

SUBJECT TO THE STIPULATED PROTECTIVE ORDER ENTERED ON 8/28/13 IN  
U.S. DISTRICT COURT, EASTERN DISTRICT OF WA, CASE NO. 2:13-cv-03016-TOR

# Livestock Nutrient Management Plan



Facility Name: Cow Palace, LLC

Owner/Operator Name: Dolsen Companies

Telephone Number: (509) 829-5777 Cell: (509) 728-1061 (Jeff Boivin)  
Cell: (509) 728-1060 (Dirk Porter)

Address: 1631 Liberty Road  
Granger, WA 98932

Latitude of Facility: 46° 24' 27.872" Section: 25 Township: 11 Range: 21

Longitude of Facility: -120° 8' 43.196"

County: Yakima Watershed: Lower Yakima River Basin (WRIA #37)

Prepared By: Laurie Crowe

Organization/Company: South Yakima Conservation District 509-837-7911

Date Prepared: Approved: 2/10/98 Certified: Prod Cert: 8/14/97

Re-approved: 3/02/2001 Re-certified: 3/02/2001 Producer Certified: 3/01/2001

Revisions (Date and Description) :

11/08 Plan update- herd /acres increase 12/12 Plan Update--Increased Acres

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CERTIFICATION OF DAIRY NUTRIENT MANAGEMENT PLAN

Conservation District: Implementation Certification

The South Yakima Conservation District certifies that Cow Palace Dairy, LLC has constructed or otherwise put in place the elements necessary to implement this dairy nutrient management plan.

A handwritten signature in black ink, appearing to be 'John V. [unclear]', written over a horizontal line.

Board Supervisor

A handwritten date '12/10/08' written in black ink over a horizontal line.

Date

Dairy Producer: Management Certification

I, Dirk Porter, certify that we are managing dairy nutrients as specified in this dairy nutrient management plan developed specifically for this operation, and approved and certified by our local conservation district.

A handwritten signature in black ink, appearing to be 'Dirk Porter', written over a horizontal line.

Dirk Porter

A handwritten date '4/8/09' written in black ink over a horizontal line.

Date

Revised February 9, 2000

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Checklist for Conservation District Approval of a Dairy Nutrient Management Plan

All answers must be yes for a conservation district to approve this plan. If all answers are yes, the district board of supervisors must approve the plan. If any answer is no, the district cannot approve the plan.

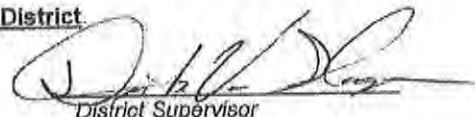
When approval is denied, the district must explain the changes required to obtain plan approval. The explanation must be in writing, and it must be delivered to the applicant within 90 days of the date the plan was received by the district.

<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Do all standard practices meet the standards, specifications and methods described in the NRCS Field Office Technical Guide and the NRCS Agricultural Waste Management Field Handbook, and if alternative practices are utilized, have such practices been approved by the Washington Conservation Commission?
<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Is a summary of the operation included (name, location, acres available for nutrient management, herd size, existing nutrient management facilities)?
<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Does the dairy nutrient management plan developed after November 1, 1998 follow the planning format adopted by the Washington Conservation Commission?
<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Have the following been inventoried and evaluated to identify potential pollution sources and to determine water quality protection needs: all fields used in the dairy operation; cattle confinement areas; barns; milking facilities; waste collection, handling and storage facilities; feed storage and mixing areas; riparian areas; irrigation systems; and drainage systems?
<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	If the plan has not been fully implemented, is there a schedule of planned practices listing the location, what will be done, how much will be done and when it will be completed?
<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Are forage and crop fields identified and their acreage shown on an aerial photo, topographic map or a plan map drawn to scale?
<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Is a month-by-month nutrient application schedule included? A nutrient balance sheet (including nutrient requirements of crops that will receive dairy wastes)?
<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Are crop yield values or estimates supported in the plan, or in the dairy producer's case file?
<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	If manure must be utilized elsewhere, are off-site manure management agreements included in the plan?
<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Is an operation plan included for the waste management system?
<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Are the major factors influencing the quantity of manure and wastewater described (e.g., herd size and composition, climatic data, existing runoff controls, etc.)?
<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Are existing manure and wastewater collection systems evaluated, and needed improvements described?
<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Are storage facilities for solid and liquid manure described, are storage needs described, and are the calculations and worksheets used to determine storage needs included?
<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Are transfer facilities and systems described?
<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	If the manure or wastewater is treated, is this described?
<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Are soils described, including their physical capacity to accept nutrient applications?
<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Is nutrient testing of soils and manure required, and testing procedures described?
<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Is a recordkeeping system included that covers soil and manure tests, application of the solid and liquid components of the manure, cropping, and other significant factors and practices?
<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Are the periods and conditions clearly described when dairy nutrients can be safely and agronomically applied?
<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Are the periods and conditions clearly described when dairy nutrients should not be applied?

A dairy nutrient management plan was submitted for approval by Cow Palace Dairy, LLC

on \_\_\_\_\_. The plan was  approved  not approved on December 10, 2008 by

the Board of Supervisors of the South Yakima Conservation District

  
District Supervisor

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Board Supervisor

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Date

Dairy Producer: Management Certification

I, **Dirk Porter**, certify that we are managing dairy nutrients as specified in this dairy nutrient management plan developed specifically for this operation, and approved and certified by our local conservation district.

Dirk Porter

Date

Revised February 9, 2000

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Cow Palace Dairy, LLC  
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1631 Liberty Road

Granger, WA  
December 2012

The Dairy Nutrient Management Plan for the Cow Palace Dairy, LLC was developed based on the requirements of the current standard and any applicable Federal, tribal, state, or local regulations or policies; and changes in any of these requirements may necessitate a revision of the plan.

The producer has the responsibility of implementing and following this Dairy Nutrient Management Plan, which requires a high level of management and commitment. South Yakima Conservation District (SYCD) and/or the Natural Resources Conservation Service (NRCS) assume no responsibility of the day-to-day management of the plan. The structural components have been certified as being adequate for the operations. NRCS and SYCD assistance is continuously available for implementing this plan. We encourage and recommend that cooperators do the best job possible to stay within plan guidelines.

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Cow Palace Dairy, LLC  
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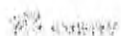
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CORRESPONDENCE*

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## DAIRY NUTRIENT MANAGEMENT PLAN

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### SECTION ONE -- INTRODUCTION

#### 1.1 Purpose

The purpose of this plan is to provide the dairy manager with Best Management Practices (BMP's) for the production, collection, storage, transfer, treatment, and agronomic utilization of the solid and liquid components of dairy nutrients in such a manner that will prevent the pollution or degradation of state ground waters and surface waters. Specific purposes include:

Prevent the chance of contaminated nutrient discharge to streams, drainage ditches, or other surface waters from the dairy.

- Prevent the chance of contaminant migration from the dairy facility to the underlying aquifer.
- To agronomically recycle the nutrients produced through soil and crops.
- Meet the requirements of *The Dairy Nutrient Management Act of 1998*, *The Clean Water Act*, and comply with Federal, State and local laws regarding water quality standards.

#### 1.2 Summary of operations

This Dairy Nutrient Management Plan was developed for the **Cow Palace Dairy, LLC**. The Cow Palace Dairy, LLC is a **confined, open lot** dairy with shades inside the pens and over the feed mangers located in the S1/2 of the SW1/4 of section 25, Township 11N, Range 21E in Granger, Washington. Currently, the dairy consists of approximately 800 total acres with **533** acres used for the application of manure and an additional 50 acres of orchard. This facility is located within the boundaries of the South Yakima Conservation District in Yakima County and is serviced by the South Yakima Conservation District field office in Zillah, Washington.

The dairy nutrient management plan for the **Cow Palace Dairy, LLC** is based on the future nutrient and wastewater production estimates for **11,840 Holstein** dairy livestock, which includes **7600** milk cows, **840** dry cows, **500** heifers, and **2900** calves. Currently, 7000 milk cows, 750 dry cows, 450 heifers, and 2700 calves are housed at the facility. **Calves remain at the dairy headquarters until they reach approximately 200 pounds and are then transferred to the Harrah Feedlot.** All solid manure is composted on-site and transported off-site per agreements.

This facility is located in the Lower Yakima Basin watershed (WRIA #37) where the Granger Drain, Sulfur Creek Wasteway, Giffin Lake, and the Yakima River are listed on the Department of Ecology's 303(d) impaired water bodies. Listed problem areas are fecal coliform, high temperatures, dissolved oxygen, pH, metals, pesticides, nutrients, low in stream flows, and turbidity. There are no sole source aquifers in this watershed. There are two required TMDL's; Lower Yakima River Suspended Sediment TMDL and the Granger Drain Fecal Coliform TMDL.

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The system is planned to manage liquids generated from the milking parlor and holding areas along with any contaminated run-off that may occur. The plan will also address the solid manure generated from the all facilities. This will be done in a manner that prevents degradation of soil, water, air, plant, and animal resources and protects public health and safety.

Discharge of manure, litter, or process wastewater into the waters of the state from the production area is prohibited, except when the production area is designed, constructed, operated and maintained to contain all manure, litter, and process wastewater including the runoff and the direct precipitation from a 25 year, 24-hour rainfall event and precipitation causes an overflow of manure, litter or process water.

Discharge of field runoff is prohibited when the field application exceed agronomic rates as defined in this nutrient management plan.

This facility is a 365 day confinement operation. Four existing storage ponds, two settling basins, a safety debris basin, and several catch basins provide temporary storage of liquid manure with an estimated storage capacity of **40,884,691 million gallons. See section seven for detailed information on cropping patterns, land base application and schedules.**

All solid manure from the feed alleys and pen areas are scraped and trucked to the composting area.

The nutrient application rates are based on soil test analysis and Pacific Northwest Land Grant University guidelines.

Field assessments (Phosphorus Index and Soil Characteristics, Table 5-3) indicate that **the manure application schedule for this dairy may be based upon nitrogen levels.**

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**SECTION TWO -- WASTE PRODUCTION**

**2.1 Herd Size**

The dairy nutrient management plan for Cow Palace Dairy, LLC was planned and designed based on the herd size in the following table.

This plan will need to be amended if the herd size, expressed in animal units, exceeds the amount in this table by more than 10% or if any changes occur in land base, crop rotation, or management that would clearly affect nutrient management adversely.

**HERD SIZE**

	<b># of COWS</b>	<b>WEIGHTS</b>	<b>ANIMAL UNITS</b>
MILKING COWS	7600	1400	10,640
DRY COWS	840	1400	1,176
HEIFERS	500	750	375
CALVES	2900	200	580
<b>TOTAL</b>	<b>11,840</b>		<b>12,771</b>

Animal units = weight X number divided by 1000.

**2.2 Operations**

Waste generated at the Cow Palace Dairy, LLC consists of the milking operations (wash water) and the manure production from the **7600 dairy milking** herd along with approximately **4240 dairy livestock** housed on-site. Precipitation collected as runoff from concrete alleys and lanes, and drainage from silage piles also contributes to the total waste volume. The contribution of silage drainage to the waste volume is negligible, however the collection of the silage drainage is provided for.

Careful nutrient management of animal rations can significantly reduce the amount of nutrients excreted. At this time, the Cow Palace Dairy, LLC feed their herd "Total Mixed Rations" (TMR) which includes pre-mixed grains (mill, canola, rape seed, cotton seed, ground corn) mixed with corn silage, chopped hay, and beet pulp. Apple pomace is sometimes used. This feed ration will change according to individual animals.

The Cow Palace Dairy, LLC milks three times per day in two milking parlors. The milking cows are pre-washed in the holding/wash area with sprinklers for approximately two minutes. They are then iodine dipped, wiped with a clean towel, milked, and then re-dipped with iodine.

The Dairy Calculation Worksheet shows the estimated volume of manure and the total gallons of wastewater that is generated annually. Liquid wastewater and manure represent approximately 20 percent of the total nutrients generated at the dairy. Approximately 80 percent of the nutrients generated are handled as a solid.

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### 2.3 Climatic Data

Climatic data from the NOAA Weather Station at WSU-IAREC in Prosser, Washington shows that the average annual precipitation rate (1948 to 2004) for this area is **6.9 inches** per year and a 25 year, 24 hour **storm event is 1.60 inches**. This arid region has an average annual evaporation of 38.25 inches with 1.81 inches of evaporation occurring between November 1<sup>st</sup> and February 28<sup>th</sup> and 3.86 inches of precipitation falling during this period.

### 2.4 Run-off

All storm water from the roadways and pens is piped to the lower settling basin through a 12" pipe. In the event of a 25 year, 24 hour storm event, the rainwater will be directed to the "safety debris basin". Any liquids in the "safety debris basin" will be pumped to the existing settling basins.

Also, an existing "catch basin" is located at the southwest corner near Kirks Road that was designed with assistance from NRCS to contain surface run-off produced by a 25 year, 24 hour storm event as well as any run-off from manure application. This storage is approximately 5-acre feet. Surface waters that are collected in this catch basin can be pumped back onto the fields. A catch basin is also located in the northeast corner to collect any surface run-off as well as any run-off from manure application. No contaminated water is allowed to reach the drain.

The Cow Palace Dairy, LLC also has a NRCS approved tail-water recovery system in place along Dekker Road. This is used to catch any irrigated run-off from wheel-line irrigated cropland located in the E1/2, SE1/4 of section 36, Township 11, Range 21.

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### SECTION THREE – COLLECTION /TRANSFER

#### 3.1 Description

Liquids from the waste storage ponds are applied agronomically to the on-site acres of the dairy as needed per crop needs via a center pivot irrigation system, wheel-lines, honey-wagons, injection system, or other acceptable methods.

For the Cow Palace Dairy, LLC the estimated nutrient content of the liquid manure stored in the storage pond before application losses is 1.5 pounds of nitrogen, 2.3 pounds of phosphorus, and 3.4 pounds of potassium per 1,000 gallons without irrigation water dilution.

#### Open pens /Compost areas/Roadways:

Solid manure generated in the corrals, pens and feed alleys is scraped as needed and composting, or used for bedding and/or mounding. Solids removed from the settling basins will be utilized in the same manner as solids from the pen areas.

The Cow Palace Dairy, LLC hauls the solid manure from the pens and settling basins to the compost site via a graveled road along the north east corner of the dairy. This reduces the need for the vehicle entering the public roads from the dairy, which minimizes vehicle track-out of mud or manure. All roads within the dairy operation are gravel surfaced or paved.

The finished compost from Cow Palace Dairy, LLC is registered as a fertilizer with the State of Washington. Approximately 35,000 tons of finished compost is generated per year. The compost is sold to third parties throughout Washington State and is used only for light orchard application.

**Any run-off that may occur from the stockpiled manure will be controlled at all times by whatever means the dairy manager deems necessary and will not contaminate ground or surface waters.**

#### Feed/Commodity area:

Feed other than hay and silage are stored in covered commodity sheds. The amount of effluent from silage can vary depending on the moisture content of the silage and the pressure of the silage. Silage leachate (silage juices) when properly harvested and stored at the correct moisture content, pose little or no pollution threat. However, if silage leachate enters a stream, its high organic content feeds bacteria that can rob the water of oxygen.

**The silage (approximately 65% moisture) at the Cow Palace Dairy, LLC is stored in a silage pit, hauled to the dairy from off-site areas, or packed into plastic "Ag-Bags". The "Ag-Bags" reduce odors and the leachate is also contained in the bags. Any leachate leakage from the bags is piped to the storm debris basin, where it is then directed to the settling basins. All runoff from the commodity area**

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**gravity flows via PVC pipe to the storm debris basin and is directed to the settling basins.**

### **Buildings /Facilities/Roadways:**

The most frequently traveled roadways and cattle walked are paved with concrete, asphalt, or gravel. Other roadways are gravel-surfaced to reduce dust generation. All runoff from sheds, gutters, barns, and facilities will be contained.

### **Parlor:**

Wastewater from the parlors flows through an existing gravity pipeline into one of two settling basins. The solid fraction of the manure is settled out and the liquid portion flows into the waste storage pond. As the first settling basin becomes full of solids, the effluent from the parlor is directed to the second settling basin. The first basin is then dried and scraped clean. The solids removed from the settling basins are trucked to the composting area. Liquids from the waste storage ponds are then applied to the on-site acres of the dairy as needed per crop needs and the soil conditions.

All water utilized for cooling milk is recycled and stored in a 25,000 gallon and 30,000 gallon water tank and reused to flush the barns.

### **Fields:**

All fields that receive manure are in a permanent crop or are double-cropped to utilize and recycle residual nitrogen and to reduce erosion. Composted manure is applied to the orchard acres. **All fields are bermed or have catch basins to prevent any contaminated run-off from leaving the field. Double cropped fields are rill irrigated when in the corn rotation. A wheel-line system is used when in the Triticale or Alfalfa/**

Liquids from the waste storage ponds are applied agronomically to the on-site acres of the dairy as needed per crop needs via center pivot irrigation systems, wheelines, big guns, or other approved methods for liquid application. These rotations

Beginning in 2013, field #1 is double cropped with a Triticale/corn rotation. The 75 acres are irrigated with a wheeline sprinkler system.

Field #2 is also double cropped and is in the 1st year of a Triticale/corn rotation. This 75 acre field is also irrigated with a wheeline sprinkler system.

Field # 3 is currently in its 1<sup>st</sup> year of a double cropped corn/Triticale rotation. The 155 acres are irrigated with a pivot sprinkler system.

Field #4a is 1st year Triticale and will be double cropped with Alfalfa. This 65 acre field is irrigated with a wheeline sprinkler system.

Field #4b is 44 acres in the 1st year of Alfalfa and is also irrigated with a wheeline sprinkler system.

Field #5 is in 5<sup>th</sup> year of Alfalfa. This 35 acre field is irrigated with a wheeline sprinkler system.

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Field # 6 is 84 acres that is double cropped with a Triticale/corn rotation and is currently rill irrigated while in corn and irrigated with a wheel-line when in Triticale.

The orchard, field #7, is irrigated with a solid set sprinkler system and consists of 34 acres of pears and 16 acres of apples.

Based on The Phosphorus Index Worksheet for Eastern Washington, the *site vulnerability class* for all fields is "*low*" to "*Medium*."

**When applying liquid manure to fields, it is important to apply the manure at a rate, which matches the soils' capacity to absorb the liquid. Soil type, amount of solid material in the manure, slope, soil moisture, and the duration of application are factors that affect the infiltration rate. Avoid application of manure on soils that have a moisture content greater than 75% of available moisture remaining. This will reduce soil compaction. If liquid manure application exceeds the soils' infiltration rate, a portion of the manure may run off.**

Manure, litter, or process water may not be applied closer than 100 feet to any down gradient surface waters, open tile intake structures, sinkholes, agricultural wellheads, or other conduits to surface waters. A permanent 35 foot wide vegetative buffer may be substituted for the 100 foot setback. If it can be demonstrated that a setback or buffer is not necessary because implementation of alternative conservation practices or field specific conditions will provide pollutant reductions equivalent or better than achieved by the 100 foot setback, then the setback requirement can be waived.

