson\Nygaard's Order of Magnitude Cost Estimates*
- Ease of Implementation/Constructability (2% weight)
  - *Source: Nelson\Nygaard's Order of Magnitude Cost Estimates*

Potential Environmental Impacts (10% total weight)

- Potential Impacts to Section 4(f) properties (2% weight)
  - *Source: Nelson\Nygaard's Analysis of Section 4(f) protected properties*
- Number of potential impacted residential properties (direct) (2% weight)
  - *Source: Nelson\Nygaard's Analysis of Parcels Impacted by Alternatives*
- Number of potential impacted business properties (direct) (2% weight)
  - *Source: Nelson\Nygaard's Analysis of Parcels Impacted by Alternatives*
- Potential for indirect impacts to residential properties (2% weight)
  - *Source: Nelson\Nygaard's Analysis of Parcels Impacted by Alternatives*
- Potential for indirect impacts to businesses/community planning (2% weight)
  - *Source: Nelson\Nygaard's Analysis of Parcels Impacted by Alternatives*

Affordable Access (5% total weight)

- Serves the elderly population of Honolulu (2% weight)
  - *Source: Nelson\Nygaard's Analysis of US Census Age 65+ Population in Proposed Walk and Bikesheds*
- Serves the low income population and employees of Honolulu (3% weight)
  - *Source: Nelson\Nygaard's Analysis of US Census Low Income Population and Employees in Proposed Walk and Bikesheds*

Non-Motorized Emergency Evacuation and Public Safety (5% total weight)

- Improves tsunami evacuation routes and times by foot and bicycle (2.5% weight)
  - *Source: Nelson\Nygaard's Analysis of Proposed Walk and Bike Travel Times from Makai side to Tsunami Safe Zone*
- Improves foot and bike traffic to increase eyes on the street and public safety (2.5% weight)
  - *Source: Nelson\Nygaard's Analysis of 2017 AirSage Mobility Data*

Vibrant Canal (3% weight)

- Creates a landmark character or destination quality for the crossing (3% weight)

- *Source: Nelson\Nygaard's Analysis of Degree of Tourist Attraction, Aesthetic Qualities, and non-Bridge Design Factors*

Bridge Type Evaluation Matrix

Operations and Maintenance (25% total weight)

- Durability of bridge materials (10% weight)
  - *Source: Analysis of bridge materials durability*
- Ease of inspection and maintenance (10% weight)
  - *Source: Analysis of ease of component inspection and replacement*
- Total maintenance cost (5% weight)
  - *Source: Analysis of total maintenance cost including repainting, inspection, component repair and replacement, etc.*

Public Process Input (22% total weight)

- Expression: Transparency (4% weight)
  - *Source: Bridge profile analysis, low profile preferred*
- Purpose: Utility (2% weight)
  - *Source: Bridge utility analysis, utility preferred over public space*
- Sense of Enclosure: Open Feel Desired (4% weight)
  - *Source: Bridge sense of enclosure analysis, open feel preferred*
- Alignment: Straight Desired(2% weight)
  - *Source: Bridge profile analysis, straight profile preferred to curved profile*
- Deck Material Type: Concrete/Wood Desired (2% weight)
  - *Source: Bridge deck material analysis, concrete or wood deck preferred*
- Character: Modern (4% weight)
  - *Source: Bridge character analysis, modern character preferred to traditional*
- Preservation of view corridors (2% weight)
  - *Source: Bridge view corridors analysis*
- Creates a sense of place (2% weight)
  - *Source: Analysis of bridge aesthetic and place-making qualities*

Project Costs (15% total weight)

- Total initial cost (8% weight)
  - *Source: Bridge type cost estimates*
- Lower material escalation risk (3% weight)
  - *Source: Analysis of escalation risk, steel has greater escalation risk than concrete or wood*
- Lower perceived construction risk (4% weight)
  - *Source: Conventional structural systems and erection schemes are priced more competitively than non-standard schemes*

