Task 2.11. Final Report

Animal Nutrient Management Assessments (ANMAs) for the Three Selected Dairies

for the project entitled

Dairy Best Available Technologies in the Okeechobee Basin

(SFWMD Contract No. C-11652)

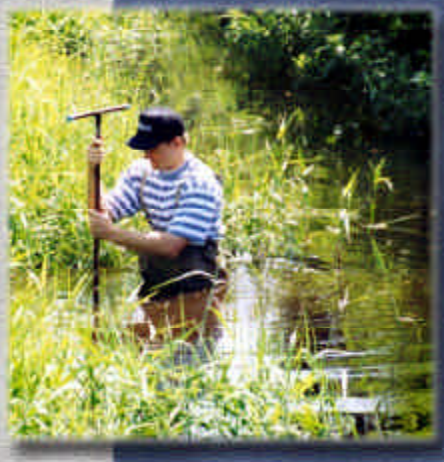
Submitted by

SWET, Inc.

Soil and Water Engineering Technology, Inc.

In Association With

MOCK•ROOS
CH2M HILL
ENTEL



September 1, 2002

The SWET Team

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General Introduction

This report presents animal nutrient management assessments (ANMAs) for the three selected dairies for the project entitled Dairy Best Available Technologies (BAT) in the Okeechobee Basin (SFWMD Contract No. C-11652). Butler Oaks Farm, Inc., Davie Dairy, Inc., and Dry Lake Dairy, Inc. are participating in the Dairy BAT project. The Dry Lake Dairy assessment also provides an evaluation of Milking R, Inc. This dairy is included in the assessment because these two dairies are highly interconnected and information regarding Milking R, Inc. (formerly Dry Lake Dairy Barn 2) is needed to fully understand the situation at Dry Lake Dairy (formerly Dry Lake Dairy Barn 1). The assessments presented here characterize the existing conditions on the dairies, from nutrient and water use standpoints, in order to identify problem areas and their potential solutions.

The three assessments have similar but not identical document structures (headings and subheadings). Due to the different nature of the dairies, different subconsultants doing the assessments, and nature of the solutions undertaken at each dairy, the structures are slightly different. The Butler Oaks assessment contains a more detailed discussion of management alternatives, but the Davie Dairy Report has the most complete description of the Edge of Farm (EOF) treatment system that is a recommended management component for each farm. The Dry Lake Dairy assessment provides alternatives for both Dry Lake Dairy and Milking R, Inc. Even though this assessment was done for both dairies, only Dry Lake Dairy will be participating in the project.

Please note that the ANMAs presented in this report are not USDA Natural Resources and Conservation Service (NRCS) comprehensive nutrient management plans (CNMPs). A NRCS CNMP is a document that is specifically prepared to demonstrate that a farm meets NRCS's nutrient balance requirements, and other whole farm planning requirements, in order to obtain NRCS approval for a final dairy design. This project is specifically focused on reducing phosphorus discharges through management practices that may support CNMP goals. However, the development of CNMP plans is not an objective of this project.

Animal Nutrient Management Assessment for Butler Oaks Farm, Inc.

1. Introduction

In the mid-1980s, runoff from dairy farms located in the Okeechobee Drainage Basin was determined, at least in part, to be a potential cause of water quality problems in Lake Okeechobee. As a result, the Florida Department of Environmental Protection (FDEP) adopted the Dairy Rule in 1987. The Rule was written in cooperation with the dairy farmers in the Lake Okeechobee Drainage Basin, the Florida Department of Agriculture, the US Department of Agriculture Soil Conservation Service, and the South Florida Water Management District (SFWMD). The Rule (Chapter 62-670.500, F.A.C.) required that owners of dairies located in the Lake Okeechobee Drainage Basin obtain industrial wastewater discharge permits from FDEP, construct waste management systems and implement "best management practices". Following the adoption of the Dairy Rule dramatic decreases in nutrient content (specifically phosphorus) in dairy farm runoff occurred. However, Lake Okeechobee still receives phosphorus in excess of the target load (FDEP, 2000). Consequently, attention is focused on dairies in the Basin with high storm water runoff phosphorus concentrations. Farm-scale nutrient balances for each of the identified dairies are needed to assess options to reduce the phosphorous concentrations in their runoff.

This ANMA describes and maps all relevant characteristics of the Butler Oaks Farm. This information was used to calculate farm's phosphorus inputs and outputs and to develop a farm-scale nutrient mass balance. The phosphorus mass balance was examined alternative nutrient management practices were identified to reduce or eliminate nutrient surpluses and minimize off-farm water resources impacts.

2.0 Description of Farming Operation

The Butler Oaks Farm encompasses approximately 1,838-acres located approximately 14 miles to the northwest of Okeechobee, Florida. More specifically, the land is in Sections 3, 4, and 5 in TS37S and R33E, Section 31 in TS36S and R33E, and Section 36 in TS36S and R32E. The property is accessed from County Road 721 (Figure **2-1**).

The predominant breed on the farm is Holstein. Over the past twelve months, the farm's total head count has averaged 1,060, with a lactating population of 750 head. The remaining 310 head consist of approximately 50 dry cows, 80 springers, 30 cows in the hospital herd, and the 150 head culled each year. The high production lactating population is divided into two herds of 165 head each. The low producers are divided into three herds of 140 head each.

Table 2-1 describes the land use, cover type (where applicable), and size for each delineated area on the farm. **Figure 2-2** shows the layout of the entire farm including location of each field land uses for each area, and the western forage production / solids application area. **Figure 2-3** provides details of the eastern portion of the farm. Hay is the only crop harvested on the farm. In a typical year, approximately 5,350 tons are harvested. All of the hay harvested is used on site.

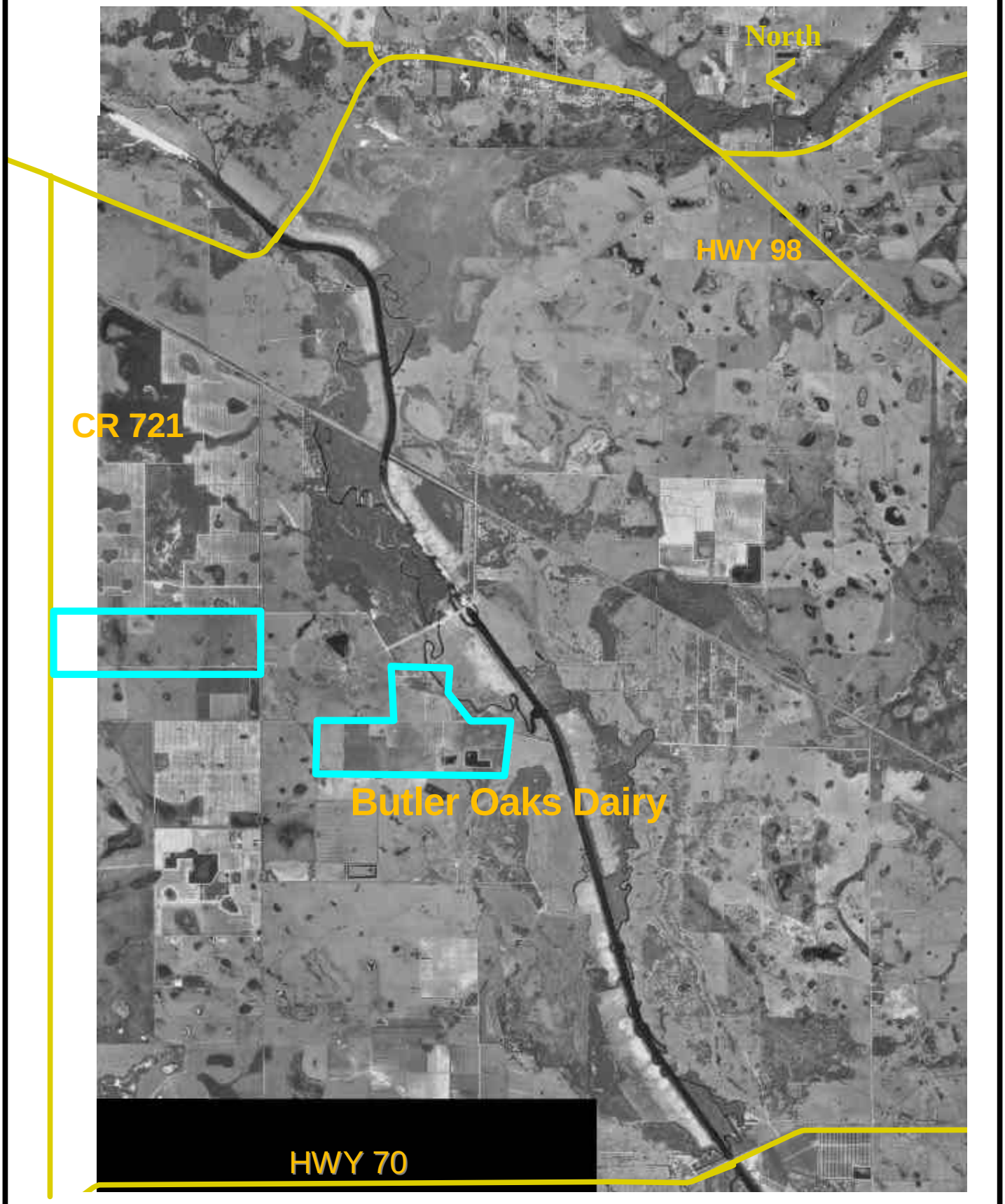
3.0 Waste Management System

3.1 Design History

The dairy farm, when established in the mid-1950s, used a system of ponds and wetlands connected by ditches to contain and drain daily washdown water and other waste materials from the barn, as well as general site surface water flow. The farm (previously referred to as the "Butler Dairy Barn #2") was included in the Florida Department of Environmental Protection (FDEP) Dairy Rule program in 1987. The U.S. Department of Agriculture Soil Conservation Service (now the Natural Resources and Conservation Service or NRCS) provided design assistance and the Florida Department of Agriculture and Consumer Services (FDACS) provided financial support. A copy of the original (and current) NRCS plan for the farm is provided as **Appendix A**.

The NRCS waste management system operation and maintenance plan for the Butler Oaks Farm was designed for a population of 990 milking cows, assuming a live weight of 1,200 pounds. The design storm, used to size system components, was a 25-year 24-hour storm event (8.2-inches of rainfall). Additionally, a barn wash flow of 55,000 gallons per day was assumed. The system design included:

- A 17.5-acre high intensity area (HIA) and ditch that surrounds the barn. Barn wash water and runoff from the HIA drains via the HIA ditch to a solids separation lagoon (solids trap).

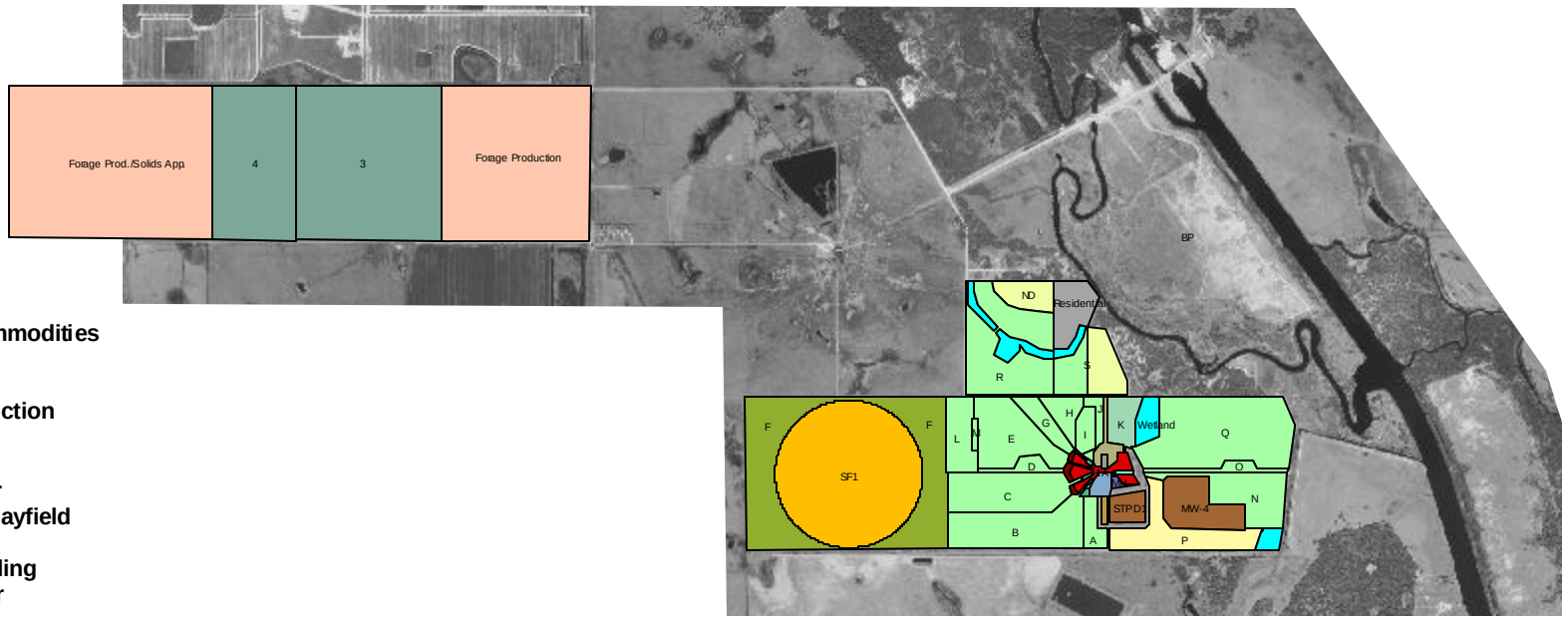


Prepared by SWET, Inc.	Figure 2-1. Butler Oaks Dairy Locator Map Butler Oaks Dairy ANMA	Scale 2 Miles

Table 2-1.
Farm Land Use and Acreage
Butler Oaks Farm, Inc.

Field Designation	Description/ Land Use	Animal Type	Vegetative Cover (If Applicable)	Acres
3	Solids Application		Bahia/ Stargrass	150.2
4	Solids Application		Bahia/ Stargrass	90.5
A	Pasture	Hobbled Herd	Stargrass	6.7
B	Pasture	Heifers	Bahia/ Stargrass	37.2
BP	Beef Pasture	Beef Herd	B/SG/P*	506.7
C	Pasture	Heifers	Bahia/ Stargrass	32.5
D	Ditch/Wetland	Not in Use		4.6
E	Pasture	Heifers	Bahia/ Stargrass	30.6
EB	East Barn			0.6
F	Hayfield		Stargrass	95.4
Facilities/Commodities	Facilities/Commodities			5.0
FP	Forage Production	Dry Cows in Winter Months	Stargrass/ Pangola	377.0
G	Pasture	Fresh Cows	Bahia/ Stargrass	8.6
H	Pasture	Hospital Herd	Bahia/ Stargrass	8.4
HIA	HIA	Lactating Herds		7.0
HIA Perimeter	HIA Perimeter	Lactating Herds		1.2
I	Wetland	Not in Use	Stargrass	5.6
J	Staging Pasture	Assorted Head	Bahia	4.1
K	Pasture	Calving Herd	Stargrass/ Common	10.0
L	Calf Weaning Pens	Not in Use	Bahia	14.5
Lagoon	Lagoon			1.3
M	Calf Barn	Not in Use		1.5
MH	Manure Handling			1.0
MP	Milking Parlor			0.4
N	Pasture	Not in Use	Partially Wooded	26.0
ND	Non Dairy	Not in Use		10.46
O	Drainage Ditch	Not in Use		4.9
P	Historical Sprayfield/ Pasture	Lactating Herd	Stargrass/ Woods	26.5
Q	Pasture	Lactating Herd	Wooded	67.6
R	Pasture	Dry Cows	Bahia	48.8
Residential	Residential		Bahia	16.1
S	Pasture	Horses/ Cow Staging	Bahia	24.7
SF1	Sprayfield		Bahia/ Stargrass	118.5
Solids Area	Solids Area			3.0
STPD1	Waste Storage Pond			6.9
STPD2	Waste Storage Pond			23.0
W1	Feed Barn			0.6
W2	Feed Barn			0.2
W3	Feed Barn			0.2
W4	Feed Barn			0.2
Water	Water			38.5
Wetland	Wetland			21.6
Total Acreage of Farm				**1,838.0**

North

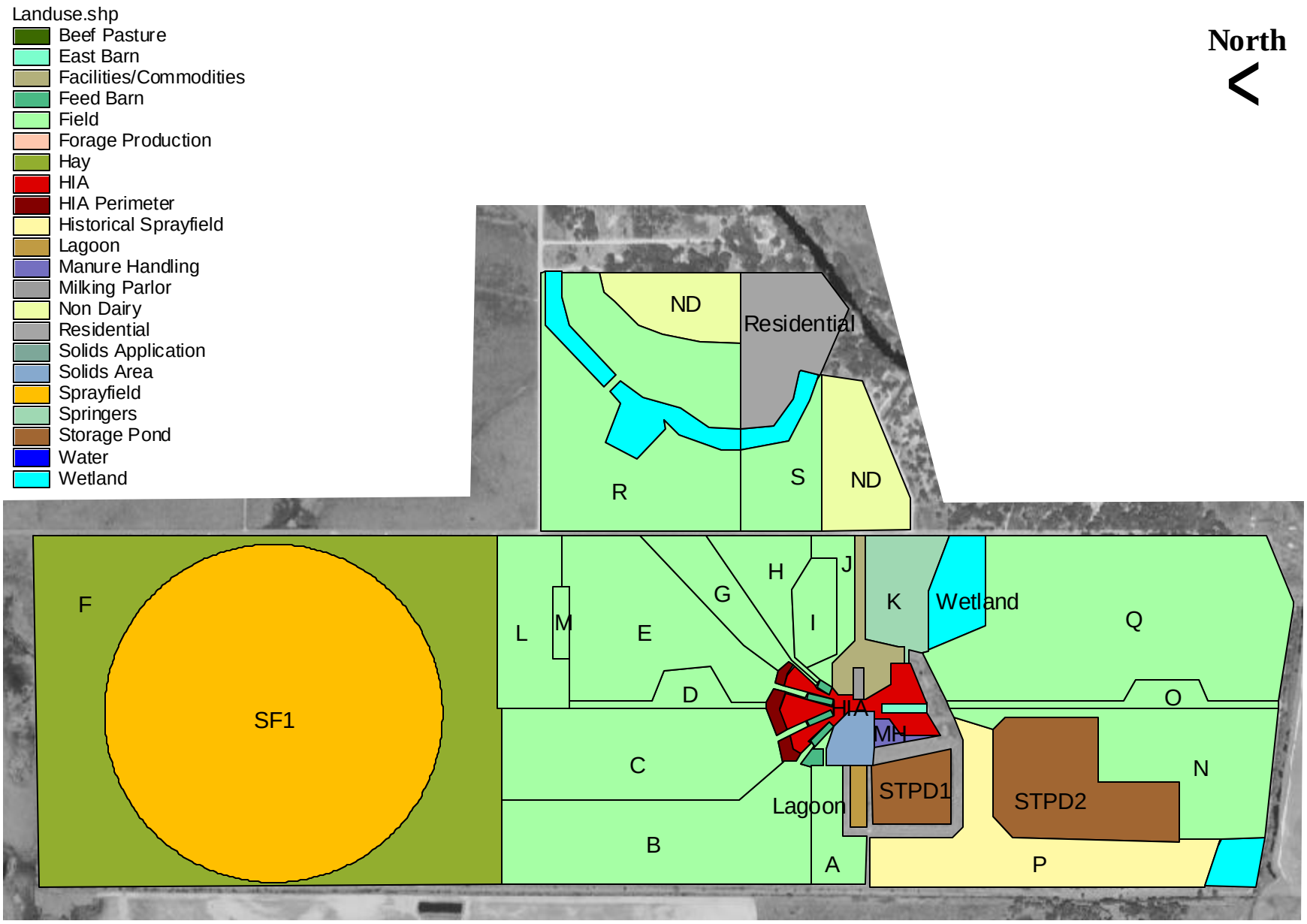


Landuse.shp
- Beef Pasture
- East Barn
- Facilities/Commodities
- Feed Barn
- Field
- Forage Production
- Hay
- HIA
- HIA Perimeter
- Historical Sprayfield
- Lagoon
- Manure Handling
- Milking Parlor
- Non Dairy
- Residential
- Solids Application
- Solids Area
- Sprayfield
- Springers
- Storage Pond
- Water
- Wetland

Prepared By SWET, Inc.

Figure 2-2. Landuse for Butler Oaks Dairy
Butler Oaks Dairy ANMA

0 0.5 1 Miles



Prepared By SWET, Inc.	**Figure 2 -3. Landuse for Butler Oaks Dairy** **Butler Oaks Dairy ANMA**	0 500 1000 Feet

- Two waste storage ponds (a 7-acre STPD 1 and an 18-acre STPD 2) designed to contain barn wash water and runoff from the high intensity area after it passes through the solids separation lagoon.
- Water from the second waste storage pond is pumped to the 118-acre irrigated field via a 1,090-gpm pump. The 118-acre center-pivot irrigation system is inscribed within a 214-acre hay and greenchop area. The design maximum application rate to the irrigated field is 0.28-inches over a 24-hour period.
- Subsurface drains in the high intensity area convey water to the high intensity ditch.

Based on available records, it appears that construction of the NRCS-designed waste management system for the Butler Oaks Farm was completed by early-1990.

3.2 Current Waste Management System

The current waste management system is essentially the same as was originally designed in early 1990. STPD 2 was constructed as approximately 23-acres instead of 18 acres. The owner, Mr. Robert Butler, reported that he operates the waste management system as designed.

Mr. Butler reported that his lactating herds, heifers, and springers spend approximately 25 percent of the time in the milking parlor, 50 percent of the time in the high intensity area, and approximately 25 percent of the time in pastures. (The original NRCS design assumed the lactating herds spend approximately 25 percent of the time in the barn, approximately 55 percent of the time in the high intensity area, and approximately 20 percent of the time in pastures.) Per the NRCS plan, dry cows are pastured 100 percent of the time. The hobbled herd spends 75 percent of the time in pastures, 10 percent in the high intensity area, and 15 percent of the time in the barn. The calving herd spends 40 percent of the time in pasture, 40 percent of the time in the high intensity area, and 20 percent of the time in the barn.

Manure is collected in and around the barn and stored in the high intensity area for drying. It is spread as needed on the irrigated field, hay field, or low use pastures. The farm records indicate that in the year 2000, 1008 tons of manure were spread on a total land area of 225-acres. Solids are not removed from the farm.

Approximately 8.6 million gallons of wastewater were pumped from the waste storage pond to the irrigated field in 2000. The waste storage pond sediment trap is typically cleaned out once every 10-years. The end of the solids trap was last cleaned out in April 1999. The sludge is placed in the manure dry storage area and is spread in hayfields or non-lactating and minimum-use pastures when needed.

4.0 Current Permit Status

The current dairy permit (FDEP wastewater permit No. FLA013655-001-IW4A, **Appendix B)** does not include specific phosphorus concentration limits for the operation. However, the permit indirectly limits phosphorus loading by limiting herd size, limiting the quantity of

wastewater discharged to the irrigated field, and limiting conditions pertaining to the land spreading of solids.

The permit restricts wastewater application on the 118-acre irrigated field to 0.28-inches per day. The permit stipulates that prior to application, the solids are to be analyzed for total phosphorus, orthophosphorus, total nitrogen, and nitrates. Using the analytical results of the solids, the phosphorus application rates for land-application are limited to that allowed in the SCS (NRCS) waste management system operation and maintenance plan (WMSOMP). The WMSOMP assumed a phosphorus uptake of 60 pounds per acre on the irrigated field and other areas managed for maximum production, and a phosphorus uptake of 45 pounds per acre on herd pastures and all other areas not managed for maximum production. Areas to receive solids were assumed to have a phosphorus uptake of 45 pounds per acre. We realize that this rate may be high, but are following the Dairy Rule guidance until NRCS provides new pasture loading recommendations.

The WMSOMP also included the following discussion regarding "phosphorus sources and delivery":

- 25 percent deposited in the barn (with 50 percent remaining in the sludge and retained in the manure and sediment trap; 50 percent delivered to the irrigation field).
- 55 percent deposited in the high intensity area (with 80 percent retained in the high intensity area, and 20 percent leaving the HIA as runoff and delivered to the irrigation field).
- 20 percent deposited in the herd pasture areas.

The phosphorus load distribution on the operation was thus designed as follows:

Location	percent of Total P Load
Irrigation Sprayfield	23.5
Herd Pasture Areas	20.0
High Intensity Area	44.0
Manure/Sedimentation Trap	12.5

4.1 Current Best Management Practices (BMPs)

The condition of structural BMPs and the waste management system is generally good. Conservation practices are generally well applied. BMPs used on the farm include maintaining the berm around the waste storage pond, maintaining fences around wetlands and waterways to exclude cows from these areas, maintaining the center-pivot irrigation system, etc. Existing state of solids buildup in the waste storage pond is "moderate". FDEP inspectors periodically visit the site.

4.2 Soil Amendments Application

As described previously, approximately 1008 tons of solids were placed on the 225-acres of hayfield during 2000. Mr. Butler indicated that last year he applied residuals to the same

two fields. According to the farm's 2000 *Dairy Annual Operation* fertilizer was applied to three fields: 39 (irrigated field), 3, and 4. Fertilizer phosphorus content is typically 5 percent. The resulting application rates for fertilizer and phosphorus for 2000 were estimated as follows:

TABLE 4-1
Fertilizer and phosphorus application rates in the year 2000. See figure 2-2 for field locations
Butler Oaks Farms, Inc.

Field ID	Fertilizer Application Rate (Lbs. per acre per year)	Fertilizer P Application Rate (Lbs. P_2O_5 per acre per year)
forage production fields	1300	45
3	400	20
4	400	20

Mr. Butler typically has dry chemical applied. Review of the farm's records reveal that soil samples are typically collected and analyzed once (occasionally twice) per year. The location of the samples are not clearly noted (the dairyman should record the location on a diagram or figure). The farm's soils map should be used for soil analyses and fertilizer application.

5.0 Soils

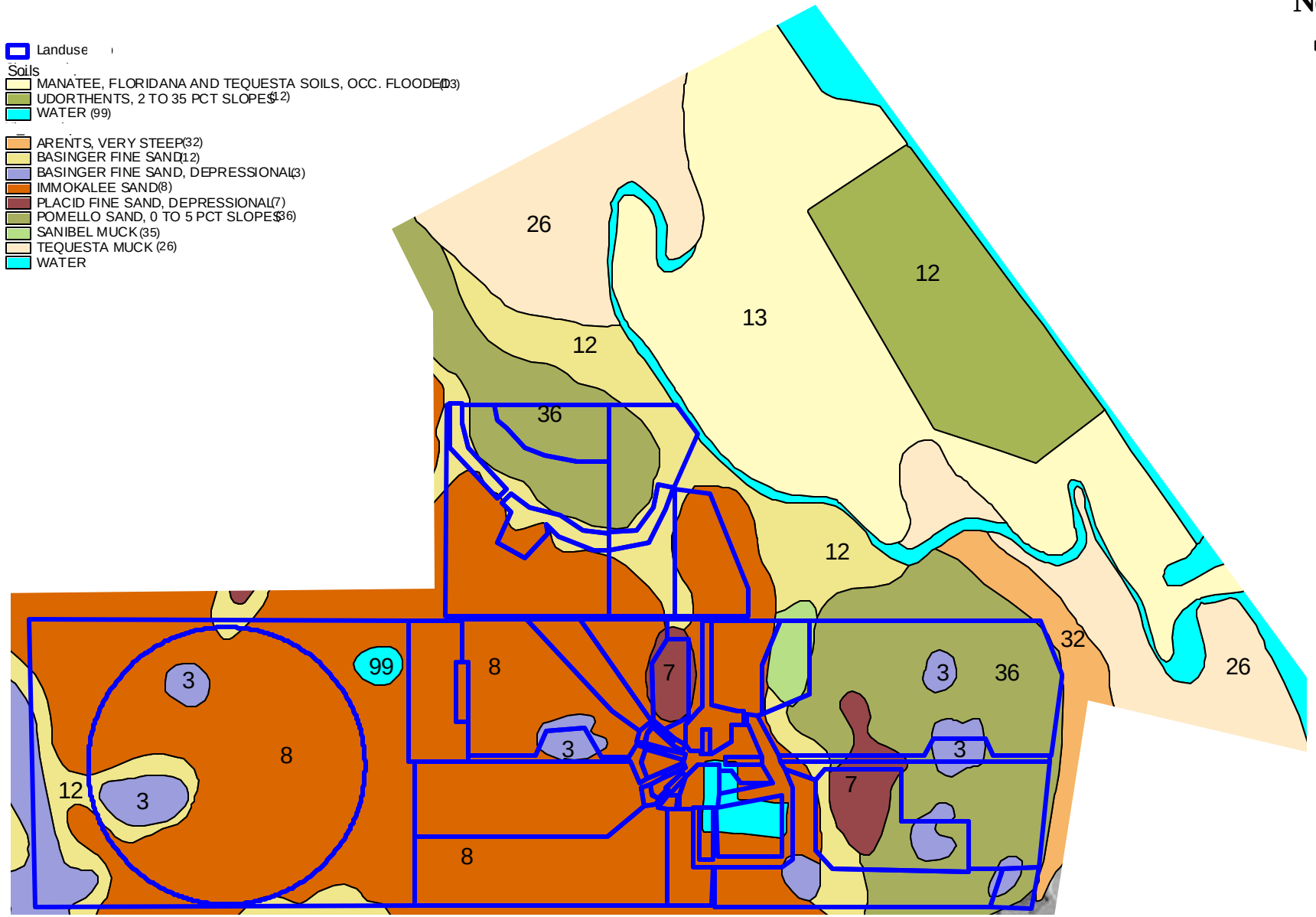
The soil map units occurring within the farm boundaries (Figure 5-1) fall into two general groups: (1) soils of the flatwoods, hammocks, and sloughs, and (2) soils of the swamps, marshes, and flood plains. Both groups of soils are nearly level, poorly drained, sandy (except for a small area of muck) soils with high runoff potential if not ditched. These soils typically have low phosphorus retention potential and can therefore leach phosphorus if phosphorus loading exceeds crop phosphorus uptake. High organic muck soils, such as Sanibel muck, are naturally high in phosphorus and when drained can mineralize large amounts of phosphorus for plant uptake. However, these soils are typically swampy and not used for crops or grazing, as is the case at Butler Oaks. Most flatwood soils have organically coated subsoils, which also contain natural phosphorus for potential crop uptake.

Specific soil types located on the Butler Oaks Farm include: Basinger and Placid depressional; Basinger fine sand; Immokalee fine sand; Valkaria fine sand; Felda fine sand; Sanibel muck; Avents, very steep; Pomello sand, 0-5 percent slope; Manatee, Delray, and Okeelantana soils.

- Basinger and Placid soils, depressional, can produce excellent forage for cattle during dry periods and the winter months. A well managed plan that includes a good water

control system, proper stocking rates, and cattle rotation is needed to maintain the range in a productive state.

- Basinger fine sand soils are suited to pasture and hay land; however, wetness is a management concern. A water-control system that removes excess surface water after heavy rainfall is needed to ensure good yields. Pangolagrass, bahiagrass, and white clover produce higher yields if well managed. Applications of lime and fertilizer are needed on a regular basis. Controlled grazing is needed to maintain plant vigor.
- Immokalee fine sand soils are suited to pasture and hay land; however, wetness is a management concern. A water-control system that removes excess surface water after heavy rainfall is needed to ensure good yields. Pangolagrass, bahiagrass, and white clover produce higher yields if well managed. Applications of lime and fertilizer are needed on a regular basis. Controlled grazing is needed to maintain plant vigor.
- Valkaria fine sand soils are suited to pasture and hay land; however, wetness is a management concern. A water-control system that removes excess surface water after heavy rainfall is needed to ensure good yields. Pangolagrass, bahiagrass, and white clover produce higher yields if well managed. Applications of lime and fertilizer are needed on a regular basis. Controlled grazing is needed to maintain plant vigor.
- Felda fine sand soils are well suited for pasture and hay crops. A water-control system that removes excess surface water after heavy rainfall is needed to ensure good yields. Pangolagrass, bahiagrass, and white clover produce higher yields if well managed. Applications of fertilizer are needed on a regular basis. Controlled grazing is needed to maintain plant vigor.
- Sanibel muck can support pasture and hay crops with adequate drainage. Proper fertilization with phosphates, potash, and trace elements is needed. Proper liming is also critical when establishing improved pasture. Water control should maintain the water table near the surface to prevent excess oxidation of the organic layer that is present.
- Arents, very steep, is generally not suited to pasture because of steepness and limited size. If used for pasture, regular applications of fertilizer and lime are needed, along with a controlled grazing plan.
- Pomello sand, 0-5 percent slope, has limited potential as grazed woodland because of the thick overstory.
- Manatee, Delray, and Okeelanta soils are well suited for pasture grasses if good pasture management practices are used. A good drainage system is needed to remove excess surface water and lime and fertilizer must be applied as needed.



Prepared By SWET, Inc.

Figure 5-1. Soils for Butler Oaks Dairy
Butler Oaks Dairy ANMA

Feet

6.0 Hydrology and Topography

Figure 6-1 shows the estimated surface water flow pattern onto and off the farm, as well as within the farm's boundaries. Figure 6-2 is an infrared aerial of the area, which provides a good view of water features on and adjacent to the farm. Water bodies appear dark green on the infrared; dry areas appear red. The Lower Kissimmee River Basin, in which the Butler Oaks Farm is located, generally drains to the south towards Lake Okeechobee. The region is particularly flat, with elevation changes typically on the order of two to three feet per mile. Visible on Figure 6-2 are the locations of ditches, waste storage facilities, cooling ponds, fields, and wetlands. There are no identified karst features on the site. Based on a review of applicable USGS quad maps the following drainage characteristics were defined:

- Approximately 15-acres of land drains internally to the high intensity area lagoon, from which water is pumped into Waste Storage Pond 1.
- Approximately 110-acres of Butler Oaks Farm drains to the east. The quality of this surface water flow is monitored at KREA 41.
- Approximately 2196-acres of land drains to a ditch along the southern boundary of the farm including land on B-4 Dairy and citrus land to the west of property. The quality of this surface water flow is monitored at KREA 41A.
- Approximately 81-acres of Butler Oaks Farm drains to the northeast. The water quality of this surface water flow is monitored at KREA 41B.

The flatwood soils of the area limit or eliminate any groundwater movement from the dairies, however shallow groundwater within field will move to ditches and express itself as surface flow at the farm boundary.

7.0 Water Quality Data

7.1 Surface Water Quality Data

Three locations are sampled to assess surface water quality near the Butler Oaks Farm (Figure 6-1: KREA 41, KREA 41A, and KREA 41B). Time series graphs of available historical water quality data collected for the three surface water-monitoring points within the farm (Figure 7-1) show no apparent change in concentration after 1992. Total phosphorus sampling data from the discharge monitoring point for the farm (Figure 7-2: KREA 41) show the water quality trending toward, but still well above the 40 ppb goal for phosphorus in the farm's surface water discharge. All of the farm's surface water discharge samples at KREA 41 have considerably exceeded the ANMA water quality goal for phosphorus.

7.2 Groundwater Quality Data

Groundwater quality data from three on-site monitoring wells (shown on Figure 6-1) were available for the period between April 1998 and April 2000. Time series graphs of the total phosphorus concentration data sets for the groundwater sampling wells on the farm (Figure 7-3) show no strong general downward trend over the period of record after 1992. The graphs also shows that total phosphorus concentrations from the compliance monitoring well located near the waste storage pond (MW-2) have been consistently higher than those

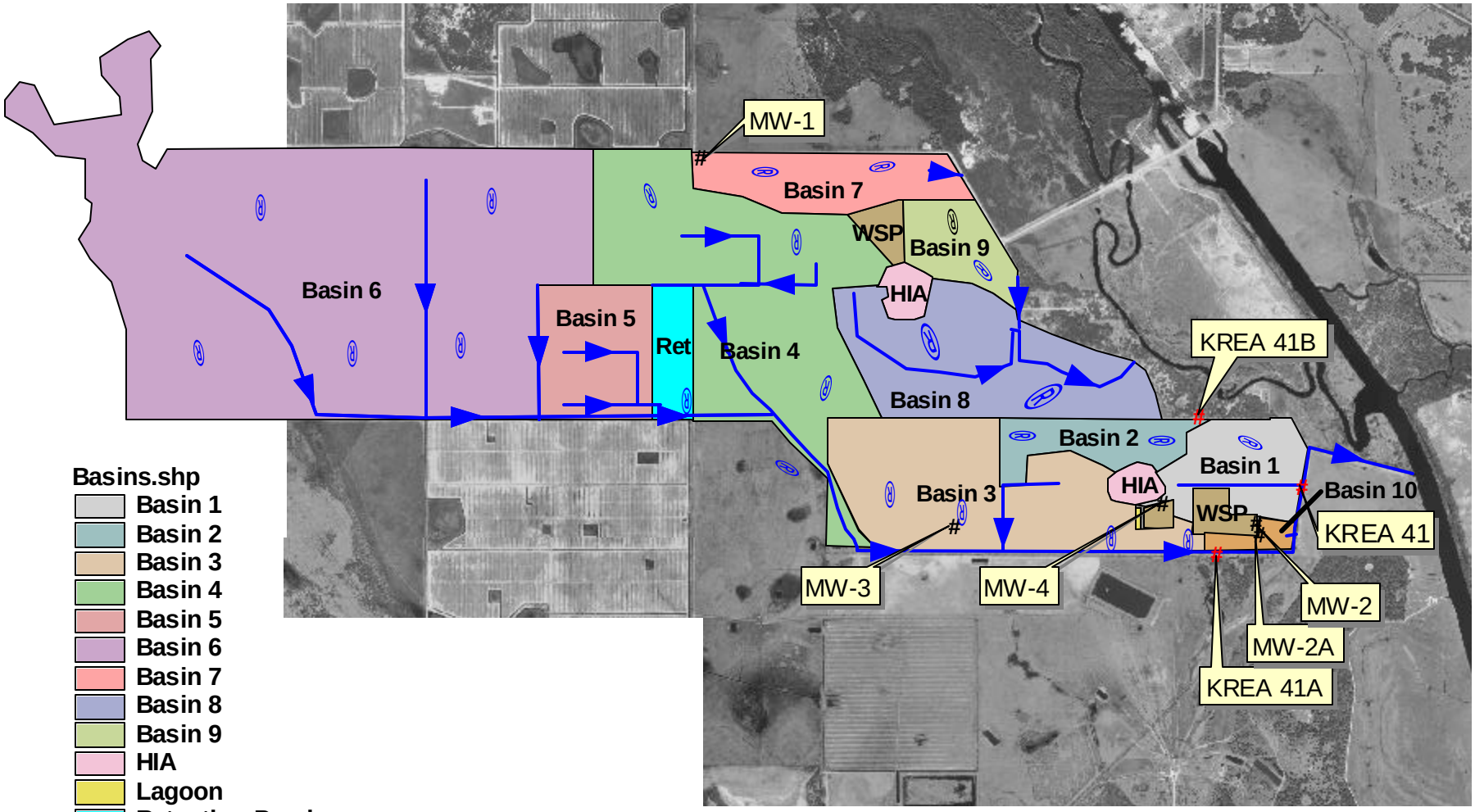


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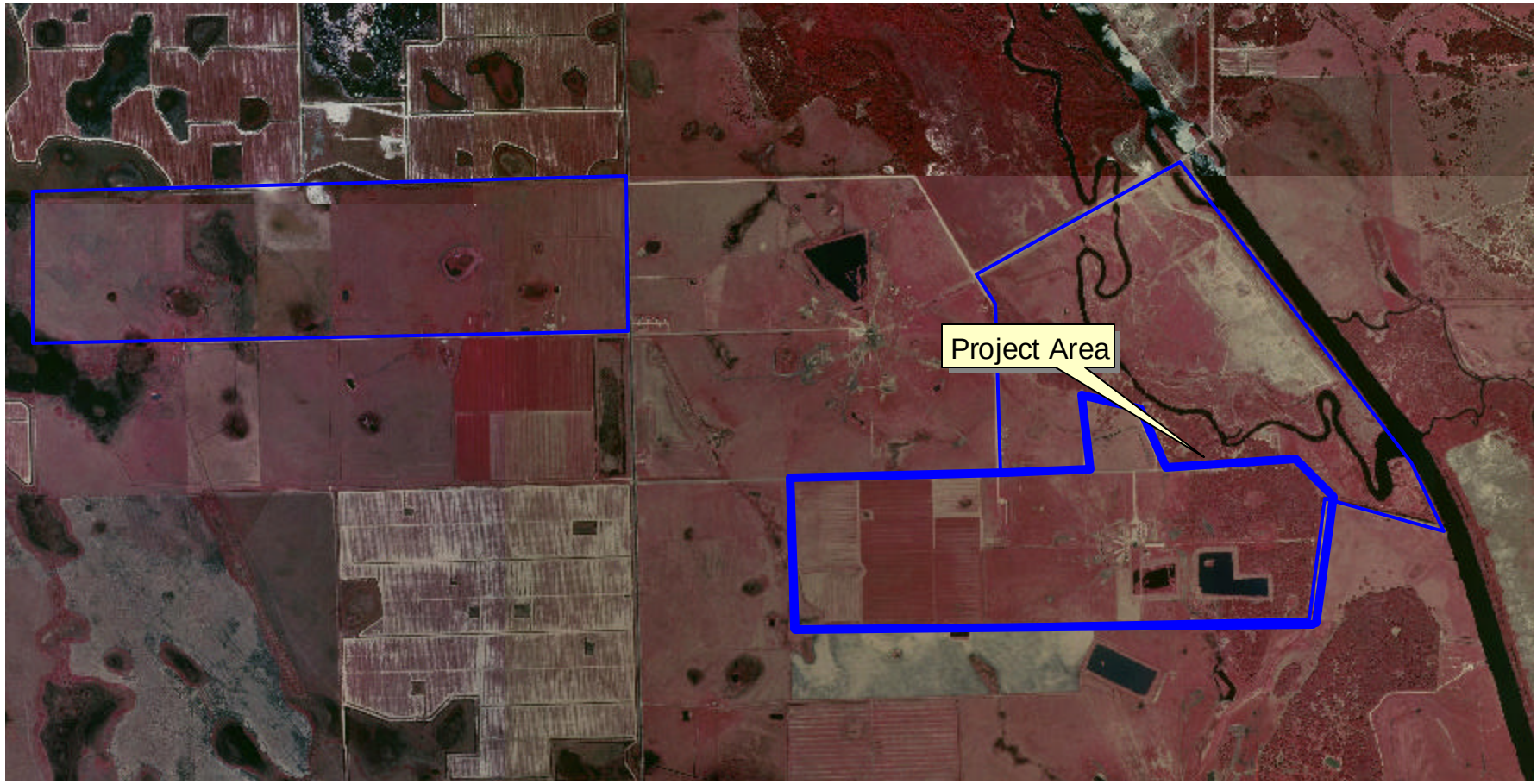
Figure 6-1. Basins for Butler Oaks Dairy
Butler Oaks Dairy ANMA

North



Prepared By SWET, Inc.	**Figure 6-2. Infared Photograph of Butler Oaks Dairy** **Butler Oaks Dairy ANMA**	0 1000 Feet

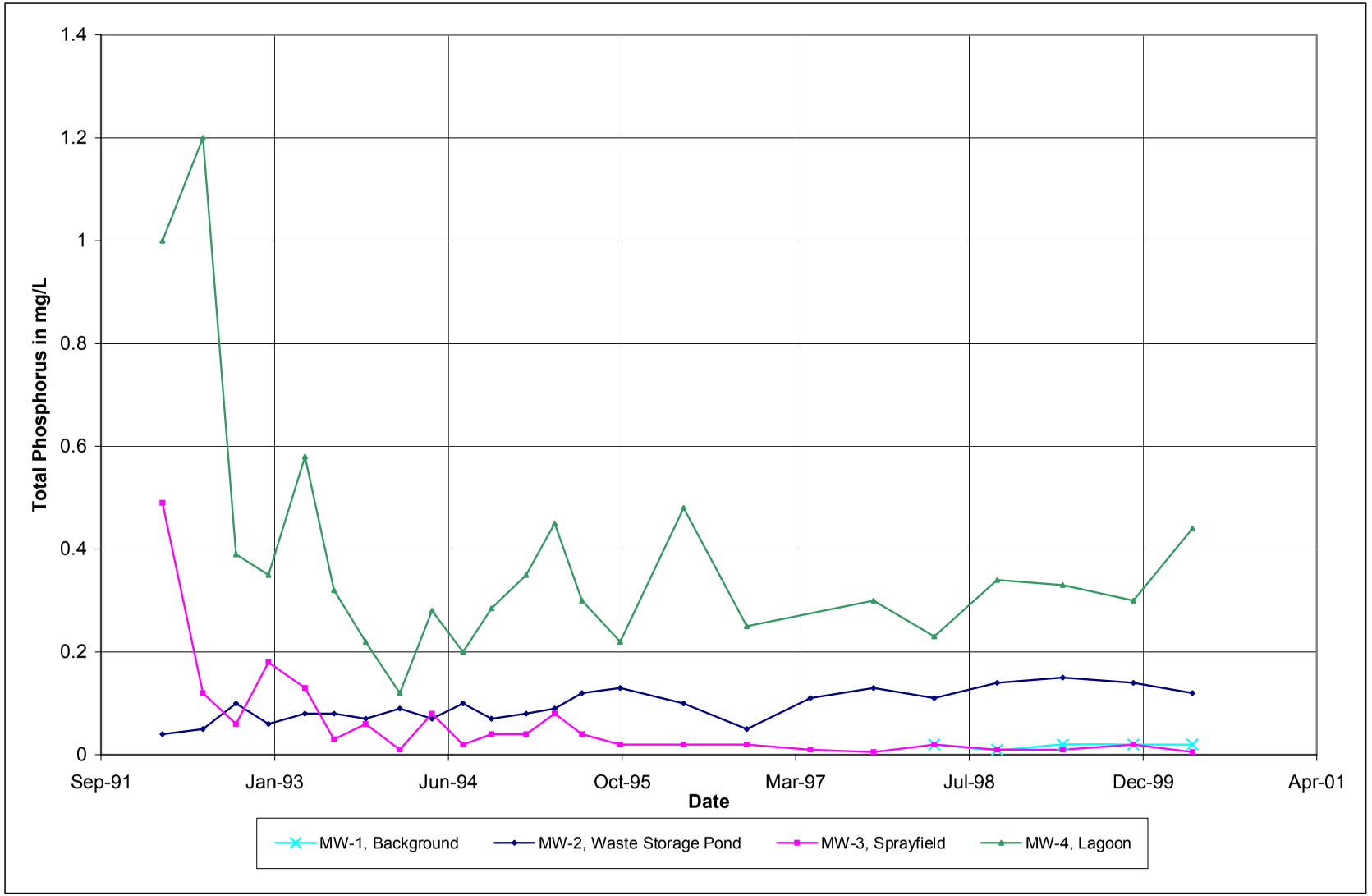


Figure 7-1
Phosphorus Concentration in Surface Water Sampling Locations at Butler Oaks Diary
Butler Oaks Dairy ANMA

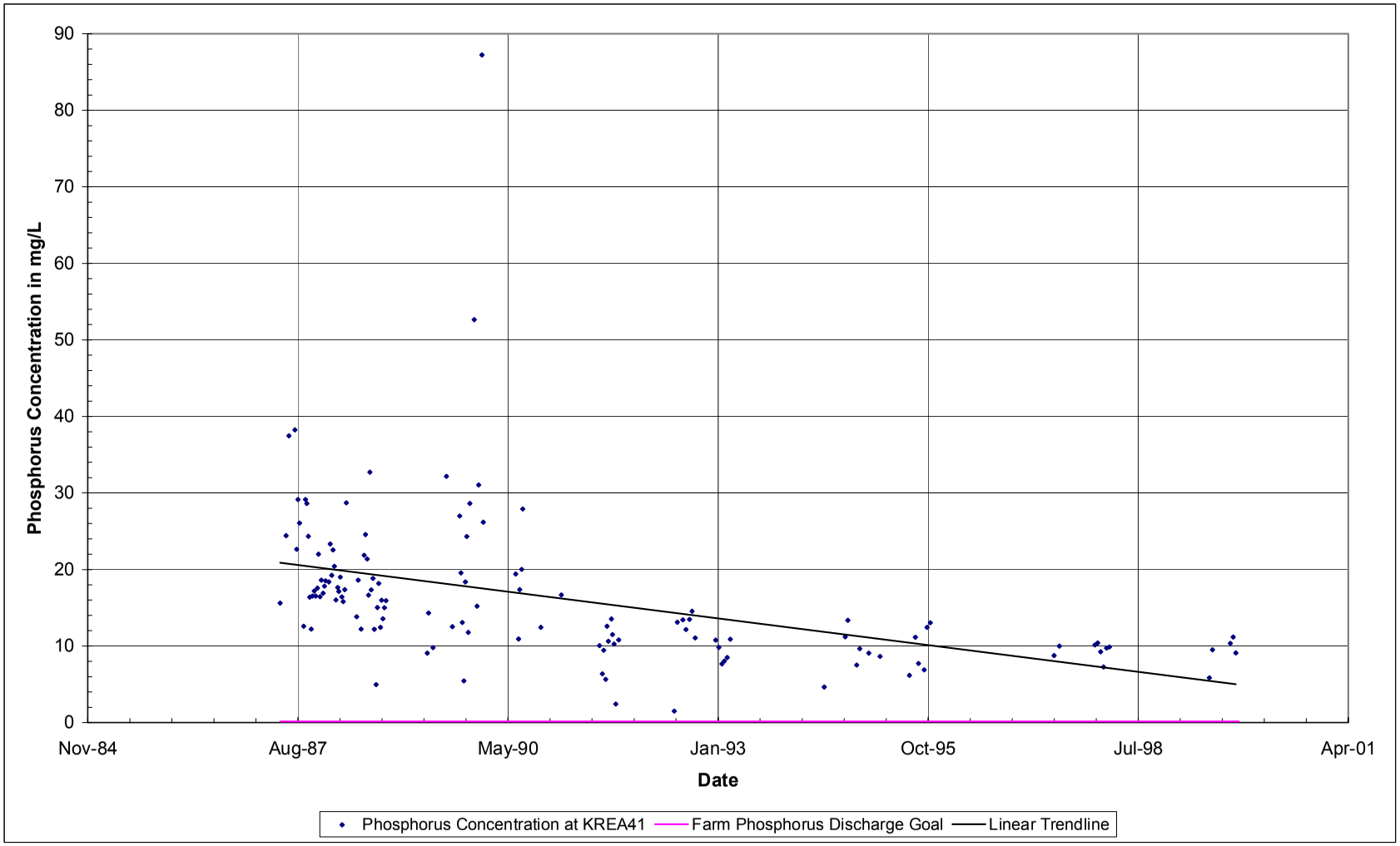


Figure 7-2
Time Series for Phosphorus Concentration in KREA41
Butler Oaks Dairy ANMA

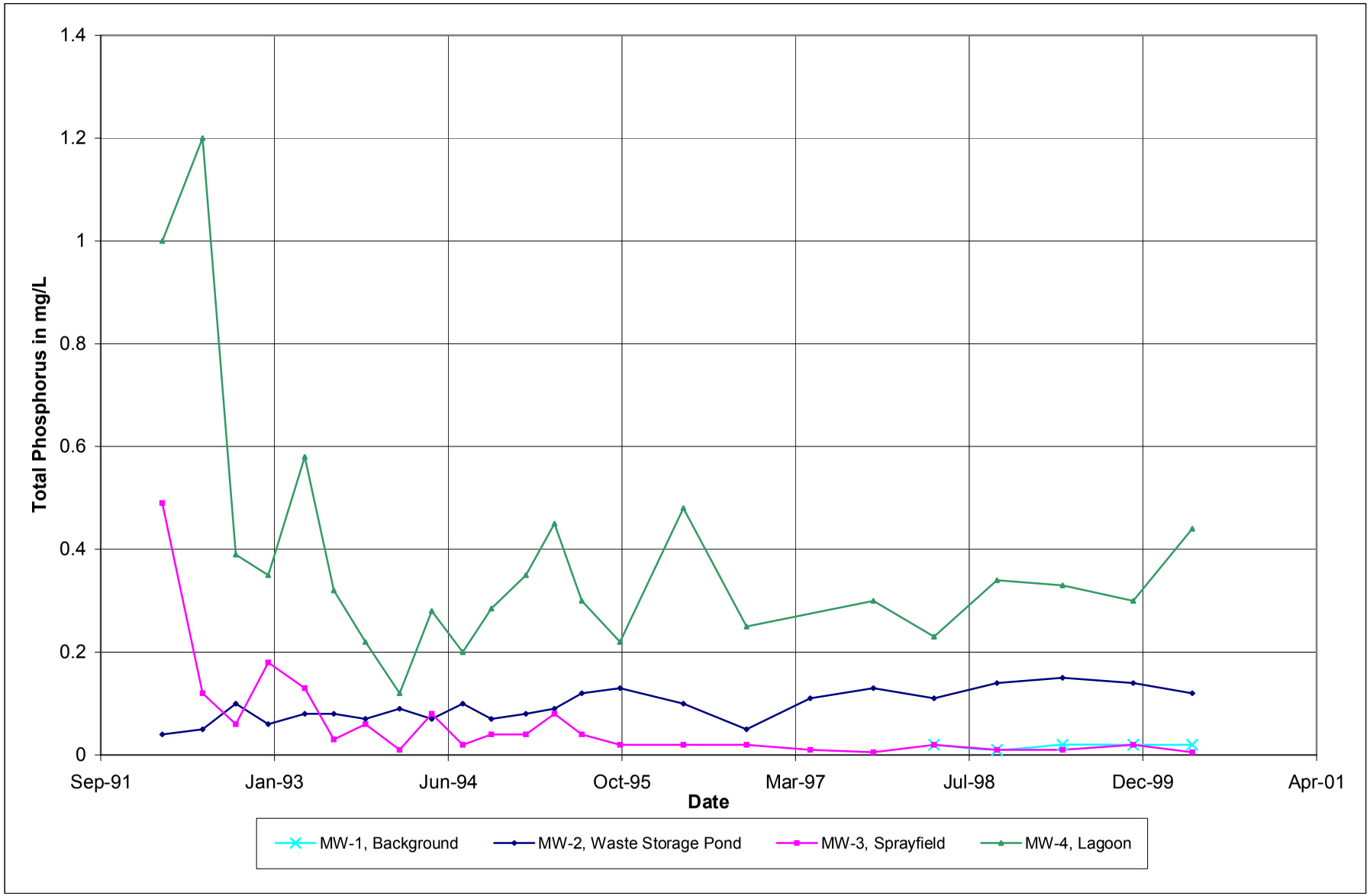


Figure 7-3
Groundwater Monitoring Wells Water Quality
Butler Oaks Dairy ANMA

of the site's background well (MW-1). In the early 1990s total phosphorus concentration in samples from the compliance well located near the spray field (MW-3) also exceeded those of the background well (MW-1). However, the sprayfield well concentrations have decreased since that time.