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### SECTION FOUR - STORAGE /TREATMENT

#### *4.1 Storage Facilities*

Proper nutrient management requires agronomic application of manure. Nutrients must be stored when conditions are not appropriate for application. The South Yakima Conservation District and the Natural Resources Conservation Service recommend a 120 day storage period for this climate to insure adequate storage during the winter months (November through February) when application may not be possible.

The Dairy Calculation Worksheet presents the storage needs for the recommended 120-day period. Also included in The Dairy Calculation Worksheet, is the estimated gallons generated for wash water, precipitation falling on the surface of the storage pond during the recommended 120 day storage period, as well as precipitation from a 25 year, 24 hour storm.

The Cow Palace/Springer One Dairy currently has two settling basins, four waste storage ponds, a "safety debris basin", and several "catch basins" for run-off from the pens and fields. These were constructed to NRCS standards and specifications and are adequate based on current herd size to collect and store wastewater and storm run-off for over 120 days.

The outside dimensions for the settling basins are approximately 200' x 133' x 10' deep and each have a capacity of approximately 1,521,000 gallons (4.7 acre feet), and a surface area of 26,600 square feet. Only one of the settling basins is included in storage area calculations because we assume, for an additional margin of safety, that the other settling basin is full at the beginning of the winter season.

Waste storage pond # 1 is 430' x 280' x 30' deep and it has a capacity of approximately 18,266,000 gallons (56 acre feet) and a surface area of 120,400 square feet. An additional storage pond (#2) was constructed with the dimensions of 200' X 300' X 15' and a capacity of approximately 5.2 million gallons and a surface area of 60,000 square feet. This pond was not designed by NRCS, but was constructed according to NRCS standards and specifications. Pond #3 is approximately 200' X 225' X 20' with a capacity of approximately 4.4 million gallons (13.6 acre feet) and a surface area of 45,000 square feet. Waste storage pond # 4 is approximately 265' X 200' X 15' with a capacity of approximately 3,689,704 gallons (11.3 acre feet) and a surface area of 53,000 square feet. All ponds meet NRCS standards and specifications.

The "catch basin" at the northeast section (east of Arms Road) is approximately 130' X 175' X 7.0 deep and has a capacity of 1,100,000 gallons (3.4 acre feet), and a surface area of 22,750 square feet. The "catch basin" on the west side of Arms road is approximately 135' X 243' X 25' and a capacity of 3,100,000 gallons (9.4 acre feet).

The existing "safety debris basin" was designed to store run-off from the non-cropland area of the dairy during a 25 year, 24 hour storm event. It measures approximately 170' X 200' X 8' deep with a capacity of approximately 2,000,000 gallons (6.2 acre feet). **Total available storage** for liquid waste generated at the Cow Palace, LLC is approximately **40,884,691 gallons**.

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STORAGE AREA	GALLONS
SETTLING BASIN (1)	1,521,432
STORAGE POND (# 1)	18,266,160
STORAGE POND (#2)	5,149,980
STORAGE POND (#3)	4,428,160
STORAGE POND (#4)	3,689,704
SAFETY DEBRIS BASIN	2,000,000
CATCH BASIN (KIRKS)	1,629,255
CATCH BASIN (NE OF ARMS RD)	1,100,000
CATCH BASIN (NW OF ARMS RD)	3,100,000
<b>TOTAL</b>	<b>40,884,691</b>

**ACTUAL STORAGE NEEDED FOR 120 DAYS IS 30,854,835 GALLONS**

**4.2 Treatment/Transfer**

All wastewater from the milking parlor flows through an existing gravity pipeline into one of the two settling basins and the solids are settled out. The overflow from the settling basin enters storage pond #1 and is then applied to on-site acres.

Solid manure is piled in wind-rows approximately 14 feet wide, 7 feet high, and hundreds of feet long. A composter is used to turn and aerate the compost piles every one to two weeks. The compost is shipped off-site per agreements or sold to third parties.

The settling ponds will remove approximately 40% of the solids.

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### SECTION FIVE - UTILIZATION

#### 5.1 General

Properly utilized agricultural nutrients can be considered a natural resource that produces economical returns. Efficient use of animal manure in crop production can result in substantial savings in energy consumption. Where application of liquid or solid manure is on pasture, the final objective is to use the nutrients to grow forage while timing the application to avoid rejection of the forage by livestock.

The most obvious benefit of recycling manure to the land is the fertilizer value. Manure adds organic matter to the soil, which improves soil structure, infiltration, and general tilth. Soil erosion is reduced and the moisture holding capacity is increased.

Another benefit is that nitrogen and phosphorus are released slowly by the action of microorganisms. This conserves these elements and makes them available throughout the year as they are needed for plant growth.

#### 5.2 Nutrient Value of Manure

The nutrient value for manure is subject to change due to such processes as storage, mineralization, volatilization, denitrification, and leaching. In addition, the amount of wash water used and the amount of added water affects the nutrient value of liquid manure on a per gallon basis. The more water used, the more dilute the nutrient value will be.

Nitrogen, phosphorus, and potassium are the major nutrients in manure. Nitrogen and Phosphorus are both considered pollutants when they are in the water. Phosphorus is rapidly absorbed in the soil and is not subject to leaching because it stays attached to the soil. If soil erosion and sedimentation exist, phosphorus will move with the soil and can get to surface water. If there is a history of manure application, phosphorus is rarely deficient. **To avoid phosphorus movement, soil erosion must be controlled. Run-off and erosion are controlled by this facility by the use of acceptable irrigation sprinkler systems on all fields except field #6. This eliminates a phosphorus movement concern.**

Potassium, although absorbed at a lesser degree, is not generally considered a pollutant in surface and subsurface waters, but may be a concern for herd health.

Nitrogen is a more mobile element. In the nitrate form it leaches easily through the soil because it is an anion that has low sorptive capabilities, and does not form insoluble precipitates. Thus, nitrogen has the greatest pollution potential of the three elements, and generally limits the amount of manure that can be safely applied.

**Application rates discussed in the following sections are based on the average values listed previously, and may need to be adjusted according to the actual test results.** Application rates are established by balancing nitrogen with crop nutrient requirements. Nitrogen in manure is in an organic form. Mineralization is a

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biological process that makes nutrients plant-available. Mineralization is temperature, pH and moisture dependent. Although some nutrients are available immediately, a lag between the time that organic material such as manure is applied to the soil and when its nutrients become available for crop use should be expected.

### 5.3 Crops Grown and Nutrient Requirements

Crop species and yield goal are important considerations when formulating agronomic rates. When determining agronomic rates for manure application, it is important to choose achievable yield goals. Average yields for the past three to five years for each field should be used. Fields with manure history can have pH problems due to salts that have accumulated from the manure. Soil amendments may need to be done to overcome these problems and achieve good nutrient uptake and yield.

Cow Palace Dairy, LLC has approximately 533 owned acres for the agronomic land application and utilization of liquid manure. An additional 50 acres of orchard are also available. The primary crops grown on the acres owned by Cow Palace Dairy, LLC are **alfalfa, corn double cropped with Triticale, and Sudan grass double cropped with Triticale.**

**Alfalfa:** High producing alfalfa has the capacity of using 480 pounds of nitrogen (N), 95 pounds of phosphorus ( $P_2O_5$ ), and 480 pounds of potassium ( $K_2O$ ) per acre annually. This should be applied in three equal amounts - in early spring, the beginning of June, and mid August. (Western Fertilizer Handbook)

**Corn:** can uptake and utilize approximately 250 pounds of nitrogen, 105 pounds of phosphorus ( $P_2O_5$ ), and 250 pounds of potassium ( $K_2O$ ) per acre annually. (Western Fertilizer Handbook)

**Triticale:** can uptake and utilize approximately 250 pounds of nitrogen, 95 pounds of phosphorus ( $P_2O_5$ ), and 200 pounds of potassium ( $K_2O$ ) per acre annually.

**Sudan Grass:** can uptake and utilize approximately 325 pounds of nitrogen (N), 125 pounds of phosphorus ( $P_2O_5$ ), and 475 pounds of potassium ( $K_2O$ ) per acre annually. (Western Fertilizer Handbook)

**These are guidelines only and are based on information obtained from the Washington State Fertilizer Guide Issued by the Washington State University Cooperative Extension Service or from Chapter 6, Table 6-6, of the Natural Resources Conservation Service Agricultural Waste Management Field Handbook, and the Western Fertilizer Handbook, Table 4-1. NRCS recognizes that farmers should vary timing and amounts of application depending on particular soil, crop type, and crops needs and weather conditions. (See Table 4b).**

It is **required** that the dairy manager test the nutrient residuals in the soil along with nutrient content testing of the storage ponds and dry manure before application.

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Field assessments indicate that **the manure application schedule for this dairy may be based upon nitrogen levels**. If future testing demonstrates that phosphorus or potassium should be considered, the application schedule will need to be modified to address these levels to avoid resource contamination.

### 5.4 Testing Requirements

Regular testing for soil nutrient availability is essential for proper nutrient management decisions making. Soil tests should be completed as close as possible to the time of seeding for best results. Tests will be completed on each field or management group for a starting point for nutrient and manure application recommendations. The soil sample shall represent the 0-12" surface layer of the soil.

#### Soil analysis.

Annual post-harvest soil nitrate nitrogen analysis;

Every three years, a current soil analysis that includes:

- (A) Organic matter;
- (B) pH;
- (C) Ammonium nitrogen;
- (D) Phosphorus (the Bray-1 method must be used to determine soil phosphorus for soils below pH 7 and the Olsen bicarbonate method must be used for soils at or above pH 7);
- (E) Potassium; and
- (F) A measure of electrical conductivity.

If double cropping, a spring and a fall test should be completed prior to any manure application. See Appendix B for management units and guidelines on proper sampling.

**Nutrient analysis** for all sources of organic and inorganic nutrients including, but not limited to, manure and commercial fertilizer supplied for crop uptake. Manure and other organic sources of nutrients must be analyzed annually for organic nitrogen, ammonia nitrogen, and phosphorus.

Manure liquids and manure solids will be tested yearly, prior to the first application of the year, to determine the nutrient content of the manure. At a minimum test for Ammonium Nitrogen (NH<sub>4</sub>-N), Organic Nitrogen, Phosphorus (P<sub>2</sub>O<sub>5</sub>), Potassium (K<sub>2</sub>O), and percent solids in the solid manure.

Cow Palace LLC currently uses a third party vendor to collect the soil samples for analysis. Random samples are collected from each owned/leased field in control of this facility and are then sent to an accredited lab. Manure samples are also collected by this vendor yearly.

Records of soil testing will be kept along with records showing the date, application rate, and the place where liquid and solid manure is applied. **THE PRODUCER IS RESPONSIBLE FOR MAINTAINING ALL RECORDS.** It is **required** that the dairy manager test the nutrient residuals in the soil along with nutrient content of the liquid in the storage ponds and the solid (dry) manure **before** land application

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**5.5 Application Management**

It is critical that the land application of the liquids from the storage ponds be scheduled agronomically throughout the growth period. This will help provide adequate storage for the winter months.

Nutrients shall not be applied to frozen, snow covered ground or saturated soil if a potential risk of discharge to ground or surface waters exists.

Land application of solid or liquid manure during the winter months may occur depending upon soil moisture conditions and agronomic needs as reflected in annual soil testing.

The following schedule shows each month of the year and the manure handling procedures used during that month.

MONTH	MANURE APPLICATION SCHEDULE
JANUARY	STORED OR AGRONOMICALLY APPLIED
FEBRUARY	STORED OR AGRONOMICALLY APPLIED
MARCH	AGRONOMICALLY APPLIED
APRIL	AGRONOMICALLY APPLIED
MAY	AGRONOMICALLY APPLIED
JUNE	AGRONOMICALLY APPLIED
JULY	AGRONOMICALLY APPLIED
AUGUST	AGRONOMICALLY APPLIED
SEPTEMBER	AGRONOMICALLY APPLIED
OCTOBER	AGRONOMICALLY APPLIED
NOVEMBER	STORED OR AGRONOMICALLY APPLIED
DECEMBER	STORED OR AGRONOMICALLY APPLIED

Manure is most commonly applied from March through October. During November, December, January, and February, nutrients will be agronomically applied in a manner that will prevent run-off or excessive deep percolation of the wastewater. Under bare ground conditions, incorporation may be necessary.

There will be periods of time when application will not be possible. Because those periods of time may vary from year to year, application of manure during November, December, January, and February must be at agronomic rates. The South Yakima Conservation District and/or the Natural Resources Conservation Service assume no responsibility.

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### Rates & Quantities

The proper timing of nutrient application is an essential part of management. Nutrients should be applied as close as possible to the period of maximum nutrient uptake by a crop. Total nutrient quantities must not exceed the amount that can be used by the crop being grown. Liquid nutrients must be applied at a rate that is compatible with the infiltration characteristics of the soil. Rates and quantities must be carefully controlled on sites that have a high water table.

**Through mineralization, nitrogen from previous applications becomes available independent of additional application. Caution should be taken when applying manure to fields with long histories of manure application.**

The majority of the soils for the agronomic application of manure on this dairy are the **Warden series** with some **Scoon** silt loam.

*Limitations for these soils for the land application of agricultural waste are slight to medium with no environmental impacts.*

In the **Scoon** series (120-122), permeability is moderate above the hardpan and very slow through it. The available water capacity is low with an effective rooting depth of 10 to 20 inches. Run-off is slow and the hazard of water erosion is moderate. The main limitations for irrigated crops are depth to hardpan, steepness of slope, and the hazard of water erosion. (*Soil Survey, Yakima County, Washington*)

**Warden** (177-180) is a very deep, well-drained soil. The surface layer is brown fine sandy loam about 5 inches thick. The subsoil is pale brown silt loam about 14 inches thick. The substratum to a depth of 60 inches or more is light gray and pale brown. The permeability of the Warden soil is moderate. Available water capacity is high (11.64 inches) and the effective rooting depth is 60 inches or more. Run-off is rapid, and the hazard of water erosion is high. (*Soil Survey, Yakima County, Washington*)

When applying liquid manure to fields, it is important to apply the manure at a rate, which matches the soils' capacity to absorb the liquid. Soil type, amount of solid material in the manure, slope, soil moisture, and the duration of application are factors that affect the infiltration rate. If liquid manure application exceeds the soils' infiltration rate, a portion of the manure may run off.

The soil intake rate for a sprinkler system on the Cow Palace Dairy, LLC is .30 inches per hour for the Warden series and .35 inches for the Scoon series.

Application of manure may cause crusting and sealing of the soil surface, which can alter the soil intake rate. Extreme caution must be used when applying manure to avoid run-off.

**When applying liquid manure to fields, it is important to apply the manure at a rate, which matches the soils' capacity to absorb the liquid. Soil type, amount of solid material in the manure, slope, soil moisture, and the duration of application are factors that affect the infiltration rate. If manure applications exceed the soils' infiltration rate, a portion of the manure may run off.**

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The following chart shows the soil intake rates for the Cow Palace Dairy, LLC.

(AWC = available water holding capacity. Furrow I'f = intake rate in inches per foot for furrow irrigation. Sprinkler I'f = intake rate in inches per foot for sprinkler irrigation. Depth = soil depth in feet.) [Source: Washington State Irrigation Guide]

ID	Text Description	AWC in / ft	Furrow I'f	Sprinkler I'f	Depth
177-180	Warden Silt Loam 0-30% slope	2.28	.29	.30	5
120-122	Scoon Silt Loam 2 - 15% slope	1.92	.20	.35	1.5

The use of sprinkler systems permits the even, controlled application of liquid manure, reduces run-off, and minimizes the risk of water erosion. The Cow Palace Dairy, LLC will apply the wastewater to cropland acres through an existing center pivot sprinkler and wheel-lines on fields 1 thru 6.

To successfully irrigate through a sprinkler system, it may be necessary to dilute the manure mixture to create a more liquid consistency. At about 96% moisture content liquid manure can be used for irrigation without using special pumps, pipes, and larger nozzles. "As excreted" manure from a milking cow is approximately 88 percent moisture and will require dilution. The addition of wastewater from the parlor, run-off from the open lots, and the flush system can reduce total solids content to 4-8%. Assuming moisture content of 92%, approximately one gallon of water must be added to each gallon of manure to obtain 96% moisture.

Application management also involves monitoring soil moisture. The amount of water or liquid manure that can be applied depends of the effective root zone of the crop and the water holding capacity of the soil. Irrigation should be started when approximately 50% of available soil moisture has been depleted.

Application of manure may cause crusting and sealing of the soil surface, which can alter the soil intake rate. Extreme caution must be used when applying manure to avoid run-off. An Irrigation Water Management Schedule is in **Appendix B**.

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### Guidelines

The following guidelines must be followed to properly utilize and manage the manure produced on the Cow Palace, LLC.

### DO'S

- Take manure nutrient concentration into account before applying to crops.
- Take soil nutrient levels into account before applying additional nutrients.
- Apply nutrients based on realistic yield (five-year average from farmer records or professional recommendations) goals, based on soils, precipitation, climate, available soil moisture, and yield history for the field.
- Apply manure during periods of low or no rainfall.
- Apply manure on days when the winds are relatively calm so that aerosols and odors are minimized from drifting onto neighboring areas, thus reducing odor complaints.
- Apply manure uniformly with calibrated equipment.
- Avoid applying manure to bare ground. This may cause nitrogen to leach into the ground water.
- Soil test to determine the proper application of manure and any supplemental fertilizers.
- Incorporate manure/fertilizer if the potential exists for surface run-off or soil erosion.
- Maintain a record for each field showing the crop sequence, crop, soil test data, any tissue testing data, kind and amount of nutrients applied, special application practices, crop yields, and water applied. These records should be maintained for 5 years.



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### DON'TS

- Do not apply manure when the ground is frozen, saturated, or snow covered.
- Do not apply manure when weather conditions will cause wind drift outside of the application area. Improper storage and handling of manure poses water pollution problems.
- Do not apply manure to irrigation canals, wells, drainage ditches, ponds, or waters of the state.
- Do not over irrigate. Over-irrigation can cause nitrates to leach below the crop root zone and may cause surface soil erosion and phosphorus movement.

### **5.6 ODOR/DUST/FLY MANAGEMENT**

#### Odor

Some odor is a natural part of any dairy operation. Manure production and land application involves manure handling at the storage site, hauling to the application site, and land application. These processes can lead to potential sources of odor.

For controlling odors during manure application, the following practices to minimize odors are recommended.

#### **General Guidelines:**

- The disposition of dead animals will be accomplished in a sanitary manner and in accordance with all state and local laws.
- Keep pens as dry as possible to provide the least favorable environment for odors and fly pupae (eggs).
- Feed spillage around feed bunks and feed mills can cause odors. Keep spillage to a minimum, especially under moist conditions.
- Keep all animal holding areas clean of excess manure. A facility that is clean, dry, and free of manure provides a less desirable environment for disease organisms to thrive and proliferate.

