AWMP Log No. 14009
MA No. 177789

ANIMAL WASTE MANAGEMENT PLAN

For the

Poland Dairy

CONFINED ANIMAL FEEDING OPERATION

Location:
3845 NW Elm Lane
Madras, Oregon 97741

For submittal to

Oregon Department of Agriculture
Natural Resources Division CAFO Program
635 Capitol Street NE
Salem, OR 97301-2532

Prepared by

Fazio Engineering
P.O. Box 246
Milton-Freewater, OR 97862

June 26, 2014

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Animal Waste Management Plan Signature Page

Poland Dairy

3845 NW Elm Lane
Madras, Oregon 97741

Plan Owner/Operator: Jos Poland
(541) 350-8683

As owner and operator of Poland Dairy, I intend to manage in accordance with the practices and operation and maintenance described in this Animal Waste Management Plan. I understand that I am responsible for keeping all necessary records associated with the implementation of this plan.

Signature JPoland Date 7-17-14

Prepared By: Fazio Engineering
P.O. Box 246
Milton-Freewater, OR 97862
(541) 938-6084

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POLAND DAIRY
CONFINED ANIMAL FEEDING OPERATION (CAFO)
ANIMAL WASTE MANAGEMENT PLAN (AWMP)

1. SUMMARY OF CAFO OPERATION

a. Contact Information

Owner/Operator:

Jos Poland
3845 NW Elm Lane
Madras, Oregon 97741

b. Facility Location

Poland Dairy is located at 3845 NW Elm Lane north of Madras, Oregon and is owned and operated by Jos and Deanna Poland. The entire property including the dairy, pastures, and cropland are located within the E 1/2 and the N 1/2 of SW 1/4 of Section 20, Township 10 South, Range 13 East, Willamette Meridian. The 340-acre farm has 240 irrigated acres with the remainder in dry land production. The dairy is centrally located on the farm.

c. Type of Operation

Poland Dairy is designated a Medium Federal CAFO.

i Livestock Numbers

The permitted herd size is 575 mature cows, 400 heifers and calves. At the current phase of construction the dairy has about 300 mature cows, 200 heifers and calves and 150 organic beef.

d. Manure Handling System

i Collection Storage and Transfer

All livestock are confined in earthen pens when not on pasture. The manure generated at the facility is handled as a dry solid, slurry or liquid form.

The holding pen and feed alleys are dry scraped using a tractor and front-end loader. Scraped manure is put into the concrete storage basin. Once in the concrete basin, manure is hauled to the drying area or land applied.

Manure deposited in the pens is scraped and mounded in the pens. Some manure is left in the pens, mounded and packed for bedding in the fall. Additional straw bedding is used in the pens during the winter months. The solid manure in the pens is stored within the dry lots and transported to fields using a conventional manure spreader.

Sources of material entering the concrete storage basin are scraped manure, alley runoff, milking parlor wash water and net precipitation falling directly on the concrete basin. Roof runoff is diverted away from the pens and manure handling area.

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ii Utilization

Poland Dairy owns about 312 acres of cropland available for manure application. Currently, there are about 240 irrigated acres and 80 acres of dry land. The irrigated acres could increase in the future if additional water is available from the irrigation district. All cropland may be used for grazing and manure application. Predominant crops will consist of pasture, small grains and haylage.

2. SPECIFIC DESCRIPTIONS AND CALCULATIONS

a. Description of Production Area and Land Application Location

i Aerial Photo and Topography

A production area map, land application map, a topography map are included in this AWMP.

ii Site Soils

Appendix B contains the USDA-Natural Resources Conservation Service soils map for the farm location. There is one soil type found on the property, 87A Madras loam, 0 to 3 percent slopes. A soils map and unit description is included in this AWMP.

b. Manure, Litter and Process Waste Volumes

Calculated volumes of all manure, bedding, wash water, and contaminated storm water have been estimated using the Oregon Animal Waste Management Worksheet (ORAWM). Please refer to the worksheet located in the appendix. The was done so that minor changes can be made without changing the text of this AWMP.

i Manure Volumes

The amount of generated manure assumes that about 25% of milk cow's manure is scraped into the collection pit. Manure from the other livestock is assumed to be deposited in the pastures or within pens.

ii Bedding Volumes

Bedding may consist of dry manure, straw and other materials such as mint slugs and seed screenings.

iii Process and Wash Water Volumes

Process and wash water generated from the parlor is collected with the scraped manure.

iv Silage and Feed Processing Leachate

No silage leachate exists.

c. Contaminated Storm Water

Storm water runoff from the pens, manure handling and feed lane are collected.

d. Nutrient Content of Manure, Litter and Process Waste

Nutrient content is estimated based on the ORAWM spreadsheet.

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e. Farm Nutrient Balance

i Nutrients Generated and Losses

The ORAWM spreadsheet was used to estimate the amount of nutrients generated, applied and exported.

ii NRCS Agronomy Techinal Note #26 and Phosphorous Index

The Site Vulnerability Class was determined to be Medium for all but one field. One field has a High value and no manure is currently being applied to that field. The high soil test P value is due previous stockpiling of seed screenings. Phosphorous Index calculations for each field are located in Appendix C. With a Medium phosphorous index the nutrient calculations balance for nitrogen.

iii Acreage Owned or Leased

Poland Dairy owns about 312 acres of cropland available for manure application. Pasture will be the predominant crop with some small grains and haylage. About 75 acres is currently farmed dry land.

Based on the ORAWM nutrient calculations and planned herd composition, about 50% of the solid manure in the pens will need to be exported off the farm. The specific amount of manure to be exported will change based cropping patterns, yields and field soil test results.

f. Application Schedule and Limitations

i Schedule of Applications and Methods

Application of liquids and solids will be done during favorable climatic conditions and crop condition. The normal schedule of liquids application is March through October. Solids and slurry may be applied throughout the year following the guidance. Application of manure will be done at appropriate times of the year as to utilize nutrients for high forage production.

The vacuum tank will be used to spread collected slurry. Solid manure will be applied using a conventional end spreader. Manure will be applied to the acreage to meet the expected nutrient uptake of the cropping system.

ii Application Limitations and Guidance

The general application limitations for Poland Dairy are:

1. Solid manures may be temporarily stored in the field edges and corners prior to application.
2. Do not apply to saturated or flooded soil.
3. All the fields appear to be down gradient of the irrigation ditches so a setback distance is not specified. There may be field edges or corners that could be up gradient of surface water. In such case, maintain a 50 foot set back from all surface ditches or ponds.
4. Do not apply during rainfall events that are expected to result in saturated soils or surface runoff.

iii Guidance for Winter Manure Applications

Only apply manure during this time period if the following guidelines can be met. Call the ODA CAFO Program for guidance if a manure application is needed and the guidelines can't be met.

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1. Apply manure only to actively growing crops such as pastures or cover crop.
2. Minimize application rates by using the maximum practical travel rates for the application equipment.
3. Maintain a 50 foot setback buffer distance from all down gradient surface ditches or ponds.
4. Do not apply during rainfall events that are expected to result in saturated soils or surface runoff.
5. Do not apply to saturated or flooded soil.
6. Do not apply to slopes greater than 5%.
7. Application of manure to frozen soil should be avoided if possible. Do the following guidelines if manure is applied to frozen soil.
   a. Apply only enough manure to address storage limitations.
   b. Minimize applications to 5 wet tons per acre or less for solids and 6,788 gallons (0.25 inches) per acre for liquids or slurry.
   c. Apply to fields of established hay, pasture or fields containing at least 90% cover and the furthest from surface water sources.
   d. Do not apply manure within 200 feet of surface water sources, drainage ditches, wells, or inlets to subsurface drainage systems.
   e. Runoff control systems such as earthen dikes must be in place where applications are made to fields with slopes greater than 5%.

iv Irrigation Water Management

North Unit Irrigation District Irrigation supplies water from one ditch. Siphon tubes, gated pipe, a wheel line, K-Line and a big gun will be used for irrigation from mid-March through mid-September. No tile lines or other form of artificial drainage are located on the property.

The irrigation goal is to manage a 2 foot root zone for pasture and 3 foot for small grains. Manual soil moisture probes are used to observe soil moisture and help schedule irrigation activities. Assuming irrigation is applied by a wheel or hand line, the estimated depth of water applied is calculated in the following table.