Because of the high water tables, artesian deep aquifer, and very low groundwater gradients on the dairy, most if not all of the infiltrated water reaching the surficial groundwater would reemerge in on-farm ditches and leave the dairy as surface water. In addition, the iron/aluminum rich spodic horizons in the flatwood soils have a high affinity for phosphorus, and therefore water passing this layer is stripped of phosphorus. These factors clearly indicate that phosphorus export in ground water from the dairy would be negligible.

8.0 Nutrient Balance for Dairy

Phosphorus is the nutrient of interest for this study because the SFWMD determined that phosphorus control is critical to the restoration of Lake Okeechobee. A farm-level phosphorus budget was prepared to assess the overall potential phosphorus runoff from the Butler Oaks Farm so that feasible farm operation management practices to reduce potential runoff from the farm could be planned. This involved identifying and quantifying all possible sources of phosphorus brought to the farm (phosphorus inputs), sent off the farm (phosphorus outputs), and kept on the farm (on-farm accumulation). Mathematically,

$$P_{\text{on-farm accumulation}} = P_{\text{inputs}} - P_{\text{outputs}}$$

Theoretically, if phosphorus inputs are reduced and/or phosphorus outputs are increased, less phosphorus accumulates on-site. Reducing the amount of phosphorus that accumulates on-site will lower the opportunity for phosphorus to leave the farm via surface water runoff.

Calculations were made using site-specific data, such as sampling data, farm records, or discussions with Mr. Butler. If site-specific data were not available, calculations were made using data cited in previous studies of Okeechobee Basin farms performed by Soil and Water Engineering Technology, Inc (SWET 2001). As a last resort, calculations were made using general data published by an established source, such as the U.S. Department of Agriculture.

9.0 Farm Level Phosphorus Budget

9.1 Phosphorus Inputs

All possible phosphorus sources entering the farm boundary were identified. These items included:

- Food for the dairy herd that was brought to the farm from off-site including commercial animal feeds, hay, citrus pulp, etc.
- Animal replacements
- Fertilizers and other soil amendments
- Detergents used on-site

- Surface water flows from off-site
- Rainfall and natural sources
- Other sources, as applicable.

An estimated 73,071 pounds of phosphorus were imported onto the Butler Oaks Farm in 2000 Table 9-1). Ninety-three percent of all the phosphorus that is imported to the farm comes in purchased feed and fertilizer.

The largest contributing phosphorus source was animal feed, which accounted for nearly 68 percent of the phosphorus entering the farm. Mr. Butler reported that he uses several types of feed, average phosphorus content of 0.44 percent, and rations the feed according to the status of each head. Typical feed rations are: 38 pounds per day per head for high producers; 39 pounds per day for the high heifers; 34 pounds per day for fresh cows; 31 pounds per day for the medium producers; 25 pounds per day per head for the hospital herd; 24 pound per day for the low producers; and 10 pounds per day per head for the dry and springer herd.

Fertilizer purchases resulted in the next largest quantity of phosphorus inputs onto the farm (Table 9-1) accounting for 26 percent of total phosphorus imports. Mr. Butler reported that approximately 187 tons of fertilizer with a phosphorus content of 5 percent was applied on the farm in 2000.

9.2 Phosphorus Outputs

All possible forms of phosphorus leaving the farm were identified:

- Animal products (milk, meat, etc.),
- Crop products,
- Surface and groundwater flows off the site, and
- Solids hauled off-site.

An estimated 20,196 pounds of phosphorus were exported off the farm in 2000. Two categories of phosphorus exports accounted for 90 percent of the total quantity of phosphorus that left the farm: milk (58 percent) and runoff discharge (32 percent) (Table 9-1).

9.3 On-Farm Phosphorus Accumulation

All phosphorus sources that can contribute to on-site accumulations were also identified. Because there was relatively limited supporting information available for Butler Oaks Farms this category included only:

- Direct manure deposition,
- Spreading of solids on fields and pastures, and
- Manure storage on-site.

If appropriate information were available, other items in this category might include:

- Phosphorus accumulation in soils
- Limitations and potential for phosphorus assimilation and crop production

TABLE 9-1.
Farm Phosphorus Balance for 2000
Butler Oaks Dairy ANMA

Category and Item Description	Subtotal (lbs. P/year)	Total (lbs. P/yr.)	Notes
Imports			
Feed (Purchased Grain)	49,482		5623 tons purchased in 2000, with P content of 0.44 percent
Purchased Forage and Hay	1,540		175 tons with an average P content of 0.44 percent
Fertilizer	18,700		187 tons applied, with P content of 5 percent
Animal Replacements	2,156		280 replacements @ 1,100 lbs. each with 0.7 percent P content
Detergents and Cleaners	0		No reported use
Surface Water Flow onto Dairy	0		No discernable on-farm flow
Rainfall P	1,193		Assuming annual rainfall on 1,830-acres of 48-in, with a P concentration of 0.06 mg/L
		73,071	
Exports			
Milk Production	11,620		5810 tons in 2000, with P content of 0.1 percent
Manure Solids	0		No solids removed from site
Beef Cows Sold	0		
Culled Cows	2,100		200 animals @ 1,500 lbs. each with 0.7 percent P content
Sold Forage and Hay	0		None sold or transported off-site
Runoff Discharge	6,476		Three drainage areas with 10-inches of runoff: 110-ac to KREA 41 @ 9.04 mg/L; 2196-ac to KREA 41A @ 0.6 mg/L; 81-ac to KREA 41B @ 6.76 mg/L
		20,196	
On-farm Accumulation			On-farm Accumulation = Imports - Exports
In Fields	35,333		Equals net minus sum of next three rows
Stored Within HIA Perimeter	1,863		According to time cows spend in HIA where runoff goes to perimeter ditch
Stored Within Waste Pond	11,180		Assumes 60 percent of waste generated in HIA ends up in the waste pond
Stored in Pasture Cooling Ponds	4,500		Assumes 15 percent of waste deposited in pastures ends up in pasture cooling ponds
		52,875	On-farm Accumulation = Imports - Exports

- Existing and potential crop needs (nutrient requirements and seasonal demand)

During 2000, an estimated 52,875 pounds of phosphorus accumulated on the farm (Table 9.1: On-Farm Accumulation). Sixty-seven percent of the phosphorus recycled internally resulted from direct deposition of manure to the farm's herd pastures; 3.5 percent was stored within the HIA perimeter, and 21 percent was stored within the waste storage pond. The remainder was estimated to be stored in pasture cooling ponds that receive field runoff.

9.4 Phosphorus Balance

The results of the farm-level phosphorus budget for Butler Oaks are summarized in Table 9-1. Purchased feed is the single largest source of phosphorus brought onto the farm (accounting for nearly 70 percent of the total quantity of phosphorus imports). Fertilizer is the next largest source of phosphorus brought onto the farm (accounting for 25 percent of the total quantity of phosphorus imports). Milk exports and surface water runoff each result in the largest quantities of phosphorus leaving the farm (55 and 37 percent of the total, respectively). Direct manure deposition in pasture accounts for 23 percent of the phosphorus that accumulated on the farm in 2000. Sixty-four percent of the phosphorus that accumulates on the farm is stored in the high intensity area or the waste storage pond. A discussion of the implications of these findings and how they can be applied to farm management to achieve the stated discharge goal of 40 ppb TP in the farm's surface water discharge is discussed in Section 10.

Phosphorus loading to the fields of the farm was estimated using the data in Table 9-1, Table 9-2, and Table 9-3. As discussed previously, Table 9-1 is the overall farm phosphorus budget. Table 9-2 provides estimates of the typical amounts of phosphorus that are excreted by animal type (the net amount taking into consideration total feed intake of phosphorus minus the phosphorus that is exported in milk, as applicable). Table 9-3 shows how each field was apportioned the farm's dairy population of 1060 head. Table 9-4 and Figure 9-1 provide the calculated distribution of phosphorus load to the farm's fields. The Dairy Rule guidance for phosphorus loading for herd pastures and irrigated fields (sprayfields) is 45 pounds phosphorus per acre and 60 pounds per acre respectively). We realize that this rate may be high, but are following that guidance until NRCS provides new pasture loading recommendations. Based on the analysis, three of the farm's herd pastures (J, K, and P) and the sprayfield are receiving more phosphorus than the NRCS plan design loading. We realize that these rates may be high, but are following Dairy Rule guidance until NRCS provides new pasture loading recommendations.

TABLE 9-2.
Phosphorus Mass Associated With Farm Animals. All values are typical estimates for Florida dairy animals
Butler Oaks Farm ANMA

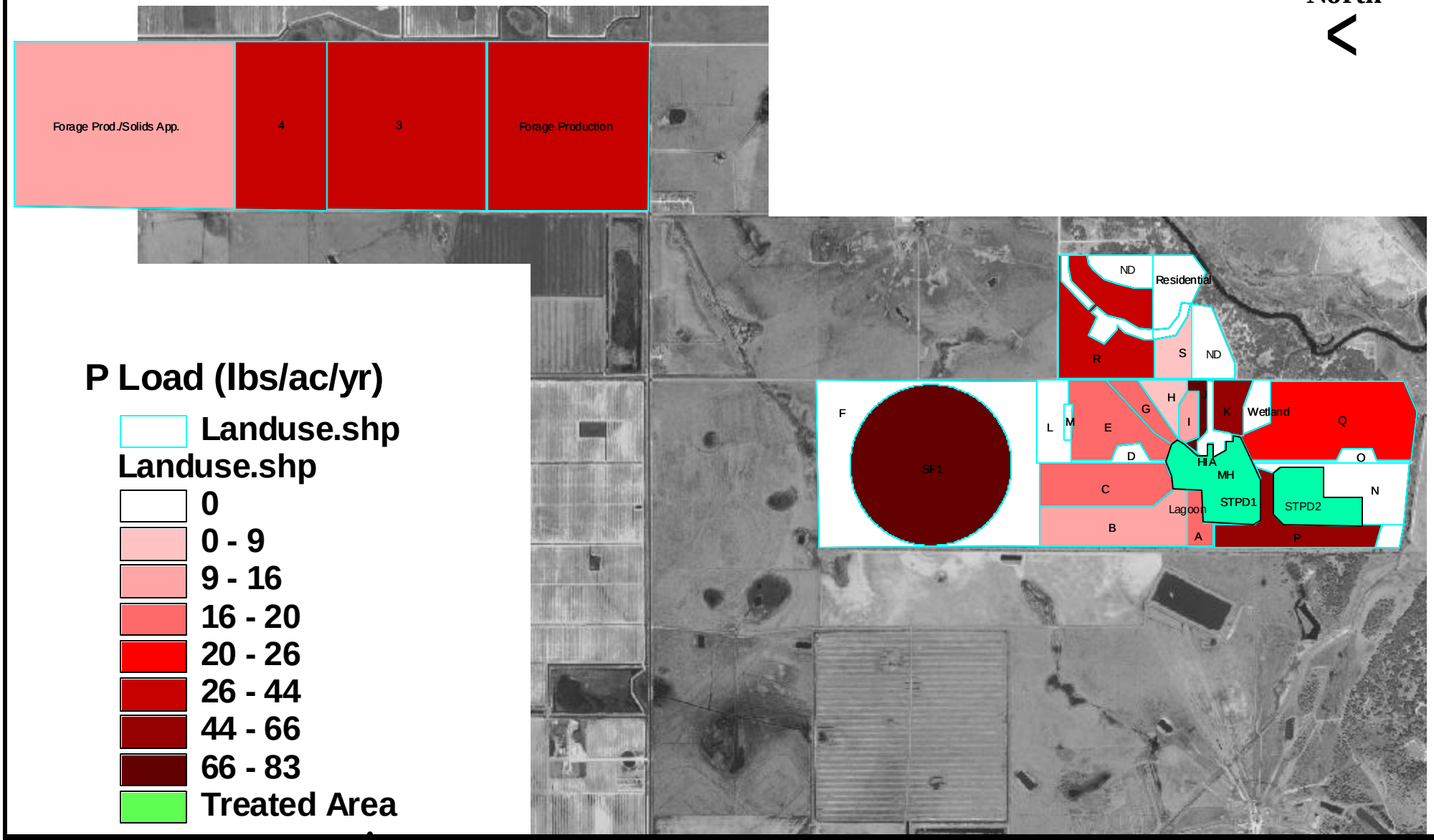
Animal Type	Average Weight (lbs)	Phosphorus Excreted (lbs.-P/yr./animal)	Body Mass Gain (lbs./yr.)	P in Body Mass Gain (lbs./yr./animal)	# of Each Type on Farm	Tot Lbs P
Lactating Cows	1,300	43	0	0	750	31,947
Dry Cows	1,350	19	0	0	50	967
Pot	1,300	19	1	0.007	50	967
Springers & Heifers	1,000	17	300	2.1	210	--
Bulls	1,200	N/A	0	0	0	0
Horses	1,000	N/A	0	0	0	0
Calves	100	N/A	100	0.7	0	0
Beef Cattle	600	N/A	400	2.8	0	0
				Totals	**1060**	**33,881**

Table 9-3. Field Distribution of Herds,
Butler Oaks Dairy ANMA

Field ID	Existing Primary Use	Animal Type	Number of Head (per Day)	Total Area (Acres)	Time Within Pasture (%)	Time Within HIA (%)	Time Within MP (%)	Time Within EB (%)	Feed in	Number of Animals in Each Field (per Day)								Totals
									Non-HIA Pasture?	Lactating	Pot Herd	Springer & Heifers *	Dry Cows	Bulls	Beef Cattle	Horses	Calves	
										- - - - - - equivalent # of cows adjusted for time spent in field - - - - -								
3	Solids Appl.	--	--	150.2	--	--	--	--	--									0
4	Solids Appl.	--	--	90.5	--	--	--	--	--									0
A	Pasture	Hobbled Herd	50	6.7	75%	10%	15%	0%	Yes	0	38	0	0	0	0	0	0	38
B	Pasture	Heifers	140	37.2	25%	50%	25%	0%	No	0	0	35	0	0	0	0	0	35
C	Pasture	Heifers	140	32.5	25%	50%	25%	0%	No	0	0	35	0	0	0	0	0	35
E	Pasture	Heifers	140	30.6	25%	50%	25%	0%	No	0	0	35	0	0	0	0	0	35
EB	East Barn	--	660	0.6	0%	50%		50%	--		0	0	0	0	0	0	0	330
FP	Forage Prod	--	--	377.0	--	--	--	--	--									0
G	Pasture	Fresh Cows	15	8.6	25%	50%	25%	0%	No	0	0	4	0	0	0	0	0	4
H	Pasture	Hospital Herd	15	8.4	25%	50%	25%	0%	No	4	4	0	0	0	0	0	0	8
I	Pasture	Hospital Herd	15	5.6	25%	50%	25%	0%	No	4	4	0	0	0	0	0	0	8
J	Pasture	Assorted Head	20	4.1	100%	--	--	--	--	0	0	0	20	0	0	0	0	20
K	Pasture	Calving Herd	80	10.0	40%	40%	20%	0%	No	32	0	0	0	0	0	0	0	32
L	Pasture	Not in Use	0	14.5	--	--	--	--	--	0	0	0	0	0	0	0	0	0
M	Calf Barn	Not In Use	0	1.5	--	--	--	--	--	0	0	0	0	0	0	0	0	0
MP	Milking Parlor *	--	--	0.4	--	--	--	--	--	0	0	0	0	0	0	0	0	0
N	Pasture	Not In Use	0	26.0	--	--	--	--	--	0	0	0	0	0	0	0	0	0
P	Hist. Sprayfield/ Pasture	Lactating Herd	165	26.5	25%	0%	25%	50%	No	41	0	0	0	0	0	0	0	41
Q	Pasture	Lactating Herd	165	67.6	25%	0%	25%	50%	No	41	0	0	0	0	0	0	0	41
R	Pasture	Dry Cows	50	48.8	100%	0%	0%	0%	Yes	50	0	0	0	0	0	0	0	50
S	Pasture	Horses/ Cow Staging	7 / 5	24.7	--	--	--	--	--	0	0	0	5	0	0	7	0	12
HIA and Perimeter	High Intensity Area		595	8.5	--	45%	55%	--	--	0	0	0	0	0	0	0	0	270
TOTALS			**1,060**	**739.6**						**172**	**45**	**109**	**25**	**0**	**0**	**7**	**0**	**957**

TABLE 9-4.
Phosphorus Loadings to Fields
Butler Oaks Dairy ANMA

Field ID	Use	Area	Manure Deposition (lbs.-P/ac/yr.)	Fertilization (lbs.-P/ac/yr.)	HIA/Barn Effluent (lbs.-P/ac/yr.)	Solids Application (lbs.-P/ac/yr.)	Total P Load per Acre (lbs.-P/ac/yr.)
3	Solids Appl.	150.2	0	20	0	16	36
4	Solids Appl.	90.5	0	20	0	16	36
A	Pasture	6.7	19.5	0	0	0	20
B	Pasture	37.2	15.9	0	0	0	16
C	Pasture	32.5	18.2	0	0	0	18
E	Pasture	30.6	19.3	0	0	0	19
EB	East Barn	0.6		0	0	0	0
F	Hayfield	95.4	0	0	0	0	0
G	Pasture	8.6	18.7	0	0	0	19
H	Pasture	8.4	8.6	0	0	0	9
HIA/ HIA Perimeter		8.2	32.9	0	0	0	33
I	Pasture	5.6	13.0	0	0	0	13
J	Pasture	4.1	82.7	0	0	0	83
K	Pasture	10.0	62.0	0	0	0	62
L	Pasture	14.5	0	0	0	0	0
N	Pasture	26.0	0	0	0	0	0
P	Hist. Sprayfield/ Pasture	26.5	66.4	0	0	0	66
Q	Pasture	67.6	26.0	0	0	0	26
R	Pasture	48.8	43.6	0	0	0	44
S	Pasture	24.7	8.2	0	0	0	8
SF1	Sprayfield	118.5	0	65	5.0	0	70



Prepared By SWET, Inc.

Figure 9-1. P Load (lbs/ac/yr) by Field for Butler Oaks Dairy
Butler Oaks Dairy ANMA

0 0.5 Miles

10.0 Management Alternatives for Achieving Discharge Goals

The previous sections have characterized the dairy and identified the high phosphorus source areas. With the goal of reducing P levels in discharge waters from the dairy to 40 ppb means that the dairy will have to implement practices and technologies that will reduce the current discharge P levels by up to 95 percent at monitoring point KREA41. To achieve these levels of reduction, technologies beyond the conventional BMP practices are required. Data from various IFAS research projects indicate that conventional practices (manure collection, storage, and land application at agronomic rates) can only achieve P discharge concentrations of between 300 to 900 ppb depending on soils, grazing density, and crops. These research projects do not address problems of historical residual P. Therefore, it becomes clear that conventional practices alone are not able to achieve the ultimate goal of 40 ppb TP. However, these practices can provide significant reductions over existing conditions. Edge of field technologies can then provide additional P retention that will help meet target concentrations.

As was shown in Section 9, the specific operational areas that constitute the largest proportions of the farm's phosphorus budget are:

- Purchased feed (grain) and fertilizer application (68 percent and 25 percent, respectively, of phosphorus imports),
- Runoff discharge (37 percent of phosphorus exports), and
- Direct manure deposition (23 percent of on-farm phosphorus accumulation).

As these operational areas constitute such a large proportion of the total farm phosphorus balance, the identification and discussion of suggested improvements will focus on these areas.

10.1 Feed Management

The farm's feed analysis records indicate that four different feed types are used on the Butler Oaks. The average phosphorus content of these feeds is 0.44 percent. Recent research indicates that feed phosphorus content may be in excess of what animals need. Satter and Wu (2001) suggest that 0.38 percent total dietary phosphorus is appropriate for lactating cows. They also indicated that a lower dietary phosphorus percentage could be fed to non-lactating cows on a farm. Powell et al (1997) stated that diets containing approximately 0.35 percent phosphorus are adequate for lactating cows. While additional research is needed in this area, it is clear that excess phosphorus is provided in the typical dairy diet and that eliminating this excess would have a significant impact on dairy farm phosphorus runoff.

Powell et al (1997) estimated that improvements in phosphorus feeding could result in 20 percent less phosphorus imported to and excreted on a farm

It is suggested that different grain mixtures continue to be fed to each of the herds of the farm. However, the maximum phosphorus content of any grain mixture should not exceed 0.35 percent, but low P feed stuff are generally not available. In addition, the phosphorus content of hay, silage, and forage fed to the herds should be regularly

determined. With this information, grain mixture phosphorus levels should be adjusted to keep the total dietary phosphorus level to the highest producing lactating herd limited to 0.35 percent. Non-producing cows could be fed total dietary phosphorus levels of 0.25 percent and still maintain sufficient rumen microbial growth to sustain ration digestibility (Satter and Wu, 2001).

It is also suggested that more detailed feed records be kept for each herd, including quantities and phosphorus content of grain, hay, silage, and forage rations. This information should be related to milk production and to farm-level phosphorus level indicators such as manure analyses, sprayfield effluent phosphorus concentration, and site surface water discharge phosphorus concentration. Though lower P rations will beneficially reduce P load on the dairy, any ration changes must be cost effective for the dairy. It is estimated that the recommended modifications will cost approximately $15,600 per year, based an estimated time for additional record keeping of 6 hours per week at $50 per hour.

10.2 Fertilizer Application Management

Fertilizer application is the second largest import of phosphorus onto the Butler Oaks Dairy. Over the past twelve months, approximately 18,580 pounds of phosphorus were applied to the farm's hayfield and irrigated fields. Since few farm soil sample reports were available for the evaluation prepared for this report, it is not currently possible to assess the actual fertilizer needs of the farm's hayfields and pastures.

Existing site surface water discharge data demonstrates that there is excess phosphorus in areas on the farm, but additional soil sampling data are needed to adequately assess this. It is suggested that a sufficient number of soil samples be collected at representative locations on the farm to provide the data necessary to evaluate the need for fertilizer. In addition to the parameters commonly tested for, it is suggested that sample analyses should also include iron and aluminum since both these elements can bind with phosphorus and make it unavailable to plants. Once this baseline information is available, soil samples should be collected and analyzed at regular intervals, certainly prior to planned fertilizer applications, to determine the most appropriate fertilizer nutrient content, method of application, and application rates. The dairy owner can do this, or as an alternative, a crop consultant could be employed to plan and oversee the nutrient management of all the farm's fields. The consultant would prepare a soil-sampling regime, manage the laboratory analyses and reporting of the samples, and prepare an appropriate fertilizer application plan for all fields on the farm.

The cost associated with the two alternative fertilizer management practices is estimated to be $2 per acre per year, if additional soil sampling is arranged for and managed by the farm owner, or $5 per acre per year if a crop consultant is employed. The resulting cost for the approximately 1,830-acres of the farm's land appropriate to include in a fertilizer management program would be $3,660 to $9,150 per year. Any cost benefit resulting from a reduction in fertilizer application can not be determined until adequate soil testing is performed.

10.3 Discharge Treatment and Reuse

Based on a review of the existing data and an evaluation of improvements discussed above, it is expected that additional treatment will be required in order for the Butler Oaks' discharge to meet the phosphorus concentration goal of 40 ppb. Recommended edge-of-farm discharge treatment facilities include on-site multi-stage stormwater ponds with a final chemical treatment-finishing pond. Any edge of farm treatment will have to consider and account for on-flow from the neighboring B-4 dairy. Low phosphorus water should be considered for by-pass. The cost for construction and implementation of these improvements is estimated to be approximately $550,000. The reuse of water for barn flushing and irrigation is encouraged. Options for reuse will be contingent upon the other nutrient management strategies selected for the farm.

10.4 Phosphorus Accumulation Management

Over the past twelve month period, runoff was the second leading mechanism of export of phosphorus from the Butler Oaks; milk exports were the leading export mechanism (Table 9-1). Based on an analysis of the data and several interviews with Mr. Robert Butler, two contributing factors to this problem were identified. Greater than desirable phosphorus loading from direct manure deposition to several of the pastures of the farm has occurred. Also, phosphorus-laden soils were placed in some of the farm's eastern pastures when the NRCS-designed improvements to the farm were constructed in the late 1980s.

As stated previously, additional soil sampling could help identify localized areas of phosphorus buildup or accumulation in soils of the pastures. The soil sampling, along with information obtained from further interviews with Mr. Butler, should be used to prepare a phosphorus map of the farm's soils. Using this map, it may be necessary to relocate or remove soils in areas that are heavily laden with phosphorus.

Phosphorus accumulation management should also include a phosphorus distribution-minded field rotation plan. While this alternative practice would not reduce the quantity of manure that is recycled on-site, it would more evenly distribute the phosphorus loading to as many of the farm's 1,830-acres as possible. This would help reduce phosphorus runoff and is expected to improve overall farm silage yields, perhaps to the point where silage could be exported off the farm.

An assessment of the phosphorus content of the soils, sediments, and surface water components should be addressed at both the farm boundary and internally to the farm. Additional surface water testing in conjunction with the proposed additional sediment sampling should provide the data necessary to better assess the effectiveness of the existing system as well as the proposed changes to the farm practices.

In summary, currently available site data limits the identification of appropriate alternative management strategies that can be feasibly implemented to reduce the phosphorus concentration of surface water runoff from the Butler Oaks Dairy. First steps to developing strategies include mapping soil P conditions and developing a fertilizer application plan based on the mapping results. Crops can be used to bind and mine excess P. Additional surface water testing can be used to assess the long-term effects of those changes.

10.5 Manure Management

Aside from what is stored within the HIA perimeter and waste storage pond, the largest source of phosphorus stored on the farm is manure directly deposited on the farm's fields and pastures. Direct manure deposition accounts for 23 percent of the phosphorus accumulated on the farm and contributes to an excessive phosphorus load on three of the farm's regularly used herd pastures.

An alternative management practice, that may reduce the quantity of manure accumulated on-site, is to keep more cows in the high intensity area more of the time. This would reduce the quantity of manure directly deposited on the pastures and make it easier to collect solids. Once the manure is collected, it could be spread on phosphorus-deficient areas of the farm or transported off-site.

Mr. Butler has indicated that manure management is particularly difficult on Butler Oaks because of the low floor elevations of the five feed barns relative to the solids separator sump and waste storage ponds. Because of this, the solids generated in the feed barns are typically very high in moisture content and are consequently difficult to properly manage. The manure management of the farm could be improved by the construction of infrastructure modifications that will enhance BMP implementation while allowing the farm operation to expand to the full potential of available land. Recommended infrastructure modifications include:

- Higher floor elevations in each of the five feed barns,
- Wash-down tanks for existing feed barns to allow gravity flushing of solids into a solids separator,
- Constructing a solids separator to provide a solids stockpile for distribution to remote fields, and
- Modifying the existing manure holding facility to more efficiently separate solids and liquids.

The estimated construction and implementation costs for the recommended infrastructure improvements are:

- Modified Feed barns (5) $ 200,000
- Wash-down tanks for existing feed barns (5) $ 50,000
- Solids separator system $ 150,000
- Solids holding facility $ 100,000
- TOTAL (manure management) $ 500,000

11.0 Other Recommendations for Achieving Agronomic Phosphorus Balance

11.1 Nutrient Record-Keeping

The NRCS conservation practice standard for Nutrient Management (Code 590) states that records applicable to monitoring the implementation of a nutrient management plan include:

- Soil tests results and recommendations for nutrient management,
- Quantities, analyses, and sources of nutrients applied,
- Dates and method of nutrient applications,
- Crops planted, planting and harvest dates, yields, and crop residues removed,
- Results of water, plant, and organic byproduct analyses, and
- Dates of review and person performing the review, and recommendations that resulted from the review.

In general, Mr. Butler's record-keeping practices are very good. He very generously offered his entire files for a thorough review in preparation of this report.

11.2 Animal Mortality Management

The Butler Oaks Farm buries all deceased herd animals on-site. Mr. Butler estimated that the typical mortality rate is 10 percent. Over the past year of operation, approximately 85 head died and were buried on-site. After a catastrophic mortality event it must be presumed that dead animals would be buried on-site unless public funds were made available to transport and dispose the animals off-site.

11.3 Emergency Response Procedures

The farm documents that were available and reviewed for this report did not include an emergency response plan. During an interview, Mr. Butler stated that no specific emergency response plan has been prepared. Feasible actions that can be taken to contain or manage any accidental discharge of manure or wastewater should be developed with farm management.

12.0 Summary of Phosphorus Management Recommendations

The recommendations for improving phosphorus management on Butler Oaks Farms include the following:

- Edge of farm treatment of runoff is the highest ranked method to reduce phosphorus discharge from the farm. The basic design, includes the following:
    - Interception of farm field runoff in a stormwater pond
    - Ditching around sprayfields to intercept runoff and seepage, returning that water to the stormwater pond

- An alum injection system for treatment of stormwater pond discharge.
- A settling pond for collection of alum floc prior to final discharge.
- Piping to provide reuse water from the stormwater pond to the sprayfield and barn water reuse system

- Different grain mixtures should continue to be fed to each of the herds of the farm, with the maximum phosphorus content of any grain mixture not to exceed 0.35 percent.

- It is recommended that a sufficient number of soil samples be collected at representative locations on the farm to provide the data necessary to evaluate the need for fertilizer. In addition to the parameters commonly tested for, it is suggested that sample analyses should also include iron and aluminum since both these elements can bind with phosphorus and make it unavailable to plants. Once this baseline information is available, soil samples should be collected and analyzed at regular intervals, certainly prior to planned fertilizer applications, to determine the most appropriate fertilizer nutrient content, method of application, and application rates.

- Phosphorus accumulation management should include a phosphorus distribution-minded field rotation plan. While this alternative practice would not reduce the quantity of manure that is recycled on-site, it would more evenly distribute the phosphorus loading to as many of the fields as possible. This would help reduce phosphorus runoff and is expected to improve overall farm silage yields, perhaps to the point where silage could be exported off the farm.

- Manage manure on the farm by creating an integrated containment system. The necessary structural additions to the farm include modified feed barns, scrapedown lanes, a solids separator, and a solids holding facility. The collected solids can be placed in low phosphorus areas on the farm, or transported off-site for disposal or other use.

  Specific infrastructure modifications for better manure management include:

  - Higher floor elevations in each of the five feed barns,
  - Wash-down tanks for existing feed barns to allow gravity flushing of solids into a solids separator,
  - Constructing a solids separator to provide a solids stockpile for distribution to remote fields, and
  - Modifying the existing manure holding facility to more efficiently separate solids and liquids.

13.0 References

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Butler Oaks Farm
APPENDIX A
O & M Plan

BUTLER DAIRY, INC. BARN # 2

WASTE MANAGEMENT SYSTEM

OPERATION AND MAINTENANCE PLAN

DESIGN CRITERIA

The following design criteria was used to plan the waste management system:

1.) The Sebring Field Office Technical Guide provided the standards and specifications for the components of the system.

2.) The daily production and composition of livestock manure is based on average values in Table 4-1 of the Agricultural Waste Management Field Manual, U.S. Department of Agriculture, Soil Conservation Service. Capacity of the system is for an average of 990 milking cows with a live weight of 1200 lbs. Nutrients for a 1200 lb. animal are as follows:

A.) Nitrogen (N) = 160 lbs/yr
B.) Phosphorous (P) = 30 lbs/yr
C.) Potassium (K_2O) = 104 lbs/yr

Phosphorous is the limiting nutrient!

3.) Phosphorous sources and delivery:

A.) Milk herd pastures, (including pot herd), will have an average of 990 cows. They will be located in fields 17, 18, 20, 21, 22, 23, 24, 26, and 27. Manure deposited from these herds is calculated as follows based on incentives in the high intensity areas (HIA), and pastures:

i.) Barn - 25% deposited with 50% of the phosphorous remaining in the sludge and retained in the solids trap and 50% delivered to the irrigated fields.

ii.) HIA - 55% deposited. Concrete ramps will have feed and water facilities on them as well as being shaded. Ramps will be scraped weekly to remove manure. During the rainy season, scraping will be done as needed to prevent manure from washing off the concrete ramps. Manure will be stored under cover to prevent rain from leaching nutrients out of the manure. It is estimated 80% of the phosphorus deposited in the HIA will be removed by scraping or will be bound in the soil of the HIA.

The remaining 20% of the phosphorus will leave the HIA as runoff, be collected, stored in the waste storage ponds (WSP's) and then utilized on the irrigated area via the irrigation system.

iii.) Pasture - 20% deposited in the herd pasture areas.

There will be no watering or feeding provided in the herd pastures. Partial shade from trees will be available in some pastures.

B.) Calf Barn Area

Calf barn phosphorus production was based on an average of 240 calves weighing 150 lbs. each. The calf barn is roofed and has a concrete floor. Waste will be stored in a solids trap where 50% of the phosphorus will be bound in sludge. The remaining 50% will be skimmed off the solids trap in liquid form and be pumped by way of pipeline to the HIA solids trap for application on the irrigated field.

4.) Phosphorous uptake was based on an annual uptake of 60 lbs/acre on the irrigated area and other areas managed for maximum production. Herd pastures, which are not managed for maximum production, have a planned P uptake not to exceed 45 lbs/acre. Planned phosphorus uptake in the areas where sludge and spoil are to be spread was based on 45 lbs./acre. However, if these areas are managed for maximum production then the phosphorus uptake level should be raised to 60 lbs./acre. Also, if any sludge or spoil is removed off the site then the acreage needed for sludge and spoil spreading would be reduced. Periodic sampling of the manure, waste water, and forages is recommended. As experience is gained from this data and also the groundwater sampling the management of the system may be improved based on the actual values obtained.

5.) Summary of phosphorous use from manure deposited in barn, HIA, calf barn and pastures:

Total irrigated area required - 125 acres
Total sludge & manure area required - 386 acres
Total pasture area required - 133 acres

Any changes in the cropping system will need to be analyzed to determine the effect it may have on the nutrient uptake and the use of water in the irrigated areas. The design is based on 55,000 gallons/day wash water and should not be exceeded except when the waste storage ponds have a depth of water less than one half of the design depth and water is needed for irrigation.

HIGH INTENSITY AREA

This will be an area where cattle congregate for periods of time. It is essential in this integrated system of best management practices that all practices function properly. Hay, water, and shade will be provided in the designated areas on the ramps in the high intensity area for each herd. Most feeding is done in the barn. When extra feed is necessary for the herds, it will be provided in the high intensity area. Mechanical and or chemical means will be used to maintain vegetation on side slopes of ditches. Sedimentation in the HIA perimeter ditch and field

ditches, will be removed as necessary. The pump sump areas will be cleaned out whenever necessary to insure they are kept at designed bottom elevations.

Concrete shall be scraped weekly. Manure is to be stockpiled in the HIA to allow for drying and timely field applications.

Capturing the phosphorous in this area is critical to the overall plan of the entire waste management system.

HIA SOLIDS TRAP

The solids trap will collect solids from the West HIA preventing it from entering the waste storage pond. It will receive waste from the west high intensity area sump by means of an axial flow pump. The accumulated sludge will be removed as needed and will require a minimum of 83 acres annually for the sludge application. Sludge removed during cleaning of the solids trap will be temporarily stored within the high intensity area to allow drying and to avoid possible contamination of the surface waters. This will also allow for more timely field applications and reduce the risk of heavy applications over short periods of time. Sludge can be spread on fields 1 through 10. Sludge may also be applied in field 39 on areas not being used for the irrigated area. Sludge may be applied in fields used for grazing as long as the total phosphorus applied does not exceed the phosphorus limit.

WASTE STORAGE PONDS

Waste storage pond (WSP) No. 1 (7 acres surface area) and waste storage pond (WSP) No. 2 (18 acres surface area), are designed to store barn wash water, runoff from the high intensity area and wash water from the calf barn. Manure will be applied to the ponds until a biological seal has been established to prevent seepage. Effluent from the WSP's shall be removed via the center pivot irrigation system. A water control structure with a sluice gate will facilitate the passage of water from WSP No. 1 to WSP No. 2. If WSP No. 1 is full and the sluice gate is not opened to allow water into WSP No. 2, the water control structure will begin functioning at Elevation 93.5. This will allow more water for irrigation by decreasing the amount of water lost to evaporation. The sluice gate for water control structure No. 1 can be opened to allow water from WSP No. 1 to WSP No. 2 for irrigation without having to completely fill WSP No. 2. The sluice gate shall be opened whenever water from WSP No. 1 is needed in WSP No. 2 for scheduled irrigations. An overflow structure is located in WSP No. 2 with a crest elevation of 92.1. Irrigation should be scheduled as frequently as possible (see Waste Water Irrigation). If WSP No. 1 is full and the water level in WSP No. 2 is within 0.5 ft. of the crest of the overflow structure, irrigation is

recommended if it will not result in damage to the crop even though runoff may occur. This is to protect against direct discharge from the pond when heavy rain is predicted. The system is designed to allow limited sludge accumulation in the waste storage pond. In the event heavy amounts of sludge do enter, removal will be required to maintain the storage capacity.

CALF BARN SOLIDS

This solids trap will collect solids and barn wash water from the calf barn area. The solids trap is sized to store the accumulated sludge for approximately one year. The sludge will be removed annually or as needed depending on intensity of use. The sludge will be uniformly spread on 9 acres annually. The solids can be spread on fields 1 through 10. The sludge may also be applied in field 39 on areas not being used for the irrigated area. The sludge may be applied in fields for grazing as long as the total phosphorus applied does not exceed the phosphorus limit. The excess wash water will be skimmed off and pumped to the HIA solids trap.

WASTE WATER IRRIGATION

The waste water collected from the barn, calf barn and high intensity areas will be transported via underground pipelines to a hay and greenchop area. A center pivot irrigation system will be used for waste water irrigation. Field 39 will be used for the irrigated area. This field will be drained to provide maximum crop production and nutrient uptake. There will be no additional phosphorous added to this irrigated area above the 60 lbs/acre allowed. Total annual waste water will be applied evenly over the irrigated area. No irrigation is permitted when the water table is within 18" of the surface. Normal irrigation to meet the plant needs should commence when the water table is 36" below the ground surface. This is a recommended starting point and needs to be adjusted as experience is gained. This depth normally varies seasonally. No "flash" grazing will be allowed in the irrigated area when there is standing water in the ditches. Irrigation should not take place while it is raining. The water control structures in the irrigated field (field #39) shall be operated to prevent direct runoff of irrigation water entering waters of the state. In the case of a major rainfall event, the flashboards can be removed from the structures to pass the design drainage flow.

WASTE MANAGEMENT-GRAZING

All milk herd pastures (fields 17, 18, 20, 21, 22, 23, 24, 26, and 27) will be stocked at a rate not to exceed 45 lbs. P/Ac. All other pasture areas will also be stocked not to exceed 45 lbs./Ac. unless they are intensively managed. This would raise the rate of allowable phosphorus uptake to 60 lbs./Ac.and would allow for a higher stocking rate. Fields 25,28,34 as well low wet areas found in fields 17 and 18 will be fenced out. This is to prevent cows from concentrating in these areas when it is wet. Flash grazing is permitted in these fields and will be important in keeping down noxious weeds. Pasture areas should be maintained to promote maximum ground cover for nutrient uptake. Liming field pastures and maintaining the proper pH aid in nutrient uptake. Noxious weed control is essential. Fencing and crossings along ditches and streams will be maintained to prevent cattle entrance. Shade , water,and hay will be provided in the HIA in a way as to encourage the animals to leave the pasture.

WASTE UTILIZATION

Determine the nutrient content of the waste collected from the manure and solids trap and the high intensity area. This concentration may vary due to rainfall and handling procedures. Waste will be applied at a rate not to exceed the amount removed by the crop. In order to achieve the P removal rates necessary to arrive at a nutrient balance on your farm, an adequate supply of N and K must be applied to these fields. Apply N and K according to soil test recommendations on the herd pastures. Apply recommended rates of N and K to the irrigated field and the fields on which solids trap sludge and HIA manure is spread. Split the amount applied into at least two applications to make the most efficient use of the fertilizer.

Proper functioning of this waste management system depends on timely harvesting and removal of 60 pounds of phosphorous per acre per year of forage in the irrigated area and 45 lbs./Ac. in areas where sludge, and manure are utilized. Plans must be made to utilize the forage produced, either on the farms or other arrangements should be made for off-site transport. In the event that herd numbers are increased in the future, this operation and maintenance plan will be revised to be in compliance with the DER Dairy Rule. Contact an SCS representative for assistance.

MAINTENANCE

All structural measures such as embankments, irrigation systems, pipes, crossings, pumps, ramps, fences, etc. must be

inspected routinely and needed repairs made as necessary to insure proper functioning.

SAFETY

Due to the possible public entrance into the system, it is recommended that warning signs be placed around the solids trap, waste storage pond, and perimeter ditch area. SCS personnel will provide assistance in sign location.

The undersigned agree that they have read and agree with all the terms and conditions of this operation and maintenance plan.

Robert L Butler V.P. 2-21-90

(Owner) (Date)

Robert L. Butler V.P.
Butler's Dairy, Inc.

Butler Oaks Farm
APPENDIX B
Surface Water Quality Data

Total Phosphorus Concentration for Surface Water Sampling Station KREA41
Butler Oaks Discharge Monitoring Point

Station Designation	Sample Date	Parameter Sampled	Analytical Result
KREA 41 19870519 19870519	05/19/87	TOTAL PHOSPHORUS	15.6
KREA 41 19870616 19870616	06/16/87	TOTAL PHOSPHORUS	24.4
KREA 41 19870630 19870630	06/30/87	TOTAL PHOSPHORUS	37.5
KREA 41 19870728 19870728	07/28/87	TOTAL PHOSPHORUS	38.3
KREA 41 19870805 19870805	08/05/87	TOTAL PHOSPHORUS	22.6
KREA 41 19870811 19870811	08/11/87	TOTAL PHOSPHORUS	29.2
KREA 41 19870819 19870819	08/19/87	TOTAL PHOSPHORUS	26.1
KREA 41 19870908 19870908	09/08/87	TOTAL PHOSPHORUS	12.6
KREA 41 19870916 19870916	09/16/87	TOTAL PHOSPHORUS	29.2
KREA 41 19870922 19870922	09/22/87	TOTAL PHOSPHORUS	28.6
KREA 41 19870930 19870930	09/30/87	TOTAL PHOSPHORUS	24.3
KREA 41 19871006 19871006	10/06/87	TOTAL PHOSPHORUS	16.4
KREA 41 19871014 19871014	10/14/87	TOTAL PHOSPHORUS	12.2
KREA 41 19871020 19871020	10/20/87	TOTAL PHOSPHORUS	16.5
KREA 41 19871028 19871028	10/28/87	TOTAL PHOSPHORUS	17.2
KREA 41 19871103 19871103	11/03/87	TOTAL PHOSPHORUS	16.5
KREA 41 19871112 19871112	11/12/87	TOTAL PHOSPHORUS	17.6
KREA 41 19871117 19871117	11/17/87	TOTAL PHOSPHORUS	22.0
KREA 41 19871125 19871125	11/25/87	TOTAL PHOSPHORUS	16.5
KREA 41 19871201 19871201	12/01/87	TOTAL PHOSPHORUS	18.6
KREA 41 19871209 19871209	12/09/87	TOTAL PHOSPHORUS	16.9
KREA 41 19871215 19871215	12/15/87	TOTAL PHOSPHORUS	17.8
KREA 41 19871221 19871221	12/21/87	TOTAL PHOSPHORUS	18.5
KREA 41 19880105 19880105	01/05/88	TOTAL PHOSPHORUS	18.4
KREA 41 19880112 19880112	01/12/88	TOTAL PHOSPHORUS	23.3
KREA 41 19880119 19880119	01/19/88	TOTAL PHOSPHORUS	19.2
KREA 41 19880125 19880125	01/25/88	TOTAL PHOSPHORUS	22.6
KREA 41 19880201 19880201	02/01/88	TOTAL PHOSPHORUS	20.4
KREA 41 19880208 19880208	02/08/88	TOTAL PHOSPHORUS	16.0
KREA 41 19880217 19880217	02/17/88	TOTAL PHOSPHORUS	17.7
KREA 41 19880222 19880222	02/22/88	TOTAL PHOSPHORUS	17.2
KREA 41 19880229 19880229	02/29/88	TOTAL PHOSPHORUS	19.0
KREA 41 19880307 19880307	03/07/88	TOTAL PHOSPHORUS	16.4
KREA 41 19880314 19880314	03/14/88	TOTAL PHOSPHORUS	15.8
KREA 41 19880321 19880321	03/21/88	TOTAL PHOSPHORUS	17.4
KREA 41 19880328 19880328	03/28/88	TOTAL PHOSPHORUS	28.7
KREA 41 19880517 19880517	05/17/88	TOTAL PHOSPHORUS	13.8
KREA 41 19880524 19880524	05/24/88	TOTAL PHOSPHORUS	18.6
KREA 41 19880607 19880607	06/07/88	TOTAL PHOSPHORUS	12.2
KREA 41 19880621 19880621	06/21/88	TOTAL PHOSPHORUS	21.9
KREA 41 19880628 19880628	06/28/88	TOTAL PHOSPHORUS	24.6
KREA 41 19880706 19880706	07/06/88	TOTAL PHOSPHORUS	21.4
KREA 41 19880712 19880712	07/12/88	TOTAL PHOSPHORUS	16.6
KREA 41 19880719 19880719	07/19/88	TOTAL PHOSPHORUS	32.7
KREA 41 19880725 19880725	07/25/88	TOTAL PHOSPHORUS	17.4
KREA 41 19880803 19880803	08/03/88	TOTAL PHOSPHORUS	18.8

Total Phosphorus Concentration for Surface Water Sampling Station KREA41
Butler Oaks Discharge Monitoring Point

Station Designation	Sample Date	Parameter Sampled	Analytical Result
KREA 41 19880809 19880809	08/09/88	TOTAL PHOSPHORUS	12.2
KREA 41 19880817 19880817	08/17/88	TOTAL PHOSPHORUS	5.0
KREA 41 19880823 19880823	08/23/88	TOTAL PHOSPHORUS	15.0
KREA 41 19880830 19880830	08/30/88	TOTAL PHOSPHORUS	18.2
KREA 41 19880907 19880907	09/07/88	TOTAL PHOSPHORUS	12.4
KREA 41 19880912 19880912	09/12/88	TOTAL PHOSPHORUS	16.0
KREA 41 19880919 19880919	09/19/88	TOTAL PHOSPHORUS	13.6
KREA 41 19880926 19880926	09/26/88	TOTAL PHOSPHORUS	15.0
KREA 41 19881003 19881003	10/03/88	TOTAL PHOSPHORUS	15.9
KREA 41 19890418 19890418	04/18/89	TOTAL PHOSPHORUS	9.1
KREA 41 19890424 19890424	04/24/89	TOTAL PHOSPHORUS	14.3
KREA 41 19890515 19890515	05/15/89	TOTAL PHOSPHORUS	9.8
KREA 41 19890718 19890718	07/18/89	TOTAL PHOSPHORUS	32.2
KREA 41 19890815 19890815	08/15/89	TOTAL PHOSPHORUS	12.5
KREA 41 19890919 19890919	09/19/89	TOTAL PHOSPHORUS	27.0
KREA 41 19890925 19890925	09/25/89	TOTAL PHOSPHORUS	19.6
KREA 41 19891002 19891002	10/02/89	TOTAL PHOSPHORUS	13.1
KREA 41 19891009 19891009	10/09/89	TOTAL PHOSPHORUS	5.4
KREA 41 19891016 19891016	10/16/89	TOTAL PHOSPHORUS	18.4
KREA 41 19891023 19891023	10/23/89	TOTAL PHOSPHORUS	24.3
KREA 41 19891030 19891030	10/30/89	TOTAL PHOSPHORUS	11.8
KREA 41 19891106 19891106	11/06/89	TOTAL PHOSPHORUS	28.6
KREA 41 19891127 19891127	11/27/89	TOTAL PHOSPHORUS	52.6
KREA 41 19891211 19891211	12/11/89	TOTAL PHOSPHORUS	15.2
KREA 41 19891218 19891218	12/18/89	TOTAL PHOSPHORUS	31.0
KREA 41 19900103 19900103	01/03/90	TOTAL PHOSPHORUS	87.2
KREA 41 19900109 19900109	01/09/90	TOTAL PHOSPHORUS	26.2
KREA 41 19900613 19900613	06/13/90	TOTAL PHOSPHORUS	19.4
KREA 41 19900626 19900626	06/26/90	TOTAL PHOSPHORUS	10.9
KREA 41 19900702 19900702	07/02/90	TOTAL PHOSPHORUS	17.4
KREA 41 19900711 19900711	07/11/90	TOTAL PHOSPHORUS	20.0
KREA 41 19900716 19900716	07/16/90	TOTAL PHOSPHORUS	27.9
KREA 41 19901010 19901010	10/10/90	TOTAL PHOSPHORUS	12.4
KREA 41 19910116 19910116	01/16/91	TOTAL PHOSPHORUS	16.7
KREA 41 19910717 19910717	07/17/91	TOTAL PHOSPHORUS	10.0
KREA 41 19910730 19910730	07/30/91	TOTAL PHOSPHORUS	6.4
KREA 41 19910806 19910806	08/06/91	TOTAL PHOSPHORUS	9.5
KREA 41 19910815 19910815	08/15/91	TOTAL PHOSPHORUS	5.7
KREA 41 19910821 19910821	08/21/91	TOTAL PHOSPHORUS	12.6
KREA 41 19910828 19910828	08/28/91	TOTAL PHOSPHORUS	10.6
KREA 41 19910911 19910911	09/11/91	TOTAL PHOSPHORUS	13.5
KREA 41 19910917 19910917	09/17/91	TOTAL PHOSPHORUS	11.5
KREA 41 19910924 19910924	09/24/91	TOTAL PHOSPHORUS	10.2
KREA 41 19911002 19911002	10/02/91	TOTAL PHOSPHORUS	2.4
KREA 41 19911016 19911016	10/16/91	TOTAL PHOSPHORUS	10.8
KREA 41 19920707 19920707	07/07/92	TOTAL PHOSPHORUS	1.5

Total Phosphorus Concentration for Surface Water Sampling Station KREA41
Butler Oaks Discharge Monitoring Point

Station Designation	Sample Date	Parameter Sampled	Analytical Result
KREA 41 19920721 19920721	07/21/92	TOTAL PHOSPHORUS	13.1
KREA 41 19920817 19920817	08/17/92	TOTAL PHOSPHORUS	13.4
KREA 41 19920831 19920831	08/31/92	TOTAL PHOSPHORUS	12.2
KREA 41 19920917 19920917	09/17/92	TOTAL PHOSPHORUS	13.5
KREA 41 19920930 19920930	09/30/92	TOTAL PHOSPHORUS	14.5
KREA 41 19921014 19921014	10/14/92	TOTAL PHOSPHORUS	11.1
KREA 41 19930120 19930120	01/20/93	TOTAL PHOSPHORUS	10.8
KREA 41 19930204 19930204	02/04/93	TOTAL PHOSPHORUS	9.8
KREA 41 19930218 19930218	02/18/93	TOTAL PHOSPHORUS	7.7
KREA 41 19930302 19930302	03/02/93	TOTAL PHOSPHORUS	8.0
KREA 41 19930316 19930316	03/16/93	TOTAL PHOSPHORUS	8.5
KREA 41 19930330 19930330	03/30/93	TOTAL PHOSPHORUS	10.9
KREA 41 19940620 19940620	06/20/94	TOTAL PHOSPHORUS	4.6
KREA 41 19940928 19940928	09/28/94	TOTAL PHOSPHORUS	11.2
KREA 41 19941011 19941011	10/11/94	TOTAL PHOSPHORUS	13.4
KREA 41 19941122 19941122	11/22/94	TOTAL PHOSPHORUS	7.5
KREA 41 19941207 19941207	12/07/94	TOTAL PHOSPHORUS	9.7
KREA 41 19950119 19950119	01/19/95	TOTAL PHOSPHORUS	9.1
KREA 41 19950313 19950313	03/13/95	TOTAL PHOSPHORUS	8.6
KREA 41 19950731 19950731	07/31/95	TOTAL PHOSPHORUS	6.2
KREA 41 19950828 19950828	08/28/95	TOTAL PHOSPHORUS	11.1
KREA 41 19950912 19950912	09/12/95	TOTAL PHOSPHORUS	7.7
KREA 41 19951009 19951009	10/09/95	TOTAL PHOSPHORUS	6.9
KREA 41 19951023 19951023	10/23/95	TOTAL PHOSPHORUS	12.4
KREA 41 19951108 19951108	11/08/95	TOTAL PHOSPHORUS	13.1
KREA 41 19970618 19970618	06/18/97	TOTAL PHOSPHORUS	8.8
KREA 41 19970714 19970714	07/14/97	TOTAL PHOSPHORUS	10.0
KREA 41 19971230 19971230	12/30/97	TOTAL PHOSPHORUS	10.2
KREA 41 19980112 19980112	01/12/98	TOTAL PHOSPHORUS	10.4
KREA 41 19980126 19980126	01/26/98	TOTAL PHOSPHORUS	9.3
KREA 41 19980209 19980209	02/09/98	TOTAL PHOSPHORUS	7.3
KREA 41 19980223 19980223	02/23/98	TOTAL PHOSPHORUS	9.7
KREA 41 19980309 19980309	03/09/98	TOTAL PHOSPHORUS	9.9
KREA 41 19990628 19990628	06/28/99	TOTAL PHOSPHORUS	5.8
KREA 41 19990712 19990712	07/12/99	TOTAL PHOSPHORUS	9.5
KREA 41 19991005 19991005	10/05/99	TOTAL PHOSPHORUS	10.3
KREA 41 19991019 19991019	10/19/99	TOTAL PHOSPHORUS	11.2
KREA 41 19991101 19991101	11/01/99	TOTAL PHOSPHORUS	9.1
KREA 41 19991115 19991115	11/15/99	TOTAL PHOSPHORUS	8.3

Total Phosphorus Concentration for Surface Water Sampling Station KREA41A
Butler Oaks Discharge Monitoring Point

