Waihe'e Shuttle Feasibility Study
Rural Alternative Transportation Systems

Volume 1, Technical Report

Prepared for
Department of Transportation

County of Maui

March 23, 2018

DanTec Associates

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Executive Summary

This report examines the feasibility of a transit service for the Waihe'e region of Maui and develops a framework for rural public transportation for other areas of Maui. The first phase of the study develops a demand estimate for a service in the Waihe'e region that meets the community's needs. That study was supported by a survey of residents conducted to identify existing travel behavior and local demographics. The demand for transit was estimated by using four different methodologies. The second phase developed service alternatives to meet the demand identified in the first phase. Cost and revenue estimates were prepared to evaluate the alternatives. A community meeting was held on February 12, 2018, to review the alternatives and select a preferred service approach that could be refined by the consultant team and applied in other rural areas.

The community of Waihe'e is predominately a Hawaiian Homelands settlement area on the Northwest coast of Maui. The nearest existing transit service is the Wailuku Loop bus route that serves Wai'ehu Heights. The 2016 Maui Short-Range Transit Plan proposed a Waihe'e Villager route 8 to serve the community and adjacent Oceanview Estates, but the route was not implemented because of funding constraints by the Maui County Council.

To gain a better understanding of the travel demand and needs in Waihe'e, a survey was developed and distributed online and in hard copy. A total of 161 surveys were completed and returned, representing about 37 percent of the total population and about 30 percent of households in Waihe'e. (Some households completed more than one survey.) The survey results provide an excellent anecdotal description of travel behavior and information on potential demand for new transit service.

To estimate the potential transit ridership, four alternative methodologies were used. They produced annual ridership estimates ranging from a low of 5,100 riders to a high of about 8,800 per year and between 17 and 29 passengers per day.

Recognizing this low demand, evaluation criteria were developed to evaluate how to serve a small market in a cost-effective manner.

An analysis was prepared that compares the proposed route 8 from the 2016 Short Range Transit Plan with six alternative approaches to serving the transit market in Waihe'e. To develop and evaluate the service, several key factors were considered including the base route network as described in the Short-Range Plan, key destinations identified in the survey, and the demand as forecast in Phase 1. The six alternatives include the following:

- To Paukukalo through neighborhoods
- Automated electric shuttle to Paukukalo through neighborhoods
- To Wailuku Business Center (plus golf and beach)
- As extension of existing Maui Bus routes #1/#2 with limited trips

- Shared taxi/ride hailing to Queen Ka'ahumanu Center
- Shared taxi/ride hailing to Paukukalo

A community meeting was held for residents of Waihe'e at the Paukukalo Hawaiian Homes Community Hall in Wailuku in February of 2018. At that meeting, the consultant team presented highlights from the community survey, the estimates of potential ridership, and the six alternative service options. After the presentations, the thirteen residents in attendance were divided into two groups, and discussions were held regarding the findings and proposals. At the conclusion of the discussions, the larger group was reconvened and a summary from each group was read aloud.

Both groups reached a consensus that service on the local subdivision streets was unnecessary. In addition, both groups reported that all-day hourly service was unnecessary, particularly in light of the high costs of providing such service. Both groups independently concluded that a more limited service of up to five trips per day would be sufficient to meet the community's needs. That level of service would be consistent with the ridership forecasts developed and the likely markets that exist in Waihe'e. This most closely matched Alternative #4.

The limited-service fixed route presented to the public workshop, Alternative #4, was based on extending some trips on routes 1 and 2. However, implementing that alternative would disrupt the current services on routes 1 and 2.

The project also sought input on applications of principles from the Waihe'e service to other rural services on Maui. As part of that analysis, the consultant team reviewed low-demand service in Kula and identified that principles of serving limited-demand service areas could be considered for that community as well.

As a further refinement, it was determined that a new seventh alternative was possible, by interlining a new Waihe'e service with the Kula service in rural Upcountry Maui. The interlining with the Kula service would give rural areas in both east and west Maui the same level of service (four to five trips per day) and provide a new, faster route to Kahului for residents in the east because the proposed routing would bypass the airport. More significantly, this alternative would extend service to Waihe'e within the existing operating and capital budget envelope of the Maui Bus operation, and no new vehicles or service hours would be required.

The new route would reduce service in Kula from every ninety minutes to five times per day. That change would better match existing demand and ensure that rural low-demand areas are treated the same. The new Alternative 7 route is shown in Figure B.

It is recommended that the new Alternative 7, Limited Fixed Route Service, interlined with a revised Kula service be implemented to serve Waihe'e. Consultation in Kula may be considered before committing to the service change. A draft schedule is provided in Figure C.

Developing a successful marketing plan for any new transit service requires a realistic alignment of the service objectives, the potential market, and the marketing resources available. A marketing plan is proposed for the Waihe'e component of the recommended solution, the new Alternative 7. The principles that apply to Waihe'e service could be adapted and applied to the Kula and connector components of the proposed service as well.

It was established through the survey of residents and the workshop held in Waihe'e that the market for transit in Waihe'e is primarily residents who do not have access to a vehicle. The market is both small and local. In responding to that potential demand, the transit marketing plan addresses five potential areas of influence:

- **Awareness** — letting people know transit exists in their community
- **Education** — educating the population about services and their benefits
- **Image/Perception** — creating a positive and inclusive image of the transit service and the overall transit system
- **Ridership** — encouraging trial ridership among new customers and continued use among existing riders
- **Support** — building support in the broad community and among community leaders

Figure A – Proposed New Route (Alternative 7)

#39 Kula / Kulamalu Town Center			#41 to Queen Ka'ahumanu Ctr	#8 Waihe'e / Queen Ka'ahumanu Ctr			#41 to Kulamalu Town Center	
Kulamalu Town Ctr. *to Kula*	Kula Hwy. / Kula Hospital *to Kulamalu*	Kulamalu Town Ctr *from Kula*	Arrive Queen Ka'ahumanu Ctr *from Kulamau*	Leave Queen Ka'ahumanu Ctr *to Waihe'e*	Leave Waihe'e Terminus *to Queen Ka'ahumanu Ctr*	Arrive Queen Ka'ahumanu Ctr *from Waihe'e*	Leave Queen Ka'ahumanu Ctr *to Kulamalu*	Arrive Kulamalu Center *from Queen Ka'ahumanu Ctr*
	6:08a	6:28a	6:58a	7:08a	7:33a	7:58a	8:05a	8:33a
8:33a	9:12a	9:32a	10:02a	10:11a	10:37a	11:03a	11:05a	11:33a
11:33a	12:12p	12:32p	1:02p	1:11p	1:37p	2:03p	2:05p	2:33p
2:33p	3:12p	3:32p	4:02p	4:11p	4:37p	5:03p	5:05p	5:33p
5:33p	6:12p	6:32p	7:02p	7:11p	7:37p	8:03p	8:05p	8:33p
8:33p	9:12p	9:32p	10:02p					

Figure B – Draft Schedule

1. Introduction

This report examines the feasibility of a transit service for the Waihe'e region of Maui and develops a framework for rural public transportation for other areas of Maui.

The first phase of the project developed a demand estimate for a service in the Waihe'e region that meets the community's needs. To identify those needs, a survey was prepared and circulated online and via hard copy though community organizations and a direct mail campaign.

The first phase of the project used information from the survey, as well as demographic information from the American Communities Survey and the last decennial census. Four methodologies were utilized to develop the demand estimates.

The second phase of the project examined service alternatives to meet the identified demand. Cost and revenue estimates were prepared to evaluate the alternatives. A community meeting was held to review the alternatives and select a preferred service approach that could be refined by the consultant team and applied in other rural areas. Following the consultation, the assessment of rural services identified the potential for a solution that addressed the needs of Waihe'e, while addressing unproductive service elsewhere on Maui.

2. Community Assessment

The community of Waihe'e is predominately a Hawaiian Homelands settlement area on the Northwest coast of Maui. It is located immediately northwest of Oceanview Estates and Wailuku, as shown in Figure 1. The eastern edge of the community is approximately defined by Malaihi Road and extends as far northwest as Halewaiu Road. West of the community is Mauna Kahalawai. The Wai'ehu Golf Course and Kahului Bay of the Pacific Ocean lie to the east of Waihe'e.

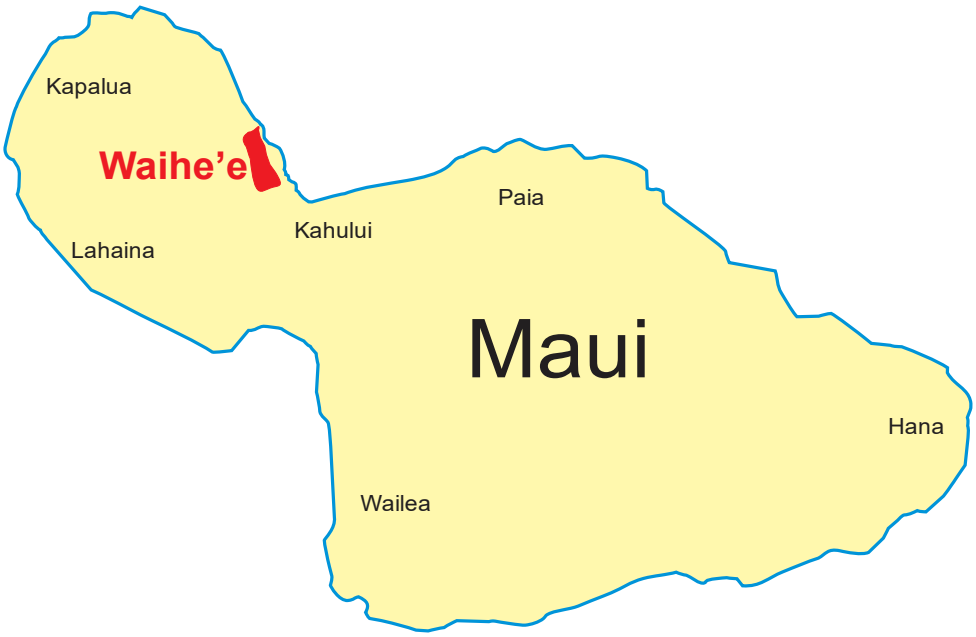

Figure 1 – Location of Waihe'e in Maui

The nearest existing transit service are the Wailuku Loop bus routes that serve Wai'ehu Heights, but there is no transit service to Oceanview Estates between Wai'ehu Heights and Waihe'e. The 2016 Maui Short-Range Transit Plan proposed a Waihe'e Villager route 8 to serve the community and Oceanview Estates. The proposed route and the existing bus service in Wailuku are shown in Figure 2.

