Wells/Drinking Water Contamination

Koloa Po'ipu Drinking Water at Risk

HDF's spokesperson, Amy Hennessey, was quoted in the Garden Island on Sunday, September 14, 2014. She told Kaua'i residents that there was no need for concern about the HDF dairy contaminating local drinking water. Ms. Hennessey's contention was based on the distance between the County Wells and the proposed effluent pond. That pond is intended to collect and hold a large volume of cow manure and urine that is washed from the raceways and milking parlor after each milking of the herd twice daily. What Ms. Hennessey did not explain, however, was that HDF plans to pump the manure sludge from the effluent pond right onto pastures of Block H that just happen to be 700-750 feet from the County Wells. To make matters worse, Block H is one of the few areas of the farm with a "well draining" soil type. Thus, the manure pumped right to the well draining soil is certain to contaminate the County Wells in time as the manure's bacteria and nutrient content pass to the acquifers and fresh water sources that charge the nearby wells.

Ms. Hennessey also did not explain why HDF's Plan (filed with the State for Approval 7/23/14) did not disclose all of the Country Wells which are very close to the proposed farm site: County Wells, "Koloa F, C and D" and the private Gillin House Well. These Wells provide the drinking water for all of Po'ipu and Koloa. The water pumped from these wells fills tanks that hold more than 4 million gallons of fresh drinking water which is distributed to Po'ipu and Koloa. In their Plan, HDF only described the distance of Koloa Well F from the dairy. HDF claimed that Koloa Well F "was more than "1/2 mile (2600 feet) away from the dairy facility site". (HDF Plan, Page 8). When the County Water Department was contacted, however, they contradicted that claim and explained that Koloa Well F is, in fact, less than 750 feet from the proposed farm site and that Koloa Well C is just over 750 feet from the farm. In response to the County Water Department information, Ms. Hennessey offered that the "over ½ mile away" claim was really intended to represent the distance of Koloa Well F from the proposed effluent pond site.

The effluent pond is not the real issue when contamination of drinking water is considered. The effluent pond itself would need to overflow to contaminate the Wells down slope from the pond. The real risk to our sources of fresh water is the Dairy's Plan to pump thousands and thousands of gallons of manure sludge from the pond down slope to "Block H" which happens to be the area of the farm nearest to the Wells. In addition, it is one of the only "well draining soil" areas on the farm. More than 60% of the farm contains clay based soils. HDF's plan to pump the manure sludge to Block H is likely to take advantage of "Block H's" ability to absorb the waste. Unfortunately, that "well draining soil" will not only absorb the bacteria and hormone laden waste, it will facilitate the migration of bacteria and nitrates into the waters that charge these wells. In addition to the pumped manure sludge planned for Block H, the pastures in that same block are to receive 100,000 lbs (50 tons) of additional fresh manure each day the herd is grazed on any part of "Block H". (HDF's Plan, pages 42 and 85). Thus, even the initial herd would add a significant daily load to the manure sludge pumped onto the pastures and soils of "Block H". (699 cows x 143 lbs/cow/day = 99,957 lbs of manure per day). If the HDF Dairy Plan is approved, after one month of operation, there would be nearly 3 million pounds of bacteria and nitrogen laden manure deposited on the Maha'ulepu site. The risk of contaminating the nearby Wells and the Koloa and Po'ipu drinking water would be very real considering the volume of waste that is certain to be produced.

Table 1 – NWI Wetlands Classification

Location (Wetland Code)	System	Sub-System	Class	Sub-Class	Modifiers
R4SBCx	Riverine	Intermittent	Streambed		• Seasonally Flooded • Excavated
PUBHh	Palustrine		Unconsolidated Bottom		• Permanently Flooded • Diked/Impounded
PEM1Hh	Palustrine		Emergent	Persistent	• Permanently Flooded • Diked/Impounded
PEM1Kx	Palustrine		Emergent	Persistent	• Artificially Flooded • Excavated

2.2.3 Water Wells

The State Department of Land and Natural Resources (DLNR) Commission on Water Resource Management (CWRM) manages and tracks water resources in the State including groundwater wells. The State database identifies two primary well sites in the Maha'ulepu Valley. The Koloa F Well is a public drinking water source used by the County of Kaua'i Department of Water Supply. The Maha'ulepu Well site includes up to 14 irrigation wells drilled by the sugar cane plantations. The water wells are shown on Figure 5, Water Resources. The Koloa F well is located over ½ mile away from the dairy facility site.