Environmental Impacts (14% total weight)

- Impacts to canal access (2% weight)

  - *Source: Clear spans preferred as canal access is not changed*
- Piers located within canal (12% weight)
  - *Source: US Army Corps of Engineers prefers a clear span across the canal with no piers within canal*

Structural Factors (10% total weight)

- Seismic performance (3% weight)
  - *Source: Base isolation system preferred for improved seismic performance*
- System redundancy (3% weight)
  - *Source: Safety analysis, redundant elements preferred*
- Superstructure depth (4% weight)
  - *Source: Thin superstructure preserve low profile walking and biking surface*

Geotechnical Factors (5% weight)

- Lower foundation risk (5% weight)
  - *Source: Foundation analysis, fewer foundations and vertical compressive forces are preferred*

Constructability (5% total weight)

- Overall constructability (3% weight)
  - *Source: Ease of constructability analysis*
- Ease of fabrication (2% weight)
  - *Source: Ease of fabrication analysis, standard sections preferred*

Delineation and Access (4% total weight)

- Separation of user types (2% weight)
  - *Source: Analysis of user type separation, more separation preferred*
- Access to bridge (2% weight)
  - *Source: Sufficiency of connection to Ala Wai Boulevard*

DRAFT Purpose & Need Statement (December 2018)

Purpose

The purpose of the project is to improve access for people travelling by foot or by bicycle across the Ala Wai Canal between Ala Moana Boulevard and the Manoa/Palolo Stream. The project's primary purpose is to improve multimodal network connectivity and enhance public safety for people walking and bicycling. The secondary purposes are to assure comfortable, sustainable mobility options that enhance economic vitality, environmental health, and social equity.

Need

Safety from Traffic

Travel time, safety, and convenience are the top three priorities 2018 Origin-Destination respondents cited when making the decision to walk or bike across the Ala Wai Canal.[2] A history of collisions involving people walking and bicycling on and near existing canal crossings indicates the need for an additional safe, comfortable, convenient crossing of the canal that reduces the travel time and exposure for people walking and bicycling. Between 2012 and 2016, seventeen car collisions involving people walking and bicycling were reported on the existing bridges.[3] O-D survey respondents agreed that existing bridges over the canal have a lot of traffic congestion (79%).[4] Consistent with Complete Streets Objective 1 to improve safety[5], respondents who bike, walk or scooter strongly agreed that the existing facilities are unsafe (76%), uncomfortable (65%) and out of the way (67%).[6]

Improved Non-Motorized Emergency Evacuation and Public Safety

All evacuation routes out of Waikiki today rely on three existing vehicle bridges (Ala Moana, McCully and Kalakaua) concentrated on the west end of the neighborhood. Waikiki hosts 32,000 regular employees and 26 million visitors annually.[7] Evacuation options by foot and by bike for both residents and tourists are imperative in the event of a tsunami or emergency. A new walking and bicycling connection bisecting the 1.33 mile Ala Wai Canal can serve as an alternative evacuation route out of Waikiki in the event of a hazardous situation.

Complete Streets Connectivity

Identified by the Waikiki Regional Circulator Study (2013) as a significant barrier in Honolulu's multimodal transportation network, the Ala Wai Canal between McCully Street and Kapahulu Avenue decreases pedestrian and bicycle connectivity between Waikiki and McCully-Moiliili neighborhoods. In line with Complete Streets Objectives 3 and 4 to protect and promote accessibility and mobility for all and balance the needs and comfort of all users[8], over half of the O-D survey respondents indicated "lack of connections" and "poor infrastructure" as barriers that kept them from biking or walking more often across the canal.