Station Designation				Sample Date	Parameter Sampled	Analytical Result
KREA	41	19870602	A 19870602	06/02/87	TOTAL PHOSPHORUS	1.2
KREA	41	19870610	A 19870610	06/10/87	TOTAL PHOSPHORUS	0.7
KREA	41	19870722	A 19870722	07/22/87	TOTAL PHOSPHORUS	0.6
KREA	41	19870805	A 19870805	08/05/87	TOTAL PHOSPHORUS	1.6
KREA	41	19870811	A 19870811	08/11/87	TOTAL PHOSPHORUS	0.8
KREA	41	19870825	A 19870825	08/25/87	TOTAL PHOSPHORUS	0.7
KREA	41	19870908	A 19870908	09/08/87	TOTAL PHOSPHORUS	0.5
KREA	41	19870922	A 19870922	09/22/87	TOTAL PHOSPHORUS	0.8
KREA	41	19871014	A 19871014	10/14/87	TOTAL PHOSPHORUS	0.8
KREA	41	19871020	A 19871020	10/20/87	TOTAL PHOSPHORUS	1.6
KREA	41	19871103	A 19871103	11/03/87	TOTAL PHOSPHORUS	1.4
KREA	41	19871112	A 19871112	11/12/87	TOTAL PHOSPHORUS	2.3
KREA	41	19871117	A 19871117	11/17/87	TOTAL PHOSPHORUS	2.0
KREA	41	19871125	A 19871125	11/25/87	TOTAL PHOSPHORUS	1.6
KREA	41	19871201	A 19871201	12/01/87	TOTAL PHOSPHORUS	1.7
KREA	41	19871209	A 19871209	12/09/87	TOTAL PHOSPHORUS	1.6
KREA	41	19871215	A 19871215	12/15/87	TOTAL PHOSPHORUS	1.3
KREA	41	19871221	A 19871221	12/21/87	TOTAL PHOSPHORUS	1.1
KREA	41	19880105	A 19880105	01/05/88	TOTAL PHOSPHORUS	0.6
KREA	41	19880112	A 19880112	01/12/88	TOTAL PHOSPHORUS	0.6
KREA	41	19880119	A 19880119	01/19/88	TOTAL PHOSPHORUS	0.7
KREA	41	19880125	A 19880125	01/25/88	TOTAL PHOSPHORUS	0.9
KREA	41	19880201	A 19880201	02/01/88	TOTAL PHOSPHORUS	0.5
KREA	41	19880208	A 19880208	02/08/88	TOTAL PHOSPHORUS	1.4
KREA	41	19880217	A 19880217	02/17/88	TOTAL PHOSPHORUS	0.5
KREA	41	19880222	A 19880222	02/22/88	TOTAL PHOSPHORUS	1.1
KREA	41	19880229	A 19880229	02/29/88	TOTAL PHOSPHORUS	0.6
KREA	41	19880307	A 19880307	03/07/88	TOTAL PHOSPHORUS	1.0
KREA	41	19880314	A 19880314	03/14/88	TOTAL PHOSPHORUS	1.1
KREA	41	19880321	A 19880321	03/21/88	TOTAL PHOSPHORUS	1.0
KREA	41	19880328	A 19880328	03/28/88	TOTAL PHOSPHORUS	1.5
KREA	41	19880404	A 19880404	04/04/88	TOTAL PHOSPHORUS	1.2
KREA	41	19880419	A 19880419	04/19/88	TOTAL PHOSPHORUS	0.1
KREA	41	19880503	A 19880503	05/03/88	TOTAL PHOSPHORUS	0.7
KREA	41	19880510	A 19880510	05/10/88	TOTAL PHOSPHORUS	0.3
KREA	41	19880517	A 19880517	05/17/88	TOTAL PHOSPHORUS	0.4
KREA	41	19880524	A 19880524	05/24/88	TOTAL PHOSPHORUS	0.3
KREA	41	19880607	A 19880607	06/07/88	TOTAL PHOSPHORUS	0.2
KREA	41	19880614	A 19880614	06/14/88	TOTAL PHOSPHORUS	0.3
KREA	41	19880621	A 19880621	06/21/88	TOTAL PHOSPHORUS	0.7
KREA	41	19880628	A 19880628	06/28/88	TOTAL PHOSPHORUS	0.7
KREA	41	19880725	A 19880725	07/25/88	TOTAL PHOSPHORUS	2.1
KREA	41	19880803	A 19880803	08/03/88	TOTAL PHOSPHORUS	1.8
KREA	41	19880809	A 19880809	08/09/88	TOTAL PHOSPHORUS	1.1
KREA	41	19880817	A 19880817	08/17/88	TOTAL PHOSPHORUS	1.5
KREA	41	19880823	A 19880823	08/23/88	TOTAL PHOSPHORUS	0.8
KREA	41	19880830	A 19880830	08/30/88	TOTAL PHOSPHORUS	0.5
KREA	41	19880907	A 19880907	09/07/88	TOTAL PHOSPHORUS	0.8
KREA	41	19880912	A 19880912	09/12/88	TOTAL PHOSPHORUS	0.6
KREA	41	19880919	A 19880919	09/19/88	TOTAL PHOSPHORUS	0.3
KREA	41	19880926	A 19880926	09/26/88	TOTAL PHOSPHORUS	0.3
KREA	41	19881003	A 19881003	10/03/88	TOTAL PHOSPHORUS	0.3

Total Phosphorus Concentration for Surface Water Sampling Station KREA41A
Butler Oaks Discharge Monitoring Point

Station Designation				Sample Date	Parameter Sampled	Analytical Result
KREA	41	19890307	A 19890307	03/07/89	TOTAL PHOSPHORUS	1.8
KREA	41	19890314	A 19890314	03/14/89	TOTAL PHOSPHORUS	4.9
KREA	41	19890320	A 19890320	03/20/89	TOTAL PHOSPHORUS	2.5
KREA	41	19890327	A 19890327	03/27/89	TOTAL PHOSPHORUS	2.5
KREA	41	19890403	A 19890403	04/03/89	TOTAL PHOSPHORUS	2.7
KREA	41	19890418	A 19890418	04/18/89	TOTAL PHOSPHORUS	1.3
KREA	41	19890424	A 19890424	04/24/89	TOTAL PHOSPHORUS	1.7
KREA	41	19890501	A 19890501	05/01/89	TOTAL PHOSPHORUS	3.1
KREA	41	19890515	A 19890515	05/15/89	TOTAL PHOSPHORUS	1.0
KREA	41	19890703	A 19890703	07/03/89	TOTAL PHOSPHORUS	1.9
KREA	41	19890815	A 19890815	08/15/89	TOTAL PHOSPHORUS	2.1
KREA	41	19890822	A 19890822	08/22/89	TOTAL PHOSPHORUS	2.0
KREA	41	19890829	A 19890829	08/29/89	TOTAL PHOSPHORUS	1.2
KREA	41	19890905	A 19890905	09/05/89	TOTAL PHOSPHORUS	1.3
KREA	41	19890911	A 19890911	09/11/89	TOTAL PHOSPHORUS	0.8
KREA	41	19890919	A 19890919	09/19/89	TOTAL PHOSPHORUS	0.6
KREA	41	19890925	A 19890925	09/25/89	TOTAL PHOSPHORUS	1.6
KREA	41	19891002	A 19891002	10/02/89	TOTAL PHOSPHORUS	1.3
KREA	41	19891009	A 19891009	10/09/89	TOTAL PHOSPHORUS	1.8
KREA	41	19891016	A 19891016	10/16/89	TOTAL PHOSPHORUS	2.0
KREA	41	19891023	A 19891023	10/23/89	TOTAL PHOSPHORUS	0.4
KREA	41	19891030	A 19891030	10/30/89	TOTAL PHOSPHORUS	0.8
KREA	41	19891106	A 19891106	11/06/89	TOTAL PHOSPHORUS	0.7
KREA	41	19891113	A 19891113	11/13/89	TOTAL PHOSPHORUS	0.4
KREA	41	19900103	A 19900103	01/03/90	TOTAL PHOSPHORUS	0.7
KREA	41	19900109	A 19900109	01/09/90	TOTAL PHOSPHORUS	1.1
KREA	41	19900117	A 19900117	01/17/90	TOTAL PHOSPHORUS	1.4
KREA	41	19900123	A 19900123	01/23/90	TOTAL PHOSPHORUS	1.7
KREA	41	19900130	A 19900130	01/30/90	TOTAL PHOSPHORUS	0.9
KREA	41	19900213	A 19900213	02/13/90	TOTAL PHOSPHORUS	3.2
KREA	41	19900221	A 19900221	02/21/90	TOTAL PHOSPHORUS	1.1
KREA	41	19900227	A 19900227	02/27/90	TOTAL PHOSPHORUS	1.0
KREA	41	19900313	A 19900313	03/13/90	TOTAL PHOSPHORUS	0.9
KREA	41	19900320	A 19900320	03/20/90	TOTAL PHOSPHORUS	1.2
KREA	41	19900418	A 19900418	04/18/90	TOTAL PHOSPHORUS	0.6
KREA	41	19900613	A 19900613	06/13/90	TOTAL PHOSPHORUS	0.5
KREA	41	19900619	A 19900619	06/19/90	TOTAL PHOSPHORUS	0.3
KREA	41	19900626	A 19900626	06/26/90	TOTAL PHOSPHORUS	1.5
KREA	41	19900702	A 19900702	07/02/90	TOTAL PHOSPHORUS	2.5
KREA	41	19900711	A 19900711	07/11/90	TOTAL PHOSPHORUS	0.9
KREA	41	19900716	A 19900716	07/16/90	TOTAL PHOSPHORUS	1.7
KREA	41	19901018	A 19901018	10/18/90	TOTAL PHOSPHORUS	0.6
KREA	41	19901024	A 19901024	10/24/90	TOTAL PHOSPHORUS	0.4
KREA	41	19901030	A 19901030	10/30/90	TOTAL PHOSPHORUS	0.1
KREA	41	19901107	A 19901107	11/07/90	TOTAL PHOSPHORUS	0.1
KREA	41	19901115	A 19901115	11/15/90	TOTAL PHOSPHORUS	0.1
KREA	41	19901129	A 19901129	11/29/90	TOTAL PHOSPHORUS	0.1
KREA	41	19901206	A 19901206	12/06/90	TOTAL PHOSPHORUS	0.1
KREA	41	19901213	A 19901213	12/13/90	TOTAL PHOSPHORUS	0.1
KREA	41	19910104	A 19910104	01/04/91	TOTAL PHOSPHORUS	0.1
KREA	41	19910110	A 19910110	01/10/91	TOTAL PHOSPHORUS	0.1
KREA	41	19910116	A 19910116	01/16/91	TOTAL PHOSPHORUS	1.8

Total Phosphorus Concentration for Surface Water Sampling Station KREA41A
Butler Oaks Discharge Monitoring Point

Station Designation				Sample Date	Parameter Sampled	Analytical Result
KREA	41	19910129	A 19910129	01/29/91	TOTAL PHOSPHORUS	0.1
KREA	41	19910206	A 19910206	02/06/91	TOTAL PHOSPHORUS	0.2
KREA	41	19910212	A 19910212	02/12/91	TOTAL PHOSPHORUS	0.1
KREA	41	19910227	A 19910227	02/27/91	TOTAL PHOSPHORUS	0.1
KREA	41	19910307	A 19910307	03/07/91	TOTAL PHOSPHORUS	0.5
KREA	41	19910314	A 19910314	03/14/91	TOTAL PHOSPHORUS	0.3
KREA	41	19910327	A 19910327	03/27/91	TOTAL PHOSPHORUS	0.2
KREA	41	19910403	A 19910403	04/03/91	TOTAL PHOSPHORUS	0.1
KREA	41	19910410	A 19910410	04/10/91	TOTAL PHOSPHORUS	0.1
KREA	41	19910422	A 19910422	04/22/91	TOTAL PHOSPHORUS	0.1
KREA	41	19910429	A 19910429	04/29/91	TOTAL PHOSPHORUS	0.1
KREA	41	19910506	A 19910506	05/06/91	TOTAL PHOSPHORUS	0.1
KREA	41	19910513	A 19910513	05/13/91	TOTAL PHOSPHORUS	0.1
KREA	41	19910520	A 19910520	05/20/91	TOTAL PHOSPHORUS	0.1
KREA	41	19910603	A 19910603	06/03/91	TOTAL PHOSPHORUS	0.1
KREA	41	19910610	A 19910610	06/10/91	TOTAL PHOSPHORUS	0.1
KREA	41	19910626	A 19910626	06/26/91	TOTAL PHOSPHORUS	0.1
KREA	41	19910710	A 19910710	07/10/91	TOTAL PHOSPHORUS	0.4
KREA	41	19910717	A 19910717	07/17/91	TOTAL PHOSPHORUS	0.5
KREA	41	19910723	A 19910723	07/23/91	TOTAL PHOSPHORUS	1.7
KREA	41	19910730	A 19910730	07/30/91	TOTAL PHOSPHORUS	1.3
KREA	41	19910806	A 19910806	08/06/91	TOTAL PHOSPHORUS	1.6
KREA	41	19910815	A 19910815	08/15/91	TOTAL PHOSPHORUS	1.4
KREA	41	19910821	A 19910821	08/21/91	TOTAL PHOSPHORUS	1.1
KREA	41	19910828	A 19910828	08/28/91	TOTAL PHOSPHORUS	1.3
KREA	41	19910911	A 19910911	09/11/91	TOTAL PHOSPHORUS	0.9
KREA	41	19910917	A 19910917	09/17/91	TOTAL PHOSPHORUS	0.7
KREA	41	19911002	A 19911002	10/02/91	TOTAL PHOSPHORUS	0.5
KREA	41	19911016	A 19911016	10/16/91	TOTAL PHOSPHORUS	0.5
KREA	41	19911030	A 19911030	10/30/91	TOTAL PHOSPHORUS	0.2
KREA	41	19911113	A 19911113	11/13/91	TOTAL PHOSPHORUS	0.1
KREA	41	19911126	A 19911126	11/26/91	TOTAL PHOSPHORUS	0.1
KREA	41	19911212	A 19911212	12/12/91	TOTAL PHOSPHORUS	0.1
KREA	41	19911223	A 19911223	12/23/91	TOTAL PHOSPHORUS	0.1
KREA	41	19920110	A 19920110	01/10/92	TOTAL PHOSPHORUS	0.1
KREA	41	19920123	A 19920123	01/23/92	TOTAL PHOSPHORUS	0.1
KREA	41	19920206	A 19920206	02/06/92	TOTAL PHOSPHORUS	0.1
KREA	41	19920220	A 19920220	02/20/92	TOTAL PHOSPHORUS	0.3
KREA	41	19920305	A 19920305	03/05/92	TOTAL PHOSPHORUS	0.1
KREA	41	19920317	A 19920317	03/17/92	TOTAL PHOSPHORUS	0.1
KREA	41	19920331	A 19920331	03/31/92	TOTAL PHOSPHORUS	0.1
KREA	41	19920414	A 19920414	04/14/92	TOTAL PHOSPHORUS	0.3
KREA	41	19920427	A 19920427	04/27/92	TOTAL PHOSPHORUS	0.2
KREA	41	19920511	A 19920511	05/11/92	TOTAL PHOSPHORUS	0.1
KREA	41	19920527	A 19920527	05/27/92	TOTAL PHOSPHORUS	0.2
KREA	41	19920608	A 19920608	06/08/92	TOTAL PHOSPHORUS	0.2
KREA	41	19920622	A 19920622	06/22/92	TOTAL PHOSPHORUS	1.0
KREA	41	19920707	A 19920707	07/07/92	TOTAL PHOSPHORUS	0.4
KREA	41	19920721	A 19920721	07/21/92	TOTAL PHOSPHORUS	0.5
KREA	41	19920803	A 19920803	08/03/92	TOTAL PHOSPHORUS	0.1
KREA	41	19920817	A 19920817	08/17/92	TOTAL PHOSPHORUS	0.2
KREA	41	19920831	A 19920831	08/31/92	TOTAL PHOSPHORUS	0.4

Total Phosphorus Concentration for Surface Water Sampling Station KREA41A
Butler Oaks Discharge Monitoring Point

Station Designation				Sample Date	Parameter Sampled	Analytical Result
KREA	41	19920917	A 19920917	09/17/92	TOTAL PHOSPHORUS	1.1
KREA	41	19920930	A 19920930	09/30/92	TOTAL PHOSPHORUS	0.5
KREA	41	19921014	A 19921014	10/14/92	TOTAL PHOSPHORUS	0.7
KREA	41	19921027	A 19921027	10/27/92	TOTAL PHOSPHORUS	0.1
KREA	41	19921110	A 19921110	11/10/92	TOTAL PHOSPHORUS	0.1
KREA	41	19921124	A 19921124	11/24/92	TOTAL PHOSPHORUS	0.1
KREA	41	19921208	A 19921208	12/08/92	TOTAL PHOSPHORUS	0.1
KREA	41	19921223	A 19921223	12/23/92	TOTAL PHOSPHORUS	0.1
KREA	41	19930105	A 19930105	01/05/93	TOTAL PHOSPHORUS	0.1
KREA	41	19930120	A 19930120	01/20/93	TOTAL PHOSPHORUS	0.2
KREA	41	19930204	A 19930204	02/04/93	TOTAL PHOSPHORUS	0.3
KREA	41	19930218	A 19930218	02/18/93	TOTAL PHOSPHORUS	0.9
KREA	41	19930302	A 19930302	03/02/93	TOTAL PHOSPHORUS	0.4
KREA	41	19930316	A 19930316	03/16/93	TOTAL PHOSPHORUS	0.9
KREA	41	19930330	A 19930330	03/30/93	TOTAL PHOSPHORUS	1.4
KREA	41	19930413	A 19930413	04/13/93	TOTAL PHOSPHORUS	0.3
KREA	41	19930427	A 19930427	04/27/93	TOTAL PHOSPHORUS	0.8
KREA	41	19930511	A 19930511	05/11/93	TOTAL PHOSPHORUS	0.2
KREA	41	19930525	A 19930525	05/25/93	TOTAL PHOSPHORUS	0.1
KREA	41	19930608	A 19930608	06/08/93	TOTAL PHOSPHORUS	0.3
KREA	41	19930707	A 19930707	07/07/93	TOTAL PHOSPHORUS	0.7
KREA	41	19930720	A 19930720	07/20/93	TOTAL PHOSPHORUS	0.4
KREA	41	19930803	A 19930803	08/03/93	TOTAL PHOSPHORUS	0.6
KREA	41	19930817	A 19930817	08/17/93	TOTAL PHOSPHORUS	0.7
KREA	41	19930831	A 19930831	08/31/93	TOTAL PHOSPHORUS	2.1
KREA	41	19930914	A 19930914	09/14/93	TOTAL PHOSPHORUS	2.1
KREA	41	19930928	A 19930928	09/28/93	TOTAL PHOSPHORUS	1.7
KREA	41	19931011	A 19931011	10/11/93	TOTAL PHOSPHORUS	6.5
KREA	41	19931026	A 19931026	10/26/93	TOTAL PHOSPHORUS	1.4
KREA	41	19931108	A 19931108	11/08/93	TOTAL PHOSPHORUS	0.5
KREA	41	19931123	A 19931123	11/23/93	TOTAL PHOSPHORUS	0.3
KREA	41	19931206	A 19931206	12/06/93	TOTAL PHOSPHORUS	0.2
KREA	41	19931220	A 19931220	12/20/93	TOTAL PHOSPHORUS	0.1
KREA	41	19940103	A 19940103	01/03/94	TOTAL PHOSPHORUS	0.4
KREA	41	19940118	A 19940118	01/18/94	TOTAL PHOSPHORUS	0.1
KREA	41	19940201	A 19940201	02/01/94	TOTAL PHOSPHORUS	0.3
KREA	41	19940216	A 19940216	02/16/94	TOTAL PHOSPHORUS	1.3
KREA	41	19940301	A 19940301	03/01/94	TOTAL PHOSPHORUS	1.4
KREA	41	19940315	A 19940315	03/15/94	TOTAL PHOSPHORUS	0.5
KREA	41	19940329	A 19940329	03/29/94	TOTAL PHOSPHORUS	1.0
KREA	41	19940426	A 19940426	04/26/94	TOTAL PHOSPHORUS	1.5
KREA	41	19940510	A 19940510	05/10/94	TOTAL PHOSPHORUS	0.3
KREA	41	19940524	A 19940524	05/24/94	TOTAL PHOSPHORUS	0.1
KREA	41	19940620	A 19940620	06/20/94	TOTAL PHOSPHORUS	0.3
KREA	41	19940705	A 19940705	07/05/94	TOTAL PHOSPHORUS	1.4
KREA	41	19940719	A 19940719	07/19/94	TOTAL PHOSPHORUS	0.5
KREA	41	19940803	A 19940803	08/03/94	TOTAL PHOSPHORUS	0.3
KREA	41	19940818	A 19940818	08/18/94	TOTAL PHOSPHORUS	0.2
KREA	41	19940831	A 19940831	08/31/94	TOTAL PHOSPHORUS	0.9
KREA	41	19940913	A 19940913	09/13/94	TOTAL PHOSPHORUS	0.7
KREA	41	19940928	A 19940928	09/28/94	TOTAL PHOSPHORUS	1.6
KREA	41	19941011	A 19941011	10/11/94	TOTAL PHOSPHORUS	0.9

Total Phosphorus Concentration for Surface Water Sampling Station KREA41A
Butler Oaks Discharge Monitoring Point

Station Designation				Sample Date	Parameter Sampled	Analytical Result
KREA	41	19941024	A 19941024	10/24/94	TOTAL PHOSPHORUS	0.3
KREA	41	19941108	A 19941108	11/08/94	TOTAL PHOSPHORUS	0.2
KREA	41	19941122	A 19941122	11/22/94	TOTAL PHOSPHORUS	1.7
KREA	41	19941207	A 19941207	12/07/94	TOTAL PHOSPHORUS	0.5
KREA	41	19941220	A 19941220	12/20/94	TOTAL PHOSPHORUS	0.2
KREA	41	19950106	A 19950106	01/06/95	TOTAL PHOSPHORUS	0.4
KREA	41	19950119	A 19950119	01/19/95	TOTAL PHOSPHORUS	0.6
KREA	41	19950130	A 19950130	01/30/95	TOTAL PHOSPHORUS	0.3
KREA	41	19950213	A 19950213	02/13/95	TOTAL PHOSPHORUS	0.2
KREA	41	19950301	A 19950301	03/01/95	TOTAL PHOSPHORUS	0.8
KREA	41	19950313	A 19950313	03/13/95	TOTAL PHOSPHORUS	0.6
KREA	41	19950328	A 19950328	03/28/95	TOTAL PHOSPHORUS	1.3
KREA	41	19950424	A 19950424	04/24/95	TOTAL PHOSPHORUS	0.7
KREA	41	19950508	A 19950508	05/08/95	TOTAL PHOSPHORUS	0.4
KREA	41	19950522	A 19950522	05/22/95	TOTAL PHOSPHORUS	1.1
KREA	41	19950605	A 19950605	06/05/95	TOTAL PHOSPHORUS	0.5
KREA	41	19950619	A 19950619	06/19/95	TOTAL PHOSPHORUS	2.4
KREA	41	19950703	A 19950703	07/03/95	TOTAL PHOSPHORUS	0.7
KREA	41	19950717	A 19950717	07/17/95	TOTAL PHOSPHORUS	0.5
KREA	41	19950731	A 19950731	07/31/95	TOTAL PHOSPHORUS	1.2
KREA	41	19950817	A 19950817	08/17/95	TOTAL PHOSPHORUS	0.5
KREA	41	19950828	A 19950828	08/28/95	TOTAL PHOSPHORUS	0.7
KREA	41	19950912	A 19950912	09/12/95	TOTAL PHOSPHORUS	1.5
KREA	41	19950925	A 19950925	09/25/95	TOTAL PHOSPHORUS	0.5
KREA	41	19951009	A 19951009	10/09/95	TOTAL PHOSPHORUS	1.5
KREA	41	19951023	A 19951023	10/23/95	TOTAL PHOSPHORUS	1.3
KREA	41	19951108	A 19951108	11/08/95	TOTAL PHOSPHORUS	0.6
KREA	41	19951120	A 19951120	11/20/95	TOTAL PHOSPHORUS	0.2
KREA	41	19951207	A 19951207	12/07/95	TOTAL PHOSPHORUS	0.1
KREA	41	19951218	A 19951218	12/18/95	TOTAL PHOSPHORUS	0.1
KREA	41	19960103	A 19960103	01/03/96	TOTAL PHOSPHORUS	0.1
KREA	41	19960118	A 19960118	01/18/96	TOTAL PHOSPHORUS	0.2
KREA	41	19960129	A 19960129	01/29/96	TOTAL PHOSPHORUS	0.2
KREA	41	19960213	A 19960213	02/13/96	TOTAL PHOSPHORUS	0.1
KREA	41	19960226	A 19960226	02/26/96	TOTAL PHOSPHORUS	0.1
KREA	41	19960312	A 19960312	03/12/96	TOTAL PHOSPHORUS	0.4
KREA	41	19960327	A 19960327	03/27/96	TOTAL PHOSPHORUS	0.1
KREA	41	19960411	A 19960411	04/11/96	TOTAL PHOSPHORUS	0.4
KREA	41	19960423	A 19960423	04/23/96	TOTAL PHOSPHORUS	0.2
KREA	41	19960508	A 19960508	05/08/96	TOTAL PHOSPHORUS	0.2
KREA	41	19960521	A 19960521	05/21/96	TOTAL PHOSPHORUS	0.2
KREA	41	19960605	A 19960605	06/05/96	TOTAL PHOSPHORUS	0.2
KREA	41	19960701	A 19960701	07/01/96	TOTAL PHOSPHORUS	0.3
KREA	41	19960715	A 19960715	07/15/96	TOTAL PHOSPHORUS	0.5
KREA	41	19960801	A 19960801	08/01/96	TOTAL PHOSPHORUS	0.2
KREA	41	19960815	A 19960815	08/15/96	TOTAL PHOSPHORUS	0.1
KREA	41	19960826	A 19960826	08/26/96	TOTAL PHOSPHORUS	0.1
KREA	41	19960909	A 19960909	09/09/96	TOTAL PHOSPHORUS	0.1
KREA	41	19960923	A 19960923	09/23/96	TOTAL PHOSPHORUS	0.2
KREA	41	19961009	A 19961009	10/09/96	TOTAL PHOSPHORUS	0.4
KREA	41	19961021	A 19961021	10/21/96	TOTAL PHOSPHORUS	0.4
KREA	41	19961106	A 19961106	11/06/96	TOTAL PHOSPHORUS	0.2

Total Phosphorus Concentration for Surface Water Sampling Station KREA41A
Butler Oaks Discharge Monitoring Point

Station Designation				Sample Date	Parameter Sampled	Analytical Result
KREA	41	19961118	A 19961118	11/18/96	TOTAL PHOSPHORUS	0.2
KREA	41	19961205	A 19961205	12/05/96	TOTAL PHOSPHORUS	0.2
KREA	41	19961216	A 19961216	12/16/96	TOTAL PHOSPHORUS	0.1
KREA	41	19970102	A 19970102	01/02/97	TOTAL PHOSPHORUS	0.1
KREA	41	19970113	A 19970113	01/13/97	TOTAL PHOSPHORUS	0.1
KREA	41	19970127	A 19970127	01/27/97	TOTAL PHOSPHORUS	0.1
KREA	41	19970210	A 19970210	02/10/97	TOTAL PHOSPHORUS	0.1
KREA	41	19970224	A 19970224	02/24/97	TOTAL PHOSPHORUS	0.3
KREA	41	19970313	A 19970313	03/13/97	TOTAL PHOSPHORUS	0.3
KREA	41	19970324	A 19970324	03/24/97	TOTAL PHOSPHORUS	0.2
KREA	41	19970407	A 19970407	04/07/97	TOTAL PHOSPHORUS	0.3
KREA	41	19970424	A 19970424	04/24/97	TOTAL PHOSPHORUS	0.2
KREA	41	19970508	A 19970508	05/08/97	TOTAL PHOSPHORUS	0.1
KREA	41	19970519	A 19970519	05/19/97	TOTAL PHOSPHORUS	0.1
KREA	41	19970603	A 19970603	06/03/97	TOTAL PHOSPHORUS	0.2
KREA	41	19970618	A 19970618	06/18/97	TOTAL PHOSPHORUS	0.9
KREA	41	19970701	A 19970701	07/01/97	TOTAL PHOSPHORUS	1.3
KREA	41	19970714	A 19970714	07/14/97	TOTAL PHOSPHORUS	1.7
KREA	41	19970730	A 19970730	07/30/97	TOTAL PHOSPHORUS	0.4
KREA	41	19970814	A 19970814	08/14/97	TOTAL PHOSPHORUS	1.2
KREA	41	19970827	A 19970827	08/27/97	TOTAL PHOSPHORUS	0.5
KREA	41	19970911	A 19970911	09/11/97	TOTAL PHOSPHORUS	0.5
KREA	41	19970924	A 19970924	09/24/97	TOTAL PHOSPHORUS	0.2
KREA	41	19971007	A 19971007	10/07/97	TOTAL PHOSPHORUS	0.2
KREA	41	19971117	A 19971117	11/17/97	TOTAL PHOSPHORUS	0.1
KREA	41	19971201	A 19971201	12/01/97	TOTAL PHOSPHORUS	0.1
KREA	41	19971218	A 19971218	12/18/97	TOTAL PHOSPHORUS	0.7
KREA	41	19971230	A 19971230	12/30/97	TOTAL PHOSPHORUS	0.8
KREA	41	19980112	A 19980112	01/12/98	TOTAL PHOSPHORUS	1.0
KREA	41	19980126	A 19980126	01/26/98	TOTAL PHOSPHORUS	0.9
KREA	41	19980209	A 19980209	02/09/98	TOTAL PHOSPHORUS	0.8
KREA	41	19980223	A 19980223	02/23/98	TOTAL PHOSPHORUS	1.2
KREA	41	19980309	A 19980309	03/09/98	TOTAL PHOSPHORUS	1.1
KREA	41	19980323	A 19980323	03/23/98	TOTAL PHOSPHORUS	0.9
KREA	41	19980407	A 19980407	04/07/98	TOTAL PHOSPHORUS	0.5
KREA	41	19980422	A 19980422	04/22/98	TOTAL PHOSPHORUS	0.4
KREA	41	19980505	A 19980505	05/05/98	TOTAL PHOSPHORUS	0.2
KREA	41	19980518	A 19980518	05/18/98	TOTAL PHOSPHORUS	0.3
KREA	41	19980602	A 19980602	06/02/98	TOTAL PHOSPHORUS	2.4
KREA	41	19980615	A 19980615	06/15/98	TOTAL PHOSPHORUS	0.9
KREA	41	19980713	A 19980713	07/13/98	TOTAL PHOSPHORUS	1.5
KREA	41	19980729	A 19980729	07/29/98	TOTAL PHOSPHORUS	0.8
KREA	41	19980810	A 19980810	08/10/98	TOTAL PHOSPHORUS	1.7
KREA	41	19980826	A 19980826	08/26/98	TOTAL PHOSPHORUS	1.3
KREA	41	19980908	A 19980908	09/08/98	TOTAL PHOSPHORUS	0.4
KREA	41	19980921	A 19980921	09/21/98	TOTAL PHOSPHORUS	1.1
KREA	41	19981005	A 19981005	10/05/98	TOTAL PHOSPHORUS	0.7
KREA	41	19981019	A 19981019	10/19/98	TOTAL PHOSPHORUS	0.2
KREA	41	19981019	A 19981019	10/19/98	TOTAL PHOSPHORUS	0.2
KREA	41	19981102	A 19981102	11/02/98	TOTAL PHOSPHORUS	0.2
KREA	41	19981117	A 19981117	11/17/98	TOTAL PHOSPHORUS	0.3
KREA	41	19981130	A 19981130	11/30/98	TOTAL PHOSPHORUS	0.1

Total Phosphorus Concentration for Surface Water Sampling Station KREA41A
Butler Oaks Discharge Monitoring Point

Station Designation				Sample Date	Parameter Sampled	Analytical Result
KREA	41	19981214	A 19981214	12/14/98	TOTAL PHOSPHORUS	0.3
KREA	41	19990112	A 19990112	01/12/99	TOTAL PHOSPHORUS	0.2
KREA	41	19990126	A 19990126	01/26/99	TOTAL PHOSPHORUS	0.2
KREA	41	19990209	A 19990209	02/09/99	TOTAL PHOSPHORUS	0.4
KREA	41	19990223	A 19990223	02/23/99	TOTAL PHOSPHORUS	0.2
KREA	41	19990308	A 19990308	03/08/99	TOTAL PHOSPHORUS	0.4
KREA	41	19990323	A 19990323	03/23/99	TOTAL PHOSPHORUS	0.4
KREA	41	19990405	A 19990405	04/05/99	TOTAL PHOSPHORUS	0.7
KREA	41	19990503	A 19990503	05/03/99	TOTAL PHOSPHORUS	0.1
KREA	41	19990517	A 19990517	05/17/99	TOTAL PHOSPHORUS	0.2
KREA	41	19990603	A 19990603	06/03/99	TOTAL PHOSPHORUS	0.2
KREA	41	19990614	A 19990614	06/14/99	TOTAL PHOSPHORUS	0.2
KREA	41	19990628	A 19990628	06/28/99	TOTAL PHOSPHORUS	1.9
KREA	41	19990712	A 19990712	07/12/99	TOTAL PHOSPHORUS	2.3
KREA	41	19990727	A 19990727	07/27/99	TOTAL PHOSPHORUS	1.2
KREA	41	19990809	A 19990809	08/09/99	TOTAL PHOSPHORUS	1.3
KREA	41	19990823	A 19990823	08/23/99	TOTAL PHOSPHORUS	0.7
KREA	41	19990909	A 19990909	09/09/99	TOTAL PHOSPHORUS	0.6
KREA	41	19990920	A 19990920	09/20/99	TOTAL PHOSPHORUS	0.3
KREA	41	19991005	A 19991005	10/05/99	TOTAL PHOSPHORUS	1.6
KREA	41	19991019	A 19991019	10/19/99	TOTAL PHOSPHORUS	1.0
KREA	41	19991101	A 19991101	11/01/99	TOTAL PHOSPHORUS	0.6
KREA	41	19991115	A 19991115	11/15/99	TOTAL PHOSPHORUS	0.2
KREA	41	19991129	A 19991129	11/29/99	TOTAL PHOSPHORUS	0.2
KREA	41	19991227	A 19991227	12/27/99	TOTAL PHOSPHORUS	0.1
KREA	41	20000110	A 20000110	01/10/00	TOTAL PHOSPHORUS	0.1

Total Phosphorus Concentration for Surface Water Sampling Station KREA41B
Butler Oaks Discharge Monitoring Point

Station Designation	Sample Date	Parameter Sampled	Analytical Result
KREA 41 19920707 B 19920707	07/07/92	TOTAL PHOSPHORUS	9.1
KREA 41 19920831 B 19920831	08/31/92	TOTAL PHOSPHORUS	7.7
KREA 41 19920917 B 19920917	09/17/92	TOTAL PHOSPHORUS	10.5
KREA 41 19920930 B 19920930	09/30/92	TOTAL PHOSPHORUS	8.8
KREA 41 19921014 B 19921014	10/14/92	TOTAL PHOSPHORUS	8.4
KREA 41 19930218 B 19930218	02/18/93	TOTAL PHOSPHORUS	4.2
KREA 41 19930316 B 19930316	03/16/93	TOTAL PHOSPHORUS	7.4
KREA 41 19930330 B 19930330	03/30/93	TOTAL PHOSPHORUS	8.7
KREA 41 19940928 B 19940928	09/28/94	TOTAL PHOSPHORUS	7.9
KREA 41 19941122 B 19941122	11/22/94	TOTAL PHOSPHORUS	7.1
KREA 41 19950119 B 19950119	01/19/95	TOTAL PHOSPHORUS	6.9
KREA 41 19950301 B 19950301	03/01/95	TOTAL PHOSPHORUS	5.8
KREA 41 19950328 B 19950328	03/28/95	TOTAL PHOSPHORUS	7.6
KREA 41 19950410 B 19950410	04/10/95	TOTAL PHOSPHORUS	6.5
KREA 41 19950731 B 19950731	07/31/95	TOTAL PHOSPHORUS	5.9
KREA 41 19950828 B 19950828	08/28/95	TOTAL PHOSPHORUS	4.2
KREA 41 19950912 B 19950912	09/12/95	TOTAL PHOSPHORUS	9.0
KREA 41 19950925 B 19950925	09/25/95	TOTAL PHOSPHORUS	8.7
KREA 41 19951009 B 19951009	10/09/95	TOTAL PHOSPHORUS	5.5
KREA 41 19951023 B 19951023	10/23/95	TOTAL PHOSPHORUS	9.5
KREA 41 19951108 B 19951108	11/08/95	TOTAL PHOSPHORUS	7.0
KREA 41 19961021 B 19961021	10/21/96	TOTAL PHOSPHORUS	11.7
KREA 41 19970618 B 19970618	06/18/97	TOTAL PHOSPHORUS	9.6
KREA 41 19970701 B 19970701	07/01/97	TOTAL PHOSPHORUS	9.9
KREA 41 19970714 B 19970714	07/14/97	TOTAL PHOSPHORUS	5.9
KREA 41 19970814 B 19970814	08/14/97	TOTAL PHOSPHORUS	4.6
KREA 41 19971218 B 19971218	12/18/97	TOTAL PHOSPHORUS	7.4
KREA 41 19971230 B 19971230	12/30/97	TOTAL PHOSPHORUS	8.3
KREA 41 19980112 B 19980112	01/12/98	TOTAL PHOSPHORUS	8.4
KREA 41 19980126 B 19980126	01/26/98	TOTAL PHOSPHORUS	8.2
KREA 41 19980209 B 19980209	02/09/98	TOTAL PHOSPHORUS	6.9
KREA 41 19980223 B 19980223	02/23/98	TOTAL PHOSPHORUS	7.1
KREA 41 19980309 B 19980309	03/09/98	TOTAL PHOSPHORUS	4.1
KREA 41 19980323 B 19980323	03/23/98	TOTAL PHOSPHORUS	6.8
KREA 41 19980826 B 19980826	08/26/98	TOTAL PHOSPHORUS	6.7
KREA 41 19980921 B 19980921	09/21/98	TOTAL PHOSPHORUS	5.7
KREA 41 19990628 B 19990628	06/28/99	TOTAL PHOSPHORUS	5.8
KREA 41 19990712 B 19990712	07/12/99	TOTAL PHOSPHORUS	7.8
KREA 41 19990727 B 19990727	07/27/99	TOTAL PHOSPHORUS	7.5
KREA 41 19990809 B 19990809	08/09/99	TOTAL PHOSPHORUS	5.0
KREA 41 19990823 B 19990823	08/23/99	TOTAL PHOSPHORUS	5.9
KREA 41 19990909 B 19990909	09/09/99	TOTAL PHOSPHORUS	6.7
KREA 41 19990920 B 19990920	09/20/99	TOTAL PHOSPHORUS	5.3
KREA 41 19991005 B 19991005	10/05/99	TOTAL PHOSPHORUS	5.3
KREA 41 19991019 B 19991019	10/19/99	TOTAL PHOSPHORUS	9.4
KREA 41 19991101 B 19991101	11/01/99	TOTAL PHOSPHORUS	9.0

Butler Oaks Farm
APPENDIX C
Ground Water Quality Data

Appendix C
Groundwater Quality Data, 1992 through 2000
Butler Oaks Farm

Well Name	Location	Sample Date	TKN	NO2-NO3	TOTN	ORTHP	TOTP	G-W_DEPTH	ELEV_MSL
MW-1	Background	14-Apr-98				1.93	0.02	0.04	
MW-1	Background	12-Oct-98				1.53	0.01	0.03	
MW-1	Background	19-Apr-99				2	0.02	0.03	
MW-1	Background	8-Nov-99				2.21	0.02	0.03	
MW-1	Background	26-Apr-00				2.05	0.02	0.03	
MW-2	WSP	14-Mar-92	4	0.02	4	0.04	0.85		
MW-2	WSP	08-Jul-92	3.7	0.02	3.7	0.05	0.14		
MW-2	WSP	12-Oct-92	4	0.03	4	0.1	0.17		
MW-2	WSP	13-Jan-93	2.9	0.03	2.9	0.06	0.12		
MW-2	WSP	28-Apr-93	3.5	0.02	3.52	0.08	0.1		
MW-2	WSP	21-Jul-93	4.88	0.04	4.92	0.08	0.15		23.78
MW-2	WSP	20-Oct-93	5.92	0.05	5.97	0.07	0.09		26.53
MW-2	WSP	26-Jan-94	3.96	0.08	4.04	0.09	0.09		25.11
MW-2	WSP	29-Apr-94	6.46	0.07	6.53	0.07	0.1		26.03
MW-2	WSP	27-Jul-94	5.55	0.03	5.58	0.1	0.11		26.86
MW-2	WSP	17-Oct-94	6.13	0.05	6.18	0.07	0.13		28.69
MW-2	WSP	25-Jan-95	8.06	0.05	8.11	0.08	0.11	2.33	27.78
MW-2	WSP	17-Apr-95	7.46	0.04	7.5	0.09	0.12	2.82	27.28
MW-2	WSP	05-Jul-95	7.34	0.05	7.39	0.12	0.13	4.4	25.66
MW-2	WSP	23-Oct-95	5.8	0.03	5.83	0.13	0.13		29.66
MW-2	WSP	22-Apr-96	7.15	0.06	7.21	0.1	0.13		25.66
MW-2	WSP	21-Oct-96	10.8	0.06	10.9	0.05	0.11	4.5	25.26
MW-2	WSP	22-Apr-97	6.47	0.08	6.55	0.11	0.16	6.58	23.46
MW-2	WSP	21-Oct-97	8.34	0.07	8.41	0.13	0.16	5	24.86
MW-2	WSP	14-Apr-98			6.1	0.11	0.13		26.06
MW-2	WSP	12-Oct-98			8.4	0.14	0.21		24.96
MW-2	WSP	19-Apr-99			7.73	0.15	0.16		23.06
MW-2	WSP	08-Nov-99			3.68	0.14	0.17		26.96
MW-2	WSP	26-Apr-00			8.55	0.12	0.14		24.36
MW-2A	PWSP	14-Apr-98			19.6	0.03	0.24		27.53
MW-2A	PWSP	12-Oct-98							27.23
MW-2A	PWSP	19-Apr-99							
MW-2A	PWSP	08-Nov-99			15.2	0.13	0.61		29.73
MW-2A	PWSP	26-Apr-00							
MW-3	SPRFD	14-Mar-92	1	0.01	1	0.02	0.49		
MW-3	SPRFD	08-Jul-92	1.6	0.25	1.8	0.03	0.12		
MW-3	SPRFD	12-Oct-92	1.2	0.02	1.2	0.03	0.06		
MW-3	SPRFD	13-Jan-93	1.4	0.02	1.4	0.005	0.18		
MW-3	SPRFD	28-Apr-93	1.69	0.01	1.69	0.01	0.13		
MW-3	SPRFD	21-Jul-93	1.2	0.03	1.23	0.005	0.03		30.43
MW-3	SPRFD	20-Oct-93	1.45	0.04	1.49	0.01	0.06		33.01
MW-3	SPRFD	26-Jan-94	1.46	0.05	1.51	0.01	0.01		32.34
MW-3	SPRFD	29-Apr-94	1.36	0.03	1.39	0.005	0.08		32.76
MW-3	SPRFD	27-Jul-94	1.2	0.02	1.22	0.005	0.02		32.68
MW-3	SPRFD	17-Oct-94	1.28	0.04	1.32	0.005	0.04		32.51
MW-3	SPRFD	25-Jan-95	1.64	0.03	1.67	0.005	0.04	4.75	32.51
MW-3	SPRFD	17-Apr-95	1.37	0.01	1.37	0.005	0.08	4.75	32.51
MW-3	SPRFD	05-Jul-95	1.48	0.01	1.48	0.02	0.04	4.9	32.31
MW-3	SPRFD	23-Oct-95	1.57	0.38	1.95	0.005	0.02	3.75	33.51
MW-3	SPRFD	22-Apr-96	1.61	0.51	2.12	0.005	0.02	5	32.26
MW-3	SPRFD	21-Oct-96	1.91	0.04	1.95	0.01	0.02	4.4	32.61
MW-3	SPRFD	22-Apr-97	1.42	0.04	1.46	0.01	0.01	7.35	29.91
MW-3	SPRFD	21-Oct-97	2.1	0.03	2.13	0.005	0.005	3.9	33.31
MW-3	SPRFD	14-Apr-98			1.61	0.005	0.02		32.31

Appendix C
Groundwater Quality Data, 1992 through 2000
Butler Oaks Farm

Well Name	Location	Sample Date	TKN	NO2-NO3	TOTN	ORTHP	TOTP	G-W_DEPTH	ELEV_MSL
MW-3	SPRFD	12-Oct-98			1.26	0.01	0.01		32.11
MW-3	SPRFD	19-Apr-99			1.76	0.005	0.01		29.71
MW-3	SPRFD	08-Nov-99			2.31	0.005	0.02		32.51
MW-3	SPRFD	26-Apr-00			1.65	0.005	0.005		30.86
MW-4	LAG	14-Mar-92	112	0.02	112	0.08	1		
MW-4	LAG	08-Jul-92	125	0.02	125	0.06	1.2		
MW-4	LAG	12-Oct-92	110	0.03	110	0.14	0.39		
MW-4	LAG	13-Jan-93	127	0.02	127	0.04	0.35		
MW-4	LAG	28-Apr-93	116	0.02	116	0.04	0.58		
MW-4	LAG	21-Jul-93	105	0.03	105	0.1	0.32		33.47
MW-4	LAG	20-Oct-93	99.2	0.03	99.2	0.06	0.22		32.72
MW-4	LAG	26-Jan-94	95.3	0.04	95.3	0.05	0.12		32.3
MW-4	LAG	29-Apr-94	86.8	0.03	86.8	0.06	0.28		32.55
MW-4	LAG	27-Jul-94	81.6	0.02	81.6	0.1	0.2		33.47
MW-4	LAG	17-Oct-94	67.9	0.04	67.9	0.06	0.285		33.88
MW-4	LAG	25-Jan-95	92.7	0.03	92.7	0.19	0.35	0.75	33.55
MW-4	LAG	17-Apr-95	67.2	0.03	67.2	0.11	0.45	2	32.3
MW-4	LAG	05-Jul-95	67.6	0.01	67.6	0.1	0.3	1.85	32.4
MW-4	LAG	23-Oct-95	72.3	0.01	72.3	0.13	0.22		34
MW-4	LAG	22-Apr-96	56.5	0.01	56.5	0.12	0.48	1	33.25
MW-4	LAG	21-Oct-96	56.8	0.01	56.8	0.19	0.25	0.5	33.45
MW-4	LAG	21-Oct-97	54.2	0.01	54.2	0.25	0.3	3.25	31
MW-4	LAG	14-Apr-98			45	0.21	0.23		33.35
MW-4	LAG	12-Oct-98			64.7	0.28	0.34		32.75
MW-4	LAG	19-Apr-99			53.4	0.32	0.33		30.45
MW-4	LAG	08-Nov-99			55.9	0.26	0.3		33.25
MW-4	LAG	26-Apr-00			52.7	0.28	0.44		31.7

Butler Oaks Farm
APPENDIX D
FDEP Permit

Department of Environmental Protection

Lawton Chiles
Governor

Southeast District
P.O. Box 15425
West Palm Beach, Florida 33416

Virginia B. Wetherell
Secretary

FEB 23 1998

NOTICE OF PERMIT ISSUANCE

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

Mr. Robert Butler
Butler Oaks Farm, Inc.
172 Shady Oaks Lane
Lorida, FL 33857

Highlands County
IW - Butler Oaks Dairy

Dear Mr. Butler:

Enclosed is Permit Number FLA013655-001-IW4A to operate a dairy wastewater treatment/disposal system, issued pursuant to Section(s) 403.087, Florida Statutes.

A person whose substantial interests are affected by the Department's proposed permitting decision may petition for an administrative hearing in accordance with sections 120.569 and 120.57 of the Florida Statutes, or all parties may reach a written agreement on mediation as an alternative remedy under section 120.573 before the deadline for filing a petition. Choosing mediation will not adversely affect the right to a hearing if mediation does not result in a settlement. The procedures for petitioning for a hearing are set forth below, followed by the procedures for pursuing mediation.

The petition must contain the information set forth below and must be filed (received) in the Department's Office of General Counsel, 3900 Commonwealth Boulevard, Mail Station 35, Tallahassee, Florida, 32399-3000. Petitions filed by the permit applicant or any of the parties listed below must be filed within fourteen days of receipt of this notice of intent. Petitions filed by any other person must be filed within fourteen days of publication of the public notice or within fourteen days of receipt of this notice of intent, whichever occurs first. A petitioner must mail a copy of the petition to the applicant at the address indicated above, at the time of filing. The failure of any person to file a petition (or a request for mediation, as discussed below) within the appropriate time period shall constitute a waiver of that person's right to request an administrative determination (hearing) under sections 120.569 and 120.57 of the Florida Statutes, or to intervene in this proceeding and participate as a party to it. Any subsequent intervention will be only at the discretion of the presiding officer upon the filing of a motion in compliance with rule 28-5.207 of the Florida Administrative Code.

A petition must contain the following information:

(a) The name, address, and telephone number of each petitioner; the Department's permit identification number and the county in which the subject matter or activity is located;
(b) a statement of how and when each petitioner received notice of the Department's action;
(c) a statement of how each petitioner's substantial interests are affected by the Department's action;
(d) a statement of the material facts disputed by the petitioner, if any;
(e) a statement of facts that the petitioner contends warrant reversal or modification of the Department's action;
(f) a statement of which rules or statutes the petitioner contends require reversal or modification of the Department's action; and
(g) a statement of the relief sought by the petitioner, stating precisely the action that the petitioner wants the Department to take.

Because the administrative hearing process is designed to formulate final agency action, the filing of a petition means that the Department's final action may be different from the position taken by it in this notice of intent. Persons whose substantial interests will be affected by any such final decision of the Department on the application have the right to petition to become a party to the proceeding, in accordance with the requirements set forth above.

Any person may elect to pursue mediation by reaching a mediation agreement with all parties to the proceeding (which includes the Department and any person who has filed a timely and sufficient petition for a hearing) and by showing how the substantial interests of each mediating party are affected by the Department's action or proposed action. The agreement must be filed in (received by) the Office of General Counsel of the Department at 3900 Commonwealth Boulevard, Mail Station 35, Tallahassee, Florida 32399-3000, by the same deadline as set forth above for the filing of a petition.

The agreement to mediate must include the following:

(a) the names, addresses, and telephone numbers of any persons who may attend the mediation;
(b) the name, address, and telephone number of the mediator selected by the parties, or a provision for selecting a mediator within a specified time;
(c) the agreed allocation of the costs and fees associated with the mediation;
(d) the agreement of the parties on the confidentiality of discussions and documents introduced during mediation;
(e) the date, time, and place of the first mediation session, or a deadline for holding the first session, if no mediator has yet been chosen;
(f) the name of each party's representative who shall have authority to settle or recommend settlement;
(g) either an explanation of how the substantial interests of each mediating party will be affected by the action or proposed action addressed in this action or a statement clearly identifying the petition for hearing that each party has already filed, and incorporating it by reference; and
(h) the signatures of all parties or their authorized representatives.

As provided in section 120.573 of the Florida Statutes, the timely agreement of all parties to mediate will toll the time limitations imposed by section 120.569 and 120.57 for requesting and holding an administrative hearing. Unless otherwise agreed by the parties, the mediation must be concluded within sixty days of the execution of the agreement. If mediation results in settlement of the administrative dispute, the Department must enter a final order incorporating the agreement of the parties. Persons whose substantial interests will be affected by such a modified final decision of the Department have a right to petition for a hearing only in accordance with the requirements for such petitions set forth above, and must therefore file their petitions within fourteen days of receipt of this notice. If mediation terminates without settlement of the dispute, the Department shall notify all parties in writing that the administrative hearing processes under section 120.569 and 120.57 remain available for disposition of the dispute, and the notice will specify the deadlines that then will apply for challenging the agency action and electing remedies under those two statutes.

This action is final and effective on the date filed with the Clerk of the Department unless a petition (or request for mediation) is filed in accordance with the above. Upon the timely filing of a petition (or request for mediation) this order will not be effective until further order of the Department.

Any party to the order has the right to seek judicial review of the order under section 120.68 of the Florida Statutes, by the filing of a notice of appeal under rule 9.110 of the Florida Rules of Appellate Procedure with the Clerk of the Department in the Office of General Counsel, 3900 Commonwealth Boulevard, Mail Station 35, Tallahassee, Florida, 32399-3000; and by filing a copy of the notice of appeal accompanied by the applicable filing fees with the appropriate district court of appeal. The notice of appeal must be filed within 30 days from the date when the final order is filed with the Clerk of the Department.

If there are any questions, please contact Tim Powell of this office, telephone number (561)681-6698.

Executed in West Palm Beach, Florida.

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL PROTECTION

Alfred Mueller 02/20/98

Water Facilities Administrator
Alfred Mueller, Jr., P.E., P.G. Date
Southeast District
P. O. Box 15425
West Palm Beach, FL 33416
(561)681-6760

AM/tp/ae
Enclosures:

Permit No. FLA013655-001-IW4A
Discharge Monitoring Report (DMR)
Dairy Annual Operating Report

Copies furnished to:

Joe Albers, SFWMD/Okeechobee Field Station
Gary Ritter, SFWMD SWIM Office/Okeechobee
Bruce Cummings, Short Environmental Laboratories, Inc./Sebring, Fla.

CERTIFICATE OF SERVICE

This is to certify that this NOTICE OF PERMIT and all copies were mailed before the close of business on FEB 23 1998 to the listed persons.

FILING AND ACKNOWLEDGMENT

FILED, on this date, pursuant to the §120.52, Florida Statutes, with the designated Department Clerk, receipt of which is hereby acknowledged.

Linda Schappat
Clerk

FEB 23 1998
Date

Department of Environmental Protection

Lawton Chiles
Governor

Southeast District
P.O. Box 15425
West Palm Beach, Florida 33416

Virginia B. Wetherell
Secretary

PERMITTEE:
Butler Oaks Farm, Inc..
172 Shady Oaks Lane
Lorida, FL 33857

PERMIT NUMBER: FLA013655-001-IW4A
DATE OF ISSUANCE: FEB 2 3 1998
EXPIRATION DATE: FEB 2 3 2003

RESPONSIBLE AUTHORITY:
Robert Butler

FACILITY:
Butler Oaks Dairy Waste Management System
172 Shady Oaks Lane
Lorida, FL 33857 Latitude: 27° 17' 43.0" N Longitude: 81°01' 35.4" W

This permit is issued under the provisions of Chapter 403, Florida Statutes (FS), and Rules 62-4, 62-620 and 62-670 of the Florida Administrative Code (FAC). The above named permittee is hereby authorized to operate the facilities shown on the application and other documents attached hereto or on file with the Department and made a part hereof and specifically described as follows:

WASTEWATER TREATMENT:

A dairy waste management system designed for a maximum annual average of 990 milk cows and 240 calves, including 55,000 gallon per day (GPD) barn wash effluent, 17.5-acre High Intensity Area (HIA) around the milk barn, feed barns, manure traps and surrounded by perimeter ditch, 4-acre solids sediment lagoon, 7-acre first stage Waste Storage Pond (WSP) No. 1, 18-acre second stage WSP No. 2, 10-acre calf barn HIA and sediment pond, 131-acre center pivot spray irrigation field, and pastures and solids application fields. Ground water monitoring wells are provided for monitoring ground water quality near the WSP, lagoon, spray field, and upgradient of the system.

EFFLUENT DISPOSAL:

Land Application: The barn wash flows into the lagoon (sediment trap) where solids settle out and the wastewater flows to the first stage (No. 1) WSP. Runoff and drainage from the HIA collected in the east and west perimeter ditches run into the corresponding sumps on each side. Wastewater is pumped from the east sump to the WSP No. 1 and from the west sump, as well as from the calf barn sediment pond, to the lagoon. Further settling of the solids takes place in the first stage pond and wastewater flows to the second stage (No. 2) WSP designed to contain such flows from a 24-hr. 25-year storm event. Eventually wastewater is pumped to the spray irrigation field for land application. The rate of application shall not exceed 0.28 inch per 24 hours.