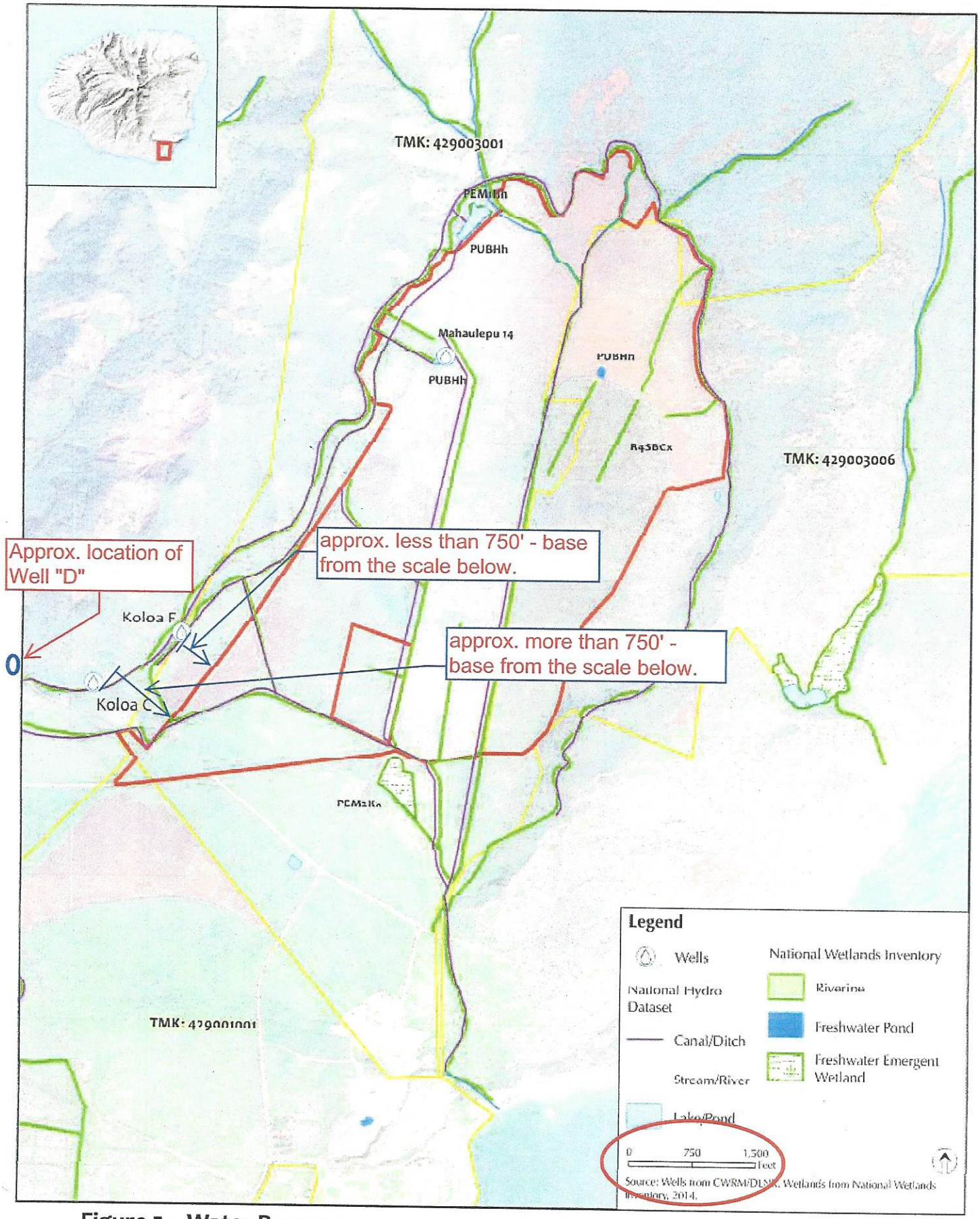


Figure 5 – Water Resources

2.3 Rainfall Data

The data sources used for sizing of the waste management systems and irrigation scheduling of the dairy facility site are described in this section.

2.3.1 Normal Precipitation

Normal monthly precipitation depths were obtained from the University of Hawai'i Rainfall Atlas of Hawai'i (2011). The average monthly precipitation depths will be used for sizing of the waste management systems and irrigation scheduling as required by the standards.