Waihe'e is a residential community with some home-based businesses, but on the other side of Kahekili Highway there are several businesses, including a nursery. The county-owned Wai'ehu Golf Course is accessed off Halewaiu Road and is the only county-owned golf course on Maui. There is one elementary school at the westernmost end of the community; however, there are no middle or high schools in the community. Residents of Waihe'e must travel to Wailuku, Paukukalo, or Kahului for shopping, banking, medical, and similar establishments as well as secondary and post-secondary educational institutions. The community enjoys several small parks, but there are no major leisure or cultural facilities in the area. The local streets are narrow with a speed limit of 15 miles per hour, and the arterial roads, such as

Kahekili Highway and Wai'ehu Beach Road, are single lanes in each direction with a speed limit of 30 miles per hour.

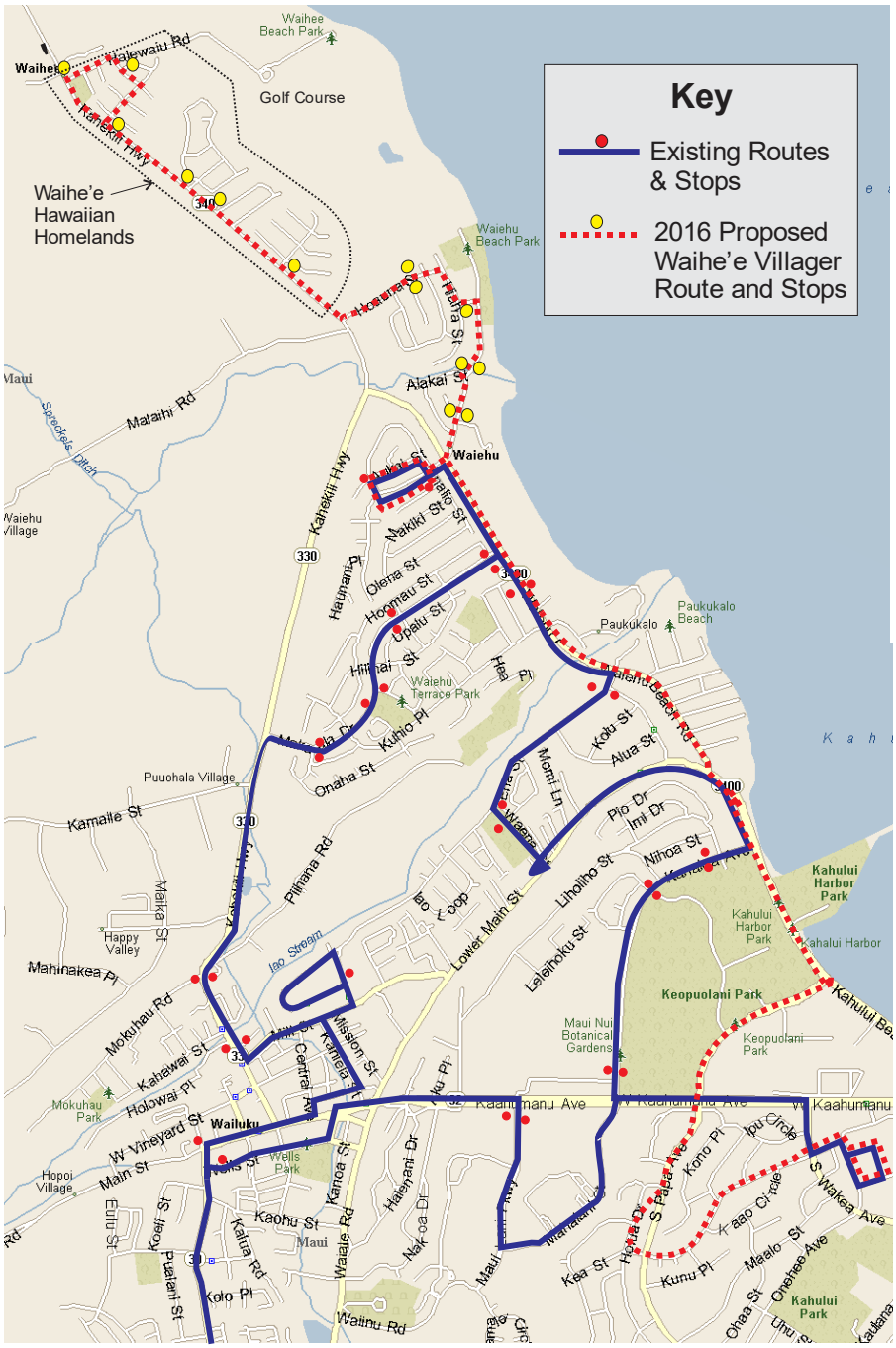

Figure 2 – Existing and 2016 Proposed Bus Routes/Stops

3. Community and Stakeholder Outreach

3.1 Survey

To gain a better understanding of the travel demand and needs in Waihe'e, a survey was developed and circulated in the community. The survey was provided online and in hard copy through various community groups, including neighborhood associations and the Parent Teacher Association at Waihe'e Elementary School.

Two versions of the survey were circulated. The longer, complete version was available online and a shorter, abbreviated version was circulated in hard copy. A total of 161 surveys were completed: 30 online and 131 hard copy versions. Of the returned surveys, about 85 percent were from residents of Waihe'e. The complete survey is provided in Appendix 1, responses are provided in Appendix 2, and the written comments submitted with completed questionnaires are listed in Appendix 3. The return rate represents households that comprise about 37 percent of the total population or about 30 percent of households in Waihe'e. (More than one survey per household was permitted.) Although that is a good response rate, it is insufficient to establish a statistically significant sample because the respondents were self-selected; however, it does provide an excellent anecdotal description of travel behavior and provides information on potential demand for new transit service.

The survey sought responses in three subject areas: current travel behavior, use of a potential new transit service, and demographics. The questions on current travel behavior were designed to provide information on the type of service that would be needed to meet Waihe'e residents' needs. The questions on future transportation behavior were designed to test whether there was interest in the use of a new transit service. Typically, surveys that ask people their intended actions (*stated preference surveys*) generate optimistic projections of the levels at which people will actually use a service. The demographic questions were designed to see how closely the survey respondents match the overall demographics of Waihe'e residents as identified in the American Communities Survey (ACS) and the federal census.

The findings of the survey confirmed that Wailuku, Paukukalo, and central Kahului are the most popular destinations. The results also indicated strong support for a new bus service and a surprising number of residents reported using the existing service, even though it is more than a half mile from most homes. The demographic questions did reveal that the 161 responses were disproportionately from residents with fewer cars and lower income, than reported in the statistically significant American Communities Survey for Waihe'e. Complete results are provided in Appendix 1 in Volume 2 of this report.

3.2 Maui Economic Opportunity Agency

The Maui Economic Opportunity Agency (MEO) is a not-for-profit group that receives grants from the County of Maui to provide a number of social services that include several transportation programs. MEO also operates the Americans with Disabilities Act (ADA) paratransit service under contract with the County of Maui. These transportation programs include several grant program services that may be operating in Waihe'e:

- Ala Hou
- Easter Seals & Adult Day Care
- Employment for the Disabled, Community (Expansion)
- Dialysis
- Low-income and Economically Challenged
- Rural Shopping Shuttle
- Senior Nutrition Program
- Maui Memorial Medical Center
- Medicaid

Although the survey did not list MEO services other than ADA Paratransit as an option under "other transportation services," it is believed that many of the "other trips" identified in the survey, are taken on MEO-sponsored transportation services. The cost to the county for each trip taken on the MEO services averages more than $17 per passenger.

If a transit service were provided in Waihe'e, some MEO services would likely see a reduced demand, but some may be meeting specialized needs that could not be accommodated on fixed-route service. The provision of public transit would also mean that the area would be included in the paratransit service area, which also could see a reduction in some MEO services if more trips were accommodated on ADA Paratransit.

3.3 Department of Education, Transportation Division

The Hawaii Department of Education provides yellow school buses for kindergarten to Grade 5 students who live more than one mile from their designated school, and transportation is provided for Grade 6 to 12 students who live more than 1.5 miles from their designated school. All students must purchase passes. The cost for an annual round-trip pass is $270, although less expensive one-way or quarterly passes also are available.

Public transit is generally not considered a reasonable alternative for elementary school students, yet it can offer more flexibility and convenience for middle and high school students. Several school districts and transit agencies on the mainland have collaborated to place middle or high school students on public transit instead of dedicated yellow school buses. That collaboration has proven highly successful

where transit agencies have unused capacity, particularly in off-peak directions. All middle and high school students in Wai'ehu Kou attend schools more than 1.5 miles from their residence. If students were offered the option of purchasing a pass on a Maui Bus service as an alternative to the yellow school bus, it could significantly boost potential ridership. However, in a discussion with a Department of Education (DOE) representative, it was found that there was little interest in a collaborative program. The DOE representative reported that students with extracurricular activities or part-time jobs could choose to ride Maui Bus, but the DOE would not be willing to subsidize the public transit fare or pass.

4. Travel Demand Forecast

In large urban centers, forecasting demand for transit is often performed with complex computer simulations based on years of historical transit, traffic, and land use data. That level of information is unavailable for Waihe'e, because it is a relatively new community, and transit is not currently provided. To develop a forecast of the potential transit ridership, four alternative methodologies were utilized, and an average value determined as a range for the forecast. The methodologies include the following:

1. Forecast based on per capita transit trip generation derived from similar developments in Maui
2. Forecast for rural transportation demand using a model developed for the Transportation Research Board (TCRP) for rural transportation (TCRP Project B-36)
3. Forecast for rural to urban transit demand for commuters using a model developed for the Transportation Research Board for rural transportation (TCRP Project B-36)
4. Using elements of a Simplified 4 Step Transportation Planning model developed in rural Virginia for rural and small communities

4.1 Maui Comparables Methodology

The premise of this methodology is that demand for transit service in Waihe'e would be similar to the demand in similar areas in Maui that currently have transit service. The defining characteristics of a shuttle service to Waihe'e are that the market being served is based on residential development. There are no major employers in the area to be served, and the only attractors are limited to the county-owned golf course, a nursery, and Waihe'e Elementary School. None of those attractors is a significant generator for transit. There are no tourist destinations in Waihe'e.

