CHAPTER VIII

Alternatives Analysis

VIII. ALTERNATIVES ANALYSIS

Under HAR Title 11, DOH, Chapter 200, EIS Rules, Section 11-200-17(F), a Draft EIS must contain a section discussing alternatives that could attain the project objectives, regardless of cost, in sufficient detail to explain why the specific alternative was rejected. Alternatives to the WCT, along with reasons why each alternative was rejected, are described below.

WCT Project Objectives

The primary mission of the WCT Master Plan is to create a new mixed-use residential community that embodies the principles and policies of the MIP and that respects and implements the Statement of Values of the Waikapū Community Association. Key guiding principles in the MIP that have guided the development of the WCT Master Plan include:

1. Respect and encourage island lifestyles, cultures, and Hawaiian traditions;
2. Promote sustainable land use planning and livable communities;
3. Keep "urban-urban" and keep "country-country;
4. Protect traditional small towns;
5. Protect open space and working agricultural landscapes;
6. Protect environmentally sensitive lands and natural resources;
7. Promote equitable development that meets the needs of each community;
8. Plan for and provide efficient and effective public facilities and infrastructure;
9. Support sustainable economic development and the needs of small business; and
10. Promote community responsibility, empowerment, and uniqueness

The WCT Master Plan also seeks to embody the values of the existing residents of Waikapū. The Waikapū Community Association's Statement of Values and Supplemental Statements have helped

to shape the WCT Master Plan. These values and supplemental statements are listed in Section III.A of the ~~DEIS~~ FEIS.

In addition to the above-referenced guiding principles from the MIP and Waikapū Community Association Statement of Values, project specific objectives include the following:

- Be a profitable development for the project's entrepreneurial developers, the County and State;
- Provide a diverse range of market and affordably priced housing in order to help address the projected housing demand through 2030;
- Develop a "complete community" with a diversity of housing, retail, and civic uses to support residents daily needs;
- Protect the environment by directing development away from sensitive lands and by incorporating sustainability practices into the design, development and operation of the project;
- Reduce automobile dependence;
- Provide a jobs and housing balance within the development;
- Create the opportunity for more active and healthy lifestyles;
- Reduce the project's energy demand through conservation, energy efficient design and development of on-site renewables;
- Respect traditional Hawaiian lifestyles and existing cultural practices;
- Facilitate agricultural development within the project's protected agricultural lands;
- Maintain a sense of community where Maui residents feel comfortable visiting, living, working and playing.

The alternatives considered prior to selecting the preferred alternative included the following:

- No Action Alternative;
- Develop fewer units;
- Develop more units by producing more workforce housing than required;
- Develop at a lower density; and

- Develop at an alternative location.

Five (5) alternatives to the proposed WCT Master Plan were considered. These alternatives are described below.

1. No Action Alternative

Under the no action alternative, existing entitlements would remain. The approximate 485 acres of agricultural lands proposed for urban and rural development would remain in agricultural use pursuant to the permitted uses allowed by the State Land Use Law and the Maui County Code. Under this scenario farming of sugar cane by HC&S would likely continue into the foreseeable future on the WCT lands they currently lease. It would be expected that the existing diversified agricultural operations of Kumu Farms, Bobby Pā'ia and others would also continue their production activities.

The existing MTP would also likely continue functioning much as it currently does, in accordance with the provision of Maui County Code, Chapter 19.86 Wailuku-Kahului Project District 5 (Maui Tropical Plantation). The No Action Alternative assumes that the housing and commercial development proposed by the WCT would not be developed elsewhere within Central Maui. Therefore, should the No Action Alternative be implemented both the benefits and costs associated with the development would not be incurred at an alternative location.

Potential benefits of the No Action Alternative might include: 1) the existing "sense of place" and open space ambiance and integrity of existing views across agricultural lands to Haleakalā and the West Maui Mountains would remain unchanged by development; 2) approximately 485 acres of highly productive agricultural lands would remain undeveloped and available as a resource for agricultural production; 3) the existing MTP would continue to generate employment and serve as a visitor attraction for the benefit of the tourism industry; 4) there would be no short-term construction-related impacts (such as construction noise, construction equipment exhaust emissions and fugitive dust); 5) avoidance of additional infrastructure demands (water, wastewater

flows, and solid waste disposal); 6) no increased WCT traffic impacts and associated infrastructure costs; and 7) less demand upon the region's coastal and inland parks and recreation facilities generated by the project population. The No Action Alternative would not add to regional population increases, or require any public services, such as parks and schools, to accommodate an increase in population within the area.

Pursuing the No Action Alternative would also impose negative impacts upon the community. Under the No Action Alternative the project would not be built. This would be in direct contradiction to the recently adopted MIP (December 2012), which sets forth a managed and directed growth strategy for the island of Maui. The MIPs Directed Growth Plan states:

> *The Directed Growth Plan is the backbone of the Maui Island Plan (MIP). Taking into account population projections, it prescribes and outlines how Maui will grow over the next two decades, including the location and general character of new development. The Directed Growth Plan accommodates growth in a manner that provides for economic development, yet protects environmental, agricultural, scenic and cultural resources; economizes on infrastructure and public services; meets the needs of residents; and protects community character.*

The No Action Alternative would negatively impact the community in the following ways:

- ***Housing Supply.*** The principal purpose of the WCT is to create additional housing supply to help address future demand. If the additional housing is not built, but demand remains strong and continues to outpace supply then home prices will remain prohibitively high for many island residents. High home costs place a significant burden on working families who also face high transportation costs, food costs, energy costs, medical costs and educational costs. The MIP states the following in the introduction to the Plan's housing element:

> *Housing is one of our most basic human needs. It is one of the fundamental building blocks in our communities and it is where our families gather and find shelter. All segments of our island have particular needs, whether it is the first home or apartment for young adults, or to accommodate the specified needs that come with age. Housing is not always treated as a human right. When adequate or appropriate housing is unattainable to a large portion of the population, it negatively impacts the entire community and decreases overall quality of life. We can do many things to promote an adequate and permanent supply of affordable for-sale and rental housing to meet resident needs. To meet our island's housing needs, we must rethink Maui's paradigm. Due to numerous factors, Maui's housing prices have escalated dramatically in the last decade. With some of the highest housing prices in the nation, many Maui residents are struggling to afford housing on the island.*

The MIP projects the total demand for new housing units on Maui through 2030 to be approximately 29,589 units of which about 10,845 units will need to be built on currently unentitled lands. The MIP designates four new planned growth areas for the Wailuku-Kahului region. These four areas are to accommodate about 4,437 units plus an undetermined number of rural lots, or about 41 percent of the projected demand island-wide. The WCTs percentage of the planned supply to be derived from newly entitled lands within Wailuku-Kahului is 32%. The No Action Alternative would therefore significantly reduce this planned supply, which would limit the diversity of housing supply available to prospective home buyers and renters and would likely lead to higher housing costs for Maui residents.

- ***Economic Development***. The WCT is expected to indirectly support Maui's existing economic base activities by providing much needed housing to serve the island's workforce. The WCT is intended to provide housing along with supporting commercial, employment and institutional uses that will allow for the growth and diversification of Maui's economic base, while also allowing for the economy to become more sustainable - including the island's agricultural industry. By providing much needed housing in a format that will create a high quality of life for Maui's working families, and by generating both short- and long-term employment in the construction, trade and agricultural industries, the Project is directly supportive of the State and County's economic development. More specifically, the No Action Alternative would deprive the State, County and general public of the significant economic benefits associated with the WCT, including an estimated:
    - The WCT development will bring in $609.1 million of new capital investment into the Maui economy.
    - The construction of the WCT components will directly create an estimated 2,320 "worker-years" of employment (the equivalent of 52 work weeks at 40 hours per week) in the trades and associated businesses during build-out, averaging about 193 worker years annually, with an estimated $188.3 million in wages (averaging about $15.7 million per year).
    - The on-going operations and maintenance of the business commercial and residential components will directly provide an estimated 4,251 FTE worker-years during the 2016-2030 projection period, providing stabilized employment for 531 permanent positions.
    - The Project will require an estimated 66 worker years of maintenance and common area element employment on a continual basis, and will generate some 1,750 worker years of off-site employment from 2016-2030 and a stabilized demand for 149 FTE positions.