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### Application Guidelines:

- Avoid spreading or agitating manure when the wind is blowing toward populated areas. Only apply manure on days when the winds are relatively calm so that aerosols and odors are minimized from drifting onto neighboring areas. In general, be a good neighbor.
- If possible, incorporate solid manure during or immediately after application.
- If manure cannot be incorporated, apply uniformly and in a layer thin enough to allow quick drying. This also kills fly eggs and larvae through drying.
- Minimize agitation and exposure of manure to air during preparation for unloading, hauling, and spreading.

### Dust

The goal for dust control for this dairy operation is to reduce the amount of man-made particulate matter from alleys and roadway conditions through planning, utilization, and evaluation of Best Management Practices.

Appropriate techniques and procedures will be used to prevent or reduce the emission and airborne transport of fugitive dust. These include, but are not limited to the following.

- Roads Maintenance - Maintain roadways in such a manner that inhibits dust. Restrict vehicular speed on unpaved roads. All roadways and cattle lanes are paved with concrete, asphalt, or gravel. Fields are irrigated and have a permanent crop or are double cropped to prevent erosion.
- Feed/Feed Processing - During feeding and feed preparation, dust will be kept to a minimum. Feed in the feed bunks generally does not generate dust because of the moisture in the feed. If dust becomes a problem, water will be added for control. Hay grinding or grain processing operations will not be done in windy conditions.

### Fly Control

Sanitation, moisture control, and manure management are critical to a successful fly control program. Appropriate insecticides may be used when necessary, but works best in conjunction with good sanitation practices.

To enhance natural predator populations (mites, parasitic wasps, and beetles) that prey on fly eggs, stacked manure should be maintained in as dry a condition as possible. This provides a good habitat for the predator and parasite reproduction and reduces the suitability of manure for larval development.

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During May thru September, insecticide is applied to the cow shades and other open structures where flies are most likely to roost. Efforts are also made to keep the waste handling areas weed free and clean.

### Chemical Handling

The producer is responsible for ensuring that chemicals<sup>1</sup> and other contaminants handled on-site are not disposed of in any manure, litter, process wastewater, or storm water storage or treatment system unless specifically designed to treat such chemicals and other contaminants. Chemicals must be stored in their original containers or in containers clearly marked and deemed suitable according to manufactures recommendations. When possible, chemicals will be stored in secondary containment (for example a 5 gallon bucket, plastic tray etc.) sized to contain 125% of the stored volume on impervious surfaces. The storage facility should be located downhill from any water supply or other sensitive resource areas. Chemical containers should be protected from physical injury by vehicles and other hazards. When the container is labeled with the words "Danger," "Warning," or "Caution" it must be stored in a secured area out of reach of children in an enclosure deemed acceptable by WSDA.

Chemical handling should be done in accordance with label directions. Chemicals will be mixed on/or loaded on impervious surfaces with secondary containment. The producer is responsible for following label requirements for mixing/loading setbacks from wells, intermittent streams and rivers, natural or impounded ponds and lakes, or reservoirs. If sprayer tanks are filled from a drinking water source a check valve will be installed to prevent back-siphoning. Application equipment should be calibrated according to manufacturer's recommendations before each use. Application equipment will be inspected for worn or cracked parts and replaced immediately if encountered. Disposal of unused chemicals shall conform to label directions and all applicable local, State and Federal regulations. Information can be found at <http://agr.wa.gov/PestFert/Pesticides/WastePesticide.htm>.

By following the above guidelines the risk of chemical spills should be greatly reduced. In the unlikely event of a spill the producer is responsible for taking immediate action. The spill should be contained by whatever means the facility manager deems appropriate for the given chemical. Once the situation has been assessed and immediate containment measures have been taken the producer should contact the Washington State Department of Ecology, Eastern Regional Office for additional advice and assistance: 1-509-329-3400.

<sup>1</sup> The term "chemicals" does not refer to (a) those chemical or biological agents that may be added to waste storage structures intentionally for treatment purposes; for example, chemicals added to aid in the breakdown of solids or in the removal of odors or (b) chemicals contained in process wastewater as a result of washing or cleaning animals or CAFO facilities.

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### Animal Mortality Management Plan

Animal mortalities will be disposed of within 72 hours to avoid nuisance odors or disease as required under the rules established under WAC 16-25 Disposal of dead animals. The primary method of animal disposal will be composting

- If the preferred method specified above is no longer viable, the alternative methods of animal mortality disposal will be rendered by a licensed rendering plant or carcass burial.
- Animal mortalities will not be disposed of in a liquid manure, storm water, or process wastewater storage or treatment system that is not specifically designed to treat animal mortalities.
- If the livestock animal has died from a reportable disease, the carcass will be disposed of in consultation with the state veterinarian. The list of reportable diseases and reporting requirements found in chapter 16-70 WAC will be kept on site.
- Animal mortality disposal will meet the applicable local health department requirements.

### **5.7 MANDATORY RECORDKEEPING**

Records will be maintained to document the implementation and management of the Dairy Nutrient Management Plan. These records must be made available to the Department of Agriculture upon request and maintained on-site for five years. Documentation must include:

#### Application Records Must include:

- Field identification and year of application
- Crop grown in each field where the application occurred
- Crop nutrient needs based on expected crop yield Nutrient sources available from residual soil nitrogen including contributions from soil organic matter, previous legume crop, and previous organic nutrients applied
- Date of applications, method of application, nutrient sources, nutrient analysis, amount of nitrogen and phosphorus applied and available for each source
- Total amount of nitrogen and phosphorus applied to each field each year
- Weather conditions twenty-four hours prior to and at time of application.

#### Manure Transfer Records must include imports or exports:

- Date of manure transfer
- Amount of nutrients transferred
- The name of the person supplying and receiving the nutrients
- Nutrient analysis of manure transferred.

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**Irrigation Water Management Records** must include:

- Field identification
- Total amount of irrigation water applied to each field each year.

An annual report summarizing any discharges, the acres available for land application, acres actually used for application, number and type of animals, amount of manure generated, applied, and exported from the operation is also required.

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Granger, WA  
December 2012

### SECTION 6 -- OPERATION AND MAINTENANCE

Operation and maintenance is a vital component to the overall nutrient management system to help achieve the objective of this plan in eliminating surface and ground water pollution. A complete and timely maintenance program should be in place.

The Cow Palace Dairy, LLC is responsible for the proper installation, operation, and maintenance of the Dairy Nutrient Management System. Although the best available technology was used to design the waste system, it needs to be inspected and properly operated and maintained in a safe manner.

- When cleaning equipment after nutrient application, always avoid high run-off areas, ponds, lakes, streams, wetlands, and other water bodies. Extreme care must be exercised to avoid contaminating wells.
- The transfer pipelines should be flushed periodically with clean water to rid the pipes of accumulated solids. This contaminated water will be agronomically applied to the fields or will be stored in the storage ponds.
- Remove accumulated solids from the storage ponds and basins as needed to ensure adequate storage, taking care not to break the existing manure/soil seal.
- The storage ponds should be as empty as feasible by **November 1** of each year to maximize the available storage capacity of the ponds. (This should be scheduled throughout the growing season).
- Maintain storage volume in the ponds by periodic agitation to prevent solids buildup. Clean the pond if storage capacity is diminished by over 20% due to solids buildup.
- Removal of liquids before the end of the storage period may be necessary if above average precipitation has occurred. Land application of nutrients during winter months must be at agronomic rates. In an emergency, it is recommended that these liquids may be applied to fields #1 thru #5. Priority should be given to those fields that have a cover crop as opposed to a field that is completely bare and applied during a period of best available weather. Notify the Department of Agriculture prior to application.
- The disposition of dead animals will be accomplished in a sanitary manner and in accordance with all state and local laws.
- Dry up pens as soon as possible each spring to provide the least favorable environment for fly pupae (eggs).
- Precautions will be taken to prevent spillage onto public roads when hauling solid or liquid manure.
- All dairy employees working with manure application should have knowledge of the Dairy Nutrient Management Plan.
- Periodic plan review to determine if adjustments or modifications to the plan are needed. As a minimum, plans will be reviewed with each soil test cycle.

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SUBJECT TO THE STIPULATED PROTECTIVE ORDER ENTERED ON 8/28/13 IN  
 U.S. DISTRICT COURT, EASTERN DISTRICT OF WA, CASE NO. 2:13-cv-03016-TOR

**DAIRY NUTRIENT MANAGEMENT PLAN**

Cow Palace Dairy, LLC  
 Dolsen Companies

1631 Liberty Road

Granger, WA  
 December 2012

**Emergency Spill Response Plan**

**In Case of an Emergency - Storage Facility Spill, Leak, or Failure:**

Implement the following first containment steps:

- a. Stop all other activities to address the spill.
- b. Use skid loader or tractor with blade to contain or divert spill or leak, if possible.
- c. Call for help & excavator if needed.
- d. Complete the clean-up and repair the necessary components
- e. Assess the extent of the emergency and determine how much help is needed.

**In Case of an Emergency - Land Application Manure/Waste Discharge**

Implement the following first containment steps:

- a. Turn off the pump. Park the tractor on the hose to stop manure flow.
- b. Till the ground ahead of the flow or create a small dam.
- b. Call for help if needed.
- c. Call sheriff's office if spilled on road for traffic control and clean the spill immediately from the road and roadside if needed.
- d. Contain the spill or runoff from entering the stream or waterway using straw bales, saw dust, or soil material.
- e. If flow is coming from a tile, plug the tile with a tile plug immediately.
- f. Assess the extent of the emergency and determine how much help is needed.

**Contact the Regulatory Agency As Soon As Possible within 24 hours**

Department/Agency	Phone
Department of Ecology	360-407-6128 (Jon Jennings)
Department of Ag.	509-969-7140 (Dan McCarty)
County Sheriff's Office	1-800-572-0490
County Health District	1-800-535-5016

**Provide the following information:**

- 1. Your Name
- 2. Farm Identification
- 3. Description of emergency
- 4. Estimate of the amounts, area covered, and distance traveled.
- 5. Has manure reached surface waters or major field drains?
- 6. Is there any obvious damage: employee injury, fish kill, or property damage?
- 7. What is currently in progress to contain situation?

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O&M-PS-313-P



OPERATION AND MAINTENANCE PLAN

"WASTE STORAGE POND"

Landowner/Operator: Cow Palace Date: 11/08

Address: 1631 Liberty Road

Zillah, WA

Legal description of practice location: SEC 25 T 11 R 21

OVERVIEW

A properly operated and maintained waste storage pond is an asset to your farm. This waste storage pond was designed and installed to provide temporary storage of animal waste. The performance life of this installation can be assured and usually increased by developing and carrying out a good operation and maintenance program.

This practice will require you to perform periodic operation and maintenance to maintain satisfactory performance. The following recommendations will help you in performing adequate operation and maintenance.

GENERAL RECOMMENDATIONS

- Maintain all pumps, agitators, piping, valves and other electrical and mechanical equipment in good operating condition following the manufacture's recommendations.
- Maintain grounding rods and wiring of all electrical equipment in good working condition.
- Prior to the storage season, empty the pond to provide storage capacity for the accumulation of animal wastes and precipitation during the storage period.
- Fences and/or warning signs shall be maintained to prevent unauthorized human or livestock entry.
- Immediately repair any vandalism, vehicular or livestock damage to any earthfills, spillway, outlets or other appurtenances.
- Maintain vigorous growth of desirable vegetative coverings. This includes reseeding, fertilization, and controlled application of herbicides when necessary. Periodic mowing or grazing may be needed to control height.
- Immediately remove any foreign debris in or adjacent to the waste storage pond.
- Determine and eliminate causes of settlement or cracks in the earthen sections and repair damage.
- Repair spalls, cracks and weathered areas in concrete surfaces.



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O&M-PS-313-P

- Repair or replace rusted or damaged metal and paint.
- Replace weathered or displaced rock riprap to constructed grade,
- Make sure all structure drains are functional and soil is not being transported through the drainage system. The screens and/or rodent guards shall also be kept in place.
- Eradicate or otherwise remove all rodents or burrowing animals and repair any damage caused by their activity.
- Immediately remove any obstructions or blockage of spillways, trash racks, or pipe inlets.
- Apply insecticides for insect control as per the manufactures recommendations and precautions, as needed.
- Operate System in a manner that minimizes odors and air drift.
- Agitating should be completed at the appropriate location(s) in order to maintain the pond liner material.

*SPECIFIC RECOMMENDATIONS FOR YOUR STRUCTURE*

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*CONTACT YOUR LOCAL NATURAL RESOURCES CONSERVATION SERVICE OFFICE FOR ANY ADDITIONAL TECHNICAL ASSISTANCE YOU MIGHT NEED FOR IMPLEMENTATION OF THIS OPERATION AND MAINTENANCE PLAN FOR YOUR STRUCTURE.*

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O&M-PS-350



OPERATION AND MAINTENANCE PLAN

"SEDIMENT BASIN"

Landowner/Operator: Cow Palace Date: 11/08

Address: 1631 Liberty Road  
Zillah

Legal description of practice location: SEC 25 T 11 R 21

OVERVIEW

A properly operated and maintained sediment basin is an asset to your farm. This sediment basin was designed and installed to remove, collect and provide temporary storage of sediment and water. The performance life of this installation can be assured and usually increased by developing and carrying out a good operation and maintenance program.

This practice will require you to perform periodic operation and maintenance to maintain satisfactory performance. The following recommendations will help you in performing adequate operation and maintenance.

GENERAL RECOMMENDATIONS

- Periodic removal of sediment is necessary to maintain the effectiveness of this installation. The cleanout intervals may vary depending upon the volume of sediment that has accumulated. As a general rule the basin will lose its effectiveness when about 50 percent of the design volume is filled with sediment.
- Maintain vigorous growth of desirable vegetative coverings. This includes reseeding, fertilization, and controlled application of herbicides when necessary. Periodic mowing may also be needed to control height.
- If fences are installed, they shall be maintained to prevent unauthorized or livestock entry.
- Remove any debris that may accumulate in or immediately upstream of the basin.
- Immediately repair any vandalism, vehicular, or livestock damage to any earth fills, spillways, or outlets.
- Make sure all structure drains are functional and soil is not being transported through the drainage system. The screens and/or rodent guards shall also be kept in place.
- Eradicate or otherwise remove all rodents or burrowing animals and repair any damage caused by their activity.

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O&M-PS-350

- Determine and eliminate causes of settlement or cracks in the earthen sections and repair damage.
- Replace weathered or displaced rock riprap to constructed grade.

**SPECIFIC RECOMMENDATIONS FOR YOUR STRUCTURE**

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*CONTACT YOUR LOCAL NATURAL RESOURCES CONSERVATION SERVICE OFFICE FOR ANY ADDITIONAL  
TECHNICAL ASSISTANCE YOU MIGHT NEED FOR IMPLEMENTATION OF THIS OPERATION AND MAINTENANCE  
PLAN FOR YOUR STRUCTURE.*

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O&M-PS-447



OPERATION AND MAINTENANCE PLAN

"IRRIGATION TAILWATER RECOVERY"

Landowner/Operator: Cow Palace Date: 11/08

Address: 1631 Liberty Road

Zillah

Legal description of practice location: SEC 25 T 11 R 21

OVERVIEW

Properly operated and maintained to recover irrigation water is an asset to your farm. This system was designed and installed to return runoff water from your irrigation to a point where it can be reused for an irrigation supply. The performance life of the system can be assured and usually increased by developing and carrying out a good operation and maintenance program.

This practice will require you to perform periodic operation and maintenance to maintain satisfactory performance. The following recommendations will help you in performing adequate operation and maintenance.

GENERAL RECOMMENDATIONS

- Periodically check all above ground connections, trash racks and structures for proper operation.
- If sediment traps or ponds are used, they shall be maintained in good working condition.
- Prevent and if necessary remove all crop residue and foreign debris from entering system.
- All pumps, structures, ponds, and/or conveyance systems shall be in good operating condition with O & M performed as per site specific recommendations for each component.
- Periodically clean out sediment from traps and/or pond.


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O&M-PS-447

**SPECIFIC RECOMMENDATIONS FOR YOUR STRUCTURE**

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*CONTACT YOUR LOCAL NATURAL RESOURCES CONSERVATION SERVICE OFFICE FOR ANY ADDITIONAL TECHNICAL ASSISTANCE YOU MIGHT NEED FOR IMPLEMENTATION OF THIS OPERATION AND MAINTENANCE PLAN FOR YOUR STRUCTURE.*

 NRCS -Washington

2/2

AUGUST 2002

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O&M-PS-442



OPERATION AND MAINTENANCE PLAN

"IRRIGATION SYSTEM, SPRINKLER"

Landowner/Operator: Cow Palace Date: 11/08

Address: 1631 Liberty Road

Zillah

Legal description of practice location: SEC 25 T 11 R 21

OVERVIEW

A properly operated and maintained sprinkler irrigation system is an asset to your farm. This irrigation system was designed and installed to apply irrigation water to meet the needs of the crops without causing erosion or runoff. The performance life of this system can be assured and usually increased by developing and carrying out a good operation and maintenance program.

This practice will require you to perform periodic operation and maintenance to maintain satisfactory performance. The following recommendations will help you in performing adequate operation and maintenance.

GENERAL RECOMMENDATIONS

- Only operate the system when needed to furnish water for plant growth.
- Operate the system at the pressure, discharge rate, duration and frequency as designed.
- Check to make sure that all connections are watertight and all valves are working properly.
- Periodically check the sprinkler heads for wear, and replace with proper parts when defective or excessive wear is found.
- Promptly repair all leaks, by replacing gaskets or worn parts.
- During non-seasonal use, drain and place the removable part of the system in an area where it will not be damaged.
- Maintain all pumps, agitators, piping, valves and other electrical and mechanical equipment in good operating condition following the manufacturer's recommendations.
- Do not allow livestock near equipment or in area during operation.
- Immediately repair any vandalism, vehicular or livestock damage,

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*SPECIFIC RECOMMENDATIONS FOR YOUR STRUCTURE*

[Lined area for writing recommendations]

*CONTACT YOUR LOCAL NATURAL RESOURCES CONSERVATION SERVICE OFFICE FOR ANY ADDITIONAL TECHNICAL ASSISTANCE YOU MIGHT NEED FOR IMPLEMENTATION OF THIS OPERATION AND MAINTENANCE PLAN FOR YOUR STRUCTURE.*

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O&M-PS-634



OPERATION AND MAINTENANCE PLAN

"MANURE TRANSFER"

Landowner/Operator: Cow Palace Date: 11/08

Address: 1631 Liberty Road  
Zillah

Legal description of practice location: SEC 25 T 11 R 21

OVERVIEW

A properly operated and maintained waste transfer system is an asset to your farm. This waste transfer system is designed and installed to move wastes from the collection area to storage, treatment or disposal. The performance life of this installation can be assured and will be increased by developing and carrying out a good operation and maintenance program.

This practice will require you to perform periodic operation and maintenance to maintain satisfactory performance. The following recommendations will help you in performing adequate operation and maintenance.