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Crop	Pasture	Sm Grain	
Allowable Depletion	50%	55%	
Soil Type	L	L	
Root Zone (feet)	2	3	
Holding Capacity (in/ft)	1.8	1.8	
Readily Available Water (inches)	1.8	2.97	
Peak Use (in/day)	0.3	0.35	
Application (in/hour)	0.2	0.2	assume 5 gpm, 40X60
Application Eff.	75%	75%	
Maximum Time to Fill RZ (hours)	12	20	
Time Between Irr. at Peak (days)	6	8	
hours to apply 1 inch	7	7	
inches per 24 hr set	3.60	3.60	
inches per 12 hr set	1.80	1.80	

Predominant Soils		HC Inches/foot
87A	Madras loam	1.8

Root Zone (RZ), Holding Capacity (HC), Efficiencies, and Use from AgriMet

g. Animal Mortality Management

Mortalities are composted in the manure handling area. Manure, soiled straw and slurry are added to the compost to provide a carbon, nitrogen and moisture source. Completed compost is applied to cropland and incorporated.

h. Mechanical Operation and Maintenance

The following identifies the general operation and maintenance procedures required to ensure proper function of each component of the manure handling facility. The operator will contain all wastewater within the facilities.

i Collection Pit

The collection will be inspected and the slurry manure removed periodically. All foreign material restricting manure flow will be removed.

ii Irrigation Pipeline

Pipeline routes and water line will be inspected periodically for leaks. Pipes will be flushed with fresh water after being used for manure applications. Any leaks and or broken pipes will be repaired and or replaced. Water will be drained during cold weather to prevent frozen lines and possible breakage. Shut off valves will be inspected periodically and broken valves will be replaced.

iii Concrete Gutters

Floor gutters and grates will be inspected periodically. All foreign material restricting manure flow will be removed. Broken floor gutters will be repaired and or replaced.

iv Curbs

Concrete curbs will be inspected periodically. Broken curbs will be repaired.

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v Trough or Tank

Watering facilities will be inspected periodically. Damaged facilities will be repaired. Float valves will be maintained in working order. Areas immediately around the watering facilities will be maintained in a stable condition.

3. Record Keeping and Reporting

a. Monitoring and Testing

At a minimum of once of every five years collect and analyze representative soil samples for phosphorus and nitrogen content from all fields where manure, litter and other process wastewaters are applied.

The following documents provide protocols for testing: manure, litter and process waste water; measuring crop nutrient removals; soil testing to evaluate nutrient application and crop uptake, and calculating manure application rates.

1. PNW 570-E, Monitoring Soil Nutrients Using a Management Unit Approach
2. E306, Manure Sampling & Analysis
3. EM 8768, Calculating Dairy Manure Nutrient Application Rates.
4. EM 8832-E, Post-harvest Soil Nitrate Testing for Manured Copping Systems West of the Cascades

b. Inspection

a) Periodically inspect:
    1. Storm water diversion devices, runoff diversion structures, animal waste storage structures, and devices channeling contaminated storm water to wastewater and manure storage and containment structures.
    2. Water lines, including drinking water or cooling lines.
    3. Liquid impoundments for manure and process wastewater.

b) When equipment is in use, periodically inspect the equipment used for land application of manure, litter, or process wastewater.

c. Record Keeping

a) Applications of manure, litter and process waste will be kept, including the date and the amount of N and P applied during each application.
b) Records of exporting manure, litter and process waste will also be kept.

d. Reporting to Oregon Department of Agriculture

The following Information will be reported to the Oregon Department of Agriculture:

a) Any discharge will be reported orally to ODA within 24 hours. Within 5 days, a written statement describing this discharge will also be submitted to ODA.
b) Amount of manure, litter and process waste water applied annually
c) Amount of manure, litter and process waste exported annually

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APPENDIX A: PRODUCTION AREA MAP

Poland Dairy Production/Drainage Area

(SEEKSEEQUA JUNCTION NE, OR)

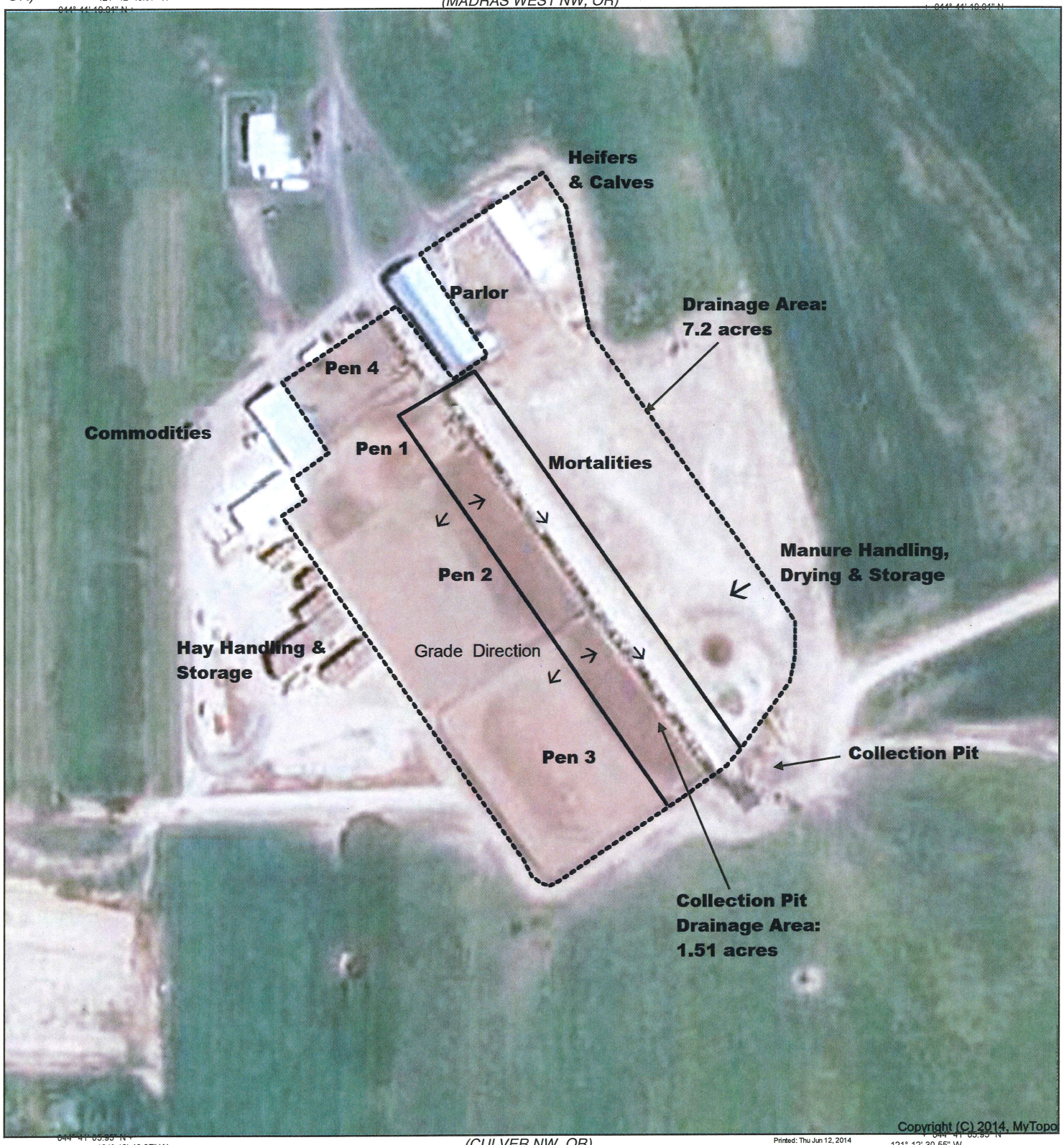
121° 12' 48.97" W
044° 41' 19.91" N

(MADRAS WEST NW, OR)

MADRAS WEST SW, OR QUADRANGLE
OREGON
AERIAL PHOTO SERIES

(MADRAS WEST NE, OR)

121° 12' 30.55" W
044° 41' 19.91" N



044° 41' 05.95" N
121° 12' 48.97" W

Printed: Thu Jun 12, 2014

044° 41' 05.95" N
121° 12' 30.55" W

(CULVER NW, OR)

(CULVER NE, OR)

SCALE 1:2000

Declination

MN

MN 15.31° E

0,0 0,0 0,0 0,0 0,0 0,1 0,1 0,1 0,1
MILES

0 100
YARDS

0,0 0,1
KILOMETERS

CONTOUR INTERVAL UNKNOWN NONE
NATIONAL GEODETIC VERTICAL DATUM 1929

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MADRAS WEST SW, OR, OR
JUL 1, 2011

APPENDIX B: SITE SOILS AND LAND APPLICATION MAPS

	18-Dec
Field	Acres
1	13.9
2	14
3	13
4	22.4
5	19.5
6	7.7
7	8.1
8	8.6
9	12.4
10	13.0
11	13.2
12	12.1
13	6.2
14	5.9
15	9.4
16	5.9
17	34.4
18	17.3
19	75.0
Total	312.0

Poland Dairy Land Application Area

Copyright (C) 2013 MyTopo

SCALE 1:8000

Produced by MyTopo Terrain Navigator
Topography based on USGS 1:12,000 Maps

North American 1983 Datum (NAD83)
Universal Transverse Mercator Projection

To place on the predicted North American 1927 move the projection lines 18M S and 92M W