Travel Time and Convenience

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[2]. Ala Pono Origin-Destination Intercept and Online Survey Responses, 2018 https://www.honolulu.gov/completestreets/alapono

[3] Ala Wai Advanced Project Planning Report for Potential Improvements to Route No. 7710 (Ala Wai Boulevard) from the Waikiki, Ala Moana, and McCully/Moiliili neighborhoods in Honolulu, 2018

[4] Ala Pono Origin-Destination Intercept and Online Survey Responses, 2018 https://www.honolulu.gov/completestreets/alapono

[5] Revised Ordinances of Honoulu 14-33.2 Complete Streets Policy; principles, https://www.honolulu.gov/rep/site/ocs/roh/ROH_Chapter_14a20__33.pdf

[6] Ibid.

[7] Waikiki Business Improvement District, (2010) Profile of Waikiki, http://www.waikikibid.org/waikikiprofile.htm

[8] Revised Ordinances of Honoulu 14-33.2 Complete Streets Policy; principles, https://www.honolulu.gov/rep/site/ocs/roh/ROH_Chapter_14a20__33.pdf

The 2018 O-D survey indicated that travel time and convenience are key factors influencing people's travel decisions: 75% of people responding to the survey identified travel time as a top travel priority and 57% selected convenience.[9] A new crossing of the Ala Wai Canal could save 20 minutes of travel time for people on foot and 10 minutes for travelers by bike.[10]

Environmental and Public Health

The 2018 O-D survey indicated that people walking and bicycling represent 65% of travelers who cross the canal most frequently (several times a day).[11] A more direct connection for people walking and biking will support Honolulu's progress toward Complete Streets Objective 7, which encourages opportunities for physical activity[12] . Additionally, enhancing the comfort and convenience of active travel modes increases public health as it supports higher levels of physical activity, mitigating chronic disease and obesity. Further, improving the walking and bicycling connection across the canal meets Complete Streets Objective 6 energy efficiency in travel[13], in addition to the Mayor's Directive on Climate Change and Sea Level Rise which mandates proactive solutions to reduce fossil fuel greenhouse gas emissions.[14]

Vibrant Canal

The areas within a convenient walking and biking distance of Central Waikiki with a new crossing over the Ala Wai Canal[15] host 96,000 residents[16], 87,000 employees[17], and 23,000 students[18]. The appearance and experience of the canal plays a role in not only the quality of life of these surrounding areas but also in Waikiki's role as a world-class destination attracting 26 million visitors annually.[19] Bolstering the economic vibrancy and environmental vitality of the Ala Wai Canal with quicker, attractive access to destinations and public space will enhance the canal as a regional destination.

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[9] Ala Pono Origin-Destination Intercept and Online Survey Responses, 2018 https://www.honolulu.gov/completestreets/alapono

[10] Ibid.

[11] Ibid.

[12] Revised Ordinances of Honoulu 14-33.2 Complete Streets Policy; principles, https://www.honolulu.gov/rep/site/ocs/roh/ROH_Chapter_14a20__33.pdf

[13] Ibid.

[14] Mayor Kirkwell City-Wide Directive on Climate Change, July 16, 2018, https://static1.squarespace.com/static/59af5d3cd7bdce7aa5c3e11f/t/5b725bcdaa4a998f8502eb4f/1534221263208/Mayor%27s+Directive+18-02.pdf

[15] Walk and Bikeshed Analysis, Ala Pono Kickoff Presentation, 2018, https://www.honolulu.gov/completestreets/alapono

[16] 2010 United States Census, Census Tracts in Waikiki Bikeshed, Table QT-P1, https://factfinder.census.gov/

[17] 2015 LEHD (Longitudinal Employer-Household Dynamics) Origin-Destination Employment Statistics, Block groups in Waikiki Bikeshed, https://lehd.ces.census.gov/data/

[18] 2010 United States Census, Census Tracts in Waikiki Bikeshed, Table QT-P1, https://factfinder.census.gov/

[19] Waikiki Business Improvement District, (2010) Profile of Waikiki, http://www.waikikibid.org/waikikiprofile.htm

Affordable Access

Upwards of 25% of Waikiki, McCully, and Moiliili residents do not own a car and regularly commute by means other than a private automobile.[20] Additionally, these neighborhoods are home to relatively high proportions of transportation marginalized residents, with 17% of residents over 65 years of age[21] and 7% of households living under the poverty level[22]. In Hawaii, the poverty level for a family of three is $23,900. With housing costs averaging at 36% of income and transportation costs at 14%[23], many low-income Honolulu residents experience affordability challenges. Increasing the convenience and comfort of walking and bicycling for residents around the canal provides lower cost transportation options for people who would benefit the most and are most likely walk or bike.