GENERAL RECOMMENDATIONS

- Maintain all pumps, agitators, piping, valves, and electrical and mechanical equipment in good operating condition following the manufacture's recommendations.
- Maintain grounding rods and wiring of all electrical equipment in good working condition.
- Maintain all safety shields on pumps, motors, and electrical or mechanical equipment.
- All fencing railings and/or warning signs shall be maintained to prevent unauthorized human or livestock entry.
- Immediately repair any vandalism, vehicular or livestock damage to the system.
- It is advisable to flush the system with clean water after each use.
- Drain all system components in areas that are subject to freezing. If parts of the system cannot be drained, a non-corrosive anti-freeze solution shall be added
- Repair spalls, cracks and weathered areas in concrete surfaces.
- Repair or replace rusted or damaged metal and paint,
- Apply insecticides for insect control as per the manufactures recommendations and precautions, as needed.





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PLANNED IMPROVEMENTS/BEST MANAGEMENT PRACTICES

Cow Palace  
 11/08

PLANNED BMP OR CONSERVATION PRACTICE	NRCS PRACTICE CODE	QUANTITY OR UNITS	DATE PRACTICE IS TO BE COMPLETED	SCHEDULED APPLICATION				
				2008	2009	2010	2011	2012
(1) Waste Storage Facility (Pond) (Clean-out)	313	4 each	Existing As needed	X	X	X	X	X
(2) Settling Basins (Clean-out)	350	2 (earthen)	Existing Ongoing-As needed	X	X	X	X	X
(3) Waste Storage Facility (Catch Basins)	313		Existing					
(4) Waste Storage Facility (Drying Area )	313		Existing					
(5) Sprinkler System -Wheel Line, Pivot, Hand-lines in Pivot Corners	442	Wheelines Pivots	Existing					
(6) Operation and Maintenance (Pond, pipes, etc)			Ongoing	X	X	X	X	X
(7) Nutrient Management (Soil Test, Manure Test, Recordkeeping)	590	All acres	Fall & Spring Ongoing	X	X	X	X	X
(8) Irrigation Water Management	449	All acres	Ongoing	X	X	X	X	X
(9) Nutrient Management Plan			Review- Spring	X	X	X	X	X

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PLANNED IMPROVEMENTS/BEST MANAGEMENT PRACTICES

Cow Palace  
 12/12

PLANNED BMP OR CONSERVATION PRACTICE	NRCS PRACTICE CODE	QUANTITY OR UNITS	DATE PRACTICE IS TO BE COMPLETED	SCHEDULED APPLICATION				
				2013	2014	2015	2016	2017
(1) Waste Storage Facility (Pond) (Clean-out)	313	4 each	Existing As needed	X	X	X	X	X
(2) Settling Basins (Clean-out)	350	2 (earthen)	Existing Ongoing-As needed	X	X	X	X	X
(3) Waste Storage Facility (Catch Basins)	313		Existing					
(4) Waste Storage Facility (Drying Area )	313		Existing					
(5) Sprinkler System -Wheel Line, Pivot, Hand-lines in Pivot Corners	442	Wheelines Pivots	Existing					
(6) Operation and Maintenance (Pond, pipes, etc)			Ongoing	X	X	X	X	X
(7) Nutrient Management (Soil Test, Manure Test, Recordkeeping)	590	All acres	Fall & Spring Ongoing	X	X	X	X	X
(8) Irrigation Water Management	449	All acres	Ongoing	X	X	X	X	X
(9) Nutrient Management Plan			Review- Spring	X	X	X	X	X

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# APPENDIX A

Topography Map

Aerial Photo

Lay-out Sketch

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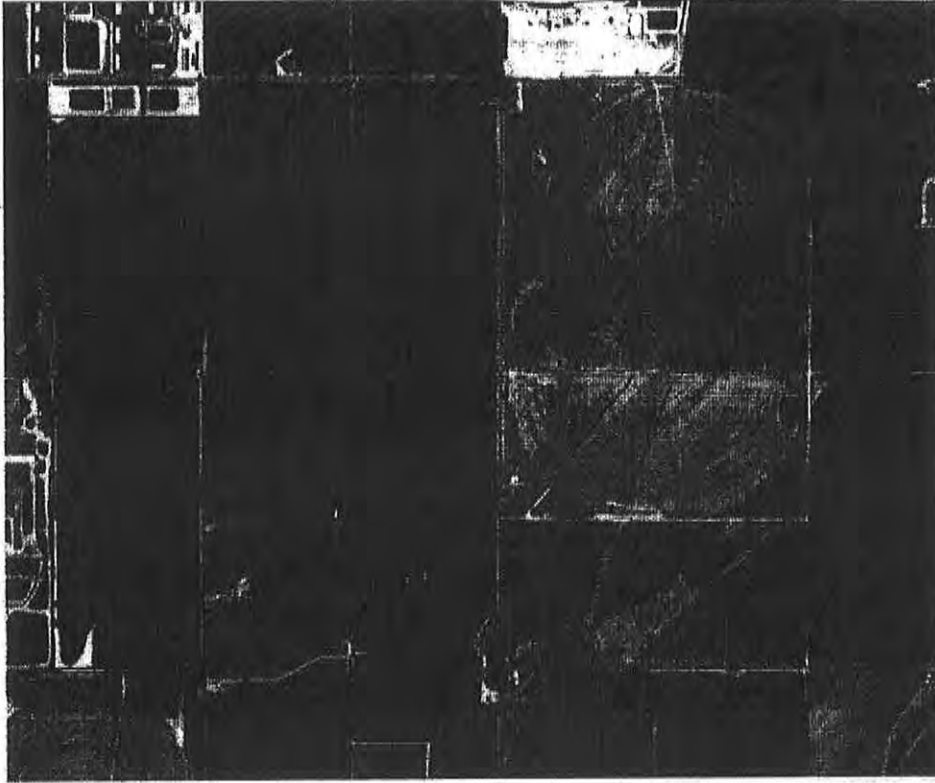
Off-Site Acres (If needed)

Letter of Intent To Receive Manure (If needed)

Polyacrylamide (PAM) Information (If used)

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**COW PALACE, LLC**

**Aerial View**

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**Application Acres**

**Legend**

 Application Acres

LATITUDE: 46° 24' 27.82"  
LONGITUDE: -120° 8' 43.20"

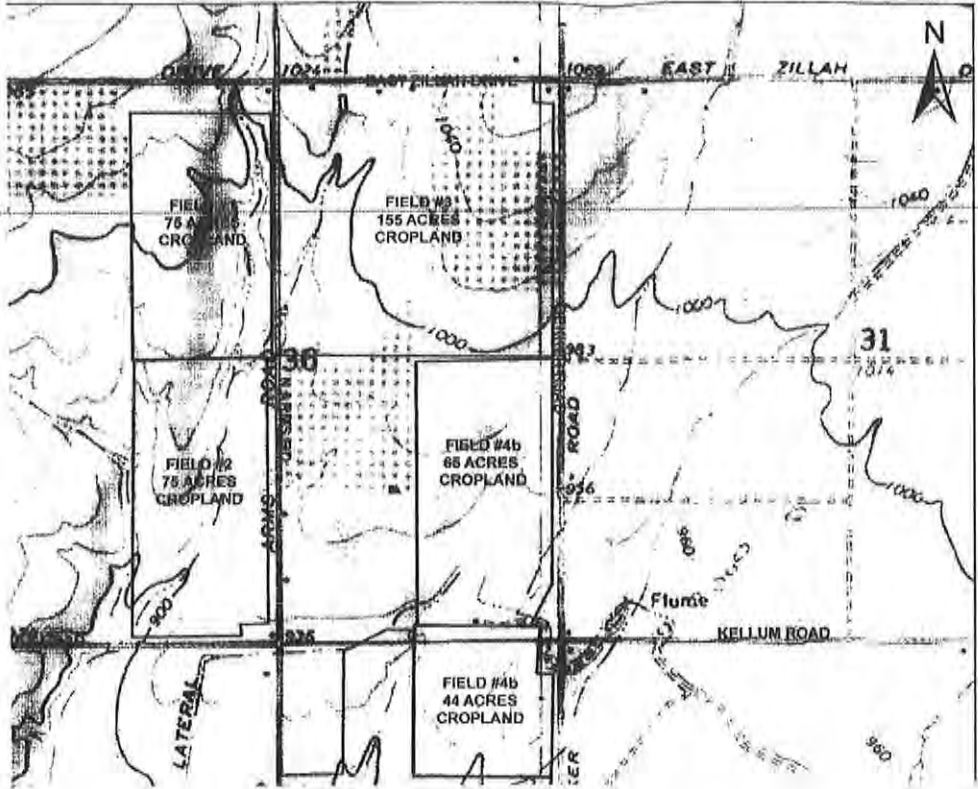
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**COW PALACE, LLC**

Aerial View

Application Acres

**Legend**

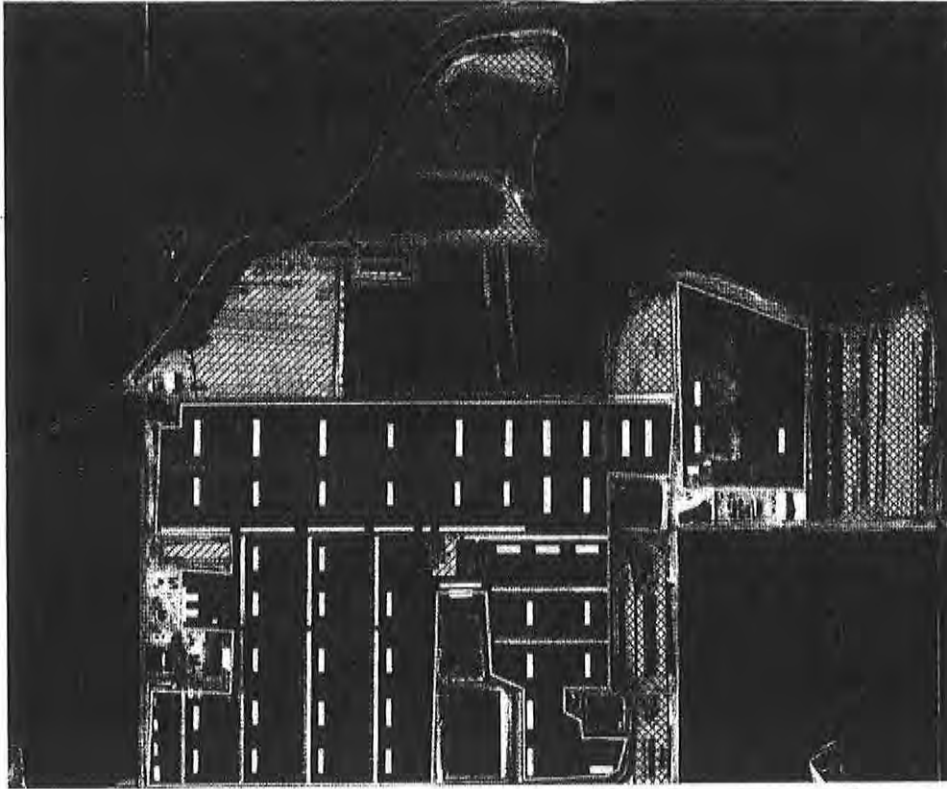
 Application Acres

LATITUDE: 46° 24' 27.82"  
LONGITUDE: -120° 8' 43.20"

SECTION: 25 TOWNSHIP:11 RANGE: 21

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







## COW PALACE, LLC

### AERIAL VIEW HEADQUARTERS

SECTION: 25 TOWNSHIP: 11 RANGE: 21

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LONGITUDE: -120° 8' 43.20"

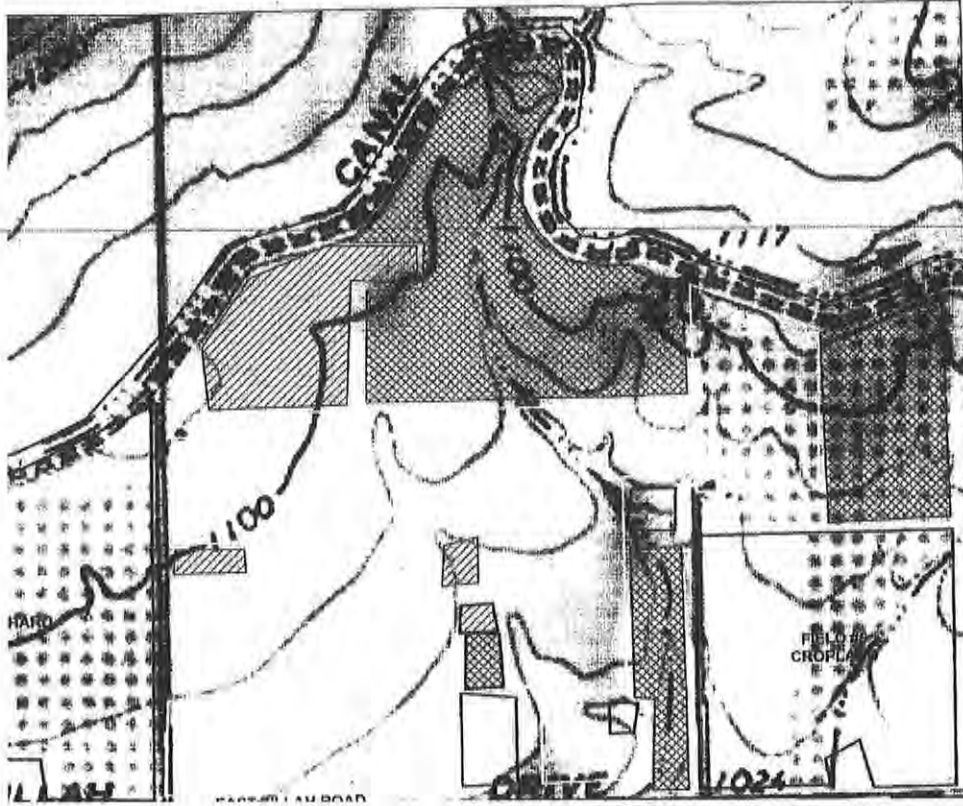
### Legend

-  Application Acres
-  Parlor
-  Pens
-  Commodities
-  Calf hutches
-  Seperator system
-  Settling Basin
-  Liquid storage

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









**COW PALACE, LLC**  
**AERIAL VIEW**  
**HEADQUARTERS**

SECTION: 25 TOWNSHIP: 11 RANGE: 21

LATITUDE: 46° 24' 27.87"  
LONGITUDE: -120° 8' 43.20"

**Legend**

-  Application Acres
-  Parlor
-  Pens
-  Commodities
-  Calf hutches
-  Seperator system
-  Settling Basin
-  Liquid storage

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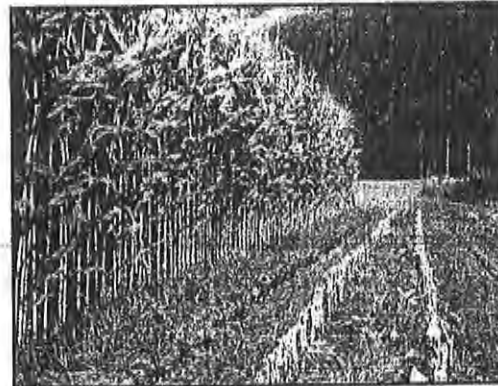
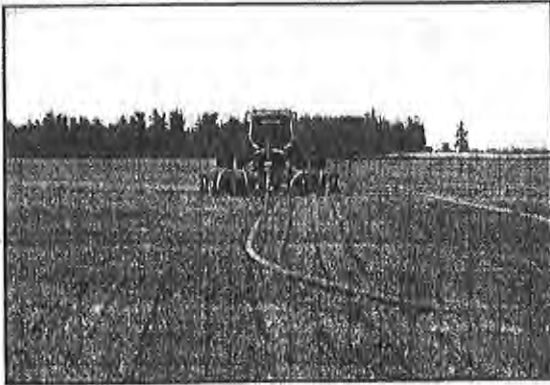


**Nutrient Management  
Conservation Practice Job Sheet**

**590**

**Natural Resources Conservation Service, Washington May 2001**

Operator \_\_\_\_\_



**Definition**

Nutrient management is managing the amount, source, form, timing, and placement of nutrients and soil amendments.

**Purpose**

Nutrient management may be applied as part of a resource management system to support the following purposes:

- To budget and supply nutrients for plant production.
- To properly utilize manure or organic byproducts as a plant nutrient source.
- To minimize agricultural non-point source pollution of surface and ground water resources.
- To maintain or improve the physical, chemical and biological condition of soil.

**Conditions Where Practice Applies**

- Nutrient management is applicable to all lands where plant nutrients and soil amendments are applied.

**Conservation Management Systems**

Nutrient management may be a component of a Resource management system. It is used in conjunction with other practices, on a site-specific basis, to address natural resource concerns identified during the planning process, to meet program requirements, or producer goals. Consider additional practices such as Waste Utilization (633), Conservation Cover (327), Contour Buffer Strips (332), Filter Strips (393), Irrigation Water Management (449), Riparian Forest Buffer (391A), Conservation Crop Rotation (328), Cover Crops (340), and Residue Management (329A, 329B, or 329C, and 344) to improve soil nutrient and water storage, infiltration, aeration, tilth, diversity of soil organisms, and to protect or improve water quality.

**General Nutrient Management  
Planning Considerations**

Plans for nutrient management shall be developed in accordance with NRCS policy and NRCS WA 590 practice standard.

**Persons who review or approve plans for nutrient management shall be certified conservation planners.**

**Plans for nutrient management shall comply with all applicable Federal, tribal, state, and local laws and regulations.**

- A nutrient budget for nitrogen (N), phosphorus (P), and potassium (K) shall be developed that considers all potential sources of nutrients listed on the Specification Sheet.
- Realistic yield goals shall be established based on soil productivity information, actual production history, climatic conditions, and level of management.
- Soil Sampling and Laboratory Analysis (Testing)
  - Soil, tissue, and manure samples shall be collected and prepared according to Pacific Northwest (PNW) Land Grant University guidance.
  - Soil test analysis shall be performed by laboratories from the WCC-103 Region enrolled in the North American Proficiency Testing Program.
  - Soil testing shall include analysis for any nutrient for which specific information is needed to develop the nutrient plan. At a minimum, pH, EC, OM, N, P, and K analysis used.
  - Current soil test results will be used to develop nutrient plans. Current soil tests for N, P, and K are those that are no older than three years for perennial crops and one year for annual crops.