- In aggregate, during the development of the WCT 8,750 worker years of employment will be created during construction and operations, on-site/direct and off-site/indirect, with stabilized employment after completion of 746 jobs.

- During the 15 years projection period, WCT will have a base economic impact of $1.3 billion with a stabilized annual benefit of $137.3 million thereafter.

- ***Master Plan Benefits***. The WCT is a master planned community that arose from the General Plan update process and which has had a tremendous amount of community input that has helped to shape and define the community design. Under the No Action Alternative, there would be no master-planned community utilizing "smart growth" and "neo-traditional" town planning principles, such as locating growth close to infrastructure, employment and facilities; creating diverse residential opportunities for all income categories; designing mixed use neighborhoods incorporating commercial and civic uses to satisfy daily needs, incorporating abundant on-site recreational amenities and integrated bicycle and pedestrian networks. Moreover, under the No Action Alternative the opportunity to establish a permanent agricultural preserve comprising approximately 800 acres, with an additional 277 acres of agricultural lands with limited subdivision potential would be lost. The WCTs agricultural lands are an important component of the overall project and will serve to create on-site agricultural employment, greater self-sufficiency in food production and a permanent open space separation between Waikapū and Māʻalaea.

For the following reasons, the No Action Alternative was rejected:

- Is not consistent with the MIPs Directed Growth Plan;
- Would exacerbate the County's current housing deficit and would worsen the island's affordable housing crisis;
- Would deny Maui residents of the many substantive benefits that would be implemented under the WCT Master Plan; and

- Would not provide the State, County and general public the significant economic benefits associated with the implementation of the WCT.

In summary, the benefits associated with the No Action Alternative are outweighed by the benefits to the community that the Project would bring.

2. Develop Fewer Units

Under this scenario, fewer units would be developed. For planning purposes, it was assumed that just the mauka lands encompassing the current MTP and surrounding agricultural lands would be developed. The site plan for the mauka lands would be updated to accommodate approximately half of the proposed development, or about 717 residential units and 100,000 square feet of commercial space. Developing the mauka lands, rather than the makai lands, is preferable because access to the project can be provided directly from Honoapi'ilani Highway. The full development of the mauka lands would not be dependent upon having the Wai`ale Bypass constructed whereas it is expected that this infrastructure is required for full development of the makai lands.

Under this scenario, there would be benefits and costs to the community. Potential benefits of this scenario include: 1) the integrity of existing views from Honoapi'ilani Highway across agricultural lands towards Haleakalā would remain unchanged by development; 2) approximately 236 acres of highly productive agricultural lands would remain undeveloped and available as a resource for agricultural production; 3) there would be no short-term construction-related impacts (such as construction noise, construction equipment exhaust emissions and fugitive dust) associated with development of the makai lands; 4) avoidance of additional infrastructure demands (water, wastewater flows, and solid waste disposal) associated with the development of about 716 residential units and 100,000 square feet of commercial on the makai lands; 6) no increased traffic and associated impacts from the development of the makai lands; and 7) less demand upon the region's coastal and inland parks and recreation facilities generated by the additional project population. Assuming that the makai units would not be built elsewhere by other projects within the region, the regional population increase may be less and the types of impacts associated with

population growth, such as increased demand upon infrastructure and public services, would be less than the preferred alternative.

The Develop Fewer Units Alternative would negatively impact the community in many of the same ways that the No Action Alternative. However, the magnitude of the negative impacts would be proportionally less. The following summarizes the principal costs to the community associated with this alternative.

- ***Housing Supply.*** The principal purpose of the WCT is to create additional housing supply to help address future demand. If the additional housing is not built, but demand remains strong and continues to outpace supply, then home prices will remain prohibitively high for many island residents. In a market with constrained supply but strong demand, those with the greatest purchasing power will bid up the price until supply approaches equilibrium with demand. Those that cannot compete in such a market are forced out, which is the current situation for many Maui residents. High home costs place a significant burden on working families who also face high transportation costs, food costs, energy costs, medical costs and educational costs.

As noted, the MIP projects total demand for new housing units on Maui through 2030 to be approximately 29,589 units of which about 10,845 units will need to be built on currently unentitled lands. The WCTs percentage of the planned supply from newly entitled lands within Wailuku-Kahului is 32%. The Develop Fewer Units Alternative would significantly reduce this planned supply, which would limit the diversity of housing supply available to prospective home buyers and renters and would likely lead to higher housing costs for Maui residents.

- ***Economic Development***. The WCT is expected to indirectly support Maui's existing economic base activities by providing much needed housing to serve the island's workforce. The WCT is intended to provide housing along with supporting commercial, employment and institutional uses that will allow for the growth and diversification of

Maui's economic base industries, while also allowing for the economy to become more sustainable - including the island's agricultural industry. By providing much needed housing in a format that will create a high quality of life for Maui's working families, and by generating both short- and long-term employment in the construction, trade and agricultural industries, the project is directly supportive of the State and County's economic development. As noted in the No Action Alternative, the full buildout of the WCT will produce significantly positive economic impacts to the community in the form of wages and employment. While the development of a smaller project will also generate positive economic impacts, these impacts will be significantly less by just developing the mauka lands.

- ***Master Plan Benefits***. The WCT is a master planned community that arose from the General Plan update process and which has had a tremendous amount of community input that has helped to shape and define the community design. In describing the WCT Planned Growth Area, the MIP states in part:

> *Providing the urban character of a traditional small town, this area will have a mix of single-family and multifamily rural residences, park land, open space, commercial uses, and an elementary or intermediate school developed in coordination with the Wai'ale project. The area is located south of Waikapū along Honoapi'ilani Highway, and it will incorporate the integrated agricultural and commercial uses of the existing tropical plantation complex. This area is proximate to the Wai'ale planned growth area, providing additional housing in central Maui within the Wailuku-Kahului Community plan region. As part of this project, parcels to the south of the project (identified as Agricultural Preserve on Figure 8-1) shall be protected in perpetuity for agricultural use through a conservation easement.*

Planned Growth Area Rationale:

Keeping the Waikapū Tropical Plantation as its town core, this area will become a self-sufficient small town with a mix of single-family and multifamily housing units in a walkable community that includes affordable housing in close proximity to Wailuku's employment centers. Schools, parks, police and fire facilities, transit infrastructure, wastewater, water supply resources, and other infrastructure should be developed efficiently, in coordination with neighboring developments including Maui Lani, Kehalani, Pu'unani and Wai'ale.

Under the Develop Fewer Units Alternative, it would be challenging to create a "complete community" where a diversity of housing could be provided at a scale that would make it economically feasible to make investments into infrastructure and public facilities – such as schools, water and wastewater systems. Moreover, it would be difficult to justify the dedication of agricultural lands for preservation, since future development pressure would likely warrant the urbanization of those lands.

For the following reasons, the no action alternative was rejected:

- Is not consistent with the MIPs Directed Growth Plan;
- Would exacerbate the County's current housing deficit and would worsen the island's affordable housing crisis;
- Would deny Maui residents of the many substantive benefits that would be implemented under the WCT Master Plan; and
- Would not provide the State, County and general public the significant economic benefits associated with the implementation of the Master Plan Update.

In summary, the benefits associated with the Develop Fewer Units Alternative are outweighed by the benefits to the community that full build-out of the Project would bring.

3. Develop More Units by Building More Workforce Housing

Under the "Develop More Units by Building More Workforce Housing" Alternative, the total number of units within the WCT would be increased by 300, or about 21 percent to 1,733 units. This alternative would be in conformance with the MIPs policy of allowing for additional units if provided as affordable housing in excess of what is required by law. The MIP states: *"Additional units may be permitted through a transfer of development rights program or to provide affordable housing in excess of what is required by law."*

In consideration of the current undersupply of affordably priced housing within Central Maui, this alternative may offer significant benefits to the community. However, by building additional units the project would also produce increased marginal impacts upon infrastructure and public facility systems. Developing additional affordable residential units would have to be conducted within the existing growth boundary designated by the MIP. Therefore, in order to accommodate additional units, the net residential density of the project would have to increase, specifically in the area currently planned for multi-family residences.