Table 2 – Average Monthly Precipitation Data

Month	Mean Monthly Rainfall (in)
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

2.3.2 NOAA 24-Hour Rainfall

Precipitation depths for various durations and recurrence intervals were obtained from NOAA Atlas 14, Volume 4, Version 3. The 25-year 24-hour precipitation data will be used for sizing of waste management systems as required by the standards.

Table 3 – NOAA 24-Hour Rainfall Data

Storm Event (Recurrence Interval)	Storm Duration	
	1-hour	24-hour
1-year	1.18"	3.47"
2-year	1.55"	4.78"
10-year	2.54"	8.18"
25-year	3.17"	**10.4"**
50-year	3.70"	12.2"
100-year	4.25"	14.1"

2.3.3 NOAA Rain Gauge Data

Rain gauge data was obtained from NOAA National Climatic Data Center for the Maha'ulepu 941.1 rain gauge located on the farm off of Maha'ulepu Road (GHCND:USC00515710 - MAHA'ULEPU 941.1 HI US). The rain gauge is located at: Elevation = 24.4, Latitude = 21.90194, Longitude = -159.42111. The data record analyzed included daily precipitation records from 1/1/1984 to 12/31/2013 for a total of approximately 10,957 days (30 years). The rainfall events were ranked based on days of consecutive rainfall (DAPR) and the corresponding multiday precipitation total (MDPR). The data suggests that having more than a week of consecutive rain is very unusual for Maha'ulepu Valley with this only having occurred 5 times in the last 30 years.

Table 4 – NOAA Rain Gauge Data

GHCND:USC00515710 - MAHA'ULEPU 941.1 HI US			
DATE	**MDPR, in**	**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

MDPR – Multiday precipitation total

DAPR – Number of days included in the multiday precipitation total (MDPR)

Occurrence – number of occurrences in 10,957 day record between 1/1/1984 to 12/31/2013

2.4 Flood Hazards

The entire project area is located within Federal Emergency Management Agency (FEMA) Zone X based on FEMA Flood Insurance Rate Map (FIRM) panels 1500020316E and 1500020318F. Zone X includes areas determined to be outside the 0.2% annual chance floodplain.

2.5 Soils

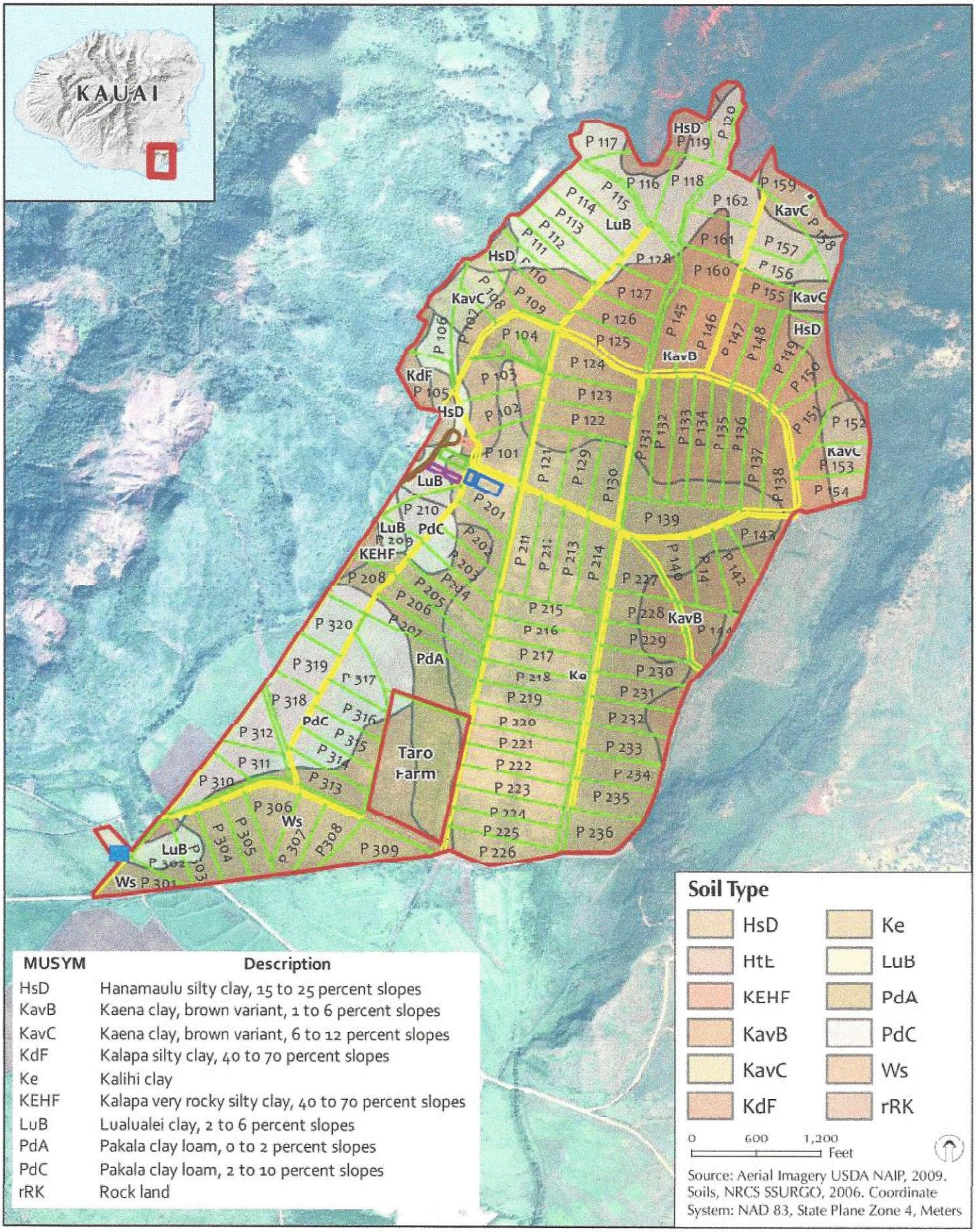
According to the United States Department of Agriculture (USDA) Natural Resource Conservation Service (NRCS) survey data, the project area consists of a variety of soils. Soil characteristics are summarized in the table below. See Figure 6, Soil Map.