Declination

GN MN

GN 1.26° E
MN 15.46° E

0.0 0.1 0.2 0.3
MILES

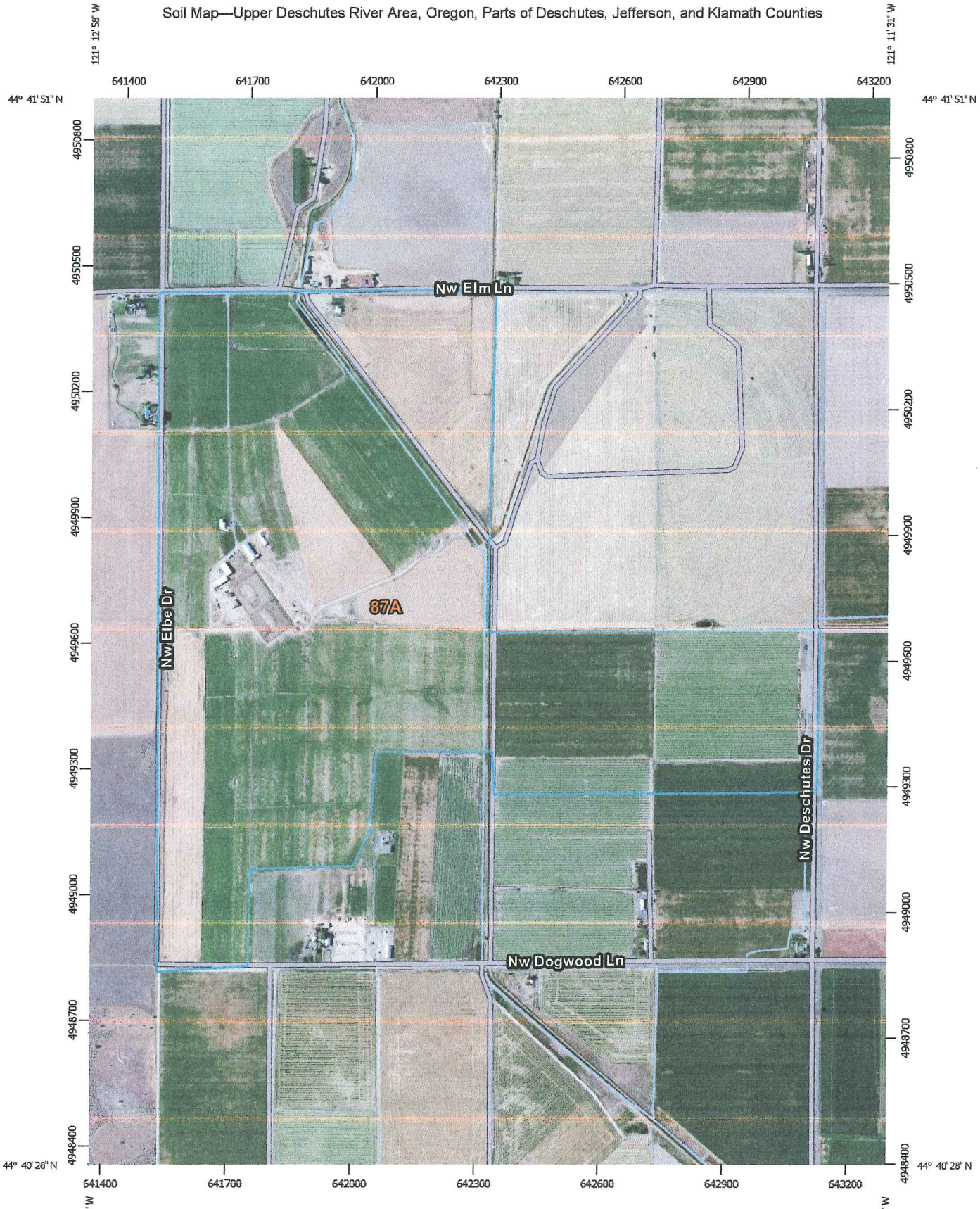
0 100 200 300 400 500 600
YARDS

0.0 0.1 0.2 0.3 0.4 0.5
KILOMETERS

CONTOUR INTERVAL UNKNOWN NONE
NATIONAL GEODETIC VERTICAL DATUM 1929

MADRAS WEST SW, OR, OR
JUN 10, 2012

Soil Map—Upper Deschutes River Area, Oregon, Parts of Deschutes, Jefferson, and Klamath Counties



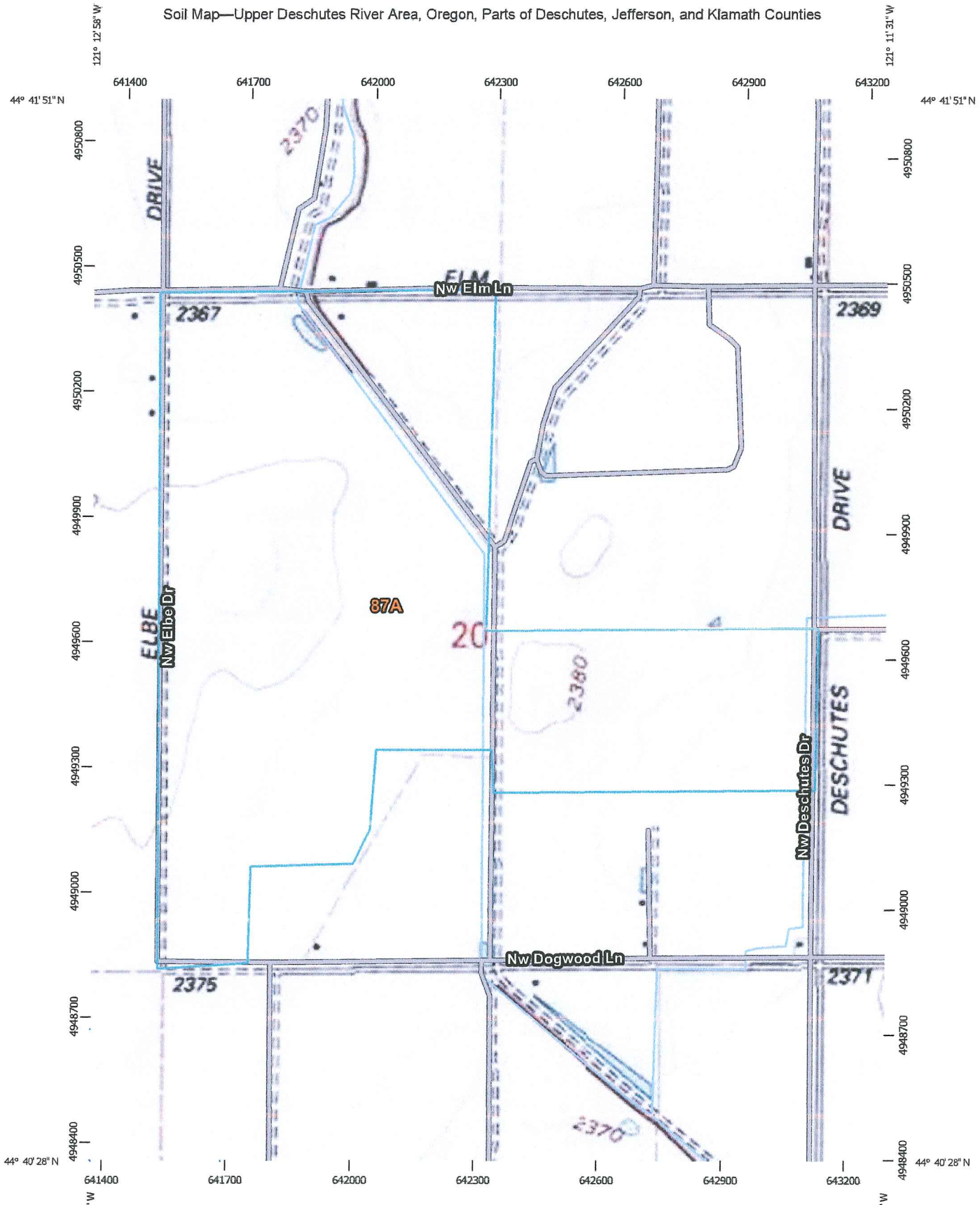
Map Scale: 1:12,400 if printed on A portrait (8.5" x 11") sheet.