IN ACCORDANCE WITH:

The original Soil Conservation Service (SCS) Operation and Maintenance (O&M) Plan received March 7, 1990, revised engineering plans for the barns and the Best Management Practices (BMPs) received January 11, 1993, request for renewal of the Operating Permit IO28-208403 received July 18, 1996, submittal of the application for permit renewal January 13, 1998, payment of the fees on June 24 and July 18 of 1996 and January 13, 1998, permit transfer of January 26, 1998 and the limitations, monitoring requirements and other conditions set forth in Parts I to VIII, pages 1 to 13 of this permit.

Derivation of the Permit Conditions

The permit conditions stipulated in the permit are consistent with the objectives of Rule 62-670.500, F.A.C., Requirements for Dairy Farms in the Lake Okeechobee Drainage Basin, otherwise known as the Dairy Rule, which mandates collection and recycling of wastewater by proper land application together with associated management practices for compliance with water quality standards.

Section VI., Compliance Schedules and Self-Imposed Improvement Schedules, includes a schedule of improvements referenced from the recommendations included in the final report "Technical Assessment of Lake Okeechobee Basin Dairies", dated January 1996 as submitted to the SFWMD by Soil & Water Engineering Technology, Inc. (SWET).

STATEMENT OF BASIS
FOR
STATE OF FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION
WASTEWATER PERMIT

PERMITTEE NAME:	Butler Oaks Farm, Inc.
PERMIT NUMBER:	FLA013655-001-IW4A
MAILING ADDRESS:	172 Shady Oaks Lane Lorida, FL 33857
FACILITY NAME:	Butler Oaks Dairy Wastewater System
FACILITY LOCATION:	172 Shady Oaks Lane Lorida, FL 33857
PERMIT WRITER NAME:	Abdula Erami

I. Status of Permit

Wastewater Permit No. FLA013655-001-IW4A is issued as a renewal of the Industrial Wastewater Operation Permit No. IO28-208403, issued June 28, 1993 and expired June 19, 1994 and permit modifications extending expiration date(s) through June 19, 1995 and subsequently through June 30, 1996. Original Soil Conservation Operation and Maintenance (O&M) Plan was received March 7, 1990 and the revised engineering plans of the barns and Best Management Practices (BMPs) of the dairy were received January 11, 1993. Request for renewal of the operating permit was received July 18, 1996 and the application for permit renewal was submitted January 13, 1998. Payment of the fees were made on June 24, 1996, July 18, 1996 and January 13, 1998. Transfer of permit to the new company was issued on January 26, 1998. The Annual Operating Report of 1996 was received May 2, 1997. Inspections of the dairy were performed on August 28, and December 16 of 1997 and a Global Position System (GPS) survey of the groundwater monitoring network of the facility was performed on October 17, 1997.

II. Facility Description

Butler Oaks Dairy (SIC No. 0241) operates a waste management system designed for a maximum annual average of 990 milk cows and 240 calves which includes 55,000 gallon per day (GPD) of barn wash effluent, 17.5-acre High Intensity Area (HIA), around the milk barn, feed barns, manure bunkers all surrounded by a perimeter ditch, 4-acre solids sediment lagoon, 7-acre first stage Waste Storage Pond (WSP) No. 1, 18-acre second stage WSP No. 2, 10-acre calf barn and sediment pond, 131-acre center pivot spray irrigation field, pastures and solid application areas. Barn effluent flows into the lagoon where solids settle out and wastewater flows into the WSP No. 1. Runoff and drainage from the HIA collected in the east and west perimeter ditches run into the corresponding sumps on each side. Wastewater is pumped from the east sump to the WSP No. 1 and from the west sump, as well as from the calf barn sediment pond, to the lagoon. Further settling of the solids takes place in the WSP No. 1 and wastewater flows to the WSP No. 2 designed to contain such flows from a 24-hr. 25-year storm event. Finally, wastewater is pumped from WSP No. 2 to the spray irrigation field for land application. The rate of application shall not exceed 0.28 inch per 24 hours. Groundwater monitoring wells are provided for the background water, the WSP, lagoon and the spray irrigation field.

III. Description of the Discharge

The sources of the wastewater are the barn wash, cow spray, milking facilities and the runoff and drainage from the HIA described above. There is no provision for chemical treatment, however, natural biological processes (treatment) occur as the wastewater passes through the system and as it resides in the WSP before application to the sprayfield.

I. Effluent Limitations and Monitoring Requirements

A Land Application Systems

1. During the period beginning with the effective date and lasting through the expiration date of this permit, the permittee is authorized to discharge from Discharge Location R001, GMS ID No. 5028X12811, wastewater to the spray irrigation field. Such discharge shall be limited and monitored by the permittee as specified below:

Parameters (units)	Storet Number	Discharge Limitations			Monitoring Requirements		
		Monthly Avg.	Daily Max.	Other (specify)	Frequency	Sample Type	Sample Point
Total Nitrogen (as N)	00600	NA	NA	Report	Quarterly	Grab	WSP
Nitrate Nitrogen (as N)	00620	NA	NA	Report	Quarterly	Grab	WSP
Total Phosphorous.(as P)	00665	NA	NA	Report	Quarterly	Grab	WSP
Ortho Phosphorous (as P)	70507	NA	NA	Report	Quarterly	Grab	WSP
Water Level (MSL)	72020	NA	NA	Report	Quarterly	Measure	WSP
pH (field)	00400	NA	NA	Report	Quarterly	Grab	WSP

2. The average daily flow to the land application system shall not exceed the SCS design rate of 0.28 inch per day.

3. Samples taken in compliance with the monitoring requirements specified in I.A.1. shall be taken at the nearest accessible point in the WSP representative of average water quality in the pond.

4. Water level of the waste storage pond shall be reported as feet below the overflow structure, to the nearest tenth of a foot.

5. Accurate records of land application of wastes shall be kept on file for at least three (3) years. A log shall be maintained for the operation of each sprayfield, to be updated daily or as often as necessary to accurately measure application rates, including the following information:

   * time irrigation started
   * time irrigation ended
   * daily rainfall (inches)
   * total amount irrigated (gallons or inches)
   * waste storage pond level (ft.)
   * visual check of water table height
   * operator's initials

   The attached "Wastewater Irrigation Log" or equivalent may be used for this purpose and should be readily available for review by Department representatives during inspection.

B. Other Methods of Disposal or Recycling

1. There shall be no discharge of wastewater from this facility to ground or surface waters, except as authorized by this permit.

2. Prior to construction of additional manure or solids processing facilities at the site the permittee shall consult with the Department regarding any additional permits which may be required.

3. Prior to any land-spreading of solids the permittee shall have the solids analyzed for Total Phosphorous, Ortho Phosphorous, Total Nitrogen and Nitrates. Such analyses shall be done at least once per each quarter during which land-spreading takes place and the results submitted to the Department along with regularly scheduled ground water monitoring results.

4. Phosphorous application rates from land-spreading of solids may not exceed what is currently allowed in the SCS Management Plan.

C. Other Limitations and Monitoring and Reporting Requirements

1. Monitoring results obtained for each calendar quarter shall be summarized for that quarter and reported on a Discharge Monitoring Report (DMR), Form 62-620.910(10) (copy attached), postmarked no later than the 28th day of the month following the completed calendar quarter. For example, data for January shall be submitted by February 28. Signed copies of the DMR shall be submitted to the address specified below:

   Florida Department of Environmental Protection
   400 North Congress Avenue
   P.O. Box 15425
   West Palm Beach, FL 33416
   Attn.: Industrial Waste Section

2. The permittee shall provide safe access points for obtaining representative samples which are required by this permit.

3. The permittee shall ensure that all laboratory analytical data submitted to the department as required by this permit is from a laboratory which has a currently valid and Department-approved Comprehensive Quality Assurance Plan (ComQAP) [or a ComQAP pending approval] for all parameters being reported as required by Chapter 62-160, Florida Administrative Code.

4. Any bypass of the treatment facility which is not included in the monitoring specified I.A.1, or I.B.1., is to be monitored for flow and all other required parameters. For parameters other than flow, at least one grab sample per day shall be monitored. Daily flow shall be monitored or estimated, as appropriate., to obtain reasonable data. All monitoring results shall be reported on the appropriate DMR.

5. No later than April 1 of each year the permittee shall complete and submit to the Department the attached Annual Operation Report form for the previous calendar year.

6. Department representatives, or its authorized agents shall be allowed access to the property as needed in order to collect water quality samples or otherwise to determine compliance with the terms of this permit. Hereunder, representatives or employees of the South Florida Water Management District (SFWMD) shall be considered authorized agents of the Department.

II. Sludge Management Requirements

A. Basic Management Requirements

1. Sludge or residuals (HIA spoil, lagoon and/or manure trap solids, scraped manure) from the wastewater collection/treatment system shall be land applied at the rates and in accordance with the original SCS Management Plan. Prior to land application the nutrient content must be analyzed as given in Section II.B.

2. Sludge or residuals shall be handled in such a manner as to protect water quality. Unless some other type of containment is provided, the material shall be stored inside the High Intensity Area in order to preclude runoff to surface waters.

B. Analysis Requirements

1. The nutrient content of all sludge or residuals (HIA spoil, lagoon and/or manure trap solids, scraped manure) shall be determined at least quarterly (every three months) prior to land application. Material which is spread at intervals longer than every three months need only be analyzed prior to the date of land application. The sludge or residuals shall be monitored by the permittee as specified below:

Parameters (units)	Monitoring Requirements		
	Frequency	Sample Type	Sample Point
Nitrate Nitrogen as N (mg/Kg)	Quarterly	See II.B.2.	
Total Nitrogen as N (mg/Kg)	Quarterly	See II.B.2.	
Ortho Phosphorus as P (mg/Kg)	Quarterly	See II.B.2.	
Total Phosphorus as P (mg/Kg)	Quarterly	See II.B.2.	
Percent Solids (%)	Quarterly	See II.B.2.	

2. The sample shall be well-mixed and representative of the average quality of the particular material being analyzed.

3. Results of the sludge or residuals monitoring shall be submitted to the district office as specified in section I.C.1.

III. Groundwater Monitoring Requirements

1. During the period of operation authorized by this permit, the permittee shall sample ground water in accordance with this permit and the approved ground water monitoring plan prepared under Rule 62-522.600, F.A.C.

2. Ground water monitoring test results shall be submitted on DEP Form 62-620.910(10) and shall be submitted in conjunction with the DMR in accordance with condition I.C.1.

3. Monitoring wells shall be located to allow vehicle access at all times. Wells shall be clearly marked and maintained so that sampling personnel can find the wells, and shall be labeled, e.g. "MW-1", for verification with the original approved ground water monitoring plan. The wells shall be protected from destruction by farm equipment or vandalism. Upon discovery of a monitoring well which has been destroyed or lost, the permittee shall notify the Department with a written report within seven days detailing the circumstances and remedial measures taken or proposed as soon as possible and have the well replaced within forty-five (45) days after Department approval.

4. Ground water monitoring wells shall be evacuated or purged prior to sampling to obtain a representative sample. Water levels shall be recorded prior to evacuating the well. Measurements, referenced to mean sea level, shall include the top of the well casing, depth to ground water, and the calculated ground water elevation at a precision of plus or minus 0.01 feet.

5. Analyses shall be conducted on unfiltered samples, unless filtered samples have been approved by the Department as being more representative of ground water conditions.

6. The following monitoring wells are included in the ground water monitoring plan:

Well Name	GMS ID Number	Depth	Aquifer	Well Type	Lat./Long.
MW-1	5028A12574'	22.0	Surficial	Background	27°18'47.4"N / 81°03'14.8"W
MW-2	5028A12807'	15.0	Water Table	WSP Peizometer	27°17'35.5"N / 81°01'08.6"W
MW-2	5028A12808'	5.0	Surficial	WSP	27°17'35.6"N / 81°01'10.5"W
MW-3	5028A12809'	12.0	Surficial	Sprayfield	27°17'33.9"N / 81°02'07.2"W
MW-4	5028A12810'	12.0	Surficial	Lagoon	27°17'39.2"N / 81°01'33.6"W

7. The wells included in the ground water monitoring plan shall be sampled for the parameters, and at the frequencies listed below.

Parameters (units)	Monitoring Requirements	
	Frequency	Sample Type
Water Level (MSL)	Semiannually	in-situ
Specific Conductance (umhos/cm)	Semiannually	in-situ
pH	Semiannually	in-situ
Temperature (°C)	Semiannually	in-situ
Nitrate Nitrogen (as N) (mg/l)	Semiannually	Grab
Total Nitrogen (as N) (mg/l)	Semiannually	Grab
Total Phosphorus, (as P) (mg/l)	Semiannually	Grab
Ortho Phosphorus (as P) (mg/l)	Semiannually	Grab

IV. Other Land Application Requirements

1. The permittee's discharge to ground water shall not cause a violation of water quality standards for Class G-II ground waters at the boundary of the zone of discharge in accordance with rules 62-520.400 and 62-520.420, F.A.C.

2. The permittee's discharge to ground water shall not cause a violation of the minimum criteria for ground water specified in rule 62-520.400, F.A.C., within the zone of discharge.

3. The water level in the storage pond shall be maintained at the lowest level possible to ensure the retention of effluent during adverse weather conditions, crop harvesting, maintenance of irrigation equipment or other conditions which will preclude land application.

4. The annual average hydraulic loading rate shall be limited to a maximum of 1.96 inches per week (0.28 inch per day).

5. The water table shall be at least eighteen (18) inches or deeper below normal ground level when wastes, either wastewater irrigation, manure, spoil, or sludge, are land applied. Observation wells shall be visually checked prior to land application. Irrigation with wastewater shall be controlled at all times to prevent runoff of wastewater from either excessive irrigation or by mixing with stormwater.

V. Operation and Maintenance Requirements

A. Operation of Treatment and Disposal Facilities

1. The permittee shall ensure that the operation of this facility is as described in the application and supporting documents.

2. The operation of the pollution control facilities described in this permit shall be under the full time supervision of a person who is qualified by formal training and/or practical experience in the field of water pollution control.

3. Feed/water and shade facilities for the milk herd shall be located inside the High Intensity Area, except as otherwise provided in the original Soil Conservation Service Operation and Maintenance (O&M) Plan submitted March 7, 1990. The facilities and herd management shall be maintained in accordance with the same O&M Plan. Herd pasture shall be maintained such that the creation of "high intensity use areas", as defined in FAC Rule 62-670, is prevented and/or pasture runoff does not cause or contribute to violations of water quality standards. Grassed berms shall be cut regularly and maintained with grass cover to prevent erosion; weed overgrowth shall be prevented.

4. Lagoons, HIA ditches and sumps, and the waste storage pond shall be cleaned of manure, sand, sludge or other material so that effective treatment and/or design volumes are maintained in accordance with the Management Plan. Float level switches for all sump pumps shall be checked periodically to assure proper operation in accordance with the original design specifications. The permittee shall maintain records of all maintenance jobs at the site and make them available for inspection.

5. All maintenance or construction activities shall be carried out in such a manner to prevent discharge of pollutants to surface waters of the state. If dewatering is necessary, the discharge shall be directed to the waste storage pond. The permittee should contact the Department for guidance should there be any questions concerning this requirement.

B. Record Keeping Requirements:

The permittee shall maintain the following records on the site of the permitted facility and make them available for inspection:

1. Records of all compliance monitoring information, including all calibration and maintenance records and all original strip chart recordings for continuous monitoring instrumentation, including, if applicable, a copy of the laboratory certification showing the certification number of the laboratory, for at least three years from the date the sample or measurement was taken;

2. Copies of all reports, other than those required in items 1. and 6. of this section, required by the permit for at least three years from the date the report was prepared, unless otherwise specified by Department rule;

3. Records of all data, including reports and documents used to complete the application for the permit for at least three years from the date the application was filed, unless otherwise specified by Department rule;

4. A copy of the current permit;

5. A copy of any required record drawings;

6. Copies of the logs and schedules showing plant operations and equipment maintenance for three years from the date on the logs or schedules.

VI. Compliance Schedules and Self-imposed Improvement Schedules

The permittee shall achieve compliance with the conditions of this permit in accordance with the following schedule:

1. SCS Operation and Management (O&M) Plan submitted March 7, 1990 effective date of permit

2. This dairy was included in a study done by Soil & Water Engineering Technology, Inc. (SWET), under contract with the SFWMD, in an effort to improve water quality in runoff. The SWET report recommended reasonable management practices which are not excessive in cost to the owner, which are hereby incorporated into the permit, to be achieved in accordance with the following schedule. These additional BMPs shall be maintained periodically as necessary during the life of the permit.

   For the KREA-41 Drainage Basin:

   a. Lime applications (3 - 4 tons/acre) to heavily manure laden areas in pastures identified as HIAs, (Solution 1)

   b. To make better use of the barn and the HIA (Solution 4);

      i- Gate outer pasture entrance to control access to outer pasture.
      ii- Increase manure scraping of the feed barn and the land available for manure spreading.
      iii- Open fences to fully utilize the land around the feed barns for exercise areas.
      iv- Create berms around the existing HIAs in the pastures and the woods to isolate these areas.

   c. Clean out sediment from the main ditch bottom and spread at agronomic rates (about 10 tons/acre) on non-P loaded land (Solution 5).

   For the KREA-41B Drainage Basin:

   a. Lime applications (3 - 4 tons/acre) in all areas identified as HIAs (Solution 1).

   b. Lime pastures to maintain the soil pH at or slightly above the highest recommended levels for the crop (Solution 2).

   c. Clean accumulated sediments in the ditches and isolated "Hot Spots" and spread at agronomic rates on non-P loaded land (Solution 4).

   d. To make better use of the barn and the HIA (Solution 5);

      i- Gate outer pasture entrance to control access to outer pasture.
      ii- Increase manure scraping of the feed barn and the land available for manure spreading.
      iii- Open fences to fully utilize the land around the feed barns for exercise areas.
      iv- Create berms around the existing HIAs in the pastures and the woods to isolate these areas.

   These BMPs must be implemented no later than 60 days after the permit issuance date.

VII. Other Specific Conditions

A. Specific Conditions Applicable to all permits

1. Drawings, plans, documents or specifications submitted by the permittee, not attached hereto, but retained on file at Department of Environmental Protection, Southeast District (DEP, SED) are made a part hereof.

2. If significant historical or archaeological artifacts are discovered at any time within the project site, the permittee shall immediately notify the District Office and the Bureau of Historic Preservation, Division of Archives, History and Records Management, R.A. Gray Building, Tallahassee, Florida 32301.

3. Where required by Chapter 471 (P.E.) or Chapter 492 (P.G.) Florida Statutes, applicable portions of reports to be submitted under this permit, shall be signed and sealed by the professional(s) who prepared them.

4. This permit satisfies Industrial Wastewater program permitting requirements only and does not authorize operation of this facility prior to obtaining any other permits required by local, state or federal agencies.

B. Duty to Reapply

1. The permittee shall submit an application to renew this permit at least 180 days before the expiration date of this permit.

2. The permittee shall apply on the appropriate form listed in Rule 62-620.910, F.A.C., and in the manner established in Rules 62-620.400 through 62-620.460, F.A.C., including submittal of the appropriate processing fee set forth in Rule 62-4.050, F.A.C.

3. An application filed in accordance with subsections 1. and 2. of this part shall be considered timely and sufficient. When an application for renewal of a permit is timely and sufficient, the existing permit shall not expire until the Department has taken final action on the application for renewal or until the last day for seeking judicial review of the agency order or a later date fixed by order of the reviewing court.

4. The late submittal of a renewal application shall be considered timely and sufficient for the purpose of extending the effectiveness of the expiring permit only if it is submitted and made complete before the expiration date.

C. Specific Conditions Related to Best Management Practices Condition

1. In accordance with Section 62-670.510(1), FAC, all dairy cattle must be fenced away from all water courses, or drainage ditches with a drainage area of 100 acres or more that will transport storm runoff to surface waters. Surface water in wetlands, low areas or cooling ponds, either natural or man-made, in which dairy cattle are allowed to enter or wade in, shall not be drained or discharged to waters of the State. The Department may require additional fencing on a case-by-case basis to prevent excessive nutrient loads in drainage which may cause or contribute to violations of state water quality standards.

2. All sources of nutrients from wastewater/runoff, HIA spoil, lagoon/manure trap solids, manure or commercial fertilizer shall be applied at rates not to exceed the annual nutrient requirements of the grasses or crops. The permittee shall record application rates of wastes and commercial fertilizer to fields and pastures to ensure that nutrients are properly managed. Records shall be available to the Department upon request or during inspections by Department representatives.

3. The Department may require the permittee to perform water quality testing for representative samples of the farm drainage. The frequency and the parameters of the analyses, as well as the appropriate sampling locations (s), shall be determined by the Department. The permittee shall be notified in writing if such monitoring is deemed necessary to demonstrate compliance with state water quality standards.

4. If the Department determines the management of dairy farm wastes causes or contributes to violations of groundwater or surface water standards the Department may require the permittee to modify the design or operation of the waste management system within a period acceptable to the Department.

5. Before construction of drainage ditches or widening or deepening of existing ditches, the permittee shall submit a written request and obtain prior approval from the Department and/or the South Florida Water Management District (SFWMD). Normal maintenance and clean-out of existing drainage ditches shall be carried out according to the regulations and/or guidelines provided by the SFWMD.

6. Cooling pond berms shall be adequately maintained to preclude a discharge from the pond(s) to surface waters.

VIII. General Conditions

The following general conditions are referenced in Florida Administrative Code Rule 62-620.610.

1. The terms, conditions, requirements, limitations and restrictions set forth in this permit are binding and enforceable pursuant to Chapter 403, Florida Statutes. Any permit noncompliance constitutes a violation of Chapter 403, Florida Statutes, and is grounds for enforcement action, permit termination, permit revocation and reissuance, or permit revision.

2. This permit is valid only for the specific processes and operations applied for and indicated in the approved drawings or exhibits. Any unauthorized deviations from the approved drawings, exhibits, specifications or conditions of this permit constitutes grounds for revocation and enforcement action by the Department.

3. As provided in Subsection 403.087(6), F.S., the issuance of this permit does not convey any vested rights or any exclusive privileges. Neither does it authorize any injury to public or private property or any invasion of personal rights, nor authorize any infringement of federal, state, or local laws or regulations. This permit is not a waiver of or approval of any other Department permit or authorization that may be required for other aspects of the total project which are not addressed in this permit.

4. This permit conveys no title to land or water, does not constitute state recognition or acknowledgment of title, and does not constitute authority for the use of submerged lands unless herein provided and the necessary title or leasehold interests have been obtained from the State. Only the Trustees of the Internal Improvement Trust Fund may express State opinion as to title.

5. This permit does not relieve the permittee from liability and penalties for harm or injury to human health or welfare, animal or plant life, or property caused by the construction or operation of this permitted source; nor does it allow the permittee to cause pollution in contravention of Florida Statutes and Department rules, unless specifically authorized by an order from the Department. The permittee shall take all reasonable steps to minimize or prevent any discharge, reuse of reclaimed water, or residuals use or disposal in violation of this permit which has a reasonable likelihood of adversely affecting human health or the environment. It shall not be a defense for a permittee in an enforcement action that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this permit.

6. If the permittee wishes to continue an activity regulated by this permit after its expiration date, the permittee shall apply for and obtain a new permit.

7. The permittee shall at all times properly operate and maintain the facility and systems of treatment and control, and related appurtenances, that are installed and used by the permittee to achieve compliance with the conditions of this permit. This provision includes the operation of backup or auxiliary facilities or similar systems when necessary to maintain or achieve compliance with the conditions of the permit.

8. This permit may be modified, revoked and reissued, or terminated for cause. The filing of a request by the permittee for a permit revision, revocation and reissuance, or termination, or a notification of planned changes or anticipated noncompliance does not stay any permit condition.

9. The permittee, by accepting this permit, specifically agrees to allow authorized Department personnel, including an authorized representative of the Department and authorized EPA personnel, when applicable, upon presentation of credentials or other documents as may be required by law, and at reasonable times, depending upon the nature of the concern being investigated, to

   a. Enter upon the permittee's premises where a regulated facility, system, or activity is located or conducted, or where records shall be kept under the conditions of this permit;

   b. Have access to and copy any records that shall be kept under the conditions of this permit;

   c. Inspect the facilities, equipment, practices, or operations regulated or required under this permit; and

   d. Sample or monitor any substances or parameters at any location necessary to assure compliance with this permit or Department rules.

10. In accepting this permit, the permittee understands and agrees that all records, notes, monitoring data, and other information relating to the construction or operation of this permitted source which are submitted to the Department may be used by the Department as evidence in any enforcement case involving the permitted source arising under the Florida Statutes or Department rules, except as such use is proscribed by Section 403.111, Florida Statutes, or Rule 62-620..302, Florida Administrative Code. Such evidence shall only be used to the extent that it is consistent with the Florida Rules of Civil Procedure and applicable evidentiary rules.

11. When requested by the Department, the permittee shall within a reasonable time provide any information required by law which is needed to determine whether there is cause for revising, revoking and reissuing, or terminating this permit, or to determine compliance with the permit. The permittee shall also provide to the Department upon request copies of records required by this permit to be kept. If the permittee becomes aware of relevant facts that were not submitted or were incorrect in the permit application or in any report to the Department, such facts or information shall be promptly submitted or corrections promptly reported to the Department.

12. Unless specifically stated otherwise in Department rules, the permittee, in accepting this permit, agrees to comply with changes in Department rules and Florida Statutes after a reasonable time for compliance; provided, however, the permittee does not waive any other rights granted by Florida Statutes or Department rules. A reasonable time for compliance with a new or amended surface water quality standard, other than those standards addressed in Rule 62-302.500, F.A.C., shall include a reasonable time to obtain or be denied a mixing zone for the new or amended standard.

13. The permittee, in accepting this permit, agrees to pay the applicable regulatory program and surveillance fee in accordance with Rule 62-5.052, F.A.C.

14. This permit is transferable only upon Department approval in accordance with Rule 62-620.340, F.A.C. The permittee shall be liable for any noncompliance of the permitted activity until the transfer is approved by the Department.

15. The permittee shall give the Department written notice at least 60 days before inactivation or abandonment of a wastewater facility and shall specify what steps will be taken to safeguard public health and safety during and following inactivation or abandonment.

16. The permittee shall apply for a revision to the Department permit in accordance with Rules 62-620.300, 62.420 or 62.620.450, F.A.C., as applicable, at least 90 days before construction of any planned substantial modifications to the permitted facility is to commence or with Rule 62-620.300 for minor modifications to the permitted facility. A revised permit shall be obtained before construction begins except as provided in Rule 62-620.300, F.A.C.

17. The permittee shall give advance notice to the Department of any planned changes in the permitted facility or activity which may result in noncompliance with permit requirements. The permittee shall be responsible for any and all damages which may result from the changes and may be subject to enforcement action by the Department for penalties or revocation of this permit. The notice shall include the following information:

    a. A description of the anticipated noncompliance;

    b. The period of the anticipated noncompliance, including dates and times; and

    c. Steps being taken to prevent future occurrence of the noncompliance.

18. Sampling and monitoring data shall be collected and analyzed in accordance with Rule 62-4.246, Chapter 62-160 and 62-601, F.A.C., and 40 CFR 136, as appropriate.

    a. Monitoring results shall be reported at the intervals specified elsewhere in this permit and shall be reported on a Discharge Monitoring Report (DMR), DEP Form 62-620.910(10).

    b. If the permittee monitors any contaminate more frequently than required by the permit, using Department approved test procedures, the results of this monitoring shall be included in the calculation and reporting of the data submitted in the DMR.

    c. Calculations for all limitations which require averaging of measurements shall use an arithmetic mean unless otherwise specified in this permit.

    d. Any laboratory test required by this permit for domestic wastewater facilities shall be performed by a laboratory that has been certified by the Department of Health and Rehabilitative Services (DHRS) under Chapter 10D41, F.A.C., to perform the test. In domestic wastewater facilities, on-site tests for dissolved oxygen, pH, and total chlorine residual shall be performed by a laboratory certified to test for those parameters or under the direction of an operator certified under Chapter 61E12-41, F.A.C.

    e. Under Chapter 62-160, F.A.C., sample collection shall be performed by following the protocols outlined in "DER Standard Operating Procedures for Laboratory Operations and Sample Collection Activities" (DER-QA-001/92). Alternatively, sample collection may be performed by an organization who has an approved Comprehensive Quality Assurance Plan (CompQAP) on file with the Department. The CompQAP shall be approved for collection of samples from the required matrices and for the required tests.

19. Reports of compliance or noncompliance with, or any progress reports on, interim and final requirements contained in any compliance schedule detailed elsewhere in this permit shall be submitted no later than 14 days following each schedule date.

20. The permittee shall report to the Department any noncompliance which may endanger health or the environment. Any information shall be provided orally within 24 hours from the time the permittee becomes aware of the circumstances. A written submission shall also be provided within five days of the time the permittee becomes aware of the circumstances. The written submission shall contain: a description of the noncompliance and its cause; the period of noncompliance including exact dates and time, and if the noncompliance has not been corrected, the anticipated time it is expected to continue; and steps taken or planned to reduce, eliminate, and prevent recurrence of the noncompliance.

    a. The following shall be included as information which must be reported within 24 hours under this condition:

        1. Any unanticipated bypass which causes any reclaimed water or the effluent to exceed any permit limitation or results in an unpermitted discharge,

2. Any upset which causes any reclaimed water or the effluent to exceed any limitation in the permit,

3. Violation of a maximum daily discharge limitation for any of the pollutants specifically listed in the permit for such notice, and

4. Any unauthorized discharge to surface or ground waters.

b. If the oral report has been received within 24 hours, the noncompliance has been corrected, and the noncompliance did not endanger health or the environment, the Department shall waive the written report.

21. The permittee shall report all instances of noncompliance not reported under Conditions VIII. A. 18. and 19. of this permit at the time monitoring reports are submitted. This report shall contain the same information required by Condition VIII. A. 20. of this permit.

22. Bypass Provisions.

a. Bypass is prohibited, and the Department may take enforcement action against a permittee for bypass, unless the permittee affirmatively demonstrates that:

(1). Bypass was unavoidable to prevent loss of life, personal injury, or severe property damage; and

(2). There were no feasible alternatives to the bypass, such as the use of auxiliary treatment facilities, retention of untreated wastes, or maintenance during normal periods of equipment downtime. This condition is not satisfied if adequate back-up equipment should have been installed in the exercise of reasonable engineering judgment to prevent a bypass which occurred during normal periods of equipment downtime or preventive maintenance; and

(3). The permittee submitted notices as required under Condition VIII. A. 22. b. of this permit.

b. If the permittee knows in advance of the need for a bypass, it shall submit prior notice to the Department, if possible at least 10 days before the date of the bypass. The permittee shall submit notice of an unanticipated bypass within 24 hours of learning about the bypass as required in Condition VIII. A. 20. of this permit. A notice shall include a description of the bypass and its cause; the period of the bypass, including exact dates and times; if the bypass has not been corrected, the anticipated time it is expected to continue; and the steps taken or planned to reduce, eliminate, and prevent recurrence of the bypass.

c. The Department shall approve an anticipated bypass, after considering its adverse effect, if the permittee demonstrates that it will meet the three conditions listed in Condition VIII. A. 22. a. through 3. of this permit.

d. A. permittee may allow any bypass to occur which does not cause reclaimed water or effluent limitations to be exceeded if it is for essential maintenance to assure efficient operation. These bypasses are not subject to the provision of Condition VIII. A. 22. a. through c. of this permit.

23. Upset Provisions

a. A permittee who wishes to establish the affirmative defense of upset shall demonstrate, through properly signed contemporaneous operating logs, or other relevant evidence that:

(1). An upset occurred and that the permittee can identify the cause(s) of the upset;

(2). The permitted facility was at the time being properly operated;

(3). The permittee submitted notice of the upset as required in Condition VIII. A. 20. of this permit; and

(4). The permittee complied with any remedial measures required under Condition VIII. A. 5. of this permit.

b. In any enforcement proceeding, the permittee seeking to establish the occurrence of an upset has the burden of proof.

c. Before an enforcement proceeding is instituted, no representation made during the Department review of a claim that noncompliance was caused by an upset is final agency action subject to judicial review.

Executed in West Palm Beach, Florida.

STATE OF FLORIDA DEPARTMENT
OF ENVIRONMENTAL PROTECTION

07/20/98

Alfred Mueller, Jr., P.E., P.G. Date
Water Facilities Administrator
Southeast District
P. O. Box 15425
West Palm Beach, FL 33416

Butler Oaks Farm
APPENDIX E
Annual Operation Report

DAIRY ANNUAL OPERATION REPORT YEAR: 2000

Dairy Name: Butler Oaks Farm, Inc (Dairy Farm) Barn # Butler #2

DEP Permit # FLA013655-001-IW4A

PART A- Size of Operation:

I- Avg. Milk Herd Size Permitted 990 Cows.

II-.Avg. Milk Herd Size, 2000.[1] 747 Cows.

PART B- Phosphorus Balance:

I- Imports:

Total Feed Consumed[2] 5,623 Tons, Sub-total P[3] in Feed 49,482 lbs.

Total Chem. Fertilizer 187 Tons, Sub-total P in Fertilizer 16,578 lbs.

Crop, Hay or Silage, Purchased 175 Tons, Sub-total P in Crop 1,540 lbs.

Total P Imported 67,600 lbs.

II- Exports:

Total Milk Production 5810 Tons, Sub-total P in Milk 11,620 lbs.

Crop, Hay or Silage, Sold Off Site 0 Tons, Sub-total P in Crop 0 lbs.

Manure Hauled Off Site 0 Tons, Sub-total P in Manure 0 lbs.

Total P Exported 11,620 lbs.

III- Application

Total Wastewater Irrigation[4] 8.6 MG, Sub-total P in WW 306 lbs.

Total Manure (and Solids)[5] 1008 Tons, Sub-total P in Manure 3780 lbs.

Total Chem. Fertilizer[6] 187 Tons, Sub-total P in Fertilizer 16,578 lbs.

Total P Applied on Entire Farm 20,664 lbs.

PART C- Application Rates:

I- Spray Irrigation Field(s);

Field No.	Acreage	Fertilizer[7] Lbs/Acre/Yr	Fertilizer P, Lbs/Acre/Yr	Wastewater[8] Applied, Gal.	Wastewater P, Lbs/Acre/Yr	Total P, Lbs/Acre/Yr
39	185/131	1300	45	8,600,000	2.35	47.35

II- Hay and Crop Field(s);

Field Location[9] (Identification)	Acreage	Fertilizer, Lbs/Acre/Yr	Fertilizer P, Lbs/Acre/Yr	Manure[10], Tons/Acre/Yr	Manure P, Lbs/Acre/Yr	Total P, Lbs/Acre/Yr
4	75	400	20	4.5	16	36
3	150	400	20	4.5	16	36

DAIRY ANNUAL OPERATION REPORT YEAR: 2000

Dairy Name: Butler Oaks Farm, Inc Barn # 2

I certify under penalty of law that I have personally examined and am familiar with the information submitted herein; and based on my inquiry of those individuals responsible for obtaining the information, I believe the submitted information is true, accurate and complete. I am aware that there are significant penalties for submitting false information including the possibility of fine and imprisonment.

NAME OF OWNER OR AUTHORIZED AGENT (Typed or printed)	TELEPHONE NO.
Robert L. Butler Pres.	(863) 763-7425 763 4389 mobil 634-1461
SIGNATURE OF OWNER OR AUTHORIZED AGENT	DATE
Robt L Butler	

Instructions: All values reported should be for the entire calendar year. Herd size should be calculated using at least monthly average herd size. Sprayfield loading rate shall be determined using the quarterly waste storage pond P concentrations and the volume land applied (unless no wastewater applied) for that quarter, and the quarterly fertilizer application (if applicable), then summed up and reported for the entire year. In this report "P" should be given as total elemental phosphorus only, i.e. not as P_2O_5 or other compound forms. Refer to the notes given below for further information on specific items. Reports are due no later than March 31 each year. Should there be any questions concerning the completion of this form, please call the DEP Industrial Waste Section in West Palm Beach, telephone (407)433-2650.

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[1] - Based on daily or monthly average herd size for the year in report.

[2] - Imported commercial feed and concentrates.

[3] - Phosphorus as elemental P.

[4] - Total volume of wastewater used on entire farm.

[5] - Total weight of manure, sludge and solids (from sand trap, solid separator, ...) used on entire farm.

[6] - Total weight of chemical fertilizer used on entire farm.

[7] - Weight of chemical fertilizer applied per acre.

[8] - Volume of wastewater applied to specific sprayfield(s).

[9] - Identify the field by location or by the Field No. in your Management (O&M) Plan.

[10] - Weight of manure and solids applied per acre.

Animal Nutrient Management Assessment for Davie Dairy, Inc.

1.0 Introduction

The South Florida Water Management District has set a target of 40 ppb phosphorus for dairy farm discharges to the environment. This Animal Nutrient Management Assessment (ANMA) is part of an effort to identify methods of cost-effectively reducing the phosphorus concentration of farm runoff. The focus of the Assessment is to describe the existing conditions on the dairy, determine the associated phosphorus (P) balance, and identify the most appropriate practices or technologies to reduce the P discharge concentrations. Once the final technologies (or technologies) are selected a comprehensive design/engineering plan will be developed (in a future task of this project).

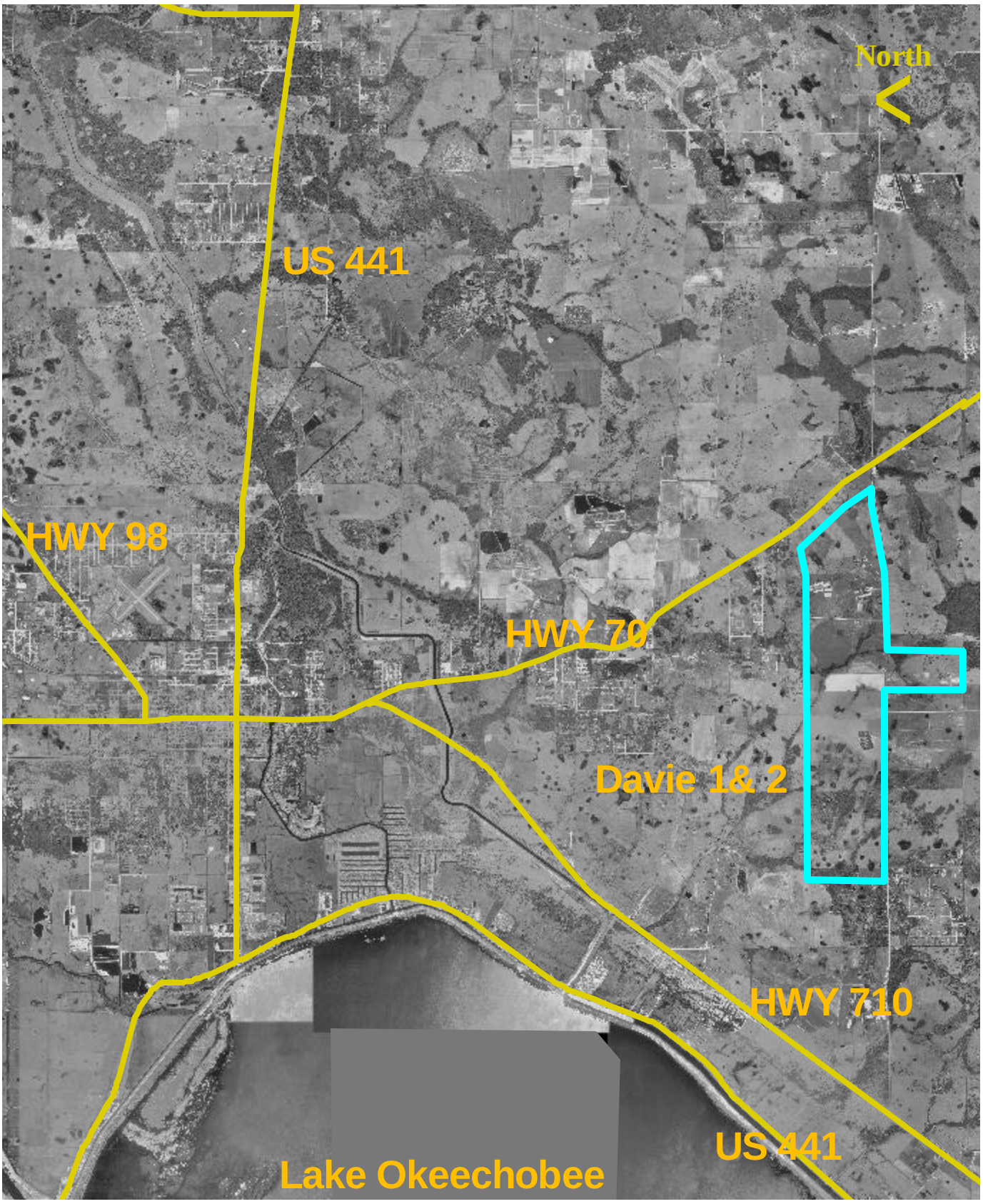
The owners of Davie Dairy, Mr. Bill Berman and Mr. Glynn Rutledge, were extremely helpful in providing dairy records and explaining the dairy's operation and historical practices. Their assistance was critical for properly characterizing the dairy and identifying the areas needing attention in order to meet the phosphorus reduction goals.

2.0 Description of Farming Operation

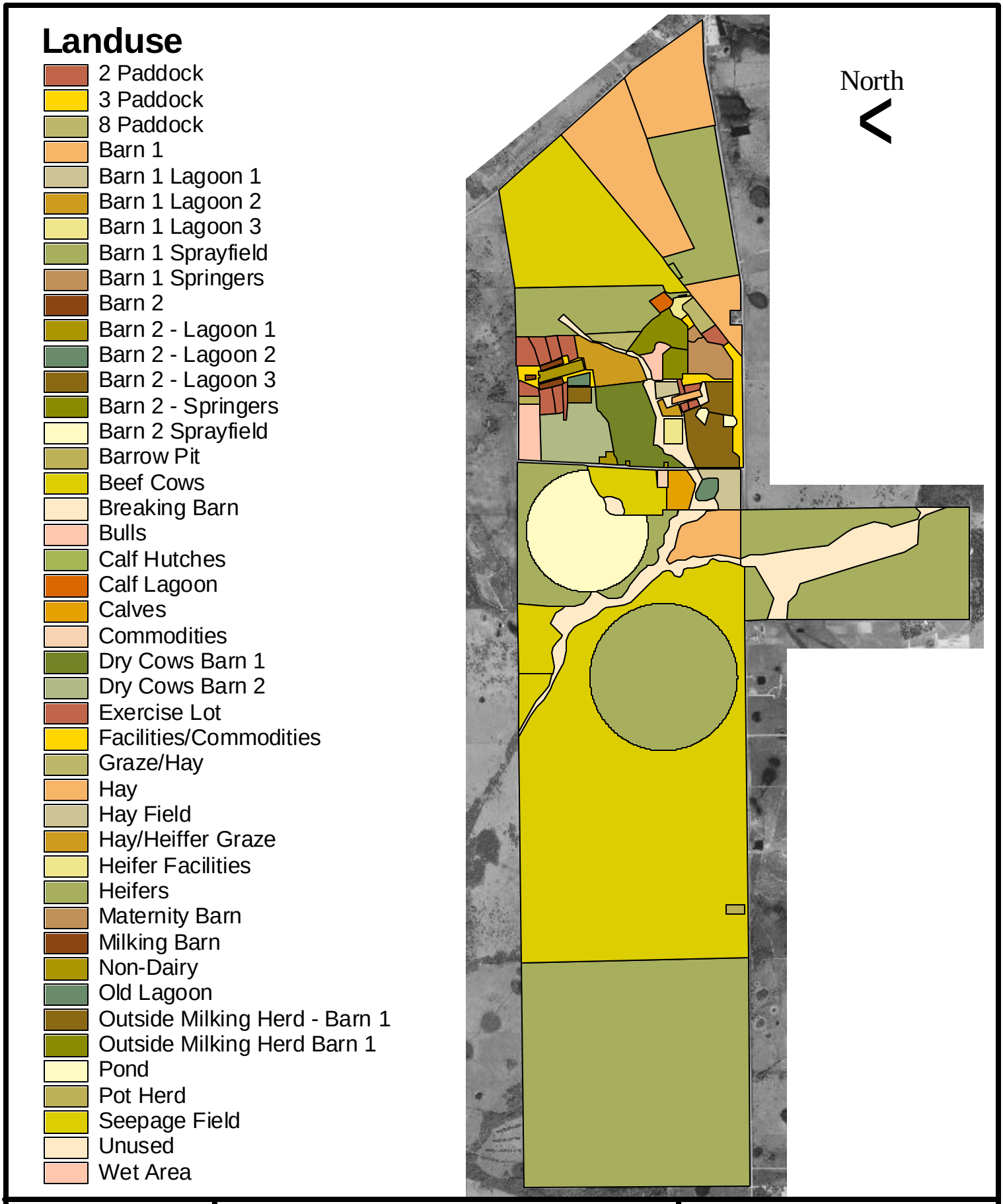
Davie Dairy is a Holstein dairy farm occupying 3410 acres of land approximately 6 miles east of Okeechobee, FL on the south side of SR 70 (Figure 2-1). The dairy consists of two milking centers referred to as Barn 1 and Barn 2. The Barn 1 milking center was built in 1967 and the Barn 2 milking center was built in 1981. The remainder of the dairy property consists of a breaking barn, a maternity barn, high intensity areas, herd pastures, dry cow pastures, springer*/heifer pastures, a bull pasture, calf lots, beef cow pastures, hayfields, sprayfields, a commodities storage area, waste ponds, residences and wetlands (Figure 2-2). Table 2-1 provides a land use description, acreage and the number of animals for the fields presented in Figure 2-2.

Unlike the majority of dairies in the Okeechobee Basin, Davie Dairy operates a confinement dairy. Barns 1 & 2 house 80 percent of the lactating herd. The cows spend approximately 70 percent of their time within the barns. The remaining 30 percent of their time is spent on exercise lots around the barn. The other 20 percent of the lactating herd are maintained on the milking herd pastures. The cows in these pastures are either

* cows ready to give birth



Prepared by SWET, Inc.	Figure 2-1. Location of Davie Dairy, Okeechobee County, FL Davie Dairy ANMA	Scale 2 Miles



Prepared by SWET, Inc.

Figure 2-2. Landuse for Davie Dairy
Davie Dairy ANMA

Table 2-1. Land Use and Fields Description for Davie Dairy ANMA

						% Time Within Area	Feed Outside Barn?	Number of Animals in Field									
Field	**Drains to:**	**Primary Use**	**Condition**	**Crop**	**Herd #**			**Lactating High**	**Lactating Medium**	**Lactating Low**	**Pot Herd**	**Springer & Heifers**	**Dry Cows**	**Bulls**	**Beef Cattle**	**Horses**	**Calves**
Barn 1 Exercise Lots																	
HIA1-1	Lagoon 1-2	Exercise Lot	cow carpet, no scraping, cooling pond	none		30	no	45									
HIA1-2	Lagoon 1-2	Exercise Lot	cow carpet, no scraping, cooling pond	none		30	no	45									
HIA1-3	Lagoon 1-1	Exercise Lot	cow carpet, no scraping, cooling pond	none		30	no	45									
HIA1-4	Lagoon 1-1	Exercise Lot	cow carpet, no scraping	none		30	no	48									
Barn 1 Outside Pasture																	
LP1-1	Wet Area/ Slough	Pasture	large cooling pond	stargrass		100	yes		128								
LP1-2	Lagoon 1-2	Pasture		stargrass		100	yes			114							
LP1-3	Eastern Road Swale	Pasture	large cooling pond	stargrass		100	yes		128								
SP1-1		Pasture	cooling pond	stargrass		100	yes					100					
DP1-1	Slough	Pasture	cooling pond, wet area	stargrass		100							125	15			
PH1-1	Lagoon 1	Holding Pen	bare lot			100					25						
Barn 2 Exercise Lots																	
HIA2-1	Slough	Exercise Lot	filled cooling pond	none	2	30	no	34.8									
HIA2-2	Slough	Exercise Lot	filled cooling pond, new concrete pond	none	4	30	no	34.8									
HIA2-3	Slough	Exercise Lot	filled cooling pond, new concrete pond	none	5	30	no	34.8									
HIA2-4	West Road Ditch/Slough	Exercise Lot	filled cooling pond	none	3	30	no	34.8									
HIA2-5	Slough	Exercise Lot		none	8	30	no	34.8									
HIA2-6	Slough	Exercise Lot	cooling pond	none	1	30	no		33								
HIA2-7	Slough	Exercise Lot	cooling pond	none	7	30	no		33								
HIA2-8	Slough	Exercise Lot	cooling pond	none	6	30	no			38.1							
Barn 2 Outside Pasture																	
PH2-1	West Road Ditch	Exercise Lot	fenced-off, old, cooling pond			100					25						
BLP2-1	West Road Ditch	Exercise Lot				100								15			
DP2-1	Slough		old, abandoned seepage field	stargrass		100							125				
SP2-1	Slough	Pasture	cooling pond	stargrass		100						105					
Calves																	
CP-1	Northeast	Hutches	240 new hutches, allow manure to drop through			100	yes										240
CP-2	Northeast	Paddocks	8 paddocks; 25 calves/ paddock			100	yes										200
CP-3	Northeast	Paddocks	3 paddocks; 25 calves/ paddock			100											75
CP-4	Northeast	Paddocks	2 paddocks; 30 calves/ paddock			100											60
CP-5	Slough	Pasture	old lagoon seepage field - plan to use for commodity barn runoff			100											229
Horses, Beef, and Miscellaneous Fields																	
HSP-1	Behind Office	Pasture				100										3	
HSP-2	Barn 1 Lagoon 1	Pasture				100										1	
HSP-3	Barn 2 Lagoon 1	Pasture				100										1	
HP-1	Slough	Pasture	15-16 month heifers - low, wet area, harvested 2/year	stargrass		100	yes					300					
HP-2	Slough	Pasture	520 acres east of Berman Rd.			100						200					
HP-3		Pasture	Harvey Field			100						400					
BP-1	Slough	Pasture	northwest- leased			100								6	90		40
BP-2	Slough	Pasture	south of sprayfield 2			100								28	114		
BP-3	Slough	Pasture	south of BP-2			100								2	100		50

Table 2-1. Land Use and Fields Description for Davie Dairy ANMA(Continued)

Field	Drains to:	Primary Use	Condition	Crop	Herd #	% Time Within Area	Feed Outside Barn?	Number of Animals in Field									
								Lactating High	Lactating Medium	Lactating Low	Pot Herd	Springer & Heifers	Dry Cows	Bulls	Beef Cattle	Horses	Calves
F-1	Northeast	Hay	Hwy 70 Hayfield - solids from Barn #1 sump & breaking barn (future).														
F-2	Northeast	Hay	Posey's Corner														
SP-3	Northeast	Pasture	springers 7 month bred, 2 borrow pits			100						163					
SF-1	Slough	Haylage	Barn 1 sprayfield 208 acres.														
SF-2	Slough	Haylage	Barn 2 sprayfield 130 acres, drain tile underdrains														
F-3	Slough	Haylage	Outside pivot 1														
F-4	Slough	Haylage	Hermothria, 35-40 acres, mucky														
F-5	Slough	Haylage	adjacent to old lagoon														
			Total					**357**	**322**	**152.1**	**50**	**1268**	**250**	**66**	**304**	**5**	**894**

low or medium production cows. Dry cows, springers and heifers, bulls, and beef cattle are grazed in separate pastures with supplemental feed provided in the pastures. Calves are started off in calf hutches and are then moved, based on their age, through a series of paddocks. The amounts and types of feed provided to the various animals are detailed in a later section.

3.0 Description of Milk Centers and Existing Waste Management Systems

Davie Dairy is divided into two essentially separate dairies named Barn 1 and Barn 2. Each of the two barns has a milking center, confinement barn(s), waste management system, exercise lots, and pastures.

3.1 Barn 1

3.1.1 Dairy

Barn 1 is a 960-cow dairy originally constructed in 1967. The current confinement barn and waste management system was designed and constructed in 1991. The cows are divided into two distinctly different management systems. Four groups of approximately 150 cows (600 cows total) are housed and fed in a free-stall confinement barn. Three groups of approximately 120 cows (360 cows total) are managed using a combination of pasture and open lots. The dairy consists of a small, flat milking parlor* used for the pot herd, the main Barn 1 milking parlor, one confinement barn, three exercise lots, three outside milking herd pastures, one springer pasture, one dry cow pasture, and a waste management system. Each group of cows within the confinement barn has access to an exercise lot equipped with a small cooling pond dug into the groundwater table. The exercise lots are covered with a geotextile "cow carpet". The geotextile fabric has been cut away from the sides of the ponds because when it is wet it is too slippery for the cows to walk on.

3.1.2 Waste Management System

Mr. Gerald R. Bodman, P.E. designed the current waste management system as part of the 1991 dairy redesign. The system consists of three lagoons and a sprayfield. Manure from the milking parlor and confinement barn is removed hydraulically. The milking parlors are flushed with fresh water into a sump. The sump is then pumped in the first lagoon. Solids that accumulate in the parlor sump are removed several times per year. This material is spread on hay fields. The confinement barn may be flushed with either recycled effluent or fresh water. The flush water gravity flows down a sloped concrete travel lane to a "speed bump" that diverts the water into the first lagoon. Any water which flows over the "speed bump" flows into the parlor sump and is pumped back into the first lagoon. A portion of the confinement barn roof is guttered to the barn floor and into the waste management system. The runoff from the non-guttered portion of the roof sheet flows either to Lagoon 1 or Lagoon 2. The exercise lots are sloped to drain away from the barn; however the runoff from the lots is eventually directed into one of the first two lagoons.

* The entire parlor is on a single elevation, rather than having the elevated milking stations used in more recent designs.

The solids in the lagoon have never been removed. Sand and grass from around the inlet pipe to the first lagoon are removed every two to three years. The three lagoons are connected, in series, by culverts. The first lagoon is approximately 17-feet deep with a surface area of 4.48-acres. The second lagoon is approximately 14-feet deep with a surface area of 2.81-acres. The third lagoon functions as a storage pond and is approximately 6-feet deep with a surface area of 6.24 acres. The waste storage pond is equipped with two pumps: one is used to recycle water to the barn flush tanks and the other pumps the effluent to the Barn 1 sprayfield.

The Barn 1 sprayfield is a 208-acre field. The effluent discharges through a center-pivot spray irrigation system. The sprayfield is planted with stargrass and is harvested for silage. The stargrass is harvested every 30 days from May through the middle of November. On average the farm harvests 10 tons of dry matter per acre per year of stargrass. From mid-November to April the sprayfield is overseeded with ryegrass. On average the farm harvests 3 tons of dry matter per acre per year of ryegrass.

3.1.3 Pasture Management

Approximately 360 cows are managed using 71.7 acres of open lots. The open lots are equipped with feed and water troughs and are used for the lactating herd. Mounds and channels are used to direct runoff back into the central slough running through the dairy property.