Four bus routes in Maui were selected as peer services: the Kula Villager, the Kahului loop service, the Islander routes to Ha'iku, and the Upcountry. The Kahului local service has a residential population, but it also serves a large commercial employment and retail area. Although tourist traffic may be using the service to access shopping, the route does not serve any major resorts.

The Kula Villager route mainly serves a residential area away from the urban core of Kahului. It is more rural than Waihe'e and, like Waihe'e, there are few local employers. It also serves a Hawaiian Homelands community. The Kula Villager feeds into the Upcountry Islander route that links Pukalani and Makawao with Kahului via the airport. Makawao is a larger community with a supermarket, other retail, a golf course, a farmers' market, and both a high school and elementary school. There are no major employers in the area. The density of the built-up portions is similar to that of the Waihe'e area, although it is more remote from Kahului.

The Ha'iku route primarily serves residential development along the Northeast coast and at Haiku Village. It is low density, and residents along the route must travel to Kahului for employment, services,

and shopping. There is a private, nine-hole golf and country club along the route but few other major attractors.

Figure 3 shows the estimated population living in the catchment area for each bus route and a calculation of the transit rides generated per capita. The catchment area for the bus route is the total population of the census block groups within a half mile along the route. The transit ridership is based on the FY 2018 ridership forecast prepared by Maui County.

Ha'iku Islander #35	
Estimated Population Served	15,600
Annual Ridership	96,700
Daily Ridership	250
Transit Rides Per Capita	6.2

Kahului Loops #5 & #6	
Estimated Population Served	26,300
Annual Ridership	223,500
Daily Ridership	610
Transit Rides Per Capita	8.5

Kula Villager #39	
Estimated Population Served	6,500
Annual Ridership	19,000
Daily Ridership	50
Transit Rides Per Capita	2.9

Upcountry Islander #40	
Estimated Population Served	20,300
Annual Ridership	107,800
Daily Ridership	300
Transit Rides Per Capita	5.3

Figure 3 – Comparable Bus Routes in Maui

Based on the results of this peer group, it is believed that the likely transit trip generation for Waihe'e would be in the range of about 4.5 to 5.5 trips per capita. That range is supported by the fact that Waihe'e is closer to Kahului than the area served by the Kula Villager or Upcountry route, which have lower ridership. The density of Waihe'e is similar to that of the area served by the Upcountry route but lacks the shops, services, and schools.

Ridership in Waihe'e will be lower than in Kahului because of the absence of major attractors such as employers, shops, and services. Ridership levels may be close to the levels experienced on the Ha'iku Islander, although the need to transfer may have a negative impact. (This may be mitigated slightly if the service can be designed to create timed connections between routes.)

The Wai'ehu Kou area has a population of about 1,375. Using the rate of five trips per capita produces a transit ridership forecast of 6,875 trips annually. That is about twenty-three per day, assuming service is provided Monday through Saturday. If service were provided hourly for fourteen hours (e.g., 6:00 a.m. to 8:00 p.m.), the average would be under 1.7 trips per hour.

4.2 Transportation Cooperative Research Program (TCRP) Rural Methodology

TCRP project B-36 developed methods for forecasting transit ridership in rural areas to quantify the need for passenger transportation services. Four different models were developed, and the software for using the models was provided as part of the project. Two of the models are appropriate for estimating ridership from Waihe'e. The models were developed using data from the rural National Transit Database (NTD), the decennial census, the ACS, and the National Household Travel Survey (NHTS).

One of the models is designed to estimate general rural transit demand. The key factors used for that estimation of demand include the number of persons in need of transportation, defined as the population residing in households with income below the poverty line and population residing in households with no personal vehicle. The trip need is defined as households having no personal vehicle multiplied by a mobility gap. The mobility gap is defined as the difference between the daily trip rate for rural households having one personal vehicle and rural households having no personal vehicle. Mobility gaps were developed for each state based on the NHTS. The mobility gap for the Pacific region that includes Hawaii, California, Alaska, Oregon, and Washington was established by the TCRP to be 1.1 trips per day.

That model predicts there would be about 8,500 total trips in Waihe'e if half-hourly service were provided and about 5,100 annual one-way trips if hourly service were provided.

4.3 TCRP Model Commuters from Rural to Urban Methodology

This methodology is designed to forecast transit demand when the travel is primarily oriented to work trips to an adjacent urban place. That version of the model requires an estimate of the number of workers who commute to the urban area and the average distance they commute. It is estimated from the census that about 500 workers in Wai'ehu Kou commute to a location outside their community. The Census found that the average commute time from Wai'ehu Kou is about twenty-two minutes. At an average vehicle speed of eighteen miles an hour, the average commute distance would be about 5.4 miles.

The model projects 6,400 annual one-way trips on transit in Waihe'e based on these inputs. That would be approximately twenty-one trips per day.

4.4 Modified & Simplified Traffic Generation Model

The Simplified Traffic Generation model provides four types of trip generation factors for rural areas:

- Home-based work person trips
- Home-based shopping auto trips
- Home-based other auto trips
- Non-home-based auto trips

Specific trip generation rates for each type of trip were developed from observations in rural areas in Virginia. The first step is to convert the vehicle trips to person trips. Those trip generation rates are combined with the results from the 2009 NHTS, which found that the average occupancy was 1.67 persons per vehicle, and the average rural mode split for transit was 0.3 percent. That results in a forecast of about twenty-nine transit trips per day or 8,400 trips annually in Waihe'e.

4.5 Summary

The four distinct methodologies used for preparing six ridership forecasts of transit ridership in Waihe'e are summarized in Figure 4 – Summary of Transit Ridership Forecasts. The results produced annual ridership estimates ranging from a low of 5,100 riders on an hourly fixed-route service to a high of about 8,800 passengers. On a daily basis, that represents a range of between seventeen and twenty-nine passengers per day, assuming service six days per week. The mean forecast value can be rounded to about 6,900 trips annually or twenty-three trips per day.

Forecast by Methodology	Annual Ridership
Based on Per Capita Peers in Maui Low	5,740
Based on Per Capita Peers in Maui High	7,010
Based on TCRP Rural Model & 30-Minute Headways	8,400
Based on TCRP Rural Model & 60-Minute Headways	5,100
Based on TCRP Rural Commuter Model	6,400
Based on Simplified Transportation Model	8,500
Mean of All Forecasts	**6,858**

Figure 4 – Summary of Transit Ridership Forecasts

5. Identify Success Criteria

The Waihe'e Shuttle service is intended to be aligned with the overall success criteria for the transit system. Those criteria are stated in several plans and summarized in the 2016 Maui Short-Range Transit Plan (pp. 1-8 and 1-9). Key policies and objectives indicate the following:

- Provision of transportation options
- Affordability
- Efficiency
- Connection to workforce residential areas
- Connection to employment centers
- Integration of transportation and land use
- Interconnected transport modes
- Retrofit of rights-of-way with adequate sidewalks, bicycle lanes, or separated multi-use transit corridors
- More diversified and stable funding base

Several criteria in the Service Design Guidelines are also relevant for evaluating route design alternatives:

- Route alignment
- Transfers and extensions
- Interlining
- Route configuration options
- Bus stop spacing
- Span of service
- Service frequency
- Scheduling

The demand forecast a small market for transit in Waihe'e. Recognizing that low demand, the evaluation criteria must, to the extent possible, evaluate the success of the service in a small market in a cost-effective manner.

Figure 5 is an evaluation matrix that accounts for the relevant criteria for a service of this nature. The criteria generally combine the criteria above to simplify understanding. It is presented here without content to show the approach. Through the report below, a set of alternatives is identified and discussed. In the evaluation section, the table is presented again with the alternatives and evaluation shown.

	Customer Experience						Operator	Funder		
	Access within Waihe'e	Connection to key destinations (survey)	Connection with other transport services	Service Level	Provision of transportation options	Service Coverage (new stops Waihe'e/System)	Ease of Operation	Capital Cost	Annual Operation Cost	Cost per Boarding
Alternative 0 Short Range Plan Routing	○–●	○–●	○–●	○–●	○–●	x/y	○–●	$	$	$
Alternative 1	○–●	○–●	○–●	○–●	○–●	x/y	○–●	$	$	$
Alternative 2	○–●	○–●	○–●	○–●	○–●	x/y	○–●	$	$	$
etc										

Figure 5 – Sample Alternatives Evaluation Matrix

The evaluation is based on a mix of qualitative and quantitative measures. The evaluation does not attempt to weight the criteria and form a single numerical score. Instead, it provides information for decision makers to understand the performance of each scenario on each criterion. Decisions can be made based on the overall judgment of decision makers, understanding the community, transport needs, funding and resource priorities, and other factors. The qualitative measures are illustrated on a five-point scale with graphics illustrating intensity; empty circles signify an unfavorable score, and full circles indicate a favorable score. Service coverage measures the number of new stops served in Waihe'e and the number of new stops served elsewhere in the system. Operator ease of operation illustrates the relative operational complexity where conventional transit is considered the midpoint. Financial criteria are reported in cost to the Maui Bus System.

6. Identify Alternative Routes Based on Service Delivery Model

The analysis below compares the proposed route 8 from the Short-Range Transit Plan with five alternative approaches to serving the transit market in Waihe'e. The alternatives are listed in Figure 6. To develop and evaluate the service, the following key factors were considered:

- The base route network described in the Short-Range Plan
- Key destinations as identified in the survey
- The demand as forecast in Phase 1

Alternative Number	Service Concept	Routing Type	Approximate One-Way Distance (miles)
0	Short-Range Plan Routing	Fixed	6.8
1	To Paukukalo through neighborhoods	Fixed	5.0
2	Automated electric shuttle to Paukukalo through neighborhoods	Fixed	5.0
3	To Wailuku Business Center through neighborhoods (plus golf course and beach)	Fixed	7.6
4	As extension of #1/2 with limited trips	Flex	5.3
5	Taxi/ride hailing to Paukukalo	Flex	2.0
6	Taxi/ride hailing to Queen Ka'ahumanu Center	Flex	6.0

Figure 6 – Alternative Service Designs

Following is a description of each scenario.