Table 5 – Soil Characteristics Summary

Soil Classification	Soil Classification	Slope Range (%)	Hydrologic Soils Group	Drainage Class	Depth to Water Table (inches)	Capacity to transmit water – Ksat (in/hr)	Typical Soil Profile - Layer 1 (depth from surface)	Typical Soil Profile - Layer 2 (depth from surface)	Typical Soil Profile - Layer 3 (depth from surface)
Hanamaulu Silty Clay	HsD	15 to 20%	B	Well Drained	> 80″	0.14 to 1.98	0 to 11″ Silty Clay	11 to 36″ Silty Clay	36 to 72″ Silty Clay Loam
Hanamaulu Stony Silty Clay	HtE	10 to 35%	B	Well Drained	> 80″	0.20 to 2.00	0 to 11″ Stony Silty Clay	11 to 36″ Silty Clay	36 to 72″ Silty Clay Loam
Ka'ena Clay, Brown Variant	KavB	1 to 6%	D	Poorly Drained	24 to 60″	0.00 to 0.20	0 to 10″ Clay	10 to 37″ Stony Clay	37 to 54″ Stony Clay
Ka'ena Clay, Brown Variant	KavC	6 to 12%	D	Poorly Drained	24 to 60″	0.00 to 0.20	0 to 10″ Clay	10 to 37″ Stony Clay	37 to 54″ Stony Clay
Kalapa Silty Clay	KdF	40 to 70%	B	Well Drained	> 80″	0.00 to 0.20	0 to 10″ Silty Clay	10 to 60″ Clay	
Kalihi Clay	Ke	n/a	D	Poorly Drained	24 to 60″	0.06 to 0.60	0 to 16″ Clay	16 to 70″ Clay	
Kalapa Very Rocky Silty Clay (Very Rocky)	KEHF	40 to 70%	B	Well Drained	> 80″	0.00 to 0.20	0 to 10″ Silty Clay	10 to 60″ Clay	
Kalapa Very Rocky Silty Clay (Rock Outcrop)	KEHF	40 to 70%	D			0.00 to 0.06	0 to 60″ Bedrock		
Lualualei Clay	LuB	2 to 6%	D	Well Drained	> 80″	0.00 to 0.20	0 to 10″ Clay	10 to 60″ Clay	

Table 5 – Soil Characteristics Summary (continued)

