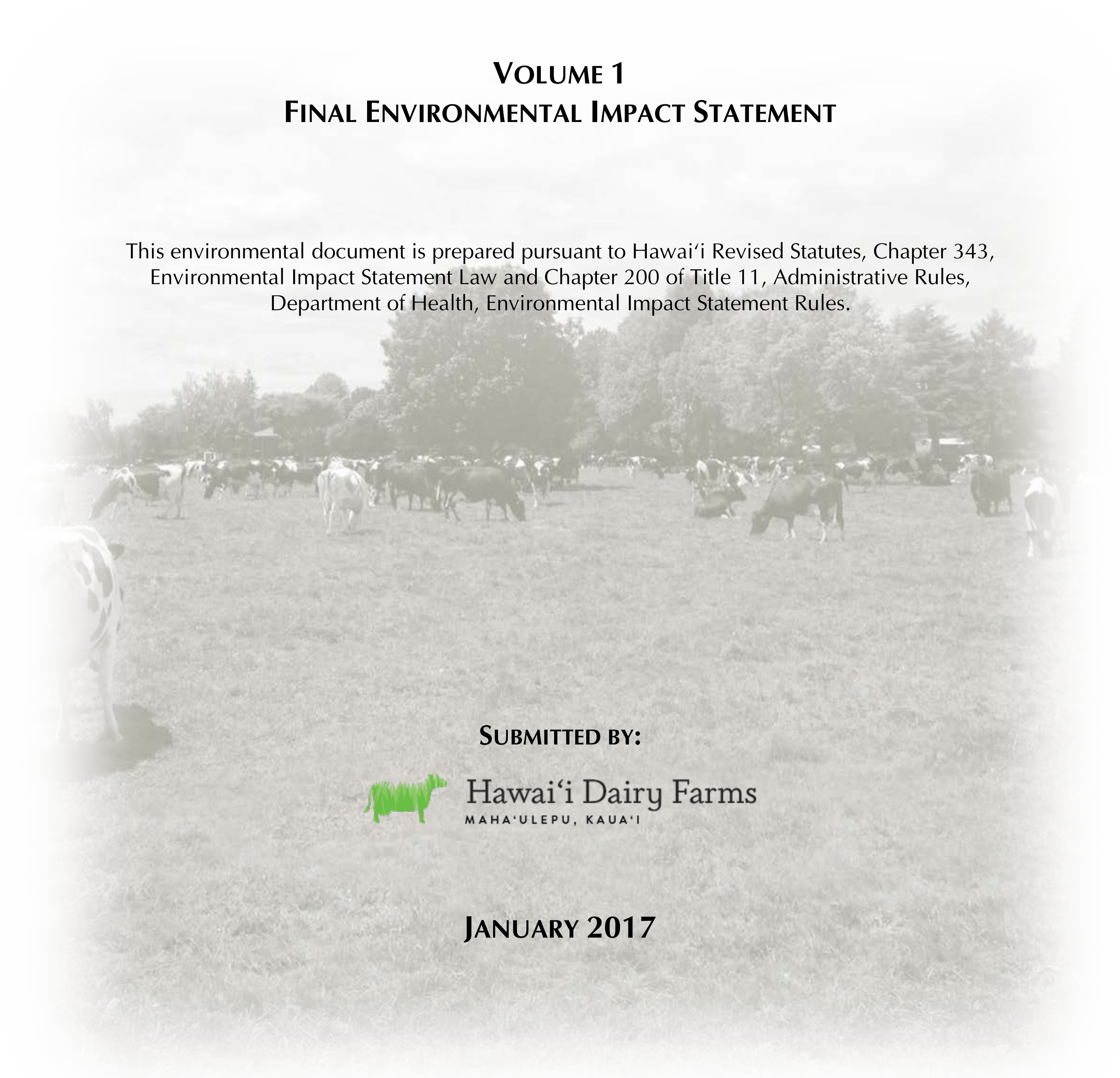
HAWAIʻI DAIRY FARMS



VOLUME 1
FINAL ENVIRONMENTAL IMPACT STATEMENT

This environmental document is prepared pursuant to Hawaiʻi Revised Statutes, Chapter 343, Environmental Impact Statement Law and Chapter 200 of Title 11, Administrative Rules, Department of Health, Environmental Impact Statement Rules.

SUBMITTED BY:

Hawaiʻi Dairy Farms
MAHAʻULEPU, KAUAʻI

JANUARY 2017

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VOLUME 1
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SUBMITTED BY:

Hawaiʻi Dairy Farms
MAHAʻULEPU, KAUAʻI

PREPARED BY:

GROUP 70 INTERNATIONAL

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1/3/17

Jeffrey H. Overton, AICP, LEED AP **Date**

JANUARY 2017

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ABBREVIATIONS AND ACRONYMS

AERMOD	Atmospheric Dispersion Modeling System
AIS	Archaeological Inventory Survey
ALISH	Agricultural Lands of Importance to the State of Hawaiʻi
AMSL	above mean sea level
ATTRA	Appropriate Technology Transfer for Rural Areas
BEACH	Beach Environmental Assessment and Coastal Health Act
CAA	Clean Air Act
CAFO	Concentrated Animal Feeding Operation
CERCLA	Federal Comprehensive Environmental Response, Compensation, and Liability Act
CIA	Cultural Impact Assessment
CNPCP	Coastal Nonpoint Pollution Control Program
COK	County of Kauaʻi
CTAHR	University of Hawaiʻi College of Tropical Agriculture and Human Resources
CWA	Clean Water Act
CWB	Department of Health Clean Water Branch
CWCS	Comprehensive Wildlife Conservation Strategy
CWRM	Commission on Water Resource Management
CZARA	Coastal Zone Act Reauthorization Amendments
CZM	Coastal Zone Management
CZMA	Coastal Zone Management Act
CZD	Capture Zone Delineations
CZO	Comprehensive Zoning Code
DAPR	days of consecutive rainfall
dB	decibels
dBA	A-weighting sound network
DBEDT	State of Hawaiʻi Department of Business, Economic Development and Tourism
DEIS	Draft Environmental Impact Statement
DLNR	State of Hawaiʻi Department of Land and Natural Resources
DM	dry material
DOA	State of Hawaiʻi Department of Agriculture
DOH	State of Hawaiʻi Department of Health

DOT	State of Hawaiʻi Department of Transportation
DOW	County of Kauaʻi Department of Water
E&WKSWCD	East and West Kauaʻi Soil and Water Conservation District
EA	Environmental Assessment
EPA	U.S. Environmental Protection Agency
EIS	Environmental Impact Statement
EISPN	Environmental Impact Statement Preparation Notice
ET	Evapotranspiration
FC	Full Circle
FDA	United States Food and Drug Administration
FEMA	Federal Emergency Management Area
FIRM	Flood Insurance Rate Map
GHG	greenhouse gas
GWP	global warming potential
gpd	gallons per day
gpm	gallons per minute
HAR	Hawaiʻi Administrative Rules
HDF	Hawaiʻi Dairy Farms, LLC
HEER	Hazard Evaluation and Emergency Response
HNN	Hawaiʻi News Now
HRS	Hawaiʻi Revised Statutes
IAL	Important Agricultural Lands
IBC	International Building Code
IPCC	Intergovernmental Panel on Climate Change
IPM	Integrated Pest Management
IWS	Individual Wastewater Systems
KIUC	Kauaʻi Island Utility Cooperative
lbs	pounds
LCA	Land Commission Awards
LUC	Land Use Commission
µS/cm	microsiemens per centimeter
µM	micromolar
MRCI	Marine Research Consultants, Inc.

MDPR	multiday precipitation total
MGD	million gallons per day
N	Nitrogen
NAAQS	National Ambient Air Quality Standards
NEH	National Engineering Handbook
NFW	no further work
NMP	Nutrient Management Plan
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollution Discharge Elimination System
NRCS	Natural Resources Conservation Service
NWI	Nation Wetlands Inventory
OSDS	on-site disposal systems
OSHA	Occupational Safety and Health Administration
OU	Odor Unit
P	Phosphorous
PBN	Pacific Business News
PC	Partial Circle
PEP	Plasch Econ Pacific
PI	Pacific Islands
PM	particulate matter
SAAQS	State Ambient Air Quality Standards
SART	State Agricultural Response Team
sf	square feet
SHPD	State Historic Preservation Division
SWAP	source water assessment program
SWCD	Soil and Water Conservation District
SWPPP	Stormwater Pollution Prevention Plan
T	tons
TGI	The Garden Island
TMDLs	total maximum daily load limits
TNWRE	Tom Nance Water Resource Engineering
TOT	time-of-travel
TSP	technical service provider

U.H.	University of Hawaiʻi
UHT	ultra-high temperate processing
U.S.	United States
USACE	U.S. Army Corps of Engineers
UST	underground storage tank
USDA	United States Department of Agriculture
USFWS	US Fish and Wildlife Service
USGS	United States Geological Survey
w/sm	Watts per Square Meter

1.0

PROJECT SUMMARY

1.0 PROJECT SUMMARY

Section 1.0 provides an overview of the contents and purpose of this Environmental Impact Statement (EIS). This section includes a summary description of Hawaiʻi Dairy Farms or “Proposed Project”, applicable environmental statutes and rules, and the potential impacts, proposed mitigation measures, and alternatives to the Proposed Project. The consistency of the Proposed Project with government land use policies and plans is summarized, along with a discussion of unresolved issues and a listing of required approvals.

1.1 PROJECT INFORMATION SUMMARY

Type of Report: Environmental Impact Statement
Project Name: Hawaiʻi Dairy Farms
Applicant: Hawaiʻi Dairy Farms, LLC
P.O. Box 1690
Kōloa, Hawaiʻi 96756-1690
(808) 544-8968

Planning Consultant: Group 70 International, Inc.
925 Bethel Street, Fifth Floor
Honolulu, Hawaiʻi 96813
Jeffrey Overton, AICP, Principal Planner
Telephone: 808-523-5866
Email: HDF@Group70int.com

Approving Agency: State of Hawaiʻi Department of Health
Contact: Laura McIntyre, Environmental Planning Office
Telephone: 808-586-4337
Email: Laura.McIntyre@doh.hawaii.gov

Project Location:	Māhāʻulepū Valley Kauaʻi, Hawaiʻi *(Figure 1-1)*
Tax Map Key:	(4) 2-9-003: 001 portion and 006 portion (4) 2-9-001: 001 portion (*Figure 1-2*)
Land Owner:	Mahaulepu Farm, LLC 3-1850 Kaumualiʻi Highway Līhuʻe, Hawaiʻi 96766
Project Area:	557 acres
Kauaʻi County Zoning:	Agriculture
State Land Use District:	Agricultural District
Existing Uses:	Vacant fallow agricultural land, former sugar plantation
Proposed Use & Components:	Agriculture (Dairy) use for dairy buildings, roads, sheds and ponds, paddocks, cow races, farm roads, irrigation system, water storage, drainage ways, setbacks/vegetated buffers.
County of Kauaʻi General Plan:	Kōloa-Poʻipū-Kalāheo Planning District
Special Management Area:	No
Flood Zone Designation:	Zone X
Required Reviews/Permits:	**County of Kauaʻi** • Building Permit **State of Hawaiʻi** Department of Land and Natural Resources State Historic Preservation Division • Hawaiʻi Revised Statutes Chapter 6E - Historic Preservation Review West Kauaʻi Soil and Water Conservation District • Conservation Plan Department of Health, Clean Water Branch • National Pollutant Discharge Elimination System (NPDES) Construction Stormwater General Permit Department of Health, Wastewater Branch • Waste Management Plan • NPDES Concentrated Animal Feeding Operation • Individual Wastewater Permit Department of Health, Sanitation Branch • Milk Producer Permit

1.2 PROPOSED PROJECT

This section summarizes the project purpose, objectives, evaluation criteria, and project overview. A summary description is provided for the dairy site requirements, buildings and support facilities, utilities, and agricultural infrastructure. The operations of the dairy are summarized for herd management, pasture management, irrigation and nutrient balance, offsite milk processing, offsite herd management and the contemplated herd size.

Project Purpose. The project purpose is to establish a sustainable, pastoral rotational-grazing dairy farm that will increase current local milk production, bolster Hawaiʻi's declining dairy industry, and reduce reliance on imported milk from the mainland United States. The rotational-grazing dairy system utilizes 100 percent of all manure on-site as natural fertilizer to grow grass. This cost-effective method reduces imported fertilizer and feed, and minimizes potential impacts to the environment.

Objectives. Hawaiʻi Dairy Farms set eight objectives to achieve to bolster local milk production in Hawaiʻi:

1. Provide more than 1,000,000 gallons annually of fresh, nutritious milk for Hawaiʻi families and revitalize the dairy industry in Hawaiʻi.
2. Apply proven, sustainable pasture-based rotational grazing system and state-of-the-art technology to reduce reliance on costly imported fertilizer and feed.
3. Grow local, quality grass as a primary feedstock optimal for dairy cow nutrition and health, utilizing results of forage research conducted at five sites across four Hawaiian Islands.
4. Design facilities to provide animal comfort, including maximum time on pasture and minimal milking time.
5. Effectively integrate dairy operations within the island community setting.
6. Optimize dairy product shipping and marketing.
7. Provide local farming employment and build the agricultural economy.
8. Protect and enhance the area's natural, cultural, social and economic environment through sound agricultural planning, preservation of open space and sensitive resources, and development of economic benefit.

Evaluation Criteria. Within the context of the Hawaiʻi Dairy Farms Objectives, HDF has established primary evaluation criteria which must be satisfied for the project to be economically, socially and environmentally responsible. The four evaluation criteria include:

1. Secure sufficient contiguous land area under long-term lease with adequate water supply (including potable water to meet standards under milk rules), suitable soil properties, gentle slope conditions, and road accessibility.
2. Generate new long-term employment in the agricultural sector on Kauaʻi in a wide range of positions including pasture agronomy/soils science, livestock management, veterinary and animal husbandry, environmental resources management, milk/milk products processing and dairy business management.
3. Create a model for dairy operations utilizing Important Agricultural Lands (IAL), demonstrating the importance of long-term agricultural leases and capital investment for agricultural infrastructure to advance food self-sufficiency.
4. Utilize 100 percent of manure on site as nutrients to grow forage for dairy cows. Grow sufficient forage to provide 70 to 85 percent of feedstock required for the herd.

Hawaiʻi Dairy Farms has been designed to meet the guiding objectives. The project represents a directed effort to establish a pasture-based dairy in Hawaiʻi that will lead to improving food security for Hawaiʻi. The model uses a pastoral rotational-grazing system on former sugarcane plantation lands. With the demonstrated success of Hawaiʻi Dairy Farms, the proponents will be able to continue and expand their community leadership and social investment within Hawaiʻi by adapting the grazing system to other locations in the state. These objectives and criteria are the guiding parameters that ultimately define the direction for Hawaiʻi Dairy Farms.

Overview of the Proposed Project. The project will reinvigorate the flagging dairy industry in Hawaiʻi and establish a financially and environmentally sustainable, pastoral rotational-grazing dairy to provide more than one-million gallons of fresh milk for Hawaiʻi's families. This section describes the proposed action within the agricultural context of the Māhāʻulepū site, and individual improvements composing the Hawaiʻi Dairy Farms project.

HDF leases agricultural land in Māhāʻulepū Valley on the south shore of Kauaʻi (Figure 1-1 Project Location Map). The 557-acre site consists of portions of three parcels leased from Mahaulepu Farm LLC (Figure 1-2 Tax Map Key). The lease area was surveyed for a metes and bounds description, which modified the acreage from an originally estimated 578-acres to the surveyed 557-acres to allow for access around the perimeter, fencing setbacks, buffers from cultural sites above the farm, and for potential future expansion of the taro farm by the lease-holder.

HDF will establish and operate a sustainable, pastoral rotational-grazing dairy farm in Māhāʻulepū Valley on the island of Kauaʻi to produce fresh, locally available nutritious milk for Hawaiʻi families. The rotational-grazing method utilizes 100 percent of the cows' manure as fertilizer for pasture grass to provide the primary source of nutrients. This cost-effective method will reduce reliance on imported fertilizer and feed. Pasture grass will provide a local food source appropriate for cow health and quality milk production, and will comprise at least 70 percent of the animals' diet.

HDF has committed to establish a herd of up to 699 mature ~~milking~~ dairy cows. HDF may contemplate possible expansion of the herd up to 2,000 mature ~~milking~~ dairy cows, following the proven success of the rotational-grazing system for local milk production and better understanding the potential carrying capacity of the pasture. While additional regulatory review and public input would be required at that time, this Environmental Impact Statement (EIS) documents the potential impacts from both herd sizes for comparative purposes and full disclosure. Differences in infrastructure or operations for the two herd sizes are noted, where applicable.

Hawaiʻi Dairy Farms has engaged with the NRCS resource conservationist to seek technical guidance, including consultation with a technical service provider (TSP). A Conservation Plan for the project, which includes a Comprehensive Nutrient Management Plan, was reviewed and accepted by West Kauaʻi Soil and Water Conservation District on December 17, 2013.

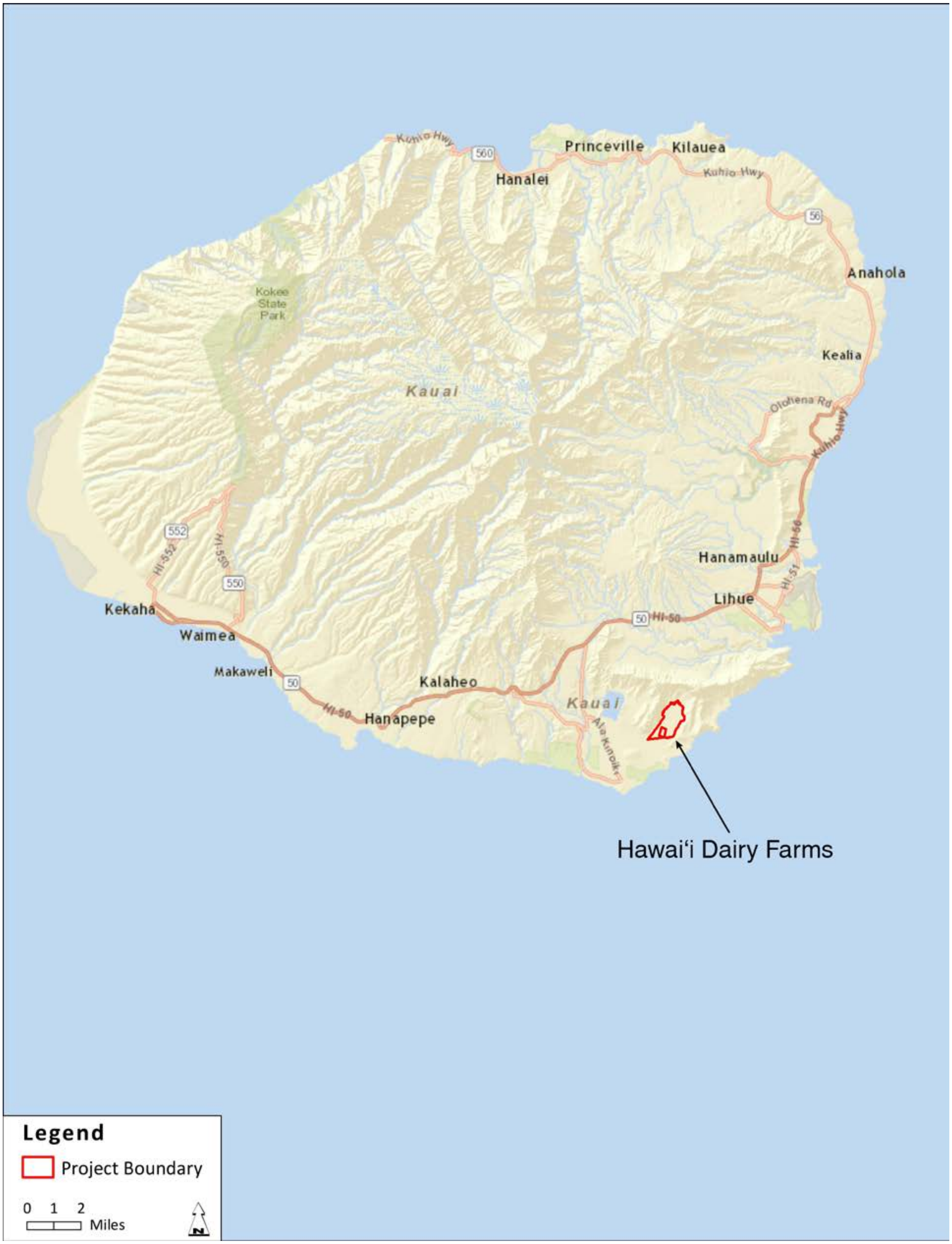


Figure 1.2-1 Island Location Map

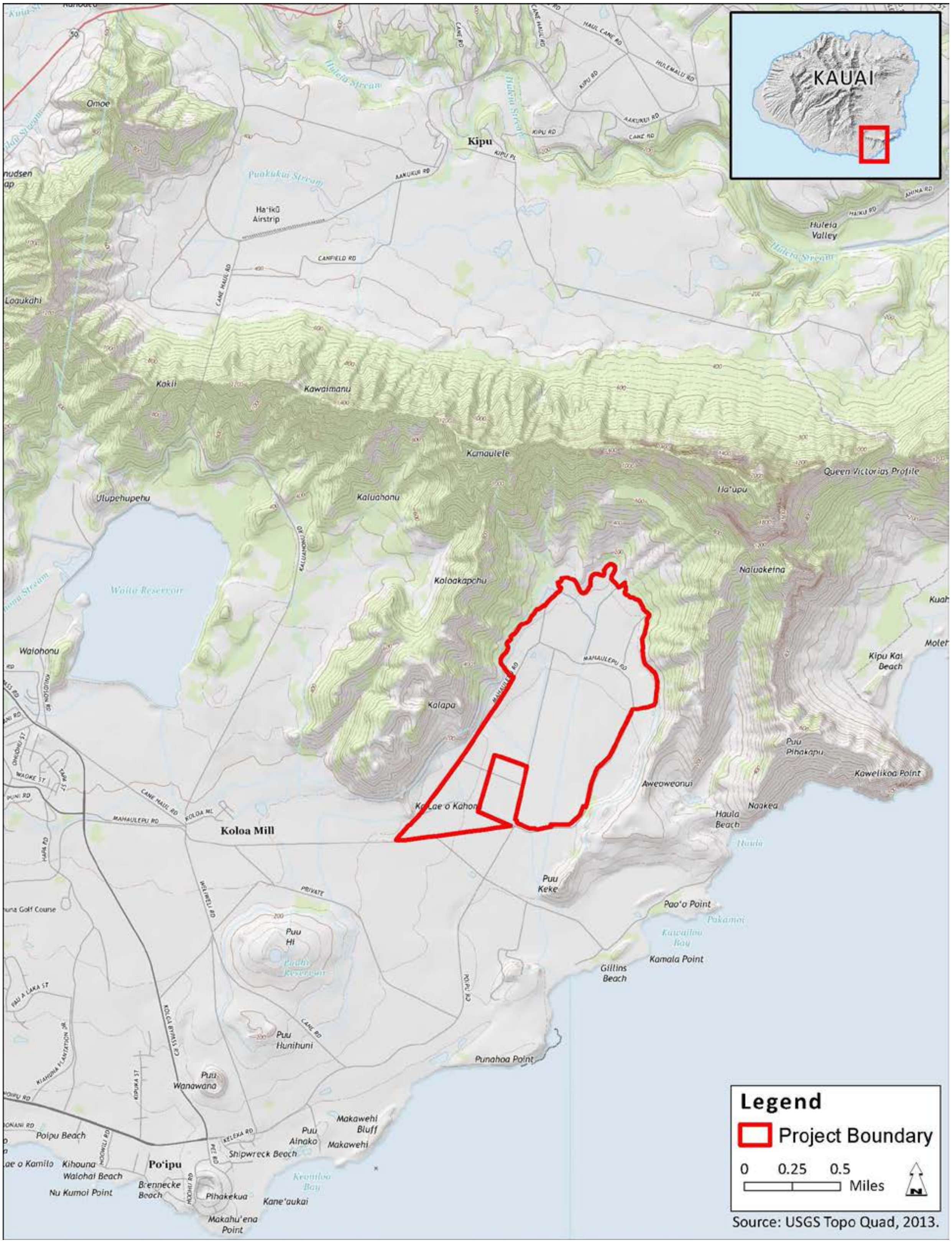


Figure 1.2-2 Project Area Map

Dairy Site Requirements. The 557-acre site consists of 547 acres for paddocks, vegetated buffers ("setbacks") along drainage ways, farm roads, and cow races. A land use summary of the dairy facilities area and pasture area is presented in Table 1-1, and described in Section 3.0.

Table 1-1 Land Use Summary

Land Use	Acres
Facilities	
Dairy Buildings, Yard, Sheds, Road, Ponds	9.7
Subtotal	**9.7**
Pasture	
Paddocks	469.9
Cow Races, Farm Roads, Drainage Ways & Setbacks / Vegetated Buffers	77.2
Subtotal	**547.1**
Total	**556.8**

The dairy facilities will occupy an area of approximately 10 acres on the western boundary of the site. The developed area "footprint" will be less than ~~0.1~~ two percent of the total farm area. Four buildings will be constructed to serve different functions, supported by utilities and infrastructure. Utilities needed for the dairy facilities include a potable water distribution system from the private on-site well, one domestic individual wastewater system (IWS, a DOH-approved septic system) for the employee restroom, and utility-provided electrical power and communications.

Buildings and Support Facilities. A summary list of buildings and support facilities is provided herein, and described in detail in Section 3.0.

- Milking Parlor. The largest building at the dairy, approximately 256-feet long by 88.5-feet wide and 33-feet tall, including a covered loading area, 60-stall rotary milking area, holding pens, mechanical room and pump room, office space, veterinary space and storage, staff restroom and milk storage.
- Implement Shed. An implement shed will be used to store equipment, tools, and supplies, and to provide space for farm machinery. Sized at approximately 65-feet long by 26-feet wide by 15-feet tall, the implement shed will be an open bay steel structure on a concrete slab with a metal roof.
- Calving Sheds. Newborn calves are kept on the farm until they are approximately 90 days old, housed in sheds to provide for their welfare until they are ready to transition to pasture. The calf sheds are open-bay steel structures with metal roofs on concrete slabs. Each of the two sheds will be approximately 81-feet long by 26-feet wide, and 15-feet tall.
- Holding Yard. Cows waiting to enter the milking parlor will move through the holding area as a mob, designed to hold a mob of up to 330 cows at any one time. The yard is approximately 12,300 square feet (150-feet long by 82-feet wide) of concrete slab with surrounding curbs to contain manure captured while the cows await milking and return to pasture; half of the area will be covered with roofing.
- Effluent Ponds. Manure and urine will be washed from the holding yard frequently to provide a healthy environment for the cows. Washdown water will be collected and transferred to effluent pond through underground pipes. The collected effluent will be diluted and utilized as natural fertilizer to provide nutrients for pasture grass.
- Access Road and Tanker Truck Turnaround. The primary access to the dairy will be from the existing farm road central to the site, via a newly paved 20-foot wide road within the dairy facility. Milk tanker trucks will utilize the Access Road to load milk and to transport milk off-site.

Utilities for Buildings and Support Facilities. Utilities servicing the buildings and support facilities are summarized below, and described in detail in Section 3.0.

- Electrical Power. Electrical power will be provided through an overhead service connection to the Kaua'i Island Utility Cooperative (KIUC) grid via existing overhead line. A new three-phase, 75-300 kVA transformer will be installed. Electrical lines will be extended to the dairy in a concrete-encased conduit routed underneath the access road. Additional 500 kW power will be supplied by photovoltaic (PV) panels mounted to structure roofs.
- Potable Water. Potable water will be sourced from the existing Māhā'ulepū Well Battery located within the project site. Water storage tanks holding up to 80,000 gallons will be located adjacent to the milking parlor, and will distribute water into the milking parlor, buildings and paddocks via small booster pumps. Total demand will initially be approximately 30,000 gpd.
- Domestic Wastewater. The facilities will be serviced by an individual wastewater system (IWS) to treat wastewater on-site using DOH-approved system (e.g. septic tank). The system will be designed for a flow of 700 gpd, with a 1,500-gallon capacity.
- Communications. Telephone and internet service will be provided through an overhead service connection via drop pole to the same subgrade trench as the electrical power, in a separate duct conduit that feeds into a 2-feet by 4-feet Hawaiian Telcom pull box.
- Storm Water Drainage. Gutters, curbs and swales will direct surface sheet flow. Metal roofing material on dairy buildings will be sloped to adequately sized gutters and downspouts. Roof run-off will be discharged directly to landscaped areas surrounding the buildings. Run-off from areas with the potential for manure will be routed to the effluent storage ponds.

Agricultural Infrastructure and Utilities. Agricultural infrastructure and utilities for the dairy operations include storage tanks and silos, effluent storage ponds, irrigation and livestock water systems.

- Storage Tanks and Silos. The dairy farm will have milk storage tanks, potable water tanks, gasoline and diesel fuel tanks.
- Livestock Water Distribution System. Potable water will come from Māhā'ulepū Well 14 and be stored in two tanks totaling 80,000 gal capacity. Small diameter water mains will deliver water to raised concrete troughs in each paddock, fitted with valves that allow water flow.
- Effluent Storage Ponds. Collection and storage of effluent allows the dairy manager to control the schedule, timing, and mix of nutrients to be applied, as presented in detail in Chapter 3. Sizing of the storage facility allows flexibility in scheduling land application when weather and field conditions are suitable. Design guidance for effluent storage requires sizing of the pond to contain all wastewater, manure, clean water, solids accumulation, net surface rainfall including runoff over an adequate storage period, and the direct precipitation sized for 24-hour rainfall event. In consideration of the contemplated possible expansion of the herd, the ponds for HDF will be sized to accommodate the potential maximum effluent generated over 30 days by the contemplated herd size of up to 2,000 ~~milking~~ mature dairy cows. For the committed herd size of 699 ~~milking~~ mature dairy cows, the ponds would have excess capacity and minimum storage equivalent to an additional 45 percent of the total volume design~~ of 394,956 gal (30-day storage)~~. As a safeguard, the HDF ponds will be sited within a secondary containment area, which provides greater backup ~~containment~~ capacity than called for under the regulatory requirements.

- Irrigation for Nutrient Utilization. The utilization of nutrient-laden water in the storage pond for any irrigated pasture area will be accomplished through irrigation applications, planned once every four days. The irrigation schedule will be adjusted depending on field conditions. Liquid effluent will be mixed with non-potable water from the Waita Reservoir, and applied to pastures through a GPS-controlled pivot irrigation system. Slurry created by mixing the solids with non-potable water will be applied through a mobile hard-hose reel dispensed through a gun nozzle, referred to as a gun irrigation system.

Herd Management. The pasture-based model allows cows to move about freely, and to lie down and rest, which is part of the digestion cycle. The animals are managed in social groups known as "mobs", mimicking the natural social order of bovines. Cows will spend 22 of each 24-hour period foraging on pasture or resting, outdoors in natural light and fresh air. The gently sloped paddocks, walkways and races minimize the energy expended by the ~~milking~~ mature dairy cows as they graze or are transferred to and from the various paddocks and the milking facility; surfaces of the walkways and cow races are designed to provide a comfortable path under hoof. The management practices and pasture model applied by HDF maximizes grass as the cows' primary nutrition source and minimizes stress to the animals. Cows tend to be healthier and live longer productive lives with access to fresh air, high quality feed, and exercise while they forage (NRCS, 2007). Following twice-daily milking in the barn, the cows are returned to paddocks. Offsite herd management by Kauaʻi ranchers, which involves raising calves and resting cows, is addressed in Section 3.7.

Pasture Management. The pastoral rotational-grazing dairy provides a local feedstock – grass – as the herd's primary food source. Reducing imported feed stabilizes costs and provides a food source closer to the natural diet of cows. Results of grass trials initially conducted at five sites across four Hawaiian Islands were instrumental in identifying appropriate varieties of grass. Additional project-specific trials at the Māhāʻulepū site on Kauaʻi have been conducted for more than 18 months. The results have identified sufficient yield and nutrition to supply 70 percent of the cows' diet; improvements in grass productivity are anticipated to provide up to 85 percent of cows' diet.

- Paddocks. The ~~478.5~~ 469.9 acres of pasture will be divided into ~~122~~ 119 paddocks ranging from 3 to 5 acres in size. Smaller paddocks are located near the dairy facility and will be used as temporary pasture for cows or calves being moved on or off the farm.
- Setbacks. To protect water quality of surface water and downstream areas, paddock fences are set 35-feet back from the top bank of drainage ways. Existing vegetation within the setbacks will be managed or restored to reduce erosion, improve stability of ditch banks, increase net carbon storage, and improve and maintain water quality.
- Fencing. A permanent perimeter fence will be constructed with steel t-posts installed every 10 feet, and a wooden post placed every 50 feet. The configuration of the perimeter fence will be determined in consultation with the U.S. Fish and Wildlife Service and the state Division of Forestry and Wildlife, and will be documented in the Endangered Species Protection Plan to be finalized prior to dairy construction and operations. ~~The fence will include 42-inch woven wire topped with a strand of straight wire at 48-inch height, with a strand of barbed wire at ground level to deter feral pigs.~~ Within the perimeter fence, paddock fencing will consist of two or three strands of electric wire mounted on wooden posts.

- Forage Productivity. Kikuyu and Guinea grasses brought in as cattle forage decades ago will be sown to transform the former sugar cane fields into pasture. As the cows excrete on the Kikuyu thatch, nutrients are incorporated into what is effectively an organic net. Due to the high moisture and moderate temperatures, the microbial activity in the thatch is very high and the excreted manure and effluent will be largely broken down by microbial activity within 24 hours. Microbes such as bacteria, protists, and fungi will break down the manure and effluent through decomposition into its nutrient components to make these readily available for uptake into the grass crop and plant matter. Even with the applied manure and effluent nutrients, the grass will need additional nutrient application with conventional fertilizers to maintain optimum grass growth and yield goals at 699 and up to 2,000 mature dairy cows.

Irrigation and Nutrient Balance. Irrigation is the primary method of applying natural fertilizer from the effluent ponds. This section discusses irrigation methods, setbacks, and determination of nutrient application rates.

- Irrigation. The total pasture area of the farm is approximately 470 acres. The majority of the pastures, 346.5 acres, will be irrigated with irrigation water and/or diluted effluent through the pivot irrigation systems, with the remainder through gun irrigators. Irrigation water supply is provided to the farm from Waita Reservoir, and will be filtered and pumped to the various irrigation components on the farm. The pivot irrigation system utilizes two central pivots that feed water to an overhead, rotating sprayer supported by trusses mounted on wheeled towers that rotate in a 1,000-foot diameter. Nozzles are suspended approximately four feet from the ground to guide water directly onto the pasture grass. Gun irrigators will be used for areas not covered by the pivots. The gun irrigators utilize a hard-hose reel, which can be moved throughout the farm as needed. The pivot system uses GPS tracking and automation to ensure the ditches and buffer zones do not receive irrigation water.
- Nutrient Balance. Nutrient management is the practice of managing the amount, rate, source, method of application, and timing of plant nutrients and soil amendments. The NRCS Conservation Practice Standard 590 Nutrient Management applies to commercial fertilizers, organic by-products, waste water, organic matter, and irrigation water. The timing and application of nutrients should correspond as closely as practical with plant uptake, soil properties and weather conditions. The results from soil testing, manure testing, and forage testing will be utilized to update and inform the nutrient management process for HDF. Application of agricultural waste can be beneficial to soils by improving organic matter, increasing infiltration of water, and improving the soils' ability to support pasture growth and root establishment.

Nutrient mass balance is described in detail within EIS Section 3 and Appendix D. A concise tabulation of the nutrient mass balance for the committed herd size (up to 699 mature dairy cows) and contemplated herd size (up to 2,000 mature dairy cows) are shown in the tables below.

Table 1-2

Nutrient Mass Balance for Committed Herd Size up to 699 Mature Dairy Cows

Nutrient Application	Area (acre)	Nitrogen Applied (lbs N/ year)	Phosphorous Applied (lbs P_2O_5 / year)
Manure As- Excreted	470.0	129,556	26,966
Liquid Effluent	285.1	11,980.8	2,586.7
Slurry Application	42.0	7,987.2	1,724.4
Total		**149,524**	**31,277**
Plant Nutrient Demand		**490,200**	**87,317**
Percentage from Animals		30.5%	35.8%
Required Chemical Fertilizer		340,676	56,040
Percentage from Chemical Fertilizer		69.5%	64.2%

Nutrient Mass Balance for Contemplated Herd Size up to 2,000 Mature Dairy Cows

Nutrient Application	Area (acre)	Nitrogen Applied (lbs N/ year)	Phosphorous Applied (lbs P_2O_5 / year)
Manure As- Excreted	470.0	374,308	78,293
Liquid Effluent	285.1	35,013.7	7,631.7
Slurry Application	171.0	23,342.5	5,087.8
Total		**432,664**	**91,012**
Plant Nutrient Demand		**490,200**	**87,317**
Percentage from Animals		88.3%	104.2%
Required Chemical Fertilizer		57,536	(3,695)
Percentage from Chemical Fertilizer		11.7%	(4.2%)

Off-site Milk Processing. Under the proposed action, milk processing is currently planned via an off-take sale agreement with a milk processor (e.g. HDF sells raw milk wholesale to processor and bottler). Pasteurization must occur on Kauaʻi prior to shipping the fluid milk to Oʻahu for processing to retain product freshness. Milk processing includes pasteurization, bottling and packaging of milk, and possibly other dairy products such as yogurts and cheese. Another potential option for offsite milk products processing would be for Hawaiʻi Dairy Farms to process and package the raw milk and possibly create additional dairy products, such as yogurt and cheese. The final products would be sold on Kauaʻi and elsewhere statewide. The offsite processing element of the proposed action would significantly reduce the overall time for milk and milk products to get from farm to table, and would maximize Kauaʻi-based agricultural industry employment. The processing facilities would contain a process unit office, refrigeration units, bulk product storage, bulk product transfers to containers, finished product packaging, and trans-shipment staging and loading.

Offsite Herd Management. Animals in various stages of development/maturity and rest will be transferred between HDF and other existing Kauaʻi ranches as needed for animal health and dairy productivity. This will benefit both the dairy and infuse the beef market in Hawaiʻi with a new, local source of pasture-raised calves. Male calves will become part of the beef cattle herd; heifers (young female calves that haven't given birth) will be raised until ready to return to the HDF herd as a birthing/milking cow.

Two ranches on Kauaʻi will initially work with HDF. Makoa Ranch near Kapaʻa is an active cattle ranch run by the Farias family. The ranch will care for dry cows during an annual resting period, and raise calves until ready for return to HDF pasture. Calves suitable as beef cattle will be incorporated into the Makoa Ranch herd or sold to other ranching operations. "Close-up cows" or those cows returning to milk production will initially be transferred to Omao Ranch for transition.

Annually, dairy cows are rested, or "dried" for 60 days before returning to milk production. The existing ranch operations are established and require no additional facilities, permits, or improvements to work with HDF. The fluctuation in herd numbers is typical of cattle operations and poses no impact to the Makoa or Omao Ranches or areas outside the project area. Only the 699 ~~milking~~ mature dairy cows and calves less than 90 days old will reside on the farm.

Contemplated Herd Size. The committed Proposed Action calls for a herd size of up to 699 ~~milking~~ mature dairy cows. The contemplated Proposed Action calls for a possible expanded herd up to 2,000 ~~milking~~ mature dairy cows. The number of animals moving through the dairy facilities would increase under the contemplated herd size. The building design and agricultural infrastructure is capable of accommodating both herd sizes.

1.3 ENVIRONMENTAL REVIEW UNDER CHAPTER 343, HAWAIʻI REVISED STATUTES

This Environmental Impact Statement was prepared in accordance with Hawaiʻi Administrative Rules Title 11 Chapter 200, implementing Hawaiʻi Revised Statutes (HRS) Chapter 343. An Environmental Impact Statement (EIS) is being prepared by the Applicant to analyze the potential environmental impacts and mitigation measures associated with agricultural operations at Hawaiʻi Dairy Farms (HDF) at Māhāʻulepū, Kauaʻi.

The environmental review process for this project was initiated with the publication of the notice of availability of the Environmental Impact Statement Notice of Preparation (EISPN). The notice was issued by the State Office of Environmental Quality Control (OEQC) in the Environmental Notice issue of February 8, 2015, which underwent a 30-day review period from February 9 through March 11, 2015. All substantive comments received during the review period are addressed in the the Draft EIS. Section 7 includes a list of consulted parties (agencies, organizations and individuals), with the comment letters and HDF responses presented in Appendix 3.

Upon its formal submittal and acceptance by the State of Hawaiʻi Department of Health for publication, the Draft Environmental Impact Statement (DEIS) ~~will undergo~~ was subject to a 45-day agency and public review. The substantive comments received during this review period ~~will be~~ are addressed, and a written response is provided and incorporated into the Final EIS ~~prior to its filing~~.

1.4 SIGNIFICANT BENEFICIAL AND ADVERSE IMPACTS & PROPOSED MITIGATION MEASURES

Development of the planned improvements for Hawaiʻi Dairy Farms will result in numerous beneficial impacts. The project will reinvigorate the flagging dairy industry in Hawaiʻi and establish a financially and environmentally sustainable, pastoral rotational-grazing dairy to provide more than 1,000,000 gallons of fresh milk for Hawaiʻi's families. Local and state economic benefits will include construction-related jobs. In the long term, HDF will create a significant number of full-time positions in agricultural operations, along with support for local ranchers. As such, the significant impacts of the Hawaiʻi Dairy Farms are anticipated to be largely beneficial, as discussed below. Mitigative measures are proposed to offset potential adverse impacts. Section 4.0 of the DEIS presents the environmental setting, potential impacts and mitigation measures.

1.4.1 BENEFICIAL IMPACTS

Implementation of Hawaiʻi Dairy Farms will provide many benefits for Kauaʻi and Hawaiʻi including local milk production, food sustainability, agricultural employment, community benefit investments and youth education. A summary of these beneficial impacts is listed below.

- <u>Increased Local Milk Production</u>. Doubling of statewide local milk production to provide more than 1,000,000 gallons of fresh milk for Hawaiʻi's families. The contemplated herd size has the potential to produce over 3,000,000 gallons of fresh milk per year, and provide statewide distribution of more local milk.
- <u>New Long-Term Agricultural Employment</u>. Creation of up to ~~28 operational~~ 22 direct and indirect jobs, as well as construction jobs and local supplier opportunities in support of agriculture on Kauaʻi.
- <u>Support for Agriculture on Kauaʻi.</u> Hawaiʻi Dairy Farms will provide the first large-scale commercial use of Important Agricultural Lands on Kauaʻi. The dairy will create a $17.5 million investment in local food production without any government subsidies. Significant opportunities for local ranchers will be created for dairy herd management support.
- <u>Increased Soil Conservation</u>. Pasture creation and management with Hawaiʻi Dairy Farms will stabilize and protect soils across nearly 500 acres at Māhāʻulepū, reducing soil erosion and suspended sediment runoff to drainage ways and the nearshore ocean waters. In addition, the pasture based system will improve and revitalize the current soils and farming productivity of the land.
- <u>Investments in Community Benefits and Youth Education</u>. Hawaiʻi Dairy Farms will provide community benefit investments in related causes through donations. HDF will work with the 4-H and FFA to educate keiki about STEM-based agricultural jobs and animal husbandry.
- <u>Increased Net Revenues to County and State Governments.</u> Hawaiʻi Dairy Farms will create $6 million to $9 million in annual operating expenditures to help support Kauaʻi's economy, providing net revenues to County and State governments.

1.4.2 PROBABLE ADVERSE IMPACTS

Implementation of Hawai'i Dairy Farms will produce potential short-term and long-term impacts. General categories of actions for the dairy establishment and operational actions include:

- Establishment of 470 acres of grazing pasture, paddocks, fencing and farm roads
- Construction of dairy facilities buildings and support infrastructure on less than 10 acres
- Implementation of dairy operations with a committed herd size of 699 mature ~~milking~~ dairy cows
- Potential implementation of a contemplated herd size of up to 2,000 mature ~~milking~~ dairy cows

To complete the improvements required to establish the dairy facilities and paddocks, there will be localized short-term construction–related impacts on the environment. Potential short-term impacts due to construction-related activities evaluated in the EIS include soil disturbance, dust and soil erosion, limited excavation and grading, fauna disruption, and traffic in the project vicinity due to construction equipment and trucks, and increased noise due to construction-related operations. Potential drainage and runoff related to construction are also evaluated.

Over the long term, impacts associated with the implementation of Hawai'i Dairy Farms are anticipated to be modest and consistent with the agricultural setting in which the farm is located. Section 4.0 addresses the potential long-term effects of the dairy farm, in categories such as archaeological resources, cultural resources, soils, air quality, water quality, traffic, employment, government revenues, visual resources and infrastructure. The dairy farm will create both negative and beneficial long-term impacts in these categories, with mitigation measures to offset detrimental effects addressed in Section 1.4.3 and Chapter 4.0.

With the dairy in operation, during periodic seasonal storm water runoff events (about 10 times/year) there may be additional nutrients introduced to the agricultural ditches, which ultimately drain to the nearshore ocean water. The findings of the water quality evaluations are presented in Sections 4.16, 4.17 4.22 and 4.23. The complete studies are presented in Appendix E and Appendix F. There is also the potential for vector insects such as flies to become established at the dairy farm, controlled by Integrated Pest Management measures. The findings of the manure-related insect study are presented in Section 4.11, and the complete study is presented in Appendix B. Air quality in the immediate vicinity of the dairy farm (within 1,700 feet) may, in the worst-case conditions, be affected with odors from the effluent pond and manure in the pasture paddocks. The findings of the air quality odor model are presented in Sections 4.19 and 4.25, and the complete study is presented in Appendix I.

1.4.3 PROPOSED MITIGATION MEASURES

There are few potential long-term adverse impacts anticipated to result from the construction and implementation of Hawai'i Dairy Farms. Relative to the agricultural, social, economic and employment benefits that are expected to result from the dairy operation, with application of the various mitigation measures described in the EIS, the potential adverse impacts are not considered significant. Potential short-term impacts due to construction activities will be limited to construction efforts such as earthwork, noise, visual and temporary air quality impacts related to dust and equipment emissions. Long-term impacts are expected to be modest and consistent with the agricultural environment in which the dairy farm is located. Potential short-term and long-term impacts, and mitigation measures are discussed in detail in Chapter 4.0 and summarized below.

Soil Erosion Mitigation. Short-term soils loss will be controlled by proper construction site management and best management practices. Pursuant to the NRCS Conservation Plan, long term soil losses will be minimized. Pasture creation and management with Hawaiʻi Dairy Farms will stabilize and protect soils across nearly 500 acres at Māhāʻulepū, reducing soil erosion and suspended sediment runoff to drainage ways and the nearshore ocean waters. Vegetated buffer zones and Best Management Practices will be employed to minimize soil erosion.

Water Quality Mitigation. To sustain pasture grasses, there will be nutrients added through the application of effluent pond water and commercial fertilizers, and some nutrients will pass through to drainageways or percolate through soils and enter the agricultural ditches. Nutrient loss will be minimized through vigorous pasture grass cover and thatch, and 35 foot wide vegetation buffers maintained along the agricultural ditches. Irrigation water will not be applied within 50 feet of the agricultural ditches. The vegetated buffers will also deter the movement of manure particles carried in runoff during peak storm events. These numerous mitigation actions by the dairy operations will minimize adverse effects to water quality and have minimal to no effects on nearshore marine water per Appendices F and K.

Archaeological and Cultural Resource Mitigation. ~~An Archaeological Inventory Survey (AIS) was conducted for the project, and is being reviewed for approval by the State Historic Preservation Division (SHPD). Based on the findings of the AIS and SHPD review, there are no archaeological sites on site, only historic period agricultural features. As directed by SHPD, potential requirements for on-site archaeological monitoring of construction activities will be implemented.~~ The State Historic Preservation Division accepted the AIS December 19, 2016 (Appendix G). SHPD concurs with the significance assessments and mitigation recommendations in the AIS, which identifies the 14 plantation-era sites within the project area as significant only under Criterion d (information potential). The letter states no further work is recommended for these sites (50-30-10-2251 through 2262). Two sites outside the Project Area, an enclosure (Site -2250) and a petroglyph complex (Site -3094), were assessed as significant under Criterion d (information potential) and e (cultural value). The SHPD letter states that the current proposed project will not affect these two sites, and no further mitigation is recommended for the project.

Pest Insect (Flies) Mitigation. The potential for the dairy to generate new fly populations at the dairy facilities will be mitigated by diligent housekeeping to wash down active areas at the milking parlor and holding pens to minimize waste accumulation and fly populations. Best Management Practices and Integrated Pest Management measures will also minimize fly populations. Introduction of dung beetles to the pasture paddocks will substantially hasten the breakdown of manure and minimize fly populations. With these mitigation measures, the dairy is not expected to increase the fly population affecting the surrounding offsite area.

Odor Mitigation. The potential for odors to be generated by the dairy facilities will be mitigated by diligent housekeeping to wash down active areas at the milking parlor and holding pens to minimize waste accumulation and subsequent odor generation. Management of the effluent ponds and effective operation of the irrigation system will further reduce the potential for odor generation. Introduction of dung beetles to the pasture paddocks will increase manure breakdown and minimize odor generation. With these mitigation measures, the dairy is not expected to generate adverse odors which would affect the surrounding offsite area.

Air Quality Mitigation. The impact of construction activity on air quality will be mitigated by conforming to dust control measures, particularly those specified in the State Department of Health's (DOH) Ambient Air Quality Standards, Chapter 11-59, Hawaiʻi Administrative Rules.

Noise Mitigation. Temporary but unavoidable noise impacts may occur during the construction activities within the area. The use of properly muffled construction equipment will help ameliorate these impacts. The incorporation of State DOH construction noise limits and curfew times, which are applicable throughout the State of Hawaiʻi, is another noise mitigation measure which is normally applied to construction activities. Once construction is completed, there will be minor additional noise impacts resulting from some dairy equipment operations.

Traffic Mitigation. During the construction phase of the dairy, some inconvenience is anticipated, as the delivery of construction equipment, construction worker vehicles and materials will utilize area roadways to access the dairy site, with an estimated increase in traffic movement of less than one-quarter of one percent for major roadways. Efforts will be made to minimize conflicts with traffic along the area roadways during construction activities. In coordination with State and County authorities, these activities will follow applicable rules and permits for transport, including routing and required additional safety escort vehicles. Traffic operations along the area roadways and intersections will not be significantly affected.

1.5 UNRESOLVED ISSUES

Below are identified issues that are being actively addressed, but which are currently unresolved.

Resolution of the Dairy Herd Size. Successful dairy farming involves the mastery of numerous elements, such as soil science, agronomy and animal husbandry. The final scaling of the mature dairy cow herd size for the Hawaiʻi Dairy Farms operations will ultimately be determined based on the results of pasture grass development at the Māhāʻulepū site, and mature dairy cow milk production levels. HDF has committed to no more than 699 ~~milking~~ mature dairy cows. Any expansion would depend on many factors that would be resolved in the future based on how the biomass and natural systems perform with 699 ~~milking~~ mature dairy cows. ~~Up to the committed herd size, this will~~ Any expansion would be an iterative process of monitoring and testing to determine the best approaches to optimize dairy operations and foster good health in the natural systems.

It is anticipated that the HDF dairy herd can be increased well beyond 1,000 to 1,500 ~~milking~~ mature dairy cows and be sustainable from an operational and environmental perspective. Expansion beyond the 699 ~~milking~~ mature dairy cows level will require issuance of a CAFO/NPDES permit by the State Dept. of Health. With careful monitoring of the operations and the natural systems, including the soils, pasture grasses and water quality, the dairy scaling can be accomplished with sensitivity to the various indicators of carrying capacity. The potential for HDF to reach the upper scale of 2,000 ~~milking~~ mature dairy cows at the dairy may or may not ultimately occur, depending upon the operational sensitivities and the indicators shown by the carefully monitored natural systems.

Milk Products Processing. The scope of milk processing operations has yet to be resolved. The location for the milk processing activity has not been finalized. The opportunity to undertake value-added processing steps in milk products processing could also be conducted on-island. Completion of milk products processing on-island would create additional employment and government revenues for Kauaʻi, increase the availability of local milk products, and further bolster the local agricultural economy. If milk products processing is not undertaken on Kauaʻi, the pasteurized milk would be shipped in bulk to one of the existing processing facilities on Oʻahu or Hawaiʻi Island for further process steps, packaging and marketing.

1.6 SUMMARY OF COMPATIBILITY WITH LAND USE POLICIES AND PLANS

The planned improvements and operations at Hawaiʻi Dairy Farms are compatible with and supportive of State of Hawaiʻi and County of Kauaʻi land use policies, plans and control related to the natural and social environment. The Proposed Project is consistent with and permitted by applicable land use designations and, as discussed in Section 5.0, will contribute a wide range of benefits to further established goals, objectives and policies. In particular, Hawaiʻi Dairy Farms is consistent with the State and County initiatives for food sustainability and the long-term intended use of Important Agricultural Land on Kauaʻi. The dairy is also consistent with the provisions of the State of Hawaiʻi Agricultural Functional Plan, and long-range planning for diversified agricultural use of Māhāʻulepū lands under the County of Kauaʻi General Plan and the South Kauaʻi Community Development Plan.

1.7 SUMMARY OF ALTERNATIVES CONSIDERED TO THE PROPOSED ACTION

Hawaiʻi Dairy Farms represents the current vision and intent to create a state of the art pasture-based, rotational grazing dairy. The Draft EIS evaluates alternatives that meet the project's Purpose and Need, and considers changes to dairy operations and location. Alternatives to the Proposed Project are evaluated in Section 6.0. The Environmental Impact Statement Rules, Hawaiʻi Administrative Rules Chapter 11-200 (HRS 11-200) requires a discussion of alternatives that could attain the objectives of the action, regardless of cost. A range of potential alternative actions may be contemplated for the future, however, several alternatives which do not meet the project purpose are not advanced for detailed analysis of environmental benefits, costs, and risks. The options considered but not meeting the project purpose included: conservation condemnation, rezoning/development for urban/resort use, development of an agricultural subdivision, and a large scale agricultural park and truck crop processing center.

Those alternatives carried forward in the Alternatives Analysis for further evaluation are several alternatives to the Proposed Project which could attain the objectives of the action. EIS law calls for rigorous exploration and evaluation of the environmental impacts of the alternatives, including those that might enhance environmental quality or avoid, reduce or minimize some or all of the adverse environmental effects, costs and risks. The alternatives considered include the following:

1. The Alternative of "No Action",
2. Conventional Feedlot Dairy Alternative,
3. Alternative Location for Pasture-Based Dairy, and
4. Milk Processing Alternative by HDF.

A summary description and evaluation is presented for each alternative in Section 1.7.1 to 1.7.4.

1.7.1 NO-ACTION ALTERNATIVE

The No-Action Alternative would continue future use of agricultural property without the establishment of the sustainable pasture-based dairy operations. With the Important Agricultural Lands designation, this land is expected to be used for either grazing or cultivation. Portions of the property would be available for cattle and sheep grazing, or other more intensive agricultural uses.

The property would be available for beef cattle grazing with a herd size of several hundred animals to become re-established, potentially with the addition of sheep or other animals. Use of these lands for cattle or sheep grazing pasture could be re-established, with cattle and/or sheep grazing on the 557 acre pasture area. At the stocking rate of two to four animals per acre, common to Kauaʻi grazing lands, the total number of cattle and sheep grazing could potentially be 2,000 animals.

With a traditional grazing operation in the No-Action Alternative, no special provisions would be required for managing agricultural land use, cover crops and runoff. Soil loss and surface water quality impacts would be consistent with other ~~large animal~~ grazing operations, as occurs commonly on large agricultural lands on Kauaʻi. With no site-specific operational controls, the grazing lease operations would be covered under the existing agricultural conservation plan applicable to the broad suite of agricultural uses on agricultural lands at Māhāʻulepū. Surface water quality would be degraded through storm runoff of animal waste and suspended sediment.

There would be no new agricultural employment with this alternative. Further, this alternative does not meet the purpose and need of the proposed action, as it does not provide support for a unique underrepresented industry like dairy, which is overly imported in the state of Hawaiʻi, and therefore was not subjected to further evaluation.

1.7.2 CONVENTIONAL FEEDLOT DAIRY ALTERNATIVE

The development and operation of a conventional feedlot dairy would potentially achieve the project purpose to increase local milk production. This alternative would utilize the conventional methods for a large-scale commercial dairy in which ~~milking~~ mature dairy cows are confined in large all-weather barn facilities, without access to forage and without pastures. A total of either 699 or 2,000 mature dairy cows would be confined within several large barns. The dairy farm complex would occupy a land area of approximately 20 ~~5.5 to 12.5~~ acres, with dairy facilities consisting of several large barns, milking parlor, storage buildings, feed storage and waste storage lagoons.

The requirement to supply imported feed would be significant, estimated at 8 to 10 tons per day for a mature dairy cow herd of 699 cows, or 25 to 30 tons per day for up to 2,000 cows. All of this imported feed would need to be imported to Kauaʻi, and transported to the dairy. It is noted that history showed the decline of Hawai'i's dairy industry and eventual demise largely due to the escalating cost of feed imported from the mainland U.S.

There would be potential long-term impacts associated with operations of the conventional feedlot alternative. Due to the higher density of animals in the barn area and a limited pasture area, the conventional feedlot alternative has a higher concentration of manure and urine waste. The barn and milking parlor facilities would require additional potable water use for the regular wash down of the large barn areas to manage sanitary conditions. The concentration of animal waste would pose the potential for increased populations of pest insects, such as flies, occurring with the conventional feedlot alternative. In addition, there would be the potential for adverse odors to be generated by the conventional feedlot operations, due to the animal waste concentration in the barns, yards and large waste ponds. The conventional feedlot dairy would also have substantial impacts in terms of truck traffic, water use, waste disposal and energy use.

Although this alternative could potentially meet the purpose and need of the proposed action, it would also produce comparatively greater environmental impacts and public health risks than the proposed action. Section 6.0 presents an evaluation of this alternative, and a comparison of the proposed project with this alternative.

1.7.3 ALTERNATIVE LOCATION FOR THE PASTURE-BASED DAIRY

An alternative Kauaʻi location using a site other than Māhāʻulepū would be considered under this alternative. The pasture-based dairy operation requires 500 to 600 acres of usable, gently-sloped land on agricultural zoned lands available for long-term lease. The micro-climate requires soil conditions favorable for nutrient absorption with access to a reasonably priced irrigation water source, to sustain nutritious grass pastures. Other required elements would include roadway access, potable water and irrigation water sources.

The high-level evaluation of agriculturally-zoned land with potential long-term availability ~~33,000 acres of Grove Farm holdings~~ under the screening criteria as potential lands to locate a pasture-based dairy, as summarized below.

- Conservation District lands and Urban lands owned by Grove Farms could not be considered for the pasture-based dairy due to inappropriate zoning/land use compatibility.
- Long-term farming leases exist across major portions of the Grove Farm agricultural holdings, along with investments (e.g. crops, livestock, improvements and facilities).
- Inland mauka agricultural lands receive high annual rainfall and lower incident sunlight, with suboptimal pasture grass growing conditions.
- Agricultural lands mauka of Kuhio Highway and Kaumualiʻi Highway generally have steep slopes, non-contiguous areas, and some rocky soils, all factors affecting animal stress.
- Irrigation water availability varies due to proximity to existing reservoirs and wells.
- Areas up-gradient of established County and private wells for drinking water supply could not be considered.
- Unavailable or inadequate support infrastructure at mauka locations.

An alternative location for the pasture-based dairy was considered on approximately 972 acres of Grove Farm agricultural land at Puhi. The alternative location would potentially satisfy some of the evaluation criteria in terms of slopes, soils, micro-climate, water supply and support infrastructure. Under the comparative evaluation criteria for site screening identification, the alternative site would be less suitable than the Māhāʻulepū site due to land tenure, greater slopes, higher rainfall and less sunlight, with a perennial stream draining into a wildlife refuge. Although this alternative could potentially meet the purpose and need of the proposed action, it would also produce comparatively greater environmental impacts than the proposed action. Section 6.0 presents an evaluation of this alternative, and a comparison of the proposed project with this alternative.

1.7.4 MILK PROCESSING ALTERNATIVE BY HDF

An alternative is for HDF to pasteurize raw milk on the island of Kauaʻi. The pasteurized milk could then be sold to a processor/packager ~~bottler~~. Currently, Meadow Gold is the only processor/packager with operational facilities on both Oʻahu and Hawaiʻi island. Any pasteurization or processing facility would be sited in an appropriately zoned industrial area with access to adequate electricity, municipal potable water and wastewater services, and with existing roadway infrastructure suitable for required truck transport. On the island of Kauaʻi, an opportunity exists to retrofit and utilize the closed processing facility in Puhi, though this alternative requires cooperation of the facility owner, Meadow Gold. Capital expenditure for the retrofit could be more than $1 million.

The processing alternative by HDF would have no significant environmental impacts. The processing facility would be sited on lands with appropriate zoning for milk processing and accessory uses without a need for obtaining additional special permits. Traffic associated with processing would add worker vehicle trips to the facility. Noise from worker vehicles and trucks would increase slightly due to the shipping. Vehicle emissions would also occur as a result of these shipments. The interisland transfers would occur as part of other freight components shipped on the existing regularly scheduled barge transits. In-state milk production would increase agricultural revenues and jobs in Hawaiʻi. With HDF processing, employment in the manufacturing industry would increase. Processing would generate substantial positive State and County revenues. The milk processing operation would require potable water from the County system. The processing operation would also generate wastewater discharged to the County sewer system. This alternative could potentially meet the purpose and need of the proposed action.

1.8 LISTING OF REQUIRED GOVERNMENT PERMITS AND APPROVALS

Table 1-3 identifies the major State and County land use permits and approvals that are anticipated to be required for the project, including site, building, construction and infrastructure approvals. Agricultural facilities and operations of HDF will require reviews and approvals from federal, state and county agencies and entities. Should HDF elect to expand the dairy beyond 699 ~~milking~~ mature dairy cows, additional permitting is required.

Table 1-3 State and County Land Use Permits and Approvals

Permit / Milestone	Agency	Status	Dates
Committed Herd Size (699 Mature Dairy Cows)			
Conservation Plan	NRCS WKSWCD	Reviewed/ Approved	8/2013 12/2013
Grading Permit Agriculture Exemption	COK	Approved	03/2014
Individual Wastewater System (IWS)	HDOH	Approved	04/2014
Waste Management Plan, Phase 1 (699 Cows)	HDOH	Reviewed	10/2014
Section 404 Permit Exemption	USACE	Approved	10/2014
Building Permit	COK	Extended Approved Indefinitely	~~11/2014~~ 180 Days from EIS acceptance
Monitoring Well Construction Permits	DLNR CWRM	Approved	07/2015
NPDES - General Permit - Construction Activities	HDOH	In Progress	12/2016
Conservation Plan Update	NRCS / WKWSCD	In Progress	~~2016~~ 2017
HRS Chapter 6E – Historic Preservation Review	DLNR/SHPD	~~In Progress~~ Determination of No Impact	Dec. 19, 2016
Anticipated EIS Acceptance	HDOH	In Progress	~~2016~~ 2017
Construction Mobilization	HDF		2017
Facility Construction (Milking Parlor, Sheds, Holding Yard, Ponds)	HDF		2017 - 2018
Farm Infrastructure (Roads, Wells & Pumps, Piping, Power, Fencing, Crossings)	HDF		2017 - 2018
Paddocks and Pasture (Grass Establishment)	HDF		2017 - 2018
Milk Producer Permit / Operational Permits	HDOH / USDA		2017
Permit Closeout / Certificate of Occupancy	HDF		2017
Start of Operations (699 Mature Dairy Cows)	HDF		2018
Contemplated Herd Size (2,000 Mature Dairy Cows)			
Waste Management Plan (2,000 Cows)	HDOH		To be determined
NPDES – CAFO Permit (2,000 Cows)	HDOH		To be determined

2.0

PURPOSE AND NEED OF THE PROPOSED PROJECT

2.0 PURPOSE AND NEED OF THE PROPOSED PROJECT

2.1 INTRODUCTION AND BACKGROUND

Hawaiʻi is an island state, with a total population of roughly 1.4 million people (U.S. Census Bureau, 2015). Roughly 70 percent of the state's population is centered on the island of Oʻahu, with smaller populations on the neighbor islands of Hawaiʻi, Maui, Molokaʻi, Lanaʻi and Kauaʻi. Hawaiʻi's indigenous population cultivated rich agricultural lands for sustenance, using food stock brought aboard the sailing canoes with the original island settlers. Agricultural field systems were created inland, close to fresh water resources. Kalo (taro), a staple crop, was cultivated in both irrigated and dry fields. Other dry land agriculture crops included ʻuala (sweet potato), uhi (yams), maiʻa (bananas), ipu (gourds), and kō (sugar cane).

Following European contact, large tracts of land were used for monoculture crop production (notably sugarcane and pineapple). These plantation crops served as the islands' major economic industry for over a century. Large-scale plantation farms were phased out by the late 1900s, as land and labor costs drove sugar and pineapple production to countries with lower production costs. Agricultural lands of the plantation era have largely remained fallow, with some areas converted to cultivation of a wide range of diversified agriculture products.

The majority of goods used in the state, including the daily food requirements of its residents, arrive via ocean and air shipping. Roughly 90 percent of all food products consumed in Hawaiʻi are imported, and the current population size makes food importation an increasingly practical necessity. Today's insulated and refrigerated ocean freight containers allow perishable goods, such as fresh produce, milk and milk products, to sustain the seven- to ten-day transit time for import from the mainland United States (U.S.) or abroad. With optimized just-in-time delivery schedules for big box retail and grocery businesses, there is limited food supply in storage. It is estimated that the on-island food storage represents less than a two-week supply. This fact highlights Hawaiʻi's vulnerability and its dependency on imported food. Whether a natural disaster such as a hurricane or labor dispute affects shipping, or geopolitical events such as 9-11, the islands are in jeopardy of a serious disruption to the food supply.

The State of Hawai'i Office of Planning, in cooperation with the Department of Agriculture, issued a report in October 2012 entitled: *Increased Food Security and Food Self-Sufficiency Strategy*. The report sets forth policies and action to increase the amount of locally grown food consumed by Hawai'i residents. Today, with cooperation by private landowners, actions to increase food self-sufficiency and food security are being initiated across the state. Milk and milk products represent perishable goods providing important nutrition that could be produced entirely in Hawai'i, and interest has grown to reestablish Hawai'i's dairy industry.

Located at the western end of the island chain, the island of Kaua'i is known for its remote setting, lush green landscape, soaring mountain ridges and raw natural beauty. The island is characterized by smaller towns totaling approximately 70,000 residents, supported by the visitor industry, agriculture, the military and a modest service economy. Large areas of prime agricultural lands have gone fallow since the closing of the sugar plantation era, with some used for grazing, and portions cultivated for seed crops and diversified agriculture products.

Concomitantly, Kaua'i residents have been concerned about issues that hamper and impact the island as a community. Prominent issues include: employment and economic stability; opportunities for affordable housing; the scale and pace of real estate and urban land development; providing for renewable energy; food production on important agricultural lands; protection of water source and quality, and endangered species and habitats; and retention of Hawaiian cultural sites and cultural values. The proposed project supports Kaua'i's social and economic function, and focuses on improving Hawai'i's food sustainability.

Figure 2.1-1 County and State Plans Supportive of Agricultural Self-Sufficiency

2.2 HISTORY OF THE DAIRY INDUSTRY IN HAWAIʻI

Dairies have been a component of the Hawaiʻi agricultural industry for over two centuries. Cattle were first brought to the islands in 1793. Records suggest that dairy cattle were introduced in the late 1800s, with the first commercial dairy in 1869; by 1880, there were five dairy operations. Many plantations across the state developed small dairy operations to support their agricultural communities. During World War II, dairy farms played an important role in the health and nutrition of the military, as milk was provided free to the injured personnel.

The island of Kauaʻi has a rich dairy history. By 1923, Kauaʻi hosted 34 dairy cattle farms operating on smaller farms across the island as plantation dairies. Many dairy operations on Kauaʻi did not persist after World War II due to increased regulations such as pasteurization, which required expensive facilities. Hawaiʻi Island dairies were located in Kohala and Hamakua. Haleakala Ranch Dairy supplied the island of Maui starting in 1896. By 1955, the number of dairies in the state was somewhere between 86 and 90 farms, and the cow populations peaked in 1965 with 15,100 head. The state's population was 711,000 residents. While each of the islands had numerous dairy operations, Oʻahu had the largest concentration of dairy cows and operations: Pacific Dairy in Waiʻanae; Waimanalo Dairy Farm; and Meadow Gold Dairy, initially in Waialae and moved to Kawailoa.

By the early 1960s, the Waimea Dairy and Sokei Dairy in Kapaʻa were the two largest dairies on Kauaʻi. Both were acquired by Meadow Gold Dairies Hawaiʻi, which ran the 170-acre Moloaʻa Dairy and developed a milk processing facility in Puhi (The Garden Island, 2014). Dairy operations were eventually consolidated at Moloaʻa, which closed in 2000. Reasons for the closure included market competition from rapidly consolidating regional and national producers with large-scale production advantages in lower cost areas, and the advent of bulk milk importation to Hawaiʻi. The smaller local operation at Moloaʻa Dairy struggled with the relatively high land, labor and regulatory costs (D. Moriki; The Garden Island, 2/26/14).

By 1974 on Oʻahu, increased urbanization pushed dairy operations from pastures to dry lot operations in Waiʻanae. The lack of forage combined with drier region of high daily temperatures increased animal stress and reduced milk production. In 1980, the cow population in Hawaiʻi began to decrease. While periodic growth occurred from the mid-1980s to 1990, costs of imported feed and transportation, milk prices, and aging dairy owners contributed to the industry decline. By 2008, operational expenses had skyrocketed. Combined with milk price regulations limiting price paid to the farmer, nearly all of Hawaiʻi's local dairies closed.

2.2.1 THE DAIRY MARKET IN HAWAIʻI

Peak milk production in the state was 160 million pounds in 1988; by 2006, production had declined by more than 64 percent to 57 million pounds (HDOA, ~~2013~~ 2012). In 1988, Hawaiʻi's dairy industry was valued in excess of $33 million, and declined 45 percent over seven years to just $18 million in 2005 (HDOA, ~~2013~~ 2012). Current production is 1.75 million gallons annually, which equates to just over 15 million pounds. The demise of Hawaiʻi's dairies stemmed from the higher cost of local milk production and loss of market presence due to competitive lower cost imported milk from the mainland U.S. To face the market forces and offset a portion of the market served by imported product, Hawaiʻi dairy businesses must overcome the hurdles in production, processing, distribution and market reach.

Until 1984, 100 percent of Hawaiʻi's milk was produced by local dairies. The first milk was imported to Hawaiʻi in 1985 by Safeway with the introduction of its Lucerne brand into the market (HDOA, ~~2013~~ 2012). By the mid-1990s, the two largest milk processors, Foremost Dairies and Meadow Gold Hawaiʻi, began importing milk in bulk for local processing. Currently, Meadow Gold (Dean Foods) is the only company in Hawaiʻi that processes and packages fluid milk, with facilities in Honolulu and Hilo. As of 2015, only 10 percent of the fluid milk sold in the islands is from local dairies.

The only two remaining dairies are located on the island of Hawaiʻi (the Big Island): Big Island Dairy in Oʻokala; and Clover Leaf Dairy in ʻUpolu. These dairies haul fluid milk product using their trucks and drivers to the Meadow Gold processing plant in Hilo. Big Island Dairy milk is marketed as "Mountain Apple" brand through KTA Supermarkets on the island of Hawaiʻi, and as "Hawaiʻi's Fresh" on other islands. With a June, 2015 announcement that Meadow Gold will reduce the price it pays to Hawaiʻi farmers by 23 percent, the Big Island dairies face serious obstacles to sustain operations (Hawaiʻi News Now, 2015). A new endeavor on the Big Island to produce milk for cheese using a herd of approximately 200 cows fed on pasture and locally-grown corn anticipates beginning commercial operation in 2016 (Pacific Business News, 2014).

The majority of Hawaiʻi's milk supply is shipped in bulk containers from the U.S. West Coast. Meadow Gold's Honolulu processing plant imports pasteurized milk in bulk insulated tanks. These bulk tanks travel unrefrigerated, with milk deemed acceptable if the temperature is below 45°F when received at the plant (HDOA, 2013). The tanks of skim milk and whole milk are re-pasteurized and blended to provide a product mix of mostly lower fat fluid milks. The Hawaiʻi State Department of Agriculture estimated milk from California takes 8 to 12 days to make it to a store shelf in Hawaiʻi (HDOA, 2013). With a 16 to 18-day shelf life remaining, milk purchased may be 24 to 30 days from the date of milking.

Packaged milk and milk products are brought in by various grocers and large retailers and transported directly to the retail store. Most is shipped in refrigerated containers. A smaller portion of packaged milk, including organic milk, undergoes ultra-high temperature processing (UHT) that sterilizes food by heating it above 275°F. This makes the product "shelf safe" which means it does not require refrigeration until opened. Most organic milk undergoes this process but rather than being packaged in aseptic, shelf safe cartons, it is packaged in the classic milk carton and sold in the refrigerated section of a retail store. This extends its shelf life to 90 days.

A simple analysis of current population and potential fluid milk demand in the State of Hawaiʻi indicates the entire size of the market is approximately 22,000 cows (HDOA, ~~2013~~ 2012). Based on U.S. per capita consumption rates, fresh milk consumption in Hawaiʻi is estimated at a potential 597,000 gallons per week. Meadow Gold currently experiences demand for approximately 400,000 gallons per week. The difference is supplied by packaged milk shipped directly by grocers and big box retailers.

Dairy operations in Hawaiʻi face significant hurdles, including a monopoly milk processor, limited breeding stock, and a need to educate the consumer on benefits of truly local milk. For Hawaiʻi to re-establish its dairy industry, it will require the introduction of advanced dairy farming technologies, efficient operational processes, and monitoring to ensure environmental protection standards are upheld.

More than six years ago, Grove Farm Company, Incorporated (Grove Farm) began contemplating how to restart Kauaʻi's dairy industry. Alternatives to the conventional feedlot based dairy were considered, and a pasture-based model was determined to be a clean, cost-effective and sustainable method. Sustainable is defined in this EIS as:

Meeting the needs of the present without compromising the ability of future generations to meet their own needs.

Grove Farm partnered with Finistere Ventures, Kamehameha Schools, Maui Land & Pineapple, and Ulupono Initiative to conduct grass trials on four islands to identify productive lands capable of growing nutritious forage for dairy cows. Māhāʻulepū Valley was determined to provide ideal conditions and to meet criteria required to establish a successful dairy venture including dedication of the land to agriculture through Important Agricultural Lands designation, allowing for long-term lease, ample water source, and relatively flat land to avoid stress on cows.

2.2.2 IMPORTANT AGRICULTURAL LANDS

Article XI of the Constitution of the State of Hawaiʻi includes conservation and protection of natural resources and lands, including agricultural lands. In a 1978 amendment to the Constitution, the concept of "important agricultural lands" (IAL) emerged in Section 3, Article XI: "The State shall conserve and protect agricultural lands, promote diversified agriculture, increase agricultural self-sufficiency and assure the availability of agriculturally suitable lands. The legislature shall provide standards and criteria to accomplish the foregoing.

Lands identified by the State as important agricultural lands needed to fulfill the purposes above shall not be reclassified by the State or rezoned by its political subdivisions without meeting the standards and criteria established by the legislature and approved by a two-thirds vote of the body responsible for the reclassification or rezoning action."

Not until 2005 were "important agricultural lands" established in statute. After decades of debate, farmers and landowners formed a historic alliance and joined with the Department of Agriculture, State Land Use Commission, Office of Planning, and members of the legislature to pass Act 183 (HDOA, 2007). Important Agricultural Lands were defined as those:

- capable of producing sustained high agricultural yields when treated and managed according to accepted farming methods and technology;
- that contribute to the state's economic base and produce agricultural commodities for export or local consumption; and
- needed to promote the expansion of agricultural activities and income for the future, even if currently not in production.

Eight specific criteria were provided, and lands meeting any of the criteria are eligible for consideration. Act 233 of 2008 established landowner incentives, such as tax credits and loan guarantees, to encourage voluntary designation of lands as IAL. The IAL designation makes it more difficult to utilize lands for non-agricultural purposes by the Constitutional requirement for a two-thirds vote of the governing body responsible for the reclassification or rezoning.

On the island of Kauaʻi, landowner Grove Farm was proactive in the identification and retention of Important Agricultural Lands within its holdings. In 2011, Mahaulepu Farm LLC (formed by Grove Farm), petitioned and received IAL designation for 1,533 acres in Māhāʻulepū. The designation meets the objectives of Hawaiʻi's IAL land use law by contributing to the maintenance of a strategic agricultural land resource base to support a diversity of agricultural activities and opportunities that expand income and job opportunities.

Māhāʻulepū has been an agricultural center on Kauaʻi for centuries. Farming occupied the low slope areas in Māhāʻulepū, and ranching used the uncultivated areas surrounding the valley for grazing. Since the demise of sugarcane in the 1990s, some acreage ~~is~~ was cultivated for the seed industry, though most former agricultural fields have been under-utilized or vacant since. Recent efforts by Grove Farm to revitalize agriculture in the area involved an agricultural park concept in Māhāʻulepū to make parcels appropriate for small farm operations. Operations established through the agricultural park offering include Haraguchi Taro Farms, a banana farm and beef cattle grazing.

In combination with Ulupono Initiative, Hawaiʻi Dairy Farms, LLC (HDF) reflects a viable approach to apply use of Important Agricultural Lands to agricultural self-sufficiency and food production. HDF represents a continued commitment by the landowner to support farming and local food production, and to aid in the resurrection of Hawaiʻi's dairy industry.

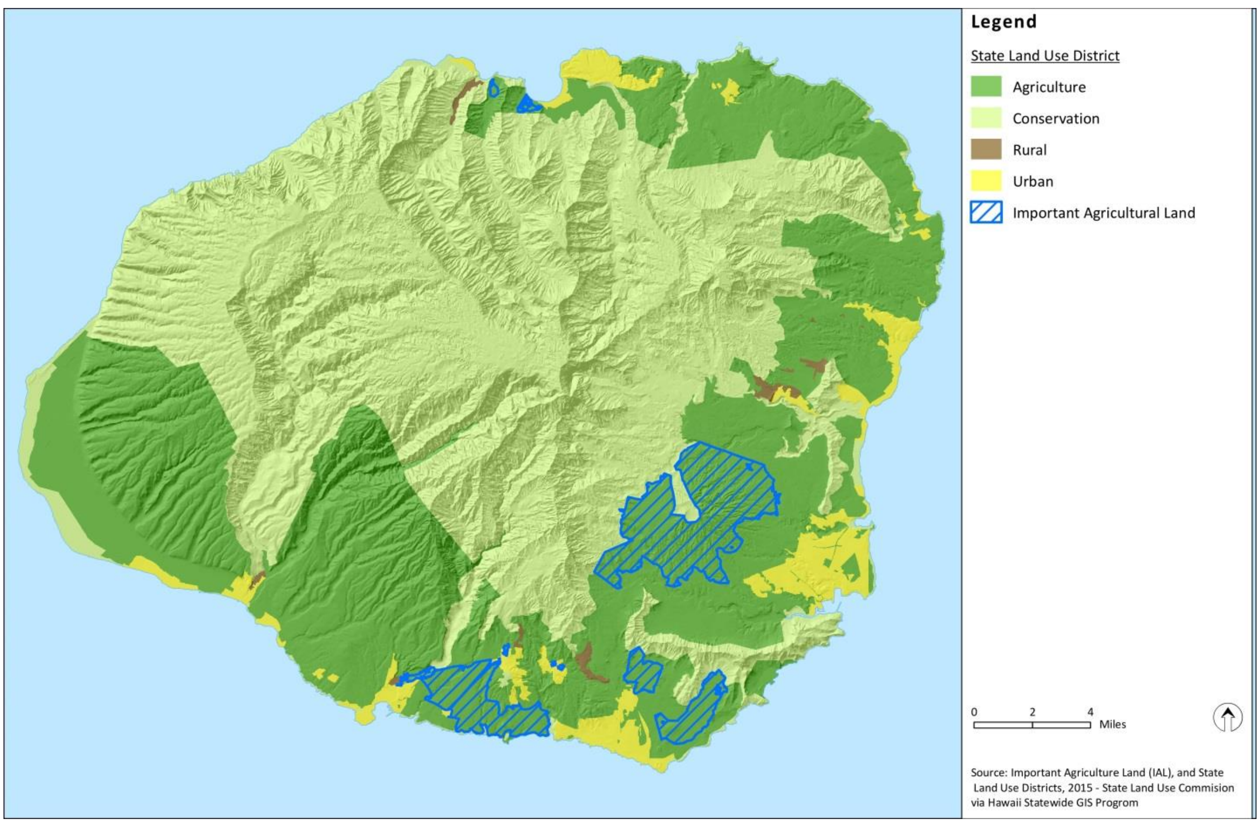


Figure 2.2-1 State Land Use Districts and Important Agricultural Lands on Kauaʻi

2.3 PURPOSE AND NEED FOR THE HAWAIʻI DAIRY FARMS PROJECT

2.3.1 PROJECT PURPOSE

The project purpose is to establish a sustainable, pastoral rotational-grazing dairy farm that will increase current local milk production, bolster Hawaiʻi's declining dairy industry, and reduce reliance on imported milk from the mainland United States. The rotational-grazing dairy system utilizes 100 percent of all manure on-site as natural fertilizer to grow grass. This cost-effective method reduces imported fertilizer and feed, and minimizes potential impacts to the environment.

2.3.2 PROJECT NEED

Currently, residents and visitors to Hawaiʻi rely on air- and ship-freight for 90 percent of goods, including food. Food sustainability is of growing interest to residents, especially those who have experienced low available supplies when faced with natural disasters, labor disputes that affect shipping ports, and geopolitical events such as 9-11. With the departure of large sugar and pineapple plantations from Hawaiʻi, more lands are available for diversified agricultural endeavors. A 2008 study identified the economic benefits of replacing 10 percent of imported food with locally produced food as generating an estimated Hawaiʻi economy-wide impact of $188 million in indirect sales, $47 million in earnings, $6 million in state tax revenues, and more than 2,300 jobs (CTAHR, 2008). Additionally, there is a desire to retain Hawaiʻi's agricultural history and the open landscapes associated with ranging and farming.

Between 1984 and 2015, importation of milk to Hawaiʻi rose from 0 to 90 percent. The local dairy industry has been reduced to just two dairies on the Big Island, and with a recent cut in price paid to those dairies of 23 percent by the processor, local milk production is in jeopardy. Conventional feedlot dairy operations face management challenges including costs of imported feed which fluctuate with grain and fuel prices, and the need to store manure in waste impoundment lagoons as a waste product. Without a need to utilize manure as a nutrient for growing crops, options for utilizing manure produced are limited to drying manure for sale, spreading on lands that can tolerate the nutrients, utilizing dried manure solids as bedding for dairy cows in confinement, or generating energy, which ultimately requires treatment and disposal. The pastoral-based dairy utilizes a system to balance needs of the forage (grass) with nutrients provided by manure produced on site.

2.3.3 PROJECT OBJECTIVES

Hawaiʻi Dairy Farms set eight objectives to achieve to bolster local milk production in Hawaiʻi:

1. Provide more than 1,000,000 gallons annually of fresh, nutritious milk for Hawaiʻi families and revitalize the dairy industry in Hawaiʻi.
2. Apply proven, sustainable pasture-based rotational grazing system and state-of-the-art technology to reduce reliance on costly imported fertilizer and feed.
3. Grow local, quality grass as a primary feedstock optimal for dairy cow nutrition and health, utilizing results of forage research conducted at five sites across four Hawaiian Islands.
4. Design facilities to provide animal comfort, including maximum time on pasture and minimal milking time.
5. Effectively integrate dairy operations within the island community setting.

6. Optimize dairy product shipping and marketing.
7. Provide local farming employment and build the agricultural economy.
8. Protect and enhance the area's natural, cultural, social and economic environment through sound agricultural planning, preservation of open space and protection of sensitive resources, and development of economic benefit.

2.3.4 EVALUATION CRITERIA

Within the context of the HDF objectives, primary evaluation criteria have been established which must be satisfied for the project to be economically, socially and environmentally responsible. The four evaluation criteria are:

1. Secure sufficient contiguous land area under long-term lease with adequate water supply (including potable water to meet standards under milk rules), suitable soil properties, gentle slope conditions, and road accessibility.

2. Generate new long-term employment in the agricultural sector on Kauaʻi in a wide range of positions including pasture agronomy/soils science, veterinary and animal husbandry, environmental resources management, milk/milk products processing and dairy business management.

3. Create a model for dairy operations utilizing IAL, demonstrating the importance of long-term agricultural leases and capital investment for agricultural infrastructure to advance food self-sufficiency.

4. Utilize 100 percent of manure on site as nutrients to grow forage for dairy cows. Grow sufficient forage to provide 70 to 85 percent of feedstock required for the herd.

Hawaiʻi Dairy Farms has been designed to meet the guiding objectives. The project represents a directed effort to establish a pasture-based dairy in Hawaiʻi that will lead to improving food security for Hawaiʻi. The model uses a pastoral rotational-grazing system on former sugarcane plantation lands. With the demonstrated success of Hawaiʻi Dairy Farms, the proponents will be able to continue and expand their community leadership and social investment within Hawaiʻi by adapting the grazing system to other locations in the state. These objectives and criteria are the guiding parameters that ultimately define the direction for Hawaiʻi Dairy Farms. As discussed in Section 6.0, these evaluation criteria are applied to evaluate and compare probable impacts of the Proposed Action with alternative actions.

2.4 PLANNED DAIRY DEVELOPMENT ON MĀHĀʻULEPŪ AGRICULTURAL LANDS

A partnership of landowners and supporters throughout the state worked to determine optimal sites for Hawaiʻi's first pasture-based dairy. The group sought an approach to dairy farming reliant on local forage and nutrient recycling, rather than the conventional feed lot dairies. After significant research and inquiry, New Zealand's grass-fed model was found to be the cleanest, most cost-effective method for sustainable dairy production in Hawaiʻi.

From 2010 to 2011, Grove Farm partnered with Finistere Ventures, Kamehameha Schools, Maui Land & Pineapple and Ulupono Initiative to conduct grass trials statewide and determine the best site for a rotational pasture-based dairy. Kauaʻi was found to be the optimal location. Operational needs for a pasture-based dairy include:

- Relatively flat, contiguous acres to move cows with minimal stress,
- Soils suitable to efficiently utilize applied nutrients for growth of forage,
- Adequate water for irrigation and operations,
- Suitable climate conditions for animals and grass growth,
- Agricultural-zoned land available for 20 years or more of sufficient acreage to support an economically viable dairy, preferably IAL, and
- Access to required operational support elements (trucking, pasteurization, work force, etc.).

In late 2013, Ulupono Initiative made the investment to fund Hawaiʻi Dairy Farms, the first pasture-based, rotational-grazing dairy in the state. HDF was formed as a positive step towards the island state's food security, economic diversity, and sustainability. At steady-state production with 699 ~~milking~~ mature dairy cows, the farm will produce roughly ~~1.2~~ 1.5 million gallons annually at market price. Increasing fresh milk by approximately 10 percent of current supply using cows in Hawaiʻi will reduce reliance on imported milk from the mainland U.S. HDF operations will be based on the most successful island dairy models in the world, and will utilize a sustainable, pasture-based rotational grazing system and 21st century technology. The farm will be very different from conventional feedlot dairy operations of Hawaiʻi's past.

HDF is committed to establishing a herd of up to 699 mature dairy cows to demonstrate the pasture-based system as an economically and environmentally sustainable model for Hawaiʻi. Precision agricultural technology that monitors cows' health, grass productivity, and effluent management will be used to ensure environmental health and safety, as well as best management practices, and help determine the ultimate carrying capacity of the land. With proven success at a herd size of 699, HDF will contemplate the possibility of expanding the herd in the future.

For dairy operations with 700 or more mature dairy cows, additional regulatory review and permitting by the State Department of Health is required. The application process for a National Pollutant Discharge Elimination System (NPDES) Concentrated Animal Feeding Operation (CAFO) permit includes public notification and input. At the discretion of HDF, management may choose to expand operations up to the carrying capacity of the land, which is estimated to be up to 2,000 productive milking dairy cows. Permit process compliance would be followed at such time HDF may decide to pursue an expanded operation.

Chapter 3 describes details of the proposed project, known as the "Proposed Action". Chapter 4 analyzes probable impacts to the environmental and socio-economic resources from the Proposed Action. Chapter 5 provides regulatory context relevant to the proposed land use and agricultural operations. Alternatives to the Proposed Action that were considered, and an analysis of potential impacts, are presented in Chapter 6.

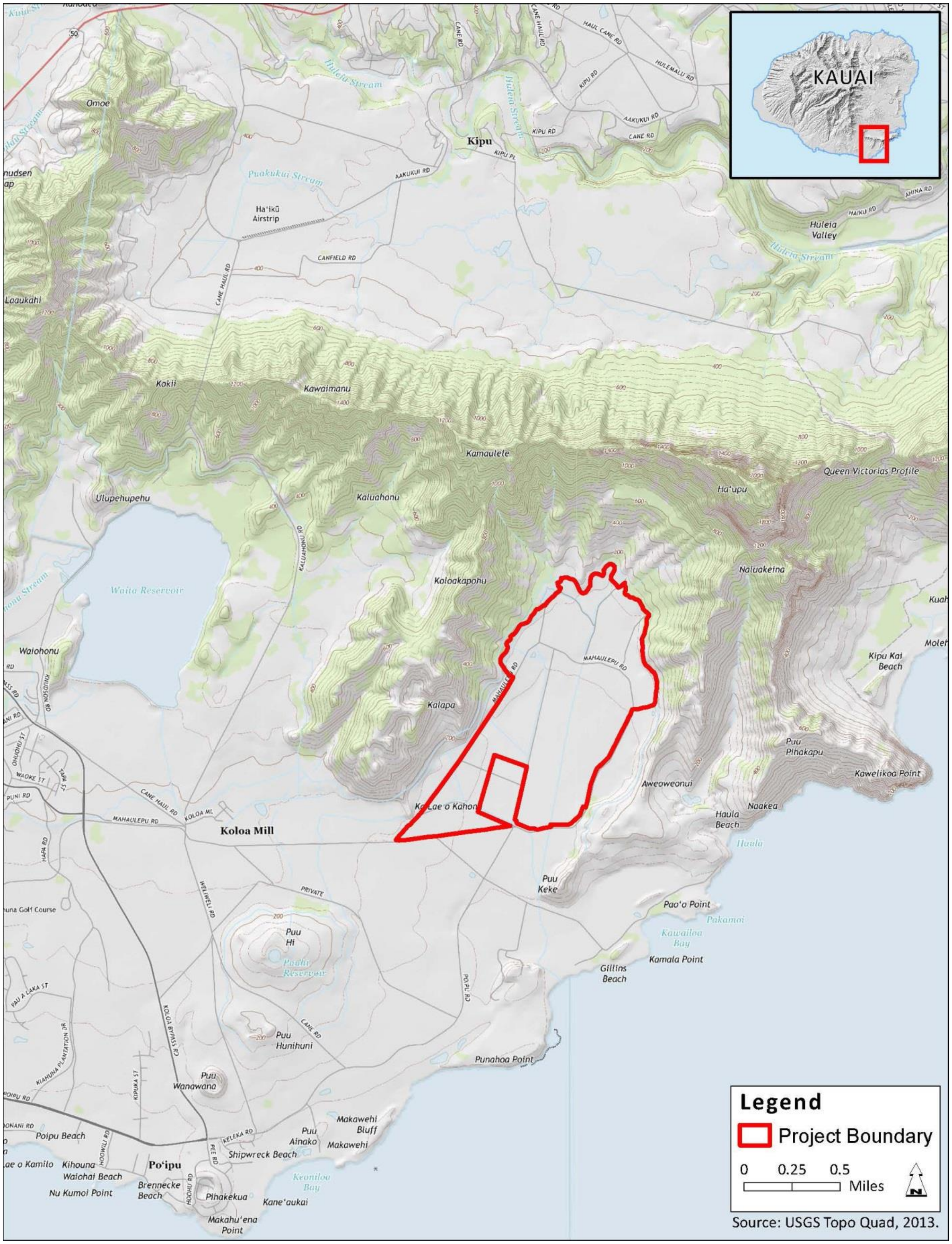


Figure 2.4-1 Project Location on Māhāʻulepū Agricultural Lands

3.0

DESCRIPTION OF THE PROPOSED ACTION

3.0 DESCRIPTION OF THE PROPOSED ACTION

The project will reinvigorate the flagging dairy industry in Hawaiʻi and establish a financially and environmentally sustainable, pastoral rotational-grazing dairy to provide more than 1,000,000 gallons of fresh milk for Hawaiʻi's families. This section describes the proposed action within the agricultural context of the Māhāʻulepū site. Individual improvements ~~composing~~ for the Hawaiʻi Dairy Farms project are detailed in this chapter, with site plans where relevant.

HDF leases agricultural land in Māhāʻulepū Valley on the south shore of Kauaʻi (see previous chapter, Figure 2.4-1 Project Location Map, and Figure 3.1-1). The 557-acre site consists of portions of three parcels leased from Mahaulepu Farm LLC (Figure 3.1-2 Tax Map Key). The lease area was surveyed for a metes and bounds description, which modified the acreage from an originally estimated 578-acres to the surveyed 557-acres to allow for access around the perimeter, fencing setbacks, buffers from cultural sites above the farm, and for potential future expansion of the taro farm by the lease-holder.

Māhāʻulepū Valley lies on the leeward side of the Hāʻupu mountain ridge, a prominent feature of southern Kauaʻi, where Mt. Hāʻupu forms the highest point at 2,297-feet elevation in the back of the valley. Māhāʻulepū has a long history of agricultural use. Prior to European contact, the valley was occupied by Hawaiians who cultivated traditional food crops such as kalo (taro) and kō (sugarcane). During the transition of land tenure following arrival of Europeans and the rule of King Kamehameha III, Māhāʻulepū Valley became the first place in the island chain where sugarcane was commercially grown.

3.1 SITE DESCRIPTION: HISTORY AND VISION

As early as 1820, sugarcane was milled in Māhāʻulepū for local use; commercial-scale operation was underway in 1878 as Kōloa Plantation and occupied roughly 875 acres in Māhāʻulepū Valley (Figure 3.1-3). Cultivation continued under various entities until 1996 when the Kōloa Mill closed. In historic times, cattle occasionally foraged on the slopes above the valley. Grove Farm Company, Incorporated (Grove Farm) leased a portion of the Māhāʻulepū area to ranchers as early as 1986, with portions of the valley floor grazed by cattle from 2002 to 2013. Approximately 400 – 500 head of beef cattle were shifted off the valley floor to surrounding properties upon HDF's lease. Taro cultivation was introduced on an adjacent parcel in 2007 when landowner Grove Farm offered small parcels with access to water to individual farmers in an effort to establish an agricultural park of varied users. The land was originally owned by Grove Farm and Visionary, LLC (Līhue Land Company) and transferred to Mahaulepu Farm LLC in 2011.

The nearest populated area to Māhāʻulepū Valley is the Kōloa town community; residences closest to the site are 2.3 miles west of the proposed dairy facilities. Kōloa town has its roots firmly tied to the agricultural history of the region. The resort area of Poʻipū began with oceanfront resort hotel development in the 1960s. During the 1970s and 1980s, agricultural lands in the Poʻipū area were reclassified from State Agricultural District to Urban District, and rezoned by the County as resort. The Grand Hyatt Kauaʻi is the closest resort to the dairy site, with 1.6 miles between the property boundaries. Significant expansion along this coastline occurred from 1980 to present, with active development of hotels, timeshare condominiums, single-family resort residences, golf courses and commercial centers.

Community concern over loss of agricultural land for another proposed resort on the last stretch of undeveloped Māhāʻulepū coastline prompted the County Council and State Legislature to pass resolutions supporting future preservation of the Māhāʻulepū ahupuaʻa. The 2000 *Kauaʻi General Plan* recommended community involvement in planning for the future of Māhāʻulepū to take into consideration various interests and factors to include: the long-term need to manage lands for preservation of significant natural and cultural features; the landowner's desire to develop revenue-producing uses that are sensitive to the area's unique qualities; the need to secure permanent public access to the shoreline; and the potential to create a coastal park (COK, 2000). Grove Farm Company, Inc., testified in response to a State resolution for re-assertion of its rights to plan for its own lands and expressed concern that development of a park or public use of Māhāʻulepū would support a takings action for government ownership. Grove Farm has continued to allow pubic access and use of Māhāʻulepū lands at its expense.