6.1 Alternative 0 – Short-Range Plan Routing

This new routing is identified in the Short-Range Transit Plan (SRTP). The service operates hourly from Waihe'e to Queen Ka'ahumanu Center. As described, its characteristics are as follows:

- Two-directional service between Waihe'e and Queen Ka'ahumanu Center
- Service within the existing system area including Wai'ehu Heights, Maui College, and Kea Street
- Hourly, 6:00 a.m. to 8:00 p.m.
- A requirement of one transit bus

- Passengers would only be able to board in the westbound (outbound) direction of Kahekili Highway.

Of the priority destinations identified in the survey, customers would have direct service to Paukukalo and Queen Ka'ahumanu Center and single-transfer service to the Wailuku Business District, though providing timed connections would be difficult if the route is timed to connect with other vehicles at Queen Ka'ahumanu Center.

Bus trips operating to Queen Ka'ahumanu Center would be 6.8 miles each way. Assuming travel speed consistent with the rest of the transit system, the round trip would take almost a full hour, and it would be difficult to operate the service reliably with a single transit vehicle. By interlining the route with other services, it could use vehicles efficiently and avoid the requirement to procure and operate a second bus. It would be operationally difficult to extend the route to the golf course in this scenario because of the time constraints.

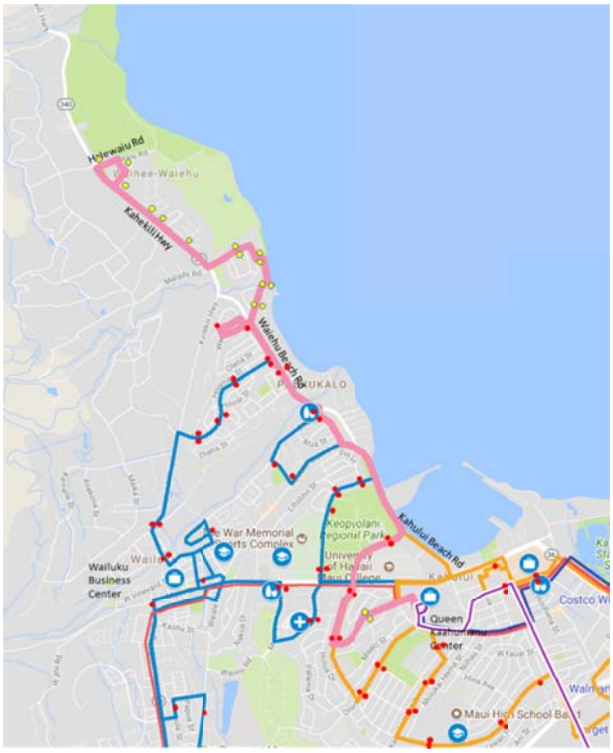

Figure 7 – Alternative 0

Because demand is forecasted to be low, (fourteen to twenty-three boardings daily from Waihe'e), this routing is projected to have low productivity—less than one boarding per hour from the community. Some additional demand may be attracted from the other segments of the route, though there is considerable duplication with other routes, so the ability to attract new demand for the system is limited. In fact, as described, the route appears to add coverage only on Kea Street in Wailuku in a neighborhood where almost every property is considered served according to the criteria of the Service Design Guidelines. The proposed route 8 operates on the Kahekili Highway and does not enter the subdivisions in Waihe'e. If the service were extended to the county-owned golf course in Waihe'e, there could be a small additional demand of several trips per day, particularly from staff.

It is likely that many trips would operate in the Waihe'e area without any passengers, which could be seen as an annoyance for residents and taxpayers. Regardless, scheduled transit service on residential streets often attracts concern from residents about noise, intrusion, and safety. Use of a smaller vehicle could mitigate those impressions somewhat. Use of a smaller vehicle also could result in lower overall costs if capital, fuel, maintenance, and driver costs were lower than with a larger vehicle.

Assuming the service could be provided reliably, a one-vehicle fixed-route solution (as shown in the SRTP) is projected to cost approximately $70 to $75 per boarding if operated with a full-size transit bus.

This compares with a 2016 average cost of $4 to $5 per boarding in the existing Maui Bus system. The overall cost would be approximately $500,000 annually plus capital for a vehicle.

6.2 Alternative 1 – Service to Paukukalo through Neighborhoods

To provide more convenient access within Waihe'e's neighborhoods, several alternative transit routings were explored. The principal concept would operate into the neighborhoods to facilitate service in both directions to reduce walking distances. Select trips also could extend to the Wai'ehu Golf Club and Waihe'e Beach Park. In that alternative, the buses would extend as far southeast as Paukukalo for access to grocery shopping and connections to other bus routes, but would not extend farther east to Queen Ka'ahumanu Center.

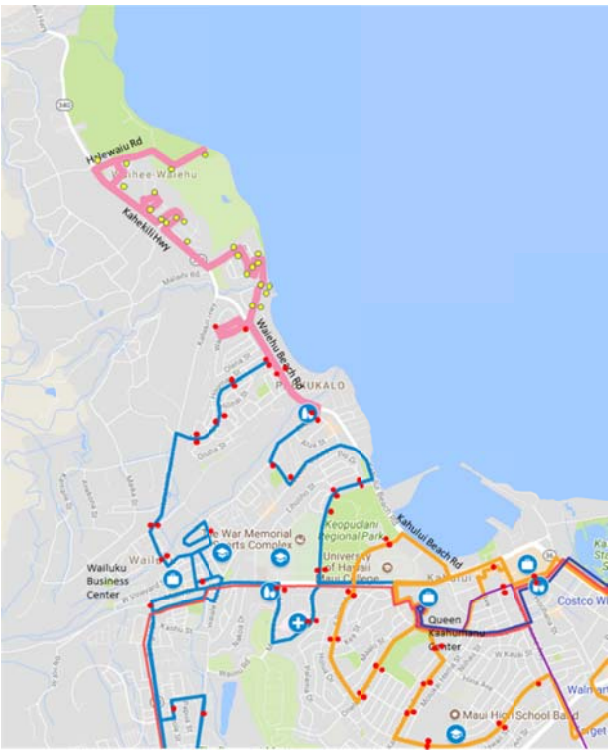

Figure 8 – Alternative 1

An improvement in convenience is achieved by using the vehicle hours to circulate on local streets at the expense of not providing direct service to any key destinations beyond Paukukalo.

Because the same number of service hours would be required, the route would cost the same as the Base option with comparable ridership performance.

Other fixed route options were considered, including these solutions:

- Extend to Wailuku Business Center and continue to Queen Ka'ahumanu Center
- Provide flexible routings into the neighborhoods of Waihe'e

These fixed route options would have a level of service that results in a capacity that exceed the projected demand. As mentioned above, scheduled transit service on residential streets often attracts concern from residents about noise, intrusion, and safety, and low demand may be cited as a taxpayer concern.

With low demand and assuming the use of a minibus, the cost of service is expected to be in the range of $50 to $55 per boarding. High costs per boarding would be the case for any scenario that requires dedication of a full vehicle for low-demand service.

6.3 Alternative 2 – Automated Electric Shuttle to Paukukalo through Neighborhoods

Driver costs are a significant factor in all transit service. To improve the business case for the Waihe'e shuttle, solutions that make more efficient use of drivers or eliminate that direct cost would be attractive. This solution would make use of automated transit vehicles. This is an emerging class of technology that is beginning to operate on public roads in the United States.

Class 4 automated shuttle vehicles are available in which "*the vehicle is capable of performing all driving functions under certain conditions. The driver may have the option to control the vehicle.*"

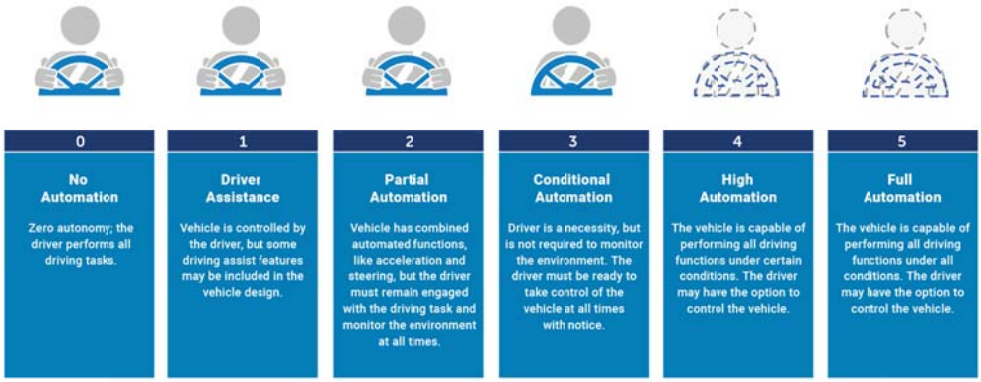

Figure 9 – Society of Automotive Engineers Level of Automation Source: NHTSA

As an emerging technology, automated buses are currently permitted to operate in several states with a customer service attendant on board. The attendant is capable of intervening if the system requires assistance. Typically, the attendant has customer service training and a basic driver's license.

An automated solution has the advantage of reducing the direct cost of the driver from the service. All the available vehicles are electrically powered and offer lower operating and maintenance costs as well, though higher upfront capital costs are expected.

Figure 10 – Example of Automated Shuttle

A high-level evaluation of this approach yielded the following conclusions:

- The Waihe'e community may be a suitable environment for the current technologies, because it has low posted speeds, relatively low traffic volumes, and a good year-round climate.
- Existing technologies may be capable of operating the number of miles and hours required each day.
- Though the Waihe'e area may have ideal conditions, there is limited real-world experience on public roads with significantly higher traffic levels.
- Currently, some providers may have data limitations with routes longer than about five miles.
- Shuttles are available with capacities sufficient for the demand of the Waihe'e shuttle.
- Vehicle capital costs are potentially several times higher than the cost of low-cost van-based shuttles, though charging technologies may require little or no investment.
- Energy and maintenance costs for electric vehicles are potentially considerably lower than for motor buses, and electric vehicles may have longer life cycles than traditional motorized vehicles.
- Technologies are progressing rapidly and may achieve Level 5, full automation, within the next few years.
- Cost efficiencies are best achieved by decoupling the operator from the vehicle. The typical current model of having an attendant on board may yield partial reductions in cost; full automation could yield further efficiencies.
- It may become easier to achieve these cost savings as technology and the regulatory environment enable full, unattended automation.
- If several automated buses were in service in the system, further efficiencies could be achieved.
- State-level regulation and legislation would need to be investigated in detail.
- Further evaluation would be required.