3.2 Barn 2

3.2.1 Dairy

Barn 2 is a 960-cow dairy with two confinement barns each housing 4 groups of approximately 120 lactating cows. There are no lactating herds outside of the barns. Barn 2 is a newer facility, also designed by Gerald R. Bodman, consisting of a milking parlor, two confinement barns, eight exercise lots, one springer pasture, one dry cow pasture, one bull pasture, one pot herd pasture and one sprayfield. The eight exercise lots are covered with a geotextile "cow carpet". Three exercise lots are each equipped with a cooling pond dug into the groundwater table. The geotextile fabric has been cut away from the sides of the ponds because when it is wet it is too slippery for the cows to walk on. Three exercise lots do not have cooling ponds. The remaining two exercise lots share an aboveground, concrete, "swimming pool" cooling pond directly connected to one of the barns.

3.2.2 Waste Management System

The waste management system for Barn 2 also consists of three lagoons and a sprayfield. Again, the three lagoons are connected, in series, by culverts. The first lagoon is approximately 17 feet deep with a surface area of 6.83-acres. The second lagoon is 14 feet deep with a surface area of 2.99-acres. The third lagoon functions as a storage pond and is 6 feet deep with a surface area of 4.66-acres. The waste storage pond is equipped with two pumps: one is used to recycle water to the barn flush tanks, the other pumps the effluent to the Barn 2 sprayfield. Manure from the milking parlor and the confinement barns is removed hydraulically. The Barn 2 milking parlor is flushed with fresh water that is discharged into the first lagoon. The two confinement barns are designed so that they may be flushed with either fresh water or recycled effluent. However, the recycle pump is not

capable of filling all four flush tanks. Therefore 1.5 tanks use recycled water and the other 2.5 tanks use fresh water. The confinement barns are not guttered. The runoff from the barn roofs flows across the pasture and into the waste management system.

The Barn 2 sprayfield is a 130-acre field with a center-pivot spray irrigation system underlain with drain tiles. The sprayfield is planted with stargrass and is harvested for silage. The stargrass is harvested every 30 days from May through the middle of November. On average the farm harvests 10 tons of dry matter per acre per year of stargrass. From mid-November to April the sprayfield is overseeded with ryegrass. On average the farm harvests 3 tons of dry matter per acre per year of ryegrass.

The concrete cooling pond is filled with fresh water and is emptied weekly. To empty the cooling pond, valves in the bottom are opened that allow the water to flow through the south barn and into the first lagoon.

4.0 Current Permit Status

All of the property owned by Davie Dairy, 3410-acres, is permitted under Florida Department of Environmental Protection (FDEP) permit (Appendix A). This area is divided between two permits: FDEP permit number IO47-206120 for Barn 1, and FDEP permit number IO-47-179196 for Barn 2.

5.0 Soil Conditions

The dairy is predominantly underlain by flatwood soils. Immokalee and Myakka fine sands make up the majority of the open pasture areas while Basinger and Placid soils make up the majority of the slough and isolated wetlands (Figure 5-1). The Immokalee and Myakka soils are poorly drained soils with an organic pan at a depth of 20 to 24 inches. These soils are rapidly permeable with a low water capacity and low organic content. The water table is normally at a depth of 30 inches, but may vary from a depth of 6 inches to 60 inches from wet to dry season. Water table depth within the slough and wetland soils range from flooded to 24-inches below ground surface. Localized interflow in the upper sandy soil horizons is limited unless drainage ditches or subsurface drains are present. Most discharge comes from surface runoff when the water tables approach ground surface.

The Immokalee and Myakka soils have a dual NRCS hydrologic group rating of B-D, which means the soils are very poorly drained (D) and produce high runoff in their native state, but become moderately well drained (B) and produce less runoff if ditched. The remaining wetland soils have a hydrologic group rating of D, which means they have a high runoff potential.

The sandy A and E surface horizons of these soils typically have low P retention and therefore can leach P if P loads exceed crop intake.

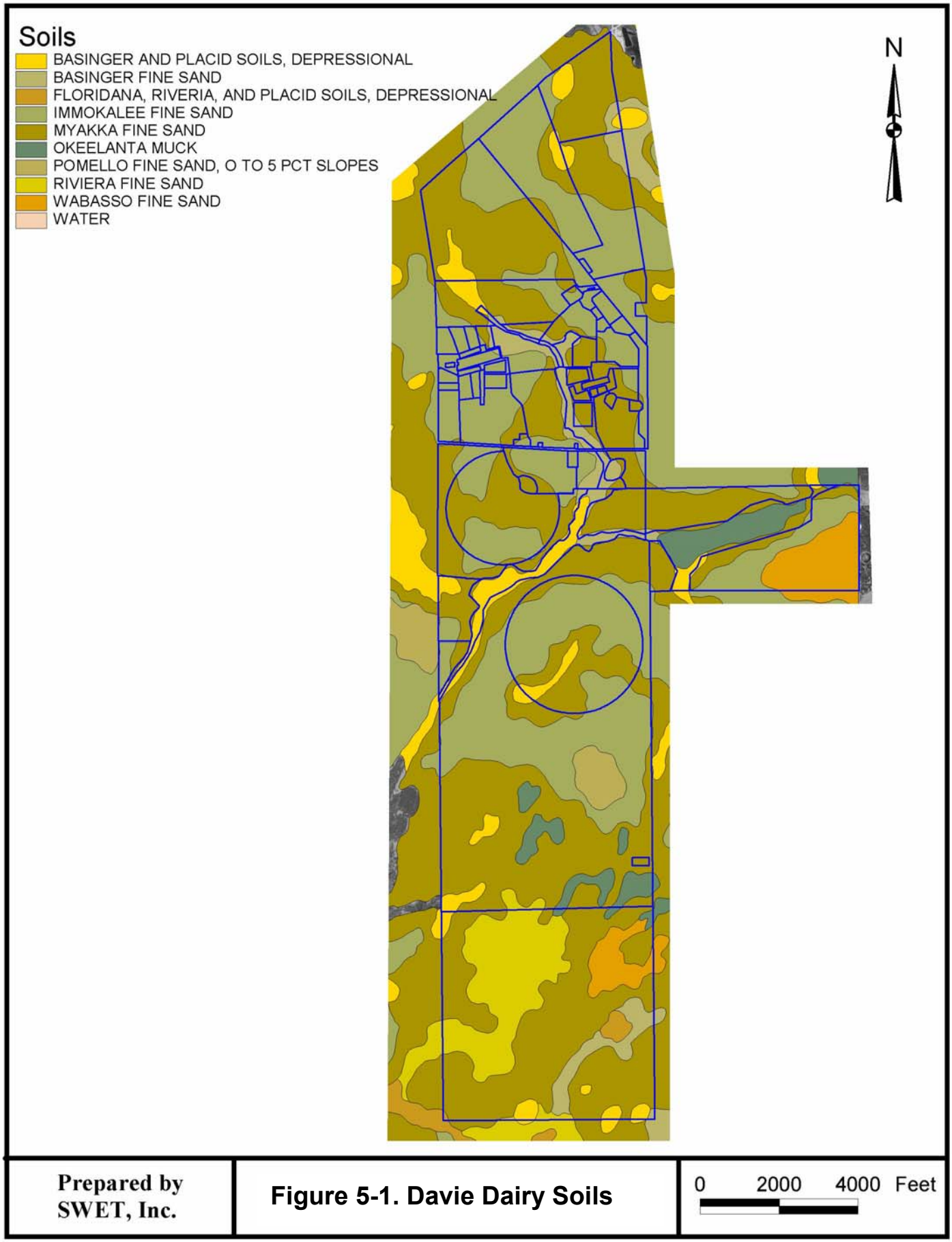


Figure 5-1. Davie Dairy Soils

6.0 Hydrology and Topography

The flatwood soils on the dairy have surface gradients of less than 3 ft per mile and topographic elevations range from 34 to 38-ft NGVD. Topographical maps of the dairy are too coarse to provide anything other than a very general flow direction and therefore are not presented. The actual drainage basin boundaries are extremely hard to delineate due to the flat terrain and numerous isolated wetlands. In some cases, the flow direction can vary depending on the rainfall pattern. Therefore, the flow paths and basins (Figure 6-1) were based on the dairyman's observations of flow direction during storm events. The ditch running east and northeast of Barn 1 in Basin 1 is shown flowing to the northeast, but may flow in the opposite direction during wet conditions. The isolated wetlands in Basins 1 & 2 can hold a significant amount of water from nearby runoff before discharging off of the farm. This means that the better-drained pastures and sprayfields generate runoff before the areas around the isolated wetland areas without drainage ditches.

The dairy is composed of five drainage basins that discharge from the dairy property at several different locations (Figure 6-1). Basins 1, 2, and 3 may receive stormwater runoff from basins of unknown area to the north and west of the dairy. In Basin 1, the ditch that collects the drainage from the area around the calf hutches (Figure 6-1) may flow north to a wetland adjacent to the farm, then through a system of interconnected wetlands, and eventually back through Basin 3 in Nubbin Slough. A small area to the west drains to the ditch on the western boundary of Basin 2 as shown in Figure 6-1. Basin 2 collects the majority of the runoff from the dairy and routes it into Basin 3, which is a portion of Nubbin Slough. The Barn 2 sprayfield underdrains also discharge through Basin 3.

In addition to the farm area, an estimate of the areas draining to the monitoring point is necessary to develop a conceptual management plan. An estimated 1,287 acres of farm property currently contribute to the discharge monitoring point (Table 6-1). The area of the dairy drained via the slough was estimated as the sum of 100 percent of Basin 2 plus 66 percent of Basin 3. Basin 4 primarily drains through the sprayfield for Barn 1 (208 acres see Table 6-1) and a drainage ditch that enters Nubbin Slough below the monitoring point. Basin 5 is pasture area used for low-density (< 1 cow per acre) beef and heifer grazing area. This basin does not contribute to the calculated amount of dairy runoff entering Nubbin Slough.

7.0 Water Quality Data

Water quality data are available for several points in Basin 3 (Figure 6-1). The points are located either within Nubbin Slough or immediately adjacent to the slough (Figure 6-1), including the sampling station used to monitor for compliance with the current dairy rule (Figure 7-1: TCNS 241). Only the data collected during the last five years (1996 – present) was analyzed because it reflects the period during which there was full implementation of

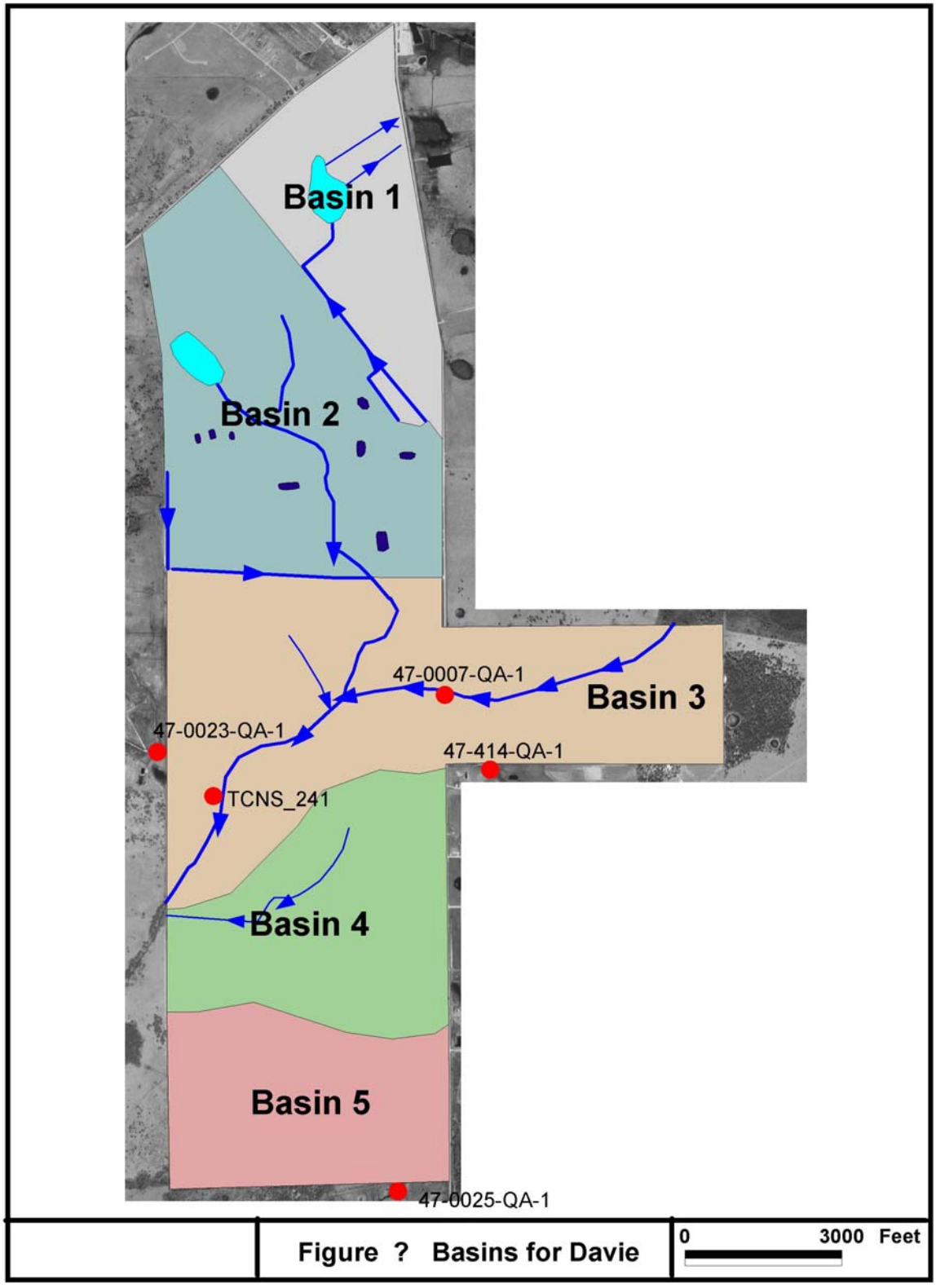


Figure ? Basins for Davie

TABLE 6-1.
Davie Dairy SUB-BASIN acres and acres contributing to the SFWMD monitoring point (See Figure 4 for Basin Locations)

Accurate drainage is difficult to discern due to flat topography. Comments indicate the owner's observation of the drainage patterns.

Basin #	Area (acres)	Acres Contributing to Monitoring Point	Comments
1	360	0	Drainage flows off the farm to the northeast, through a series of interconnected wetlands, eventually entering Nubbin Slough.
2	687	687	Basin contains the densely populated areas of the dairy
3	909	600	Approximately 30% of basin drains to Nubbin Slough prior to the main farm drainage ditch, and the monitoring point.
4	454	0	Sprayfield and low-density beef cattle grazing area, that drains into Nubbin Slough below the monitoring point.
5	1000	0	Low density beef cattle grazing area that drains into main stream below the monitoring point
TOTAL	**3410**	**1287**	
Estimate of upstream drainage flowing onto the farm		2500	Nubbin Slough drains a large area east and north of the dairy. 2500 acres is a conservative estimate of the area drained by the slough at the point of entry to the dairy in Basin #3.

BMPs associated with the current dairy rule. Other data evaluated includes data available from monitoring wells in the sprayfields and elsewhere on the farm.

As noted above, the runoff reaching compliance site TCNS 241 is a combination of two sources, Davie Dairy and drainage from other property. The other property is primarily beef cattle pasture with isolated wetlands draining into Nubbin Slough east and north of the dairy.

The average total phosphorus (TP) measured from Sprayfield 1 was much lower than the average value for Sprayfield 2 (Table 7-1), suggesting that Sprayfield 2 may have been overloaded. However, it is difficult to confidently make this conclusion with only one sampling point. The average TP values from other wells on the property were not surprising. The high value for Davie 2, MW2 is expected given that the well is located in the berm for the second lagoon.

Nubbin Slough monitoring data for the dairy (Figure 6-1) show that the runoff concentrations for the past few years have been relatively constant. The data generally vary between 0.5 and 1.5 mg/L TP, with occasional higher excursions.

TABLE 7-1
Davie Dairy Surface and Groundwater Quality Information, 1996 To Present

Dairy	Sample Site	Sample type	Average TP (mg/l)	Sample size
Compliance site*	TCNS 241	Surface water	0.819	87
Background site	47-0007-QA-1	Surface Water	0.267	14
Davie 2	MW2	Well in lagoon berm	10.80	1
Davie 2	MW2A	Well adjacent to storage pond	2.36	
Davie 2	MW3	Well in Sprayfield 2	1.37	
Davie 2	WSP	Effluent to Sprayfield 2	13.59	
Davie 1&2	MW1	Background	0.18	8
Davie 1&2	MW2	Well adjacent to storage pond	0.081	13
Davie 1	MW3	Well in Sprayfield 1	0.094	8
Davie 1	MW4	Well adjacent to lagoon	0.13	11
Davie 1	WSP	Effluent to Sprayfield 1	16.78	13

8.0 Nutrient Balance for Dairy

The nutrient of interest for the dairy is phosphorus. There are three reasons for selecting phosphorus: (1) The South Florida Water Management District has determined that phosphorus is the critical nutrient to be controlled for the restoration of Lake Okeechobee. (2) The Florida Department of Environmental Regulation's TMDL program has targeted phosphorus the critical nutrient for the Okeechobee basin. (3) The low nitrogen to phosphorus ratio, and high nitrogen volatilization, of cow manure means that nitrogen applications from manure will always be below crop needs if phosphorus applications are limited to agronomic rates. For these reasons only the phosphorus budget is presented in this assessment. The phosphorus budget for Davie Dairy is based on dairy records, as much as possible, and literature values where actual data are not available. The dairy has good records for purchased amounts of feed, fertilizer, and other commodities as well as milk production. Limited data are available for crop yields and related phosphorus recycling on the farm. Phosphorus budgets were generated for the entire dairy and for the individual fields and facilities on the dairy.

* Compliance site refers to the SFWMD compliance sampling point.

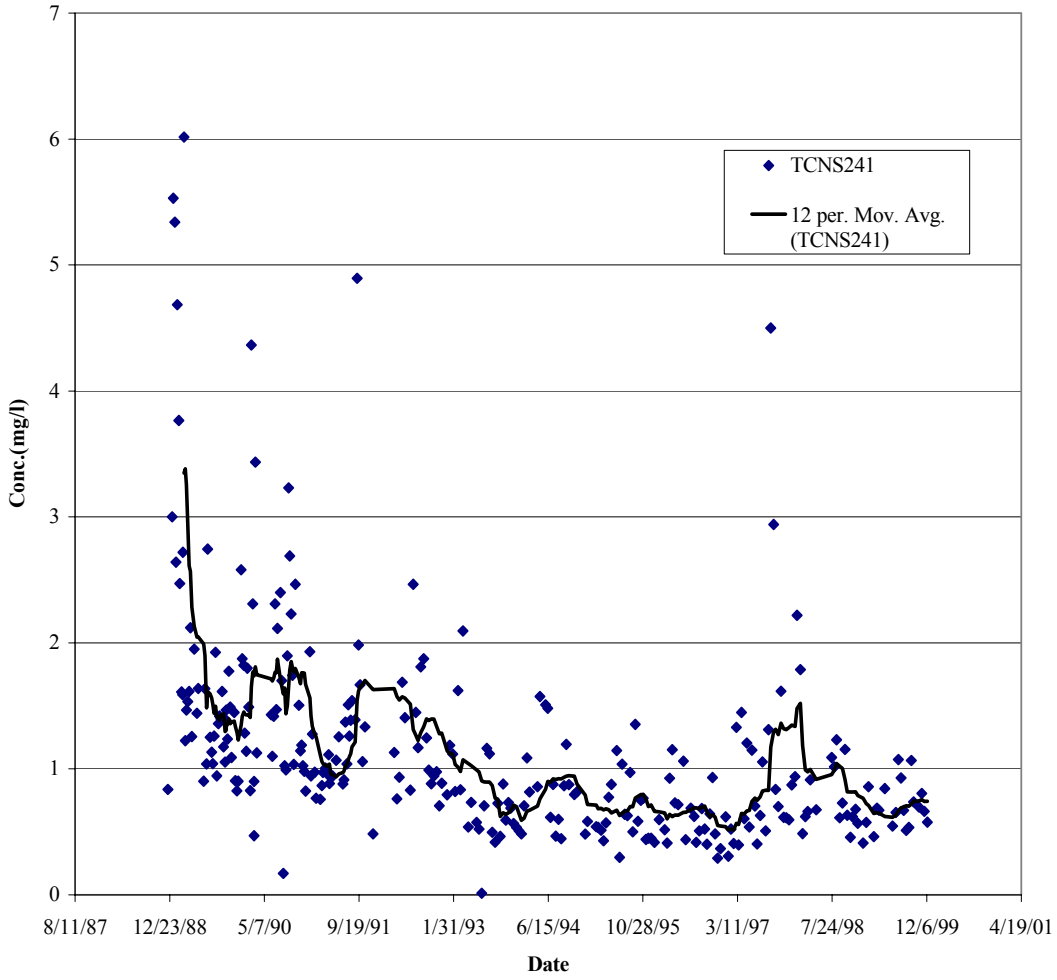


FIGURE 7-1. TP data from SFWMD sampling point for Davie Dairy - TCNS 241.

9.0 Farm Level Phosphorus Budget

The overall farm phosphorus budget is presented in Table 4. It was determined by assessing the following phosphorus imports and exports for the dairy.

Phosphorus Imports to Dairy
- Purchased Feed and Mineral Supplements
- Fertilizer and Soil Amendments

Animal Replacements
- Detergents and Cleaners
- Rainfall

Phosphorus Exports from Dairy
- Milk Production
- Beef Cows Sold
- Culled Cows
- Dead Cows
- Stormwater and sprayfield runoff

Section 9.1 presents the assumptions and calculations used to determine the phosphorus imports. Section 9.2 presents the assumptions and calculations used to determine the

phosphorus exports. Section 9.3 provides a more detailed discussion of the overall phosphorus budget and phosphorus recycling on the dairy.

9.1 Phosphorus Imports

The phosphorus imported in purchased feed and mineral supplements represent the majority of the imported phosphorus and therefore was evaluated in detail (Table 9.1). The amount of feed brought onto the dairy for the various animals was evaluated for phosphorus content. Tables 9-2 and 9-3 provide the feed ration for lactating cows, dry cows, springers/heifers, and horses, respectively. These rations show both purchased feed and feed grown (recycled) on the dairy through silage and hay production. These tables provide the estimated annual "as fed" feed amounts for the different animal types based on the feed ration. Table 9-4 summarizes the annual amount of phosphorus imported onto the farm for each animal group.

Fertilizer and soil amendments account for approximately 4 percent of the phosphorus imported onto the dairy. Table 9-5 and Figure 9-1 present information regarding the amount of phosphorus applied to each field. For the purpose of this section the relevant columns are the fertilizer application columns. However, this table also presents phosphorus-recycling information that will be discussed in Section 9.3.

The second largest phosphorus import is in the form of animal replacements. This quantity is lower than most dairies because the Davie Dairy raises a significant number of calves to maturity. Table 9-6 summaries the number of animal replacements and the associated phosphorus imported with these animals.

Dairy records regarding the amount of detergents and cleaners purchased were evaluated. Based on the MSDS, it was determined that the products used by the dairy do not contain phosphoric acid or any other phosphorus-containing compound.

TABLE 9-1. Overall Dairy Phosphorus Balance, Davie Dairy ANMA

Budget Category		Annual P Balance (lbs./yr.)	Percent of Total
P Imports to Dairy			
Purchased Feed and Mineral Supplements		200594	90%
Fertilizer and Soil Amendments		9321	4%
Animal Replacements		11752	5%
Detergents and Cleaners[1]		0	0%
Runoff flowing onto Dairy		0	0%
Rainfall P[2]		2300	1%
	Total P Imported	223967	100%
P Exports from Dairy			
Milk Production[3]		36000	65%
Beef Cows Sold		2464	4%
Culled Cows		7598	14%
Dead Cows		1355	2%
Runoff		8375	15%
	Total P Exported	55791	100%
On-Farm Accumulation of P (Import - Export)		168176	168176

1 Dairy eliminated phosphoric acid based cleaner at both dairy centers c. 1999.

2 Assumes annual rainfall on 3509 acres is about 48 in/yr. with a P concentration of about .06 mg/l, which would yields about 1500 lbs.-P/yr. or about .5 lbs./ac

3 Based on 18700 lbs./cow/year & 960 cows at Barn 2 and18800 lbs./cow/year & 960 cows at Barn 1. Assume milk P content of 0.1%

TABLE 9-2. Estimated Phosphorus Content of Imported Feed Ration for Cows, Davie Dairy ANMA

Group	Haylage	Dry Matter	P by DM	P in Haylage	Import Dry Matter	P imported feed	P in import Feed	Total P
	(lbs./cow/day)	%	%	lbs./cow/day	(lbs./cow/day)	%	(lbs.-P/day/cow)	(lbs.-P/day/cow)
High Cows	40	28%	0.2%	0.022	46.9	0.34%	0.182	0.204
Medium Cows	35	28%	0.2%	0.020	38.7	0.38%	0.167	0.186
Low Cows	25	28%	0.2%	0.014	29.3	0.42%	0.137	0.151
Dry	28	28%	0.2%	0.016	11.7	0.39%	0.061	0.077
Springers	20.7	28%	0.2%	0.012	19.5	0.42%	0.093	0.105
Heifers - Breeding	20.7	28%	0.2%	0.012	12.8	0.47%	0.072	0.083
Heifers - Pastures	20.7	28%	0.2%	0.012	11.7	0.53%	0.074	0.085
Calves - Paddocks				0.000	9	0.67%	0.060	0.060

Feed information provided by Dr. Chalupa, Nutritionist, University of Pennsylvania

Note: Waste feed from the barns is fed to the bred heifers in the East Pasture and the springers behind the office.

TABLE 9-3. Estimated Phosphorus Content of Total Feed Ration for Horses, Davie Dairy ANMA

Feed Stuff*	"As Fed" Feed	P in feed**	Dry Matter ***	P by DM	Dry Matter Intake	P in Feed
	(lbs./day)	%	%	%	(lbs./day)	(lbs.-P/day/horse)
Horse Feed	8.5	0.56%	93%	0.61%	7.8625	0.048
Hay - Bales	8	0.22%	88%	0.25%	7.04	0.018
Pasture Grass	8	0.06%	20%	0.30%	1.6	0.005
Total Ration	24.5	0.29%	67%	0.42%	16.5025	0.070

TABLE 9-4. Annual Amount of Imported P in Feed for Both Barns, Davie Dairy ANMA

Animal	Number of Animals	Total lbs./year
High Cows	1190	88720
Medium Cows	476	32361
Low Cows	241	13288
Dry	150	4215
Springers	205	7863
Heifers - Breeding	200	6084
Heifers - Pastures	663	20617
Calves - Paddocks	804	17696
Horses	5	128
Beef	430	9623
Total	3929	200594

TABLE 9-5
Phosphorus Loads to Fields, Davie Dairy ANMA

Field	Drains to:	Primary Use	Acreage (ac)	Manure Deposition		Fertilization		Lagoon Effluent		Total P Load	
				(lbs.-P/ac/yr.)	(lbs.-P/yr.)	(lbs.-P/ac/yr.)	(lbs.-P/yr.)	(lbs.-P/ac/yr.)	(lbs.-P/yr.)	(lbs.-P/ac/yr.)	(lbs.-P/yr.)
Barn 1 Exercise Lots											
HIA1-1	Lagoon 1-2	Exercise lot	0.93	2500	2325		0		0	2500	2325
HIA1-2	Lagoon 1-2	Exercise lot	0.86	2703	2325		0		0	2703	2325
HIA1-3	Lagoon 1-1	Exercise lot	0.78	2980	2325		0		0	2980	2325
HIA1-4	Lagoon 1-1	Exercise lot	1.41	1759	2480		0		0	1759	2480
HSP-2	Barn 1 Lagoon 1	Pasture	0.75	34	26		0		0	34	26
HSP-3	Barn 2 Lagoon 1	Pasture	0.75	34	26		0		0	34	26
		Subtotal	**5.48**								
Barn 1 Outside Pasture											
LP1-2	Lagoon 1-2	Pasture	10.79	546	5889		0		0	546	5889
PH1-1	Lagoon 1	holding pen	0.32	4036	1292		0		0	4036	1292
LP1-3	Eastern road swale	Pasture	30.21	219	6613		0		0	219	6613
SP1-1		Pasture	18.66	206	3836		0		0	206	3836
DP1-1	slough	Pasture	52.72	75	3934		0		0	75	3934
		Subtotal	**71.38**								
Barn 2 Exercise Lots											
HIA2-1	slough	Exercise lot	2.22	810	1798		0		0	810	1798
HIA2-2	slough	Exercise lot	3.15	571	1798		0		0	571	1798
HIA2-3	slough	Exercise lot	4.71	382	1798		0		0	382	1798
HIA2-4	west road ditch/slough	Exercise lot	3.33	540	1798		0		0	540	1798
HIA2-5	slough	Exercise lot	6.81	264	1798		0		0	264	1798
HIA2-6	slough	Exercise lot	5.06	337	1705		0		0	337	1705
HIA2-7	slough	Exercise lot	3.71	460	1705		0		0	460	1705

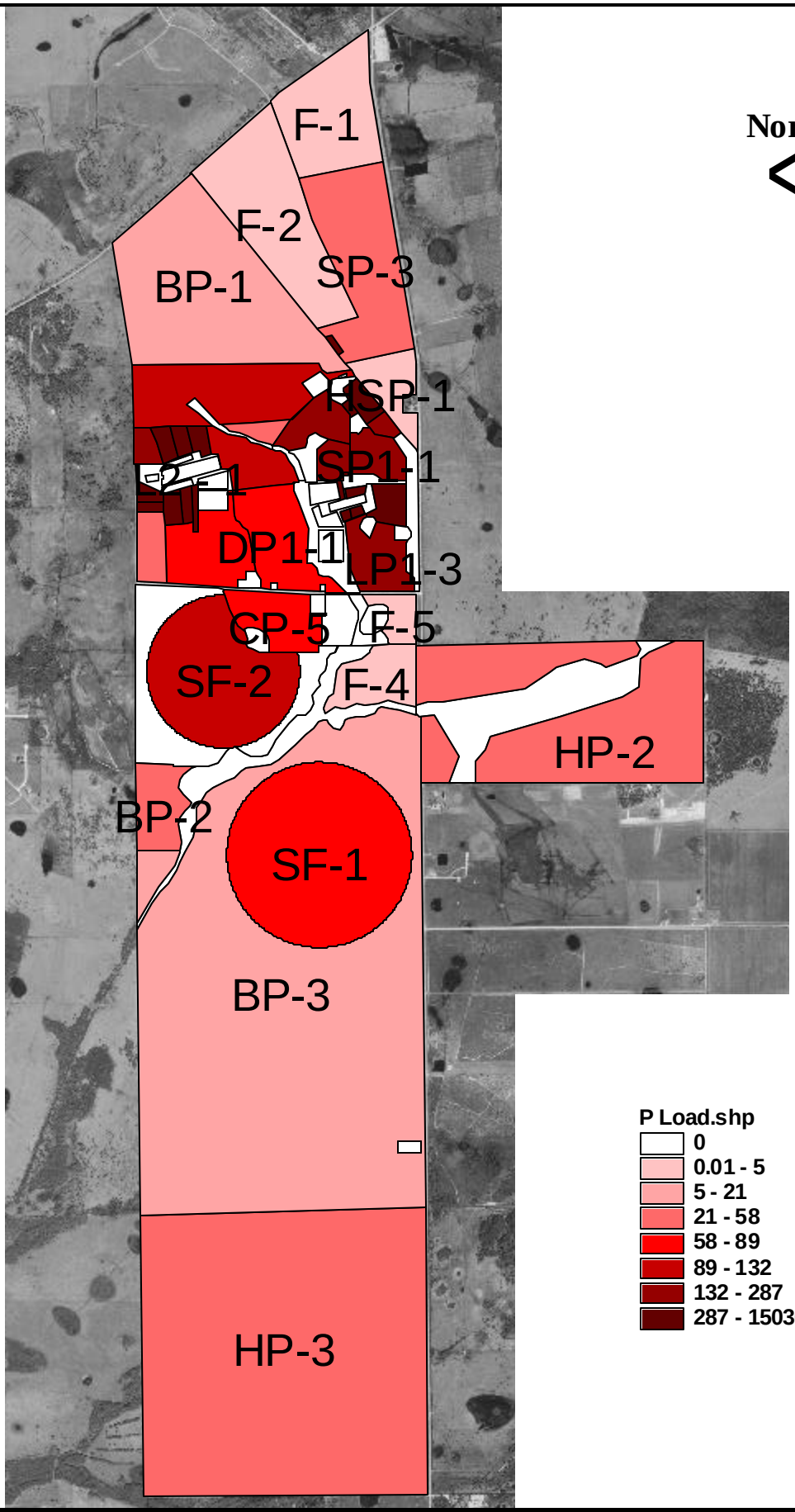
TABLE 9-5
Phosphorus Loads to Fields, Davie Dairy ANMA

Field	Drains to:	Primary Use	Acreage (ac)	Manure Deposition		Fertilization		Lagoon Effluent		Total P Load	
				(lbs.-P/ac/yr.)	(lbs.-P/yr.)	(lbs.-P/ac/yr.)	(lbs.-P/yr.)	(lbs.-P/ac/yr.)	(lbs.-P/yr.)	(lbs.-P/ac/yr.)	(lbs.-P/yr.)
HIA2-8	slough	Exercise lot	4.63	425	1968		0		0	425	1968
		subtotal	**33.62**								
Barn 2 Outside Pasture											
PH2-1	west road ditch	Exercise lot	2.18	592	1292		0		0	592	1292
BLP2-1	west road ditch	Exercise lot	15.83	27	422		0		0	27	422
DP2-1	slough		46.55	75	3513		0		0	75	3513
SP2-1	slough	Pasture	19.99	201	4027		0		0	201	4027
		subtotal	**84.55**								
Calves											
CP-1	Northeast	Hutches	1.12	2786	3120		0		0	2786	3120
CP-2	Northeast	Paddocks	7.11	366	2600		0		0	366	2600
CP-3	Northeast	Paddocks	1.19	819	975		0		0	819	975
CP-4	Northeast	Paddocks	4.06	192	780		0		0	192	780
CP-5	slough	Pasture	35.19	85	2977		0		0	85	2977
		subtotal	**48.67**								
Horses											
HSP-1	Behind office	Pasture	27.95	3	77		0		0	3	77
		subtotal	**27.95**								
Heifers											
HP-1	slough	Pasture	118.18	97	11507	4	463		0	101	11970
HP-2	slough	Pasture	242.3	32	7671	5	1270		0	37	8941
HP-3		Pasture	654.82	23	15342		0		0	23	15342

TABLE 9-5
Phosphorus Loads to Fields, Davie Dairy ANMA

Field	Drains to:	Primary Use	Acreage (ac)	Manure Deposition		Fertilization		Lagoon Effluent		Total P Load	
				(lbs.-P/ac/yr.)	(lbs.-P/yr.)	(lbs.-P/ac/yr.)	(lbs.-P/yr.)	(lbs.-P/ac/yr.)	(lbs.-P/yr.)	(lbs.-P/ac/yr.)	(lbs.-P/yr.)
		subtotal	**1015.3**								
Springer Pasture											
SP-3	Northeast	Pasture	109.88	57	6252		0		0	57	6252
		subtotal	**109.88**								
Beef Pasture											
BP-1	slough	Pasture	211.16	15	3218		0		0	15	3218
BP-2	slough	Pasture	103.6	39	3990		0		0	39	3990
BP-3	slough	Pasture	726.6	5	3516		0		0	5	3516
		subtotal	**1041.36**								
Hay Fields											
F-1	Northeast	Hay	120.62	0	0	5	632		0	5	632
F-2	Northeast	Hay	84.05	0	0	5	440		0	5	440
F-3	slough	Haylage	60	0	0		0		0	0	0
F-4	slough	Haylage	35.25	0	0	5	185		0	5	185
F-5	slough	Haylage	13.92	0	0	5	73		0	5	73
		subtotal	**313.84**								
Sprayfields											
SF-1	slough	Haylage	218.1	0	0	22	4885	67	14613	89	19498
SF-2	slough	Haylage	129.94	0	0	11	1372	113	14683	124	16055
		subtotal	**348.04**								
		total	**3100**		**116713**		**9321**		**29296**		**145825**

*Dairy recently purchased a manure spreader to apply solids from breaking barn. No solids application occurred before the manure spreader was purchased.



Prepared by
SWET, Inc.

Figure 9-1. P Load (lbs/ac/yr) by Field
Davie Dairy ANMA

1000 0 1000 Feet

TABLE 9-6. Phosphorus Imports and Exports in Animal Body Mass, Davie Dairy ANMA

Animal Type	Avg. Weight (lbs.)	# of Animals (#/year)	P Content (lbs./yr.)
Imported Animals			
Replacement Heifers and Cows	1100	381	2931
		Subtotal	2931
Exported Animals			
Culled Cows Sold	1500	724	7598
Dead Cows Sent to Landfill	1500	129	1355
Calves Sold	60	800	336
Beef Cows Sold	800	440	2464
		Subtotal	11752

9.2 Phosphorus Exports

Phosphorus is exported from the dairy in three forms: milk, animal tissue, and runoff. Dairy records show that milk production is 18,700 lbs./cow/year for the 960 cows at Barn 2 and 18,800 lbs./cow/year for the 960 cows at Barn 1. Phosphorus content of the milk is assumed to be 0.1 percent. Based on these numbers, each year 36,000 pounds of phosphorus are exported from the dairy in the form of milk.

Table 9-6 presents the number of animals exported from the Davie Dairy property each year. In order to estimate the pounds of phosphorus exported in the form of animal tissue, typical weights for these types of animals, and phosphorus content of 0.7 percent were assumed.

The final component of the amount of phosphorus exported is the runoff, which is defined as the amount of phosphorus that is transported off the farm in water. The runoff was estimated as the sum of runoff from the Barn 1 and 2 area plus the runoff from the rest of the farm property and the P in Nubbin Slough. The runoff for the Barn 1 and 2 area is calculated as 1,287 acres (see Table 6-1) draining water with a concentration of 1.89 mg/L TP.

The estimated TP runoff concentration (Table 9-7) was calculated using the known concentrations of the two Nubbin Slough sampling points (Table 7-1: Compliance site TNCS and Background site 47-007-QA-1) and their estimated contributing areas. The compliance site concentration is the result of farm drainage through the main farm ditch (draining about 1,287 acres – Table 6-1) mixing with water coming based on the Nubbin Slough drainage areas to the east and north. This area was estimated as 2,500 acres from examination of aerial photography. The main farm ditch concentration was calculated as the difference between the estimated TP load at the compliance and monitoring sites

divided by the estimated runoff volume from the area drained by the main farm ditch. Rainfall runoff was assumed to be 10 inches per year.

TABLE 9-7
Estimated Total Phosphorus Runoff Concentration*

Water Quality Site	Contributing Acres	Concentration (mg/L TP)	TP Load
Monitoring Site	3,787	0.819	7,030
Background Site	2,500	0.267	1,507
Main Farm Ditch at Nubbin Slough	1,287	1.890 (estimated)	5,523
Remainder of farm	2,123	0.267 (estimated)	1,285

*Calculation of TP concentration in main farm ditch at Nubbin Slough. The volume of runoff is assumed to be 10 inches per year over the contributing area.

The runoff from the farm property that does not drain to the main ditch was assumed to have a concentration of 0.267 mg/L TP, which is the same concentration as the background monitoring point (see Table 7-1). The farm runoff estimated in Table 9-1 is the sum of the TP load for the main drainage ditch and the load from the remaining farm acreage.

9.3 Phosphorus Balance

The overall dairy phosphorus balance (Table 9-1) shows that the dairy imports approximately 223,967 lbs. of phosphorus per year while exporting approximately 55,791 lbs. per year. This leaves an on-farm accumulation of phosphorus of about 168,176 lbs. per year.

The Davie Dairy property is 3,410 acres. If the phosphorus were evenly distributed across the entire 3,410 acres owned by Davie Dairy the loading rate would be a reasonable 47 lbs.-P/ac. However, the dairy was not designed to evenly apply phosphorus, nor is it practical to do so. Therefore, it is necessary to examine the amount of phosphorus applied to each field in order to identify possible trouble spots. Table 9-5 provides detailed information regarding the amount of phosphorus applied to each field and the form it is applied in: manure deposition, commercial fertilizer, or lagoon effluent.

Manure excreted by cattle is the primary source of phosphorus applied to the fields at Davie Dairy. As there is not a practical means to directly measure the amount of phosphorus applied to the fields in manure, this value was conservatively calculated as the phosphorus ingested as feed minus the phosphorus exported in milk, where applicable. It is important to note that phosphorus accumulation in body mass is negligible for daily excretion rates however it was accounted for in the annual overall dairy phosphorus budget. The P excretion rates compare favorably with IFAS estimates (Van Horn, et al. 1998), but were slightly higher than NRCS (1992) and ASAE (1996) standards for animal manure characteristics.

FDEP reports provided the amount of fertilizer applied to the sprayfields. Mr. Rutledge provided estimates of the amount of fertilizer applied to the remaining hayfields. The only fields that received phosphorus fertilizer were the sprayfields and hayfields. Phosphorus fertilizer is necessary in these areas because crop needs exceed the available phosphorus from the waste pond effluent.

FDEP reports were also used to calculate the amount of phosphorus applied to the sprayfields in the form of lagoon effluent. The total gallons applied for that quarter was multiplied by the concentration of the lagoon effluent to obtain a loading in pounds.

The calculated loading rates were checked against "ideal" application rates of 45 lbs. P/ac for pasture grasses and 60 lbs P/ac for forage production fields, such as the sprayfields. We realize that this rate may be high, but are following Dairy Rule guidance until NRCS provides new pasture loading recommendations. Compared to these values the sprayfields, exercise lots and lactating herd outer pastures have excessive phosphorus loads. However, the loadings presented in Table 9-5 represent the total phosphorus applications to the fields, which includes P that might become sequestered in the wetlands or cooling ponds within the pasture. The "ideal" phosphorus application rates are based on potential crop phosphorus uptake plus in-soil retention. (A more in-depth discussion on phosphorus application rates is presented in the next section.) It is anticipated that phosphorus loading in the open grassed pasture areas would be only about 70 to 80 percent of the values shown due to cooling pond and localized phosphorus accumulation within HIAs. Even with this phosphorus sequestering the sprayfields, exercise lots and outer lactating herd pastures are out of balance. The dry cow pastures and springer pastures also need to be addressed.

10.0 Management Alternatives for Achieving Discharge Goals

10.1 Overview

The previous sections have characterized the dairy and identified the high phosphorus source areas. The goal of reducing P levels in discharge waters from the dairy to 40 ppb means that the dairy will have to implement practices and technologies that will reduce the current discharge P levels by up to 95 percent at monitoring point TCNS 241. To achieve these levels of reduction, technologies beyond the conventional BMP practices are required. Data from various IFAS research projects indicate that conventional practices (manure collection, storage, and land application at agronomic rates) can only achieve P discharge concentrations of between 300 to 900 ppb depending on soils, grazing density, and crops. These research projects do not address problems of historical residual P. Therefore, it becomes clear that conventional practices alone are not able to achieve the ultimate TP goal of 40 ppb. However, these practices can provide significant reductions over existing conditions.

The P balance assessment for the dairy's current operations clearly indicates that the sprayfields, exercise lots and outer lactating pastures are the areas of concern. These pastures are receiving P loads in excess of an agronomic balance. Dry cow and springer pastures are also high, but are more easily addressed. The P loads of most other fields' (hay and beef pastures) are currently in agronomic balance with respect to P loading, or

are loaded below the maximum agronomic rate. The high P loads in the lactating pastures, added to the historical practices (prior to Dairy Rule BMPs) of direct barn discharges and unmanaged HIA drainage, have resulted in a significant amount of P accumulated in both the lactating pastures the slough draining the dairy. The transport concern for these pastures is for surface runoff rather than groundwater. The flatwood soils on the dairy have extremely low groundwater gradients, creating little if any offsite ground flow. The residual historical P means that bringing the dairy into compliance requires addressing both the historical P as well as improving the current P balance on the dairy.

10.2 Improved Phosphorus Management Plan for Davie Dairy

The purpose of the Dairy best available technology (BAT) project is to evaluate three farms for P management conditions, to identify technologies which cost-effectively deal with the primary problems on each farm, and to test those technologies. The first step in the process is to make a detailed assessment of the phosphorus conditions and balance on each farm selected. The assessment of Davie Dairy identified a variety of problems including:

- Pastures that are out of agronomic balance with respect to phosphorus
- Sprayfields that are out of agronomic balance
- Stormwater ditches that drain off the farm in several directions, making capture of runoff more difficult.
- Stormwater runoff TP concentrations in excess of the current and proposed targets
- Excessive use of groundwater for barn flushing

The technologies proposed for implementation at Davie Dairy include chemical treatment of stormwater runoff, structural changes to improve farm water balance and agronomic P balance, and changes to drainage patterns on the farm. The funds available through the Dairy BAT project are sufficient to identify general problems and to test specific technologies, but are not necessarily sufficient to implement comprehensive solutions.

At Davie Dairy, conventional agronomic practices have the potential to reduce P discharges by 70 percent once the dairy comes to equilibrium. However, due to high residual P in the fields and streams, it might take years to achieve this equilibrium. An edge-of-farm stormwater detention and treatment system is proposed to further reduce P concentrations in runoff, provide material for the treatment of excess phosphorus in the fields, and provide additional water for irrigation and other reuse purposes.

11.0 Proposed Technologies

11.1 Best Available Technology - Edge-Of-Farm Treatment

Edge of farm treatment of runoff is the highest ranked method to reduce phosphorus discharge from the farm. The basic design, (Figure 11-1) includes the following:

- Interception of farm field runoff in a stormwater pond

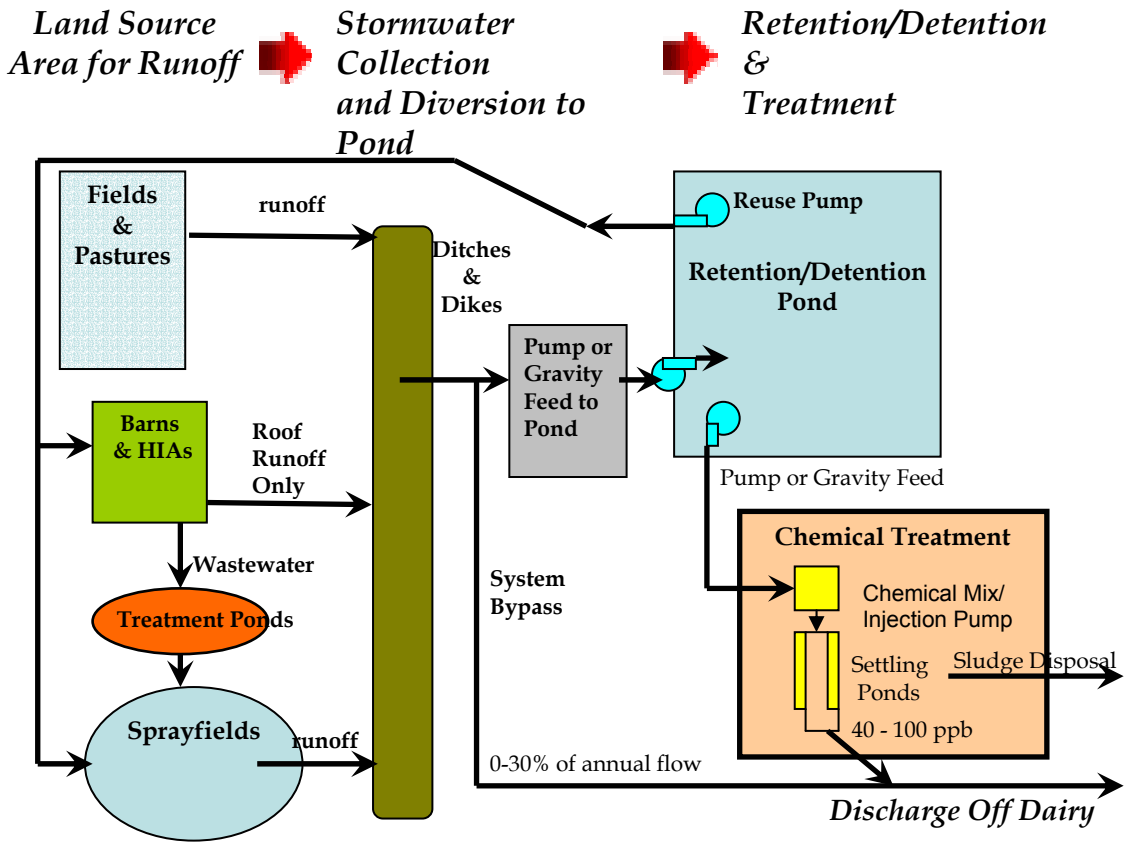


FIGURE 11-1. Conceptual Design for an Edge-Of-Field Treatment System at Davie Dairy.

- Ditching around sprayfields to intercept runoff and seepage, returning that water to the stormwater pond
- An alum injection system for treatment of stormwater pond discharge.
- A settling pond for collection of alum floc prior to final discharge.
- Piping to provide reuse water from the stormwater pond to the sprayfield and barn water reuse system

For Davie Dairy, the edge of farm treatment might be placed in Basin 2 east of the main farm drainage ditch and north of Nubbin Slough (Figure 6-1). The stormwater runoff pond could be located west of the existing sprayfield for Barn 2 and across the slough from the Barn 1 sprayfield. Included in the pond area is an abandoned lagoon that would have to be treated with alum to ensure permanent storage of P present within the lagoon borders if this area is used for a pond.

The stormwater runoff pond would have a discharge/ alum treatment system including an alum injection system, alum storage tanks, and two 5,000-gpm pumps, to provide treatment of up to one inch of stormwater runoff in three days or less. A settling pond 2.5 acres and 6-feet deep could provide alum floc removal prior to final discharge of the

water to Nubbin Slough. A second settling pond would be constructed to provide for continuous service when the first is taken offline for management.

Both sprayfields would be ditched to collect any runoff, which would then be pumped back into the storage pond. Stormwater pumped into the new pond would be pumped, as needed, to the third waste cells for Barn 1 and Barn 2 waste systems. There, it could be used instead of groundwater currently being pumped as flushwater, improving the overall water balance. This would also reduce the hydraulic loading of the sprayfields. Storage of the water prior to recycling may also decrease P concentrations slightly but is not expected to have a major impact on the overall P budget.

A cost estimate for an edge of field system, like that described above, is provided in Table 11-1. This is an order of magnitude estimate. There are many variables that cannot be taken into account in an evaluation this coarse.

TABLE 11-1. Order Of Magnitude Cost Estimate For Edge Of Farm Treatment System Components, Davie Dairy ANMA

Component	Cost per unit / Unit	Total cost	Comments
Stormwater pond levees	$5 / cubic yard	$164,000	Levee cross section (cs): 10' top-width, 2.5:1-sideslope, 6'-high, cs area = 150 sq. ft. 50-acre pond = 5,903 linear feet of levee
Alum treatment pond levees	$5 / cubic yard	$60,000	1,320 linear feet of levee 8' high = cs area = 240 sq. ft.
Runoff capture ditching	$3 / cubic yard	$102,000	5-bottom, 4-feet depth, 20'top-width: cs area = 80 sq. ft. for approximately 11,500 linear feet of ditch
18-inch sprayfield runoff pipe	$36/ foot	$43,200	1,200 feet
6-inch stormwater resupply pipe	$12/ foot	$42,200	3,376 feet
5,000-gpm pump	$10,000	$70,000	7 pumps. Pumps needed for sprayfield runoff interception, stormwater pond, and discharge to alum treatment.
10,000-gpm pump		$20,000	1 pump for stormwater peak flow
Alum injection system	$25,000	$25,000	
Alum storage tanks – 10,000 gal.	$3,000	$6,000	
Additional sprayfield irrigator and piping		$40,000	
Stormwater reuse pipe	$5,000	$5,000	Returns water from stormwater pond to final waste storage pond for flushwater use
Total Estimate		$587,000	

In the edge-of-farm treatment concept, stormwater that cannot be recycled will be treated with alum and detained in a settling pond prior to discharge to Nubbin Slough. Alum treatment can reduce TP concentrations in the final discharge to 100 ppb. During storms when the pond is at capacity, water in excess of the system's treatment rate will bypass the system and go directly to Nubbin Slough, as presently occurs. Application of alum treatment residuals to pastures is one potential beneficial use of this material. Excess phosphorus in the surface layer of the pasture soil and in isolated wetlands contributes significantly to farm runoff P concentration. The residual will likely have some remaining P sequestering capacity that will capture soluble P if applied to the soil.

Application of alum residuals has been shown to reduce P runoff concentration and availability of appropriate materials and spreading costs should be further evaluated. If edge-of-farm treatment of runoff water with alum is implemented, the treatment residuals that accumulate in the settling ponds can be applied to fields that are not used for hay production, to runoff swales, and other areas containing high soil P. The high intensity areas for each barn are carpeted, so application of residuals in those fields is not possible.

11.2 Second-Ranked Technologies

Davie Dairy already utilizes a confinement system, which allows for greater control of the phosphorus-loading rate. Additional improvements to increase the amount of time the cows can be confined include the construction of concrete cooling ponds attached to the barns and the addition of rubber matting in the barns to allow the cows to stand longer without injury. These technologies will help bring the pastures into agronomic balance without extensive new construction to the basic farm system.

11.3 Third-Ranked Technologies

Other changes with the potential to improve the agronomic balance on the farm include:

- Improvement of the flushing system equipment. This change will ensure sufficient pressures and filling rates so that all available recycled water, rather than groundwater, is used whenever possible.
- Addition of a third sprayfield. The current sprayfield for Barn 2 is undersized. A third sprayfield may be constructed in Basin 4 to bring the sprayfield system into balance.
- The dairy currently experiences a shortage of freshwater to irrigate their crops. This can lead to an over application of wastewater, and thus phosphorus, in order to meet the water requirement for the crop. The addition of a freshwater irrigation system may improve the quality of the crop and the phosphorus uptake.

12.0 Other Recommendations For Achieving Agronomic P Balance

In addition to providing the information necessary to select technologies, the farm assessment provided the basis of comprehensive recommendations for improving

phosphorus management that are outside the scope of the BAT project. These recommendations include specific technologies already in use on other farms in the basin and specific management approaches to bring the farm into P balance:

- Adjustment of animal densities in dry cow pastures to agronomic rates.
- Improvement of farm record keeping and emergency response plans.

12.1 Redirect Runoff from the Exercise Lots and Outside Lactating Herd Pastures to the Barn Waste Management System

The dairy waste management system was designed to collect runoff from the exercise lots and lactating herd pastures surrounding the barns. The drainage patterns, for this report, were determined anecdotally. Detailed observation and surveying needs to be performed in order to properly adjust the site grading and berms to ensure the site drains as designed.

It also appears that the drainage from Basin 1 can be better captured by connecting existing ditches draining Basin 1 to the northern most drainage swale in Basin 2. Survey will determine the need for regrading the Basin 1 ditches to better accomplish this goal.

In addition, the use of concrete cooling ponds that direct all the solids back into the waste management system would improve phosphorus management as well as increasing cow comfort within the confinement system.