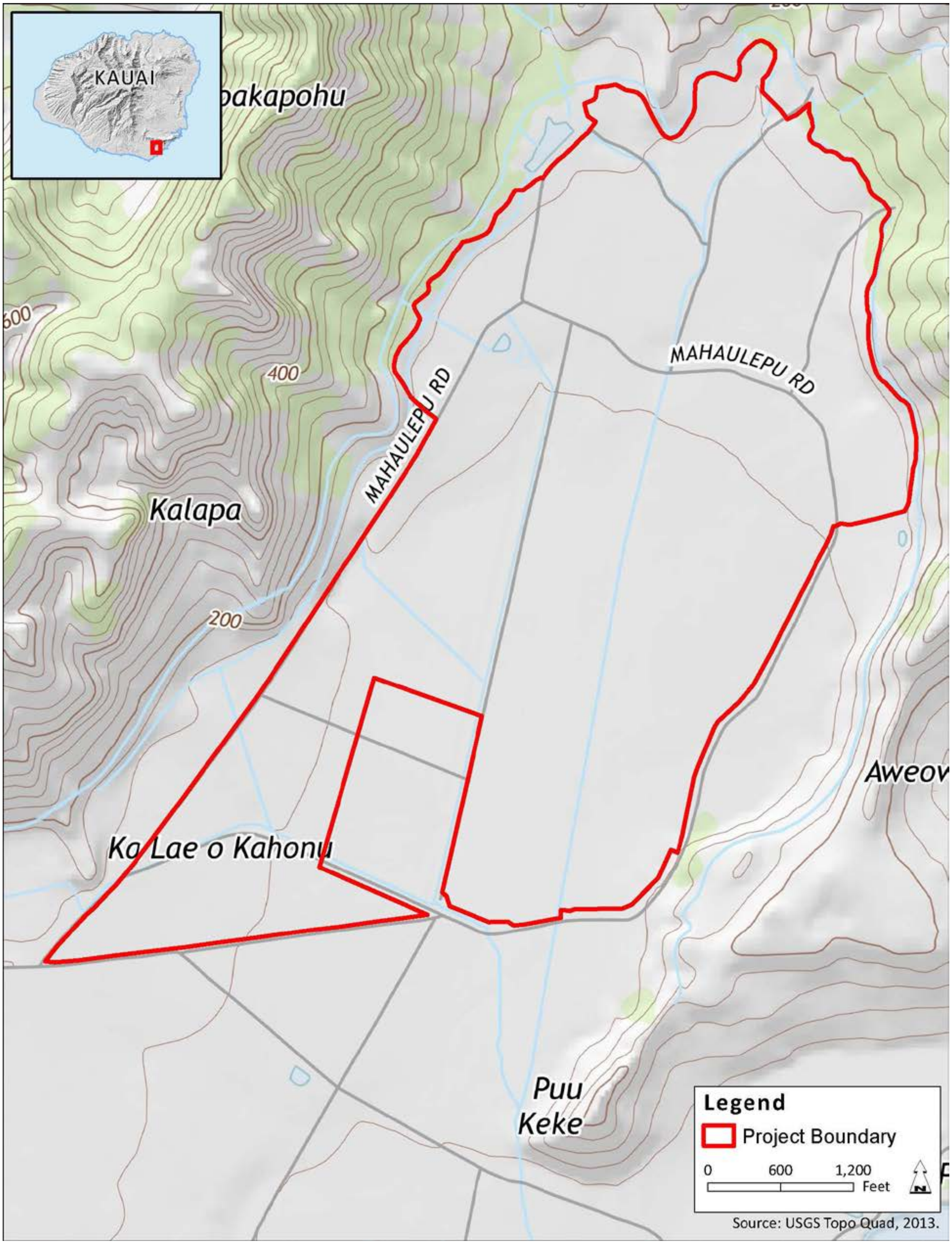


Figure 3.1-1 Project Area

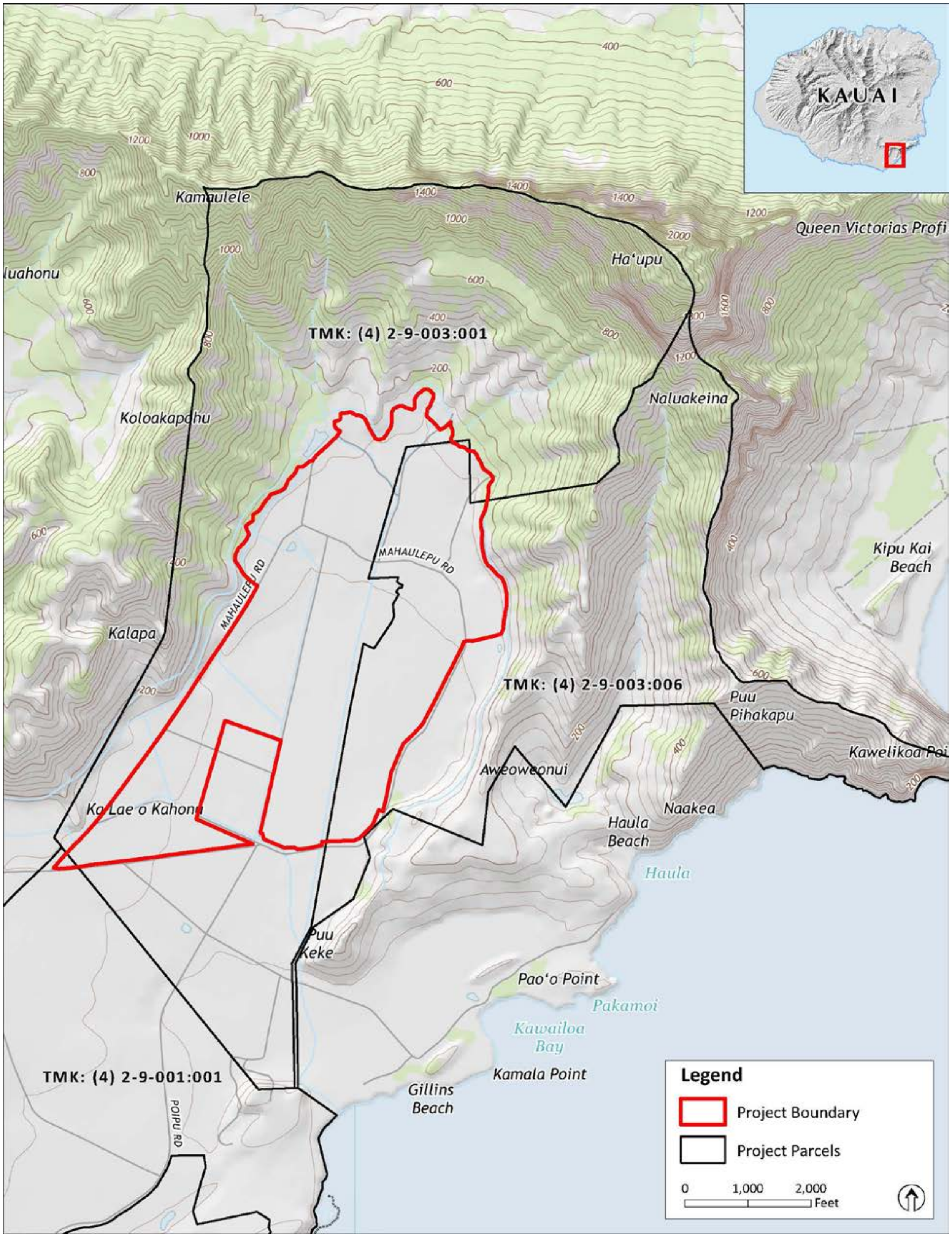


Figure 3.1-2 Tax Map Key for Project Area

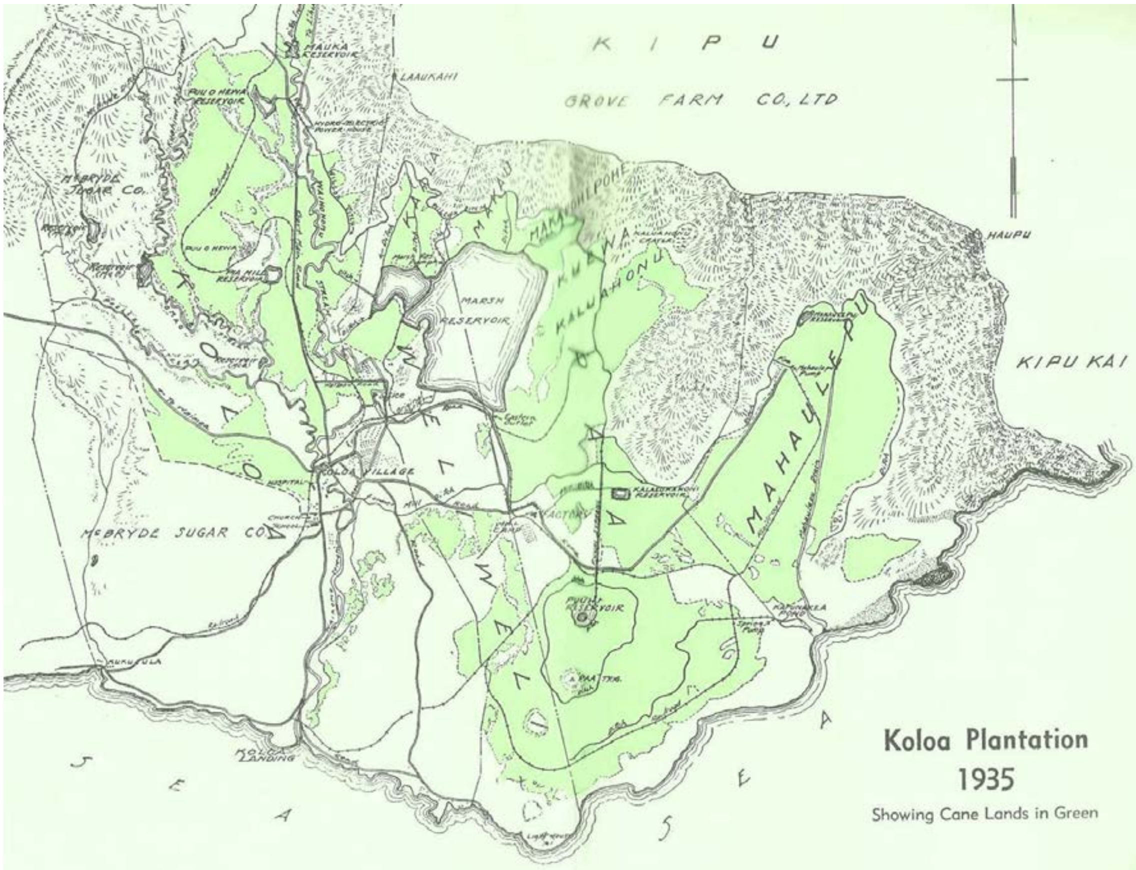


Figure 3.1-3 Kōloa Plantation Sugarcane Lands in 1935

In 2011 the landowner petitioned for, and the State Land Use Commission designated, 1,533 acres in the Māhāʻulepū region as Important Agricultural Lands (IAL) under the provision of the Hawaiʻi State Constitution (Article XI, Section 3). This constitutional requirement is for conservation and protection of agricultural lands, promotion of diversified agriculture, and increased agricultural self-sufficiency. The IAL designation assures available lands suitable to support a diversity of agricultural activities and opportunities to expand agricultural income and job opportunities. The designation includes the 557 acres leased by HDF (See previous chapter, Figure 2.2-1).

HDF will establish and operate a sustainable, pastoral rotational-grazing dairy farm in Māhāʻulepū Valley on the island of Kauaʻi to produce fresh, locally available nutritious milk for Hawaiʻi families. The rotational-grazing method utilizes 100 percent of the cows' manure as fertilizer for pasture grass to provide the primary source of nutrition. This cost-effective method will reduce reliance on imported fertilizer and feed. Pasture grass will provide a local food source appropriate for cow health and quality milk production, and will comprise at least 70 percent of the animals' diet.

HDF has committed to establish a herd of up to 699 mature dairy cows. As explained in Section 2.4, HDF may contemplate possible expansion of the herd following proven success of the rotational-grazing system for local milk production. While additional regulatory review and public input would be required at that time, this Environmental Impact Statement (EIS) documents potential impacts from both herd sizes for comparative purposes and full disclosure. Differences in infrastructure or operations for the two herd sizes are noted, where applicable.

3.2 CONSERVATION PRACTICES

In 1935, the U.S. Congress directed the creation of the Soil Conservation Service in response to drought and wide-scale soil erosion in the mid-western U.S. known as the "Dust Bowl". Erosion of soil was recognized as having an impact on the Nation and rural communities. The Soil Conservation Service became the Natural Resources Conservation Service (NRCS) in 1994 to acknowledge its expanded role in watershed-scale approach using science-based tools and standards in agronomy, engineering economics, wildlife biology and other disciplines to aid landowners in implementation of conservation practices.

Conservation planning under NRCS emphasizes desired future conditions while improving the conditions of natural resources. Participation is voluntary for private projects on private lands that do not use federal funds. NRCS employees work with local conservation districts to establish objectives that reflect resource issues and priorities of the district (NRCS, ~~2013~~ 2014). The NRCS approach combines locally-led solutions with science and research, stewardship, partnerships, and proven conservation practices. Technical guidance is available through NRCS handbooks, input from NRCS conservationists, certified technical service providers (TSP), ~~and~~ the local soil and water conservation district (SWCD), and NRCS conservation practices and standards.

In Hawaiʻi, soil and water conservation districts are legally constituted self-governing sub-units of the Hawaiʻi state government organized under the 1947 Hawaiʻi Soil and Water Conservation District Law. Hawaiʻi Revised Statutes Chapter 180, as amended, outlines the duties and powers of the SWCDs to administer and conduct soil and water conservation activities within the State of Hawaiʻi. Since 1967, the Hawaiʻi State Department of Land and Natural Resources (DLNR) has provided funding and administrative support (SWCD, 2016). The East and West Kauaʻi Soil and Water Conservation Districts were founded in 1953. As with the other districts in the state and across the nation, the districts are locally led, grassroots organizations guided by unpaid volunteers who contribute their time and effort, with support from conservation partners, to preserve natural resources and enhance the quality of life in their communities (E&WKSWCD, 2015).

Hawaiʻi Dairy Farms has ~~engaged~~ worked with the NRCS resource conservationist to ~~seek~~ obtain technical guidance, including consultation with a technical service provider (TSP). A Conservation Plan for the project, which includes a Comprehensive Nutrient Management Plan, was reviewed and accepted by West Kauaʻi Soil and Water Conservation District. Conservation planning is a process that recognizes the art and science of natural resource management will never be complete or finished. As conditions and knowledge of the resources change, the methods to achieve natural resource and agricultural goals may be modified. On-going dialogue and guidance based on observations in the field are anticipated throughout project implementation and establishment.

NRCS has set a standard for numerous conservation practices which are known as practice standards and practice codes. Planning for both HDF implementation and future operations incorporates these practice standards and codes. Where the standards and codes have been customized for Hawaiʻi and other Pacific Island environments by the local NRCS Pacific Islands Area office, the 'PI' standard or code was followed. Table 3.2-1 documents the Practice Codes utilized in the HDF project.

Table 3.2-1 NRCS Conservation Practices to be Utilized at HDF[1]

Code No.	Code Name	Code No.	Code Name
102/104	Comprehensive Nutrient Management Plan	516	Pipeline
313	Waste Storage Facility	517	Animal Trails and Walkways (Raceways)
316	Animal Mortality	521A	Pond Sealing or Lining, Flexible Membrane
350	Sediment Basin	533	Pumping Plant
380	Windbreak/Shelterbelt Establishment	558	Roof Runoff Structure
382	Fencing	560	Access Road
390	Riparian Herbaceous Cover	561	Heavy Use Area Protection
412	Grassed Waterway	578	Stream Crossings
430	Irrigation Pipeline	590	Nutrient Management
442	Irrigation System, Sprinkler	614	Watering Facility
449	Irrigation Water Management	620	Underground Outlet
512	Forage and Biomass Planting	634	Waste Transfer

[1] Additional relevant Practice Codes may be utilized

Normal ongoing farming and ranching activities conducted in accordance with NRCS conservation practice standards are exempt from the Clean Water Act Section 404. HDF received confirmation of exemption for the maintenance of existing drainage ditches from the Honolulu District, U.S. Army Corps of Engineers (USACE) in 2013. Additional practices, including but not limited to those shown above, are anticipated to fall under the exemption for construction or maintenance of existing or new animal walkways, stream crossings, and farm roads in accordance with NRCS conservation ~~best management~~ practice~~s~~ standards.

3.3 DAIRY SITE REQUIREMENTS AND LAYOUT

Operational needs for a pasture-based dairy are listed in Section 2.4. Two additional operational needs - suitable climate and soil - are discussed in Chapter 4. The following section expands upon the elements of the Māhāʻulepū site that fit the following needs:

- relatively flat, contiguous acreage;
- adequate water for irrigation and operations;
- agricultural-zoned land available for 20 years or more with sufficient acreage to support an economically viable dairy (preferably utilizing Important Agricultural Lands - IAL); and
- access to support elements (trucking, pasteurization, and work force).

A pasture-based dairy requires relatively flat, contiguous acreage. Gentle slopes allow dairy cows to conserve energy moving between paddocks and the milking parlor twice each day. The Māhāʻulepū site ranges from 0-10 percent slope, with steeper areas along the agricultural ditches created for irrigation during the sugarcane plantation era. Minimal stones in the pastures and along the raceways provide for hoof comfort and protect against injury and lameness. The predominant soils are suitable for establishment of nutritious grasses and nutrient application (See Sect. 3.5 and 4.3).

The 557-acre site consists of 547 acres for paddocks, vegetated buffers ("setbacks") along drainage ways, farm roads, and cow races. The dairy buildings and supporting infrastructure, holding yards and roads occupy the remaining 10-acre area, located on the western boundary of the site (Table 3.3-1 and Figure 3.3-1).

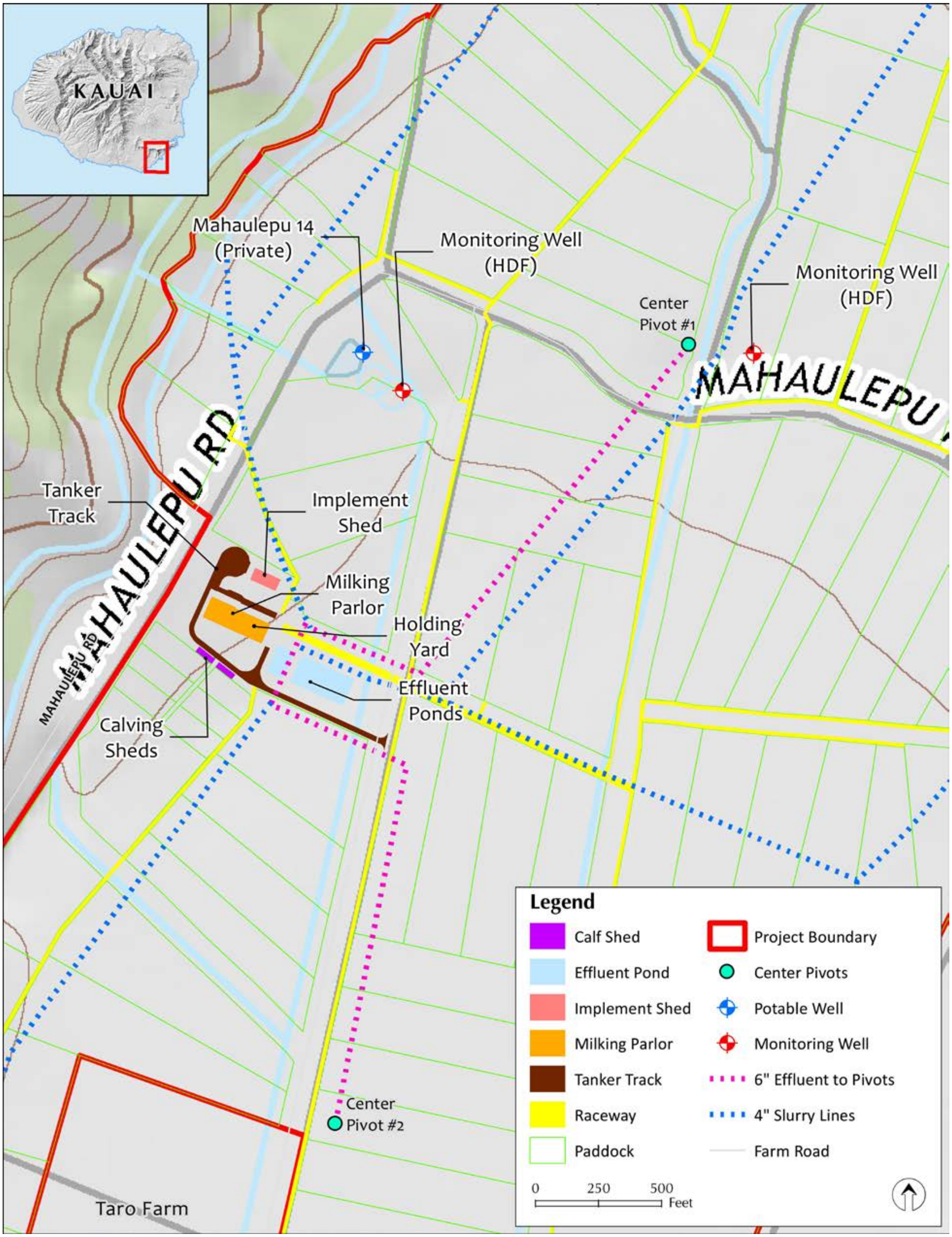


Figure 3.3-1 Dairy Facility Site Plan

Table 3.3-1 Land Use Summary

Land Use	Acres
Facilities	
Dairy Buildings, Yard, Sheds, Road, Ponds	9.7
Subtotal	**9.7**
Pasture	
Paddocks	469.9
Cow Races, Farm Roads, Drainage Ways & Setbacks / Vegetated Buffers	77.2
Subtotal	**547.1**
Total	**556.8**

3.3.1 BUILDINGS

The developed area "footprint" would occupy less than two percent of the total farm area. Four buildings would be constructed to serve different functions, supported by utilities and infrastructure.

Utilities needed for the dairy facilities include a potable water distribution system from the private on-site well, one domestic individual wastewater system (IWS, a DOH-approved septic system) for the employee restroom, and utility-provided electrical power and communications. Agricultural infrastructure components are discussed in Section 3.3.2. Typically 5-10 people, including HDF employees, are estimated to be on site day to day. The maximum number of people on site is estimated to be up to 20.

3.3.1.1 Milking Parlor

The largest building designed for the dairy is known as the milking parlor. Components of the building, approximately 256-feet long by 88.5-feet wide and 33-feet tall, include a covered loading area, milking area, holding pens, mechanical room and pump room, office space, veterinary space and storage, staff restrooms, and milk storage.

The milking area contains an automated 60-stall rotary, which utilizes a slowly turning platform. A dairy employee will place a milking machine on the udder; the machine disengages when no milk is detected. Cows are eager to enter the rotary where they are provided a mixture of grain and supplemental nutrients, which would initially constitute approximately 30 percent of their dietary needs. The grain mixture complements the main diet of grass and provides supplemental nutrients to support cow health and milk production. The supplemental grain feed would be stored in two 44-ton capacity, 60-degree cone silos. The milking parlor would operate 365 days a year. Typical milking time is 8 to 10 minutes; the time moving between the paddocks and milking parlor is approximately one hour per session, for a total of two hours off pasture each day.

3.3.1.2 Implement Shed

An implement shed would be used to store equipment, tools, and supplies, and to provide space for farm machinery. Sized at approximately 65-feet long by 26-feet wide by 15-feet tall, the implement shed will be an open bay steel structure on a concrete slab with a metal roof. Refer to Figure 3.3-1, Dairy Facilities Site Plan.

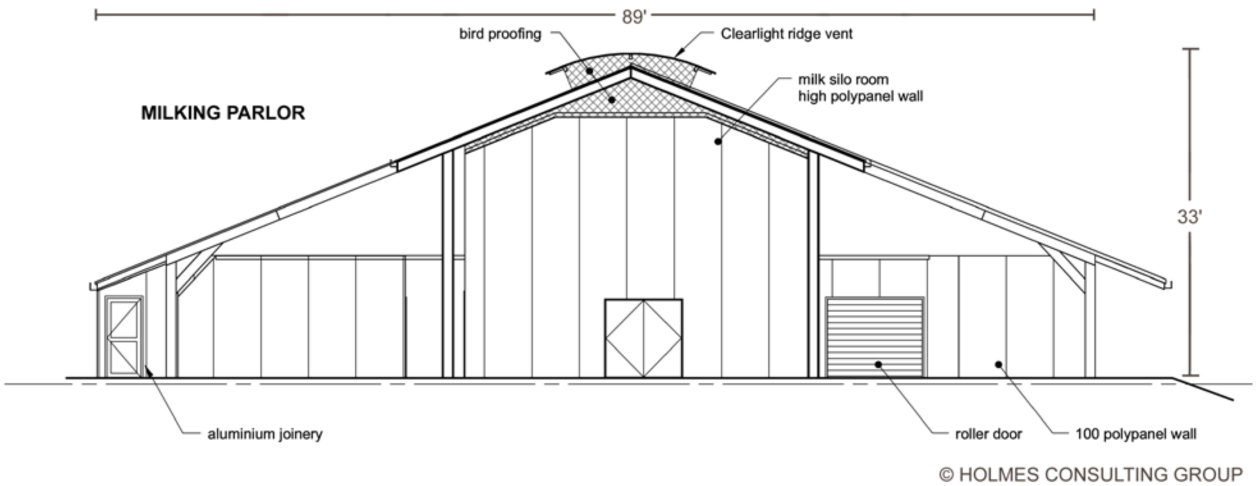


Figure 3.3-2 Milking Parlor

3.3.1.3 Calf Sheds

The calf sheds are steel-framed structures with metal roofs anchored to foundation on an underlying concrete slab. Each of the two sheds will be approximately 81-feet long by 26-feet wide, and 15-feet tall (Figure 3.3-3). To allow for the natural social behavior of calves and provide room for them to turn comfortably and lie down, 20 calves share a pen. The pens are sized to allot roughly 21 square feet per calf, and are divided into a feeding area and a bedding area. Newborn calves are kept in individual protective "crates" within the calf shed for the first 10 days to ensure successful feeding and to provide individual monitoring and attention. At approximately 10 days of age, calves are moved to pens with other calves until they are ready to transition to pasture at about 3 to 4 weeks of age. The feeding area is washed daily, with wash water routed to the effluent ponds through under surface pipes (see Agricultural Infrastructure section, following). With freedom to move about, calves typically will not soil their bedding while at rest; any manure will be removed as needed.

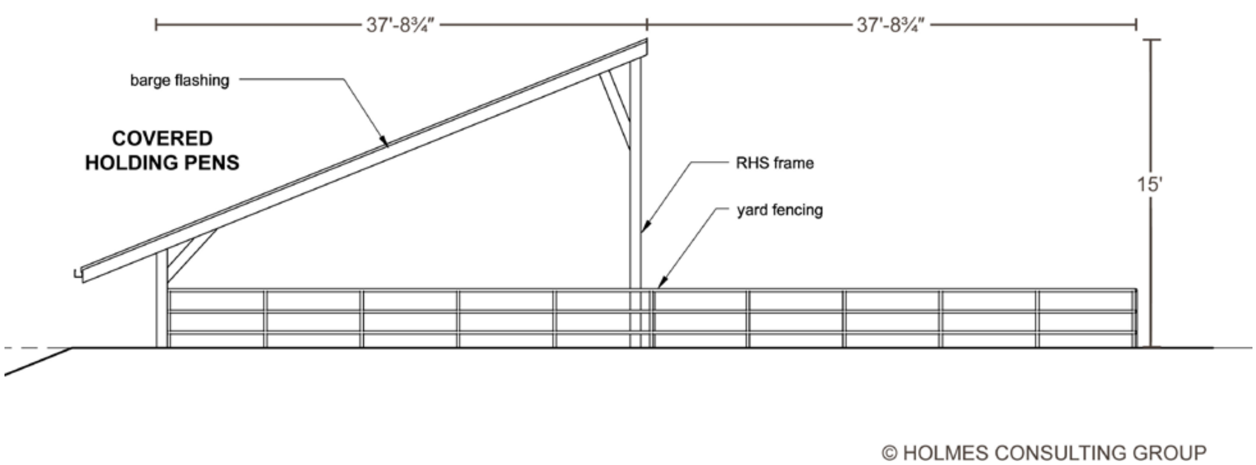


Figure 3.3-3 Calving Sheds

3.3.1.4 Holding Yard

Cows waiting to enter the milking parlor will move through the holding area as a mob, twice each day. The yard is designed to hold a mob of up to 330 cows at any one time. The committed herd size of 699 mature dairy cows will be managed in mobs of 105 to 115 cows. A mob is a group of cows that mimics the natural social order of bovines and is managed together. The yard is approximately 12,300 square feet (150-feet long by 82-feet wide); half of the area will be covered with roofing (Figure 3.3-4 Dairy Facility Detail). The maximum time off pasture for each milking – including moving from the paddock, through the holding yard and milking parlor, and back to a fresh paddock – will be one-hour per milking, two times each day.

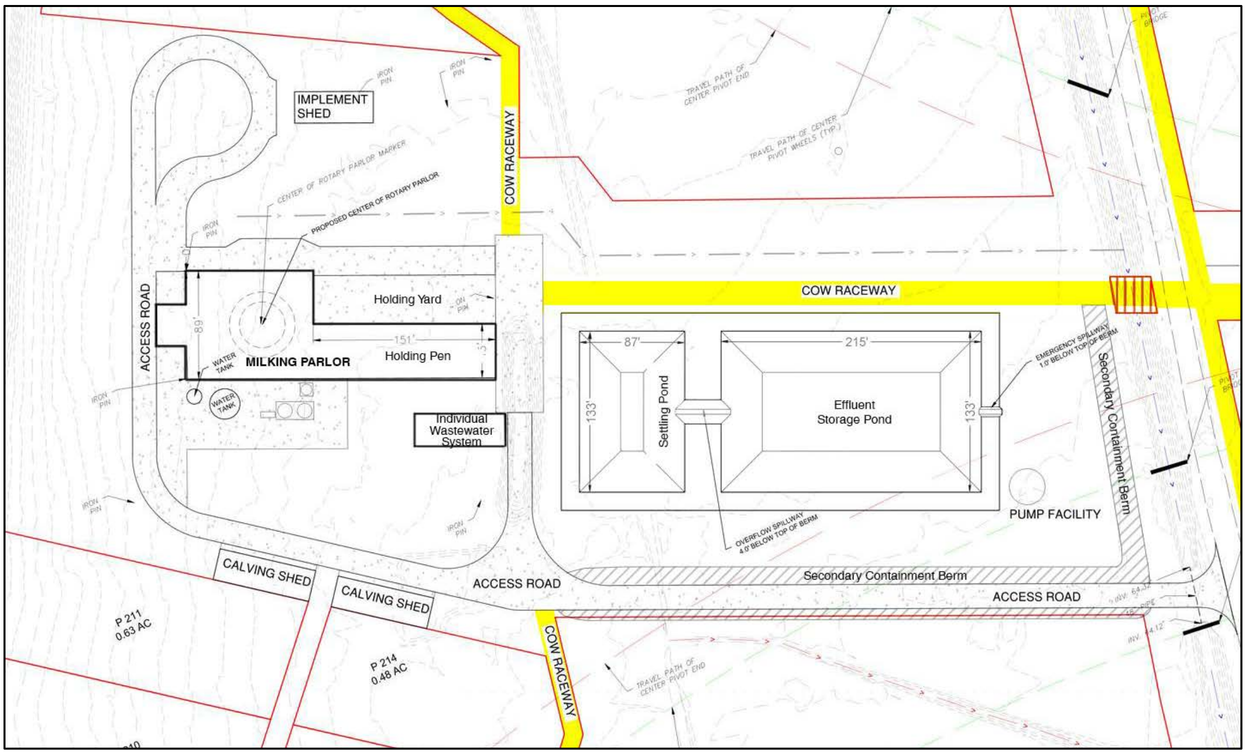


Figure 3.3-4 Dairy Facility Detail

3.3.1.5 Effluent Ponds

Manure will be washed from the yard frequently to provide a healthy environment for the cows. Washdown water containing manure and urine will be collected and transferred to the settling pond through underground pipes. The collected effluent will be utilized as natural fertilizer to provide nutrients for pasture grass (see Section 3.5.4, Irrigation and Nutrient Balance). The pond area will be fenced to exclude animals and unauthorized people.

3.3.1.6 Access Road and Tanker Truck Turnaround

Primary access to the dairy facility will be from the existing farm road in the center of the site, via a newly paved 20-foot wide road. Milk tanker trucks will utilize the access road to load milk and to transport milk off-site. The paved road will terminate at a truck turnaround by the covered loading area of the milking parlor, where raw, cooled milk will be pumped directly into insulated tanker trucks from the loading area for transport off-site (Figure 3.3-1 Dairy Facility Site Plan).

3.3.1.7 Utilities

Utilities will be installed to provide electrical power, potable water, domestic wastewater, drainage and communications within the buildings and facilities in the area of the milking parlor, as described in this section.

Electrical Power
Electrical power will be provided through an overhead service connection to the existing Kauaʻi Island Utility Cooperative (KIUC) grid. An existing overhead line along the farm road mauka of the facility will feed to a new three-phase, 75-300 kVA transformer via a subgrade duct bank. Electrical lines to the dairy facilities will be run in a concrete-encased conduit routed underneath the access road. Additional power will be supplied by photovoltaic (PV) panels mounted to structure roofs, with a total generation capacity of 500 kW power.

Potable water
Potable water is required for milk cooling, livestock consumption, and consumption within the dairy facility, as well as to supply wash water to maintain animal health and sanitation of the milking parlor, holding yards and calf sheds. State of Hawaiʻi Department of Health (DOH) Milk Rules require potable water used for milk production – in the milking parlor and for milking operations - be from an approved supply that is properly located, protected, and operated in a sanitary manner.

Potable water will be sourced from the existing Māhāʻulepū Well Battery located within the project site. The well site originally contained up to 14 wells, the first ten of which were drilled by the sugar plantation between 1897 and 1901 (TNWRE, 2016). The final four wells were drilled during a modification of the well battery in 1927 to 1928. Of the 14 wells, only 3 were deemed sufficient and available for use by HDF. One well will be used for potable water, a second will be used for groundwater monitoring, and the third will be available for backup if needed. The well water has been tested and is of acceptable quality to meet the DOH Milk Rules.

Water will be stored in lined water storage tanks with a total capacity of approximately 80,000 gallons located outside the milking parlor's southwest corner. From the storage tanks, water will be distributed into the milking parlor and to adjacent buildings for use. Water from the tanks will be used for both milk parlor and yards, as well as delivered to the paddocks to supply water for the herd (livestock water is discussed in Section 3.3.2, Agricultural Infrastructure). Small booster pumps will be used to deliver the required flow throughout the farm.

Within the milking parlor, potable water is primarily used to cool milk and to maintain sanitation. Water is used to flush out the milking equipment, as well as to wash manure and urine into the effluent ponds from the holding areas, milking parlor, and calf sheds. Sanitation facilities for dairy employees include restroom and hand-washing facilities, including hot and cold running water dispensed through a mixing valve and faucet.

Demand for potable water in the milking parlor facility is estimated to be approximately 12,165 gallons per day (gpd) for human consumption and wash water, and 17,475 for livestock consumption (at 25 gpd per cow per day). Total demand will initially be approximately 30,000 gpd with the committed herd size of 699 mature dairy cows. The potable water demand for the contemplated possible herd expansion up to 2,000 mature dairy cows is shown in Section 3.8.1.

Domestic Wastewater
Wastewater from a restroom planned for dairy personnel will be serviced by an individual wastewater system (IWS). An IWS treats wastewater on-site using DOH-approved systems (e.g. septic tank). The system will be designed for 35 gpd per employee for 20 employees, a flow of 700 gpd, with a 1,500-gallon capacity septic tank certified by the International Association of Plumbing and Mechanical Officials. The IWS septic tank system will be underground, outside and just south of the milking parlor. HDF anticipates 5 to 10 full time employees (see Sections 4.15 and 4.21).

Communications
Telephone and internet service will be provided through an overhead service connection via drop pole to the same subgrade trench as the electrical power, in a separate duct conduit that feeds into a 2′-0″ by 4′-0″ Hawaiian Telecom pull box. Communication lines will extend from the pull box to the dairy facilities via subgrade concrete encased conduit.

Stormwater Run-Off/Drainage
Gutters, curbs and swales will be used within the dairy facility to direct surface sheet flow as a part of the overall site stormwater management plan. Metal roofing material on dairy buildings will be sloped to adequately sized gutters and downspouts. Roof run-off from the implement shed, milking parlor, and covered section of the holding yard will be discharged at ground level directly to grass surrounding the buildings. Run-off from a 1.75-acre area within the facility, primarily uncovered areas with potential of manure, will be routed to the storage ponds. This area includes the loading area, the uncovered part of the holding yard, and the area immediately surrounding the effluent ponds. The pond edge will be above grade to prevent run-off from outside areas from entering the ponds.

Stormwater run-off from the calving shed roofs will discharge at ground level and be collected with the potentially contaminated runoff from the uncovered areas and directed to the storage ponds.

3.3.2 AGRICULTURAL INFRASTRUCTURE

Agricultural infrastructure and utilities required for the dairy operations will include storage tanks and silos, effluent storage ponds, livestock water systems, and drainage improvements. The irrigation system and distribution of livestock water are discussed in Section 3.5, Pasture Management.

3.3.2.1 Storage Tanks and Silos

Milk storage tanks will be erected in the "milk room" within the milking parlor. The tanks maintain milk at the regulated temperature until transferred to a tanker truck. The milk room is located just inside the covered loading bay.

Potable water will be stored in two tanks described in the previous section under Utilities. The tanks are located outside the southwest corner of the milking parlor. Feed is stored in two cone silos outside the south side of the milking parlor, as explained in Section 3.3.2. Feed is lifted from the delivery pit via a grainleg and dispensed into troughs accessible by cows in the 60-stall rotary while milking. The silos are sited on a concrete pad.

Gasoline and diesel fuels will be stored in above-ground tanks. Fuels will be used in farm equipment, and will be available if needed to power an emergency back-up generator. Storage and inventory procedures for fuels and other petroleum products utilized at the dairy are described in Chapter 4, Section 4.13 Hazardous Substances.

3.3.2.2 Livestock Water Distribution System

Availability of drinking water has an impact on animal health and milk production. The livestock water distribution system has been designed to supply a large volume of water to meet the seasonal high daily water demand of 25 gpd per cow. Potable water will be pumped from the Māhāʻulepū Well 14 and stored near the milking parlor in two covered storage tanks with combined capacity of 80,000 gallons. Small diameter water mains will deliver water to at least two troughs in each paddock.

Watering troughs will contain water for the period of 12 to 24 hours when cows are utilizing the troughs in the occupied paddocks. HDF personnel will fill troughs just before the cow "mobs" enter the paddock(s) for the grazing period; troughs will be emptied after the cows are moved to another paddock. Thus troughs will be managed to prevent mosquito breeding. Troughs will be fitted with valves that allow water flow when the water level decreases, and to stop water flow when the trough is full. The raised, concrete troughs will be placed on a stable crushed rock base at a height that allows cows to reach over and into the water, but discourages stepping into the trough.

The total potable water demand for HDF is documented in Chapter 4, Sections 4.16.~~2.~~3 and ~~4.23.1~~ 4.22.2.

3.3.2.3 Drainage Improvements

Drainage improvements will consist of surface modifications to include swales (referred to as grassed waterway in NRCS Practice Codes), ~~sediment basins,~~ stream crossings, surface drainages, and water and sediment control basins. Much of the existing drainage infrastructure, installed and used for sugarcane irrigation, will be restored where possible and reused or improved.

Estimated peak flow of stormwater runoff will be reduced. Existing and proposed conditions related to stormwater runoff and drainage are identified in the *Hydrologic Assessment for the Pasture Areas for Hawaiʻi Dairy Farms* (Group 70, 2016), contained in EIS Volume 2 Appendix K. Proposed conditions include roughly 80 acres of maintained drainageways, vegetated setbacks, cow walkways topped with soft, crushed, permeable limestone, and farm roads. Also, a thick grass ground cover for the pasture area constitutes the majority of the farm: nearly 470 acres of the 557-acre site. With organic matter from manure, the predominately kikuyu grass crop will improve surface infiltration of rainfall and irrigation (Yost, 2016, in EIS Appendix 5-A).

Calculations in the Hydrologic Assessment show the reduction in runoff from various storm events, estimated in Māhāʻulepū Ditch immediately south of the project site where flows combine. For the 10-year storm event, peak flow leaving the project site will be reduced by 257 cubic feet per second (cfs); for the 25-year storm event, reduced by 283 cfs; and for the 50-year storm event, reduced by nearly 300 cfs.

3.3.2.4 Effluent Storage Ponds

The pasture-based system utilizes manure as a valuable resource. This is a fundamental difference and advantage over conventional feedlot dairy operations, which have insufficient land to recycle the nutrients for uptake by forage plants and instead rely on imported feed and large storage lagoons to hold manure. The pasture-based dairy relies on 100 percent of the nutrients from manure deposited on the pasture, with application of manure captured in the effluent ponds, to grow the majority of forage for the herd.

Collection and storage of effluent provide a tool for the dairy manager to control the schedule, timing, and mix of nutrients to be applied. Sizing of the storage facility allows flexibility in scheduling land application when weather and field conditions are suitable, and when nutrients in the effluent can best be used. The storage period is determined by the utilization schedule. The ponds for HDF will be sized to accommodate the potential maximum effluent generated from the contemplated herd size of up to 2,000 mature dairy cows. As designed, the ponds will have spare volume representing an additional buffer of up to 12 percent at the contemplated herd size. For the committed herd size of 699 mature dairy cows, the ponds will have excess capacity equivalent to an additional 45 percent of the total volume design, nearly double the total volume required.

Siting, design and construction of the ponds will be in compliance with the DOH, University of Hawaiʻi College of Tropical Agriculture and Human Resources (CTAHR) and NRCS technical guidance. The *Guidelines for Livestock Management* (DOH, 2010) requires storage facilities for animal wastes should provide a minimum buffer of 1,000 feet from public drinking water resources, and 50-feet from surface water resources. At their closest points, the ponds will be sited approximately 125 feet from the nearest drainage ditch, and 3,420 feet from the nearest public drinking water well (Figure 3.3-5). Design guidance for effluent storage requires sizing of ~~the~~ a pond to contain all wastewater, manure, clean water, solids accumulation, net surface rainfall including runoff over an adequate storage period, and the direct precipitation sized for a 25-year, 24-hour rainfall event.

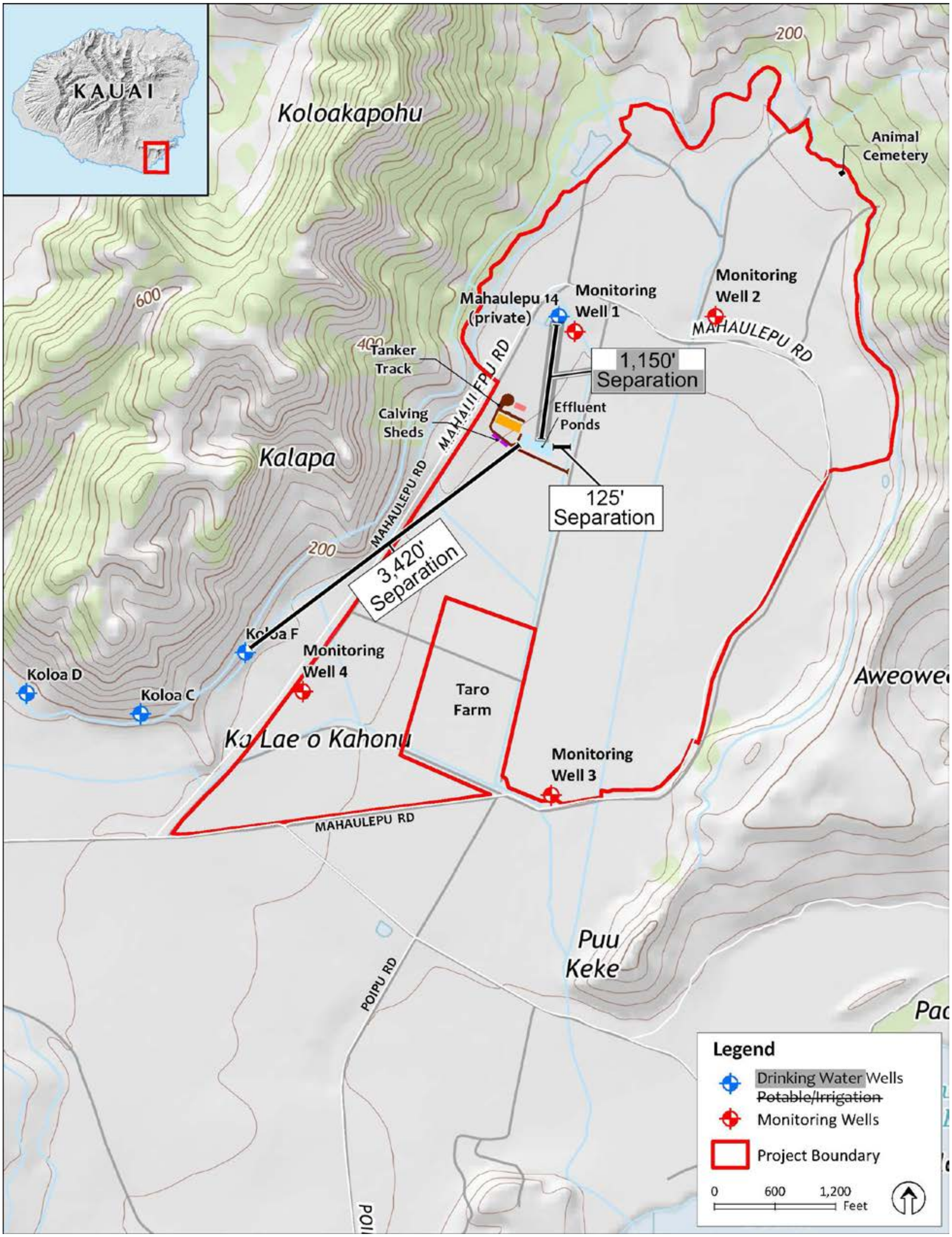


Figure 3.3-5 Effluent Pond Siting

Wash water from the milking parlor will be routed to the settling pond through a pipe. Run-off from the dairy facility will be managed as described in Section 3.3.1.7 (Stormwater Run-Off/Drainage). The ~~U.H. Waste Management~~ DOH *Guidelines for Livestock Management* (2010) require waste lagoons to be lined with a synthetic liner if within 1,000 feet of a public drinking water source, or within 50 feet from surface water resources and/or State waters.

While the ponds' distances from water resources exceed ~~U.H. Waste~~ livestock management guidelines (DOH, 2010) thresholds to require lining with synthetic liner, HDF has elected to line the ponds to protect against seepage into surrounding soil. The synthetic liner will meet the standards of the NRCS Conservation Practice Code, and will be underlain with a sensor system that can detect moisture and alert personnel to potential leaks. Inlets, outlets, ramps and other elements of the effluent transfer system will be installed according to NRCS practices to prevent damage to the operation of the liner. Volumes, assumptions and additional description of the pond system can be found in Appendix D, Nutrient Balance Analysis.

The two-pond system for HDF will be composed of a settling pond and a storage pond. Daily generation of effluent with wash water entering the ponds has been calculated to be 13,226 gallons per day (gpd) for the committed herd size of 699 mature dairy cows. Roughly 1 percent of the daily effluent consists of solids, with approximately 5,952 gallons of solids accumulating over a 45-day ~~storage~~ maximum period between slurry applications (Table 3.3-2). Storage calculations for the contemplated future possible herd size of up to 2,000 mature dairy cows are shown in Section 3.8.1.

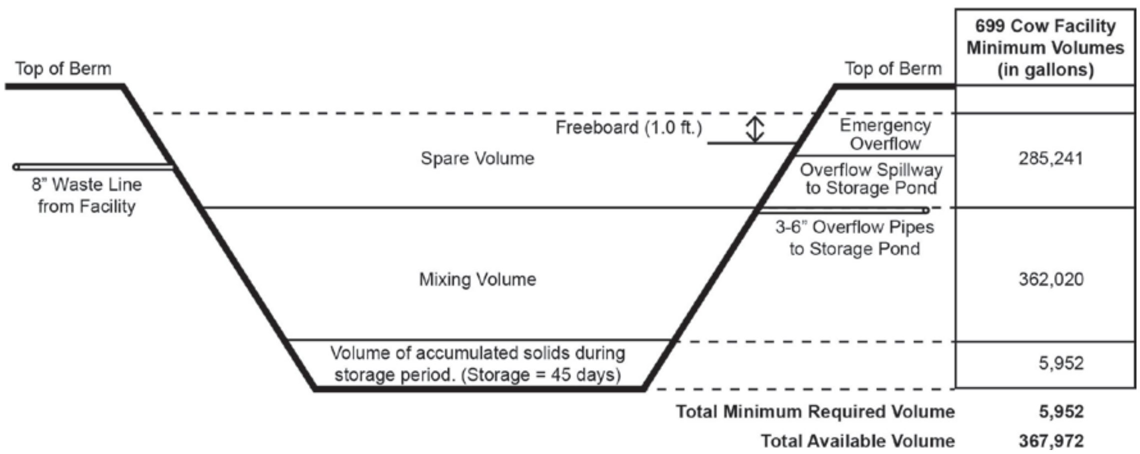
Table 3.3-2 Effluent Pond Sizing Criteria for Committed Herd Size up to 699 Mature Dairy Cows

Design Criteria/Assumption	699 Mature Dairy Cows	Pond
Daily Effluent Generation	**13,225.8 gpd**	
Percentage of Solids	1%	Settling
Volume of Accumulated Solids for 45-day Period Between Application	5,951.6 gal.	Settling
Daily Effluent Flow to Storage Pond	**13,225.8 gpd**	
Minimum Volume of Effluent Storage for 30-day Design Volume Period	396,774.0 gal.	Storage
Depth of 25-Year, 24 Hour Storm	10.4 inches	Storage
Depth of 30-day Design Volume for Normal Precipitation	6.0 inches	Storage

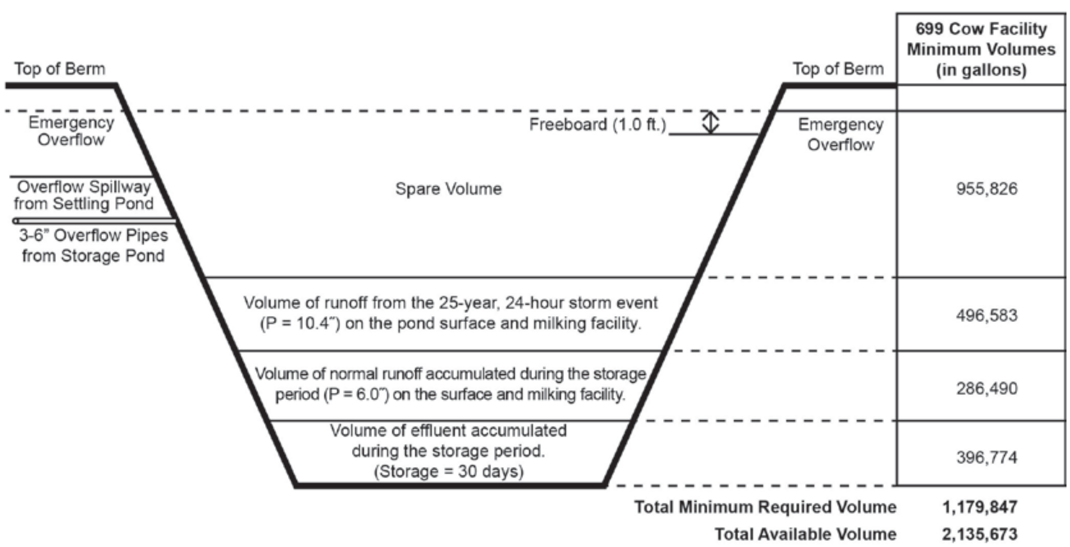
Solids are allowed to settle in the settling pond and are also retained ~~in the settling pond~~ through filters. The volume of the settling pond allows space for stirring to re-suspend solids for application to pastures, which provides an additional 285,241 gallons of pond capacity (Figure 3.3-6). Solids will be cycled through the pond onto the paddocks over a maximum period of ~~approximately~~ 45 days (see Section 3.5.4, Irrigation and Nutrient Balance), and more frequently as manageable.

The storage pond is sized to hold a volume equivalent to 30 days of effluent from the contemplated herd size of up to 2,000 mature dairy cows, plus normal precipitation and run-off for a 30-day period from the 1.75-acre, uncovered portion of the total facility area to receive manure and wash water, plus the possible rainfall from a 25-year, 24-hour storm event (Figure 3.3-6). While precipitation over these areas is directed to the storage ponds via drain inlets and piping because it will be mixed with manure and wash water, other precipitation from remaining areas of the facility and adjacent pasture will not enter the pond, as the pond edges consist of raised berms. Grading around the facility will direct uncontaminated rainfall away from the facility.

For the committed herd size of 699 mature dairy cows, the storage pond could accommodate nearly one million gallons more than the NRCS design requirements (Figure 3.3-6). In normal operations, the storage pond provides additional spare volume at the top of the pond. In the 699-cow scenario, the spare volume is an additional 45~~%~~ percent of the total volume design. In the 2,000-cow scenario, the spare volume represents an additional buffer of up to 12 percent. These spare volumes provide even greater buffer above the design capacity which includes not only the required 25-year, 24 hour storm event, but also allows volume for 30 days of storage, and normal precipitation to the surface~~s~~ of the pond and surrounding the ponds.



Settling Pond Typical Section and Volumes



Storage Pond Typical Section and Volumes

Figure 3.3-6 Effluent Pond Plan and Section for Committed Herd of 699 Mature Dairy Cows

Nonetheless, the storage pond design incorporates an emergency spillway to direct overflow to a secondary containment area in case of a cataclysmic event. This containment is beyond the regulatory requirement, and would only be utilized during an unprecedented rain or flood event. The capacity of the secondary containment is approximately ~~1,125,600~~ 1,136,841 gallons, which is roughly equivalent to the total wastewater volume for a 30-day period from the potential contemplated herd size of up to 2,000 mature dairy cows.

Liquid effluent will be mixed with non-potable water from the Waita Reservoir and applied to pastures through a pivot irrigation system. The typical utilization schedule for the nutrient-laden water from the storage pond for any irrigated pasture area is every four days, depending on field conditions. Slurry will be applied through a mobile hard-hose reel dispensed through a gun nozzle, referred to as a gun irrigation system. Slurry refers to solids from the bottom of the settling pond mixed with non-potable water that can be applied through the gun irrigation system. The frequency and quantity of effluent applied depends on a variety of conditions discussed in Section 3.5.4, Irrigation and Nutrient Balance.

3.4 HERD MANAGEMENT

The management practices and pasture-based rotational grazing system to be applied by HDF maximizes grass as the cows' primary nutrition source and minimizes stress to the animals. Cows will be managed in social groups known as "mobs", mimicking the natural social order of bovines. The committed herd size of 699 mature dairy cows will be organized in mobs of 105 to 115 cows. Generally, each mob will be rotated among 18 different paddocks over an 18-day period, leaving an even application of manure throughout the pastures. Grass in each paddock is given an 18-day rest and regrowth cycle before being grazed again.

The pasture-based model allows cows to move about freely and to lie down and rest, which is an important part of the digestion cycle. Cows will spend 22 of each 24-hour period foraging on pasture or resting, outdoors in natural light and fresh air. The gently sloped paddocks and walkways will minimize the energy expended by the mature dairy cows as they graze or are transferred to and from the various paddocks and the milking facility; surfaces of the walkways and cow races will be topped with crushed limestone to provide a comfortable path under hoof. Cows tend to be healthier and live longer productive lives with access to fresh air, high quality feed, and exercise while they forage (NRCS, 2007).

Health of the herd is of primary importance as the success of a dairy relies on cows effectively producing quality milk. All cows will be treated with a high standard of care. Dairy managers and caretakers will be trained and competent in handling animals to minimize stress and ensure the herds' welfare. A licensed veterinarian may prescribe use of antibiotics approved by the Food and Drug Administration (FDA) for treatment of illnesses. Adherence to guidelines that prohibit the sale of milk from cows undergoing antibiotic treatment will ensure no adulteration of milk. Routine laboratory tests of milk for traces of antibiotic residue will be conducted. HDF will not inject cows with sub-therapeutic, preventative, or growth promoting use of antibiotics, ionophores or bovine growth hormone, referred to as rBST or rBGH.

With the committed herd size, there will be approximately 150 calves on the HDF site at any one time. Approximately 50 calves would be housed within the calf sheds, with approximately 100 calves on pasture, grazing. The actual numbers will depend on the calves' age, size and health status. Once the calves reach approximately 165 pounds or 90 days of age, they will be transferred to an offsite calf raising facility (see Sections 3.7 and 3.8.4, Offsite Herd Management).

Should animals die at the site, they will be buried at a designated area, following plans for carcass management as specified in the Waste Management Plan reviewed by DOH. HDF has adequately planned its cemetery site and incorporated Best Management Practices required to protect water resources surrounding the HDF site. The anticipated animal mortality rate for HDF is typically less than 2 percent for productive cows. Greater numbers of animal mortality are expected for the young and stillborn calves, consisting of between 4 percent and 5 percent of the herd size. The animal cemetery is specifically located on the north side of the farm, in an area of relatively flat pasture.

Site selection criteria for the cemetery paddock included protection from prevailing winds, and distance more than 100 feet away from any drainageway, 200 feet from any natural watercourse, 300 feet from any well, and more than 20 feet from any buildings. Within the cemetery paddock, pits will be sited based on soil suitability and slope. An area of approximately 5,000 square feet is needed for the animal cemetery at the contemplated herd size of up to 2,000 mature dairy cows, which is a fraction of a 3- to 5-acre paddock.

HDF will comply with the applicable State and Federal regulations related to the importation of livestock and livestock disease control. This includes importation requirements by the State of Hawaiʻi Animal Industry Division pre-entry requirements such as testing for diseases such as brucellosis, and tuberculosis. The cows will also undergo approved external parasite prevention methods, and national uniform tagging or identification registration and processing.

3.5 PASTURE MANAGEMENT

The pastoral rotational-grazing dairy provides a local feedstock – grass – as the herd's primary food source. Reducing imported feed stabilizes costs and provides a food source closer to the natural diet of cows. Pasture is defined by the Natural Resource Conservation Service (NRCS) as:

> ... a land use type having vegetation cover comprised primarily of introduced or enhanced native forage species that is used for livestock grazing. Pasture receives periodic renovation and cultural treatments such as tillage, fertilization, mowing, weed control, and may be irrigated. Pasture vegetation can consist of grasses, legumes, other forbs, shrubs or a mixture. Pasture differs from range in that it primarily produces vegetation that has initially been planted to provide preferred forage for grazing livestock. The majority of these forages are introduced, having originally come from areas in other continents. Most are now naturalized and are vital components of pasture based grazing systems (NRCS, 2016).

Results of grass trials initially conducted at five sites across four Hawaiian Islands were instrumental in identifying appropriate varieties of grass. Additional project-specific trials at the Māhāʻulepū site on Kauaʻi have been conducted for more than 18 months. The results have identified sufficient yield and nutrition to supply 70 percent of the cows' diet; improvements in grass productivity are anticipated to provide up to 85 percent of cows' diet. See Section 3.5.3.

3.5.1 PADDOCKS, FENCING AND SETBACKS

The 469.9 acres of pasture will be divided into 119 paddocks that average 3 to 5 acres in size (Figure 3.5-~~3~~1 and Table 3.3-1). Smaller paddocks will be located near the dairy facility for use as temporary pasture for cows or calves being moved on or off the farm (see Section 3.7, Offsite Herd Management by Kauaʻi Ranchers). To protect water quality of surface water and downstream areas, two types of setbacks will be established. A physical setback to exclude cows from waterways and drainages will be created with paddock fencing ~~es are~~ set 35 feet back from the top of bank of drainage ways ~~in the~~ on site. Existing vegetation within the setbacks will be managed or restored to reduce erosion, improve stability of ditch banks, increase net carbon storage, and improve and maintain water quality (Figure 3.5-2). The other setbacks restrict liquid effluent application near water sources, and are explained in Section 3.5.4.2, Nutrient Balance.

As described in Section 3.3.2, a minimum of two concrete above-ground water troughs will be installed in each paddock for livestock drinking water. Watering troughs will contain water only when cows are occupying the paddocks. Troughs will be emptied after the cows are moved to another paddock.

Fencing is essential to containing cows for safety, protecting water quality, and optimizing animal and pasture health, milking output, grazing coverage, and nutrient distribution. A permanent perimeter fence will be constructed using steel t-posts installed every 10 feet, and a wooden post placed every 50 feet. The configuration of the perimeter fence will be determined in consultation with the U.S. Fish and Wildlife Service and the state Division of Forestry and Wildlife, and will be documented in the Endangered Species Awareness and Protection Plan to be finalized prior to dairy construction and operations. The perimeter fence will include 42-inch woven wire topped with high tensile ~~a strand of straight~~ wire at 48-inch height, with ~~a strand of barbed~~ high tensile wire at ground level to deter feral pigs. Within the perimeter fence, paddock fencing will consist of two or three strands of electric wire mounted on wooden t-posts. Electric fencing is the standard material used for cows and cattle as it is effective and moved with relative ease to re-configure paddocks. T-posts are pounded into the earth using a hand-held pole pounder. Fence corners are strengthened through use of 6-inch diameter-wood posts driven 2-feet into the ground using a mechanical pounder powered by a tractor hydraulics system. Gate posts made of steel pipe will be installed in holes approximately 12 inches across and 36 inches deep and set in concrete. The integrity of the fence is essential to project success, and will be diligently monitored and maintained by the dairy manager, who will be onsite daily.

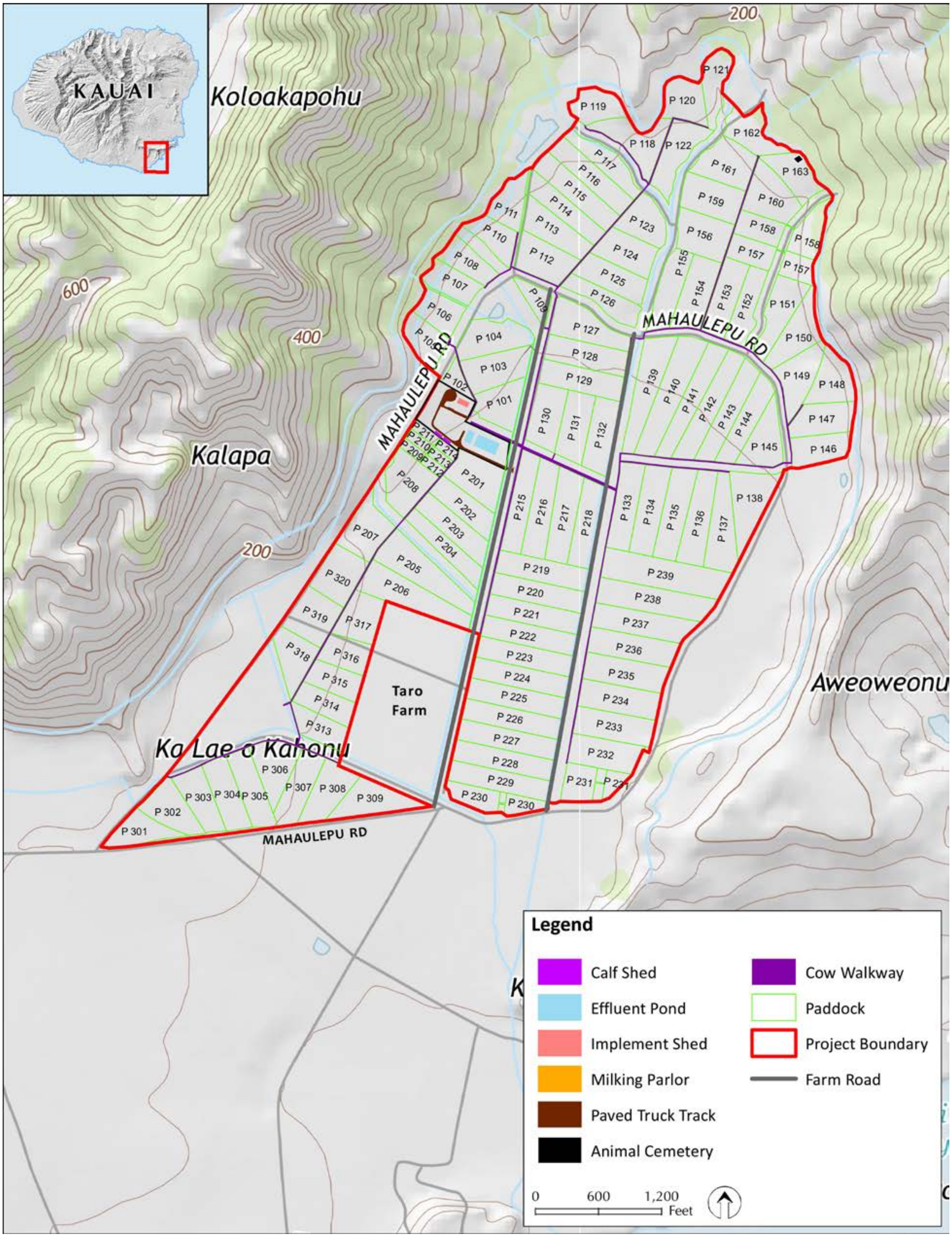


Figure 3.5-~~3~~1 Paddock Layout

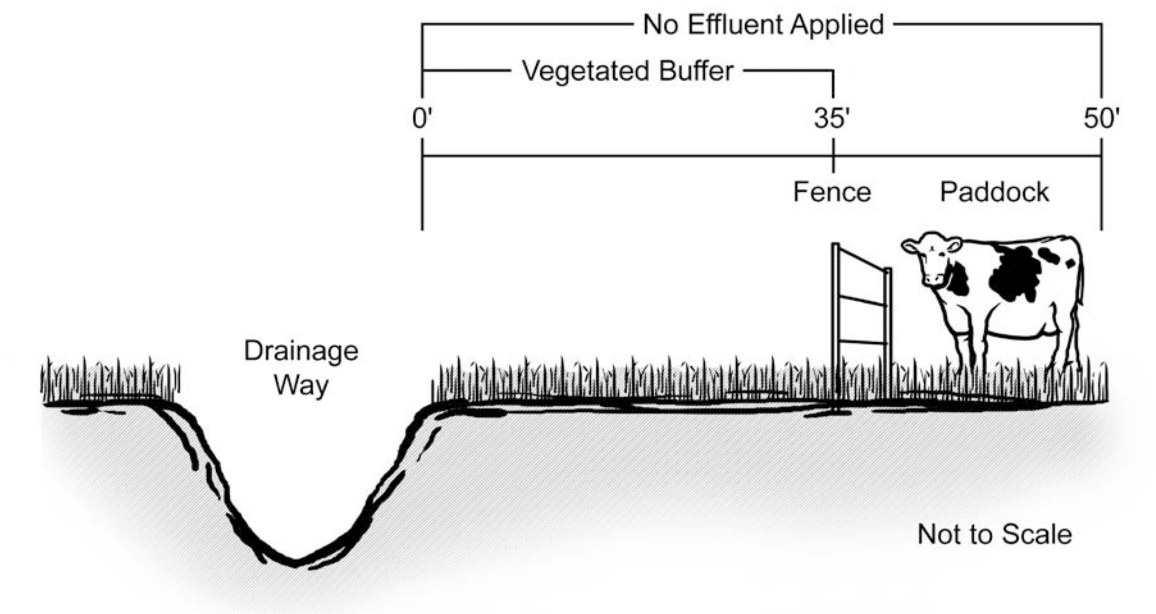


Figure 3.5-2 Setbacks to Protect Water Quality

3.5.2 COW WALKWAYS

Contiguous acreage is required for a pasture-based grazing system in which cows must walk to and from the milking parlor twice each day. Cow walkways are designed to conserve energy of the animals by utilizing gentle slope, and to minimize stress by allowing mobs to move at a relaxed pace. The walkways at HDF will be 16- to 20-feet wide, which allows the mob to walk as a group with their heads lowered. The walkways will be topped with crushed limestone that provides a soft surface to minimize hoof damage. The walkways will be elevated above the pasture grade, and in some areas will be parallel to farm roads. Fencing consisting of three to five strands of electric wire will border the walkways. Surfaces will be slightly crowned to ensure drainage to either side of the walkway, and swales roughly 12-inches in depth will be created parallel to each road or raceway. Design and installation of roads, raceways, and swales will be in compliance with the HDF Conservation Plan and utilize standards from applicable NRCS Practice Codes.

3.5.3 FORAGE PRODUCTIVITY

Field trials of Kikuyu varieties conducted at the farm over the last 18 months are the basis for determining initial yields of pasture grass. The grass yields resulting from the field trials are anticipated to increase with full establishment of the dairy and maturation of the pastures. Cows on pasture aerate soils while foraging and deposit manure which, in turn, increases organic matter and carbon in the soil. These elements revitalize soil structure through improved microbial communities that assist with incorporation of manure nutrients into the soils, and convert them to a form readily available for plant uptake. Horticultural experts will continue to monitor grass yields during pasture establishment and as part of the ongoing dairy management. As a key piece of the overall nutrient balance, these data sets will help determine the ultimate potential carrying capacity of the farm.

Figure 3.5-3~~2~~ Kikuyu Grass

Kikuyu and Guinea grasses brought in as cattle forage decades ago will be sown to transform the former sugar cane fields into pasture. The grass thatch will be built and initially maintained by frequent mowing. When the thatch is established, paddocks will be grazed for 8- to 12-hour periods during which cows leave manure behind to nourish soils and grass with a supply of natural nutrients. The dominant grass is Kikuyu (*Pennisetum clandestinum*), a high yielding species that can yield more than 20 tons (U.S.) dry matter per acre annually. In moist, tropical conditions with a year-round growing season, the grass has produced more than 35 tons of dry matter per acre per year.

As the cattle excrete on the Kikuyu thatch, nutrients are incorporated into what is effectively an organic net. Healthy soils contain primary decomposers such as earthworms and dung beetles that move manure into the soil profile when they burrow, aerating the soil to make organic materials accessible to secondary decomposers. Secondary decomposers include microbes (microorganisms) such as bacteria, protozoa, and fungi. The decomposition process breaks down manure into nutrient components that are readily available for uptake by the grass crop. In a healthy system, a manure pile can be removed from the soil surface within 24 hours. Even with the applied manure and effluent nutrients, the grass will need significant additional nutrients from conventional fertilizers to maintain optimum grass growth and yield goals with 699 mature dairy cows.

Kikuyu yield ranges between 4 tons (unfertilized) and 35 tons of dry matter (DM)/acre/year depending on fertilization levels. Kikuyu's response to fertilization is linear, and anticipated growth rates in Māhāʻulepū with irrigation are estimated to be some of the best in the world.

HDF coordinated the collection of Kikuyu grass samples beginning September 2, 2014. Kikuyu grass samples were collected at 18-day intervals between mowing and repeated after every fourth mowing. The intent was to simulate harvest of the grass by cows grazing on the paddock every 18 days, which allows for an 18-day rest period. A random grab sample method was used to replicate a cow grazing. Samples were collected every 5 steps while walking diagonally across the field. About 30 grabs were collected from each field and mixed to create a composite sample for the field. These samples were collected and dried at the same time as the production data samples and sent to Cumberland Valley Analytical Services for wet chemistry and in vitro assay of forage quality. The trials were conducted in different locations on the farm for over a year across more than 75 acres of planted pasture.

Although the goal is for a 20-ton Kikuyu yield for mature pasture grass, the Kikuyu grass trials have conservatively averaged 16.3 tons of ~~Dry Matter (~~DM~~)~~ / acre / year which will initially be used as the basis for all nutrient application rates. This rate includes consideration for seasonal variations in production and the effect of irrigated and non-irrigated areas of the pasture. The production of grass and realized yields is directly related to the nutrient application rates that can be utilized, as the grass relies on removal of natural or applied nutrients from the soils for growth. As the grass and pasture is established, yields are expected to increase, and removal of nutrients from the soil for uptake to the crop will increase.

Based on the Cumberland Valley Analytical results, the nutrient removal rates for Kikuyu in pounds removed per ton of ~~Dry Matter (~~DM~~)~~ which can be used in the nutrient mass balance analysis (see Section 3.5.4, Irrigation and Nutrient Balance) are as follows:

Pounds of Nitrogen (Lbs N) removed per ton DM = 64 lbs. N

Pounds of Phosphorus (Lbs P) removed per ton DM = 11.4 lbs. P

Pounds of Potassium (Lbs K) removed per ton DM = 90 lbs. K

While the crop growing season in Hawaiʻi is year-round, trials have indicated that production of grass is lower during the winter months and higher during the summer months (16.3 tons of DM / acre/ year is an average). HDF expects to harvest, bale, and store extra grass crops during the summer months to supplement crop production and feed during the winter months to balance the availability of grass feed. Additionally, the grass yields resulting from the field trials are anticipated to increase with full establishment of the dairy and maturation of the pastures, a process which can take up to three years to reach optimal potential.

The NRCS Technical Service Provider working with HDF to develop the nutrient management plan, Red Barn Consulting, incorporated soil and agronomy information from technical consultants gathered at the Māhāʻulepū site (see Section 3.5.4, Irrigation and Nutrient Balance). The findings indicate a nutrient deficient soil regime, requiring supplemental commercial fertilizer for sustained pasture growth in addition to anticipated manure nutrients. The nutrient balance analysis shows that with the committed herd size of 699, supplemental commercial fertilizers will be needed to provide sufficient nutrients for continued soil health and grass productivity.

3.5.4 IRRIGATION AND NUTRIENT BALANCE

Irrigation is the primary method of applying natural fertilizer from the effluent ponds. This section discusses irrigation methods, setbacks, and determination of nutrient application rates.

3.5.4.1 Irrigation

The available pasture for grazing totals 469.9 acres. Of those acres, 346.5 acres will be irrigated with irrigation water and/or diluted effluent through either the pivot irrigation systems or through gun irrigators. Irrigation water supply is provided to the farm from Waita Reservoir, and will be filtered and pumped to the various irrigation components on the farm. The pivot irrigation system utilizes two central pivots that feed water to an overhead, rotating sprayer supported by trusses mounted on wheeled towers that rotate in an approximately ~~1,000~~ 1,200-foot ~~diameter~~ radius. Nozzles are suspended several feet from the ground to direct water directly onto the pasture grass;

the droplet size is large enough to reach the ground effectively without aerosolizing. Irrigation is not conducted during high winds.

The irrigation system will be controlled by a software system utilizing global positioning system (GPS) receivers to allow very precise application of irrigation and/or diluted effluent on the pasture. The rate at which irrigation water and/or diluted effluent will be applied can be varied by controlling pivot speed and water volume, depending on the actual irrigation needs of the farm. A somewhat typical application rate would include a 48-hour rotation and application of up to 0.39 inches of irrigation and/or diluted effluent onto the paddocks. Pivot crossings will consist of an elevated metal track anchored on both sides of the waterway to allow the pivot wheel to traverse ditches without impact. Any manure picked up by the pivot wheel will be retained in the 35-foot vegetated buffer area.

Approximately 26.2~~%~~ percent of the total pasture area will not be irrigated, primarily in the mauka areas of the farm where the pivots are unable to reach. No gun irrigation system will be used in this area. See Figure 3.5-5, Irrigated~~ion~~ ~~Map~~ Pasture Area, for irrigated and non-irrigated areas. These areas will receive nutrient application as needed to maintain optimal grass growth; nutrient application is discussed in the following section.

Gun irrigators will be used to irrigate areas not covered by the pivots. The gun irrigators utilize a hard-hose reel, which can be moved throughout the farm as needed (Figure 3.5-45, Irrigated Pasture Area). Additional information on development of an irrigation system and irrigation management plan, including application methods, rates and schedules for irrigation are presented in Appendix D.

The GPS system within the pivots turns the irrigation and/or diluted effluent spray off within 50 feet on either side of a ditch, adhering to the best practice of not applying nutrients within the setback areas of waterways and ditches (see following section). Figure 3.5-4 illustrates the irrigation pivot system.

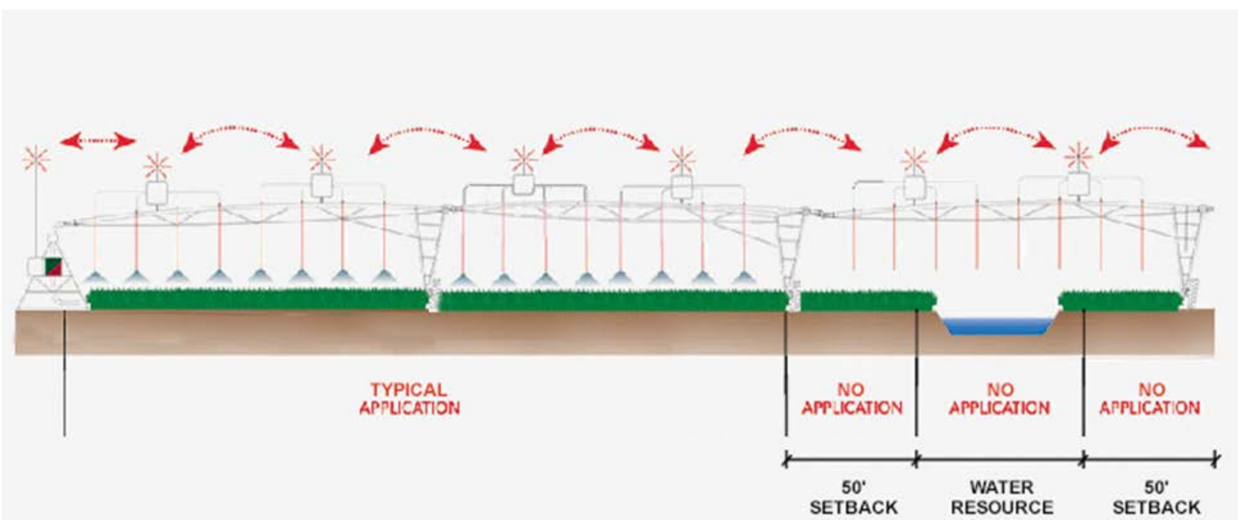


Figure 3.5-4 Components of the Central Pivot Irrigation System

A separate rotating, hard-hose reel gun system will be utilized for application of solids from the settling pond as slurry, and is discussed in the following section – Nutrient Balance. This system will be completely separate from the gun irrigation system in the makai areas of the farm. A mixture of suspended solids, liquid effluent, and irrigation water will form the slurry mix, which will be pumped from the settling pond via underground piping to hydrants around the farm to which the hard-hose reel gun system connects.

The actual amount of applied irrigation and schedule of irrigation days will depend on the number of rain days and amount of precipitation. Therefore, irrigation demand is further examined on a monthly basis for operational purposes, based upon historical rainfall data, the pasture grass crop evapotranspiration (ET) rates, and average monthly precipitation. Effective precipitation is assumed to be up to 0.80 inches of the daily rainfall amount at the Māhāʻulepū Rain Gauge Station 941.1, with the assumption that rainfall greater than 0.80 inches is either lost to deep percolation into the soil or runoff, thereby reducing precipitation available to the crop (~~TNWRE~~ Group 70, 2016).

Based upon the effective precipitation, demand estimates and methodology described in the Nutrient Balance Analysis (Appendix D), an Irrigation Water Management Plan, which will detail specific farm operating procedures, will be developed to provide the farm operator a plan for proper management and application of irrigation water to allow efficient use of water, minimize energy consumption, and maximize crop yield.

3.5.4.2 Nutrient Balance

NRCS provides technical guidance on applying agricultural waste depending on the desired use of the waste. Where waste is utilized as a resource, it is being used for the constituent components that provide benefit.

Nutrient management is the practice of managing the amount, rate, source, method of application, and timing of plant nutrients and soil amendments. The NRCS Conservation Practice Standard 590 (referred to as Standard 590), Nutrient Management, ~~is applied~~ applies to commercial fertilizers, organic by-products, waste water, organic matter, and irrigation water. The timing and application of nutrients should correspond as closely as practical with plant uptake, soil properties and weather conditions. The NRCS Standard 590 purpose, as reflected in a Nutrient Management Plan, is to:

- Budget, supply and conserve nutrients for plant production;
- To minimize agricultural nonpoint source pollution of surface and groundwater resources;
- To properly utilize manure or organic by-products as a plant nutrient source;
- To protect air quality by reducing odors, nitrogen emissions, and the formation of atmospheric particulates; and
- To maintain or improve the physical, chemical, and biological condition of soil.

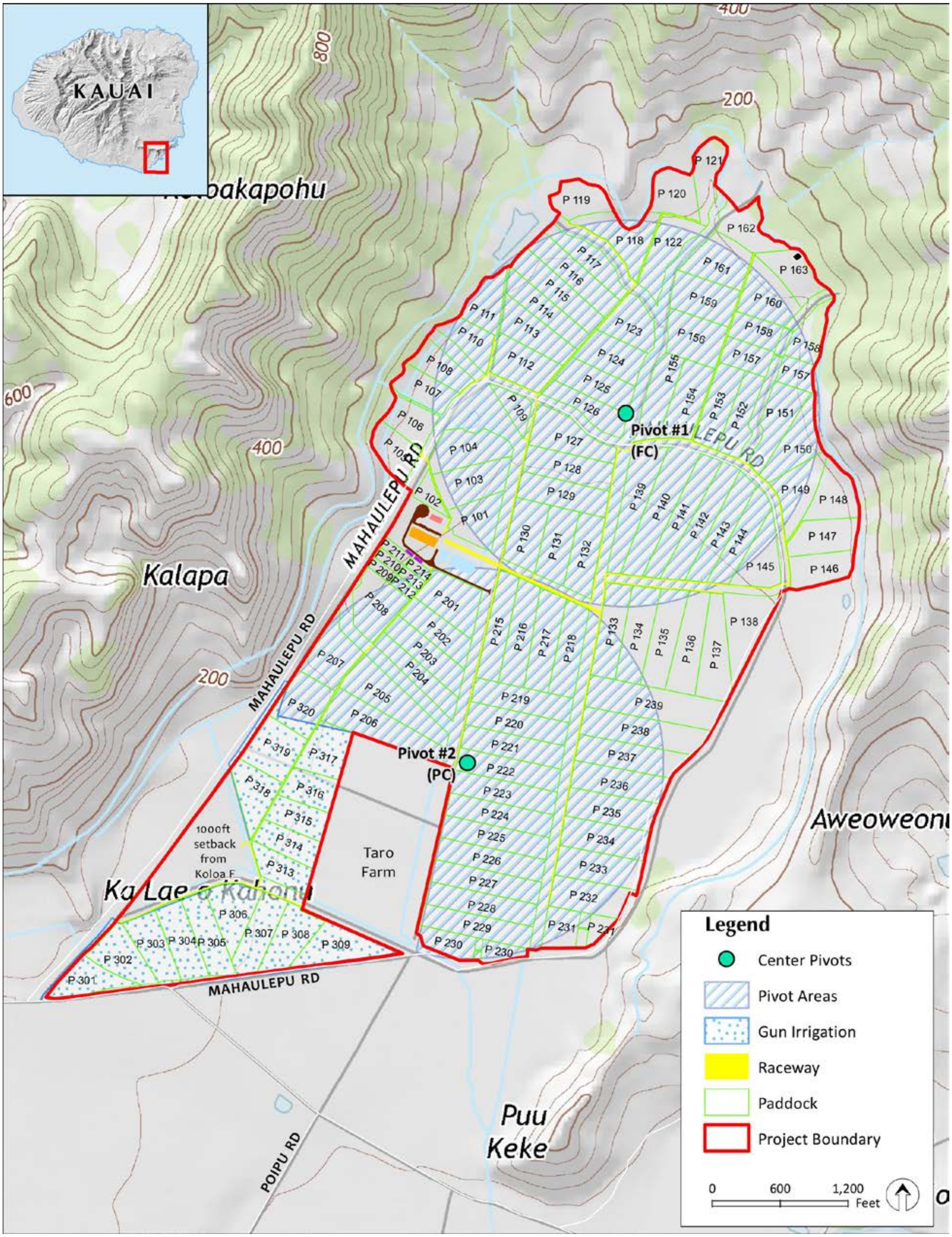


Figure 3.5-45 Irrigated Pasture Area

A Technical Service Provider knowledgeable in NRCS Conservation Practices was retained to work with HDF technical advisors in determining a nutrient balance for the Māhāʻulepū site. Application of manure can be beneficial to soils by improving organic matter, increasing infiltration of water, and improving the soils' ability to support pasture growth and root establishment.

The Nutrient Management Plan (NMP) developed for HDF includes the following required components:

1. An inventory of nutrient sources on the farm, including manure and crop residues.
2. Nutrient analyses of each of these sources.
3. A budget to supply and conserve nutrients for plant production
4. Soil tests to determine the nutrient needs of the crops to be grown.
5. Procedures for when and how to apply the manure to maximize crop benefit and minimize the potential environmental impacts of the nutrients.
6. Best Management Practices that minimize the potential for nutrient loss from the fields.
7. Best Management Practices that minimize agricultural sources of pollution to surface and groundwater resources.
8. Procedures to monitor and maintain or improve the physical, chemical, and biological condition of the soil.

It is important to note that the NMP is an adaptive management tool. Sometimes described as a "living, breathing document," the nutrient conditions are constantly monitored and the NMP will be updated as conditions on the dairy mature. The results from soil testing, manure testing, and forage testing will be utilized to update and inform the nutrient management process for HDF. Tests will be performed annually at a minimum, and more frequently as needed to assist with nutrient management on the farm.

Liquid effluent, containing vital nutrients for the Kikuyu crop growth that support and feed the mature dairy cows on pasture, will be applied through either of the two center pivots, providing a total application area of 285.1 acres. This represents the pasture area under the pivots, excluding access roads, cow raceways, dairy facility, and the 50-foot liquid effluent setback from drains/waterways. Priority areas for nutrient application will be recently grazed paddocks that are in a regrowth period for approximately 18 days – a "rest" period for the paddocks, as the grass will require significant nutrient during its regrowth phase.

Soil moisture and the amount of precipitation will also determine the actual amount of both irrigation water and effluent to be applied in an application. Any deficit below field capacity determines the amount that can and may be applied. The frequency and number of heavy rain days will dictate the schedule of both irrigation water and effluent application. The maximum flow rate from the pump injecting the effluent from the storage pond is 320 gallons per minute (gpm). During the 48-hour cycle, roughly 0.12 inches of effluent water is applied via injection into the irrigation water to the center pivot, as part of the 0.39 inches of total irrigation per cycle.

The following liquid effluent setbacks are incorporated into the design to prevent application of effluent within the distance specified below:

- County Well Kōloa F – **1,000 feet** on all sides (through County DOW agreement)
- Irrigation ditch, agricultural water, and natural water resource - **50 feet** from top of bank of the water resource on both sides.
- Cow walkways and races - **6 feet** on both sides
- Existing taro farm - **20 feet** on all sides

The setback distances from water resources are based upon requirements contained within the "Guidelines for Livestock ~~Waste~~ Management", by DOH with the University of Hawaiʻi Mānoa, College of Tropical Agriculture and Human Resources (CTAHR). While the minimum setback distance for the application of effluent from public drinking water sources is 50 feet per the Guidelines, HDF has agreed to increase this setback to 1,000 feet from Kōloa F well following consultation with the County of Kauaʻi Department of Water. Within this setback, no effluent will be applied and no animals will deposit manure as the area will not be used for grazing.

Based upon the areas served by each pivot, 0.54 MG of effluent can be applied by Pivot #1 and 0.39 MG of effluent can be applied by Pivot #2 per run. Each run lasts for a 48-hour cycle. These quantities are well below the irrigation demand of the crop for the 48-hour cycle during the spring, summer, and fall months. The storage pond effluent level will be lowered after each application cycle, as effluent applied by just one run of either pivot is greater than the daily effluent generation of 0.038 MGD at the contemplated herd size of up to 2,000 mature dairy cows.

When soils are saturated, irrigation and effluent application will be delayed until the soil structure can take additional water. Pond levels will be maintained at an operation level that allows capacity to store - in addition to capacity for the 25-year, 24-hour rainfall event - normal precipitation for up to 30 days, suspended solids and effluent from the contemplated herd size of up to 2,000 mature dairy cows, and slurry mixing volume. At 699 mature dairy cows, less effluent is produced allowing for even greater storage capacity and operational buffer. Each application of liquid effluent will be managed by area and volume, to ensure nutrients do not exceed crop demand.

Solids (mostly soft organic matter, but also some sand and mud, etc.), mixed with liquid effluent or irrigation water into a suspension, will be applied on designated areas, at a minimum of every 5 weeks (within 45 days), and it will be applied through a rotating gun system, utilized only for slurry. The slurry gun system is separate from the irrigation gun system used at the makai side of the farm. At 699 mature dairy cows, the area where the slurry will be applied is typically in non-irrigated areas, which are outside of the liquid effluent application area from the center pivot as well as the gun irrigation system. At 2,000 mature dairy cows, slurry can be applied to non-irrigated areas, which are outside of the liquid effluent application area from the center pivot, as well as areas under the gun irrigation system. Management of the placement of slurry helps to ensure that nutrients or irrigation water are not excessively applied in any particular area, in ~~exceeding~~ exceedance of crop demand.

HDF anticipates slurry application more frequently than the maximum 45 day time frame, to manage effluent levels within the settling pond and reduce the overall volume utilized within the storage pond. If slurry is removed more frequently from the settling pond, more liquid effluent generated by the washdown of the dairy facility would be utilized in the settling pond's mixing volume for slurry application in lieu of being collected in the storage pond and injected into the center pivots irrigation system, as the settling pond would be more frequently empty. This allows for additional buffer capacity in the storage pond system. Each application of slurry will be managed by area and volume, to ensure nutrients do not exceed crop demand.

Each application of nutrient, whether as-excreted manure from the cows on pasture, liquid effluent from the center pivots, or slurry application, ~~must~~ will be managed by area and volume to ensure nutrients do not exceed crop demands. Such management is summarized in a nutrient mass balance analysis. Refer to Appendix D. An overview of Hawaiʻi Dairy Farm's planned nutrient mass balance for 699 mature dairy cows is shown in the following table. The mass balance for the contemplated herd size is provided in Section 3.8.3.

Table 3.5-1 Nutrient Mass Balance for Committed Herd Size up to 699 Mature Dairy Cows

Nutrient Application	Area (acre)	Nitrogen Applied (lbs N/ year)	Phosphorus Applied (lbs P_2O_5 / year)
Manure As- Excreted	469.9	129,556	26,996
Liquid Effluent	285.1	11,980.8	2,586.7
Slurry Application	42.0	7,987.2	1,724.4
Total		**149,524**	**31,277**
Plant Nutrient Demand		**490,200**	**87,317**
Percentage from Animals		30.5%	35.8%
Required Chemical Fertilizer		340,676	56,040
Percentage Demand from Fertilizer		69.5%	64.2%

The nutrient mass balance approach for HDF assumes that 100 percent of the *manure* nutrients are 100 percent available at the time of application. This is a very conservative way of calculating nutrients that are available for crop uptake, and ultimately the stocking density and number of animals that can be supported on the pasture. Because of nitrogen dynamics, most nutrient management plans only account for 50 percent of the nitrogen to be plant available while the other 50 percent is lost to the environment through volatilization. This nutrient balance analysis does not take any volatilization into account.

Plant nutrient uptake is also inefficient with respect to phosphorous because of the extensive sorption and binding reactions of phosphorous with the soils at the HDF site, sharply reducing the amount that is plant available. This mass balance uses the full amount of *manure* nutrients applied to the fields, whether it is irrigated, applied as slurry, or is excreted by the cow directly onto the pasture, as available to the crop, in the management of the farm's nutrient cycle and to determine the overall stocking density. If volatilization or soil sorption were taken into account, more *manure* nutrients (and more cows up to 2,000) could be used to maintain a healthy pasture and soil/crop nutrient balance.

While the nutrient deficits shown in Table 3.5-1 represent the supplemental fertilizer required for the Kikuyu crop, it are not an exact accounting of the total amount of *commercial* nutrients that must be applied to maintain high forage productivity and soil health. Rather, these values only represent the net amount of nutrients that need to be provided to and utilized by the crop through *commercial* fertilization, beyond the nutrient that is available to the crop from *manure* sources. Fertilization, especially the application of commercial nitrogen, can be inefficient with actual requirements with respect to forage production, and fertilization needs can be as much as 25 to 50 percent greater than the arithmetical difference resulting from a mass balance calculation - due to volatilization or soil sorption (Yost & Krueger, 2016). It should be noted and planned that the *commercial* fertilization requirements to maintain high forage productivity and soil health can exceed the simple arithmetic difference between the nutrients applied by manure and the forage uptake.

~~While these two factors in nutrient availability may seem contrary to each other in nutrient management analyses,w~~ Where it would appear that *manure* nutrients are 100 percent available to the crop but more *commercial* nutrients would be needed due to inefficiencies in fertilization, the *manure* nutrient application and availability are first and foremost~~,~~ the primary factors in measuring the stocking density of the farm, as the manure is the primary source of nutrients for the kikuyu crop. The *commercial* nutrient application is only meant to provide the needed deficit of nutrients to the crop, beyond what is provided by the manure, to maintain high forage productivity and soil health. The inefficiencies of nutrient application from a mass balance perspective and from a commercial fertilization perspective do not have the same impacts on the pasture-based rotation grazing dairy system. By assuming 100 percent of *manure* nutrients are available to the crop (though it is anticipated that nutrients are lost to volatilization of nitrogen and soil sorption of phosphorous), HDF is proposing a very conservative mass balance approach that reduces the stocking density of the farm. By understanding that *commercial* fertilizers are inefficient due to these same dynamics, HDF is realistic in its commercial fertilizer expectations and what is needed to provide the remaining nutrients to the crop that it does not get from manure sources.

3.5.4.3 Contingency Scenario

The ponds are sized to accommodate 30 days of storage for up to 2,000 mature dairy cows and more than 85 days of storage for 699 mature dairy cows. The ponds will also provide storage for normal precipitation over 30 days and rainfall from the 25-year/24-hour event. It will be highly unlikely that the storage pond will be full at any time for the contemplated 2,000 cow dairy and nearly impossible for the committed 699 cow dairy. For the pond to become full would require a number of extremely low probability events occurring at the same time (large storm events in tandem, extended heavy rain periods, no irrigation days, and no application of the settling pond slurry). Throughout the 30-day storage period, effluent is planned for application for any irrigated pasture area every 4 days and the slurry application is expected at least once every 45 days, ensuring that the pond levels are kept at manageable levels.

Nonetheless, if the storage pond were full, the time to completely empty the pond is around 100 hours, if a cataclysmic storm was forecast. If warranted due to potential impact from the approaching storm event, the settling pond could also be pumped empty within an additional 36 hours. If the forecasted storm is forecast six days prior, then virtually no effluent would remain in the ponds when the storm arrives.

3.6 OFFSITE MILK PROCESSING

Under the proposed action, HDF will sell raw milk wholesale to a processor/packager. Milk processing includes pasteurization, bottling and packaging of milk. A processing facility would need refrigeration units, bulk product storage, bulk product transfers to containers, finished product packaging, and trans-shipment staging and loading.

Milk was processed by Meadow Gold at a facility in Puhi until the closure of Kauaʻi's last dairy at Moloaʻa (Meadow Gold) in the year 2000. The Puhi, Kauaʻi facility could be retrofitted with cooperation from Meadow Gold, the state's only current milk processor and bottler with operational facilities on Oʻahu and Hawaiʻi Island. One option for retrofitting the existing facility could be to pasteurize milk on Kauaʻi, then ship the pasteurized milk to another island for processing and packaging. Another option could be to retrofit the existing facility to bring the milk to market by pasteurizing, bottling, and packaging on Kauaʻi. This would be similar to the production of milk from the two existing dairies on the Big Island, where the majority of milk produced and processed is also on the Big Island. In addition to fluid milk, other milk products such as soft cheeses and yogurt could be produced as added-value products. Determination as to the best option for pasteurization and processing would be made by the processor/packager prior to the start of Hawaiʻi Dairy Farms operations.

It is anticipated that agreements will be established for milk processing at the existing Meadow Gold Dairies Hawaiʻi facility on Oʻahu. Under this scenario, Meadow Gold will take possession of the raw milk on Kauaʻi for shipment. Milk will be trucked in chilled containers from Kauaʻi to the interisland barge dock at Nawiliwili Harbor. Containers will be loaded aboard regularly scheduled interisland barge service, which can carry a variety of cargo including containers and vehicles. Once the barge arrives at its terminal on Oʻahu, containers will be trucked to the existing Meadow Gold processing facility in Honolulu.

Milk processing will be undertaken by the purchaser of raw milk and utilize existing process facilities, equipment, refrigeration units, bulk product storage, finished product packaging, and distribution. Milk and milk products would ultimately be sold to supermarkets and retail stores on Oʻahu, and possibly distributed to customers throughout the State.

3.7 OFFSITE HERD MANAGEMENT BY KAUAʻI RANCHERS

The milk production cycle of a cow begins after birth of a calf, when lactation begins. Newborn calves will be housed on the Māhāʻulepū site and provided essential colostrum and nutrients for a healthy start. During the calves' initial 90 days, they will be transitioned to pasture at HDF before transfer to ranches on Kauaʻi to be raised offsite. The permitted herd size of 699 mature dairy cows at the Māhāʻulepū site applies to mature dairy cows. Animals in various stages of lactation and rest will be transferred between HDF and other ranches as needed for animal health and dairy productivity. This will both benefit the dairy, and infuse the beef market in Hawaiʻi with a new, local source of pasture-raised calves. Male calves will become part of the beef cattle herd; heifers (female calves that haven't given birth) will be raised until returned to the HDF herd as a birthing/milking cow.

Two ranches on Kauaʻi have initially expressed an interest in taking HDF calves and cows. Makoa Ranch near Kapaʻa is an active cattle ranch run by the Farias family. The ranch will care for dry cows during an annual resting period, and raise calves until ready for return to HDF pasture. Calves suitable as beef cattle will be incorporated into the Makoa Ranch herd or sold to other ranching operations. "Close-up cows", or those cows returning to milk production at HDF will initially be transferred to ʻOmaʻo Ranch for transition.

Annually, dairy cows are rested or "dried" for 60 days before returning to milk production. The existing ranch operations are established and require no additional facilities, permits, or improvements to have fluctuation in herd numbers, which is typical of cattle operations.

For the initial two years of operation with the committed herd size, approximately 600 cows and calves will be managed offsite. When the herd has matured to the full 699 dairy cows, the number of animals to be managed offsite will be approximately 1,100. Section 3.8.4 shows the number of offsite animals under the contemplated herd size.

3.8 CONTEMPLATED HERD SIZE

3.8.1 BUILDINGS AND AGRICULTURAL INFRASTRUCTURE

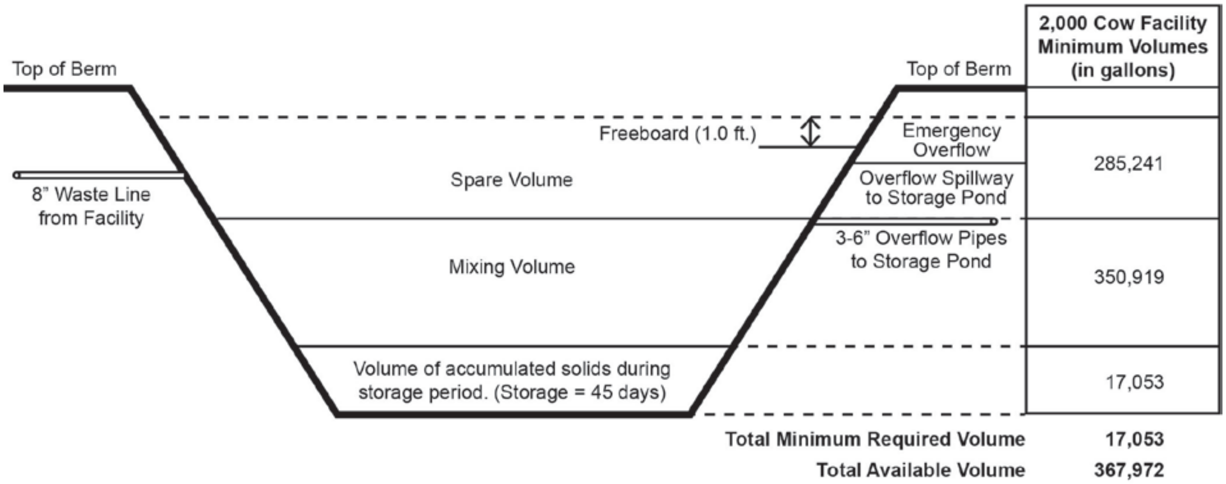
The building design and agricultural infrastructure is capable of accommodating both the committed Proposed Action herd size of up to 699 mature dairy cows, as well as the contemplated Proposed Action of a possible expanded herd up to 2,000 mature dairy cows. The number of animals moving through the dairy facilities would increase under the contemplated herd size. Specific differences between the committed and contemplated herd size are discussed in the following.

Potable water demand will increase with additional cows under the contemplated potential future herd size. Another 25 gpd per animal for drinking water is required, increasing the livestock water demand by approximately 12,500 gallons daily to a total of 50,000 gpd. Additional wash water of 17.4 gpd per animal would be required; this would increase demand by 22,640 gpd. The total potable water demand for up to 2,000 mature dairy cows would be 84,800 gpd, an increase of 54,800 gpd over the committed herd size.

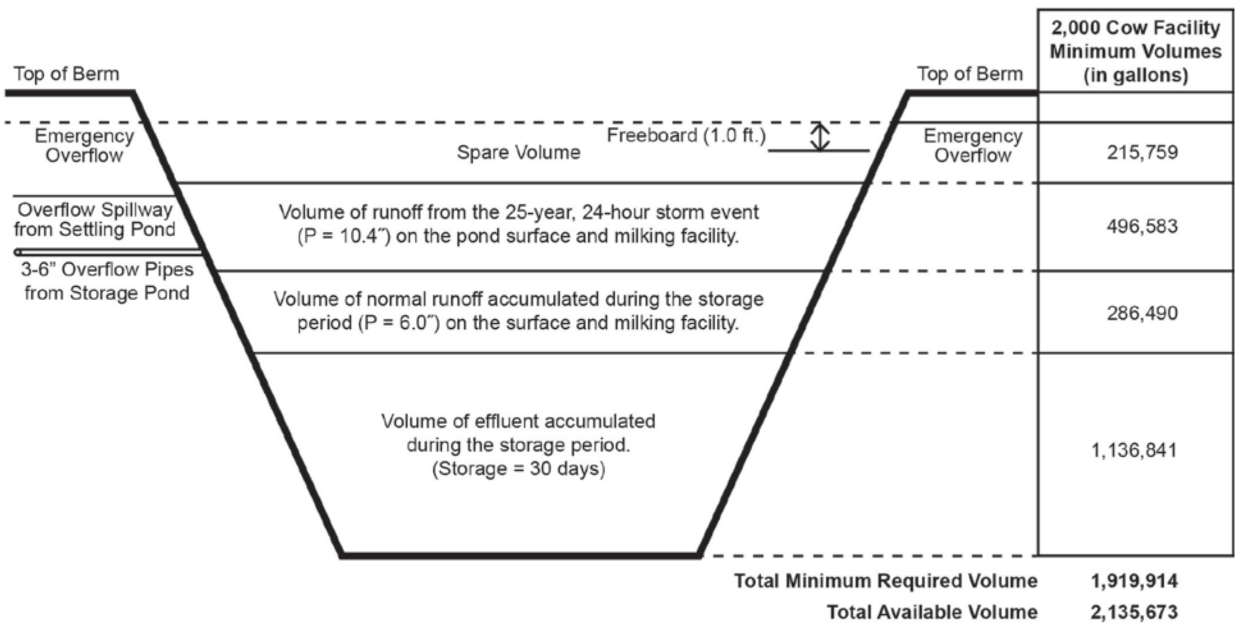
Table 3.8-1 Effluent Pond Sizing Criteria for Contemplated Future Possible Herd up to 2,000 Mature Dairy Cows

Design Criteria/Assumption	2,000 Mature Dairy Cows	Pond
Daily Wastewater Generation	**37,895.0 gpd**	
Percentage of Solids	1%	Settling
Volume of Accumulated Solids for 45-day Period Between Application	17,052.6 gal	Settling
Daily Effluent Flow to Storage Pond	**37,895.0 gpd**	
Minimum Volume of Effluent Storage for 30-day Design Volume Period	1,136,841 gal	Storage
Depth of 25-Year, 24 Hour Storm	10.4 inches	Storage
Depth of 30-day Design Volume for Normal Precipitation	6 inches	Storage

As described in Section 3.3.2, the effluent ponds have been designed in accordance with NRCS and University of Hawai'i guidance, and were reviewed by the Department of Health in the 2014 HDF Waste Management Plan. The pond design is the same for the committed and contemplated herd sizes. The regulatory design requirement is containment of generated effluent from an adequate storage period based on utilization, ~~for 30 days of effluent storage for the herd size,~~ plus precipitation and run-off from the 1.75-acre, uncovered portion of the facility that will receive manure and wash water, and precipitation from the 25-year, 24 hour storm event. The storage period HDF proposes is 30-days. The HDF pond design includes ~~excess~~ volume equivalent to 30-days of normal precipitation to the surfaces surrounding the pond and provides an additional buffer of 12 percent for spare volume for the 2,000-cow scenario.