Soil Classification	Soil Classification	Slope Range (%)	Hydrologic Soils Group	Drainage Class	Depth to Water Table (inches)	Capacity to transmit water - Ksat (in/hr)	Typical Soil Profile - Layer 1 (depth from surface)	Typical Soil Profile - Layer 2 (depth from surface)	Typical Soil Profile - Layer 3 (depth from surface)
Pakala Clay Loam	PdA	0 to 2%	B	Well Drained	> 80"	0.60 to 1.98	0 to 16" Clay Loam	16 to 60" Silty Clay Loam	
Pakala Clay Loam	PdC	2 to 10%	B	Well Drained	> 80"	0.60 to 1.98	0 to 16" Clay Loam	16 to 60" Silty Clay Loam	
Rock Land	rRK	n/a	D	Well Drained	> 80"	0.00 to 0.06	0 to 4" Silty Clay	4 to 8" Silty Clay	8 to 20" Bedrock
Rock Land (Rock Outcrop)	rRK	n/a	D			0.00 to 0.06	0 to 60" Bedrock		
Waikomo Stony Silty Clay	Ws	n/a	D	Well Drained	> 80"	0.00 to 0.06	0 to 14" Stony Silty Clay	14 to 20" Stony Silty Clay Loam	20 to 30" Bedrock



MUSYM	Description
HsD	Hanamaulu silty clay, 15 to 25 percent slopes
KavB	Kaena clay, brown variant, 1 to 6 percent slopes
KavC	Kaena clay, brown variant, 6 to 12 percent slopes
KdF	Kalapa silty clay, 40 to 70 percent slopes
Ke	Kalihi clay
KEHF	Kalapa very rocky silty clay, 40 to 70 percent slopes
LuB	Lualualei clay, 2 to 6 percent slopes
PdA	Pakala clay loam, 0 to 2 percent slopes
PdC	Pakala clay loam, 2 to 10 percent slopes
rRK	Rock land