12.2 Adjust Animal Densities in Pastures to Agronomic Rates

There are a few pastures, other than the lactating herd pastures, that have animal densities higher than the agronomic rate of 45 lbs.-P/ac/yr that is the NRCS-recommended loading rate for the Dairy Rule designs. We realize that this rate may be high, but are following current guidance until NRCS provides new pasture loading recommendations. The springer and dry cow pastures for both barns need to expand. Several beef pastures and current forage and hayfields are well below the agronomic phosphorus rate, so there is sufficient land available for these expansions. When possible, animal densities should be lowered below agronomic rates in pastures with high residues in order to "mine" or reduce residuals.

12.3 Keep Additional Records

- The dairy is currently maintaining good records of the following:
- Animal numbers type, size, and location on dairy
- Milk production by herd (only for P export estimates)
- Animal imports and exports from dairy with estimated body weight
- Animal mortality rate and method and location of disposal
- Feed Purchases and P analysis of feed products
- Effluent P concentration and irrigation volume to each sprayfield

The following additional records will be required under a proposed management plan that includes edge-of-farm treatment:

- Crop yields and P analysis for hay and forage fields, including sprayfields

- P concentration and volume of manure or solids removed from barns, solids separators, lagoons, waste ponds, and HIAs and the location of land application or amount transported offsite
- Soil test results for all pastures and effluent and solids application areas.
- Amounts and locations of any soil amendment added to fields, including fertilizers, lime, and chemical stabilization amendments
- Water levels in new retention/detention ponds
- Inflow and outflow and P concentrations for the edge-of-farm treatment facility
- Chemical use and cost records for edge-of-farm facility
- Sludge volumes and disposal method from chemical treatment facility.
- Repair and maintain records for all components of the waste management system, including pumps, dikes, and irrigation systems.
- Observation of any unusual events, such as material spills.

Records should be maintained on a continuous basis, and summarized annually, unless otherwise required by permit.

12.4 Establish an Emergency Response Plan

An emergency response plan for the final system design will be needed in the system's operation and maintenance (O & M) plan to address potential catastrophic events, such as chemical spills, dike failures, power failures, and extreme weather events. The plan should include appropriate contact names and phone numbers for the appropriate agencies, as well as action plans for the most likely incidents.

12.5 Animal Disposal Practice

The current practice at the dairy for handling dead animals is to transport them offsite to the Okeechobee landfill. Scavengers consume the few animals, mostly calves, which are not found and taken to the landfill. The potential P losses associated with these dead animals is negligible.

13.0 Summary of Phosphorus Management Recommendations

The recommendations for improving phosphorus management on Davie Dairy include the following:

- Edge of farm treatment of runoff is the highest ranked method to reduce phosphorus discharge from the farm. The basic design, (Figure 11-1) includes the following:
    - Interception of farm field runoff in a stormwater pond
    - Ditching around sprayfields to intercept runoff and seepage, returning that water to the stormwater pond
    - An alum injection system for treatment of stormwater pond discharge.
    - A settling pond for collection of alum floc prior to final discharge.
    - Piping to provide reuse water from the stormwater pond to the sprayfield and barn water reuse system

- Improvement of internal drainage patterns. Detailed observation and survey information as necessary should be performed to ensure that the maximum amount of drainage from the exercise lots and lactating-herd pastures is directed to the waste management system and that the remainaing drainages direct as much runoff as possible to the edge of farm runoff system.
- The use of concrete cooling ponds within the confinement system. Cooling ponds that direct all the solids back into the waste management system would improve phosphorus management as well as increasing cow comfort.
- Addition of a third sprayfield 4 to bring the sprayfield system into balance.
- Adjustment of animal densities in dry cow pastures to agronomic rates.
- The addition of a freshwater irrigation system to ensure provision of irrigation water to the crop fields.
- Improvement of farm record keeping and emergency response plans. Davie Dairy has organized, well kept records. However, the following additional records will be necessary under a more comprehensive P management plan:

    - Crop yields and P analysis for hay and forage fields, including sprayfields
    - P concentration and volume of manure or solids removed from barns, solids separators, lagoons, waste ponds, and HIAs and the location of land application or amount transported offsite
    - Soil test results for all pastures and effluent and solids application areas.
    - Amounts and locations of any soil amendment added to fields, including fertilizers, lime, and chemical stabilization amendments
    - Water levels in new retention/detention ponds
    - Inflow and outflow and P concentrations for the edge-of-farm treatment facility
    - Chemical use and cost records for edge-of-farm facility
    - Sludge volumes and disposal method from chemical treatment facility.
    - Repair and maintain records for all components of the waste management system, including pumps, dikes, and irrigation systems.
    - Observation of any unusual events, such as material spills.

    Records should be maintained on a continuous basis, and summarized annually, unless otherwise required by permit.

- An emergency response plan for the edge of farm system will be needed as part of the system's operation and maintenance (O & M) plan to address potential catastrophic events, such as chemical spills, dike failures, power failures, and extreme weather events.

14.0 References

ASAE. 1996. *ASAE Standards1996 – Standard Engineering Practices Data*. 43rd Edition. American Society of Agricultural Engineers. St. Joseph, Mich.

Bodman, G.R. 1992. *Operation and Maintenance Manual*. Davie Dairy, Inc.

Bottcher, A.B. 1995. Effectiveness of Various Components of a Dairy Waste Management System for Controlling Nitrogen and Phosphorus Losses to Surface and Groundwater. Fla. Dept. of Env. Protection. Tallahassee, FL.

NRCS. 1992. *Agricultural Waste Management Field Handbook*. US Department of Agriculture. Natural Resource and Conservation Service.

Soil & Water Engineering Technology, Inc. 1996. *Tri-County Agricultural Best Management Practures Study (Phase II)*. Final Report to the St. Johns River Water Management District.

Van Horn, H.H., G.L. Newton, R.A. Nordstedt, E.C. French, G. Kidder, E.A. Hanlon, D.A. Graetz, and C.F. Chambliss. 1998. *Dairy Manure Management: Strategies for Recycling Nutrients to Recover Fertilizer Value and Avoid Environmental Pollution*. Circular 1016. IFAS, University of Florida. Gainesville, FL.

Davie Dairy
APPENDIX A

Florida Department of Environmental Protection
Dairy Waste Management System Permit
for Davie Dairy, Inc.
Permit # FLA013922-001-IW4A
Permit #FLA013908-001-JW4A

Department of Environmental Protection

Lawton Chiles
Governor

Southeast District
P.O. Box 15425
West Palm Beach, Florida 33416

Virginia B. Wetherell
Secretary

PERMITTEE:
Davie Dairy, Inc..
3105 N E 128th Avenue
Berman Road
Okeechobee, FL 34974

PERMIT NUMBER: FLA013922-001-IW4A
ISSUANCE DATE: JAN - 5 1998

EXPIRATION DATE: March 31, 2002
APPLICATION NO.: IO47-176196

RESPONSIBLE AUTHORITY:
William Berman

FACILITY:
Davie Dairy Barn #1 Waste Management System
12550 N E 25th Street
(Davie Dairy Road)
Okeechobee, FL 34974 Latitude: 27° 16' 00.2" N Longitude: 80°41' 50.4" W

This permit is issued under the provisions of Chapter 403, Florida Statutes (FS), and Rules 62-4, 62-620 and 62-670 of the Florida Administrative Code (FAC). The above named permittee is hereby authorized to operate the facilities shown on the application and other documents attached hereto or on file with the Department and made a part hereof and specifically described as follows:

WASTEWATER TREATMENT:

A dairy waste management system designed for a maximum annual average of 960 milk cows of which 600 head are confined to free stall barns and 360 head are also allowed to pasture. Confined herds shall be kept at the barn at all times except for the periods of time that they may be allowed in the exercise lots Pasturing herds shall graze in the fields and will receive feed and water only at the free stall feed barns. The system includes free stall confinement feed barns and milking facilities, exercise lots adjacent to the barn, high intensity area (HIA) of about 10 acres adjacent to the milk barn, 3-cell facultative lagoon and waste storage ponds (WSP) with design areas of 4.41, 2.82 and 6.24 acres, and 133-acre center pivot spray irrigation system for land application of the wastewater. Barn wash of 122,000 gallons per day (GPD) average flow with a maximum rate of 263,000 GPD is provided for cleaning of the milk barn. The feed barns are flushed by recycled wastewater from the third cell. Ground water monitoring wells are provided for monitoring ground water quality near the spray field, WSP, and upgradient of the system.

EFFLUENT DISPOSAL:

Land Application: The barn wash and the runoff and drainage from the HIA and the barn area flow into the first waste storage cell (lagoon) where most of the solids are settled out and the wastewater flows to the second and third cells. Waste storage system is designed to contain such flows from a 24-hour 25-year storm event. Wastewater is recycled from the third cell (WSP) to the feed barns for flushing of the floors. Eventually wastewater is pumped from the third cell to the spray irrigation field for land application. The rate of application of wastewater shall not exceed 0.28 inch per 24 hours.

IN ACCORDANCE WITH:

Request received February 26, 1997 and the application forms for permit renewal received December 1, 1997, Operation and Maintenance (O&M) Manual received June 30, 1992; request for construction of cooling ponds within the exercise lots received January 6, 1997; submittal of the fees on May 16, 1996 and October 28, 1997, and the limitations, monitoring requirements and other conditions set forth in Parts I to VII, pages 1 to 12 of this permit.

I. Effluent Limitations and Monitoring Requirements

A Land Application Systems

1. During the period beginning with the effective date and lasting through the expiration date of this permit, the permittee is authorized to discharge from Discharge Location R001, GMS ID No. 5147X12325 wastewater to the spray irrigation field. Such discharge shall be limited and monitored by the permittee as specified below:

Parameters (units)	Storet Number	Discharge Limitations			Monitoring Requirements		
		Monthly Avg.	Daily Max.	Other (specify)	Frequency	Sample Type	Sample Point
Total Nitrogen (as N)	00600	NA	NA	Report	Quarterly	Grab	WSP
Nitrate Nitrogen (as N)	00620	NA	NA	Report	Quarterly	Grab	WSP
Total Phosphorous.(as P)	00665	NA	NA	Report	Quarterly	Grab	WSP
Ortho Phosphorous (as P)	70507	NA	NA	Report	Quarterly	Grab	WSP
Water Level (MSL)	72020	NA	NA	Report	Quarterly	Measure	WSP
pH (field)	00400	NA	NA	Report	Quarterly	Grab	WSP

2. The average daily flow to the land application system shall not exceed the SCS design rate of 0.28 inch per day.

3. Samples taken in compliance with the monitoring requirements specified in I.A.1. shall be taken at the nearest accessible point the WSP representative of average water quality in the pond.

4. Water level of the waste storage pond shall be reported as feet below the overflow structure, to the nearest tenth of a foot.

5. Accurate records of land application of wastes shall be kept on file for at least three (3) years. A log shall be maintained for the operation of each sprayfield, to be updated daily or as often as necessary to accurately measure application rates, including the following information:
   * time irrigation started
   * time irrigation ended
   * daily rainfall (inches)
   * total amount irrigated (gallons or inches)
   * waste storage pond level (ft.)
   * visual check of water table height
   * operator's initials

   The attached "Wastewater Irrigation Log" or equivalent may be used for this purpose and should be readily available for review by Department representatives during inspection.

B. Other Methods of Disposal or Recycling

1. There shall be no discharge of wastewater from this facility to ground or surface waters, except as authorized by this permit.

2. Prior to construction of additional manure or solids processing facilities at the site the permittee shall consult with the Department regarding any additional permits which may be required.

3. Phosphorous application rates from land-spreading of solids may not exceed what is currently allowed in the O&M Management Plan.

C. Other Limitations and Monitoring and Reporting Requirements

1. Monitoring results obtained for each calendar quarter shall be summarized for that quarter and reported on a Discharge Monitoring Report (DMR), Form 62-620.910(10) (copy attached), postmarked no later than the 28th day of the month following the completed calendar quarter. For example, data for January shall be submitted by February 28. Signed copies of the DMR shall be submitted to the address specified below:

   Florida Department of Environmental Protection
   400 North Congress Avenue
   P.O. Box 15425
   West Palm Beach, FL 33416
   Attn.: Industrial Waste Section

2. The permittee shall provide safe access points for obtaining representative samples which are required by this permit.

3. The permittee shall ensure that all laboratory analytical data submitted to the department as required by this permit is from a laboratory which has a currently valid and Department-approved Comprehensive Quality Assurance Plan (ComQAP) [or a ComQAP pending approval] for all parameters being reported as required by Chapter 62-160, Florida Administrative Code.

4. Any bypass of the treatment facility which is not included in the monitoring specified I.A.1, or I.B.1., is to be monitored for flow and all other required parameters. For parameters other than flow, at least one grab sample per day shall be monitored. Daily flow shall be monitored or estimated, as appropriate., to obtain reasonable data. All monitoring results shall be reported on the appropriate DMR.

5. No later than April 1 of each year the permittee shall complete and submit to the Department the attached Annual Operation Report form for the previous calendar year.

6. Department representatives, or its authorized agents shall be allowed access to the property as needed in order to collect water quality samples or otherwise to determine compliance with the terms of this permit. Hereunder, representatives or employees of the South Florida Water Management District (SFWMD) shall be considered authorized agents of the Department.

II. Sludge Management Requirements

A. Basic Management Requirements

1. Sludge or residuals (HIA spoil, lagoon and/or manure trap solids, scraped manure) from the wastewater collection/treatment system shall be land applied at the rates and in accordance with the original O&M Management Plan. Prior to land application the nutrient content must be analyzed as given in Section II.B.

2. Sludge or residuals shall be handled in such a manner as to protect water quality. Unless some other type of containment is provided, the material shall be stored inside the High Intensity Area in order to preclude runoff to surface waters.

B. Analysis Requirements

1. The nutrient content of all sludge or residuals (HIA spoil, lagoon and/or manure trap solids, scraped manure) shall be determined at least quarterly (every three months) prior to land application. Material which is spread at intervals longer than

every three months need only be analyzed prior to the date of land application. The sludge or residuals shall be monitored by the permittee as specified below:

Parameters (units)	Monitoring Requirements		
	Frequency	Sample Type	Sample Point
Nitrate Nitrogen as N (mg/Kg)	Quarterly	See II.B.2.	
Total Nitrogen as N (mg/Kg)	Quarterly	See II.B.2.	
Ortho Phosphorus as P (mg/Kg)	Quarterly	See II.B.2.	
Total Phosphorus as P (mg/Kg)	Quarterly	See II.B.2.	
Percent Solids (%)	Quarterly	See II.B.2.	

2. The sample shall be well-mixed and representative of the average quality of the particular material being analyzed.

3. Results of the sludge or residuals monitoring shall be submitted to the district office as specified in section I.C.1.

III. Groundwater Monitoring Requirements

1. During the period of operation authorized by this permit, the permittee shall sample ground water in accordance with this permit and the approved ground water monitoring plan prepared under Rule 62-522.600, F.A.C.

2. Ground water monitoring test results shall be submitted on DEP Form 62-620.910(10) and shall be submitted in conjunction with the DMR in accordance with condition I.C.1.

3. Monitoring wells shall be located to allow vehicle access at all times. Wells shall be clearly marked and maintained so that sampling personnel can find the wells, and shall be labeled, e.g. "MW-1", for verification with the original approved ground water monitoring plan. The wells shall be protected from destruction by farm equipment or vandalism. Upon discovery of a monitoring well which has been destroyed or lost, the permittee shall notify the Department with a written report within seven days detailing the circumstances and remedial measures taken or proposed as soon as possible and have the well replaced within forty-five (45) days after Department approval.

4. Ground water monitoring wells shall be evacuated or purged prior to sampling to obtain a representative sample. Water levels shall be recorded prior to evacuating the well. Measurements, referenced to mean sea level, shall include the top of the well casing, depth to ground water, and the calculated ground water elevation at a precision of plus or minus 0.01 feet.

5. Analyses shall be conducted on unfiltered samples, unless filtered samples have been approved by the Department as being more representative of ground water conditions.

6. The following monitoring wells are included in the ground water monitoring plan.

Well Name	GMS ID Number	Depth	Aquifer	Well Type	Lat./Long.
MW-1	5147A12320	14.0	Surficial	Background	27°16'49.3"N /80°42'14.9"W
MW-2	5147A12321	14.0	Surficial	Waste Storage Cell #3	27 15'50.8"N /80 42'01.4"W
MW-2A	5147A12322	5.0	Water Table	Cell #3 Peizometer	27 15'51.5"N /80 42'01.5"W
MW-3	5147A12323	15.0	Surficial	Sprayfield	27 15'05.5"N /80 42'14.9"W
MW-4	5147A12324	14.0	Surficial	Waste Storage Cell #1	27 15'57.6"N /80 42'04.5"W

7. The wells included in the ground water monitoring plan shall be sampled for the parameters, and at the frequencies listed below.

Parameters (units)	Monitoring Requirements	
	Frequency	Sample Type
Water Level (MSL)	Semiannually	in-situ
Specific Conductance (umhos/cm)	Semiannually	in-situ
pH	Semiannually	in-situ
Temperature (°C)	Semiannually	in-situ
Nitrate Nitrogen (as N) (mg/l)	Semiannually	Grab
Total Nitrogen (as N) (mg/l)	Semiannually	Grab
Total Phosphorus, (as P) (mg/l)	Semiannually	Grab
Ortho Phosphorus (as P) (mg/l)	Semiannually	Grab

IV. Other Land Application Requirements

1. The permittee's discharge to ground water shall not cause a violation of water quality standards for Class G-II ground waters at the boundary of the zone of discharge in accordance with rules 62-520.400 and 62-520.420, F.A.C.

2. The permittee's discharge to ground water shall not cause a violation of the minimum criteria for ground water specified in rule 62-520.400, F.A.C., within the zone of discharge.

3. The water level in the storage pond shall be maintained at the lowest level possible to ensure the retention of effluent during adverse weather conditions, crop harvesting, maintenance of irrigation equipment or other conditions which will preclude land application.

4. The annual average hydraulic loading rate shall be limited to a maximum of 1.96 inches per week (0.28 inch per day).

5. The water table shall be at least eighteen (18) inches or deeper below normal ground level when wastes, either wastewater irrigation, manure, spoil, or sludge, are land applied. Observation wells shall be visually checked prior to land application. Irrigation with wastewater shall be controlled at all times to prevent runoff of wastewater from either excessive irrigation or by mixing with stormwater.

6. The use of the center pivot sprayfield must be controlled such that wastewater is not directly sprayed over the collection ditch when there is flow in the ditch. The operator should carefully monitor the use of the pivot after rainy periods to prevent the direct spraying of wastewater into the ditch under such conditions.

V. Operation and Maintenance Requirements

A. Operation of Treatment and Disposal Facilities

1. The permittee shall ensure that the operation of this facility is as described in the application and supporting documents.

2. The operation of the pollution control facilities described in this permit shall be under the full time supervision of a person who is qualified by formal training and/or practical experience in the field of water pollution control.

3. Feed/water and shade facilities for the milk herd shall be located inside the High Intensity Area, except as otherwise provided in the Operation and Maintenance (O&M) Manual signed by the Engineer of the Plan and received June 30, 1992. The facilities and herd management shall be maintained in accordance with the O&M plan. Herd pasture shall be maintained such that the creation of "high intensity use areas", as defined in FAC Rule 62-670, is prevented and/or pasture runoff does not cause or contribute to violations of water quality standards. Grassed berms shall be cut regularly and maintained with grass cover to prevent erosion; weed overgrowth shall be prevented.

4. Lagoons, HIA ditches and sumps, and the waste storage pond shall be cleaned of manure, sand, sludge or other material so that effective treatment and/or design volumes are maintained in accordance with the Management Plan. Float level switches for all sump pumps shall be checked periodically to assure proper operation in accordance with the original design specifications. The permittee shall maintain records of all maintenance jobs at the site and make them available for inspection.

5. All maintenance or construction activities shall be carried out in such a manner to prevent discharge of pollutants to surface waters of the state. If dewatering is necessary, the discharge shall be directed to the waste storage pond. The permittee should contact the Department for guidance should there be any questions concerning this requirement.

B. Record Keeping Requirements:

The permittee shall maintain the following records on the site of the permitted facility and make them available for inspection:

1. Records of all compliance monitoring information, including all calibration and maintenance records and all original strip chart recordings for continuous monitoring instrumentation, including, if applicable, a copy of the laboratory certification showing th certification number of the laboratory, for at least three years from the date the sample or measurement was taken;

2. Copies of all reports, other than those required in items 1. and 6. of this section, required by the permit for at least three years from the date the report was prepared, unless otherwise specified by Department rule;

3. Records of all data, including reports and documents used to complete the application for the permit for at least three years from the date the application was filed, unless otherwise specified by Department rule;

4. A copy of the current permit;

5. A copy of any required record drawings;

6. Copies of the logs and schedules showing plant operations and equipment maintenance for three years from the date on the logs or schedule

VI. **Compliance Schedules and Self-imposed Improvement Schedules**

The permittee shall achieve compliance with the conditions of this permit in accordance with the following schedule:

1. Operation and Maintenance (O&M) Manual submitted June 30, 1992: effective date of permit

2. Cooling ponds constructed in the exercise lots shall be maintained in satisfactory health and operating conditions. Should these ponds prove to be an environmental nuisance they shall be filled in and original lot conditions to be restored.

VII. Other Specific Conditions

A. Specific Conditions Applicable to all permits

1. Drawings, plans, documents or specifications submitted by the permittee, not attached hereto, but retained on file at Department of Environmental Protection, Southeast District (DEP, SED) are made a part hereof.

2. If significant historical or archaeological artifacts are discovered at any time within the project site, the permittee shall immediately notify the District Office and the Bureau of Historic Preservation, Division of Archives, History and Records Management, R.A. Gray Building, Tallahassee, Florida 32301.

3. Where required by Chapter 471 (P.E.) or Chapter 492 (P.G.) Florida Statutes, applicable portions of reports to be submitted under this permit, shall be signed and sealed by the professional(s) who prepared them.

4. This permit satisfies Industrial Wastewater program permitting requirements only and does not authorize operation of this facility prior to obtaining any other permits required by local, state or federal agencies.

B. Duty to Reapply

1. The permittee shall submit an application to renew this permit at least 180 days before the expiration date of this permit.

2. The permittee shall apply on the appropriate form listed in Rule 62-620.910, F.A.C., and in the manner established in Rules 62-620.400 through 62-620.460, F.A.C., including submittal of the appropriate processing fee set forth in Rule 62-4.050, F.A.C.

3. An application filed in accordance with subsections 1. and 2. of this part shall be considered timely and sufficient. When an application for renewal of a permit is timely and sufficient, the existing permit shall not expire until the Department has taken final action on the application for renewal or until the last day for seeking judicial review of the agency order or a later date fixed by order of the reviewing court.

5. The late submittal of a renewal application shall be considered timely and sufficient for the purpose of extending the effectiveness of the expiring permit only if it is submitted and made complete before the expiration date.

C. Specific Conditions Related to Best Management Practices Condition

1. In accordance with Section 62-670.510(1), FAC, all dairy cattle must be fenced away from all water courses, or drainage ditches with a drainage area of 100 acres or more that will transport storm runoff to surface waters. Surface water in wetlands, low areas or cooling ponds, either natural or man-made, in which dairy cattle are allowed to enter or wade in, shall not be drained or discharged to waters of the State. The Department may require additional fencing on a case-by-case basis to prevent excessive nutrient loads in drainage which may cause or contribute to violations of state water quality standards.

2. All sources of nutrients from wastewater/runoff, HIA spoil, lagoon/manure trap solids, manure or commercial fertilizer shall be applied at rates not to exceed the annual nutrient requirements of the grasses or crops. The permittee shall record application rates of wastes and commercial fertilizer to fields and pastures to ensure that nutrients are properly managed. Records shall be available to the Department upon request or during inspections by Department representatives.

3. The Department may require the permittee to perform water quality testing for representative samples of the farm drainage. The frequency and the parameters of the analyses, as well as the appropriate sampling locations (s), shall be determined by the Department. The permittee shall be notified in writing if such monitoring is deemed necessary to demonstrate compliance with state water quality standards.

4. If the Department determines the management of dairy farm wastes causes or contributes to violations of groundwater or surface water standards the Department may require the permittee to modify the design or operation of the waste management system within a period acceptable to the Department.

5. Before construction of drainage ditches or widening or deepening of existing ditches, the permittee shall submit a written request and obtain prior approval from the Department and/or the South Florida Water Management District (SFWMD). Normal maintenance and clean-out of existing drainage ditches shall be carried out according to the regulations and/or guidelines provided by the SFWMD.

6. Cooling pond berms shall be adequately maintained to preclude a discharge from the pond(s) to surface waters.

VIII. General Conditions

The following general conditions are referenced in Florida Administrative Code Rule 62-620.610.

1. The terms, conditions, requirements, limitations and restrictions set forth in this permit are binding and enforceable pursuant to Chapter 403, Florida Statutes. Any permit noncompliance constitutes a violation of Chapter 403, Florida Statutes, and is grounds for enforcement action, permit termination, permit revocation and reissuance, or permit revision.

2. This permit is valid only for the specific processes and operations applied for and indicated in the approved drawings or exhibits. Any unauthorized deviations from the approved drawings, exhibits, specifications or conditions of this permit constitutes grounds for revocation and enforcement action by the Department.

3. As provided in Subsection 403.087(6), F.S., the issuance of this permit does not convey any vested rights or any exclusive privileges. Neither does it authorize any injury to public or private property or any invasion of personal rights, nor authorize any infringement of federal, state, or local laws or regulations. This permit is not a waiver of or approval of any other Department permit or authorization that may be required for other aspects of the total project which are not addressed in this permit.

4. This permit conveys no title to land or water, does not constitute state recognition or acknowledgment of title, and does not constitute authority for the use of submerged lands unless herein provided and the necessary title or leasehold interests have been obtained from the State. Only the Trustees of the Internal Improvement Trust Fund may express State opinion as to title.

5. This permit does not relieve the permittee from liability and penalties for harm or injury to human health or welfare, animal or plant life, or property caused by the construction or operation of this permitted source; nor does it allow the permittee to cause pollution in contravention of Florida Statutes and Department rules, unless specifically authorized by an order from the Department. The permittee shall take all reasonable steps to minimize or prevent any discharge, reuse of reclaimed water, or residuals use or disposal in violation of this permit which has a reasonable likelihood of adversely affecting human health or the environment. It shall not be a defense for a permittee in an enforcement action that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this permit.

6. If the permittee wishes to continue an activity regulated by this permit after its expiration date, the permittee shall apply for and obtain a new permit.

7. The permittee shall at all times properly operate and maintain the facility and systems of treatment and control, and related appurtenances, that are installed and used by the permittee to achieve compliance with the conditions of this permit. This provision includes the operation of backup or auxiliary facilities or similar systems when necessary to maintain or achieve compliance with the conditions of the permit.

8. This permit may be modified, revoked and reissued, or terminated for cause. The filing of a request by the permittee for a permit revision, revocation and reissuance, or termination, or a notification of planned changes or anticipated noncompliance does not stay any permit condition.

9. The permittee, by accepting this permit, specifically agrees to allow authorized Department personnel, including an authorized representative of the Department and authorized EPA personnel, when applicable, upon presentation of credentials or other documents as may be required by law, and at reasonable times, depending upon the nature of the concern being investigated, to
   a. Enter upon the permittee's premises where a regulated facility, system, or activity is located or conducted, or where records shall be kept under the conditions of this permit;

   b. Have access to and copy any records that shall be kept under the conditions of this permit;

   c. Inspect the facilities, equipment, practices, or operations regulated or required under this permit; and

   d. Sample or monitor any substances or parameters at any location necessary to assure compliance with this permit or Department rules.

10. In accepting this permit, the permittee understands and agrees that all records, notes, monitoring data, and other information relating to the construction or operation of this permitted source which are submitted to the Department may be used by the Department as evidence in any enforcement case involving the permitted source arising under the Florida Statutes or Department rules, except as such use is proscribed by Section 403.111, Florida Statutes, or Rule 62-620.302, Florida Administrative Code. Such evidence shall only be used to the extent that it is consistent with the Florida Rules of Civil Procedure and applicable evidentiary rules.

11. When requested by the Department, the permittee shall within a reasonable time provide any information required by law which is needed to determine whether there is cause for revising, revoking and reissuing, or terminating this permit, or to determine compliance with the permit. The permittee shall also provide to the Department upon request copies of records required by this permit to be kept. If the permittee becomes aware of relevant facts that were not submitted or were incorrect in the permit application or in any report to the Department, such facts or information shall be promptly submitted or corrections promptly reported to the Department.

12. Unless specifically stated otherwise in Department rules, the permittee, in accepting this permit, agrees to comply with changes in Department rules and Florida Statutes after a reasonable time for compliance; provided, however, the permittee does not waive any other rights granted by Florida Statutes or Department rules. A reasonable time for compliance with a new or amended surface water quality standard, other than those standards addressed in Rule 62-302.500, F.A.C., shall include a reasonable time to obtain or be denied a mixing zone for the new or amended standard.

13. The permittee, in accepting this permit, agrees to pay the applicable regulatory program and surveillance fee in accordance with Rule 62-5.052, F.A.C.

14. This permit is transferable only upon Department approval in accordance with Rule 62-620.340, F.A.C. The permittee shall be liable for any noncompliance of the permitted activity until the transfer is approved by the Department.

15. The permittee shall give the Department written notice at least 60 days before inactivation or abandonment of a wastewater facility and shall specify what steps will be taken to safeguard public health and safety during and following inactivation or abandonment.

16. The permittee shall apply for a revision to the Department permit in accordance with Rules 62-620.300, 62.420 or 62.620.450, F.A.C., as applicable, at least 90 days before construction of any planned substantial modifications to the permitted facility is to commence or with Rule 62-620.300 for minor modifications to the permitted facility. A revised permit shall be obtained before construction begins except as provided in Rule 62-620.300, F.A.C.

17. The permittee shall give advance notice to the Department of any planned changes in the permitted facility or activity which may result in noncompliance with permit requirements. The permittee shall be responsible for any and all damages which may

result from the changes and may be subject to enforcement action by the Department for penalties or revocation of this permit. The notice shall include the following information:

a. A description of the anticipated noncompliance;

b. The period of the anticipated noncompliance, including dates and times; and

c. Steps being taken to prevent future occurrence of the noncompliance.

18. Sampling and monitoring data shall be collected and analyzed in accordance with Rule 62-4.246, Chapter 62-160 and 62-601, F.A.C., and 40 CFR 136, as appropriate.

a. Monitoring results shall be reported at the intervals specified elsewhere in this permit and shall be reported on a Discharge Monitoring Report (DMR), DEP Form 62-620.910(10).

b. If the permittee monitors any contaminate more frequently than required by the permit, using Department approved test procedures, the results of this monitoring shall be included in the calculation and reporting of the data submitted in the DMR.

c. Calculations for all limitations which require averaging of measurements shall use an arithmetic mean unless otherwise specified in this permit.

d. Any laboratory test required by this permit for domestic wastewater facilities shall be performed by a laboratory that has been certified by the Department of Health and Rehabilitative Services (DHRS) under Chapter 10D41, F.A.C., to perform the test. In domestic wastewater facilities, on-site tests for dissolved oxygen, pH, and total chlorine residual shall be performed by a laboratory certified to test for those parameters or under the direction of an operator certified under Chapter 61E12-41, F.A.C.

e. Under Chapter 62-160, F.A.C., sample collection shall be performed by following the protocols outlined in "DER Standard Operating Procedures for Laboratory Operations and Sample Collection Activities" (DER-QA-001/92). Alternatively, sample collection may be performed by an organization who has an approved Comprehensive Quality Assurance Plan (CompQAP) on file with the Department. The CompQAP shall be approved for collection of samples from the required matrices and for the required tests.

19. Reports of compliance or noncompliance with, or any progress reports on, interim and final requirements contained in any compliance schedule detailed elsewhere in this permit shall be submitted no later than 14 days following each schedule date.

20. The permittee shall report to the Department any noncompliance which may endanger health or the environment. Any information shall be provided orally within 24 hours from the time the permittee becomes aware of the circumstances. A written submission shall also be provided within five days of the time the permittee becomes aware of the circumstances. The written submission shall contain: a description of the noncompliance and its cause; the period of noncompliance including exact dates and time, and if the noncompliance has not been corrected, the anticipated time it is expected to continue; and steps taken or planned to reduce, eliminate, and prevent recurrence of the noncompliance.

a. The following shall be included as information which must be reported within 24 hours under this condition:

1. Any unanticipated bypass which causes any reclaimed water or the effluent to exceed any permit limitation or results in an unpermitted discharge,

2. Any upset which causes any reclaimed water or the effluent to exceed any limitation in the permit,

3. Violation of a maximum daily discharge limitation for any of the pollutants specifically listed in the permit for such notice, and

4. Any unauthorized discharge to surface or ground waters.

b. If the oral report has been received within 24 hours, the noncompliance has been corrected, and the noncompliance did not endanger health or the environment, the Department shall waive the written report.

21. The permittee shall report all instances of noncompliance not reported under Conditions VIII. A. 18. and 19. of this permit at the time monitoring reports are submitted. This report shall contain the same information required by Condition VIII. A. 20. of this permit.

22. Bypass Provisions.

a. Bypass is prohibited, and the Department may take enforcement action against a permittee for bypass, unless the permittee affirmatively demonstrates that:

(1). Bypass was unavoidable to prevent loss of life, personal injury, or severe property damage; and

(2). There were no feasible alternatives to the bypass, such as the use of auxiliary treatment facilities, retention of untreated wastes, or maintenance during normal periods of equipment downtime. This condition is not satisfied if adequate back-up equipment should have been installed in the exercise of reasonable engineering judgment to prevent a bypass which occurred during normal periods of equipment downtime or preventive maintenance; and

(3). The permittee submitted notices as required under Condition VIII. A. 22. b. of this permit.

b. If the permittee knows in advance of the need for a bypass, it shall submit prior notice to the Department, if possible at least 10 days before the date of the bypass. The permittee shall submit notice of an unanticipated bypass within 24 hours of learning about the bypass as required in Condition VIII. A. 20. of this permit. A notice shall include a description of the bypass and its cause; the period of the bypass, including exact dates and times; if the bypass has not been corrected, the anticipated time it is expected to continue; and the steps taken or planned to reduce, eliminate, and prevent recurrence of the bypass

c. The Department shall approve an anticipated bypass, after considering its adverse effect, if the permittee demonstrates that it will meet the three conditions listed in Condition VIII. A. 22. a. through 3. of this permit.

d. A. permittee may allow any bypass to occur which does not cause reclaimed water or effluent limitations to be exceeded if it is for essential maintenance to assure efficient operation. These bypasses are not subject to the provision of Condition VIII. A. 22. a. through c. of this permit.

23. Upset Provisions

a. A permittee who wishes to establish the affirmative defense of upset shall demonstrate, through properly signed contemporaneous operating logs, or other relevant evidence that:

(1). An upset occurred and that the permittee can identify the cause(s) of the upset;

(2). The permitted facility was at the time being properly operated;

(3). The permittee submitted notice of the upset as required in Condition VIII. A. 20. of this permit; and

(4). The permittee complied with any remedial measures required under Condition VIII. A. 5. of this permit.

b. In any enforcement proceeding, the permittee seeking to establish the occurrence of an upset has the burden of proof.

c. Before an enforcement proceeding is instituted, no representation made during the Department review of a claim that noncompliance was caused by an upset is final agency action subject to judicial review.

Executed in West Palm Beach, Florida.

STATE OF FLORIDA DEPARTMENT
OF ENVIRONMENTAL PROTECTION

01/02/98

Alfred Mueller, Jr., P.E., P.G. Date
Water Facilities Administrator
Southeast District
P. O. Box 15425
West Palm Beach, FL 33416

Department of Environmental Protection

Lawton Chiles
Governor

Southeast District
P.O. Box 15425
West Palm Beach, Florida 33416

Virginia B. Wetherell
Secretary

PERMITTEE:
Davie Dairy, Inc..
3105 N E 128th Avenue
Berman Road
Okeechobee, FL 34974

PERMIT NUMBER: FLA013908-001-IW4A
EFFECTIVE DATE: DEC - 5 1997
EXPIRATION DATE: March 31, 2002
APPLICATION NO.: IO47-176196

RESPONSIBLE AUTHORITY:

William Berman

FACILITY:
Davie Dairy Barn #2 Waste Management System
11250 N E 25th Street
(Davie Dairy Road)
Okeechobee, FL 34974 Latitude: 27° 16' 01.8" N Longitude: 80°42' 35.7" W

This permit is issued under the provisions of Chapter 403, Florida Statutes (FS), and Rules 62-4, 62-620 and 62-670 of the Florida Administrative Code (FAC). The above named permittee is hereby authorized to operate the facilities shown on the application and other documents attached hereto or on file with the Department and made a part hereof and specifically described as follows:

WASTEWATER TREATMENT:

A dairy waste management system designed for a maximum annual average of 960 milk cows. The system includes two confinement feed barns and milking facilities, exercise lots adjacent to each feed barn, 3-cell facultative lagoon and waste storage ponds (WSP) with design areas of 5.56, 2.94 and 4.88 acres, and 130-acre center pivot spray irrigation system for land application of the wastewater. Barn wash of 96,800 gallons per day (GPD) average with a maximum rate of 178,000 GPD is provided for cleaning of the milk barn, and the feed barns are flushed by recycled wastewater from the third cell. All milk cows shall be confined to the free stall barns except for short durations that herds may be allowed in the exercise lots. Ground water monitoring wells are provided for monitoring ground water quality near the spray field, WSP, and upgradient of the system.

EFFLUENT DISPOSAL:

Land Application: The barn wash and the runoff and drainage from the barn area flow into the first waste storage cell (lagoon) where most of the solids are settled out and the wastewater flows to the second and third cells. Waste storage system is designed to contain such flows from a 24-hour 25-year storm event. Wastewater is recycled from the third cell (WSP) to the to the feed barns for flushing of the floors. Eventually wastewater is pumped from the third cell to the spray irrigation field for land application. The rate of application of wastewater shall not exceed 0.28 inch per 24 hours.

IN ACCORDANCE WITH:

Application for renewal of the permit received April 29, 1996; Operation and Maintenance (O&M) Plan received January 30, 1992; submittal of the fees on October 28, 1997, and the limitations, monitoring requirements and other conditions set forth in Parts I to VII. pages 1 to 11 of this permit.

I. Effluent Limitations and Monitoring Requirements

A Land Application Systems

1. During the period beginning with the effective date and lasting through the expiration date of this permit, the permittee is authorized to discharge from Discharge Location R001, GMS ID No. 5147X11986 wastewater to the spray irrigation field. Such discharge shall be limited and monitored by the permittee as specified below:

Parameters (units)	Storet Number	Discharge Limitations			Monitoring Requirements		
		Monthly Avg.	Daily Max.	Other (specify)	Frequency	Sample Type	Sample Point
Total Nitrogen (as N)	00600	NA	NA	Report	Quarterly	Grab	WSP
Nitrate Nitrogen (as N)	00620	NA	NA	Report	Quarterly	Grab	WSP
Total Phosphorous.(as P)	00665	NA	NA	Report	Quarterly	Grab	WSP
Ortho Phosphorous (as P)	70507	NA	NA	Report	Quarterly	Grab	WSP
Water Level (MSL)	72020	NA	NA	Report	Quarterly	Measure	WSP
pH (field)	00400	NA	NA	Report	Quarterly	Grab	WSP

2. The average daily flow to the land application system shall not exceed the SCS design rate of 0.28 inch per day.

3. Samples taken in compliance with the monitoring requirements specified in I.A.1. shall be taken at the nearest accessible point in the WSP representative of average water quality in the pond.

4. Water level of the waste storage pond shall be reported as feet below the overflow structure, to the nearest tenth of a foot.

5. Accurate records of land application of wastes shall be kept on file for at least three (3) years. A log shall be maintained for the operation of each sprayfield, to be updated daily or as often as necessary to accurately measure application rates, including the following information:
   * time irrigation started
   * time irrigation ended
   * daily rainfall (inches)
   * total amount irrigated (gallons or inches)
   * waste storage pond level (ft.)
   * visual check of water table height
   * operator's initials

   The attached "Wastewater Irrigation Log" or equivalent may be used for this purpose and should be readily available for review by Department representatives during inspection.

B. Other Methods of Disposal or Recycling

1. There shall be no discharge of wastewater from this facility to ground or surface waters, except as authorized by this permit.

2. Prior to construction of additional manure or solids processing facilities at the site the permittee shall consult with the Department regarding any additional permits which may be required.

3. Phosphorous application rates from land-spreading of solids may not exceed what is currently allowed in the O&M Management Plan.

C. Other Limitations and Monitoring and Reporting Requirements

1. Monitoring results obtained for each calendar quarter shall be summarized for that quarter and reported on a Discharge Monitoring Report (DMR), Form 62-620.910(10) (copy attached), postmarked no later than the 28th day of the month following the completed calendar quarter. For example, data for January shall be submitted by February 28. Signed copies of the DMR shall be submitted to the address specified below:

Florida Department of Environmental Protection
400 North Congress Avenue
P.O. Box 15425
West Palm Beach, FL 33416
Attn.: Industrial Waste Section

2. The permittee shall provide safe access points for obtaining representative samples which are required by this permit.

3. The permittee shall ensure that all laboratory analytical data submitted to the department as required by this permit is from a laboratory which has a currently valid and Department-approved Comprehensive Quality Assurance Plan (ComQAP) [or a ComQAP pending approval] for all parameters being reported as required by Chapter 62-160, Florida Administrative Code.

4. Any bypass of the treatment facility which is not included in the monitoring specified I.A.1, or I.B.1., is to be monitored for flow and all other required parameters. For parameters other than flow, at least one grab sample per day shall be monitored. Daily flow shall be monitored or estimated, as appropriate., to obtain reasonable data. All monitoring results shall be reported on the appropriate DMR.

5. No later than April 1 of each year the permittee shall complete and submit to the Department the attached Annual Operation Report form for the previous calendar year.

6. Department representatives, or its authorized agents shall be allowed access to the property as needed in order to collect water quality samples or otherwise to determine compliance with the terms of this permit. Hereunder, representatives or employees of the South Florida Water Management District (SFWMD) shall be considered authorized agents of the Department.

II. Sludge Management Requirements

A. Basic Management Requirements

1. Sludge or residuals (HIA spoil, lagoon and/or manure trap solids, scraped manure) from the wastewater collection/treatment system shall be land applied at the rates and in accordance with the original O&M Management Plan. Prior to land application the nutrient content must be analyzed as given in Section II.B.

2. Sludge or residuals shall be handled in such a manner as to protect water quality. Unless some other type of containment is provided, the material shall be stored inside the High Intensity Area in order to preclude runoff to surface waters.

B. Analysis Requirements

1. The nutrient content of all sludge or residuals (HIA spoil, lagoon and/or manure trap solids, scraped manure) shall be determined at least quarterly (every three months) prior to land application. Material which is spread at intervals longer than

every three months need only be analyzed prior to the date of land application. The sludge or residuals shall be monitored by the permittee as specified below:

Parameters (units)	Monitoring Requirements		
	Frequency	Sample Type	Sample Point
Nitrate Nitrogen as N (mg/Kg)	Quarterly	See II.B.2.	
Total Nitrogen as N (mg/Kg)	Quarterly	See II.B.2.	
Ortho Phosphorus as P (mg/Kg)	Quarterly	See II.B.2.	
Total Phosphorus as P (mg/Kg)	Quarterly	See II.B.2.	
Percent Solids (%)	Quarterly	See II.B.2.	

2. The sample shall be well-mixed and representative of the average quality of the particular material being analyzed.

3. Results of the sludge or residuals monitoring shall be submitted to the district office as specified in section I.C.1.

III. Groundwater Monitoring Requirements

1. During the period of operation authorized by this permit, the permittee shall sample ground water in accordance with this permit and the approved ground water monitoring plan prepared under Rule 62-522.600, F.A.C.

2. Ground water monitoring test results shall be submitted on DEP Form 62-620.910(10) and shall be submitted in conjunction with the DMR in accordance with condition I.C.1.

3. Monitoring wells shall be located to allow vehicle access at all times. Wells shall be clearly marked and maintained so that sampling personnel can find the wells, and shall be labeled, e.g. "MW-1", for verification with the original approved ground water monitoring plan. The wells shall be protected from destruction by farm equipment or vandalism. Upon discovery of a monitoring well which has been destroyed or lost, the permittee shall notify the Department with a written report within seven days detailing the circumstances and remedial measures taken or proposed as soon as possible and have the well replaced within forty-five (45) days after Department approval.

4. Ground water monitoring wells shall be evacuated or purged prior to sampling to obtain a representative sample. Water levels shall be recorded prior to evacuating the well. Measurements, referenced to mean sea level, shall include the top of the well casing, depth to ground water, and the calculated ground water elevation at a precision of plus or minus 0.01 feet.

5. Analyses shall be conducted on unfiltered samples, unless filtered samples have been approved by the Department as being more representative of ground water conditions.

6. The following monitoring wells are included in the ground water monitoring plan.

Well Name	GMS ID Number	Depth	Aquifer	Well Type	Lat./Long.
MW-1	5147A12320	14.0	Surficial	Background	27°16'49.3"N /80°42'14.9"W
MW-2	5147A11984	18.0'	Surficial	WSP	27°15'55.3"N /80°42'18.9"W
MW-2A	5147A12514	5.0'	Water Table	WSP Peizometer	27°15'56.3"N /80°42'19.4"W
MW-3	5147A11985	18.0'	Surficial	Compliance	27°15'09.2"N /80°42'26.4"W

7. The wells included in the ground water monitoring plan shall be sampled for the parameters, and at the frequencies listed below.

Parameters (units)	Monitoring Requirements	
	Frequency	Sample Type
Water Level (MSL)	Semiannually	in-situ
Specific Conductance (umhos/cm)	Semiannually	in-situ
pH	Semiannually	in-situ
Temperature (°C)	Semiannually	in-situ
Nitrate Nitrogen (as N) (mg/l)	Semiannually	Grab
Total Nitrogen (as N) (mg/l)	Semiannually	Grab
Total Phosphorus, (as P) (mg/l)	Semiannually	Grab
Ortho Phosphorus (as P) (mg/l)	Semiannually	Grab

IV. Other Land Application Requirements

1. The permittee's discharge to ground water shall not cause a violation of water quality standards for Class G-II ground waters at the boundary of the zone of discharge in accordance with rules 62-520.400 and 62-520.420, F.A.C.

2. The permittee's discharge to ground water shall not cause a violation of the minimum criteria for ground water specified in rule 62-520.400, F.A.C., within the zone of discharge.

3. The water level in the storage pond shall be maintained at the lowest level possible to ensure the retention of effluent during adverse weather conditions, crop harvesting, maintenance of irrigation equipment or other conditions which will preclude land application.

4. The annual average hydraulic loading rate shall be limited to a maximum of 1.96 inches per week (0.28 inch per day).

5. The water table shall be at least eighteen (18) inches or deeper below normal ground level when wastes, either wastewater irrigation, manure, spoil, or sludge, are land applied. Observation wells shall be visually checked prior to land application. Irrigation with wastewater shall be controlled at all times to prevent runoff of wastewater from either excessive irrigation or by mixing with stormwater.

6. The use of the center pivot sprayfield must be controlled such that wastewater is not directly sprayed over the collection ditch when there is flow in the ditch. The operator should carefully monitor the use of the pivot after rainy periods to prevent the direct spraying of wastewater into the ditch under such conditions.

V. Operation and Maintenance Requirements

A. Operation of Treatment and Disposal Facilities

1. The permittee shall ensure that the operation of this facility is as described in the application and supporting documents.

2. The operation of the pollution control facilities described in this permit shall be under the full time supervision of a person who is qualified by formal training and/or practical experience in the field of water pollution control.

3. Feed/water and shade facilities for the milk herd shall be located inside the High Intensity Area, except as otherwise provided in the Operation and Maintenance (O&M) Manual signed by the Engineer of the Plan and received January 30, 1992. The facilities and herd management shall be maintained in accordance with the O&M plan. Herd pasture shall be maintained such that the creation of "high intensity use areas", as defined in FAC Rule 62-670, is prevented and/or pasture runoff does not cause or contribute to violations of water quality standards. Grassed berms shall be cut regularly and maintained with grass cover to prevent erosion; weed overgrowth shall be prevented.

4. Lagoons, HIA ditches and sumps, and the waste storage pond shall be cleaned of manure, sand, sludge or other material so that effective treatment and/or design volumes are maintained in accordance with the Management Plan. Float level switches for all sump pumps shall be checked periodically to assure proper operation in accordance with the original design specifications. The permittee shall maintain records of all maintenance jobs at the site and make them available for inspection.

5. All maintenance or construction activities shall be carried out in such a manner to prevent discharge of pollutants to surface waters of the state. If dewatering is necessary, the discharge shall be directed to the waste storage pond. The permittee should contact the Department for guidance should there be any questions concerning this requirement.

B. Record Keeping Requirements:

The permittee shall maintain the following records on the site of the permitted facility and make them available for inspection:

1. Records of all compliance monitoring information, including all calibration and maintenance records and all original strip chart recordings for continuous monitoring instrumentation, including, if applicable, a copy of the laboratory certification showing the certification number of the laboratory, for at least three years from the date the sample or measurement was taken;

2. Copies of all reports, other than those required in items 1. and 6. of this section, required by the permit for at least three years from the date the report was prepared, unless otherwise specified by Department rule;

3. Records of all data, including reports and documents used to complete the application for the permit for at least three years from the date the application was filed, unless otherwise specified by Department rule;

4. A copy of the current permit;

5. A copy of any required record drawings;

6. Copies of the logs and schedules showing plant operations and equipment maintenance for three years from the date on the logs or schedule

VI. Compliance Schedules and Self-imposed Improvement Schedules

The permittee shall achieve compliance with the conditions of this permit in accordance with the following schedule:

1. Operation and Maintenance (O&M) Manual submitted January 30, 1992: effective date of permit

VII. Other Specific Conditions

A. Specific Conditions Applicable to all permits

1. Drawings, plans, documents or specifications submitted by the permittee, not attached hereto, but retained on file at Department of Environmental Protection, Southeast District (DEP, SED) are made a part hereof.

2. If significant historical or archaeological artifacts are discovered at any time within the project site, the permittee shall immediately notify the District Office and the Bureau of Historic Preservation, Division of Archives, History and Records Management, R.A. Gray Building, Tallahassee, Florida 32301.

3. Where required by Chapter 471 (P.E.) or Chapter 492 (P.G.) Florida Statutes, applicable portions of reports to be submitted under this permit, shall be signed and sealed by the professional(s) who prepared them.

4. This permit satisfies Industrial Wastewater program permitting requirements only and does not authorize operation of this facility prior to obtaining any other permits required by local, state or federal agencies.

B. Duty to Reapply

1. The permittee shall submit an application to renew this permit at least 180 days before the expiration date of this permit.

2. The permittee shall apply on the appropriate form listed in Rule 62-620.910, F.A.C., and in the manner established in Rules 62-620.400 through 62-620.460, F.A.C., including submittal of the appropriate processing fee set forth in Rule 62-4.050, F.A.C.

3. An application filed in accordance with subsections 1. and 2. of this part shall be considered timely and sufficient. When an application for renewal of a permit is timely and sufficient, the existing permit shall not expire until the Department has taken final action on the application for renewal or until the last day for seeking judicial review of the agency order or a later date fixed by order of the reviewing court.

5. The late submittal of a renewal application shall be considered timely and sufficient for the purpose of extending the effectiveness of the expiring permit only if it is submitted and made complete before the expiration date.

C. Specific Conditions Related to Best Management Practices Condition

1. In accordance with Section 62-670.510(1), FAC, all dairy cattle must be fenced away from all water courses, or drainage ditches with a drainage area of 100 acres or more that will transport storm runoff to surface waters. Surface water in wetlands, low areas or cooling ponds, either natural or man-made, in which dairy cattle are allowed to enter or wade in, shall not be drained or discharged to waters of the State. The Department may require additional fencing on a case-by-case basis to prevent excessive nutrient loads in drainage which may cause or contribute to violations of state water quality standards.

2. All sources of nutrients from wastewater/runoff, HIA spoil, lagoon/manure trap solids, manure or commercial fertilizer shall be applied at rates not to exceed the annual nutrient requirements of the grasses or crops. The permittee shall record application rates of wastes and commercial fertilizer to fields and pastures to ensure that nutrients are properly managed. Records shall be available to the Department upon request or during inspections by Department representatives.

3. The Department may require the permittee to perform water quality testing for representative samples of the farm drainage. The frequency and the parameters of the analyses, as well as the appropriate sampling locations (s), shall be determined by the Department. The permittee shall be notified in writing if such monitoring is deemed necessary to demonstrate compliance with state water quality standards.

4. If the Department determines the management of dairy farm wastes causes or contributes to violations of groundwater or surface water standards the Department may require the permittee to modify the design or operation of the waste management system within a period acceptable to the Department.

5. Before construction of drainage ditches or widening or deepening of existing ditches, the permittee shall submit a written request and obtain prior approval from the Department and/or the South Florida Water Management District (SFWMD). Normal maintenance and clean-out of existing drainage ditches shall be carried out according to the regulations and/or guidelines provided by the SFWMD.

6. Cooling pond berms shall be adequately maintained to preclude a discharge from the pond(s) to surface waters.

VIII. General Conditions

The following general conditions are referenced in Florida Administrative Code Rule 62-620.610.

1. The terms, conditions, requirements, limitations and restrictions set forth in this permit are binding and enforceable pursuant to Chapter 403, Florida Statutes. Any permit noncompliance constitutes a violation of Chapter 403, Florida Statutes, and is grounds for enforcement action, permit termination, permit revocation and reissuance, or permit revision.

2. This permit is valid only for the specific processes and operations applied for and indicated in the approved drawings or exhibits. Any unauthorized deviations from the approved drawings, exhibits, specifications or conditions of this permit constitutes grounds for revocation and enforcement action by the Department.

3. As provided in Subsection 403.087(6), F.S., the issuance of this permit does not convey any vested rights or any exclusive privileges. Neither does it authorize any injury to public or private property or any invasion of personal rights, nor authorize any infringement of federal, state, or local laws or regulations. This permit is not a waiver of or approval of any other Department permit or authorization that may be required for other aspects of the total project which are not addressed in this permit.

4. This permit conveys no title to land or water, does not constitute state recognition or acknowledgment of title, and does not constitute authority for the use of submerged lands unless herein provided and the necessary title or leasehold interests have been obtained from the State. Only the Trustees of the Internal Improvement Trust Fund may express State opinion as to title.

5. This permit does not relieve the permittee from liability and penalties for harm or injury to human health or welfare, animal or plant life, or property caused by the construction or operation of this permitted source; nor does it allow the permittee to cause pollution in contravention of Florida Statutes and Department rules, unless specifically authorized by an order from the Department. The permittee shall take all reasonable steps to minimize or prevent any discharge, reuse of reclaimed water, or residuals use or disposal in violation of this permit which has a reasonable likelihood of adversely affecting human health or the environment. It shall not be a defense for a permittee in an enforcement action that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this permit.

6. If the permittee wishes to continue an activity regulated by this permit after its expiration date, the permittee shall apply for and obtain a new permit.

7. The permittee shall at all times properly operate and maintain the facility and systems of treatment and control, and related appurtenances, that are installed and used by the permittee to achieve compliance with the conditions of this permit. This provision includes the operation of backup or auxiliary facilities or similar systems when necessary to maintain or achieve compliance with the conditions of the permit.