The high-level analysis suggests that some cost savings could be achieved, resulting in a cost in the range of $35 to $40 per boarding, but still much higher than the existing system cost per boarding. Eliminating the attendant/driver could ultimately reduce the cost by $15 to $20 per hour, making the cost more competitive with other options.

The state of automated vehicle technology is progressing rapidly, and it is expected that solutions will become available in the coming years, advancing along with regulatory environments to enable transit providers to greatly increase service quality within existing resources.

6.3 Alternative 3 – To Wailuku Business Center through Neighborhoods

In this alternative, the route from Waihe'e would operate through the community including Wai'ehu Heights and continue to Wailuku Business Center. In addition, select trips would extend northwest of Waihe'e to the Wai'ehu Golf Club and to Waihe'e Beach Park.

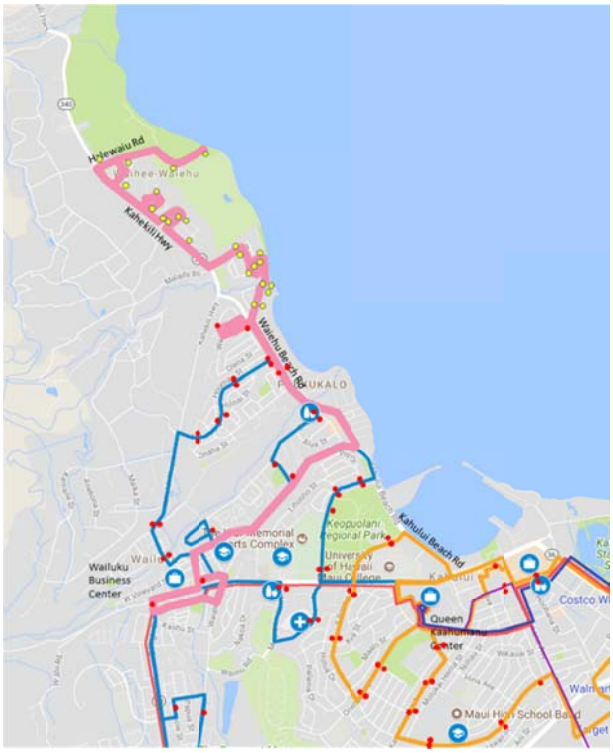

Figure 11 – Alternative 3

The route would provide the following:

- Two-directional service between Waihe'e and Wailuku Business Center.
- New service on
    - Wai'ehu Beach Road southeast of Eha Street to Main Street
    - Main Street between Waena Street and Imi Kala Street.
    - Service on select trips on Halewaiu Road to the Wai'ehu Golf Course and Waihe'e Beach Park.
    - (Other segments of Wai'ehu Beach Road and Main Street already have service.)
- Connections to route #1/#2 on Wai'ehu Beach Road at Eha Street.
- Hourly, 6:00 a.m. to 8:00 p.m.
- A requirement of one minibus
- Service into most neighborhoods of Waihe'e where bus stops would allow boarding and alighting.

Of the priority destinations identified in the survey, customers would have direct service to Paukukalo and Wailuku Business Center and single-transfer service to Queen Ka'ahumanu Center. Some timed connections may be possible to route #1/#2 at Eha Street or at Wailuku Business Center. The absence of free transfers for cash passengers may limit the ability to attract occasional riders.

Bus trips operating to Wailuku Business Center would be 7.6 miles each way for the full trip to Waihe'e Beach Park. Assuming travel speed consistent with the rest of the transit system, the round trip would take almost a full hour, and it would be difficult to operate the service reliably with a single transit vehicle. However, it is expected that demand to the park and golf course would be relatively low and not consistent at all times of day. By providing those extensions only on select trips, the usual trip time would be shorter, and the service would be possible with one vehicle. Operational interlining is recommended.

This route would serve a large proportion of the service area envisioned to be provided by Route 7 in the SRTP. As a result, it is expected that the route would attract additional demand in the areas not currently served, including minor demand to the golf course and beach park.

A high-level demand forecast, based on a comparison with the Waihe'e forecast conducted in Phase 1, suggests that this routing would attract more customers per day than the Waihe'e route alone. Accounting for demand to the beach, the golf course, and new service to neighborhoods along Wai'ehu Beach Road and Lower Main Street, ridership could be as high as ninety to one hundred boardings per day net growth. Despite the higher forecast, that level of demand would result in this alternative operating well below the system's average productivity. Service would average approximately five boardings per hour at a cost of approximately $16 per boarding.

As stated above, it is likely that many trips would operate in the Waihe'e area with few or no passengers and could be seen as an annoyance for residents and taxpayers, mitigated somewhat by the use of a smaller vehicle. Ultimately, the service could operate on demand, which could reduce actual miles operated and achieve a small reduction in cost per passenger.

6.4 Alternative 4 – Extension of #1 and #2 with Limited Trips

A solution was identified that achieves efficiencies by extending Wailuku Central routes #1 and #2 to the Waihe'e area. For customers in Waihe'e, service would be available to both Wailuku Business Center and Queen Ka'ahumanu Center. An extension to the Wai'ehu Golf Course and Waihe'e Beach Park may be possible.

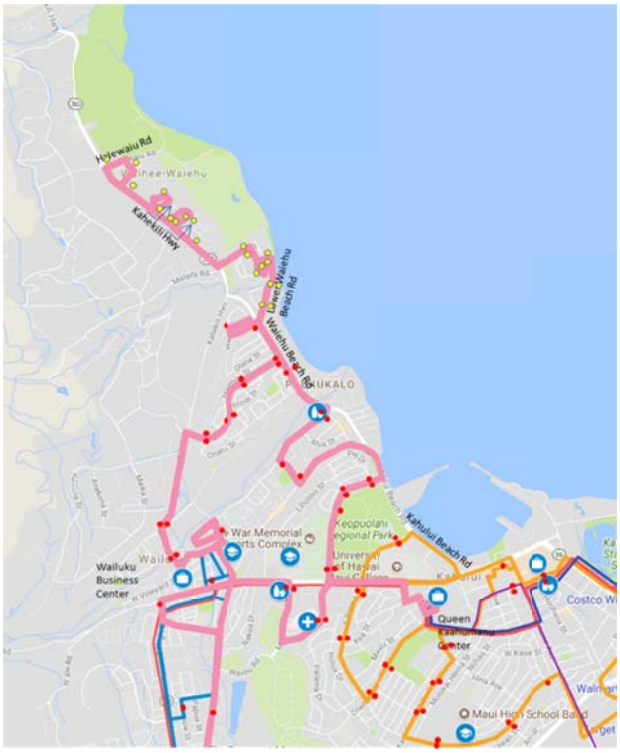

Figure 12 – Alternative 4

If the Waihe'e service were operated every sixty minutes, the route would still require a full vehicle, and the costs would be comparable to the alternative in the SRTP. It is anticipated that extending the route would require about one-third of a bus (i.e., approximately twenty minutes each hour), but a full vehicle would be required if there were no operational interlining opportunity.

A more efficient solution would extend #1 or #2 to the Waihe'e area only on a select number of trips daily. That is a common practice in low-demand

areas that allows efficient use of vehicles. The extension would affect the #1/#2 schedule by having a wider gap between trips approximately three times in the daytime; a fourth trip could operate at the end of the of the evening schedule with no impact on #1/#2. As a result, the service could be provided at low additional cost to the system. The impact on each route could be reduced by scheduling the trips in a direction of travel that reduces the impact on most people. For example, morning trips could operate on #1 when potential riders are returning to Queen Ka'ahumanu Center, and afternoon trips could operate on #2 from Queen Ka'ahumanu Center.

It is anticipated that this approach would provide basic service for customers who would be most likely to benefit from it—those with no realistic alternative means of independent travel. Some customers wishing to ride from upper Maakala Drive could experience a detour on select trips. Regular customers would become aware of the schedule and plan accordingly. It also could be possible to schedule some directionally timed connections.

Recognizing the nature of transit travel from Waihe'e and to minimize the impact on routes #1 and #2, trips would be scheduled during non-peak times. It would be possible to add a trip at the beginning of the morning period and the end of the evening peak period by extending a bus shift by thirty minutes, the only incremental cost for the service.

Customers would be required to consult a timetable to know trip times at key times of day, and some would lose the convenience of the existing service. A primary drawback of that approach is that it interrupts the schedule of #1 and #2, some of the most productive routes on Maui.

A more logical service design may be possible by redesigning #1 and #2 to replace the large loops with two-way routes and reliable timed connections while remaining sensitive to the transit service guidelines, including service coverage.

Because this alternative does not require an additional vehicle and reallocates existing service hours to the extent possible, there is no incremental capital cost and little operating cost. Service could be provided for about $2 per boarding.

If the Maui Bus system chose to introduce route #7 as identified in the Short-Range Plan, it would be a suitable route to provide this service extension instead of #1 and #2. As a new route, the extension could be provided without any adverse impacts on existing schedules and trip times.

6.5 Alternative 5 – Shared Taxi/Ride Hailing to Queen Ka'ahumanu Center

On-Demand Service Concept

As described above, some transit systems provide service in low-demand communities with on-demand service. In Waihe'e, demand-responsive service could be provided through a contract with a local taxi

company or through a contract with a transportation network company (TNC), also known as a ride hailing service such as Uber or Lyft, which already operate on Maui.

Customers would contact a designated phone number or use a web/mobile app to request a trip from Waihe'e. The service provider would respond within a time specified by the agreement with Maui Bus. The contractor could combine the service with a request for another customer, making the trip more efficient, or simply provide the trip within an agreed time window. The trip would operate to a designated location or zone within the transit service area and along a defined route east of Waihe'e. For return trips, the customer would make a request using the same phone number or app for pickup at a designated bus stop/transfer point. If the pickup were at a transit transfer point, the Waihe'e trip would be dispatched to pick the customer up within a designated time window following a scheduled bus trip to that stop. The service would be subject to service hours and other limitations of the transit system. In such ways, the service would remain public transit in character and integrate with the rest of the system. Fare payment for such a service could be complex when integrated with the rest of the transit system and would require local solutions.