[20] OahuMPO 2017-2020 Transportation Alternatives Program, Ala Wai Pedestrian and Bicycle Safety and Mobility Project Application, https://www.oahumpo.org/2017-2020-transportation-alternatives-program/

[21] 2010 United States Census, Census Tracts in Waikiki Bikeshed, Table QT-P1, https://factfinder.census.gov/

[22] 2016 American Community Survey 5-year estimates, United States Census, Census Tracts in Waikiki Bikeshed, Table S1903, https://factfinder.census.gov/

[23] Bureau of Labor Statistics, Consumer Expenditures for the Honolulu Metropolitan Area: 2015-2016 https://www.bls.gov/regions/west/news-release/2017/pdf/consumerexpenditures_honolulu_20171205.pdf

Ala Wai Alternatives Analysis - Alternatives Screening Criteria

March 1, 2019

ALA PONO
an Ala Wai crossing

			Primary Study Area Alternatives												
			No Build	**Improvements to Existing Structures Alternatives**	Improvements to the Ala Moana Boulevard Bridge	Improvements to the Kalakaua Avenue Bridge	Improvements to the McCully Street Bridge	**New Build Alternatives**	New Bicycle/Pedestrian Bridge aligned with University Ave	New Bicycle/Pedestrian Bridge in Vicinity of the Ala Wai Golf Course	**Other Alternatives**	Aerial Tram	Aquabus	Bicycle/Pedestrian Tunnel	
			1	**2**	**2A**	**2B**	**2C**	**3**	**3A**	**3B**	**4**	**4A**	**4B**	**4C**	
		TOTAL SCORE (MAX = 100)	**20**		**43**	**43**	**51**		**95**	**74**		**19**	**26**	**58**	
ADDRESSES THE FOLLOWING NEEDS:	**WEIGHT**	**MEASUREMENT**													**METRIC/METHOD**
Complete Streets Connectivity	15%		0		8	10	10		15	10		0	0	15	
Expands the area accessible by walking and biking	5%	High = 2, Med.=1, Low = 0	0		1	1	1		2	2		0	0	2	*Additional land area of walk and bike sheds*
Expands the potential for walk and bike commuting	5%	High = 2, Med.=1, Low = 0	0		1	1	1		2	2		0	0	2	*Number of additional commute trips possible by foot or bike*
Connects existing priority bicycle and pedestrian facilities	5%	High = 2, Med.=1, Low = 0	0		1	2	2		2	0		0	0	2	*Connections between existing priority walk and bike corridors*
Travel Time and Convenience	10%		0		0	0	0		10	10		0	0	10	
Reduces travel times for people walking across the Ala Wai Canal	5%	High = 2, Med.=1, Low = 0	0		0	0	0		2	2		0	0	2	*Decreased pedestrian travel times to and from key activity centers on both sides of the canal*
Reduces travel times for people bicycling across the Ala Wai Canal	5%	High = 2, Med.=1, Low = 0	0		0	0	0		2	2		0	0	2	*Decreased bicycle travel times to and from key activity centers on both sides of the canal*
Enhance Sustainable Mobility and Improve Public Health	10%		0		5	5	5		10	10		0	0	10	
Increases sustainable transportation mode share in the study area	5%	High = 2, Med.=1, Low = 0	0		1	1	1		2	2		0	0	2	*Person trips accessible within 20 minutes by bike and 10 minutes by walking (trip capture)*
Encourages physical activity	5%	High = 2, Med.=1, Low = 0	0		1	1	1		2	2		0	0	2	*Active person trips accessible within 20 minutes by bike and 10 minutes by walking (trip capture)*
Safety from Traffic	10%		0		8	5	3		10	8		8	8	8	