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# **APPENDIX B**

**Nutrient Management Worksheet (Table 4A, Table 4B, Table 4C)**

**Waste Production Worksheet**

**Pond Worksheet**

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**Irrigation Water Management Worksheet**

**Sprinkler Application Rates**

**Irrigation Dilution Chart**

**Nutrient Information**

**Manure Applicator Calibration**

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NUTRIENT UTILIZATION WORKSHEET

Cow Palace

Dec-12

TABLE 4.A ANNUAL AVAILABLE NUTRIENT VALUES (AFTER LOSSES)

	NITROGEN	PHOSPHORUS (P <sub>2</sub> O <sub>5</sub> )	POTASSIUM (K <sub>2</sub> O)	TOTAL POUNDS OF NITROGEN IN LIQUIDS	TOTAL POUNDS OF NITROGEN IN SOLIDS
WASTE WATER AVERAGE	118,125	178,257	284,035		
#100 GALLONS	1.51	2.27	3.37		
SOLID MANURE AVERAGE	749,487	793,051	1,139,074	118,125	749,487
#TONS	3.96	4.19	6.01		
<b>TOTAL</b>	<b>867,612</b>	<b>971,308</b>	<b>1,402,159</b>		

ONLY LIQUIDS ARE APPLIED TO CROPLAND ACRES

TABLE 4.B NITROGEN UPTAKE PER ON-SITE CROPS

CROP	ACRES	YIELD/ACRE	NUTRIENT UPTAKE (LBS/ACRE)			K <sub>2</sub> O	NUTRIENT UPTAKE (LBS/ACRE)		K OVER/ UNDER
			N	P <sub>2</sub> O <sub>5</sub>	K <sub>2</sub> O		N	P <sub>2</sub> O <sub>5</sub>	
ALFALFA	144	8 TON	480	95	480	69,120	49,006	164,577	194,985
CORN	389	30 TON	250	105	250	97,250	-43,245	123,732	97,715
TRITICALE	454	10 TON	250	130	250	113,500	-161,745	64,712	-15,785
SUDAN GRASS	0	18 TON	325	125	475	0	0	64,712	-15,785
PEARS	34	15 TON	85	25	95	2,850	164,635	53,852	-13,015
APPLES	16	15 TON	120	55	215	1,920	-166,555	62,982	-22,455
<b>TOTAL</b>	<b>533</b>					<b>284,680</b>	<b>115,275</b>		<b>286,540</b>

NOT INCLUDED IN ACRES

TABLE 4.C NITROGEN APPLIED OFF-SITE

CROP	ACRES	YIELD/ACRE	NUTRIENT UPTAKE (LBS/ACRE)			K <sub>2</sub> O	NUTRIENT UPTAKE (LBS/ACRE)		K OVER/ UNDER
			N	P <sub>2</sub> O <sub>5</sub>	K <sub>2</sub> O		N	P <sub>2</sub> O <sub>5</sub>	
			0	0	0	0	0	0	0
			0	0	0	0	0	0	0
			0	0	0	0	0	0	0
<b>TOTAL</b>			<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>

NITROGEN HAS THE GREATEST POLLUTION POTENTIAL OF THE THREE ELEMENTS (NPK) AND WILL BE THE LIMITING FACTOR FOR THIS DAIRY. ALL SOLIDS ARE COMPOSTED ON-SITE AND APPROXIMATELY 98% OF THE COMPOSTED MATERIAL LEAVES THE DAIRY. ADJUST THE RATE NEEDED DEPENDING ON YOUR ACTUAL SOIL AND MANURE ANALYSIS

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DAIRY WASTE CALCULATIONS							
ANIMAL UNITS	ANIMAL	AMOUNT	WEIGHT	AU'S	Cow Palace	Dec-12	
(INCLUDES OFF-SITE LIVE STOCK)	MILKERS	7600	1400	10640			
	DRY	840	1400	1176			
	HEIFERS	500	750	375			
	CALVES	2900	200	580			
	OTHERS	0	0	0			
	TOTAL	11840		12771			
LIQUIDS							
WASH WATER	MILK COWS X GAL/COW/DAY X DAYS/YR	7600 22			365	61026,000	GALLONS
		7600 22			120	20,084,000	GALLONS
LIQUIDS							
MANURE COLLECTED (AWM/FH TABLE 4-5)	CU. FT X GALLONS X AU'S X DAYS	1.7 7.48	10640	365		46,303,856	GALLONS
		1.7 7.48	10640	120		16,235,789	GALLONS
LIQUIDS							
ANNUAL PRECIPITATION (ALL PENS)	50. FT X FT OF PRECIP. X GAL/CU. FT.	305,000 0.58 0.69	7.48	0.47		621,910	GALLONS
			7.48	0.47		0	GALLONS
LIQUIDS							
ANNUAL PRECIPITATION (OTHER PENS)	50. FT X FT OF PRECIP. X GAL/CU. FT.	2,200,000 0.58 0.68	7.48	0.47		1,485,906	GALLONS
			7.48	0.47		0	GALLONS
LIQUIDS							
25 YR - 24 HOUR STORM (ALL PENS)	50. FT X FT OF PRECIP. X GAL/CU. FT.	305,000 0.13 0.13	7.48			296,582	GALLONS
			7.48			0	GALLONS
LIQUIDS							
25 YR - 24 HOUR STORM (OTHER PENS)	50. FT X FT OF PRECIP. X GAL/CU. FT.	2,200,000 0.13 0.13	7.48			2,139,280	GALLONS
			7.48			0	GALLONS
LIQUIDS							
WASTE WATER	MANURE COLLECTED X % PARLOR TIME + WASH WATER + OTHER RUN-OFF	46,303,856 0.20 16,235,789	0.20	01,026,000 7,543,677		78,448,449 30,854,832	GALLONS/365 DAYS GALLONS/120 DAYS
LIQUIDS							
TOTAL NITROGEN PRODUCED IN (LIQUIDS)	NUMBER OF ANIMALS X AU'S X DAYS/YEAR X % PARLOR TIME	MILKERS 0.71 10640	365	0.20		551,471 181,306	LBS OF N/YEAR LBS OF N/120 DAYS
			120	0.20			
W/M/FH	P <sub>2</sub> O <sub>5</sub>	0.27 10640	365	0.20		209,714 68,947	LBS OF P/YEAR LBS OF P/120 DAYS
TABLE 4-5)	K <sub>2</sub> O	0.40 10640	365	0.20		310,688 102,144	LBS OF K/YEAR LBS OF K/120 DAYS
			120	0.20			
	CONVERTED TO FERTILIZER FORM			TOTAL N		551,471	LBS OF N/YEAR
	CONVERTED TO FERTILIZER FORM			TOTAL P <sub>2</sub> O <sub>5</sub>		209,714	LBS OF P/YEAR
	CONVERTED TO FERTILIZER FORM			TOTAL K <sub>2</sub> O		310,688	LBS OF K/YEAR
LIQUID LOSSES							
STORAGE AND APPLICATION LOSSES	LBS OF NITROGEN X STORAGE LOSS X VOLATILIZATION X DENITRIFICATION X MIN X % SOLIDS REMAINING	551,471					
	LBS OF NITROGEN/YEAR						
	STORAGE	0.60	0.70	0.85	1.00	0.60	118,126 LBS OF N/YEAR
	VOLATILIZATION						378,257 LBS OF P/YEAR
	DENITRIFICATION						264,095 LBS OF K/YEAR
	MINERALIZATION						
(AWM/FH TABLES 11-2 TO 11-6)							
(LIQUIDS)							1.51 LBS N/1000 GAL
							2.27 LBS P/1000 GAL
							3.32 LBS K/1000 GAL
	40% OF N REMOVED THROUGH SETTLING BASINS						

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SOLIDS											
NITROGEN IN STACK MANURE	ANIMAL UNITS X % SPLIT X FACTOR X DAYS		FACTOR	DAYS							
	AU'S	% SPLIT									
N	MILKERS	10640	0.60	0.71	365					2,205,885	LBS OF NITROGEN
P		10640	0.60	0.12	365					372,826	LBS OF PHOSPHORUS
K		10640	0.80	0.33	365					1,025,270	LBS OF POTASSIUM
N	DRY	1178	1.00	0.3	365					128,772	LBS OF NITROGEN
P		1178	1.00	0.04	365					17,170	LBS OF PHOSPHORUS
K		1178	1.00	0.1	365					42,924	LBS OF POTASSIUM
(AWMFH)	N	HEIFERS	375	1.00	0.42	365				57,498	LBS OF NITROGEN
	P		375	1.00	0.05	365				6,844	LBS OF PHOSPHORUS
	K		375	1.00	0.11	365				15,056	LBS OF POTASSIUM
TABLE 4-5)	N	CALVES	680	1.00	0.27	365				57,160	LBS OF NITROGEN
	P		680	1.00	0.05	365				10,566	LBS OF PHOSPHORUS
	K		680	1.00	0.11	365				23,787	LBS OF POTASSIUM
		OTHERS	0								
										2,449,303	LBS OF NITROGEN
										833,001	LBS OF PHOSPHORUS
										1,338,911	LBS OF POTASSIUM
SOLID LOSSES											
STORAGE AND APPLICATION LOSSES	LBS OF NITROGEN X STORAGE LOSS X VOLATILIZATION X DENITRIFICATION X MIN										
	2,449,303 LBS OF NITROGEN										
	933,001 LBS OF PHOSPHORUS										
	1,338,911 LBS OF POTASSIUM										
		STORAGE	VOLATILIZATION	DENITRIFICATION	MINERALIZATION						
N		0.60	0.60	0.85	1.00					749,487	LBS OF NITROGEN
P		0.85			1.00					793,051	LBS OF PHOSPHORUS
K		0.85			1.00					1,138,074	LBS OF POTASSIUM
(AWMFH TABLES 11-2 TO 11-6 (STACK MANURE))											
SOLIDS											
TONS OF MANURE IN STACK	ANIMAL UNITS X % IN STACK X FACTOR #/AU X 365/2000 LBS/TON		LBS/AU		DAYS		/2000 LBS/TON				
	MILKERS	10640	0.80	100						167,772	
	DRY	1178	1.00	63						17,819	
	HEIFERS	375	1.00	56						3,833	
	CALVES	680	1.00	21						2,223	
(AWMFH TABLE 4-5)										189,417	TONS
										3.96	LBS/TON OF N
										4.19	LBS/TON OF P
										6.01	LBS/TON OF K

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POND CALCULATIONS					
DAIRY WASTE LAGOON/POND CALCULATIONS	D= STORAGE	30	2:1	AVERAGE AREA	
	S= SIDE SLOPE			310	INSIDE LENGTH
	L= LENGTH	430		160	INSIDE WIDTH
	W=WIDTH	280		370	AVERAGE LENGTH
	AREA=FT <sup>2</sup>	120,400		220	AVERAGE WIDTH
	TOTAL				
	POND #1	FT AVERAGE	81,400		
	CUBIC FT	2,442,000			
	GALLON CAPACITY	18,266,160			
	TOTAL				
	ACRE FEET	56.1	DEPTH IS THE STORAGE DEPTH OF LAGOON LENGTH AND WIDTH IS THE OUTSIDE DIMENSIONS		
Settling Basin (2)	D= STORAGE	10	2:1	AVERAGE AREA	
	S= SIDE SLOPE			93	INSIDE LENGTH
	L= LENGTH	133		160	INSIDE WIDTH
	W= WIDTH	200		113	AVERAGE LENGTH
	AREA=FT <sup>2</sup>	26,600		180	AVERAGE WIDTH
	TOTAL				
		FT AVERAGE	20,340		
	CUBIC FT	203,400			
	GALLON CAPACITY	1,521,432			
	ACRE FEET	4.7	DEPTH IS THE STORAGE DEPTH OF LAGOON LENGTH AND WIDTH IS THE OUTSIDE DIMENSIONS		
Pond #2	D= STORAGE	15	2:1	AVERAGE AREA	
	S= SIDE SLOPE			140	INSIDE LENGTH
	L= LENGTH	200		240	INSIDE WIDTH
	W=WIDTH	300		170	AVERAGE LENGTH
	AREA=FT <sup>2</sup>	60,000		270	AVERAGE WIDTH
	TOTAL				
		FT AVERAGE	45,900		
	CUBIC FT	688,500			
	GALLON CAPACITY	5,149,980			
	ACRE FEET	15.8	DEPTH IS THE STORAGE DEPTH OF LAGOON LENGTH AND WIDTH IS THE OUTSIDE DIMENSIONS		
Pond #3	D= STORAGE	20	2:1	AVERAGE AREA	
	S= SIDE SLOPE			120	INSIDE LENGTH
	L= LENGTH	200		145	INSIDE WIDTH
	W=WIDTH	225		160	AVERAGE LENGTH
	AREA=	45,000		185	AVERAGE WIDTH
	TOTAL				
		FT AVERAGE	29,600		
	CUBIC FT	592,000			
	GALLON CAPACITY	4,428,160			
	ACRE FEET	13.6	DEPTH IS THE STORAGE DEPTH OF LAGOON LENGTH AND WIDTH IS THE OUTSIDE DIMENSIONS		
Pond #4	D= STORAGE	14	3:1	AVERAGE AREA	
	S= SIDE SLOPE			181	INSIDE LENGTH
	L= LENGTH	265		116	INSIDE WIDTH
	W=WIDTH	200		223	AVERAGE LENGTH
	AREA=	53,000		158	AVERAGE WIDTH
	TOTAL				
		FT AVERAGE	35,234		
	CUBIC FT	493,276			
	GALLON CAPACITY	3,689,704			
	ACRE FEET	11.3	DEPTH IS THE STORAGE DEPTH OF LAGOON LENGTH AND WIDTH IS THE OUTSIDE DIMENSIONS		
\$	ICE AREA	305,000			
	VOLUME				
	CATCH BASINS				
	TOTAL				
		40,884,691			

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U.S. DISTRICT COURT, EASTERN DISTRICT OF WA, CASE NO. 2:13-cv-03016-TOR**

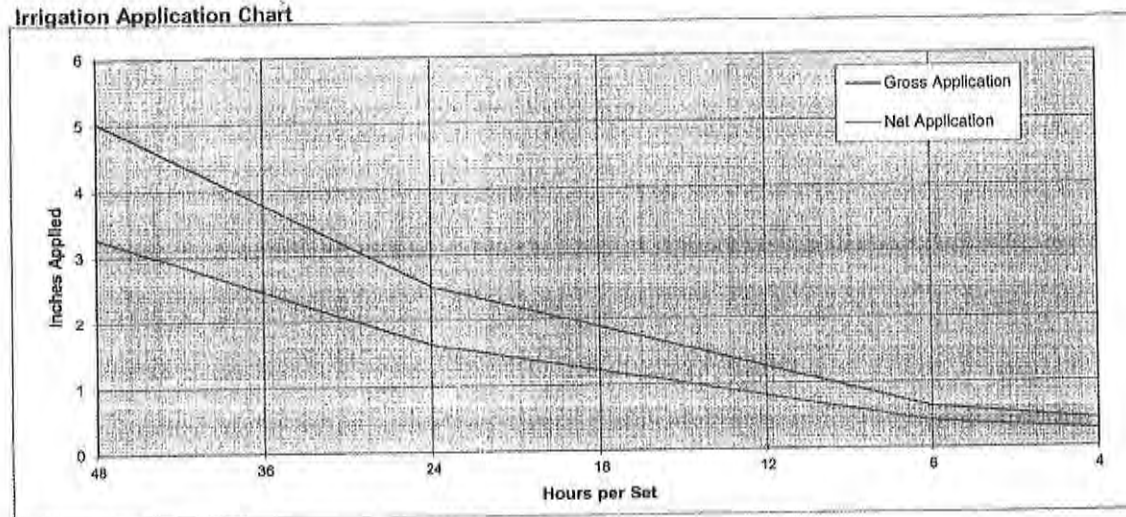
**IRRIGATION WATER MANAGEMENT WORKSHEET**

NAME: Cow Palace Dairy, LLC	DATE: Dec-12
ADDRESS: 1631 Liberty Road	FIELD: 6
LOCATION: 25-11-21	ACRES: 84.00

<b>Crop Information</b>		
TYPE:	Corn	
ROOT DEPTH:	3	ft
MAD(%)**	50%	
SEASONAL CONSUMPTIVE USE:	29.31	inches

<b>Soil Information</b>		
PREDOMINATE SOIL SERIES:	178	Warden Silt Loam 5 - 8% slope
INTAKE RATE:	0.3	inches / hour
DEPTH:	5	ft
AWC in / ft	2.328	
TWHC - Total Water Holding Capacity:	11.64	inches
AWHC - Available Water Holding Capacity:	5.82	inches / ft

<b>System Information</b>		
TYPE:	Wheel Line	EFFICIENCY 65%
SPACING LATERAL:	40	ft
SPACING MAINLINE:	60	ft
NOZZLE DISCHARGE:	5.22	GPM
SET TIME:	12	hours
APPLICATION RATE:	0.21	inches / hour
NET APPLICATION / ACRE:	1.63	inches / set
GROSS APPLICATION / ACRE:	2.51	inches / set



<b>Irrigation Schedule</b>									
set time	12	APRIL	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	TOTAL
MONTH CU (inches)		0.00	1.39	4.38	10.38	9.06	4.10	0.00	29.31
DAILY CU (inches)		0.00	0.05	0.16	0.42	0.36	0.15	0.00	
FREQ / DAYS		0	35	10	4	5	11	0	
IRRIG / MO (daily CU)		0	0	3	8	7	3	0	20
IRRIG / AVG (monthly CU)		0	0	3	6	6	3	0	18

**Notes**  
THE ABOVE IRRIGATION SCHEDULE SHOULD BE USED AS A GUIDE. FREQUENCY SHOULD BE BASED ON ACTUAL SOIL MOISTURE MONITORING AT CROP ROOT EXTRACTION DEPTH.

\*\* MAD      MAXIMUM ALLOWABLE DEPLETION      CU      CONSUMPTIVE USE  
TWHC      TOTAL WATER HOLDING CAPACITY      AWHC      AVAILABLE WATER HOLDING CAPACITY

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**SUBJECT TO THE STIPULATED PROTECTIVE ORDER ENTERED ON 8/28/13 IN  
U.S. DISTRICT COURT, EASTERN DISTRICT OF WA, CASE NO. 2:13-cv-03016-TOR**

**IRRIGATION WATER MANAGEMENT WORKSHEET**

NAME: Cow Palace Dairy, LLC	DATE: Dec-12
ADDRESS: 1631 Liberty Road Zillah	FIELD: 1
LOCATION: 25-11-21	ACRES: 75.00

**Crop Information**

TYPE:	Corn	
ROOT DEPTH:	3	ft
MAD(%)**	50%	
SEASONAL CONSUMPTIVE USE:	29.31	inches

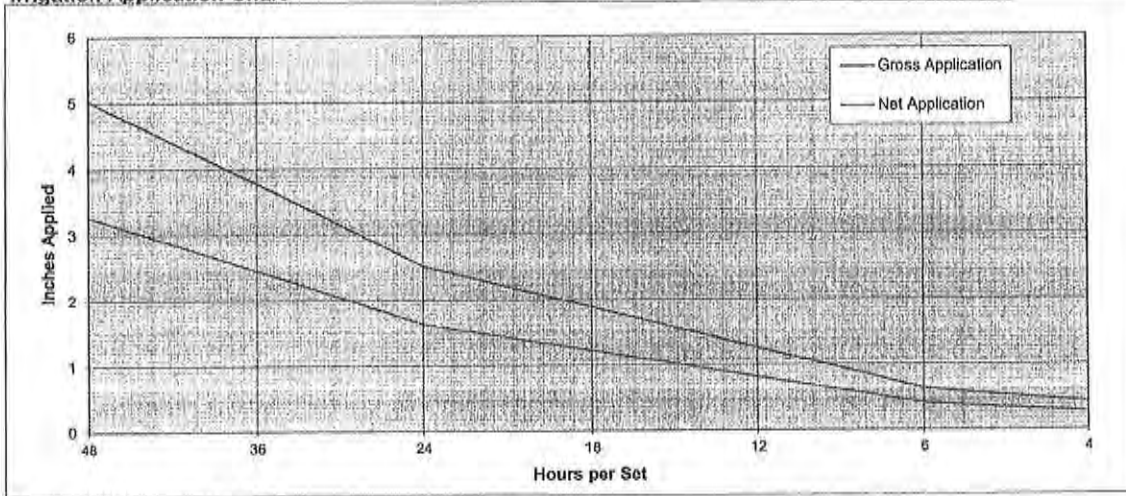
**Soil Information**

PREDOMINATE SOIL SERIES:	177	Warden Silt Loam 2 - 5% slope
INTAKE RATE:	0.3	inches / hour
DEPTH:	5	ft
AWC in / ft	2.328	
TWHC - Total Water Holding Capacity:	11.64	inches
AWHC - Available Water Holding Capacity:	5.82	inches / ft

**System Information**

TYPE:	Wheel Line	EFFICIENCY	65%
SPACING LATERAL:	40	ft	
SPACING MAINLINE:	60	ft	
NOZZLE DISCHARGE:	5.22	GPM	
SET TIME:	12	hours	
APPLICATION RATE:	0.21	inches / hour	
NET APPLICATION / ACRE:	1.63	inches / set	
GROSS APPLICATION / ACRE:	2.51	inches / set	

**Irrigation Application Chart**



**Irrigation Schedule**

set time	12	APRIL	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	TOTAL
MONTH CU (Inches)		0.00	1.39	4.38	10.38	9.06	4.10	0.00	29.31
DAILY CU (inches)		0.00	0.05	0.16	0.42	0.36	0.15	0.00	
FREQ / DAYS		0	35	10	4	5	11	0	
IRRIG / MO (daily CU)		0	0	3	8	7	3	0	20
IRRIG / AVG (monthly CU)		0	1	3	6	6	3	0	18

**Notes**

THE ABOVE IRRIGATION SCHEDULE SHOULD BE USED AS A GUIDE. FREQUENCY SHOULD BE BASED ON ACTUAL SOIL MOISTURE MONITORING AT CROP ROOT EXTRACTION DEPTH.