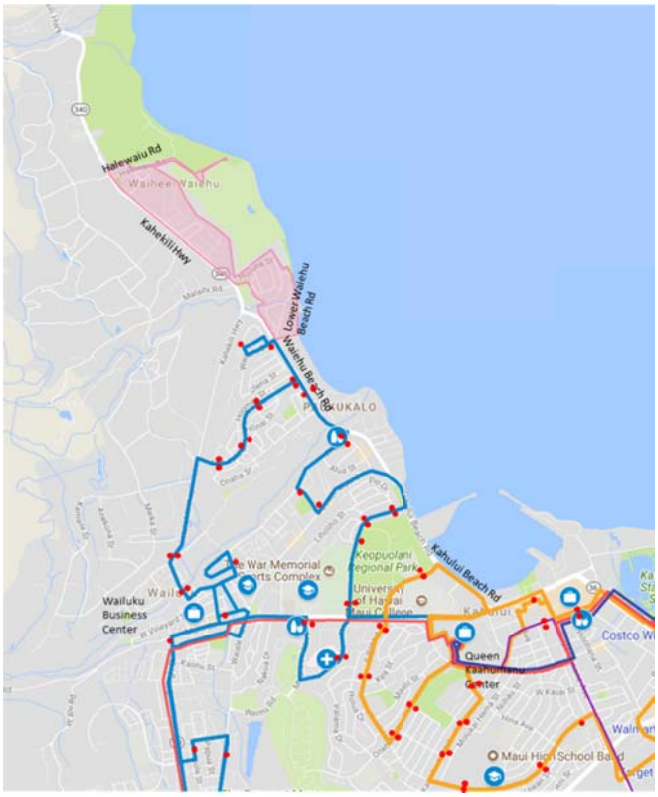

Figure 13 – Alternative 5

The Americans with Disabilities Act (ADA) requires that fixed-route operators or on-demand services operate with fully accessible vehicles staffed with operators trained to proficiently assist passengers with disabilities. Achieving ADA fleet compliance could require a capital investment from the county to provide suitable vehicles to the operator. Allocation of designated ADA-compliant vehicles and qualified drivers could reduce efficiency, increase delays for customers, and increase the cost of the service. It is difficult to forecast the costs to operate services such as this because taxi and ride-hailing rates may be different from the posted meter rates if the service is provided through a competitive tendering process.

Description of Alternative 5

In this alternative, trips would be provided on demand from the Waihe'e area to Queen Ka'ahumanu Center. Customers within Waihe'e would make a request and board curbside. The vehicle could collect

other customers making similar trips, and it would not be required to follow any specified routing. When the vehicle arrived at Paukukalo (Wai'ehu Beach Road at Lower Wai'ehu Beach Road), it would cease to collect customers and continue to Queen Ka'ahumanu Center (or until all customers have alighted) along the specified routing. For return trips, customers would make a trip request and then board the vehicle at a bus stop along the same routing. West of Paukukalo, the vehicle would follow any appropriate routing to the customers' destinations. A provision would be required to treat the vehicles as transit vehicles so they could serve designated bus stops.

This alternative only incurs cost when there is demand; cost is limited to connections to the nearest transit stop. Cost per boarding is projected in the range of $20 to $25 because the trips extend as far as Queen Ka'ahumanu Center. Costs may vary considerably depending on the potential to have shared ride trips, the actual length of the trips, and the contractual arrangement with a supplier.

6.7 Alternative 6 – Shared Taxi/Ride Hailing to Paukukalo

Following the same service principles as in Alternative 5, this option would operate on request within Waihe'e and then provide drop-off service at stops for routes #1 and #2 along Wai'ehu Beach Road as far west as Eha Street. Trips would be timed to connect with transit trips on routes #1 and #2.

Returning to Waihe'e, customers could make a request to be collected at Wai'ehu Beach Road at Eha Street or a point farther west. Vehicles would be dispatched to pick up customers soon after the scheduled bus transfer times.

This alternative has the advantage of reducing the cost to provide the service while still connecting Waihe'e residents with the rest of the transit system. The other considerations, including ADA compliance, also would apply to this alternative.

As in the previous option, this alternative only incurs cost when there is demand; however, the cost is limited because the route only operates to the nearest existing transit stop. As a result, cost per boarding is projected to be much lower, in the range of $5. That cost would vary depending on the potential to have shared ride trips, the actual length of the trips, and the contractual arrangement with a supplier.

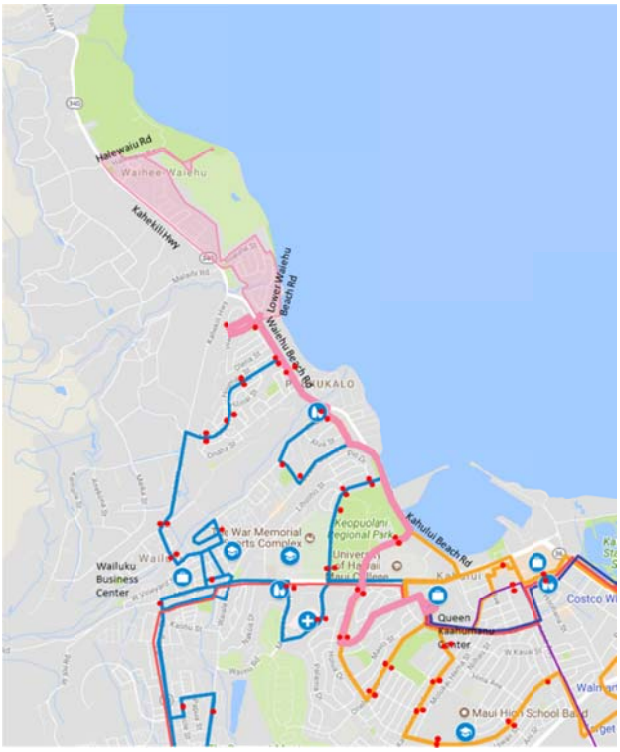

Figure 14 – Alternative 6

Evaluation of Transit Scenarios

Scenario Number	Service Concept	Approx One-Way Distance (miles)	Coverage: (New Stops Waihe'e / System)	Fleet	Freqncy	Fleet Req'd	Capital Cost	Daily Hrs	Annual Op Cost	Op Cost / Brdng	Brdngs / Hr	Notes
					Fixed Route Alternatives							
0	Short Range Plan Routing	6.8	14 / 2	Transit Bus	60	1	$450k	15	$500,000	$73	1	Requires interlining to maintain reliability with 1 vehicle. Could operate with minibus at lower cost per hour and per boarding.
1	To Paukukalo through neighborhoods	5.0	23 / 0	Minibus	60	1	$150k	15	$440,000	$53	1	Could operate with transit bus at higher cost per hour and per boarding.
2	Automated to Paukukalo through neighborhoods	5.0	21 / 0	Automated Minibus	60	1	$335k*	15	$250,000 – $275,000	$33 – $35	1	Costs are shown as a range reflecting uncertainty in emerging sector.
3	to Wailuku Business Center, plus Waihe'e Golf Course and Beach Park	7.6	23 / 0	Minibus	60	1	$150k	15	$440,000	$16	5	May require transit bus to accommodate demand south of Eha Street
4	Extension of #1 / #2 with limited trips	5.4	21 / 0	Bus	3 - 5 trips daily	0	$0**	0.5	$15,000	$2	38	Assumes limited extension of service hours.
					Flexible Route Alternatives							
5	Shared Taxi / Ride Hailing to QKC	6.0	>23 / 0	Car/Taxi	Request	0***	$0***	#N/A	$160,000	$24	#N/A	Cost based on approx. average taxi cost / mile for sample trips.
6	Shared Taxi / Ride Hailing to Paukukalo	1.6	>23 / 0	Car/Taxi	Request	0***	$0***	#N/A	$40,000	$5	#N/A	Cost based on approx. average Uber cost / mile for sample trips.

* List price from one supplier, excluding Insurance, additional options, financing costs, SIM card subscription or transportation. Costs expected to vary with number purchased and as technology advances.
** Reallocates vehicles from other routes for designated trips.
*** Dedicated vehicles are not required, however purchase or lease of ADA compliant vehicles may be needed to meet requirements.

Figure 15 – Summary of Alternatives

7. Community Meeting

A community meeting was held for residents of Waihe'e at the Paukukalo Hawaiian Homes Community Hall in Wailuku. At that meeting, the consultant team presented highlights from the community survey, the estimates of potential ridership, and the five alternative service options developed. Following the presentations, participants were divided into two groups, and discussions were held regarding the findings and proposals. At the end of the discussions, the larger group was reconvened, and a summary from each group was read aloud. Maui Bus staff were present.

Both groups reached a consensus that service on the local subdivision streets was unnecessary and undesirable. In addition, they felt that all-day hourly service was unnecessary, particularly in view of the high costs of providing such service. Both groups independently concluded that a more limited service of approximately five trips per day would be sufficient to meet the community's needs. That level of service would be consistent with the ridership forecasts developed and the likely markets that exist in Waihe'e.

8. Potential Applicability to Other Rural Areas

The project scope includes an assessment of opportunities to extend the principles from the Waihe'e service to address service issues in other rural areas.

Through the evaluation of the Waihe’e service proposal, several system design opportunities have been identified. Those include opportunities with the potential to improve the quality of service in the central Maui urban area and to improve coverage and service elsewhere in Maui County. Those opportunities also have the potential to make the best use of limited resources and permit more basic service coverage within existing resources. The principles apply both to the Central Maui urban routes and to the rural Islander and Villager routes, recognizing that travel demand spans the island of Maui.

A strength of Maui Bus is a commitment to timed connections. That is a useful tool for low-frequency systems because it allows customers to travel through the system with minimal delay, even when the overall frequencies are low.

The commitment to minimum service levels is appropriate for Central Maui and higher-demand services. Lower-demand services may simply have too few passengers to support hourly service levels. Because of the low density of land use, transportation pricing and other factors, rural communities have little potential to increase demand from people who have a transportation choice.

To improve the viability of low-demand services, the Waihe’e neighborhood analysis explored ways to reduce the cost, including the following:

- Smaller vehicles
- Shorter route lengths (requiring a connection to continue a passenger trip)
- Reduced operating cost (shared taxi/ride hailing and autonomous vehicles)
- On-demand service or reduced frequency/span of service

Smaller vehicles usually have a slightly lower intrinsic operating cost because they consume less fuel and have standard parts for maintenance, but driver costs continue to be the primary cost for transit. As a result, systems that have differential driver costs for smaller vehicles may enjoy lower overall costs than systems that have one wage cost for all transit drivers. In some systems, this distinction is made by having vehicles that can be operated with different license categories, such as Class 3.