If this alternative were to be pursued, an approximate 300-unit workforce housing project would be proposed on the makai lands abutting the proposed elementary school and within close proximity to the Community Park, Main Street and the Main Street commercial districts. The WCT Master Plan designates this area for multi-family and country town mixed-use development (**See**: Figure No. 48, Preferred Location to Develop Additional Affordable Housing).

If developed, the 100 percent affordable 201H project would likely be built as a two- and 3-story multi-family project with about one-half of the units offered for sale and the other half for rent. By developing 300 additional units within the areas of the WCT Master Plan designated for Multi-Family, the net residential density of the WCTs multi-family development would increase from about 10.61 units per acre to about 21.34 units per acre. The overall net residential density for the urban lands (excluding rural units) within the WCT would increase from about 8.29 units per acre to about 10.12 units per acre. The MIPs net residential density guideline for the WCTs Planned

Figure 48: Preferred Location for Additional Affordable Housing

Area is 9 to 12 dwelling units per acre. Thus, even with the development of a 100 percent affordable 300 unit workforce housing project, the WCT would still be well within the MIPs net residential density guideline. Under this scenario, the proportion of multi-family units to single-family units would increase from about 27 percent of the project to about 39 percent, which is consistent with the MIPs Planned Growth Area guideline of having a "balance of single-family to multi-family residences".

This scenario presents benefits and costs to the community. Potential costs associated with this scenario relate mostly to the additional population generated by the development. If 300 additional workforce multi-family units are developed, is should be expected that the project population would increase by about 735 persons. The increase in the project population would increase demand for infrastructure and public facilities including parks, schools, water, police, fire and wastewater systems. The project would also generate additional traffic, which would impact roadways within the project area.

However, the additional workforce housing units would also produce significant benefits to the County. As noted, high home costs place a significant burden on working families who also face high transportation costs, food costs, energy costs, medical costs and educational costs. Many Maui families have been forced to leave Hawai'i, live in overcrowded housing conditions, or have fallen into homelessness due to the limited availability and high cost of housing on Maui. The additional affordable units would increase the supply of affordable rentals and for sale housing units in an area within walking distance of an elementary school, an intermediate school (at the proposed Wai`ale community), parks, shopping and employment. The project site is also within a short vehicular commute by transit, or personal automobile, to the employment, commercial and governmental centers within Wailuku, Kahului and Kīhei.

This scenario would also likely produce greater positive short- and longer-term operation phase employment and wage impacts relative to the preferred alternative. Another potential benefit of developing additional workforce housing, is the more efficient use of the urban lands that the MIP

has placed within a designated growth boundary. By developing at higher densities, less land in the future may be required for urbanization and the marginal cost per unit for infrastructure and land typically decreases.

Developing additional workforce housing units will require further analysis of the associated impacts to infrastructure and public facility systems. It will also require further consultation with agency and community stakeholders to gauge community support for the workforce housing units. While, development of additional affordable housing units is not the Preferred Alternative, if such housing is pursued at a future date additional impact assessment studies would be required before the development could be pursued.

4. Develop at a Lower Density

As an alternative to the preferred alternative, the project could also be developed at a lower density. For example, rather than developing the urban area of the project site at a net residential density of 8.29 units per acre the urban areas could be developed at 4 units per acre. In addition, rather than developing the rural lots at an average of about 1.5 acres per lot, these lots could be developed at an average net density of 1 unit per 4 acres.

Under such a scenario the urban land area would need to increase by about 214 acres to about 377 acres and the rural land area would increase from about 150 acres to about 345 acres. Thus, the MIPs small town and rural growth boundaries would need to increase in area by about 409 acres to accommodate the 1,433 units at a lower density.

Under this scenario, there are benefits and costs to the community. One benefit of this scenario might be an overall increase in the value of the residential and rural lots, which might generate greater property tax revenues to the County relative to fiscal costs. As such, the net fiscal impact to the County might be higher for a less dense, and assumably less affordable, project relative to a higher density project with the same number of units.

Some home buyers may also prefer this scenario because the project would offer considerably larger lots, with more privately owned open space, for their use and enjoyment. Regarding development impacts, this scenario would likely produce similar impacts to public infrastructure and facility systems since the population of the project is assumed to be the same. However, by spreading development out over a larger area more land would need to be developed with impervious surfaces, such as roadways, and the need for larger and more expensive on-site detention basins to retain the a larger volume of runoff from the project site should be expected.

The negative impacts to the community are primarily four-fold:

- ***Higher Home Prices***. It should be expected that with less density infrastructure and land costs will be higher, increasing the cost of each lot. Less density requires proportionally more roadways and longer utility runs for the same number of units. These costs are passed on to consumers, especially in an environment where there is a shortage of supply relative to demand. Developers will also often pass on the cost of the additional land, plus a profit, to buyers of larger lots. Moreover, many home buyers typically pay more for the perceived benefit of having larger lawns and greater separation between neighboring properties, which can make such communities more exclusive resulting in a crowding out of lower income working families. Larger lots are also often more expensive to maintain. Large lots require more time for maintenance and more water for irrigation. The cost of water is high on Maui and watering a lawn can add a considerable cost to home ownership.
- ***Greater Dependence upon the Automobile***. Lower density communities generally require greater communing distances between residential neighborhoods, parks, schools and commercial services. Since the scenario described doubles the distance required for most residents to walk or bike to civic and commercial services, it should be expected that many residents will choose to drive rather than walk or bicycle. Automobile dependence places significant burdens upon society. These burdens include: increased air pollution and greenhouse gas emissions, decrease in physical activity, increase in the cost of living, congestion and the need for more land dedicated to parking and roadways.

- ***Impact on Prime Agricultural Lands.*** Lower density would also require the urbanization of an additional 409 acres of prime agricultural land. This would reduce the WCTs agricultural lands from 1,077 to about 668 acres. While the loss of the additional agricultural lands to urbanization would likely not produce a significantly negative impact upon Maui County's agricultural economy, it would reduce the availability of this resource for future generations. Best planning practice generally prescribes that development should be directed away from prime resources lands in favor of lands without these values. Policy 7.1.1.f of the MIP states: "Strongly discourage the conversion of productive and important agricultural lands (such as sugar, pineapple and other produce lands) to rural or urban use, unless justified during the General Plan Update, or when other overriding factors are present." Developing additional prime agricultural lands in favor of a lower density development directly contradicts this MIP policy, and does not offer "overriding factors" that would justify such a proposal.

For the following reasons, the Develop at a Lower Density Alternative was rejected:

- Is not consistent with the MIPs Land Use Element or Directed Growth Plan;
- Would likely result in higher development costs and home prices for Maui consumers;
- Would reduce the area of the WCTs holdings of prime agricultural lands, which are intended to be leased to farmers for agricultural development.

In summary, the benefits associated with the Develop at a Lower Density Alternative are outweighed by the benefits to the community that the preferred alternative would bring.

5. Develop at an Alternative Location

Under the "Alternative Location" Alternative, the 1,433 residential units and associated commercial and civic spaces could be relocated to an alternative location within Central or South Maui. For example, the development could be relocated to one of the MIPs other Planned Growth Areas designated to receive residential development in Central or South Maui. Or, the development

could be directed to other unentitled lands beyond the designated Urban and Rural Growth Boundaries. The MIP notes in its Directed Growth Chapter that Maui's future urban development will occur through infill and redevelopment, urban expansion, new towns and settlements, and infill and expansion of existing towns and villages.

Finding appropriate locations for urban development depends upon many factors including topography and soil conditions on the site, presence of natural and environmental resource constraints, proximity and availability of infrastructure and supporting public facilities, and proximity to employment. Other key factors include underlying land entitlements, community support and/or opposition to development, land ownership and amenity values.