Settling Pond Typical Section and Volumes



Storage Pond Typical Section and Volumes

Figure 3.8-1 Effluent Pond Plan and Section for Contemplated Herd of up to 2,000 Mature Dairy Cows

3.8.2 HERD MANAGEMENT

Under the contemplated Proposed Action of an expanded herd, cows will be managed in larger groups (300-330 cows per mob). It takes more time to milk the entire mob, corresponding to an increase in animal numbers. However, the individual milking time for each cow remains 8- to 10-minutes per cow. The number of paddocks and the acreage remains the same.

With the contemplated herd of up to 2,000 mature dairy cows, there will be approximately 500 calves at any one time, 167 of which will be housed within the calf sheds. This is an increase of 350 calves over the committed herd size model.

3.8.3 PASTURE MANAGEMENT

Pasture management for the contemplated herd size of up to 2,000 mature dairy cows is similar to the committed herd size. The 469.9 acres of pasture will be divided into paddocks ranging from 3 to 5 acres in size. Mobs of 300 – 330 cows will graze adjacent paddocks, and move to the milking parlor one mob at a time twice each day.

It is expected that grass yields will improve by several tons per acre with establishment of the committed herd size of 699 mature dairy cows having provided organic nutrients from manure. As explained in Section 3.5.2, the organic matter will result in improved soils and more efficient nutrient uptake by plants. Yields achieved during trials at the HDF site have conservatively averaged 16.3 Tons of Dry Matter (DM) / acre / year taking into account seasonal variations in production and the irrigated and non-irrigated field areas. With manure and cows on site, yields are anticipated to rise, and HDF anticipates a future yield of 20 tons (U.S.) of Kikuyu dry matter production per acre per year.

The contemplated herd size would produce additional manure both within paddocks and in the milking parlor, providing additional organic nutrients and reducing the requirement of supplemental commercial fertilizer. As a conservative estimate, the nutrient mass balance for the contemplated herd size assumes the grass yields do not increase. As shown in Table 3.8-2, the percentage of nitrogen provided by animals is 88.3 percent, an increase of 57.8 percent over the amount provided by the committed herd size (shown in Table 3.5-1). The percentage of phosphorus increases by 68.4 percent from the amount provided by the committed herd size.

Table 3.8-2 Nutrient Mass Balance for Contemplated Herd Size up to 2,000 Mature Dairy Cows

Nutrient Application	Area (acre)	Nitrogen Applied (lbs N/ year)	Phosphorus Applied (lbs P_2O_5 / year)
Manure As- Excreted	~~478.5~~ 469.9	374,308	78,293
Liquid Effluent	285.1	35,013.7	7,631.7
Slurry Application	171.0	23,342.5	5,087.8
Total		**432,664**	**91,012**
Plant Nutrient Demand		**490,200**	**87,317**
Percentage from Animals		88.3%	104.2%
Required Chemical Fertilizer		57,536	(3,695)
Percentage Demand from Fertilizer		11.7%	(4.2)%

Total calculation for phosphorus provided by animals exceeds the plant demand at the dry matter yield of 16.3 ~~T~~tons of DM/acre/year. With a one-ton increase, to 17.3 ~~T~~tons of DM/acre/year, phosphorus will return to a deficit and require supplemental commercial fertilizer.

Nutrient management and mass balance analyses are dynamic and are influenced by the many different environmental variables that enter into nutrient cycle planning. Variables include grass yields, stocking density, manure nutrient content, soil nutrient content, and crop nutrient content. Several management options exist to keep phosphorus and other nutrients in balance, which may include and are not limited to: improved soil health from initial additions of phosphorus, reduction in contemplated herd size to approximately 1,875 mature dairy cows, or the expected increase in the grass yields from 16.3 tons of DM per acre per year to 20 tons of DM per acre per year (though an increase to 17.3 tons of DM per acre per year would be sufficient to bring phosphorus applications back into balance with crop demand and eliminate any phosphorus overage). Higher grass yields would demand additional phosphorus. Nitrogen from commercial fertilizer would be required at both 1,875 and 2,000 mature dairy cows.

3.8.4 OFFSITE HERD MANAGEMENT

As shown in Section 3.4, the cows managed offsite include cows returning to productivity at HDF, cows in rest, heifers raised until becoming productive dairy cows at HDF, and baby steers available for beef operations. Initially, the contemplated herd size of up to 2,000 mature dairy cows at HDF will provide an additional 900 cows for other ranches to manage. With the contemplated herd fully operational, approximately 2,000 cows will be managed by other ranches.

3.9 PROJECTED COSTS

Total project development costs are estimated to be between $9.5 and $11.5 million. These costs included projected construction needs as well as related equipment expenses to fully develop the project.

3.10 IMPLEMENTATION AND PERMIT SCHEDULE

The timing for implementation of the dairy development is tied to the completion of plan reviews, document reviews, permits and approvals. Table 3.10-1 provides a summary of permits required and status, and an implementation timetable.

Table 3.10-1 Permit Listing and Implementation Timetable

Permit / Milestone	Agency	Status	Dates
Committed Herd Size (699 Mature Dairy Cows)			
Conservation Plan	NRCS / WKSWCD	Reviewed/ Approved	8/2013 12/2013
Grading Permit Agriculture Exemption	COK	Approved	03/2014
Individual Wastewater System (IWS)	HDOH	Approved	04/2014
Waste Management Plan, Phase 1 (699 Cows)	HDOH	Reviewed	10/2014
Section 404 Permit Exemption	USACE	Approved	10/2014
Building Permit	COK	Extended Approved Indefinitely	~~11/2014~~ 180 Days from EIS acceptance
Monitoring Well Construction Permits	DLNR CWRM	Approved	07/2015
NPDES – General Permit for Construction Activities	HDOH	In Progress	12/2016
Conservation Plan Update	NRCS / WKSWCD	In Progress	~~2016~~ 2017
HRS Chapter 6E – Historic Preservation Review	DLNR/SHPD	~~In Progress~~ Determination of No Impact	Dec. 19, 2016
Anticipated EIS Acceptance	HDOH	In Progress	~~2016~~ 2017
Construction Mobilization	HDF		2017
Facility Construction (Milking Parlor, Sheds, Holding Yard, Ponds)	HDF		2017 - 2018
Farm Infrastructure (Roads, Wells & Pumps, Piping, Power, Fencing, Crossings)	HDF		2017 - 2018
Paddocks and Pasture (Grass Establishment)	HDF		2017 - 2018
Milk Producer Permit / Operational Permits	HDOH / USDA		2017
Permit Closeout / Certificate of Occupancy	HDF		2017
Start of Operations (699 Mature Dairy Cows)	HDF		2018
Contemplated Herd Size (2,000 Mature Dairy Cows)			
Waste Management Plan (2,000 Cows)	HDOH		To be determined
NPDES – CAFO Permit (2,000 Cows)	HDOH		To be determined

4.0

ENVIRONMENTAL SETTING, POTENTIAL IMPACTS, AND MITIGATION MEASURES

4.0 THE ENVIRONMENTAL SETTING, POTENTIAL IMPACTS, AND MITIGATION MEASURES

This chapter describes the existing environmental conditions and identifies probable impacts of the proposed project. "Environmental conditions" include human and economic conditions as well as natural resources. Strategies to mitigate significant impacts are identified.

As described in Section 2.4, Hawaiʻi Dairy Farms (HDF) is committed to establishing a herd of up to 699 mature dairy cows to demonstrate the pasture based, rotational-grazing system is an economically and environmentally sustainable model for Hawaiʻi. With proven success at a herd size of 699, HDF may contemplate possible expansion of the herd in the future. A possible expansion of the herd would require additional permits that would be sought at such time as HDF may decide to pursue an expanded operation. However, to fully disclose potential impacts of both the committed herd size and the contemplated, possible expansion up to a 2,000- ~~milking~~ mature dairy cow herd, this chapter presents possible impacts of both herd sizes where applicable.

Sections 4.1 – 4.14 present resource conditions and probable impacts that will not differ between the herd sizes. Impacts that may change with dairy operations at different herd sizes begin with Section 4.15, Demographic and Economic Conditions. Probable impacts and mitigation from the committed herd size of up to 699 ~~milking~~ mature dairy cows are presented in Sections 4.15 through 4.20. Probable impacts and mitigation for the contemplated expansion of the herd potentially up to 2,000 ~~milking~~ mature dairy cows are presented in Sections 4.21 through 4.26.

4.1 CLIMATE

Climatic conditions affect the growth of forage and the health of dairy cows. Heat stress can reduce the productivity of dairy cows, and suitable climatic conditions were an important consideration in siting the dairy. Cows in the pasture-based system are on pasture 22 hours of each day and therefore exposed to natural airflow with ample space between animals for cooling. Selecting an appropriate breed of cow for Hawaiʻi's climate was another important consideration for HDF.

Potential climate change effects on future dairy operations are also discussed, though climate effects would not be created by the proposed project.

4.1.1 Existing Conditions - Climate

The Poʻipū area is generally known for its mild conditions. Temperatures range from 72 to 86°F in the summer months, and 64 to 80°F in the winter. The area's climate is greatly influenced by its inland location and valley topography. Winds in the Poʻipū area are generally from the east-northeast direction (tradewinds) ranging from 5 to 15 miles per hour. Wind conditions vary depending on season and weather conditions, as occasional storms can generate strong Kona winds from the south and land breeze circulations develop during times of weak tradewind conditions.

Meteorological data for 2014 was obtained for the project site. Depicted on a windrose, the data shows predominant winds from the northeast. The strongest winds come periodically from the southwest. Calm conditions occur just 1 percent of the time (Figure 4.1-1).

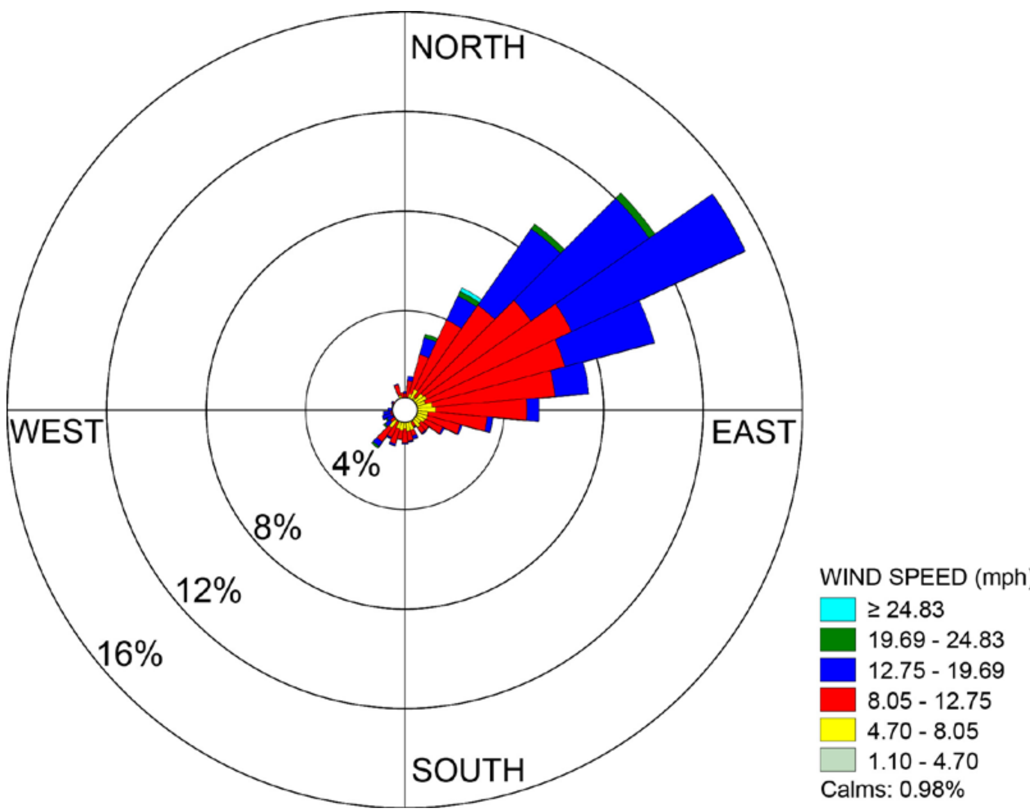


Figure 4.1-1 Wind Direction and Wind Speed for Māhāʻulepū Valley

Average rainfall in Māhāʻulepū is just under 50 inches annually.

Table 4.1-1 Average Monthly Rainfall Data

Record Period: 1904 - 1983	
Month	**Mean Monthly Rainfall (inches)**
January	4.88
February	4.20
March	5.04
April	3.66
May	3.05
June	2.86
July	3.13
August	3.20
September	3.25
October	4.96
November	6.01
December	5.71
Annual	**49.95**

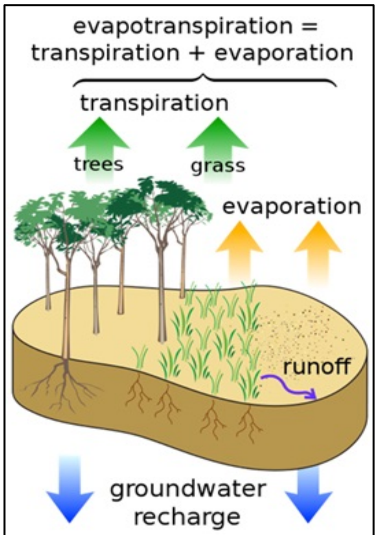
Source: Giambelluca et al. 2013

Rain gauge data for a rain gauge located near the site off Māhāʻulepū Road ("Māhāʻulepū 941.1") was obtained from National Oceanic and Atmospheric Administration (NOAA) National Climatic Data Center. The data reveal that more than a week of consecutive rain is very unusual for Māhāʻulepū Valley. The rainfall events for 30 years were recorded (a total of 10,957 days from 1/1/1984 to 12/31/2013) and ranked based on days of consecutive rainfall (DAPR) including days of insignificant rainfall. ~~and t~~The corresponding multiday precipitation total (MDPR) is shown below. Table 4.1-2 shows only 5 occurrences in the last 30 years with more than a week of consecutive rain. And rainfall exceeded 2 or more inches of rain during only 4 of those occurrences, with 2.6 and 3.7 inches recorded (highlighted in following table).

Table 4.1-2 NOAA Rain Gauge Data`

GHCND:USC00515710 - MĀHĀʻULEPŪ 941.1 HI US			
DATE	**MDPR (inches)**	**DAPR**	**Occurrence**
19960108	1.90	17	1
19920922	2.60	12	1
19930104	3.70	7	3
19960930	0.20	7	3
19980105	1.48	7	3
19920928	0.02	6	5
19940105	0.03	6	5
19960923	0.03	6	5
19970106	0.05	6	5
20031229	0.20	6	5
19861229	0.04	5	21

Solar radiation in the project area is estimated to range from a low of 155.2 watts/square meter in January to a high of 234.5 watts/square meter in June, with an annual average of 196.6 watts/square meter (Giambelluca et al., 2014). This is in comparison to the highest solar intensity for Kauaʻi in the south Poʻipū area, estimated to range from a low of 164 watts/square meter in December to a high of 296.6 watts/square meter in June, with an annual average of 238.5 watts/square meter. The solar radiation values are estimates, as routine monitoring of solar radiation occurs at relatively few locations in Hawaiʻi. University of Hawaiʻi researchers have estimated values across the State by combining modeling with observations from ground stations and satellites. The effects of clouds and shading on terrain are incorporated. Information on solar radiation informs evapotranspiration which, in turn, informs understanding of the hydrologic cycle (Giambelluca et al., 2014).



Source: Mwtoews

Evapotranspiration is variable and influenced by climate factors, soils properties, and types of vegetation. As evapotranspiration rates are difficult to measure directly, the rates for Hawaiʻi have been modeled and mapped across the state. The modeling was conducted to inform management of water resources and to plan conservation activities under agreement between the State of Hawaiʻi Commission on Water Resource Management and the U.S. Army Corps of Engineers. Additional information can be found at: http://evapotranspiration.geography.hawaii.edu.

Climate Change

Climate change is being observed globally. In Hawaiʻi, trends documented over the last 40 or more years include warmer air temperatures, decreased prevailing northeasterly trade winds, decline in in rainfall, and warming sea surface temperatures (SOEST, 2014). Hawaiʻi's total annual average rainfall has decreased over the last century (Chu, 1995, Chu and Chen 2005 in: SOEST, 2014). Rain gauge stations across Hawaiʻi have recorded a 27 percent decrease in high intensity rain events, while the frequency of low intensity rain events has increased (Timm et al., 2001; Chu et al., 2010 in: SOEST, 2014). Rainfall has become less intense for the western islands (Oʻahu and Kauaʻi) over the last 60 years, but more intense for the island of Hawaiʻi.

Natural variability in rainfall patterns makes future climate predictions challenging. Rainfall varies based on trade winds, topography, mid-latitude weather systems, storms and cyclones, and phases such as the El Niño Southern Oscillation (Sea Grant and COK, 2014). Climate change scientists use computer models to predict future conditions, and such models have limitations, and varying degrees of uncertainty. Projections for Hawaiʻi at the end of the 21st century are for a general wet-season drying trend, according to two recent assessment reports by the Intergovernmental Panel on Climate Change (IPCC) (Timm et al., 2014). The projected regional rainfall changes represent mostly open-ocean conditions so reliable estimates for change in rainfall over land need to take into account the geometry of islands and orographic features (mountains and their effects on air streams).

Future rainfall anomalies for the main Hawaiian Islands were projected based on a linear statistical downscaling of a global model (Timm et al., 2014). Applied to project both wet and dry season rainfall changes in Hawaiʻi for the middle and late 21st century, the results are thought to be more reliable for the wet season than for the dry season. Dry leeward sides of Kauaʻi (such as Poʻipū), Oʻahu, Maui and Hawaiʻi Island exhibit the strongest drying trends. The wet sides of the islands are likely to see small increases in the average wet-season rainfall amounts. A trend toward drier than normal conditions is estimated to affect all climatically dry regions of the Hawaiian Islands during both seasons (Timm et al., 2014).

Sea level rise predictions also vary by location and under different scenarios. The University of Hawaiʻi Sea Grant College Program (Sea Grant) prepared a technical study *Kauaʻi Climate Change and Coastal Hazards Assessment* as an update to the Kauaʻi General Plan and to assist the County of Kauaʻi with adaptive policies for future climate change related hazards. Based on the best available science, a range of sea-level rise of 1 foot by 2050 and 3 feet by 2100 is a reasonable, and possibly conservative, target for Kauaʻi and other Hawaiian Islands (Sea Grant and COK, 2014). Sea level rise will not directly impact the HDF site, and is not further discussed in this EIS.

4.1.2 Probable Impacts and Mitigation Measures - Climate

Impacts that would be considered significant related to climate could include:

- Increase in solar radiation; and
- Changes to the evapotranspiration cycle from dairy operations.

Greenhouse gas emissions are discussed in Section 4.19.3, Greenhouse Gases.

Short-term Impacts and Mitigation - Climate

Changes to solar radiation and the evapotranspiration cycle large enough to affect climate would be large-scale and long-term. The scale of HDF is not large enough to influence these global cycles. Neither the committed Proposed Action (699 ~~milking~~ mature dairy cows) nor the contemplated Proposed Action (expanded herd of up to 2,000 mature dairy cows) will impact climate conditions in the short-term. No significant impacts are anticipated, and no mitigation would be required.

Long-term Impacts and Mitigation - Climate

The scale of HDF is not large enough to influence global cycles of solar radiation and the hydrologic cycle. Minimal construction and an increase in ground cover density will not affect climate processes. The Proposed Action will increase vegetative density across the pasture areas, which will hold more moisture than the current intermittent coverage of vegetation across the site. The 557-acre site is not large enough to have a regional influence on climate.

Current climate change models project decreased rainfall on the dry leeward sides of Kauaʻi (such as Poʻipū), which will reduce available freshwater resources (Timm et al., 2014). Given the degree of uncertainty in the climate change models, the impact on HDF operations cannot be predicted. Future reduction of available freshwater, in conjunction with projected population and visitor growth, is an issue that must be addressed by State and County, with cooperation from water providers and water consumers.

Neither the committed herd size nor the contemplated herd size will impact climate conditions in the long-term. No significant impacts are anticipated, and no mitigation would be required.

4.2 TOPOGRAPHY

4.2.1 Existing Conditions - Topography

The project site is situated in the valley of Māhāʻulepū ahupuaʻa on the island of Kauaʻi. Māhāʻulepū Valley is located on the leeward side of the Haʻupu mountain ridge, which runs in the east-west direction. The valley is flanked by low ridges. From Mount Haʻupu at 2,297 feet above mean sea level (AMSL), the highest point along the ridge forming the back of the valley, the ground drops steeply down to the valley bottom at an elevation of about 150 feet AMSL.

The upper reach of the dairy farm property begins at the 150 feet AMSL elevation, gradually sloping to an elevation of 60 feet AMSL along Māhāʻulepū Road on the makai side of the project site. Terrain within the dairy typically slopes from 2 to 15 percent, which is the gentle slope required for the comfort of dairy cows when grazing and navigating between paddocks and the milking parlor. Isolated areas of steeper slopes associated with drainages installed by plantation era agricultural operations cross the areas proposed for pasture.

4.2.2 Probable Impacts and Mitigation Measures - Topography

Impacts that would be considered significant related to topography could include:

- Changes to drainage patterns from large-scale excavation, filling, or leveling; and
- Potential for loss of stability.

Facility design utilizes guidance from the Natural Resources Conservation Service (NRCS), National Engineering Handbook (NEH) and from the American Society of Agricultural and Biological Engineers. Conservation practices established in NRCS technical guidance are incorporated both into the design and construction, including the animal walkways (Pacific Islands Area - PI - Code 575), the access road and waterway crossing (Codes 560 and 578), and heavy use area protection (PI Code 561).

The dairy facility and associated infrastructure will be constructed in a 10-acre area located along the site's western boundary. Built facilities within this area will total less than 2 percent of the HDF site: the milking parlor, calving sheds, implement shed; supporting agricultural infrastructure such as silos and stormwater controls; and the section of paved road with truck turn-around. Areas surrounding the built facilities will be graded to create drainage swales and berms, to install underground pipelines, and to modify existing farm roads and establish cow walkways.

Existing drainage ways will be protected from impacts of cows through fencing, to be installed 35-feet from the top of each bank. Within the pasture area, low lying areas, berms, and other features previously installed by former agricultural operations may be smoothed as needed to ~~minimize hazards to cows~~ facilitate productivity of the forage crop.

Best management practices to avoid, control and capture soil erosion from grading and ground disturbance are discussed in Section 4.17, Surface Water Resources. Foundation areas for buildings will utilize cut and fill within the site to minimize disturbances to topography.

Short-term Impacts and Mitigation – Topography

Structural and management controls to limit and route drainage within the construction area are explained in Section 4.17 Surface Water Resource Impacts.

Changes to drainage on the project site in the short-term are not anticipated to be significant as a result of dairy construction. No mitigation is required.

Long-term Impacts and Mitigation - Topography

The existing major drainage ditches on the site will be maintained. Within the 10-acre dairy facility area, swales will be installed as part of the drainage design to route stormwater run-off according to best management practices for livestock operations. In the pasture area, previously installed swales for agriculture and low-lying areas may be smoothed or filled in accordance with NRCS Practice Code for Land Smoothing, to improve surface drainage and uniformity ~~for grazing~~.

Existing farm roads and cow raceways will be elevated above the pasture grade. Surfaces will be slightly crowned to ensure drainage to either side of the road or raceway and swales roughly 12-inches in depth will be created parallel to each road or raceway. Design and installation of roads, raceways and swales will be in compliance with the HDF Conservation Plan and utilize standards from applicable NRCS Practice Codes.

Changes to topography, including improved drainage, are not anticipated to be significant over the long-term. No mitigation is required.

4.3 SOILS

Soil health, also referred to as soil quality, is defined as the continued capacity of soil to function as a vital living ecosystem that sustains plants, animals, and humans. Soil contains living organisms that perform functions required to grow food and fiber. Soil is an ecosystem that can be managed to provide nutrients for plant growth, to absorb and hold rainwater for use during dryer periods, to filter and buffer potential pollutants from leaving fields, to serve as a firm foundation for agricultural activities, and to provide habitat for soil microbes to flourish and diversify to keep the ecosystem running smoothly (NRCS, 2015).

Comments received during the initial scoping for this Environmental Impact Statement (EIS) included a "Custom Soils Resource Report for Island of Kaua'i, Hawai'i." The report was generated from the United States Department of Agriculture (USDA) NRCS website, which allows any internet user to define an area of interest, customize data results, and generate a Custom Soil Resource Report. The user can select or deselect parameters based upon which data the user would like to display. These user-generated reports are not evaluated by NRCS.

4.3.1 Existing Conditions - Soils

The types of soils in Māhā'ulepū Valley and soil properties are both relevant to this EIS. The information presented is based on NRCS soils maps, supplemented with two rounds of independent soil sampling to characterize available soil nutrients and conditions. Baseline conditions and implications for long-term soil health and productivity are summarized in the following section, and recommendations for nutrient management are included in the report attached as Appendix C, *Hawai'i Dairy Farms Soils Baseline Nutrient Status*.

Soil Types

NRCS has mapped and classified soils for more than 95 percent of the United States. Table 4.3-1 summarizes the soil types for the project area. The most abundant soil types occurring throughout the HDF site are Kalihi Clay and Kaʻena Clay Brown Variant. These soils underlay 32 percent and 29 percent of the dairy project area, respectively (Figure 4.3-1). The Kalihi series is described as "poorly drained" soils that developed in alluvium derived from basic igneous rock. Average annual soil temperature is 74°F. The Kaʻena series is described as a very deep soil, also as poorly drained, and is primarily located on alluvial fans and talus slopes on both Oʻahu and Kauaʻi. Elevations of this soil series vary anywhere from 50 to 150 feet.

The classification of soils as poorly drained indicates the relatively slow rate water movement within soil and to surrounding areas. Poorly drained is not an indication of low or poor infiltration. Infiltration refers to the ability of water to enter the soil surface, whereas "drainage" refers to the movement of water within or from the soil profile. Poorly drained soils typically have low hydraulic conductivity (Yost & Krueger, 2016). Hydraulic conductivity is further discussed in the following section, Soil Properties.

Soils classified as poorly drained often exhibit anaerobic conditions. Anaerobic conditions typically result in higher rates of denitrification, which is the conversion of nitrate and nitrite to gaseous forms. This essentially reduces the potential for nitrate impacts on waterbodies. With reduced movement of water through the soil profile, the mobility of nutrients such as potassium and phosphorus is also reduced. Soil types at the HDF site are known to adsorb and retain large amounts of phosphorus. In this way, "poorly drained" soils may represent less risk of nitrate and nitrite leaching to associated waterbodies than "well drained" soils (Yost & Krueger, 2016).

Table 4.3-1 Soils of HDF

Soil Classification Map Unit Abbreviation		Slope Range (%)	Area within HDF (% of total)	Area within HDF (acres)
Hanamaulu Silty Clay	HsD	15 to 20%	2.55%	14.2
Hanamaulu Stony Silty Clay	HtE	10 to 35%	.08%	.5
Kaʻena Clay, Brown Variant	KavB	1 to 6%	28.66%	159.5
Kaʻena Clay, Brown Variant	KavC	6 to 12%	4.09%	22.8
Kalapa Silty Clay	KdF	40 to 70%	0.37%	2.1
Kalihi Clay	Ke	n/a	31.68%	176.4
Kalapa Very Rocky Silty Clay (Very Rocky)	KEHF	40 to 70%	.28%	1.6
Lualualei Clay	LuB	2 to 6%	13.69%	76.2
Pakala Clay Loam	PdA	0 to 2%	2.98%	16.6
Pakala Clay Loam	PdC	2 to 10%	8.61%	47.9
Waikomo Stony Silty Clay	Ws	n/a	7.0%	39.0
Total Acreage				**556.8**

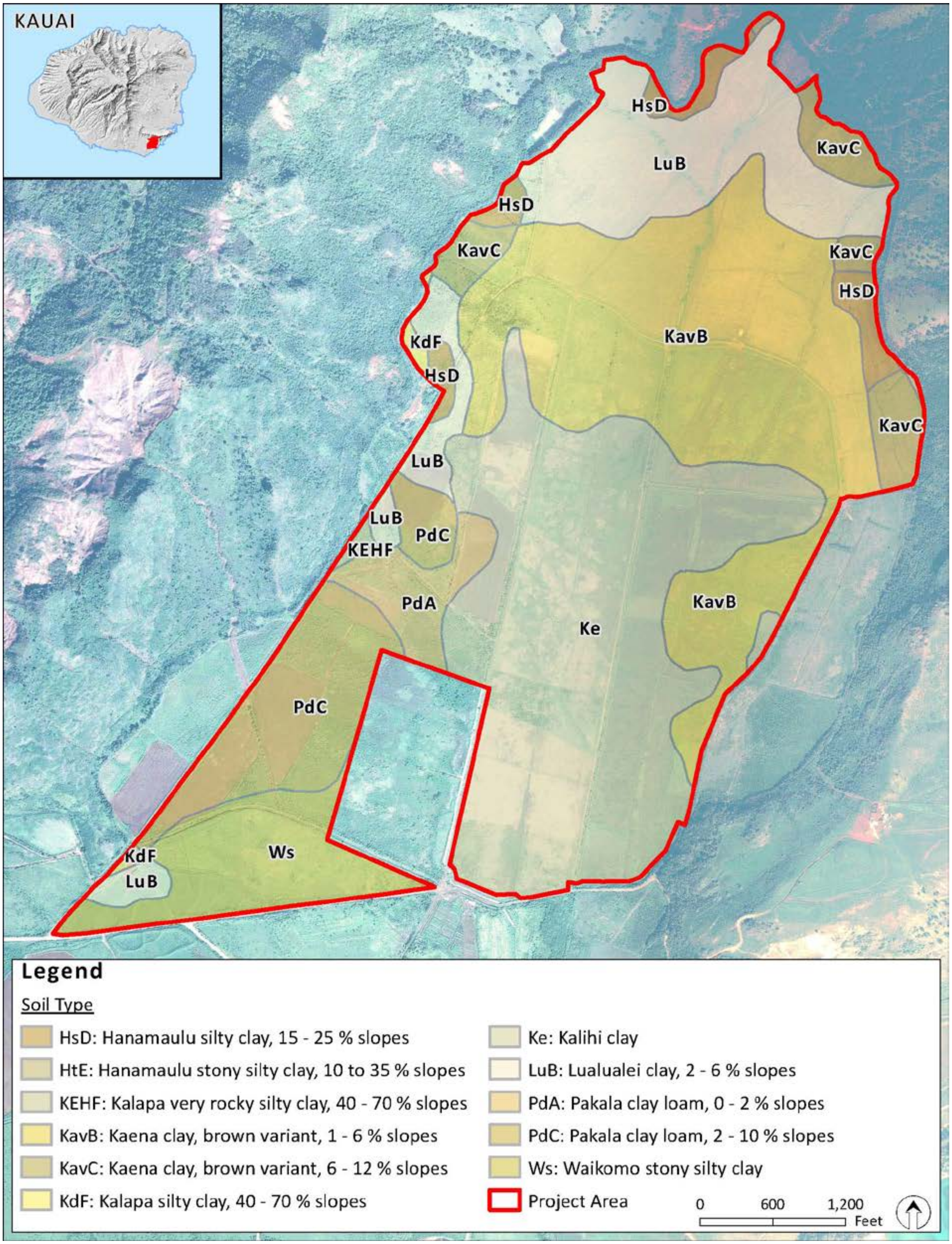


Figure 4.3-1 Soils Characterization at HDF

Soil samples were taken throughout the site in April, 2014 and February, 2015. Laboratory analysis of 2014 soil samples identified pH, phosphorus, nitrogen, potassium, calcium, magnesium, organic matter, salinity, micronutrients and other constituents. The results illustrate that the soils are depleted of nutrients, which is typical for lands formerly used for sugarcane. The soil nutrient status and fertility demands of the primary crop, Kikuyu grass, were used to identify the quantities of nutrients required for productive grass growth. The soils data provide a baseline to guide adaptive nutrient management throughout establishment and maturity of the dairy.

The second round of field sampling was conducted in 2015 by University of Hawaiʻi researchers acting as technical consultants. This sampling focused on evaluation of soils characterized as "poorly drained", and established a quantitative baseline of soil salinity and sodicity to provide for future monitoring of soil health with application of manure effluent. Laboratory analysis determined electrical conductivity and exchangeable sodium percentage, in addition to nutrient levels of nitrogen, phosphorus, calcium, magnesium, and potassium.

The NRCS Nutrient Management Standard provides a phosphorus leaching index for Hawaiʻi soils. The leaching potential for each soil type at HDF is low, with an index value of 10 to 18 which is well below the upper index value of 30 still considered low. The moderate index ranges from 30 to 90, and the high index is for values above 90. Under the NRCS Nutrient Management Standard, on low risk soils, phosphorus can be applied at rates greater than crop requirements, not to exceed the nitrogen requirement for the succeeding crop, if manure or other organic materials are used to supply nutrients. Since the grass crop is not newly planted for each rotation and the growing season is constant and year-round, the phosphorus application is planned to be managed and adjusted to not exceed the crop requirement rate.

Soil Properties

Manure will add organic matter to the soil, which improves soil structure. Higher levels of humus and organic matter compounds can improve porosity of soils, which improves water-holding capacity, infiltration rate, and water-capture efficiency. With improved porosity, rainwater can more quickly penetrate the soil, resulting in less runoff and higher rates of water retention. Uptake of carbon dioxide from the atmosphere by plants is the process of photosynthesis. When cows eat plants, organic carbon is returned to the soils as manure. Forms of carbon that are difficult to break down become stabilized in the soil as humus, which provides stable organic material that maintains soil tilth and enhances the ability of soils to absorb water and nutrients (ATTRA, 2001).

Traditionally, soil has been the largest area of storage for carbon on earth. However, human disruption of the carbon cycle throughout periods of modern industrialization has released excess carbon into the atmosphere and into the oceans, resulting in a lack of stable carbon that was previously stored in soils. Photosynthesis is the greatest catalyst of transferring carbon from the air into soil. Once in soils, carbon feeds soil microbes that assist plants in acquiring nutrients and create stable forms of soil carbon (Center for Food Safety, 2015). Microbes such as mycorrhiza effectively transport a variety of needed nutrients effectively into plants, including nitrogen and phosphorus. High rates of synthetic fertilizers have interrupted the biological efficiency of nutrient uptake by plants; in a biologically active environment, ammonia is rapidly converted into an organic form of nitrogen that cannot be leached or volatilized (Jones, 2015).

In waste treatment, the primary functions of soil are to prevent migration of pathogens to surface water or groundwater, retard and reduce contaminants, and provide a barrier against direct human contact with effluent. A study prepared for the State of Hawaiʻi Department of Health (DOH), Safe Drinking Water Branch identified groundwater zones most at risk from on-site disposal systems by evaluating – among other parameters - soil filtering capacity. Titled *Human Health and Environmental Risk Ranking of On-Site Sewage Disposal Systems for the Hawaiian Islands of Kauai, Molokai, Maui, and Hawaii* (Whittier and El-Kadi, 2014), the study mapped soil hydraulic conductivity state-wide. For adequate treatment to occur, the soil must be permeable enough to prevent saturated conditions, but also have a small enough pore throat diameter to filter pathogens from the effluent. Clay particles act as sorption sites for nitrate and other nutrients. Bacteria in soils can convert reactive nitrogen species into inert nitrogen gas (Whittier and El-Kadi, 2014).

Hydraulic conductivity represents the ability of soils to transport water given a hydraulic gradient, and is expressed in units of feet per day. The hydraulic conductivity of permeable flank lavas in the Hawaiian Islands ranges from hundreds to thousands of feet per day, whereas estimates for less permeable dike-intruded lavas range from 1 to 500 feet per day (Hunt, 1996, in Whittier and El-Kadi, 2014). Figure 4.3-2 depicts the hydraulic conductivity for the south Kauaʻi area. Permeable lavas, represented by a high hydraulic conductivity, increase the distance groundwater can travel before pathogens die-off or contaminants can degrade to a point of being benign (Whittier and El-Kadi, 2014). The weathered alluvium of Māhāʻulepū Valley shows a hydraulic conductivity on the order of 10.5 – 50 feet per day, whereas the adjacent soils of the Kōloa-Poʻipū region is on the order of 201 – 500 feet per day. Therefore, water movement through soils under the proposed dairy site is 10 times slower than the neighboring area, allowing greater time for the remedial properties of soil and associated bacteria to denitrify nitrates and render potential contaminants inert.

Implications of soil hydraulic conductivity in the Kōloa-Poʻipū and Māhāʻulepū regions are discussed in Section 4.16.2, Potable Water.

4.3.2 Probable Impacts and Mitigation Measures - Soils

Impacts that would be considered significant related to soils could include:

- Increased potential for soil loss or erosion;
- Depletion or enhancement of soil nutrients and reduction or increase in organic matter; and
- Creating imbalance of soil nutrients and minerals through application of nutrients in manure and fertilizer.

Minimizing and controlling erosion from construction is discussed in Section 4.2, Topography, and Section 4.17, Surface Water Resources and Nearshore Marine Environment.

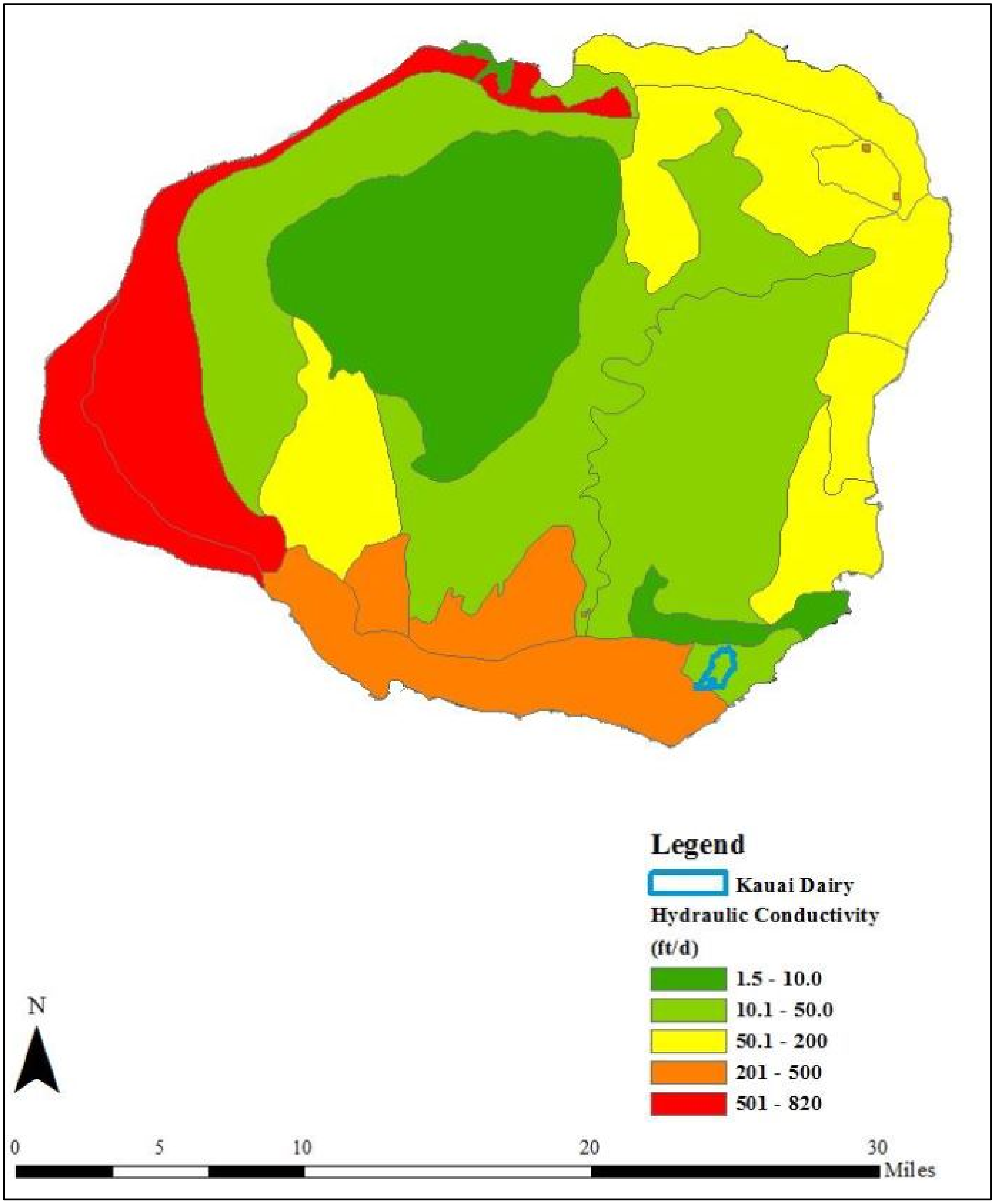


Figure 4.3-2 Soil Hydraulic Conductivity

Short-term Impacts and Mitigation - Soils

Short-term soil impacts during establishment of the dairy farm will include earthwork for the dairy facility, creating cow raceways, paving key road areas within the dairy facility, improvements to existing drainage systems, and installation of effluent storage ponds and utility infrastructure. The dairy project has been granted an exemption under Section 22.7.6 of the County Sediment and Erosion Control Ordinance by the County of Kauaʻi Department of Public Works provided that conservation practices documented in the HDF Conservation Plan are employed.

Soil conservation is a core principal of the Conservation Plan. Applicable conservation practices are listed in Chapter 3, Section 3.2, Conservation Practices. NRCS practice codes identify design and construction standards related to drainage, materials, operations and applicable engineering standards. Work to date at HDF has followed the Conservation Plan, which was been approved by the West Kauaʻi Soil and Water Conservation District in December 2013.

Best management practices are described in Section 4.17, Surface Water Resources and Nearshore Marine Environment. These practices ~~will be~~ are documented in the Stormwater Pollution Protection Plan ~~to be~~ submitted as part of the National Pollutant Discharge Elimination System (NPDES) – Construction Stormwater General Permit Notice of Intent.

Soil loss during construction will be minimized through the various best management practices and controls. Soil loss is expected to be within permitted thresholds. No significant impacts will result.

Long-term Impacts and Mitigation – Soils

The soil types in HDF are classified as poorly drained, depleted of nutrients. Step one to improve soils for sufficient crop growth is to restore nutrients. Nutrients beyond the crop demand will be taken up by the soils, and will begin to build to levels that will be reflected in improved tithe. The soils are suitable for nutrient application, initially a higher percentage of commercial fertilizers followed by increasing organic nutrients from manure as the herd matures. Estimates by the groundwater engineer are two percent of the nitrogen, and one percent of the phosphorus may ~~pass through to shallow ground water and~~ eventually discharge to the ocean (see Section 4.17, Surface Water Resources and Nearshore Marine Environment). The poorly permeable soils allow little movement of groundwater, which provides ample time for denitrification and for biological organisms in the soil to make nutrients available for plants.

The dairy's focus on robust and healthy grass growth will build organic matter in soils through use of manure as a natural fertilizer. Soil can incorporate carbon from the atmosphere, which benefits soil health. According to recent studies in the Soil Science Society of America Journal, the conversion of formerly tilled cropland to grazed pasture can drive substantial accumulation of organic carbons in soil, with a potential to offset up to one-third of the annual increase in atmospheric carbon dioxide (Lal 2004, in Machmuller et al., 2015). The potential soil organic matter and carbon dioxide sequestration benefits are likely greatest in highly degraded soils in warm subtropical climates, partly due to long pasture-growing seasons (Machmuller et al., 2015).

Long-term soil impacts are anticipated to result in improvements to the physical, chemical, and biological condition of the soil.

Opponents to the dairy, specifically the community group Friends of Māhāʻulepū and Kawailoa Development LLP, owner of the Grand Hyatt Kauaʻi, charge that the dairy will have negative impacts on soil conditions and soil health (Volume 4, Appendix 5). The assertions are based on the use of erroneous rainfall data and equating the rotational-grazing system to that of unmanaged grazing and/or traditional confined feedlot dairy operations. HDF stands by the environmental analyses conducted for this EIS, which uses reasonable and diligent processes to disclose all probable impacts and demonstrates the dairy will have beneficial impacts on soil conditions. Appendix 5-A in Volume 4 contains a full response to the comments provided regarding soils.

4.4 LAND USE AND AGRICULTURAL SETTING

4.4.1 Existing Conditions - Land Use and Agricultural Setting

The project area occupies agricultural land in Māhāʻulepū Valley, an area that has a long history of agricultural use, as it was the first place in the island chain where sugarcane was commercially grown. The property is an Agricultural District per State Land Use District designations. The property also features land classified as Prime per the State Department of Agriculture's Agricultural Lands of Importance to the State of Hawaiʻi (ALISH).

In 2005, the State established Important Agricultural Lands (IAL) by statute. The purpose of IAL lands is to conserve and protect agricultural lands, promote diversified agriculture, increase agricultural self-sufficiency and assure the availability of agriculturally suitable lands. The designation process determines that the land meets physical requirements including contiguous, functional land units large enough to allow flexibility in agricultural production near appropriate infrastructure and water, with high soil agricultural productivity ratings under the Land Study Bureau of University of Hawaiʻi.

The State Land Use District Boundaries under the State of Hawaiʻi Land Use Law classify the uses of lands within Hawaiʻi to accommodate growth and development while still retaining the natural resources in the area. The dairy site is situated in the State designated Agricultural District and the County of Kauaʻi designated Agriculture District (Figure 4.4-1).

In 2011, in accordance with Hawaiʻi Revised Statutes (HRS) 205-44 and -45 and Hawaiʻi Administrative Rules (HAR) Chapter 15-15, Mahaulepu Farm LLC filed a petition with the State of Hawaiʻi Land Use Commission (LUC) to designate 1,533 acres of agricultural lands in Māhāʻulepū (including 557 acres that make up the Hawaiʻi Dairy Farm project area) as Important Agricultural Lands (IAL) under the IAL provision of the Hawaiʻi State Constitution (Article XI, Section 3). Figure 4.4-2 shows the IAL designation in the South Kauaʻi region. The IAL designation meets the objectives of HRS 205-42 by contributing to the maintenance of a strategic agricultural land resource base to support a diversity of agricultural activities and opportunities that expand agricultural income and job opportunities.

The designation process determined that the land meets a number of requirements established in HRS §205-45, including contiguous, functional land units large enough to allow flexibility in agricultural production near appropriate infrastructure and water, with 88.5 percent of the area featuring an overall soil agricultural productivity rating of "B" (with "A" representing the class of highest productivity soils and "E" representing the lowest) per the Land Study Bureau of U.H.

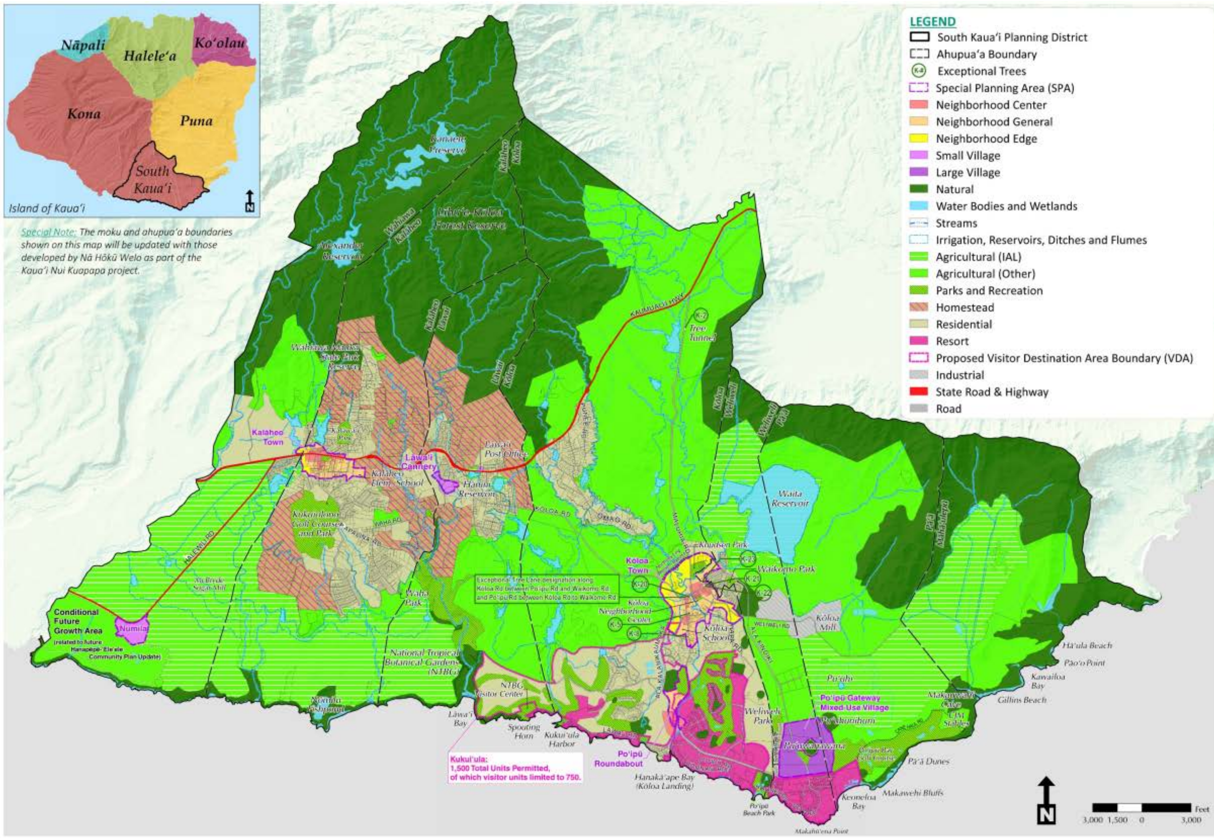


Figure 4.4-1 South Kauaʻi Community Plan Land Use Map

The 2000 *Kauaʻi General Plan* recommended community involvement in planning for the future of Māhāʻulepū to take into consideration various interests and factors to include: the long-term need to manage lands for preservation of significant natural and cultural features; the landowner's desire to develop revenue-producing uses that are sensitive to the area's unique qualities; the need to secure permanent public access to the shoreline; and the potential to create a coastal park (COK, 2000). Grove Farm Company, Inc., in response to a State resolution supporting future preservation of the Māhāʻulepū ahupuaʻa, testified for re-assertion of its rights to plan for its own lands and expressed concern that development of a park or public use of Māhāʻulepū would support a takings action for government ownership. Grove Farm has continued to allow public access and use of Māhāʻulepū lands at its expense.

<u>Neighboring Areas</u>

Properties immediately surrounding the HDF site are in agricultural use. The south shore of Kauaʻi is home to some of the most productive farm land in the state, attributed to consistent sunshine, ample fresh water, and a large amount of Class A and B soils. The large tracts of farmland with a regional water system such as that maintained by Mahaulepu Farm and Grove Farm, allow for stability in support of farm ventures while providing local residents with a reliable source of employment (HDOA, 2016).

Several single-family farm lot dwellings are located on agricultural lands approximately one mile west of the dairy site's southwestern corner. The closest residential communities are Kōloa and Poʻipū, approximately 2.3 miles and 2.5 miles away from the dairy facilities, respectively. Located to the west and southwest of the dairy property, these communities have an estimated 3,704 housing units, an increase of roughly 3.1 percent since 2000. Approximately 36.8 percent of Kōloa-Poʻipū housing units are vacant for seasonal, recreational, or occasional use, a higher proportion compared to 14.4 percent of units for Kauaʻi County as a whole (PEP, 2016).

The Poʻipū Beach Resort area has been developed along the coastline over the past 30 years. During the 1970s and 1980s, agricultural lands in the Poʻipū area were reclassified from State Agricultural District to Urban District, and rezoned by the County as Resort. Significant expansion along this coastline occurred from 1980 to present, with active development of hotels, timeshare condominiums, single-family resort residences, golf courses, and commercial development. This includes the Grand Hyatt Kauaʻi, Sheraton Kauaʻi Resort and Kōloa Landing.

The largest share of visitor units on Kauaʻi is located within the Poʻipū/Kukuiʻula area. Of the 8,492 visitor units, 3,065 units were located in Poʻipū /Kukuiʻula. This includes 1,124 hotel units, or 41.1 percent of the total number of hotel units on the island. Hotels in the area include the Grand Hyatt Kauaʻi Resort & Spa, Koa Kea Hotel & Resort, and the Sheraton Kauaʻi Resort. The Grand Hyatt Kauaʻi Resort & Spa, the closest hotel to the proposed Hawaiʻi Dairy Farms, is located approximately 2.4 miles away from the dairy facilities and provides 602 visitor units (Figure 4.4-3).

4.4.2 Probable Impacts and Mitigation Measures - Land Use and Agricultural Setting

Impacts that would be considered significant related to Land Use could include:

- Non-compliance with State and County land use designations; and
- Request for change of State and County land use designations

Short-term Impacts and Mitigation – Land Use and Agriculture

The development of Hawaiʻi Dairy Farms would be in full compliance with its agricultural State Land Use District designation, and embodies the IAL designation per the Hawaiʻi State Constitution by using lands in the project area for their intended purpose of diversified agriculture and agricultural self-sufficiency.

No request for change of land use will be made and no short-term impacts are anticipated. No mitigation is needed.

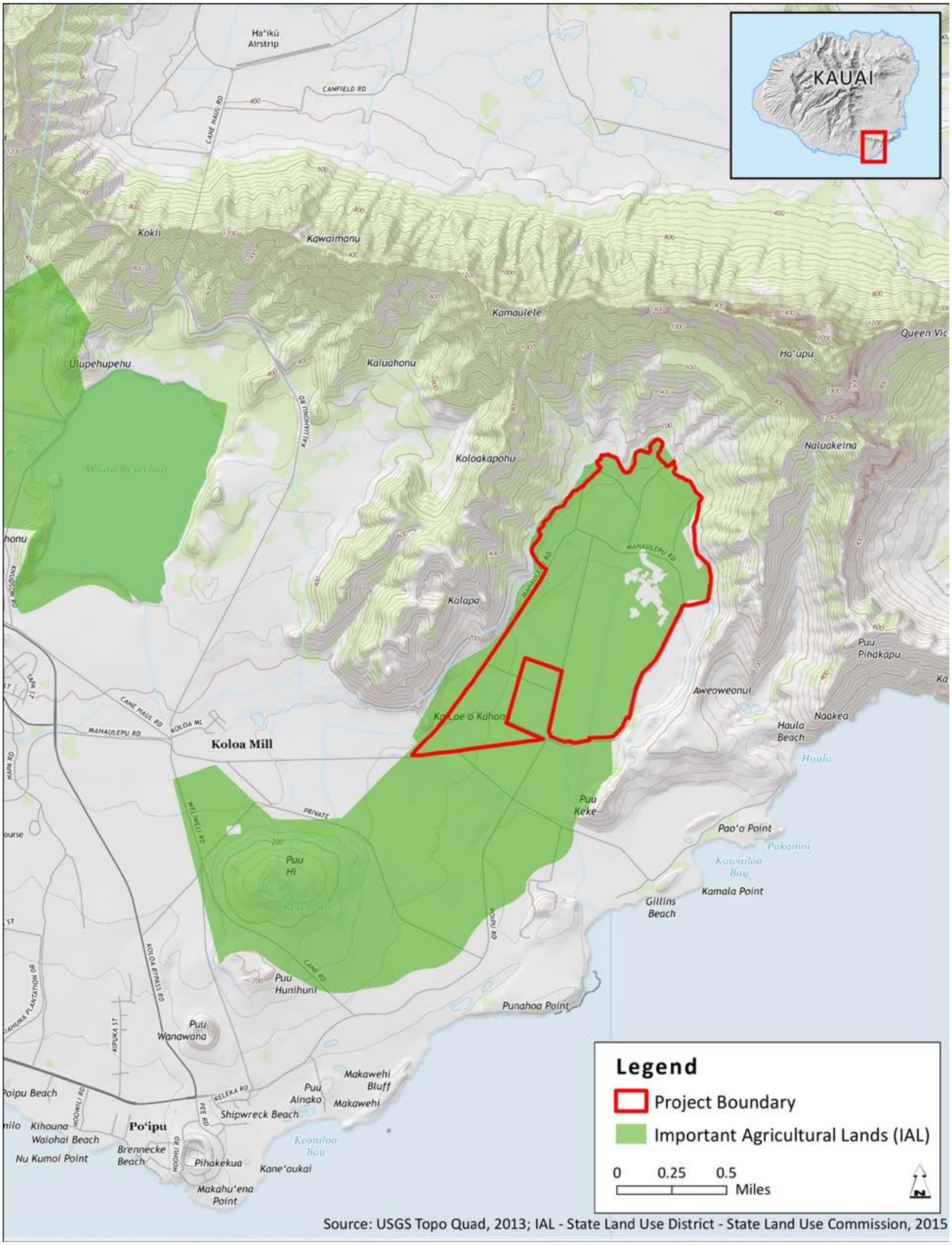


Figure 4.4-2 Important Agricultural Lands in Region

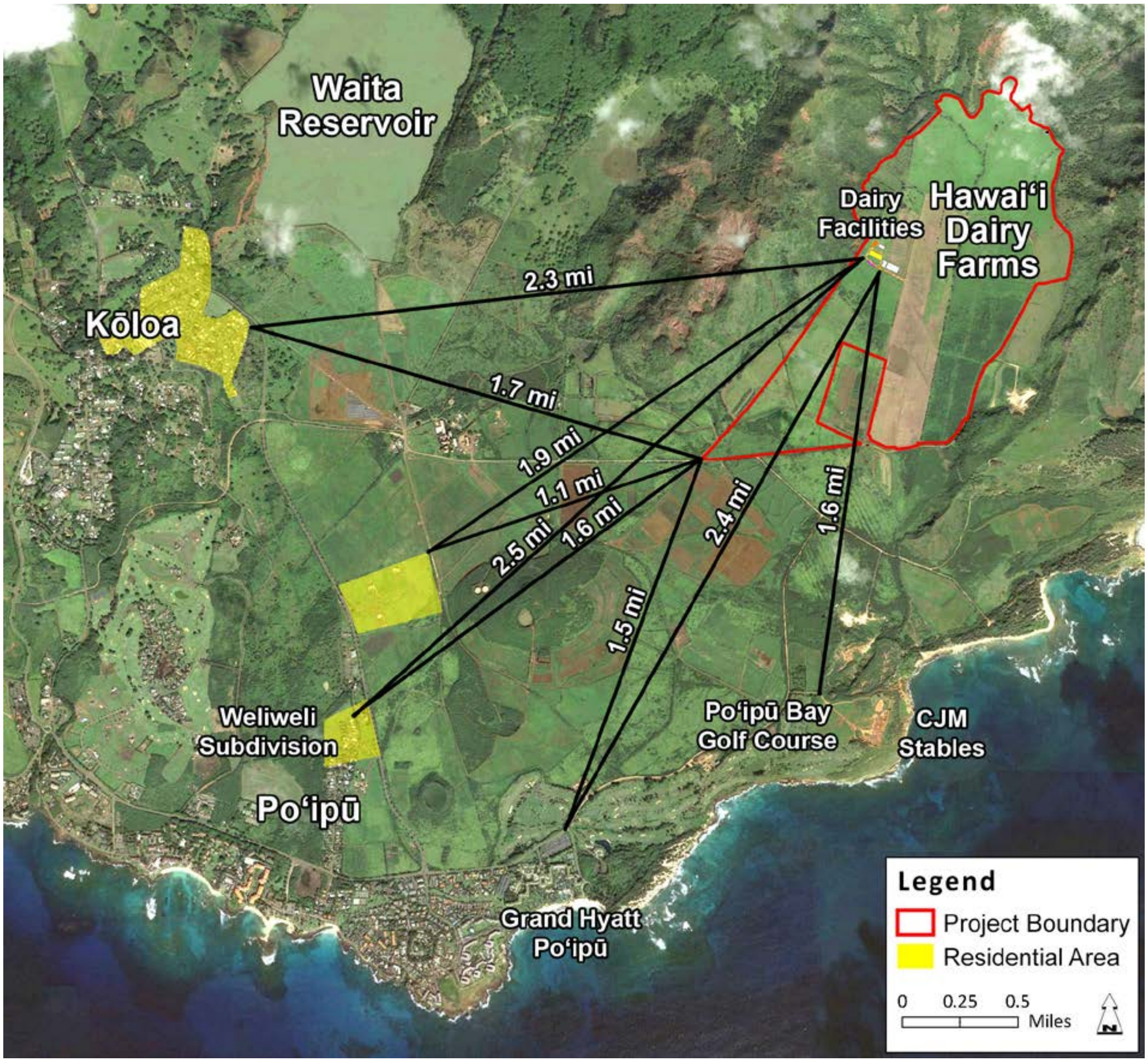


Figure 4.4-3 Dairy Distances from Development

4.5 VISUAL AND AESTHETIC RESOURCES

4.5.1 Existing Conditions - Visual and Aesthetic Resources

The Kōloa-Poʻipū-Kalaheo Planning District Heritage Resources shown in the Kauaʻi 2000 General Plan depict important landforms with ecological, recreational, cultural, and scenic value. The County's intent is to preserve these scenic resources and public views, ranging from parks, to highway corridors, mountains and elevated landforms, as well as shoreline views. According to the resources map, the majority of the project area is identified as Open Space, Parks, Agriculture, and Conservation. To the southwest, the Puʻu Hunihuni crater is identified as an important landform, and Ala Kinoiki Road is identified as a scenic roadway corridor. To the north/northeast, the Haʻupu Mountains that surround the project area are identified as an important landform (Figure 4.5-1).

Existing views of the dairy property and adjoining agricultural lands at Māhāʻulepū Valley are shown in Figure 4.5-2. The dairy site is not visible from public vantage points along County roadways or areas along the coastline. Access into the valley is limited to minimize conflict with existing agricultural operations. HDF lands are accessible from Māhāʻulepū Road or other agricultural roads, which are secured by farm gates. The majority of the dairy area has gentle topography, with no evident physical features standing out within this broad agricultural valley. Intervening vegetation and topography generally screen public views of the valley lowlands. From distant vantage points, portions of the HDF pasture area may be visible.

The tallest structures of the Hawaiʻi Dairy Farms facilities would include the milking parlor and associated storage tanks, all of which will be roughly 33 feet in height. These items are in keeping with the agricultural character of the area, and are expected to have minimal to no impact on public views of the Puʻu Hunihuni crater, views from the Ala Kinoiki Road corridor, or the views of the Mount Haʻupu surrounding the project. Dairy farm structures will conform to County height limits for agricultural zoned land.

Figure 4.5-1 Hawaiʻi Dairy Farms Site in Māhāʻulepū Valley, Kauaʻi

4.5.2 Probable Impacts and Mitigation Measures - Visual and Aesthetic Resources

Impacts that would be considered significant related to visual resources could include:

- Changes or obstructions to views due to construction activities and/or equipment; and
- Potential impacts on visual resources by permanent dairy structures and facilities.

Short-term Impacts and Mitigation – Visual and Aesthetic Resources

Views during the farm development phase will show pasture establishment (grazing grass crop grow-out, pasture mowing, fence installation) and facility construction (buildings, erection of silos and tanks). Views of the dairy support facilities development will be very limited, occurring more than 1,000 feet from Māhāʻulepū Road and several miles away from public roads. Construction activity will be short-term, lasting approximately four to six months. There are no public scenic views or lookouts that will be affected by construction of the dairy.

Due to the limited public access to view locations along farm roads in Māhāʻulepū Valley, there will be little or no impact to public views of the dairy property during the development of the dairy pastures and support facilities.

View A

View B

View C

View D

View E

Figure 4.5-2 Views of Māhāʻulepū Valley and the Dairy Property
(View Key Provided in Figure 4.5-3)

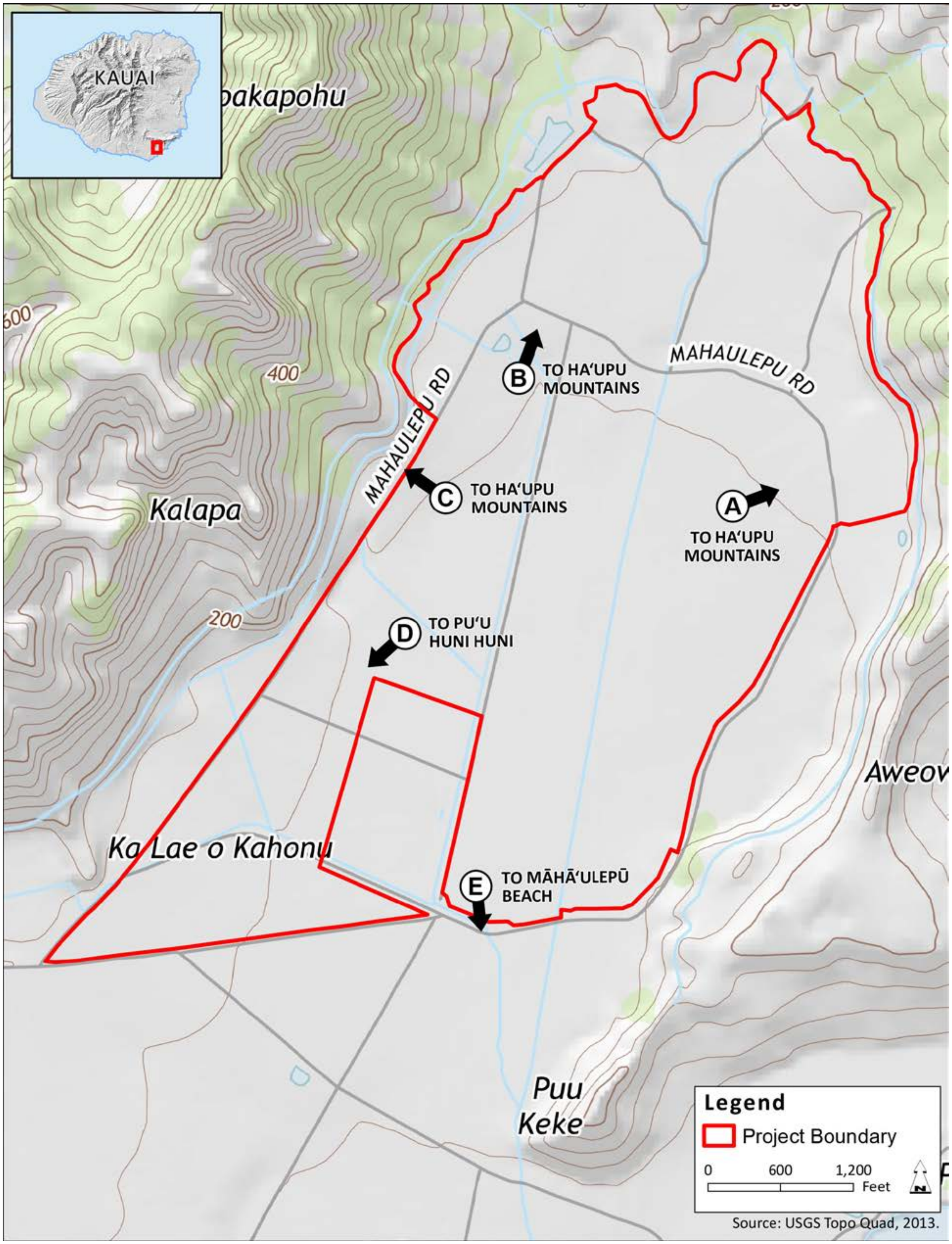


Figure 4.5-3 View Key Map

Long-term Impacts and Mitigation - Visual and Aesthetic Resources

The tallest structures of the Hawaiʻi Dairy Farm facilities ~~include~~ will be the milking parlor and the associated storage tanks, which will be roughly 33 feet tall. These facilities will be noticeable from offsite locations with distant views of the pastures and dairy facilities location. The proposed facilities are in keeping with the agricultural character of the area, and are expected to have minimal impact to public views.

There are no public scenic views or lookouts that will be affected by dairy development or operations. There will be no adverse effect to public views of the Puʻu Hunihuni crater, views from the Ala Kinoiki Road corridor, or impediment to views of the Mount Haʻupu.

4.6 NATURAL HAZARDS

Natural hazards affecting Hawaiʻi include flooding, tsunamis, earthquakes, and hurricanes. According to the 2002 USGS Atlas of Natural Hazards in the Hawaiian Coastal Zone, the Poʻipū coast has an Overall Hazard Assessment that ranges between low (3) to moderate (5). Figure 4.6-1 depicts the hazard ratings for the various natural hazards that could affect the Poʻipū coastal area.

4.6.1 Existing Conditions - Natural Hazards

Flooding

The Māhāʻulepū area is located within Federal Emergency Management Agency (FEMA) Zone X, based on FEMA Flood Insurance Rate Map (FIRM), which includes areas outside the 0.2% annual chance floodplain (Figure 4.6-2).

With the discontinuation of sugarcane cultivation in 1996, culverts and ditches in the valley became impacted with sediments and vegetation. During periods of high rainfall, reduced capacity caused Waiopili Ditch to be overwhelmed and stormwater was reported flowing across Māhāʻulepū Road. Since leasing the site, HDF has worked with the landowner, Mahaulepu Farm, to remove sediments and restore capacity to the ditches. Calculations of rainfall runoff show sufficient drainage capacity in the ditches when maintained with minimal sediment build-up.

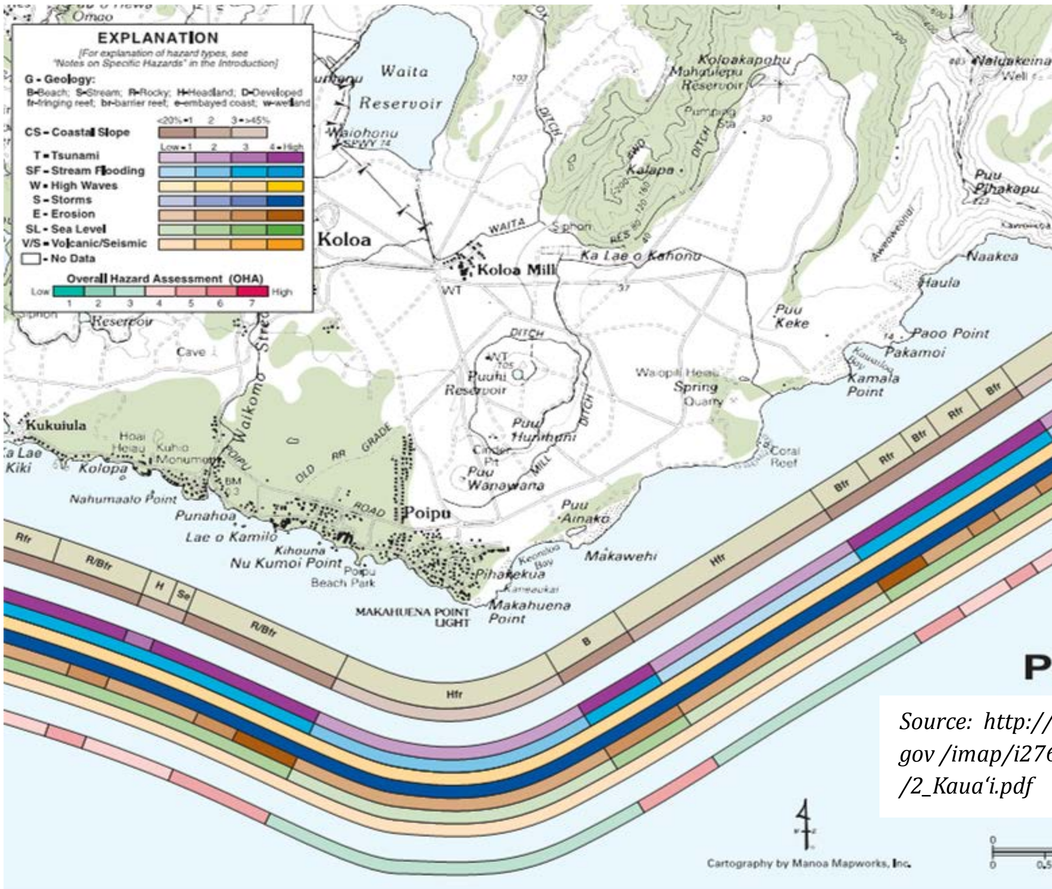
Tsunami Inundation

The proposed location for HDF lies between the 60 and 150 feet elevation, outside the tsunami evacuation zone (Figure 4.6-2). There is no threat of tsunami inundation at the project site.

Hurricanes

Historical hurricane paths over the central Pacific show a typical pattern passing to the south of the Hawaiian Islands, with a maximum hurricane occurrence during the late summer when the ocean surface is warmest. Storms that approach the Hawaiian Islands from the east have historically weakened east of Hawaiʻi under the combined influence of unfavorable westerly wind conditions, resulting in large wind shear and cooler sea-surface temperatures. However, natural variability in ocean circulation and atmosphere has allowed potentially destructive storms to reach Hawaiʻi from the east. Hurricanes Dot (1959), Iwa (1982), and Iniki (1992) all approached from the south, ~~passed near~~ and the hurricane force winds of all three hurricanes caused extensive damage to Kauaʻi. This unusual track requires a breakdown of the semi-permanent ridge of high pressure to the north of the islands, which occurs when a trough of low pressure approaches the island chain from the northwest. Such troughs are generally confined to higher latitudes, except in winter.

Although they occur infrequently, Kauaʻi has received a greater amount of damage from hurricanes when compared to the other Hawaiian Islands.



Source: http://pubs.usgs.gov /imap/i2761/sections /2_Kauaʻi.pdf

Figure 4.6-1 Natural Hazard Rating for Poʻipū Coast

Seismic

The Kauaʻi and Niʻihau region of the Hawaiian Islands has experienced tremors from earthquakes originating further south in the island chain, but no known seismic activity has originated among these northern islands. Per the 2006 International Building Code (IBC) Seismic Design Map (Figure 1613.5(10)), the project area could experience seismic activity between .20 and .25 of the earth's gravitational acceleration (g-force). This represents the upper limits of probable force experienced by the region during a probable seismic event. According to the USGS, seismic hazards in the Poʻipū region are low.

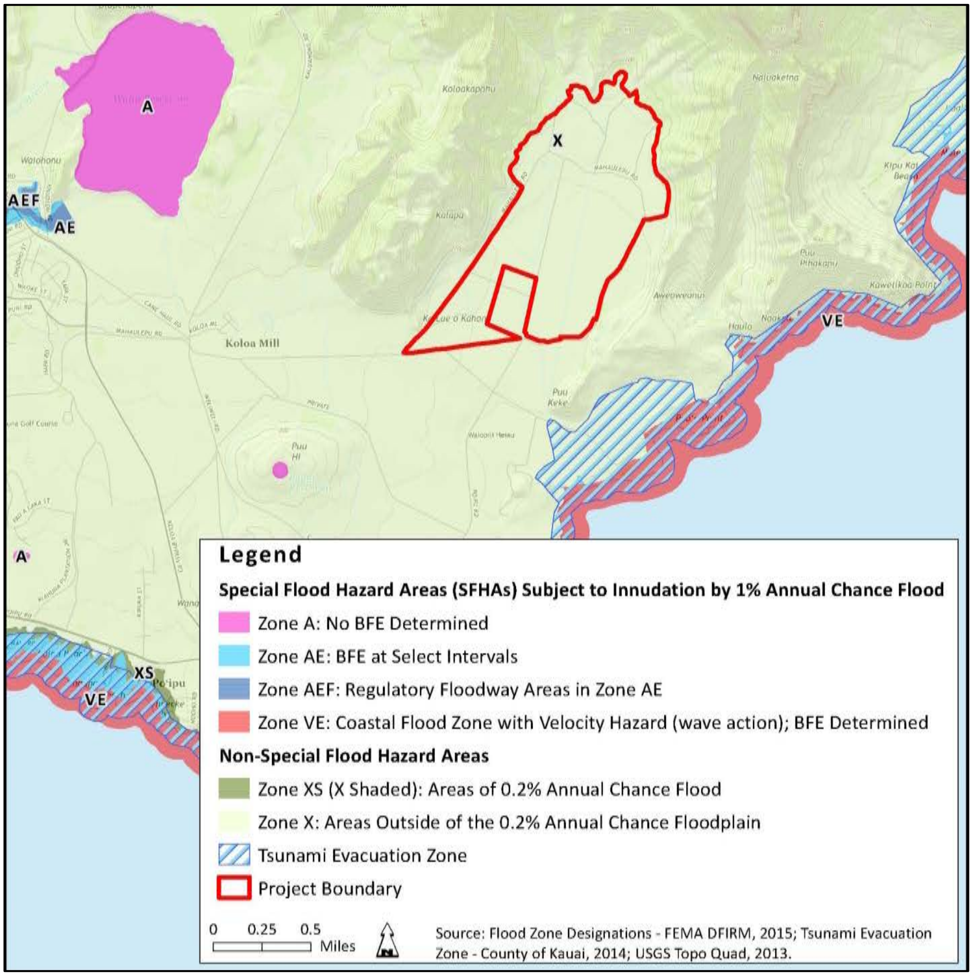


Figure 4.6-2 Flood and Tsunami Hazard

4.6.2 Probable Impacts and Mitigation Measures - Natural Hazards

Impacts that would be considered significant related to natural hazards could include:

- Damage to facilities or harm to personnel or livestock from natural hazards; and
- Failure to anticipate and plan for protection of the dairy facility and operations from a natural hazard.

Preparedness is the best protection for natural disasters. Structural design of dairy facilities will meet IBC 2006 standards with local amendments. Provisions in design will address wind loading (including hurricane gusts), rain and flood loading, and earthquake loading. A geotechnical evaluation of the area recommended Seismic Site Class D under IBC standards be utilized for foundation design where the barns and agricultural infrastructure will be constructed.

A natural disaster plan has been prepared by the Hawai‘i Dairy Farms’ manager to address hurricane, fire, and potential flooding hazard scenarios. HDF is not in a tsunami inundation area, so this scenario is mentioned in the disaster plan only for HDF personnel to maintain awareness. The disaster response plan outlines safety procedures during the event, follow up actions, and emergency contacts for assistance before, during or following the event.

The disaster plan relies upon knowledge of cow behavior. Extensive guidance for livestock protection comes from NRCS, the Florida State Agricultural Response Team (SART), Pennsylvania State College of Agricultural Sciences, and Cornell University Cooperative Extension. Adapting guidance to specific natural disaster threats is the first step in preparing the HDF disaster response plan. Land managers in the Māhāʻulepū region during hurricanes that affected Kauaʻi in 1982 and 1992 observed defoliation of vegetation, and no flooding event in the period following passage of the storms (Killerman, pers. com.).

For the herd at HDF, which will not be confined within structures, the 470 acres of pasture within the valley would provide the best protection. Evacuation off the farm is not planned. Cows sense security in numbers, and prefer to remain within a group (known as a mob, described in Chapter 3). Mobs will be moved to an appropriate group of paddocks based on the threat. Each paddock is equipped with sufficient drinking water troughs for the number of livestock corresponding to paddock size. Once the threat has passed, mobs will be returned to the next scheduled paddock in the mobs' rotation.

Ditches and culverts will be monitored for blockages or debris dams during high rainfall events. Such debris would be removed to maintain the full capacity of the ditches.

Short-term Impacts and Mitigation – Natural Hazards

Emergency procedures for the construction site will comply with Occupational Safety and Health Administration (OSHA), County of Kauaʻi, and State of Hawaiʻi safety requirements. An emergency preparedness plan for protection of animals has been prepared for HDF internal use. Construction design will meet IBC standards with local amendments. No short-term significant impacts are anticipated related to natural hazards.

Long-term Impacts and Mitigation – Natural Hazards

Geologic and potential natural hazards pose no major constraints to the project. Emergency management procedures and staff training for emergency events will be in place to implement prevention and mitigation should natural hazards occur in the region that may impact the dairy herd or facilities.

There has been no storm event that would exceed the capacity of the effluent ponds since rainfall has been recorded in Māhāʻulepū Valley (see Section 4.1, Table 4.1-2). The effluent pond capacity for the committed herd size of 699 ~~milking~~ mature dairy cows has been designed well beyond the regulatory requirements, and would provide nearly 1 million additional gallons of storage. As an additional safeguard, a secondary containment berm with an additional capacity of 1,131,000 gallons – representing more than 85 days of effluent with wash water from the 699 ~~milking~~ mature dairy cow herd, and 30 days of effluent with wash water for the contemplated herd size of up to 2,000 mature dairy cows – is included in the design. So there are two stages of storage capacity beyond both the regulatory requirements and any recorded rainfall event over the past three decades.

4.7 ARCHAEOLOGICAL AND HISTORIC RESOURCES

The Hawaiʻi Dairy Farms project is subject to a historic preservation review by the State Department of Land and Natural Resources, State Historic Preservation Division (SHPD) under HRS Chapter 6E and Chapter 13-284. An archaeological inventory survey (AIS) of the proposed site was conducted in July and August 2014 by Scientific Consultant Services, Inc. The following comes from the findings of the AIS, which is included as Appendix G.

4.7.1 Existing Conditions - Archaeological and Historic Resources

Archaeological Studies

Previous archaeological studies along the Māhā'ulepū coast have identified a number of sites including petroglyphs, human burials, fossils, cultural artifacts, and several heiau. However, despite the vast amount of archaeological information available for the coastal areas, inland studies of Māhā'ulepū — including the project site — are limited. The only site previously identified and given an official State site number was Site 3094, located at the northern end of the valley on land outside of the boundaries of the project area. This site contains a large boulder with about 20 anthropomorphic figures (petroglyphs), two pecked cups, and a long etched groove.

A total of 16 sites were identified during the AIS (Figure 4.7-1). These sites were identified through pedestrian survey of the project area and an extended survey area within 100-meters of the northern boundary. Fifteen (15) of the sites were newly identified during the current survey and one site, State Site 50-30-10-3094, had been previously identified and was again found during this survey. Of the 16 identified sites, 6 sites occur in the project area and 10 sites occur in the extended survey area. One of these newly identified sites offsite is believed to be associated with pre-Contact and/or early historic times, a rectangular rock enclosure (Site 2250) interpreted to be an agricultural heiau. Only one other pre-contact site, ~~the~~ three petroglyph boulders, is offsite. The remaining sites consist of historic-era bridges, ditches, culverts, retaining walls, and a flume system dating from the 20th century, all of which are affiliated with sugarcane cultivation.

That a majority of the documented sites are related to the historic-era is not surprising, given the massive landscape modifications that occurred during intensive sugarcane cultivation on the valley floor. Survey and subsurface exploration within a cluster of land commission awards (LCAs) within the valley revealed no historic era cultural materials. LCAs represent land claims by commoners following a change of ownership from ali'i (Hawaiians of noble descent) to those who had longevity of occupancy.

Historic Period Development

Sugarcane began to be grown and milled commercially in Māhā'ulepū Valley and around Kōloa in the 1820s. In 1835 the Kōloa Plantation, owned by Ladd and Company, was up and running, the first attempt at producing sugarcane commercially. The land was leased for a fifty-year period from Kaua'i Governor Kaikioewa and King Kamehameha III. The lease was the first of its kind in Hawai'i and was the first formal recognition that an individual other than a chief could control land use.

The sugar industry grew sporadically between 1845 and 1875. The Hawaiian Government benefited from a reciprocity treaty negotiated towards the end of this period, allowing all unrefined Hawaiian sugar to be admitted into the United States duty free. Kōloa Plantation commenced growing sugarcane in Māhā'ulepū Valley in 1878, a practice that continued for more than one hundred years.

The various parcels around Kōloa went through a succession of owners until 1864 when George N. Wilcox consolidated and purchased all of Māhā'ulepū Valley and coastal lands forming Grove Farm Company. Sugar cultivation in the valley continued through 1996. Since the cessation of sugarcane cultivation, Māhā'ulepū Valley has been the location of ranching (2002) and taro cultivation (2007), the latter conducted by W.T. Haraguchi under lease from Mahaulepu Farm, LLC.

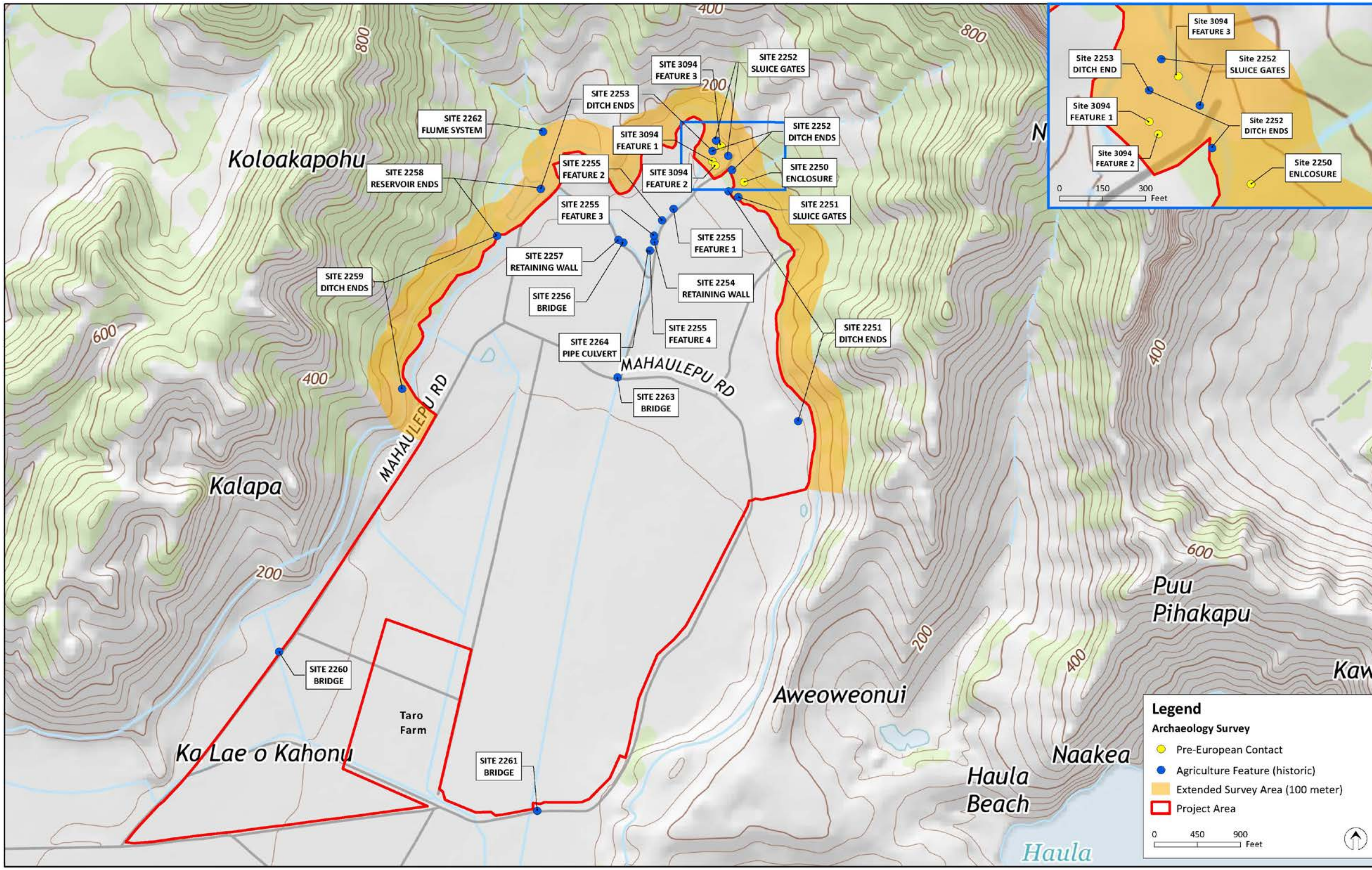


Figure 4.7-1 Archaeological Survey

4.7.2 Probable Impacts and Mitigation Measures - Archaeological and Historic Resources

Impacts that would be considered significant related to archaeological and historic resources could include:

- Disturbance or discovery of archaeologic or historic features during construction; and
- Potential future disturbances of historic sites from on-going dairy operations.

Short-term Impacts and Mitigation – Archaeological and Historic Resources

The findings of the current AIS indicate that portions of the project area were used for agriculture in the period after European contact. No pre-contact cultural sites were identified within the project site boundaries. In the unlikely event that archaeological resources are discovered during construction, appropriate procedures will be followed as required in applicable Hawaiʻi Revised Statutes and regulations, including contacting State Historic Preservation Division.

The project will be fully enclosed by perimeter fencing along the boundary of the leased premises, which will contain dairy activities and related impacts within the project area. No short-term impacts are anticipated.

Long-term Impacts and Mitigation – Archaeological and Historic Resources

~~The sixteen historic properties were assessed for significance by the archaeological consultant. No effect from dairy facility installation or operations is anticipated, and no further archaeological work is recommended for the sites. The two sites considered significant under multiple criteria occur outside the project area. Neither site will be adversely affected by the proposed dairy project.~~ The State Historic Preservation Division accepted the AIS December 19, 2016 (Appendix G). SHPD concurs with the significance assessments and mitigation recommendations in the AIS, which identifies the 14 plantation-era sites within the project area as significant only under Criterion d (information potential). The letter states no further work is recommended for these sites (50-30-10-2251 through 2262). Two sites outside the Project Area, an enclosure (Site -2250) and a petroglyph complex (Site -3094), were assessed as significant under Criterion d (information potential) and e (cultural value). The SHPD letter states that the current proposed project will not affect these two sites, and no further mitigation is recommended for the project. Future proposed projects outside the current project area shall require consultation with SHPD.

A majority of the identified sites within the project area were associated with Plantation-era sugarcane cultivation, and will not be adversely affected by the proposed project. Most are in fair to good condition. While representing an interesting time period in the history of the Kōloa-Māhāʻulepū area, no further work is recommended as all relevant information has been gathered from these sites. Adaptive re-use is a possibility, such as use of bridges and culverts. No long-term impacts are anticipated, and no further mitigation is recommended for the project area.

Table 4.7-1 Site Type, Description, and Status

Site Number 50-30-10-#	Description	Status
HISTORIC PERIOD		
Ditches/Reservoir		
-2259	Ditch (2 points: South End and North End)	Out of Project area. No effect; No further work (NFW)
-2258	Reservoir (2 points: South End and North End)	Out of Project area. No effect; NFW
-2253	Ditch (2 points: West End and East End)	Out of Project area. No effect; NFW
-2252	Ditch (2 points: West End and East End)	Out of Project area. No effect; NFW
-2251	Ditch (North End and South End)	Out of Project Area; No effect; NFW

Site Number 50-30-10-#	Description	Status
Built Features		
-2252	Sluice Gate	Out of Project area. No effect; NFW
-2253	Sluice Gate	Out of Project area. No effect; NFW
-2251	Sluice Gate	Out of Project area. No effect; NFW
-2257	Retaining Wall	Within Project area. Cows will be excluded from feature by fencing as it lies near waterway. No effect; NFW.
-2254	Retaining Wall	Within Project area. Cows will be excluded from feature by fencing as it lies near waterway. No effect; NFW
-2261	Bridge	Out of Project Area; No effect; NFW
-2263	Bridge	No effect; NFW; will be used to cross existing waterway.
-2255	Culvert bridges (4)	No effect; NFW; will be used to cross existing waterway.
-2256	Concrete bridge	No effect; NFW; will be used to cross existing waterway.
-2264	Remnant irrigation pipe	No effect; NFW
-2260	Bridge (east rail)	Out of Project area. No effect; NFW
-2262 (TS 16)	Flume System	Out of Project area. No effect; NFW
PREHISTORIC PERIOD		
-3094	Pohaku w/petroglyphs	Out of Project area. No effect; NFW
-2250	Enclosure	Out of Project area. No effect; NFW

Opponents to the dairy, specifically the community group Friends of Māhāʻulepū and Kawailoa Development LLP, owner of the Grand Hyatt Kauaʻi, charge that the dairy will have negative impacts on archaeological and cultural resources (Volume 4, Appendix 27). HDF stands by the AIS conducted for this EIS, which uses reasonable and diligent processes to disclose all probable impacts and demonstrates the dairy will have no effect on archaeological or cultural resources. Appendix 27-A in Volume 4 contains a response to the comments provided regarding burials within the HDF site.

4.8 CULTURAL PRACTICES AND RESOURCES

Scientific Consultant Services, Inc. prepared a Cultural Impact Assessment (CIA) of the dairy farm and vicinity dated April, 2016. The CIA evaluation seeks to assess traditional cultural practices as well as resources pertaining to the project area within the ahupuaʻa. This section summarizes the types of traditional practices and cultural resources associated with the proposed project site vicinity. The full CIA is in Appendix H.

4.8.1 Existing Conditions - Cultural Practices and Historic Resources

Traditional Hawaiian Background

Early settlement and agricultural development is thought to have been first established on the windward sides of the Hawaiian Islands sometime in the A.D. 900-1000 range on Kauaʻi during what is known as the Colonization Period. Most likely arriving from east Polynesia, these early inhabitants brought with them a variety of tools, fishing gear, and household goods. Dogs, pigs and chickens were brought by these Polynesian voyagers for food.

Considering that every food crop cultivated by the Hawaiians arrived with them shows a considerable knowledge not only of the planting and harvesting of these crops but the ability to transport their seeds, cuttings, and roots. Prior to European Contact (1778), Hawaiians cultivated taro in both irrigated and dry fields. Other dry land agriculture crops included ʻuala (sweet potato), uhi (yams), maiʻa (bananas), ipu (gourds), and kō (sugarcane).

Hawaiian aquaculture was extensive, with the construction and maintenance of coastal and riverine fish ponds. Their fishing ranged from shoreline to pelagic with different strategies for each. In order to maintain and benefit from all of these resource zones, Hawaiian polities were organized into ahupuaʻa which gave residents access to a wide array of resources extending from mountain top forests to deep sea fishing zones. Ahupuaʻa boundaries could expand, contract, appear, and disappear, as dependent upon political events. Given the size of Māhāʻulepū Valley and environs, this ahupuaʻa was highly valued.

Initial Polynesian settlement of Kauaʻi occurred in the resource-rich regions surrounding Wailua River, on the east coast, the equally verdant Waimea River region on the southern coast, and the Hanalei region on the north coast. Pre-Contact sites have been most commonly identified in coastal or near coastal areas, locations removed from intensive sugarcane production. Initial settlement is presumed near the coastline in the A.D. 1000 to 1200 range, with expansion inland during the A.D. 1400 to 1600s, as was typical across the islands.

In early 1778 Captain James Cook and the two ships under his command, H.M.S. Resolution and H.M.S. Discovery arrived off of Kauaʻi. Finding that they could not make land fall at Wailua, Cook continued westward until reaching Waimea. This would be the beginning of contact between

Europeans and Hawaiians. After the death of Cook in 1778, the journey continued, now under the command of Captain Clerke. After their departure a short time later, it would not be until 1786 that Europeans returned to the Hawaiian Islands, with Waimea (Kauaʻi) receiving her share of British and American vessels focusing on the lucrative fur trade in the Pacific Northwest.

Beginning in approximately 1790, battles between several rulers ~~on~~ occurred on and around Maui, Molokaʻi, and Hawaiʻi Island with increasing ferocity. After two unsuccessful efforts that failed in 1796 and 1804 due to storms and smallpox respectively, in 1810 King Kamehameha I used diplomacy, suggesting that he rule the eastern islands in name and deed, while the ruler of Kauaʻi, King Kaumualiʻi, acknowledge his suzerainty but continue to rule Kauaʻi and Niʻihau. It was agreed that the arrangement would end with the death of Kaumualiʻi and that rule would then pass to the heirs of Kamehameha.

This arrangement lasted between 1810 and 1822. It endured the death of Kamehameha the Great in 1819. During these 12 years, Kaumualiʻi solidified rule of his kingdom and engaged in efforts to gain foreign weapons and support from the Russian Fur Company. Also during this time, the trade in sandalwood flourished. Harvested in the Hawaiian Islands, traded for goods to European and American captains, and sold in the Chinese trade ports of Macao and Canton, sandalwood became the first Hawaiian cash crop. The independent rule of Kauaʻi came to an end in 1824 with the death of Kaumualiʻi. This same year, the heir of Kamehameha, Liholiho Kamehameha II also died. The kingdom of Hawaiʻi would now be ruled by Queen Kaʻahumanu. Kaʻahumanu ruled as Regent until her death in 1831.

A daughter of Kamehameha, Kīnaʻu, took over as regent until 1834 at which time Kauikeaouli Kamehameha III took the throne. He had lived on Kauaʻi as a boy but had spent the majority of his youth on Oʻahu. Ruling until his own early death in 1854, his reign was admirable for its civil rights, efficiency, and the creation of the Great Mahele, by which land awards to commoners and granting ownership to the disenfranchised was achieved. In Māhāʻulepū, there were many Land Commission Awards, but the majority of the acreage was retained by the government. During his reign, there was an increase in the number of immigrants from Europe, the United States, and China. Missionaries, merchants, laborers, and farmers of multiple nationalities added to the diversity and complexity of the Kingdom.

Traditional and Historic Land Tenure and Use

The Māhele was a drastic change in the lives of Hawaiians. Commoners, also known as makaʻainana, had for centuries been allowed use, but denied ownership, of the lands they worked. This changed in the late 1840s when private ownership of lands was made into law. Certainly aliʻi, or nobles, had the better of the deal, but commoners were allowed to claim, through right of labor and longevity of occupancy, LCA. Many of LCAs for Māhāʻulepū are tightly clustered within the ʻili of Kawailoa, which is within the current project area. There is a cluster east of Māhāʻulepū Ditch near the center of the valley. The remainder of the valley was deemed government land. Thus, no LCAs occur elsewhere in the project area or the extended survey area.

The Governor of Kauaʻi in 1842 was Kekauonohi, the granddaughter of Kamehameha. During her governorship she partook in land exchanges, consolidating her grants in Māhāʻulepū and Kōloa. These consolidated lands would become the basis for the next cash crop, one that could be rejuvenated and continued, unlike sandalwood. From the 1830s until the 1990s, sugar would be the economic focus of Māhāʻulepū. Remnants of industrial-level sugarcane cultivation in the area represent the greatest number of historic properties documented during the current AIS study.

That the entire valley (including the project area) was under intensive sugarcane cultivation is evidenced by the infrastructure put into the valley through time. Early 20th century maps also document the extent of the fields throughout the Kōloa area, showing the entirety of the current project area consisted of sugarcane lands.

4.8.2 Probable Impacts and Mitigation Measures - Cultural Practices and Historic Resources

Impacts that would be considered significant related to cultural practices and resources could include:

- Isolation of cultural resources from their setting; and
- Introduction of elements that may alter the setting in which cultural practices take place.

Short-term Impacts and Mitigation – Cultural Practices and Resources

The cultural assessment examined the potential effect of the project on cultural resources, practices or beliefs. Information received from the community indicates the Māhā'ulepū ahupua'a has been and is currently used for traditional cultural purposes. However, the dairy project area has not been included in these activities. Gathering of plants and marine resources, and two known State sites are outside the project area: State Site 50-30-10-2250, the agricultural heiau; and State Site 50-30-10-3094, ~~a carved~~ three petroglyph boulders. No significant cultural sites occur within the HDF site.

No change to current cultural practices within the Māhā'ulepū ahupua'a will occur from dairy establishment or operations.

Long-term Impacts and Mitigation – Cultural Practices and Resources

The perception of most community members interviewed was that the dairy may have indirect and direct negative impacts on the environment in the area. This EIS analyzes potential environmental impacts, which are summarized in Section 4.27.

The findings of research related to preparation of the Cultural Impact Assessment for the dairy site, including interviews of community members, states that it is reasonable to conclude that, pursuant to Act 50, the exercise of native Hawaiian rights or any ethnic group related to numerous traditional cultural practices will not be impacted by establishment of the dairy.

4.9 FLORA

A botanical survey of the dairy property was conducted by Eric Guinther (August 2014) to assess the existing plant species. The survey also investigated for the presence of plants currently listed as endangered, threatened or proposed for listing under Federal or the State of Hawai'i's endangered species programs, located onsite or within the immediate vicinity of the dairy site. The findings of the assessment are included in Appendix A.

4.9.1 Existing Conditions - Flora

The Hawai'i Dairy Farms project site is proposed for an area currently in pasture. The pastures vary between recently cultivated and various states of weedy regrowth. No active grazing was observed at the time of the survey (July 2014). A small herd of cows (*Bos taurus*) were seen within a paddock beyond the east side of the property. Consequently, while many of the pastures are a mix of open ground and weedy growth, others are densely overgrown with grasses and other herbaceous plants. Trees are few and scattered, mostly along waterways on the property. Along the edges of the survey area, on the east, north, and west, the sloping land is forested. Since nearly all of the forest is out of the survey area, it was visited at numerous points along the margin but not entered for any significant distance (generally only as far as the old plantation ditch which extended around the valley edge). The vegetation within the project area is herbaceous and typical of regularly disturbed land (i.e., agricultural).