\*\* MAD      MAXIMUM ALLOWABLE DEPLETION      CU      CONSUMPTIVE USE  
TWHC      TOTAL WATER HOLDING CAPACITY      AWHC      AVAILABLE WATER HOLDING CAPACITY

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**IRRIGATION WATER MANAGEMENT WORKSHEET**

NAME: Cow Palace Dairy, LLC	DATE: Dec-12
ADDRESS: 1631 Liberty Road Zillah	FIELD: 2
LOCATION: 25-11-21	ACRES: 75.00

**Crop Information**

TYPE: Corn	
ROOT DEPTH: 3	ft
MAD(**): 50%	
SEASONAL CONSUMPTIVE USE: 29.31	inches

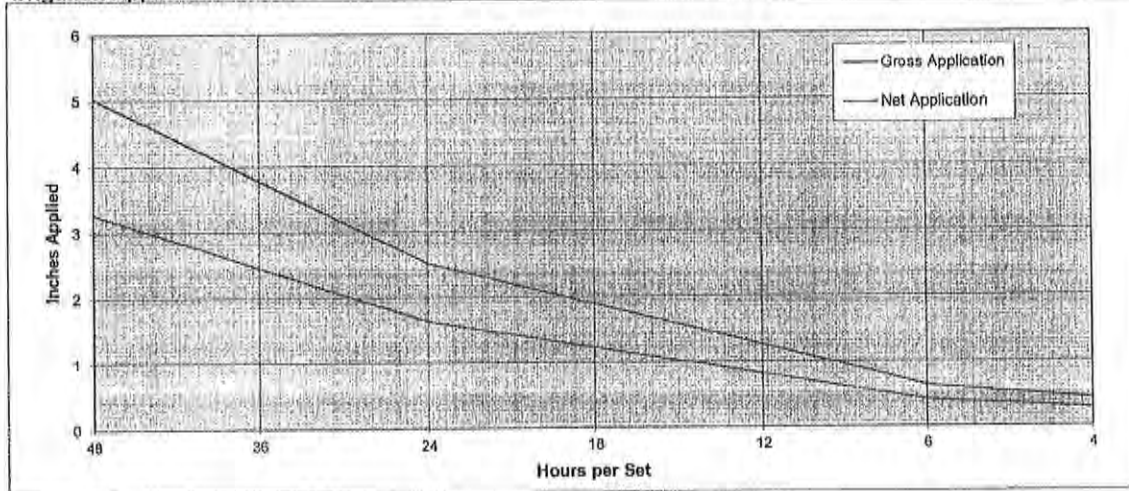
**Soil Information**

PREDOMINATE SOIL SERIES: 177	Warden Silt Loam 2 - 5% slope
INTAKE RATE: 0.3	inches / hour
DEPTH: 5	ft
AWC in / ft: 2.328	
TWHC - Total Water Holding Capacity: 11.64	inches
AWHC - Available Water Holding Capacity: 5.82	inches / ft

**System Information**

TYPE: Wheel Line		EFFICIENCY 65%
SPACING LATERAL: 40	ft	
SPACING MAINLINE: 60	ft	
NOZZLE DISCHARGE: 5.22	GPM	
SET TIME: 12	hours	
APPLICATION RATE: 0.21	inches / hour	
NET APPLICATION / ACRE: 1.63	inches / set	
GROSS APPLICATION / ACRE: 2.51	inches / set	

**Irrigation Application Chart**



**Irrigation Schedule**

set time 12	APRIL	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	TOTAL
MONTH CU (inches)	0.00	1.39	4.38	10.38	9.06	4.10	0.00	29.31
DAILY CU (inches)	0.00	0.05	0.16	0.42	0.36	0.15	0.00	
FREQ / DAYS	0	35	10	4	5	11	0	
IRRIG / MO (daily CU)	0	0	3	8	7	3	0	20
IRRIG / AVG (monthly CU)	0	1	3	6	6	3	0	18

**Notes**

THE ABOVE IRRIGATION SCHEDULE SHOULD BE USED AS A GUIDE. FREQUENCY SHOULD BE BASED ON ACTUAL SOIL MOISTURE MONITORING AT CROP ROOT EXTRACTION DEPTH.

\*\* MAD      MAXIMUM ALLOWABLE DEPLETION      CU      CONSUMPTIVE USE  
 TWHC      TOTAL WATER HOLDING CAPACITY      AWHC      AVAILABLE WATER HOLDING CAPACITY

**SUBJECT TO THE STIPULATED PROTECTIVE ORDER ENTERED ON 8/28/13 IN  
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**IRRIGATION WATER MANAGEMENT WORKSHEET**

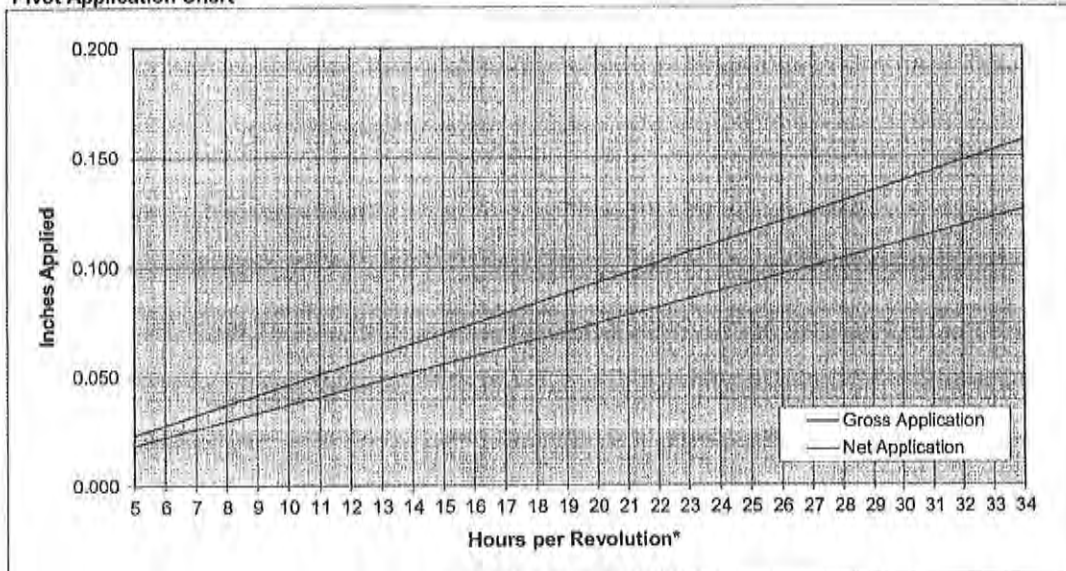
NAME: Cow Palace Dairy, LLC	DATE: Dec-12
ADDRESS: 1631 Liberty Road Zillah	FIELD: 3
LOCATION: 25-11-21	ACRES: 155.00

<b>Crop Information</b>		
TYPE:	Corn	
ROOT DEPTH:	3	ft
MAD(%)**	50%	
SEASONAL CONSUMPTIVE USE:	29.31	inches

<b>Soil Information</b>		
PREDOMINATE SOIL SERIES:	177	Warden Silt Loam 2 - 5% slope
INTAKE RATE:	0.3	inches / hour
DEPTH:	5	ft
AWC in / ft	2.328	
TWHC - Total Water Holding Capacity:	11.64	inches
AWHC - Available Water Holding Capacity:	5.82	Inches / ft

<b>System Information</b>		
TYPE:	Center Pivot - Rotators - with endgun	EFFICIENCY 80%
IRRIGATED RADIUS: AVERAGE	670	ft
PIVOT ANGLE:	360	degrees
APPLICATION RATE:	0.35	inches / hour
TOTAL GPM:	325	GPM
HOURS PER REVOLUTION*	24	hours
NET APPLICATION / ACRE:	0.089	inches / revolution
GROSS APPLICATION / ACRE:	0.111	inches / revolution

**Pivot Application Chart**



\* For half or partial pivots "hours per revolution" = hours for one direction only

**Irrigation Schedule**

hours / rev	24	APRIL	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	TOTAL
MONTH CU (Inches)		0.00	1.39	4.38	10.38	9.06	4.10	0.00	29.31
DAILY CU (Inches)		0.00	0.06	0.21	0.54	0.47	0.20	0.00	
FREQ / DAYS		0	1	0	0	0	0	0	
IRRIG / MO (daily CU)		0	20	71	183	157	66	0	498
IRRIG / AVG (monthly CU)		0	16	49	117	102	46	0	329

**Notes**

THE ABOVE IRRIGATION SCHEDULE SHOULD BE USED AS A GUIDE. FREQUENCY SHOULD BE BASED ON ACTUAL SOIL MOISTURE MONITORING AT CROP ROOT EXTRACTION DEPTH.

** MAD	MAXIMUM ALLOWABLE DEPLETION	CU	CONSUMPTIVE USE
TWHC	TOTAL WATER HOLDING CAPACITY	AWHC	AVAILABLE WATER HOLDING CAPACITY

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4a

IRRIGATION WATER MANAGEMENT WORKSHEET										
NAME:	Cow Palace Dairy, LLC				DATE:	Dec-12				
ADDRESS:	1631 Liberty Road			Zillah	FIELD:	4a				
LOCATION:	25-11-21				ACRES:	65.00				
<b>Crop Information</b>										
TYPE:	Corn									
ROOT DEPTH:	3	ft								
MAD(**)	50%									
SEASONAL CONSUMPTIVE USE:	29.31	inches								
<b>Soil Information</b>										
PREDOMINATE SOIL SERIES:	177	Warden Silt Loam 2 - 5% slope								
INTAKE RATE:	0.3	inches / hour								
DEPTH:	5	ft								
AWC in / ft	2.328									
TWHC - Total Water Holding Capacity:	11.64	inches								
AWHC - Available Water Holding Capacity:	5.82	inches / ft								
<b>System Information</b>										
TYPE:	Wheel Line				EFFICIENCY	65%				
SPACING LATERAL:	40	ft								
SPACING MAINLINE:	60	ft								
NOZZLE DISCHARGE:	5.22	GPM								
SET TIME:	12	hours								
APPLICATION RATE:	0.21	inches / hour								
NET APPLICATION / ACRE:	1.63	inches / set								
GROSS APPLICATION / ACRE:	2.51	inches / set								
<b>Irrigation Application Chart</b>										
<b>Irrigation Schedule</b>										
set time	12	APRIL	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	TOTAL	
MONTH CU (inches)		0.00	1.39	4.38	10.38	9.06	4.10	0.00	29.31	
DAILY CU (inches)		0.00	0.05	0.16	0.42	0.36	0.15	0.00		
FREQ / DAYS		0	35	10	4	5	11	0		
IRRIG / MO (daily CU)		0	0	3	8	7	3	0	20	
IRRIG / AVG (monthly CU)		0	1	3	6	6	3	0	18	
<b>Notes</b>										
THE ABOVE IRRIGATION SCHEDULE SHOULD BE USED AS A GUIDE. FREQUENCY SHOULD BE BASED ON ACTUAL SOIL MOISTURE MONITORING AT CROP ROOT EXTRACTION DEPTH.										
** MAD	MAXIMUM ALLOWABLE DEPLETION				CU	CONSUMPTIVE USE				
TWHC	TOTAL WATER HOLDING CAPACITY				AWHC	AVAILABLE WATER HOLDING CAPACITY				

SUBJECT TO THE STIPULATED PROTECTIVE ORDER ENTERED ON 8/28/13 IN  
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4b

IRRIGATION WATER MANAGEMENT WORKSHEET									
NAME:	Cow Palace Dairy, LLC				DATE:	Dec-12			
ADDRESS:	1631 Liberty Road				FIELD:	4b			
LOCATION:	25-11-21				ACRES:	44.00			
<b>Crop Information</b>									
TYPE:	Alfalfa								
ROOT DEPTH:	5	ft							
MAD(**)	50%								
SEASONAL CONSUMPTIVE USE:	37.02	Inches							
<b>Soil Information</b>									
PREDOMINATE SOIL SERIES:	177	Warden Silt Loam 2 - 5% slope							
INTAKE RATE:	0.3	inches / hour							
DEPTH:	5	ft							
AWC in / ft	2.328								
TWHC - Total Water Holding Capacity:	11.64	inches							
AWHC - Available Water Holding Capacity:	5.82	inches / ft							
<b>System Information</b>									
TYPE:	Wheel Line				EFFICIENCY	65%			
SPACING LATERAL:	40	ft							
SPACING MAIN LINE:	60	ft							
NOZZLE DISCHARGE:	5.22	GPM							
SET TIME:	12	hours							
APPLICATION RATE:	0.21	inches / hour							
NET APPLICATION / ACRE:	1.63	inches / set							
GROSS APPLICATION / ACRE:	2.51	inches / set							
<b>Irrigation Application Chart</b>									
<b>Irrigation Schedule</b>									
set time	12	APRIL	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	TOTAL
MONTH CU (inches)		0.76	5.91	7.26	9.16	7.44	4.77	1.72	37.02
DAILY CU (inches)		0.02	0.23	0.28	0.36	0.29	0.18	0.06	
FREQ / DAYS		68	7	6	4	6	9	28	
IRRIG / MO (daily CU)		0	0	5	7	5	3	0	20
IRRIG / AVG (monthly CU)		0	4	4	6	6	3	1	23
<b>Notes</b>									
THE ABOVE IRRIGATION SCHEDULE SHOULD BE USED AS A GUIDE. FREQUENCY SHOULD BE BASED ON ACTUAL SOIL MOISTURE MONITORING AT CROP ROOT EXTRACTION DEPTH.									
** MAD	MAXIMUM ALLOWABLE DEPLETION				CU	CONSUMPTIVE USE			
TWHC	TOTAL WATER HOLDING CAPACITY				AWHC	AVAILABLE WATER HOLDING CAPACITY			

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#5

IRRIGATION WATER MANAGEMENT WORKSHEET									
NAME:	Cow Palace Dairy, LLC		DATE:	Dec-12					
ADDRESS:	1631 Liberty Road	Zillah	FIELD:	5					
LOCATION:	25-11-21		ACRES:	35.00					
<b>Crop Information</b>									
TYPE:	Alfalfa								
ROOT DEPTH:	5	ft							
MAD(**)	50%								
SEASONAL CONSUMPTIVE USE:	37.02	inches							
<b>Soil Information</b>									
PREDOMINATE SOIL SERIES:	177	Warden Silt Loam 2 - 5% slope							
INTAKE RATE:	0.3	inches / hour							
DEPTH:	5	ft							
AWC in / ft	2.328								
TWHC - Total Water Holding Capacity:	11.64	inches							
AWHC - Available Water Holding Capacity:	5.82	inches / ft							
<b>System Information</b>									
TYPE:	Wheel Line		EFFICIENCY	65%					
SPACING LATERAL:	40	ft							
SPACING MAINLINE:	60	ft							
NOZZLE DISCHARGE:	5.22	GPM							
SET TIME:	12	hours							
APPLICATION RATE:	0.21	inches / hour							
NET APPLICATION / ACRE:	1.63	inches / set							
GROSS APPLICATION / ACRE:	2.51	inches / set							
<b>Irrigation Application Chart</b>									
<b>Irrigation Schedule</b>									
set time	12	APRIL	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	TOTAL
MONTH CU (inches)		0.76	5.91	7.26	9.16	7.44	4.77	1.72	37.02
DAILY CU (inches)		0.02	0.23	0.28	0.38	0.29	0.18	0.06	
FREQ / DAYS		68	7	6	4	5	9	28	
IRRIG / MO (daily CU)		0	0	5	7	5	3	0	20
IRRIG / AVG (monthly CU)		0	4	4	6	5	3	1	23
<b>Notes</b>									
THE ABOVE IRRIGATION SCHEDULE SHOULD BE USED AS A GUIDE. FREQUENCY SHOULD BE BASED ON ACTUAL SOIL MOISTURE MONITORING AT CROP ROOT EXTRACTION DEPTH.									
** MAD	MAXIMUM ALLOWABLE DEPLETION			CU	CONSUMPTIVE USE				
TWHC	TOTAL WATER HOLDING CAPACITY			AWHC	AVAILABLE WATER HOLDING CAPACITY				