Improves safety along high crash corridors	5%	High = 2, Med.=1, Low = 0	0		1	0	0		2	1		2	2	2	*Minimzes exposure to high-crash locations, provides a low-crash link for people walking and bicycling across the canal*
Improves the safety and comfort of trips across the Ala Wai Canal by bike or foot	5%	High = 2, Med.=1, Low = 0	0		2	2	1		2	2		1	1	1	*Change in Level of Traffic Stress or Comfort Index for people walking and biking*
Public Process Input	22%		0		0	0	11		22	11		0	0	0	
Intercept and online survey feedback responses to date	22%	High = 2, Med.=1, Low = 0	0		0	0	1		2	1		0	0	0	*Feedback on alternative from previous online and intercept survey*
Vibrant Canal	3%		0		2	2	2		3	3		3	3	0	
Creates a landmark character or destination quality for the crossing	3%	High = 2, Med.=1, Low = 0	0		1	1	1		2	2		2	2	0	*Landmark character (degree of tourist attraction, non-bridge design factors)*
Affordable Access	5%		0		0	0	0		5	5		5	5	5	
Serves the elderly population of Honolulu	2%	High = 2, Med.=1, Low = 0	0		0	0	0		2	2		2	2	2	*Population over 65 years old and under 18 years old served by new crossing in walk or bike sheds*
Serves low income population and employees of Honolulu	3%	High = 2, Med.=1, Low = 0	0		0	0	0		2	2		2	2	2	*Population below the poverty line served by new crossing in walk or bike sheds; Employees earning less than $1,250/month served by new crossing*
Improved Non-Motorized Emergency Evacuation and Public Safety	5%		0		1	1	1		5	5		1	1	3	
Improves tsunami evacuation routes and times by foot and bicycle	2.5%	High = 2, Med.=1, Low = 0	0		0	0	0		2	2		0	0	0	*Decrease in walk/bike travel time from Makai side tsunami safe zone*
Improves foot and bike traffic to increase eyes on the street and public safety	2.5%	High = 2, Med.=1, Low = 0	0		1	1	1		2	2		1	1	2	*Potential additional eyes on the street, crime reduction (based on ridership forecast)*
Implementation	10%		10		10	10	10		7	4		0	1	3	
Capital Cost ($)	3%	Low=2, Med.= 1, High = 0	2		2	2	2		1	0		0	0	0	*Estimated construction cost*
Operational Cost ($) - (for transportation infrastructure only)	3%	Low=2, Med.= 1, High = 0	2		2	2	2		2	2		0	0	2	*Estimated operational cost over time*
Design and Construction time	2%	Low=2, Med.= 1, High = 0	2		2	2	2		1	1		0	0	0	*Estimated construction time*
Ease of Implementation/Constructability	2%	Ease = 2, Neutral =1, Difficult. = 0	2		2	2	2		1	0		0	1	0	*Constructability*
Potential Environmental Impacts	10%		10		10	10	10		8	8		2	8	5	
Potential Impacts to Section 4(f) properties	2%	No Impact = 2, Deminimus=1, Direct=0	2		2	2	2		1	1		1	1	1	*Section 4(f) properties*
Number of potential impacted residential properties (direct)	2%	Low=2, Med.= 1, High = 0	2		2	2	2		2	2		0	2	1	*Impacted residential properties*
Number of potential impacted business properties (direct)	2%	Low=2, Med.= 1, High = 0	2		2	2	2		2	2		0	2	1	*Impacted business properties*
Potential for indirect impacts to residential properties	2%	Low=2, Med.= 1, High = 0	2		2	2	2		1	1		0	1	1	*Indirect impacts to resident properties*
Potential for indirect impacts to businesses/community planning	2%	Low=2, Med.= 1, High = 0	2		2	2	2		2	2		1	2	1	*Indirect impacts to resident properties*