N

Meters
0 150 300 600 900

Feet
0 500 1000 2000 3000

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 10N WGS84


121° 12' 58" W
121° 11' 31" W
641400
641700
642000
642300
642600
642900
643200
44° 41' 51" N
44° 40' 28" N
4950800
4950500
4950200
4949900
4949600
4949300
4949000
4948700
4948400
DRIVE
ELM
Nw Elm Ln
2367
2369
2370
ELBE
Nw Elbe Dr
87A
20
2380
DRIVE
DESCHUTES
Nw Deschutes Dr
Nw Dogwood Ln
2375
2371
2370
Map Scale: 1:12,400 if printed on A portrait (8.5" x 11") sheet.
N
Meters
0 150 300 600 900
Feet
0 500 1000 2000 3000
Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 10N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Topographic Map
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Upper Deschutes River Area, Oregon, Parts of Deschutes, Jefferson, and Klamath Counties
Survey Area Data: Version 8, Aug 20, 2012

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jul 20, 2010—Sep 4, 2010

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Upper Deschutes River Area, Oregon, Parts of Deschutes, Jefferson, and Klamath Counties (OR620)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
87A	Madras loam, 0 to 3 percent slopes	343.5	100.0%
Totals for Area of Interest		**343.5**	**100.0%**

Upper Deschutes River Area, Oregon, Parts of Deschutes, Jefferson, and Klamath Counties

87A—Madras loam, 0 to 3 percent slopes

Map Unit Setting

Elevation: 2,000 to 3,000 feet
Mean annual precipitation: 8 to 10 inches
Mean annual air temperature: 47 to 50 degrees F
Frost-free period: 120 to 140 days

Map Unit Composition

Madras and similar soils: 85 percent

Description of Madras

Setting

Landform: Lava plains
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Interfluve
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loess over residuum weathered from volcaniclastic sediments of the deschuteas formation

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: 22 to 40 inches to paralithic bedrock; 26 to 44 inches to lithic bedrock
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Low (about 3.6 inches)

Interpretive groups

Farmland classification: Prime farmland if irrigated
Land capability classification (irrigated): 3c
Land capability (nonirrigated): 4c
Hydrologic Soil Group: C
Ecological site: LOAMY PLAINS 8-10 PZ (R010XA001OR)

Typical profile

0 to 10 inches: Loam
10 to 16 inches: Loam
16 to 23 inches: Clay loam
23 to 27 inches: Weathered bedrock

27 to 37 inches: Unweathered bedrock

Data Source Information

Soil Survey Area: Upper Deschutes River Area, Oregon, Parts of Deschutes, Jefferson, and Klamath Counties
Survey Area Data: Version 8, Aug 20, 2012

Poland Dairy
Phosphorous Index Summary

5/16/14

Field	1	2	3	4	5	6	7	8	9	10
Map Unit	87A	87A	87A	87A	87A	87A	87A	87A	87A	87A
Hydraulic Soil Group	C	C	C	C	C	C	C	C	C	C
Average Slope %	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
Flooding Frequency	none	none	none	none	none	none	none	none	none	none
Crops	Pasture	Pasture	Pasture	Pasture	Pasture	Pasture	Pasture	Pasture	Pasture	Pasture
Soil Test P Olsen 1ft (ppm)	34	61	49	36	54	47	43	85	61	54
Commercial Application Rate (lbs/ac P2O5)	0	0	0	0	0	0	0	0	0	0
Organic Application Rate (lbs/ac P2O5)	134	134	134	134	134	134	134	134	134	134
Nutrient Application Method	Spreader	Spreader	Spreader	Spreader	Spreader	Spreader	Spreader	Spreader	Spreader	Spreader
Transport Factors										
Soil Erosion	3	3	3	3	3	3	3	3	3	3
Soil Erosion from Sprinkler Irrigation	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Soil Erosion from Surace Irrigation	0	0	0	0	0	0	0	0	0	0
Runoff Class	1	1	1	1	1	1	1	1	1	1
Distance to Perennial Surrace Waters	0	0	0	0	0	0	0	0	0	0
Subsurface Drainage	0	0	0	0	0	0	0	0	0	0
Trasport Factors Subtotal (TFS)	4.25	4.25	4.25	4.25	4.25	4.25	4.25	4.25	4.25	4.25
Source Factors										
Soil Test P (0-12")	1.4	4.1	2.9	1.6	3.4	2.7	2.3	6.5	4.1	3.4
Commercial P Applicaton Rate	0	0	0	0	0	0	0	0	0	0
Commercial P Application Method	0	0	0	0	0	0	0	0	0	0
Organic P Application Rate	2.68	2.68	2.68	2.68	2.68	2.68	2.68	2.68	2.68	2.68
Organic P Application Method	8	8	8	8	8	8	8	8	8	8
Source Factors Subtotal (SFS)	12.08	14.78	13.58	12.28	14.08	13.38	12.98	17.18	14.78	14.08
Total Rating Value (TFS x SFS)	51.34	62.82	57.72	52.19	59.84	56.87	55.17	73.02	62.82	59.84
Site Vulnerability Class	Medium	Medium	Medium	Medium	Medium	Medium	Medium	Medium	Medium	Medium

Assumption/Notes:
Assumed soil erosion factor of 3.
Soil tests are 8/8/13 and (19) 4/23/14
Assume applied to surface and not incorp.
P applied to pasture when balancing for N.

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Poland Dairy
Phosphorous Index Summary

Field	11	12	13	14	15	16	17	18	19
Map Unit	87A	87A	87A	87A	87A	87A	87A	87A	87A
Hydraulic Soil Group	C	C	C	C	C	C	C	C	C
Average Slope %	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
Flooding Frequency	none	none	none	none	none	none	none	none	none
Crops	Pasture	Pasture	Pasture	Pasture	Pasture	Pasture	Pasture	Pasture	Pasture
Soil Test P Olsen 1ft (ppm)	44	60	48	38	40	46	45	504	37
Commercial Application Rate (lbs/ac P2O5)	0	0	0	0	0	0	0	0	0
Organic Application Rate (lbs/ac P2O5)	134	134	134	134	134	134	134	0	134
Nutrient Application Method	Spreader	Spreader	Spreader	Spreader	Spreader	Spreader	Spreader	Spreader	Spreader
Transport Factors									
Soil Erosion	3	3	3	3	3	3	3	3	3
Soil Erosion from Sprinkler Irrigation	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Soil Erosion from Surace Irrigation	0	0	0	0	0	0	0	0	0
Runoff Class	1	1	1	1	1	1	1	1	2
Distance to Perennial Surrace Waters	0	0	0	0	0	0	0	0	0
Subsurface Drainage	0	0	0	0	0	0	0	0	0
Trasport Factors Subtotal (TFS)	4.25	4.25	4.25	4.25	4.25	4.25	4.25	4.25	5.25
Source Factors									
Soil Test P (0-12")	2.4	4	2.8	1.8	2	2.6	2.5	48.4	1.7
Commercial P Applicaton Rate	0	0	0	0	0	0	0	0	0
Commercial P Application Method	0	0	0	0	0	0	0	0	0
Organic P Application Rate	2.68	2.68	2.68	2.68	2.68	2.68	2.68	0	2.68
Organic P Application Method	8	8	8	8	8	8	8	0	8
Source Factors Subtotal (SFS)	13.08	14.68	13.48	12.48	12.68	13.28	13.18	48.4	12.38
Total Rating Value (TFS x SFS)	55.59	62.39	57.29	53.04	53.89	56.44	56.02	205.70	65.00
Site Vulnerability Class	Medium	Medium	Medium	Medium	Medium	Medium	Medium	High	Medium

Assumption/Notes:
Assumed soil erosion factor of 3.
Soil tests are 8/8/13 and (19) 4/23/14
Assume applied to surface and not incorp.
P applied to pasture when balancing for N.

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APPENDIX C: ORAWM OUTPUT AND STORAGE ESTIMATES

OREGON ANIMAL WASTE MANAGEMENT DESIGN AID (ORAWM)

6/20/2014

CLIENT: Poland Dairy

ASSISTED BY: John Fazio

ANIMAL WASTE MANAGEMENT SYSTEM INVENTORY

ANIMAL INVENTORY

Type of Animal	Number of Animals	Average Weight (lbs.)	Animal Units (1,000 lb.)	Milk Production in Pounds/Cow/Day= 70 — Nutrient Production (lbs./day/1000 lb. Animal Unit) N	P	K	Nutrient Production (lbs./day) N	P	K	Manure CF/D/AU	Annual Days Confined	Annual Days Grazed	Annual Days Off Farm
MILKER (Holstein)	275	1,300	357.5	0.70	0.12	0.32	250.25	42.97	115.04	1.70	145	220	0
MILKER (DRY)	25	1,400	35.0	0.30	0.04	0.10	10.50	1.47	3.50	0.92	0	365	0
HEIFERS (12-24 Months)	100	970	97.0	0.27	0.05	0.12	25.80	4.41	11.64	0.90	61	305	0
CALVES (1-12 Months)	100	150	15.0	0.42	0.05	0.11	6.30	0.81	1.65	1.34	61	305	0
FINISHING CATTLE	150	700	105.0	0.36	0.04	0.11	37.8	4.62	11.55	1.24	61	305	0
Totals/Averages-	650	904	609.5	0.54	0.09	0.24	330.7	54.3	143.4	1.4			