In all, 115 species of plants were identified from various parts of the survey area. Only five of these (or 4.3 percent) are species native to Hawaiʻi, and all of those are considered indigenous (found in Hawaiʻi and other Pacific Islands, as opposed to endemic species that are unique to the Hawaiian Islands). All of the remainder (110 species) are introduced plants that have become naturalized, with the exception of one introduction that is regarded as an ornamental plant.

A somewhat unusual aspect of the flora is the abundance of a number of weedy herbaceous dicots in the fields. Species, such as false ragweed (*Parthenium hysterophorus*), kikānia (*Xanthium strumarium*), little bell (*Ipomoea triloba*), fuzzy rattlepod (*Crotalaria incana*), sensitive plant (*Mimosa pudica*), and prickly sida (*Sida spinosa*), are especially abundant covering large areas of relatively recently disturbed pastureland. Guinea grass (*Urochloa maxima*) and California grass (*Urochloa mutica*) are dominant in areas where the pasture has not been disturbed recently by tilling or ungulate browsing, and are abundant mixed with the dicot herbs just mentioned. There are also pasture areas where other species of grass predominate.

Five indigenous species were identified in the botanical survey. These include the ʻilima (*Sida fallax*), a common short-stature shrub, moa (*psilotum nudum*), a ground cover fern, ʻuhaloa (*Waltheria indica*), a short-stature shrub, hala (*Pandanus textorius*) a medium to large size shade tree, *Cyperus polystachyos*, a short-stature shrub, and *Fimbristylis dichotoma*, a grass-like plant that grows in/around water features.

The nature of the land and its present and historical uses for intensive agriculture very much limit the natural botanical resources anticipated to occur on this land. The results of the survey substantiate this prediction. Only four percent of all plants recorded during the survey were native, indicating that only species adapted ~~of~~ to constant disturbances can survive. With but a few exceptions, these adapted species are non-natives in the lowlands of the Hawaiian Islands.

A search of Bernice P. Bishop Museum Herbarium records conducted by Anita Manning, yielded 91 entries for “Māhāʻulepū”. The majority of the natives in the listing were collected along the coast or “Hāʻupu Ridge” or “Puʻu Pihakapu”. The list of rare native species is impressive, and though the locations are associated with Māhāʻulepū Valley, the habitats represented are vastly different from those of the valley floor where the dairy would be located. Indeed, all of the plants of interest were collected in either coastal dunes, exposed coastal sites, or the steep, rocky cliffs at elevations well above the site. All species in the collection with locations likely to be similar to, if not in, the project pasture lands, are non-native species.

An endangered native plant, ʻōhai (*Sesbania tomentosa*, a shrub in the pea family), is typically found in dry, coastal areas below 2,500 feet elevation. Destruction of its natural habitats has greatly reduced natural occurrence Statewide. The primary remaining natural population of ʻohai on Kauaʻi is within Polihale State Park, with a single individual plant recently identified in a coastal area south-east of Polihale (USFWS, 2015). According to the National Park Service Māhāʻulepū, Island of Kauaʻi Reconnaissance Survey (2008), the U.S. Fish and Wildlife Service has designated Critical Habitat along the entire Māhāʻulepū shoreline for the endangered ʻōhai. No suitable habitat for the

ʻōhai plant exists on the dairy site. The plant is successfully cultivated from seed, and has been out-planted at appropriate sites throughout the state, including Makauwahi Cave Reserve (USFWS, 2010). So while the coastal area of Māhāʻulepū could provide appropriate habitat for this endangered plant, no naturally occurring population of the species is currently known to exist in the area. HDF minimization measures explained throughout this chapter will reduce stormwater runoff, retain nutrients, and prevent impacts to off-site areas, including the critical habitat established for this rare, native plant.

4.9.2 Probable Impacts and Mitigation Measures - Flora

Impacts that could be considered significant related to flora could include:

- Disturbance or displacement of native vegetation and native habitats, or flora with State or Federal status as threatened or endangered; and
- Long-term degradation of native habitat or flora on site as part of on-going dairy operations.

Short-term Impacts and Mitigation – Flora

Native plants with potential to stabilize banks will be encouraged and supplemented if needed to enhance the planned buffer strips along drainages (Section 4.17.2, Surface Water Quality). No threatened or endangered plants occur on the project property. Only 5 of the 115 plant species recorded during the survey were native, and no intact native habitat exists. Construction of the dairy farm is not expected to result in adverse impacts to native plants.

Long-term Impacts and Mitigation – Flora

Vegetated buffer strips along the drainageways are part of the Conservation Plan to reduce erosion and stabilize slopes. Where native plants occur or could survive if planted, native plants will be used in the stabilization. No long-term impacts to native plant habitats or endangered or threatened plants species will occur as a result of the dairy.

Opponents to the dairy, specifically the community group Friends of Māhāʻulepū and Kawailoa Development LLP, owner of the Grand Hyatt Kauaʻi, charge that the botanical survey for the project is insufficient to predict potential impacts to exotic (non-native) plants and threatened native plants (Volume 5, Appendix E). Survey methods used for the purposes of this EIS were determined and undertaken by an ecologist with 49 years of experience in Hawaiʻi, including 20 years as a field biologist, and represent an appropriate characterization of existing conditions. HDF stands by the environmental analyses conducted for this EIS, which uses reasonable and diligent processes to disclose all probable impacts and demonstrates the dairy will not negatively impact native ecosystems or threatened or endangered plants. The more detailed response can be found in Volume 5, Appendix E-E.

4.10 FAUNA

Avian and mammalian surveys were conducted by Rana Biological Consulting, Inc. (August 2014). This survey was conducted to assess the potential presence of avian or mammalian species currently listed as endangered, threatened or proposed for listing under either Federal or State endangered species lists. The survey covered the dairy site area and immediate vicinity. The results of the survey are included in Appendix A.

4.10.1 Existing Conditions - Fauna

A total of 1,070 individual birds of 31 species, representing 23 separate families, were recorded during station counts in the vicinity of the HDF site. Of the 31 species detected during station counts, seven were native species. Four of the native species are listed as endangered under both Federal and State of Hawaiʻi: Nēnē (*Branta sandvicensis*), Hawaiian Duck (*Anas wyvilliana*), the Hawaiian sub-species of the Common Gallinule (*Gallinula galeata sandvicensis*) and Black-necked Stilt (*Himantopus mexicanus knudseni*). The remaining three native species detected during point counts, Black-crowned Night-Heron (*Nycticorax nycticorax hoactli*), Pacific Golden-Plover (*Pluvialis fulva*), and Wandering Tattler (*Tringa incana*) are indigenous species. The heron is an indigenous resident breeding species and the plover and tattler are indigenous migratory shorebird species. An additional endangered endemic species, Hawaiian Coot (*Fulica alai*) was recorded as an incidental observation while transiting from one count station to another. The remaining 27 avian species detected are alien to the Hawaiian Islands.

Avian diversity and densities were in keeping with the location of the property and the habitats presently on the site. Four alien species, Zebra Dove (*Geopelia striata*), Cattle Egret (*Bulbucus ibis*), Common Myna (*Acridotheres tritis*) and Japanese White-eye (*Zosterops japonicus*) accounted for 52 percent of all birds recorded during station counts. The most commonly recorded species was Zebra Dove, which accounted for 18 percent of the total number of individual birds recorded. An average of 38 individual birds was recorded per station count, a number that is relatively high for a lowland site on Kauaʻi.

Six terrestrial mammalian species were recorded on the site. A small herd of cows (*Bos taurus*) were seen within a paddock just beyond the east side of the property. Flocks of recently shorn sheep were present within the taro farm, which is located within the dairy property, but is not part of the dairy farm. All other species identified in the survey are listed in Appendix A. No mammalian species proposed for listing, or listed as endangered or threatened under either Federal or State of Hawaiʻi endangered species statutes, was recorded during the course of this survey (DLNR 1998; USFWS 2014, in Rana Biological, 2016).

4.10.2 Probable Impacts and Mitigation Measures - Fauna

Impacts that would be considered significant related to fauna could include:

- Disturbance or displacement of endangered species habitat during construction; and
- Long-term disruption of fauna on site and nearby as part of on-going dairy operations.

Short-term Impacts and Mitigation – Fauna

There is no critical habitat for endangered species in the upper Māhāʻulepū Valley. Four species of endangered waterbirds have been recorded on or adjacent to the site, though the area does not provide critical habitat. Seabirds that nest in upland areas of Kauaʻi may overfly the site; outside lights used at night will utilize shades to protect against uplighting and be dark sky compliant to prevent possible disorientation of the birds.

Short-term impacts for waterbirds and seabirds could be posed by construction activities, such as clearing and grubbing, which have the potential to disturb nesting waterbirds, nests, eggs and young. There also is the potential for interactions between endangered waterbirds and construction equipment, vehicles and construction personnel. Waterbirds disturbed when nesting may abandon their nest, eggs and to a lesser degree chicks. Nēnē nest in the general Kōloa area, and the habitat present on parts of the site is suitable for nēnē nesting. Potential impacts to this species are similar to those discussed for waterbirds, though nēnē may utilize areas far from water to nest, if adequate shrubbery exists. Increased vehicular traffic associated with construction activities also increases the risk of birds being run over or hit by vehicles, within the dairy site.

Measures ~~will be adopted~~ to avoid potential seabird and nēnē ~~goose~~ collisions with fences and structures~~. Potential measures~~ will include lowering construction cranes at night, using ~~conservation fencing~~ dust shields to protect specified areas, marking tall structures and fencing with white visibility polytape, ~~limiting nighttime lighting~~ prohibit nighttime construction, and shading any outside lights used at night.

HDF has been coordinating with the U.S. Fish and Wildlife Service (USFWS) and the State Department of Land and Natural Resource Division of Forestry and Wildlife (DOFAW) to specify management actions related to both construction and dairy operation to prevent impacts to any endangered species potentially present within the project area. An initial draft of the Endangered Species Awareness and Protection Plan (ESAPP) is attached to this EIS as Appendix L. The ESAPP will be refined in coordination with USFWS and DOFAW, and will be finalized prior to construction of the dairy and implemented throughout start-up and during on-going dairy operations. Key components of the ESAPP are listed below.

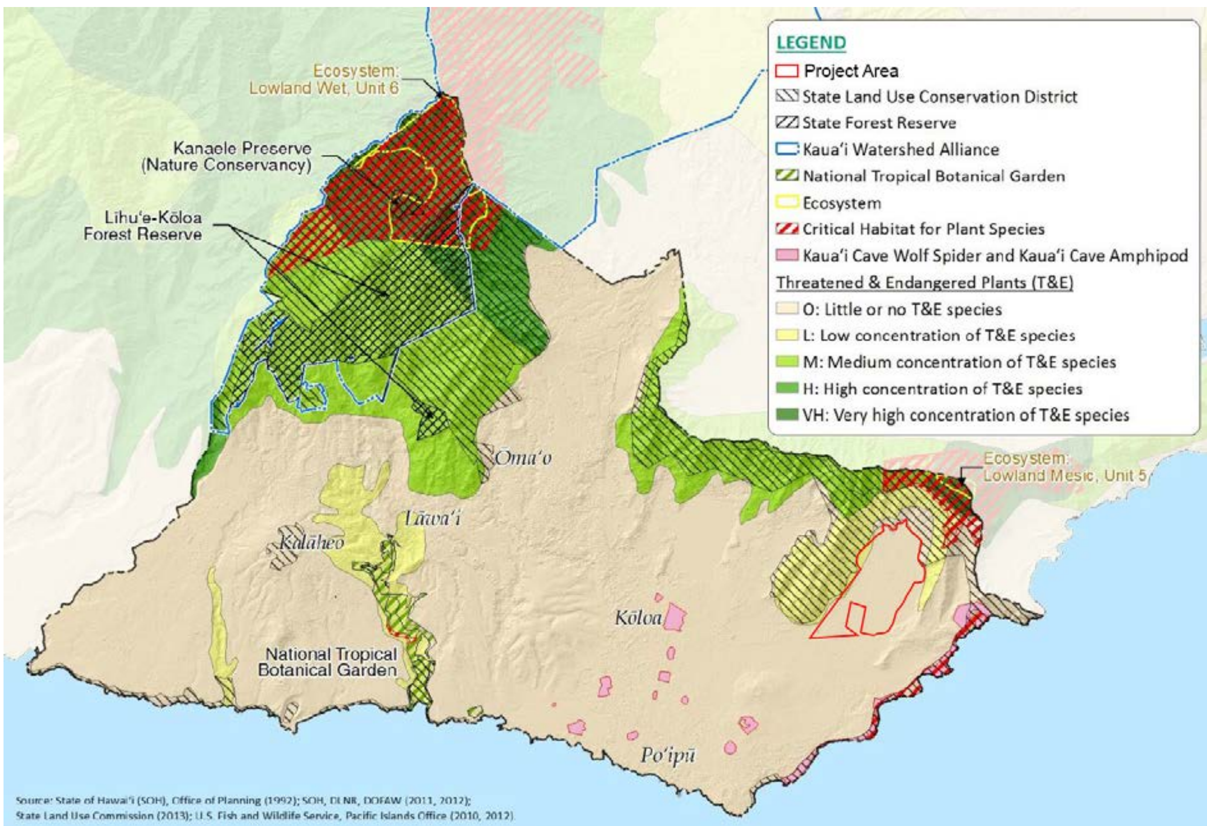


Figure 4.9-1 Critical Habitats, Reserves, State Conservation Districts, and Ecosystems

Modified from: South Kaua'i Community Plan, 2015

During the construction phase and throughout day-to-day operation of the dairy farm, the following measures and training ~~are recommended~~ will be utilized to ensure that construction activities do not result in deleterious impacts to the ~~birds~~ endangered species that may be encountered during construction.

- Develop an endangered species awareness training module
- Provide endangered species awareness training to construction and other workers prior to starting work
- Prepare Endangered Species Identification references with photographs, description of habits, and likely areas on the property where they are most likely to occur and/or to nest
- Have a qualified biologist act as a monitor to survey for nesting waterbirds and nēnē immediately prior to construction activities. ~~Halt~~ Construction activity will be halted if nesting activity is identified within 100 feet of construction until nesting activity ~~has~~ ends~~ed~~. Alternately, the biological monitor will consult with State or Federal wildlife regulators to determine the best course of action
- Post 15 mile per hour speed limit signs and enforce on all roads within the project
- No pets allowed on property – especially dogs and cats
- Provide closed trash receptacles for all personnel and visitor food and provide for disposal
- Enforce no feeding of any birds
- Designate construction personnel parking areas
- Survey and delineate construction materials and equipment parking and maintenance areas
- Include the above as contract provisions and in construction best management practices
- ~~If~~ No nighttime construction activity will be conducted. Any ~~or~~ equipment maintenance. ~~is proposed during~~ required at night during the construction phases of the dairy farm will utilize 100 percent cutoff, fully shielded luminaires and be mounted high enough off the ground to be directed perpendicular to the ground. ~~all associated lights should be, and when large flood/work lights are used, they should be placed on poles that are high enough to allow the lights to be pointed directly at the ground.~~
- All outdoor lights installed as part of the project will be shielded to reduce the potential for interactions of nocturnally flying seabirds with external lights and man-made structures (Reed et al., 1985; Telfer et al., 1987, in Rana Biological, 2016)
- Construct fences without barbed wire
- Maintain traps with or without baits to capture feral cats or rats that may harm waterbirds or nēnē transiting or using the HDF site, as agreed to during coordination with the USFWS and DOFAW.

Long-term Impacts and Mitigation – Fauna

The impacts described for the dairy construction period for the four waterbird species, nēnē and seabirds potentially overflying the area would be similar for long-term dairy operations. Additionally, operation of the dairy may attract higher densities of mammalian predators such as cats, dogs and rats. On many dairy farms the increased number of rodents drawn to feed, silage and waste treatment areas is usually alleviated by encouraging cats within the facility to assist in the control of rodents. The increase in either or both of these predators would pose heightened risks to nesting nēnē and protected waterbirds, nests, eggs and their young. A predator control program will be implemented to bait and trap for rodents. Control of other mammalian predators will be adaptive and responsive to changing patterns of activity.

It is likely that Hawaiian hoary bats overfly the project area on a seasonal basis. The principal potential impact that the development of the proposed dairy farms poses to bats is during the clearing and grubbing phases of construction as vegetation is removed. The removal of vegetation within the project site may temporarily displace individual bats, which may use the vegetation as a roosting location. There are very few mature trees on the dairy farm site, which is the habitat preferred by hoary bats as roosting locations. As bats use multiple roosts within their home territories, the potential disturbance resulting from the removal of the vegetation is likely to be minimal. During the pupping season (June to September), females carrying their pups may be less able to rapidly vacate a roost site as the vegetation is cleared. Additionally, adult female bats sometimes leave their pups in the roost tree while they forage.

While ~~T~~there are almost no suitable roost trees within the dairy site, HDF will not disturb, remove or trim woody plants greater than 15 feet tall during the Hawaiian hoary bat pupping season. ~~n~~No ~~e~~affect to bats is expected from activities and operations ~~that~~ of the dairy farm.

~~Following~~ Prior to build-out and the start of Dairy operations, the following mitigation strategies will be implemented:

- Develop an ~~Avian~~ Endangered Species Awareness and Protection Plan (ESAPP) in coordination with the USFWS and DOFAW.~~; the plan would include all of the topics outlined above.~~ The ~~material~~ draft ESAPP attached as Appendix L provides ~~would be presented in~~ more detail and ~~with~~ the rationale for ~~why following those~~ best management practices ~~is necessary~~ to ensure that dairy operations would not result in deleterious impacts to protected wildlife. The ~~Plan~~ ESAPP will be finalized to ~~would~~ also include these additional topics:
    - ~~Prepare~~ Endangered Species Identification references with photographs, description of habits, and areas on the property where they are most likely to occur and/or to nest
    - Employee endangered species training, provided both in writing and as a PowerPoint presentation for use in training new personnel and annual updates of training
    - Predator control program
    - Downed seabird, and injured waterbird response protocols

Opponents to the dairy, specifically the community group Friends of Māhāʻulepū and Kawailoa Development LLP, owner of the Grand Hyatt Kauaʻi, charge that the faunal survey for the project is insufficient to predict potential impacts to threatened and endangered birds, and fails to analyze a potential increase in non-native birds on the HDF site (Volume 5, Appendix E). Survey methods used for the purposes of this EIS were determined and undertaken by a biologist with more than 30 years of experience on the island of Kauaʻi, using avian survey protocols based on those developed by the former National Biological Survey and further refined by the U.S. Geological Survey. HDF stands by the environmental analyses conducted for this EIS, which uses reasonable and diligent processes to disclose all probable impacts and demonstrates the dairy will operate in a way that minimizes potential impact to threatened or endangered species. The more detailed response can be found in Volume 5, Appendix E-E.

4.11 INVERTEBRATE SPECIES AND PEST INSECTS

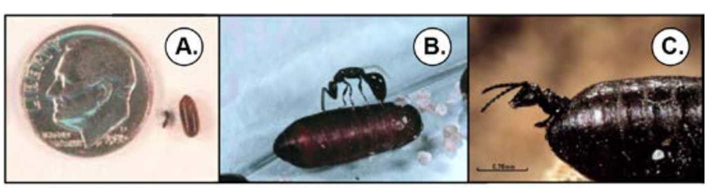
A study of invertebrate species and pest insects was conducted by Steven Lee Montgomery, PhD, Consulting Biologist (January 2016). The study summarizes the presence or absence of native species or pest species associated with cattle manure in the general Māhāʻulepū area, as well as the parasites and predators on site that control those species. Fieldwork was conducted September 15-16, 2014. The full report is in Appendix B.

4.11.1 Existing Conditions – Invertebrate Species and Pest Insects

Beneficial insects include primary decomposers such as earthworms and dung beetles, and pollinators including bees. Pest insects are those that can negatively impact livestock health and production, such as flies. An invertebrate study of manure-associated insects was conducted for the EIS. The study included a field survey that used manure from an adjacent beef cattle herd as a lure, and determined which flies and other manure-related insects are currently present at the HDF site. Two common flies, the stable fly and the horn fly, were identified. Both of these flies are widespread throughout the Hawaiian Islands. The greenbottle fly was reared from manure taken back to a laboratory following the field survey. Additionally, flies known to exist on Kauaʻi but not seen at the HDF site during the survey are identified and include the house fly, the dog dung fly, and the chicken dung fly. These pests are common in areas with high pet populations.

The stable fly is so named due to its association with the manure of horses and cattle, but it can breed in rotting vegetation including beach seaweeds. The adult stable fly prefers to land on animals' legs, causing annoyance as they feed on the blood of livestock. As with most insect pests associated with livestock, this annoyance causes stress and loss of operational productivity. The stable fly may bite humans nearby. The horn fly has been widespread in the Hawaiian Islands since 1898; Kauaʻi herds have benefitted from control by parasitic micro-wasps and introduced dung beetles that reduce larvae breeding in dung. The horn fly causes pain and annoyance to cattle, but rarely bites man. The greenbottle fly was not observed on site but did hatch from manure brought back to a laboratory setting following the survey. This fly cannot bite or sting (Montgomery, 2016).

Twenty species of predators and competitors to the horn fly were successfully established in Hawaiʻi between 1898 and 1985. Research shows that 95 percent fewer horn flies emerged from dung patties containing a beetle species that has been identified at the HDF site. Proven control methods for the stable fly include parasitic micro-wasps and spreading out manure (DuPonte and Larish in Montgomery, 2016). Among the invertebrates introduced to combat livestock-related flies are extremely tiny parasitic wasps that prey on various fly species. The adult wasps could be described as the size of gnat. Using an ovipositor – described by lay people as a "stinger" – the female lays eggs in the larvae or pupa of flies. The male wasp has no such "stinger". See Figure 4.11-1 a – c.



A. Life size comparison of U.S. dime, parasitic wasp, fly pupa.
B. *Spalangia cameroni* attacking fly pupa to lay egg.
C. Adult wasp emerging from housefly pupa.

Figure 4.11-1 Parasitic Wasp Introduced to Hawaiʻi

No native invertebrates of any species are attracted to manure of large herbivores. As deer, goats, cattle, pigs, and horses were not present in pre-human Hawaiʻi, native invertebrates did not evolve to use large, wet manure piles as habitat or food (Montgomery, 2016). No Federally or State listed endangered or threatened invertebrate species were noted in a survey (Montgomery, 2016). The project location does not provide any habitat for *Drosophila musaphilia*, the only Kauaʻi species of native Hawaiian fly listed as Endangered or Threatened (USFWS 2008). Native Drosophila habitat is located many miles away in the high elevation koa-ʻōhiʻa forests.

Bees are an essential part of the agricultural ecosystem. Honey bees (*Apis mellifera*) were observed at the watering trough for the Māhāʻulepū Cattle Co. stock and on the dairy farm overhead pivot irrigation system. It is to be expected that honey bees will visit any water source set up for the dairy herd. Recent declines in honey bee populations in the wild on Oʻahu and Hawaiʻi Island are due to accidental Varroa mite introductions and a souring beetle that ferments its nectar in bee hives (Montgomery, 2016). While neither has been reported on Kauaʻi, State quarantines are currently in place to minimize spread of the mites and help protect local bee populations.

Sheep are kept near the Haraguchi Farm kalo ponds to graze for weed control. The pellet-sized manure of sheep is structurally quite different from that of cattle and does not support the same invertebrate species.

Some illegal dumping of household trash is known to occur in the area. The anonymity provided by locations such as the country roadsides in the vicinity of the dairy farm make it a convenient place to drop trash. Bags of trash containing food remains may be dumped, and this household trash sitting in the open is a recognized fly breeding habitat (Ikeda et al. 1973, in Montgomery, 2016).

<u>Kōloa Lava Tube System.</u> There are no known caves or lava tubes found on or adjacent to the dairy farm property. The known caves in the vicinity are approximately 0.75 mile from the closest point to the dairy farm. Several miles away from the dairy farm property is the Kōloa Lava Tube System, which provides habitat for two endemic cave species, the Kauaʻi Cave Wolf Spider and the Kauaʻi Cave amphipod. Both invertebrates are listed as endangered under the U.S. Endangered Species Act. Not all caves in the Kōloa area contain these animals. Per the 2006 U.S. Fish and Wildlife Service (USFWS) Draft Recovery Plan for Kauaʻi Cave Species, most caves in the Kōloa District do not contain the optimal climatological conditions required by these organisms. Continued development for housing and tourism is described by the USFWS (2006) as potentially leading to the destruction of remaining cave habitats in the area.

Comments received on the Draft EIS questioned potential impacts to the cave habitat down gradient from the HDF site. As described earlier, neither the botanical and faunal survey nor the invertebrate survey revealed any evidence of lava tubes or caves on the property, and no such features have been reported for the area in the near surrounds of the HDF site. The known caves in the vicinity are approximately 0.75 mile from the closest point to the dairy farm, with no reported connection to the dairy farm site. The majority of critical habitat for the endangered cave spider and amphipod is in the Kōloa region several miles away. Chapter 3 and Section 4.17 Surface Water Resources and Nearshore Marine Environment, physical setbacks and vegetated filter strips will be used to minimize potential runoff and to maintain nutrients on site for growth of grass. It is important to recognize the food supply of the wholly saprophagic arthropods is organic matter derived from roots and other decaying plant debris. Nitrogenous and phosphoric nutrients will promote plant growth, so impacts of nutrients - if any at all - can be expected to expand the food supply in the oligotrophic subterranean ecosystem (Volume 5, Appendix C-C of this EIS).

4.11.2 Probable Impacts and Mitigation Measures

Impacts that would be considered significant related to invertebrate insects and pest species could include:

- Disturbance or displacement of protected or endangered insects; and
- Inadvertent introduction of non-native species not known to Hawaiʻi, or an increase in pest populations.

Short-term Impacts and Mitigation – Invertebrate Species and Pest Insects

There are no native, protected or endangered insect species within the HDF site. Construction will not impact any endangered invertebrate populations. It is possible that flies known from elsewhere on the island, associated with areas containing high pet populations, could be inadvertently transferred the HDF site and possibly utilize cow manure as a food source.

To minimize potential establishment of pest flies or other insects, food waste generated during the construction phase will be bagged, covered, contained and disposed of in order to limit possible breeding habitat for flies. Inspections of building materials for ants or other insects will be conducted to prevent introduction of new pests to the HDF site.

Long-term management for pests (explained in the following) relies on a natural food web cycle that will expand as the habitat (manure) is increased. In the short-term, supplemental pest control using mechanical and chemical methods may be used to prevent any spike in pest populations. Mechanical methods include sticky tapes or ribbons that could be used in the milking parlor or covered areas of the dairy facility. Traps will be used as needed for both monitoring and removal of flies. Traps can use attractants or not; versions designed for use outdoors could be used in paddocks from which cows are excluded (those not being actively grazed). Chemical methods may be used to prevent short-term spikes in pest populations. Insecticides and herbicides are non-discriminatory and kill beneficial as well as pest insects. Such control would only be used when needed by those qualified to apply chemicals, and in accordance with authorized procedures and regulatory labeling requirements.

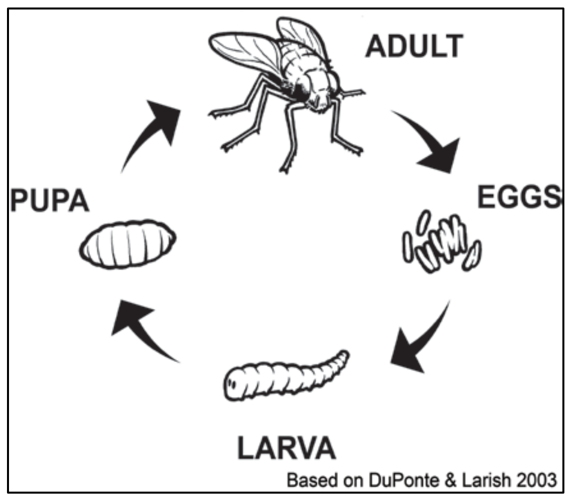


Figure 4.11-2 Egg to Fly Lifecycle

Long-term Impacts and Mitigation – Invertebrate Species and Pest Insects

Integrated pest management utilizes knowledge of the ancient food web among species. Disrupting reproduction of potential pests with appropriate means at key points in the life cycle has been used in Hawaiʻi for decades (Figure 4.11-2). Extensive introduction of dung beetle species between 1898 and 1985 in response to cattle-related insect pests resulted in 14 dung beetle species becoming established on Kauaʻi. Cattle egrets, a bird species introduced to Hawaiʻi in the late 1950s to control cattle-associated insects, break up dung patties while searching for prey (Figure 4.11-3).

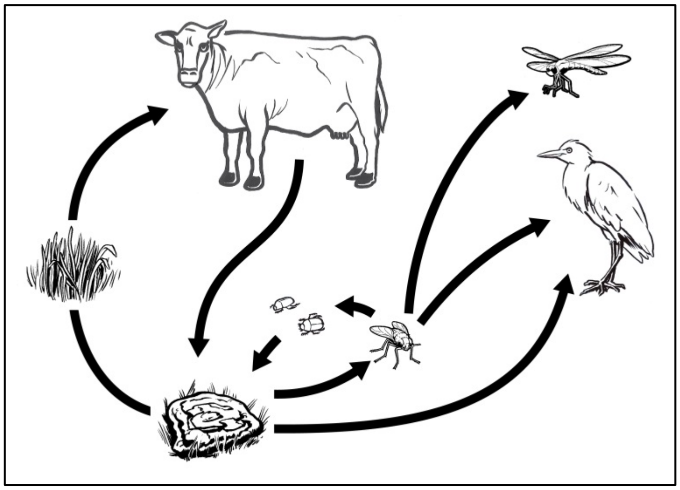


Figure 4.11-3 Manure-Related Food Web

Dung beetles speed incorporation of the manure into the soil by breaking up bovine manure pats and transporting the organic material into the soil. A healthy population of dung beetles can bury a dung pat in one to three days. Breaking up and burying the dung patty destroys the habitat for insects such as flies to complete their life cycle. The stable fly requires approximately 21 days within the dung patty for the immature life stage (egg to pupa) to survive. The house fly takes 7 to 10 days from egg to fly, and can use a number of damp, decaying material as habitat. The horn fly takes 10 to 20 days from egg to adult.

The behavioral diversity among dung beetle species working together can bury dung pats in one to three days. Some beetle species fly at night and some during the day; some prefer older manure over fresh. HDF and other ranchers on Kauaʻi may choose to engage with the State Department of Agriculture to translocate dung beetle species already introduced on Kauaʻi or in the state to Māhāʻulepū and other areas if manure-related flies become a problem (Figure 4.11-2).

HDF will not maintain any populations of dogs, cats or chickens at the dairy, and will discourage feral pigs and the island's wild jungle fowl. These domesticated or feral animal populations could provide dung that facilitates breeding of several species of flies not currently established on site. Proper disposal of dog and cat feces is important. Chicken feces can accumulate in sufficient amount to provide a location for fly breeding. While feral chickens are common throughout Kauaʻi, HDF will diligently clean any spilled feed or other potential attractants to keep chickens away from the dairy facility as well as rats.

Good housekeeping is an important tool in controlling establishment of most flies. Human food waste from on-site workers' meals would be disposed of in a covered, lined container and removed from the site often. Any spilled or waste supplement foods for the cattle should not be allowed to become wet and stay exposed. Rotting food waste can provide attractive habitat for fly breeding, therefore food waste ~~must~~ will be disposed of properly. HDF personnel ~~would~~ will be alert for bags along the roads around the property and remove them if practical. If left, the trash bags could breed flies that would then migrate to the nearest habitat of interest – the cattle manure.

Haraguchi Farm must also maintain the health of its sheep, as cows and sheep can share health issues. Of special concern should be the sheep bot fly (*Oestrus ovis*) that rarely can pass to cattle. This pest attacks by laying eggs that produce maggots in eyes and nasal passages.

Bees are an essential part of any agricultural ecosystem. It is expected that honey bees will visit water sources set up for the HDF herd. A 'ramp' will be built into any open water source to allow bees some chance of swimming to an escape rather than drowning. A struggling bee, floating in the tank, lapped up by a drinking cow could sting by reflex. A scoop or sieve will be used to remove bees before stock access the drinking area. The bees should be disposed of safely as the stingers of even a dead bee will function if pressure is exerted. Also, safe application practices for any unavoidable herbicide or pesticide will be utilized to narrowly target the correct pest species without harming other insects and animals in the area. Anyone using herbicides or pesticides will be properly trained and informed, and if a honey bee colony location appears to be a danger to workers or cattle, or to be in danger itself, a local beekeeper will be contacted for advice and removal (Montgomery, 2016).

Livestock water troughs will contain water for the period of 12 to 24 hours when cows occupy the paddocks. HDF personnel will fill troughs just before the cow "mobs" enter the paddock(s) for the grazing period; troughs will be emptied after the cows are moved to another paddock. Thus troughs will be managed to prevent mosquito breeding.

Neither the botanical and faunal survey nor the invertebrate survey revealed any evidence of lava tubes or caves on the property, and no such features have been reported for the area in the near surrounds of the HDF site. Thus no cave invertebrate species will be affected by the dairy farm. The known caves in the vicinity are approximately 0.75 mile from the closest point to the dairy farm, with no reported connection to the dairy farm site. The majority of critical habitat for the endangered cave spider and amphipod is in the Kōloa region several miles away. Integrated pest management measures employed to reduce cattle-associated pest fly species at this site will not affect native flies (Drosophila), as the habitat for this species is high elevation koa-ʻōhiʻa forests located miles away.

The dairy operation is not expected to impact any endangered invertebrate populations. HDF will minimize populations of any pest insects such as flies, which already exist on the island of Kauaʻi.

Opponents to the dairy, specifically the community group Friends of Māhāʻulepū and Kawailoa Development LLP, owner of the Grand Hyatt Kauaʻi, charge that the HDF should have conducted a full invertebrate survey of the site and that potential mitigation for impacts to the endangered Kauaʻi cave wolf sider and Kauaʻi cave amphipod were unaddressed (Volume 5, Appendix E). Survey methods used for the purposes of this EIS were determined and undertaken by a biologist with more than 48 years of experience in Hawaiʻi, using survey protocols appropriate to characterize site conditions and environs for native and non-native invertebrates. HDF stands by the environmental analyses conducted for this EIS, which uses reasonable and diligent processes to disclose all probable impacts, and demonstrates the dairy will operate in a way that minimizes impacts from manure-related invertebrates. The more detailed response can be found in Volume 5, Appendix E-E.

4.12 NOISE

Acoustic conditions (noise) in the area of the dairy farm and surroundings are evaluated in this section. The anticipated short-term and long-term noise conditions associated with the dairy farm and planned mitigation actions are discussed.

4.12.1 Existing Conditions - Noise

Noise can be defined as unwanted sound, a sound that is considered loud or unpleasant, and/or sound that causes disturbance. Research related to noise and livestock focuses on noise levels and minimization of unexpected sounds that caused stress to cows. Noise stress results in loss of livestock productivity and thereby financial loss to farmers and ranchers. Little research exists on the sound levels from livestock.

Sound is measured in decibels (dB). The State of Hawaiʻi Department of Health rules use the A-weighting sound network (dBA) in the HAR §11-46, Community Noise Control. Sound through the air is similar to ripples on a pond of water. In open space without reflection, ripples spread uniformly in all directions and decrease in amplitude further from the source. In free field conditions such as outdoors, amplitude drops by half as distance doubles (OSHA, 2016). When sound passes close to absorbing ground cover such as grassland and fields, the "soft ground" absorbs extra sound as it passes.

Typical dBA of conversational speech is 60 dBA; the sound of a shower or vacuum cleaner is roughly 70 to 75 dBA. The OSHA standard for protection against the effects of noise exposure allows an 8-hour duration at 90 dBA before a hearing conservation program is required for employees.

The HDF site in Māhā'ulepū Valley is 1.5 to 2.5 miles from resort and residential areas on land zoned for agricultural use. Typical noise currently generated near the HDF site is truck ingress/egress along private farm roads, agricultural equipment, and cattle and sheep.

4.12.2 Probable Impacts and Mitigation Measures

Impacts that would be considered significant related to noise could include:

- Increased noise levels during construction; and
- Noise levels that interfere with human activities at home, work or in schools, or that is injurious to people's health and well-being.

Short-term Impacts and Mitigation – Noise

Construction work at the project site will involve activities that may generate an increase in noise levels. Noise related to construction will be a short-term condition, occurring during daylight hours.

Construction vehicles and activities must comply with HAR §11-46. A permit is required for construction activities that emit noise in excess of 78 decibels or that cost a total of more than $250,000 (based on the value on the building permit).

Construction noise is anticipated to be short-term, and will be minimized through application of best management practices to include the use of mufflers to suppress loud equipment and limitations on the hours of heavy equipment operation.

Long-term Impacts and Mitigation – Noise

The dairy farm will utilize milking equipment contained in the milking parlor, and will use field equipment such as tractors. Equipment will typically be used during daylight hours. Dairy operations will comply with applicable noise control ordinances. Under HAR §11-46, agriculture is classified as Zoning District Class C, which specifies maximum permissible sound levels of 70 dBA in the daytime and 70 dBA at nighttime. Maximum permissible sound levels apply to any point at or beyond the property line, and are not to be exceeded more than 10 percent of the time within any 20-minute period.

Dairy operations will generate noise in keeping with agricultural zoning of the parcel. The primary noise receptors in the area would be farmers working nearby parcels. Noise from the dairy will not exceed the DOH threshold, and will not contribute to excessive noise in the region.

4.13 HAZARDOUS SUBSTANCES

This section summarizes a search of State and Federal public records for known hazardous waste on the dairy property. The use and storage of regulated materials for dairy operations is also documented. The potential for a hazardous chemical release associated with dairy farms – while originating from the natural process of animal digestion and manure decomposition – is considered.

4.13.1 Existing Conditions – Hazardous Substances

State of Hawaiʻi. The State DOH Solid and Hazardous Waste Branch regulates the generation, treatment, storage, and disposal of hazardous waste. Underground storage tanks (UST) that store petroleum or pesticides are commonly found on agricultural lands. A search of the State's UST list, last updated September 4, 2015, show no USTs on the dairy parcels (DOH, 2015).

The DOH Hazard Evaluation and Emergency Response (HEER) office provides leadership, support and partnership in preventing, planning for, responding to, and enforcing environmental laws relating to the release or threats of releases of hazardous substances. Former agricultural operations resulted in soil contamination on sites across the island of Kauaʻi. Site-specific facilities, sites or areas in which HEER has investigated or may investigate are tracked in the public records accessed through the HEER website. The HEER Emergency Response Lookup Spreadsheet (updated 12/2/2014) revealed no sites within the HDF site.

Review of the historical sources for the property site – topographic maps and aerial photos - show no pesticide mixing or storage facilities on the HDF site or surrounding areas.

Federal Database. None of the dairy farm parcels are listed for action in the Federal Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) information systems database. CERCLA is commonly referred to as the "Superfund" program. The database tracks the location of identified abandoned hazardous waste sites. No such sites exist within or adjacent to the dairy parcels.

According to the database provided by HEER, no Brownfield sites have been identified within or adjacent to the parcel by Federal, State or County agencies. A Brownfield property is any real property that may be contaminated and is not being used to its full potential. The State's HEER office works with prospective purchasers and developers to clean up properties under available CERCLA programs.

Review of State and Federal public records for the island of Kauaʻi show no reports of petroleum, hazardous substances, pollutants or contaminant releases at the dairy farm site.

4.13.2 Probable Impacts and Mitigation Measures – Hazardous Substances

Impacts that would be considered significant related to hazardous substances could include:

- Production or run-off of hazardous substances during construction; and
- Long-term purposeful or inadvertent introduction or seepage of hazardous substances to soils or waters from on-going dairy operations.

Short-term Impacts and Mitigation – Hazardous Substances

Construction equipment operations at the dairy farm will involve the use of fuels and lubricants. Construction operators will conduct operations in compliance with State and Federal laws to properly manage the use and storage of fuels, lubricants and cleaning to avoid the release of hazardous materials.

No significant short-term impacts related to hazardous substances will occur.

Long-term Impacts and Mitigation – Hazardous Substances

Establishment of pasture and on-going cultivation of the robust grass that will provide dairy cows with the majority of their food source will include use of commercial fertilizer to support sufficient grass yields. Herbicides will be used judiciously where needed to control pasture weeds. Flies inhibit productivity on a dairy farm. An integrated pest management program will be employed, with primary control focused on eliminating breeding sites and maintaining a natural predator-prey cycle among invertebrates. Pesticides may be used to prevent short-term spikes in insect pest population (see Section 4.11, Invertebrate Species and Pest Insects).

Healthy cows are a priority for HDF, and antibiotics as prescribed by a licensed veterinarian may be used from time to time, to ensure cows remain healthy and are treated humanely. Guidelines set by Food and Drug Administration (FDA) will be followed to avoid any antibiotic adulteration of milk. Additionally, HDF will routinely conduct laboratory tests on milk for any trace of antibiotic residue. HDF will not treat cows with sub-therapeutic, preventative, or growth promoting use of antibiotics, ionophores or hormones (such as rBST). ~~bovine growth hormones (rBST or rBGH).~~

Equipment operations at the dairy farm require fuels and lubricants. An emergency power generator with associated fuel storage will be available to power the milking parlor and other critical operations in the event of an electrical outage. Off-road diesel fuel and unleaded gasoline for use in farm vehicles will be stored in two above-ground exterior tanks. Hydraulic fluid and motor oil, to be delivered from a local fuel supplier, will be retained in 55-gallon drums. Brake and transmission fluids and all-purpose grease, will be maintained in the original containers. All containers and drums will be stored within appropriately designed secondary containment areas.

Pesticides, herbicides, fuels and lubricants will be stored according to regulations. Products will be locked within the implement shed when not in use, and segregated by type and per regulations. Fertilizers will be stored in original packaging as delivered by the supplier. Herbicides, pesticides and veterinarian-prescribed medicines will be stored in a separate, locked area under the direct control of the dairy manager or delegate.

The Emergency Planning and Community Right-to-Know Act (EPCRA) under the Environmental Protection Agency (EPA) regulation 40 CFR Part 355 (2008) requires information regarding the existence of chemicals at individual facilities, and any hazardous releases. The regulation informs emergency planning and increases the public's knowledge of facilities in their communities. Under EPCRA, for dairies with 700 or more mature dairy cows, releases of ammonia or hydrogen sulfide emissions in excess of 100 pounds per day must be reported. Animals that reside primarily outside of an enclosed structure and graze on pasture are not counted toward the threshold, and any emissions from the waste while not stabled or confined are not counted towards the reportable quantity unless the waste is consolidated into a storage unit (40 CFR Part 355.31, 2008).

For the committed herd size of up to 699 mature dairy cows, the regulation does not apply. Total potential emissions of ammonia and hydrogen sulfide were calculated for the contemplated herd size of up to 2,000 mature dairy cows to determine the potential for releases and reporting under EPCRA. Average daily ammonia and hydrogen sulfide emissions related to manure routed to the effluent ponds from the milking parlor and holding yard are estimated to be 39 pounds per day of ammonia, and 9 pounds per day of hydrogen sulfide. Emissions from effluent application from the ponds to the pastures are calculated at 48 pounds per day for ammonia, and zero for hydrogen sulfide (Arcadis, unpublished). The threshold of 100 pounds per day of either ammonia or hydrogen sulfide will not occur at the contemplated herd size of up to 2,000 mature dairy cows, and HDF operations will not fall under the EPCRA reporting requirement.

No significant long-term impacts will occur from hazardous substances related to dairy operations, due to minimization of risk, secondary containment, and compliance with best management practices.

4.14 PUBLIC SERVICES

4.14.1 Fire Department

Existing Conditions - Fire Department

The County of Kauaʻi Fire Department services the entire island of Kauaʻi. The closest fire station to the dairy is located in Kōloa, approximately 4.5 miles to the west.

Probable Impacts and Mitigation Measures - Fire Department

The dairy farm facilities will be built in compliance with County building and fire codes. Dairy facilities and dairy operations are not anticipated to place a significant demand on fire protection services. Fire suppression and fire safety training requirements for the facilities will be satisfied in consultation with the Kauaʻi Fire Department. There will be no significant short-term or long-term impacts anticipated on fire department services as a result of this project.

4.14.2 Medical

Existing Conditions - Medical

The nearest medical facility is located at Wilcox Memorial Hospital in Līhuʻe, 16.5 miles northeast of the dairy farm location.

Probable Impacts and Mitigation Measures - Medical

Dairy employees may infrequently require service at the local medical facility. Such use is not anticipated to adversely affect the service capacity of Wilcox Memorial Hospital. There are no significant short-term or long-term impacts anticipated on medical services as a result of this project.

4.14.3 Police

Existing Conditions - Police

The County of Kauaʻi Police Department provides police services for the entire island. The closest police substation to the dairy is located in Kōloa, approximately 3.5 miles away.

Probable Impacts and Mitigation Measures - Police

The dairy operations will not impact police service in the area. There are no significant short-term or long-term impacts anticipated to police services as a result of this project. Therefore, no mitigation will be required.

4.14.4 Educational Facilities

Existing Conditions - Educational Facilities

A number of public and private elementary, middle schools, high schools, and a community college are located throughout the neighboring Kōloa and Līhuʻe regions. These schools include Kalaheo Elementary, Kōloa Elementary, Holy Cross School, ʻEleʻele Elementary School, Kamehameha Schools, Island School, Olelo Christian Academy, Chiefess Kamakahelei Middle School, Kawaikini Public Charter School, Kauaʻi High School, and Kauaʻi Community College.

Probable Impacts and Mitigation Measures - Educational Facilities

The dairy farm operations will not impact local educational facilities. Employees of the farm may have children attending local schools. Education programs will be established for local schools to learn about the pasture-based dairy operation and food sustainability. No mitigation measures will be required. There are no significant short-term or long-term impacts anticipated to educational facilities as a result of this project.

4.14.5 Libraries

Existing Conditions - Libraries

Public libraries located in proximity to Hawai'i Dairy Farms include the Kōloa Public and School Library and the Līhuʻe Public Library.

Probable Impacts and Mitigation Measures - Libraries

The dairy will not affect the local public library system. There are no significant short-term or long-term impacts anticipated to libraries as a result of this project. No mitigation will be required.

4.15 DEMOGRAPHIC AND ECONOMIC CONDITIONS

Analysis of impacts examine the ways in which the existing physical environment of the community can be altered by land developments, and how these changes may affect the area's demographics and economy.

Potential impacts and mitigation for a herd size of 699 ~~milking~~ mature dairy cows are presented in this section; for a contemplated herd size of up to 2,000 ~~milking~~ mature dairy cows, impacts and mitigation are presented in Section 4.21.

4.15.1 Existing Conditions - Demographic and Economic Conditions

Demographic Characteristics of Poʻipū Residents

The project area of Māhāʻulepū is located in the Poʻipū area on the south shore of Kauaʻi. In 2010, the population of the Kōloa-Poʻipū Census tract was 2,544, with a median age of 44.8 years old. This represents nearly 4 percent of the island's total 67,100 residents.

Between 2009 and 2013, white residents comprised a slightly higher proportion of the Kōloa-Poʻipū population compared to the County as a whole: 42.1 percent of residents were white compared to

33.4 percent of residents in the County. A slightly lower proportion of the Kōloa-Poʻipū population was born in the State of Hawaiʻi; an estimated 51.6 percent of the region's population was native born to the State, compared to 55.9 percent for the County as a whole.

The resident profile of the Kōloa-Poʻipū Census tract is slightly older than that of Kauaʻi County. The median age in Kōloa-Poʻipū was 44.8 years old between 2009 and 2013, compared to 41.6 years old in the County. The Kōloa-Poʻipū region is characterized by a higher proportion of retirement age residents (65 years and older) and a lower proportion of school age children. Of the residents living in the Kōloa-Poʻipū Census tract, 66.7 percent attended some college or received a higher education degree, compared to 61.1 percent throughout the County (PEP, 2016).

Poʻipū has been known as one of the two major tourist and luxury home destinations on the island, with the largest inventory of hotel rooms, transient vacation rentals, and luxury vacation homes on the island. The north shore is the second major tourist and luxury home region. The median sales price for a single-family home in Kōloa-Poʻipū was $1,210,000 in May, 2015, nearly double the county-wide median price of $645,000 (PEP, 2016).

Economic Characteristics

The median household income for Kauaʻi County during the period 2009 to 2013 is estimated at $62,052, an increase of 37.8 percent since the year 2000. Approximately 11.2 percent of the County's population was living below the poverty line. Census data for the Kōloa-Poʻipū area shows the median household income level the same as that of the County as a whole ($62,052), though Kōloa-Poʻipū has a higher per capita income and a lower proportion of residents living in poverty (7.5 percent compared to 11.2 percent at poverty for the County).

Tourism is one of the largest industries in Hawaiʻi. Statewide, the top three industries are educational, health and social services (20.3 percent); arts, entertainment, recreation, and accommodation (15.7 percent); and retail trade (11.6 percent). At the County level on Kauaʻi, the employment trends are very similar to the State's, except with an even greater proportion of the work force in the tourism-related industries of arts, entertainment, recreation, and accommodation (21.8 percent) as well as retail trade (13.5 percent). Poʻipū area trends mirror trends of the island, further highlighting the strong influence of the visitor industry.

Conversely, the agriculture, forestry, fishing, and hunting industry is one of the smallest in the State at 1.6 percent. On Kauaʻi, this percentage is slightly higher at 2.9 percent. The Poʻipū census tract, however, is more similar to the State trend, with agriculture accounting for just 1.5 percent of the employed population.

Despite the changing character of the Poʻipū area towards a resort town, Māhāʻulepū has a long history of agricultural use, as it was one of the first places in the island chain where sugarcane was commercially grown. In 2011, the State of Hawaiʻi Land Use Commission designated 1,533 acres of land (including 557 acres that make up the Hawaiʻi Dairy Farms project area) as "Important Agricultural Lands" under HRS Chapter 205 – Hawaiʻi's land use law. Per HRS Chapter 205, both State and County governments are responsible for promoting the long-term viability of agricultural use of conserved/protected Important Agricultural Lands. This designation is intended to increase the viability of agriculture through the expansion of the agriculture industry, increase job opportunities, and increase in food security for current and future generations.

Opponents to the dairy, specifically the community group Friends of Māhāʻulepū and Kawailoa Development LLP, owner of the Grand Hyatt Kauaʻi, charge that the dairy will have negative impacts on the economy in the region (Volume 4, Appendix 4). The assertions are based on research conducted on impacts from poorly managed mainland conventional feedlot dairy operations. These conventional dairies confine dairy cows to feed lots and/or barns and provide silage as feed and forage. Section 6.4, Conventional Feedlot Dairy Alternative, describes the elements of these conventional dairies. Most notably, animals are confined 24 hours a day and all manure deposited within the facility must be removed and transferred to large waste lagoons for storage and eventual disposal.

Opponents to the dairy have contradicted findings of HDF's Hawaiʻi-based expert consultants by using wildly different assumptions and, in several cases, incorrect data. In most cases, the assumptions are based on poorly-managed conventional feedlot dairy operations. The unfounded assertions are addressed throughout this chapter within the relevant resource section. HDF stands by the environmental analyses conducted for this EIS, which uses reasonable and diligent processes to disclose all probable impacts and demonstrates the dairy will not create nuisance impacts that reach beyond surrounding agricultural lands. The more detailed response can be found in Volume 5, Appendix A-A.

Property Values

Economic impacts of nuisance issues that could affect property values were examined. With a long history of agriculture, most of Kaua'i has a rural ambiance. Most homes and visitor units on the island are within one mile of some agricultural activity; the rural character adds to the appeal of the island. The site of the Grand Hyatt Kauaʻi was rezoned from agriculture to resort; the resort opened in 1992 while sugarcane was still grown just mauka of the hotel property.

Sugarcane fields bordered Kōloa on three sides, and bordered parts of Poʻipū. Sugarcane fields were burned prior to harvest, creating smoke; dust and soil runoff followed field disturbance; and large canehaul trucks created considerable noise, dust and cane litter. The Kōloa Sugar Mill emitted odors, smoke and noise. The distance of the mill to the nearest homes in Kōloa is approximately 0.8 mile; proposed dairy ~~activities~~ facilities would be 2.3~~5~~ miles from the nearest home in Kōloa. An agricultural transition to seed crops utilized land adjacent to the Poʻipū Bay Resort Golf Course. Dust from disturbed, open lands was an issue, and concern of herbicide use drifting offsite dominated community conversations. Dust from proposed HDF operations would be minimal with grass as the cover crop.

With the demise of sugar and seed crops in Kōloa and Poʻipū, the cattle grazing for the beef market is now the dominant use of agricultural land in the region. Grazing lands to the east, north and west of Kōloa total over 2,900 acres, which is reduced from over 3,300 acres before Māhāʻulepū Valley was leased by HDF. In the near term, grazing is likely to expand onto most of the lands used recently for seed crops. In Kōloa and Poʻipū, grazing occurs less than 200 feet from some homes, less than 1 mile from some visitor units, less than one-third of mile to the east and west of the main commercial area of Kōloa, and less than 200 feet from a golf course.

Many of the homes in the region that are near cattle operations are in the northeast and eastern sections of Kōloa; most of the homes were built before 1980 and are of modest size (less than 1,200 square feet). For these homes, the 2016 median assessed values ranged from $406,100 to $567,500. At the western end of Poʻipū is Kukuiʻula—a luxury residential community that abuts grazing land. Most of the homes are newer, built after 2012, and most are large at over 2,100 square feet. For 2016, median assessed values of these residential lots and homes ranged from $1,297,150 for a lot, to $2,893,100 for a lot with home.

4.15.2 Probable Impacts and Mitigation Measures - Demographic and Economic Conditions

Impacts that would be considered significant related to demographic and economic conditions could include:

- Impact of construction labor and materials on local economy and businesses; and
- Long-term impacts from the dairy operation on nearby property values and the agricultural industry locally and Statewide.

Short-term Impacts and Mitigation – Demographic and Economic Conditions

The Hawaiʻi Dairy Farms project would create short-term benefits through jobs for local construction personnel and local material suppliers. Construction employment would be expected to average about 12 jobs per year during the development period. Such jobs would include equipment operators, cement workers to lay foundations, metal workers, carpenters, plumbers, electricians, roofers, supervisors, painters, etc. Based on State employment multipliers, indirect employment related to Dairy construction would be expected to average about 16 jobs on Kauaʻi, and 8 on Oʻahu. Thus direct-plus-indirect employment associated with Dairy development would be expected to average approximately 36 jobs, of which 28 would be on Kauaʻi (PEP, 2016).

Construction of the facilities at HDF would contribute approximately $9.1 million per year during the development phase. This includes direct equipment and construction expenditures, and indirect sales related to construction.

In addition to the creation of an average of 12 construction worker jobs during the estimated construction period, the State of Hawaiʻi and County of Kauaʻi will receive excise tax revenues on finished development and building materials, conveyance taxes, and income taxes on wages. Revenues from development activities to the State is estimated at $650,000, with revenue offset by a tax credit for improvements on lands designated IAL. County revenue derived from development will be negligible.

Long-term Impacts and Mitigation – Demographic and Economic Conditions

Hawaiʻi Dairy Farms would contribute to diversification of Kauaʻi's economy, which is heavily based on the visitor industry. With only two dairies remaining in the State (both on the Big Island), less than 10 percent of Hawaiʻi's milk is locally supplied. The Hawaiʻi Dairy Farms project, with an established herd of up to 699 ~~milking~~ mature dairy cows, will increase the supply of local fluid milk by approximately 1.5 million gallons of milk annually, a 50 percent increase in statewide milk production. Once the facility is established and dairy operations have reached the committed herd size, approximately 11 direct and indirect full-time equivalent jobs would be sustained on Kauaʻi, including 5 farm jobs and about 6 indirect jobs. An additional 3 indirect jobs would be created on Oʻahu. For the contemplated herd size direct and indirect employment will roughly double.

Once fully operational with a herd of 699 mature dairy cows, annual direct-plus-indirect sales are estimated annually at $8.1 million on Kauaʻi, with an additional $2 million on Oʻahu.

When the dairy has matured to full production for the 699-cow dairy, net income to the State is calculated to exceed $60,000 annually. Net income to the County from HDF is anticipated to generate $51,000 (PEP, 2016). Employment and sales and tax revenue for the contemplated herd size of up to 2,000 ~~milking~~ mature dairy cows is discussed in Section 4.21.

Results of the technical study on economic impacts included an evaluation of property values adjacent to grazed areas within Kōloa and Poʻipū. For ~~N~~new, larger homes being built adjacent to grazing lands in developments with amenities, the 2016 median assessed values ranges from $1,297,150 for a lot, to $2,893,100 for a lot with home. Clearly, beef cattle operations are compatible with nearby homes, commercial areas, resorts and recreational areas. Although stocking densities are lower for beef cattle on unirrigated pastures than they are for the proposed dairy on irrigated pastures, the operations are similar: cattle are rotated among pastures as limited by the carrying capacity of the land.

Results of technical studies and the findings of the EIS show no unmitigated nuisances that would affect property values as a result of dairy implementation or operations. No noticeable odors, flies, noise, waste or water discharges will reach resort or residential areas. As such, the dairy will not adversely affect residents, nearby recreational activities, guests in nearby resorts, or diminish property sales or property values in the area. The dairy will help maintain the existing rural character and ambience of the Kōloa-Poʻipū region. (PEP, 2016).

4.16 GROUNDWATER RESOURCES

Water is essential for life. As an island state, Hawaiʻi has limited access to natural fresh water supplies. Competition for fresh water from increasing resident and visitor populations, as well as potential impacts of global climate change, require that Hawaiʻi become as efficient as possible in its use of limited fresh water supplies. More than 90 percent of the State's drinking water comes from groundwater sources, while much of the water used for agricultural irrigation comes from surface water sources (CH2MHill, 2013).

Groundwater is defined by the State Water Code as "water found beneath the surface of the earth, whether in perched supply, dike-confined, flowing, or percolating in underground channels or streams, under artesian pressure or not, or otherwise." Groundwater is protected through regulation at the Federal, State and County level. The Commission on Water Resource Management (CWRM), under the State Department of Land and Natural Resources, is the primary steward of the water resources public trust and has broad powers and responsibilities to protect and manage Hawaiʻi's water resources.

CWRM administers the State Water Code, codified in Hawaiʻi Revised Statutes Chapter 174C (2008 amendment) and associated administrative rules. Other State agencies continue to have responsibilities for water quality (Department of Health) and coastal zone management (Department of Business, Economic Development and Tourism). Four types of water resource and development plans are referred to as the "Hawaiʻi Water Plan": a water resource protection plan prepared by CWRM; water use and development plans prepared by and for each county; a State water project plan; and a water quality plan prepared by the Department of Health.

This section of the EIS presents existing conditions of groundwater resources of the Māhāʻulepū area, and assesses probable impacts from dairy farm operations with the committed herd size of 699 ~~milking~~ mature dairy cows. Probable impacts and recommended mitigation for groundwater related to the contemplated herd size of up to 2,000 ~~milking~~ mature dairy cows are presented in Section 4.22.

4.16.1 Hydrology

Existing Conditions - Hydrology

The Kōloa area was formed by lavas of the Napali formation of the Waimea volcanic series. Surface lavas of the Napali formation exhibit extensive weathering which may extend to considerable depths – as great as 400 feet below sea level. Weathered lava in the area is typically Saprolite, a soft, thoroughly decomposed rock. The Māhāʻulepū valley floor is filled with alluvium, which generally extends about 60 feet under the surface and is underlain by highly weathered lava at a shallow depth by secondary eruptions of the Kōloa series (COK DOW, 2001) (Figure 4.16-1).

Groundwater units have been established by CWRM (2008) to manage groundwater resources. Primarily determined by subsurface conditions, each island is divided into regions that reflect hydrogeological similarities within hydrographic, topographic and historical boundaries. The hydrologic unit encompassing Māhāʻulepū Valley is the 51-square mile Kōloa Aquifer System Area (code 20101). The sustainable yield of the aquifer is 30 million gallons per day (MGD). For the Kōloa aquifer in general, CWRM (2008) notes that the nature and extent of the basal ground water lens is not well understood due to the presence of a discontinuous, unmapped confining layer.

An analysis of groundwater and surface water was conducted for this EIS that identified two groundwater bodies within the valley: (1) a deep aquifer system within unweathered volcanic material, which is buried beneath thick alluvium that covers the valley floor; and (2) shallow groundwater in the thick alluvium. The alluvial material is highly weathered lava composed of dark brown to black silty clay and clayey silt. The aquifer of highest value and use resides deep within the unweathered volcanic material. The alluvial material blanketing the valley floor is less permeable than the unweathered volcanics by orders of magnitude. Groundwater wells developed for access to potable water are described in the following section 4.16.2, Potable Water.

Four wells to access groundwater in the alluvium were installed within the HDF site to facilitate the groundwater and surface water analysis. Water quality samples were taken to determine general conditions and to document baseline conditions, and the alluvial waterbody was monitored in response to pumping within the deep aquifer wells located in the volcanics to determine hydrologic connectivity. The proposed water quality monitoring program is presented in Section 4.16.3, Probable Impacts and Recommended Mitigation.

Hydrologic Connectivity of Waterbodies within Māhāʻulepū

The groundwater and surface water analysis for this EIS examined whether the two waterbodies within Māhāʻulepū may be connected. Four studies were conducted to determine whether the groundwater in the alluvial material might discharge into the lower aquifer confined in the unweathered volcanic material at depth. Additionally, the study quantified the current water quality within the alluvial waterbodies. Methods and results of the examination are summarized here and the full report is included in Appendix E.

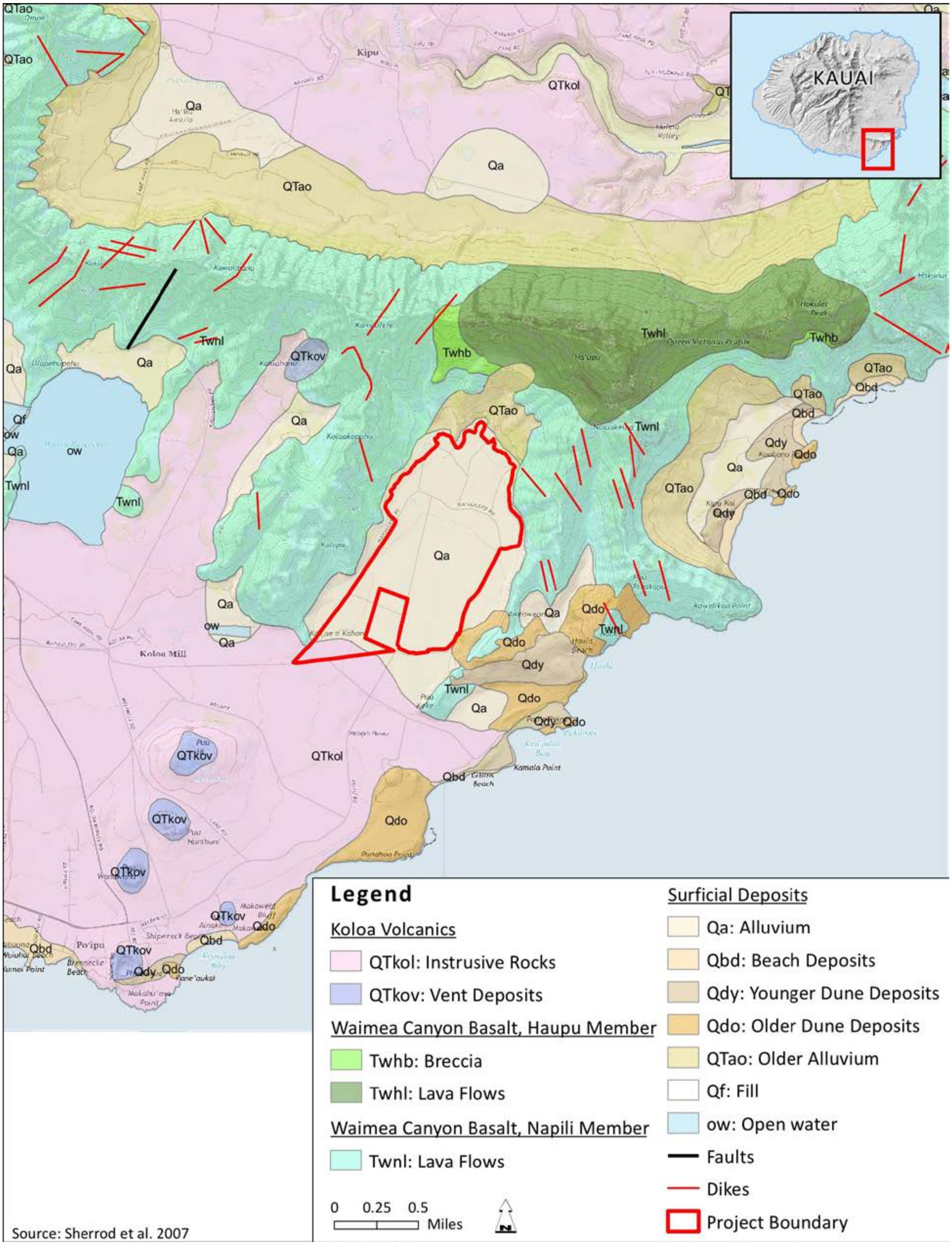


Figure 4.16-1 Geology of Māhāʻulepū and Vicinity

The following studies were conducted to determine any relationship between groundwater bodies, as part of the groundwater analysis:

1. Review of drilling logs for the last four wells developed in the Well 14 Battery, which ascertained the wells fully penetrated the alluvium and tap into groundwater within the unweathered volcanics;
2. Measurements of salinity and temperature of groundwater from two water bodies – one in the unweathered volcanics, and another in the deep alluvium on the valley floor;
3. Pump testing of a well in the Māhāʻulepū Well 14 Battery while monitoring response of groundwater in the alluvium; and
4. Response of groundwater in the alluvium to operation of the Kōloa Well F pump.

Driller's logs for installation of the final four wells developed in the Māhāʻulepū Well 14 Battery were published in the 1960 Bulletin 13 of the Hawaiʻi Division of Hydrography. The logs record sticky red, brown, and purple clay layers from 75- to 300-foot depth. These layers are essentially impermeable and function as an aquiclude to separate the groundwater in the alluvium from the confined groundwater in the underlying volcanics (TNWRE, 2016).

Measurements of salinity and temperature in the deep, confined aquifer accessed through one of the three Māhāʻulepū 14 wells showed a uniform conductivity and temperature, at 335 μS/cm (microsiemens per centimeter) and 72.0° F, respectively. Measurements of the groundwater within the alluvium show significantly higher salinity in three of the monitoring wells (HDF-1, HDF-3 and HDF-4), and significantly lower salinity (fresher) water in HDF-2. Water in the four monitoring wells was 2 to 6 degrees warmer than the temperatures recorded in the deep aquifer. Percolation of rainfall directly on the ground and surface runoff from upland provides recharge to the groundwater in the alluvium; the significant salinity and temperature differences measured between the aquifers suggests discharge of water from the alluvium into the deep volcanic aquifer is not occurring (TNWRE, 2016).

The pump test utilized water level recorders within wells HDF-1 and HDF-2, as well as two wells in the Well 14 Battery, to measure drawdown of water within a well while pumping water out of the Māhāʻulepū 14 well. The test was conducted on March 17, 2015; water levels were recorded at 30-second intervals throughout the 10-hour pumping period. By the end of the pumping period, water levels were drawn down 17.1 feet (at a pumping rate of 825 gallons per minute [gpm]) in the Māhāʻulepū 14 well. Water response in the other two wells within the Well 14 battery was instantaneous; one located 96 feet east showed drawdown of 5.3 feet, and the other located 67 feet west of the Māhāʻulepū 14 well showed drawdown of 3.7 feet.

Response of water levels within the two monitoring wells was also recorded. HDF-1 is 190 feet east of the pumped well. The water level actually showed a build-up of 0.05 feet during the pump test. This was attributed to the weight of the pumped water deposited on the ground surface. Otherwise, there was no response to the well water level. HDF-2 is 1,300 feet east of the pumped well, and showed no response to pumping. Graphs of the results can be found in Appendix E.

Finally, water level recorders were installed in each of the four HDF monitor wells and in the County Department of Water (DOW) Kōloa Well F for a seven-day period from May 13 to 20, 2015. The objective was to determine any identifiable response in the nearest monitoring well, HDF-4, which is 630 feet from Kōloa Well F. The most likely response was anticipated to be a pressure pulse arriving at HDF-4 several minutes following the starting or stopping of the pump at Kōloa F well. No such response occurred.

The groundwater and surface water study provides insight to the depth of the groundwater in the alluvial layer. Toward the inland end of the property (wells HDF-1 and 2), groundwater levels are about 80 feet AMSL. The level drops rapidly going makai, to 68 feet AMSL at HDF-4, and to 49 feet at HDF-3. In general, the movement of groundwater in the alluvium is from mauka to makai with ultimate discharge into the marine environment. Seasonally, modest amounts of groundwater may discharge to the agricultural ditch during wet conditions in the vicinity of the HDF-1 and HDF-2 monitoring wells. Because the groundwater level drops substantially at the makai end of the site (near the HDF-3 monitoring well), no groundwater discharge to the ditches occurs in this area (TNWRE, 2016).

Overall, groundwater levels in the alluvial layer are 30-feet to more than 50-feet higher than the piezometric head of groundwater in the confined underlying volcanic series. The results of the four examinations demonstrate that there is complete hydrologic separation of the two groundwater bodies in Māhāʻulepū (TNWRE, 2016).

4.16.2 Potable Water

Existing Conditions – Potable Water

Wells in Māhāʻulepū Vicinity

HDF will utilize an onsite well for potable water that was established a century ago to serve the sugarcane plantation. The last of the 14 field wells developed between 1897 and 1928, it is the deepest of the wells drilled through alluvial material to reach the aquifer deep within the volcanic series (Table 4.16-1 Information on Wells In and Near to Māhāʻulepū, Kauaʻi). The battery of wells produced 3 MGD during use for sugarcane irrigation (TNWRE, 2016).

Table 4.16-1 Information on Wells In and Near to Māhāʻulepū, Kauaʻi

State Number	Well Name	Year Drilled	Casing Diam (Inches)	Ground Elev. (Feet MSL)	Total Depth (Feet)	Elev. At Bottom of Well (Feet MSL)	Length of Solid Casing (Feet)	Elev. At Bottom of Solid Csg. (Feet MSL)	Length of Slotted Casing (Feet)	Initial Water Level (Feet MSL)	Initial Chlorides (MG/L)	Installed Pump Capacity (GPM)
5425-01	Well 1	1897	12	85	303	-218	242	-157	None			
5425-02	Well 2	1897	12	85	300	-215	242	-157	None			
5425-03	Well 3	1897	12	85	300	-215	220	-135	None			
5425-04	Well 4	1897	12	85	301	-216	224	-139	None			
5425-05	Well 5	1897	12	85	300	-215	210	-125	None			
5425-06	Well 6	1897	12	85	304	-219	212	-127	None			
5425-07	Well 7	1899	12	85	300	-215	215	-130	None			
5425-08	Well 8	1899	12	85	300	-215	215	-130	None			
5425-09	Well 9	1901	12	85	300	-215	215	-130	None			
5425-10	Well 10	1901	12	85	300	-215	215	-130	None			
5425-11	Well 11	1927	12	85	505	-420	245	-160	None	31.1	70	
5425-12	Well 12A	1927	12	85	506	-421	301	-216	None	31.0	65	
5425-13	Well 13	1927	12	85	510	-425	309	-224	None	31.0	72	
5425-14	Well 14	1928	12	85	532	-447	315	-230	None	30.0	75	
5425-15	Koloa F	1998	16	130	377	-247	123	7	175	25.9	84	1200
5426-04	Koloa C	1977	16	157	393	-236	293	-136	None	25.1		1200
5426-05	Koloa D	1981	16	222	420	-198	320	-98	None	24.0	98	1200

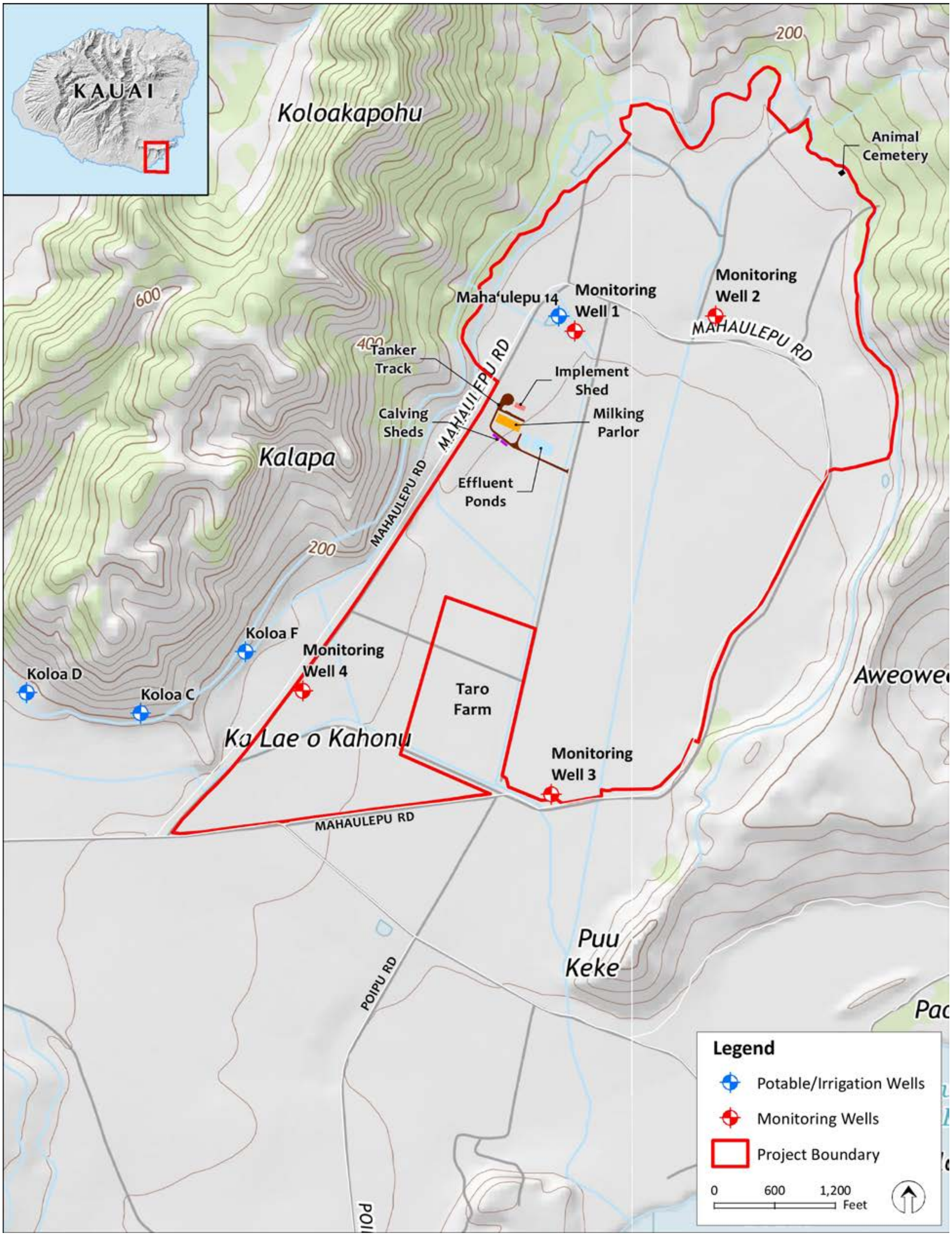


Figure 4.16-~~12~~ Wells in Māhāʻulepū Vicinity

In 1928, the original 10 wells were abandoned when the well battery was modified with four new wells and above-ground line shaft turbine pumps. Of the four well drilled in 1927 to 1928, only three functional wells were relocated during the groundwater and surface water analysis conducted for this EIS. One well will provide potable water to be used by HDF for dairy operations, a second well will be maintained as a back-up for potable water, and the third well will be utilized for deep groundwater monitoring.

The County of Kauaʻi developed three potable water wells in 1977, 1981, and 1998 to meet the demand for the growing Poʻipū resort community (Figure 4.16-~~1~~2, Wells in the Māhāʻulepū Area). Well depths range from 198-feet to 247-feet below sea level and lie in the water-bearing, unweathered Waimea volcanic series. The Kōloa F well, developed in 1998, is the closest public water source to the proposed dairy with a distance of 580-feet from the closest boundary of the HDF leased area, and approximately 0.6 mile from the dairy facilities (Figure 3.3-4). Geotechnical investigations at the Kōloa F well site determined that residual and alluvial soils underlie the surface to a depth of at least 15 feet, much shallower than the estimated 60-foot depth of alluvium on the valley floor of deep (COK DOW, 2001).

A report prepared in June 1999 on development of Kōloa F well noted barometric responses in the County Kōloa wells indicated confined aquifers or compartments (COK DOW, 2001).

Groundwater Source Protection

To assess the susceptibility of public water systems to contamination, the State of Hawaiʻi Department of Health ~~Clean Water Branch (CWB)~~ Safe Drinking Water Branch (SDWB) initiated a source water assessment program (SWAP) consistent with Federal requirements established by the U.S. Environmental Protection Agency (EPA) and with existing assessment and protection efforts in Hawaiʻi (Whittier et al., 2010). The SWAP process involved: (1) delineation of the area around a drinking water source through which contaminants may travel to the water supply; (2) inventory for potential activities that may release microbiological or chemical contaminants within the delineated area; and (3) determination of the drinking water source susceptibility to surrounding potential contamination activities (Spengler, 2014).

The SWAP delineated three zones of contribution referred to as capture zone delineations (CZD) for all public drinking water sources in the State of Hawaiʻi based on groundwater time-of-travel (TOT) criteria (Whittier and El-Kadi, 2014). The initial zone, Zone A, is the “well control site” zone and consists of a 50-meter diameter around each well. The second CZD, Zone B, delineates the 2-year TOT, which relates to conservative survival times for bacteria and viruses in soil and groundwater. The third CZD, Zone C, delineates the 10-year TOT, which would allow sufficient time to implement management and remedial measures to mitigate contamination from accidental contamination spills or other causes (Whittier, 2010).

Figure 4.16-~~2~~3 depicts the modeled capture zones for the Kōloa F well, and displays the groundwater flow pathlines from the west- north-west. The modeling depicts Zone C, the 10-year TOT, overlapping the southwest corner of the HDF site indicating a potential for leachate. ~~However, results of the hydrologic assessment demonstrate the complete hydrologic separation of the two groundwater bodies in Māhāʻulepū: the aquifer in the deep unweathered volcanic series and the source of the Kōloa F well, from the groundwater in alluvial layers on the valley floor (TNWRE, 2016).~~ Additionally, the groundwater flow pathlines depict the majority of water captured is from the west- north-west (CWB, 2016). However, results of the hydrologic assessment demonstrate the

complete hydrologic separation of the two groundwater bodies in Māhāʻulepū: the aquifer in the deep unweathered volcanic series and the source of the Kōloa F well, from the groundwater in alluvial layers on the valley floor (TNWRE, 2016).

A discussion of the ability of soils to mediate bacteriological and chemical contaminants is introduced in Section 4.3.1, Soils. As shown in Figure 4.3-2, the hydraulic conductivity of the soils in Māhāʻulepū range from 10.5 – 50 feet per day. The hydrologic assessment conducted for this EIS estimates the permeability coefficient as almost certainly less than 1.0 feet per day (TNWRE, 2016).

Findings for the Poʻipū - Kōloa region are included in the following section.

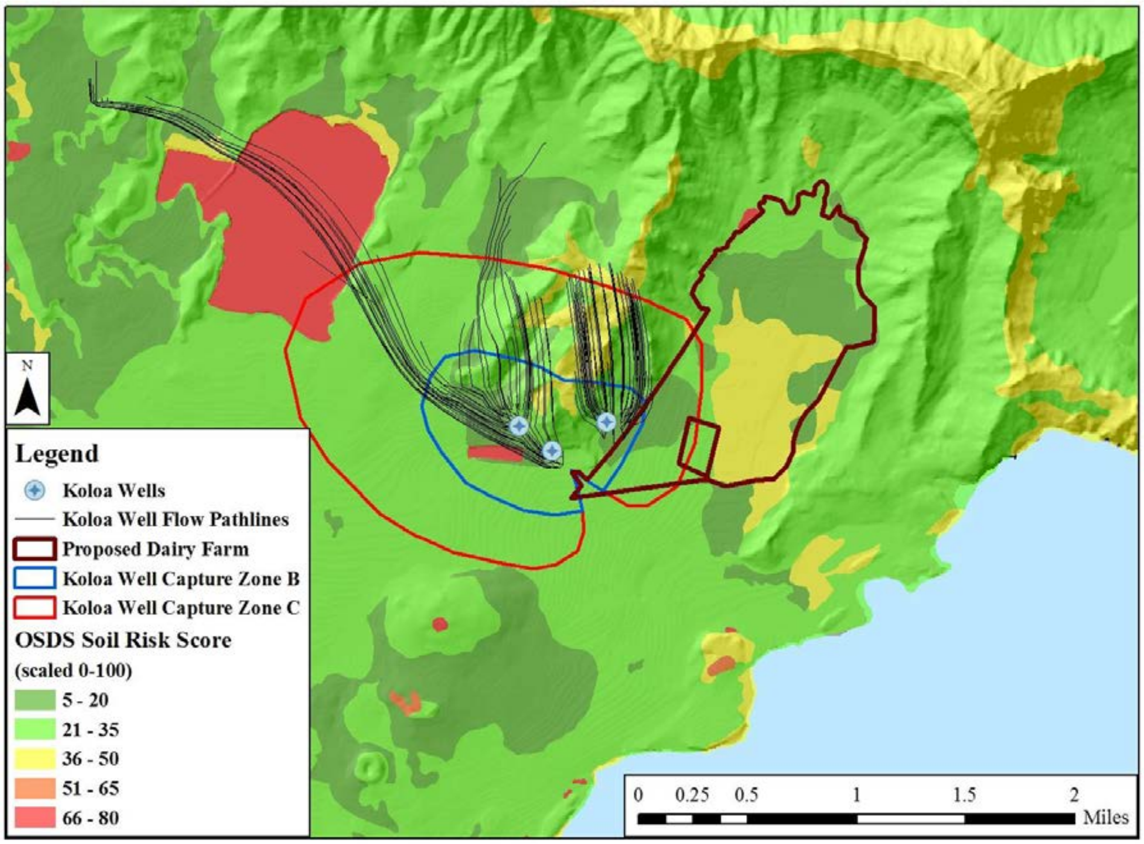


Figure 4.16-~~2~~3 County Well Head Capture Zone Delineation

Department of Health Clean Water Branch Sanitary Survey

Public complaints of contamination of Waiopili Ditch spurred an investigation by the Hawaiʻi Department of Health CWB into all possible sources that may contribute to high bacteria levels or other potential contamination sources in a watershed. The CWB research utilized a methodology known as a "Sanitary Survey."

The Sanitary Survey completed by the CWB (2016) documents the existing inventory of wastewater injection wells, stormwater injection wells, and individual wastewater systems including cesspools in the highly urbanized Waikomo Watershed. The Waikomo Watershed includes the developed areas of Kōloa and Poʻipū. Approximately 120 private injection wells discharge an estimated 1.4

MGD ~~per day~~ from private wastewater treatment systems in the area. ~~Cesspools discharge raw sewage into the ground without treatment at the estimated rate of 1.6 MGD per day and represent 76 percent of the 2,238 on-site disposal systems (OSDS) in the area.~~ An additional 1.6 MGD is estimated to be discharged from the 2,238 on-site disposal systems (OSDS) in the area, including 1,600 cesspools which put untreated waste into the ground (Whittier, El-Kadi 2014 in CWB 2016). There are no wastewater injection wells within the Māhāʻulepū sub-watershed or upgradient of the dairy property.

The Kōloa karst topography and lava tube systems that straddles the Waikomo Watershed may provide transport of injection well and cesspool effluent to the Makauwahi Cave/sinkhole lava tube system in the Māhāʻulepū sub-watershed. The fate of these discharges is eventual release into the nearshore waters at various points at reef shelf depths offshore. The Sanitary Survey estimates groundwater and coastal waters of south-east Kauaʻi are being contaminated with roughly 3 MGD of wastewater daily (CWB, 2016).

Groundwater Monitoring Wells

As described earlier in this section, four wells to access groundwater in the alluvium were installed within the HDF site to facilitate the hydrologic assessment. Analysis of water quality samples were conducted to serve as a baseline for the nutrient composition of the shallow waterbody within the alluvium. Future water quality samples can then be compared to these samples, collected prior to dairy implementation. Periodic assessments can identify any change in nutrient content that may identify seepage of nutrients into this waterbody. While the waterbody in the alluvial material is hydrologically disconnected from the deeper aquifer in volcanic basalt, any significant increases could inform nutrient management of HDF and allow for management changes to minimize nutrients not being effectively utilized by the grass crop.

Results from the baseline water quality samples collected in May and July of 2015, show that water within the alluvial ground waterbody is fresh (salinities on the order of 0.18 to 0.47 parts per thousand). Results also reveal that the nitrogen and silica levels are much lower than typical for groundwater in Hawaiian basalt. Typical nitrogen levels in basalt aquifer wells throughout the State are 70 to 80 micro molar µM, per the hydrologist's experience over decades of sampling. Typical silica levels are 700 µM. For the groundwater in the alluvium sampled from the monitor wells, nitrogen and silica are about half the typical levels found in wells tapping aquifers in basalt. The complete results of the groundwater monitoring are contained in both Appendix E (*Estimates of the Potential Impact on Groundwater and Surface Water by Hawaiʻi Dairy Farms in Māhāʻulepū, Kauaʻi)* and Appendix F (*Baseline Conditions and An Assessment of the Effect of the Proposed Hawaiʻi Dairy Farm on Surface Water and Marine Water Chemistry, Māhāʻulepū, Kauaʻi, Hawaiʻi*).

One of the three usable wells in the Māhāʻulepū 14 battery will be utilized as needed for deep water quality monitoring.

4.16.3 Probable Impacts and Mitigation Measures - Groundwater Resources

Impacts that would be considered significant related to groundwater supply and groundwater quality could include:

- Depleting the groundwater supply or interfering with groundwater recharge for aquifers in the project area; and
- Degradation of groundwater quality below State or Federal standards.

Short-term Impacts and Mitigation – Groundwater Resources

Water supply required for construction is anticipated to be nominal in comparison to previous agricultural water demand. The major water demand during construction will be for fugitive dust control in compliance with Hawaiʻi Air Quality rules (see Section 4.19). Water will come from a non-municipal source: either the on-site deep wells; or from the HDF allocation of water from Waita Reservoir (see following Section 4.17, Surface Water).

Construction of Hawaiʻi Dairy Farms facilities is not anticipated to deplete the groundwater source or interfere with groundwater recharge in the short-term. There will be no significant effect on the groundwater supply in the short-term.

Long-term Impacts and Mitigation – Groundwater Resources

Long-term groundwater supply impacts are not anticipated to be significant. Total potable water demand is approximately 30,000 gpd (0.03 MGD) for the committed proposed action herd size of up to 699 ~~milking~~ mature dairy cows (Table 4.16-2). Groundwater use for the contemplated herd size of up to 2,000 ~~milking~~ mature dairy cows is shown in Section 4.22, Table 4.22-1. The demand of approximately 30,000 gallons per day (0.03 MGD) the committed herd size is a small fraction of the 3 MGD produced by the on-site, existing Māhāʻulepū 14 well during the sugarcane plantation era (TNWRE, 2016). The sustainable yield of the larger 51-square mile Kōloa Aquifer System is 30 MGD (CWRM, 2008).

Table 4.16-2 Water Demand for HDF Operations Committed Herd Size of 699 ~~Milking~~ Mature Dairy Cows

Potable Water			
Wash water, milk cooling, employee use†	Dairy Facility	@ 699 head	12,163 gpd†
Livestock water (*25 gpd/cow)	Total Field	@ 699 head	17,475 gpd
	Total Potable Demand		**29,638 gpd**

†The majority of water used will be captured and re-used to irrigate pasture grass.

A majority of the potable water will be used as wash water. Chapter 3, Section 3.3.1.7 notes that the DOH Milk Rules require potable water for milk production including that used as wash water in the milk house and milking operations. The pasture-based dairy system utilizes all manure produced on site, capturing effluent washed from the milking parlor and holding yards though floor drains via pipes into the effluent ponds. The water and associated nutrients from cow effluent are then re-used on pastures as irrigation water. All potable water used as wash water will be re-applied to pasture and thus remain a part of the hydrologic cycle.

The buildings with related infrastructure and paved area of the dairy facility will constitute less than two percent of the total site acreage. Therefore, minimal impermeable area will be created. Stormwater runoff will either be directed to areas of grass, or be routed via curbing to the effluent ponds for runoff that potentially contains manure.

The groundwater and surface water analysis determined that the modest potable water use rate for dairy operations, and the 4,500-foot distance between the Māhāʻulepū 14 well and the nearest County potable water well (Kōloa Well F), will result in no adverse impacts to ongoing use of groundwater in the unweathered volcanic series, which is the source of potable water (TNWRE, 2016). Further, the assessment determined there is no hydrologic connection between the aquifer in the unweathered volcanic series, the source of potable water, and the shallow groundwater body in the alluvium. Thus nutrients added by the dairy operation will have no impacts to the County drinking water well, the source of potable water within the deep volcanics.

A calculation of applied nutrients that may pass-through grass and soils was estimated based on the mass nutrient balance for HDF (TNWRE, 2016). The estimate assumed that of the nutrients applied or excreted at the HDF site, two percent of total nitrogen and one percent of phosphorus could potentially ~~pass through the turf~~ run off to drainageways ~~and~~ or percolate through soil~~:~~ to shallow groundwater in the alluvium ~~and eventual release to surface water~~. Surface water is estimated to carry three times more nutrients than groundwater moving through the alluvium on the valley floor (see following discussion, Surface Water). The nutrient contributions from the dairy pastures would not occur as chronic daily releases, rather, the runoff contributions would be limited to periods of major rainfall and storm water events. Per best practices, no effluent application would be conducted during such weather events.

Though the waterbody in which the County wells occur (the deep volcanics) is confined and hydrologically separated from shallow waterbodies in the Māhāʻulepū Valley alluvial material, HDF established a 1,000-foot setback surrounding the Kōloa F well in agreement with the County Department of Water. Within this setback, no effluent will be applied and no animals will deposit manure as the area will not be used for grazing. Chapter 3, Figure 3.5-~~2~~3, Paddock Layout, shows the area within the HDF site that will be excluded from grazing and nutrient application. This is greater than the 50-meter well control zone, and is significantly greater than the 50-foot setback for application of livestock effluent identified in the DOH *Guidelines for Livestock Management* (2010).

Four water monitoring wells installed by HDF into the shallow water aquifer within the alluvium will allow long-term water quality monitoring. Monitoring and analysis of nutrient and chemical constituent levels over time will identify any change in composition of shallow groundwater in the alluvium. Results from the monitoring program will be ~~shared with~~ made available to DOH CWB, dairy neighbors and the local Kauaʻi community.

4.17 SURFACE WATER RESOURCES & NEARSHORE MARINE ENVIRONMENT

The State DLNR Commission on Water Resource Management has established surface water hydrologic units for managing surface water resources. The project area is located within the Māhāʻulepū Surface Water Hydrologic Unit, which features relatively high precipitation with relatively low stream discharge.

This section of the EIS presents existing conditions of surface water resources and the nearshore marine environment of the Māhāʻulepū area, and assesses probable impacts from dairy farm operations with the committed herd size of 699 ~~milking~~ mature dairy cows. Probable impacts and recommended mitigation for surface water resources and nearshore marine related to the contemplated herd size of up to 2,000 ~~milking~~ mature dairy cows are presented in Section 4.23.

4.17.1 Intermittent Streams and Agricultural Ditches of Māhāʻulepū Valley

Existing Conditions – Surface Waters and Ditches

The project area is located on the bottom-land of the upper Māhāʻulepū Valley, which is fed by several intermittent streams coming off of the south slope of the Haʻupu Ridge. Intermittent streams in Hawaiʻi only flow during periods of significant rainfall that causes runoff. These normally dry streams converge into man-made channels that intermittently run~~ning~~ through the project site across the valley floor, and meet a concrete ditch that parallels lower Māhāʻulepū Road. This ditch, named Waiopili Ditch, is joined by a reach from the west that originates at a small unnamed reservoir, and continues off site towards the south. Older agricultural ʻauwai (ditch) that run in and around the project area appear abandoned and no longer functional.

The main surface water course which crosses the HDF site is not named on the U.S. Geologic Survey quadrangle map. At its mauka end above the HDF property, it is a relatively steep, naturally occurring water course with several small tributaries. Across the HDF property and for some distance further makai, the channel is manmade and was created to facilitate former sugarcane irrigation. The groundwater and surface water analysis conducted for this EIS (see Section 4.16.1, Hydrology) observed that groundwater from the alluvium discharges into the channels on a seasonal basis in the vicinity of the HDF-1 and HDF-2 monitoring wells. In the lower elevations of the site no such discharge occurs as the groundwater level in the alluvium is substantially lower.

There are a number of other drainage channels that convey surface water runoff which originates offsite and cross or border the HDF property. Historically the Waita Reservoir Ditch circumnavigated the Māhāʻulepū Valley floor, bringing water to both the Māhāʻulepū Reservoir (outside the HDF site) and to provide for sugarcane furrow irrigation. This ditch apparently fell out of use when the irrigation method was converted from furrow to drip (TNWRE, 2016). From that time forward, water from the Well 14 battery was apparently the sole source of irrigation for sugarcane in the valley. In the post-plantation period (from about 1999), water from Waita Reservoir has been delivered to Māhāʻulepū via a 12-inch pipeline. The pipeline supplies an actively cultivated taro farm within Māhāʻulepū Valley, banana cultivation near DOW's Kōloa Well F, a quarry on the east side of the valley, and agricultural crops makai of the HDF property. HDF is utilizing the non-potable water source to irrigate approximately 70 acres of grass at the mauka end of the site.

Many of the aquatic features just described are shown on the USFWS National Wetlands Inventory (NWI) and assigned codes that describe the habitat type presumed by the Inventory (most information in the NWI was derived from aerial photographs and maps, not field investigations; USFWS, 2014). All of the water ditches on the property (and the *ʻauwai* around the margin of the valley floor) are coded "R4SBCx", which represents: intermittent (seasonally flooded) flowing water, in an excavated channel. An exception is the ditch (and channel upslope) directing stream flow off Kāmaulele (Figure 4.4-2), which is coded R3RBH: an upper perennial stream with a rock bottom. However, this characterization is unlikely (Rana Biological and AECOS, 2016). According to CWRM (2005, 2008), there are no perennial streams in the Māhāʻulepū watershed.

4.17.2 Surface Water Quality

Hawaiʻi's Department of Health Clean Water Branch (CWB) administers and enforces Statewide water pollution laws and rules. CWB oversees permits for point-source discharge, monitors permit compliance, investigates complaints, and conducts water quality sampling. The CWB Monitoring and Analysis Section is responsible for sampling and analysis in support of Federal Clean Water Act (CWA) §303(d) assessments, §305(b) integrated reports, and §319 non-point source management grants. A major activity of CWB is water quality monitoring of beaches as initiated under the Beaches Environmental Assessment and Coastal Health Act of 2000 (BEACH), an amendment to the Federal CWA. Additionally, coastal chemistry monitoring of nearshore and offshore waters is conducted for select indicators of water quality; however, offshore sampling has been suspended due to manpower and funding constraints (CWB, 2012).

Water quality standards are established relative to designation of the waterbody (e.g. inland freshwater, open ocean, embayment, estuaries). Classification of State waters (inland or marine) and water uses are documented in Hawaiʻi Administrative Rules (HAR) HAR §11-54. HAR§11-54 does not classify for protection any flowing inland waters within the Māhāʻulepū Watershed, thus they fall into Class 2 [HAR §11-54-5.1(a)(1)(C)]. "The objective of Class 2 waters is to protect their use for recreational purposes, the support and propagation of aquatic life, agricultural and industrial water supplies, shipping, and navigation... These waters shall not act as receiving waters for any discharge which has not received the best degree of treatment or control compatible with the criteria established for this class..." (DOH, 2014).

Narrative and numeric criteria are specific to waterbody classification, and provide the basis for evaluating water quality data. The U.S. Environmental Protection Agency (EPA) recommended new water quality criteria for recreational waters to protect health of beaches and waters. Priority for Hawaiʻi's nearshore water quality monitoring goes to public beaches where the general public recreates in numbers; areas accessed across private lands are typically not included due to limited funding.

The Kauaʻi Chapter of the Surfrider Foundation began collecting water samples in Waiopili Ditch near the bridge accessing Makauwahi Cave Reserve in April of 2014. Its "Blue Water Task Force" typically collects water samples from the ocean environment, and some streams not tested by DOH. The group reported high levels of enterococcus to the State DOH and provided its data. However, for DOH to utilize water quality data provided by a third party, the party must furnish its Quality Assurance Project Plan, chain of custody, and laboratory reports. Evaluation of the third-party data by DOH CWB determined it did not meet CWB quality assurance/quality control requirements, and it could not be used for regulatory purposes.

CWB had not conducted water quality sampling for either nearshore recreation waters at the terminus of Waiopili Ditch, or of surface waters in the Māhāʻulepū Surface Water Hydrologic Unit as the remote areas are on private lands. Complaints from the public citing the high levels of enterococcus in Waiopili Ditch and public concerns about the proposed dairy prompted CWB to conduct a "Sanitary Survey" of the Māhāʻulepū and adjacent watersheds. DOH conducted water sampling within the Waiopili Ditch and areas upstream, and initiated a series of investigations into water quality issues. Following EPA standards for a Sanitary Survey, DOH has completed Part I of its report: *Waiopili Ditch Sanitary Survey, Kauai, Part I* (CWB, 2016).

The findings of the Sanitary Survey indicate that high levels of enterococcus and *Clostridium perfringens* occur in sediment of Waiopili Ditch. Soil has been identified as a primary source of fecal indicator bacteria in the environment, and can be transported by precipitation into even pristine streams and rivers (Hardina and Fujioka, 1991, in CWB, ~~unpublished~~ 2016). The agricultural ditch and intermittent streams showed degraded water quality parameters for nutrients and pathogens. Elevated levels in these water courses is due to the low flow conditions and varied inputs from the agricultural lands and natural contributions from the watershed. Water inputs to the agricultural ditches come from a watershed area surrounding the Māhāʻulepū Valley, including the sloped areas from Hāʻupu Ridge (CWB, 2016).

The Sanitary Survey found no significant impact to the Waiopili Ditch from any activity that can be attributed to the dairy. Feral animal waste, decaying organic debris and inputs from existing agricultural operations may all be contributing factors in the indicator levels found in ditches running through Māhāʻulepū Valley. The dense canopy along the makai end of Waiopili ditch blocks ultraviolet rays that could help reduce bacteria levels. CWB notes that Waiopili Ditch is a man-made drainage on private property, and is not an inviting recreational body of water utilized by people. The predicted risk of illness from recreation exposure to a cattle-impacted waterbody is 25- to 150-times lower than the risk of illness associated with exposure to human sources of contamination in a waterbody (EPA, 2010 in CWB, 2016).

Marine Research Consultants, Inc. (MRCI) conducted water quality surveys of the intermittent streams and agricultural ditches feeding into and including the Waiopili Ditch for this EIS (see Figure 4.17-1). Counts of indicator bacteria (enterococcus and *C. perfringens*) in surface water samples and nearshore marine samples showed no repetitive pattern: counts were high and variable between sampling sites, and showed variation among periods sampled. As no dairy activities existed during the sampling, the high levels of indicator bacteria appear to be the result of naturally occurring sources, as well as other ongoing land uses (MRCI, 2016). These sources may include feral animals, or domesticated animals (pigs, sheep) that are being raised near the dairy property. No dairy cattle were present on the site during any of the sampling events, so the observed counts of indicator bacteria are not a result of dairy operations.

4.17.3 Nearshore Marine Waters

Water quality constituents including nutrients and bacteria were measured in the nearshore waters off Waiopili Ditch and the coastline along Māhāʻulepū and Poʻipū to establish baseline conditions for this EIS (see Figure 4.17-1). Ocean waters along this shoreline are considered high quality ocean waters due to the active wave, winds and currents which provides mixing energy. This stretch of open coastal waters is classified as Class A under State Water Quality Standards, as no embayments, marine waters, or open coastal waters in the vicinity are listed in HAR §11-54 for special protection. Use of Class A waters in the standards state: "the objective of Class A [marine] waters that their use for recreational purposes and aesthetic enjoyment be protected. Any other use shall be permitted as long as it is compatible with the protection and propagation of fish, shellfish, and wildlife, and with the recreation in and on these waters. These waters shall not act as receiving waters for any discharge which has not received the best degree of treatment or control compatible with the criteria established for this class" (DOH, 2014).

Comparing the surface water samples to those taken in nearshore ocean water revealed that indicator bacteria were substantially lower in the ocean than in the ditch. The rapid decrease is likely a result of both physical mixing of water masses and toxicity from saline water. In any event, the elevated levels of indicator bacteria do not extend beyond the shoreline (MRCI, 2016).