Ala Wai Alternatives Analysis - Bridge Type Screening Criteria

March 1, 2019

		University St Crossing Alternatives					
		Type 1	Type 2	Type 3	Type 4	Type 5	
		Concrete Beam	Steel Arch - Network	Concrete Cable-Stayed	Concrete Arch - Bifurcated	Steel Lenticular Truss	
TOTAL SCORE (MAX = 100)		**76**	**66**	**77**	**82**	**58**	
EVALUATION CRITERIA	**WEIGHT**						**NOTES ON CRITERIA**
Project Costs	15%	15	9	11	10	7	
Total Initial Cost	8%	8	5	6	5	4	*Estimated upfront cost*
Lower Material Escalation Risk	3%	3	1	3	3	1	*Steel carries a higher escalation risk than concrete or wood*
Low Perceived Construction Risk	4%	4	3	2	2	2	*A more conventional structural system or erection scheme will be more competitively priced by Contractors*
Environmental Impacts	14%	0	12	12	12	12	
Canal	2%	0	2	2	2	2	*A clear span will provide unimpeded access while piers in the water restrict navigation*
No piers within canal	12%	0	10	10	10	10	*USACE has stated they prefer a clear span across the canal*
Public Process Input	22%	19	18	19	20	12	
1) Expression: Transparency	4%	4	3	3	3	1	*Range: (Low Profile STRONGLY PREFERRED < > Intense)*
2) Purpose: Utility	2%	2	2	2	2	1	*Range: (Utility PREFERRED < > Public Space)*
3) Sense of Enclosure: Open Feel Desired	4%	4	2	3	3	0	*Range: (Open STRONGLY PREFERRED < > Enclosed)*
4) Alignment: Straight Desired	2%	2	2	2	2	2	*Range: (Straight STRONGLY PREFERRED < > Curved)*
5) Deck Material Type: Concrete/Wood Desired	2%	2	2	2	2	2	*Range: (Wood PREFERRED > Concrete PREFERRED > Glass)*
6) Character: Modern	4%	2	4	4	4	3	*Range: (Traditional < > Modern PREFERRED)*
Preservation of view corridors	2%	2	1	1	2	1	
Creates a sense of place	2%	1	2	2	2	2	
Delineation & Access	4%	3	3	4	4	3	
Separation of user types	2%	1	1	2	2	1	*Is clear separation possible?*
Access to bridge	2%	2	2	2	2	2	*Ala Wai Blvd connection and can the form accomodated a shifted alignment*
Geotechnical	5%	3	5	2	5	5	
Lower foundation risk	5%	3	5	2	5	5	*Fewer foundations and vertical compressive forces are most desirable*
Structural	10%	7	10	7	9	10	
Seismic Performance	3%	3	3	1	3	3	*Can a base isolation system be employed*
System Redundancy	3%	3	3	2	2	3	*Increased safety with redundant structural elements*
Superstructure depth	4%	1	4	4	4	4	*Can a thin superstructure be used to keep the walking surface profile as low as possible*
Constructability	5%	5	3	3	2	3	
Constructability	3%	3	2	2	1	2	*How easy will it be to construct the structure be built across the channel?*
Ease of Fabrication/Erection	2%	2	1	1	1	1	*How easy is the system conceived to be fabricated; does it use standard sections?*
Operations & Maintenance	25%	24	6	19	20	6	
Low Total Maintenance Cost	5%	5	1	4	4	1	*Repainting and inspection increase costs*
Durability	10%	9	2	8	9	2	*Material selection influences this - preference is for concrete?*
Ease of Inspection/Maintenance	10%	10	3	7	7	3	*How easy is it to inspect the components and also maintain them?*