Figure 6 – Soils Map

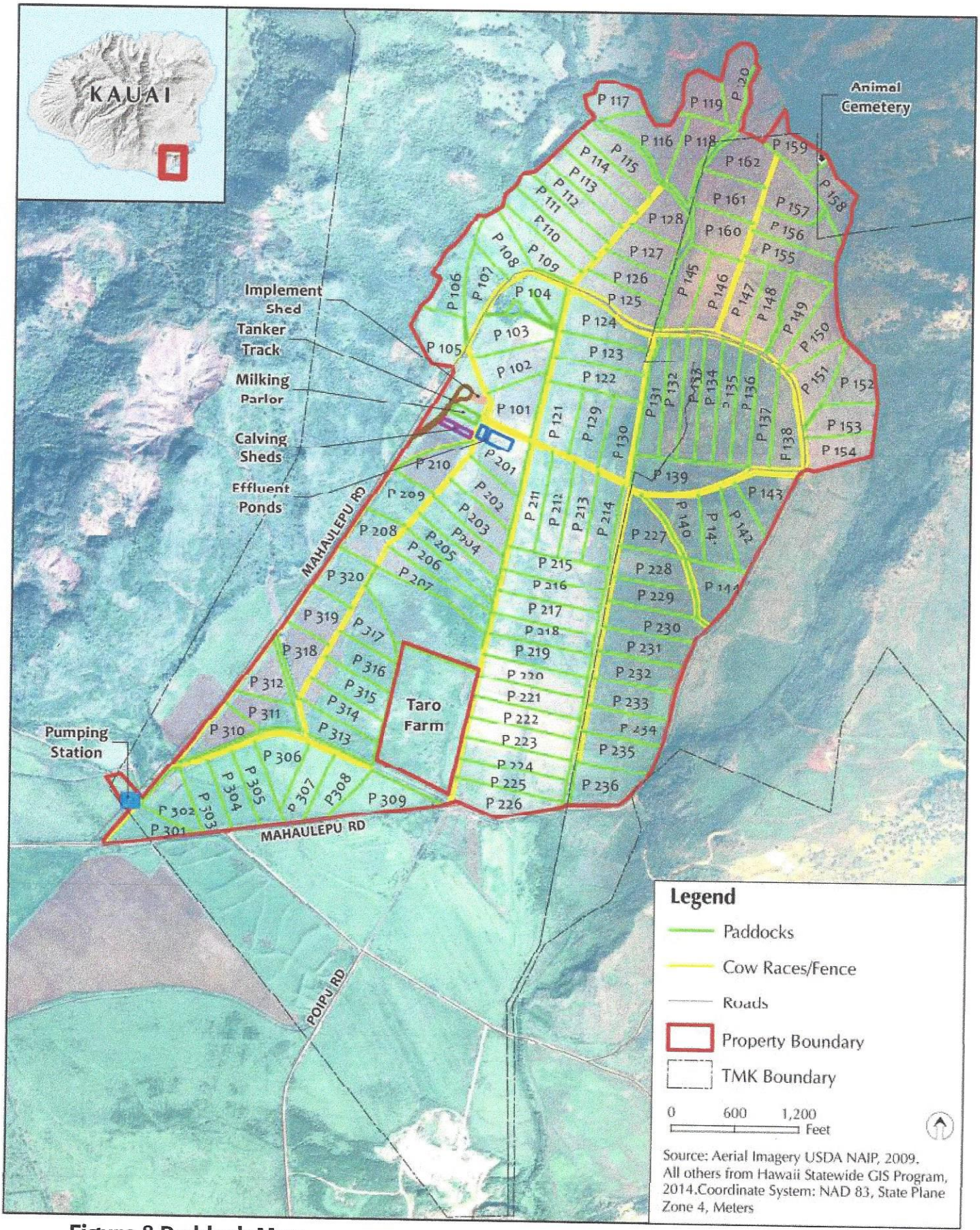


Figure 8 Paddock Map

Table 7 – Paddock Area Summary

Field	Acres	Field	Acres	Field	Acres	Field	Acres
P 101	4.82	P 131	4.35	P 161	4.67	P 229	4.59
P 102	4.82	P 132	4.35	P 162	4.67	P 230	4.59
P 103	4.82	P 133	4.35	P 201	4.94	P 231	4.59
P 104	4.82	P 134	4.35	P 202	4.27	P 232	4.59
P 105	4.69	P 135	4.35	P 203	4.27	P 233	4.59
P 106	4.69	P 136	4.35	P 204	4.27	P 234	4.59
P 107	4.27	P 137	4.45	P 205	4.27	P 235	4.59
P 108	4.27	P 138	4.50	P 206	4.27	P 236	4.94
P 109	4.27	P 139	5.63	P 207	4.27	P 301	3.04
P 110	4.27	P 140	4.30	P 208	3.95	P 302	3.95
P 111	4.27	P 141	4.30	P 209	3.95	P 303	4.20
P 112	4.27	P 142	4.30	P 210	3.95	P 304	4.30
P 113	4.27	P 143	4.30	P 211	4.62	P 305	4.05
P 114	4.27	P 144	4.30	P 212	4.62	P 306	4.30
P 115	4.27	P 145	4.67	P 213	4.62	P 307	4.30
P 116	5.06	P 146	4.67	P 214	4.62	P 308	4.20
P 117	3.24	P 147	4.67	P 215	4.59	P 309	4.94
P 118	5.06	P 148	4.67	P 216	4.54	P 310	3.85
P 119	3.58	P 149	4.67	P 217	4.54	P 311	3.85
P 120	3.58	P 150	4.67	P 218	4.54	P 312	3.85
P 121	4.67	P 151	4.67	P 219	4.54	P 313	4.03
P 122	4.67	P 152	4.08	P 220	4.54	P 314	4.03
P 123	4.67	P 153	4.08	P 221	4.54	P 315	4.27
P 124	4.67	P 154	4.08	P 222	4.54	P 316	4.12
P 125	4.05	P 155	4.67	P 223	4.54	P 317	4.03
P 126	4.05	P 156	4.67	P 224	4.54	P 318	4.03
P 127	4.05	P 157	4.67	P 225	4.54	P 319	4.03
P 128	4.05	P 158	3.58	P 226	4.59	P 320	4.03
P 129	4.67	P 159	3.58	P 227	4.64		
P 130	4.67	P 160	4.67	P 228	4.59	***Total***	***517.29***

7.0 Wastewater Treatment

The dairy is a pasture-based operation, and livestock spend a limited time in the holding yard and Milking Parlor. Livestock waste and wastewater generated from the dairy facility, including any runoff, will be collected, treated and reused on the farm. Fundamentally, the water treatment system recycles 100% of all wastes with zero point source discharge into State waters. The objectives of the design are:

i. To capture all of the effluent that is produced at the dairy facility
ii. To spread the effluent on the grazing land to meet nutrient demand of the plants/pasture
iii. To control the effluent application rate and spread effluent only on the desired areas within boundaries
iv. To keep effluent completely separate from potable water to prevent contamination
v. To comply with all regulatory requirements under the state and federal laws