Both the analysis and the public engagement revealed that lower-frequency services may be acceptable to residents looking for basic mobility and may be possible at costs-per-boarding comparable to the range of costs elsewhere in the system. In low-demand areas, stop placement may be important to optimize convenience and safety for pedestrians.

From the Waihe'e project, the following rural transit principles are suggested to create the possibility of sustainable rural services at low demand levels:

1. Retain a commitment to timed connections between services including Central Maui, Islander, Villager, and Rural routes.
2. Provide rural services at low frequency to satisfy basic mobility needs.
3. Retain a commitment to small bus operation for productivity and to serve narrow and neighborhood streets.
4. Seek stop spacing and placement that are appropriate to the neighborhood.
5. Consider providing low-demand service on demand or with a reduced daily service span.

9. Preferred Option

9.1 New Alternative 7 – Limited Fixed-Route Service Interlined with Revised Kula Villager

Based on the engagement and in exploring the application of the Waihe'e insights to rural services, it was identified that route #39 in Kula continues to experience lower than projected ridership, despite the recent modification to reduce the headway from sixty minutes to ninety minutes and to extend the route to Makawao. It is among the least productive services on Maui.

On reviewing the rural land use in the Upcountry Kula area, it is anticipated that the area would continue to produce low demand for transit. With low demand, there is a challenge for the system to maintain any service because the existing service design does not provide opportunities to share buses and hours between routes.

By understanding the rural service need in the context of the Waihe'e planning process, a candidate service model has been identified that could use existing resources to provide benefits to both Waihe'e and Kula with a potential new connection as a further benefit.

Figure 16 - New Option 7

That alternative would create the following:

1) **A new Waihe'e routing from Waihe'e to Queen Ka'ahumanu Center** – Buses would generally follow the original route identified in the 2016 SRTP (except service is not provided on the Aukai/Wailupe loop or Kea Street), linking Waihe'e to Queen Ka'ahumanu Center. Service would operate every three hours, providing five daily trips.
2) **A new connection between Queen Ka'ahumanu Center and Kulamalu Town Center** – Buses would travel directly to Kulamalu Town Center in Pukalani, serving major shopping destinations and avoiding a diversion through the airport (new route #41).
3) **A revised routing and schedule for route #39** – Route #39 would operate with the same bus every three hours, a frequency more closely aligned with demand. The routing would be modified to eliminate the duplicated segment to Makawao that is already served by #40.

At the end of the Kula trip, the bus would return to Queen Ka'ahumanu Center to provide a trip to Waihe'e. Buses traveling between Kulamalu Town Center and Queen Ka'ahumanu Center would operate in service as route #41, providing a new, direct connection between the centers and potentially generating additional revenue.

Benefits of that approach include the following:

- Implementation of the Waihe'e service consistent with the community's input and preference during consultation
- Modification of the service levels in Kula to match demand more closely and improve route #39's productivity
- A predictable, stable schedule for residents in both Waihe'e and in Kula
- The creation of a new direct connection between Hawaiian Homelands communities at Waihe'e and Keokea, despite low overall demand

Tradeoffs include the following:

- A reduction in service on the Kula service
- Reduced overall frequency between Makawao and Kula (route #40 still provides service)

It is noted that a new, direct service on route #41 between Kulamalu Town Center and Queen Ka'ahumanu Center may be attractive to residents in Upcountry, including in Pukalani. Route #40 operates in the same corridor but takes longer because it operates to Makawao (trips to Queen Ka'ahumanu Center) and to the airport (both directions). The new link would also provide service coverage to shopping areas and increase the overall frequency of service between the centers with the potential to generate new demand and increased revenue.

Operationally, the three routes would work together on a three-hour, round-trip cycle and make timed connections at Queen Ka'ahumanu Center. It is recommended that they operate as separate route numbers. As an alternative, the connector service between Queen Ka'ahumanu Center and Kula could be operated as a lengthened route #39, though that option could provide less long-term flexibility.

Because that route operates with resources currently dedicated to #39, the entire service can be provided at no incremental cost to the system, including capital (fleet) and operating cost, saving approximately $500,000 and one bus from the service in the Short-Range Plan. As noted above, the elimination of unproductive miles and hours for midday fueling currently required on #39 could produce an operational saving, though that has not been confirmed. As with all the transit-based alternatives, there is a cost to establish new bus stops.

It is anticipated that there would be little change in demand in the Kula area on route #39 and that additional ridership and revenue would be achieved both through the Waihe'e service and from the creation of a new connector between Queen Ka'ahumanu Center and Kula. That new demand has not been forecast as part of this project.

9.2 Alternatives Evaluation

Figure 17 on the following page uses the evaluation criteria described in Section 5 to provide an evaluation of the alternatives. Empty circles have low ratings (unfavorable), and filled circles have higher (favorable) ratings on each criterion, though the scale is generally qualitative. Notes on the scoring are available in Appendix 1.

9.3 Refined Demand Forecast

The demand forecast prepared in Phase 1 revealed low transit demand for Waihe'e. At this level of demand, any all-day fixed route service is likely to have a high cost per boarding. That evaluation considers whether the infrequent service alternative would significantly reduce demand.

Given high automobile ownership, cheap or free parking at most key destinations, and the difficulty of accessing the service, it is unlikely that any of the transit solutions would attract residents who have access to a vehicle. Demand in Waihe'e is expected to come mainly from people without alternative personal mobility. As experienced in many similar communities and as indicated in the engagement session, it is expected that the service would attract customers who are willing and able to adjust their travel schedules to use a basic transit service with limited daily trips. As a result, the demand for the limited service alternative is expected to be within the range of estimates already developed.

A second evaluation considered whether expansion of service coverage in the other alternatives would increase demand significantly. Alternatives that provide service on local streets in the neighborhoods would be slightly more convenient than the SRTP alternative, although they could be unpopular with other residents. The routes would be more circuitous, slower, less understandable, and less comfortable than direct service operating on the Kahekili Highway, offsetting any meaningful gain in demand. Some alternatives included extensions to the Wai'ehu Golf Club and Waihe'e Beach Park. Based on experience in other municipalities, demand to golf courses is low overall. Some employees may use transit to get to and from work but, typically, few golf customers use transit. Demand to the Beach Park may be slightly higher because some people traveling to parks for recreation may be willing to adapt their trip times to a limited bus schedule. The relevant forecasts were increased slightly to reflect those potential increases.

The SRTP alternative also shows service to Kea Street. That service would be unlikely to generate significant demand because almost all the properties in that neighborhood are already within walking distance of transit as defined in the Service Design Guidelines.

For those reasons, the demand forecasts developed in Chapter 4 are appropriate for the alternatives described in this report.

Alternatives Evaluation Matrix

	Customer Experience						Operator	Funder		
	Access within Waihe'e	Connection to key destination (survey)	Connection with other transport services	Service Level	Provision of transportation options	Service Coverage (new stops Waihe'e System)	Ease of Operation	Capital Cost	Annual Operation Cost	Extra Cost per Boarding
Alternative 0 Short Range Plan Routing	◑	◑	●	◑	◑	14 /2	◕	$450,000	$500,000	$73
Alternative 1 to Paukukalo through neighborhoods	◕	◔	◑	◑	◑	23/0	◑	$150,000	$440,000	$53
Alternative 2 Automated electric shuttle to Paukukalo through neighborhoods	◕	◔	◑	◑	◑	21/0	◕	$335,000*	$250,000 - $275,000	$33 – $35
Alternative 3 to Wailuku Business Center (+Golf and Beach)	◕	◑	◕	◑	◑	23/0	◑	$150,000	$440,000	$16
Alternative 4 as extension of #1/#2 with limited trips	◕	◕	◕	◔	◔	21/0	◑	$0**	$15,000	$2
Alternative 5 Shared Taxi/Ride Hailing to QKC	●	◑	●	●	◑	>21/0	◕	$0***	$160,000	$24
Alternative 6 Shared Taxi/Ride Hailing to Paukukalo	●	◔	◑	●	◑	>21/0	◕	$0***	$40,000	$5
New Alternative 7 Limited Fixed Route Service Interlined with Revised Kula	◕	◑	◑	◔	◔	>21/0	◑	$0**	$0	$0

Figure 17 – Alternatives Evaluation Matrix

* List price from one supplier, excluding insurance, additional options, financing costs, SIM card subscription, or transportation. Costs expected to vary with number purchased and as technology advances.
** Reallocates vehicles from other routes for designated trips.
*** Dedicated vehicles are not required, but purchase or lease of ADA-compliant vehicles may be needed to meet requirements.

Additional Explanatory Notes for Figure 17

Notes: Alternative 0 – Short-Range Plan Model
Access within Waihe'e is limited because the stops are available only in the westbound (outbound) direction on the Kahekili Highway. Upgrading of the highway to include road crossings and bus stops eastbound would improve that score and be consistent with transit access goals in the governing plans.

Connection to key destinations also receives a moderate score because the route provides direct service to Queen Ka'ahumanu Center, which has slightly less demand than the Wailuku Business District and other destinations.

Connection with other transport services receives the highest score because the route connects with all other transit routes at Queen Ka'ahumanu Center, a timed transfer location.

Service level is moderate because the frequency is hourly (independent of demand).

Provision of transportation options is moderate for all the alternatives because they improve transit though they make no additional improvements for walking or cycling.

Ease of operation is moderate because it requires careful operation or schedule interlining to maintain reliability with one bus.

Notes: Alternative 1 – Service to Paukukalo through Neighborhoods
Access within Waihe'e is strong because the route could be scheduled to operate partially within the neighborhoods. Upgrading of the highway to include marked crossings and bus stops eastbound could provide better access for all the neighborhoods.

Connection to key destinations receives a lower score because the route requires connections for service to all destinations beyond Paukukalo.

Connection with other transport services receives a moderate score because the route requires transfers to reach all destinations east of Paukukalo. Timed connections would be possible, which would mitigate this factor.

Ease of operation is at the midpoint because this is traditional transit service.

Notes: Alternative 2 – Automated Service to Paukukalo through Neighborhoods
Ease of operation is moderately high because this alternative features new technologies that include electric vehicles and automated systems. This may be mitigated by the level of support achieved through a lease or support agreement with the vehicle supplier.

Notes: Alternative 3 – To Wailuku Business Center through Neighborhoods (Plus Wai'ehu Golf Course and Beach Park)

Connection to key destinations score is moderate because the route provides direct service to Wailuku Business Center and new service on Wai'ehu Beach Road and on Main Street but does not operate direct to Queen Ka'ahumanu Center.