8. This permit may be modified, revoked and reissued, or terminated for cause. The filing of a request by the permittee for a permit revision, revocation and reissuance, or termination, or a notification of planned changes or anticipated noncompliance does not stay any permit condition.

9. The permittee, by accepting this permit, specifically agrees to allow authorized Department personnel, including an authorized representative of the Department and authorized EPA personnel, when applicable, upon presentation of credentials or other documents as may be required by law, and at reasonable times, depending upon the nature of the concern being investigated, to

a. Enter upon the permittee's premises where a regulated facility, system, or activity is located or conducted, or where records shall be kept under the conditions of this permit;
b. Have access to and copy any records that shall be kept under the conditions of this permit;
c. Inspect the facilities, equipment, practices, or operations regulated or required under this permit; and
d. Sample or monitor any substances or parameters at any location necessary to assure compliance with this permit or Department rules.

10. In accepting this permit, the permittee understands and agrees that all records, notes, monitoring data, and other information relating to the construction or operation of this permitted source which are submitted to the Department may be used by the Department as evidence in any enforcement case involving the permitted source arising under the Florida Statutes or Department rules, except as such use is proscribed by Section 403.111, Florida Statutes, or Rule 62-620..302, Florida Administrative Code. Such evidence shall only be used to the extent that it is consistent with the Florida Rules of Civil Procedure and applicable evidentiary rules.

11. When requested by the Department, the permittee shall within a reasonable time provide any information required by law which is needed to determine whether there is cause for revising, revoking and reissuing, or terminating this permit, or to determine compliance with the permit. The permittee shall also provide to the Department upon request copies of records required by this permit to be kept. If the permittee becomes aware of relevant facts that were not submitted or were incorrect in the permit application or in any report to the Department, such facts or information shall be promptly submitted or corrections promptly reported to the Department.

12. Unless specifically stated otherwise in Department rules, the permittee, in accepting this permit, agrees to comply with changes in Department rules and Florida Statutes after a reasonable time for compliance; provided, however, the permittee does not waive any other rights granted by Florida Statutes or Department rules. A reasonable time for compliance with a new or amended surface water quality standard, other than those standards addressed in Rule 62-302.500, F.A.C., shall include a reasonable time to obtain or be denied a mixing zone for the new or amended standard.

13. The permittee, in accepting this permit, agrees to pay the applicable regulatory program and surveillance fee in accordance with Rule 62-5.052, F.A.C.

14. This permit is transferable only upon Department approval in accordance with Rule 62-620.340, F.A.C. The permittee shall be liable for any noncompliance of the permitted activity until the transfer is approved by the Department.

15. The permittee shall give the Department written notice at least 60 days before inactivation or abandonment of a wastewater facility and shall specify what steps will be taken to safeguard public health and safety during and following inactivation or abandonment.

16. The permittee shall apply for a revision to the Department permit in accordance with Rules 62-620.300, 62.420 or 62.620.450, F.A.C., as applicable, at least 90 days before construction of any planned substantial modifications to the permitted facility is to commence or with Rule 62-620.300 for minor modifications to the permitted facility. A revised permit shall be obtained before construction begins except as provided in Rule 62-620.300, F.A.C.

17. The permittee shall give advance notice to the Department of any planned changes in the permitted facility or activity which may result in noncompliance with permit requirements. The permittee shall be responsible for any and all damages which may result from the changes and may be subject to enforcement action by the Department for penalties or revocation of this permit. The notice shall include the following information:
    a. A description of the anticipated noncompliance;
    b. The period of the anticipated noncompliance, including dates and times; and
    c. Steps being taken to prevent future occurrence of the noncompliance.

18. Sampling and monitoring data shall be collected and analyzed in accordance with Rule 62-4.246, Chapter 62-160 and 62-601, F.A.C., and 40 CFR 136, as appropriate.

a. Monitoring results shall be reported at the intervals specified elsewhere in this permit and shall be reported on a Discharge Monitoring Report (DMR), DEP Form 62-620.910(10).
b. If the permittee monitors any contaminate more frequently than required by the permit, using Department approved test procedures, the results of this monitoring shall be included in the calculation and reporting of the data submitted in the DMR.
c. Calculations for all limitations which require averaging of measurements shall use an arithmetic mean unless otherwise specified in this permit.
d. Any laboratory test required by this permit for domestic wastewater facilities shall be performed by a laboratory that has been certified by the Department of Health and Rehabilitative Services (DHRS) under Chapter 10D41, F.A.C., to perform the test. In domestic wastewater facilities, on-site tests for dissolved oxygen, pH, and total chlorine residual shall be performed by a laboratory certified to test for those parameters or under the direction of an operator certified under Chapter 61E12-41, F.A.C.
e. Under Chapter 62-160, F.A.C., sample collection shall be performed by following the protocols outlined in "DER Standard Operating Procedures for Laboratory Operations and Sample Collection Activities" (DER-QA-001/92). Alternatively, sample collection may be performed by an organization who has an approved Comprehensive Quality Assurance Plan (CompQAP) on file with the Department. The CompQAP shall be approved for collection of samples from the required matrices and for the required tests.

19. Reports of compliance or noncompliance with, or any progress reports on, interim and final requirements contained in any compliance schedule detailed elsewhere in this permit shall be submitted no later than 14 days following each schedule date.

20. The permittee shall report to the Department any noncompliance which may endanger health or the environment. Any information shall be provided orally within 24 hours from the time the permittee becomes aware of the circumstances. A written submission shall also be provided within five days of the time the permittee becomes aware of the circumstances. The written submission shall contain: a description of the noncompliance and its cause; the period of noncompliance including exact dates and time, and if the noncompliance has not been corrected, the anticipated time it is expected to continue; and steps taken or planned to reduce, eliminate, and prevent recurrence of the noncompliance.
    a. The following shall be included as information which must be reported within 24 hours under this condition:
        1. Any unanticipated bypass which causes any reclaimed water or the effluent to exceed any permit limitation or results in an unpermitted discharge,
        2. Any upset which causes any reclaimed water or the effluent to exceed any limitation in the permit,
        3. Violation of a maximum daily discharge limitation for any of the pollutants specifically listed in the permit for such notice, and
        4. Any unauthorized discharge to surface or ground waters.
    b. If the oral report has been received within 24 hours, the noncompliance has been corrected, and the noncompliance did not endanger health or the environment, the Department shall waive the written report.

21. The permittee shall report all instances of noncompliance not reported under Conditions VIII. A. 18. and 19. of this permit at the time monitoring reports are submitted. This report shall contain the same information required by Condition VIII. A. 20. of this permit.

22. Bypass Provisions.
    a. Bypass is prohibited, and the Department may take enforcement action against a permittee for bypass, unless the permittee affirmatively demonstrates that:
        (1). Bypass was unavoidable to prevent loss of life, personal injury, or severe property damage; and
        (2). There were no feasible alternatives to the bypass, such as the use of auxiliary treatment facilities, retention of untreated wastes, or maintenance during normal periods of equipment downtime. This condition is not satisfied if adequate back-up equipment should have been installed in the exercise of reasonable engineering judgment to prevent a bypass which occurred during normal periods of equipment downtime or preventive maintenance; and
        (3). The permittee submitted notices as required under Condition VIII. A. 22. b. of this permit.
    b. If the permittee knows in advance of the need for a bypass, it shall submit prior notice to the Department, if possible at least 10 days before the date of the bypass. The permittee shall submit notice of an unanticipated bypass within 24 hours of learning about the bypass as required in Condition VIII. A. 20. of this permit. A notice shall include a description of the

bypass and its cause; the period of the bypass, including exact dates and times; if the bypass has not been corrected, the anticipated time it is expected to continue; and the steps taken or planned to reduce, eliminate, and prevent recurrence of the bypass.

c. The Department shall approve an anticipated bypass, after considering its adverse effect, if the permittee demonstrates that it will meet the three conditions listed in Condition VIII. A. 22. a. through 3. of this permit.

d. A. permittee may allow any bypass to occur which does not cause reclaimed water or effluent limitations to be exceeded if it is for essential maintenance to assure efficient operation. These bypasses are not subject to the provision of Condition VIII. A. 22. a. through c. of this permit.

23. Upset Provisions

a. A permittee who wishes to establish the affirmative defense of upset shall demonstrate, through properly signed contemporaneous operating logs, or other relevant evidence that:
(1). An upset occurred and that the permittee can identify the cause(s) of the upset;
(2). The permitted facility was at the time being properly operated;
(3). The permittee submitted notice of the upset as required in Condition VIII. A. 20. of this permit; and
(4). The permittee complied with any remedial measures required under Condition VIII. A. 5. of this permit.

b. In any enforcement proceeding, the permittee seeking to establish the occurrence of an upset has the burden of proof.

c. Before an enforcement proceeding is instituted, no representation made during the Department review of a claim that noncompliance was caused by an upset is final agency action subject to judicial review.

Executed in West Palm Beach, Florida.

STATE OF FLORIDA DEPARTMENT
OF ENVIRONMENTAL PROTECTION

12/4/97

Alfred Mueller, Jr., P.E., P.G. Date
Water Facilities Administrator
Southeast District
P. O. Box 15425
West Palm Beach, FL 33416

Animal Nutrient Management Assessment for Dry Lake Dairy

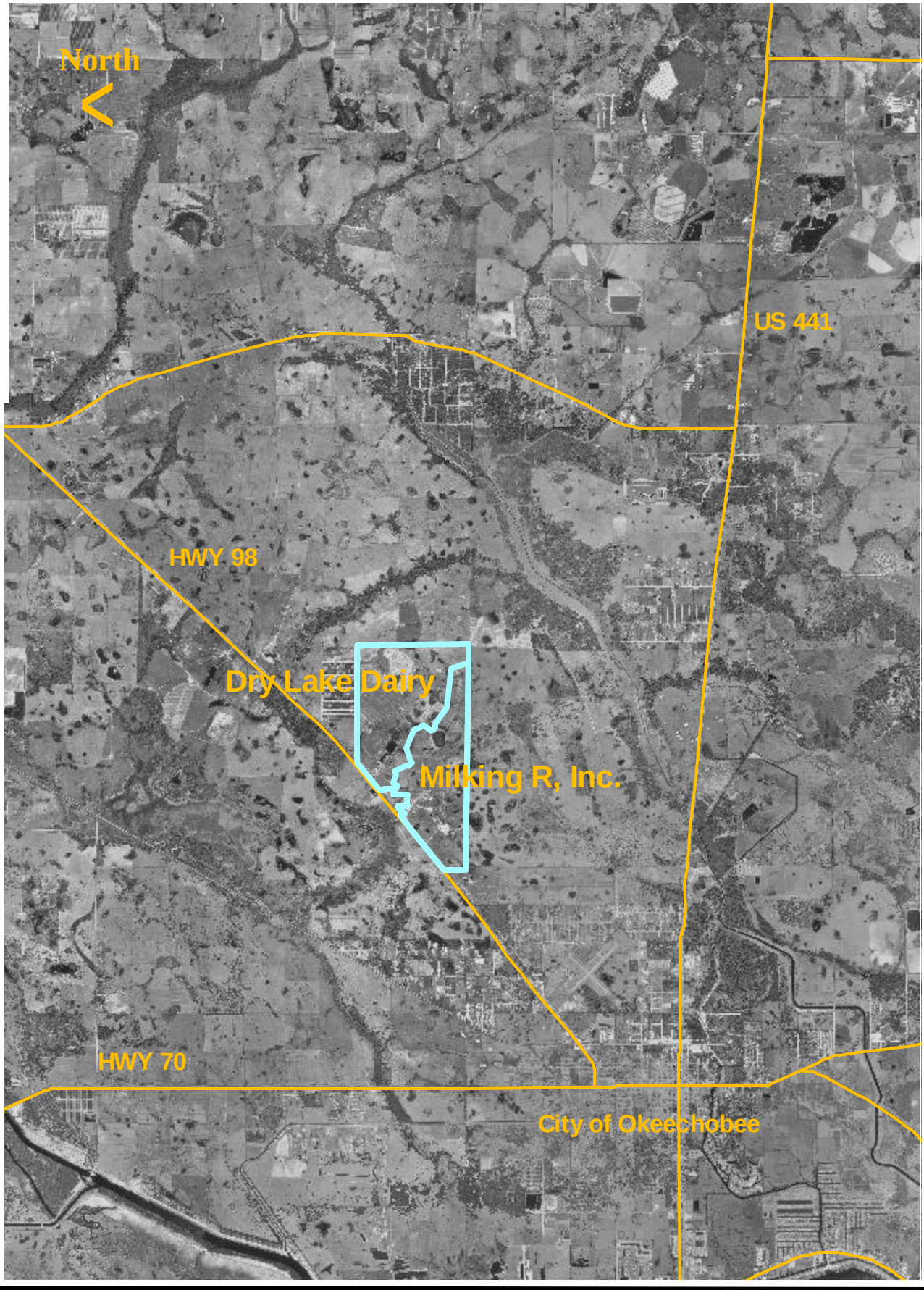
1.0 Introduction

This animal nutrient management assessment (ANMA) was completed for Dry Lake Dairy, Inc. Milking R, Inc. (formerly Dry Lake Dairy Barn 2) was included in the assessment because the two dairies are highly interconnected and information regarding Milking R, Inc. was needed to fully understand the situation at Dry Lake Dairy (formerly Dry Lake Dairy Barn 1). The focus of the ANMA was to describe the existing conditions and related phosphorus (P) balance on the dairy so that the most appropriate practices or technologies can be identified to further reduce phosphorus (P) discharges to the target goal of 40 ppb. High P source-areas are identified and potential solutions proposed. This assessment is a revised copy of the February 26, 2001 assessment completed for the Florida Department of Agriculture and Consumer Services.

Mr. Charlie Rucks with Dry Lake Dairy and Mr. Sutton Rucks with Milking R, Inc., were extremely helpful in providing dairy records and explaining the overall dairy operation and historical practices. Their assistance was critical for properly characterizing the dairies and identifying areas needing attention to meet the P reduction goals for the dairy.

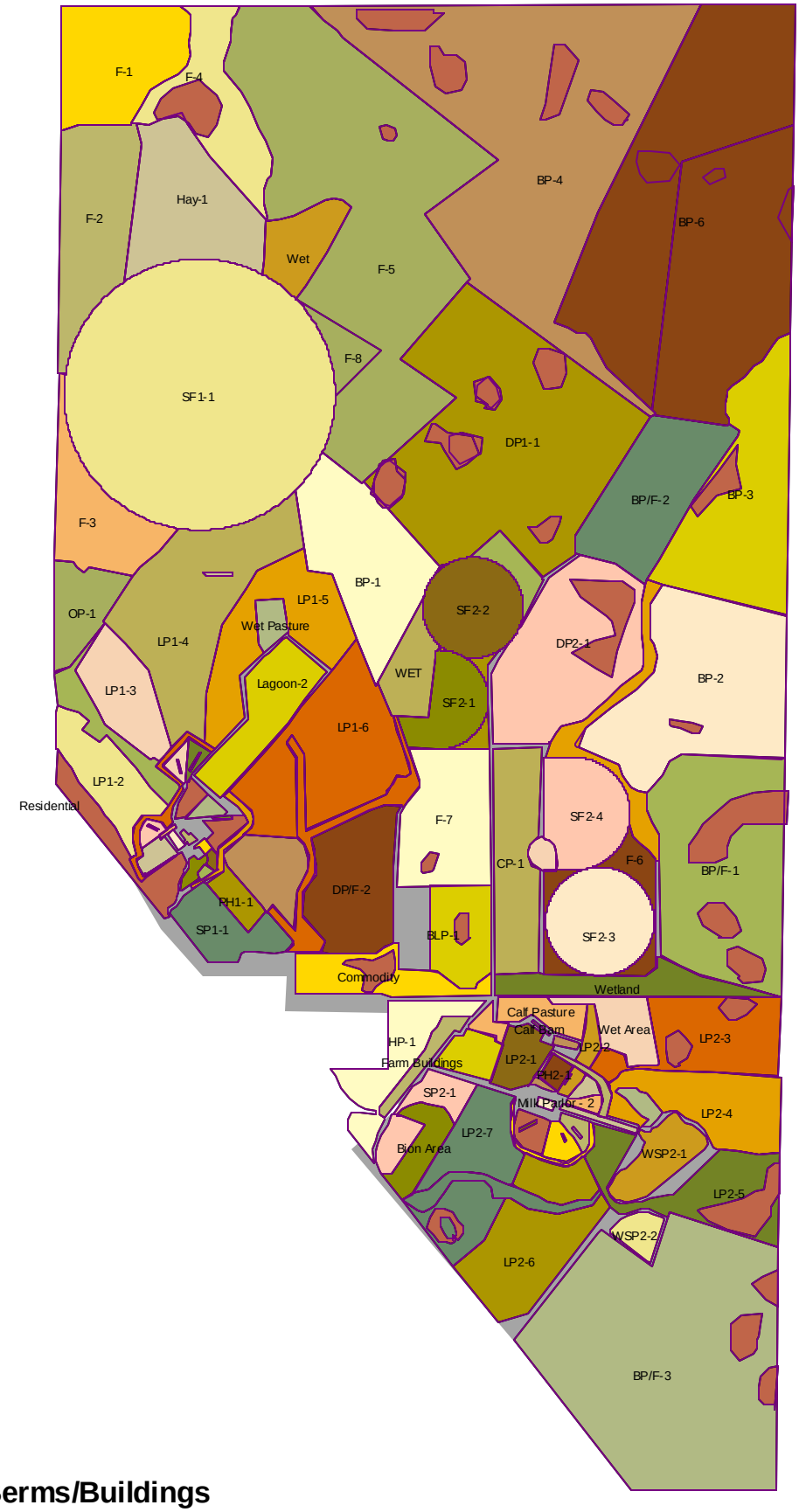
2.0 Description of Farming Operation

Dry Lake Dairy and Milking R, Inc. are located on approximately 2318 acres of land about 6 miles northwest of Okeechobee, FL on the north side of US HWY 98 (Figure 2-1). The predominant dairy cow breed is Holstein. The Dry Lake Dairy milk center was built in 1956 and Milking R, Inc. milk center was completed in 1986. The remainder of the dairy property consists of high intensive areas (HIAs) / holding pastures within a HIA perimeter drainage ditch, outer lactating herd pastures, dry cow pastures, springer / heifer pastures, a bull pasture, calf lots, beef pastures, hayfields, sprayfields, commodities storage area, waste ponds, residences, and wetlands (Figure 2-2). Table 2-1 provides the land use, size, and animal densities for the fields presented in Figure 2-2. The lactating cows are fed and watered in feed barns located within the HIAs or in the outer pastures (outside of HIA perimeter ditch). A few lactating herds are not fed in the outer pasture. Dry cows, springers and heifers, bulls, and beef cattle are grazed in separate pastures with supplemental feed provided in the pastures (some bulls run with the dry cows, springers, and heifers). Calves are fed within their small holding lots. The amounts and types of feed provided the various animals are detailed in a later section.



Prepared by SWET, Inc.	Figure 2-1. Dry Lake Dairy Locator Map Dry Lake Dairy ANMA	Scale 2 Miles

North



Land Use Legend

- Horse Pasture
- Beef Pasture
- Beef/Forage Past
- Bion - Solids
- Bion EcoReactor
- Bull Pasture
- Calf Barn
- Calf Pasture
- Commodity
- Dry Cow Pasture
- Dry/Forage Past
- Farm Buildings
- Feed Barn
- Fenced Ditch
- Forage
- HIA
- Hay
- Lactating Pastur
- Lagoon
- Milk Parlor
- Old Pasture
- Perimeter Ditch
- Pond
- Pot Herd
- Pri. Feed Barn
- Residential
- Sprayfield
- Waste Pond
- Wetland
- Misc. Drives/Ditches/Berms/Buildings

Prepared by SWET, Inc.	Figure 2-2. Dry Lake Dairy Land Uses Dry Lake Dairy ANMA	Scale 2000 feet

Table2-1. Land Use and Fields Description for Dry Lake Dairy

Field ID	Primary Use	Crop	% Time within HIA Ditch	Feed in Non-HIA Pasture?	Area Outside HIA Ditch	Number of Animals in Fields							
						Lactating	Pot Herd	Springer & Heifers	Dry Cows	Bulls	Beef Cattle	Horses	Calves
			(%)		(acres)	- - - - - - equivalent # of cows adjusted for time spent in field - - - - -							
Areas where Waste is Collected and Treated													
HIA1-1	Fresh Cows within HIA @ Barn 1	Bare/Stargrass	100	-	2.3	65							
HIA1*	Other Cows within HIA @ Barn 1	Bare/Stargrass	-	-	8.3	273	2.5	36		2.3			
PH2-1	Pot Herd within HIA @ Barn 2	Bare/Stargrass	100	-	1.9		25						
HIA2*	Other Cows within HIA @ Barn 2	Bare/Stargrass	-	-	7.7	228				1.5			
Barn 1 Outer Pastures													
LP1-2	1st Calf Heifers	stargrass	40	No	17.4	78							
LP1-3	Low Prod.-preg	stargrass	30	Yes	18.0	77							
LP1-4	High Prod.-preg	stargrass	25	Yes-Barn	55.2	137							
LP1-5	High Prod.-open	stargrass	35	Yes	30.8	161				1.3			
LP1-6	Low Prod.-open	stargrass	40	Yes	47.1	84				1.2			
PH1-1	Pot Herd	stargrass	10	Yes	4.5		22.5						
SP1-1	Springers - Barn 1	stargrass	40	No	13.4			54		1.2			
Barn 2 Outer Pastures													
LP2-1	High Prod. - Fresh	stargrass	25	Yes	7.1	41							
LP2-2	Low Prod.-Open	stargrass	40	No	2.4	42				1.2			
LP2-3	Low Prod. - Preg	stargrass	25	Yes	28.4	68							
LP2-4	High Prod. - Preg	stargrass	40	No	25.6	30							
LP2-5	High Prod.-Preg	stargrass	35	A little	26.8	107							
LP2-6	High Prod.-Open	stargrass	35	A little	34.5	88				1.3			
LP2-7	High Prod.	stargrass	35	A little	27.5	72							
Fields where animal have no access to Milk Barn's HIAs													
DP1-1	Dry Cows - Barn 1	stargrass	-	Yes	123.8				210				
DP1/F-2	Forage, prev. Dry Cows	stargrass	-	Yes	29.7								
DP2-1	Dry Cows - Barn 2	stargrass	-	Yes	53.3				100				
SP2-1	Springers - Barn 2	stargrass	-	Yes	20			88					
BLP-1	Bulls Pasture	stargrass	-	Yes	22.5					18			
BP-1	Beef Pasture	stargrass	-	Minerals	43.0						20		
BP-2	Beef Pasture	stargrass	-	Minerals	70.2						20		
BP-3	Beef Pasture	stargrass	-	Minerals	57.1						20		
BP-4	Beef Pasture - Solids	stargrass	-	Minerals	168.6						80		
BP-5	Beef Pasture/Hay - Solids	stargrass	-	Minerals	166.6						70		
BP-6	Beef Pasture	stargrass	-	Minerals	180.9						70		
BP/F-1	Beef/Forage - Solids	stargrass	-	Minerals	74.7						10		
BP/F-2	Beef/Forage Pasture	stargrass	-	Minerals	37.5						10		
BP/F-3	Beef/Forage,Old Heifer P.	stargrass	-	Minerals	144.1						10		
HAY-1	Hayfield	stargrass	-	-	39.6								
HAY-2	Hayfield	stargrass	-	-	15.7								

Table 2-1 cont'. Land Use and Fields Description for Dry Lake Dairy

Field ID	Primary Use	Crop	% Time within HIA Ditch	Feed in Non-HIA Pasture?	Area Outside HIA Ditch	Number of Animals in Fields						
						Lactating	Pot Herd	Springer & Heifers	Dry Cows	Bulls	Beef Cattle	Horses
			(%)		(acres)	- - - - - - equivalent # of cows adjusted for time spent in field *						
HP-1	Horse/Show Calves Past.	stargrass	-	Yes	17.6							
CP-1	Calf Pens/Pasture	stargrass	-	Yes	26.6							
CP-2	Calf Pasture	stargrass	-	Yes	6.4							
CP-3	Calf Pasture	stargrass	-	Yes	6.0							
Fields with No Animals												
SF1-1	Sprayfield Barn 1 - Forage	stargrass/oats	-	-	162							
SF2-1	Sprayfield Barn 2 - Forage	stargrass/oats	-	-	14.7							
SF2-2	Sprayfield Barn 2 - Forage	stargrass/oats	-	-	21.4							
SF2-3	Sprayfield Barn 2 - Forage	stargrass/oats	-	-	24.9							
SF2-4	Sprayfield Barn 2 - Forage	stargrass/oats	-	-	21.4							
F-1	Forage Crop - Solids	stargrass	-	-	35.2							
F-2	Forage Crop	stargrass	-	-	37.7							
F-3	Forage Crop	stargrass	-	-	24.3							
F-4	Forage Crop	stargrass	-	-	30.5							
F-5	Forage Crop(SF2-1 edges)	stargrass	-	-	7.6							
F-6	Forage Crop(SF2-3 edges)	stargrass	-	-	15							
F-7	Forage Crop - Solids	stargrass	-	-	31.3							
F-8	Forage Crop	stargrass	-	-	6.4							
Other Areas on Dairy												
Unused	Wetlands, Ditches	-	-	-	111							
NonDairy	Residential	-	-	-	11.2							
Facilities	Commodities/roads/buildings/dikes	-	-	-	49							
OP-1	Old Unused Pastures, wetlands	stargrass	-	-	13.8							
WSP1-1	Barn 1 Waste Storage Pond	-	-	-	19.9							
Lagoon2	Barn 2 Lagoon	-	-	-	1.2							
Lagoon-C	Calf Barn Lagoon	-	-	-	0.5							
WSP2-1	1st Waste Pond Barn 2	-	-	-	11.5							
WSP2-2	2nd Waste Pond Barn 2	-	-	-	4.5							
Totals					**2318**	**1550**	**50**	**178**	**310**	**28**	**310**	

* These are cows that come and go from HIA, cow numbers shown are the equivalent number of animals within the HIA

Table 2-1 addendum. Summary of Animals

	Number of Animals by Type							
	Lactating	Pot Herd	Springer & Heifers	Dry Cows	Bulls	Beef Cattle	Horses	Calves
Barn 1	875	25	90	210	6	0	0	0
Barn 2	675	25	88	100	4	0	0	0
Other Pastures					18	310	3	155
Totals	**1550**	**50**	**178**	**310**	**28**	**310**	**3**	**155**

3.0 Description of Milk Centers and Existing Waste Management Systems

The two milk centers have separate waste management systems and are therefore described separately.

3.1 Dry Lake Dairy Waste Management System

Dry Lake Dairy (also known as barn 1) is the original milking facility that was purposely built next to a small creek in the 1950's to drain manure away from the barns. This original waste management system has left a significant amount manure residues in the surrounding ditches and streams. A lagoon and seepage drainage system was installed in about 1970 to divert barn flush water away from the stream. This system was further improved in 1988 to come into compliance with the Florida Department of Environmental Protection (FDEP) Dairy Rule. The waste management system was designed by the Natural Resources and Conservation Service (NRCS) to handle the waste from 950 lactating cows and meets all NRCS construction standards.

As part of the Dairy Rule improvements, a perimeter ditch was installed around the HIAs near the barn to collect all drainage water for later land application (Figure 3-1). The perimeter ditch drainage water is pumped into a much-enlarged waste storage pond (20 ac). A sprayfield (162 ac center pivot) was also established to handle the effluent from the waste storage pond. The entire system was designed to hold the 24-hour, 25-year storm event and not to have any effluent application to the sprayfield if water tables within the sprayfield were within 18 in. of the surface. In 1992, a Bion sediment basin was added prior to the waste storage pond to remove solids and produce a marketable soil amendment.

The waste management system at Barn 1 handles all the water and waste generated within the HIA perimeter ditch. Manure is deposited within the HIA in seven separate areas: the milk parlor, cow wash area, primary feed barn "Flat Barn", concrete travel lanes, milk herd feed sheds, springers feed barn, and open dirt lots. The milk parlor, cow wash area, and primary feed barn are flushed with fresh water. All flush water drains through a sand trap and then through a large sedimentation basin (Bion system) prior to entering the 20 ac waste storage pond. The other concrete areas (travel lanes, staging areas, and feed sheds) are scraped directly into the Bion sedimentation basin. The dirt lots are periodically scraped and graded to maintain good drainage. The scraped materials from the lots are spread on beef pastures and hayfields. The solids in the Bion sediment basin are removed and stacked beside the basin for drying about twice a year. The partially composted material from the Bion system had been until year 2000 picked up and hauled off site by Bion. At the start of this year, the dairy has been forced to handle these solids, which are now applied to beef-pastures and hayfields onsite. The one springer / heifer feed barn located within the HIA perimeter ditch is scraped and spread onto beef and hayfields.

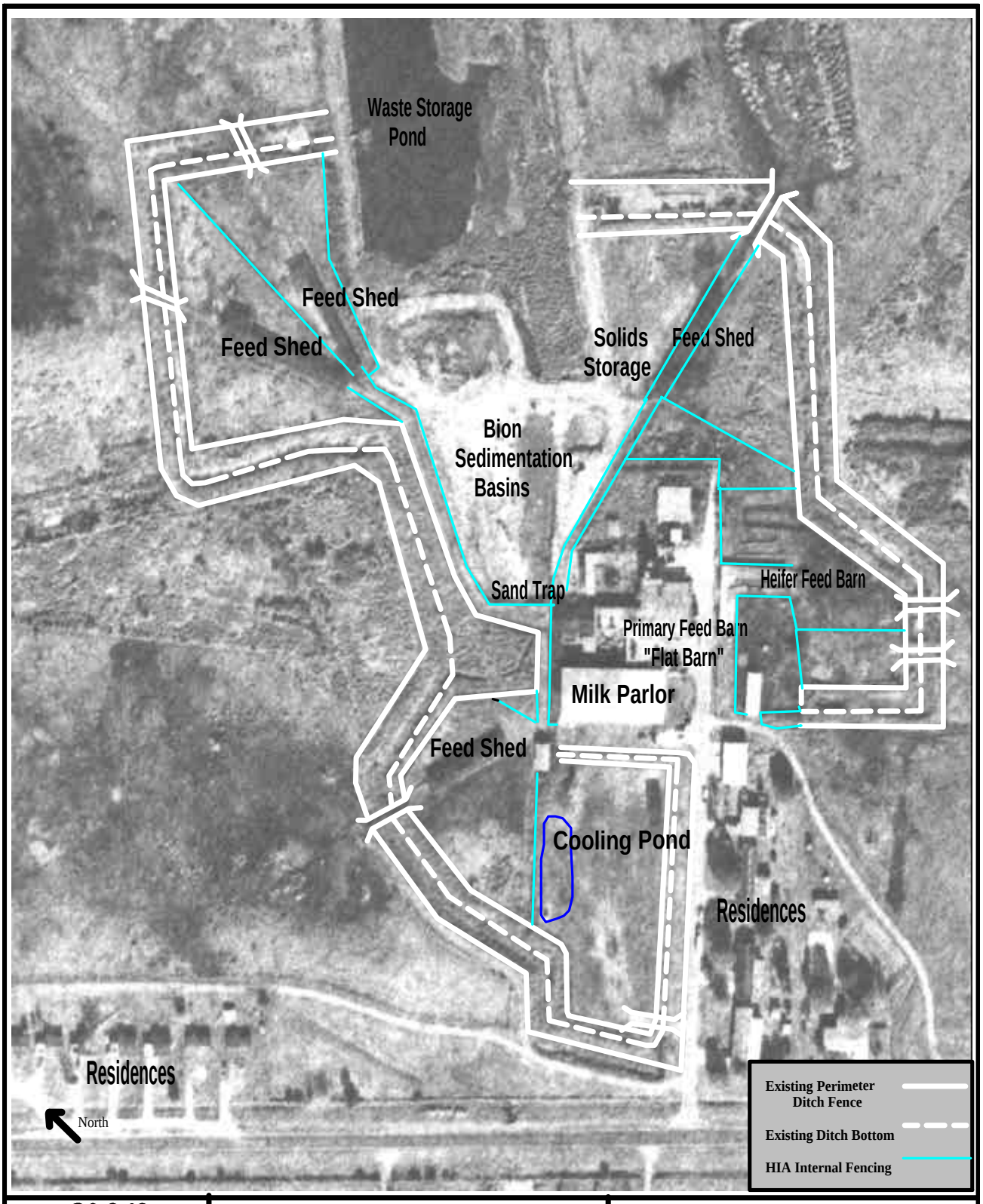


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Figure 3-1. HIA Layout for Barn 1, Dry Lake Dairy ANMA

Top of Embankment Elevation = ~ 101ft
Ditch Bottom Elevation = ~ 92 ft
Scale : 1 inch = ~ 240 ft

The effluent from the waste storage pond is spray irrigated through a center pivot irrigation system onto approximately 162-ac sprayfield. The sprayfield has a series of 18-in deep field ditches to provide field drainage. Effluent is only applied to the sprayfield if no water is present in any of the field ditches. The sprayfield is planted with Stargrass, which is harvested for silage 6 to 8 times a year. All silage produced is fed on the dairy.

3.2 Milking R, Inc. Waste Management System

Milking R, Inc. is a newer facility that was built in 1986 in accordance with the DEP Dairy Rule. The facility was designed by NRCS and constructed to their standards to handle the waste from 700 lactating cows. Similar to Dry Lake Dairy Barn 1, Milking R, Inc. has a perimeter ditch (Figure 3-2) around the HIAs near the barn. Within the HIA perimeter ditch are the milk parlor, cow wash area, four feed barns, one cooling pond, open lots, and a large unused wet area. The milk parlor and cow wash areas are flushed with fresh water directly to a 1.2 ac anaerobic lagoon. The feed barns are flushed with recycled water from the 1st stage waste storage pond and drain directly into the anaerobic lagoon. There is no sand or solids separation prior to the lagoon and therefore the lagoon acts as both solids trap an anaerobic lagoon. The drainage collected in the HIA perimeter ditch is pumped into the anaerobic lagoon about midway from the barn. Effluent from the lagoon drains to the 1st stage waste storage pond (12 ac), which is connected by culvert to a 2nd stage waste storage pond (4.5 ac). The 2nd stage pond was added in 1994 to provide additional storage. Effluent from the waste storage ponds is spray irrigated onto about 85 ac of forage land using four small pivots (see Figure 2-2). The sprayfields are drained with 18 in deep drainage ditches. Application is not to occur on the sprayfields if water is present in the drainage ditches. Stargrass within the sprayfields is harvested 6 to 8 times per year for silage production.

The solids collecting within the anaerobic lagoon have not been removed to date. When they are removed they will be placed on the lagoon banks to dry for several months and then collected and spread in the beef pastures and hay fields or hauled offsite.

3.3 Pasture Management

Lactating cows (while outside of the HIA perimeter ditch), dry cows, heifers, springers, bulls, and beef cows are maintained on Stargrass pastures. Figure 2-2 and Table 2-1 present the location and distribution of animals on these pastures. Water is provided in all pastures. Supplement feed is also provided in the pastures, except for pastures LP1-2, SP1-1, LP2-2, and LP2-4. Cooling ponds are available in most pastures. Only pasture LP1-4 has a feed barn located within the pasture. Pastures are maintained by periodic mowing and spraying for invasive species. Pastures are not fertilized with phosphorus but they will receive nitrogen fertilization from time to time.

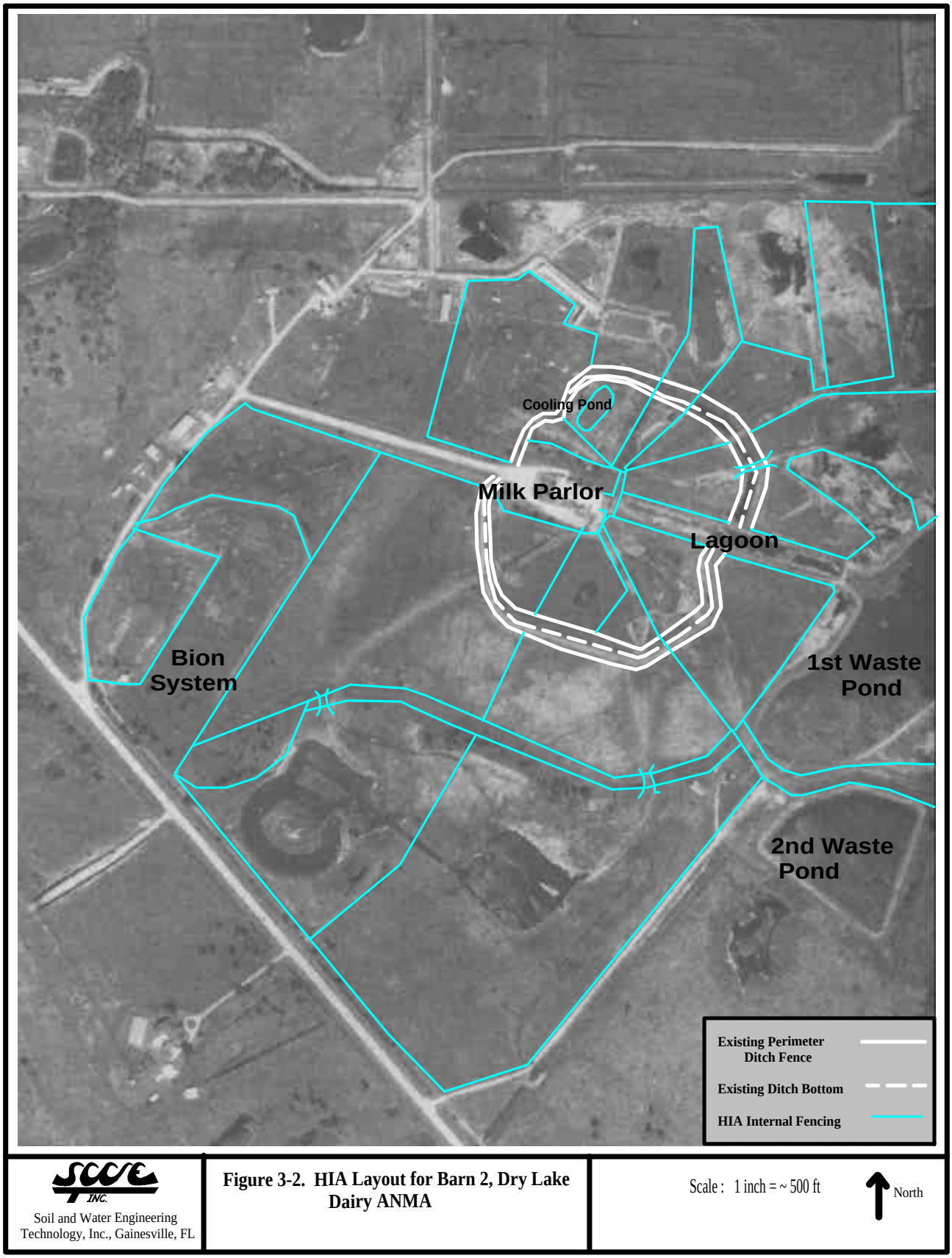

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Figure 3-2. HIA Layout for Barn 2, Dry Lake Dairy ANMA

Scale : 1 inch = ~ 500 ft

North

4.0 Current Permit Status

The former Dry Lake Dairy, Inc. had separate FDEP permits for each barn. Currently Dry Lake Dairy Barn 1 is under permit no. 10-28-191195 and Milking R, Inc., (the former Barn 2) is under permit no. 10-47-175927. FDEP routinely inspects the dairies for compliance with permit requirements. These inspections have found the dairy's waste management systems to be functioning properly since they were built. However, some other problems such as feed bunk placement in outer pastures and lack of full utilization of the HIA within the perimeter ditch were noted and corrected during the course of these inspections. The dairy is in good standing with DEP.

5.0 Soil Conditions

The dairies have predominantly flatwood soils. Immokalee and Myakka fine sands make up the majority of the open pasture areas while Basinger, Pompano, Placid, and Delray fine sands make up the majority of the slough and isolated wetlands as seen Figure 5-1. The Immokalee and Myakka soils are poorly drained soils with a spodic hardpan at about 30 to 45 in, but when drained, these soils are very productive for crop growth, particularly forage grasses. Water tables in the Immokalee and Myakka soils range from about 6 to 60 in below the ground surface from the wet to dry season, respectively. The slough and wetland soils can provide dry season grass production, but typically support native wetland species. Water tables within the slough and wetland soils range from flooded to 24 in below the ground surface. Localized interflow in the upper sandy soil horizons is limited unless drainage ditches or subsurface drains are present. Most discharge comes from surface runoff when the water tables approach the ground surface.

The predominant soils (Immokalee and Myakka) on the dairy have a dual NRCS hydrologic group rating of B-D, which means the soils are very poorly drained (D) and produce high runoff in their native state but become moderately well drained (B) and produce less runoff if ditched. The remaining wetland soils have a hydrologic group rating of D, which means they have high runoff potential. However, the existence of isolated wetlands creates significant onsite storage that can reduce runoff. The sandy A and E surface horizons of these soils typically have low P retention and therefore can leach P if P loads exceed crop uptake.

North

Soil Legend

Ad - Adamsville fine sand
Bc - Basinger - Placid complex
Bm - Basinger and Pompano fine sands, ponded
Ch - Charlotte fine sand
De - Delaray fine sand
Fp - Felda, Pompano, and Placid soils, ponded
Fr - Ft. Drum fine sand
Im - Immokalee fine sand
My - Myakka fine sand
Pe - Parkwood fine sand
Pf - Placid fine sand
Pn - Pompano fine sand
Wa - Wabasso fine sand

Land Use Boundaries ——

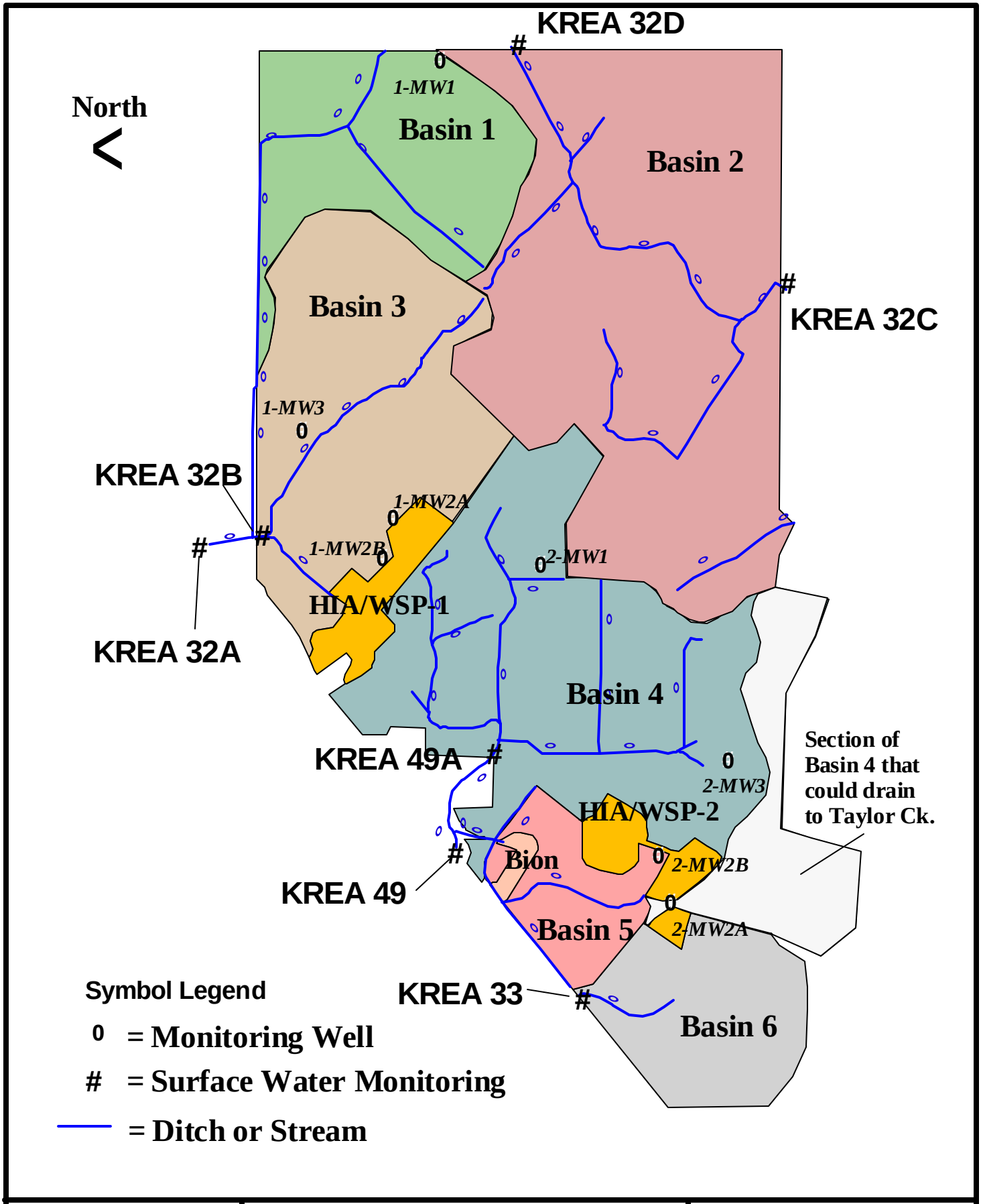
Prepared by SWET, Inc.	Figure 5-1. Soils for Dry Lake Dairy Dry Lake Dairy ANMA	Scale 2000 feet

6.0 Hydrology and Topography

The flatwood soils on the dairies are very flat with surface gradients of less than 3 ft per mile. Topographical maps of the dairies are too coarse to provide anything other than very general flow direction information and therefore are not presented. Elevations on the dairies range from a 34 to 38 ft NGVD. Figure 6-1 shows the streams, flow direction, and drainage basins within the dairies. The flow paths and basins were generated based on the dairyman's observations of flow direction during storm events. The actual drainage basin boundaries are extremely hard to delineate due to the flat terrain that is featured with numerous isolated wetlands. In some cases, the flow direction can vary depending on the rainfall pattern. The isolated wetlands east and northeast of Barn 2 in Basin 4 are shown flowing to site 49, but may actually flow east to Taylor Creek during wet conditions. The isolated wetlands, particularly those mentioned above, can hold a significant amount of water from nearby runoff before discharge off farm will occur. This means that the better-drained pastures and sprayfields will generate runoff well before some of the areas around isolated wetland areas that do not have drainage ditches.

The dairies have six drainage basins that discharge from the property at six different locations (see Figure 6-1). Basins 1 and 2 have inflow from offsite properties to the north of the dairies from areas of about 100 and 300 acres, respectively. The southern portion of the north-south ditch that collects the drainage from Basin 1 is located on the adjacent property and also collects flow from areas immediately to the west of the dairies. Basin 2 discharges at two locations to the east into the Taylor Creek basin while all the other basins drain to the Kissimmee River basin. Basin 3 discharges from the property at monitoring station KREA 32B and collects flow from Dry Lake Dairy Barn 1's outer pastures and sprayfield. Basin 1's drainage enters downstream of the KREA 32B monitoring site but upstream of site KREA 32A. Basin 4 drains Barn 2's sprayfields and several pastures associated with Barns 1 and 2. The eastern part of Basin 4, (shaded in Figure 6-1), is characterized by isolated wetlands that typically have no discharge except during very wet periods. It is unclear if these wetlands flow to the east or west; therefore this area may or may not be part of Basin 4. Basin 5 represents Milking R Inc.'s outer lactating pastures that drain through the Bion Bioreactor. Drainage from the pastures is mixed with ferric sulfate when pumped into the Bion Bioreactor to facilitate P removal. Basin 6 is an old heifer pasture that has recently been converted to forage production.

The areas signified as HIA/WSP 1 and HIA/WSP 2 in Figure 6-1 are the areas within the HIA perimeter ditches and the waste storage ponds at Dry Lake Dairy Barn 1 and Milking R, Inc., respectively. These areas are designed to have no stormwater discharge for storms equal to, or less than, the 25-year, 24-hour storm event. Effluent from these areas is spray irrigated on five separate sprayfields located in Basins 3 and 4.



Prepared by SWET, Inc.	Figure 6-1. Drainage Bsins, Streams, and Monitoring Locations Dry Lake Dairy ANMA	0 2000 Feet

Runoff from the basins can vary greatly due to rainfall variations and on farm storage in isolated wetlands. For example, Basin 6 discharges infrequently as compared to the other basins due to in-field storage.

7.0 Water Quality Data

Phosphorus concentrations have been measured at a number of monitoring locations located at the dairies' boundaries and internal to the dairies. The last five-year averages (Table 7-1) for the five primary monitoring sites clearly show that the P concentrations exceed the current District target of 1.2 mg/l. Figure 6-1 shows the location of seven monitoring sites that are part of the South Florida Water Management District's water quality monitoring program. Data collection started in 1987, about the time that the Dairy Rule modifications were being implemented. Figures 7-1 to 7-5 show the data for sites KREA 32B (Basin 3), 32C (outflow from Basin 2), 32D (inflow to Basin 2), 33 (Basin 6), and 49 (Basins 4 & 5), respectively, that have been monitored since 1987. Sites KREA 32A and 49A have not been monitored regularly, particularly in recent years, and therefore are not very useful for assessing current conditions.

The data clearly show that the implementation of the Dairy Rule BMPs in the late 1980's dairy caused a significant reduction in P concentrations for those sites that had drainage from the barns' HIAs (sites 32B and 49), but since the early 1990's no further improvement has occurred. Site 32C represents a combination of inflow from KREA 32D and beef pastures. Site 33 represents a former heifer pasture and is currently in forage production. Both Sites 32C and 33 have remained about the same, until the most recent 2000 data that shows a significant drop at both sites to 0.2 and 1.1 mg-P/l at sites 32C and 33, respectively. The recent conversion of Basin 6 (draining to site 33) to forage where a silica soil amendment was applied appears to have had a positive effect on P reduction. The removal about two years ago of heifers and feeding troughs from the field around the ditch draining to site 32C probably explains the observed P reductions at this site. Note that site 32C is also influenced by flow from offsite.