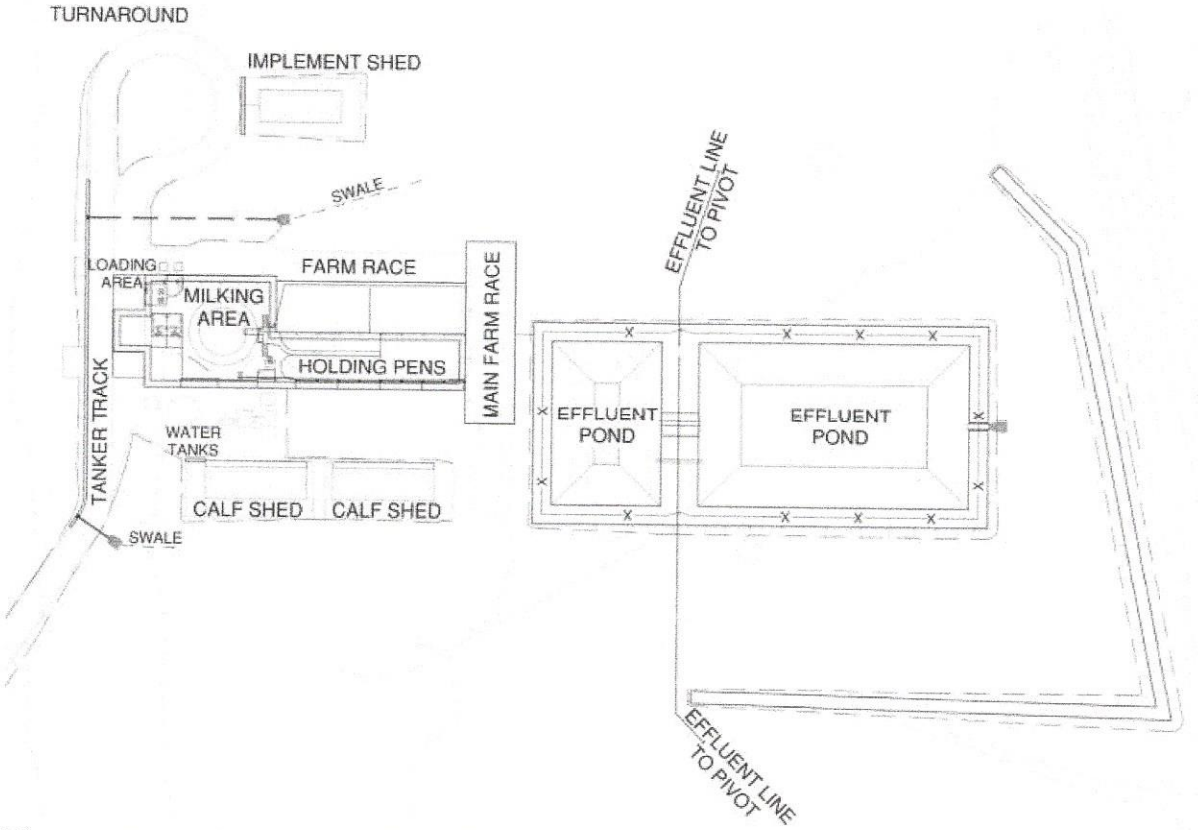


Figure 17 – Dairy Facility Site Plan

The dairy facility including the wastewater treatment ponds and other infrastructure will be sized and constructed for the Phase 2 capacity of 2,000 cows. However, the calculations in this report are based on the Phase 1 capacity of 699 cows. A future amendment to the Waste Management Plan will be submitted for review and approval for Phase 2. Refer to NRCS Practice Code Standard 633 Waste Utilization.

7.1 Effluent/Manure Volume

HDF is a pasture-based dairy farm that is being designed for kiwi-cross animals. A mature kiwi-cross cow's weight is about 1,210 lbs. and it produces an average of 143 lbs. of manure per day or 8.8 lbs. (1.05 gallons) average per waking hour. The 699 cows in Phase 1 will be maintained in mobs of 105-115 animals, on a 54-acre block, that is subdivided into 18 paddocks. The cows graze for one day per paddock, so once every 18 days the entire mob (all 105-115 animals) will produce the majority of its effluent on that one paddock as it grazes.

Grass-fed cattle produce significantly more liquid manure than cattle fed on concentrate and Kikuyu is also a relatively wet grass (87% water). The total amount of manure produced in the milking platform each day will be 1,477 gpd [699 cows x (1hr x 2 milkings per day) x manure of 1.05 gallon per hour = 1,477 gpd].