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test

SOUTH YAKIMA CONSERVATION DISTRICT				POND VOLUME SPREADSHEET			FILE NAME
STATE	WA	PROJECT					
BY	Iac	DATE	1/18/2013	CHECKED BY		DATE	
SUBJECT	Gallons of Storage per foot of depth						
Inside Bottom Length =				Fl.			
Inside Bottom Width =				Ft.			
Inside Slope =				ft/ft			
Storage Depth =				Fl.			
25Yr/24hr Rain on Pond=				Inches			
25Yr/24hr Rain on Pond=		0.13		Feet	Gallons = 143760	Cubic Ft = 19219.2	
Depth (ft)	Length	Width	Area sqft	Ave. Area	Gallons/ft	Total gallons	% of total
430		280	120400				
434		284	123256	121828	911273	911273	3%
438		288	126144	124700	932756	1844029	6%
442		292	129064	127604	954478	2798507	9%
446		296	132016	130540	976439	3774947	13%
450		300	135000	133508	998640	4773586	16%
454		304	138016	136508	1021080	5794666	19%
458		308	141064	139540	1043759	6838425	23%
462		312	144144	142604	1066678	7905103	27%
466		316	147256	145700	1089836	8994939	30%
470		320	150400	148828	1113233	10108173	34%
474		324	153576	151988	1136870	11245043	38%
478		328	156784	155180	1160746	12405789	42%
482		332	160024	158404	1184862	13590651	46%
486		336	163296	161660	1209217	14799868	50%
490		340	166600	164948	1233811	16033679	54%
494		344	169936	168268	1258645	17292324	58%
498		348	173304	171620	1283718	18576041	62%
502		352	176704	175004	1309030	19885071	67%
506		356	180136	178420	1334582	21219653	71%
510		360	183600	181868	1360373	22580026	76%
514		364	187096	185348	1386403	23966429	80%
518		368	190624	188860	1412673	25379101	85%
522		372	194184	192404	1439182	26818283	90%
526		376	197776	195980	1465930	28284214	95%
530		380	201400	199588	1492918	29777132	100%
							#DIV/0!
							#DIV/0!
							#DIV/0!
							#DIV/0!
							#DIV/0!
					Gallons (gross) = 29,777,132		
					Gallons (net) = 28,722,099		
					Existing Storage =		
					<b>Total Gallons = 28,722,099</b>		

**SUBJECT TO THE STIPULATED PROTECTIVE ORDER ENTERED ON 8/28/13 IN  
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**POND DEPTH CAPACITIES**

Cow Palace  
Pond #1

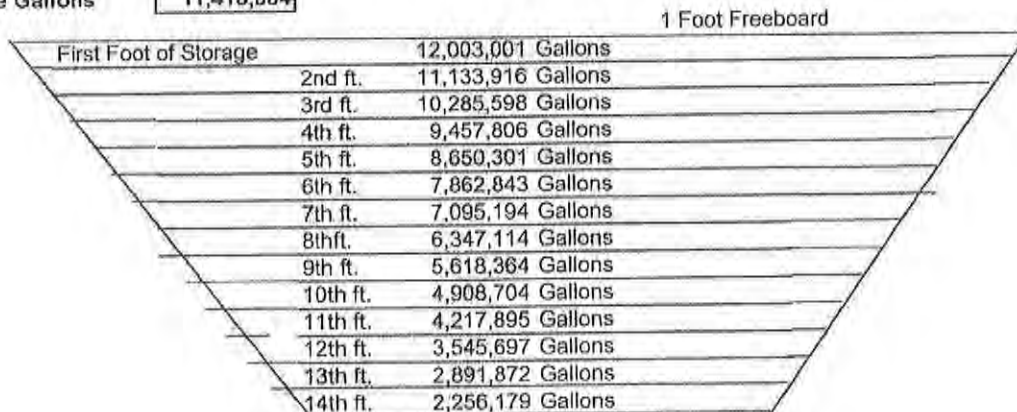
Top Length =	430	Ft.
Top Width =	280	Ft.
Inside Slope =	2	ft/ft
Design Depth =	31	Ft.
Free Broad (typical) =	1	Ft. (NOTE: Actual freeboard must include 25yr/24hr storm event)
Bottom Dead Space (typical) =	0.5	Ft.
Storage Depth =	30	Ft.

25Yr/24hr Rain on Pond=	1.6	Inches
25Yr/24hr Rain on Pond=	0.13	Feet

Depth (ft)	Length (ft)	Width (ft)	Area (sq ft)	Avg. Area	Gallons per ft	Total Gallons	Percent of Net
<b>31</b>	<b>430</b>	<b>280</b>	<b>120,400</b>	<b>118,988</b>	<b>890,090</b>	<b>12,893,091</b>	
30	426	276	117,576	116,180	869,084	12,003,001	100%
29	422	272	114,784	113,404	848,319	11,133,916	86%
28	418	268	112,024	110,660	827,792	10,285,598	80%
27	414	264	109,296	107,948	807,505	9,457,806	73%
26	410	260	106,600	105,268	787,457	8,650,301	67%
25	406	256	103,936	102,620	767,649	7,862,843	61%
24	402	252	101,304	100,004	748,080	7,095,194	55%
23	398	248	98,704	97,420	728,750	6,347,114	49%
22	394	244	96,136	94,868	709,660	5,618,364	44%
21	390	240	93,600	92,348	690,809	4,908,704	38%
20	386	236	91,096	89,860	672,198	4,217,895	33%
19	382	232	88,624	87,404	653,826	3,545,697	28%
18	378	228	86,184	84,980	635,693	2,891,872	22%
17	374	224	83,776	82,588	617,800	2,256,179	17%
16	370	220	81,400	80,228	600,146	1,638,379	13%
15	366	216	79,056	76,760	574,203	1,038,234	8%
14	362	212	76,744	0	0	0	0%
13	358	208	74,464	62,032	464,030	464,030	4%
					<b>12,893,091</b>		



Gross Storage Gallons	<b>12,893,091</b>	Total Gross Gallons
- Freeboard (gal)	890,090	
- 24hr/25yr Storm Event	120,087	1.66 <i>Inches below freeboard necessary to hold 25yr/24hr storm event.</i>
- Dead Space Storage	464,030	
Net Storage Gallons	<b>11,418,884</b>	



COWPAL000522  
CONFIDENTIAL



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**POND DEPTH CAPACITIES**

Cow Palace  
Pond # 2

Top Length =	300	Ft.
Top Width =	200	Ft.
Inside Slope =	2	ft/ft
Design Depth =	16	Ft.
Free Broad (typical) =	1	Ft. (NOTE: Actual freeboard must include 25yr/24hr storm event)
Bottom Dead Space (typical) =	0.5	Ft.
Storage Depth =	15	Ft.

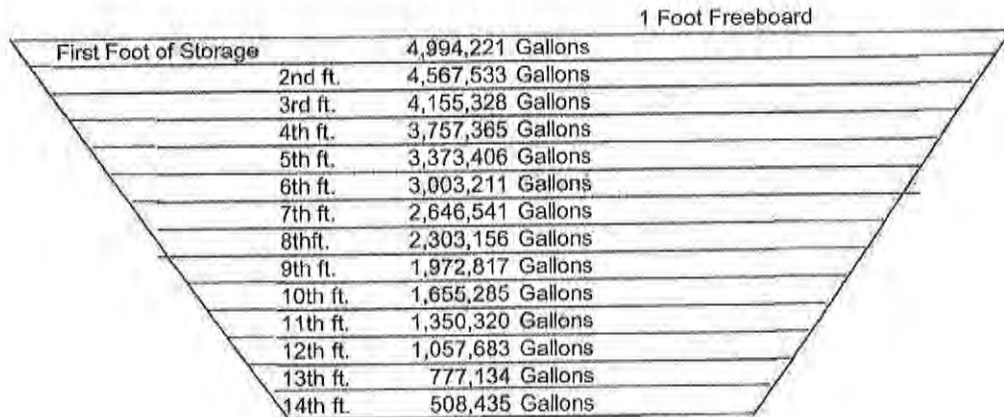
25Yr/24hr Rain on Pond=	1.6	Inches
25Yr/24hr Rain on Pond=	0.13	Feet

Depth (ft)	Length (ft)	Width (ft)	Area (sq ft)	Avg. Area	Gallons per ft	Total Gallons	Percent of Net
16	300	200	60,000	59,008	441,409	5,435,631	
15	296	196	58,016	57,040	426,688	4,994,221	100%
14	292	192	56,064	55,104	412,205	4,567,533	84%
13	288	188	54,144	53,200	397,963	4,155,328	76%
12	284	184	52,256	51,328	383,959	3,757,365	69%
11	280	180	50,400	49,488	370,195	3,373,406	62%
10	276	176	48,576	47,680	356,670	3,003,211	55%
9	272	172	46,784	45,904	343,385	2,646,541	49%
8	268	168	45,024	44,160	330,339	2,303,156	42%
7	264	164	43,296	42,448	317,532	1,972,817	36%
6	260	160	41,600	40,768	304,965	1,655,285	30%
5	256	156	39,936	39,120	292,637	1,350,320	25%
4	252	152	38,304	37,504	280,549	1,057,683	19%
3	248	148	36,704	35,920	268,700	777,134	14%
2	244	144	35,136	34,368	257,090	508,435	9%
1	240	140	33,600	33,600	251,345	251,345	5%
0	0	0	0	0	0	0	0%



**Total Gross Gallons 5,435,631**

Gross Storage Gallons	5,435,631	
- Freeboard (gal)	441,409	
- 24hr/25yr Storm Event	59,844	1.68 Inches below freeboard necessary to hold 25yr/24hr storm event.
- Dead Space Storage	251,345	
<b>Net Storage Gallons</b>	<b>4,683,032</b>	



COWPAL000523  
**CONFIDENTIAL**

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U.S. DISTRICT COURT, EASTERN DISTRICT OF WA, CASE NO. 2:13-cv-03016-TOR**

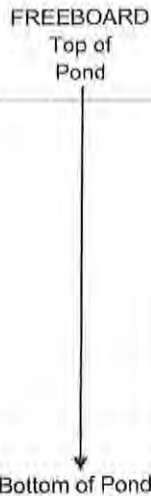
**POND DEPTH CAPACITIES**

Cow Palace  
Pond # 3

Top Length =	225	Ft.
Top Width =	200	Ft.
Inside Slope =	2	ft/ft
Design Depth =	21	Ft.
Free Broad (typical) =	1	Ft. (NOTE: Actual freeboard must include 25yr/24hr storm event)
Bottom Dead Space (typical) =	0.5	Ft.
Storage Depth =	20	Ft.

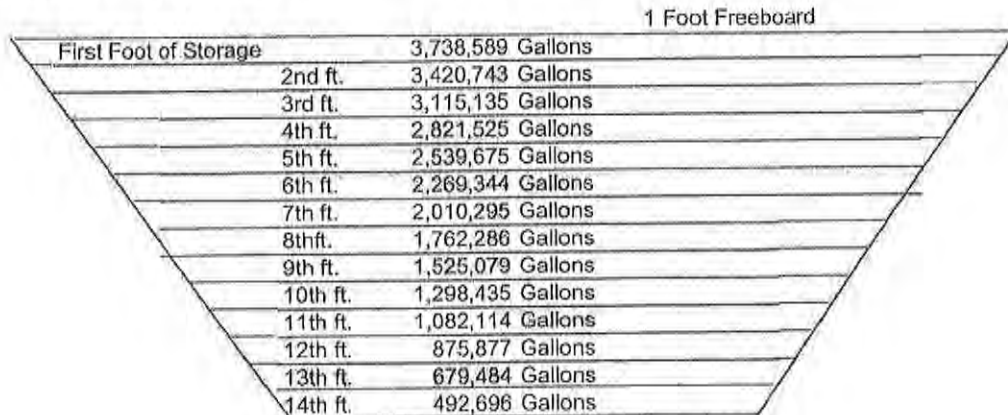
25Yr/24hr Rain on Pond=	1.6	Inches
25Yr/24hr Rain on Pond=	0.13	Feet

Depth (ft)	Length (ft)	Width (ft)	Area (sq ft)	Avg. Area	Gallons per ft	Total Gallons	Percent of Net
21	225	200	45,000	44,158	330,324	4,068,913	
20	221	196	43,316	42,490	317,846	3,738,589	100%
19	217	192	41,664	40,854	305,608	3,420,743	84%
18	213	188	40,044	39,250	293,610	3,115,135	77%
17	209	184	38,456	37,678	281,850	2,821,525	69%
16	205	180	36,900	36,138	270,330	2,539,675	62%
15	201	176	35,376	34,630	259,050	2,269,344	56%
14	197	172	33,884	33,154	248,008	2,010,295	49%
13	193	168	32,424	31,710	237,207	1,762,286	43%
12	189	164	30,996	30,298	226,644	1,525,079	37%
11	185	160	29,600	28,918	216,321	1,298,435	32%
10	181	156	28,236	27,570	206,237	1,082,114	27%
9	177	152	26,904	26,254	196,393	875,877	22%
8	173	148	25,604	24,970	186,788	679,484	17%
7	169	144	24,336	23,718	177,422	492,696	12%
6	165	140	23,100	22,498	168,296	315,273	8%
5	161	136	21,896	19,648	146,977	146,977	4%



**Total Gross Gallons 4,068,913**

Gross Storage Gallons	4,068,913	
- Freeboard (gal)	330,324	
- 24hr/25yr Storm Event	44,883	1.69 Inches below freeboard necessary to hold 25yr/24hr storm event.
- Dead Space Storage	146,977	
<b>Net Storage Gallons</b>	<b>3,546,729</b>	



COWPAL000524  
CONFIDENTIAL

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**POND DEPTH CAPACITIES**

Cow Palace  
Pond # 4

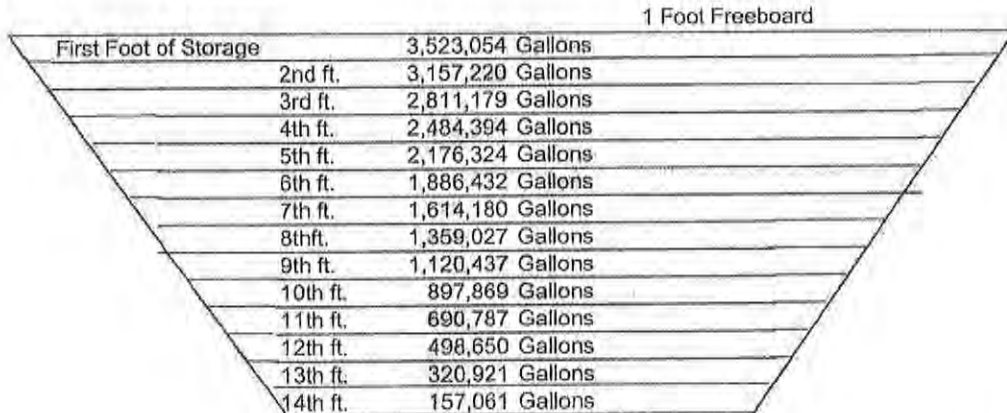
Top Length =	265	Ft.
Top Width =	200	Ft.
Inside Slope =	3	ft/ft
Design Depth =	15	Ft.
Free Broad (typical) =	1	Ft. (NOTE: Actual freeboard must include 25yr/24hr storm event)
Bottom Dead Space (typical) =	0.5	Ft.
Storage Depth =	14	Ft.

25Yr/24hr Rain on Pond=	1.6	Inches
25Yr/24hr Rain on Pond=	0.13	Feet

Depth (ft)	Length (ft)	Width (ft)	Area (sq ft)	Avg. Area	Gallons per ft	Total Gallons	Percent of Net
15	265	200	53,000	51,623	386,166	3,909,220	
14	259	194	50,246	48,905	365,834	3,523,054	100%
13	253	188	47,564	46,259	346,040	3,157,220	81%
12	247	182	44,954	43,685	326,786	2,811,179	72%
11	241	176	42,416	41,183	308,069	2,484,394	64%
10	235	170	39,950	38,753	289,892	2,176,324	56%
9	229	164	37,556	36,395	272,253	1,886,432	48%
8	223	158	35,234	34,109	255,152	1,614,180	41%
7	217	152	32,984	31,895	238,591	1,359,027	35%
6	211	146	30,806	29,753	222,567	1,120,437	29%
5	205	140	28,700	27,683	207,083	897,869	23%
4	199	134	26,666	25,685	192,137	690,787	18%
3	193	128	24,704	23,759	177,729	498,650	13%
2	187	122	22,814	21,905	163,860	320,921	8%
1	181	116	20,996	20,996	157,061	157,061	4%
0	0	0	0	0	0	0	0%
0	0	0	0	0	0	0	0%

**Total Gross Gallons 3,909,220**

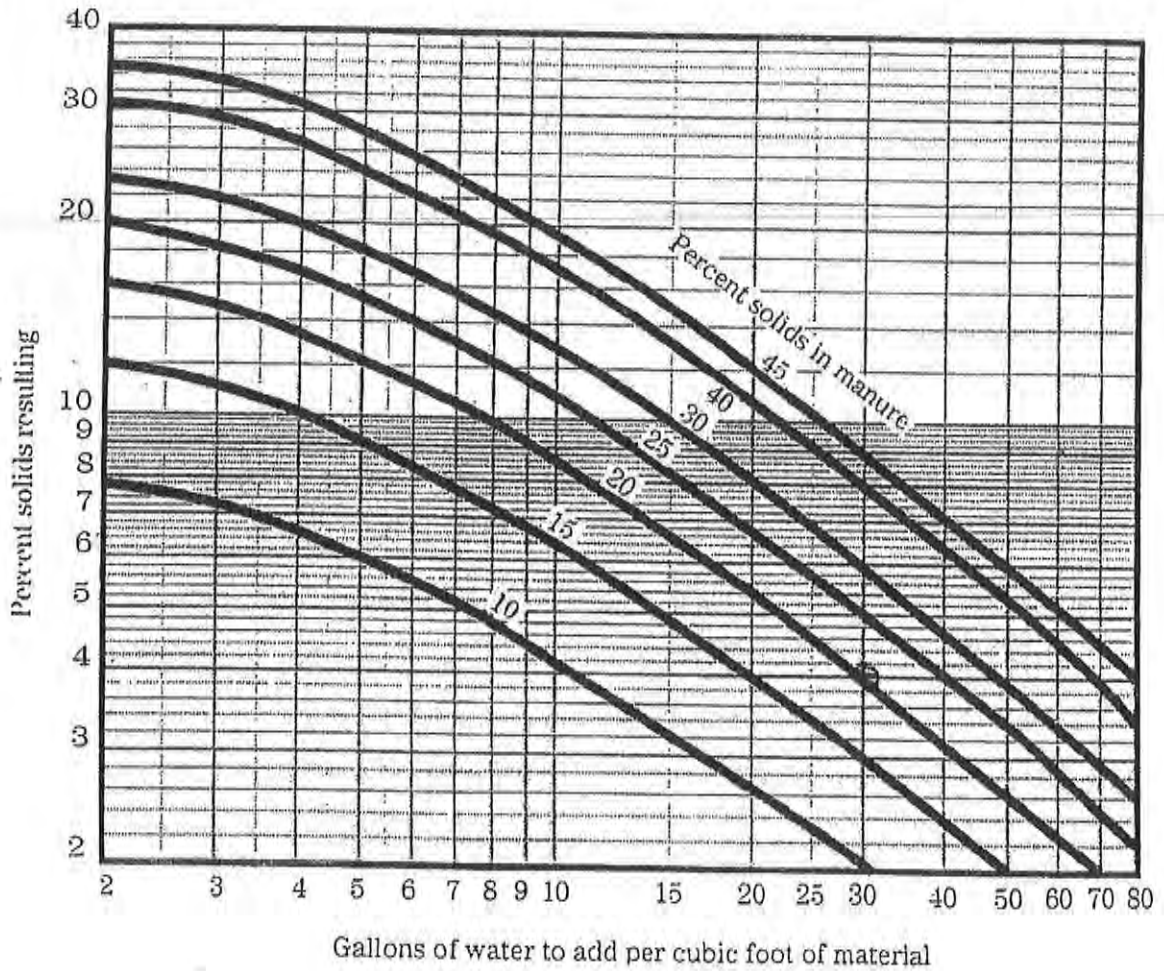
Gross Storage Gallons	3,909,220	
- Freeboard (gal)	386,166	
- 24hr/25yr Storm Event	52,862	1.73 Inches below freeboard necessary to hold 25yr/24hr storm event.
- Dead Space Storage	157,061	
<b>Net Storage Gallons</b>	<b>3,313,131</b>	