Analyses of water chemistry samples from the marine environment indicate two major patterns. Small elevations of inorganic nutrients (Si, NO_3-, $PO_4{}^3$-, TN, TP) at the shoreline, along with corresponding decreases in salinity indicate only a small input of groundwater at the shoreline. Groundwater input is mixed to background oceanic values within meters of the shoreline. Along the marine sampling station originating at the juncture of Waiopili Ditch and the ocean, steep gradients of nutrients, salinity, Chloryphyll *a* and turbidity were observed. These gradients are the result of a narrow zone of mixing between ditch water and ocean water in the intertidal region of the reef flat. Typical oceanographic conditions of tradewind generated seas and long-period swells breaking on the reef platform result in rapid mixing and dilution of ditch water constituents within a narrow zone that only extends several meters from the shoreline. As a result, input from ditch water is highly restricted in terms of effects to the marine environment.

The MRCI report is included as Appendix F. To address comments to the Draft EIS, HDF engaged MRCI to survey the marine biotic community structure and provide baseline documentation of existing conditions. The typical weather and sea conditions in the area are characterized as a high energy environment due to frequent tradewinds and long-period ocean swell, which rapidly mix the water column. This translates to rough water conditions considered dangerous for human recreation except during periods of exceptionally calm wind and waves. The survey was conducted during such a period in November 2016, to allow for safety as well as for visibility within the water.

The shoreline and nearshore marine environment is shaped by a submerged basaltic shelf, formed from ancient lava flows. A semi-embayment is created seaward of the basaltic shelf, bounded by extrusions of pillow lava that form distinct shallow dikes that focus breaking waves. Within the central area of this semi-embayment are expansive sand flats. Biotopes – areas of uniform environmental conditions that provide a living place for a specific assemblage of plants and animals - were documented and described for the Māhāʻulepū area. The open coastal exposure to long-period south swells and tradewind-generated seas are reflected in the survey findings. There is essentially no biotic community structure in the areas where the ditch water flow meets the ocean.

Coral community structure throughout the nearshore zone that has a hard bottom is generally restricted to the hardy pioneering coral *Pocillopora meandrina*. Where substratum is more sheltered from wave effects or has more complexity in the form of undercuts, ridges and knolls, additional common species are seen: *Porites lobata* and *P. compressa*, and *Montipora patula* and *M. capitata*. Coral cover in such areas was 10 to 20 percent of bottom cover. The exception was a small area approximately 0.3 miles south of the ditch point of discharge, where a well-established coral community was identified. The larger coral colonies likely exist due to a protective lava extrusion that shelters the area from destructive waves; assumedly these corals withstood wave forces associated with hurricanes that directly impacted Kauaʻi in 1982 and 1992. The corals within this area, while not common for the high energy marine environment, are composed of the most common components of most Hawaiian reefs. Due to the distance from the discharge point (approximately 2,000 feet, or 0.3 mile), nutrient or biological inputs from the ditch would be diluted to background marine levels. The complete marine biotic assessment report, including a coral cover map, is included in Volume 2 as Appendix F-1.

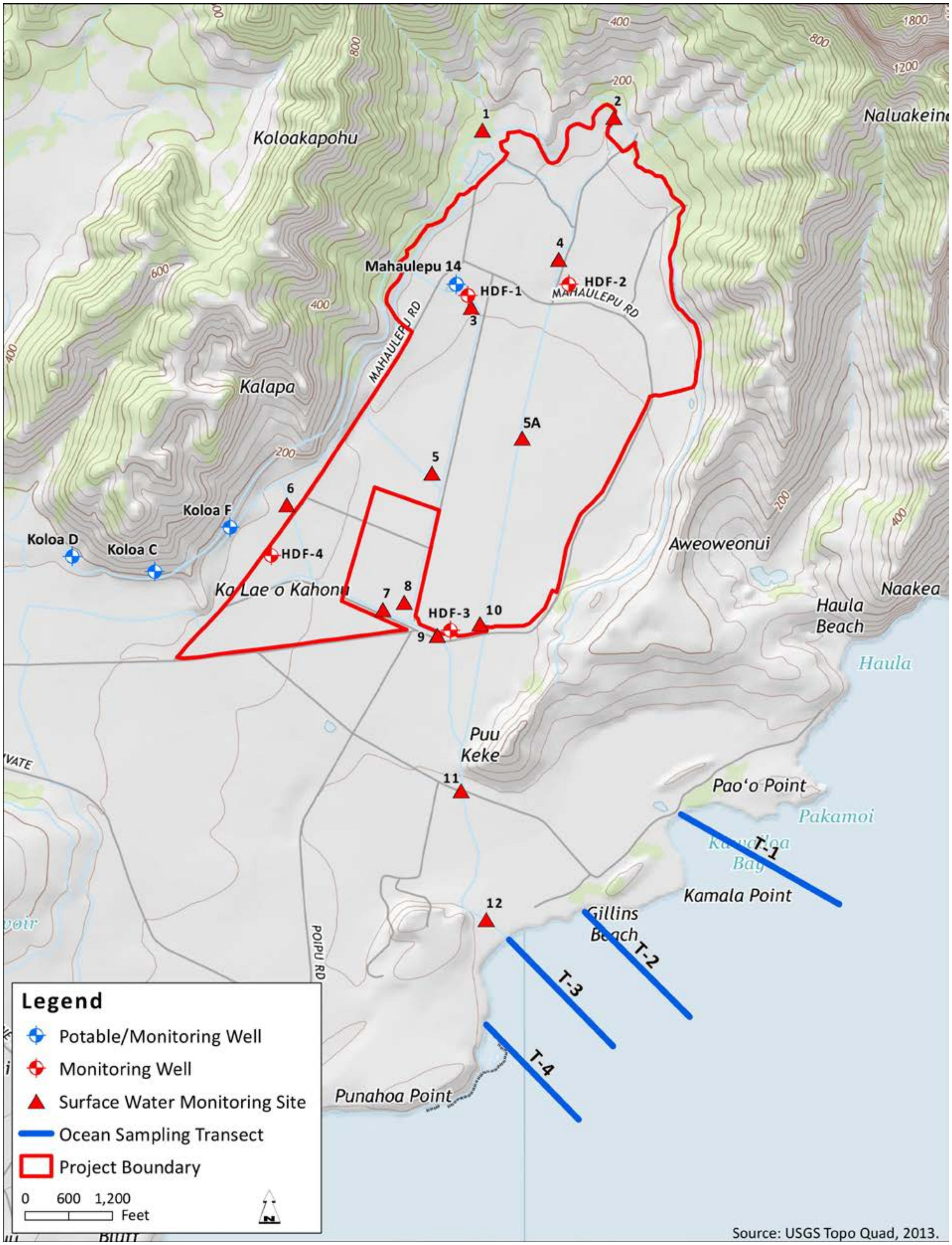


Figure 4.17-1 Surface and Marine Water Sampling Sites

4.17.4 Probable Impacts and Mitigation Measures

Impacts that would be considered significant related to surface water could include:

- Cows depositing manure into on-site surface water and damaging the banks of the drainageway causing erosion;
- Introducing sedimentation into the on-site drainage ways; and
- Stormwater run-off carrying manure or nutrients into surface waters.

The probable impacts to surface waters and the nearshore marine environment are discussed in this section. The *Surface Water Quality and Marine Assessment* report prepared by MRCI includes an analysis of potential impacts from dairy operations, including nutrient run-off from the dairy site. Proposed minimization and mitigation measures to reduce HDF impacts to surface waters and the nearshore marine environment are included.

<u>Short-term Impacts and Mitigation Measures – Surface Water Resources & Marine Environment</u>

As discussed in Chapter 3.0, Description of the Proposed Action and Section 4.2, Topography, there will be site work required for pasture establishment and dairy facilities development. These developments will be designed to employ NRCS standards per the HDF Conservation Plan. Best management practices will be utilized during construction and pasture establishment.

A Stormwater Pollution Prevention Plan (SWPPP) has been developed for the site to document controls and best management practices to avoid, control, and trap potential erosion associated with construction activities. The SWPPP is required as part of the application for the NPDES – Construction Stormwater General Permit, and describes any discharge in compliance with relevant regulations.

In compliance with Federal and State Clean Water regulations, HDF will institute appropriate controls and procedures to retain stormwater impacted by construction, and to prevent hazardous materials such as petroleum products from construction vehicles from coming into contact with stormwater run-off. Both management controls and structural controls will be implemented in the short-term. Management controls will include: minimizing exposure of disturbed surfaces; monitoring and repair of structural controls; prohibiting leaking or poorly-maintained construction equipment and machinery; and keeping adjacent public, paved streets free of dirt and mud. Structural controls to be utilized during construction will include: silt fence installed in key locations; sand bags barriers in swales; and geotextile filter fabric and sediment logs around drain inlets.

Normal ongoing farming and ranching activities are exempt from the Clean Water Act Section 404. HDF received confirmation of exemption for maintenance of existing drainage ditches from the Honolulu District, U.S. Army Corps of Engineers (USACE) in ~~2013~~ 2014. Additional practices are anticipated to fall under the exemption for construction or maintenance of existing or new animal walkways, stream crossings, and farm roads with application of best management practices.

Short-term adverse impacts to surface waters from construction are anticipated to be within NPDES permitted levels. No short-term adverse effects are anticipated to the quality of nearshore ocean waters and the nearshore marine environment.

<u>Long-term Impacts and Mitigation Measures – Surface Water Resources & Marine Environment</u>

Long-term impacts will improve surface water quality in agricultural ditches and the downstream Waiopili Ditch.

Soil Erosion and Suspended Sediments. Over the long-term, the surface water quality in the intermittently flowing agricultural ditches and Waiopili Ditch will be improved by active management of the dairy site. Cultivation of a grass thatch for complete vegetative cover throughout the dairy paddocks will minimize currently exposed soils within the site. The reduction in runoff from various storm events was estimated where flows combine in Māhāʻulepū Ditch immediately south of the project site. For the 10-year storm event, peak flow leaving the project site will be reduced by 257 cubic feet per second (cfs); for the 25-year storm event, reduced by 283 cfs; and for the 50-year storm event, reduced by nearly 300 cfs (Section 3.3.2.3).

Vegetation and stream flow in the areas downstream of the dairy site are beyond the control of the dairy operation. Mahaulepu Farm's agricultural tenants have responsibilities to maintain farm lands and vegetation growth along ditches to allow channel flow during peak stormwater runoff events. Suspended soil inputs from natural sources and offsite ranching and agricultural uses in the watershed will continue to enter the agricultural ditches, which drain downstream into Waiopili Ditch and the nearshore ocean waters.

Waiopili Ditch receives runoff from the larger 2,700-acre Māhāʻulepū Valley sub-watershed, including the lands mauka and makai of the dairy facilities and pasture paddocks. The dairy site represents roughly 20 percent of the sub-watershed, and soil erosion within the dairy will be reduced by establishment of the thick grass ground cover for pasture and filter strips along drainageways (Section 4.3.2, Soils).

Nutrients from Effluent Irrigation and Commercial Fertilizer Application. The Conservation Plan and best management practices include setbacks to minimize impacts to waterways. For effluent application, the setback is 50 feet from drainageways. Irrigation and nutrient application will maintain sufficient pasture grazing grasses for the herd. Non-potable irrigation water from Waita Reservoir will be applied through the central pivot system, and can be mixed with nutrient-enriched water from the effluent ponds as fertilizer. Refer to Section 3.5.3 and Appendix D, Nutrient Balance Analysis (Group 70 and Red Barn, 2016).

The natural fertilizer from manure deposited directly to pasture and effluent collected from the milking parlor is insufficient to meet the agronomic need of the pasture grass crop with the committed herd size of 699 ~~milking~~ mature dairy cows. Therefore, supplemental commercial fertilizer will be required to provide sufficient nutrients to sustain the pasture grass at the committed herd size. In keeping with the NRCS Nutrient Management Practice Code, monitoring and analysis of soil, manure, and tissue samples will be used to amend the nutrient budget analysis prepared for the site (Appendix D).

Surface water is estimated to carry three times more nutrients than groundwater moving through the alluvium on the valley floor (see previous discussion, Groundwater). The groundwater and surface water analysis (Appendix E) estimates two percent of total nitrogen and one percent of phosphorus could potentially leave the site ~~pass through the turf and soil~~. Given the poor permeability of the alluvium, groundwater flow would be modest. However, the groundwater level in the alluvium is approximately 80 feet above mean sea level near the HDF monitoring wells 1 and 2, and lie approximately 8 to 10 feet deep (Nance, Volume 4 Appendix A-2). The groundwater can rise in wetter periods and intersect the deep drainage ditches. Episodic, seasonal events will result in a modest amount of discharge from groundwater into the surface channel.

Using NRCS curve number method to compute runoff for the sites' B and D class soils and irrigated pasture in good condition, it is estimated that actual runoff into drainageways from HDF pasture will only occur when rainfall exceeds 0.8 inches. Based on the 30-year daily rainfall record for the area, such rainfall events are estimated to occur approximately three percent of days, or an average of 10 days annually (TNWRE, 2016). Applying the estimate~~s~~ of two percent and one percent of nutrients ~~pass-through~~ to the HDF operational nutrient mass balance, two percent of nitrogen ~~pass through~~ would total 10,000 pounds per year, and one percent of phosphorus ~~pass through~~ would total 900 pounds per year leaving the site through periodic run-off to drainageways or percolatation through soil. Note that nutrient release from the dairy site would not occur as chronic daily release, rather, the ~~runoff~~ contributions would be limited to periods of the major rainfall and storm water events. Per best practices, no effluent application would be conducted two days prior to, during, and two days after such weather events. The estimate of nutrients leaving the site from either groundwater or surface water is the same for both the committed herd size of 699 mature dairy cows and the contemplated herd size of up to 2,000 mature dairy cows.

Section 4.20.1, Interrelationships and Cumulative Environmental Impacts, compares the nutrient input from the adjacent Kōloa-Poʻipū region. Nitrogen additions to the near-term marine environment along the Poʻipū coastline are estimated at 38,510 pounds per year from domestic wastewater and landscape fertilization, equating to 3.5 times greater than the potential contribution from HDF; phosphorus of 1,260 pounds per year is calculated and is 1.4 times greater than the potential contribution from HDF.

Nutrients from Manure in Pastures. Utilizing nutrients from the manure's organic matter is key to the pasture-based rotational grazing system. As described in Section 4.3, Soils, microbes within the soils effectively transport nutrients from manure and effluent to plants. Cow manure deposited in the pastures will break down naturally into organic matter and release nutrients in the process. The soluble nutrients from the manure will enter the pasture grass, underlying thatch and soil profile, and be utilized as part of the nutrient requirement of pasture grasses. Montgomery (2016) notes that high populations of dung beetles at this location will effectively bury dung pats into the soil profile in one to three days. Yost & Krueger (2016) anticipates the manure nutrients will largely be utilized by the pasture grass.

NRCS Practice Standards and the ~~U.H. Guidebook~~ DOH *Guidelines for Livestock Management* (2010) have established various setbacks to minimize impacts to waterways. Fences will be erected along 35-foot setbacks to exclude cows from drainageways. The 35-foot setbacks (totaling 70 feet, as setbacks are on both sides of the drainageways) will be vegetated to act as filter strips and trap soil particles and organic debris from stormwater runoff. Manure particles that do not settle out in to the buffer area could be carried into ditch waters and downstream with stormwater flows. During runoff events, ditch waters will also contain substantial organic debris, suspended sediment and nutrients from natural and other man-made sources in the watershed. The relative contribution of manure particles in the stormwater flows within agricultural ditches will be a small fraction of the total from the watershed.

Impacts to the Nearshore Marine Environment. During the rainfall and runoff events, the dairy's nutrient contributions would be further diluted by additional volume of surface runoff and ditch flows. The terminus of Waiopili Ditch is a deep, muddy basin that joins the ocean through a channel cut through beach sand. Water chemistry measurements made by MRCI identified mixing of ditch water occurs rapidly and within a short distance of the shoreline. MRCI concluded there will be no substantial effects to marine water quality from the HDF dairy (Appendix F).

Based on results of the marine biotic survey and considering the response of other marine habitats throughout Hawaiʻi to nutrient inputs, there is no indication of any conditions associated with potential discharge from HDF that could lead to deleterious effects to coral reef communities (Appendix F).

Mitigation –Buffers. Vegetative buffers totaling 70 feet in width – 35 feet on either side measured from the top of the agricultural ditches – will be established in keeping with the *Guidelines for Livestock Management* (~~U.H.~~ DOH, 2010) to improve and maintain water quality and reduce erosion. Fences will be erected along the 35-foot setbacks to exclude cows from the buffer areas; vegetation along the buffer will trap soil particles and organic debris in order to minimize inputs to stormwater runoff. Vegetation in and adjacent to the ditches will be maintained to control overgrowth and minimize ditch bank soil erosion.

Additional effluent application setbacks totaling 100 feet in width – 50 feet from the top of either side of a waterway – will keep nutrient applications away from waterways.

Mitigation - Surface Water Quality Monitoring. A long-term water quality monitoring program has been instituted to regularly sample and analyze nutrient and chemical constituent levels of the surface waters (agricultural ditches and Waiopili Ditch). The monitoring program and methods will be established to meet the CWB quality assurance/quality control requirements. The ongoing testing program will provide feedback to the dairy management team regarding changes in water quality. Data from the surface water monitoring program will be ~~shared with~~ made available to the DOH CWB, dairy neighbors and the local Kauaʻi community.

Increases in nutrients as a result of dairy establishment or operations can inform modification of the operation's nutrient management. Modifications to the timing and placement of effluent can be made; the rate of application can be changed; different crops can be utilized to increase uptake by plants; and the number of cows can be changed. Nutrient management is a dynamic process that is informed by monitoring a number of parameters; the ability to monitor nearby water bodies for changes in nutrients is an additional check that provides data to be publically shared.

Mitigation - Ocean Water Quality Monitoring. A long-term ocean water quality monitoring has been instituted in conjunction with the surface water quality monitoring, to regularly sample and analyze nutrient and chemical constituent levels in the nearshore marine waters. The ongoing testing program will provide feedback to the dairy management team regarding changes in water quality. Data from the nearshore water monitoring program will be ~~shared with~~ made available to the DOH CWB, dairy neighbors and the local Kauaʻi community.

Opponents to the dairy, specifically the community group Friends of Māhāʻulepū and Kawailoa Development LLP, owner of the Grand Hyatt Kauaʻi, charge that the proposed dairy will impact the marine environment and noted that the Draft EIS did not include a survey of the marine biotic community down-gradient. In response, HDF conducted a marine biotic assessment; a summary of its findings is included in this Final EIS. The full report, with maps, is contained in the FEIS Volume 2, Technical Appendices, Appendix F-1.

4.18 ROADWAYS AND TRAFFIC

In this section, analysis for the committed herd size of 699 ~~milking~~ mature dairy cows is presented. Refer to Section 4.24.1 for the traffic-related conditions related to the future contemplated herd size of up to 2,000 ~~milking~~ mature dairy cows.

4.18.1 Existing Conditions – Roadways and Traffic

Primary access to the site is via Māhāʻulepū Road, a two-way, two-lane road, which is accessible from Kōloa Road (Highway 530) via Ala Kinoiki Road, a two-way, two-lane County bypass road that provides mauka-makai access from Māhāʻulepū Road to Poʻipū Road. Secondary access would be provided southeast of the project site from Poʻipū Road, a two-way, two-lane County collector road, which connects to Māhāʻulepū Road. Kōloa Road is a two-way, two-lane County road that runs from Kaumualiʻi Highway to the west to Maluhia Road to the east (Figure 4.18-1). Traffic for 2009-2010 was measured along Ala Kinoiki Road at 8,000 vehicles per day, and along Kōloa Road at 6,500 vehicles per day (Fehr & Peers in COK, 2015a).

The HDF site is accessed from Māhāʻulepū Road via a network of unimproved private agriculture haul roads. The agricultural roads are utilized by trucks accessing quarry operations and agricultural properties in the vicinity of the HDF site. Privately owned and rental vehicles travel the rough, unpaved roads to access beaches east of the HDF site. The private landowner, Mahaulepu Farm, allows access during daylight hours and locks gates across the access points at night. Typically these vehicles follow a dirt road that begins at the terminus of Poʻipū Road near the Grand Hyatt Kauaʻi.

4.18.2 Probable Impacts and Mitigation Measures - Roadways and Traffic

Impacts that would be considered significant related to traffic could include:

- A significant increase in traffic on Ala Kinoiki or Poʻipū roads; significant traffic delays for a substantial number of motorists; or
- Changes to traffic patterns or road infrastructure that affect pedestrian, bicyclist or motorist safety.

Short-term Impacts and Mitigation Measures – Roadways and Traffic

The proposed project is not expected to significantly increase traffic in the project vicinity in the short-term. The construction-related traffic will end after project completion.

There will be no significant change to traffic patterns or infrastructure related to the public roads.

Long-term Impacts and Mitigation Measures – Roadways and Traffic

Traffic operations along Māhāʻulepū Road and the surrounding County roads are expected to continue to operate at acceptable levels of service during peak hours of traffic for the long-term. The projected increase in vehicle movements related to HDF operations is shown in Table 4.18-1, and includes daily employees accessing the site, milk tanker and supply trucks every two days, and truck with stock trailer, for a total of 12 additional vehicle trips per day. These additional trips would have a minimal effect on traffic conditions at County roadways in the surrounding area.

Table 4.18-1 Change in Daily Traffic Movement
For Committed Herd Size (699 ~~Milking~~ Mature Dairy Cows)

Traffic Data	*2009-2010 Baseline	w/ 699 Herd Dairy	% Change
Ala Kinoiki Road	8,000	8,012	0.15%
Koloa Road	6,500	6,512	0.18%
	*2035 Projection	w/ 699 Herd Dairy	% Change
Ala Kinoiki Road	7,200	7,212	0.17%
Koloa Road	9,500	9,512	0.13%

**Source: Fehr & Peers 2014 in County of Kauaʻi 2015b, South Kauaʻi Community Plan*

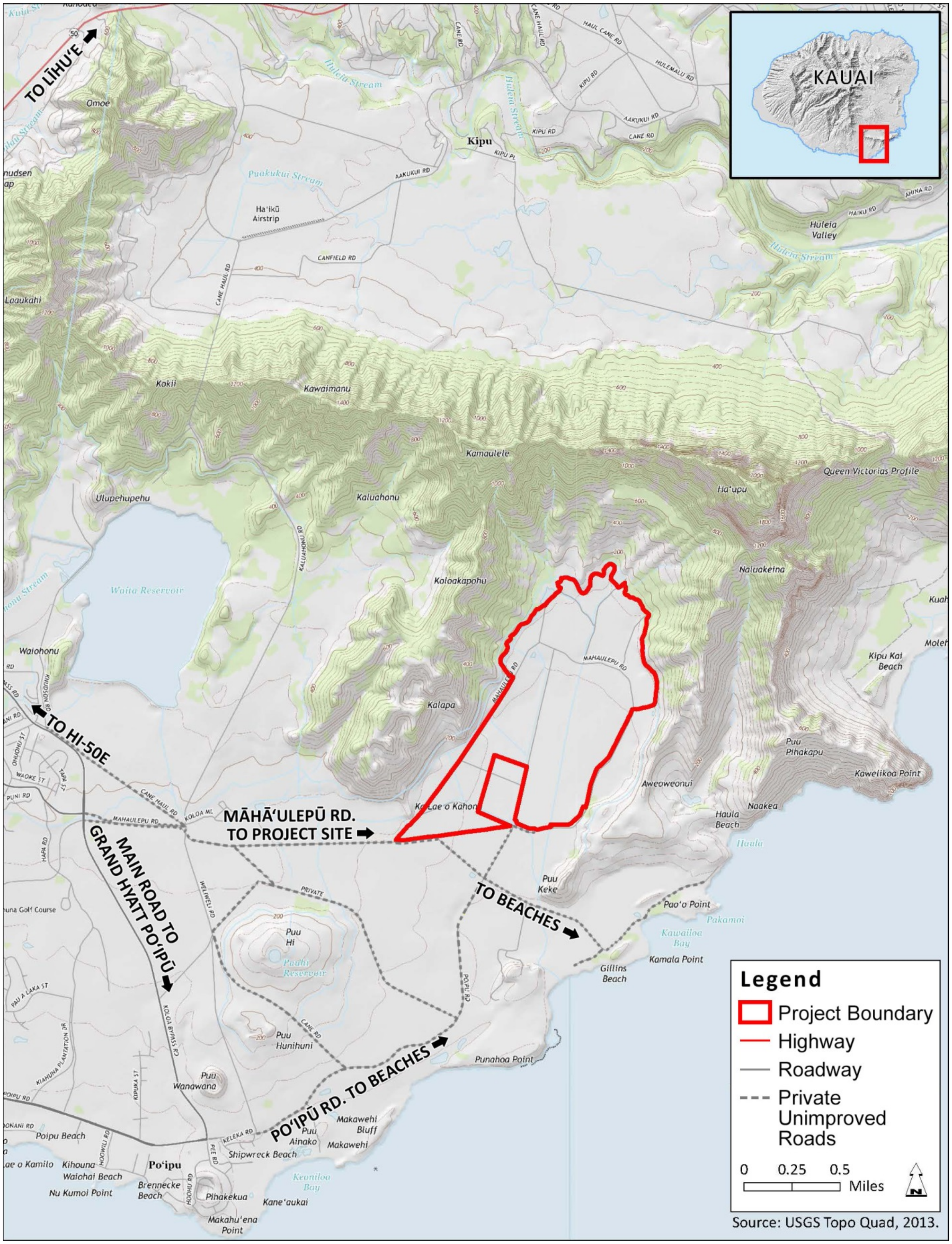


Figure 4.18-1 Major Roads in Vicinity

There will be no significant change to traffic patterns or infrastructure related to the public roads. Construction equipment mobilization will comply with Hawaiʻi Department of Transportation and County requirements. Delivery trucks and milk tanker trucks will be in compliance with State and County size and weight limits; no oversized vehicles will be used for ongoing operations.

The potential traffic impact based on the contemplated herd size is discussed in Section 4.24.

4.19 AIR QUALITY, ODOR, AND GREENHOUSE GAS

Potential odors and emission levels for air pollutants relevant to dairy operations were modeled, as currently there are no cows on site. Odors, greenhouse gas (GHG) emission rates, and potential fugitive dust for the proposed dairy operations were estimated based on published research values and local weather data. The full report, *Hawaiʻi Dairy Farms Air Emissions and Odor Evaluation Technical Report*, is included as Appendix I of this EIS.

Under the *Clean Air Act of 1970* (CAA), amended November 1990, the U.S. Environmental Protection Agency (EPA) regulates both large and small sources of air pollutants by establishing National Ambient Air Quality Standards (NAAQS) for six criteria pollutants:

1. Particle Pollution (often referred to as particulate matter, PM_{10} and $PM_{2.5}$),
2. Sulfur Dioxide (SO_2),
3. Nitrogen Dioxide (NO_2),
4. Ground-level Ozone (O_3),
5. Carbon Monoxide (CO), and
6. Lead (Pb).

The State of Hawaiʻi has established its own *State Ambient Air Quality Standards* (SAAQS) as provided for under HAR 11-59 that are as strict or, in some cases ~~more~~ stricter than the NAAQS. In addition to the six criteria pollutants, the State established a SAAQS that includes hydrogen sulfide (H_2S) (resulting from volcanic gases). The State has also established standards for air pollution control such as fugitive dust emissions emanating from construction activities (Hawaiʻi Administrative Rules [HAR] Chapter 11 Title 60.1 [11-60.1]). These standards prohibit any visible emissions of fugitive dust from construction activities at the property line. The State standards are administered by the Hawaiʻi Department of Health (DOH), Clean Air Branch (CAB).

No State or Federal regulations for greenhouse gas emissions from farm operations or small businesses currently exist.

Emissions relevant to livestock operation include particulate matter and fugitive dust. Greenhouse gases related to dairy cows include methane (CH_4) from enteric fermentation, and both methane and nitrous oxide (N_20) emissions from manure application.

In the following sections, analysis for the committed herd size of 699 ~~milking~~ mature dairy cows is presented. Refer to Section 4.25 for the air quality, odor and greenhouse gas analysis for the future contemplated herd size of up to 2,000 ~~milking~~ mature dairy cows.

The potential for a hazardous chemical release associated with dairy farms – while originating from the natural process of animal digestion and manure decomposition – is considered in Section 4.13, Hazardous Substances.

4.19.1 Air Quality

Existing Conditions – Air Quality

Emissions associated with animal livestock operations include fugitive dust. GHG emissions are discussed separately in Section 4.19.3.

Dust will be generated as cows move along soft limestone walkways that connect the paddocks and lead to and from the milking parlor. Potential emission rates were estimated from published literature, where particulate matter (PM) is measurable from the "drylots" of confined dairy operations where animals walk over dirt and dried manure throughout the day. Applying the emission rates from this available literature to HDF, therefore, greatly overestimates potential emission, as cows in the rotational-grazing system will be on pasture 22 hours each day and will spend two hours – in two separate milking cycles – moving to and from the barn for the 10- to 15-minute milking sessions.

Methodology – Air Quality Modeling

Natural sources of air pollution emissions that could affect the project area at times but cannot be quantified accurately include the ocean (sea spray), plants (aero-allergens), wind-blown dust, and perhaps distant volcanoes on Hawaiʻi Island.

Fugitive dust concentrations were modeled for HDF by applying the PM rates from available literature, which measured PM from a "dry lot" used for traditional confinement dairies. Using these dust rates in the model, therefore, over-estimate the potential quantity of PM, because HDF will utilize a pasture-based system. The HDF system will have cows off pasture just two hours each day.

Using atmospheric dispersion modeling system (AERMOD), the rates were scaled to the size of the non-pasture areas used by cows at HDF. Results were added to the background concentration of particulate matter (both PM_{10} and $PM_{2.5}$) measured on the island of Oʻahu. This was considered the total impact and is compared to the State ambient air quality standards in Table 4.19-1. Only the contemplated herd size of up to 2,000 ~~milking~~ mature dairy cows was modeled, as at the lower threshold of 699 ~~milking~~ mature dairy cows the potential fugitive dust impact would be negligible.

Table 4.19-1 Fugitive Dust Analysis for Contemplated Herd Size

Pollutant	Average Time	Concentration ($\mu g/m^3$)	Background	Total Impact	Standards
PM_{10}	24 hr	2.01	39 $\mu g/m^3$	41.01 $\mu g/m^3$	150 $\mu g/m^3$
PM_{10}	annual	0.33	15 $\mu g/m^3$	14.83 $\mu g/m^3$	50 $\mu g/m^3$
$PM_{2.5}$	24 hr	0.23	12 $\mu g/m^3$	12.23 $\mu g/m^3$	35 $\mu g/m^3$
$PM_{2.5}$	annual	0.04	3.9 $\mu g/m^3$	3.94 $\mu g/m^3$	15 $\mu g/m^3$

Probable Impacts and Mitigation Measures - Air Quality

Impacts that would be considered significant related to air quality could include:

- Dust and debris generated during construction of the dairy facilities; and
- On-going dairy operations increasing odor, GHG, and air pollutants in the region.

Short-term Impacts and Mitigation – Air Quality

Short-term impacts may consist of exhaust emissions from construction equipment and increased vehicular activity during the construction phase, and fugitive dust emissions during soil excavation. Exhaust emissions from vehicle and heavy equipment may be perceptible along public roads, however, emissions from on-site work will dissipate before reaching public access areas due to the remote dairy location. Vehicular access to the site during construction will include limited delivery of construction materials and heavy equipment for site work, and daily vehicle access to the site by construction workers.

In accordance with Title 11, Hawai'i Administrative Rules Chapter §11-60.1 "Air Pollution Control", control measures are required to prevent or minimize any fugitive dust emissions caused by construction work from affecting the surrounding areas. Short-term construction dust can be reduced through implementation of dust control measures as recommended by DOH Clean Air Branch. Relevant control measures include:

- Using water to control dust on disturbed surfaces and haul roads;
- Limiting the disturbed area at any given time, and/or mulching or stabilizing inactive areas that have been worked; and
- Establish and monitor speed limits for trucks on-site.

Moving construction equipment and workers to and from the project site during off-peak traffic hours will help to mitigate exhaust emissions. Equipment and materials requiring heavy truck transport will be moved during periods of low traffic volume. Daytime work hours for construction will be set to avoid peak traffic hours in the project vicinity. Details of construction plans and contractor coordination will be determined in conjunction with contractor selection. Construction activities will comply with the State Air Pollution Control rules.

Long-term Impacts and Mitigation – Air Quality

Long-term impacts from dairy operations may occur from particulate matter in the form of dust. Utilizing published fugitive dust rates to the model overestimates potential particulate matter from cows at HDF moving along dairy raceways and paved areas. Only the contemplated herd size of up to 2,000 ~~milking~~ mature dairy cows was modeled, as at the lower threshold of 699 mature dairy cows the potential fugitive dust impact would be negligible. The estimated concentration for PM_{10} for up to 2,000 mature dairy cows is 2.01 μg/m^3 per 24-hour period, well below the State standard of 150 μg/m^3. The estimated concentration for $PM_{2.5}$ is 0.23 μg/m^3 per 24-hour period, well below the Federal standard of 35 μg/m^3 (Table 4-19.2). Dust control (e.g. watering walkways and washing down the holding yards) will be utilized as needed to keep any particulate matter on site.

The total annual particulate matter emissions were also estimated for PM and greenhouse gases (GHGs). Total annual emissions (in tons per year) are typically estimated for potential permitting applicability. Results of the estimate for a herd size of 699 mature dairy cows for PM was 0.6 tons per year. The project will not require any permits under the Clean Air Act, or State of Hawai'i counterpart.

Potential impacts related to the potential contemplated herd size can be found in Section 4.25.1.

4.19.2 Odor Assessment

Odor refers to the combined effects of a mixture of gases on the sense of smell. Odor emissions are generated during incomplete anaerobic decomposition of organic matter in manure. No animals or dairy facilities currently exist in the area leased by HDF, so air dispersion models were used to determine potential odor levels based on dairy facility design and established modeling methods. Local weather data was used in conjunction with the AERMOD (version 1) modeling system to evaluate odors documented for dairy heifers and effluent ponds.

Existing Conditions - Odor

The project area and surrounding acreage have been leased to various tenants for ranching and diversified agricultural operations since the late 1990s, when wide-scale sugar cultivation ceased and the Kōloa Mill closed. W.T. Haraguchi Taro Farm utilizes 38 acres for the cultivation of taro, surrounded on three sides by the HDF project. The taro farm also maintains a herd of sheep to keep weedy plants in check surrounding the loʻi kalo (taro ponds).

Predominant winds blow towards the southwest with an average wind speed of 10 miles per hour (Figure 4-1.1). The developed area nearest HDF is 1.1 miles from the site (Figure 4.4-3). It is an agricultural subdivision east of Ala Kinoiki Road, currently with two homes. The Grand Hyatt Kauaʻi and the Weliweli residential area west of Ala Kinoiki are both 1.6 miles from the south-westernmost corner of the HDF pastures, and 2.5 miles from the dairy facilities, which includes the milking parlor and effluent storage pond (Figure 4.4-3). Two private recreational facilities – the easternmost edge of the Poʻipu Bay Golf Course and CJM Country Stables – lie 1.6 miles from the facilities of the proposed dairy.

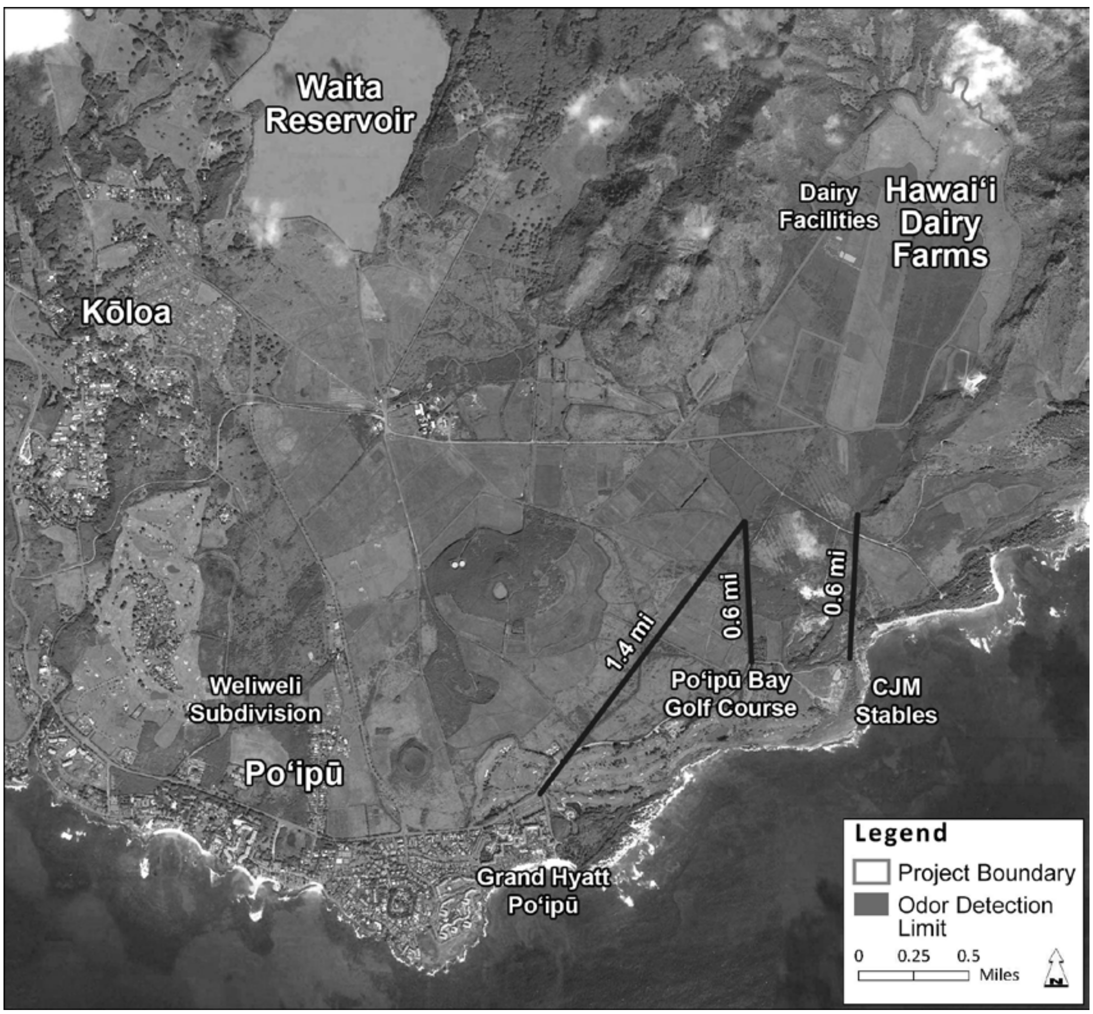
Methodology – Odor Assessment

Odor is perceived when one or more chemical substances in the air come in contact with various human sensory systems. A human's sense of smell is derived from the olfactory receptors in the top, back of the nasal cavity. Scientific methods to measure odor have been developed for use in sensory evaluation related to the trade industry (for perfumes, coffee, wine, etc.) and for regulatory monitoring and compliance. International standards dictate the scientific methods and practices of odor measurement which are objective, quantitative, dependable and reproducible. The perception threshold of an "odor unit" is defined by the point at which 50 percent of panelists, in laboratory conditions, cannot smell the odor but 50 percent of the panelists can detect the odor (Arcadis, 2016).

No regulatory threshold exists for dairy farm odors, and determining an odor threshold is complicated by lack of suitable data on odor levels associated with annoyance and complaint. A 2004 study suggested 6.5 OU/m^3, 1-hour averaging and the 99.5th percentile at the receptor as appropriate criteria (Wang & Feitz, 2004, in Arcadis, 2016). The 6.5 OU/m^3 is described as the point at which 50 percent of a population can successfully detect ~~an~~ dairy odor. The 1-hour averaging and 99.5th percentile describes the time over which the 6.5 OU/ m^3 may be detected. With 8,760 hours in a year, 0.5 percent of the year equates to 44 hours. Therefore, the 6.5 OU/ m^3, 1-hour averaging at the 99.5th percentile means that 50 percent of the population may detect an odor during just 44 hours during a one-year period. The modeling considers the emissions at the most impactful locations ~~worst-case meteorological conditions~~, so it is likely odor detection beyond the HDF boundaries will be even less frequent (Arcadis, 2016b).

Odor emission sources identified for modeling at HDF were manure in the pasture fields, irrigation water containing diluted nutrients from effluent, the effluent storage ponds, slurry containing solids from the effluent pond, and the dairy buildings. The odor model assumed the total pasture area was approximately 557 ~~563~~ acres, which overestimates the actual area used as pasture. Farm roads, cow walk/raceways, and vegetated buffers along drainages total nearly 70 acres of areas utilized for transit or excluded by fencing. The dairy facility will occupy less than 10 acres of the total project area.

Measures of odors for the evaluation conducted for HDF by Arcadis utilized data relevant to the odor emission source. Odor rates for the effluent storage ponds were published in *Dairy Australia* in 2008, based on analysis of 30 ponds over 12 months in Australia. Odor emission rates for the evaluation in the Draft EIS used values for manure of dairy heifers were determined in a trial conducted at the Pennsylvania State University (Topper et al., 2008, in Arcadis, 2016). For this Final EIS, Arcadis adapted the data used by Exponent (Jacobson et al., 2001) for manure deposited in the field to account for differences in diet and for the Kikuyu thatch that will receive manure at HDF as opposed to a conventional compacted dirt feedlot which was used by Exponent. Emission rates for the dairy buildings were based on Jacobson et al. (2001, in Arcadis, 2016). The revised odor report is included as an addendum to Appendix I.



~~**Figure 4.19-1 Odor Detection Limits for 699 Herd Size**~~

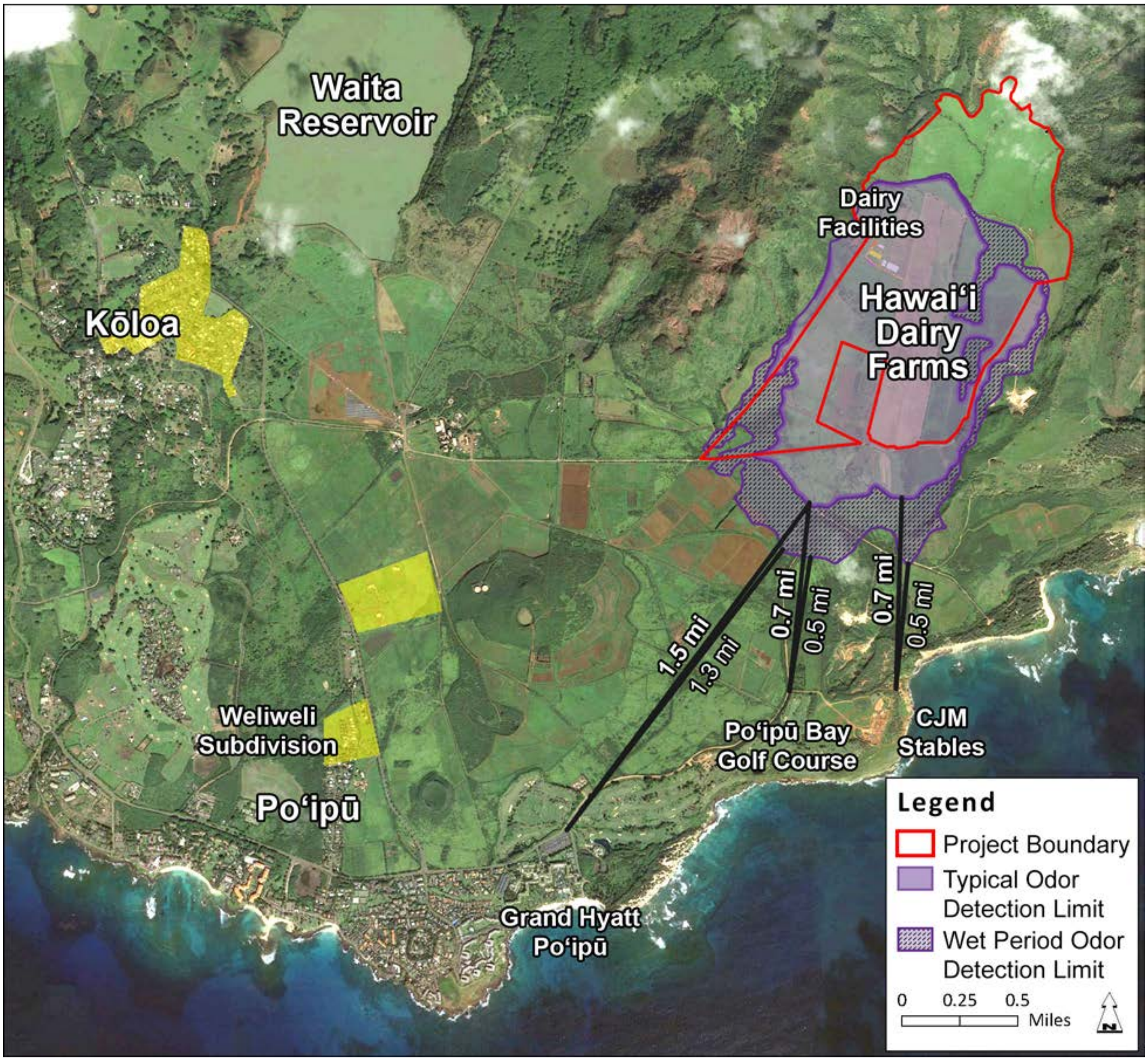


Figure 4.19-1 Odor Detection Limits for 699 Herd Size Effluent Irrigation Application

Probable Impacts and Mitigation Measures - Odor

Odor isopleths (a line used to map all points having the same numerical value) were created using the results of AERMOD computer modeling that utilized four types of input data: emission source information, receptor locations, meteorology, and model specific control options (site and project specific data options).

Short-term Impacts and Mitigation – Odor

As the herd is established at HDF, odor will be below the modeled quantity as fewer animals will be on site. In the short-term, there will be no odor impacts.

Long-term Impacts and Mitigation – Odor

Unlike a ~~traditional confinement~~ conventional feedlot dairy facility, the majority of manure will be deposited directly on the pasture where it will break down and be incorporated into the soil within a one- to three-day period. Manure collected from barns and paved areas will be washed into a settling pond for re-use on the pastures. Manure is cycled through the ponds on a regular basis guided by irrigation needs; over a period of roughly 45 days, effluent is completely utilized and replaced.

Figure 4-19.1 ~~2~~ displays results of modeling the annual extent of the 6.5 OU/m^3 odor level for the herd size of 699 ~~milking~~ mature dairy cows, with irrigation effluent at two dilutions. For typical precipitation conditions, the effluent concentration will be approximately 4 percent; in unusually wet periods with more precipitation, the effluent concentration could approach 50 percent. The colored area depicts the 99.5th percentile threshold of 6.5 OU/m^3. Within the detection area ~~(Figure 4.19-1~~ odors may be detectable by 50 percent of the sensitive population once per 200 hours, or 44 hours per year. For the typical conditions, ~~T~~the odor isopleth does not extend beyond the dairy farm boundary more than approximately 1,200 ~~1,670~~ feet (within ~~one-third~~ one-quarter of a mile), and does not reach recreational or residential areas. For wet periods, odor could extend approximately 2,151 feet (less than one-half of a mile) beyond the southern boundary.

Generally, tradewinds will disperse odors to less than detectable levels beyond the HDF site. ~~; in~~ It is important to understand that the isopleths for irrigation effluent represent periods of no winds, during which odor may not be dispersed creating the "worst case" scenario. ~~In these periods without normal tradewind flow, the odor plume would extend to the south of the HDF site (Figure 4.19-1).~~ It should be noted that the parameters used in the odor assessment were intentionally very conservative and the impacts shown depend on an unlikely confluence of most impactful emission source locations; thus, actual offsite odor impacts are likely to be much lower and/or less frequent than displayed.

The potential odor from slurry application (to be conducted approximately every 45 days), is shown in Figure 4.19-2. To minimize potential odor impacts from slurry used as pasture nutrients, HDF has elected to restrict slurry application to periods when wind speeds are between 9 and 20 mph. With application at the most impactful location, paddocks south of the taro farm, the odor from slurry application barely crosses the southern boundary. Due to wind speeds within this range occurring on average 243 days of the year, the 99.5th percentile is reduced to potentially perceiving the odor just 29 hours per year (Arcadis, 2016b).

Windbreaks, also known as shelterbelts, are used for a variety of purposes including reduction and interception of airborne odors. As a best management practice, *Casuarina cunninghamiana* will be planted along the east south-east boundary of the dairy site. Locally known as ironwood, this tree was introduced to Hawaiʻi from its native Australia in the late 1800s.

Potential impacts related to the potential contemplated herd size can be found in Section 4.25.2.

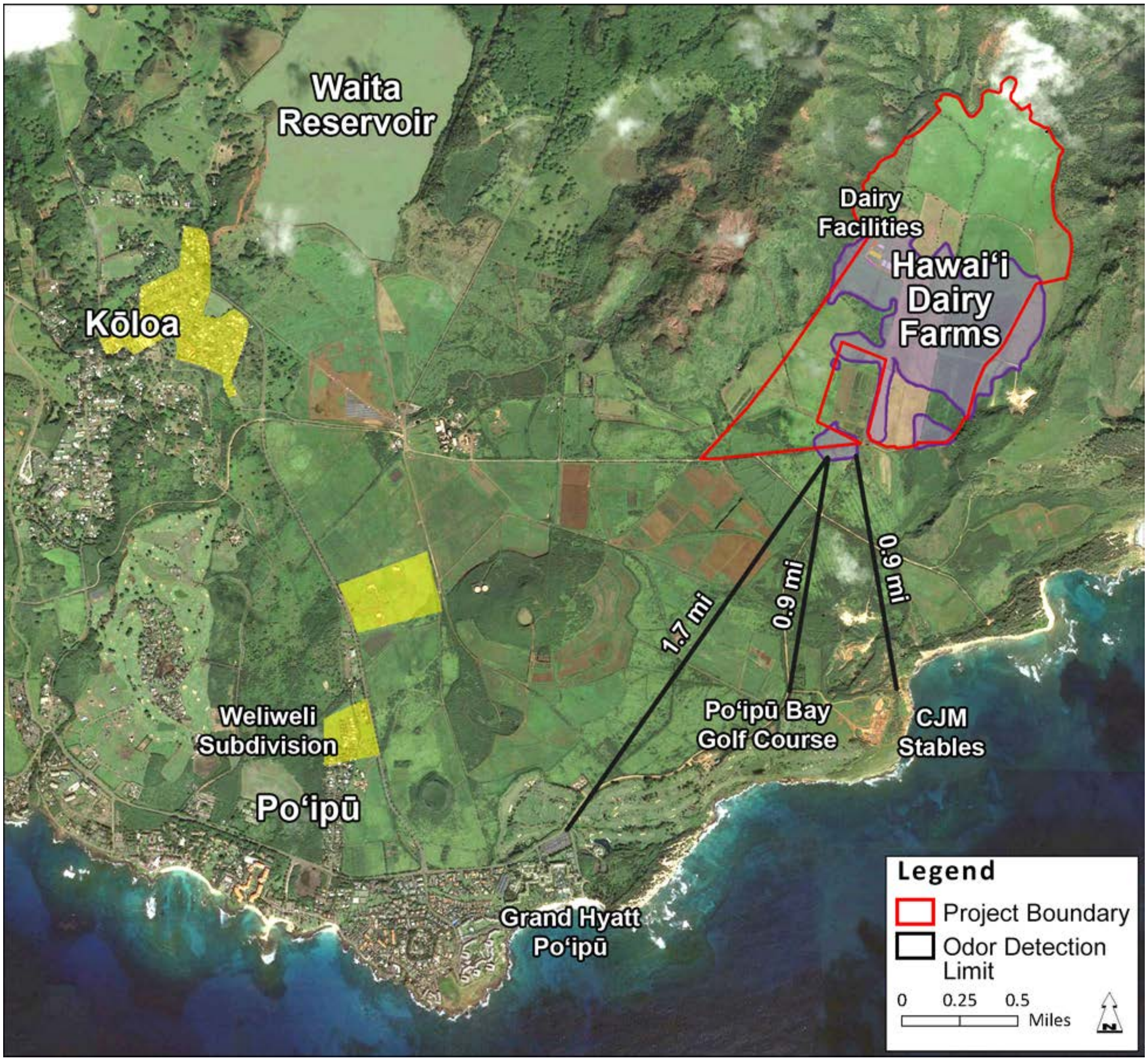


Figure 4.19-2 Odor Detection Limits for 699 Herd Size Slurry Application

4.19.3 Greenhouse Gases

No State or Federal regulations for greenhouse gas emissions from farm operations or small businesses currently exist. However, livestock and agriculture as an industry contributes to greenhouse gas emissions. During the public scoping period, inquiries about the project's potential contribution to greenhouse gas were received. As the dairy has not been established, published scientific models were applied to calculate probable emissions from the pasture-based dairy operations. Results are presented here, and the probable impacts assessed.

When sunlight reaches Earth's surface, it can either be reflected back into space or absorbed by Earth. Once absorbed, the planet releases some of the energy back into the atmosphere as heat (also called infrared radiation). Greenhouse gases (GHGs) like water vapor (H_2O), carbon dioxide (CO_2), and methane (CH_4) absorb energy, slowing or preventing the loss of heat to space. In this way, GHGs act like a blanket, making Earth warmer than it would otherwise be. This process is commonly known as the "greenhouse effect". Human activities have contributed substantially to climate change by adding CO_2 and other heat-trapping gases to the atmosphere. Human activities, such as the burning of fossil fuels and changes in land use, release large amounts of CO_2, causing concentrations in the atmosphere to rise.

GHG emissions or the "carbon footprint" related to transporting fluid milk are not considered as part of this EIS. Carbon footprint is a term used to measure the amount of net carbon dioxide or other carbon compounds emitted into the atmosphere by the activities of an individual, company, country, etc. Carbon emission calculators have been developed to measure the carbon footprint of various activities, and rely on assumptions which vary greatly. Carbon calculators have been found to differ by an order of magnitude (Peck, 2010). Most carbon calculators identify direct greenhouse consumption, such as household energy use, transportation distances and methods. Indirect carbon emissions relate to food choices, recycling habits, leisure activities and shopping habits (Fry, 2008).

The primary sources of GHG gases in the United States are: electricity production (41 percent); transportation (27 percent); industry (21 percent); commercial and residential (12 percent); agriculture, including livestock (9 percent) and land use and forestry (13 percent) (EPA, 2015). Methane from enteric fermentation, and both methane and nitrous (N_20) emission from manure application are gases that can contribute to greenhouse gas (GHG) emissions. The Kaua'i Island Utility Cooperative published its CO_2 emission for energy generation between 2010 and 2013. The range is from more than 302,000 tons of CO_2 in 2010, to less than 294,000 tons in 2013.

Removing carbon dioxide from the atmosphere is known as "sequestration". Natural sequestration is a biological process that occurs during photosynthesis of plants.

Existing Conditions – Greenhouse Gases

Prior to HDF's lease of the property, the land was used for a herd of approximately 250 beef cattle. Currently, the site consists of agricultural equipment in operation necessary to grow an area of grass in the northeast corner of the farm. With the current minimal equipment and no cows currently present, GHG emission rates are negligible.

Methodology – Greenhouse Gases

Estimates of GHG emission rates from a pasture-based dairy were calculated using the Intergovernmental Panel on Climate Change (IPCC) *Guidelines for National Greenhouse Gas Inventories* (2006). Parameters for dairy cattle in Oceanic (warm) climates were selected as most applicable to conditions at HDF. Estimated emissions of methane and nitrous were converted to carbon dioxide equivalents (CO_2e) using the IPCC's AR3 global warming potential (GWP) that relates the GHG to CO_2 (Arcadis, 2016).

Potential hydrogen sulfide and ammonia emissions are discussed in Section 4.13 related to reporting requirements under EPCRA. For the committed herd size of up to 699 mature dairy cows, the regulation does not apply.

Probable Impacts and Mitigation Measures - Greenhouse Gases

The EPA issued the *Final Mandatory Reporting of Greenhouse Gases Rule* (GHG Reporting Rule), which became effective on January 1, 2010. The GHG Reporting Rule requires annual reporting of GHG emissions from large sources in the United States, including suppliers of fossil fuels or industrial GHGs; manufacturers of vehicles and engines; and facilities that emit greater than 25,000 metric tons per year (mtpy) each of CO_2 and other GHGs. Permits and reporting for the stationary source emitters with the potential to emit 25,000 metric tons per year or greater of GHGs are required under the Clean Air Act. Small businesses and farms are not included or required to report.

Short-term Impacts and Mitigation – Greenhouse Gases

Short-term impacts that could contribute to greenhouse gases are those identified related to construction in Section 4.19.1, Air Quality. Mitigation measures to reduce emissions are outlined in the Air Quality section. Contributions to GHG from implementation of the dairy over the short-term will not be significant.

Long-term Impacts and Mitigation – Greenhouse Gases

Long-term operational impacts were modeled using the IPCC guidelines and conversions, and estimated the emissions potential for GHG at the dairy at the committed herd size of 699 ~~milking~~ mature dairy cows to be 2,693 CO_2e metric tons per year (2,969 US tons). This is equivalent to the GHG generated by 170 4-person households, including home energy consumption, transportation and waste (https://www3.epa.gov/carbon-footprint-calculator).

Operational practices to protect air quality by reducing nitrogen emissions will come from guidance in NRCS Conservation Practice Standard 590, Nutrient Management. Application of nutrients must be adjusted to minimize negative impacts of GHG release to the environment through adjustments to the source, timing, amounts, and placement of nutrients. Specific practices to be utilized at HDF include: slow release fertilizers; nutrient enhancement technologies; and stabilized nitrogen fertilizers.

To reduce use of fossil fuels at the dairy, HDF will install solar photovoltaic power generation to provide onsite power. A roof-top mounted system using solar panels will be designed to produce 500 kilowatt hours.

While the presence of cows may increase GHG, a long-term beneficial impact of the grazing fields is the sequestration of carbon as CO_2 captured by the process of from photosynthesis by the grass. According to recent studies in the Soil Science Society of America Journal, converting formerly tilled cropland to grazed pasture can drive substantial accumulation of organic carbons in soil, which enhances soil quality, grass production, and has the potential to offset up to one-third the annual increase in CO_2 production of an area (Machmuller, 2015).

Estimated GHG related to the potential contemplated herd size can be found in Section 4.25.3.

4.20 SUMMARY OF PROBABLE IMPACTS AND CONTEXTUAL ISSUES (COMMITTED HERD SIZE)

This section discusses the dairy farm's potential secondary effects and the cumulative impacts on the environment at the committed herd size of 699 ~~milking~~ mature dairy cows.

4.20.1 Interrelationships and Cumulative Environmental Impacts

Hawaiʻi Dairy Farms is being implemented to make productive use of lands designated as Important Agricultural Land with food production and a dairy to produce fresh milk and milk products. The dairy farm is an agricultural use planned within the existing Māhāʻulepū agricultural area. Other known uses underway or planned in the region, with the dairy farm in operation, will contribute to the contextual setting of interrelationship and cumulative effects.

Agricultural and Commercial Uses in Māhāʻulepū Valley

Surrounding agricultural operations and activities within the Māhāʻulepū sub-watershed include:

- Vasconcellos Cattle –cow-calf operation (adjacent, northwest)
- Palama / Māhāʻulepū Cattle –head beef cattle (adjacent, east)
- CJM Country Stables – commercial guided horseback riding (not adjacent, south)
- Māhāʻulepū Quarry, Jas. W. Glover, Ltd – sand and limestone aggregate (not adjacent, east)
- W.T. Haraguchi Taro Farm – taro cultivation; approx. 80 sheep (within HDF site)
- Pioneer Parent Seed Co. – recently vacated; land no longer in cultivation (adjacent, south)
- Banana Farm – approximately 10 acres (not adjacent, southeast)

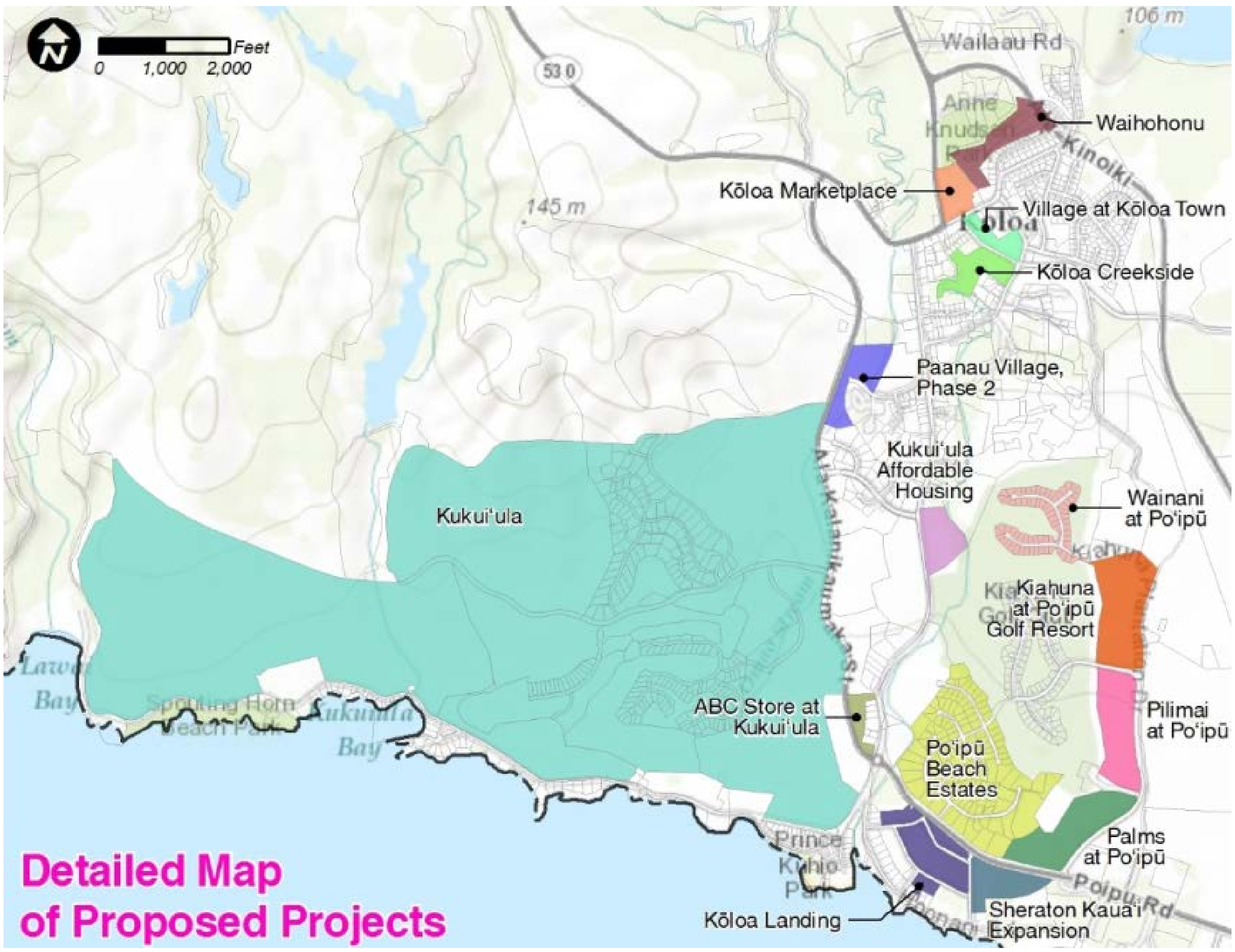
Planned Development in the Kōloa - Poʻipū Region

Currently, there are several new agricultural enterprises planned in the vicinity, along with other public and private development and redevelopment efforts in the Kōloa Town and Poʻipū area. The South Kauaʻi Community Plan (County of Kauaʻi Planning Department, July 2015) summarizes planned developments in the region. Some may be on hold pending finances or funding:

- The Kōloa - Poʻipū Regional Wastewater Reclamation Facility is a privately-owned (HOH Utilities, LLC) and operated regional wastewater reclamation facility and wastewater collection system.
- The County of Kauaʻi Department of Water: water system improvements to support residents and businesses for planned growth in the Kōloa Town and Poʻipū communities
- Kōloa Landing Resort: adding 200 new residential units in Poʻipū by 2016
- Sheraton Kauaʻi Resort Expansion: 394 units on 10.7 acres; planned conversion to timeshare
- Kukuiʻula master planned resort residential community: 1,000 acres in development phases, including golf course, clubhouse, spa, commercial centers, and residential units
- Kukuiʻula Affordable Housing project: 60 affordable units
- Kōloa Marketplace: 71,000 square-feet (sf) mixed-use commercial center
- Waihohonu: 50-unit residential development at the old Kōloa Camp area
- Village at Kōloa Town: 34 residences and 45,000 sf retail office
- Kōloa Creekside: 72-unit multi-family residential project in Kōloa
- Paanau Village, Phase 2: 50-unit multi-family residential project in Kōloa Town
- Wainani at Poʻipū: 69 single-family homes by DR Horton
- Kahuna at Poʻipū Golf Resort: new phase build-out
- Pili Mai Community in Poʻipū: 191 luxury condominiums by Brookfield Homes Hawaiʻi
- Royal Palms at Poʻipū Beach: 100-unit resort condominium development
- Poʻipū Gateway Mixed-use Village: 1,100 new residential units and mixed use commercial
- Koaʻe Workforce Housing Development: 130 to 150 multifamily affordable housing residential units (County of Kauaʻi, 2015)

Probable Cumulative Impacts

Existing commercial and agricultural uses within the Māhāʻulepū sub-watershed have the potential to impact natural resources, notably use of potable water, and to contribute to environmental impacts in the region, notably nutrient inputs to groundwater and the nearshore marine environment from on-site sewage disposal systems. Nearly 2,500 new residences or room units are listed in the South Kauaʻi Community Plan, ranging from high-end single family resort homes to affordable housing, and including commercial and retail development. Recognizing the number of development projects planned and probable impacts, alongside potential impacts from the dairy farm, combine to provide insight to probable cumulative impacts. Qualitative or quantitative analyses were conducted in this EIS for pest insects, demographic and economic conditions, groundwater resources, surface water and nearshore marine resources, roadways and traffic, and air quality, odors and greenhouse gases.



Source: County of Kauaʻi Planning Department (2015)

Figure 4.20-1 Proposed Projects in Kōloa-Poʻipū Area

Pest Insects

There are no native, protected or endangered insect species within the HDF site. Flies identified on the HDF site using manure from neighboring livestock as bait for invertebrates include two flies associated with livestock (the stable fly and the horn fly), and the greenbottle fly, often confused with the house fly. Flies known to exist on Kauaʻi but not seen at the HDF site include the house fly, the dog dung fly, and the chicken dung fly. These pests are common in areas with high pet populations. It is possible these fly species could be brought inadvertently to the dairy and could transfer to manure as a food source.

Fly populations at HDF will be minimized through a process known as Integrated Pest Management (IPM). IPM disrupts reproduction with appropriate means at key points in the pest's life cycle. Used in Hawaiʻi for decades, dozens of invertebrates and a bird (the cattle egret) were introduced between 1898 and 1985 to reduce livestock-related insects. IPM utilizes knowledge of the ancient food web among species. An especially important insect to minimize fly breeding habitat in manure is the dung beetle, which can bury manure in one to three days and thereby incorporate it into the soil. This interrupts the egg to fly lifecycle, which ranges from 7 to 20 days depending on the species. Populations of dung beetles found on Kauaʻi and those species already in Māhāʻulepū Valley, will expand with the growing manure food source, thus increasing and speeding breakdown of manure.

Area ranchers may work together with the State Department of Agriculture to request translocation of dung beetle species already on Kauaʻi. This would supplement beetles on the HDF site and at other ranches with additional beetle species to more quickly and effectively bury manure. Different species are active at different times (day versus night), and perform different roles (burying deep versus shallow) to integrate manure into soils.

In the Kōloa- Poʻipū region, pest fly populations are dependent upon food and breeding sources nearby such as dog, cat, and chicken dung. Beef cattle graze in the region on agriculturally-zoned lands along Ala Kinoiki Road between Kōloa and Poʻipū, and it is likely that livestock-related flies are found in this region, which is more than 1.5 miles from HDF. Localized controls are needed in the Kōloa- Poʻipū area to address breeding sites in and amongst the food and animals wastes within the region to reduce pest populations.

Demographic and Economic Conditions

Implementation of the dairy farm will provide approximately 11 direct and indirect full-time equivalent jobs, including 5 farm jobs and 6 indirect jobs on Kauaʻi, with 3 additional indirect jobs on Oʻahu at the committed herd of 699 ~~milking~~ mature dairy cows. The economic impacts are summarized in Section 4.15, and the complete study is provided in Appendix J. The increase in agricultural employment will add to local economic activity. Once fully operational with a herd of 699 mature dairy cows, annual direct-plus-indirect sales are estimated annually at $8.1 million on Kauaʻi, with an additional $2 million on Oʻahu. These sales would generate $60,000 annually in net income to the State, mostly from excise taxes on sales. The dairy farm will add agricultural industry employment, provide net revenues to the County and State, and bring fresh milk and milk products to advance local food sustainability.

Groundwater Resources

Demand - HDF:
The dairy farm would use 30,000 gpd of potable water for the committed herd size of 699 ~~milking~~ mature dairy cows. This includes 25 gpd per cow for drinking water, and less than 18 gpd per cow for wash water in the milking parlor. The existing, on-site agricultural well will be re-activated and utilized; its yield during the sugarcane planation era was 3 million gallons per day. The demand is well within the aquifer yield.

Nearly all of the potable water used will be re-applied to pasture and thus remain a part of the evapotranspiration cycle. Potable water used in the milking parlor and dairy facilities will be captured and recycled in irrigation water, and some percentage of the livestock drinking water will be returned as effluent and ultimately utilized by the pasture grass. The modest potable water use rate for dairy operations, and the 4,500-foot distance between the Māhāʻulepū 14 well and the nearest County potable water well (Kōloa Well F), will result in no adverse impacts to ongoing use of groundwater in the unweathered volcanic series, which is the source of potable water (TNWRE, 2016).

Demand - Kōloa-Poʻipū:
Total demand for municipal potable water in the Kōloa-Poʻipū region was 2.3 MGD (CWRM, 2008). Documented use rates for residential and resort units were last published for Kauaʻi in the Department of Water's long-range plan, *Water Plan 2020* (COK, 2001). For planning purposes, single-family demand assumed was 500 gpd per residential unit, and 350 gpd per resort unit. Golf course irrigation rates are estimated to average 51,000 gpd per golf course statewide (CH2MHill, 2013). Municipal water demand for the three golf courses in the Kōloa-Poʻipū region is therefore estimated at 153,000 gpd.

The adjacent, developed Kōloa-Poʻipū region shows large and increasing demand for potable water for community and resort development. The State Department of Economic Development and Tourism (DBEDT) projects the population of Kauaʻi will increase from the year 2010 population of 67,100 residents to 84,400 in 2030, an increase of 17,300 residents over the 20-year period. The South Kauaʻi population is estimated to reach 16,855 in 2035. Compared to the remainder of the island, population growth for this region is projected to increase to encompass 19.2 percent of the County population; in 2010 the region contained roughly 17.4 percent of the County population (COK, 2015a).

Water resources must therefore be carefully managed to accommodate the projected growth and water demand in the region through 2035.

Groundwater Quality – HDF:
The groundwater assessment determined there is no hydrologic connection between the shallow groundwater body in the alluvium and the source of potable water in the unweathered volcanic series. The poor permeability of the alluvium means that groundwater flow would be modest. Surface water is estimated to carry three times the nutrients than groundwater moving through the alluvium on the valley floor (see following section, Surface Water and Nearshore Marine). Nutrients added by the dairy operation will have no impacts to the County drinking water well, the source of potable water within the deep volcanics.

Groundwater Quality – Kōloa-Poʻipū:
The Kōloa karst topography and lava tube systems that straddles the Waikomo Watershed may provide transport of injection well and cesspool effluent to the Makauwahi Cave/sinkhole lava tube system in the Māhāʻulepū sub-watershed. The CWB Sanitary Survey estimates groundwater and coastal waters of south-east Kauaʻi are being contaminated with roughly 3 MGD of wastewater daily (CWB, 2016).

Effluent Production – HDF:
The total generation of effluent captured by the settling and storage ponds for re-use on pastures is estimated at 10.9 gpd per cow. Including minimal input from calves within the calf sheds, the total wastewater volume to be collected from dairy facilities is 13,225 gpd (0.013 MGD) for the committed herd size. This includes required wash water of 17.4 gpd per cow (see Demand – HDF, preceding). The wastewater from dairy facilities will be re-applied to grow pasture grass, a locally available food source which will provide 70 percent or more of the herd's nutritional requirements.

Effluent Production – Kōloa-Poʻipū:
The County of Kauaʻi uses an average daily standard to estimate current and future wastewater of 100 gallons per person per day. An estimated at 1.17 MGD of wastewater disposal was processed at treatment plants in 2010 (SSFM, 2016). This is in addition to estimates of wastewater disposed of through on-site systems; see Groundwater Quality - Kōloa-Poʻipū, preceding. An evaluation of Kauaʻi's infrastructure through the year 2035 predicts the island will face inadequate wastewater treatment and solid waste capacity (SSFM, 2016). For the year 2035, wastewater volume for the region is projected to more than double to 2.58 ~~42~~ MGD (SSFM, 2016).

Reclaimed wastewater from sewage treatment plants is used to both treat wastewater and provide nutrients to landscaping and golf courses. The *2013 Update of the Hawaii Water Reuse Survey and Report* (CWRM, 2013) reports that the key factor for reclaimed water use at most Kauaʻi County water reuse projects is primarily wastewater disposal. Reclaimed wastewater is derived from sewage that undergoes preliminary treatment (removal of large debris), then primary and secondary treatment to settle out solids and organic materials and manages microorganisms like bacteria, protozoa, ciliates and worms that eat the organic material. Advanced treatment, also known as tertiary treatment, can include additional filtration and disinfection such as ultra-violet light or chlorine, to reduce pathogen levels. Additional nutrient removal through uptake by flora in treatment lagoons or constructed wetlands~~, though often the~~ has the benefit of retaining nitrogen and phosphorus in reclaimed water, making ~~es~~ it useful for irrigation. The extent of disinfection is reflected in whether the effluent water is characterized as R-2 or R-1 reclaimed water. Most reclaimed water projects blend the treated water with surface or brackish water for golf course and landscape irrigation.

The Poʻipū Bay Resort Golf Course, located 1.6 miles southwest of the proposed HDF facilities, averaged 100,000 gpd (0.1 MGD) use of R-2 reclaimed water in 2013. The wastewater source used is from the Grand Hyatt Kauaʻi wastewater treatment facility. Reclaimed water is mixed with Waita Reservoir and stream water for irrigation. The percentage of recycled water varies throughout the year depending on rainfall volumes. An on-site injection well operated by golf course maintenance personnel is used to dispose of excess recycled water during extended rainy conditions when irrigation is not required (CWRM, 2013).

Kiahuna Golf Course is located in the Waikomo watershed in Poʻipū, to the west of Māhāʻulepū Valley. R-2 water from the Poʻipū Water Reclamation Facility (WRF) has been used since 1984 for irrigation, blended at 40 to 60 percent with water from Waikomo Stream. DOH guidelines require a 500-foot buffer between the point of application and nearby properties, however, R-2 water has been used via spray irrigation along fairways lined with single-family homes as this use was approved and initiated prior to passage of the DOH guidelines. The reclaimed water used at the course has been upgraded to R-1. On-site injection wells are available for disposal of wastewater when effluent does not meet R-1 water standards, or if the golf course does not require irrigation due to heavy rain events (CWRM, 2013).

The golf course is considered a convenient effluent disposal option of the Poʻipū WRF as it can typically utilize the entire daily flow from the facility. In 2013, Kiahuna Golf Course used 360,000 gpd (0.36 MGD) of reclaimed water to partially meet irrigation demand. Waikomo Stream has partially satisfied demand with 0.3 MGD for irrigation, but peak summer irrigation demand ~~for~~ reaches 0.7 MGD, which can only be met with reclaimed water supply. The R-1 water from the Poʻipū WRF is also provided though the golf course system to the nearby commercial properties. Kōloa Landing receives 70,000 gpd (0.07 MGD) of reclaimed water for landscape irrigation.

Surface Water and Nearshore Marine Resources

The surface waters crossing the dairy farm site include some input from an intermittent stream above the site and drainage from periodic rain water runoff is collected in agricultural ditches developed during the sugarcane plantation era. These surface waters are not a recreational resource and are not used by the public, even near the ditch terminus at the ocean. With an on-site manager for the new agricultural endeavor utilizing best management practices to protect water quality through nutrient and soil management, current run-off would be reduced. HDF will follow its NRCS reviewed Conservation Plan to minimize sediment, nutrient and pathogen inputs to the surface waters in these drainages.

The groundwater body in the alluvium is hydrologically disconnected from the County well water in deep unweathered volcanics. Episodic, seasonal rainfall events cause groundwater in the alluvium to rise and intersect with the deep agricultural ditches in the vicinity of HDF monitoring wells 1 and 2. Such episodes are calculated to average 10 days annually, which would result in a modest amount of groundwater containing nutrients to discharge into the surface ditches. The amount of nutrients estimated from HDF operations released to surface water is calculated at 10,000 pounds of nitrogen and 900 pounds of phosphorus annually.

An estimate of nitrogen input to the marine environment from resort landscaping fertilization and domestic wastewater in the Poʻipū region is calculated to be 38,510 pounds of nitrogen annually. This is 3.8 times greater than the estimate from dairy operations. Phosphorus for both domestic wastewater and landscape fertilization in the region is estimated to be 1,260 pounds annually, or 1.4 times greater than the potential discharge from HDF. Significantly different soils mean that nutrient inputs from the Poʻipū region are constant throughout the year, and no mitigation is applied to reduce the quantities.

Working closely with DOH and NRCS, dairy farm staff are helping to improve understanding of factors that affect local water quality. Adherence to strict measures to protect water quality through proper irrigation management practices and re-analysis of nutrient inputs and outtake, the dairy farm will balance nutrient needs of pasture grass as well as improve the water-holding capacity of soils. Occasional nutrient run-off may allow some diluted nutrients to bypass mitigation measures to be employed, but will have no significant deleterious effect on the area's surface water quality. Nearshore water quality at the Waiopili Ditch outlet and along this coastline will not be significantly degraded by inputs from HDF.

Roadways and Traffic

The development of the dairy farm facilities and future operations is not expected to have a significant impact on traffic operations in the area roadways. The projected increase in vehicle movements related to HDF operations for the committed herd size of 699 ~~milking~~ mature dairy cows is approximately 12 additional vehicle trips per day. Traffic data in 2009 to 2010 on Ala Kinoiki Road was 8,000 trips per day, and on Kōloa Road, 6,500 daily trips, for a total of 14,500 vehicle trips in the vicinity. An additional 12 trips daily would have a minimal effect on traffic conditions at County roadways in the area.

Air Quality/Odors/Greenhouse Gases

Results from the air quality odor model indicate that any long-term impacts on air quality in the project area due to dairy farm operations would be negligible. Under the worst-case meteorological conditions, concentrations of odor are limited to within 800 feet of the dairy farm boundary and do not reach residential or resort areas. With active management of the dairy operations, there will be no noticeable odors or reduction of air quality in the surrounding area. The limited number of worker vehicles and trucks will create nominal increase in air emissions, not significantly contributing to the air emissions generated by vehicles in the region. Contributions to greenhouse gas will not be significant.

According to the *2013 Update of the Hawaii Water Reuse Survey and Report* (CWRM, 2013), effluent from sewage treatment plants, referred to as reclaimed water, is blended into the Po‘ipū Bay Resort Golf Course lake at a concentration of 20 to 40 percent with Waita Reservoir water. Irrigation of the first three holes on the golf course uses up to 60 percent reclaimed water, as maintenance personnel have observed the benefit of added nutrients. A slight odor is noted when the reclaimed water is spray-irrigated, and is reported to be more noticeable at the first three holes where the higher concentration is used (CWRM, 2013). The irrigation of effluent located within the recreational area~~,~~ creates an odor source in close proximity to the resort.

4.20.2 Potential Secondary Effects

Local Milk Production and Food Sustainability. The creation of Hawai‘i Dairy Farms will produce substantial secondary effects in terms of local milk production and increased food sustainability. When the dairy matures to full capacity with a committed herd size of 699 ~~milking~~ mature dairy cows, it will produce approximately 1.5 million gallons of fresh, local milk each year for the residents of Hawai‘i. The 1.5 million gallons of locally produced milk will reduce Hawai‘i's 90 percent dependence on milk shipments from the U.S. mainland. Potential future processing of fluid milk into soft cheeses and yogurt could provide value-added products for HDF or procurers of the fluid milk.

Indirect Employment. For the development period of the dairy, indirect employment during the construction period based on state employment multipliers is expected to average 16 jobs on Kaua‘i and an additional 8 indirect jobs on O‘ahu. When the dairy is operational at the committed herd size, approximately 6 additional indirect jobs will be created on Kaua‘i and another 3 indirect jobs created on O‘ahu. These full-time equivalent jobs are in addition to the direct HDF job creation included in Section 4.15.

Source of Calves for the Local Ranching Industry. Over the long-term, dairy operations will provide a source of calves for the local ranching industry and expand the market for ranch-related additional goods and services from local vendors.

Offsite Herd Management. The committed herd size of 699 ~~milking~~ mature dairy cows at the Māhāʻulepū site relates to a permitting threshold that references the count of mature ~~milking~~ dairy cows. Animals in various stages of lactation and rest will be transferred between HDF and existing Kauaʻi ranches as needed for animal health and dairy productivity. Makoa Ranch and ʻOmaʻo Ranch are existing ranch operations, which require no additional facilities, permits, or improvements. The fluctuation in herd numbers is typical of cattle operations, and poses no impact to the Makoa or ʻOmaʻo ranches, or areas outside the project area.

The Hawaiʻi Dairy Farms' operation will produce calves, as discussed in Chapter 3.0, Section 3.4. Newborn calves will initially be housed at the Māhāʻulepū site and transitioned to pasture at about three to four weeks of age. At approximately 90 days of age (or at 165 pounds), the calves will be transferred to existing working ranches on Kauaʻi and raised offsite. Two ranches on Kauaʻi have initially agreed to take calves from HDF. Makoa Ranch near Kapaʻa is an active cattle ranch run by the Farias family. The ranch will raise heifers until ready for return to HDF pasture. Calves to be raised for beef will be incorporated into the Makoa Ranch herd, or sold to other ranching operations. ʻOmaʻo Ranch will care for dry cows during an annual resting period.

Cattle ranching on Kauaʻi spans generations, and ranchers are stewards of the lands: healthy lands raise healthy beef cattle. Ranchers are experienced in animal welfare, and will collaborate with HDF to care for dairy cows during annual rest cycles and to raise calves until old enough to join the dairy herd. The availability of calves from a dairy such as HDF provides new animals to maintain or expand a beef herd. Each ranch will determine its capacity based on business and operational goals.

Offsite Transportation. Employees working at HDF will create five offsite vehicle trips each day. Transport of cows for herd management will involve at most one ~~or two~~ truck trip~~s~~ per day between HDF and the offsite ranches. Fluid milk will be trucked offsite once every two days. Sand and feed delivery would generate three truck trips per week. Fertilizer would be delivered once every other month. Milk transport from Kauaʻi would be once or twice each week via regularly scheduled ocean barges departing from Nawiliwili Harbor. Offsite transportation associated with HDF operations is not anticipated to generate significant secondary effects.

4.20.3 Relationship between Local Short-term Uses of the Environment and the Maintenance and Enhancement of Long-term Productivity

Narrowing of the range of beneficial uses of the environment

The area in which HDF will operate a dairy farm has been used for commercial agricultural for nearly two decades. The dairy farm does not propose a change in land use or a narrowing of the range of beneficial uses of the environment. Instead, it proposes a revitalization of farming on this area designated as Important Agricultural Land and introduction of a sustainable food production. After the end of the lease term – initially 20-years with an additional 10-year option – the land could be used for other purposes. This term could possibly be further extended.

Long-term risks to health and safety

Hawaiʻi Dairy Farms will not create long-term risk to health and safety. Evaluation of operations and probable impacts to drinking water quality and surface waters demonstrates risks to be minimal. Water quality monitoring will be established to demonstrate no loss of water quality from operations. Pest insects and odors will be minimized by dairy management and is without potential nuisance or health effects to area residents, workers and visitors.

Foreclosure of future options

The dairy farm maintains the existing and reasonable uses of the property for agriculture, and does not foreclose future options at the end of the lease term.

Trade-offs among short-term and long-term gains and losses

The short-term inconveniences caused by construction activity include increased noise and dust, and increased traffic due to construction vehicles. Once construction is completed, the dairy farm will become a producer of local fresh milk and milk products without the delay and added costs of shipping from the mainland. Along with gains to local food security, the long-term benefits outweigh the relatively short-term losses anticipated during construction.

4.20.4 Irreversible and Irretrievable Commitments of Resources

The construction of the dairy facilities will occupy less than 10 acres, totaling less than 2 percent of the 557-acre site. The site could be modified for other uses in the future. Soil conditions and fertility will be improved through the addition of manure and organic matter, resulting in better growing conditions for future agricultural endeavors.

An irretrievable commitment of private fiscal resources, labor, construction materials and energy will be expended to implement the dairy. There will be a permanent commitment of private funds and resources to plan, design, construct and operate the facilities.

Use of the site for dairy operations does not preclude future conservation use of the wider region, such as examined by the U.S. National Park Service in its 2006 to 2007 reconnaissance study.

4.20.5 Potential for Environmental Accidents

The potential for environmental accidents at the dairy farm has been minimized through exceedance of design requirements and redundancies. The effluent ponds are scaled beyond required capacity. For the extremely remote possibility that the ponds would overflow, a secondary containment system has been designed as an additional safeguard. Risks to surface water quality are minimized with application of best practices including vegetated filter strips and 35-foot setbacks to exclude cows from drainageways. Fuels and chemicals utilized at the dairy facilities will be stored following established protocols and be utilized by qualified applicators in compliance with labeling to safeguard the environment. Secondary containment systems will be utilized in keeping with requirements and best management practices.

4.20.6 Adverse Environmental Effects that Cannot Be Avoided

Implementation of the project will produce unavoidable affects in the short and long-term. Short-term effects are generally associated with construction, and will prevail only for the duration of the construction period. Long-term effects would generally arise after construction. Effects that can be considered both adverse and unavoidable are discussed below.

Unavoidable Adverse Short-Term Effects

- Temporary increases in soil erosion may result from construction, consistent with possible levels after application of best management practices. Small amounts of soil and dust may be carried beyond construction sites in surface runoff water.
- Temporary increases in noise impacts may occur during the construction activities within the HDF site, particularly during excavation activities.
- Temporary impacts to air quality, primarily from fugitive dust emissions, are anticipated during construction activities. Impacts will be within permitted thresholds.
- Short-term traffic impacts from construction activities would be expected to occur as the result of the following types of activities:
  - Increases in truck traffic associated with construction, equipment staging, and delivery of construction materials;
  - Increases in automobile traffic associated with construction workers traveling to and from the dairy farm site.

Unavoidable Adverse Long-Term Effects

- Vegetation will be replaced with non-permeable surfaces where facilities are constructed, totaling ~~0.1~~ less than 2 percent of the site.
- Dairy farm operations will increase potable water consumption for the dairy herd and milking, and non-potable water for pasture irrigation.
- Dairy cows will produce manure and urine in the paddocks to be managed as part of the overall pasture grass nutrient demand, with a small percentage of nutrients passing to surface water and the nearshore marine environment where it will have no impact.
- There will be increased demand on existing utilities and infrastructure. Sustainable design practices and technology will be utilized to reduce demand requirements, including solar power generation.
- There will be an insignificant increase in traffic in the area due to the agricultural industry worker vehicles and local supplier deliveries to and from the dairy.

4.21 DEMOGRAPHIC AND ECONOMIC CONDITIONS (CONTEMPLATED HERD SIZE)

4.21.1 Existing Conditions - Demographic and Economic Conditions

The existing conditions are as described in Section 4.15.

4.21.2 Probable Impacts and Mitigation Measures - Demographic and Economic Conditions

As described in Section 4.15, the production of HDF with an established herd of up to 699 ~~milking~~ mature dairy cows would increase the supply of local fluid milk by approximately 1.5 million gallons annually. With a herd up to 2,000 ~~milking~~ mature dairy cows, approximately 4.4 million gallons of milk would be produced. This would double local milk production currently supplied by operational dairies on the Island of Hawai'i.

Additional employment generated by a possible expansion to accommodate the contemplated 2,000 ~~milking~~ mature dairy cow herd is estimated at approximately double that of the committed herd size (see Section 4.15). Five additional farm jobs and another 6 indirect jobs would increase the total of direct and indirect full-time equivalent jobs on Kauaʻi to 11, with an additional 3 indirect jobs created on Oʻahu, bringing the total Oʻahu indirect jobs to 6. This would total 22 direct-indirect jobs on Kauaʻi, and 6 indirect jobs on Oʻahu.

At full operations, HDF would generate a net income to the County of $51,000 per year, derived from property taxes on improvements. The State would derive approximately $170,000 annually in revenues, primarily from excise tax on sales for the contemplated herd sizes of 2,000 mature dairy cows.

With a long history of agriculture, most of Kaua'i has a rural ambiance. Most homes and visitor units on the island are within one mile of some agricultural activity; the rural character adds to the appeal of the island. The review of property values adjacent to beef cattle operations in the region reveals newer homes with large square footage in a luxury residential community with 2016 assessed values of $1,297,150 for a lot, to $2,893,100 for a lot with home. Clearly, beef cattle operations are compatible with nearby homes, commercial areas, resorts and recreational areas. The ranching and rural ambience adds to the value.

4.22 GROUNDWATER RESOURCES (CONTEMPLATED HERD SIZE)

4.22.1 Existing Conditions – Groundwater Resources

The existing conditions are as described in Section 4.16.

4.22.2 Probable Impacts and Mitigation Measures – Groundwater Resources

Impacts that would be considered significant related to groundwater supply and groundwater quality could include:

- Depleting the groundwater supply or interfering with groundwater recharge for aquifers in the project area; and
- Degradation of groundwater quality below State or Federal standards.

Short-term Impacts and Mitigation – Groundwater Resources

Short-term impacts are similar to those described in Section 4.16.3 for the committed herd size. Construction of Hawaiʻi Dairy Farms facilities is not anticipated to deplete the groundwater source or interfere with groundwater recharge in the short-term.

Long-term Impacts and Mitigation – Groundwater Resources

Long-term impacts on groundwater resources at the committed herd size as shown in Section 4.16.3 are not significant. For the contemplated herd size of up to 2,000 ~~milking~~ mature dairy cows, the potable water demand will be approximately 54,800 gpd more than the committed herd size. Water demand would increase by 25 gallons per cow per day, and additional potable water would be needed for milk cooling and sanitation within the milking parlor. An estimated 84,800 gpd would be required for the future contemplated herd size (Table 4.22-1). As with the committed herd size, all potable water used as wash water will be re-applied to pasture and thus remain a part of the evapotranspiration cycle. The potable water well located on the HDF site provided 3 MGD during the sugarcane plantation era; the demand of approximately 84,800 gallons per day (0.085 MGD) is well within the capacity of Māhāʻulepū 14 well.

Table 4.22-1 Water Demand for HDF Operations
Contemplated Herd Size of up to 2,000 ~~Milking~~ Mature Dairy Cows

Potable Water	
Wash water, milk cooling, employee use[†]	Dairy Facility @2,000 34,800 gpd[†]
Livestock water (*25 gpd/cow)	Total Field @2,000 50,000 gpd
	Total Potable Demand 84,800 gpd

[†]The majority of water used will be captured and re-used to irrigate pasture grass.

The water use rate for a potential future herd size of up to 2,000 ~~milking~~ mature dairy cows will not significantly impact the aquifer capacity. The potable water demand for the contemplated herd size is relatively modest compared to the 3 MGD capacity of the aquifer deep in the weathered volcanics. The 4,500-foot distance between the HDF Māhāʻulepū 14 well source and the nearest County potable water well (Kōloa Well F), coupled with the modest demand, means that no adverse impacts to ongoing use of groundwater in the volcanics will occur as a result of this use (TNWRE, 2016). Long-term groundwater supply impacts at the future contemplated herd size are not anticipated to be significant.

The groundwater and surface water analysis determined there is no hydrologic connection between the aquifer in the unweathered volcanic series and the shallow groundwater body in the alluvium. Thus nutrients added by the dairy operation will have no impacts to the County drinking water well, the source of potable water within the deep volcanics.

Four water monitoring wells have been installed by HDF into the shallow groundwater within the alluvium to allow monitoring of water quality. Results from the monitoring program will be ~~shared with~~ made available to the DOH CWB, dairy neighbors and the local Kauaʻi community.

4.23 SURFACE WATER RESOURCES & NEARSHORE MARINE ENVIRONMENT (CONTEMPLATED HERD SIZE)

4.23.1 Existing Conditions - Surface Water Resources

The existing conditions are as described in Section 4.17.

4.23.2 Probable Impacts and Mitigation Measures

Impacts that would be considered significant related to surface water could include:

- Cows depositing manure into on-site surface water and damaging the banks of the drainageway causing erosion;
- Introducing sedimentation into the on-site drainage ways; and
- Stormwater run-off carrying manure or nutrients into surface waters.

Probable Impacts and Mitigation – Surface Water Resources & Nearshore Marine Environment

Short-term Impacts and Mitigation – Surface Water Resources & Nearshore Marine Environment (Contemplated Herd Size)

Short-term impacts are similar to those described in Section 4.17.4 for the committed herd size. A Stormwater Pollution Prevention Plan (SWPPP) has been developed for the site to document controls and best management practices to avoid, control, and trap potential erosion associated with construction activities. The SWPPP is required as part of the application for the NPDES – Construction Stormwater General Permit, and describes any discharge in compliance with relevant regulations. Pasture establishment and setbacks of 35-feet from the top of each drainageway will act as filter strips to reduce sediments contributing to surface water turbidity downstream of the dairy site. No short-term adverse effects are anticipated to the quality of nearshore ocean waters and the nearshore marine environment

Long-term Impacts and Mitigation – Surface Water Resources & Nearshore Marine Environment (Contemplated Herd Size)

Section 4.17 describes how nutrients applied for dairy operations could potentially move to surface waters. The groundwater level of the alluvium is approximately 80 feet above mean sea level near the HDF monitoring wells 1 and 2, and lie approximately 8 to 10 feet deep (Nance, Volume 4 Appendix A-2). This groundwater fluctuates with seasonal high rainfall. In wetter periods, the level rises above the invert elevation of the manmade channels, and a modest amount of discharge from groundwater enters the ditch (TNWRE, 2016). These amounts could possibly be discharged when rainfall exceeds 0.8 inches; according to the 30-year rainfall record, such rainfall has occurred at about three percent of days or about ten day per year on average. These runoff-producing events would be the primary mode of conveyance of nitrogen and phosphorus into surface waters and ultimately to the marine environment. With the estimate of two percent of nitrogen and one percent of phosphorus from HDF operations ~~passing through the pasture turf~~ via periodic run-off to drainageways or percolate through soil into shallow groundwater in the alluvium, an estimated 10,000 pounds per year of nitrogen and 900 pounds per year of phosphorus could ~~enter surface water~~ leave the site (Appendix E).

Nutrients required to sustain the 470 acres of pasture are the same for the committed and the future contemplated herd size. What changes is the amount supplied as natural fertilizer (manure and effluent) and supplemental chemical fertilizer. The Nutrient Balance Analysis prepared for HDF shows that natural fertilizer from manure deposited directly to pasture and the effluent collected from the milking parlor for the contemplated herd size at 2,000 ~~milking~~ mature dairy cows will result in an excess of phosphorus from manure and effluent. Nutrient values relevant to the HDF site were used to create the existing mass balance for the site; only through monitoring actual field conditions can the true nutrient balance be known and maintained.

Several management options exist to keep phosphorus and other nutrients in balance. Higher grass yields would demand additional phosphorus. With an increase from the current 16.3 tons of dry matter (DM) per acre per year to a yield of 17.3 tons DM per acre per year, phosphorus demand by the pasture will eliminate any phosphorus overage. Based on research by consultants to HDF, yields of 20 tons DM per acre per year are anticipated following establishment of the committed herd of 699 ~~milking~~ mature dairy cows and several years of pasture maturation. Should yields not increase as planned, carrying capacity of the site would be 1,875 ~~milking~~ mature dairy cows. With reduced manure, phosphorus levels would require commercial supplementation to maintain the pasture. Nitrogen from commercial fertilizer would be required at both 1,875 and 2,000 ~~milking~~ mature dairy cows. Adherence to the Conservation Plan and NRCS Nutrient Management Practice Code requires monitoring and analysis of soil, manure, and tissue samples which can be used to amend the nutrient budget prepared for the site.

Setbacks established in adherence to the Conservation Plan and best management practices to reduce impacts to waterways are detailed in Chapter 3, Section 3.5. The setback for effluent application is 50 feet from each side of surface waters. Perimeter fencing to exclude cows from surface waters provides a 35-foot buffer on either side of the drainageways. Vegetative buffers will be maintained within the 35-foot setback from the drainageways.

At both herd sizes, the reduction in stormwater runoff from various storm events was estimated where flows combine in Māhāʻulepū Ditch immediately south of the project site. For the 10-year storm event, peak flow leaving the project site will be reduced by 257 cubic feet per second (cfs); for the 25-year storm event, reduced by 283 cfs; and for the 50-year storm event, reduced by nearly 300 cfs (Section 3.3.2.3).

A long-term water quality monitoring program will be instituted to regularly evaluate surface water quality in the agricultural ditches and Waiopili Ditch, along with nearshore ocean waters. The ongoing monitoring will inform the dairy management team of changes in water quality to gauge whether nutrients and pathogens are reaching a level of environmental concern.

4.24 ROADWAYS AND TRAFFIC (CONTEMPLATED HERD SIZE)

4.24.1 Existing Conditions – Roadways and Traffic

The existing conditions are as described in Section 4.18.

The South Kauaʻi Community Plan projects daily vehicle counts along Ala Kinoiki Road at 7,200 trips per day by the year 2035, and 9,500 daily trips on Kōloa Road (COK, 2015a).

4.24.2 Probable Impacts and Mitigation Measures – Roadways and Traffic

Impacts that would be considered significant related to traffic could include:

- A significant increase in traffic on Ala Kinoiki or Poʻipū roads; significant traffic delays for a substantial number of motorists; or
- Changes to traffic patterns or road infrastructure that affects pedestrian, bicyclist or motorist safety.

Short-term Impacts and Mitigation – Roadways and Traffic (Contemplated Herd Size)

The anticipated impacts from construction are the same as for the committed herd size, as described in Section 4.18.1. There will be no ~~A~~additional traffic ~~will be~~ generated during construction at the contemplated herd size, which ~~but~~ will return to normal levels after project completion during day-to-day operations.

There will be no significant change to traffic patterns or infrastructure related to the public roads.

Long-term Impacts and Mitigation – Roadways and Traffic (Contemplated Herd Size)

Traffic operations along Māhāʻulepū Road and associated public roads will continue to operate at acceptable levels of service during peak hours of traffic for the long-term. The larger potential contemplated herd size would result in a total of 23 vehicles daily, to include employees and delivery vehicles. This is an increase of 11 vehicles daily over the committed herd size.

The South Kauaʻi Community Plan estimates a slight decrease in daily vehicle movements along Ala Kinoiki Road by 2035, from the 2010 level of 8,000 to 7,200 daily vehicles. Daily vehicles along Kōloa Road, however, are expected to increase from 7,200 vehicles per day to 9,500 daily vehicles. An increase of 23 vehicles daily from HDF operations would result in ~~0.14~~ approximately 0.30 percent increase, which is less than one-third of one percent of ~~in~~ total vehicle trips in the area. An additional 23 trips daily would have a minimal effect on traffic conditions at County roadways in the area over the long-term.

Construction equipment mobilization will comply with Hawaiʻi Department of Transportation and County requirements. Delivery trucks and milk tanker trucks will be in compliance with State and County size and weight limits; no oversized vehicles will be used for ongoing operations.

Table 4.24-1 Change in Daily Traffic Movement For Contemplated Herd Size

Traffic Data	*2009-2010 Baseline	w/ 2,000 Herd Dairy	% Change
Ala Kinoiki Road	8,000	8,023	0.29%
Koloa Road	6,500	6,523	0.35%
	*2035 Projection	w/ 2,000 Herd Dairy	% Change
Ala Kinoiki Road	7,200	7,223	0.32%
Koloa Road	9,500	9,523	0.24%
**Source: Fehr & Peers 2014 in County of Kauaʻi 2015b, South Kauaʻi Community Plan*			

There will be no change to traffic patterns or infrastructure related to the public roads.

4.25 AIR QUALITY, ODOR, AND GREENHOUSE GASES (CONTEMPLATED HERD SIZE)

As described in Section 4.19, the potential odor and emission levels relevant to dairy operations were modeled and estimated for the proposed dairy. The full report, *Hawaiʻi Dairy Farms Air Emissions and Odor Evaluation Technical Report*, is included in Appendix I.

4.25.1 Air Quality (Contemplated Herd Size)

Existing Conditions – Air Quality

The existing conditions are as described in Section 4.19.1.