TABLE 7-1. Average Total Phosphorus Concentration for Dry Lake Dairy Monitoring Sites from 1996 to 2000, Dry Lake Dairy ANMA

Site Code	Description	TP (mg/l)
KREA 32B	Outflow of Basin 3	2.8
KREA 32C	Outflow of Basin 2	2.6
KREA 32D	Inflow to Basin 2	1.8
KREA 49	Outflow of Basins 4 and 5	5.3
KREA 33	Outflow of Basin 6	5.6

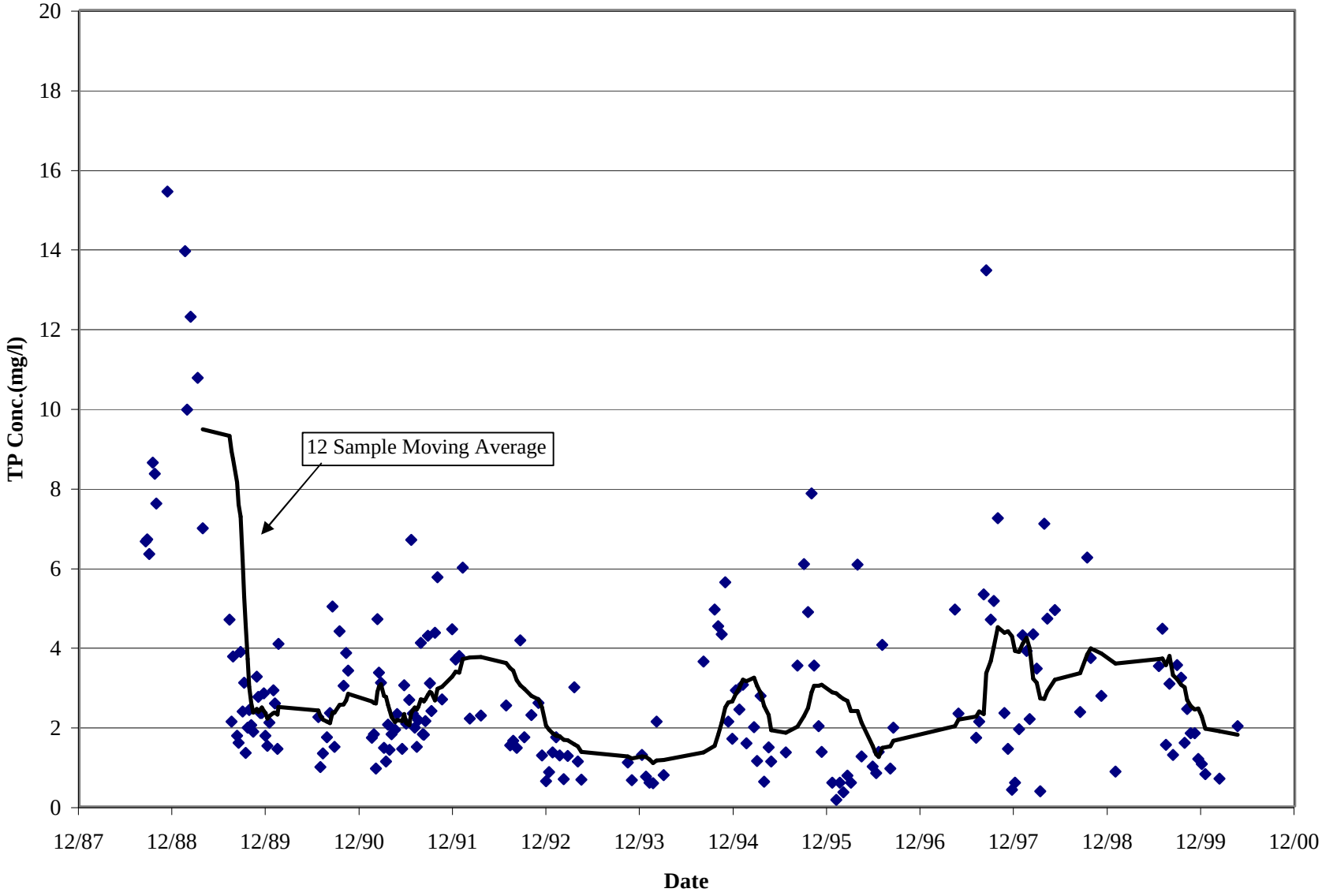


Figure 7-1. TP Concentration at Site KREA 32B - DRY LAKE 1 (Basin 3)

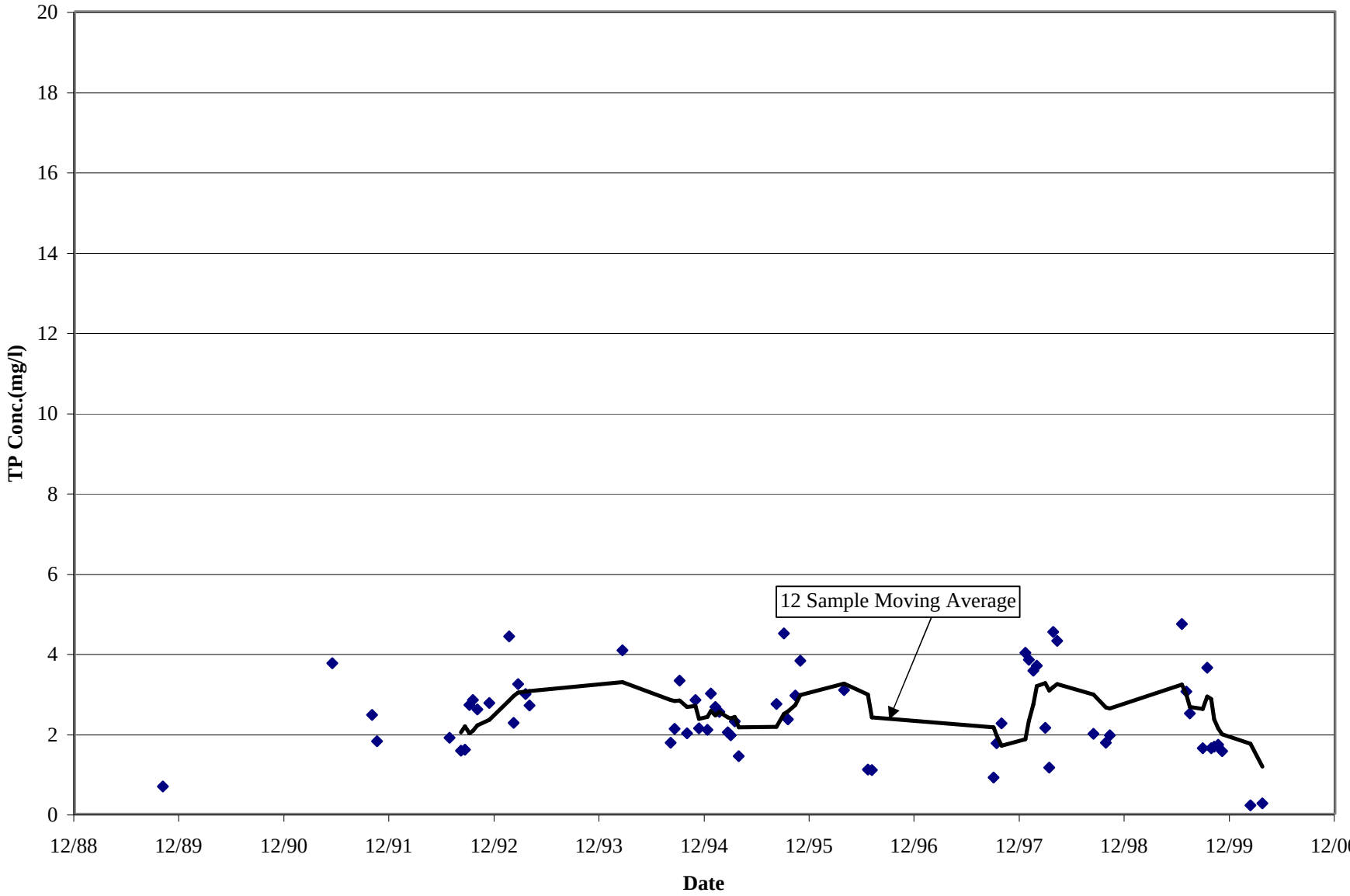


Figure 7-2. TP Concentration at Site KREA32C - Dry Lake 1 & 2 (Basin 2)

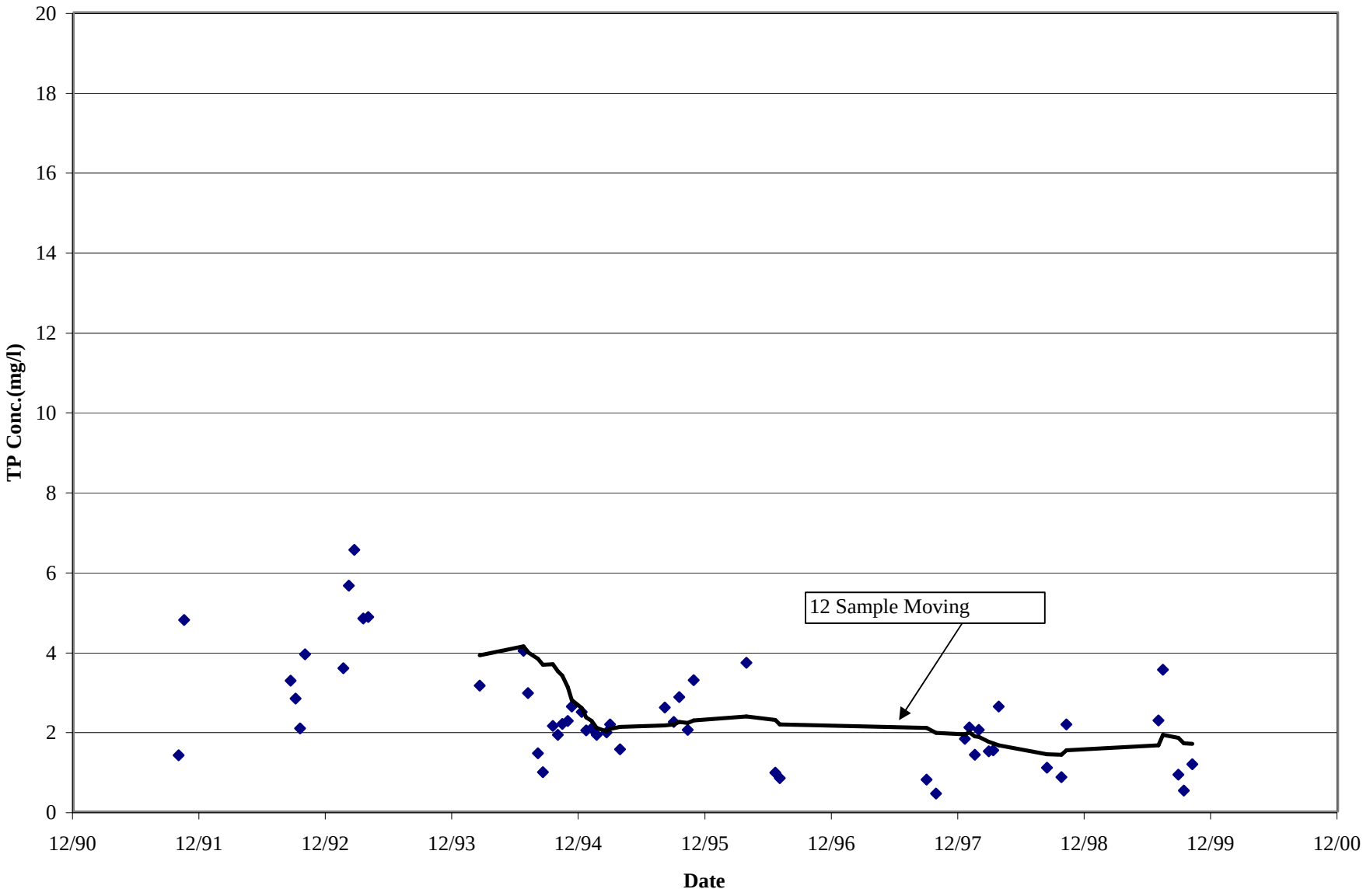


Figure 7-3. TP Concentration at Site KREA32D - Inflow to Dry Lake Dairy

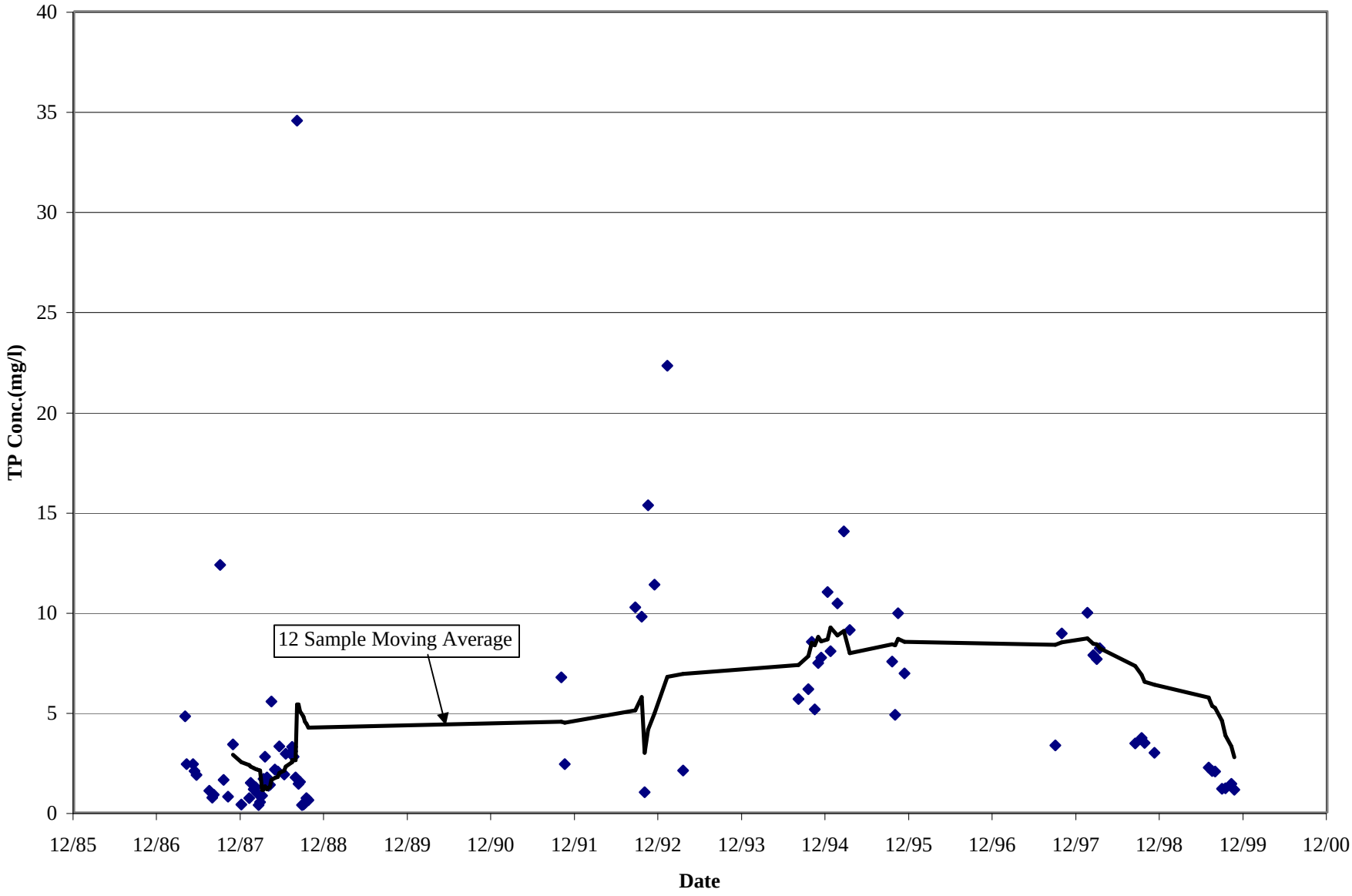


Figure 7-4. TP Concentration at Site KREA33 - Dry Lake 2 (Basin 6)

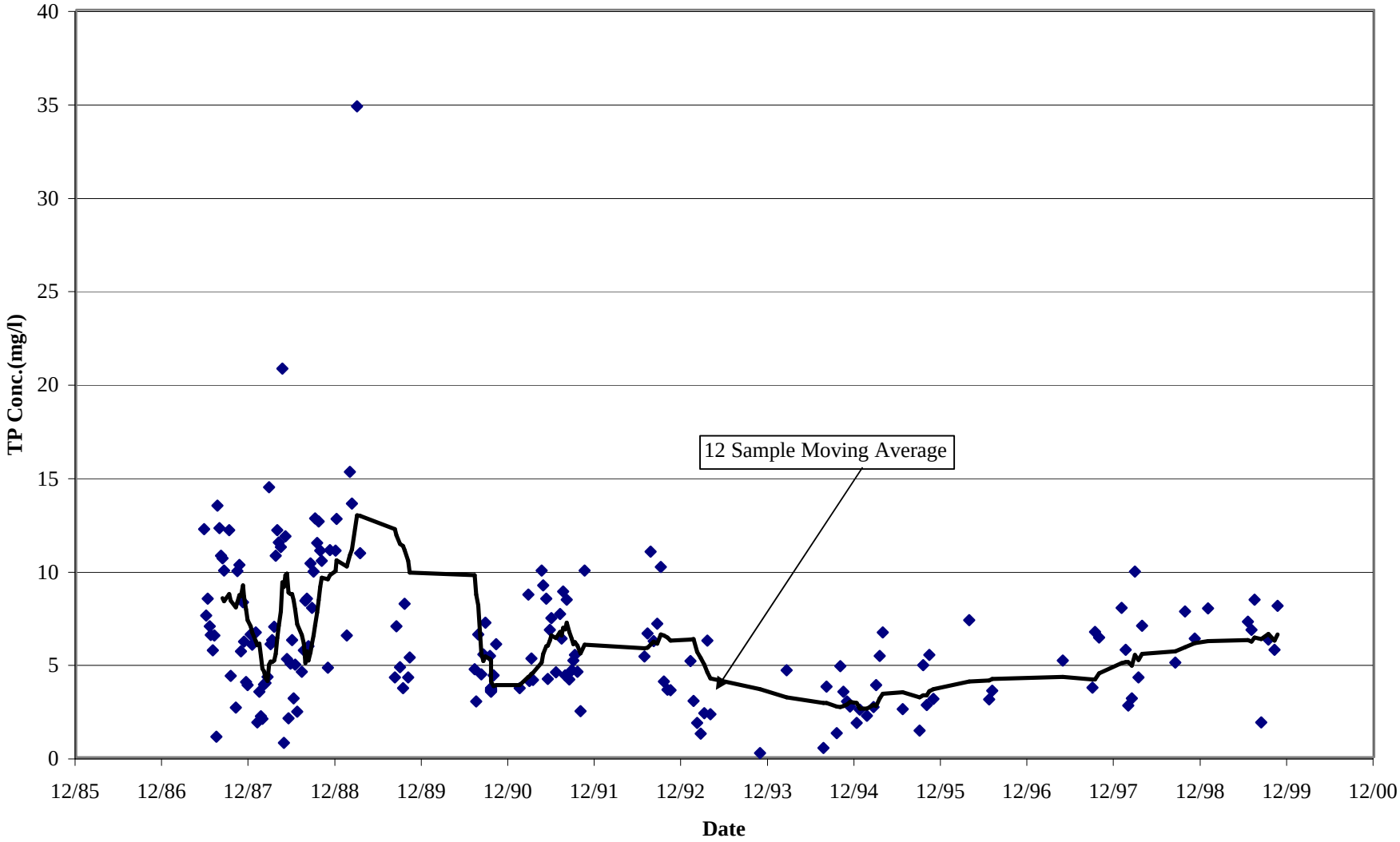


Figure 7-5. TP Concentration at Site KREA49 - Dry Lake 1 & 2 (Basins 4 & 5)

The dairies have also done periodic monitoring of internal flows to locate high P source areas. These data show that some internal drainage ditches have very high P levels and have helped identify problem areas that need attention. Milking R, Inc.'s northern lactating pastures, sprayfields, and calf pen areas were found to be high P source areas. The Bion Bioreactor discharge has also been monitored regularly since 1992 with P concentration ranging from about 0.4 to 1.4 mg/l until late 1998 when concentrations jumped from 6 to 13 mg/l. Upon investigation it was discovered the culvert draining the Bioreactor, which crosses under the inflow ditch to the Bioreactor, was rusted out and was receiving direct inflow from the pasture runoff. The culvert was fixed in April 2000, but no discharge has occurred since its repair to verify its effectiveness.

The dairies have eight shallow ground water monitoring wells. The wells are about 10 to 20 ft deep. The wells are located near the waste storage ponds and sprayfields (Figure 6-1). There are also two background wells, 1-MW1 and 2-MW1, that were suppose to be located in low impact areas, however 2-MW1 is near one of Barn 2's sprayfields. Table 7-2 provides the 1999-2000 high concentration values for each well. In general, the P concentrations are quite low except for 2-MW-2A, which has reached 12.4 mg-P/l. The P concentration below at least one of the dikes of the ponds is relatively high. However, the low anticipated percolation rate from the ponds (no observed seepage re-emergence around any of the ponds) would result in relatively low seepage related P loads. There are currently two studies being done to better evaluate potential seepage from waste ponds. If these studies show that seepage is a problem at the current study sites, then additional evaluation of seepage at other farms in the basin may be necessary. Mitigation for existing seepage could be easily accomplished by installing a perimeter drain and lift pump to return the seepage to the waste pond.

TABLE 7-2. Ground Water Monitoring Data for 1999 - 2000 (high value shown), Dry Lake Dairy ANMA

Code	Location	Ortho-P (mg/l)	TP (mg/l)	Nitrate as N (mg/l)	TN (mg/l)
Barn 1					
1-MW-1	Background	.59	.64	.05	2.58
1-MW-2a	Barn 1 Pond	.73	4.76	.03	51.1
1-MW-2b	Barn 1 Pond	.02	.02	.05	5.29
1-MW-3	Sprayfield	.09	.1	1.23	3.55
Barn 2					
2-MW-1	Background	.26	.41	.09	8.06
2-MW-2a	Barn 2 Pond	12.2	12.4	.02	37.7
2-MW-2b	Barn 2 Pond	1.2	2.4	.09	12.8
2-MW-3	Sprayfield	.08	.45	.09	4.61

8.0 Nutrient Balance For Dairy

The nutrient of interest for the dairies is P because the South Florida Water Management District determined that P is critical nutrient for Lake Okeechobee. The Florida Department of Environmental Regulation's TMDL program also has targeted P the critical nutrient for the Okeechobee basin. In addition, on dairy farms the low N/P ratio of manure and high manure nitrogen volatilization means that nitrogen applications from manure are always below crop needs if P applications are limited to agronomic rates. For these reasons, only the P budget is presented in this ANMA. The following P budget for the dairies was based on dairy records, as much as possible and literature values where actual data were not available. The dairies' records were quite good for purchased amounts of feed, fertilizer, and other commodities and milk production, but limited or no data were available for crop yields and related P recycling on the farm. Phosphorus budgets were generated for both dairies and for the individual fields and facilities on the dairies.

9.0 Farm-Level Phosphorus Budget

The overall farm P budget was determined by assessing the following P imports and exports for the dairy:

- P Imports to Dairy
- Purchased Feed and Mineral Supplements
- Fertilizer and Soil Amendments
- Animal Replacements
- Detergents and Cleaners
- Rainfall
- Runoff Inflows to Dairy
- P Exports from Dairy
- Milk Production
- Manure Solids Taken Offsite
- Beef Cows Sold
- Culled Cows
- Dead Cows
- Sold Forage and Hay
- Runoff Discharge

Table 9-1 provides a summary of the overall P balance. The following section presents the sources of the values in Table 9-1. The overall balance shows that the dairies import about 145,000 lbs. of P per year while exporting about 65,000 lbs. per year. This leaves an on-farm accumulation of P of about 80,000. Of the P remaining on the dairies, about 85 percent is deposited in fields for crop utilization. The remaining 15 percent is accumulating in the HIAs, waste storage ponds, and cooling ponds. The total lands available for P application is 2075 ac. If the P was evenly distributed the application rate would be about 32 lbs.-P/ac. However, as will be shown, P distribution is not uniform.

The amount of P imported in purchased feed and mineral supplements represent the majority of the imported P and therefore was evaluated in detail. The amount of feed brought onto the dairy was determined in two ways. First, the daily feed ration for the various animals on the dairies was provided by the dairyman and then evaluated for P content. Tables 9-2 to 9-5 provide the feed ration for lactating cows, dry cows, springers/heifers, and horses, respectively. These rations show both purchased feed and feed grown (recycled) on the dairies through silage and hay production. Table 9-6 shows the total feed balance for the dairies for all animals for both milk centers. The table also provides the estimated annual "as fed" feed amounts for the different animal types based on the feed ration and estimates based on purchased feed records. It was difficult to determine actual annual purchased feed amounts because the inventories at the time of purchase were not available. Therefore purchased feed amounts could crossover from one year to the next. However, in general the purchased feed records verified feed ration data. Table 9-7 summarizes the P balance for all feedstuffs for both purchased and on-farm grown (recycled) feeds.

The second largest P import is animal replacements. Table 9-8 summarizes the number of animal replacements and the associated P imported with these animals.

Dairy records provided the amount of fertilizer, detergents, and cleaners purchased. The only fields that received P fertilizer were the sprayfields because crop needs exceeded the available P from the waste pond effluent. The sources and calculations for the other P imports (on-flow and rainfall) are provided as footnotes in Table 9-1).

Exports were also estimated based on dairy records for milk production, culled cows, dead animals sent to the rendering plant, beef cows sold, solids moved onsite, and hay sold. Phosphorus exported in animal body mass is summarized in Table 9-8. Sources and calculations for the other exports are provided as footnotes in Table 9-1. The high cull rate of about 38 percent and death rate of about 15 percent are fully matured (1500 lbs./cow) versus the replacement cows being purchased at about 1100 lbs./cow. This creates a net export of about 4700 lbs. of P per year in animal body mass. About 85 percent of the dead animals are sent offsite to a rendering plant. The remaining 15 percent of dead animals feed the buzzards or are buried.

TABLE 9-1. Overall Dairy Phosphorus Balance, Dry Lake Dairy ANMA

Budget Category		Annual P Balance (lbs./yr.)
P Imports to Dairy		
Purchased Feed and Mineral Supplements		129009
Fertilizer and Soil Amendments		4888
Animal Replacements		6969
Detergents and Cleaners[1]		200
Runoff Flowing onto Dairy[2]		900
Rainfall P[3]		1500
	Total P Imported	**143465**
P Exports from Dairy		
Milk Production[4]		34401
Manure Solids[5]		1160
Beef Cows Sold		448
Culled Cows		9503
Dead Cows		2205
Sold Forage and Hay[6]		726
Runoff Discharge[7]		15651
	Total P Exported	**64093**
On-Farm Accumulation of P (Import - Export)		
Applied to Fields		67572
Collected Solids		16007
Direct Manure Deposition		45664
Sprayfield Effluent		5900
Storage within HIA perimeter		2900
Storage within Lagoons and Waste Ponds		6900
Storage in Pasture Cooling Ponds		2000
	Total P Remaining on Dairy	**79372**

1 Based on about 210 gals/yr. of 30% phosphoric acid cleaner at both dairy centers
2 An area of about 210 acres drains onto the dairy from the north. Assuming about 10 in/yr. of runoff and a P concentration of 1.8 mg/l (based on KREA 32D) would yield a P inflow of 900 lbs.-P/yr.
3 Assumes annual rainfall on 2318 acres is about 48 in/yr. with a P concentration of about .06 mg/l, which would yields about 1500 lbs.-P/yr. or about .5 lbs./ac .
4 Based on 700 cows at Barn 2 @ 60lbs/day and 950 cows at Barn 1 @ 55 lbs./day with an assume milk P content of 0.1%
5 About 145 tons of solids are moved offsite @ about 0.4 % P
6 Based on about 165 tons @ 0.22 % P
7 Drainage area of 2318 acres and assuming about 10 in/yr. of runoff at an average P concentration of 3 mg/l (based on sites KREA 32B, 32C, 49, & 33)

Table 9-2. Estimated Phosphorus Content of Total Feed Ration for Lactating Cows

Feed Stuff*	"As Fed" Feed (lbs/cow/day)	P in feed** %	Dry Matter *** %	P by DM %	Dry Matter Intake (lbs/day)	P in Feed (lbs-P/day/cow)
Silage	29	0.06%	28%	0.21%	8.12	0.017
Hay - Alfalpha	4	0.20%	87%	0.23%	3.48	0.008
Grain Mix	37	0.45%	93%	0.49%	34.225	0.167
Mineral Mix	0.25	3.90%	100%	3.90%	0.25	0.010
Molasses	1.5	0.08%	75%	0.11%	1.125	0.001
Total Ration	**71.75**	**0.28%**	**66%**	**0.43%**	**47.2**	**0.203**

* Based on dairy feed records

** Feed laboratory analysis data

*** Feed laboratory analysis and verified by IFAS Estimates from Dr. Van Horn

Table 9-3. Estimated Phosphorus Content of Total Feed Ration for Dry Cows

Feed Stuff*	"As Fed" Feed (lbs/cow/day)	P in feed** %	Dry Matter *** %	P by DM %	Dry Matter Intake (lbs/day)	P in Feed (lbs-P/day/cow)
Silage	28	0.06%	28%	0.21%	7.84	0.017
Hay - Alfalpha	1	0.20%	87%	0.23%	0.87	0.002
Dry Cow Grain	12	0.35%	93%	0.38%	11.1	0.042
PDQ - Mineral Mix	0.75	5.90%	100%	5.90%	0.75	0.044
Molasses	2	0.08%	75%	0.11%	1.5	0.002
Hay - Bales	2.5	0.22%	88%	0.25%	2.2	0.006
Pasture Grass	5	0.06%	20%	0.30%	1	0.003
Total Ration	**51.25**	**0.22%**	**49%**	**0.46%**	**25.26**	**0.115**

* Based on dairy feed records

** Feed laboratory analysis data

*** Feed laboratory analysis and verified by IFAS Estimates from Dr. Van Horn

Table 9-4. Estimated Phosphorus Content of Total Feed Ration for Springers/Heifers

Feed Stuff*	"As Fed" Feed (lbs/animal/day)	P in feed** %	Dry Matter *** %	P by DM %	Dry Matter Intake (lbs/day)	P in Feed (lbs-P/day/cow)
Silage	20.7	0.06%	28%	0.21%	5.796	0.012
Hay - Alfalpha	3.1	0.20%	87%	0.23%	2.697	0.006
Grain Mix	12	0.26%	93%	0.28%	11.1	0.031
Cat-An 321	3	1.65%	100%	1.65%	3	0.050
Molasses	1	0.08%	75%	0.11%	0.75	0.001
Hay - Bales	2.5	0.22%	88%	0.25%	2.2	0.006
Pasture Grass	2	0.06%	20%	0.30%	0.4	0.001
Total Ration	**44.3**	**0.24%**	**59%**	**0.41%**	**25.943**	**0.107**

* Based on dairy feed records

** Feed laboratory analysis data

*** Feed laboratory analysis and verified by IFAS Estimates from Dr. Van Horn

Table 9-5. Estimated Phosphorus Content of Total Feed Ration for Horses

Feed Stuff*	"As Fed" Feed (lbs/day)	P in feed** %	Dry Matter *** %	P by DM %	Dry Matter Intake (lbs/day)	P in Feed (lbs-P/day/cow)
Horse Feed	8.5	0.56%	93%	0.61%	7.8625	0.048
Hay - Bales	8	0.22%	88%	0.25%	7.04	0.018
Pasture Grass	8	0.06%	20%	0.30%	1.6	0.005
Total Ration	**24.5**	**0.29%**	**67%**	**0.42%**	**16.5025**	**0.070**

Table 9-6. Annual Feed Amounts "As Fed" for Both Barns

	Lactating Cows	Dry Cows	Springer/Heifers	Calfs	Horses	Bulls	Total	Purchased
# of Animals =	1650	310	165	50	3	28		
Feed Stuff Units	tons	tons	tons	tons	tons	tons	tons	tons
Silage*	8733	1584	623			105.8	11046	-
Hay - Alfalpha	1205	57	93			15.8	1370	2042
Grain Mix	11142						11142	?-use ration
Mineral Mix	75						75	144
Dry Cow Grain		679	361			61.3	1102	?-use ration
PDQ - Mineral Mix		42				3.8	46.3	5.25
Cat-An 321			90				90	23.8
Molasses	452	113	30			10.2	605	801
Calf Feed				91				
Hay - Bales*		141	75		4.4	12.8	234	60
Pasture Grass*		283	60		4.4	25.6	373	-
Horse Feed					4.7		4.7	4.7
Grand Total	**21606**	**2899**	**1334**	**91**	**13**	**235**	**26088**	**15324**

* Feed grown onsite that would represent recycled P.

Table 9-7. Annual Amount of P in Feed for Both Barns

	Lactating Cows	Dry Cows	Springer/Heifers	Calves	Horses	Bulls	Total
# of Animals =	1650	310	165	50	3	28	
Feed Stuff Units	lbs	lbs	lbs	lbs	lbs	lbs	lbs
Purchased Feed							
Hay - Alfalpha	4818	226	373			20	5438
Grain Mix	100275						100275
Mineral Mix	5872						5872
Dry Cow Grain		4752	1879			429	7061
PDQ - Mineral Mix		5007				452	5459
Cat-An 321			2981				2981
Molasses	723	181	48			16	968
Horse Feed					52.1		52
Calf Feed				639			639
Hay - Bales		160	85		5	14	264
Subtotal	**111687**	**10167**	**5282**	**639**	**52**	**918**	**129009**
Grown Feed - Recycled							
Silage	10479	1901	748			172	13300
Hay - Bales		463	246		14.3	42	765
Pasture Grass		339	72		5.3	31	448
Subtotal	**10479**	**2703**	**1067**	**0**	**20**	**244**	**14512**
Grand Total	**122166**	**12870**	**6348**	**639**	**72**	**1162**	**143521**

TABLE 9-8. Phosphorus Imports and Exports in Animal Body Mass, Dry Lake Dairy ANMA

Animal Type	Avg. Weight	# of Animals	P Content
	(lbs.)	(#/year)	(lbs./yr.)
Imported Animals			
Replacement Heifers and Cows	1100	905	6969
Exported Animals			
Culled Cows Sold	1500	905	9503
Dead Cows Sent to Rendering Plant*	1500	210	2205
Calves Sold	60	700	294
Beef Cows Sold	800	80	448
		Subtotal	**12450**

* Represents 85% of Dead cows. The remainder are consumed by scavengers or buried on site.

9.1 Phosphorus Flows Internal to the Dairy

The primary source of P internal to the dairies is excreted feces and urine. Table 9-9 provides the estimated excreted P by animal type based on the total feed intake minus the P exported in milk. The annual average milk production for the dairy is about 55 and 60 lbs./day for Dry Lake Dairy Barn 1 and Milking R, Inc., respectively. P accumulation in body mass is negligible for daily excretion rates but were considered and estimated for the annual overall dairy P budget. The P excretion rates compare favorably with IFAS estimates (Van Horn, et al. 1998) but were slightly higher than NRCS (1992) and ASAE (1996) standards for animal manure characteristics.

TABLE 9-9. Annual Amount of P in Manure Calculated as Fed P – P Exported in Milk, Dry Lake Dairy ANMA

	Lactating Cows Lbs./cow/yr.	**Dry Cows** lbs./cow/yr.	**Springer/Heifers** lbs./cow/yr.	**Calves** lbs./cow/yr.	**Horses** lbs./cow/yr.	**Bulls** lbs./cow/yr.
Excreted Phosphorus	53	42	37	13	24	42

A summary of the manure P flows through the waste management systems of Dry Lake Dairy Barn 1, and Milking R, Inc., is provided in Table 9-10. The estimated manure generation within the HIAs is based on the assumption that the estimated time the animals spend in an area is proportional to manure deposited (Bottcher, 1995). The estimated P removed in solids and retained in the waste ponds is based on the difference between the manure load to the ponds minus the amount of effluent P going to the sprayfields. The effluent P is calculated from the irrigation volume times the P concentration in the effluent as provided in the dairy's annual permit report. It is clear that both barns, particularly Dry Lake Dairy Barn 1, have high phosphorus removal occurring in solids with only about 14 percent (Dry Lake Dairy Barn 1) and 24 percent (Milking R, Inc) of the P deposited within the HIA perimeter ditch reaching the sprayfield. Dry Lake Dairy Barn 1 is more efficient for P removal due to the Bion solids separator and deposition in a very large storage pond (20 ac).

All excreted manure on the dairies that is not deposited within the HIAs is deposited in Stargrass pastures. Table 9-11 and Figure 9-1 present the estimated P loading from animal excretion, waste pond effluent, and fertilizers to all the fields on the dairies

including that deposited within the HIA perimeter ditches. Using the Dairy Rule rate of 45 lbs.-P/ac for pasture grasses and 60 lbs.-P/ac for forage production fields such as the sprayfields, it is clear that the lactating herd outer pastures have exceedingly high P loads. We realize that this rate may be high, but are following that guidance until NRCS provides new pasture loading recommendations. This explains the high P concentrations observed in runoff from these areas. The loadings presented in Table 9-11 and Figure 9-1 are total P application to the field, which includes P that might become sequestered in the wetlands or cooling ponds within the pasture. It is anticipated that P loadings in the open grassed pasture areas would be only about 70 to 80 percent of the values shown due to cooling pond and localized HIA P accumulation. Even with this P sequestering, the outer lactating herd pastures are out of balance. The dry cow pastures and Milking R, Inc. springer pastures are also slightly higher than agronomic rates and need to be addressed.

TABLE 9-10. Breakdown of Phosphorus Load Within the HIA Perimeter Ditch, Dry Lake Dairy ANMA

Location	Fraction of Manure Deposited Within HIA Ditch (about 9.2 hrs/day)	P Deposited (lbs.-P/yr.)	Collection Method	P Removed as Solids to be Land Applied (lbs.-P/yr.)	P to Waste (lbs.-P/yr.)	P to Sprayfield* (See Note Below) (lbs.-P/yr.)	Removal before Sprayfield (%)
Barn 1 - HIA							
Cow Wash and Parlor	20%	3899	Flush	2144	1755	877	78%
Primary Feed Barn	20%	3899	Hose Flush	2144	1755	877	78%
Feed Sheds	20%	3899	Scraped to Bion	2729	1170	585	85%
Springer Feed Barn	10%	1950	Runoff, Scraped & Hauled	1950	0	0	100%
Open Dirt Lots	30%	5849	Runoff, Scraped & Hauled	2339	1755	351	94%
Total	100%	19495		11307	6433	2690	86%
Barn 2 - HIA							
Cow Wash and Parlor	35%	4715	Flush	2122	2593	1297	73%
Feed Sheds	35%	4715	Flush	2122	2593	1297	73%
Open Dirt Lots	30%	4041	Runoff, Scraped & Hauled	1617	1212	606	85%
Total	100%	13471		5860	6399	3199	76%

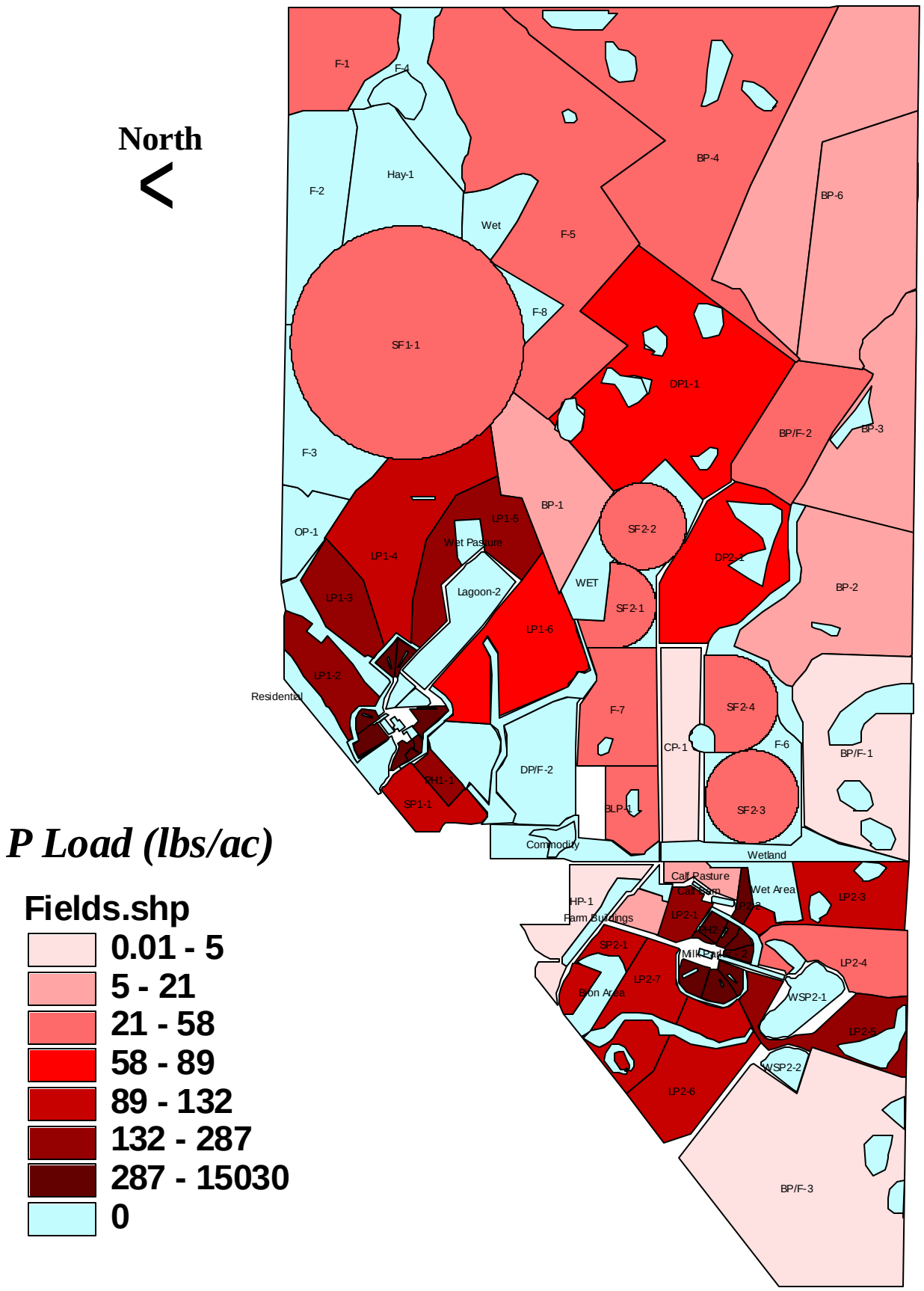
* The fraction of P to the sprayfield is highly dependent on rainfall/water balance in waste pond and varies greatly by year, values shown are

long-term average estimates. Average measured effluent concentration is about 15 mg-P/l for both barns when applied to about 75 gal/cow/day yields approximately 5900 lbs.-P/yr. to sprayfields that has been measured.

Table 9-11. Phosphorus Loads to Fields, Dry Lake Dairy ANMA

Field ID	Manure Deposition (lbs-P/ac/yr)	Fertilization (lbs-P/ac/yr)	HIA/Barn Effluent (lbs-P/ac/yr)	Solids* Application (lbs-P/ac/yr)	Total P Load per acre (lbs-P/ac/yr)	Total P Load per field (lbs)
Areas where Waste is Collected and Treated						
HIA1-1	1499.3				1499	3448
HIA1*	1878.1				1878	15588
PH2-1	698.1				698	1326
HIA2*	1577.3				1577	12145
Barn 1 Outer Pastures						
LP1-2	237.8				238	4138
LP1-3	226.9				227	4085
LP1-4	131.2				131	7242
LP1-5	279.4				279	8606
LP1-6	95.7				96	4506
PH1-1	265.3				265	1194
SP1-1	100.0				100	1341
Barn 2 Outer Pastures						
LP2-1	308.2				308	2188
LP2-2	949.2				949	2278
LP2-3	126.1				126	3581
LP2-4	62.2				62	1592
LP2-5	212.3				212	5690
LP2-6	136.5				137	4709
LP2-7	137.9				138	3793
Sprayfields						
SF1-1	0.0	20	17		37	5930
SF2-1	0.0	20	39		59	865
SF2-2	0.0	20	39		59	1259
SF2-3	0.0	20	39		59	1465
SF2-4	0.0	20	39		59	1259
Other Fields						
DP1-1	70.4				70	8718
DP1/F-2	0.0				0	0
DP2-1	77.9				78	4151
SP2-1	105.2				105	2103
BLP-1	33.2				33	747
BP-1	11.6				12	500
BP-2	7.1				7	500
BP-3	8.8				9	500
BP-4	11.9			36	48	8076
BP-5	10.5			36	47	7754
BP-6	9.7				10	1750
BP/F-1	3.3				3	250
BP/F-2	6.7			36	43	1601
BP/F-3	1.7				2	250
HAY-1	0.0				0	0
HAY-2	0.0				0	0
HP-1	4.8				5	84
CP-1	4.7				5	125
CP-2	19.5				20	125
CP-3	20.8				21	125
F-1				36	36	1268
F-2					0	0
F-3					0	0
F-4					0	0
F-5					0	0
F-6					0	0
F-7				36	36	1128
F-8					0	0

* Assumed 100% of collected solids are spread onsite, note in 1999 about 7% were hauled offsite.



Prepared by SWET, Inc.	**Figure 9-1. P Load (lbs/ac/yr) by Field for Dry Lake Dairy Dry Lake Dairy ANMA**	**Scale** 2000 feet

10.0 Management Alternatives For Achieving Discharge Goals

10.1 Overview

The previous sections have characterized the dairies and identified the high P source areas. The goal of reducing P levels in discharge waters from the dairies to 40 ppb dictates that the dairies have to implement practices and technologies that reduce the current discharge P levels by up to 97 percent at monitoring point KREA 49. To achieve these levels of reduction, technologies beyond the conventional BMP practices are required. Data from various IFAS research projects indicate that conventional practices (manure collection, storage, and land application at balanced rates) can only achieve P discharge concentrations of between 300 to 900 ppb depending on soils, grazing density, and crops. These research projects do not address problems of historical residual P. Therefore, it becomes clear that conventional practices alone are not able to achieve the ultimate goal of 40 ppb TP. However, these practices can provide significant reductions over existing conditions.

The P balance assessment for the dairies' current operations clearly indicates that the outer lactating pastures are the primary areas of concern. These pastures are receiving P loads in excess of an agronomic balance. Dry cow and springer pastures are also slightly high but are more easily addressed. The P loads of most other fields (forage, hay, and beef pastures) are currently below the maximum agronomic rate. The high P loads in the lactating pastures, added to the historical practices (prior to Dairy Rule BMPs) of direct barn discharges and unmanaged HIA drainage, has resulted in a significant amount of P accumulated in both the lactating pastures and in the streams and sloughs draining these areas. The transport concern for these pastures is for surface runoff rather than ground water. The flatwood soils on the dairy properties have extremely low ground water gradients, creating little if any offsite ground flow. The residual historical P means that bringing the dairy into compliance requires addressing both the historical P as well as improving the current P balance on the dairy..

10.2 Recommended Phosphorus Management Plan for the Dry Lake Dairy Barn 1

To achieve the target P reduction goal for Dry Lake Dairy Barn 1 the following P management plan is proposed:

- Reduce cow densities in the outer lactating pastures by moving the cows inside the HIAs perimeter ditches at Dry Lake Dairy Barn 1 and Milking R, Inc. Expand their waste management systems accordingly.
- Improve solids separation and promote offsite transport of solids.
- Adjust animal densities in dry and springer/heifer pastures to agronomic rates by enlarging these pastures.

- Use soil amendments in fields with high P accumulations to reduce P transport in runoff.
- Implement edge-of-farm wetland/chemical treatment systems or a chemical-assisted detention area to reduce dairy P discharge to target levels.
- Further reduce P in feed rations.

The approach is to first reduce P in runoff by using proven conventional practices, i.e., bring all fields into nutrient balance (agronomic rates) using proper collection and redistribution of manure P. Conventional practices have the potential to reduce P discharges by 70 percent once the dairy comes to equilibrium. However, due to high residual P in the fields and streams, it might take 20 to 40 years to achieve this equilibrium. Therefore, it is proposed to chemically treat existing residual P with soil amendments such as silica, iron, or aluminum compounds to make the P less mobile. Because these two approaches are still not expected to fully achieve the 40 ppb TP goal, a final edge-of- farm treatment system is proposed. The edge-of-farm treatment would need to be either a chemical, or a chemically assisted wetland, treatment system to achieve the low P concentrations required. Iron or aluminum precipitation technologies are recommended.

The following P management plan should be considered preliminary and conceptual in nature until a full engineering and cost assessment can be done and other technologies that might be identified by the Dairy BAT study are considered.

11.0 Proposed Technologies

11.1 Increase Cow Confinement within the HIAs to Reduce Outer Pasture Loads

To reduce animal densities in the outer lactating pastures, the existing HIA facilities need to be improved significantly in order to allow cows to spend more time within the HIA without adverse effects on milk production. Currently, lactating cows spend about 35 percent of their time within the HIA perimeter ditch. This time needs to be increased to at least 80 percent to achieve nutrient balances in the outer pastures. To provide the maximum flexibility for waste management on the dairy it is proposed to design the HIAs to house the lactating cows 100 percent of time. In consultation with the dairyman, it is proposed to expand the HIA perimeter ditches at both milk centers to enclose a new feed barn(s), exercise lots, and cooling ponds.

The additional animals within the HIAs will result in approximately 2.5 times more manure deposited within the HIA and therefore solids separators, waste ponds, and sprayfields will need to be expanded accordingly. In the case of Milking R, Inc., an entirely new solids separator is needed. The waste storage ponds will need to be expanded in proportion to the increased area within the HIAs while the sprayfields will need to be expanded in proportion to increased manure loads. A significant amount of engineering will be required to size and design the facilities before precise costs can be provided. A rough estimate for the HIA improvements, including four barns, expanded

perimeter ditch, solids separators, increased waste storage ponds, and expanded sprayfields, would be in the order of 1.5 to 2.0 million dollars.

11.2 Transporting Collected Solids Offsite

Though there is adequate land onsite to spread collected solids from the proposed waste management system, offsite transport of solids is potentially one of the best ways to increase exported P and thereby further improve the P balance in the fields. In light of the high residual P on the dairy, it will be advantageous to reduce P loads as much as possible below agronomic rates.

Three options should be explored for increasing offsite solids transport: (1) construct an on-farm composting facility to develop a marketable compost product, (2) contract with an offsite composting/bioprocessing firm to take solids, and (3) contract with other landowners to spread solids on their land.

Because the option 2 is currently not available and option 3 does not remove the P from the region, it is suggested that option 1 be further investigated. At a minimum the solids separators should be designed with drying beds adjacent to them to facilitate solids preparation for cheaper transport.

11.3 Adjust Animal Densities in Pastures to Agronomic Rates

There are a few pastures other than the lactating herd pastures that have animal densities higher than the Dairy Rule rate of approximately 45 lbs.-P/ac/yr. The springer pasture (SP2-1) for Milking R, Inc. and the dry cow pastures (DP1 and DP2) for both farms need to expand by 140 percent, 55 percent, and 75 percent, respectively. Several beef pastures and current forage and hayfields are significantly under loaded so that there is sufficient land available for these expansions. When possible, animal densities should be lowered below agronomic rates in pastures with high residues in order to "mine" or reduce residuals.

11.4 Stabilize Residual P in Fields, Streams, and Wetlands using Chemical Amendments

It is roughly estimated that there could be as much as 500 tons of residual P in the fields, streams, and wetlands located on the dairies. The majority of this residual P is located in the lactating pastures and the historical drainage ways leading away from the old HIAs and milk barns. The residual P is mostly in organic sediments in the streams and wetlands and in the soil organic matter in the fields. Additional P is stored as adsorbed P to soil mineral surfaces. Through mineralization of the organic compounds P and P desorption will continue to leach P into drainage water at relatively high levels for many years. Therefore, it is proposed to further stabilize the P residues with the application of aluminum sulfate (alum) or ferric sulfate. Other chemical treatments, such as heavy lime applications or silica compounds, may also be considered but would less likely to have long-term effectiveness for P retention. These amendments will bind and reduce P solubility but they are quite expensive and their long-term effectiveness is not documented. Also the impacts (positive or negative) on crop growth must be considered. This practice is presented here primarily as a potential means to reduce P loads to the edge-of-farm treatment system. It is anticipated that the HIA improvements and use of

these amendments alone are not sufficient to meet the P reduction goal. Therefore, before this practice is implemented, its relative cost of P removal as compared to edge-of-farm treatment must be evaluated further. Edge-of-farm stormwater treatment is a proven technology that can handle the higher P inflow levels if in-field stabilization of P is more costly than expanding the edge-of-farm treatment facility.

It is beyond the scope of this ANMA to provide a full evaluation of the soil amendment treatment alternative. It is roughly estimated to cost between $250 to $500 per acre per treatment (dosing rate of 1-2 tons/ac for alum). With approximately 1000 acres needing treatment, the total cost is about $250,000 to $500,000 for a one-time treatment. The actual dosing rate per treatment and the need for additional treatments is not known at this time so the above estimate may vary significantly. In addition, a monitoring program would be needed to test and verify the efficacy of this practice.

11.5 Edge-Of-Farm Treatment

The conventional practices and the use of P stabilization amendments is not likely to be sufficient to lower P discharge concentrations to 40 ppb. Therefore, the additional treatment of stormwater prior to discharge from the dairy is needed. There are six separate locations that stormwater discharges from the dairy (see Figure 6-1). However, it is recommended that only two edge-of-farm treatment facilities be constructed at monitoring points KREA 32B and 49A. Basins 1, 2, and 6, which currently do not drain to these locations, are low impacted areas and therefore may be sufficiently treated with soil amendments. If required, however, the basins' drainage can be diverted to one of the proposed treatment locations.

The recommended edge-of-farm treatment technology would be a high volume detention/retention pond in association with a chemical flocculation/precipitation facility using either iron or aluminum compounds. Stormwater from the dairy would be pumped into a large retention/detention pond constructed at each location. These ponds would be designed to store at least the first inch of runoff but the larger the better. During dry periods, stored water may be used for irrigation thus reducing the net discharge from the farm by as much as 50 percent depending on the size of the pond. The ponds would also contain wetland vegetation and sedimentation capabilities that would trap additional P before discharging to the chemical flocculation/precipitation facility. The ponds also act as a surge control to allow for a slower, more constant discharge rate through the treatment facilities, thereby increasing their efficiency. The treatment facilities will consist of a chemical injector and mixing module and a sediment collection module. The chemical mixing is normally accomplished by chemical injection just prior to a pump that regulates flow through the sedimentation basins that will settle the flocculants and precipitates containing the P. The accumulated sludge will need to be collected and hauled to a landfill or appropriately buried on site.

Again, it is beyond the scope of this ANMA to design and cost out the proposed edge-of-farm treatment. However, it is roughly estimated to cost $75 to $100 per lb. of P removed for capital improvements and $5 to $10 per lb. of P removed for annual operating costs. Assuming about 5000 lbs of P to be removed, this means the system for Dry Lake would cost about $500,000 to construct and about $50,000 per year to operate. This estimate was

developed from a cost estimate made for the design of a similar chemical treatment plant designed for the Tri-County Agricultural Area in St. Johns County, FL for the St. Johns River Water Management District. The values were adjusted as necessary to reflect the design conditions and components for this project, and changes in prices. These figures assume that the other BMPs provide about a 70 percent P reduction prior to the edge-of-farm treatment. These costs vary significantly based on the degree of pretreatment, final design, inflow concentrations, and results of jar testing.

12.0 Other Recommendations for Achieving Agronomic Phosphorus Balance

12.1 Reduce Phosphorus in Feed Ration

Though the dairies have already significantly reduced the amount of P in their feed ration, they should continue to look for ways to further reduce the P content in feed. The dairies rely on the dairy feed experts with the University of Florida and USDA to show just how much lower they might be able to go.

12.2 Record-keeping

Though the dairies currently maintain good records for most of the information needed to assess the waste management system, additional record keeping is required under the proposed management plan. Maintaining accurate records is critical for documenting the functionality of the waste management system and diagnosing potential problems when they occur. The following minimum records are suggested:

- Animal numbers by type, size, and location on dairy
- Milk production by herd (only for P export estimates)
- Animal imports and exports from dairy with estimated body weight
- Animal mortality rate and method and location of disposal
- Feed purchases and P analysis of feed products
- Crop yields and P analysis for hay and forage fields, including sprayfields
- Daily rainfall
- Effluent P concentration and irrigation volume to each sprayfield
- Water levels in waste ponds
- P concentration and volume of manure or solids removed from barns, solids separators, lagoons, waste ponds, and HIAs and their location of land application or amount transported offsite
- Soil test results for all pastures and effluent and solids application areas.
- Amounts and locations of any soil amendment added to fields, including fertilizers, lime, and chemical stabilization amendments
- Inflow and P concentration for drainage pumps to new retention/detention ponds
- Water levels in new retention/detention ponds
- Inflow and outflow and P concentrations for the edge-of-farm treatment facility
- Chemical use and cost records for edge-of-farm facility
- Sludge volumes and disposal method from chemical treatment facility

- Repair and maintenance records for all components of the waste management system, including pumps, dikes, and irrigation systems, observation of any unusual events, such as material spills

12.3 Animal Mortality

Records should be maintained on a continuous basis, and summarized annually, unless otherwise required by permit. The current practice at the dairy for handling dead animals is considered sufficient. Eighty-five percent of the dead animals are transported offsite for rendering. The few animals that are not found in time to be sent to the rendering plant are either consumed by scavengers or buried onsite. The potential P losses associated with these dead animals is negligible.

12.4 Emergency Response Plan

An emergency response plan for the final system design will be needed in the system's operation and maintenance (O & M) plan to address potential catastrophic events, such as chemical spills, dike failures, power failures, and extreme weather events. The plan should include the contact names and phone numbers for the appropriate agencies, as well as action plans for the most likely incidents.

13.0 Summary of Phosphorus Management Recommendations

To achieve the target P reduction goal for Dry Lake Dairy Barn 1 the following P management plan is proposed:

- Reduce cow densities in the outer lactating pastures by moving the cows inside the HIAs perimeter ditches at Dry Lake Dairy Barn 1 and Milking R, Inc. Expand their waste management systems accordingly.
- Improve solids separation and promote offsite transport of solids.
- Adjust animal densities in dry and springer/heifer pastures to agronomic rates by enlarging these pastures.
- Use soil amendments in fields with high P accumulations to reduce P transport in runoff.
- Implement edge-of-farm wetland/chemical treatment systems to reduce dairy P discharge to target levels.
- Continue to look for ways to further reduce the P content in feed rations.

Though the dairies currently maintain good records for most of the information needed to assess the waste management system, additional record keeping is required under the proposed management plan:

- Animal numbers by type, size, and location on dairy
- Milk production by herd (only for P export estimates)
- Animal imports and exports from dairy with estimated body weight
- Animal mortality rate and method and location of disposal

- Feed purchases and P analysis of feed products
- Crop yields and P analysis for hay and forage fields, including sprayfields
- Daily rainfall
- Effluent P concentration and irrigation volume to each sprayfield
- Water levels in waste ponds
- P concentration and volume of manure or solids removed from barns, solids separators, lagoons, waste ponds, and HIAs and their location of land application or amount transported offsite
- Soil test results for all pastures and effluent and solids application areas.
- Amounts and locations of any soil amendment added to fields, including fertilizers, lime, and chemical stabilization amendments
- Inflow and P concentration for drainage pumps to new retention/detention ponds
- Water levels in new retention/detention ponds
- Inflow and outflow and P concentrations for the edge-of-farm treatment facility
- Chemical use and cost records for edge-of-farm facility
- Sludge volumes and disposal method from chemical treatment facility
- Repair and maintenance records for all components of the waste management system, including pumps, dikes, and irrigation systems, observation of any unusual events, such as material spills.

An emergency response plan for the final system design will be needed in the system's operation and maintenance (O & M) plan to address potential catastrophic events, such as chemical spills, dike failures, power failures, and extreme weather events.

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