The proposed project site scores favorably on most of these criteria. Its principal drawback is the underlying lands value for agricultural production. However, as documented in Section V.A.7 of the ~~DEIS~~ FEIS, an abundance of other highly suitable agricultural land is available on Maui. Moreover, the WCT is dedicating approximately 800 acres of prime agricultural lands, with access to affordable irrigation water, to create an agricultural preserve for long-term diversified agricultural production at the WCT.

Relocating the subject project would create similar demands upon infrastructure and public facilities regardless of location. Likewise, developing raw lands produces a set of similar impacts – such as construction phase dust, noise and drainage that must be mitigated regardless of location. Most urban expansion in Central Maui will produce some level of impact upon agricultural lands since the majority of the Central Maui isthmus is comprised of high quality agricultural lands. This is especially true on the urban fringe of Wailuku-Kahului, which also happens to be the area that is most proximate to employment and urban levels of infrastructure and services. Placing development mauka of Piilani Highway, within North and Central Kīhei, would displace less productive agricultural land, but this area has less favorable topography and soils, is significantly further from the Central Maui employment center, and would significantly burden the Piilani Highway.

The MIP considered many of these factors in selecting its Central Maui Planned Growth Areas, and through a highly transparent and thoroughly vetted public planning process, determined that the WCT location was a desirable location for future urban expansion – when considering the various factors described above.

For the following reasons, the Develop at an Alternative Location Alternative was rejected:

- Is not consistent with the MIPs Land Use Element or Directed Growth Plan;
- Would likely result in higher development costs and home prices for Maui consumers;
- Would likely produce a less desirable location for future Maui residents to live.

In summary, the benefits associated with developing at the proposed location outweigh relocating the development to an alternative location.

6. Wastewater Treatment Alternatives

The Applicant has evaluated several alternatives for the treatment of the Project's wastewater. The alternatives analyzed included following:

1. Connect to the KWWRF to treat the entire Project;
2. Temporarily connect to the KWWRF for the first 650 residential units and then construct a private on-site and/or regional Waikapū wastewater reclamation facility;
3. Construct a regional Waikapū wastewater reclamation treatment facility in association with the County of Maui and adjoining property owners;
4. Construct a private wastewater reclamation facility on property owned by the Applicant;
5. Construct a conventional wastewater treatment plant within the subject property;
6. Construct an Organica Food Chain Reactor (FCR) facility within the subject property; and

7. No action, which is to not proceed with the Project.

The following summarizes each of the subject alternatives:

1. ***Connect the WCT to the KWWRF to treat the entire Project***. In a letter dated July 16, 2013, the Department of Environmental Management, Wastewater Reclamation Division, stated that the preferred method of treatment for future projects within the Waikapū area is for a Waikapū wastewater reclamation facility to be constructed. The Division noted that such a facility would eliminate energy costs for pumping, reduce the volume of wastewater being disposed of through shoreline injection wells and would allow for reuse of the treated wastewater for non-potable irrigation. However, the Department also suggested in their letter that a temporary connection to the KWWRF for the Project might be possible. The Division noted that a temporary connection would allow the Project to proceed with sales while designing and constructing a wastewater reclamation facility for the area. The Division's letter further states: *"An agreement would need to be completed between the County and the developer(s) with defined milestones in regards to required upgrades, building permits allowed, possible reimbursements (if any) for improvement work on the existing collection system, provisions for the treatment facility etc."*

   The Division's July 16, 2013 letter also provided an overview of the capacity of the KWWRF's gravity sewer, pump station and treatment facility. Key findings of the Division's analysis included:

   - After build-out of the following entitled projects: Kehalani, Waiolani Mauka, Waikapū Gardens Multi-family and Maui Lani (approx. 2,100 units) the KWWRF would have additional capacity for approximately 1.11 mgd (3,000 dwelling units) and 0.54 mgd for other supportive uses permits. This was as of June 30, 2013.
   - *"The Wailuku Wastewater Pump Station would have adequate capacity to accommodate about 2,000 homes above the currently expected for the area,*

however; additional studies would be needed to determine if any modifications at the Kahului WWRF headworks would be required."

- *"In order for the collection system to accept any flows from the Tropical Plantation/Wai'ale area of Waikapū an upgrade of the existing gravity sewer in Lower Main Street from 12 inch to 15 inch would be required. This segment stretches from Ainahou Place to Hala Place (Manholes KA20GE0100 to KA20GB0510) and is approximately 1950 linear feet."*
- *"A second upgrade would be required prior to the number of equivalent housing units exceeding two hundred (200). This would require upsizing current lines at two locations: (a) the 8 inch main trunk line from the force main daylight manhold in Waiko Road through Waikapū Gardens would need to be upgraded to 12 inch (approximately 2,750 linear feet); (b) upsize the final two pipe segments prior to the Wailuku Pump station from 24 inch to 36 inch (approximately 150 linear feet with a major bypass operation.) Upgrade 4 (a) would accommodate approximately 450 additional homes."*
- *"Further analysis is required to determine the exact extent of Lower Main Street improvements required for additional units over 650."*

Based upon the Division's July 2013 capacity analysis it can be concluded that capacity currently exists within the KWWRF to accommodate the Project. However, significant improvements to transmission capacity would be required to accommodate the Project's wastewater. While the June 2013 letter documents required improvements to accommodate up to 650 of the Project's residential units, additional analysis would be required to determine needed transmission improvements to accommodate the entire Project. In order for the Applicant to invest into expanding the transmission infrastructure to connect the Project to the KWWRF, the Applicant would require a guarantee from the County that the Project's wastewater could be conveyed to the facility for treatment.

However, In response to the Project's January 2016 DEIS, the Wastewater Reclamation Division notified the Applicant in its April 13, 2016 comment letter that the KWWRF *does not have the capacity to accept flows from outside the current service area and* that the collection system is unable to accept flows from the Project without significant upgrades. The Division also stated that the Applicant shall work with the County and area developers to complete a master plan for a regional treatment solution and that the Project shall contribute its fair share towards the implementation of this regional improvement (**See**: Appendix S, DEIS Agency and Community Comment and Response Letters).

Assuming that the KWWRF has capacity to accept the Project's wastewater, and that transmission infrastructure can be upgraded to accommodate the Project, there are benefits and costs associated with connecting the Project to the KWWRF. Potential benefits to the Applicant and County by connecting the Project to the KWWRF may include the following:

- ***More Cost Effective Infrastructure Development***. Based upon the capacity analysis conducted by the County, Department of Environmental Management's, Wastewater Reclamation Division it appears that capacity exists at the KWWRF to accept existing entitled development within the service area and additional flows from the Maui Island Plan's (MIP's) Planned Grown Areas in Waikapū. Directing wastewater flows to existing developed centralized facilities is typically more cost effective that constructing new facilities. Assuming that it is less expensive to invest in the expansion of transmission infrastructure to connect the Project to the KWWRF then it would be more cost effective to utilize existing infrastructure than to build new more expensive infrastructure. Preliminary cost estimates to construct a private wastewater treatment facility using Organica's FCR technology is approximately $25.85 million. Preliminary cost estimates to expand the transmission infrastructure to accommodate approximately 650 of the Project's

residential units is about $2.0 million. Further study is required to determine the expansion costs required for the entire project.

- ***More Affordable Housing***. The Project is located within a Planned Growth Area identified in the Maui Island Plan. The purpose of a Planned Growth Area is to provide new housing to accommodate future demand. A project's infrastructure costs will impact the cost of development and ultimately the price of housing charged to consumers. Connecting to the KWWRF, in lieu of developing a new wastewater reclamation facility in Waikapū, would likely result in lower cost housing to consumers. Developing affordably priced housing is consistent with the MIP Goal 5.1 and Objective 5.1.4. MIP Goal 5.1 states: "*Maui will have safe, decent, appropriate, and affordable housing for all residents developed in a way that contributes to strong neighborhoods and a thriving island community*". MIP Objective 5.1.4 states: "*Provide infrastructure in a more timely manner to support the development of affordable housing*."
- ***Lower Project Risk***. Connecting to the existing KWWRF may require considerably less capital investment than the capital required to construct a Waikapū wastewater treatment facility. High upfront capital costs generally makes a project more difficult to finance and therefore requires greater returns for the investor to justify the investment. Therefore, assuming the cost to connect to the KWWRF is lower than constructing a new Waikapū wastewater treatment plant, the project would be less risky to implement if it could connect to the existing KWWRF.