GRAZING PERIOD

Type of Animal	Percent of Month and Number of Animals Grazing OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	AU-YR.
MILKER (Holstein)	90%	90%	0%	0%	0%	0%	90%	90%	90%	90%	90%	90%	
	275	275	275	275	275	275	275	275	275	275	275	275	2,574
MILKER (DRY)	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	
	25	25	25	25	25	25	25	25	25	25	25	25	420
HEIFERS (12-24 Months)	100%	100%	50%	50%	50%	50%	100%	100%	100%	100%	100%	100%	
	100	100	100	100	100	100	100	100	100	100	100	100	970
CALVES (1-12 Months)	100%	100%	50%	50%	50%	50%	100%	100%	100%	100%	100%	100%	
	100	100	100	100	100	100	100	100	100	100	100	100	150
FINISHING CATTLE	100%	100%	50%	50%	50%	50%	100%	100%	100%	100%	100%	100%	
	150	150	150	150	150	150	150	150	150	150	150	150	1,050
													0
													0
													0
													0
													0
Total AUM's Available>	0	0	0	0	0	0	0	0	0	0	0	0	0
Total AUM's Needed>>>	574	574	144	144	144	144	574	574	574	574	574	574	5,164
Total AUM's>>>>>>>>>>	-574	-574	-144	-144	-144	-144	-574	-574	-574	-574	-574	-574	-5,164

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ANIMAL WASTE MANAGEMENT SYSTEM INVENTORY

WEATHER STATION

MADRAS

Month	25Yr-24Hr	2.10	Lot Runoff Factors as a Percent of Monthly Precipitation	
	RCN=	90.00		
	Average Monthly Inches			
	Precipitation	Evaporation	Paved	Unpaved
October	0.77	2.08	40%	10%
November	1.39	1.27	35%	10%
December	1.25	0.62	38%	10%
January	1.24	0.64	35%	10%
February	0.97	0.95	28%	10%
March	0.89	1.80	30%	10%
April	0.87	3.26	20%	10%
May	0.95	5.26	30%	5%
June	0.57	6.40	40%	5%
July	0.53	7.49	30%	0%
August	0.48	6.68	25%	0%
September	0.46	4.51	35%	10%
Annual	10.37	40.96		

AREAS CONTRIBUTING RUNOFF TO LIQUID STORAGE FACILITY

Description of Runoff Area	Area in SF
Paved Lot Area >>> Is paved lot scraped daily? (Y/N) NO	17,100
Unpaved Lot Area >>>	48,450
Roof Area >>>	0
Surface Area of Silage Storage Facility>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>> Does Silage Seepage Drain to Storage Facility? (Y/N) NO	0
Total Runoff Area Contributing to Liquid Storage Facility>>>>>>>>>>>>>>>>	65,550

WATER USE THAT ENTERS LIQUID STORAGE FACILITY

Type of Water Use	Number of Animals	Number of Washes per Day	Gallons of Water Used per Wash-Day	Total Water Use per Day, Gallons	Total Water Use per Day, Cubic Feet
Animal Washwater	275.0	2	0.25	138	18.4
Equipment Wash		2	100.00	200	26.7
Flushwater		2	100.00	200	26.7
Miscellaneous		2	200.00	400	53.5
Total>>>				938	125.3

CROP DATA

Field Number	Acres	Crop	Percent Dry Matter (DM)	Yield Units	Target Yield	Nutrients Removed in Pounds per Acre: Nitrogen N	Phosphorous P_2O_5	Potassium K_2O
Pasture A	50.0	Grass/Legume Hay/Pasture	30%	Ton	22.00	263	94	71
Pasture B	100.0	Ryegrass Hay/Pasture	30%	Ton	22.00	259	97	266
trit	37.0	Triticale, Haylage	30%	Ton	11.00	162	51	45
grain	30.0	Barley, Grain Straw Removed	85%	Ton	2.20	112	45	88
drypasture	45.0	Perennial Hay/Pasture(Low Intensity)	30%	Ton	10.00	96	41	137
Pasture C	50.0	Perennial Hay/Pasture(Med-High Intensity)	30%	Ton	22.00	383	121	318
Off Farm								
Total Acres-	312.0							

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ANIMAL WASTE MANAGEMENT SYSTEM INVENTORY

BEDDING VOLUME

Type of Animal	Type of Bedding Facility	Bedding Material	Unit Weight Lbs/CF	Amount Needed Lbs/Day/AU	Volume CF/Day/AU	Total Volume CF/Day	Total Weight Lbs/Day
MILKER (Holstein)	Loose Housing	Loose Straw	2.50	9.30	3.72	1330	3,325
MILKER (DRY)	Nonconfined						
HEIFERS (12-24 Months)							
CALVES (1-12 Months)	Confined	Loose Straw	2.50	25.00	10.00	150	375
FINISHING CATTLE							

SOLIDS SEPARATION FACTOR

Type of Animal	Type of Separator	Separation Factor %	Volume of Solids Separated CF/Day	Volume of Solids in Liquids CF/Day	Volume of Manure in Liquids CF/Day	Volume of Manure in Solids CF/Day	Accumulated Sludge in Storage CF/Day	Density of Separated Solids Lbs/CF	Weight of Separated Solids Lbs/Day
MILKER (Holstein)	Dry Scrape System	75%	1,454	485	152	457	88	36	52,355
MILKER (DRY)	Dry Scrape System	100%	32	0	0	32	0	36	1,159
HEIFERS (12-24 Months)	Dry Scrape System	100%	87	0	0	87	0	36	3,143
CALVES (1-12 Months)	Dry Scrape System	100%	170	0	0	20	0	36	6,124
FINISHING CATTLE	Dry Scrape System	100%	130	0	0	130	0	36	4,676
Total Solids>>			1,874	485	152	726	88		67,457

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ANIMAL WASTE MANAGEMENT SYSTEM PRODUCTION

MONTHLY VOLUMES

Month	Runoff in Cubic Feet: Roof Area Square Feet 0	Runoff in Cubic Feet: Paved Slab Area Square Feet 17,100	Runoff in Cubic Feet: Unpaved Lot Area Square Feet 48,450	Runoff in Cubic Feet: Silage Pit Surface Area, SF 0	Facility Water Use Cubic Feet	Manure Solids Cubic Feet	Manure Liquids Cubic Feet	Bedding Cubic Feet	Bedding Pounds	Solids Separated Cubic Feet	Solids Separated Pounds	Solids in Liquids Cubic Feet	Solids in Liquids Pounds	Total Solids Cubic Feet	Total Liquids Cubic Feet
October	0	439	311	0	3,885	240	1,649	4,123	10,307	4,508	162,301	1,503	54,100	4,508	6,138
November	0	693	561	0	3,760	232	1,596	3,990	9,974	4,363	157,065	1,454	52,355	4,363	6,469
December	0	677	505	0	3,885	2,878	19,685	43,552	108,880	51,087	1,839,115	15,028	541,003	51,087	20,095
January	0	618	501	0	3,885	2,878	19,685	43,552	108,880	51,087	1,839,115	15,028	541,003	51,087	20,032
February	0	387	392	0	3,509	2,599	17,780	39,337	98,343	46,143	1,661,136	13,574	488,648	46,143	17,862
March	0	380	359	0	3,885	2,878	19,685	43,552	108,880	51,087	1,839,115	15,028	541,003	51,087	19,653
April	0	248	351	0	3,760	232	1,596	3,990	9,974	4,363	157,065	1,454	52,355	4,363	5,814
May	0	406	192	0	3,885	240	1,649	4,123	10,307	4,508	162,301	1,503	54,100	4,508	5,986
June	0	325	115	0	3,760	232	1,596	3,990	9,974	4,363	157,065	1,454	52,355	4,363	5,654
July	0	227	0	0	3,885	240	1,649	4,123	10,307	4,508	162,301	1,503	54,100	4,508	5,615
August	0	171	0	0	3,885	240	1,649	4,123	10,307	4,508	162,301	1,503	54,100	4,508	5,559
September	0	229	186	0	3,760	232	1,596	3,990	9,974	4,363	157,065	1,454	52,355	4,363	5,629
Annual	0	4,801	3,472	0	45,747	13,119	89,812	202,442	506,106	234,887	8,455,947	70,486	2,537,480	234,887	124,506
Annual Gallons	0	35,911	25,972	0	342,188	98,128	671,792	1,514,270		1,756,958		527,232		1,756,958	931,303

DAILY NUTRIENT PRODUCTION

Type of Animal	Liquids N	Liquids P_2O_5	Liquids K_2O	Solids N	Solids P_2O_5	Solids K_2O	Grazing N	Grazing P_2O_5	Grazing K_2O	Grazing Manure Gallons/Yr	Confined Manure Cubic Feet/Yr
	Pounds/Day of Nutrients from **LIQUIDS**			Pounds/Day of Nutrients from **SOLIDS**			Pounds/Day of Nutrients from **GRAZING**				
MILKER (Holstein)	62.56	24.61	34.66	187.69	73.84	103.97	250.25	98.45	138.63	1,000,644	88,575
MILKER (DRY)	0.00	0.00	0.00	10.50	3.37	4.22	10.50	3.37	4.22	87,912	0
HEIFERS (12-24 Months)	0.00	0.00	0.00	25.80	10.11	14.03	25.80	10.11	14.03	198,840	5,282
CALVES (1-12 Months)	0.00	0.00	0.00	6.30	1.86	1.99	6.30	1.86	1.99	45,781	1,216
FINISHING CATTLE	0.00	0.00	0.00	37.80	10.58	13.92	37.80	10.58	13.92	295,834	7,858
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0
									Total-	1,629,011	102,931