The holding yard and Milking Parlor are washed twice a day after each milking. All of the manure produced in the Milking Parlor and yards is washed out and the contaminated water is transferred to the settling pond. The milk storage tanks located within the Milking Parlor are also washed out after milk is pumped to tanker trucks for delivery. Wash water from the milk tanks is also transferred to the settling pond. The total wastewater volume for 699 cows from the machine wash, yard wash, and other milking activity is 10,667 gpd. See Figure 18, Water Flow Schematic.

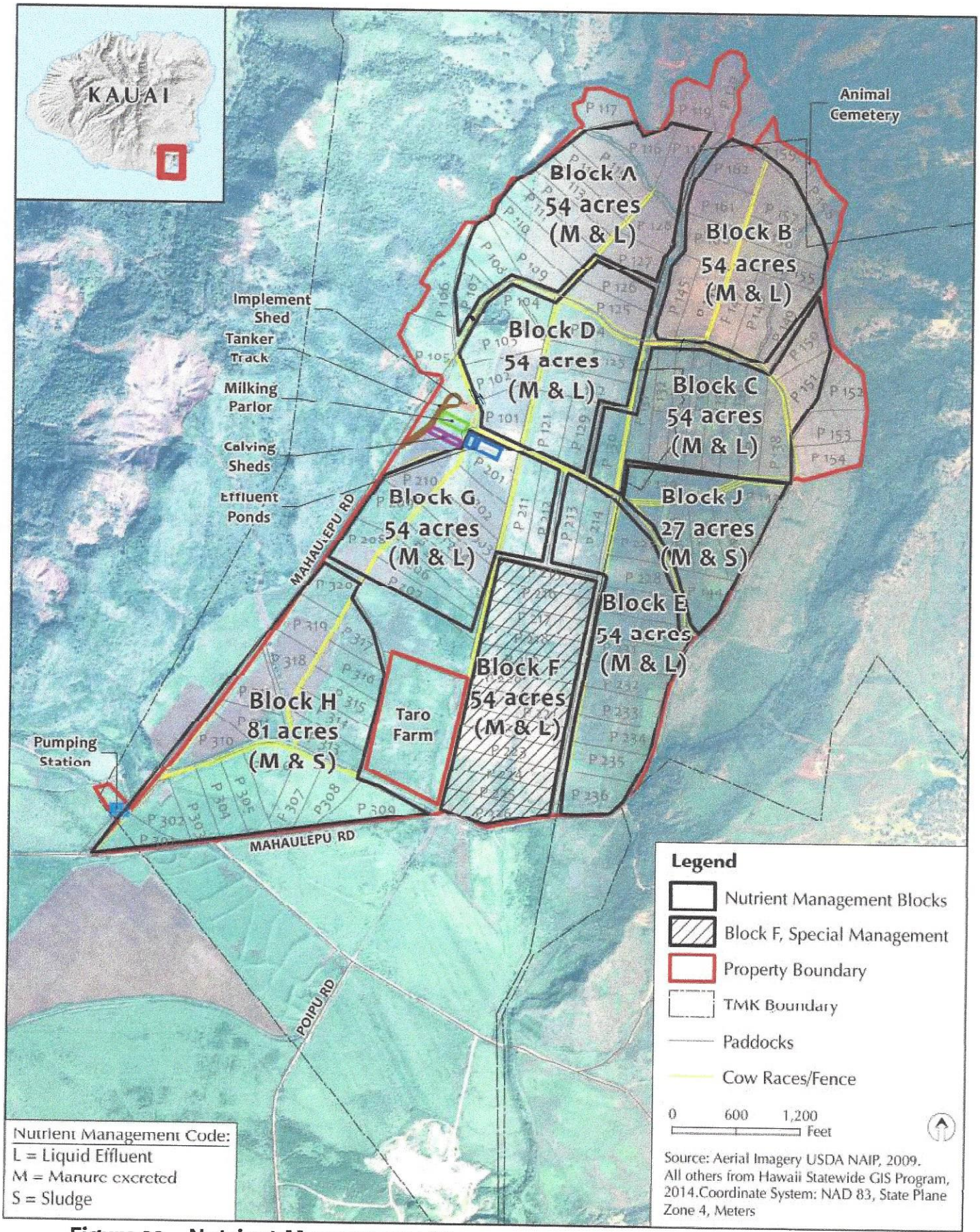


Figure 23 – Nutrient Management Map