Potential costs to the Applicant and County by connecting the Project to the KWWRF may include the following:

- ***Increased Tsunami Risk.*** According to the United States Federal Emergency Management Agency, the KWWRF is located within Flood Zone VE. Flood Zone VE represents areas of coastal flood zone with velocity hazard and base flood elevations (BFE) determined. The BFE ranges from approximatey 15 feet to 19 feet

in this area. Although the County of Maui is investing in the KWWRF to armor it against tsunami inundation, the facility's location is within a tsunami hazard area, which places it in risk of being inundated. By constructing a standalone treatment facility in Waikapū, the Project's wastewater treatment would not be directly threatened by tsunami inundation.

- ***Less Opportunity for Wastewater Reuse.*** The KWWRF relies upon injection wells to dispose of its approximate 4.7 mgd of treated wastewater. The KWWRF has not been improved to treat wastewater to R-1 quality, where it could be broadly applied for non-potable irrigation. The facility is also located along the shoreline and the pumping of recycled water may be more cost prohibitive than for a facility located within the subject property in Waikapū. The MIP's Objective 6.2.3 states that the County should increase its reuse of wastewater.
- ***Greater Reliance upon Injection Wells.*** The KWWRF relies upon injection wells to dispose of the approximate 4.7 mgd of effluent that is treated by the facility. After treatment to State and County standards, this effluent flows by gravity to the injection wells where it enters the nearshore groundwater and then it leaches into the ocean's nearshore coastal waters. There have been concerns expressed and recent studies that document that injection wells have an impact upon nearshore water quality.
- ***MIP Policy 6.2.1.c.*** MIP Policy 6.2.1.c states the following: "*establish new wastewater treatment plant(s) outside the tsunami zone*". Although the existing treatment plant is already within the tsunami zone, placing greater reliance upon this facility may be inconsistent with this County policy.

During pre-consultation with the County regarding the Project's wastewater treatment, it was represented by the County in its July 13, 2016 letter, that a temporary connection to the KWWRF might be possible provided that the Project upgrade the transmission system. Thereafter, in its April 13, 2016 letter, the County informed the Applicant that the KWWRF does not have sufficient capacity to accept flows from outside of the current service area

and that the Project should develop wastewater treatment in Waikapū. In consideration of the County's April 13, 2016 letter regarding the capacity of the KWWRF to accept Project flows, the "***Connect the WCT to the KKWRF to treat the entire Project"*** alternative is not viable and is therefore not being considered.

2. Connect to the KWWRF for the first phase of the Project and then transition the Project to a Waikapū facility once it is developed.

In a letter dated July 16, 2013 (See Appendix S), the Department of Environmental Management (DEM), Division of Wastewater Reclamation, stated that it was possible that the KWWRF could accept the wastewater flow of approximately 650 of the Project's residential units on a temporary basis, but that significant upgrades to the transmission system would be required. In its letter, the Division further stated the following (**See**: Appendix S, DEIS Agency and Community Comment and Response Letters):

> *"Thus there exists a possibility of allowing a temporary connection for these out of service area projects so that they can proceed with development and sales while designing and constructing a wastewater reclamation facility for the area. An agreement would need to be completed between the County and the Developer(s) with defined milestones in regards to required upgrades, building permits allowed, possible requirements, if any, for improvement work on the existing collection system, provisions for the treatment facility etc."*

The Department further noted that in order for the existing collection system to accept flows from the WCT, the following transmission system improvements would be required:

Table 62 ~~56~~: Required Off-site Wastewater Transmission System Improvements

Required off-site Wastewater Transmission System Improvements		
Location	**Description**	**No. Units Accommodated**
Lower Main Street	Upgrade existing gravity sewer line in Lower Main Street from 12-inch to 15-inch. This segment stretches from ʻĀinahou Place to Hala Place (Manholes KA2OGE0100 to KA20GB0510) and is approximately 1,950 linear feet.	200
Waiko Road;	Upgrade approximately 2,750 linear feet of the 8-inch main trunk line from the force main daylight manhole in Waiko Road through Waikapū Gardens to 12-inch;	450
Wailuku Pump Station	Upsize the final two pipe segments prior to the Wailuku Pump station from 24-inch to 36-inch, which is approximately 150 linear feet with a major bypass operation.	
TOTAL UNITS		**650**

The DEM further stated that adding additional WCT residential units beyond 650 would require further analysis to determine the extent of Lower Main Street improvements.

The policy of the DEM is that wastewater capacity cannot be reserved until the project is ready to receive building permits. If capacity at the KWRF is available at the time building permits are ready to be issued for the project, it may be possible for the Project to temporarily connect to the County's sewer system and complete the upgrades to connect up to 650 units in the phase I development.

The DEM's long-term desire is for a wastewater treatment plant to be constructed in the Waikapū Area to accommodate future flows generated by development within the Waikapū region. In the Project's DEIS, the Applicant indicated a desire to connect temporarily to the KWWRF for the initial 650 units and then to transition the Project to either a standalone private wastewater reclamation facility within the WCT project area or to work with the County and nearby landowners to construct a regional Waikapū wastewater reclamation facility. In was estimated by Otomo Engineering in November 2014 that the cost of the upgrades identified in Table 62 ~~43~~ would be approximately $2.27 million. It was the Applicant's desire to invest in the temporary capacity upgrades, and then once the Waikapū facility was constructed, request a reimbursement from the County since the capacity improvements could then be utilized to service infill development.

As described in Alternative 1, "***Connect the WCT to the KWWRF to treat the entire Project"***, there are benefits and costs associated with connecting the Project to the KWWRF. While the benefits of Alternative 2 would be similar to Alternative 1, there are also important differences. Benefits to the Applicant, and to the County, for allowing a temporary connection to the KWWRF may include.

- ***Reduces Up-front Capital Costs***. The Project is allowed to proceed with a portion of the development prior to the construction of a costly wastewater reclamation facility. By deferring this up-front capital cost, the Applicant is able to build-up a reserve of funding from Phase I home-buyers to pay for a significant first increment of the facility.
- ***Provides Additional Time for the Design and Permitting of a Treatment System***. The planning, design, permitting and construction of a wastewater treatment facility may take many years to complete. There is a risk to the Applicant that delays caused by permitting and/or financing of the facility could produce a delay in the Project's groundbreaking. The opportunity to have a temporary connection to the KWWRF mitigates these risks to the Applicant.

- **Provides Additional Time to Coordinate the Development of a Regional System**. Development of a regional Waikapū wastewater treatment facility will require a considerable investment in time to formalize a plan with the pertinent stakeholders to determine the following: 1) location of the facility; 2) type of facility to be constructed; 3) size of the facility; 4) phasing of the facility; 5) cost sharing; and 6) project financing. Finalizing the details of an agreement with all of the relevant stakeholders and then securing financing for planning, design and construction will likely require considerable time to conclude. The additional time provided by having temporary access to the KWWRF would create the space needed to achieve a greater likelihood of developing a regional facility.

Alternative 2, "Connect to the KWWRF for the first phase of the Project and then transition the Project to a Waikapū Facility" presents the following costs:

- ***Continued Reliance upon the KWWRF***. Although Alternative 2 is intended to provide a temporary wastewater treatment option for the Project, it nonetheless places greater reliance upon the KWWRF for servicing the region's wastewater treatment demand. The KWWRF is an aging facility that was designed in 1972 and constructed in 1976. Concerns regarding the existing facility include: 1) its location within a flood hazard area that makes it subject to tsunami inundation; and 2) the facility relies upon injection wells.
- ***Risk to the County that the Applicant may not develop a Private and/or Regional Facility once Connected to the KWWRF.*** Should the cost of developing a regional facility be determined to be cost prohibitive, it is possible that the facility would not be developed and the 650 units would thereby be permanently connected to the Kahului treatment plant.