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ASSISTED BY: **John Fazio**

ANIMAL WASTE MANAGEMENT SYSTEM PRODUCTION

MONTHLY NUTRIENT PRODUCTION

Month	Pounds of Nutrients from LIQUIDS			Pounds of Nutrients from SOLIDS			Pounds of Nutrients from GRAZING			Total Pounds of Nutrients from ALL SOURCES		
	N	P_2O_5	K_2O	N	P_2O_5	K_2O	N	P_2O_5	K_2O	N	P_2O_5	K_2O
October	194	76	107	582	229	322	9,474	3,550	4,926	10,250	3,855	5,356
November	188	74	104	563	222	312	9,169	3,436	4,767	9,920	3,731	5,183
December	1,939	763	1,074	6,902	2,638	3,687	1,409	454	595	10,250	3,855	5,356
January	1,939	763	1,074	6,902	2,638	3,687	1,409	454	595	10,250	3,855	5,356
February	1,752	689	970	6,234	2,383	3,330	1,273	410	537	9,258	3,482	4,838
March	1,939	763	1,074	6,902	2,638	3,687	1,409	454	595	10,250	3,855	5,356
April	188	74	104	563	222	312	9,169	3,436	4,767	9,920	3,731	5,183
May	194	76	107	582	229	322	9,474	3,550	4,926	10,250	3,855	5,356
June	188	74	104	563	222	312	9,169	3,436	4,767	9,920	3,731	5,183
July	194	76	107	582	229	322	9,474	3,550	4,926	10,250	3,855	5,356
August	194	76	107	582	229	322	9,474	3,550	4,926	10,250	3,855	5,356
September	188	74	104	563	222	312	9,169	3,436	4,767	9,920	3,731	5,183
Annual	**9,097**	**3,579**	**5,039**	**31,519**	**12,100**	**16,928**	**80,073**	**29,715**	**41,096**	**120,688**	**45,394**	**63,064**

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ANIMAL WASTE MANAGEMENT SYSTEM APPLICATION

MANAGEMENT CRITERIA FOR TRACTOR SPREADER APPLICATION OF SOLIDS

To apply **234,887** cubic feet of solids generated from the operation it will take approximately **1,180** trips annually. Based on applying NITROGEN, N
at agronomic rate use the application depths, travel lengths, and loads per acre listed below for each crop.

Field Number	Acres	Crop	Tractor Spreader Capacity		Spread Width	NITROGEN, N Concentration in Storage Facility		Pounds of Nutrients to be Applied	Number of Applications Needed to meet Crop Demand	Tons per Acre of Solids to Apply	Travel Length per Load Needed in Feet	Loads per Acre	Assumed Solids Density lbs/CF
			Bushels	CF	Feet	PPM	Lbs/Ton						
Pasture A	50	Grass/Legume Hay/Pasture	160	199	15	2,423	4.85	263	1.00	82.6	126	23	36
Pasture B	100	Ryegrass Hay/Pasture	160	199	15	2,423	4.85	259	1.00	81.3	128	23	36
trit	37	Triticale, Haylage	160	199	15	2,423	4.85	162	1.00	50.7	205	14	36
grain	30	Barley, Grain Straw Removed	160	199	15	2,423	4.85	112	1.00	35.2	296	10	36
drypasture	45	Perennial Hay/Pasture(Low Intensity)	160	199	15	2,423	4.85	96	1.00	30.1	345	8	36
Pasture C	50	Perennial Hay/Pasture(Med-High Intensity)	160	199	15	2,423	4.85	383	1.00	120.1	87	34	36

MANAGEMENT CRITERIA FOR BIG GUN SPRINKLER APPLICATION OF LIQUIDS

To apply **803,399** gallons of liquids generated from the operation it will take approximately **45** hours of pumping annually. Based on applying NITROGEN, N
at agronomic rate use the application depths, set times, and travel rates listed below for each crop.

Field Number	Acres	Crop	Sprinkler Flowrate GPM	Wetted Diameter Feet	Portion of Wetted Diameter Receiving Liquids	NITROGEN, N Concentration in Storage Facility		Pounds of Nutrients to be Applied	Number of Applications Needed to meet Crop Demand	Inches of Liquids to Apply	Application Rate in Inches/Hour	Set Time Needed in Hours	Travel Rate Needed in Feet/Minute
						PPM	Lbs/1000Gal						
Pasture A	50	Grass/Legume Hay/Pasture	300	250	1/2 Circle	950	7.93	263	1.00	1.74	1.45	2.95	1.11
Pasture B	100	Ryegrass Hay/Pasture	300	250	1/2 Circle	950	7.93	259	1.00	1.71	1.45	2.90	1.13
	37	Triticale, Haylage	300	250	1/2 Circle	950	7.93	162	1.00	1.07	1.45	1.81	1.81
grain	30	Barley, Grain Straw Removed	300	250	1/2 Circle	950	7.93	112	1.00	0.74	1.45	1.26	2.60
drypasture	45	Perennial Hay/Pasture(Low Intensity)	300	250	1/2 Circle	950	7.93	96	1.00	0.63	1.45	1.07	3.04
Pasture C	50	Perennial Hay/Pasture(Med-High Intensity)	300	250	1/2 Circle	950	7.93	383	1.00	2.52	1.45	4.28	0.76

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ANIMAL WASTE MANAGEMENT SYSTEM APPLICATION

MANAGEMENT CRITERIA FOR TANK WAGON APPLICATION OF LIQUIDS

To apply **803,399** gallons of liquids generated from the operation it will take approximately **201** trips annually. Based on applying NITROGEN, N at agronomic rates use the application depths, travel lengths, and loads per acre listed below for each crop.

Field Number	Acres	Crop	Tank Wagon Capacity Gallons	Spread Width Feet	NITROGEN, N Concentration in Storage Facility PPM	NITROGEN, N Concentration in Storage Facility Lbs/1000Gal	Pounds of Nutrients to be Applied	Number of Applications Needed to meet Crop Demand	Inches of Liquids to Apply	Travel Length per Load Needed in Feet	Loads per Acre
Pasture A	50	Grass/Legume Hay/Pasture	4,000	15	950	7.93	263	1.00	0.86	496	5.9
Pasture B	100	Ryegrass Hay/Pasture	4,000	15	950	7.93	259	1.00	0.85	503	5.8
trit	37	Triticale, Haylage	4,000	15	950	7.93	162	1.00	0.53	807	3.6
grain	30	Barley, Grain Straw Removed	4,000	15	950	7.93	112	1.00	0.37	1,164	2.5
drypasture	45	Perennial Hay/Pasture(Low Intensity)	4,000	15	950	7.93	96	1.00	0.31	1,360	2.1
Pasture C	50	Perennial Hay/Pasture(Med-High Intensity)	4,000	15	950	7.93	383	1.00	1.25	341	8.5

COMPUTED NUTRIENT CONCENTRATIONS IN STORAGE

Storage Facility	Annual Volume Production	Units	Concentration of Nutrients in Storage N	P_2O_5	K_2O	Units
Tank (Uncovered)	803,399	Gallons	7.93	3.79	5.33	lbs/1,000 Gal
Open Lot (Arid Region)	2,114	Tons	4.85	2.58	3.60	lbs/Ton

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ANIMAL WASTE MANAGEMENT SYSTEM UTILIZATION

NUTRIENTS AVAILABLE AFTER STORAGE

Nutrient Source	Type of Operation / Type of Storage Facility	Pounds of Nutrients Available			Percent Nutrients Retained After Storage			Pounds of Nutrients Retained After Storage		
	Dairy	N	P_2O_5	K_2O	N	P_2O_5	K_2O	N	P_2O_5	K_2O
Liquids	Tank (Uncovered)	9,097	3,579	5,039	**70%**	**85%**	**85%**	6,368	3,042	4,283
Solids	Open Lot (Arid Region)	31,519	12,100	16,928	**65%**	**90%**	**90%**	20,487	10,890	15,235
Grazing	NONE	80,073	29,715	41,096	**100%**	**100%**	**100%**	80,073	29,715	41,096

NUTRIENTS AVAILABLE AFTER APPLICATION

Nutrient Source	Type of Application System	Pounds of Nutrients Available			Percent Nutrients Retained After Application			Pounds of Nutrients Retained After Application		
		N	P_2O_5	K_2O	N	P_2O_5	K_2O	N	P_2O_5	K_2O
Liquids	Sprinkling	6,368	3,042	4,283	**75%**	**100%**	**100%**	4,776	3,042	4,283
Solids	Broadcast (Incorporated 7 or more days after application)	20,487	10,890	15,235	**70%**	**100%**	**100%**	14,341	10,890	15,235
Grazing	Grazing	80,073	29,715	41,096	**85%**	**100%**	**100%**	68,062	29,715	41,096