COWPAL000525  
CONFIDENTIAL

SUBJECT TO THE STIPULATED PROTECTIVE ORDER ENTERED ON 8/28/13 IN  
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Gallons of water required per cubic foot of material for dilution to pumping consistency



COWPAL000526  
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SUBJECT TO THE STIPULATED PROTECTIVE ORDER ENTERED ON 8/28/13 IN  
U.S. DISTRICT COURT, EASTERN DISTRICT OF WA, CASE NO. 2:13-cv-03016-TOR

*Sprinkler Application Rates*

*Appendix E*

Surface Soil Texture	Total Liquid Applied (in inches)															
	0.25				0.50				1.0				1.25			
	----- % Total Solids -----															
	1	2	5	7	1	2	5	7	1	2	5	7	1	2	5	7
Maximum Sprinkler Application Rate (inches per hour)																
Sand	3.3	1.9	0.8	0.6	3.3	1.9	0.8	0.6	3.3	1.9	0.8	0.6	3.3	1.9	0.8	0.6
Loamy Sand	3.2	2.2	1.1	0.8	3.2	2.2	1.1	0.8	2.3	1.6	0.8	0.6	2.1	1.4	0.7	0.5
Sandy Loam	3.8	3.1	2.0	1.6	2.3	1.9	1.2	1.0	1.5	1.2	0.8	0.6	1.4	1.1	0.7	0.6
Loam	2.9	2.7	2.3	2.1	1.6	1.5	1.3	1.1	0.9	0.9	0.7	0.7	0.8	0.7	0.6	0.6
Silt Loam	2.6	2.5	2.2	2.0	1.4	1.3	1.2	1.1	0.8	0.7	0.7	0.6	0.7	0.6	0.6	0.5
Sandy Clay Loam	1.7	1.6	1.5	1.4	0.9	0.9	0.8	0.8	0.5	0.5	0.5	0.5	0.5	0.5	0.4	0.4
Clay Loam	1.3	1.2	1.2	1.2	0.7	0.7	0.6	0.6	0.4	0.4	0.4	0.4	0.3	0.3	0.3	0.3
Silty Clay Loam	1.1	1.1	1.1	1.1	0.6	0.6	0.6	0.6	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Sandy Clay	0.6	0.6	0.6	0.6	0.3	0.3	0.3	0.3	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Silty Clay	0.8	0.8	0.8	0.8	0.4	0.4	0.4	0.4	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Clay	0.4	0.4	0.4	0.4	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1

The infiltration rates listed above are found when there is full vegetative cover and when initial soil moisture content is 50% of the available water capacity. (Source: Agricultural Waste Management Field Handbook, Soil Conservation Service, 1992)

This table identifies maximum sprinkler application rates based on soil infiltration rates. Soil texture, solids content, and the amount of liquid applied are the factors used in determining these infiltration rates.

The maximum sprinkler application rates can be used to estimate a rate of application at which liquid manure can be applied without exceeding the soils capacity to absorb the liquid. For example, you want to apply 0.50 inches of liquid manure to your field. You know from manure test results that the total solids content is 5%. You also know that the soil texture in your field is sandy loam. To determine the maximum sprinkler application rate, go to the section at the top of the table titled "Total Liquid Applied - 0.50". In that section, find the column titled "5% total solids" and go down the table to "sandy loam". The maximum sprinkler application rate shown is 1.2 inches per hour.

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**Example 11-2:**

The land user wants to apply 1 inch of wastewater with a 5 percent solids content on a loam soil. What is allowable application rate in inches per hour?

Maximum application rate from table 11-2 is 0.98 inch per hour. The reduction coefficient from table 11-3 is 0.74. The allowable application rate is:

$$0.98 \times 0.74 = 0.73 \text{ in/hr}$$

**Example 11-3:**

A land user wants to apply wastewater with a 5 percent solids content on a silt loam soil that has dense vegetation. The estimated surface storage is 0.2 inches, before any runoff would occur. The land user would like to apply 1.2 inches at a set. What is the allowable application rate?

Because 0.2 inches can be applied before surface runoff starts, the minimum amount that must infiltrate into the soil is 1.2 less 0.2, or 1.0 inch. From table 11-2, the maximum application rate is 0.82 inches per hour. To determine the application rate for 5 percent solids, the maximum application rate for clean water is multiplied by the reduction coefficient for 5 percent solids. factor is 0.81 from table 11-3. Therefore, the application rate for 5 percent solids is:

$$0.82 \text{ in/hr} \times 0.81 = 0.66 \text{ in/hr}$$

The amount of application must be based upon either the nutrient requirements of the crop or consumptive use requirements of the crop, whichever factor is limiting. For example, to achieve a desired nutrient loading, the irrigation requirement might be exceeded. In this case, irrigation requirements would govern because meeting the nutrient requirement requires an excess water application, leading to excessive deep percolation and leaching of nutrients below the root zone. If meeting the irrigation requirement is not a management objective, water requirements must still be considered so that excess leaching or runoff can be avoided.

**(iv) Management considerations**—Waste must be applied in a manner that

- Prevents runoff or excessive deep percolation of the wastewater,
- Applies nutrients in amounts that do not exceed the needs of the crop, and
- Minimizes odors from the waste being applied.

**Table 11-2** Maximum application rate (in/hr)

Soil texture	----- Application amount in inches -----							
	0.25	0.5	0.75	1.0	1.25	1.5	2.0	
Sand	6.00	6.00	6.00	6.00	6.00	6.00	6.00	
Loamy sand	6.00	6.00	4.83	4.22	3.86	3.62	3.32	
Sandy loam	4.91	2.97	2.32	1.99	1.80	1.67	1.51	
Loam	3.11	1.69	1.21	0.98	0.84	0.74	0.62	
Silt loam	2.70	1.45	1.03	0.82	0.70	0.61	0.51	
Sandy clay loam	1.74	0.96	0.69	0.56	0.48	0.43	0.37	
Clay loam	1.27	0.68	0.48	0.39	0.33	0.29	0.24	
Silty clay loam	1.09	0.57	0.40	0.32	0.26	0.23	0.19	
Sandy clay	0.61	0.33	0.23	0.19	0.16	0.14	0.12	
Silty clay	0.84	0.44	0.30	0.24	0.20	0.17	0.14	
Clay	0.39	0.21	0.14	0.11	0.09	0.08	0.07	

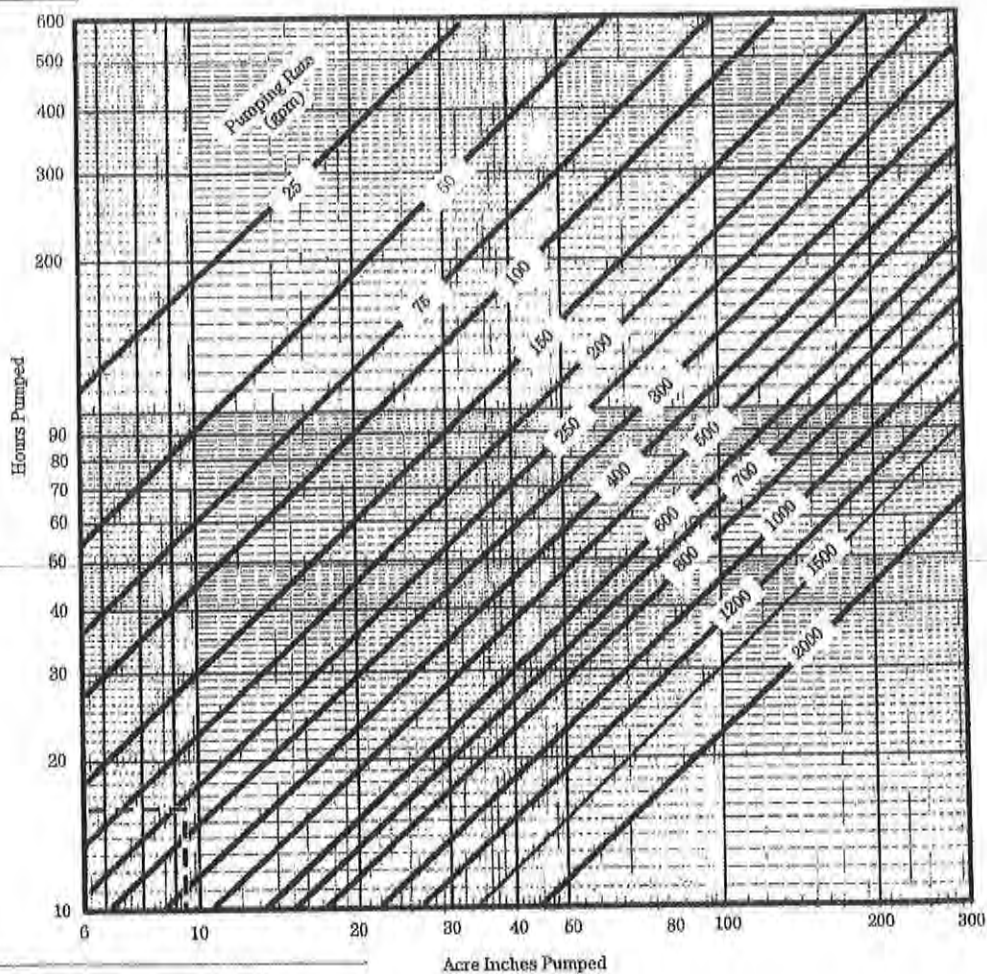
**Note:** This table is for infiltration rate for full cover conditions and initial moisture content at 50 percent of the available water capacity. Field capacity of sand through sandy loam is assumed to be at 1/10 bar.

**Table 11-3** Reduction coefficients by percent solids

Soil texture	----- Percent solids (by wt) -----							
	0.5	1.0	2.0	3.0	5.0	7.0	10.0	
Sand	0.88	0.55	0.31	0.22	0.13	0.10	0.07	
Loamy sand	0.70	0.54	0.37	0.28	0.19	0.14	0.10	
Sandy loam	0.87	0.77	0.63	0.53	0.40	0.32	0.25	
Loam	0.97	0.93	0.88	0.83	0.74	0.67	0.59	
Silt loam	0.98	0.95	0.91	0.87	0.81	0.75	0.68	
Sandy clay loam	0.99	0.97	0.95	0.92	0.87	0.83	0.78	
Clay loam	0.99	0.99	0.98	0.97	0.94	0.92	0.89	
Silty clay loam	1.00	1.00	0.99	0.99	0.98	0.97	0.96	
Sandy clay	1.00	1.00	1.00	1.00	0.99	0.99	0.99	
Silty clay	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Clay	1.00	1.00	1.00	1.00	1.00	1.00	1.00	

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Figure 11-3 Acre inches pumped in given time at various pumping rates



**Example 11-4:**

A dairy operation has a 34,000 cubic foot aboveground storage structure that needs to be emptied and a pump and pipe system that can deliver 275 gallons per minute to the field. A 1,000 gallon tank wagon is available to haul manure. It takes 17 minutes to fill the tank and make a round trip to the field. The operator estimates 1 hour of labor for pipe moving for each acre inch of waste applied, at a cost of \$7 per hour.

**Questions:**

1. How much actual pumping time is required to empty the storage structure using the pump-pipeline system? Using the tank wagon?
2. What is the labor cost for pumping the waste to the field as compared to that for using a tank wagon and hauling?

**Pump-pipeline—**

$$\begin{aligned} \text{Storage} &= \frac{34,000 \text{ ft}^3 \times 12 \text{ in}}{43,560 \text{ ft}^2/\text{ac} \times 1 \text{ ft}} \\ &= \frac{34,000 \times 12 \text{ in}}{43,560} \\ &= 9.4 \text{ ac-in} \end{aligned}$$

Enter figure 11-3 at 9.4 acre-inches pumped and proceed vertically to the curves for 250 gpm and 300 gpm; 275 gpm will be halfway between the curves. Go horizontally and read 15.5 hours pumped.

**Tank wagon—**Enter figure 11-4 at 34,000 cubic feet storage. Move up vertically to the curve for a 1,000 gallon tank wagon. Move horizontally through the number of loads line (255 trips) to the cycle time (17 minutes), which is between the 15 and 20 minutes per cycle lines. Then move down vertically to the removal time in hours (about 70 hours).

Actual time to remove 34,000 cubic feet is 72.3 hours:

$$\frac{34,000 \text{ ft}^3 \times 7.5 \text{ gal/ft}^3}{1,000 \text{ gal tank/cycle}} \times \left( 17 \text{ min/cycle} \times \frac{1 \text{ hr}}{60 \text{ min}} \right)$$

Pumping would require about 15 hours as compared to 70 hours to haul the waste to the field.

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L I V E S T O C K  S E R I E S



# HEALTH

## Nitrate Poisoning

no. 1.610

by T.L. Stanton<sup>1</sup>

### Quick Facts...

Death loss from nitrate is an occasional problem in cattle consuming certain annual forages, particularly sorghum hybrids.

Cattle producers should be concerned if rations contain over 5,000 ppm nitrate on a dry matter basis.

Avoid poisoning with good management practices.

A qualitative check called the diphenylamine test can be used to screen forages for potential harm.

High nitrate forages can be used if diluted with other feedstuffs and supplemented with energy.

Nitrate toxicity is sometimes a lethal problem for livestock especially during the fall. The amount of nitrate accumulated within the plant depends on two factors: the rate of uptake by the plant from the soil, and the rate the plant reduces it. If uptake exceeds the rate of reduction, large amounts of nitrate can accumulate. If the rate of reduction equals the rate of uptake, there is no accumulation.

Nitrate accumulation usually results from plant stress, such as drought, and is accentuated by excessive soil nitrogen. Most nitrate accumulates in plant stems rather than leaves, and concentration tends to be highest in immature forage. A characteristic symptom of nitrate toxicity is a chocolate-brown color to the blood.

Use good management practices to avoid poisoning. Fertility programs consistent with plant needs and growing conditions minimize the problem. Test potentially dangerous forage before feeding. Often hay containing excessive nitrate can be fed safely when diluted with other feed, particularly concentrates.

### Nitrate Accumulation

Nitrate is the primary nutrient form of nitrogen in most soils and is a normal constituent of plants. Normally nitrate is assimilated so rapidly following absorption from soil that its concentration in plant tissues is low. Occasionally, excessive levels in plants occur. In Colorado, the most notorious accumulators of nitrate are the sorghums. Other annuals that less frequently accumulate nitrate are small grains (wheat, oats, rye and barley) and millet.

Some perennial grasses (fescue and johnsongrass) and weeds (pigweed, mustard, kochia, nightshade and lamb's quarters) also can contain dangerous levels. The corn may be safe but weeds harvested with it may be poisonous. Stinging nettle, elderberry, burdock and Canadian thistle are a few of the known nitrate accumulators. In fact, some of these will accumulate nitrate to such a high concentration that they literally explode when burned — nitrate is explosive.

Accumulation usually is triggered by some environmental stress where plant growth is restricted but absorption of nitrate from soil continues. The most common stress of summer annuals is drought. Lack of moisture, together with excessive soil nitrogen for existing growing conditions, is a frequent cause of toxic levels of nitrate in sorghums. Other stress factors that favor buildup are reduced sunlight from cloudiness or shading, frost, certain herbicides including 2,4-D, acid soils, low growing temperatures, and deficiencies of essential nutrients like phosphorus, sulfur and molybdenum.

When more soil nitrogen is present than needed for maximum growth, some plants tend to accumulate nitrate even without environmental stress. This response is particularly true with hardy soil feeders like sorghum, noted for "luxury consumption" of certain nutrients.



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*Summary*

*Nitrate poisoning can be a serious problem for livestock producers if not considered in their management plan. Drought, excessive soil nitrogen, shade, frost, certain herbicides, acid soils, low growing temperatures and nutrient deficiencies can contribute to high nitrate levels in plants. Stems usually have higher nitrate content than leaves. Do not overlook the nitrate content of water when a nitrate problem arises. Avoid poisoning by routinely testing any forage suspected of containing excessive nitrate. High nitrate forages can be used by diluting it with other feedstuffs and supplementing it with energy.*

differences in yield, quality, drought tolerance and insect and disease resistance.

Take extra care when moisture stress occurs in sorghums before harvest or grazing. Test samples of plants from different areas of the field, particularly those showing the most stress, for nitrate content. If the level is dangerous, delay harvest until rain comes and the plant increases in maturity. Occasionally forage that is questionable as hay can be grazed safely when forage is abundant, because animals tend to select leaves and refuse stalks. Silage also may be a good alternative since appreciable reduction in nitrate levels occurs during ensiling. Forages that are high in nitrate will normally lose 40 to 60 percent of their nitrate content during fermentation.

### Testing for Nitrates

Avoid poisoning by routinely testing any forage — pasture, hay or silage — suspected of containing excessive nitrate. A qualitative check called the diphenylamine test can be used to screen forages for potential harm. Positive results indicate more than 5,000 ppm NO<sub>3</sub> and possible danger.

If results of the diphenylamine test are positive, send forage samples to a laboratory for quantitative analysis.

When forage is collected for analysis, it is essential that representative samples be taken. Although samples often are pooled for other laboratory analyses like moisture and protein, nitrate tests often are required on individual bales or from specific areas of a field to accurately assess the potential for toxicity. To illustrate this point, an evaluation of 15 large round bales of sorghum hybrid hay from one cutting showed considerable variation from bale to bale, with nitrate levels ranging from 17,500 to 39,000 ppm.

### Feeding High Nitrate Forages

In most instances, hay high in nitrate can be fed safely with adequate laboratory testing and good management. The best alternative is to dilute dangerous forage with feeds low in nitrate, preferably concentrates. Unfortunately for many producers, proper dilution makes it necessary to grind and mix. Gradual acclimation to questionable feed is a good practice to minimize risk. Animals should be healthy, on a good nutrition plane, and filled with low nitrate feed before they are allowed access to nitrate-containing forage. With respect to supplementary rations, those containing urea result in less toxicity than soybean meal, and the presence of readily available carbohydrate (corn, sugar, etc.) offers a considerable degree of protection. This may be due to lower pH in the rumen that facilitates reduction of nitrate.

Nitrates have been reported to increase the need for vitamin A in the ration. Recent information indicates that a relationship of this kind may not be of practical importance under most feeding conditions. Formulate rations to be adequate in vitamin A as well as other nutrients. Excessive vitamin A fortification does not appear to be needed.

Hay, straw or fodder suspected of being high in nitrate should not be fed when damp. Damp feed seems to be more toxic. The probable explanation is that some of the nitrate is converted to the more toxic nitrite before being consumed.

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