Connection with other transport services receives a higher score because it connects with several other routes at Paukukalo and at Wailuku Business Center.

Notes: Alternative 4 – Extension of #1 and #2 with Limited Trips
Connection to key destinations receives a higher score because the route provides direct service to the highest-rated destinations in the survey.

Connection with other transport services receives a moderate score because the travel time to some destinations would be high. Directionally timed connections may be possible, mitigating this factor.

Service level receives a low rating because the service is less frequent than the other options.

Notes: Alternative 5 – Shared Taxi/Ride Hailing to Queen Ka'ahumanu Center
Connection with other transport services receives the highest score because the route connects with all other transit routes at Queen Ka'ahumanu Center, a timed transfer location.

Service level receives a moderate score because on-request service is coordinated with other, hourly, services.

Annual operating cost and **cost per boarding** are shown based on a reference trip estimate from a local taxi company and are provided as a general reference for upper bounds of costs.

Notes: Alternative 6 – Shared Taxi/Ride Hailing to Paukukalo
Access within Waihe'e receives the highest score because service can be curbside throughout Waihe'e.

Ease of operation is moderately high because it requires no direct operation of service but does require management oversight of a nontraditional transit contract.

Annual operating cost and **cost per boarding** are shown based on sample trips generated from the Uber website and are provided as a general reference for lower bounds of costs.

Notes: New Alternative 7 – Limited Fixed-Route Service Interlined with Revised Kula

All costs are shown as $0 because there is no incremental cost; the service is provided by sharing resources with another route already in operation.

10. Plan Selection

The consultation revealed that potential transit users in low-demand communities place high value on basic mobility. As a result, they indicated that they would be satisfied with a limited service that provided three to five daily trips. That input is consistent with transit experience in many other low-demand US neighborhoods.

To serve that demand, two alternatives have been identified:

Alternative 4 – Extension of #1 and #2 with Limited Trips. This alternative has a significant impact on an existing high-productivity route in the system. While it is possible to modify the route with minimum impacts, it is generally undesirable to diminish the quality of service on an attractive, higher-demand route.

New Alternative 7 – Limited Fixed Route Service Interlined with Revised Kula. This alternative serves Waihe'e with limited service similar to Alternative 4 above and addresses a low-productivity rural transit service on route #39 in Kula by reducing the number of daily trips and reallocating a share of service to serve Waihe'e. It introduces a new, limited service connector between Kulamalu and Queen Ka'ahumanu Center with service to shopping destinations and adds full two-way service between Pukalani, Makawao, and Hali'imaile as additional benefits.

It is recommended that Maui Bus implement **New Alternative 7** to provide service in both Waihe'e and Kula at the reduced service levels.

11. Marketing Plan

Developing a successful marketing plan for new transit service requires a realistic alignment of the service objectives, the potential market, and the marketing resources available. This plan is developed for the Waihe'e component of the recommended solution **New Alternative 7**. The principles that apply to Waihe'e service could be adapted and applied to the Kula and connector components of the service as well.

Marketing Goals and Objectives

It has been established that the market for transit in Waihe'e is primarily from residents who do not have access to a vehicle, and the market is both small and local.

A typical transit marketing plan will address five potential areas of influence:

- **Awareness** — letting people know transit exists in their community
- **Education** — educating the population about the services and their benefits
- **Image/Perception** — creating a positive and inclusive image of the transit service and the overall transit system
- **Ridership** — encouraging trial ridership among new customers and continued use among existing riders
- **Support** — building support in the broad community and among community leaders

The following are recommendations in each of those areas for the new Waihe'e service:

Awareness — letting people know transit exists in Waihe'e

Community residents comprise the essential market for the Waihe'e service. A small number of people may also use the service to visit friends who live in Waihe'e.

Service awareness can be established by creating key information that can be included in the printed timetable and on the website. That objective includes the following:

- A full description of the route with all streets listed in order and in both directions.
- A timetable listing the scheduled times at key locations. Note that, for printed material, it is advisable to list only key stops; customers can estimate the time between them. Doing so permits a smaller timetable that provides more useful information overall.
- A high-resolution map showing the entire route that, ideally, marks the stops, relevant streets, and key locations.
- The existing information about fares, transferring, contacts, the app, and other core resources for customers.

All of that information would be essential for users and always should be available to customers at key transit locations, activity centers, retail outlets, hospitals and medical centers, and other places where potential customers may travel. Waihe'e has an active neighborhood association that may be willing to distribute the materials and promote the service.

For the start-up, a special version of the timetable could be produced that highlights the new service.

As part of the start-up, it is recommended to send copies to each household in the neighborhoods by mail or as a newspaper insert and in any community-oriented online forums. The Hawaiian Homelands office also should be provided with copies of maps and timetables.

Other opportunities for establishing awareness include the following:

- High-quality information at new bus stops and on existing stops that the route would serve.
- Use of press releases and other media influence to create earned media stories.
- Email and social media contacts, especially with community influencers.

The recommended awareness program would include the following:

- Update of the Maui Bus timetable brochure to include the Waihe'e route, including the following:
    - Produce a new, more detailed map on the brochure that shows all the streets for each route. That may require a redesign and, potentially, enlarging of the brochure. At a minimum, produce a map of the new Waihe'e route that shows all the streets.
    - A list of all the streets served in text form.
    - Times at key stops.
- Send that brochure by mail to all residences within a half mile of the Waihe'e route, including residents within the existing service area, about five to seven days before the start of service.
- Post a laminated copy of the map and timetable on every bus stop served by the route with a bright banner announcing that it is new service and when that service would start.
- Prepare and distribute a press release for print, radio, and community television that announces the start of service. Include the timetable brochure with maps and photos of the bus in the neighborhood.
- Prepare and distribute a social media announcement to community influencers. Include links to the website and app.

Education — educating the population about services and their benefits

Some people on Maui may have an expectation that transit exists for the purpose of shifting drivers to transit. Though this may be the case in many urban areas, transit often has a role in communities such as Waihe'e to provide basic mobility for people who don't have transportation alternatives.

Transit education is vital to establishing a realistic public and customer expectation of what transit will do and how productive it will be in Waihe'e.

Recommended education messages and approach

Create key messages about the following:

- The role transit plays in Waihe'e:
    - Transit in Waihe'e provides basic mobility with a limited number of trips daily.
    - It creates opportunities for residents who don't have access to a car to be independent and engage in socially meaningful activities.
    - It frees family members who otherwise might need to drive family and friends to appointments and for shopping.
    - It is not expected to serve the needs of people who have a personal vehicle.
- How transit would perform in Waihe'e:
    - Each trip would carry a small number of people for vital activities.
    - Service levels would be limited to provide service in a cost-effective manner.
    - Trips would connect Waihe'e with the rest of Maui by connecting with other routes.

Include those educational messages in media materials and in messages to stakeholders, community influencers, critics, and others.

Image/Perception — creating a positive and inclusive image of the Waihe'e transit service and the overall transit system

Recommended image/perception messages and approach would include the following points:

- Transit is vital for Maui because it connects communities, supports the economic vitality of the island, is an alternative to driving in some areas, and provides basic mobility.
- Suburban and rural transit is part of the overall transit network. From neighborhoods, people using transit can be connected to many places on Maui.
- Transit is easy to use. Information and education are available on the website, and brochures are readily available.
- Transit is modern with real-time information available on a mobile app and on computers, and a Twitter feed alerts customers to incidents that may affect their travel.
- Drivers are trained professionals and always drive with care and attention.

Include those points in media materials and in messages to stakeholders, community influencers, critics, and others.

Ridership — encouraging trial ridership among new customers and continued use among existing riders

It is important to encourage customers to try the transit system for the first time. Residents who are familiar with transit may find it easy to use the new routes, but customers unfamiliar with transit may be intimidated and unsure.

Some systems provide free trips for a day, vouchers for free trips, or discounted rides during a start-up period of days or weeks. Though that strategy has some short-term revenue implications, the benefit in new ridership often compensates quickly.

For vulnerable customers, it also may be helpful to work with community groups to provide orientation guides that take new customers for their initial trip to reduce the anxiety about using transit for the first time. As an incentive, Maui Bus may consider making the trip free for the guides. There is some benefit in having the customer pay a fare because that provides fuller orientation about how to use the system.

Recommended ridership approach

Encourage potential customers to try the service by operating fare-free on this route on its first day when any customer boarding #8 may board free. Customers transferring to another route would be required to pay a fare. Advertise the fare-free day in the household mailing, press releases, website, and other materials. Consider also providing another fare-free day after the first month when residents have had an opportunity to notice the buses and hear about them from neighbors.

Work with community advocates to identify individuals or organizations that are capable and willing to provide orientation to new users. Establish a policy that allows guides to make a trip fare-free with a new user for orientation purposes.

Use all the other information and marketing channels to invite residents to try the service and encourage their friends and family members to use it.

Support — building support in the broad community and among community leaders

Ongoing support is vital for transit as it gains and sustains acceptance in the community. Waihe'e has an active group of transit supporters in the community association and other groups. Those could be enlisted as advocates of the service to encourage customers and to address community concerns. The same advocates could have an ongoing role to encourage dialog between the community and Maui Bus.

It is possible to collect constructive feedback from users to promote fine-tuning of service and high customer satisfaction. It also allows Maui Bus to develop contacts to disseminate system information when changes are contemplated or are being implemented.

Recommended support approach

Work with community organizations and community advocates to promote transit among potential users. Provide them with education and training materials as well as key messages. Ensure they understand the target markets for the new Waihe'e service and communicate realistic messages about the role transit will play in the community.

Engage with them periodically (more often at the start) to hear their feedback and provide encouragement in their role of supporting mobility in their community.

Further Resources

The US Department of Transportation, Federal Transit Administration has prepared a National Rural Transit Assistance Program (RTAP) Marketing Toolkit. Many attributes for the Waihe'e service are aligned with the RTAP program. The toolkit is available online and includes many resources, including the following:

- Photo Library (with usable photos and ideas)
- Graphics Library
- Templates (brochures, printed promotional materials, news release guidelines)
- Transit Benefits Statistics (useful for communicating to diverse groups)
- Other Tools (various resources to aid transit agencies)

The principles of this marketing plan could be applied to Waihe'e service alone, or they could be extended to a combined marketing plan for Waihe'e and Kula services.