NUTRIENTS AVAILABLE AFTER DENITRIFICATION

Nutrient Source	Location / Soil Drainage Class	Pounds of Nutrients Available			Percent Nutrients Retained After Denitrification			Pounds of Nutrients Retained After Denitrification		
	East of Cascade Mountains	N	P_2O_5	K_2O	N	P_2O_5	K_2O	N	P_2O_5	K_2O
Liquids	Well Drained	4,776	3,042	4,283	**94%**	**100%**	**100%**	4,489	3,042	4,283
Solids	Well Drained	14,341	10,890	15,235	**94%**	**100%**	**100%**	13,481	10,890	15,235
Grazing	Well Drained	68,062	29,715	41,096	**94%**	**100%**	**100%**	63,978	29,715	41,096
							TOTAL-	***81,948***	***43,647***	***60,615***

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ANIMAL WASTE MANAGEMENT SYSTEM UTILIZATION

PERCENT OF MANURE TO BE APPLIED TO FIELD AND UTILIZATION ACRES NEEDED BASED ON NITROGEN, N

Field Number	Acres	Crop	LIQUIDS			SOLIDS			GRAZING		
			Percent to be Applied	Pounds of Nutrients to be Applied	Acres Needed for Utilization of Nutrients	Percent to be Applied	Pounds of Nutrients to be Applied	Acres Needed for Utilization of Nutrients	Percent to be Applied	Pounds of Nutrients to be Applied	Acres Needed for Utilization of Nutrients
Pasture A	50.0	Grass/Legume Hay/Pasture	18%	822	3	5%	674	3	18%	11,714	44
Pasture B	100.0	Ryegrass Hay/Pasture	36%	1,619	6	8%	1,078	4	36%	23,076	89
trit	37.0	Triticale, Haylage	8%	373	2	2%	270	2	8%	5,323	33
grain	30.0	Barley, Grain Straw Removed	5%	210	2	1%	135	1	5%	2,995	27
drypasture	45.0	Perennial Hay/Pasture(Low Intensity)	6%	270	3	2%	270	3	6%	3,843	40
Pasture C	50.0	Perennial Hay/Pasture(Med-High Intensity)	27%	1,195	3	6%	809	2	27%	17,028	44
Off Farm			0%	0		76%	10,245		0%	0	
TOTALS-	312		100%	4,489	19	100%	13,481	15	100%	63,978	278

NUTRIENT BALANCE BASED ON AVAILABLE ACRES

Field Number	Acres	Crop	NUTRIENTS APPLIED			- NUTRIENTS REMOVED			= NUTRIENT BALANCE		
			Nitrogen, N Lbs/Acre	Phosphorous, P_2O_5 Lbs/Acre	Potassium, K_2O Lbs/Acre	Nitrogen, N Lbs/Acre	Phosphorous, P_2O_5 Lbs/Acre	Potassium, K_2O Lbs/Acre	Nitrogen, N Lbs/Acre	Phosphorous, P_2O_5 Lbs/Acre	Potassium, K_2O Lbs/Acre
Pasture A	50.0	Grass/Legume Hay/Pasture	264	131	181	263	94	71	1	36	111
Pasture B	100.0	Ryegrass Hay/Pasture	258	127	176	259	97	266	-2	30	-90
trit	37.0	Triticale, Haylage	161	80	110	162	51	45	0	28	65
grain	30.0	Barley, Grain Straw Removed	111	55	76	112	45	88	-1	10	-12
drypasture	45.0	Perennial Hay/Pasture(Low Intensity)	97	49	67	96	41	137	1	7	-70
Pasture C	50.0	Perennial Hay/Pasture(Med-High Intensity)	381	187	260	383	121	318	-2	66	-58
Off Farm											

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Poland Dairy: Runoff and Storage Estimates

6/19/2014

Site Surface Area		Area Square Feet	Total Square Feet	CN	for 25 yr event
Roof Area		0		98	
	Roof Areas Subtotal		0		
Main Pens (50 feet worth)		28,500		90	
Close Up Pen		-		90	
Manure Handling (35 feet worth)		19,950		90	
Misc. Areas		-		85	
	Unroofed Area Subtotal		48,450		
Concrete Feed Lane and Alley		17,100		98	
Holding Area and Alley				98	
	Concrete Subtotal		17,100		
		Total Runoff Area	65,550	92.09	Weighted CN
			1.50	Acres, should match drainage map	

Runoff Calculations

Madras Station

Month	Days	Monthly Average Inches Precipitation	Monthly Average Inches Evaporation	Lot Runoff Factors as a % of Monthly Precipitation Paved	Unpaved	Paved Cubic-Feet	Unroofed Cubic-Feet	Roof Cubic-Feet	Total Runoff Cubic-Feet
October	31	0.77	2.08	40%	10%	439	311	-	750
November	30	1.39	1.27	35%	10%	693	561	-	1,254
December	31	1.25	0.62	38%	10%	677	505	-	1,182
January	31	1.24	0.64	35%	10%	618	501	-	1,119
February	28	0.97	0.95	28%	10%	387	392	-	779
March	31	0.89	1.80	30%	10%	380	359	-	740
April	30	0.87	3.26	20%	10%	248	351	-	599
May	31	0.95	5.26	30%	5%	406	192	-	598
June	30	0.57	6.40	40%	5%	325	115	-	440
July	31	0.53	7.49	30%	0%	227	-	-	227
August	31	0.48	6.68	25%	0%	171	-	-	171
September	30	0.46	4.51	35%	10%	229	186	-	415
Annual	365	10.37	40.96			4,801	3,472	-	8,273

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24 Hour 25 Year Storm

Precipitation from 24hr 25yr storm		2.10 inches		
Selected CN	92.5			
Runoff from 24hr 25yr storm		1.30 inches (Table 2-2 EFH)	7,101	cubic feet
			0.16	acre-feet

Estimated Parlor Water Use

from ORAWM		gpd	
Milker wash water		138	
Equipment Wash		200	
Miscellaneous		400	
Holding Pen Flush		200	
	Total	938	gallons per day (gpd)
	Total	125	cubic-ft/day
	Total	0.003	acre-feet/day

Estimated Total Manure in Water

193 cubic-ft/day per ORAWM
0.004 acre-feet/day

Storage Sizing

Storage Period	60	Days
Lagoon Surface Area	10,200	Sq. Feet

Month	Days	Prec.-Evap. Cubic-Feet	Normal Runoff Cubic-Feet	Parlor Water Cubic-Feet	Total Manure Cubic-Feet	Total Storage Cubic-Feet
October	31	(1,114)	750	3,888	5,983	9,507
November	30	102	1,254	3,762	5,790	10,909
December	31	536	1,182	3,888	5,983	11,588
January	31	510	1,119	3,888	5,983	11,500
February	28	17	779	3,511	5,404	9,711
March	31	(774)	740	3,888	5,983	9,837
April	30	(2,032)	599	3,762	5,790	8,120
May	31	(3,664)	598	3,888	5,983	6,805
June	30	(4,956)	440	3,762	5,790	5,037
July	31	(5,916)	227	3,888	5,983	4,181
August	31	(5,270)	171	3,888	5,983	4,772
September	30	(3,443)	415	3,762	5,790	6,525
Annual	365	(26,002)	8,273	45,775	70,445	98,492

Component Entering Storage	Inches	Cubic-Feet	Source
Rainfall on Storage, 24hr 25yr	2.10	1,785	Weather Station Data
Runoff, 24hr 25yr Storm		7,101	Runoff Calculations
Precipitation - Evaporation	1.23	1,046	Weather Station Data
Runoff from normal precipitation		2,301	Runoff Calculations (Dec & Jan)
Parlor Water Use		7,775	(December & January)
Manure in Flush Water		11,966	(December & January)
Solids Accumulation		-	
	Total	31,974	Assumes 2 month storage

	Bottom Length (ft)	Bottom Width (ft)	Water Depth (ft)	Ramp Length	Volume (ft^3)	
Current Cell	26	30	3	14	2,970	
New Cell	60	100	4	30	30,000	less a corner
				Total	32,970	

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25-yr, 24-hr Storm Event Runoff Volume and VTA Calculation

NRCS National Engineering Handbool part 650
Engineering Field Handbook Ch. 2 Estimating Runoff

$$Q = \frac{(P - 0.2s)^2}{P + 0.8S}$$

P =	2.1	
CN =	90	assumed for pens
S = (1000/CN) - 10	1.11	
Numerator	3.53	
Denominator	2.99	
Q =	1.18	
Surface Area (acres)	5.70	7.2-1.5 see PA Map
Surface Area (SF)	248,292	
Runoff Volume (ac-ft)	0.56	
Runoff Volume (CF)	24,410	

Nitrogen application onto Adjacent Fields
from pen runoff from the 25-yr, 24-hr storm event.