As noted, the DEM notified the Applicant it its April 13, 2016 comment letter (See Appendix S, Agency and Community Comment and Response Letters) that the KWRF does not have

the capacity to accept flows from outside the current service area and that the existing collection system is inadequate and unable to accept flows from the development without significant upgrades. As such, this alternative is not being considered further by the Applicant.

3. Construct a regional Waikapū wastewater reclamation treatment facility in association with the County of Maui and adjoining property owners.

In its April 13, 2016 comment letter, the DEM stated the following: "*the Applicant shall work with the County and area developers to complete a master plan for a regional treatment solution and shall contribute its fair share towards its implementation*" (See Appendix S, Agency and Community Comment and Response Letters). The construction of a regional Waikapū wastewater reclamation facility was studied in 2015. In April 2015 Brown and Caldwell Consultants were retained by the Department of Environmental Management to prepare the *"Central Maui Recycled Water Study".* The report states the following:

> *"A conceptual Central Maui service area wastewater system was developed. The major elements required for the Central Maui service area include:*
>
> - *Three new WWPSs.*
> - *A wastewater conveyance system that includes gravity sewers and forcemains.*
> - *A new Central Maui WWRF to produce R-1 recycled water.*
> - *A soil aquifer treatment system for excess recycled water disposal.*
> - *A brackish groundwater well to provide supplemental water to the recycled water system.*
> - *A recycled water pump station and storage tank.*

- *Recycled water transmission pipelines to the Tier 1 areas.*

The total cost for the system is estimated to be $91.4 million, or $20,300 per market-rate EDU. The County may consider increasing the size of the service area to include areas outside the defined Central Maui growth area. Future MIP updates could include projects that have been proposed but were excluded from the current Urban Growth Boundaries. Examples include the Department of Hawaiian Homelands project in Puunene, and Maalaea Mauka subdivision. The County could also consider providing capacity for the existing Maalaea development area to eliminate the use of near-shore injection wells there. These additional areas would contribute to wastewater flows, and would have to be considered in the conveyance, treatment, reuse, supplemental water, and disposal systems. Capital costs, O&M costs, and WWRF land area requirements would increase to accommodate projects that are outside of the defined service area boundaries. Assessment of the additional costs and land area requirements was outside the scope of this study. Approximately 80 percent of the recycled water that is produced by the WWRF throughout a typical year would be beneficially used for irrigation purposes. Supplemental groundwater would be needed to meet the irrigation needs of the recycled water users during the hot season. The system will have no injection wells for effluent disposal. Excess recycled water during the wet season would be disposed in a soil aquifer treatment system. The soil aquifer treatment system will provide additional natural treatment as the applied water percolates through the soil to groundwater. The soil aquifer treatment system will provide an additional layer of environmental

protection compared to the status-quo injection well systems used for effluent disposal at the County's existing WWRF's. If the County decides to proceed with a public wastewater system for the Central Maui growth area it should consider preparing a master plan for the wastewater and recycled water systems."

Alternative 3, "Construct a Regional Waikapū Wastewater Reclamation Facility in Association with the County of Maui and Adjoining Property Owners" provides both benefits and costs to the Applicant and to the County. Benefits to the Applicant, and to the County, from Alternative 3, may include the following:

- ***Reduced Tsunami Risk.*** A regional *Waikapū Wastewater Reclamation facility* would be located outside of a flood hazard area. However, according to the United States Federal Emergency Management Agency, the KWWRF is located within Flood Zone VE. Flood Zone VE represents areas of coastal flood zone with velocity hazard and base flood elevations (BFE) determined. The BFE within the area of the treatment plant ranges from 15 feet to 19 feet. Although the County of Maui is investing in the KWWRF to armor it against tsunami inundation, the facility is located within a tsunami hazard area, which places it in risk of being inundated. By constructing a standalone treatment facility in Waikapū, the facility would not be directly threatened by tsunami inundation.
- ***Greater Opportunity for Wastewater Reuse.*** The KWWRF relies upon injection wells to dispose of its approximate 4.7 mgd of wastewater. The KWWRF has not been improved to treat wastewater to R-1 recycled quality, which is the level of treatment required to use it broadly for non-potable irrigation. The facility is also located along the shoreline, which makes the pumping of recycled wastewater to users more expensive due to pumping costs. The MIP's Objective 6.2.3 states that the County should increase its reuse of wastewater. Constructing a regional wastewater treatment facility in Waikapū would be consistent with that objective.

- ***Reduced Reliance upon Injection Wells.*** The KWWRF relies upon injection wells to dispose of the approximate 4.7 mgd of effluent that is treated by the facility. After treatment to State and County standards, this effluent in pumped by the injection wells into the nearshore groundwater and then it leaches into the ocean's nearshore waters. There have been concerns expressed, and studies have recently confirmed, that injection wells produce negative impacts upon nearshore water quality. Constructing a regional wastewater treatment facility in Waikapū would reduce the reliance of the County upon injection wells.
- ***Consistency with MIP Policy 6.2.1.c.*** MIP Policy 6.2.1.c states the following: "*establish new wastewater treatment plant(s) outside the tsunami zone*". Constructing a regional wastewater treatment facility in Waikapū would be consistent with this policy.
- ***Greater Economy of Scale.*** Relative to Alternative 2 and Alternative 4, which are limited to treatment plants designed to treat just the Project's wastewater, participating with other area developers and the County to build a regional wastewater treatment facility could offer greater "economy-of-scale". Generally, building facilities at a larger economy-of-scale spreads fixed costs over a development, which can result in construction and operating cost savings. Such savings may be passed along to home buyers in the form of more affordable housing.

Costs to the Applicant, and to the County, from Alternative 3, may include the following:

- ***Greater Complexity and Risk of Delay***. Development of a regional Waikapū wastewater treatment facility will require a considerable investment in time to formalize a plan with the pertinent stakeholders that would require agreement on the following: 1) location of the facility; 2) type of facility to be constructed; 3) size of the facility; 4) phasing of the facility; 5) cost sharing; and 6) project financing. Finalizing the details of an agreement with all of the relevance stakeholders; and

then securing financing for planning, design and construction would likely have a significantly negative impact upon the Project's development schedule.

- ***Larger Investment of Time and Funding by the County***. In order to develop a regional wastewater treatment facility, the County would likely be required to take a more active role in planning and financing the facility. Greater participation required of the County would place additional demand upon County resources.

4. Construct a stand-alone private wastewater reclamation facility to service the Project.

The WCT could construct a standalone private wastewater treatment plant within the subject property. A private wastewater treatment plant would be owned and operated by the Applicant and subject to State Department of Health regulations. Alternative 4, "*Construct a standalone wastewater reclamation facility to service the project*" may offer benefits and costs to the Applicant and County. Benefits to the Applicant, and to the County, from Alternative 4 may include the following:

- ***Reduced Tsunami Risk; Greater Opportunity for Wastewater Reuse; Reduced Reliance upon Injection Wells; Consistency with MIP Policy 6.2.1.c.*** These are the same benefits that are associated with Alternatives 2 and 3 and that have been described previously.
- ***More Control and Flexibility for the Applicant.*** Alternative 4 provides the Applicant with the opportunity to have exclusive control over the location, design, timing and financing of the wastewater treatement facility. For the Applicant, having the opportunity to control the location, timing and design of the facility will help to ensure that the Project's schedule is not delayed by having multiple decision-making parties. In addition, bringing multiple parties together to formulate an agreement for the execution of a large regional capital project would require a considerable investment of time and resources, which would likely delay the Project. Finally, developing a regional wastewater treatment plant would require a separate HRS Chapter 343 Environmental Assessment (EA) because it

would likely be located off-site, have differing neighboring lands uses, and potentially other types of impacts. Preparing and processing a separate EA would take considerable time and likely significantly impact the Project's schedule.