Probable Impacts and Mitigation Measures - Air Quality

Impacts that would be considered significant related to air quality could include:

- Dust and debris generated during construction of the dairy facilities; and
- On-going dairy operations increasing odor, GHG, and air pollutants in the region.

Short-term Impacts and Mitigation – Air Quality (Contemplated Herd Size)

Short-term impacts from construction are the same as for the committed herd size, described in Section 4.19.1. Exhaust emissions from construction equipment and increased vehicular activity may occur during the construction phase. Fugitive dust emissions are probable during soil excavation, though control measures are required to prevent or minimize fugitive dust emissions from affecting surrounding areas. Due to the remote dairy location, emissions from on-site work will dissipate before reaching public access areas.

Long-term Impacts and Mitigation – Air Quality (Contemplated Herd Size)

Particulate matter in the form of dust will be created by cows when walking along unpaved raceways to the barn area, and, in theory, when walking on dried manure in the paved holding yard. In reality, the paved holding yard is hosed off regularly, and wash water and manure is collected in the effluent ponds for re-application as fertilizer on the pastures. But as explained in Section 4.19.1, the methodology overestimates potential fugitive dust as the model is based on measurements from dry lots (not paved) covered with dry manure where cows are confined.

Impacts are explained in Section 4.19.1 for the committed herd size of 699 ~~milking~~ mature dairy cows. The following estimate is for a model threshold of 2,000 ~~milking~~ mature dairy cows based on the dry lot model (Table 4-26.2).

Probable Impacts and Mitigation Measures – Air Quality (Contemplated Herd Size)

Modeling for HDF at both the 699 herd size and the contemplated herd size of up to 2,000 ~~milking~~ mature dairy cows used a high fugitive dust rate which is considered beyond conditions for HDF but rely on the available published literature (see Section 4.19.1). Only the contemplated herd size of up to 2,000 ~~milking~~ mature dairy cows was modeled, as at the lower threshold of 699 cows the potential fugitive dust impact would be negligible. The estimated concentration for PM10 is 2.01 μg/m3 per 24-hour period, well below the State standard of 150 μg/m3. The estimated concentration for PM2.5 is 0.23 μg/m3 per 24-hour period, well below the Federal standard of 35 μg/m3 (Table 4.26-1). Dust control (e.g. watering walkways and washing down the holding yards) will be utilized as needed to keep any particulate matter on site.

Table 4.26-1 Fugitive Dust Analysis

Pollutant	Average Time	Concentration (ug/m^3)	Background	Total Impact	Standards
PM_{10}	24 hr	2.01	39 ug/m^3	41.01 ug/m^3	150 ug/m^3
PM_{10}	annual	0.33	15 ug/m^3	14.83 ug/m^3	50 ug/m^3
$PM_{2.5}$	24 hr	0.23	12 ug/m^3	12.23 ug/m^3	35 ug/m^3
$PM_{2.5}$	annual	0.04	3.9 ug/m^3	3.94 ug/m^3	15 ug/m^3

The highest estimated concentrations do not come close to the State standard (Table 4-26.2). Dust control (e.g. watering walkways and washing down the holding yards) will be utilized as needed to keep any particulate matter on site.

The total annual particulate matter emissions were also estimated for PM and greenhouse gases (GHGs). Total annual emissions (in tons per year) are typically estimated for potential permitting applicability. The estimate for a potential future contemplated herd size of up to 2,000 mature dairy cows was 3.3 tons per year. The project will not require any permits under the Clean Air Act, or State of Hawaiʻi counterpart.

4.25.2 Odor Assessment (Contemplated Herd Size)

An explanation of the odor assessment methodology can be found in Section 4.19.2.

Existing Conditions - Odor

The existing conditions are as described in Section 4.19.2.

Probable Impacts and Mitigation Measures – Odor (Contemplated Herd Size)

Odor isopleths (a line used to map all points having the same numerical value) were created using the results of AERMOD computer modeling that utilizes four types of input data: emission source information, receptor locations, meteorology, and model specific control options (site and project specific data options). For the contemplated herd size, Figure 4.25-1 displays the results of modeling for the effluent irrigation application in typical precipitation conditions (dilution of roughly 12 percent for the larger herd size), and unusually wet periods when dilution could be up to 50 percent ~~annual extent of the 6.5 OU/m³ odor level~~. The colored area depicts the 99.5th percentile threshold of 6.5 OU/m^3. Within the colored area, odors may be detectable by 50 percent of the sensitive population once per 200 hours, or 44 hours per year.

~~The odor isopleth shows potential odor beyond the dairy farm boundary does not extend more than 2,780 feet (just over one-half mile), and does not reach recreational or residential areas (Figure 4.25-1).~~

Short-term Impacts and Mitigation – Odor

The short-term odor extent is repeated here for the committed herd size as it is assumed ~~to~~ the herd will be built from an initial herd to the committed herd size (up to 699 mature dairy cows) before reaching the contemplated herd size. The extent of possible odor is that which could possibly be detectible by 50 percent of the sensitive population within 1,200 ~~1,670~~ feet past the southern boundary, up to 44 hours out of every year. During unusually wet periods, odor could extend approximately 2,151 feet (less than one-half of a mile) beyond the southern boundary for the committed herd size (see Section 4.19.2). Should HDF decide to expand the herd beyond 699 ~~milking~~ mature dairy cows, the short-term odor extent may increase correspondingly, and is shown under long-term impacts.

Long-term Impacts and Mitigation – Odor

The odor modeling analysis and isopleths for the larger contemplated herd size is shown in Figure 4.25-1 ~~4.26-3~~. The odor threshold – defined as the 99.5th percentile of 6.5 OU/m^3 odor – is the area in which odors may be detectable by 50 percent of the population at a frequency of once every 200 hours, or roughly 44 hours per year.

The odor isopleth for the typical irrigation effluent extends beyond the dairy farm boundary approximately ~~2,780~~ 3,070-feet (~~just~~ over one-half mile), which would not reach recreational or residential areas (Figure 4.25-1). During unusually wet periods, odor could extend approximately 4,085 feet (approximately three-quarters of a mile) beyond the southern boundary for the contemplated herd size. As explained in Section 4.19.2, the parameters used in the analysis were intentionally conservative, and the impacts shown assume an unlikely confluence of worst-case meteorological data irrigation location, and grazing location. Actual offsite odor impacts are likely to be much lower and/or less frequent than shown (Arcadis, ~~2015~~ 2016).

Generally, tradewinds will disperse odors to less than detectable levels beyond the HDF site.~~; in~~ It is important to understand that the isopleths for irrigation effluent represent periods of no wind, during which odor may not be dispersed, creating the "worst case" scenario. ~~In these periods without normal tradewind flow, the odor plume would extend to the south of the HDF site (Figure 4.25-1).~~ It should be noted that the parameters used in the odor assessment were intentionally very conservative and the impacts shown depend on an unlikely confluence of most impactful emission source locations; thus, actual offsite odor impacts are likely to be much lower and/or less frequent than displayed.

~~**Figure 4.25-1 Odor Detection Limits for 2,000 Herd Size**~~

The potential odor from slurry application – which will occur at least once every 45 days - is shown in Figure 4.25-2. To minimize potential odor impacts from slurry used as pasture nutrients, HDF has elected to restrict slurry application to periods when wind speeds are between 9 and 20 mph. With application at the most impactful location – paddocks south of the taro farm – the odor from slurry application could extend approximately 1,580 feet, or less than one-third of a mile. Due to wind speeds within this range occurring on average 243 days of the year, the 99.5th percentile is reduced to potentially perceiving the odor just 29 hours per year (Arcadis, 2016b).

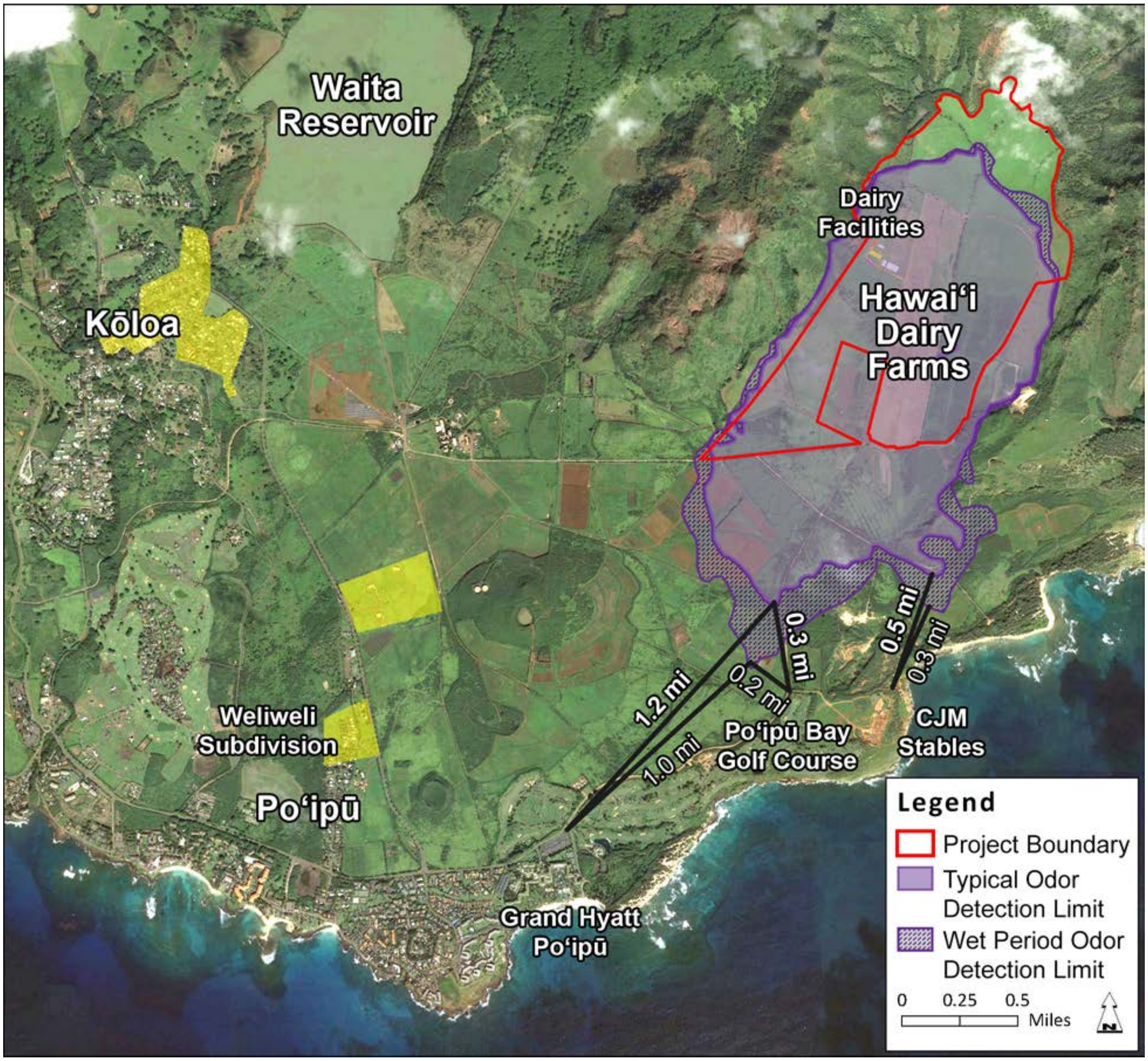


Figure 4.25-1 Odor Detection Limits for 2,000 Herd Size Effluent Irrigation Application

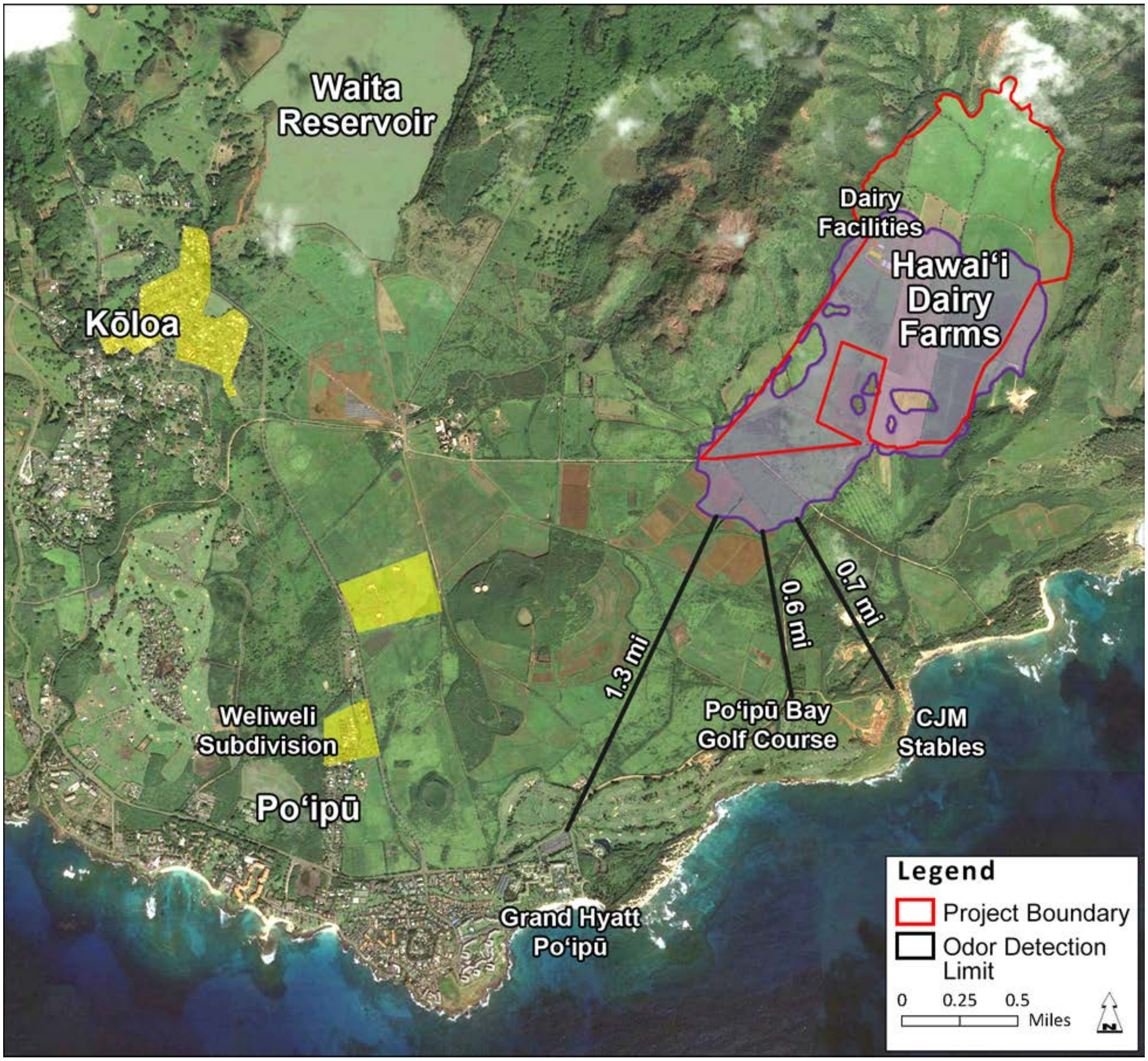


Figure 4.25-2 Odor Detection Limits for 2,000 Herd Size Slurry Application

4.25.3 Greenhouse Gases (Contemplated Herd Size)

See Section 4.19.3 for an overview of Greenhouse Gas (GHG).

Existing Conditions and Methodology – Greenhouse Gases

See Section 4.19.3 for existing conditions and methodology of GHG estimates for HDF. Under the Federal 2010 greenhouse gas reporting rule by the EPA, small businesses and farms are exempted from permitting requirements.

Probable Impacts and Mitigation Measures – Greenhouse Gases (Contemplated Herd Size)

Short-term Impacts and Mitigation – Greenhouse Gases

For the committed herd size, contributions to GHG in the short-term will not be significant. See Section 4.19.3. With establishment of the contemplated herd size, GHG emissions at HDF may reach the estimated 2,693 CO_2e tons (2,969 US tons) per year as modeled for the committed herd size. This is equivalent to the GHG generated by 170 4-person households annually, including home energy consumption, transportation and waste.

Long-term Impacts and Mitigation – Greenhouse Gases

Potential GHG emissions for HDF at the contemplated herd size of up to 2,000 mature dairy cows was modeled as described in Section 4.19.3 using the IPCC guidelines and conversions. The estimated total of 7,705 CO_2e metric tons per year (8,493 US tons) was 5,012 CO_2e metric tons (5,525 tons) more than the committed herd size of 699 ~~milking~~ mature dairy cows. ~~This~~ The total would be equivalent to the GHG generated by 485 4-person households, including home energy consumption, transportation and waste (https://www3.epa.gov/carbon-footprint-calculator).

Recent research demonstrates an increased carbon accumulation in soils used for management-intensive grazing practices. Soils with accumulated carbon increase cation exchange and water holding capacity, thus improving soil quality and providing for climate mitigation by sequestering carbon from the atmosphere (Machmuller et al., 2014).

Operational practices to protect air quality by reducing nitrogen emissions will come from guidance in NRCS Conservation Practice Standard 590, Nutrient Management. Application of nutrients will be adjusted through adjustments to the source, timing, amounts, and placement of nutrients. Specific practices to be utilized at HDF include: slow release fertilizers; nutrient enhancement technologies; and stabilized nitrogen fertilizers. Monitoring of soil nutrient levels and manure nutrient levels will be conducted and used to evaluate agronomic needs for the grass and assess potential changes to nutrient uptake.

4.26 SUMMARY OF PROBABLE IMPACTS AND CONTEXTUAL ISSUES (CONTEMPLATED HERD SIZE)

This section discusses the dairy farm's potential secondary effects and the cumulative impacts on the environment under the contemplated herd size of up to 2,000 ~~milking~~ mature dairy cows. This summary addresses anticipated potential effects, in addition to effects from the committed dairy herd size.

4.26.1 Interrelationships and Cumulative Environmental Impacts (Contemplated Herd Size)

The contemplated dairy farm would be within the active Māhāʻulepū agricultural area. Other known land uses underway or planned in the region, with the dairy farm in operation, will contribute to the contextual setting of interrelationship and cumulative effects. These known include uses listed in Section 4.20.1, including Agricultural and Commercial Uses and Planned Development in the Kōloa-Poʻipū Region. There are several new agricultural enterprises planned in the vicinity, along with other public and private development and redevelopment efforts in Kōloa Town and Poʻipū area, as referenced under the South Kauaʻi Community Plan (COK, 2015a).

Probable Cumulative Impacts (Contemplated Herd Size)

Recognizing the number of development projects planned, the potential impacts of the dairy farm (contemplated herd size) combined with other projects in the region provide insight to probable cumulative impacts. Qualitative or quantitative analyses were conducted in this EIS for pest insects, demographic and economic conditions, groundwater resources, surface water and nearshore marine resources, roadways and traffic, and air quality, odors and greenhouse gases. Of note, nearly all construction activities will have been completed earlier for the establishment of the committed dairy herd.

Pest Insects (Contemplated Herd Size)

There are no native, protected or endangered insect species within the HDF site. For potential manure-related flies, integrated pest management will be utilized to control fly populations around dairy operations, and best practices will be applied to minimize standing manure within the dairy facilities. An especially important insect to minimize fly breeding habitat in manure is the dung beetle, which can bury manure in one to three days and thereby incorporate it into the soil thus interrupting the egg to fly lifecycle which ranges from 7 to 20 days depending on the species. Populations of dung beetles found on Kauaʻi and those species already in Māhāʻulepū Valley, will expand with the growing manure food source, thus increasing and speeding breakdown of manure.

With the establishment of the committed herd size of 699 ~~milking~~ mature dairy cows, dung beetle populations will have had time to expand. With the natural systems established by the dairy operations, the pest insect populations are not anticipated to increase significantly with the dairy at the contemplated herd size.

Demographic and Economic Conditions (Contemplated Herd Size)

Implementation of the dairy farm at the contemplated herd size will provide approximately 11 direct and indirect full-time equivalent jobs on Kauaʻi, including 10 farm jobs. On Oʻahu, 6 indirect jobs would be created at the contemplated herd of up to 2,000 ~~milking~~ mature dairy cows. The economic impacts are summarized in Section 4.21, and the complete study is provided in Appendix J. The increase in agricultural employment will add to local economic activity, generating $170,000 in net revenues annually to the State, and net income to the County of $51,000 per year. The dairy farm at the contemplated herd size will add more agricultural industry employment, provide greater net revenues to the County and State, and bring additional fresh milk and milk products to advance local food sustainability.

With a long history of agriculture, most of Kaua'i has a rural ambiance. Most homes and visitor units on the island are within one mile of some agricultural activity; the rural character adds to the appeal of the island. The review of property values adjacent to beef cattle operations in the region reveals newer homes with large square footage in a luxury residential community with 2016 assessed values of $1,297,150 for a lot, to $2,893,100 for a lot with home. Clearly, beef cattle operations are compatible with nearby homes, commercial areas, resorts and recreational areas. The ranching and rural ambience adds to the value.

Groundwater Resources (Contemplated Herd Size)

Demand - HDF:
With an increase in cows for the contemplated potential future herd size, another 25 gpd per animal for drinking water is required, as well as additional wash water of 17.4 gpd per animal. This would increase demand for potable water to 84,800 gpd for up to 2,000 ~~milking~~ mature dairy cows, or 54,800 gpd over the committed herd size. The existing, on-site agricultural well had an estimated yield of 3 MGD during the sugarcane planation era; the increased demand of 84,800 gallons (0.85 million gallons) is well within the aquifer yield.

Nearly all of the potable water used will be re-applied to pasture and thus remain a part of the evapotranspiration cycle. Potable water used in the milking parlor and dairy facilities will be captured and recycled with nutrients as irrigation water. Some percentage of the livestock drinking water is returned as effluent and ultimately utilized by the pasture grass. The potable water use rate for the potential contemplated herd size of up to 2,000 ~~milking~~ mature dairy cows, and the lack of connection plus the 4,500 foot distance between the on-site well and the nearest County potable water well (Kōloa Well F) will result in no adverse impacts to ongoing use of groundwater in the volcanic aquifer layer.

Demand - Kōloa-Poʻipū:
Per Section 4.20.1, the adjacent developed Kōloa-Poʻipū region shows large and growing demand for potable water for community and resort development. The State Department of Economic Development and Tourism (DBEDT) projects the population of Kauaʻi will increase from the year 2010 population of 67,100 residents to 84,400 in 2030, a change of 17,300 residents over the 20-year period. The South Kauaʻi population is estimated to reach 16,855 in 2035. Compared to the remainder of the island, population growth for this region is projected to increase to encompass 19.2 percent of the County population; in 2010 the region contained roughly 17.4 percent of the County population (COK, 2015a).

Water use reported from the Kōloa aquifer in 2004 was approximately 2.3 MGD, approximately 8 percent of the estimated 30 MGD sustainable yield for the aquifer (CWRM, 2008). For the South Kauaʻi region (the Kōloa - Poʻipū - Kalaheo districts), water use in 2035 is projected to be ~~3.24~~ 5.61 MGD, an increase of nearly ~~1~~ 2.62 million gallons per day (SSFM, ~~unpublished~~ 2016). An evaluation of the island's infrastructure capacity for projected growth in population (both residents and visitors) through the year 2035 predicts the island will be facing a shortage of well water (SSFM, ~~unpublished~~ 2016). ~~Water resources must therefore be carefully managed to accommodate the projected growth and water demand anticipated in the region through 2035.~~

Current climate change models project decreased rainfall on the dry leeward sides of Kauaʻi (such as Poʻipū), which will reduce available freshwater resources (Timm et al., 2014). Given the degree of uncertainty in the climate change models, water availability cannot be predicted. Future reduction of available freshwater, in conjunction with projected population and visitor growth, is an issue that must be addressed by State and County, with cooperation from water providers and water consumers.

With the contemplated herd size of up to 2,000 mature dairy cows, conservative calculations of potential nitrogen and phosphorus inputs to groundwater from HDF operations are the same as for the committed herd size. The addition of these nutrient levels will represent a fraction of the nutrient inputs from the ~~Koloa-Poipu~~ Kōloa - Poʻipū region.

Nitrogen input to the marine environment from resort landscaping and golf course fertilization, and domestic wastewater, in the Poʻipū region is 38,510 pounds of nitrogen annually. Phosphorus for both domestic wastewater and landscape fertilization in the region is estimated to be 1,260 pounds annually. This is 3.8 times greater than the estimate from dairy operations. Phosphorus for both domestic wastewater and landscape fertilization in the region is estimated to be 1,260 pounds annually, or 1.4 times greater than the potential discharge from HDF. Significantly different soils mean that nutrient inputs from the Poʻipū region are constant throughout the year, and no mitigation is applied to reduce the quantities.

Surface Water and Nearshore Marine Resources (Contemplated Herd Size)

With an on-site manager for the new agricultural endeavor utilizing best management practices to protect water quality through nutrient and soil management, current run-off would be reduced. Under the contemplated herd size of up to 2,000 ~~milking~~ mature dairy cows, the NRCS-reviewed Conservation Plan will minimize sediment, nutrient and pathogen inputs to the surface waters in these drainages. The reduction in runoff from various storm events was estimated where flows combine in Māhāʻulepū Ditch immediately south of the project site. For the 10-year storm event, peak flow leaving the project site will be reduced by 257 cubic feet per second (cfs); for the 25-year storm event, reduced by 283 cfs; and for the 50-year storm event, reduced by nearly 300 cfs (Section 3.3.2.3).

At contemplated herd size, HDF will continue to balance nutrient needs of pasture grass as well as improve the water-holding capacity of soils. Working closely with DOH and NRCS, dairy farm staff are helping to improve understanding of factors that affect local water quality. Adherence to strict measures to protect water quality through proper irrigation management practices and re-analysis of nutrient inputs and outtake, the dairy farm will balance nutrient needs of pasture grass as well as improve the water-holding capacity of soils. Occasional nutrient run-off may allow some diluted nutrients to bypass mitigation measures to be employed, but will have no significant deleterious effect on the area's surface water quality. Nearshore water quality at the Waiopili Ditch outlet and along this coastline will not be significantly degraded by inputs from HDF.

Roadways and Traffic (Contemplated Herd Size)

The development of the dairy farm facilities and future operations is not expected to have a significant impact on traffic operations in the area roadways. The projected increase in vehicle movements related to HDF operations for the future contemplated herd size of 2,000 ~~milking~~ mature dairy cows is approximately 23 additional vehicle trips per day. Projected daily vehicle counts for the year 2030 on Ala Kinoiki Road are 7,200 trips per day, with an additional 9,500 daily trips projected for Kōloa Road, totaling 16,700 vehicle trips in the vicinity. An increase of 23 vehicles daily from HDF operations would result in 0.14 percent increase in total vehicle trips in the area. HDF will contribute no significant impacts to traffic conditions on County roadways.

Air Quality/Odors/Greenhouse Gases (Contemplated Herd Size)

Results from the air quality odor model indicate that any long-term impacts on air quality in the project area due to contemplated dairy farm operations would be negligible. Under the worst-case meteorological conditions, concentrations of odor are limited to within 2,780-feet of the dairy farm boundary and do not reach residential or resort areas. With active management of the dairy operations, there will be no noticeable odors or reduction of air quality in the surrounding area. The limited number of worker vehicles and trucks will create nominal increase in air emissions, not significantly contributing to the air emissions generated by vehicles in the region. Contributions to greenhouse gas will not be significant.

4.26.2 Potential Secondary Effects (Contemplated Herd Size)

Local Milk Production and Food Sustainability. At the contemplated herd size of up to 2,000 ~~milking~~ mature dairy cows, Hawaiʻi Dairy Farms will produce substantial secondary effects in terms of local milk production, local milk products production and increased food sustainability. When the dairy matures to full capacity with a contemplated herd size of 2,000 ~~milking~~ mature dairy cows, it will produce approximately 4.4 million gallons of fresh, local milk each year for the residents of Hawaiʻi. This equates to over 25 million pounds of milk, which exceeds the level for food sustainability for the island of Kauaʻi (see Section 4.21, Demographic and Economic Conditions). The 3.0 million gallons of locally produced milk will reduce Hawaiʻi's 90 percent dependence on milk shipments from the US mainland. Potential future processing of fluid milk into soft cheeses and yogurt could provide value-added products for HDF or procurers of the fluid milk.

Indirect Employment. For the estimated development period of the dairy, indirect employment will be generated and is expected to average 44 jobs on Kauaʻi and an additional 13 jobs on Oʻahu. For on-going dairy operations with the contemplated herd size, it is estimated that about 15 additional indirect jobs will be created on Kauaʻi and another 8 indirect jobs created on Oʻahu, in addition to the direct HDF jobs.

Source of Calves for the Local Ranching Industry. Over the long-term, dairy operations will provide a source of calves for the local ranching industry and expand the market for ranch-related additional goods and services from local vendors. This source of calves will increase with the contemplated herd size.

Cattle ranching on Kauaʻi spans generations, and ranchers are stewards of the lands: healthy lands raise healthy beef cattle. Ranchers are experienced in animal welfare, and will collaborate with HDF to care for dairy cows during annual rest cycles and to raise calves until old enough to join the dairy herd. The availability of calves from a dairy such as HDF provides new animals to maintain or expand a beef herd. Each ranch will determine its capacity based on business and operational goals.

Offsite Herd Management. The contemplated herd size of up to 2,000 ~~milking~~ mature dairy cows at the Māhāʻulepū site relates to a permitting threshold that references the count of ~~milking~~ mature dairy cows. As discussed in Chapter 3.0 and Section 4.20.2, animals in various stages of lactation and rest will be transferred between HDF and existing Kauaʻi ranches as needed for animal health and dairy productivity. Makoa Ranch and ʻOmaʻo Ranch on Kauaʻi are existing ranch operations, which require no additional facilities, permits, or improvements to have fluctuation in herd numbers, which is typical of cattle operations. No impact to the Makoa or ʻOmaʻo ranches, or areas outside the project area, will occur as a result of the offsite herd management.

With the contemplated herd size of up to 2,000 ~~milking~~ mature dairy cows at the Māhāʻulepū site, more animals will be transferred between HDF and existing Kauaʻi ranches.

Offsite Transportation. With the contemplated herd size of up to 2,000 ~~milking~~ mature dairy cows, employees working at HDF will generate an estimated 10 offsite vehicle trips each day. Transport of cows for herd management will involve two truck trips per day between HDF and the offsite ranches. Fluid milk will be delivered to the milk processing site twice each day. Sand and feed delivery would generate four to five truck trips per week. Fertilizer would be delivered once every other month. Milk transport from Kaua'i would be twice each week via regularly scheduled ocean barges departing from Nawiliwili Harbor. Offsite transportation associated with HDF operations is not anticipated to generate significant secondary effects.

4.26.3 Relationship between Local Short-term Uses of the Environment and the Maintenance and Enhancement of Long-term Productivity (Contemplated Herd Size)

Narrowing of the range of beneficial uses of the environment (Contemplated Herd Size)

The area in which HDF will operate a dairy farm has been used for commercial agricultural for nearly two decades. The dairy farm does not propose a change in land use or a narrowing of the range of beneficial uses of the environment. Instead, it proposes a revitalization of farming on this area designated as Important Agricultural Land and introduction of a sustainable food production. After the end of the lease term – initially 20-years with an additional 10-year option – the land could be used for other purposes. This term could possibly be extended. Further, additions of organic matter from manure will improve soil tilth - the physical condition of the soil - over the long-term.

Long-term risks to health and safety (Contemplated Herd Size)

Hawai'i Dairy Farms at the contemplated herd size is not anticipated to create long-term risk to health and safety. The groundwater and surface water analysis confirmed no connection between groundwater in the alluvium on the valley floor and the deeper aquifer within unweathered volcanic series containing the County drinking water source. Regardless, HDF has installed monitoring wells to assess any increased nutrients within the waterbodies in the alluvium. Measures are to be taken to protect drinking water quality and surface waters. Pest insect populations will be managed through an integrated pest management system focused on the natural food web of invertebrates to disrupt breeding. Under worse-case meteorological conditions, odors may be detected by 50 percent of people just 44 hours of each year, however, the worst-case range is within one-half mile of the site and would not reach recreational or residential areas.

Foreclosure of future options (Contemplated Herd Size)

The dairy farm at the contemplated herd size maintains the existing and reasonable uses of the property for agriculture, and does not foreclose future options after the end of the lease term.

Trade-offs among short-term and long-term gains and losses (Contemplated Herd Size)

Although construction activities will have largely been completed earlier for the establishment of the committed dairy herd, there will be short-term inconveniences caused by construction activity at the contemplated herd size. This will include some incremental increase in noise and dust, and increase in traffic due to construction vehicles. Once construction is completed, the dairy farm at the contemplated herd size will become an even larger producer of local fresh milk and milk products without the delay and added costs of shipping from the mainland. Along with gains to local food security, the long-term benefits outweigh the relatively short-term losses anticipated during construction.

4.26.4 Irreversible and Irretrievable Commitments of Resources (Contemplated Herd Size)

The construction of the dairy facilities will occupy less than 10 acres, totaling less than 2 percent of the 557-acre site. The site could be modified for other uses in the future. Soil conditions and fertility will be improved through the addition of manure as organic matter, resulting in better growing conditions for future agricultural endeavors.

Use of the site for dairy operations does not preclude future conservation use of the wider region, such as examined by the U.S. National Park Service in its 2006 to 2007 reconnaissance study.

4.26.5 Potential for Environmental Accidents (Contemplated Herd Size)

At the contemplated herd size, the potential for environmental accidents at the dairy farm will remain minimal. Standards and regulatory requirements must be met; reviews and approvals are required from the State Department of Health for the waste management facilities. Capacity beyond that required has been built into the design and scaling of the effluent ponds. For the extremely remote possibility that the ponds would overflow, a secondary containment system has been designed as an additional safeguard. Risks to surface water quality are minimized with application of best practices including vegetated filter strips and 35-foot setbacks to exclude cows from drainage ways. Fuels and chemicals utilized at the dairy facilities will be stored following established regulations and applied by qualified applicators in compliance with labeling to safeguard the environment.

4.26.6 Adverse Environmental Effects that Cannot be Avoided (Contemplated Herd Size)

Implementation of the dairy farm at the contemplated herd size will produce unavoidable affects in the short term and long term. Short-term effects are generally associated with construction, and will prevail only for the duration of the construction period, mostly completed under the committed herd size. Long-term effects would generally arise after construction. Effects that can be considered both adverse and unavoidable at the contemplated herd size are discussed below.

Unavoidable Adverse Short-Term Effects (Contemplated Herd Size)

- Existing ground cover vegetation and landscaping will be displaced by built facilities, covering approximately 2 percent of the site.~~, will be completed at~~ The built facilities and creation of non-permeable surfaces will be the same as ~~T~~the committed herd ~~size the committed dairy herd level~~.
- Temporary increases in soil erosion may result from dairy establishment at the committed herd size as noted in Section 4.20.6 limited to the construction period.
- Potential short-term air quality impacts, primarily from fugitive dust emissions related to construction at the committed herd size, are noted in Section 4.20.6 limited to the construction period.
- Short-term traffic impacts from construction activities, ~~largely~~ which will be completed for the committed dairy herd, would be expected to occur as the result of the following types of activities:
    - Increases in truck traffic associated with removal and redistribution of excavation fill materials and delivery of construction materials.
    - Increases in automobile traffic associated with construction workers traveling to and from the dairy farm site.

Unavoidable Adverse Long-Term Effects (Contemplated Herd Size)

- Dairy farm operations will increase potable water consumption for the dairy herd and milking, and non-potable water for pasture irrigation.
- Dairy cows will produce manure and urine in the pasture paddocks in the contemplated herd size dairy farm operations. This will continue to be managed as part of the overall pasture grass nutrient demand, with a small percentage of nutrients passing to surface water and shallow groundwater.
- There will be increased demand on existing utilities and infrastructure in the contemplated herd size dairy farm operations. Sustainable design practices and technology will be utilized to reduce demand requirements, including solar power generation.
- There will be an insignificant increase in traffic in the area in the contemplated herd size dairy farm operations, due to the agricultural industry worker vehicles and local supplier deliveries to and from the dairy.

4.27 SUMMARY OF PROBABLE IMPACTS FOR BOTH HERD SIZES

Table 4.27-1 summarizes the impacts described in this chapter.

Table 4.27-1 Summary of Impacts from the Committed and Contemplated Herd Size

SUMMARY OF PROBABLE IMPACTS Proposed Action - Committed Herd Size: 699 ~~milking~~ mature dairy cows	Proposed Action - Contemplated Herd Size: 2,000 ~~milking~~ mature dairy cows
CLIMATE	
The scale of HDF is not large enough to influence global climate cycles related to solar radiation or evapotranspiration. No significant impacts are anticipated, and no mitigation would be required. Future rainfall due to long-term climate change is projected to trend to drier than normal conditions for climatically dry regions of the Hawaiian Islands such as Poʻipū. Given the degree of uncertainty in the climate change models, impact on HDF operations cannot be predicted.	No change.
TOPOGRAPHY	
The dairy facility and associated infrastructure will be constructed in a 10-acre area located along the site's western boundary. Built facilities within this area will total less than 2 percent of the site. Within the pasture area, swales previously installed for agriculture and low-lying areas may be smoothed or filled to improve surface drainage and uniformity ~~for grazing~~. Existing farm road will be slightly elevated, with cow raceways constructed in parallel above grade; swales will be created to direct run-off where needed.	No change.
SOILS	
Short-term soil disturbance for construction of roadways and dairy facilities will be minimized through the adherence to the Conservation Plan, best management practices, and controls per an NPDES Construction Stormwater General Permit. Soil loss is expected to be within permitted thresholds and to not be significant. Long-term soil impacts are anticipated to result in improvements to the physical, chemical, and biological condition of the soil.	Increased benefit to soil conditions long-term.
LAND USE & AGRICULTURAL SETTING	
The development of Hawaiʻi Dairy Farms will be in full compliance with its agricultural State Land Use District designation and embodies the IAL designation per the Hawaiʻi State Constitution by using the protected lands in the project area for their intended purpose of diversified agriculture and agricultural self-sufficiency. No request for change of land use will be made, and no mitigation is needed.	No change.

VISUAL & AESTHETIC RESOURCES	
No public scenic views or lookouts will be affected by dairy development or operations. There will be no adverse effect to public views of the Puʻu Hunihuni crater, views from the Ala Kinoiki Road corridor, or impediment to views of the Hāʻupu Mountains from the HDF site.	No change.
NATURAL HAZARDS	
Structural design of dairy facilities will meet International Building Code (IBC) 2006 standards with local amendments. Design incorporates wind loading (including hurricane gusts), rain and flood loading, and earthquake loading. A geotechnical evaluation recommended Seismic Site Class D under IBC standards for the area where the barns and agricultural infrastructure will be constructed. A natural disaster plan has been prepared by the Hawaiʻi Dairy Farms' manager to address hurricane, fire, and potential flooding hazard scenarios. HDF is not in a flood zone or tsunami inundation area, so this scenario is mentioned in the disaster plan only for HDF personnel to maintain awareness. The disaster response plan outlines safety procedures during the event, follow up actions, and emergency contacts for assistance before, during or following the event.	No change.
ARCHAEOLOGICAL & HISTORIC RESOURCES	
The project will be fully enclosed by perimeter fencing along the boundary of the leased premises, which will contain dairy activities and related impacts within the project area. The State Historic Preservation Division accepted the AIS December 19, 2016 (Appendix G). SHPD concurs with the significance assessments and mitigation recommendations in the AIS. ~~Ten post-European contact era~~ Twelve sites associated with Plantation-era sugarcane cultivation were identified on site. No further work regarding these sites is recommended. Dairy operations will adapt some sites for utilization, such as bridges and culverts. In the unlikely event that resources are discovered during construction, appropriate procedures will be followed as required in applicable HRS regulations. In an extended survey area up to 1,000 meters outside the HDF northern boundary, two sites were identified that are considered significant under ~~multiple~~ criteria ~~occur~~ d (information potential) and e (cultural value). Neither site, both of which are outside the project area, will be adversely affected by the proposed dairy project. The SHPD letter states that the current proposed project will not affect these two sites, and no further mitigation is recommended for the project.	No change.

CULTURAL PRACTICES & RESOURCES	
Information received from the community indicates the Māhāʻulepū ahupuaʻa has been, and is currently used for traditional cultural purposes. However, the dairy project area has not been included in these activities. Based on the research and comments received from the community, it is reasonable to conclude that, pursuant to Act 50, the exercise of native Hawaiian rights or any ethnic group related to numerous traditional cultural practices will not be adversely impacted by establishment of the dairy.	No change.
FLORA & FAUNA	
No threatened or endangered plants occur on the project property, and no intact native plant habitat exists within or surrounding the site. No critical habitat for endangered flora or fauna species is defined in or immediately surrounding the site; no impacts are anticipated from the dairy. Native plants with potential to stabilize banks will be encouraged and supplemented if needed to enhance the planned buffer strips along drainages. Potential use of paddocks by native, endangered waterbirds may occur. In keeping with best practices related to protected species, any outside lighting at night will be shielded to prevent attraction to overflying seabirds. There are almost no suitable roost trees within the dairy site; therefore, no effect to bats is expected from that the dairy farm. HDF ~~will develop~~ has drafted an ~~Avian~~ Endangered Species Awareness and Protection Plan, which will be finalized in coordination with USFWS and DOFAW. The ESAPP includes details of actions and training for employees to detect endangered waterbirds and nēnē and prevent harmful impacts from dairy operations.	No change.
INVERTEBRATE SPECIES & PEST INSECTS	
There are no native, protected or endangered insect species within the HDF site. Construction of the dairy facilities will not impact any native or endangered invertebrate populations. Integrated pest management will be used to disrupt the fly lifecycle and minimize populations of manure-related flies. Use of mechanical insect controls, including traps (outdoors) in paddocks where cows are excluded, and sticky tapes (indoors) will be used as needed for both monitoring and removal of flies. Water troughs will incorporate "ramps" for honey bees to ~~protect~~ allow bees to escape ~~that come to~~ water. Water troughs will be managed to prevent mosquito breeding. HDF personnel will fill troughs just before the cow "mobs" enter the paddock(s) for the grazing period; troughs will be emptied after the cows are moved to another paddock.	No change.

NOISE	
Construction work at the project site will involve activities that may generate an increase in noise levels. Noise related to construction will be a short-term condition, occurring during daylight hours. Milking equipment will be contained in the milking parlor structure, and field equipment such as tractors will typically be used during daylight hours. Dairy operations will generate noise in keeping with agricultural zoning of the parcel. Noise from the dairy will not exceed the DOH threshold, and will not contribute to excessive noise in the region.	No change.
HAZARDOUS SUBSTANCES	
Pesticides, herbicides, fuels and lubricants will be stored according to regulations and utilize secondary containment per best practices and requirements. No significant long-term impacts will occur from hazardous substances related to dairy operations, due to minimization of risk, secondary containment, and compliance with best management practices. A review of historic aerial photos and topographic maps show there were no pesticide mixing or storage operations on the HDF site. The Emergency Planning and Community Right-to-Know Act (EPCRA) regulation for reporting quantities of ammonia or hydrogen sulfide emissions does not apply to the committed herd size of up to 699 mature dairy cows.	EPCRA reporting is required only for emissions from waste of animals while stabled or confined, not while grazing on pasture. Average daily ammonia and hydrogen sulfide emissions related to manure routed to the effluent ponds from the milking parlor and holding yard are estimated to be 39 pounds per day of ammonia, and 9 pounds per day of hydrogen sulfide. Emissions from effluent application from the ponds to the pastures are calculated at 48 pounds per day for ammonia, and zero for hydrogen sulfide. The threshold of 100 pounds per day of either ammonia or hydrogen sulfide will not occur at a herd size of 2,000 mature dairy cows, and HDF operations will not fall under the EPCRA reporting requirement.
PUBLIC SERVICES	
Dairy facilities and dairy operations are not anticipated to place a significant demand on fire protection, police, or medical services. The dairy will help to support these services through contributions to County real property tax.	No change.
DEMOGRAPHIC & ECONOMICS	
The dairy will create construction jobs and 36 direct and indirect full time jobs during construction. Construction will provide revenues to businesses on both Kauaʻi and Oʻahu. The dairy will generate substantial positive State and County revenues. In-state milk production will expand agricultural revenues and jobs in Hawaiʻi. Approximately 11 direct and indirect full-time equivalent jobs would be sustained on Kauaʻi for the committed herd size, including 5 farm jobs and about 6 indirect jobs. An additional 3 indirect jobs would be created on Oʻahu. Annual direct-plus-indirect sales are estimated annually at $8.1 million on Kauaʻi, with an additional $2 million on Oʻahu.	With the contemplated herd size, milk production would be 4.4 million gallons annually at steady-state. This would double current local milk production of operational dairies in Hawaiʻi. Employment for ongoing operations at the contemplated herd size would be double that of the committed herd size: total 22 direct-indirect jobs on Kauaʻi, and 6 indirect jobs on Oʻahu. Net income to the County of $51,000 per year, derived from property taxes on improvements. The State would derive approximately $170,000 annually in revenues, primarily from excise tax on sales.

Net income to the State is calculated to exceed $60,000 annually. Net income to the County from HDF is anticipated to generate $51,000.	The review of property values adjacent to beef cattle operations in the region reveals newer homes with large square footage in a luxury residential community with 2016 assessed values of $1,297,150 for a lot, to $2,893,100 for a lot with home. Clearly, beef cattle operations are compatible with nearby homes, commercial areas, resorts and recreational areas. The ranching and rural ambience adds to the value.
GROUNDWATER RESOURCES	
Construction of Hawaiʻi Dairy Farms facilities is not anticipated to deplete the groundwater source or interfere with groundwater recharge. Short-term water supply demand during the construction period is anticipated to be nominal. The major water demand during construction will be for fugitive dust control. Water will come from a non-municipal source: either the on-site deep wells; or from the HDF allocation of water from Waita Reservoir. The dairy will utilize 30,000 gallons per day of groundwater from on-site wells for potable uses: livestock water; and sanitation in the milking parlor. The demand of approximately 30,000 gallons per day (0.03 MGD) for potable water is well within the capacity of the existing Māhāʻulepū 14 well, which produced 3 MGD during the sugarcane plantation era. All potable water used as wash water will be re-applied to pasture and thus remain a part of the evapotranspiration cycle. The groundwater and surface water assessment determined there is no hydrologic connection between the aquifer in the unweathered volcanic series, which is the source of drinking water, and the groundwater body in the alluvium. Thus nutrients added by the dairy operation will have no impacts to the County drinking water well and potable water within the deep volcanics~~, the source of potable water~~. Further, the assessment concluded that the modest potable water use rate for dairy operations, and the 4,500-foot distance between the onsite potable water well and the nearest County potable water well (Kōloa Well F), mean that no adverse impacts to ongoing use of groundwater in the unweathered volcanics will occur as a result of this use. Though the waterbody in which the County wells occur is confined and hydrologically separated from shallow waterbodies in the Māhāʻulepū Valley alluvial material, HDF established a 1,000-foot setback surrounding the Kōloa F well in agreement with the County Department of Water. Within this setback, no effluent will be applied and no animals will deposit manure as the area will not be used for grazing.	An additional 54,800 gallons per day of potable water will be used for the contemplated herd size, for a total of 84,800 gallons per day. Setbacks are the same for both herd sizes.

SURFACE WATER RESOURCES

Controls and best management practices to avoid, control, and trap potential erosion associated with construction activities will be implemented. Any stormwater discharge associated with construction in the short-term will be in compliance with relevant regulations. Over the long-term, adherence to the Conservation Plan and best management practices establishes setbacks to minimize impacts to waterways. The setback for effluent application is 50 feet from each side of surface waters. Perimeter fencing to exclude cows from surface waters provides a 35-foot buffer on either side of the drainageways. Vegetative buffers will be maintained within the 35-foot setback from the drainageways.

The natural fertilizer from manure deposited directly to pasture and the effluent collected from the milking parlor is insufficient to meet the agronomic need of the pasture grass crop. Supplemental commercial fertilizer will be required to provide sufficient nutrients to sustain the pasture grass at the committed herd size.

Episodic, seasonal rainfall events cause groundwater in the alluvium to rise and intersect with the deep agricultural ditches in the vicinity of HDF monitoring wells 1 and 2. Such episodes are calculated to average 10 days annually, which would result in a modest amount of groundwater containing nutrients to discharge into the surface ditches. The amount of nutrients estimated from HDF operations ~~released to surface water~~ that could potentially leave the site is calculated at 10,000 pounds of nitrogen and 900 pounds of phosphorus annually.

The minor contributions of nutrients from episodic rainfall anticipated to occur just 10 days annually from dairy operations will not adversely affect ocean water quality and the marine environment. The nearshore area is a highly mixed environment which actively disperses inputs within several meters from shore.

Based on results of the marine biotic survey and considering the response of other marine habitats throughout Hawaiʻi to nutrient inputs, there is no indication of any conditions associated with potential discharge from HDF that could lead to deleterious effects to coral reef communities (Appendix F).

There are over 120 private wastewater treatment injection wells serving resort development in Poʻipū. Nitrogen input to the marine environment in the Poʻipū region is calculated to be 38,510 pounds annually, or 3.5 times more than the estimate of potential nutrient throughput from HDF. Phosphorus for both domestic

Setbacks and NRCS standard practices remain the same between the committed and contemplated herd sizes.

Nutrients required to sustain the 470 acres of pasture are the same for the committed and the future contemplated herd size. The estimate of potential nutrients leaving the site is the same for both the committed herd size and the contemplated herd size. What changes is the amount supplied as natural fertilizer (manure and effluent) and supplemental chemical fertilizer. The Nutrient Balance Analysis prepared for HDF shows that natural fertilizer from manure deposited directly to pasture and the effluent collected from the milking parlor for the contemplated herd size at 2,000 ~~milking~~ mature dairy cows will result in an excess of phosphorus from manure and effluent with current grass yields of 16.3 tons of dry matter per acre. Nutrient values relevant to the HDF site were used to create the existing mass balance for the site; only through monitoring actual field conditions can the true nutrient balance be known and maintained.

Several management options exist to keep phosphorus and other nutrients in balance. An increase in the conservative forage yield of 16.3 tons of dry matter (DM) per acre per year to a yield of 17.3 tons DM per acre per year would utilize all phosphorus and eliminate any overage. Alternately, ~~A~~ a herd of 1,875 ~~milking~~ mature dairy cows would provide less manure and thus reduce phosphorus to levels requiring commercial supplementation. Nitrogen from commercial fertilizer would be required at both 1,875 and 2,000 ~~milking~~ mature dairy cows.

Adherence to the Conservation Plan and NRCS Nutrient Management Practice Code requires monitoring and analysis of soil, manure, and tissue samples which can be used to amend the nutrient budget prepared for the site.

At both herd sizes, the reduction in runoff from various storm events was estimated where flows combine in Māhāʻulepū Ditch immediately south of the project site. For the 10-year storm event, peak flow leaving the project site will be reduced by 257 cubic feet per second (cfs); for the 25-year storm event, reduced by 283 cfs; and for the 50-year storm event, reduced by nearly 300 cfs (Section 3.3.2.3).

wastewater and landscape fertilization in the region is estimated to be 1,260 pounds annually, or 1.4 times greater than the potential discharge from HDF. The nutrient inputs from domestic uses in the Poʻipū region are constant throughout the year and no mitigation is applied to reduce the quantities. State DOH surveys and environmental sampling/testing programs have identified high levels of enterococci bacteria in ~~the agricultural~~ Waiopili ~~d~~Ditches, particularly near the terminus of the ditch near the ocean. State standards apply to recreational waters, and the ditch is not utilized recreationally by bathers. Over the long-term, the surface water quality in the agricultural ditches and Waiopili Ditch will be improved by active management of the dairy site. The dairy site represents roughly 20 percent of the 2,700-acre Māhāʻulepū Valley sub-watershed, and soil erosion from the HDF site will be reduced by establishment of thick grass ground cover and maintenance of vegetative buffers totaling 70 feet in width – 35 feet on either side of the agricultural drainageways.	A long-term water quality monitoring program will be instituted to regularly evaluate surface water quality in the agricultural ditches and Waiopili Ditch, along with nearshore ocean waters. The ongoing monitoring will inform the dairy management team of changes in water quality to gauge whether nutrients and pathogens are reaching a level of environmental concern.
ROADWAYS & TRAFFIC	
Short-term construction traffic will occur during the development of the dairy facilities. For the long-term, worker vehicles and delivery and supply trucks will access the dairy on a weekly basis. The number of vehicles associated with the dairy at the committed herd size will increase by approximately 12 vehicles per day, and will not represent a significant amount of the total traffic on local roadways. HDF trips would increase projected traffic by less than one-twentieth of one percent (0.17 percent). Traffic conditions on roadways in Poʻipū and Kōloa will not deteriorate as a result of the dairy operations.	Traffic operations along Māhāʻulepū Road and associated public roads will continue to operate at acceptable levels of service during peak hours of traffic. The larger potential contemplated herd size would result in a total of 23 vehicles daily, to include employees and delivery vehicles. This is an increase of 11 vehicles daily over the committed herd size. Based on known and planned developments for the South Kauaʻi region, estimated travel on Ala Kinoiki Road for the year 2035 is anticipated to be 7,200 vehicles daily. For the same year, daily vehicle travel on Kōloa Road is anticipated to be 9,500. An increase of 23 vehicles daily from HDF operations would result in 0.14 percent increase in total vehicle trips in the area. This is less than one percent, and will not have a significant impact on traffic in the area.
AIR QUALITY, ODOR & GREENHOUSE GASES	
Construction effects on air quality including dust and construction vehicle emissions will be temporary and reduced by best management practices and short-term mitigation measures. Odor conditions at the pasture-based dairy will be limited within the dairy project area and immediate vicinity. In the worst-case meteorological conditions, odor may reach approximately ~~1,670~~ 1,200 feet south of the HDF southern boundary under typical precipitation conditions. For wet	No air quality impacts are anticipated during construction as a result of either herd size. For the contemplated herd size, odor may reach approximately ~~2,780~~ 3,070 feet south of the HDF southern boundary under typical precipitation conditions. For wet periods, odor may extend approximately 4,085 feet beyond the southern boundary. Parameters used in the analysis were intentionally conservative and assume an unlikely confluence of

periods, odor may extend approximately 2,150 feet beyond the southern boundary. Under these temporary worst case conditions, ~~T~~the odors would extend to adjacent agricultural lands and will not reach resort or residential communities. For the area within the modeled odor isopleths, odor may be detectable by 50 percent of the population at a frequency of once every 200 hours, or roughly 44 hours per year.	worst-case meteorological data irrigation location, and grazing location. Actual offsite odor impacts are likely to be much lower and/or less frequent than shown in the worst-case meteorological conditions. The odors will not reach resort or residential communities. For the area within the modeled odor isopleth, odor may be detectable by 50 percent of the population at a frequency of once every 200 hours, or roughly 44 hours per year. Greenhouse gas emissions will not be significant, and in fact may be negated by the ability of soils to sequester carbon from the atmosphere and improve soil structure and function.
CUMULATIVE IMPACTS	
The development and operation of the pasture-based dairy may be combined with impacts associated with anticipated future developments in the Poʻipū and Kōloa region. With mitigation, there may be limited short-term impacts such as soil erosion, dust, and vehicle emissions. Long-term cumulative effects may include limited soil erosion, storm water runoff, groundwater use, nutrient contributions to agricultural ditches, worker vehicle traffic, and air emissions. Odors will be contained within the dairy and adjacent farms. In addition to injected wastewater nutrients entering the nearshore ocean waters generated by the Poʻipū resorts and residential areas, there will be minor amounts of nutrients contributed from the pasture-based dairy. The dairy will provide net economic benefits, adding to the agricultural economy of Kauaʻi.	Quantification of probable impacts from the contemplated herd size are shown in the specific resource section. Otherwise, cumulative impacts from both the committed herd size and contemplated herd size are not significant.

4.28 UNRESOLVED ISSUES

Resolution of Milk Products Processing by HDF

The scope of milk processing operations has yet to be resolved. The location for the milk processing activity has not been finalized. The opportunity to undertake value-added processing steps in milk products processing could be conducted on-island. Completion of milk products processing on-island would create additional employment and government revenues for Kaua'i, increase the availability of local milk products, and further bolster the local agricultural economy. If milk products processing is not undertaken on Kaua'i, the milk would be shipped in bulk to one of the existing processing facilities on O'ahu or Hawai'i Island for further process steps, packaging and marketing.

Resolution of the Final Dairy Farm Herd Size

Successful dairy farming involves the mastery of numerous elements, such as soil science, agronomy and animal husbandry. The final scaling of the ~~milking~~ mature dairy cow herd size for the Hawai'i Dairy Farms' operations will ultimately be determined based on the results of pasture grass development at the Māhā'ulepū site, and dairy cow milk production levels. Up to the ~~committed~~ ultimate sustainable herd size, this will be an iterative process of monitoring and testing to determine the best approaches to optimize dairy operations and foster good health in the natural systems. It is anticipated that the HDF dairy herd can be increased well beyond 1,000 to 1,500 ~~milking~~ mature dairy cows and be sustainable from an operational and environmental perspective. With careful monitoring of the operations and the natural systems, including the soils, pasture grasses and water quality, the dairy scaling can be accomplished with sensitivity to the various indicators of carrying capacity. The potential for HDF to reach the upper scale of 2,000 ~~milking~~ mature dairy cows at the dairy may or may not ultimately occur, depending upon the operational sensitivities and the indicators shown by the carefully monitored natural systems.

5.0

Plans and Policies

5.0 CONSISTENCY WITH GOVERNMENT PLANS AND POLICIES

This section addresses the Hawaiʻi Dairy Farms consistency with applicable policies and plans set forth in the relevant Federal acts, laws and plans of the State of Hawaiʻi, and the plans and ordinances of the County of Kauaʻi. The discussion presents the Proposed Project's consistency with the Hawaiʻi State Plan, Hawaiʻi Functional Plans, Hawaiʻi 2050 Sustainability Plan, State of Hawaiʻi Water Policies, Hawaiʻi Land Use Districts, and Hawaiʻi Coastal Zone Management Act. This section also addresses the Proposed Project's consistency with County of Kauaʻi plans and policies, including the County General Plan, South Kauaʻi Community Plan, and Comprehensive Zoning Ordinance.

FEDERAL

This section assesses the relationship of the project with primary and applicable Federal regulatory controls, which includes the Coastal Zone Management Act (CZMA).

5.1 COASTAL ZONE MANAGEMENT ACT

In 1972, the Federal government enacted the CZMA to effectively manage, use, protect, and develop coastal areas in the U.S. The CZMA was a government response to increasing and competing demands upon habitats and resources of coastal lands and waters. Such demands often resulted in a loss of living marine resources and wildlife; depleted nutrient-rich areas; shoreline erosion; diminished open space for public use; and permanent and adverse changes to ecological systems. Under the CZMA, States are authorized to work in a unified manner with Federal and local governments to develop programs, policies, evaluation criteria, development standards that lend to the effective protection and prudent use of coastal lands and waters. The enforcement authority for the Federal Coastal Management Program (Public Law 104-150, as amended in 1996) has been delegated to the State of Hawaiʻi under Hawaiʻi Revised Statutes (HRS) Chapter 205A, Coastal Zone Management (CZM) Program.

In 1990, congress enacted the Coastal Zone Act Reauthorization Amendments (CZARA) by adding a new Section 6217 "Protecting Coastal Waters," which requires that each State with an approved coastal zone management program must develop a Coastal Nonpoint Pollution Control Program (CNPCP) to U.S. Environmental Protection Agency (EPA) and National Oceanic and Atmospheric Administration (NOAA) for approval. The purpose of the program "shall be to develop and implement management measures for nonpoint source pollution to restore and protect coastal waters, working in close conjunction with other State and local authorities". The Hawaiʻi CNPCP follows a Watershed Approach, and activities are coordinated through Hawaiʻi's Implementation Plan for Polluted Runoff Control and considerations for Stormwater Management.

Discussion: *The Hawaiʻi Dairy Farms is located within the CZMA, which is defined by the State of Hawaiʻi as encompassing the entire state. The project improvements are designed to conform to the goals, policies, and objectives of Hawaiʻi's CZM Program. The Proposed Project's consistency with CZMA programs and policies to protect coastal lands and waters is documented in Sections 3 and 4 of this EIS, including significant measures to minimize or mitigate potential non-point source pollution impacts to the aquatic resources and nearshore coastal waters.*

STATE OF HAWAIʻI

5.2 HAWAIʻI STATE CONSTITUTION

The Hawaiʻi Constitution was framed by a Constitutional Convention under Act 334, Session Laws of Hawaiʻi 1949. It was adopted by the people at the election held on November 7, 1950, and was deemed amended when three propositions submitted to the people in accordance with the Act of Congress approved March 18, 1959, 73 Stat 4, Public Law 86-3, were adopted by the people at the election held on June 27, 1959. As so amended, it was accepted, ratified, and confirmed by Congress by the Act of March 18, 1959. It went into effect on August 21, 1959, upon the issuance of a presidential proclamation admitting the state of Hawaiʻi into the Union.

Article XI of the Constitution, "Conservation, Control and Development of Resources," includes conservation and protection of agricultural lands under Section 3. Following the 1978 Constitutional Convention, Section 3 was amended to require two-thirds vote by the body responsible for reclassification or rezoning to other uses, for lands identified by the State as important agricultural lands.

> *The State shall conserve and protect agricultural lands, promote diversified agriculture, increase agricultural self-sufficiency and assure the availability of agriculturally suitable lands. The legislature shall provide standards and criteria to accomplish the foregoing. Lands identified by the State as important agricultural lands needed to fulfill the purposes above shall not be reclassified by the State or rezoned by its political subdivisions without meeting the standards and criteria established by the legislature and approved by a two-thirds vote of the body responsible for the reclassification or rezoning action.*

5.2.1 ACT 183 (SLH) RELATING TO IMPORTANT AGRICULTURAL LANDS

Article XI of the State Constitution stipulates that the State shall conserve and protect agricultural lands, promote diversified agriculture, increase agricultural self-sufficiency, and assure the availability of agricultural lands through standards and criteria provided by the legislature. The criteria were developed over several decades and have just recently been operationalized on Kauaʻi through the County of Kauaʻi's own Important Agricultural Lands (IAL) study of the island's agriculturally zoned lands.

Community concern over loss of agricultural land for another proposed resort on the last stretch of undeveloped Māhāʻulepū coastline prompted protection of 1,533 acres of agricultural lands under the IAL provision of the Hawaiʻi State Constitution (Article XI, Section 3). This constitutional requirement is for conservation and protection of agricultural lands, promotion of diversified agriculture, and increased agricultural self-sufficiency. The IAL designation assures available agriculturally suitable lands to support a diversity of agricultural activities and opportunities that expand agricultural income and job opportunities. In 2011, approximately 1,533 acres of land in Māhāʻulepū were classified by the State Land Use Commission as IAL. This IAL area includes the 557 acres leased by Hawaiʻi Dairy Farms, LLC (HDF), which will be used to fulfill the goals of the important agricultural lands designation, including conservation, diversifying the types of agriculture industries in the state, and providing an opportunity for the state to grow its milk production industry to be more self-sufficient.

Figure 5.2-1 State Land Use Commission Important Agricultural Lands Map (2013)

5.3 HAWAIʻI STATE PLAN

The Hawaiʻi State Plan establishes a statewide planning system that provides the goals, objectives, and policies that prioritize the directions and concerns of the State of Hawaiʻi. These will be discussed as they relate to the proposed project.

Table 5-1 assesses and evaluates how Hawaiʻi Dairy Farms supports the objectives for Important Agricultural Lands, as promulgated under HRS Chapter 205 Part III. State plan goals are not applicable to this project where noted.

Table 5-1 Hawaiʻi State Plan, HRS Chapter 205 Part III **S = Supportive, N/S = Not Supportive, N/A = Not Applicable**	**S**	**N/S**	**N/A**
Section 205-41: Declaration of Policy. It is declared that the people of Hawaiʻi have a substantial interest in the health and sustainability of agriculture as an industry in the State. There is a compelling state interest in conserving the State's agricultural land resource base and assuring the long-term availability of agricultural lands for agricultural use to achieve the purposes of:			
(1) Conserving and protecting agricultural lands	X		
(2) Promoting diversified agriculture	X		
(3) Increasing agricultural self-sufficiency	X		
(4) Assuring the availability of agriculturally suitable lands	X		

Table 5-1 Hawaiʻi State Plan, HRS Chapter 205 Part III S = Supportive, N/S = Not Supportive, N/A = Not Applicable	S	N/S	N/A
Discussion: The project supports the goals of the State of Hawaiʻi to promote sustainability in agriculture as an industry, and protecting the long term availability of lands for agriculture use, described further in EIS Sections 2.3 and 4.4.			
Section 205-43: Important agricultural lands; policies. State and county agricultural policies, tax policies, land use plans, ordinances, and rules shall promote the long-term viability of agricultural use of important agricultural lands and shall be consistent with and implement the following policies:			
(1) Promote the retention of important agricultural lands in blocks of contiguous, intact, and functional land units large enough to allow flexibility in agricultural production and management	X		
(2) Discourage the fragmentation of important agricultural lands and the conversion of these lands to nonagricultural uses	X		
(3) Direct nonagricultural uses and activities from important agricultural lands to other areas and ensure that uses on important agricultural lands are actually agricultural uses	X		
(4) Limit physical improvements on agricultural lands to maintain affordability of these lands for agricultural purposes	X		
(5) Provide a basic level of infrastructure and services on important agricultural lands limited to the minimum necessary to support agricultural uses and activities	X		
(6) Facilitate the long-term dedication of important agricultural lands for future agricultural use through the use of incentives	X		
(7) Facilitate the access of farmers to important agricultural lands for long-term viable agricultural use	X		
(8) Promote the maintenance of essential agricultural infrastructure systems, including irrigation systems	X		
Discussion: The project retains and protects existing Important Agricultural Lands, and also provides a basic level of infrastructure necessary to support the agricultural uses and activities of the dairy, as described in EIS Section 4.4.			

Table 5-2 assesses and evaluates how Hawaiʻi Dairy Farms supports the Hawaiʻi State Plan, as promulgated under HRS Chapter 226. State plan goals are not applicable to this project where noted.

Table 5-2 Hawaiʻi State Plan, Hawaiʻi Revised Statutes, Chapter 226 S = Supportive, N/S = Not Supportive, N/A = Not Applicable	S	N/S	N/A
Section 226-4: State Goals. In order to guarantee, for the present and future generations, those elements of choice and mobility that insure that individuals and groups may approach their desired levels of self-reliance and self-determination, it shall be the goal of the State to achieve:			
(1) A strong, viable economy, characterized by stability, diversity, and growth, that enables the fulfillment of the needs and expectations of Hawaiʻi's present and future generations	X		
(2) A desired physical environment, characterized by beauty, cleanliness, quiet, stable natural systems, and uniqueness, that enhances the mental and physical well-being of the people.			X
(3) Physical, social and economic well-being, for individuals and families in Hawaiʻi, that nourishes a sense of community responsibility, of caring, and of participation in community life.	X		
Discussion: The project supports the goals of the State of Hawaiʻi to achieve a strong, viable economy. Hawaiʻi Dairy Farms' purpose is to provide sustainable financial and food security for the island of Kauaʻi and the State of Hawaiʻi as a whole, further described in EIS Section 2.3.			
Section 226-5: Objective and Policies for Population. (A) It shall be the objective in planning for the State's population to guide population growth to be consistent with the achievement of physical, economic, and social objectives contained in this chapter. (B) To achieve the population objective, it shall be the policy of this State to:			

Table 5-2 Hawaiʻi State Plan, Hawaiʻi Revised Statutes, Chapter 226 **S = Supportive, N/S = Not Supportive, N/A = Not Applicable**	**S**	**N/S**	**N/A**
(1) Manage population growth statewide in a manner that provides increased opportunities for Hawaiʻi's people to pursue their physical, social and economic aspirations while recognizing the unique needs of each county.			X
(2) Encourage an increase in economic activities and employment opportunities on the neighbor islands consistent with community needs-and desires.	X		
(3) Promote increased opportunities for Hawaiʻi's people to pursue their socioeconomic aspirations throughout the islands.			X
(4) Encourage research activities and public awareness programs to foster and understanding of Hawaiʻi's limited capacity to accommodate population needs and to address concerns resulting from an increase in Hawaiʻi's population.			X
(5) Encourage federal actions and coordination among major governmental agencies to promote a more balanced distribution of immigrants among states, provided that such actions do not prevent the reunion of immediate family members.			X
(6) Pursue an increase in federal assistance for states with a greater proportion of foreign immigrants relative to their state's population.			X
(7) Plan the development and availability of land and water resources in a coordinated manner so as to provide for the desired levels of growth in each geographic area.	X		

Discussion: The project will not significantly add to Hawaiʻi's residential population growth. Implementation of the project will positively stimulate Hawaiʻi's tax base, and create new jobs both in the short-term construction phase and long-term dairy commerce operations. The project's development is a coordinated effort to utilize available land and infrastructure, and will ensure valuable resources are utilized in a prudent and efficient manner.

Section 226-6: Objectives and Policies for the Economy in General.	S	N/S	N/A
(A) Planning for the State's economy in general shall be directed toward achievement of the following objectives:			
(1) Increased and diversified employment opportunities to achieve full employment, increased income and job choice, and improved living standards for Hawaiʻi's people.	X		
(2) A steadily growing and diversified economic base that is not overly dependent on a few industries, and includes the development and expansion of industries on the neighbor islands.	X		
(B) To achieve the general economic objectives, it shall be the policy of this State to:			
(1) Expand Hawaiʻi's national and international marketing, communication, and organizational ties, to increase the State's capacity to adjust to and capitalize upon economic changes and opportunities occurring outside the State.			X
(2) Promote Hawaiʻi as an attractive market for environmentally and socially sound investment activities that benefit Hawaiʻi's people.	X		
(3) Seek broader outlets for new or expanded Hawaiʻi business investments.			X
(4) Expand existing markets and penetrate new markets for Hawaiʻi's products and services.	X		~~X~~
(5) Assure that the basic economic needs of Hawaiʻi's people are maintained in the event of disruptions in overseas transportation.			X
(6) Strive to achieve a level of construction activity responsive to, and consistent with, state growth objectives.			X
(7) Encourage the formation of cooperatives and other favorable marketing arrangements at the local or regional level to assist Hawaiʻi's small scale producers, manufacturers, and distributors.	X		
(8) Encourage labor-intensive activities that are economically satisfying and which offer opportunities for upward mobility.			X
(9) Foster greater cooperation and coordination between the government and private sectors in developing Hawaiʻi's employment and economic growth opportunities.			X
(10) Stimulate the development and expansion of economic activities which will benefit areas with substantial or expected employment problems.	X		
(11) Maintain acceptable working conditions and standards for Hawaiʻi's workers.	X		
(12) Provide equal employment opportunities for all segments of Hawaiʻi's population through affirmative action and nondiscrimination measures.	X		
(13) Encourage businesses that have favorable financial multiplier effects within Hawaiʻi's economy.			X

Table 5-2 Hawaiʻi State Plan, Hawaiʻi Revised Statutes, Chapter 226
S = Supportive, N/S = Not Supportive, N/A = Not Applicable

		S	N/S	N/A
(14)	Promote and protect intangible resources in Hawaiʻi, such as scenic beauty and the Aloha spirit, which are vital to a healthy economy.			X
(15)	Increase effective communication between the educational community and the private sector to develop relevant curricula and training programs to meet future employment needs in general, and requirements of new, potential growth industries in particular.	X		
(16)	Foster a business climate in Hawaiʻi - including attitudes, tax and regulatory policies, and financial and technical assistance programs--that is conducive to the expansion of existing enterprises and the creation and attraction of new business and industry.	X		

Discussion: Implementation at the contemplated herd size will more than double the existing local milk production in the State of Hawaiʻi, developing and revitalizing the State's dairy industry to provide more fresh milk for local families, while also providing employment opportunities for local communities. The planned improvements will help to stabilize Hawaiʻi's economy and encourage self-sufficiency in the agriculture and dairy industries. HDF will create educational opportunities and will foster an environment for economic expansion.

		S	N/S	N/A
Section 226-7 Objectives and Policies for the Economy – Agriculture.				
(A)	Planning for the State's economy with regard to agriculture shall be directed towards achievement of the following objectives:			
(1)	Viability of Hawaiʻi's sugar and pineapple industries.			X
(2)	Growth and development of diversified agriculture throughout the State.	X		
(3)	An agriculture industry that continues to constitute a dynamic and essential component of Hawaiʻi's strategic, economic, and social well-being.	X		
(B)	To achieve the agriculture objectives, it shall be the policy of this State to:			
(1)	Establish a clear direction for Hawaiʻi's agriculture through stakeholder commitment and advocacy.	X		
(2)	Encourage agriculture by making best use of natural resources.	X		
(3)	Provide the governor and the legislature with information and options needed for prudent decision making for the development of agriculture.	X		
(4)	Establish strong relationships between the agricultural and visitor industries for mutual marketing benefits.			X
(5)	Foster increased public awareness and understanding of the contributions and benefits of agriculture as a major sector of Hawaiʻi's economy.	X		
(6)	Seek the enactment and retention of federal and state legislation that benefits Hawaiʻi's agricultural industries.	X		
(7)	Strengthen diversified agriculture by developing an effective promotion, marketing, and distribution system between Hawaiʻi's producers and consumer markets locally, on the continental United States, and internationally.	X		~~X~~
(8)	Support research and development activities that provide greater efficiency and economic productivity in agriculture.	X		
(9)	Enhance agricultural growth by providing public incentives and encouraging private initiatives.			X
(10)	Assure the availability of agriculturally suitable lands with adequate water to accommodate present and future needs.	X		
(11)	Increase the attractiveness and opportunities for an agricultural education and livelihood.	X		
(12)	Expand Hawaiʻi's agricultural base by promoting growth and development of flowers, tropical fruits and plants, livestock, feed grains, forestry, food crops, aquaculture, and other potential enterprises.	X		
(13)	Promote economically competitive activities that increase Hawaiʻi's agricultural self-sufficiency.	X		
(14)	Promote and assist in the establishment of sound financial programs for diversified agriculture.			X
(15)	Institute and support programs and activities to assist the entry of displaced agricultural workers into alternative agricultural or other employment.			X
(16)	Facilitate the transition of agricultural lands in economically non-feasible agricultural production to economically viable agricultural uses.	X		

Table 5-2 Hawaiʻi State Plan, Hawaiʻi Revised Statutes, Chapter 226

S = Supportive, N/S = Not Supportive, N/A = Not Applicable

Discussion: HDF will support conservation and protection of agricultural lands, promotion of diversified agriculture, and increased agricultural self-sufficiency in the County of Kauaʻi and the State of Hawaiʻi as a whole. The agricultural activities and opportunities created will expand agricultural income and job opportunities.

Section 226-8 Objective and Policies for the Economy - Visitor Industry.

(A) Planning for the State's economy with regard to the visitor industry shall be directed towards the achievement of the objective of a visitor industry that constitutes a major component of steady growth for Hawaiʻi's economy.

(B) To achieve the visitor industry objective, it shall be the policy of this State to:

		S	N/S	N/A
(1)	Support and assist in the promotion of Hawaiʻi's visitor attractions and facilities.			X
(2)	Ensure that visitor industry activities are in keeping with the social, economic, and physical needs and aspirations of Hawaiʻi's people.			X
(3)	Improve the quality of existing visitor destination areas.			X
(4)	Encourage cooperation and coordination between the government and private sectors in developing and maintaining well-designed, adequately serviced visitor industry and related developments which are sensitive to neighboring communities and activities.			X
(5)	Develop the industry in a manner that will continue to provide new job opportunities and steady employment for Hawaiʻi's people.			X
(6)	Provide opportunities for Hawaiʻi's people to obtain job training and education that will allow for upward mobility within the visitor industry.			X
(7)	Foster a recognition of the contribution of the visitor industry to Hawaiʻi's economy and the need to perpetuate the aloha spirit.			X
(8)	Foster an understanding by visitors of the aloha spirit and of the unique and sensitive character of Hawaiʻi's cultures and values.			X

Discussion: While Hawaiʻi Dairy Farms supports the State's policies related to improving Hawaiʻi's visitor industry, they are not directly applicable to the Proposed Project.

Section 226-9 Objective and Policies for the Economy - Federal Expenditures.

(A) Planning for the State's economy with regard to federal expenditures shall be directed towards achievement of the objective of a stable federal investment base as an integral component of Hawaiʻi's economy.

(B) To achieve the federal expenditures objective, it shall be the policy of this State to:

		S	N/S	N/A
(1)	Encourage the sustained flow of federal expenditures in Hawaiʻi that generates long-term government civilian employment.			X
(2)	Promote Hawaiʻi's supportive role in national defense.			X
(3)	Promote the development of federally supported activities in Hawaiʻi that respect state-wide economic concerns, are sensitive to community needs, and minimize adverse impacts on Hawaiʻi's environment.			X
(4)	Increase opportunities for entry and advancement of Hawaiʻi's people into federal government service.			X
(5)	Promote federal use of local commodities, services, and facilities available in Hawaiʻi.	~~X~~		X
(6)	Strengthen federal-state-county communication and coordination in all federal activities that affect Hawaiʻi.			X
(7)	Pursue the return of federally controlled lands in Hawaiʻi that are not required for either the defense of the nation or for other purposes of national importance, and promote the mutually beneficial exchanges of land between federal agencies, the State, and the counties.			X

Discussion: While Hawaiʻi Dairy Farms supports the State's policies related to economy and federal expenditures, they are not directly applicable to the Proposed Project.

Section 226-10 Objective and Policies for the Economy - Potential Growth Activities.

(A) Planning for the State's economy with regard to potential growth activities shall be directed towards achievement of the objective of development and expansion of potential growth activities that serve to increase and diversify Hawaiʻi's economic base.

(B) To achieve the potential growth activity objective, it shall be the policy of this State to:

		S	N/S	N/A
(1)	Facilitate investment and employment in economic activities that have the potential for growth such as diversified agriculture, aquaculture, apparel and textile manufacturing, film and television production, and energy and marine-related industries.	X		

Table 5-2 Hawaiʻi State Plan, Hawaiʻi Revised Statutes, Chapter 226 S = Supportive, N/S = Not Supportive, N/A = Not Applicable	S	N/S	N/A
(2) Expand Hawaiʻi's capacity to attract and service international programs and activities that generate employment for Hawaiʻi's people.			X
(3) Enhance and promote Hawaiʻi's role as a center for international relations, trade, finance, services, technology, education, culture, and the arts.			X
(4) Accelerate research and development of new energy-related industries based on wind, solar, ocean, and underground resources and solid waste.			X
(5) Promote Hawaiʻi's geographic, environmental, social, and technological advantages to attract new economic activities into the State.			X
(6) Provide public incentives and encourage private initiative to attract new industries that best support Hawaiʻi's social, economic, physical, and environmental objectives.			X
(7) Increase research and the development of ocean-related economic activities such as mining, food production, and scientific research.			X
(8) Develop, promote, and support research and educational and training programs that will enhance Hawaiʻi's ability to attract and develop economic activities of benefit to Hawaiʻi.			X
(9) Foster a broader public recognition and understanding of the potential benefits of new, growth-oriented industry in Hawaiʻi.			X
(10) Encourage the development and implementation of joint federal and state initiatives to attract federal programs and projects that will support Hawaiʻi's social, economic, physical, and environmental objectives.			X
(11) Increase research and development of businesses and services in the telecommunications and information industries.			X
Discussion: Hawaiʻi Dairy Farms supports the State's policies by diversifying and enhancing the local agriculture industry in developing dairy, which diversifies the State economy as a whole by providing more economic options to lessen our dependency on tourism, as described in EIS Section 4.15.			
Section 226-10.5 Objectives and Policies for the Economy - Information Industry. (A) Planning for the State's economy with regard to the information industry shall be directed toward the achievement of the objective of positioning Hawaiʻi as the leading dealer in information businesses and services in the Pacific Rim. (B) To achieve the information industry objective, it shall be the policy of this State to:			
(1) Encourage the continued development and expansion of the telecommunications infrastructure serving Hawaiʻi to accommodate future growth in the information industry;			X
(2) Facilitate the development of new business and service ventures in the information industry which will provide employment opportunities for the people of Hawaiʻi;			X
(3) Encourage greater cooperation between the public and private sectors in developing and maintaining a well- designed information industry;			X
(4) Ensure that the development of new businesses and services in the industry are in keeping with the social, economic, and physical needs and aspirations of Hawaiʻi's people;			X
(5) Provide opportunities for Hawaiʻi's people to obtain job training and education that will allow for upward mobility within the information industry;			X
(6) Foster a recognition of the contribution of the information industry to Hawaiʻi's economy; and			X
(7) Assist in the promotion of Hawaiʻi as a broker, creator, and processor of information in the Pacific.			X
Discussion: While Hawaiʻi Dairy Farms supports the State's policies related to improving Hawaiʻi's information industry, the Proposed Project will not directly impact these policies.			
Section 226-11 Objectives and Policies for the Physical Environment - Land-based, Shoreline, and Marine Resources. (A) Planning for the State's physical environment with regard to land-based, shoreline and marine resources shall be directed towards achievement of the following objectives:			
(1) Prudent use of Hawaiʻi's land-based, shoreline, and marine resources.	X		
(2) Effective protection of Hawaiʻi's unique and fragile environmental resources.	X		
(B) To achieve the land-based, shoreline, and marine resources objectives, it shall be the policy of this State to:			
(1) Exercise an overall conservation ethic in the use of Hawaiʻi's natural resources.	X		
(2) Ensure compatibility between land-based and water-based activities and natural resources and ecological systems.	X		

Table 5-2 Hawaiʻi State Plan, Hawaiʻi Revised Statutes, Chapter 226 S = Supportive, N/S = Not Supportive, N/A = Not Applicable		S	N/S	N/A
(3)	Take into account the physical attributes of areas when planning and designing activities and facilities.	X		
(4)	Manage natural resources and environs to encourage their beneficial and multiple uses without generating costly or irreparable environmental damage.	X		
(5)	Consider multiple uses in watershed areas, provided such uses do not detrimentally affect water quality and recharge functions.	X		
(6)	Encourage the protection of rare or endangered plant and animal species and habitats native to Hawaiʻi.	X		
(7)	Provide public incentives that encourage private actions to protect significant natural resources from degradation or unnecessary depletion.			X
(8)	Pursue compatible relationships among activities, facilities and natural resources.	X		
(9)	Promote increased accessibility and prudent use of inland and shoreline areas for public recreational, educational and scientific purposes.			X

Discussion: The project is a balanced development proposal that is compatible to existing uses and relationships in the Māhāʻulepū agricultural region, and measures to protect water resources and water quality are presented in EIS Sections 4.16, 4.17, 4.23 and 4.24. While the project supports the County's initiatives for shoreline and marine environment protection and conservation, the project is located over one mile inland of the coastline, and does not have any shoreline or marine features.

Section 226-12 Objective and Policies for the Physical Environment - Scenic, Natural Beauty, and Historic Resources.		S	N/S	N/A
(A)	Planning for the State's physical environment shall be directed towards achievement of the objective of enhancement of Hawaiʻi's scenic assets, natural beauty, and multi-cultural/historical resources.			
(B)	To achieve the scenic, natural beauty, and historic resources objective, it shall be the policy of this State to:			
(1)	Promote the preservation and restoration of significant natural and historic resources.	X		
(2)	Provide incentives to maintain and enhance historic, cultural, and scenic amenities.			X
(3)	Promote the preservation of views and vistas to enhance the visual and aesthetic enjoyment of mountains, ocean, scenic landscapes, and other natural features.	X		
(4)	Protect those special areas, structures, and elements that are an integral and functional part of Hawaiʻi's ethnic and cultural heritage.	X		
(5)	Encourage the design of developments and activities that complement the natural beauty of the islands.	X		

Discussion: The project will not impact scenic natural resources or historical and cultural resources found in and around the project site. The proposed facilities are in keeping with the agricultural character of the area, and are expected to have minimal impact to public views.

There are no public scenic views or lookouts that will be affected by dairy development or operations. There will be no adverse effect to public views of the Puʻu Hunihuni crater, views from the Ala Kinoiki Road corridor, or impediment to views of the Mount Hāʻupu.

Section 226-13 Objectives and Policies for the Physical Environment - Land, Air, and Water Quality.		S	N/S	N/A
(A)	Planning for the State's physical environment with regard to land, air, and water quality shall be directed towards achievement of the following objectives:			
(1)	Maintenance and pursuit of improved quality in Hawaiʻi's land, air, and water resources.	X		
(2)	Greater public awareness and appreciation of Hawaiʻi's environmental resources.			X
(B)	To achieve the land, air, and water quality objectives, it shall be the policy of this State to:			
(1)	Foster educational activities that promote a better understanding of Hawaiʻi's limited environmental resources.			X
(2)	Promote the proper management of Hawaiʻi's land and water resources.	X		
(3)	Promote effective measures to achieve desired quality in Hawaiʻi's surface, ground and coastal waters.	X		
(4)	Encourage actions to maintain or improve aural and air quality levels to enhance the health and well-being of Hawaiʻi's people.	X		
(5)	Reduce the threat to life and property from erosion, flooding, tsunamis, hurricanes, earthquakes, volcanic eruptions, and other natural or man-induced hazards and disasters.	X	~~X~~	
(6)	Encourage design and construction practices that enhance the physical qualities of Hawaiʻi's communities.		X	
(7)	Encourage urban developments in close proximity to existing services and facilities.			X

Table 5-2 Hawaiʻi State Plan, Hawaiʻi Revised Statutes, Chapter 226 **S = Supportive, N/S = Not Supportive, N/A = Not Applicable**	**S**	**N/S**	**N/A**
(8) Foster recognition of the importance and value of the land, air, and water resources to Hawaiʻi's people, their cultures and visitors.	X		
Discussion: Best management practices and regulatory controls will ensure air and water quality are within acceptable regulatory limits on-site and within the immediate area.			
Section 226-14 Objective and Policies for Facility Systems - In General. (A) Planning for the State's facility systems in general shall be directed towards achievement of the objective of water, transportation, waste disposal, and energy and telecommunication systems that support statewide social, economic, and physical objectives. (B) To achieve the general facility systems objective, it shall be the policy of this State to:			
(1) Accommodate the needs of Hawaiʻi's people through coordination of facility systems and capital improvement priorities in consonance with state and county plans.			X
(2) Encourage flexibility in the design and development of facility systems to promote prudent use of resources and accommodate changing public demands and priorities.			X
(3) Ensure that required facility systems can be supported within resource capacities and at reasonable cost to the user.			X
(4) Pursue alternative methods of financing programs and projects and cost-saving techniques in the planning, construction, and maintenance of facility systems.			X
Discussion: While Hawaiʻi Dairy Farms supports the State's policies related to improving Hawaiʻi's facility systems policies, they are not directly applicable to the Proposed Project.			
226-15 Objectives and Policies for Facility Systems - Solid and Liquid Wastes. (A) Planning for the State's facility systems with regard to solid and liquid wastes shall be directed towards the achievement of the following objectives:			
(1) Maintenance of basic public health and sanitation standards relating to treatment and disposal of solid and liquid wastes.	X		~~X~~
(2) Provision of adequate sewerage facilities for physical and economic activities that alleviate problems in housing, employment, mobility, and other areas.			X
(B) To achieve solid and liquid waste objectives, it shall be the policy of this State to:			
(1) Encourage the adequate development of sewerage facilities that complement planned growth.			X
(2) Promote re-use and recycling to reduce solid and liquid wastes and employ a conservation ethic.	X		
(3) Promote research to develop more efficient and economical treatment and disposal of solid and liquid wastes.			X
Discussion: Hawaiʻi Dairy Farms does not address domestic waste, the dairy operation is centrally based upon the recycling non-domestic waste as fertilizer to produce locally available feedstock in a pasture-based rotational grazing method, which supports Objective (B)(2).			
226-16 Objective and Policies for Facility Systems - Water. (A) Planning for the State's facility systems with regard to water shall be directed towards achievement of the objective of the provision of water to adequately accommodate domestic, agricultural, commercial, industrial, recreational, and other needs within resource capacities. (B) To achieve the facility systems water objective, it shall be the policy of this State to:			
(1) Coordinate development of land use activities with existing and potential water supply.	X		
(2) Support research and development of alternative methods to meet future water requirements well in advance of anticipated needs.			X
(3) Reclaim and encourage the productive use of runoff water and wastewater discharges.	X		
(4) Assist in improving the quality, efficiency, service, and storage capabilities of water systems for domestic and agricultural use.	X		
(5) Support water supply services to areas experiencing critical water problems.			X
(6) Promote water conservation programs and practices in government, private industry, and the general public to help ensure adequate water to meet long-term needs.	X		

Table 5-2 Hawai'i State Plan, Hawai'i Revised Statutes, Chapter 226 S = Supportive, N/S = Not Supportive, N/A = Not Applicable	S	N/S	N/A
Discussion: Hawai'i Dairy Farms nutrient management plan is designed to collect, treat, and reuse all livestock waste and wastewater generated from the facility. Fundamentally, this pasture-based dairy will effectively recycle 100% of animal wastes, as presented in EIS Section 3.3. The project is consistent with objectives and policies for water supply and water management, as discussed in EIS Section 4.16			
226-17 Objectives and Policies for Facility Systems - Transportation. (A) Planning for the State's facility systems with regard to transportation shall be directed towards the achievement of the following objectives:			
(1) An integrated multi-modal transportation system that services statewide needs and promotes the efficient, economical, safe, and convenient movement of people and goods.			X
(2) A statewide transportation system that is consistent with and will accommodate planned growth objectives throughout the State.			X
(B) To achieve the transportation objectives, it shall be the policy of this State to:			
(1) Design, program, and develop a multi-modal system in conformance with desired growth and physical development as stated in this chapter;			X
(2) Coordinate state, county, federal, and private transportation activities and programs toward the achievement of statewide objectives;			X
(3) Encourage a reasonable distribution of financial responsibilities for transportation among participating governmental and private parties;			X
(4) Provide for improved accessibility to shipping, docking, and storage facilities;			X
(5) Promote a reasonable level and variety of mass transportation services that adequately meet statewide and community needs;			X
(6) Encourage transportation systems that serve to accommodate present and future development needs of communities;			X
(7) Encourage a variety of carriers to offer increased opportunities and advantages to inter-island movement of people and goods;			X
(8) Increase the capacities of airport and harbor systems and support facilities to effectively accommodate transshipment and storage needs;			X
(9) Encourage the development of transportation systems and programs which would assist statewide economic growth and diversification;			X
(10) Encourage the design and development of transportation systems sensitive to the needs of affected communities and the quality of Hawai'i's natural environment;			X
(11) Encourage safe and convenient use of low-cost, energy-efficient, non-polluting means of transportation;			X
(12) Coordinate intergovernmental land use and transportation planning activities to ensure the timely delivery of supporting transportation infrastructure in order to accommodate planned growth objectives; and			X
(13) Encourage diversification of transportation modes and infrastructure to promote alternate fuels and energy efficiency.			X
Discussion: While Hawai'i Dairy Farms supports the State's policies related to improving Hawai'i's transportation systems and practices, they are not directly applicable to the Proposed Project.			
226-18 Objectives and Policies for Facility Systems - Energy. (A) Planning for the State's facility systems with regard to energy shall be directed toward the achievement of the following objectives, giving due consideration to all:			
(1) Dependable, efficient, and economical statewide energy systems capable of supporting the needs of the people;			X
(2) Increased energy self-sufficiency where the ratio of indigenous to imported energy use is increased;			X
(3) Greater energy security in the face of threats to Hawai'i's energy supplies and systems; and	X		
(4) Reduction, avoidance, or sequestration of greenhouse gas emissions from energy supply and use.	X		
(B) To achieve the energy objectives, it shall be the policy of this State to ensure the provision of adequate, reasonably priced, and dependable energy services to accommodate demand. (C) To further achieve the energy objectives, it shall be the policy of this State to:			
(1) Support research and development as well as promote the use of renewable energy sources;	X		

Table 5-2 Hawaiʻi State Plan, Hawaiʻi Revised Statutes, Chapter 226 **S = Supportive, N/S = Not Supportive, N/A = Not Applicable**	**S**	**N/S**	**N/A**
(2) Ensure that the combination of energy supplies and energy-saving systems is sufficient to support the demands of growth;		~~X~~	X
(3) Base decisions of least-cost supply-side and demand-side energy resource options on a comparison of their total costs and benefits when a least-cost is determined by a reasonably comprehensive, quantitative, and qualitative accounting of their long-term, direct and indirect economic, environmental, social, cultural, and public health costs and benefits;		~~X~~	X
(4) Promote all cost-effective conservation of power and fuel supplies through measures including: (A) Development of cost-effective demand-side management programs; (B) Education; and (C) Adoption of energy-efficient practices and technologies;	X		
(5) Ensure to the extent that new supply-side resources are needed, the development or expansion of energy systems utilizes the least-cost energy supply option and maximizes efficient technologies;			X
(6) Support research, development, and demonstration of energy efficiency, load management, and other demand-side management programs, practices, and technologies;			X
(7) Promote alternate fuels and energy efficiency by encouraging diversification of transportation modes and infrastructure;			X
(8) Support actions that reduce, avoid, or sequester greenhouse gases in utility, transportation, and industrial sector applications; and			X
(9) Support actions that reduce, avoid, or sequester Hawaiʻi's greenhouse gas emissions through agriculture and forestry initiatives.	X		

<u>**Discussion:**</u> Hawaiʻi Dairy Farms supports several of the State's policies related to improving Hawaiʻi's facilities systems in regards to energy usage and conservation. Hawaiʻi Dairy Farms environmental commitments, such as energy efficiency and sustainable building operations. The use of solar photovoltaic energy and other energy-efficient technologies are integrated into the dairy farm, refer to EIS Section 3.2. Greenhouse gas emissions are avoided through on-site power generation and on-site waste management.

The dairy's focus on robust and healthy grass growth will build organic matter in soils through use of manure as a natural fertilizer. Soil can incorporate carbon from the atmosphere, which benefits soil health. According to recent studies in the Soil Science Society of America Journal, the conversion of formerly tilled cropland to grazed pasture can drive substantial accumulation of organic carbons in soil, with a potential to offset up to one-third the annual increase in atmospheric carbon dioxide

226-18.5 Objectives and Policies for Facility Systems - Telecommunications.

(A) Planning for the State's telecommunications facility systems shall be directed towards the achievement of dependable, efficient, and economical statewide telecommunications systems capable of supporting the needs of the people.

(B) To achieve the telecommunications objective, it shall be the policy of this State to ensure the provision of adequate, reasonably priced, and dependable telecommunications services to accommodate demand.

(C) To further achieve the telecommunications objective, it shall be the policy of this State to:

	S	N/S	N/A
(1) Facilitate research and development of telecommunications systems and resources;			X
(2) Encourage public and private sector efforts to develop means for adequate, ongoing telecommunications planning;			X
(3) Promote efficient management and use of existing telecommunications systems and services; and	X		
(4) Facilitate the development of education and training of telecommunications personnel.			X

<u>**Discussion:**</u> While these policies apply more directly to government, Hawaiʻi Dairy Farms will continue to incorporate current and efficient telecommunication technologies.

226-19 Objectives and Policies for Socio-Cultural Advancement - Housing.

(A) Planning for the State's socio-cultural advancement with regard to housing shall be directed toward the achievement of the following objectives:

	S	N/S	N/A
(1) Greater opportunities for Hawaiʻi's people to secure reasonably priced, safe, sanitary, and livable homes, located in suitable environments that satisfactorily accommodate the needs and desires of families and individuals, through collaboration and cooperation between government and nonprofit and for-profit developers to ensure that more affordable housing is made available to very low-, low- and moderate-income segments of Hawaiʻi's population.			X

Table 5-2 Hawaiʻi State Plan, Hawaiʻi Revised Statutes, Chapter 226 **S = Supportive, N/S = Not Supportive, N/A = Not Applicable**	**S**	**N/S**	**N/A**
(2) The orderly development of residential areas sensitive to community needs and other land uses.			X
(3) The development and provision of affordable rental housing by the State to meet the housing needs of Hawaiʻi's people.			X
(B) To achieve the housing objectives, it shall be the policy of this State to:			
(1) Effectively accommodate the housing needs of Hawaiʻi's people.			X
(2) Stimulate and promote feasible approaches that increase housing choices for low-income, moderate-income, and gap-group households.			X
(3) Increase homeownership and rental opportunities and choices in terms of quality, location, cost, densities, style, and size of housing.			X
(4) Promote appropriate improvement, rehabilitation, and maintenance of existing housing units and residential areas.			X
(5) Promote design and location of housing developments taking into account the physical setting, accessibility to public facilities and services, and other concerns of existing communities and surrounding areas.			X
(6) Facilitate the use of available vacant, developable, and underutilized urban lands for housing.			X
(7) Foster a variety of lifestyles traditional to Hawaiʻi through the design and maintenance of neighborhoods that reflect the culture and values of the community.			X
(8) Promote research and development of methods to reduce the cost of housing construction in Hawaiʻi.			X
Discussion: There is no residential development planned as part of Hawaiʻi Dairy Farms.			
226-20 Objectives and Policies for Socio-Cultural Advancement - Health. (A) Planning for the State's socio-cultural advancement with regard to health shall be directed towards achievement of the following objectives:			
(1) Fulfillment of basic individual health needs of the general public.	X		
(2) Maintenance of sanitary and environmentally healthful conditions in Hawaiʻi's communities.	X		
(B) To achieve the health objectives, it shall be the policy of this State to:			
(1) Provide adequate and accessible services and facilities for prevention and treatment of physical and mental health problems, including substance abuse.			X
(2) Encourage improved cooperation among public and private sectors in the provision of health care to accommodate the total health needs of individuals throughout the State.			X
(3) Encourage public and private efforts to develop and promote statewide and local strategies to reduce health care and related insurance costs.			X
(4) Foster an awareness of the need for personal health maintenance and preventive health care through education and other measures.			X
(5) Provide programs, services, and activities that ensure environmentally healthful and sanitary conditions.			X
(6) Improve the State's capabilities in preventing contamination by pesticides and other potentially hazardous substances through increased coordination, education, monitoring, and enforcement.	X	~~X~~	
Discussion: Hawaiʻi Dairy Farms' goals of providing fresh, healthy, locally produced milk to the State of Hawaiʻi supports the HRS objectives and policies for health's role in socio-cultural advancement. By containing and reusing waste and runoff, it also supports the maintenance of sanitary and environmentally healthy conditions in Hawaiʻi. Fuels, agricultural chemicals, lubricants, cleaners or potentially hazardous substances will be utilized in compliance with applicable State and Federal requirements.			
226-21 Objective and Policies for Socio-Cultural Advancement - Education. (A) Planning for the State's socio-cultural advancement with regard to education shall be directed towards achievement of the objective of the provision of a variety of educational opportunities to enable individuals to fulfill their needs, responsibilities, and aspirations. (B) To achieve the education objective, it shall be the policy of this State to:			
(1) Support educational programs and activities that enhance personal development, physical fitness, recreation, and cultural pursuits of all groups.			X
(2) Ensure the provision of adequate and accessible educational services and facilities that are designed to meet individual and community needs.			X
(3) Provide appropriate educational opportunities for groups with special needs.			X

Table 5-2 Hawaiʻi State Plan, Hawaiʻi Revised Statutes, Chapter 226 S = Supportive, N/S = Not Supportive, N/A = Not Applicable	S	N/S	N/A
(4) Promote educational programs which enhance understanding of Hawaiʻi's cultural heritage.			X
(5) Provide higher educational opportunities that enable Hawaiʻi's people to adapt to changing employment demands.			X
(6) Assist individuals, especially those experiencing critical employment problems or barriers, or undergoing employment transitions, by providing appropriate employment training programs and other related educational opportunities.			X
(7) Promote programs and activities that facilitate the acquisition of basic skills, such as reading, writing, computing, listening, speaking, and reasoning.			X
(8) Emphasize quality educational programs in Hawaiʻi's institutions to promote academic excellence.			X
(9) Support research programs and activities that enhance the education programs of the State.			X
Discussion: While Hawaiʻi Dairy Farms supports the State's policies related to improving Hawaiʻi's educational opportunities, they are not directly applicable to the Proposed Project.			
226-22 Objective and Policies for Socio-Cultural Advancement - Social Services. (A) Planning for the State's socio-cultural advancement with regard to social services shall be directed towards the achievement of the objective of improved public and private social services and activities that enable individuals, families, and groups to become more self-reliant and confident to improve their well-being. (B) To achieve the social service objective, it shall be the policy of the State to:			
(1) Assist individuals, especially those in need of attaining a minimally adequate standard of living and those confronted by social and economic hardship conditions, through social services and activities within the State's fiscal capacities.			X
(2) Promote coordination and integrative approaches among public and private agencies and programs to jointly address social problems that will enable individuals, families, and groups to deal effectively with social problems and to enhance their participation in society.			X
(3) Facilitate the adjustment of new residents, especially recently arrived immigrants, into Hawaiʻi's communities.			X
(4) Promote alternatives to institutional care in the provision of long-term care for elder and disabled populations.			X
(5) Support public and private efforts to prevent domestic abuse and child molestation, and assist victims of abuse and neglect.			X
(6) Promote programs which assist people in need of family planning services to enable them to meet their needs.			X
Discussion: Hawaiʻi Dairy Farms supports the policies for government actions for socio-cultural advancement in regards to social services. However, it is not applicable to the Proposed Project.			
226-23 Objective and Policies for Socio-Cultural Advancement - Leisure. (A) Planning for the State's socio-cultural advancement with regard to leisure shall be directed towards the achievement of the objective of the adequate provision of resources to accommodate diverse cultural, artistic, and recreational needs for present and future generations. (B) To achieve the leisure objective, it shall be the policy of this State to:			
(1) Foster and preserve Hawaiʻi's multi-cultural heritage through supportive cultural, artistic, recreational, and humanities-oriented programs and activities.			X
(2) Provide a wide range of activities and facilities to fulfill the cultural, artistic, and recreational needs of all diverse and special groups effectively and efficiently.			X
(3) Enhance the enjoyment of recreational experiences through safety and security measures, educational opportunities, and improved facility design and maintenance.			X
(4) Promote the recreational and educational potential of natural resources having scenic, open space, cultural, historical, geological, or biological values while ensuring that their inherent values are preserved.	X		
(5) Ensure opportunities for everyone to use and enjoy Hawaiʻi's recreational resources.			X
(6) Assure the availability of sufficient resources to provide for future cultural, artistic, and recreational needs.			X
(7) Provide adequate and accessible physical fitness programs to promote the physical and mental well-being of Hawaiʻi's people.			X

Table 5-2 Hawaiʻi State Plan, Hawaiʻi Revised Statutes, Chapter 226 S = Supportive, N/S = Not Supportive, N/A = Not Applicable	S	N/S	N/A
(8) Increase opportunities for appreciation and participation in the creative arts, including the literary, theatrical, visual, musical, folk, and traditional art forms.			X
(9) Encourage the development of creative expression in the artistic disciplines to enable all segments of Hawaiʻi's population to participate in the creative arts.			X
(10) Assure adequate access to significant natural and cultural resources in public ownership.	X		
Discussion: Hawaiʻi Dairy Farms ~~will not restrict~~ does not control access via Grove Farm / Mahaulepu Farm to historical and culturally significant sites located near the project site ~~to promote and preserve cultural features, traditions and historical properties in the region~~. Refer to EIS Sections 4.7 and 4.8.			
226-24 Objective and Policies for Socio-Cultural Advancement - Individual Rights and Personal Well-Being. (A) Planning for the State's socio-cultural advancement with regard to individual rights and personal well-being shall be directed towards achievement of the objective of increased opportunities and protection of individual rights to enable individuals to fulfill their socio-economic needs and aspirations. (B) To achieve the individual rights and personal well- being objective, it shall be the policy of this State to:			
(1) Provide effective services and activities that protect individuals from criminal acts and unfair practices and that alleviate the consequences of criminal acts in order to foster a safe and secure environment.			X
(2) Uphold and protect the national and state constitutional rights of every individual.	X		
(3) Assure access to, and availability of, legal assistance, consumer protection, and other public services which strive to attain social justice.			X
(4) Ensure equal opportunities for individual participation in society.	X		
Discussion: Hawaiʻi Dairy Farms supports the individual rights and personal well-being of employees through compliance with State and Federal employee rights laws.			
226-25 Objective and Policies for Socio-Cultural Advancement - Culture. (A) Planning for the State's socio- cultural advancement with regard to culture shall be directed toward the achievement of the objective of enhancement of cultural identities, traditions, values, customs, and arts of Hawaiʻi's people. (B) To achieve the culture objective, it shall be the policy of this State to:			
(1) Foster increased knowledge and understanding of Hawaiʻi's ethnic and cultural heritages and the history of Hawaiʻi.			X
(2) Support activities and conditions that promote cultural values, customs, and arts that enrich the lifestyles of Hawaiʻi's people and which are sensitive and responsive to family and community needs.			X
(3) Encourage increased awareness of the effects of proposed public and private actions on the integrity and quality of cultural and community lifestyles in Hawaiʻi.			X
(4) Encourage the essence of the aloha spirit in people's daily activities to promote harmonious relationships among Hawaiʻi's people and visitors.			X
Discussion: Hawaiʻi Dairy Farms supports the policies for government actions for socio-cultural advancement in regards to cultural values and cultural education.			
226-26 Objectives and Policies for Socio-Cultural Advancement - Public Safety. (A) Planning for the State's socio- cultural advancement with regard to public safety shall be directed towards the achievement of the following objectives:			
(1) Assurance of public safety and adequate protection of life and property for all people.	X		
(2) Optimum organizational readiness and capability in all phases of emergency management to maintain the strength, resources, and social and economic well-being of the community in the event of civil disruptions, wars, natural disasters, and other major disturbances.	X		
(3) Promotion of a sense of community responsibility for the welfare and safety of Hawaiʻi's people.	X		
(B) To achieve the public safety objectives, it shall be the policy of this State to:			
(1) Ensure that public safety programs are effective and responsive to community needs.			X
(2) Encourage increased community awareness and participation in public safety programs.			X
(C) To further achieve public safety objectives related to criminal justice, it shall be the policy of this State to:			
(1) Support criminal justice programs aimed at preventing and curtailing criminal activities.			X

Table 5-2 Hawai'i State Plan, Hawai'i Revised Statutes, Chapter 226 S = Supportive, N/S = Not Supportive, N/A = Not Applicable	S	N/S	N/A
(2) Develop a coordinated, systematic approach to criminal justice administration among all criminal justice agencies.			X
(3) Provide a range of correctional resources which may include facilities and alternatives to traditional incarceration in order to address the varied security needs of the community and successfully reintegrate offenders into the community.			X
(D) To further achieve public safety objectives related to emergency management, it shall be the policy of this State to:			
(1) Ensure that responsible organizations are in a proper state of readiness to respond to major war-related, natural, or technological disasters and civil disturbances at all times.			X
(2) Enhance the coordination between emergency management programs throughout the State.			X

Discussion: Hawai'i Dairy Farms takes the responsibility of the wellness and safety of its employees, livestock, and facilities very seriously. Buildings will be designed to appropriate natural disaster and emergency code standards, and staff will be trained to address a range of situations that require immediate response to emergencies or unlawful activity on-site. Response plans are also in place in the event of natural disaster events, further described in EIS Section 4.6.

	S	N/S	N/A
226-27 Objectives and Policies for Socio-Cultural Advancement - Government. (A) Planning the State's socio-cultural advancement with regard to government shall be directed towards the achievement of the following objectives:			
(1) Efficient, effective, and responsive government services at all levels in the State.			X
(2) Fiscal integrity, responsibility, and efficiency in the state government and county governments.			X
(B) To achieve the government objectives, it shall be the policy of this State to:			
(1) Provide for necessary public goods and services not assumed by the private sector.			X
(2) Pursue an openness and responsiveness in government that permits the flow of public information, interaction, and response.			X
(3) Minimize the size of government to that necessary to be effective.			X
(4) Stimulate the responsibility in citizens to productively participate in government for a better Hawai'i.			X
(5) Assure that government attitudes, actions, and services are sensitive to community needs and concerns.			X
(6) Provide for a balanced fiscal budget.			X
(7) Improve the fiscal budgeting and management system of the State.			X
(8) Promote the consolidation of state and county governmental functions to increase the effective and efficient delivery of government programs and services and to eliminate duplicative services wherever feasible.			X

Discussion: Policies related to the operation of State government are the responsibility of the State of Hawai'i and are not directly applicable to Hawai'i Dairy Farms.

Hawai'i State Plan - HRS Ch. 226 - Part III. Priority Guideline	S	N/S	N/A
226-101 Purpose. The purpose of this part is to establish overall priority guidelines to address areas of statewide concern.			
226-102 Overall Direction. The State shall strive to improve the quality of life for Hawai'i's present and future population through the pursuit of desirable courses of action in five major areas of statewide concern which merit priority attention: economic development, population growth and land resource management, affordable housing, crime and criminal justice, and quality education.			
226-103 Economic Priority Guidelines. (A) Priority guidelines to stimulate economic growth and encourage business expansion and development to provide needed jobs for Hawai'i's people and achieve a stable and diversified economy:			
(1) Seek a variety of means to increase the availability of investment capital for new and expanding enterprises. (a) Encourage investments which:			
(i) Reflect long term commitments to the State;	X		
(ii) Rely on economic linkages within the local economy;	X		
(iii) Diversify the economy;	X		
(iv) Reinvest in the local economy;	X		
(v) Are sensitive to community needs and priorities; and	X		

Table 5-2 Hawaiʻi State Plan, Hawaiʻi Revised Statutes, Chapter 226 S = Supportive, N/S = Not Supportive, N/A = Not Applicable	S	N/S	N/A
(vi) Demonstrate a commitment to provide management opportunities to Hawaiʻi residents.	X		
(2) Encourage the expansion of technological research to assist industry development and support the development and commercialization of technological advancements.			X
(3) Improve the quality, accessibility, and range of services provided by government to business, including data and reference services and assistance in complying with governmental regulations.			X
(4) Seek to ensure that state business tax, labor laws, and administrative policies are equitable, rational, and predictable.			X
(5) Streamline the building and development permit and review process, and eliminate or consolidate other burdensome or duplicative governmental requirements imposed on business, where public health, safety and welfare would not be adversely affected.			X
(6) Encourage the formation of cooperatives and other favorable marketing or distribution arrangements at the regional or local level to assist Hawaiʻi's small-scale producers, manufacturers, and distributors.	X		
(7) Continue to seek legislation to protect Hawaiʻi from transportation interruptions between Hawaiʻi and the continental United States.			X
(8) Provide public incentives and encourage private initiative to develop and attract industries which promise long-term growth potentials and which have the following characteristics:			
(a) An industry that can take advantage of Hawaiʻi's unique location and available physical and human resources.			X
(b) A clean industry that would have minimal adverse effects on Hawaiʻi's environment.	X		
(c) An industry that is willing to hire and train Hawaiʻi's people to meet the industry's labor needs at all levels of employment.	X		
(d) An industry that would provide reasonable income and steady employment.	X		
(9) Support and encourage, through educational and technical assistance programs and other means, expanded opportunities for employee ownership and participation in Hawaiʻi business.			X
(10) Enhance the quality of Hawaiʻi's labor force and develop and maintain career opportunities for Hawaiʻi's people through the following actions:			
(A) Expand vocational training in diversified agriculture, aquaculture, information industry, and other areas where growth is desired and feasible.	X		
(B) Encourage more effective career counseling and guidance in high schools and post-secondary institutions to inform students of present and future career opportunities.			X
(C) Allocate educational resources to career areas where high employment is expected and where growth of new industries is desired.			X
(D) Promote career opportunities in all industries for Hawaiʻi's people by encouraging firms doing business in the State to hire residents.	X		
(E) Promote greater public and private sector cooperation in determining industrial training needs and in developing relevant curricula and on- the-job training opportunities.			X
(F) Provide retraining programs and other support services to assist entry of displaced workers into alternative employment.			X
(B) Priority guidelines to promote the economic health and quality of the visitor industry:			
(1) Promote visitor satisfaction by fostering an environment which enhances the Aloha Spirit and minimizes inconveniences to Hawaiʻi's residents and visitors.			X
(2) Encourage the development and maintenance of well- designed, adequately serviced hotels and resort destination areas which are sensitive to neighboring communities and activities and which provide for adequate shoreline setbacks and beach access.			X
(3) Support appropriate capital improvements to enhance the quality of existing resort destination areas and provide incentives to encourage investment in upgrading, repair, and maintenance of visitor facilities.			X
(4) Encourage visitor industry practices and activities which respect, preserve, and enhance Hawaiʻi's significant natural, scenic, historic, and cultural resources.			X
(5) Develop and maintain career opportunities in the visitor industry for Hawaiʻi's people, with emphasis on managerial positions.			X
(6) Support and coordinate tourism promotion abroad to enhance Hawaiʻi's share of existing and potential visitor markets.			X

Table 5-2 Hawaiʻi State Plan, Hawaiʻi Revised Statutes, Chapter 226 S = Supportive, N/S = Not Supportive, N/A = Not Applicable		S	N/S	N/A
(7)	Maintain and encourage a more favorable resort investment climate consistent with the objectives of this chapter.			X
(8)	Support law enforcement activities that provide a safer environment for both visitors and residents alike.			X
(9)	Coordinate visitor industry activities and promotions to business visitors through the state network of advanced data communication techniques.			X
(C)	Priority guidelines to promote the continued viability of the sugar and pineapple industries:			
(1)	Provide adequate agricultural lands to support the economic viability of the sugar and pineapple industries.			X
(2)	Continue efforts to maintain federal support to provide stable sugar prices high enough to allow profitable operations in Hawaiʻi.			X
(3)	Support research and development, as appropriate, to improve the quality and production of sugar and pineapple crops.			X
(D)	Priority guidelines to promote the growth and development of diversified agriculture and aquaculture:			
(1)	Identify, conserve, and protect agricultural and aquacultural lands of importance and initiate affirmative and comprehensive programs to promote economically productive agricultural and aquacultural uses of such lands.	X		
(2)	Assist in providing adequate, reasonably priced water for agricultural activities.	X		
(3)	Encourage public and private investment to increase water supply and to improve transmission, storage, and irrigation facilities in support of diversified agriculture and aquaculture.	X		
(4)	Assist in the formation and operation of production and marketing associations and cooperatives to reduce production and marketing costs.			X
(5)	Encourage and assist with the development of a waterborne and airborne freight and cargo system capable of meeting the needs of Hawaiʻi's agricultural community.			X
(6)	Seek favorable freight rates for Hawaiʻi's agricultural products from inter-island and overseas transportation operators.			X
(7)	Encourage the development and expansion of agricultural and aquacultural activities which offer long-term economic growth potential and employment opportunities.	X		
(8)	Continue the development of agricultural parks and other programs to assist small independent farmers in securing agricultural lands and loans.			X
(9)	Require agricultural uses in agricultural subdivisions and closely monitor the uses in these subdivisions.			X
(10)	Support the continuation of land currently in use for diversified agriculture.	X		
(E)	Priority guidelines for water use and development:			
(1)	Maintain and improve water conservation programs to reduce the overall water consumption rate.	X		
(2)	Encourage the improvement of irrigation technology and promote the use of non-potable water for agricultural and landscaping purposes.	X		
(3)	Increase the support for research and development of economically feasible alternative water sources.			X
(4)	Explore alternative funding sources and approaches to support future water development programs and water system improvements.			X
(F)	Priority guidelines for energy use and development:			
(1)	Encourage the development, demonstration, and commercialization of renewable energy sources.	X		
(2)	Initiate, maintain, and improve energy conservation programs aimed at reducing energy waste and increasing public awareness of the need to conserve energy.	X		
(3)	Provide incentives to encourage the use of energy conserving technology in residential, industrial, and other buildings.			X
(4)	Encourage the development and use of energy conserving and cost-efficient transportation systems.			X
(G)	Priority guidelines to promote the development of the information industry:			
(1)	Establish an information network that will serve as the catalyst for establishing a viable information industry in Hawaiʻi.			X
(2)	Encourage the development of services such as financial data processing, products and services exchange, foreign language translations, telemarketing, teleconferencing, a twenty-four-hour international stock exchange, international banking, and a Pacific Rim management center.			X
(3)	Encourage the development of small businesses in the information field such as software development, the development of new information systems and peripherals, data conversion and data entry services, and home or cottage services such as computer programming, secretarial, and accounting services.			X

Table 5-2 Hawai'i State Plan, Hawai'i Revised Statutes, Chapter 226 S = Supportive, N/S = Not Supportive, N/A = Not Applicable	S	N/S	N/A
(4) Encourage the development or expansion of educational and training opportunities for residents in the information and telecommunications fields.			X
(5) Encourage research activities, including legal research in the information and telecommunications fields.			X
(6) Support promotional activities to market Hawai'i's information industry services.			X
Discussion: Hawai'i Dairy Farms supports the HRS objectives to diversify and improve the state economy by revitalizing and developing the local dairy industry in the State, providing more job opportunities for residents while also providing a clean facility that reuses waste, and promotes water and energy reuse and conservation.			
226-104 Population Growth and Land Resources Priority Guidelines. (A) Priority guidelines to effect desired statewide growth and distribution:			
(1) Encourage planning and resource management to insure that population growth rates throughout the State are consistent with available and planned resource capacities and reflect the needs and desires of Hawai'i's people.			X
(2) Manage a growth rate for Hawai'i's economy that will parallel future employment needs for Hawai'i's people.			X
(3) Ensure that adequate support services and facilities are provided to accommodate the desired distribution of future growth throughout the State.			X
(4) Encourage major state and federal investments and services to promote economic development and private investment to the neighbor islands, as appropriate.			X
(5) Explore the possibility of making available urban land, low-interest loans, and housing subsidies to encourage the provision of housing to support selective economic and population growth on the neighbor islands.			X
(6) Seek federal funds and other funding sources outside the State for research, program development, and training to provide future employment opportunities on the neighbor islands.			X
(7) Support the development of high technology parks on the neighbor islands.			X
(B) Priority guidelines for regional growth distribution and land resource utilization:			
(1) Encourage urban growth primarily to existing urban areas where adequate public facilities are already available or can be provided with reasonable public expenditures, and away from areas where other important benefits are present, such as protection of important agricultural land or preservation of lifestyles.			X
(2) Make available marginal or nonessential agricultural lands for appropriate urban uses while maintaining agricultural lands of importance in the agricultural district.			X
(3) Restrict development when drafting of water would result in exceeding the sustainable yield or in significantly diminishing the recharge capacity of any groundwater area.			X
(4) Encourage restriction of new urban development in areas where water is insufficient from any source for both agricultural and domestic use.			X
(5) In order to preserve green belts, give priority to state capital-improvement funds which encourage location of urban development within existing urban areas except where compelling public interest dictates development of a noncontiguous new urban core.			X
(6) Seek participation from the private sector for the cost of building infrastructure and utilities, and maintaining open spaces.	X		
(7) Pursue rehabilitation of appropriate urban areas.			X
(8) Support the redevelopment of Kaka'ako into a viable residential, industrial, and commercial community.			X
(9) Direct future urban development away from critical environmental areas or impose mitigating measures so that negative impacts on the environment would be minimized.			X
(10) Identify critical environmental areas in Hawai'i to include but not be limited to the following: watershed and recharge areas; wildlife habitats (on land and in the ocean); areas with endangered species of plants and wildlife; natural streams and water bodies; scenic and recreational shoreline resources; open space and natural areas; historic and cultural sites; areas particularly sensitive to reduction in water and air quality; and scenic resources.			X
(11) Identify all areas where priority should be given to preserving rural character and lifestyle.			X

Table 5-2 Hawaiʻi State Plan, Hawaiʻi Revised Statutes, Chapter 226 S = Supportive, N/S = Not Supportive, N/A = Not Applicable	S	N/S	N/A
(12) Utilize Hawaiʻi's limited land resources wisely, providing adequate land to accommodate projected population and economic growth needs while ensuring the protection of the environment and the availability of the shoreline, conservation lands, and other limited resources for future generations.	X		
(13) Protect and enhance Hawaiʻi's shoreline, open spaces, and scenic resources.	X		
Discussion: Hawaiʻi Dairy Farms is an agricultural project in an agriculture district, with agriculturally zoned land, which supports the priority guidelines relating to land resources by keeping agricultural land in active agricultural use (as opposed to residential or resort development). In support of these HRS objectives, Hawaiʻi Dairy Farms will finance the cost for building infrastructure and utilities with private funds. Hawaiʻi Dairy Farms recognizes its environmental responsibility, and supports the promotion of sustainable business practices through its commitment with its sustainable dairy farm model.			
226-105 Crime and Criminal Justice Priority Guidelines. (A) Priority Guidelines in the Area of Crime and Criminal Justice:			
(1) Support law enforcement activities and other criminal justice efforts that are directed to provide a safer environment.			X
(2) Target state and local resources on efforts to reduce the incidence of violent crime and on programs relating to the apprehension and prosecution of repeat offenders.			X
(3) Support community and neighborhood program initiatives that enable residents to assist law enforcement agencies in preventing criminal activities.			X
(4) Reduce overcrowding or substandard conditions in correctional facilities through a comprehensive approach among all criminal justice agencies which may include sentencing law revisions and use of alternative sanctions other than incarceration for persons who pose no danger to their community.			X
(5) Provide a range of appropriate sanctions for juvenile offenders, including community-based programs and other alternative sanctions.			X
(6) Increase public and private efforts to assist witnesses and victims of crimes and to minimize the costs of victimization.			X
Discussion: Policies related to public safety are primarily the responsibility of government agencies and are not directly applicable to the Proposed Project. However, Hawaiʻi Dairy Farms will institute a program for the safety of its employees with security and emergency response plans, procedures, and training in-place.			
226-106 Affordable Housing Priority Guidelines. (A) Priority guidelines for the provision of affordable housing:			
(1) Seek to use marginal or nonessential agricultural land and public land to meet housing needs of low- and moderate-income and gap-group households.			X
(2) Encourage the use of alternative construction and development methods as a means of reducing production costs.			X
(3) Improve information and analysis relative to land availability and suitability for housing.			X
(4) Create incentives for development which would increase home ownership and rental opportunities for Hawaiʻi's low- and moderate-income households, gap-group households, and residents with special needs.			X
(5) Encourage continued support for government or private housing programs that provide low interest mortgages to Hawaiʻi's people for the purchase of initial owner- occupied housing.			X
(6) Encourage public and private sector cooperation in the development of rental housing alternatives.			X
(7) Encourage improved coordination between various agencies and levels of government to deal with housing policies and regulations.			X
(8) Give higher priority to the provision of quality housing that is affordable for Hawaiʻi's residents and less priority to development of housing intended primarily for individuals outside of Hawaiʻi.			X
Discussion: Hawaiʻi Dairy Farms supports the Hawaiʻi State Plan Priority Guideline Policy of affordable housing; however, this policy is directed toward government, and does not apply to the Proposed Project.			
226-107 Quality Education Priority Guidelines. (A) Priority guidelines to promote quality education:			

Table 5-2 Hawai'i State Plan, Hawai'i Revised Statutes, Chapter 226 S = Supportive, N/S = Not Supportive, N/A = Not Applicable	S	N/S	N/A
(1) Pursue effective programs which reflect the varied district, school, and student needs to strengthen basic skills achievement.			X
(2) Continue emphasis on general education "core" requirements to provide common background to students and essential support to other university programs.			X
(3) Initiate efforts to improve the quality of education by improving the capabilities of the education work force.			X
(4) Promote increased opportunities for greater autonomy and flexibility of educational institutions in their decision-making responsibilities.			X
(5) Increase and improve the use of information technology in education by the availability of telecommunications equipment for.			X
(a) The electronic exchange of information.			X
(b) Statewide electronic mail.			X
(c) Access to the Internet.			X
Discussion: Hawai'i Dairy Farms supports the Hawai'i State Plan Priority Guideline Policy regarding quality education; however, this policy is directed primarily toward government, and does not apply to the Proposed Project beyond the opportunities the project provides through career development.			
226-107 Sustainability Priority Guidelines. (A) Priority guidelines to promote sustainability:			
(1) Encourage balanced economic, social, community, and environmental priorities	X		
(2) Encourage planning that respects and promotes living within the natural resources and limits of the State.	X		
(3) Promote a diversified and dynamic economy.	X		
4) Encourage respect for the host culture.	X		
(5) Promote decisions based on meeting the needs of the present without compromising the needs of future generations.	X		
(6) Consider the principles of the ahupua'a system.	X		
(7) Emphasize that everyone, including individuals, families, communities, businesses, and government, has the responsibility for achieving a sustainable Hawai'i.	X		
Discussion: Hawai'i Dairy Farms supports the Hawai'i State Plan Priority Guideline Policy regarding the promotion of sustainability through its project goals to establish a wastewater reuse, pasture-based dairy in Hawai'i. HDF will utilize a sustainable, pasture-based rotational grazing system to produce fresh, locally-available milk for the State of Hawai'i that reduces reliance on imported goods and diversifies the local economy.			
226-109 Climate Change Adaptation Priority Guidelines. (A) Priority guidelines to adapt to climate change:			
(1) Ensure that Hawai'i's people are educated, informed, and aware of the impacts climate change may have on their communities			X
(2) Encourage community stewardship groups and local stakeholders to participate in planning and implementation of climate change policies			X
(3) Invest in continued monitoring and research of Hawai'i's climate and the impacts of climate change on the State.			X
(4) Consider native Hawaiian traditional knowledge and practices in planning for the impacts of climate change.			X
(5) Encourage the preservation and restoration of natural landscape features, such as coral reefs, beaches and dunes, forests, streams, floodplains, and wetlands~~,~~ that have the inherent capacity to avoid, minimize, or mitigate the impacts of climate change.			X
(6) Explore adaptation strategies that moderate harm or exploit beneficial opportunities in response to actual or expected climate change impacts to the natural and built environments.			X
(7) Promote sector resilience in areas such as water, roads, airports, and public health, by encouraging the identification of climate change threats, assessment of potential consequences, and evaluation of adaptation options.			X
(8) Foster cross-jurisdictional collaboration between county, state, and federal agencies and partnerships between government and private entities and other nongovernmental entities, including nonprofit entities.			X

Table 5-2 Hawai'i State Plan, Hawai'i Revised Statutes, Chapter 226 S = Supportive, N/S = Not Supportive, N/A = Not Applicable	S	N/S	N/A
(9) Use management and implementation approaches that encourage the continual collection, evaluation, and integration of new information and strategies into new and existing practices, policies, and plans.			X
(10) Encourage planning and management of the natural and built environments that effectively integrate climate change policy.			X
Discussion: While Hawai'i Dairy Farms supports the State's policies related to prioritizing climate change impacts, they are not directly applicable to the Proposed Project.			

5.4 HAWAI'I STATE FUNCTIONAL PLANS

The State Functional Plans implement the goals, objectives, policies and priority guidelines of the Hawai'i State Plan. The Functional Plans provide the connection between State programs and State policy. Twelve functional plans have been adopted by the State Legislature, including in the areas of agriculture, conservation lands, education, energy, health, higher education, historic preservation, housing, recreation, tourism, transportation and Water Resources. These plans contain multiple objectives and specific action items to be implemented by specific state or county agencies in partnership with named entities such as academic institutions and/or community organizations. The dairy supports the following objectives of the Agriculture Functional Plan:

B. Achievement of an orderly agricultural marketing system through product promotion and industry organization.

E. Achievement of adequate capital, and knowledge of its proper management, for agricultural development

H. Achievement of productive agricultural use of lands most suitable and needed for agriculture

J. Achievement of maximum degree of public understanding and support of agriculture in Hawai'i.

M. Achievement of adequate support services and infrastructure to meet agricultural needs.

Discussion: Hawai'i Dairy Farms will promote the Functional Plan's goal of self-sustainability in Hawai'i, and provide positive marketing for sustainable, locally produced agriculture products that increase public understanding and support of the agriculture industry in the State.

Act 183 of 2005 was enacted to establish Important Agricultural Lands in HRS Chapter 205, Section 205-42. Hawai'i Dairy Farms will be one of the first commercial food production operations to establish operations using IAL on Kaua'i.

5.5 HAWAIʻI 2050 SUSTAINABILITY PLAN

The Hawaiʻi 2050 Sustainability Plan was developed in 2008 by the State of Hawaiʻi Sustainability Task Force as follow up to the State Plan and as a long-term strategy in respect to the culture, character, beauty, and history of Hawaiʻi's island communities; balance among economic, community, and environmental priorities; and an effort to meet the needs of the present without compromising the ability to future generations to meet their own needs.

The 2050 Plan includes five goals toward a more sustainable Hawaiʻi, accompanied by strategic actions for implementation and evaluation. The goals and strategic actions that relate to the Hawaiʻi Dairy Farms project are as follows:

Goal One: Living sustainably is part of our daily practice in Hawaiʻi:

Strategic Actions:

- *Develop a sustainability ethic.*
- *Conduct ongoing forums and cross-sector dialogue to promote collaboration and progress on achieving Hawaiʻi's sustainability goals.*

Discussion: In producing more local milk for Hawaiʻi residents, the project will promote more sustainable consumption practices. In the long-term this will not only promote the ethic of "buying local," but will also help to alleviate the current amount of fossil fuels consumed to import milk from mainland farms. The pasture-based model used at the dairy, wherein 100 percent of the cows' manure remains on the farm to enrich the land as fertilizer, will also set the precedent for more sustainable dairy methods in Hawaiʻi, reducing reliance on imports and renewing local soils for future generations.

Goal Two: Our diversified and globally competitive economy enables us to meaningfully live, work, and play in Hawaiʻi.

Strategic Actions:

- *Develop a more diverse and resilient economy.*

Discussion: Hawaiʻi Dairy Farms aims to further expand Hawaiʻi's dairy industry by potentially doubling the current production of local milk. In addition to about 10-15 operational jobs, the project will create local supplier opportunities to support the farm operations on Kauaʻi, as well as provide herd management and opportunities for local ranchers. The project also aims to work with Kōloa Elementary School, 4-H and Future Farmers of America to educate local youth about Science Technology Engineering and Mathematics-based agricultural jobs and animal husbandry. Table 5-3 provides an evaluation summary of the project's compatibility with Hawaiʻi 2050's goals and strategic actions.

Table 5-3 Hawaiʻi 2050 Sustainability Plan (SB2532 HD1, 2010 Legislative Session) S = Supportive, N/S = Not Supportive, N/A = Not Applicable	S	N/S	N/A
The State's first definition of sustainability: A. Hawaiʻi that achieves the following: 2.0 Respects the culture, character, beauty and history of our state's island communities 3.0 Strikes a balance among economic, social and community, and environmental priorities 4.0 Meets the needs of the present without compromising the ability of future generations to meet their own needs			
GOAL 1: Living sustainably is part of our daily practice in Hawaiʻi.			
Develop a sustainability ethic.			
Integrate sustainability principles and practices into public and private school curricula.			X
Develop a statewide marketing and public awareness campaign on sustainability principles and practices.			X
Conduct ongoing forums and cross-sector dialogue to promote collaboration and progress on achieving Hawaiʻi's sustainability goals.	X		
Continually monitor trends and conditions in Hawaiʻi's economy, society and natural systems.	X		

Discussion: Hawaiʻi Dairy Farms was founded as a sustainable dairy facility, with sustainable practices such as utilizing nutrients in manure to grow the grass as a primary food source for the dairy cows, and a pasture rotational-grazing system to distribute nutrients through the fields.

	S	N/S	N/A
GOAL 2: Our diversified and globally competitive economy enables us to meaningfully live, work and play in Hawaiʻi.			
Develop a more diverse and resilient economy.			
Provide incentives that foster sustainability-related industries, which include, but aren't limited to renewable energy, innovation and science-based industries, and environmental technologies.			X
Increase production and consumption of local foods and products, particularly agricultural products.	X		
Increase commercialization and technology transfer between post-secondary institutions and the business sector.	~~X~~		X
Support the building blocks for economic stability and sustainability.			
Recognize and support established industries such as the visitor industry, military, construction and agriculture as strong components of the Hawaiʻi economy.	X		
Provide incentives for industries to operate in more sustainable ways.			X
Attract local and outside capital and investments in Hawaiʻi's economic activities.	X		
Reduce regulations and lower the cost of running a business.			X
Increase the competitiveness of Hawaiʻi's workforce.			
Invest in and improve our public education system to provide for a skilled workforce.			X
Create incentives and opportunities for workforce skills upgrade training programs, including the availability of remedial education programs.			X
Increase student enrollment in post-secondary educational programs.			X
Adopt living wage guidelines and measurements.			X
Identify, prioritize and fund infrastructure "crisis points" that need fixing.			X

Discussion: A goal of Hawaiʻi Dairy Farms is to reinvigorate the island's dairy industry, allowing for more locally produced food creating local jobs in traditional agriculture product industries, increasing the production of local goods, and decreasing our reliance on mainland and international imports. Hawaiʻi Dairy Farms ~~also aims to~~ will work with local educational institutions to help provide agricultural educational opportunities for future generations.

	S	N/S	N/A
GOAL 3: Our natural resources are responsibly and respectfully used, replenished and preserved for future generations.			
Reduce reliance on fossil (carbon-based) fuels.			
Expand renewable energy opportunities.		X	
Increase energy efficiency in private and public buildings, including retrofitting existing buildings.	X		
Improve energy efficiencies and options in transportation.			X
Encourage the production and use of locally produced bio-fuels.			X
Adopt building codes that encourage "green building" technology.			X
Encourage all government agencies to adopt sustainable practices, including purchasing hybrid cars, buying biodegradable products, and mandating recycling.			X
Conserve water and ensure adequate water supply.			
Reduce water consumption by means of education and incentives.			X

Table 5-3 Hawaiʻi 2050 Sustainability Plan (SB2532 HD1, 2010 Legislative Session) **S = Supportive, N/S = Not Supportive, N/A = Not Applicable**	S	N/S	N/A
Encourage greater production and use of recycled water.	X		
Continually review water-conserving technologies for possible incorporation in county building codes.			X
Encourage price structures for water use that furthers conservation.			X
Require water conservation plans from large private users.			X
Increase recycling, reuse and waste reduction strategies.	X		
Provide greater protection for air, and land-, fresh water- and ocean-based habitats.			
Strengthen enforcement of habitat management.			X
Fund public and private conservation education.			X
Improve management of protected watershed areas.			X
Incorporate the values and philosophy of the ahupuaʻa resource management system, as appropriate.	X		
Establish funding for invasive species control and native ecosystems protection.			X
Conserve agricultural, open space and conservation lands and resources.			
Create compact patterns of urban development.			X
Encourage "smart growth" concepts in land use and community planning.			X
Research and strengthen management initiatives to respond to rising sea levels, coastal hazards, erosion and other natural hazards.			X
Develop a comprehensive environmental mapping and measurement system to evaluate the overall health and status of Hawaiʻi's natural ecosystems.			X
Discussion: Hawaiʻi Dairy Farms is dedicated to sustainable business operations, as the core operations of the project are based upon a creating a sustainable dairy operation that conserves through water reuse that encourages reduction in water use. Using agriculturally zoned land for an agricultural use allows for the conservation of open space and rural land without moving towards larger patterns of urban development.			
GOAL 4: Our community is strong, healthy, vibrant and nurturing, providing safety nets for those in need.			
Strengthen social safety nets.			
Increase affordable housing opportunities for households up to 140% of median income.			X
Ensure access to affordable health care for all residents.			X
Reduce crime and violence.			X
Provide access to elderly housing, care-giving and other long-term care services.			X
Invest in greater prevention and treatment of those suffering from substance abuse and mental illness.			X
Increase awareness of and competency in financial literacy and asset building.			X
Strengthen the nonprofit sector, philanthropy and volunteerism.			X
Ensure that persons with disabilities are afforded equal opportunity to participate & excel in all aspects of community life.			X
Provide after-school and extra-curricular programs to enable Hawaiʻi's youth to broaden their life experiences.			X
Improve public transportation infrastructure and alternatives.			
Reduce traffic congestion.			X
Encourage and provide incentives for telecommuting.			X
Increase and improve bicycle and pedestrian facilities, including multi-use pathways.			X
Strengthen public education.			
Support parenting, educational and financial literacy initiatives that span early childhood through lifelong learning.			X
Increase high school graduation rates.			X
Strengthen career pathways for technical and trade schools that enhance Hawaiʻi's workforce.			X
Support post-secondary and distance learning programs that broaden personal and professional learning opportunities.			X
Provide access to diverse recreational facilities and opportunities.			X
Discussion: While Hawaiʻi Dairy Farms supports the State's policies related to improving Hawaiʻi's social and economic benefit programs for those in need, they are not directly applicable to the Proposed Project.			

GOAL 5: Our Kanaka Maoli and island cultures and values are thriving and perpetuated.			
Honor Kanaka Maoli culture and heritage.			
Ensure the existence of and support for public and private entities that further the betterment of Kanaka Maoli.			X
Increase fluency in Kanaka Maoli language. It is one of the official languages of Hawaiʻi.			X
Sponsor cross-sector dialogue on Kanaka Maoli culture and island values.			X
Protect Kanaka Maoli intellectual property and related traditional knowledge.			X
Provide Kanaka Maoli cultural education for residents, visitors and the general public.			X
Celebrate our cultural diversity and island way of life.			
Identify and protect the places, features and sacred spaces that give Hawaiʻi its unique character and cultural significance.	X		
Increase the number of educators who teach cultural and historic education.			X
Enable Kanaka Maoli and others to pursue traditional Kanaka Maoli lifestyles and practices.			
Provide Kanaka Maoli mentors with opportunities to pass on Hawaiʻian culture and knowledge to the next generation of Kanaka Maoli and others. The power of wisdom comes from communication.			X
Perpetuate Kanaka Maoli food production associated with land and ocean traditions and practices.			X
Provide support for subsistence-based businesses and economies.			X
Discussion: Hawaiʻi Dairy Farms supports and honors the state's Kanaka Maoli heritage through identifying all historical and cultural resources found in and around the project site area.			

5.6 HAWAIʻI STATE LAND USE DISTRICT BOUNDARIES

The State of Hawaiʻi Land Use Law regulates the classification and uses of lands in the State to accommodate growth and development, and to retain the natural resources in the area. All State lands are classified by the State Land Use Commission as Urban, Rural, Agricultural, or Conservation, with consideration given to the General Plan of the County.

Table 5-4 provides an evaluation and summary of the project's compatibility with Hawaiʻi State Land Use District Boundaries.

Table 5-4 Hawaiʻi State Land Use District Boundaries **S = Supportive, N/S = Not Supportive, N/A = Not Applicable**	**S**	**N/S**	**N/A**
Chapter 205-2 (d) HRS, states that Agricultural districts shall include:			
1) Activities or uses as characterized by the cultivation of crops, crops for bioenergy, orchards, forage, and forestry;	X		
2) Farming activities or uses related to animal husbandry and game and fish propagation…	X		
Discussion: Hawaiʻi Dairy Farms was founded with a core purpose of developing dairy as a farming activity to produce milk in an economically and environmentally sustainable way for the island of Kauaʻi and the State of Hawaiʻi as a whole.			

5.7 STATE OF HAWAIʻI DEPARTMENT OF AGRICULTURE

The State Department of Agricultural (DOA) is the lead state agency supporting agriculture within the State of Hawaiʻi. Pursuant to HRS §26-16(c), the DOA is tasked with:

- promoting the conservation, development, and utilization of agricultural resources in the State;
- assisting the farmers of the State and any others engaged in agriculture by research projects, dissemination of information, crop and livestock reporting service, market news service, and any other means of improving the well-being of those engaged in agriculture and increasing the productivity of the lands;
- administering the programs of the State relating to animal husbandry, entomology, farm credit, development and promotion of agricultural products and markets, and
- establishing and enforcing rules on the grading and labeling of agricultural products; and
- administering the aquaculture program under HRS §141-2.5.

Additional duties of the DOA include the formulation and implementation of general and special plans, administering HRS Chapter 166 relating to the agricultural park program, and also administering HRS Chapter 167 relating to the irrigation water development program.

Discussion: Hawaiʻi Dairy Farms supports the Department of Agriculture's goals of promoting the conservation and utilization of agricultural resources in the State, improving the productivity of the Māhāʻulepū farm lands, and promoting dairy products and the dairy industry as a whole.

5.8 STATE OF HAWAIʻI WATER POLICIES

Table 5-5 provides an evaluation and summary of the project's compatibility with State of Hawaiʻi Water Policies.

Table 5-5 State of Hawaiʻi Water Policies – Department of Health **S = Supportive, N/S = Not Supportive, N/A = Not Applicable**	S	N/S	N/A
Anti-degradation Policy (HAR 11-54-1.1) Hawaiʻi Administrative Rules pertaining to water quality anti-degradation require that existing uses and level of water quality necessary to protect the existing uses of receiving State waters be maintained and protected. In areas where water quality exceeds the standards necessary to support aquatic species and other wildlife, the water quality shall continue to be maintained and protected unless the director finds that allowable lower water quality is needed to accommodate important economic or social developments in the area. The process to allow for lower water quality will depend on intergovernmental coordination and public input provisions, and will be conditioned upon the assurance that the changes in water quality will still be adequate to fully protect existing uses. In addition, all new and existing point sources shall be under the highest statutory and regulatory requirements, and all nonpoint sources shall be under cost-effective and reasonable best management practices.			
Designated Uses (HAR Section 11-54-3) Classification of the receiving State waters. Storm water discharge shall be allowed given that the waters meet the following requirements:			
Inland Waters			
Class 1: Waters to remain in their natural state as nearly as possible with an absolute minimum of pollution from any human-caused source. To the extent possible, wilderness character of these areas shall be protected. Waste discharge into these waters is prohibited. Any conduct which results in a demonstrable increase in point or nonpoint source contamination levels in class 1 waters is prohibited.	~~X~~		X

Table 5-5 State of Hawaiʻi Water Policies – Department of Health S = Supportive, N/S = Not Supportive, N/A = Not Applicable	S	N/S	N/A
Class 1.a: Uses to be protected in these waters include scientific and educational purposes, protection of native breeding stock, baseline references from which human-caused changes can be measured, compatible recreation, aesthetic enjoyment, and other nondegrading uses which are compatible with the protection of the ecosystems associated with waters of this class;			X
Class 1.b: Uses to be protected in these waters are domestic water supplies, food processing, protection of native breeding stock, the support and propagation of aquatic life, baseline references from which human-caused changes can be measured, scientific and educational purposes, compatible recreation, and aesthetic enjoyment. Public access to these waters may be restricted to protect drinking water supplies			X
Class 2: Waters that are protected for their use for recreational purposes, the support and propagation of aquatic life, agricultural and industrial water supplies, shipping, and navigation. The uses to be protected in this class of waters are all uses compatible with the protection and propagation of fish, shellfish, and wildlife, and with recreation in and on these waters. These waters shall not act as receiving waters for any discharge which has not received the best degree of treatment or control compatible with the criteria established for this class. No new treated sewage discharges shall be permitted within estuaries. No new industrial discharges permitted within estuaries, with the exception of: *A) Acceptable non-contact thermal and drydock or marine railway discharges within Pearl Harbor, Oahu;* *B) Storm water discharges associated with industrial activities which meet, at the minimum, basic water quality criteria applicable to all waters;* *C) Discharge covered by a National Pollutant Discharge Elimination System general permit, approved by the U.S. Environmental Protection Agency.*	X		
Discussion: Flowing inland waters within the Māhāʻulepū Watershed fall into Class 2, not otherwise classified for protection [HAR §11-54-5.1(a)(1)(C)].			
Marine Waters			
Class AA: Waters to remain in their natural pristine state as nearly as possible with an absolute minimum of pollution or alteration of water quality from any human-caused source or actions. To the extent practicable, the wilderness character of these areas shall be protected. No zones of mixing shall be permitted in this class *A) Within a defined reef area, in waters of a depth less than 18 meters; or* *B) In waters up to a distance of 300 meters off shore if there is no defined reef area and if the depth is greater than 18 meters. The uses to be protected in this class of waters are oceanographic research, the support and propagation of shellfish and other marine life, conservation of coral reefs and wilderness areas, compatible recreation, and aesthetic enjoyment. The classification of any water area as Class AA shall not preclude other uses of the waters compatible with these objectives and in conformance with the criteria applicable to them.*			X
Class A: Objective of Class A waters is to be used for recreational purposes and aesthetic enjoyment. Any other use shall be permitted as long as it is compatible with the protection and propagation of fish, shellfish, and wildlife, and with recreation in an on these waters. These waters shall not act as receiving waters for any discharge which has not received the best degree of treatment or control compatible with the criteria established for this class. No new sewage discharges will be permitted within embayments. No new industrial discharges shall be permitted within embayments, with the exception of: *A) Acceptable non-contact thermal and drydock or marine railway discharges in the following water bodies:* *i. Honolulu Harbor* *ii. Barbers Point Harbor* *iii. Keehi Lagoon marina Area* *iv. Ala Wai Boat Harbor* *v. Kahului Harbor* *B) Storm water discharges associated with industrial activities which meet, at the minimum, the basic water quality criteria applicable to all waters* *C) Discharges covered by a NPDES general permit, approved by the US EPA.*	X		
Discussion: Marine waters and embayments downstream of the Māhāʻulepū Watershed are not classified for protection by DOH, and therefore fall into Class A [HAR §11-54-6(b)(2)(B).			

Marine Bottom Ecosystems			
Class I: This objective of this class of waters is to remain as nearly as possible in their natural pristine state with an absolute minimum of pollution from any human-induced source. Uses of marine bottom ecosystems in this class are passive human uses without intervention or alteration, allowing the perpetuation and preservation of the marine bottom in a most natural state, such as for nonconsumptive scientific research, nonconsumptive education, aesthetic enjoyment, passive activities, and preservation.			X
Class II: It is the objective of this class of waters to be protected for their uses including fish, shellfish, and wildlife propagation, and for recreational purposes. The uses to be protected in this class are all uses compatible with the protection and propagation of fish, shellfish, and wildlife, and with recreation. Any action which may permanently or completely modify, alter, consume, or degrade marine bottoms, such as structural flood control channelization, (dams); landfill and reclamation; navigational structures (harbors, ramps); structural shore protection (seawalls, revetments); and wastewater effluent outfall structures may be allowed upon securing approval in writing from the director, considering the environmental impact and the public interest.			X
<u>Discussion:</u> During the rainfall and runoff events, the dairy's nutrient contributions would be further diluted by additional volume of surface runoff and ditch flows. The terminus of Waiopili Ditch is a deep, muddy basin that joins the ocean through a channel cut through beach sand. Water chemistry measurements identified mixing of ditch water occurring rapidly and within a short distance of the shoreline. There will be no substantial effects to marine water quality from the HDF dairy.			
Open Coastal Waters			
Marine waters bounded by the 183 meter or 600 foot (100 fathom) depth contour and the shoreline, excluding bays named in subsection (a).			
Class AA: As listed in Appendix D dated July 1, 2014: all open waters in preserves, reserves, sanctuaries and refuges established by the department of land and natural resources under chapter 195 or 190.			
Class A: All other open coastal waters not otherwise specified.			
<u>Discussion:</u> Coastal waters downstream of the Māhāʻulepū Watershed fall into Class A: not otherwise listed for special protection.			

5.9 HAWAIʻI COASTAL ZONE MANAGEMENT PROGRAM

The Hawaiʻi State Coastal Zone Management Program (CZMP) was enacted by Hawaiʻi Revised Statutes 205A – Hawaiʻi Coastal Zone Management Act (CZMA), as a requirement of the National Coastal Zone Management Program of 1972. The program provides policy guidance for development activities as they relate to coastal land and water resources. The entire land area of the State of Hawaiʻi has been determined to be within the Coastal Zone as defined by the CZMA. The primary objectives and policies of the CZM program that apply to the project include the following:

Table 5-6 discusses how the project addresses the applicable objectives and policies of the CZMA.

Table 5-6 Objectives and Policies of the CZMP **S = Supportive, N/S = Not Supportive, N/A = Not Applicable**	**S**	**N/S**	**N/A**
Historic Resources			
A. Identify and analyze significant archaeological resources	X		
B. Maximize information retention through preservation or remains and artifacts or salvage operations.	X		
C. Support state goals for protection, restoration, interpretation, and display of historic resources.	X		
Recreational Resources			
A. Provide adequate, accessible, and diverse recreational opportunities in the coastal zone management area.			X
Scenic and Open Space Resources			
A. Ensure that new developments are compatible with their visual environment by designing and locating such developments to minimize the alteration of natural landforms and existing public views to and along the shoreline.	X		
B. Encourage those developments that are not coastal dependent to locate in inland areas.			X

Table 5-6 Objectives and Policies of the CZMP S = Supportive, N/S = Not Supportive, N/A = Not Applicable	S	N/S	N/A
Coastal Ecosystems			
A. Exercise an overall conservation ethic, and practice stewardship in the protection, use, and development of marine and coastal resources.			X
B. Improve the technical basis for natural resource management.			X
C. Preserve valuable coastal ecosystems, including reefs, of significant biological or economic importance.			X
D. Minimize disruption or degradation of coastal water ecosystems by effective regulation of stream diversions, channelization, and similar land and water uses, recognizing competing water needs.			X
E. Promote water quantity and quality planning and management practices that reflect the tolerance of fresh water and marine ecosystems and maintain and enhance water quality through the development and implementation of point and nonpoint source water pollution control measures.	X		
Economic Uses			
A. Concentrate coastal dependent development in appropriate areas.			X
B. Ensure coastal dependent development such as harbors and ports, and coastal related development such as visitor industry facilities and energy generating facilities, are located, designed, and constructed to minimize adverse social, visual, and environmental impacts in the coastal zone management area.			X
Coastal Hazards			
A. Develop and communicate adequate information about storm wave, tsunami, flood, erosion, subsidence, and point and nonpoint source pollution hazards.	X		
B. Control development in areas subject to storm wave, tsunami, flood, erosion, hurricane, wind, subsidence, and point and nonpoint source pollution hazards.	X		
C. Ensure that developments comply with requirements of the Federal Flood Insurance Program.	X		
D. Prevent coastal flooding from inland projects.			X
Managing Development			
A. Use, implement, and enforce existing law effectively to the maximum extent possible in managing present and future coastal zone development.			X
B. Facilitate timely processing of applications for development permits and resolve overlapping or conflicting permit requirements.			X
C. Communicate the potential short and long-term impacts of proposed significant coastal developments early in their life cycle and in terms understandable to the public to facilitate public participation in the planning and review process.			X
Public Participation			
A. Promote public involvement in coastal zone management processes.			X
B. Disseminate information on coastal management issues by means of educational materials, published reports, staff contact, and public workshops for persons and organizations concerned with coastal issues, developments, and government activities.			X
C. Organize workshops, policy dialogues, and site-specific mediations to respond to coastal issues and conflicts.			X
Beach Protection			
A. Locate new structures inland from the shoreline setback to conserve open space, minimize interference with natural shoreline processes, and minimize loss of improvements due to erosion.			X
Marine Resources			
A. Ensure that the use and development of marine and coastal resources are ecologically and environmentally sound and economically beneficial.			X
B. Coordinate the management of marine and coastal resources and activities to improve effectiveness and efficiency.			X
C. Encourage research and development of new, innovative technologies for exploring, using, or protecting marine and coastal resources.			X

Discussion: The site is outside the SMA as delineated by the County of Kauaʻi. An archaeological survey was performed for the project area in compliance with Chapter 6E of the Hawaiʻi Revised Statutes, supporting the CZMP's objective to protect and preserve historic resources. Water quality management practices are promoted by Hawaiʻi Dairy Farms through soils conservation, nutrient management, and water monitoring.

COUNTY OF KAUAʻI

5.10 COUNTY OF KAUAʻI GENERAL PLAN

Fulfilling State law mandates and the Charter of the County of Kauaʻi, Kauaʻi's General Plan provides guidance for the land use regulations, designations, and character of new development and facilities, and planning for County and State facilities and services. The objectives and policies pertaining to the project are as follows:

Table 5-7 discusses how the Proposed Project addresses the applicable objectives and policies of the County of Kauaʻi.

Table 5-7 (Elements of the) County of Kauaʻi General Plan **S = Supportive, N/S = Not Supportive, N/A = Not Applicable**		**S**	**N/S**	**N/A**
2.0 Vision for Kauaʻi 2020				
2.1 Community Values				
A.	Protection, management, and enjoyment of our open spaces, unique natural beauty, rural lifestyle, outdoor recreation and parks.	X		~~X~~
B.	Conservation of fishing grounds and other natural resources, so that individuals and families can support themselves through traditional gathering and agricultural activities.			X
C.	Access to and along shorelines, waterways and mountains for all. However, access should be controlled where necessary to conserve natural resources and to maintain the quality of public sites for fishing, hunting, recreation and wilderness activities valued by the local community.			X
D.	Recognition that our environment IS our economy, our natural capital, the basis of our economic survival and success.	X		
E.	Balanced management of our built environment, clustering new development around existing communities and maintaining the four-story height limit.			X
F.	Diverse job and business opportunities so that people of all skill levels and capabilities can support themselves and their families.	X		
G.	Government that supports and encourages business.			X
H.	Balanced economic growth development promoting providing good jobs and a strong economy, without sacrificing our environment and or our quality of life.	X		
I.	Respect and protection for the values and rights of our many cultures, in compliance with our laws and responsibilities as citizens.			X
J.	Preservation of our cultural, historical, sacred and archeological sites.	X		
K.	Appreciation and support for the traditions of the Native Hawaiʻian host culture and the many other cultural traditions and values that make up the Kauaʻi community.	X		
L.	Appreciation and support for the visitor industry's role in preserving and honoring all cultures and their values as Kauaʻi's leading source of income and as a supporter of community festivals, recreation, arts and culture.			X
M.	Protection of Kauaʻi's unique character.	X		
N.	Recognition of the uniqueness of our communities, supporting people with roots and history in those communities to continue to live and raise their families there.			X
O.	Safety for all citizens and visitors.			X
P.	Support for our youth, educating them to succeed.			X
Q.	Broad participation in the public process.			X
2.2 Vision for Kauaʻi 2020				
A.	Caring for Land, Waters and Culture - Through planning and land use regulations, the County of Kauaʻi carefully safeguards its heritage of ecologically- and culturally-important lands, waters and sites.	X		
B.	A Strong, Diverse Economy - Preservation of Kauaʻi's special environment and culture, Expanding local markets for local products and reducing imports, resulting in more money remaining in the local economy, More jobs with higher wages, reflecting a variety of profitable businesses seeking qualified employees, A strong education system which prepares Kauaʻi's children, teens, college students and adults to work in the diversified economy.	X		

Table 5-7 (Elements of the) County of Kauaʻi General Plan S = Supportive, N/S = Not Supportive, N/A = Not Applicable		S	N/S	N/A
C.	Agriculture and Aquaculture - Agricultural enterprise helps to keep Kauaʻi green and economically healthy through a variety of crops sold locally and exported. Kauaʻi residents support the farmers by buying locally-grown fruits, vegetables, taro and other basic foods. The market for organically-grown crops is increasing. In place of imported meat, Kauaʻi residents enjoy grass-fed beef from cattle raised in Kauaʻi's pasturelands and prepared in local processing facilities. Kauaʻi now produces 50 percent of its own food, reducing food imports and keeping more money within the community.	X		
D.	High Technology - Kauaʻi's high quality of life attracts knowledge-based businesses working in high technology enterprises. These businesses are linked with the college and the high schools, providing internship and training opportunities for Kauaʻi students. After attending college, students are able to find well-paying high-technology jobs on Kauaʻi. All parts of the island are served with fiber optic cable, allowing high-speed communications.			X
E.	Business Health and Diversity - Small business is the foundation of Kauaʻi's economy, employing the largest percentage of the population. There is a wide variety of business opportunities, including outdoor recreation, with environmental tourism and sports facilities; support facilities for movies and television; healing, health care, wellness and retreat centers both in alternative health and traditional medicine; assisted living facilities for retirees; innovative power generation; light manufacturing and food processing; authentic Hawaiʻian cultural businesses and cultural education; and home-based cottage businesses networked with electronic marketing.	X		
F.	Opportunities and Prosperity - An attitude of government and community responsibility translates into effective programs that improve employment, housing and educational opportunities for Kauaʻi's less advantaged citizens. The County, through its Offices of Community Assistance and its Office of Economic Development, works with federal and State programs, business, and the non-profit sector to develop employment opportunities for Kauaʻi's less advantaged citizens.			X
G.	A Vibrant, Stable Visitor Industry - The people of Kauaʻi appreciate the many benefits the visitor industry brings to the island. They, in turn, give the gift of aloha, encouraging guests to return and to stay longer. Residents support the industry's role in strengthening the economy, preserving the culture, and protecting the environment. In general, residents agree that a healthy, well-managed visitor industry is a major contributor to the quality of life on Kauaʻi.			X
H.	A Rural Place - The Island of Kauaʻi is a rural place. "Rural" describes many aspects of Kauaʻi that people value: green, open lands; raising crops for food; small communities where people know each other; the absence of city noise and lights; not feeling crowded. Kauaʻi's rural character lies not just in those lands classified as "rural" or "agriculture". Rather, it lies in how the whole island fits together – the relationship of urban settlements to open lands, how the built-up areas relate to the natural features of the landscape, how people get around.	X		
I.	Urban Areas - Expansion of urban areas, particularly new shopping centers and other retail developments which attract a large amount of vehicular traffic, are controlled to avoid urban sprawl and strip development along the highway. Town edges are clearly defined, and scenic corridors are maintained along the highways and major roads between towns.			X
J.	Agricultural Lands - Agricultural areas are characterized by broad expanses of open space – a mixture of pastures and large-scale agricultural plantations, small farms, and clusters of residences. Land use regulations specifically provide for agricultural communities, with design standards for subdivisions to preserve open space and landscape features. Land use regulations and tax incentives are structured to promote legitimate agriculture enterprises and to increase opportunities for small farmers.	X		
K.	Rural Roads and Highways - Our rural roads retain their "country character." They are limited to two lanes, bordered with natural vegetation. Speed limits are kept low for safety reasons. The right-of-way may include grassed drainage swales, but there are no sidewalks, curbs or gutters. One-lane bridges have been preserved in the Hanalei-Hāʻena region, both for their historic value and because they slow traffic. Some historic bridges have also been retained in other communities, where traffic volumes are low. Traffic signage is minimal. Safe bicycle and pedestrian routes are provided.			X
L.	Coastal Development - In new resort developments and subdivisions along the coast, buildings are setback from the shoreline in order to serve the following purposes: to avoid potential tsunami or hurricane damage; to preserve dunes, coastal bluffs, and other important physical features; to allow space for coastal erosion, so that there is no need for a seawall and dry beach area is preserved; and to preserve views. Setbacks are based on historic coastal erosion trends, damages during past hurricane and tsunami events, the nature of the topography, and scenic values.			X

Table 5-7 (Elements of the) County of Kauaʻi General Plan **S = Supportive, N/S = Not Supportive, N/A = Not Applicable**	**S**	**N/S**	**N/A**
M. Parks and Access to Mountains and Ocean - Visitors share Kauaʻi's parks, natural areas, and waters in harmony with residents and the environment. The County is implementing a long-range park master plan which is regularly updated and sets priorities for park operations and capital improvements. Each of the major State parks also has an up-to-date master plan, prepared in collaboration with the community.			**X**
N. Towns and Commercial Development - Under the General Plan, new commercial development has been focused on meeting community shopping needs while supporting local small businesses and older business areas. With strategic decisions about highway development and new commercial zoning, the County has avoided strip development and urban sprawl.			**X**
O. Public Facilities and Services - The County of Kauaʻi leads the state in having the lowest per capita rate of waste generation and the highest rate of reuse and recycling. The County is a leader in adopting and applying “best management practices” for land use, site development and construction. Because of careful management and regulation, Kauaʻi is free of concrete-lined drainage channels.			**X**
P. Electrical Power - Residents of Kauaʻi County are dedicated to the efficient use of energy and to minimizing the deleterious health, safety and aesthetic impacts of power installations. In particular, the county seeks opportunities and economic methods to render facilities (including transmission lines) inconspicuous in order to enhance a “parklike” appearance throughout the island.			**X**
Q. Airports and Harbors - Līhuʻe Airport is continually upgraded in order to support the desired level of visitor industry development and the export of agricultural products to the mainland. The commercial harbors at Nāwiliwili and Port Allen are continually upgraded to accommodate the latest cargo shipping systems.			**X**
R. Community Participation - Kauaʻi citizens enjoy a rich civic life because of their individual and collective commitment to each other’s well-being and respect for the place. Key values are trust, mutual respect, and a determination to maintain open dialogue. Citizens of all ages, ethnic heritages, and income levels actively participate in community life at many levels and through a variety of activities. Community organizations inform citizens and mobilize them to participate in dialogue. Government agencies and public officials provide fair and equal access to information and assistance for all citizens; give adequate notice of proposed actions; conduct open meetings; and make public records accessible.	**X**		
Discussion: Hawaiʻi Dairy Farms embodies the Kauaʻi Vision for 2020 through preserving Kauaʻi’s rural character through non cluster non-urban development, while keeping Kauaʻi green and economically healthy through a sustainable and progressive dairy model that expands local markets and reduces imports.			
3.0 Caring for Land, Water and Culture			
3.1.1 Heritage Resources Maps			
A. The Heritage Resources Map depicts natural, cultural and scenic resources that are important to the County of Kauaʻi and that are intended to be conserved. The mapping of important landforms, streams and other physical elements represents the general location of the resource.	**X**		
3.1.2 State Responsibility			
A. The State of Hawaiʻi plays the preeminent role in managing natural resources. The Department of Land and Natural Resources (DLNR) controls and manages the forest reserves, natural area reserves, and state parks. In addition to their value as forested watershed, these lands also harbor rare and endangered plant and animal species and areas where the native ecosystem remains relatively intact. In regulating land use on urban and agricultural lands, the County seeks expert advice from DLNR on aquatic and marine resources, streams, rare and endangered species, and historic and archaeological resources.			**X**
3.2 Scenic Views			
A. In developing public facilities and in administering land use regulations, the County shall seek to preserve scenic resources and public views. Public views are those from a public place, such as a park, highway, or along the shoreline. In maintaining scenic resources, ~~P~~ preserve the scenic qualities of mountains, hills and other elevated landforms, qualities such as the silhouette against the horizon and the mass and shape of the landform.	**X**		
3.3 Historic and Archaeological Resources			
3.3.1 Overview and 3.3.2 Policy			
A. As stated in the Vision, the people of Kauaʻi value their cultural and historic places and traditions. Many individuals and organizations care for these resources on a daily basis. Here are some examples: taking care of a heiau; organizing a Bon dance; cultivating taro in ancient taro loʻi; interpreting historic sites to visitors;	**X**		

Table 5-7 (Elements of the) County of Kauaʻi General Plan S = Supportive, N/S = Not Supportive, N/A = Not Applicable	S	N/S	N/A
restoring historic buildings; attending an exhibit of Kauaʻi artists at the Kauaʻi Museum. Historic and cultural resources help to give Kauaʻi its unique identity – to establish a "sense of place." Preserve important archaeological and historic sites and provide: (1) a buffer area between the site and adjacent uses; and (2) public pedestrian access, as appropriate to the site.			
3.4 Watersheds, Streams and Water Quality			
A. As stated in the Vision, the modern concept of watershed management mirrors the Native Hawaiʻian land use principles and practices under the ahupuaʻa land divisions. Like the modern concept of "watershed," the ahupuaʻa recognizes the integral connection among land-based, stream-based, and ocean-based resources and activities.	X		
B. Watersheds are affected by natural events and human activities that cause changes in land and in the flow of water from the high mountains to the ocean. Current Federal and State clean water programs are targeting "nonpoint source pollution control," with specific emphasis on protecting coastal waters from polluted runoff. County agencies fulfill particular functions in a network of regulations and agencies that control polluted runoff	X		
3.5 Coastal Lands			
A. As mandated under the State CZM Act, the County has delineated the boundaries of the coastal Special Management Area on Kauaʻi and has adopted regulations to manage development within the SMA. The SMA regulations have been effective in mitigating the effects of new development, particularly in preserving natural and cultural resources and providing permanent public access to the beach. The SMA regulations, however, do not supersede zoning; the SMA regulations state that development must be "consistent" with the General Plan and zoning. Since SMA permits must be consistent with zoning, it is important that coastal lands be zoned based on a policy of preserving natural, cultural and scenic resources and preventing hazards to structures and the coastal environment.			X
3.6 Native Hawaiian Rights			
A. Under the State Constitution and the County Charter, the County of Kauaʻi is empowered to promote the health, safety and welfare of all inhabitants without discrimination as to ethnic origin. As part of carrying out its responsibilities under the Constitution and the Charter, the County recognizes the rights of native Hawaiians and the laws concerning lands and waters that have been established through the State Constitution, State and Federal laws, and State and Federal court decisions. No County ordinance or rule shall modify or diminish these rights.			X
Discussion: Hawaiʻi Dairy Farms facilities are expected to have minimal to no impact on views of the Puʻu Hunihuni crater, views from the Ala Kinoiki Road corridor, or the views of the Hāʻupu Mountains surrounding the project. There are no public scenic views or lookouts that would be affected by this project. Construction of the Hawaiʻi Dairy Farms and associated facility improvements is expected to have minimal effects on the existing groundwater systems and local watersheds. The project area is not a source of groundwater recharge, such as a forest reserve or conservation area. Continued agricultural use perpetuates the ranching heritage within the Kōloa region.			
4.0 Developing Jobs and Businesses			
4.1 Diversifying the Economy			
A. Diversifying the economy is a major theme of Kauaʻi Vision 2020 (Chapter 2). The objective is to strengthen various sectors of Kauaʻi's economy, so that Kauaʻi is less dependent on a single industry – i.e., the visitor industry. Through the Kauaʻi General Plan Update process, the Citizens Advisory Committee (CAC) has identified three developing industries as having the greatest promise for the future: agriculture, aquaculture, and high technology. These are addressed in Sections 4.3 and 4.4 below (in this plan, aquaculture is discussed as a subset of agriculture).	X		
4.2 Visitor Industry			
A. The visitor industry is the most significant economic force on Kauaʻi, as it is in the state as a whole. It is estimated that about 40 percent of Kauaʻi's jobs are dependent on the visitor industry. Therefore, the economy of Kauaʻi is to a large extent determined by the number of visitors drawn to the island, how long they stay, and how much they spend. Given the existing supply of Resort-designated land, there is no cause to make major redesignations through the General Plan Update. The addition of the two West Side sites provides a potential for visitor industry development not previously available in that region.			X

Table 5-7 (Elements of the) County of Kauaʻi General Plan **S = Supportive, N/S = Not Supportive, N/A = Not Applicable**	**S**	**N/S**	**N/A**
4.3 Agriculture			
A. Diversified agriculture, defined as products other than sugar and pineapple, is an industry that has strong potential to be a major force in the pursuit of the 2020 Vision for economic diversification. It is a particularly important time to encourage further development of the industry since the closure of Amfac's Līhuʻe and Kekaha sugar plantations is not a matter of "if" but a matter of "when". Further development of this industry is highly desirable because it keeps valuable agricultural lands in productive use. It also has the added benefit of preserving rural lands from development.	**X**		
4.4 High Technology			
A. Further development of the island's high technology sector would not only create new jobs, but would also provide Kauaʻi residents with, on average, higher paying jobs. Kauaʻi's high cost of living and dependence on the relatively low-paying service sector, increases the attractiveness of developing a strong high technology industry.			**X**
4.5 Supporting Businesses and Jobs for Kauaʻi Residents			
A. Support and encourage the development of a wide range of small businesses, including home-based businesses.	**X**		~~**X**~~
B. Eliminate unnecessary land use and other regulations, clarify regulatory requirements, and reduce the time for processing permit applications wherever possible.			**X**
C. Support small business by providing needed infrastructure to towns and urban centers.			**X**
D. Develop and support business and technical assistance programs.			**X**
E. Strengthen the public education system in order to equip Kauaʻi's children, teens, college students, and adults with the knowledge and skills needed to obtain a well-paying job or start a business.			**X**
F. Work with employers to provide career opportunities and training for local youth. Seek commitments from new or expanding businesses that they will actively recruit and train Kauaʻi residents for new jobs.			**X**
4.6 Land Supply for Commercial & Industrial Uses			
A. The County supports commercial and industrial development on appropriately zoned lands by providing the necessary infrastructure and services. Develop vacant lands with existing commercial and industrial zoning, to the extent feasible, before approving new commercial and industrial zoning.			**X**
B. Concentrate commercial and industrial development, particularly new shopping centers which attract a large amount of vehicular traffic, in Kauaʻi's major towns and job centers in order to minimize highway traffic and avoid urban sprawl and strip development. Concentrate commercial development in Līhuʻe, other urban centers, and in town centers. The County shall strive for a balance between meeting community shopping needs with new commercial development and supporting local small businesses in older business areas.			**X**
4.7 Airports			
A. The State Department of Transportation, Airports Division, operates two facilities on Kauaʻi: Līhuʻe Airport, the primary air terminal for the island; and Pt. Allen Airport, a general aviation airport with minimal facilities. Policies are to support improvements to Līhuʻe Airport as necessary to provide for the desired level of visitor industry development and the export of agricultural products to the mainland and to support centralization of State-owned helicopter facilities and operations at Līhuʻe Airport.			**X**
4.8 Commercial Harbors			
A. Kauaʻi's two commercial harbors, Nāwiliwili Harbor and Port Allen, are owned by the State of Hawaiʻi and operated by the State Department of Transportation (DOT), Harbors Division. Policies are to develop capital improvements to Nāwiliwili Harbor to support the future needs of cruise ships and cargo vessels, develop ground transportation facilities, pedestrian circulation improvements, and terminal facilities at Nāwiliwili Harbor that will accommodate 2,000-passenger cruise ships, develop shuttle and other transportation improvements to move people out of the Nāwiliwili Harbor area to various recreation, shopping and cultural attractions, and to integrate planning for commercial facilities and Nāwiliwili Beach Park with the harbor master plan.			**X**
4.9 Harbor Facilities			
A. Support improvements to Kīkīaola Harbor, in order to serve local fishing and recreation needs, to develop ocean-oriented businesses, and to serve as a cruise ship drop-off site. Encourage the development of parking and other facilities to expand the capacity of Port Allen Harbor and provide improved service. Support facilities expansion at Kukuiʻula Small Boat Harbor.			**X**

Table 5-7 (Elements of the) County of Kauaʻi General Plan S = Supportive, N/S = Not Supportive, N/A = Not Applicable	S	N/S	N/A
Discussion: Agriculture is one of the three developing industries identified by the CAC as having the greatest promise for future diversification of the Kauaʻi economy. Hawaiʻi Dairy Farms will keep valuable agricultural lands in productive use, and preserve the rural qualities of the region from undesirable urban development.			
5.0 Preserving Kauaʻi's Rural Character			
5.1.1 Basic Policy			
A. Enhance Urban Centers and Towns and maintain their identity by defining the Town Center and the edges of each Town. Concentrate shopping and other commercial uses in Town Centers. Encourage residential development within Urban and Town Centers and in Residential Communities contiguous to them.			X
B. Promote compact urban settlements in order to limit public service costs and to preserve open space.			X
C. Define and conserve Scenic Roadway Corridors along the roadways that connect Towns, Resort areas, and Residential Communities. These corridors are intended to conserve the open space between towns and to prevent sprawl and commercial strip development.			X
5.2 Agricultural Lands			
A. Lands included within the Agriculture designation shall be predominantly used for or held in reserve to be used in the future for agricultural activities. These activities include the breeding, planting, nourishing and caring for, gathering, and processing of any animal or plant organism, including aquatic animals and plants, for the purpose of producing food or material for non-food products; the commercial growing of flowers or other ornamental plants; the commercial growing of forest products; and the commercial breeding and caring for domestic animals and pets.	X		
B. The primary intent of the Agriculture designation is to conserve land and water resources in order to: (1) insure an excellent resource base for existing and potential agricultural uses; (2) assure a sufficient supply of land available for sale or lease at a cost that is economically feasible for agricultural enterprise; and (3) promote and preserve open agricultural lands as a key element of Kauaʻi's rural character and lifestyle, essential to its image as "The Garden Island" and to the continued viability and development of Kauaʻi's visitor industry.	X		
C. In administering zoning and subdivision regulations, the County shall seek to preserve important agricultural lands. Important agricultural lands include those designated "A" or "B" by the Land Study Bureau evaluation or "Prime" or "Unique" by the Agricultural Lands of Importance State of Hawaiʻi evaluation; provided that these ratings shall be superseded at such time as the State of Hawaiʻi officially maps and designates Important Agricultural Lands, as mandated in the State Constitution.	X		
D. Lands designated Agriculture shall include: important agricultural lands; lands in active agricultural use; lands with potential for agriculture, silviculture or aquaculture; and other lands not suited for urban development because of location, topography, economy of public services, or other purpose related to general health, safety and welfare.	X		
E. The secondary intent of the Agriculture designation is to provide an opportunity for Kauaʻi citizens to reside in an agricultural community. An "agricultural community" is an area that has both agricultural uses and residences. Typically, an agricultural community is established through subdivision of land and provision of roads and potable water service. Agricultural communities are generally located in outlying areas, do not have convenient access to County facilities, and may not receive the full range or highest level of County services such as are available to residential communities, towns, and urban centers.			X
F. The primary intent of the Agriculture designation shall take precedence over the secondary intent.	X		
G. To implement the Agriculture designation, specific controls on the subdivision and alteration of designated lands shall be formulated to prevent the dissipation of agricultural potential, the loss of rural character, and the dispersal of residential and other urban uses.			X
H. The following principles shall be applied in the development of an agricultural community: (1) maintain irrigation works and easements where feasible and beneficial to existing or potential agricultural uses within the site or downstream; and (2) preserve wetlands and streams and provide a riparian buffer area to prevent land disturbance and to filter runoff.	X		

Table 5-7 (Elements of the) County of Kauaʻi General Plan **S = Supportive, N/S = Not Supportive, N/A = Not Applicable**	**S**	**N/S**	**N/A**
5.3 Open Lands			
A. The intent of the Open designation is to preserve, maintain or improve the natural characteristics of non-urban land and water areas that: (1) are of significant value to the public as scenic or recreation resources; (2) perform essential physical and ecologic functions important to the welfare of surrounding lands, waters, and biological resources; (3) have the potential to create or exacerbate soil erosion or flooding on adjacent lands; (4) are potentially susceptible to natural hazards such as flood, hurricane, tsunami, coastal erosion, landslide or subsidence; or (5) form a cultural, historic or archaeological resource of significant public value.			X
B. Lands designated Open shall include: important landforms such as mountains, coastal bluffs, cinder cones, and stream valleys; native plant and wildlife habitat; areas of predominantly steep slopes (20 percent or greater); beaches and coastal areas susceptible to coastal erosion or hurricane, tsunami, or storm-wave inundation; wetlands and flood plains; important scenic resources; and known natural, historic and archaeological resources. Open shall also include parks, golf courses, and other areas committed to outdoor recreation.			X
C. Lands designated Open shall remain predominantly free of development involving buildings, paving and other construction. With the exception of kuleanas and other small lots of record, any construction that is permitted shall be clearly incidental to the use and open character of the surrounding lands.			X
5.4 Urban Land Uses			
A. One of the key policies in the Framework for preserving Kauaʻi's rural character is to promote growth and development in compact urban areas. Urban lands comprise only four to five percent of Kauaʻi's land area, leaving 55 percent in conservation and 40 percent in agriculture. This section sets policy for the following urban land use designations: Urban Center, Resort, Residential Community, Transportation, Military and Parks.			X
5.5 Scenic Roadway Corridors			
A. The purpose of designating Scenic Roadway Corridors is to conserve open space, scenic features, and views within and along Kauaʻi's most heavily-traveled routes. The policy of conservation recognizes the vital function of these roadways in meeting the public need for transportation. It also recognizes the legitimate desire of private landowners to make economic use of their lands. The intent of this policy is to establish basic principles for roadway design and land use within these scenic corridors and to provide a basis for County action to establish programs and regulations to implement them.			X
B. Scenic Roadway Corridors are primarily designated in areas between towns where the surrounding lands are primarily designated Agriculture and Open. Where a Scenic Roadway Corridor is designated within a town or adjoins an area planned for urban use, the primary intent is to promote setbacks, landscaping, and views of scenic features. Scenic Roadway Corridors are intended to provide design guidance but not to restrict the principal land uses of urban areas.			X

Discussion: The goals of the Hawaiʻi Dairy Farms are in accordance with the ideals set forth by the Kauaʻi General Plan (2000), as it insures a resource base for agricultural uses, promotes and preserves open agricultural lands as a key element of Kauaʻi's rural character and lifestyle, and preserves Important Agricultural Lands and "Prime" agricultural lands for the agricultural uses of the dairy farm.

	S	**N/S**	**N/A**
6.0 Enhancing Towns & Communities and Providing for Growth			
6.4 Kōloa-Poʻipū-Kalāheo			
A. Located on the sunny south shore, the Kōloa-Poʻipū-Kalāheo Planning District is home to Kauaʻi's largest resort destination as well as some of the most active agricultural businesses. Hotels and resort condominiums are centered around the beaches and golf courses of Poʻipū. Visitors are drawn to bicycling and ocean recreation activities, as well as attractions such as the Allerton Gardens at Lāwaʻi Kai, the historic towns. Large- and small-scale agricultural activities are located principally in the sunny, well-irrigated coastal lands makai of Kūhiō Highway. Corporate agriculture operations, such as the A&B coffee plantation and the seed corn facility, are located in the area west of Kukuiʻula and the area south and east of Kōloa. Smaller farms and private agricultural parks occupy leased lands throughout the region. Range-fed cattle and other livestock are raised on the pasturelands around Lāwaʻi and Kalāheo, as well as on lands further mauka.	X		

Table 5-7 (Elements of the) County of Kauaʻi General Plan **S = Supportive, N/S = Not Supportive, N/A = Not Applicable**	**S**	**N/S**	**N/A**
6.4.3 Issues & Opportunities			
A. Māhāʻulepū. Grove Farm has proposed low-scale resort development extending east from the Hyatt Regency to Māhāʻulepū, mauka of the shoreline area (which lies in the State Conservation District). Significant archaeological, historic and natural features are located in the shoreline area. The lands proposed for development are designated Open and Agricultural on the General Plan Land Use Map. Grove Farm has outlined the land areas proposed for re-designation but has not proposed any specific development or number of visitor units. Access to the Māhāʻulepū and Kawailoa Bay beaches is currently allowed over unpaved canehaul roads, and use by both residents and visitors is increasing. Grove Farm's proposal calls for preserving significant cultural and natural resources, setting aside the shoreline area as a natural resource park, and improving public access to the shoreline. Community and environmental groups have expressed concern that development would lead to overuse and degradation and loss of special natural resources. They value the scenic qualities of the area and question the need to extend resort facilities further along the southern shoreline.	X		
B. Wastewater Disposal. There is no County wastewater system serving the Kalāheo-Kōloa-Poʻipū Planning District. Currently, 13 privately-owned treatment plants serve the resort developments in Poʻipū. All but one dispose of effluent using injection wells. As these systems age, they are subject to failure. In addition, County septage pumping logs reveal that Kōloa Town, Lāwaʻi Town and Lāwaʻi Estates have chronic problems with failed individual wastewater systems (septic tank or cesspool). Alexander & Baldwin has developed a 1.1 mgd aerated lagoon plant to serve the Kukuiʻula project and Kōloa Town. It could be converted into a County regional plant, serving the entire Poʻipū area, but this would be expensive. What should be the long-range plan for wastewater treatment and disposal in this growing resort area?			X
6.4.4.2 Policies			
A. Māhāʻulepū. Involve the community in planning for the future of Māhāʻulepū. Planning should take into consideration various interests and factors, including but not limited to: the long-term need for managing Māhāʻulepū lands to preserve their significant natural and cultural features; the owner's desire to develop revenue-producing uses in a way that is sensitive to the area's unique qualities; the need to secure permanent public access to the shoreline; and the potential to create a coastal park.			X
B. Māhāʻulepū. This area needs a community-based planning effort that engages the landowner and local community interests, drawing upon the County government, the State DLNR, and various professional experts, as needed. Options for the area include some development in exchange for a park and/or preservation areas; or purchase of the land for a State park.	X		~~X~~

<u>Discussion:</u> Hawaiʻi Dairy Farms supports the County's policies related to improving Kauaʻi's towns and communities and providing for growth, these are not directly applicable to the proposed project. The dairy farm represents a sustainable revenue generating operation on the inland Important Agricultural Land, and is generally supportive of these policies with community engagement throughout its planning process. Long-term operation of the dairy does not preclude the future potential for a coastal park at Māhāʻulepū.

7.0 Building Public Facilities and Services			
A. In order to preserve rural character and provide for growth in jobs, businesses and households, the County will need to support development within planned urban centers and residential communities. Building basic services involves both the County and State governments. The services include Regional Highways and Roads, Bus Transit, Bikeways, Water Supply, Wastewater Treatment, Drainage and Flood Control, Electrical Power, Solid Waste, Parks and Recreation, Police and Fire Safety, and Schools.			X
7.4 Water Supply			
A. In general, Kauaʻi's municipal water systems have adequate source and storage capacity to support the existing maximum water demand and provide storage for fire emergencies. Many systems, however, operate at or near capacity. As a result, DOW places certain operational restrictions on requests for new service. In order to accommodate future growth, most of the water systems would need to be expanded.			X
7.5 Wastewater Treatment			
A. Wastewater treatment varies from community to community. The County provides service to a few communities; other communities and larger developments have private treatment systems; and many residents and businesses rely on Individual Wastewater Systems (IWSs) – i.e., cesspools and septic tank systems. In general, wastewater disposal is adequate and does not pose a significant public health or			X

Table 5-7 (Elements of the) County of Kauaʻi General Plan S = Supportive, N/S = Not Supportive, N/A = Not Applicable	S	N/S	N/A
environmental threat. The State Department of Health (DOH) regulates the operations of both County and private wastewater systems. The effluent of most County and private plants is used for irrigation. Service needs include a few areas of Kauaʻi that have failing individual IWSs, but commercial pumping services keep these from becoming a significant problem. The Water Quality Management Plan for the County of Kauaʻi (November 1993) discusses the need to create a regional system serving Kōloa Town, which has subsurface disposal problems, and Poʻipū, where smaller visitor properties and residences are currently served by a variety of small private plants. Because these plants dispose of effluent by ground injection, there is a long-term risk of polluting adjacent ocean waters. The long-range concept is for the County to develop the regional system by expanding the Kukuiʻula sewage treatment plant and assuming responsibility for plant operation. Effluent disposal is a critical factor hindering development of a regional system.			
7.6 Drainage and Flood Control			
A. Kauaʻi Vision 2020 (Chapter 2) describes a future in which “Kauaʻi streams run freely in their natural courses... Because of careful land management, Kauaʻi is free of concrete-lined drainage channels.” The Vision and the policy statements that follow describe Kauaʻi’s present situation as well as goals for the future. Policies include: (a) Establish zoning and subdivision regulations that (1) strictly limit development on lands that are steeply-sloped and/or have highly erodible soils, in order to prevent flooding, landslides and nonpoint pollution; and (2) strictly limit development on shoreline lands within coastal flood hazard areas or susceptible to shoreline erosion. (b) Focusing on the most heavily impacted urban watersheds, evaluate flooding and erosion risks and develop long-range plans for drainage and flood hazard management. Establish an ongoing program to clear streams and drainageways and maintain their capacity to accommodate stormwater flows. (c) Establish erosion control and drainage regulations that incorporate best management practices for controlling nonpoint source pollution. (d) Regulations and drainage improvements shall be consistent with the following principles: (1) Use natural drainageways for storm runoff waterways wherever possible. (2) Avoid channelization or alteration of natural drainageways. (3) Avoid diversion of storm runoff from one basin to another. (4) Do not replace natural drainageways with structured, closed systems, except at road crossings. (5) Require detention basins in new developments, in order to maintain predevelopment stormwater flow rates. Requirements shall be based on the two-year storm but may be increased. (6) To conserve land, develop detention basins in conjunction with park or open lands and design for multiple uses. (7) Protect buildings from the 100-year flood. (8) Where there are no downstream drainage systems or if the downstream systems lacks sufficient capacity, require retention facilities sufficient to maintain 100-year storm flows at pre-development rates and conditions.			**X**
7.8 Solid Waste			
A. The following general policies apply to solid waste management on Kauaʻi. Specific policies to guide solid waste programs should be provided in the long-range SWMP. (a) Using long-range integrated resource planning, the County shall manage an islandwide system of solid waste collection, reuse, recycling and disposal that (1) is environmentally sound and cost-effective; (2) increases diversion of waste from the island’s landfill(s); and (3) provides for the timely and orderly expansion of solid waste facilities. (b) Through a multi-faceted program of education, management measures, and financial incentives, the County shall support and stimulate Kauaʻi businesses and residents to reduce their solid waste generation and increase the reuse and recycling of materials. (c) The County shall incorporate entrepreneurial principles in managing solid waste, involve private businesses, and support market-oriented innovations and initiatives. Among other options, the County shall consider opportunities for utilizing the waste stream for energy generation..			**X**

Table 5-7 (Elements of the) County of Kauaʻi General Plan S = Supportive, N/S = Not Supportive, N/A = Not Applicable	S	N/S	N/A
Discussion: Hawaiʻi Dairy Farms supports the County's policies related to improving Kauaʻi's public facilities and services, development of pasture will help reduce stormwater runoff and soil erosion through best management practices and improved grass and soil conditions.			
8.0 Improving Housing, Parks and Schools			
8.1 Housing			
A. Following are policies to guide housing and community development programs on Kauaʻi. (a) Increase the supply of affordable rental housing, as indicated by market conditions. (b) Increase opportunities for moderate- and low-income households to become homeowners. Work from the bottom up, serving the 35 percent of residents whose income is 80 percent of the median or less. The intent is to move families out of expensive rental subsidy programs into homeownership, developing housing at a very low cost through self-help programs and reduced-rate mortgage financing. (c) Acquire and bank land and infrastructure improvements for future housing development. (d) Support the development of housing and support services for elderly and special needs groups, including persons with disabilities, the homeless, and other at-risk populations needing shelter and rehabilitation programs. (e) Reserve the program income from the HOME and CDBG disaster grants to fund housing and community development projects. Use the Housing and Community Development Revolving Fund to finance projects and maintain capital. (f) Continue to prepare and adopt a five-year Consolidated Plan and one-year Action Plans, with community participation. (g) Continue to partner with for-profit and nonprofit organizations in order to provide the highest level of housing and community development assistance possible. (h) Develop a flexible planning process for housing programs that monitors current real estate and socio-economic conditions and allows the County to make timely changes in strategy and resource allocation. (i) Develop an Affordable Housing Program to standardize the application and administration of affordable housing requirements within the County of Kauaʻi.			X
8.2 Parks and Recreation			
8.2.3 Policy			
A. (a) Develop and maintain Kauaʻi's parks to meet the needs of the island's various communities and of both residents and visitors. (b) Provide convenient access to all of Kauaʻi's beaches and inland recreation areas. (c) Provide for the safe and secure use of public parks and recreation facilities. (d) Give high priority to improving maintenance of grounds and comfort stations. (e) Give high priority to acquiring and developing additional beach parks and community or neighborhood parks in communities that are under-served or experiencing growth. Consider community concerns in all planning efforts. (f) Provide for flexibility in administering the park dedication requirements, so that developer land dedication or fee payments result in a usable park complete with facilities. Create new parks through County-developer partnerships.			X
8.3 Education			
8.3.1 Policy			
A. Since public education is a State responsibility, the County's role is to support excellence in schools through youth programs and other efforts. The availability of adequate school facilities is a concern that the County must address with the DOE in considering the location of new development. (a) Strive for a strong education system which provides Kauaʻi's children, teens, college students, and adults with the knowledge and skills needed to obtain a well-paying job on Kauaʻi. (b) Approve new residential developments only after the State DOE certifies that adequate school facilities, either at existing schools or at new school sites, will be available when the development is completed. (c) Have developers pay their fair share of all costs needed to ensure provision of adequate school facilities for the children living in their developments.			X

Table 5-7 (Elements of the) County of Kauaʻi General Plan S = Supportive, N/S = Not Supportive, N/A = Not Applicable		S	N/S	N/A
(d)	Consider schools as community resources for learning about specialized environmental, cultural, and historic subjects related to Kauaʻi and each of its communities. Schools should also assume important community functions such as recreational centers, meeting facilities, and emergency shelters.			
Discussion: Hawaiʻi Dairy Farms supports the County's policies related to improving Kauaʻi's housing, parks, and schools, however, they are not directly applicable to the Proposed Project.				
9.0 Implementation				
A.	Initiating zoning map and development code amendments to conform to the policies of the General Plan			X
B.	Undertaking planning for infrastructure systems and facilities, parks and housing in order to guide public investment in support of the vision and policies of the General Plan			X
C.	Recommending approval, approval with modifications or denial of developments seeking zoning or other land use permits, based on their conformance to GP policies and how well they support the vision for Kauaʻi's development;			X
D.	Preparing development plans for Kauaʻi's various communities in collaboration with community coalitions;			X
E.	Developing indicators and reporting progress on achieving General Plan vision and policies; and			X
F.	Conducting a comprehensive review of the General Plan every 10 years and recommending revisions as necessary			X
Discussion: Hawaiʻi Dairy Farms supports the County's policies related to implementing and reviewing progress on Kauaʻi's General Plan and related policies, however, these actions are not directly applicable to the Proposed Project.				

5.11 COUNTY OF KAUAʻI COMPREHENSIVE ZONING ORDINANCE

The purpose of the CZO is to regulate land use in a manner that will encourage development in accordance with the Kauaʻi's scenic beauty and rural character, and to prevent any inadequate, harmful or disruptive conditions that may be detrimental to the well-being of Kauaʻi residents. The CZO carries out adopted land use policies, including the County of Kauaʻi General Plan and development plans. These standards are applicable to the location, height, bulk and size of structures, yard areas, off-street parking facilities, and open spaces, and the use of structures and land for agriculture, industry, business, residences or other purposes.

The County of Kauaʻi adopted the Comprehensive Zoning Ordinance in September 1, 1972, and is currently updating the CZO in two phases. The first phase will adopt Ordinance No. 935, the newly adopted zoning code for the County of Kauaʻi, and is serving as the official zoning code until the County of Kauaʻi completes the second phase. The CZO regulates ag ~~[EXPAND W/OVERVIEW of AG ZONING]~~ (agricultural) zoning: lands designated to be used for or held in reserve to be used in the future for agricultural activities (including the purpose of producing food). The project is in ag zoning and produces food, therefore the project is in keeping with County of Kauaʻi zoning.

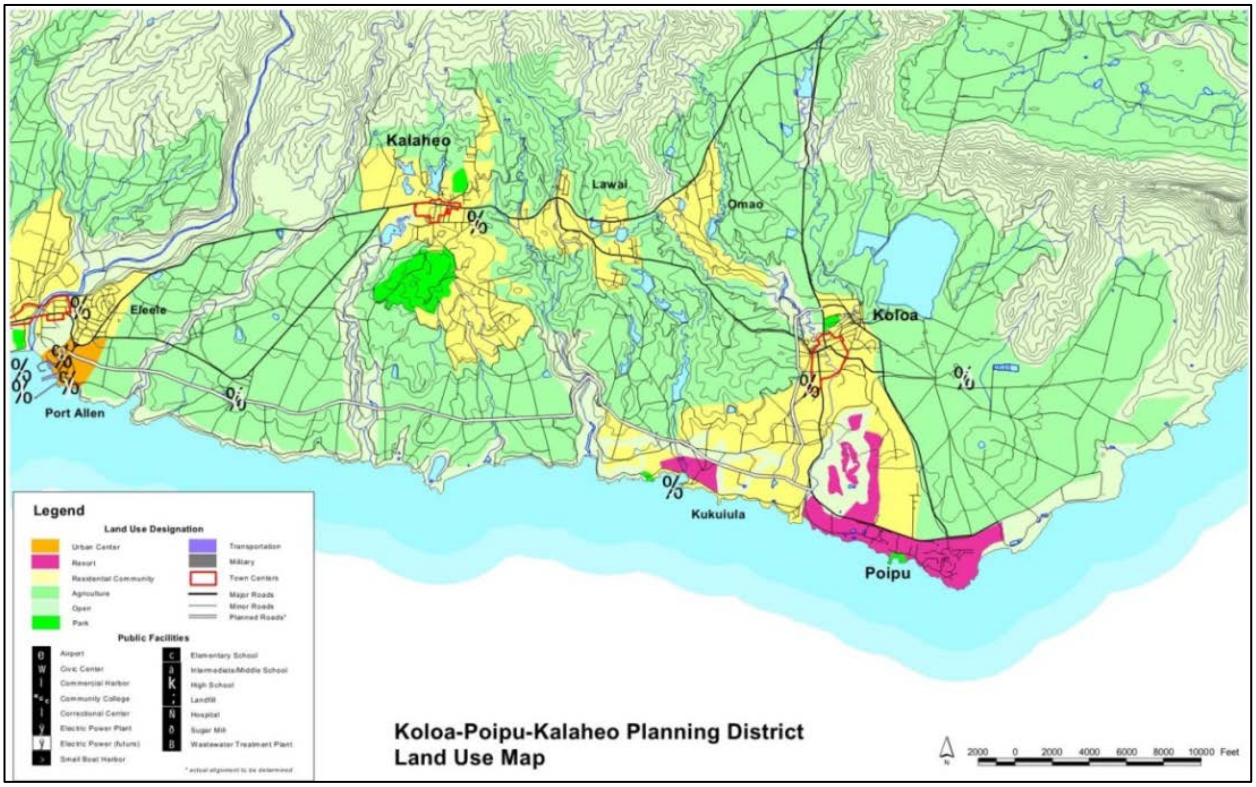


Figure 5.11-1 County of Kauaʻi Land Use Map – Kōloa-Poʻipū-Kalaheo Planning District

__**Discussion:**__ The subject property is designated as agriculture by the County of Kauaʻi *(Figure 5.12-1)*. The purpose of the Agricultural district is to both protect and accommodate existing and potential agricultural needs. The zoning designation also serves as a means to limit and control the dispersal of residential and urban use on agriculturally viable lands. Hawaiʻi Dairy Farms is consistent with the permitted land uses under the ordinance.

5.12 COUNTY OF KAUAʻI – SPECIAL MANAGEMENT AREA

The Hawaiʻi State Coastal Zone Management Program (CZMP) was enacted by Hawaiʻi Revised Statutes 205A – Hawaiʻi Coastal Zone Management Act (CZMA), as a requirement of the National Coastal Zone Management Program of 1972. The program provides policy guidance for development activities as they relate to coastal land and water resources. The entire land area of the State of Hawaiʻi has been determined to be within the Coastal Zone as defined by the CZMA.

The Special Management Area (SMA) permitting system is part of the CZM Program approved by Federal and State agencies. When CZM, first became law in 1975, the legislature established the SMA regulatory function at the county level, and the Kauaʻi Planning Commission is the authoritative agency in the County of Kauaʻi. Based on SMA maps of the region, the site area is located outside the Special Management Area (SMA) *(Figure 5.13-1).*

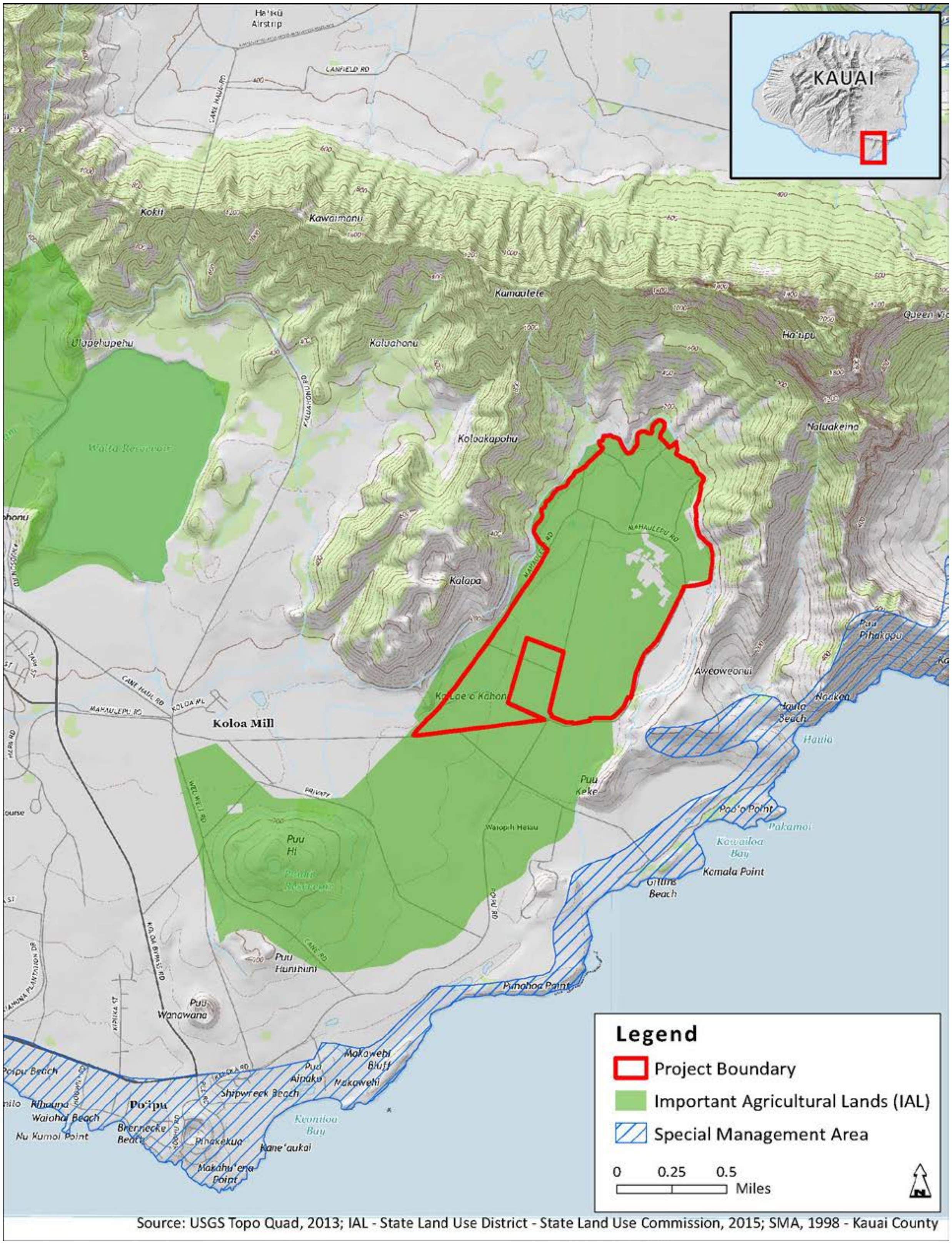


Figure 5.12-1 Special Management Area in Vicinity

5.13 COUNTY OF KAUAʻI –SOUTH KAUAʻI COMMUNITY PLAN

The previous regional planning document, the 1978 Kōloa-Poʻipū-Kalaheo Development Plan, was adopted by the County Council in 1983. This has since been replaced by the 2015 South Kauaʻi Community Plan (SKCP 2015). The 2015 SKCP serves to update and supersede the maps and land use policies found in the previous development plan.

Table 5-8 County of Kauaʻi – Kauaʻi South Community Plan **S = Supportive, N/S = Not Supportive, N/A = Not Applicable**	**S**	**N/S**	**N/A**
The South Kauaʻi Community Plan released in July 2015 updated maps and land use policies for the region. The guiding principles of the plan are:			
1) Watershed Management	**X**		
2) Cultural Stewardship and Interpretation	**X**		
3) Hazard and Climate Risk Management	**X**		~~**X**~~
4) Compact Walkable Neighborhoods			**X**
5) Multi-modal Transportation System			**X**
6) Sustainable Resorts and Tourism			**X**
7) Economic Development Opportunities	**X**		
8) Diversity of Housing Types			**X**
9) Public Infrastructure and Facilities			**X**
<u>Discussion:</u> The County of Kauaʻi South Kauaʻi Community Plan serves to guide development in the southern Kōloa-Poʻipū-Kalaheo-ʻOmaʻo-Lawaʻi region of Kauaʻi, and the policies are reflected in the Community Plan Land Use Map (Figure 5-13.1). Watersheds will be protected through sustainable practices in accordance with county, state, and federal guidelines, cultural resources will be identified and protected per HRS Chapter 6E Historic Preservation requirements. The agricultural use of the dairy project is consistent with the agricultural designation per the South Kauaʻi Community Plan Land Use Map, and will continue Kauaʻi's longstanding policy of preserving agricultural lands as a valuable resource base. Use of the site for dairy operations does not preclude future conservation use of the wider region, such as examined by the U.S. National Park Service (NPS, 2008) reconnaissance study (EIS Section 4.26.4). The reconnaissance study's recommendation for authorization of a Special Resource Study included "so long as it focuses on non-traditional management alternatives that a) involve local partners and b) include options for continued farm and ranch operations on private agricultural lands".			

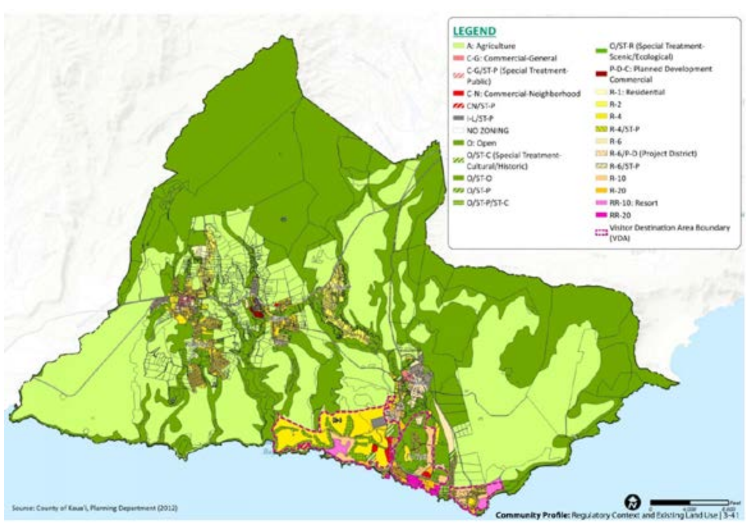


Figure 5.13-1 County of Kauaʻi Development Plan Map (2012)

6.0

ALTERNATIVES TO THE PROPOSED ACTION

6.0 ALTERNATIVES TO THE PROPOSED ACTION

6.1 ALTERNATIVES ANALYSIS OVERVIEW

This chapter evaluates alternatives that could attain the objectives of the action's purpose and need, and compares environmental benefits, costs, and risks of each reasonable alternative against those of the proposed action. Additionally, reasonable land use alternatives that emerged from public input during the project scoping phase are documented and briefly discussed. The alternatives that do not meet the project purpose are not advanced for analysis of environmental benefits, costs, and risks. The Environmental Impact Statement Rules, Hawaiʻi Administrative Rules Chapter 11-200 (HRS 11-200) requires a discussion of alternatives that could attain the objectives of the action, regardless of cost. There is no requirement for the alternatives analysis to consider every possible land use.