In addition to Benefits, there may be costs associated with Alternative 4. Potential costs to the Applicant and County may include the following:

- ***Less Economy of Scale***. Participating with other area developers and the County to build a regional wastewater treatment facility could offer greater "economy-of-scale". Generally, building facilities at a larger economy-of-scale reduces fixed costs over a larger development, which can result in construction and operating cost savings. Such savings may be passed along to home buyers in the form of more affordable housing.
- ***Risk / Cost Sharing***. Since constructing a wastewater reclamation facility requires a considerable up-front capital cost, sharing these costs amongst multiple parties may mitigate risk to the Applicant. Increased risk taking generally warrants higher returns to investors, which could impact the cost of the housing.
- ***Reduced Risk of Insolvency.*** Private utilities may also pose unique risks to the County. While the construction and operation of a private utility is typically privately financed, saving the government money, there is the potential that private parties may become insolvent, requiring intervention by the government to continue providing needed services to residents.

5. ***Alternative Designs; a Stand-alone Conventional Private Wastewater Reclamation Facility versus a Facility using Organica Food Chain Reactor (FCR) Technology.*** The Applicant contracted with Enviniti LLC to perform an analysis of a conventional wastewater reclamation plant. The Applicant also contracted with Mana Water LLC, in association with Kennedy/Jenks Consultants, to perform an analysis of the Organica FCR wastewater reclamation technology.

The Enviniti study identifies regulatory and design requirements for the planning, design, construction, operation, and maintenance of such a facility. Conventional wastewater treatment technology generally involves liquids treatment consisting of preliminary treatment, flow equalization, primary sedimentation treatment, secondary biological treatment, secondary sedimentation treatment, disinfection, and disposal. The treatment of solids includes stabilization, dewatering, and disposal.

The Mana Water and Kennedy Jenks report describes the FCR technology and its advantages over more conventional treatment systems. A FCR configuration consists of biological treatment in successive reactor zones utilizing fixed biomass on a combination of natural plant roots and engineered biofiber media, along with a limited amount of suspended biomass. This alternative generally involves pretreatment, secondary biological treatment through a FCR zone, process aeration, chemical phosphorus removal/coagulation, flocculation, disinfection and disposal. The reactors are made of concrete, have fine bubble aeration at the bottom (just as in any traditional technology) and have suspended "activated sludge" (hungry bacteria that feeds off of the wastewater organic material and nutrients) as in traditional solutions. What is new to a FCR system is that a few centimeters under the water surface there is a grid on which plants are placed. The root systems of these plants are submerged into the water at a depth of 3- to 5-feet. This allows for several thousand species to naturally develop in the reactor, which produces a much larger variety of species than in traditional systems.

While the plants are one of the most visible parts of and FCR system, it is not the plants that treat the water, but their extensive root systems that provide the habitat for a complex ecosystem that treats the wastewater both more robustly and efficiently than other biological systems.

The primary advantage of utilizing conventional wastewater reclamation facility technology is its long history of use throughout the United State and in Hawai'i. In addition, State and

County regulators are likely to be more familiar with conventional technologies and these facilities have a track record of compliance with governmental requirements.

However, facilities using biological treatment trains have been used for many decades and Organica's FCR technology is well established in Europe, the Middle-East and Asia. Factors considered in determining whether one facility was preferred over the other included:

1. ***Reliability***. Organica FCR systems are more reliable than conventional activated sludge systems because the bulk of secondary treatment is performed by attached growth organisms. Attached growth systems are less likely to become upset than suspended growth systems such as activated sludge. For example, if there is a big rain or flood event that washes through the system, the facility will be much more resilient than a traditional facility where the bulk of the bacteria are washed out, because in the Organica system the biology is fixed to the plant roots and artificial media.

2. ***Feasibility of being permitted by the State***. While State and County regulators are likely to be more familiar with conventional technologies, the feasibility of State Department of Health permitting should be similar for both the Organica FCR system and conventional wastewater treatment systems. They both are considered biological wastewater treatment systems and are subject to the same regulatory and permit requirements.

3. ***Capital cost***. The capital cost will be somewhat less in the Organica FCR system than in conventional wastewater treatment systems because the size of the Organica FCR system is less than conventional activated sludge systems. Other factors that will reduce capital cost are a smaller aeration system, no Return Activated Sludge (RAS) required and less site preparation/site work required.

4. ***Operating cost***. The overall operating cost of an Organica FCR is significantly less than other activated sludge-based systems (conventional systems), primarily due to reductions in both energy demand and sludge production. Because the solution relies on fixed-film cultures, and less on cultures suspended in the water, the water in the reactor has lower solids concentration and is "clearer". Oxygen transfer in clearer water is more efficient, thus less air is required to be pumped into the reactor to meet oxygen demand. This results in lower power consumption; typically 20 to 50 percent lower than competitive designs. Further, due to the multi-level food chains that are present in complex ecosystems, the bacteria that process waste material are consumed by other organisms, which are in turn prey for higher predators within the food chain. This food chain effect results in lower excess sludge (commonly 20 to 30 percent less) at the end of the treatment process.

5. ***Land area requirements***. Organica FCR systems use less than one-half the land area of conventional activated sludge systems due to the high density of microorganisms in the FCRs.

6. ***Aesthetics.*** Organica FCR systems are more aesthetically pleasing than conventional wastewater treatment systems. The plants used in the Organica FCR system give the facility a park like atmosphere created by the facility's fresh vegetation rather than the typical industrial like atmosphere associated with conventional systems.

7. ***Odors.*** Odors are similar for each type of facility. A properly designed wastewater treatment plant will have odor control systems in place to minimize odors. Most of the odors emanate from the plant headworks where raw wastewater enters the facility. A well designed system ensures that the headworks (where the sewage enters the facility) are enclosed and equipped with a state-of-the-art air filter and odor control mechanisms.

8. ***Noise***. Noise levels are similar for conventional wastewater treatment and FCR systems. Most of the noise will emanate from the air blowers than run continuously. The blowers are required to provide an aerobic environment for the microorganisms. There will be less noise from sludge removal operations since Organica FCR systems generate less sludge than conventional activated sludge systems. Because the system is fixed film the blower requirements are generally lower because only fine bubble aeration is required as opposed to traditional coarse aeration.

9. ***Water use / demand***. Water use/demand will be similar for each type of system.

10. ***Other environmental impacts.*** Organica FCR systems have a lower carbon footprint than conventional wastewater systems. This is due to 1) lower energy requirements and 2) the plants utilized in the FCR system help absorb carbon dioxide from the atmosphere.

11. ***Energy demand***. Organica FCR systems typically utilize 30% less energy than conventional activated sludge systems.

While both a conventional and FCR system would be suitable for treatment of the Project's wastewater, the FCR system has several advantages that make it the preferred wastewater treatment option. These advantages include: 1) greater reliability; 2) lower capital costs; 3) lower operating costs; 4) smaller facility footprint; 5) better aesthetics; 6) better for the environment; and 7) less energy demand.

6. ***Alternative Locations***. The Applicant considered multiple locations within the property for the wastewater reclamation facility. The following site selection criteria were considered to determine the preferred location for the facility:

- ***Land area requirements*.** The facility requires a site of 12 acres. Of this area, approximately 5.6 acres is required for a Soil Aquifer Treatment (SAT) Basin.
- ***Drainage patterns.*** The optimal site should allow for the WCT's wastewater to gravity flow to the treatment facility in order to minimize pumping costs.
- ***Pumping costs and network optimization.*** Pumping costs can be a significant component of the operating costs of a wastewater treatment facility. Therefore, the ideal location should utilize natural topography/drainage patterns wherever feasible to maximize gravity flow. Likewise, once the wastewater is treated, gravity flow should be utilized to direct the non-potable irrigation water to users. Such users may include agricultural fields and landscaped open space areas such as parks and roadway right-of-way.
- ***Proximity to recycled water users.*** A location proximate to potential recycled water users, which may reduce pumping costs to these users, is preferable to more distant locations where costly pumping may be required.
- ***Proximity to planned wastewater collection system network.*** In order to minimize sub-surface transmission system infrastructure costs, the ideal location would be proximate to the wastewater collection system network.
- ***Impact upon WCT Master Plan uses.*** The facility could be placed within the WCT's Small Town Growth Boundary. However, this would displace approximately 12 acres of land that is planned for residential use. Moreover, this would place the reclamation facility within close proximity of residences, which could cause concern over odor, aesthetic and noise impacts and decrease property values in the immediate area.
- ***Land Ownership.*** A treatment facility may be able to be located on or off-site, depending upon the users being serviced by the plant. However, if the treatment plant is to be developed by the Applicant for the purpose of supporting the Project, then it is preferable to locate the facility within the Applicant's property.