Four alternatives that do not meet the project purpose are discussed. Two of those alternatives would not be viable given existing zoning and private land tenure: rezoning the land for resort or residential development; or a potential conservation condemnation. These two uses are examined and eliminated from analysis. Two additional alternatives were considered as reasonable land uses as they could be permitted within the existing State Land Use Agricultural District and County Agricultural Zoning District. These options include an Agricultural Park with Processing Center, and development of an Agricultural Subdivision. The alternatives are examined but eliminated from further analysis, as they would not fulfill the project purpose.

The analysis, therefore, focuses on alternatives that meet the project purpose. Rigorous exploration and evaluation of the environmental impacts of the alternatives, including those that might enhance environmental quality or avoid, reduce or minimize some or all of the adverse environmental effects, costs and risks. These alternatives include: (1) the development of a Conventional Feedlot Dairy (a non-pasture-based dairy) at the same location; (2) development of the Pasture-Based Dairy at an Alternative Location on Kauaʻi; and (3) milk products processing by HDF. The alternative of "No Action" is also evaluated.

6.2 ALTERNATIVES CONSIDERED AND ELIMINATED

Among the possible land uses which were considered in the initial alternatives analysis, several options would not meet the project purpose for Hawaiʻi Dairy Farms. Two potential options would be rezoning the land for resort or residential development, or condemnation to establish a conservation area. These options would not be reasonably viable given the existing private land tenure and existing zoning, as discussed in Section 6.2.1.

Two additional alternatives were considered in Section 6.2.2 as reasonable land uses that could potentially be permitted within the existing State Land Use Agricultural District and County Agricultural Zoning District. These options include Agricultural Park with Processing Center, and Agricultural Subdivision Development. These alternatives were examined and eliminated from further analysis, however, as they would not fulfill the project purpose.

6.2.1 NON-VIABLE ALTERNATIVES

Two alternative land uses considered but discarded from further analysis in this EIS include those that are not viable given private land tenure and zoning: a) land development for resort or residential, requiring rezoning; and b) conservation condemnation. A brief description of these alternatives eliminated from further analysis in this EIS follows:

a. Non-Viable Alternative: Rezoning Land for Resort or Residential Development

Under Hawaiʻi's land use law (Hawaiʻi Revised Statutes Chapter 205), permissible uses are defined within the various use districts. Development for resort or residential zoning on Agricultural lands would require rezoning. Important Agricultural Lands have further restrictions from rezoning for other uses. The County of Kauaʻi directs land use through its General Plan and Communities Plans; the designation for the Māhāʻulepū Valley region is Agriculture, with growth areas identified elsewhere on the island. For these reasons, development for resort or residential is not considered a reasonable alternative for this EIS, and is eliminated from further analysis.

b. Non-Viable Alternative: Conservation Condemnation

Legislative efforts supported by facets of the community have previously suggested that government create a state or national park in the Māhāʻulepū region for conservation and public uses in perpetuity. The process whereby government could take private lands is referred to as condemnation, which can occur when a local, state, or federal government seizes private property and compensates the owner. The power of the government to do this is called eminent domain, which essentially means the government takes private property for public use. With the subject HDF site on Māhāʻulepū farm lands, the public condemnation of the 557 acres of Important Agricultural Land could eliminate the potential future use for crop production or livestock farm use. This action would be contrary to the stated policies of the State of Hawaiʻi and County of Kauaʻi which designate this land for long-term food production to sustain the people of Kauaʻi.

6.2.2 AGRICULTURAL PARK AND PROCESSING CENTER ALTERNATIVE

The Agricultural Park Alternative would convert this agricultural property into active crop cultivation for one or several crops, including the development and operation of an agricultural products processing center.

Grove Farm created Mahaulepu Farm, LLC, to enact a long-term vision for Māhāʻulepū Agricultural Valley as a flagship sustainable agricultural area. The intention of the initiative has been to "grow what Kauaʻi eats". Mahaulepu Farm has planned an agricultural valley that encompasses about 800 acres of food crops. Portions of the Māhāʻulepū lands are currently in use for taro cultivation, fruit trees, small crops, ranching and, formerly, seed cultivation. The proposal for a pasture-based dairy (proposed action) would be consistent with the landowner's and County's vision for local food production, as would be the alternative for the cultivation of food crops.

Grove Farm has explored the feasibility of growing a variety of produce crops at Māhāʻulepū for local consumption. The long-range plan called for about 300 acres at Māhāʻulepū to be used to grow taro, with the rest of the valley to be dedicated to raising other edible produce. For years, Grove Farm has worked with the University of Hawaiʻi and consultants to pursue an implementation plan. Operations established through the agricultural park offering include Haraguchi Taro Farms, a banana farm and beef cattle grazing.

Apart from the past efforts of the landowner to pursue this approach without success, the Agricultural Park Alternative is examined as a future option. With the Important Agricultural Lands designation, and the existing soils ratings and rainfall conditions, these lands pose some potential suitability to raise a variety of food crops. It would be expected that the Agricultural Park would focus on truck crops with commercial viability. As a farming business, this could be organized under a single business entity or possibly arranged as an agricultural business cooperative. It is recognized that there are many variable and requirements involved with agribusiness development (e.g. land tenure/lease, irrigation water supply, irrigation systems, soil conditions, crop growth, field management, products processing, markets/shipping). The potential details for the agribusiness structure and finance are not evaluated herein. Each of these factors must be satisfied to establish a viable long-term farming venture.

The Agricultural Park and Processing Center Alternative would involve intensive cultivation. Approximately 557 acres could be divided into multiple farming operations, which would share in the development and operation of an Agricultural Processing Center. The Agricultural Park operations could follow examples set by the larger produce farms in the state. Farms operating in ʻEwa and Central Oʻahu currently raise a range of produce crops, including: green onions, pak choy, choy sum, kai choy, daikon, radish, zucchini, won bok (Chinese cabbage), apple banana, herbs (mint, basil, chives, chinese parsley, lemon grass), sweet onion, eggplant (long), Japanese cucumber, long beans, string beans, paria leaf (bitter melon leaf), camote leaf (potato leaf), head cabbage, cantaloupe, honeydew, sunburst, broccoli, sweet corn, pumpkin, squash and watermelon. It is not known which truck crops could be successfully cultivated at the Māhāʻulepū location. This would require field trials to prove the actual growing conditions to cultivate produce crops at a commercially viable scale.

In support of the Agricultural Park crop production and marketing, an on-site agricultural products processing facility would be developed to serve as the center for the farm operations. The facility would provide sorting, cleaning, washing, packaging, storage, refrigeration and transshipment of the agricultural products. Development of a 15,000- to 20,000-square foot Packaging Facility would include office space, supply rooms, equipment maintenance shop, backup power generator, restrooms, equipment yard and worker parking.

Anticipated Environmental Impacts - Agricultural Park and Processing Center Alternative

Although this alternative scenario would not meet the project purpose, a summary of anticipated environmental impacts is provided.

Intensive cultivation operations of an Agricultural Park would require a conservation plan utilizing Natural Resources Conservation Service technical guidance to document farm-wide objectives and define best management practices. Depending upon the extent of site-specific operational controls, the possibility of bare and tilled soils from intensive cultivation could lead to soil loss and resulting surface water quality impacts ~~consistent~~. Even with efforts to protect soils with ground cover and runoff control, erosion of farmland soils commonly occurs from large agricultural lands on Kaua'i. Surface water quality would be degraded through fertilizers and pesticide constituents in stormwater runoff. Depending upon surface water quality effects, there could be measurable downstream effects to ocean water quality in the nearshore area.

The Agricultural Park and Processing Center Alternative would not be anticipated to generate adverse impacts to climate, topography, groundwater, land use, views, flora and fauna species, natural hazards and public services. There would be no adverse effect upon archaeology or cultural resources, with no affect to resources within the farm limits.

With the Agricultural Park and Processing Facility Alternative, there would be some limited effect on roadways and traffic, noise, air quality, hazardous materials, and agricultural infrastructure. Trucks and worker vehicles would access the agricultural park each day, along with shipments of agricultural products and faming supplies. These vehicles would generate noise along local area roadways, and cause dust generation along the farm roadways. Use of hazardous materials would occur, primarily fuels and lubricants for farm equipment and required agricultural chemicals (pesticides, herbicides, fungicides).

The Agricultural Park and Processing Facility Alternative would include farm worker employment for field and processing facility operations. Use of these lands for agricultural cultivation crops would generate lease rent of $300/acre/year for the landowner. Depending upon the types of crops raised, extent of on-site processing and markets for products, the farm could generate over $150,000/year in gross lease rent. The Agricultural Park operations would produce modest positive economic effects through employment, expenditures and State and County tax revenues.

There would be limited substantial cumulative or secondary effects associated with the Agricultural Park and Processing Facility Alternative, potentially long term cumulative surface water effects from suspended soils and farming chemicals in storm water runoff. No irreversible or irretrievable commitments of resources would be anticipated.

Conclusion of Alternative Evaluation. This alternative does not meet the purpose and need of the proposed action. The alternative does not fulfill the need for a new agricultural model, and does not provide a ~~critical~~ source ~~of protein~~ nutritious milk for the people of Hawai'i who are vulnerable to supply disruption. This alternative was not advanced for further evaluation.

6.2.3 AGRICULTURAL SUBDIVISION

The Agricultural Subdivision Alternative would involve the development of land that is currently designated by the land owner and County as IAL. To develop an agricultural subdivision, action would be required to rescind the IAL designation with applicable County real property tax implications. This action would clearly contradict the intention of Grove Farm in its prior initiative to designate the land into long-term productive agricultural function, and the potential to abandon the conversion to urban land classification or subdivision for farm dwellings. For the purpose of this evaluation of alternatives, the creation of an Agricultural Subdivision was assessed.

The County of Kauaʻi Comprehensive Zoning Code (CZO) (Ord 935) specifies allowed uses of Agricultural zoned land, as outlined below for the purpose of calculating the number of agricultural lots and residential densities. Provisions under Sec. 8-8.2 Agricultural District Development Standards state the permitted residential densities shall be calculated as follows:

(1) One (1) dwelling unit for each parcel one (1) acre or larger.

(2) One (1) additional dwelling unit for each additional three (3) acres in the same parcel, provided that no more than five (5) dwelling units may be developed on any one (1) parcel.

Provisions under Sec. 8-8.3 Limitations on Subdivisions of Parcels in Agricultural Districts states that contiguous lots or parcels of record in common ownership existing prior to or on September 1, 1972, larger than three hundred (300) acres, may be subdivided only in accordance with the following criteria:

(A) a maximum of seventy-five (75) acres may be subdivided into not more than ten (10) parcels, none of which shall be smaller than five (5) acres.

(B) an additional twenty percent (20 percent) of the total parcel area or three hundred (300) acres, whichever is less, may be subdivided into parcels, none of which shall be smaller than twenty five (25) acres.

Following the County of Kauaʻi CZO allowances, the potential development of the 557-acre site into an Agricultural Subdivision would be calculated as follows:

- 75 acres: Five parcels of 15 acres, yielding 5 homes per parcel, with 25 homes total.
- 111 acres: Four parcels of minimum 25 acres, with 5 homes per parcel, 20 homes total.
- 371 acres: Agricultural land (either integrated with large parcels or separate farm area).

The CZO would allow for the development of a total of 45 homes (farm dwellings) under the Agricultural Subdivision Alternative. Each home would be required have agricultural operations within the property to generate revenue to the occupant of the farm dwelling. It is estimated that roughly 45 acres would be dedicated to the farm dwellings and surrounding accessory uses, another 12 acres dedicated to roadways and drainage, and approximately 371 acres of active agriculture and a central processing facility would be developed. The individual farm lots would also develop agricultural uses on their lands, such as grazing, fruit trees, or intensive cultivation. The farming operations could be conducted on individual lots, or potentially organized under a common farming management entity for uniform crop production across agricultural production zones on each lot, served by a centralized farm processing operation. An overall agricultural plan would be formulated, requiring review and approval by the State of Hawaiʻi Department of Agriculture and County Planning Commission.

With the agricultural subdivision alternative there would be substantial needs for supporting infrastructure such as access roadways, potable water supply, fire protection, defined drainage courses, and agricultural support areas/buildings. Individual wastewater systems (septic tank, infiltration disposal field) would be allowed for these homes. Since the development would be approximately 45 homes, this could necessarily trigger the need for a consolidated wastewater treatment system and injection well or irrigation disposal system, along with HRS Chapter 343 compliance for EA/EIS preparation and supporting technical studies. With no consolidated treatment and disposal facility, the 45 homes would necessarily be serviced with on-site individual wastewater systems, pending DOH consent.

Anticipated Environmental Impacts - Agricultural Subdivision Alternative

Although this alternative scenario would not meet the project purpose, a summary of anticipated environmental impacts is provided.

With the development of 45 farm dwellings there would be short-term impacts associated with the construction phase of the agricultural subdivision alternative. The short-term impacts would include effects due to soil disturbance, runoff and erosion, dust generation, construction noise, worker vehicles and truck traffic, and vehicle and truck emissions. Development of the internal roadways and support infrastructure (e.g. drainage system, water supply, sewers, electrical and communications) would be substantial to serve the 45 house lots. The individual farm lots would also develop agricultural uses across the majority of their lands, with potential for grazing, fruit trees, and intensive cultivation. There would be construction phase mitigation, such as NPDES construction best management practices, required to limit site development impacts. The construction phase employment associated with the development of the 45 homes would benefit Kauaʻi construction workers. Associated equipment and materials purchases would also generate business sales and State tax revenues.

Over the long term, there would be potential long-term impacts associated with operations of the agricultural subdivision alternative. The occupants of the subdivision would generate the traditional types of impacts associated with a low density 45-home agricultural lot development. Water use for domestic and agricultural purposes would be significant. Potable water use is estimated at 500 gallons per day (gpd) per residential unit, with a total daily demand of 22,500 gpd. Depending upon the type of crops, the 371 acres of farmland would require agricultural irrigation of 2,000 to 3,000 gpd per acre, totaling 742,000 to 1.1 million gpd. Wastewater generation from the subdivision would be substantial, estimated at roughly 500 gpd per unit or 22,500 gpd. Individual wastewater systems (IWS) may not be approved ~~as~~ at the site, which would require construction of an onsite sewage collection system and conveyance to a consolidated wastewater treatment facility for treatment and disposal. Disposal from the wastewater treatment plant would be comparable to the ~~over 100~~ approximately 120 private wastewater injection wells ~~associated with small package plants~~ serving the residential, commercial and resort areas in the Kōloa and Poʻipū communities. Alternatively, it is possible that agricultural irrigation reuse of treated effluent could be pursued for application on certain agricultural crops, with required 30-day effluent storage ponds and back-up effluent injection disposal during prolonged rainy weather periods. The agricultural subdivision could create measurable downstream effects to surface water and nearshore ocean water quality.

Archaeological resources on the site consist of historic agricultural structures (culverts, bridges, and retaining wall). Archaeological resources identified within 1,000 meters of the site's northern boundary include two pre-Contact sites that may have been used for ceremonial purposes: an enclosure; and boulders with petroglyphs. The archaeological resources could be altered or removed with the development of drainage system for the 45-unit agricultural subdivision. The residential use would bring people to the foot of the Hāʻupu slopes and ridges, allowing more access to hikers and hunters and thereby creating a potential for adverse effects to these sensitive sites surrounding the potential development. The nearby coastal area would likely receive more pressure on fishing and resource gathering.

Additional employees for the agricultural subdivision would generate additional worker vehicle trips and truck trips on local roadways. It is estimated that 5 to 10 employees could be involved in the new farming operations at the agricultural subdivision, on individual farm leases or larger scale common area farm(s). Farm supplies and product shipments from the agricultural subdivision would involve daily deliveries and truck trips. Vehicle noise and air emissions would increase due to the added vehicle and trip trips on local roadways.

Approximately 135 to 180 people would live in the new agricultural subdivision. Residents would travel on local roadways to reach places of employment, shopping, schools and recreational activities. Traffic associated with the 45 agricultural subdivision homes would add a significant number of vehicles on local roadways. It is estimated that up to 68 to 90 peak period vehicle trips could be generated from residents and workers associated with the agricultural subdivision. Most residents of the agricultural subdivision would not be farmers, and they would travel to and from employment locations in Poʻipū, Kōloa and Līhuʻe.

It is estimated that between 45 to 68 school-aged children would live at the agricultural subdivision, placing a new demand on local area public school facilities, libraries and park facilities. The agricultural subdivision would place new demands on County public services such as fire protection, police protection, and emergency medical services. The County of Kauaʻi would need to make provisions to serve this new subdivision development, with offsetting fee contributions from the subdivision developer.

The agricultural subdivision will require substantial electricity use for the 45 homes and agricultural processing operation. This energy demand could be partially offset by on-site solar energy generation by individual homeowners. The agricultural subdivision would require the extension of additional 12 kV power supply, and possibly offsite electrical system upgrades to the Kauaʻi Island Utility Cooperative (KIUC) system serving the Kōloa-Poʻipū area. Roads and home will create impermeable surfaces; utility corridors will require trenching. Improvements will result in irreversible impacts to topography and soils, and add to stormwater runoff in the area.

It is estimated that 5 to 10 new permanent jobs would be created with the operation of the agricultural subdivision farms and processing facilities. State tax revenues would be increased through employment income taxes and sales taxes on products. County real property tax revenues would be increased through higher property value assessment with the 45 homes and lands within the agricultural subdivision. Local businesses in Kōloa and Poʻipū would benefit from the purchasing activity of the residents living in this agricultural subdivision.

<u>Conclusion of Alternative Evaluation:</u> This alternative does not meet the purpose and need of the proposed action, as it does not provide support for a unique underrepresented industry like dairy to produce milk, which is overly imported in the state of Hawaiʻi. This alternative did not advance ~~for~~ as an additional evaluation ~~alternative~~.

6.3 NO ACTION ALTERNATIVE

The No Action Alternative would continue ~~future~~ use of this agricultural property for animal grazing, as it was prior to the HDF lease, without the establishment of the sustainable pasture-based dairy operations. With the Important Agricultural Lands designation, this land would be expected to be used for either grazing or ~~cultivation~~ related agricultural activities. Use of the site for cultivation of one or several crops as an alternative is described in Section 6.2.2. The No Action Alternative assumes ongoing beef cattle grazing, and possibly sheep which currently graze on the taro farm. This alternative assumes a tenant other than HDF, as the goal of HDF is to produce milk in Hawaiʻi utilizing a rotational pasture-based system. Use of these lands for cattle or sheep grazing pasture could be reestablished, with cattle and/or sheep grazing on the 500+ acre pasture area. At the stocking rate of two to four animals per acre, common to Kauaʻi grazing lands, the total number of cattle and sheep grazing on the land could potentially range up to 2,000 animals.

Anticipated Environmental Impacts – No Action Alternative

With a traditional grazing operation in the No Action Alternative, no special provisions would be required for managing cover crops and runoff. Soil loss and surface water quality impacts would be consistent with other animal grazing operations on Kauaʻi. With no site-specific operational controls, the grazing lease operations would be covered under the existing agricultural conservation plan applicable to the broad suite of agricultural uses on Grove Farm lands at Māhāʻulepū. Without mitigation and controls, surface water quality could be degraded through storm runoff of animal waste and suspended sediment.

The No Action Alternative would not be anticipated to generate adverse impacts to climate, topography, groundwater, land use, views, flora and fauna species, natural hazards, roadways and traffic, noise, hazardous materials, agricultural infrastructure, and public services. There would be no adverse effect upon archaeology or cultural resources, unless the grazing operation fails to maintain fences and gates to contain animals.

The No Action Alternative would include limited employment through the agricultural economic activity. Use of these lands for cattle or sheep grazing pasture would likely be reestablished at the estimated rate of $100/acre/year. The total area within the 557 acres could be leased for cattle or sheep grazing by a Kauaʻi livestock operation. The limited grazing revenues could restrict the amount of operational program manpower and implementation of farm environmental controls. The grazing operations would add limited economic benefits to State and County revenues.

There would be limited substantial cumulative or secondary effects associated with the No Action Alternative. Potential long-term effects to surface waters from periodic storm water runoff would continue to allow suspended soils and animal waste into the ditch system. No irreversible or irretrievable commitments of resources would be anticipated.

<u>Conclusion of Alternative Evaluation:</u> This alternative does not meet the purpose and need of the proposed action. No support for a unique, underrepresented agricultural industry would occur; no advancement of food sustainability for the state would occur. This alternative was not advanced for further evaluation.

6.4 CONVENTIONAL FEEDLOT DAIRY ALTERNATIVE

The development and operation of a conventional feedlot dairy would potentially achieve the project purpose to increase local milk production. This alternative would utilize the conventional methods for a large-scale commercial dairy in which ~~milking~~ mature dairy cows are confined in large all-weather barn facilities, without access to forage and without pastures.

The conventional feedlot dairy alternative would utilize large barns to house and feed the dairy cows. A total of either 699 or 2,000 mature dairy cows would be confined within several large barns. There would be no pasture area utilized in this alternative. The dairy farm complex would occupy a land area of approximately 20 acres, with dairy facilities consisting of several large barns, milking parlor, storage buildings and waste storage lagoons.

With the conventional feedlot alternative, pasture grass would not be utilized as a locally available feed source. Grain and forages would be imported as the primary feed source to sustain dairy cows, at significant additional cost to the dairy operation. Cows would be fed in barns, where they are housed 24 hours each day without natural light and air. Individual animals would be rotated through the milking parlor during twice-daily milking. The requirement to supply imported feed would be significant, estimated at ~~8 to 10~~ 18 tons (36,000 pounds) per day for a herd of 699, and ~~25 to 30~~ 52 tons (104,000 pounds) per day for a herd of 2,000 mature dairy cows. History showed the decline of Hawaiʻi's dairy industry and eventual demise was largely due to the escalating cost of feed imported from the mainland U.S. Ideally, the portion of feed consisting of forage could be grown locally.

The alternative for a conventional feedlot at the Māhāʻulepū location would require a program for manure management that collects all manure produced by cows confined within the dairy facilities for 24 hours each day. Potable water would be required to adequately wash down the milking parlor and walkways to maintain animal health. Approximately ~~30,000~~ 34,800 gpd of wash down water would be managed with the manure from 2,000 mature dairy cows (Table 6.4-2).

Manure management for a conventional feedlot operation would involve manure collection, transfer and long-term storage in lagoon ponds for evaporation and oxidation breakdown. A scraper system would collect all manure within the cow barns. This material will be the transferred to a lagoon where the parlor wash-down water and cow barn material are mixed. The blended material would be mechanically separated to provide of dry matter that can be dried again and re-used as bedding for the cows. The waste laden water is then captured in a storage pond where it could be managed for irrigation to row crops for silage that could be grown on surrounding lands.

The area and volume of the storage ponds would be sized to allow for the estimated daily waste production of 60,000 gpd for the 2,000 cow dairy (Table 6.4-2). The storage ponds would be three to four times the size of the storage ponds for a pasture-based dairy. Storage ponds would also require sizing to retain rainfall during storm events, which would further expand the volume of waste laden water at the dairy. This alternative would entail significant risk in terms of not being able to comply with waste pond overflow potential.

With the conventional feedlot alternative, manure nutrients would not be returned to pastures through a managed irrigation program intended to balance soils function and pasture grass uptake of the majority of nutrients. Effluent from the waste ponds would be applied daily to nearby crop producing acres. The resultant increased quantities of effluent would require nearly constant disposal in the pasture/fields, as the effluent nutrients would not be managed in a precise manner focused on the optimal growth of pasture grass for forage. This would be a concentrated disposal program that would maximize the application quantities and potentially exceed the nutrient requirements of the surrounding soils.

Anticipated Environmental Impacts – Conventional Feedlot Alternative

Table 6.4-1 Comparison of Rotational-grazing Pasture versus Feedlot Dairy At Committed Herd Size (699 mature dairy cows)

Type of Dairy	Required Building Facility area (square feet)	Feed required for cows (lbs/day)	Wash water requirement (gal/day)	Waste produc-tion (gal/day)	Waste Storage (gal)	Waste Storage (feet)
Pasture-based (5 employees)	22,580	9,000	12,165	1,000	2.1m	215' x130' x17'
Conventional feedlot (9 employees)	77,650	36,000	12,165	20,970	4.5m	180' x360' x14'

Table 6.4-2 Comparison of Rotational-grazing Pasture versus Feedlot Dairy At Contemplated Herd Size (2,000 mature ~~milking~~ dairy cows)

Type of Dairy	Required Building Facility area (square feet)	Feed required for cows (lbs/day)	Wash water requirement (gal/day)	Waste production (gal/day)	Waste Storage (gal-lons)	Waste Storage (feet)
Pasture-based (5 employees)	22,580	26,000	34,800	3,000	2.1m	215' x130' x17'
Conventional feedlot (12 employees)	229,224	104,000	34,800	60,000	14m	240' X760' x14'

The conventional feedlot operation would generate short-term impacts associated with the construction phase development. There would be soil disturbance, runoff and erosion, dust generation, construction noise, worker vehicles and truck traffic, and vehicle and truck emissions. Construction phase employment would benefit Kauaʻi workers, and equipment and materials purchases would generate local sales and State tax revenues. There would be construction phase mitigation required to limit impacts.

There would be potential long-term impacts associated with operations of the conventional feedlot alternative. Due to the higher density of animals in the barn area and no pasture area, the conventional feedlot alternative collects 100 percent of manure generated. Manure is eventually dried and used as bedding for cows, which generates particulate matter. Manure storage lagoons typically contain waste for roughly 6 months, which fosters off-gassing and contributes to greenhouse gases. Should digesters be used to generate electricity from the gases, the potential exists for unexpected releases of the accumulation of noxious chemicals within the structure.

The concentration of animal waste would pose the potential for increase populations of vector insects such as flies occurring with the conventional feedlot alternative. Natural fly predators such as dung beetles, cattle egrets and dragonflies exist in a balanced predator-prey cycle. Populations of arthropods that prey on fly larvae and disrupt the fly life-cycle require soils as habitat. In the barn setting where manure accumulates on impermeable surfaces until it is either washed from the milking parlor or scraped from the barns for transport to lagoons for storage, integrated pest management is not an option.

Conventional feedlots provide silage as feed and forage. Silage is fermented, high-moisture stored fodder made from grasscrops, including maize, sorghum or other cereals. Silage can be made from many field crops using the entire green plant (not just the grain). The fermentation is done on-site, by placing cut green vegetation into a silo or pit, or compressing it with heavy machinery. The pile is then covered with a plastic sheet or baled and wrapped in plastic film until the fermentation process renders the material palatable and digestible by cows. Managing moisture is essential to controlling odor; various odor descriptors can be used to help the dairy operator determine corrective action for the fermentation mix. The odor descriptors include: like ethanol or vinegar; rancid and fishy; or moldy and musty.

In ~~A~~ additional to the odors from fermentation and use of silage, the larger manure storage lagoons would be another impact of a conventional feedlot dairy. The lagoons would be sized to hold six months of manure produced; the surface area of the lagoon is significantly greater than that required for the pasture-based dairy which cycles effluent through and reapplies it with irrigation to provide nutrients to the grass.

With the conventional feedlot operation, historical, archaeological and cultural resources would not be affected, as the sites fall outside of the conventional feed lot dairy footprint of approximately 20 acres. Employees for the conventional feedlot alternative operation would generate additional worker vehicle trips and truck trips on local roadways. It is estimated that three to four additional employees would be added to the facility. Feed shipments for the dairy would involve daily truck trips to Līhuʻe, along with fluid milk delivery to processing on Kauaʻi or elsewhere in the state. Vehicle noise and air emissions would increase due to the added vehicle trips on local roadways.

The conventional feedlot operation facilities will require substantial electricity use for ventilation and lighting. Barns are designed for space efficiency with cows in close quarters but allowing room to lie down, as rest is important for a cow to digest its food. Spray misters are often used with fans to provide cooling. Estimates of electrical demand range between 800 and 1200 kWh per cow per year would only be partially offset by the operation of additional on-site solar energy generation. Solar energy collection with photovoltaic panels generating a total capacity of approximately 500 kW would be installed across the roof of the facility, and tied into the overall on-site energy generating system.

There would be an addition of three to four permanent jobs with the operation of the conventional feedlot operation. State tax revenues would be increased through employment and sales taxes. County real property tax revenues would increase with the property value assessment.

6.5 ALTERNATIVE LOCATION FOR THE PASTURE-BASED DAIRY

The Hawai'i Dairy Farms project emerged from a group of partners and affiliates, including Grove Farm, Finistere Ventures, Kamehameha Schools, Maui Land & Pineapple and Ulupono Initiative. The group conducted grass trials statewide to determine the best site for a rotational-grazing pasture based dairy. In addition to the grass trials, HDF coordinated with landowners of agriculturally-zoned lands in the State, as well as the Department of Agriculture, the Agribusiness Development Corporation, and the Trust for Public Land. The broader team identified, toured and evaluated six parcels of sufficient size: two on O'ahu; two on Hawai'i Island; and two on Kaua'i. Kaua'i was found to be the optimal location, as it met all the operational requirements for pasture-based dairy:

- Relatively flat, contiguous acres to move cows with minimal stress,
- Soils suitable to efficiently utilize applied nutrients for growth of forage,
- Adequate water for irrigation and operations,
- Suitable climate conditions for animals and grass growth,
- Agricultural-zoned land available for 20 years or more of sufficient acreage to support an economically viable dairy, preferably IAL, and
- Access to required operational support elements (trucking, pasteurization, work force, etc.).

In response to comments on the Draft EIS, Ulupono Initiative again searched for agriculturally-zoned land with potential long-term availability that may have become available in the past few years. An additional 1,300 acres of Grove Farm property on Kaua'i in the Māhā'ulepū area were recently vacated by Pioneer Seed Company. These fields are closer to resorts and residences, and do not provide further benefit to the project or community than the HDF site evaluated in this EIS. Alexander & Baldwin announced in January 2016 that Maui lands in sugarcane will be transitioned to diversified agriculture in the future. However, water rights and access for diversified agriculture must be settled through a forthcoming process, and water availability is currently unknown. Thus, Ulupono Initiative, which conducted the research, is unaware of any new property meeting the requirements for a pasture-based dairy that has become available since its initial evaluation.

Grove Farm land holdings on Kaua'i total nearly 33,000 acres, much of which comprise the lands controlled by the former Lihue Plantation Company and Amfac Sugar Kaua'i operation, which closed in 2000. Nearly half of these lands are designated as State Conservation District, and the remainder is mostly designated as State Agricultural District. Roughly 550 acres are designated as State Urban District in portions of Hanama'ulu and Līhue town. Over 12,500 acres were classified by the State and County as IAL, placing them into a committed status for long term agricultural purposes. According to the State of Hawai'i Department of Agriculture, the South Shore of Kaua'i features some of the state's most productive farmland due to high sugar yields as a result of steady sunshine and ample fresh water (DOA, 2016).

The high-level evaluation of Grove Farm holdings applying screening criteria to potential lands resulted in a number of findings:

- Conservation District lands and Urban lands owned by Grove Farm could not be considered for the pasture-based dairy due to inappropriate zoning/land use compatibility.
- Long-term farming leases already exist across major portions of the Grove Farm agricultural holdings, along with investments (e.g. crops, livestock, improvements and facilities).
- Inland mauka agricultural lands receive high annual rainfall and lower incident sunlight, with suboptimal pasture grass growing conditions.

- Agricultural lands mauka of Kūhiō Highway and Kaumualiʻi Highway generally have steep slopes, non-contiguous areas and some rocky soils, which are all factors affecting animal stress.
- Irrigation water availability varies due to proximity to existing reservoirs and wells.
- Areas up-gradient of established County and private wells for drinking water supply could not be considered.
- Unavailable or inadequate support infrastructure at mauka locations.

An alternative location for the pasture-based dairy was considered on approximately 972 acres of agricultural land at Kīpū, including a portion of area located in Conservation District Land. The alternative dairy site location is shown in Figure 6.5-1, and analyzed further in this section.

During the scoping for this EIS, the former Meadow Gold dairy site at Moloaʻa has been suggested as an alternate location. The dairy was a conventional confined dairy with 460 dairy cows on 170 acres of land. The site does not meet the criteria for a rotational-grazing pasture based dairy.

Figure 6.5-1 Alternative Dairy Location at Kīpū, Kauaʻi

The alternative Kīpū location would potentially satisfy some of the evaluation criteria in terms of slopes, land tenure, soils, micro-climate, water supply and support infrastructure.

Under the four comparative evaluation criteria for site screening identification, the alternative site would provide less suitable properties for pasture-based dairy than the Māhāʻulepū site. Comparative information under key evaluation criteria is summarized below:

- Slope: The Kīpū site contains greater slope conditions, with over 10 percent of site containing 5-10 percent slopes, as compared to generally level conditions at the Māhāʻulepū site.
- Rainfall: The Kīpū site has higher rainfall, with 65-80 inches per year, as compared to 50-65 inches per year at the Māhāʻulepū site.
- Sunlight: Kīpū has lower incident sunlight with an average of 184.77 watts per square meter (w/sm) compared to 196.6 w/sm at the Māhāʻulepū site (U.H. Manoa, 2015).
- Land Classification: Roughly 26 percent of the Kīpū site is classified as State Conservation District with the remainder classified State Agricultural District.
- IAL Designation: The Kīpū site is not classified as IAL.
- Sensitive Habitat: The perennial Hulēʻia Stream running through the site, which eventually drains through the Hulēʻia National Wildlife Refuge.

Of note, Hulēʻia Stream has experienced pollution in the past. The State of Hawaiʻi approved total maximum daily load limits (TMDLs) on the stream in 2008, including limits for enterococci, turbidity, and Total Suspended Solids (DOH, 2014).

Comparative statistics are shown below for the proposed HDF site and alternative site.

Table 6.5-1 Comparison of Māhāʻulepū Valley Site and Alternative Kauaʻi Location

Pastoral Rotational-Grazing Dairy Operational Requirements	Māhāʻulepū Valley	Alternative Location
Size of Dairy Farm	557 ac	730 ac (include Conserv. Land)
Projected Herd Size	699 up to 2,000	~~2,400~~ 2,000
Annual Milk Production Goal	1.5 ~~1.2~~ MG	~~2~~ 1.5 MG
Relatively flat, contiguous acres to move cows with minimal stress	Mostly 0-5% Slopes Generally Level	0-5% Slopes Sections of 5-10% Slope
Soils suitable to efficiently utilize applied nutrients for growth of forage	Overall "B" rated Land Study Bureau Classification [1]	Mainly "D" rated Land Study Bureau classification, some pockets of "C" [1]
Adequate water for irrigation and operations	2.93 MGD (Irrigation), Waita Reservoir & existing wells	3.80 MGD (Irrigation), Halenanahu Reservoir
Suitable climate conditions for animals and grass growth	Solar incidence: 196.6 wsm Rainfall: 40-55 in./yr.	Solar incidence: 184.8 wsm Rainfall: 50-65 in./yr.
Agricultural-zoned land available for 20+ years, sufficient area to support an economically viable dairy and preferably IAL	25 Yr Lease 557 acres usable IAL Designated	Not available for purchase No 25 Yr Lease ~600 acres usable Not IAL Designated
Access to required operational support elements (trucking, work force)	Existing private agriculture haul roads on site, improved to meet NRCS code guidelines	Existing private agricultural roads, crushed gravel interior roads, all weather asphalt - vehicles

[1] Grades "A" through "E" and "U" per HRS Chapter 205 – The State Land Use Law

Anticipated Environmental Impacts – Alternative Location

Pasture-based dairy development at the alternative location poses the potential for short-term impacts associated with the construction phase. There would be soil disturbance, runoff and erosion, dust generation, construction noise, worker vehicles and truck traffic, and vehicle and truck emissions. Construction phase employment would benefit Kauaʻi workers, and equipment and materials purchases would generate local sales and State tax revenues. There would be construction phase mitigation required to limit impacts.

To create safe grazing conditions for dairy cows, ~~S~~slope conditions at the alternative dairy location would ~~warrant limited~~ require more site disturbance and soil erosion controls. Specific measures would be required to avoid erosion and sediment runoff entering the perennial flowing waters of Hulēʻia Stream, which discharges downstream in the Hulēʻia National Wildlife Refuge and Nawiliwili Bay.

There would be potential long-term impacts associated with operations of the pasture-based dairy. Due to higher rainfall and lower incident sunlight, field trials indicated lower growth rates for the pasture grasses as compared to the Māhāʻulepū site. To provide the same level of forage grass crop for the dairy cows, it would require a larger 300 acre pasture area requirement to support the ~~2,400~~ 2,000 cow dairy for pasture operations, including effluent irrigation.

The design of the waste pond would accommodate the wash water contributed to the waste pond on a daily basis. High annual rainfall at this location would limit the ability to irrigate pasture grass during the wet season, requiring greater waste pond storage retention. Potable water demands for livestock water and wash water in the milking parlor is the same as stated in the Proposed Action. Dairy irrigation operation would reuse the diluted effluent accumulated in the waste pond, with no anticipated adverse effects to ground water or surface water quality.

If managed properly, there would be no adverse odors generated by the dairy operations. Archaeological and cultural resources would be avoided or protected as appropriate ~~in a manner similar to the pasture-based dairy~~. There are cultural resources located along the hillside areas of the alternative dairy property, and historical agricultural features located within the dairy pasture areas.

Employees for the dairy operation would generate worker vehicle trips and truck trips on local roadways. ~~It is estimated that three to four additional employees would be added to the facility to conduct the processing operations.~~ Fluid milk shipments from the dairy would involve daily truck trips to Līhue for shipment to offsite milk processing, located either on Kauaʻi and elsewhere in the state. Vehicle noise and air emissions would increase due to the added vehicle and trip trips on local roadways.

The pasture-based dairy facilities will require ~~substantial~~ additional electricity use, which would be partially offset by the ~~operation of~~ additional of on-site solar energy generation. Solar energy collection with photovoltaic panels would be installed across the roof of the milking parlor facility, and tied into the overall on-site energy generating system. The dairy facility is anticipated to require the extension of additional 12 kV power supply, or offsite electrical system upgrades to the KIUC system serving the Kīpū area.

There would be an addition of ~~8~~ 5 to 10 permanent direct farm jobs, and 6 to 12 indirect jobs created on Kaua'i, with additional jobs created on O'ahu, with the operation of the dairy facilities. State tax revenues would be increased through employment and sales taxes on dairy products. County real property tax revenues would be increased through higher property value assessment with the dairy operations.

(Note: Since this alternative location was evaluated in 2015, the land has been contracted for sale to another landowner who is not planning to develop a pasture-based dairy.)

6.6 MILK PRODUCTS PROCESSING BY HDF

As described in Chapter 3, the HDF Proposed Action is the sale of raw milk, wholesale, to a processor /packager. An alternative is for HDF to pasteurize raw milk on the island of Kaua'i. The pasteurized milk could then be sold to a processor/bottler. Currently Meadow Gold is the only processor/packager with operational facilities on both O'ahu and Hawai'i island. The island's last dairy was owned by Meadow Gold and closed in the year 2000; the facility on Kaua'i ceased processing at that time, and became a distribution center until it was eventually closed.

Any pasteurization or processing facility would be sited in an appropriately zoned industrial area with access to adequate electricity, municipal potable water and wastewater services, and with existing roadway infrastructure suitable for required truck transport. On the island of Kaua'i, an opportunity exists to retrofit and utilize the closed processing facility in Puhi, though this alternative requires cooperation of the facility owner, Meadow Gold. Capital expenditure for such a retrofit by HDF could be more than $1 million.

Anticipated Environmental Impacts – Milk Products Processing by HDF Alternative

The processing alternative by HDF would have no significant environmental impacts. The processing facility would be sited on lands with appropriate zoning for milk processing and accessory uses without a need for obtaining additional special permits.

Traffic associated with processing would add worker vehicle trips to the facility, Nawiliwili Harbor, and to and from Honolulu Harbor. Noise from worker vehicles and trucks would increase slightly due to the shipping. Vehicle emissions would also occur as a result of these shipments. The interisland transfers would occur as part of other freight components shipped on the existing regularly scheduled barge transits.

In-state milk production would increase agricultural revenues and jobs in Hawai'i. With HDF processing, employment in the manufacturing industry would increase. Processing would generate substantial positive State and County revenues.

The milk processing operation would require potable water from the County system. The processing operation would also generate wastewater discharged to the County sewer system.

6.7 SUMMARY COMPARISON OF ALTERNATIVES

This chapter provides a comprehensive evaluation of the range of viable potential alternatives, including the two alternative development scenarios. Although the alternatives are potentially reasonable uses under existing zoning and neighboring uses, each fails to comprehensively fulfill the project requirements defined by the eight Project Objectives and the four established Evaluation Criteria (Chapter 2, Sections 2.3.3 and 2.3.4):

Project Objectives (Section 2.3.3):

1. Provide more than 1,000,000 gallons annually of fresh, nutritious milk for Hawaiʻi families at affordable prices and revitalize the dairy industry in Hawaiʻi.
2. Apply proven, sustainable rotational-grazing pasture system and state-of-the-art technology to reduce reliance on costly imported fertilizer and feed.
3. Grow local, quality grass as a primary feedstock optimal for dairy cow nutrition and health, utilizing results of forage research conducted at five sites across four Hawaiian Islands.
4. Design facilities to provide animal comfort, including maximum time on pasture and minimal milking time.
5. Effectively integrate dairy operations within the island community setting.
6. Optimize dairy product shipping and marketing.
7. Provide local farming employment and build the agricultural economy.
8. Protect and enhance the area's natural, cultural, social and economic environment through sound agricultural planning, preservation of open space and protection of sensitive resources, and development of economic benefit.

Evaluation Criteria (Section 2.3.4):

1. Secure sufficient contiguous land area under long-term lease with adequate water supply (including potable water to meet standards under milk rules), suitable soil properties, gentle slope conditions, and road accessibility.
2. Generate new long-term employment in the agricultural sector on Kauaʻi in a wide range of positions including pasture agronomy/soils science, veterinary and animal husbandry, environmental resources management, milk/milk products processing and dairy business management.
3. Create a model for dairy operations utilizing IAL, demonstrating the importance of long-term agricultural leases and capital investment for agricultural infrastructure to advance food self-sufficiency.
4. Utilize 100 percent of manure on site as nutrients to grow forage for dairy cows. Grow sufficient forage to provide 70 – 85 percent of feedstock required for the herd.

The essential differences as compared to the proposed action are highlighted in the following statements.

- Only one of the alternative actions (conventional feedlot alternative) would create a commercial scale dairy operation in Hawaiʻi, with the capability to produce 10 percent of the State's fresh milk demand thus reducing dependence on imported milk (Objective 1). This alternative, however, would not reduce reliance on costly imported fertilizer and feed (Objective 2); grow local, quality grass as a primary feedstock (Objective 3); and would not utilize 100 percent of manure on site as nutrients to grow forage for dairy cows (Criterion 4).

- None of the alternatives would secure a dairy location that meets the requirements for a rotational-grazing pasture dairy: sufficient contiguous land area; available long-term land tenure; adequate potable water supply; suitable soil properties; gentle slope conditions; and accessibility (Criterion 1).
- One alternative (Agricultural Park) could potentially generate new long-term employment in the agricultural sector on Kaua'i in a wide range of positions including pasture agronomy/soils science, environmental resources management (Criterion 2).
- The Agricultural Park alternative could also develop sustainable food production utilizing Important Agricultural Lands, demonstrating the importance of long-term agricultural leases and capital investment for agricultural infrastructure, water systems and support facilities. (Criterion 3). However, after years of trying, it appears there was limited interest in such a venture.
- Finally, addressing the range of potential environmental impacts (natural, cultural, social and economic) (Objective 8) the two alternative development scenarios would generate fewer beneficial impacts and produce impacts that could potentially exceed those anticipated from the proposed project.

In contrast to the other options considered, the planned agricultural operation of Hawai'i Dairy Farms, was determined to be the most viable option and is the preferred alternative. Of all the alternatives considered, this is the only approach that achieves project objectives and meets each of the four Evaluation Criteria.

- Hawai'i Dairy Farms will create a commercial scale pasture-based dairy operation in Hawai'i, with the capability to provide more than 1,000,000 gallons of the fresh milk demand, reducing dependence on imported milk (Objective 1).
- The planned dairy location meets the requirements of minimum land area, soil properties, slope conditions, water supply, land tenure and availability, and accessibility (Criterion 1).
- The planned action will generate new long-term employment in the agricultural sector on Kaua'i, including pasture agronomy/soils science, veterinary and animal husbandry, environmental resources management, milk/milk processing, and dairy business management (Criterion 2).
- Sustainable food production utilizing Important Agricultural Lands (Criterion 3) will occur with the proposed action, demonstrating the importance of long term agricultural leases, and the ability to draw capital investment for agricultural infrastructure including water systems and support facilities (Criterion 3).
- Address the range of potential environmental impacts by utilizing 100 percent of manure as natural fertilizer to grow the majority of food for cows (Criterion 4). The alternatives evaluated would generate fewer beneficial impacts and produce impacts that could potentially exceed those anticipated from the proposed project.
- Creating an economically viable pasture rotational-grazing model maintains agriculture, retains open space, and provides buffer between highly utilized resort and residential development and sensitive natural or cultural resources (Objective 8).

Table 6.7-1 COMPARISON OF ALTERNATIVES BY EVALUATION CRITERIA

HDF EVALUATION CRITERIA	Proposed Action: Committed	Proposed Action: Contemplated	No Action	Conventional Feedlot Dairy	Alternative Location
1. Secure sufficient land area under long-term lease with adequate water supply (including potable water to meet standards under milk rules), suitable soil properties, gentle slope conditions, and road accessibility.	**SUITABLE** Suitable lease, water, soils, slopes and access	**SUITABLE** Suitable lease, water, soils, slopes and access	**UNSUITABLE** Either no farming or short term grazing lease	**PARTIAL** Suitable lease, water. Not reliant upon soils, Little to no pasture	**UNSUITABLE** Long-term farm lease not available, less suitable soils, slope and access
2. Generate new long-term employment in the agricultural sector in a wide range of positions including pasture agronomy/soils science, livestock management, veterinary and animal husbandry, environmental resources management, milk/milk products processing and dairy business management.	**SUITABLE** Employment in agricultural sector, including pasture agronomy, soil science and milk processing	**SUITABLE** Employment in agricultural sector, including pasture agronomy, soil science and milk processing	**UNSUITABLE** Employment limited with no pasture agronomy, no milk or milk products created.	**SUITABLE** Employment in agricultural sector	**SUITABLE** Employment in agricultural sector, including pasture agronomy, soil science and milk processing
3. Create a model for dairy operations utilizing IAL, demonstrating the importance of long-term agricultural leases and capital investment for agricultural infrastructure to advance food self-sufficiency.	**SUITABLE** Utilizes IAL with capital investment for food sustainability	**SUITABLE** Utilizes IAL with capital investment for food sustainability	**UNSUITABLE** Under-utilization of IAL without capital investment	**UNSUITABLE** Follows existing model of confined feedlot dairy	**UNSUITABLE** Site not designated as IAL
4. Utilize 100 percent of manure on site as nutrients to grow forage for dairy cows. Grow sufficient forage to provide 70 – 85 percent of feedstock required for the herd.	**SUITABLE** 100% manure nutrients used as fertilizer for forage	**SUITABLE** 100% manure nutrients used as fertilizer for forage	**UNSUITABLE** Manure not managed as fertilizer	**UNSUITABLE** Manure concentrated in storage lagoons, no pasture forage feed	**~~UN~~SUITABLE** ~~<~~100% manure nutrients used as fertilizer for forage

ENVIRONMENTAL RESOURCE	PROPOSED ACTION (699 AND UP TO 2,000 COWS)	NO ACTION ALTERNATIVE	CONVENTIONAL FEED LOT DAIRY	ALTERNATIVE LOCATION
CLIMATE	The scale of HDF is not large enough to influence global climate cycles related to solar radiation or evapotranspiration. No significant impacts are anticipated, and no mitigation would be required.	No adverse effect, comparable to proposed action	No adverse effect, comparable to proposed action	No adverse effect, comparable to proposed action
TOPOGRAPHY	The dairy facility and associated infrastructure will be constructed in a 10-acre area, less than 1 acre will be utilized for built facilities. Pasture swales previously installed for agriculture and low-lying areas may be smoothed or filled to improve surface drainage and uniformity for grazing. Existing farm road will be slightly elevated, with cow raceways constructed in parallel above grade; swales will be created to direct run-off where needed. Minor effects to topography.	No adverse effect	No significant changes to site topography. Comparatively greater foundation excavation for larger dairy facilities.	Steeper grades would require significant topography changes to establish pasture paddocks and farm roadways. Foundation excavation for facilities.
SOILS	Short-term soil disturbance for construction of roadways and dairy facilities will be minimized through the adherence to the Conservation Plan, best management practices, and controls per NPDES Construction Stormwater General Permit. Soil loss is expected to be within permitted thresholds and to not be significant Long-term soil impacts are anticipated to result in improvements to the physical, chemical, and biological condition of the soil. Long term increase in soil organic matter and nutrient properties, expected to improve physical, chemical and biological conditions of the soil.	No adverse effect on soils.	Comparatively less short term soil disturbance for construction of roadways and dairy facilities.	Comparatively greater short term soil disturbance for construction of roadways and dairy facilities. Long term improvement of soil organic matter and nutrient properties.
LAND USE & AGRICULTURAL SETTING	Hawaiʻi Dairy Farms will be in full compliance with its agricultural State Land Use District designation and embodies the IAL designation per the Hawaiʻi State Constitution by using the protected lands in the project area for their intended purpose of diversified agriculture and agricultural self-sufficiency. Dairy use will not preclude the future potential for the coastal park at Māhāʻulepū.	Cattle/sheep grazing use would retain the agricultural setting. Fallow overgrown lands would be comparably worse by not maintaining active agricultural land use.	Comparable to the proposed action, the feed lot dairy would be a consistent use of Important Agricultural Lands, and would retain the existing agricultural setting.	A pasture-based dairy is a consistent use of County Agricultural Lands, and will retain the existing agricultural setting. There would be potential impacts to downstream wildlife preserve areas.
VISUAL & AESTHETIC RESOURCES	No public scenic views or lookouts will be affected by dairy development or operations. There will be no adverse effect to public views of the Puʻu Hunihuni crater, views from the Ala Kinoiki Road corridor, or impediment to views of the Hāʻupu Mountains from the HDF site.	Grazing activity would preserve views, while fallow overgrown lands would be comparably worse for views & aesthetics.	The feed lot dairy would have several large barn structures with comparatively greater visibility than the proposed action, adverse effects to views & aesthetics.	Dairy facilities and pasture paddocks will retain scenic vistas, with no adverse effects to views & aesthetics.
NATURAL HAZARDS	The dairy facilities will follow Building Code requirements for wind loading. Location is outside tsunami risk area and flood zone. Effluent pond capacity will exceed rain from 25-year/24-hour event. A natural disaster plan has been prepared by the Hawaiʻi Dairy Farms' manager to address hurricane, fire, and potential flooding hazard scenarios. HDF is not in a flood zone or tsunami inundation area.	No structures would be built, posing less risk due to natural hazards.	The feed lot dairy will have more barn structures posing greater comparative risk. Location outside tsunami risk area & flood zone.	The dairy facilities will follow Building Code requirements for wind loading. Location outside tsunami risk area and flood zone. Potential drainage concerns related to surface watercourses in and adjoining the dairy site.

ENVIRONMENTAL RESOURCE	PROPOSED ACTION (699 AND UP TO 2,000 COWS)	NO ACTION ALTERNATIVE	CONVENTIONAL FEED LOT DAIRY	ALTERNATIVE LOCATION
ARCHAEOLOGICAL & HISTORIC RESOURCES	No pre-historic archaeological sites were found on the dairy site. ~~Archaeological~~ Two pre-historic sites located beyond the mauka dairy boundary ~~will be preserved~~ were determined by SHPD to not be adversely affected by the current proposed project. The off-site features are recommended for preservation, should future development be contemplated outside the HDF site. Fourteen post-European contact era sites associated with Plantation-era sugarcane cultivation were identified. No further work regarding these sites is recommended. ~~Historic sites will be managed per SHPD for data recovery or adaptive re-use.~~	There would be no protection or management of archaeological sites and historic sites.	Comparable to the proposed action, per SHPD requirements, pre-historic sites located beyond the dairy boundary will be preserved should future development be contemplated in the area, and historic agricultural sites will be outside of the conventional feed lot dairy development ~~within the dairy site will be managed~~.	Archaeological sites are not known to exist at the alternative site. Newly identified archaeological sites and historic agricultural sites would be managed per SHPD requirements.
CULTURAL RESOURCES	The perception of most community members interviewed was that the dairy may have indirect and direct negative impacts on the environment in the area. The findings of research related to preparation of the Cultural Impact Assessment for the dairy site, including interviews of community members, states that it is reasonable to conclude that, pursuant to Act 50, the exercise of native Hawaiian rights or any ethnic group related to numerous traditional cultural practices will not be impacted by establishment of the dairy.	No change from existing.	Comparable to the proposed action.	Cultural impact assessment would need to be conducted to determine potential impacts at an alternative location.
FLORA & FAUNA	No threatened or endangered plants occur on the project property, and no intact native plant habitat exists within or surrounding the site. No critical habitat for endangered flora or fauna species is defined in or immediately surrounding the site; no impacts are anticipated from the dairy. Native plants with potential to stabilize banks will be encouraged and supplemented if needed to enhance the planned buffer strips along drainages. Potential use of paddocks by native, endangered waterbirds may occur. Outside lighting at night will be shielded to prevent attraction to overflying seabirds. No effect to bats is expected from ~~that~~ the dairy farm. HDF ~~will~~ has developed an ~~Avian~~ Endangered Species Awareness and Protection Plan and will train employees to detect endangered waterbirds and nēnē, to prevent harmful impacts from operations.	Status quo.	The larger facility footprint will reduce open space in the valley. Fields would be unoccupied by cows and irrigation equipment. Larger lagoons may ~~provide an~~ attract ~~ive nuisance to~~ endangered waterbirds.	The alternative Kīpū site has sensitive water resources: the perennial Hulēʻia Stream running through the site, which eventually drains through the Hulēʻia National Wildlife Refuge. Hulēʻia Stream is on Hawaiʻi's 303(d) list of impaired waters; total maximum daily load limits have been established for enterococci, turbidity, and Total Suspended Solids. An endangered flora or fauna survey would be required to determine potential impacts for the alternative site. The Hulēʻia National Wildlife Refuge, a waterbird refuge, is downgradient from the site.

ENVIRONMENTAL RESOURCE	PROPOSED ACTION (699 AND UP TO 2,000 COWS)	NO ACTION ALTERNATIVE	CONVENTIONAL FEED LOT DAIRY	ALTERNATIVE LOCATION
INVERTEBRATE SPECIES & PEST INSECTS	Strict dairy operation housekeeping, managed effluent ponds and pasture biological controls (e.g. dung beetle) will avoid fly populations at and beyond the dairy. Integrated pest management will be used to disrupt the fly lifecycle and minimize populations of manure-related flies. Use of mechanical insect controls, including traps (outdoors) in paddocks where cows are excluded, and sticky tapes (indoors) will be used as needed for both monitoring and removal of flies.	Status quo.	Concentrations of manure waste would occur at several large feedlot areas, with no dispersion of manure, no soil cycle, and ~~no~~ without fly population integrated pest management control measures for larger barns and waste ponds.	Active dairy housekeeping and pasture biological controls (e.g. dung beetle) would avoid fly populations at and beyond the dairy.
NOISE	Construction work at the project site will involve activities that may generate an increase in noise levels. Noise related to construction will be a short-term condition, occurring during daylight hours. Milking equipment will be contained in the milking parlor structure, and field equipment such as tractors will typically be used during daylight hours. Dairy operations will generate noise in keeping with agricultural zoning of the parcel. Noise from the dairy will not exceed the DOH threshold, and will not contribute to excessive noise in the region.	Very limited noise would be generated by grazing and worker vehicle visits. No off-hour noises are anticipated from animal grazing operations~~, unless the site remains vacant and is unmanaged~~.	The dairy would generate low noise levels typical of agricultural activities associated with worker vehicles and transport trucks. No off-hour noises are anticipated.	The dairy would generate low noise levels typical of agricultural activities associated with worker vehicles and transport trucks. No off-hour noises are anticipated.
HAZARDOUS SUBSTANCES	Illegal dumping at the dairy site will be curtailed by the active control and management of the land. Pesticides, herbicides, fuels and lubricants will be stored according to regulations and utilize secondary containment per best practices and requirements. No significant long-term impacts will occur from hazardous substances related to dairy operations, due to minimization of risk, secondary containment, and compliance with best management practices.	No hazardous materials would be used or stored onsite in the alternative. There would be potential for illegal dumping of hazardous materials if the site is not consistently controlled and managed.	The dairy operation would use a limited number of fuels, lubricants and solvents which ~~will~~ would be managed according to State and Federal rules.	The dairy operation would use a limited number of fuels, lubricants and solvents which will be managed according to State and Federal rules. There would be some additional sensitivity due to the nearby wetlands and wildlife sanctuary.
PUBLIC SERVICES	Dairy facilities and dairy operations are not anticipated to place a significant demand on fire protection, police, or medical services. The dairy will help to support these services through contributions to County real property tax. New residents to Kauaʻi associated with the dairy will place limited demands on public services, such as schools. A private service will collect solid waste.	Police, fire, and emergency medical service would not be required. Limited County real property tax revenues would be provided to support public services.	Police, fire, and emergency medical service would be required infrequently. The dairy would help support these services through County real property tax expenditures. New residents to Kauaʻi associated with the dairy would place limited demands on public services, such as schools. A private service would collect solid waste.	Police, fire, and emergency medical service would be required infrequently. The dairy would help support these services through County real property tax expenditures. New residents to Kauaʻi associated with the dairy would place limited demands on public services, such as schools. A private service would collect solid waste.

ENVIRONMENTAL RESOURCE	PROPOSED ACTION (699 AND UP TO 2,000 COWS)	NO ACTION ALTERNATIVE	CONVENTIONAL FEED LOT DAIRY	ALTERNATIVE LOCATION
DEMOGRAPHIC & ECONOMICS	Direct-plus-indirect employment associated with Dairy development would be expected to average approximately 36 jobs, of which 28 would be on Kauaʻi . With ongoing operations at the committed herd size, 11 direct and indirect full-time equivalent jobs would be created on Kauaʻi, including 5 farm jobs and about 6 indirect jobs. An additional 3 indirect jobs would be created on Oʻahu. Employment for the contemplated herd size would be double. The dairy will generate substantial positive State and County revenues. In-state milk production will expand agricultural revenues and jobs in Hawaiʻi. New residents to Kauaʻi associated with the dairy will place limited demands on public services, with offsetting revenues.	No construction jobs or full time jobs would be created, and no revenues to other agricultural operations on Kauaʻi. Limited County real property tax revenues and State tax revenues would be generated.	The dairy would create construction jobs and over 20 full time jobs, and provide long-term revenues to agricultural partners on Kauaʻi. The dairy will generate substantial positive State and County revenues. In-state milk production would expand agricultural revenues and jobs in Hawaiʻi. New residents to Kauaʻi associated with the dairy would place limited demands on public services, with offsetting revenues.	The dairy would create construction jobs and over 20 full time jobs, and provide long-term revenues to agricultural partners on Kauaʻi. The dairy will generate substantial positive State and County revenues. In-state milk production would expand agricultural revenues and jobs in Hawaiʻi. New residents to Kauaʻi associated with the dairy would place limited demands on public services, with offsetting revenues.

ENVIRONMENTAL RESOURCE	PROPOSED ACTION (699 AND UP TO 2,000 COWS)	NO ACTION ALTERNATIVE	CONVENTIONAL FEED LOT DAIRY	ALTERNATIVE LOCATION
GROUND WATER RESOURCES	There are over ~~100~~ 120 wastewater treatment injection wells serving resort development in Po'ipū. The potential inputs to shallow groundwater from the pasture based dairy will represent less than 5% of the total nutrients disposed each day from the existing wastewater injection wells in Po'ipū. Construction of HDF facilities is not anticipated to deplete the groundwater source or interfere with recharge. Short-term water supply demand during the construction period is anticipated to be nominal. The major water demand during construction will be for fugitive dust control. Water will come from a non-municipal source: either the on-site deep wells; or from the HDF allocation from Waita Reservoir. The dairy will utilize between 30,000 and 84,800 gpd of groundwater from on-site wells for potable uses: livestock water; and sanitation in the milking parlor. The demand of ~~approximately 30,000 gpd (0.03 MGD)~~ up to 84,800 gpd (0.085 million gallons per day – MGD) for potable water is well within the capacity of the existing Māhā'ulepū 14 well which produced 3 MGD during the sugarcane plantation era. Potable water used as wash water will be re-applied to pasture and thus remain a part of the evapotranspiration cycle. The groundwater and surface water assessment determined there is no hydrologic connection between the aquifer in the unweathered volcanic series and the groundwater body in the alluvium. Thus nutrients added by the dairy operation will have no impacts to the County drinking water well and potable water within the deep volcanics, the source of potable water. Further, the assessment concluded that the modest potable water use rate for dairy operations, and the 4,500-foot distance between the onsite potable water well and the nearest County potable water well (Kōloa Well F), mean that no adverse impacts to ongoing use of groundwater in the unweathered volcanics will occur from this use.	The no action alternative would have limited to no effect on groundwater resources. A small portion of nutrients resulting from cattle/sheep manure breakdown in pasture areas will enter shallow groundwater.	The feed lot dairy will utilize from 30,000 to 84,800 gpd of groundwater from on-site wells for potable use at the dairy office, livestock water, and wash down at the milking parlor and barn area. ~~Additional water would be required for the very extensive washdown requirements associated with the conventional dairy.~~ Groundwater source supply and quality at the Kōloa Well F would not be adversely affected by the dairy operations.	The dairy would utilize ~~approximately 30,000~~ more than 100,000 gpd of groundwater from on-site wells for potable use at the dairy office, livestock water, and wash down at the milking parlor and barn area, at the fully developed 2,000 cow herd size for this location. The pasture-based dairy would irrigate pastures utilizing non-groundwater sources from the closest available agricultural reservoir system, blended with water in the effluent storage ponds. Groundwater source supply and quality at the nearest aquifer source would not be adversely affected by the requirements for the dairy operations. Shallow groundwater underlying the pasture paddocks could receive minor contributions of dissolved nutrients in applied effluent irrigation, applied fertilizer and natural manure breakdown.

ENVIRONMENTAL RESOURCE	PROPOSED ACTION (699 AND UP TO 2,000 COWS)	NO ACTION ALTERNATIVE	CONVENTIONAL FEED LOT DAIRY	ALTERNATIVE LOCATION
SURFACE WATER RESOURCES	Controls and best management practices to avoid, control, and trap potential erosion associated with construction activities will be implemented. Any stormwater discharge associated with construction in the short-term will be in compliance with relevant regulations. Over the long-term, adherence to the Conservation Plan and best management practices establishes setbacks to minimize impacts to waterways. The setback for effluent application is 50 feet from each side of surface waters. Perimeter fencing to exclude cows from surface waters provides a 35-foot buffer on either side of the drainageways. Vegetative buffers will be maintained within the 35-foot setback from the drainageways. Episodic, seasonal rainfall events of 0.8 inches or more (~10 days/yr.) may cause runoff to drainageways or percolate through soil to shallow groundwater in the alluvium. This shallow groundwater may ~~to~~ rise and intersect with the agricultural ditches becoming surface water ~~and groundwater containing nutrients~~. ~~HDF will release a~~ An estimated 10,000 pounds of nitrogen and 900 pounds of phosphorus annually could potentially leave the site. Contributions of nutrients from episodic rainfall (10 days/yr) will not adversely affect ocean water quality and the marine environment. The nearshore area is a highly mixed environment which actively disperses inputs in several meters from shore. Over 120 wastewater treatment injection wells serving resort development in Po'ipū. Nitrogen input to the marine environment in the Poi'pū region is calculated to be 38,510 pounds annually, or 3.5 times more than the potential HDF nutrient throughput. Phosphorus for both domestic wastewater and landscape fertilization in the region is estimated to be 1,260 pounds annually, or 1.4 times greater than the potential discharge from HDF. State DOH surveys and environmental sampling/testing programs have identified high levels of enterococci bacteria in the agricultural ditches, particularly near the terminus of the ditch near the ocean. State standards apply to recreational waters, and the ditch is not utilized recreationally by bathers. Over the long-term, the surface water quality in the agricultural ditches and Waiopili Ditch will be improved by active management of the dairy site. The dairy site represents roughly 20 percent of the 2,700-acre Māhā'ulepū Valley sub-watershed, and soil erosion from the HDF site will be reduced by establishment of thick grass ground cover and maintenance of vegetative buffers totaling 70 feet in width – 35 feet on either side of the agricultural drainageways.	The no action alternative would generate limited surface water quality impacts associated with manure from grazing animals, and soil erosion during peak storm runoff events. If the land is not used for grazing, there would continue to be some level of ongoing soil erosion. Compared to the storm runoff constituents from a pasture-based dairy there would be lower nutrient contributions and greater soil erosion contributions to the ditches and stream.	A well-managed feedlot dairy, with dairy cows contained within barns 24 hours each day, should be designed to effectively manage and minimize stormwater runoff to prevent contamination from manure. Nutrients would not be applied to pastures. The larger effluent ponds pose a risk of overflow from catastrophic events, and would require a large secondary containment area. ~~The feedlot dairy operation is expected to generate comparably greater amounts of dissolved nutrients in surface water runoff during large storm events. Natural vegetation buffers would be established along agricultural drainage ditches bordering the effluent disposal fields. Buffers would aid capture suspended sediment and plants/thatch will uptake dissolved nutrients.~~ ~~On average four to five times each year, large rainfall events will generate peak storm water flows from pastures which will enter the agricultural ditches, which merges into Waiopili Stream. Under peak storm flow conditions, the dairy contributions of suspended sediment and nutrients will represent a minor amount of contaminants of stormwater draining into the agricultural ditches and stream, and eventually reaching the ocean. The nearshore ocean water off Mahaulepu is a highly mixed environment which actively disperses natural inputs. Minor contributions of nutrients associated with dairy storm runoff during peak rainfall events will not adversely affect ocean water quality and the marine environment.~~	The alternative location for the pasture-based dairy operation is expected to generate minor amounts of dissolved nutrients in surface water runoff during large storm events. Dissolved nutrients in surface runoff will result from applied effluent irrigation, applied fertilizer, and manure breakdown. Natural vegetation buffers ~~would be~~ established along ~~agricultural~~ drainages as setbacks bordering the pasture paddocks ~~will~~ to effectively capture suspended sediment and uptake dissolved nutrients. ~~On average four to five times each year, l~~Large rainfall events will generate peak storm water flows from pastures which will flow into agricultural ditches. Under these conditions, the dairy contributions of suspended sediment and nutrients will represent a minor amount of contaminants entering surface water, and ultimately these drainages discharge into the receiving waters of Hulē'ia Stream. The minor contributions of nutrients from the pasture-based dairy associated with storm water runoff to agricultural ditches during peak rainfall events would not be anticipated to adversely affect stream water quality and the aquatic environment. The alternative site drains into Hulē'ia Stream which leads downstream to Hulē'ia National Wildlife Refuge, and eventually reaching Nawiliwili Bay. The nearshore ocean water off Nawiliwili Bay is a highly mixed environment which actively disperses natural and man-made inputs.

ENVIRONMENTAL RESOURCE	PROPOSED ACTION (699 AND UP TO 2,000 COWS)	NO ACTION ALTERNATIVE	CONVENTIONAL FEED LOT DAIRY	ALTERNATIVE LOCATION
ROADWAYS & TRAFFIC	Short-term construction traffic will occur during the development of the dairy facilities. For the long-term, worker vehicles and delivery and supply trucks will access the dairy on a weekly basis. The number of vehicles associated with the dairy at the committed herd size will increase by approximately 12 vehicles per day, and will not represent a significant amount of the total traffic on local roadways. Traffic conditions on roadways in Po'ipū and Kōloa will not deteriorate as a result of the dairy operations.	The no action alternative would have little traffic, with minimal daily worker vehicle trips associated with a grazing operation. If left fallow, there would be no traffic with this alternative.	Short-term construction traffic would occur during the development of the feedlot dairy facilities. Over the long-term, dairy worker vehicles and trucks would access the site on a daily basis. Without use of the pasture paddocks for grazing, cows would depend 100% upon feed. With a herd of 699 cows, imported feed supply would be a major requirement for this dairy, requiring daily truck deliveries of grain feed for the cows. The number of vehicles associated with the dairy will not represent a significant amount of the total traffic on local roadways. Traffic conditions on roadways in Po'ipū and Kōloa would not deteriorate as a result of the feedlot dairy operations.	Short-term construction traffic would occur during the development of the dairy facilities. For the long-term, worker vehicles and trucks will access the pasture-based dairy on a daily basis. The number of vehicles associated with the dairy would not represent a significant amount of the total traffic on local roadways. Traffic conditions on roadways in Puhi would not deteriorate as a result of the dairy operations.
AIR QUALITY, ODOR & GREENHOUSE GASES	Construction effects on air quality including dust and construction vehicle emissions will be temporary and reduced by best management practices and short-term mitigation measures. Odor conditions at the pasture-based dairy will be limited within the dairy project area and immediate vicinity. In the worst-case meteorological conditions, odor may reach approximately ~~1,670~~ 1,200 feet south of the HDF southern boundary under typical precipitation conditions. For wet periods, odor may extend approximately 2,150 feet beyond the southern boundary. For the contemplated herd size, odor may reach approximately 4,085 feet south of the HDF southern boundary in the worst-case meteorological conditions. There are no homes or resort facilities in this area. The odors will not reach resort or residential communities. For the area within the modeled odor isopleth, odor may be detectable by 50 percent of the population at a frequency of once every 200 hours, or roughly 44 hours per year.	The no action alternative would generate no emissions or add to greenhouse gas production. Depending upon the number of grazing cattle or sheep, odors could result from manure waste in the grazing pasture.	For the feedlot dairy option, short-term construction would affect air quality including dust and construction vehicle emissions, reduced by mitigation actions. Odor conditions from a feedlot dairy would include odors created by fermentation and storage of silage used as feed and fodder, as well as larger manure storage ponds. ~~at the pasture-based dairy will be limited within the dairy project area and immediate vicinity. No adverse odor conditions will result in the 2+ mile distant resort and residential community.~~ ~~The production of greenhouse gases will be reduced by producing milk locally for Hawaii consumers, versus greenhouse gas emissions due to ocean shipping milk from the US mainland.~~	At the alternative site, there would be short-term construction effects on air quality including dust and construction vehicle emissions, reduced by mitigation actions. Odor conditions at the alternative site for the pasture-based dairy would be similar to conditions at Māhā'ulepū. ~~limited within the dairy project area and immediate vicinity. No adverse odor conditions will result in the 2+ mile distant resort and residential community.~~ ~~The production of greenhouse gases would be reduced by producing milk locally for Hawaii consumers, versus greenhouse gas emissions due to ocean shipping milk from the U.S. mainland.~~

ENVIRONMENTAL RESOURCE	PROPOSED ACTION (699 AND UP TO 2,000 COWS)	NO ACTION ALTERNATIVE	CONVENTIONAL FEED LOT DAIRY	ALTERNATIVE LOCATION
CUMULATIVE IMPACTS	The development and operation of the pasture based dairy will be combined with impacts associated with anticipated future developments in the Poipu and Koloa region. With mitigation, there will be limited short term impacts such as soil erosion, dust, worker traffic and vehicle emissions. Long-term cumulative effects will include limited soil erosion, storm water runoff, groundwater use, nutrient contributions to agricultural ditches, worker vehicle traffic, and air emissions. Odors will be contained within the dairy and limited adjacent farms. In addition to injected wastewater nutrients entering the nearshore ocean waters generated by the Poʻipū resorts and residential areas, there will be minor amounts of nutrients contributed from the pasture-based dairy. The dairy will provide net economic benefits, adding to the agricultural economy of Kauaʻi.	The no action alternative generally would not contribute to cumulative impacts. Grazing operations without mitigation controls would add to soils erosion, nutrients in storm runoff. Depending upon the herd size, the grazing operation could generate potential odors. GREATER COMPARATIVE IMPACTS	The effects associated with the development and operation of a feedlot confined dairy would combine with impacts associated with anticipated future developments in the Poipu and Koloa region. With mitigation, there would be limited short term impacts such as soil erosion, dust, worker traffic and vehicle emissions. Less land would be committed with minimal pasture area. Long-term cumulative effects would include limited soil erosion, storm water runoff, groundwater use, nutrient contributions to agricultural ditches, worker vehicle traffic, and air emissions. ~~Odors would likely extend into the resort community.~~ In addition to injected wastewater nutrients entering the nearshore ocean waters generated by the Poʻipū resorts and residential areas, there will be comparatively greater amounts of nutrients contributed from the pasture-based dairy. The feedlot dairy will provide net economic benefits, adding to the agricultural economy of Kauaʻi. GREATER COMPARATIVE IMPACTS	The development and operation of the alternative site for the pasture based dairy would be combined with impacts associated with anticipated future developments in the ~~Poipu and Koloa~~ region. With mitigation, there will be limited short term impacts such as soil erosion, dust, worker traffic and vehicle emissions. Long-term cumulative effects will include limited soil erosion, storm water runoff, groundwater use, nutrient contributions to agricultural ditches, worker vehicle traffic, and air emissions. Odors will be contained within the dairy and limited adjacent farms. There would be minor nutrients contributions from the pasture-based dairy to Hulēʻia Stream. The dairy will provide net economic benefits, adding to the agricultural economy of Kauaʻi. GREATER COMPARATIVE IMPACTS

7.0

AGENCIES AND PARTIES CONSULTED

7.0 AGENCIES AND PARTIES CONSULTED

7.1 AGENCIES AND PARTIES CONSULTED

This section presents a listing of agencies and parties consulted in the preparation of this EIS.

Table 7-1 lists the agencies, organizations, and individuals who were either: 1) formally consulted, provided a presentation, or notified early in the planning process or are a part of an ongoing consultation effort throughout the environmental review process; 2) officially received a copy of the Environmental Impact Statement Preparation Notice ("EISPN"); or 3) responded to the EISPN with a comment letter. Entities ~~to be sent will~~ that have received a copy of the Draft Environmental Impact Statement ("DEIS") upon publication are also indicated.

Copies of formal comment letters received during the EISPN comment and the applicant's responses are included in this section. The list of consulted parties ~~will be~~ has been updated to indicate ~~future~~ comments ~~to be~~ received during the 45-day DEIS review period that commenced upon formal notice issued in the June 8, 2016 issue of the Office of Environmental Quality Control's *The Environmental Notice*. This list has been updated to indicate entities that have received a copy of the Final Environmental Impact Statement ("FEIS") upon publication.

Table 7-1 Consulted Parties

Respondents and Distribution	Early or Ongoing Consultation, Presentation, or Notification	Comments Received EISPN	Received DEIS	Comments Received DEIS	Received FEIS
A. Federal Agencies or Affiliates					
Environmental Protection Agency Region IX Pacific Islands			X		
Department of Agriculture Natural Resources Conservation Service	X		X		
Department of Commerce National Marine Fisheries Service			X		
Department of Homeland Security Coast Guard 14th District			X		
Department of Transportation Federal Aviation Administration			X		
Department of Transportation Federal Transit Administration			X		
Department of Transportation Federal Highways Administration			X		
Department of the Navy			X		
National Oceanic and Atmospheric Administration Fisheries Pacific Island Regional Office	X	X	X	X	X
U.S. Army Corps of Engineers, Honolulu District	X		X	X	X

Table 7-1 Consulted Parties					
Respondents and Distribution	**Early or Ongoing Consultation, Presentation, or Notification**	**Comments Received EISPN**	**Received DEIS**	**Comments Received DEIS**	**Received FEIS**
U.S. Department of the Interior Fish and Wildlife Service, Pacific Islands	X	X	X	X	X
Department of Interior, Geological Survey, Pacific Islands Water Science Center			X	X	X
Department of the Interior National Parks Service, Pacific Islands			X		
B. State Agencies					
Department of Accounting and General Services	X		X	X	X
Department of Agriculture	X	X	X		X
Department of Business, Economic Development & Tourism (DBEDT)	X		X		
DBEDT, Office of Planning	X		X	X	X
DBEDT, Strategic Industries Division	X		X		
Department of Defense			X	X	X
Department of Hawaiian Home Lands			X		X
Department of Land and Natural Resources (DLNR)	X	X	X		X
DLNR, CWRM	X	X	X		X
DLNR, Engineering Division	X	X	X	X	X
DLNR, Historic Preservation Division	X	~~X~~	X	X	X
Kauaʻi/Niʻihau Island Burial Council	X	X	X		X
DLNR, Land Division, Kauaʻi District	X	X	X	X	X
DLNR, Soil and Water Conservation District, West Kauaʻi	X		X		
Department of Health (DOH) via Environmental Planning Office	X	X	X	X	X
DOH, Clean Air Branch	X	X	X		X
DOH, Clean Water Branch	X	X	X		X
DOH, Communications Office					X
DOH, Compliance Assistance Office					X
DOH, Environmental Health Services Division (EHSD)					X
DOH, EHSD – Food & Drug Branch – Indoor & Radiological Health Branch					X
DOH, EHSD – Food & Drug Branch – Sanitation Branch					X

Table 7-1 Consulted Parties					
Respondents and Distribution	**Early or Ongoing Consultation, Presentation, or Notification**	**Comments Received EISPN**	**Received DEIS**	**Comments Received DEIS**	**Received FEIS**
DOH, EHSD – Vector Control Branch					X
DOH, Environmental Management Division					X
DOH, Environmental Resources Office					X
DOH, Hazard Evaluation and Emergency Response Office					X
DOH, Health Resources Administration					X
DOH, Kauaʻi District Health Office					X
DOH, Planning, Policy, and Program Development Office					X
DOH, Safe Drinking Water Branch					X
DOH, Sanitation	X	X	X		X
DOH, Solid & Hazardous Waste Branch					X
DOH, State Laboratories Division					X
DOH, Wastewater Branch	X	X	X		X
Department of Transportation (DOT)	X	X	X		X
~~Kauaʻi/Niʻihau Island Burial Council~~	~~X~~		~~X~~		
Office of Environmental Quality Control			X		X
Office of Hawaiian Affairs	X	X	X		X
University of Hawaiʻi, Environmental Center			X		X
University of Hawaiʻi, Water Resources Research Center			X		
C. County of Kauaʻi					
Department of Parks and Recreation	X		X		
Department of Planning	X		X		X
Department of Public Works	X	X	X		X
Department of Water	X	X	X		X
Fire Department	X		X		
Office of Economic Development	X		X		
Office of the County Clerk	X	~~X~~	X		
Police Department	X		X		
Transportation Agency	X		X		

Table 7-1 Consulted Parties					
Respondents and Distribution	**Early or Ongoing Consultation, Presentation, or Notification**	**Comments Received EISPN**	**Received DEIS**	**Comments Received DEIS**	**Received FEIS**
E. Elected Officials					
U.S. Senator Brian Schatz			X		X
U.S. Senator Mazie Hirono			X		X
(former) U.S. Representative Mark Takai 1st District			X		
U.S. Representative Colleen Hanabusa 1st District					X
U.S. Representative Tulsi Gabbard, 2nd District			X		X
Council Chair, Mel Rapozo	X		X	X	X
Council Vice Chair, Ross Kagawa	X		X	X	X
Councilmember, Arryl Kaneshiro	X		X		
Councilmember, Gary L Hooser	X	X	X	X	X
Councilmember, JoAnn A. Yukimura	X		X	X	X
Councilmember, KipuKai Kualiʻi	X		X		
Councilmember, Mason K. Chock	X		X	X	X
Honorable Mayor Bernard P. Carvalho, Jr.	X		X		
Representative Dee Morikawa, House District 16	X		X		
~~Representative~~ Councilmember, Derek S.K. Kawakami ~~House District 14~~	X		X	X	X
Representative James K. Tokioka, House District 15	X		X		
Senator Ronald D. Kouchi, Senate District 8	X		X		
F. Media					
Honolulu Star Advertiser			X		X
Hawaiʻi Tribune Herald			X		X
West Hawaiʻi Today			X		X
The Garden Island	X		X		X
Maui News			X		X
Molokaʻi Dispatch			X		X
Honolulu Civil Beat			X		X

Table 7-1 Consulted Parties

Respondents and Distribution	Early or Ongoing Consultation, Presentation, or Notification	Comments Received EISPN	Received DEIS	Comments Received DEIS	Received FEIS
H. Libraries					
Department of Education Hawaiʻi State Library Hawaiʻi Documents Center			X		X
Hawaiʻi Kai Regional Library			X		X
Hilo Regional Library			X		X
Kahului Regional Library			X		X
Kaimuki Regional Library			X		X
Kāneʻohe Regional Library			X		X
Legislative Reference Bureau			X		X
Library of the Department of Business, Economic Development, and Tourism			X		
Līhuʻe Regional Library	X		X		X
Hanapepe Public Library			X		X
Kapaʻa Public Library			X		X
Kōloa Public and School Library			X		X
Princeville Public Library			X		X
Waimea Public Library			X		X
Pearl City Regional Library			X		X
University of Hawaiʻi Hamilton Library			X		X
University of Hawaiʻi at Hilo Edwin H. Moʻokini Library			X		X
University of Hawaiʻi Kauaʻi Community College Library	X		X		X
University of Hawaiʻi, Maui College Library			X		X
I. Community Interest Groups and Individuals					
Aha Moku Advisory Committee				X	X
Center for Biological Diversity				X	X
Center for Food Safety				X	X
Contractors Association Kauaʻi	X		X	X	X
Friends of Māhāʻulepū	X	X	X	X	X
Grove Farm	X	X	X	X	X
Hawaii Cattlemen's Council, Inc.				X	X

Table 7-1 Consulted Parties

Respondents and Distribution	Early or Ongoing Consultation, Presentation, or Notification	Comments Received EISPN	Received DEIS	Comments Received DEIS	Received FEIS
Hawaiʻi Chapter of the Sierra Club Kauaʻi Group	X	X	X	X	X
Kauaʻi Chamber of Commerce	X		X	X	X
Kauaʻi County Farm Bureau	X		X	X	X
Kauaʻi Economic Development Board	X		X		
Kauaʻi Filipino Chamber of Commerce	X		X		
Kauaʻi Planning and Action Alliance	X		X		
Kauaʻi Visitors Bureau	X		X		
Kawailoa Development	X	X	X	X	X
Kohola Leo				X	X
Kōloa Community Association	X		X		
Kōloa Landing	X		X		
Malama Kōloa	X		X		
Malama Māhāʻulepū	X	X	X	X	X
Maui School Garden Network				X	X
Poiʻpū Bay Golf Course				X	X
Poʻipū Beach Resort Association	X		X	X	X
Poʻipū Crater Homeowners' Association	X	X	X		X
Poʻipū Kai	X		X		
Rotary Club of Poʻipū Beach	X		X		
Surfrider Foundation, Kauaʻi Chapter	X	X	X	X	X
Whalers Cove Resort	X		X		
J. Individuals					
Albert, Martin, M.D.	X	X	X		X
Albert, Phyllis	X	X	X		X
Albrecht, Arnold and Jane	X	X	X		X
Alexander, Mary				X	X
Amsterdam, Jo	X	X	X		X
Anderson, Gary R.	X	X	X		X
Andrade, Mac				X	X
Anthony, John				X	X

Table 7-1 Consulted Parties

Respondents and Distribution	Early or Ongoing Consultation, Presentation, or Notification	Comments Received EISPN	Received DEIS	Comments Received DEIS	Received FEIS
Aqui, Emeline				X	X
Ascuena, Jodi	X	X	X	X	X
Ascuena, Victor				X	X
Ashkenazy, Janet	X	X	X		X
Baldwin, Peter				X	X
Bandsma, Gloria				X	X
Barich, Terese	X	X	X		X
Barnard, Bill	X	X	X		X
Baron, Chris	X	X	X		X
Bartlett, Tom and Mary	X	X	X	X	X
Basile, Jude	X	X	X		X
Basler, Sabra	X	X	X	X	X
Bator, Bonnie P.	X	X	X	X	X
Bay, Greg & Shelley	X	X	X	X	X
Beall, Allan				X	X
Beall, Charlotte				X	X
Beall, Charlotte and Allen	X	X	X		X
Beam, Craig	X	X	X		X
Bedwell, Curtis J.	X	X	X	X	X
Bell, Betty	X	X	X	X	X
Bell, Masai	X	X	X		X
Beuttell, Jack				X	X
Blaich, Beryl	X	X	X	X	X
Bishop, Roger	X	X	X	X	X
Blessing, Alison K. & Breckenridge, Robert L.	X	X	X		X
Blessing, Phillip L. and Kathleen L.	X	X	X		X
Boll, Sharon	X	X	X		X
Boyd, Carylee	X	X	X		X
Boyle, Cornelia	X	X	X	X	X
Brendel, Judith E.	X	X	X		X
Britzmann, Katy	X	X	X	X	X

Table 7-1 Consulted Parties					
Respondents and Distribution	Early or Ongoing Consultation, Presentation, or Notification	Comments Received EISPN	Received DEIS	Comments Received DEIS	Received FEIS
Brockett, Kyle				X	X
Brockett, Sonja				X	X
Bronzino, Edna				X	X
Brouchoud, Bob & Kathy				X	X
Bulder, Liedeke & Wright, Dick	X	X	X		X
Burkhardt, Joanne	X	X	X		X
Burnham, Deborah				X	X
Burns, Mrs. Robert E.	X	X	X		X
Calipjo, Lesther				X	X
Carrick, Donna			X	X	X
Carrick, George			X	X	X
Carrick, George and Donna	X	X	X		X
Cassidy, Andrea			X	X	X
Cassidy, Michael and Andrea	X	X	X		X
Caylor, Carolyn	X	X	X		X
Cerioni, Lee	X	X	X		X
Clark, Kat				X	X
Clune, Constance A.				X	X
Coe, Charlie				X	X
Collison, David H. V.	X	X	X		X
Coon, Michael M.	X	X	X		X
Coon-Waymen, Michael & Jenica			X	X	X
Cowden, Felicia	X	X	X	X	X
Cox, Carroll				X	X
Crawford, Brenda S.	X	X	X		X
Curtis, Mya				X	X
Dalton, Judy	X	X	X		X
Davis, Amy Boudreau				X	X
Davis, Eric				X	X
Davis-Briant, Carol Ann	X	X	X		X
Decker, Lori	X	X	X	X	X

Table 7-1 Consulted Parties					
Respondents and Distribution	**Early or Ongoing Consultation, Presentation, or Notification**	**Comments Received EISPN**	**Received DEIS**	**Comments Received DEIS**	**Received FEIS**
DeMarco, Richard				X	X
DeMichiel, Catherine	X	X	X		X
DeMichiel, Robert P.	X	X	X		X
deVries, Diane	X	X	X	X	X
Deyden, Myra VanOrnum				X	X
DeZerega, David	X	X	X		X
DeZerega, Sara	X	X	X		X
Di Pietro, Jeri	X	X	X		X
Diamant, Michael	X	X	X		X
Dorrance, Jay	X	X	X		X
Ebata, Ellen	X	X	X	X	X
Eckberg, Ronalee and Eric	X	X	X		X
EerNisse, Errol P.				X	X
Ellul, Beverley and Joseph	X	X	X		X
Erichsen, Andrew				X	X
Faraldi, Russell	X	X	X		X
Farias, Bronwyn				X	X
Farias, Robert				X	X
Farrell, Cheryl Ann	X	X	X		X
Faye, Alan	X	X	X		X
Fehring, Bruce				X	X
Feldmeir, Matthew & Susan				X	X
Ferguson, James & Susan	X	X	X	X	X
Fleming, Collin and Factor, Kim	X	X	X		X
Forbes, Micha				X	X
Forer, Karl	X	X	X		X
Freeman, Margery	X	X	X	X	X
Fry, Robert				X	X
Garcia, Shawn				X	X
George, Heather				X	X
Gia, Debborrah				X	X

Table 7-1 Consulted Parties					
Respondents and Distribution	Early or Ongoing Consultation, Presentation, or Notification	Comments Received EISPN	Received DEIS	Comments Received DEIS	Received FEIS
Gipson, Farouz				X	X
Goeggel, Cathy				X	X
Goodwin, Sharon	X	X	X		X
Gottlieb, Alan				X	X
Grace, Yojana	X	X	X	X	X
Grant, Amy	X	X	X		X
Gudoy, Gina				X	X
Hadwin, Jim	X	X	X	X	X
Hadwin, Kathleen	X	X	X		X
Hagan, Beth	X	X	X		X
Hagan, Pat	X	X	X		X
Hagensen, Julie M.	X	X	X		X
Hager, Vivian	X	X	X		X
Halliday, John & Terri	X	X	X	X	X
Hammerquist, Bridget	X	X	X	X	X
Hanohano, Kalanikumai Ka Maka ʻuli ʻuli ʻO Na Aliʻi	X	X	X		X
Hartman, Diann				X	X
Hartman, Lisa	X	X	X		X
Hashimoto, Danny				X	X
Hayden, Chris & Diana				X	X
Hayes, Terrie and Kaohelauli'i, Billy	X	X	X	X	X
Heacock, Donald E.	X	X	X	X	X
Healy, John T.	X	X	X		X
Hee, Stephen	X	X	X		X
Heinen, Gary and Jackie	X	X	X		X
Heller, Larry	X	X	X		X
Hennessy, Tom and Ann	X	X	X		X
Herndon, Herb	X	X	X		X
Herndon, Joyce	X	X	X		X
Hibbitt, Mindy				X	X

Table 7-1 Consulted Parties					
Respondents and Distribution	Early or Ongoing Consultation, Presentation, or Notification	Comments Received EISPN	Received DEIS	Comments Received DEIS	Received FEIS
Hiraoka, Joy				X	X
Hoff, John R.	X	X	X	X	X
Hokupaa				X	X
Holl, Sherrie				X	X
Holt, Howard & Maureen	X	X	X	X	X
Horak, Joe				X	X
Houby, Jens	X	X	X		X
Howell, David & Linda	X	X	X	X	X
Hubner, Andy				X	X
Hurley, Marisa	X	X	X		X
Ito, Y. Marvin				X	X
James, Michael				X	X
Janai, Kapua	X	X	X	X	X
Jarrett, Nancee				X	X
Jerdal, Larry and Karen	X	X	X		X
John, Ronald O.	X	X	X	X	X
Jones, Ruthann				X	X
Jones, Vince and Fran	X	X	X		X
Jorgens, Gayle and Wai, Stanley	X	X	X		X
Judd, David	X	X	X		X
Kalanikumai Ka Makauliuli O Na Alii Hanohano				X	X
Kallai, Hope				X	X
Kanna, Jacqueline K.				X	X
Kashiwaeda, Suzanne	X	X	X	X	X
Kaui, Trinette				X	X
Kawahara, Dawn Fraser	X	X	X		X
Kawahara, Delano H.	X	X	X		X
Kawahara, Lani	X	X	X		X
Kaye, Melanie				X	X
Keamoai, Hoku				X	X

Table 7-1 Consulted Parties					
Respondents and Distribution	**Early or Ongoing Consultation, Presentation, or Notification**	**Comments Received EISPN**	**Received DEIS**	**Comments Received DEIS**	**Received FEIS**
Kechloian, Eileen	X	X	X	X	X
Kechloian, John (Jay)	X	X	X	X	X
Kelley, MaryLu	X	X	X		X
Kelly, Frank and Marilyn	X	X	X		X
Ken (no last name)	X	X	X		X
Khalsa, Dr. H.S.S.				X	X
Kinsey, Sinclair W.	X	X	X		X
Kroll, Jean				X	X
Kuala, Marty	X	X	X		X
Lauryn, Steven	X	X	X		X
Lawrence, Jr., Delton				X	X
Lee-Jackson, Debra	X	X	X		X
Leininger, Susan	X	X	X		X
Levy, Joan	X	X	X		X
Lo, Karl & Catherine	X	X	X		X
Lott, Jacquelynn K.				X	X
Low, Kristen				X	X
Lucas, Paul	X	X	X		X
Lynam, Christina	X	X	X		X
Macdougall, Sandy	X	X	X		X
Malapit, Lon				X	X
Maple, Stuart & Lynne	X	X	X		X
Martin, Marianne	X	X	X		X
Masters, Jeff and Deborah	X	X	X		X
Matsumura, Lynne				X	X
McCaslin, Candace	X	X	X		X
McCoubrey, Sharon	X	X	X	X	X
Meboe, Ellen F.	X	X	X	X	X
Meboe, Joe	X	X	X	X	X
Meyer, Ira & Rayme	X	X	X	X	X
Mikaila, Taressa				X	X

Table 7-1 Consulted Parties					
Respondents and Distribution	**Early or Ongoing Consultation, Presentation, or Notification**	**Comments Received EISPN**	**Received DEIS**	**Comments Received DEIS**	**Received FEIS**
Miller, John W.	X	X	X		X
Mills, Mary P.	X	X	X		X
Miner, Imogene	X	X	X		X
Mizumoto, Lance C.	X	X	X		X
Mizuo, Kenneth & Lynette				X	X
Montgomery, Yuri	X	X	X		X
Morey, Lee	X	X	X		X
Mukai, Richard & Victoria				X	X
Muller, Jan	X	X	X	X	X
Muller, John T. Jr.	X	X	X	X	X
Murguia, Kathleen	X	X	X		X
Muzik, Katherine				X	X
Neudorffer, Mary	X	X	X	X	X
Nishek, Jerry				X	X
Nishimura, Randall				X	X
Norman, Rita	X	X	X		X
O'Connor, Tim	X	X	X		X
Oliver, Polli C.	X	X	X		X
Olry, Michele	X	X	X		X
Olson, Dick and Maria	X	X	X		X
Osterer, Lorraine	X	X	X	X	X
Oxford, Patty	X	X	X		X
Oyama, Mark				X	X
Patterson, John	X	X	X		X
Perez, Kymry	X	X	X		X
Pescaia, Carol	X	X	X		X
Petersen, Greg	X	X	X		X
Pilaria, Rowland	X	X	X	X	X
Pilaria, Shari	X	X	X	X	X
Pilaria, Val	X	X	X		X
Pinzon, Crystal				X	X

Table 7-1 Consulted Parties					
Respondents and Distribution	Early or Ongoing Consultation, Presentation, or Notification	Comments Received EISPN	Received DEIS	Comments Received DEIS	Received FEIS
Plotkins, Pierra A.	X	X	X		X
Poindexter, James M.	X	X	X		X
Pollock, Sherry				X	X
Powers, Eve	X	X	X		X
Purdy, Ken				X	X
Purdy, Susie				X	X
R, Liz				X	X
Rachap, Allan	X	X	X	X	X
Rachap, Judith	X	X	X	X	X
Ray, Robert	X	X	X		X
Rees, Gerald and Hannah	X	X	X	X	X
Riley, Mark and Simpson, Ann	X	X	X		X
Rogers, Puanani				X	X
Rose, Mike and Laurie	X	X	X		X
Rosen, Gail C.	X	X	X		X
Rosen, Henry and Sara	X	X	X	X	X
Rosener, Matt	X	X	X	X	X
Rowe, Rupert				X	X
Rozelle, Linda M.	X	X	X		X
Ruchaber, Krista				X	X
Rullman, Charles	X	X	X		X
Russell, Richard	X	X	X	X	X
Saiki, Michael				X	X
Salazar, Tiffany L.				X	X
Santos, Ivy				X	X
Sauve, Joe	X	X	X		X
Scamahorn, Elizabeth				X	X
Schimmelfennig, William	X	X	X		X
Schwartz, Ken and Stephanie	X	X	X	X	X
Shablow, Janette	X	X	X		X
Shaffer, Jamie H.	X	X	X		X

Table 7-1 Consulted Parties					
Respondents and Distribution	Early or Ongoing Consultation, Presentation, or Notification	Comments Received EISPN	Received DEIS	Comments Received DEIS	Received FEIS
Sheffield, Kathy				X	X
Sherman, Dr. Irene & Douglas	X	X	X	X	X
Simms, Shelby				X	X
Sindt, Ed	X	X	X	X	X
Smith, Annick				X	X
Smith, Sarah				X	X
Smith, Stephen E.	X	X	X		X
Snyder, Eleanor	X	X	X	X	X
Sparks, Norma Doctor	X	X	X		X
Sparks, Stephen A.	X	X	X		X
Stecher, Steven & Igarashi, Portia	X	X	X		X
Stein, Jerry and Wendy	X	X	X	X	X
Steinhagen, James & Susan	X	X	X		X
Sterns, Nancy	X	X	X		X
Stone, Mary Isabella	X	X	X		X
Stone, Rebecca	X	X	X		X
Street, Nicole				X	X
Sullivan, Don	X	X	X		X
Sullivan, James	X	X	X	X	X
Summerfield, Yvonne	X	X	X		X
Sussman, Jay	X	X	X		X
Suzie				X	X
Swanson, Ashley	X	X	X		X
Swanson, William	X	X	X	X	X
Sweeney, Sean Keoki				X	X
Sylvester, Linda				X	X
Talaber, Cynthia & Dave	X	X	X	X	X
Taylor, Gabriela				X	X
Taylor, Ken	X	X	X		X
Taylor, Terry	X	X	X		X
Thompson, Tayemi Susan	X	X	X	X	X

Table 7-1 Consulted Parties

Respondents and Distribution	Early or Ongoing Consultation, Presentation, or Notification	Comments Received EISPN	Received DEIS	Comments Received DEIS	Received FEIS
Thurston, Anne	X	X	X		X
Tilley, Karen	X	X	X		X
Trapp, Max	X	X	X		X
Trentlage, Sheri & Dave	X	X	X		X
Trevino, Luis	X	X	X	X	X
Valentini, George & Littlefield, Pam	X	X	X	X	X
Valenziano, Beth	X	X	X	X	X
Varnel, Deboragh				X	X
Vernon, Ian				X	X
Viluan, Tia				X	X
Vlach, Robert	X	X	X		X
Walden, Diane	X	X	X		X
Walden, Terry	X	X	X		X
Waldrop, Mark	X	X	X		X
Waldrop, Mary	X	X	X	X	X
Waybright, Liz				X	X
Weil, Martin	X	X	X		X
Weiner, Jill				X	X
Welti, Cynthia	X	X	X		X
Werner, Mariah				X	X
Wesland, Coni	X	X	X		X
White, Allan B.	X	X	X		X
Whitney, William	X	X	X		X
Wiener, Susan	X	X	X		X
Wilcox, Mark	X	X	X		X
Wildman, Kelly	X	X	X		X
Wildman, Randall	X	X	X		X
Williams, Bob				X	X
Williams, Bob and Jeanette	X	X	X		X
Williams, Carol	X	X	X		X
Williams, Jeanette				X	X

Table 7-1 Consulted Parties					
Respondents and Distribution	**Early or Ongoing Consultation, Presentation, or Notification**	**Comments Received EISPN**	**Received DEIS**	**Comments Received DEIS**	**Received FEIS**
Williams, Laura	X	X	X		X
Wollin, Pearl	X	X	X		X
Wolny, Kerry	X	X	X		X
Wolny, Pam	X	X	X	X	X
Wry, Diane				X	X
Wyeth, Hau'onalani	X	X	X	X	X
Yamada, Debbie				X	X
Yamamoto, James				X	X
Yamasaki, Morton				X	X
Yatsuoka, Vanessa				X	X
Yeo, Gwen	X	X	X		X
Zelkovsky, Robert	X	X	X	X	X
Zepeda, Joy				X	X
Zimmerman, Jack	X	X	X		X

7.2 COMMENTS AND RESPONSES TO THE EISPN

Hawaiʻi Dairy Farms Final ~~Draft~~ EIS Volume 8 ~~3~~ and Volume 9 4 contains the EISPN comment letters and responses.

7.3 COMMENTS AND RESPONSES TO THE DEIS

Hawaiʻi Dairy Farms Final EIS Volume 6 and Volume 7 contains the DEIS comment letters and responses.

8.0

LIST OF REFERENCES

8.0 LIST OF REFERENCES AND PREPARERS OF THE EIS

8.1 REFERENCES

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8.2 PREPARERS OF THE EIS

Below is a list of individuals that contributed to the preparation and completion of this Environmental Impact Statement (EIS). The list includes the name of the individual and their role, or the name of the company and the subfield of professional expertise utilized to conduct and complete the EIS.

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