- ***Prevailing winds and possible odor impacts.*** Locating wastewater treatment facilities downwind of developed urban areas may help to mitigate possible odor and or dust impacts generated by the facility.
- ***Impact upon neighboring land users.*** Although noise and air quality impacts can largely be mitigated through proper design, neighboring property owners may have concerns regarding the aesthetics of the facility as well as air quality and noise impacts. Such concerns may make neighboring properties less marketable and therefore decrease property values.
- ***Environmental impacts.*** A wastewater reclamation facility may generate environmental impacts if not properly designed and located in appropriate areas. For the purpose of disposing of the wastewater through injection wells or SAT basins, it is preferable to locate the plant outside of the State of Hawai'i's Underground Injection Control (UIC) Line. The purpose of the UIC Line is to protect potable ground water resources from contamination.
- ***Flood Hazards.*** The facility should be located outside of areas that are prone to flooding.
- ***Expansion and interconnection potential for offsite users.*** A location that allows for off-site users to tie into the system in a manner that minimizes pumping costs for treatment and recycled water use is preferable to a location that does not provide for such opportunities.
- ***Accessibility.*** The project site should be easily accessible to passenger vehicles and large trucks.

Based upon the site selection criteria, it was determined that the location for the wastewater reclamation facility should be located east of the Wai'ale Bypass Road. Placing the facility east of the Wai'ale Bypass places the facility outside of the UIC Line and minimizes pumping costs since the wastewater will be able to gravity flow to the facility. In addition, locating the plant east of the Bypass also places it within close proximity to future agricultural and open space recycled water users. It was also decided that the facility

should not be located within the Small Town Growth Boundary, since this would displace considerable land that could be used for residential, commercial, or park use. Morover, placing the facility within the urban project boundary may produce concerns by neighboring property owners about odors, noise and aesthetic impacts. As such, two sites east (makai) of the Bypass, within the Applicant's property, were evaluated.

Site Location A, located at the northeast corner of the development (**See**: Figure No. 49, "Alternative Site A for WWRF) did not provide sufficient acreage to accommodate the facility. Furthermore, a portion of this site is located with a flood hazard area. Site Location B, located near the southeast edge of the development, performs well across all of the site selection criteria. It is located adjacent to the agricultural site of reuse and leverages the project areas natural drainage patters, thereby reducing pumping and energy consumption which further reduces the carbon footprint of the WCT. Moreover, this location takes advantage of the prevailing northeast winds, is within the Applicant's property and is easily accessible by all types of vehicles (**See**: Figure No. 50, Alternative Site B for WWRF).

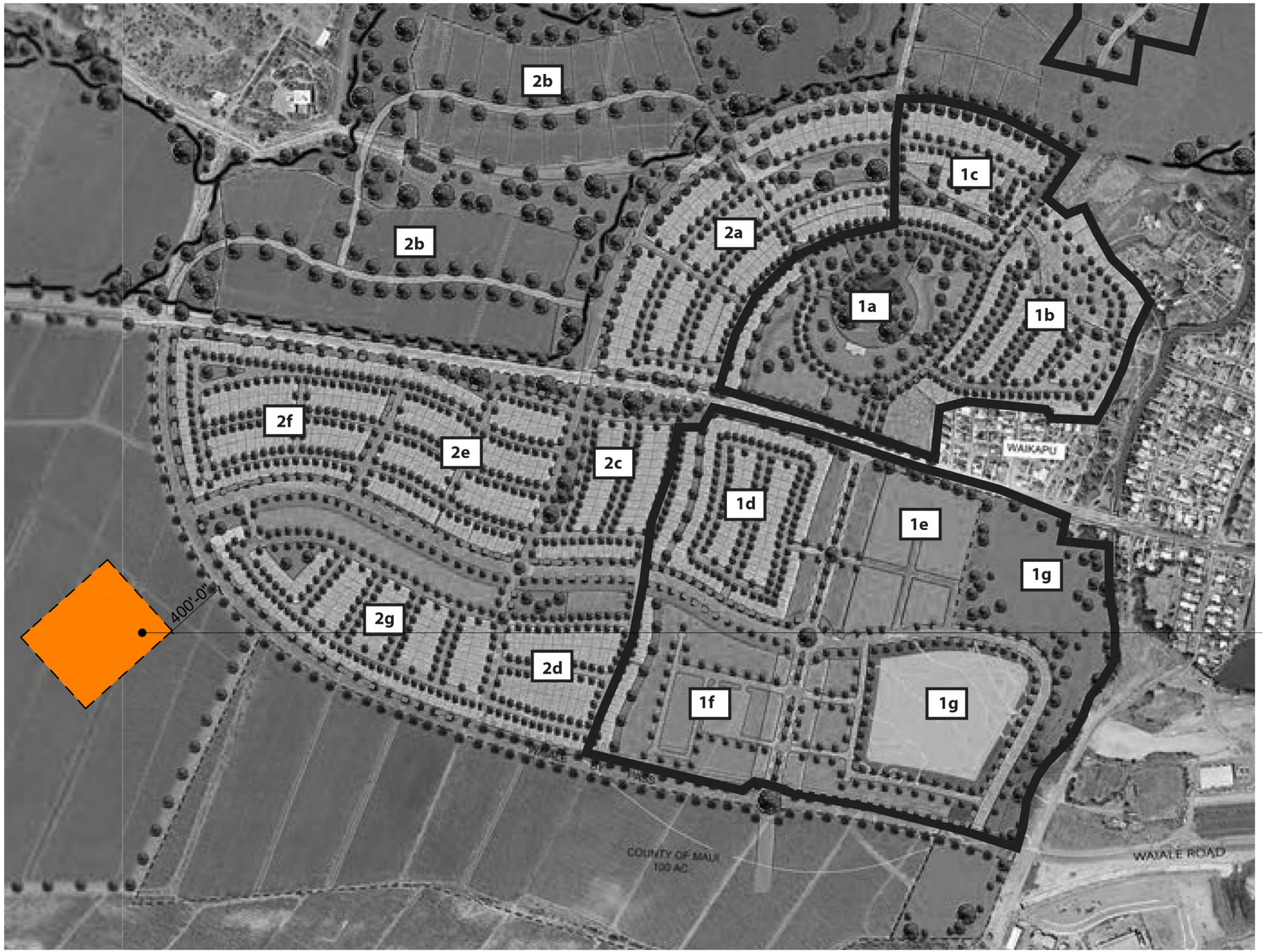
Location A | Site Plan - scale 1:7500

Water Reclamation Facility

Figure 49: Alternative Site "A" For WWRF

Location B | Site Plan - scale 1:7500

Water Reclamation Facility



Water Reclamation Facility (Location "B")

N

Figure 50: Alternative Site "B" For WWRF

Table 66 ranks the site selction criteria on a score of -3 as the worst and +3 as the best. Based upon this analysis, Location "B" is superior to Location "A" across most of the site selection parameters.

Table 66: WWRF Site Selection Criteria

Considerations	**Location B**	**Location A**
Land area requirements	3	1
Drainage patterns	3	2
Pumping costs and network optimization	3	1
Proximity to recycled water users	3	1
Proximity to planned wastewater collection system network	3	3
Impact upon WCT Master Plan uses	3	3
Land ownership	3	3
Prevailing winds and possible odor impacts	3	2
Impact upon neighboring land users	3	2
Environmental impacts	3	3
Flood hazards	3	1
Expansion and interconnection potential for offsite users	2	3
Accessibility	2	1
Total	**37**	**26**

6. ***No Action***. The "No Action" alternative would leave the property in its existing condition so that a wastewater treatment plant would not be warranted. This would not be consistent with the MIP's directed growth strategy and/or goals, objectives and policies in the MIP that promote economic development and the delivery of a diversity of residential housing types to accommodate population grown. This alternative is also not consistent with the Applicant's desire to develop the Project. Therefore, Alternative 6 was not considered further.