Runoff V (gallons)	182,596	
# N/1,000 gallons	5	Assumed
Total N in 25/24 event	913	
VTA acres	40	103 Approx: Fields 7, 8, 9, 10, 4, 3, 2, 1
# N/acre	22.82	
inches runoff/acre	0.17	

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6/20/2014

Construction Approval Request

I would like to request approval for the following construction plans.

I plan on building a manure pit (Structure) at my facility located at 3845 NW Elm Lane Madras, OR 97741 (Address / City / State / Zip) Poland Dairy (Organization / company) is responsible for the planning and/or construction of this structure.

Additional information and/or comments: _____

Attached are the completed documents required for construction approval.

Signature [signature] Date 2-24-14

Phone: 541-350-8683 E-mail: polandorganicdairy@gmail

- [x] Site map including the location of the proposed structure(s) in AWMP
- [x] Engineer-stamped drawing of the proposed manure storage structure(s)
- [x] Operation and maintenance for the proposed manure storage structure(s) in AWMP

FOR ODA USE ONLY:

MA#: 177789
LOG#: 14008
COUNTY: Jefferson
STATUS:
DATE:
REVIEWED BY: (initials)

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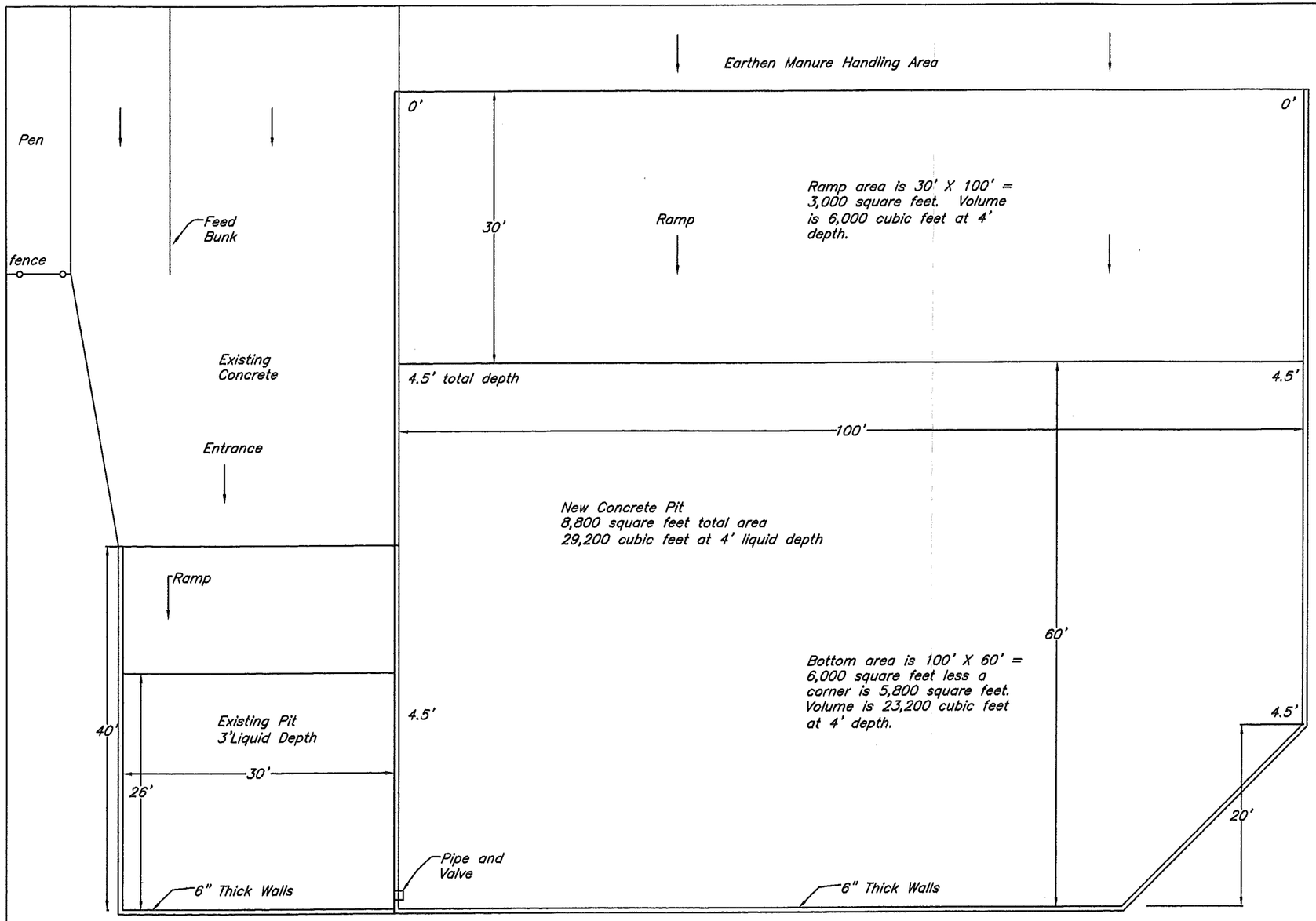
MAR 07 2014
ODA - AREA V

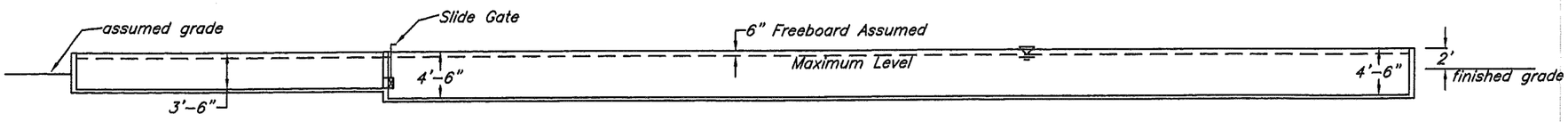
RECEIVED
FEB 26 2014
NATURAL RESOURCES DIVISION

Rev (3/05) reformatted (01/2012)



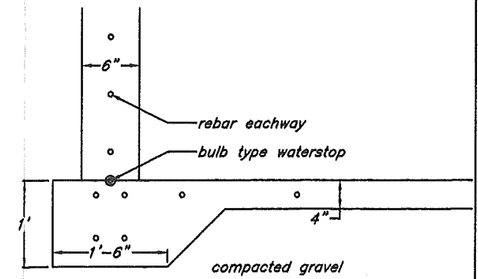
PLAN VIEW

not to scale



SECTION VIEW

not to scale



TYP. SLAB/WALL DETAIL

not to scale

CONSTRUCTION NOTES:

1. The site may have been used for manure storage. Organic material and impacted soil shall be stripped from the embankment foundations. Stripped material shall be stockpiled until outside embankment construction is complete. It shall then be spread on the outside slope and top of embankments.

2. A 4-inch thick floor and 6-inch thick concrete walls are proposed as the existing pit. Only small tractors and equipment are used.

3. The recommended concrete is 6 sack mix with a 6-inch thick compacted gravel subgrade. The suggested rebar placement is:
6" Wall: #3, 12" vertical, #3, 7" horizontal
4" Floor: #4 rebar, 12" OC both ways

RECEIVED
JUL 18 2014
ODA - AREA V

REGISTERED PROFESSIONAL ENGINEER 18152PE OREGON DEC. 6, 1995 JOHN A. FAZIO

exp 12/31/15

DATE 6/14 7/2014
DESIGN jaf
DRAWN jaf
CHECKED
APPROVED
TITLE

File: cell2012.dwg

FAZIO ENGINEERING
P.O. BOX 246
MILTON-FREEWATER, OR 97862
(541) 938-6084

PROPOSED PIT LAYOUT
POLAND DAIRY
MADRAS, OREGON

SHEET 1 OF 1

MA No.: 177789
Log No.: 15022

FAZIO ENGINEERING
P.O. Box 246
Milton-Freewater, OR 97862
(541) 938-6084

August 28, 2015

Maria Snodgress
Oregon Department of Agriculture
475 NE Bellevue Dr Suite 110
Bend, OR 97701

Re: Poland Dairy Manure Cell Certification

Dear Maria,

Please consider this letter and supporting documentation the construction certification for the new manure pit next to the existing pit. The original plan was to construct a concrete manure pit about 60 feet wide by 100 feet long and a 4.5 foot total depth with an access ramp. The final pit is generally the same size, but was divided into two cells. One cell is concrete and the other is soil lined. This final layout is better because it provides more flexibility. The general construction events were as follows.

1. The contractor Lee Baggett completed the work on about 2/24/15.
2. Wallace Group conducted compaction tests on 4/1/15.
3. I visited the site on 8/14/15 to take final measurements.

The soil permeability was tested during dairy construction in anticipation of any silage, or manure handling area construction. The specific discharge for the earthen pit was calculated to be about 28 gallons per acre per day after the manure sealing credit.

The following items are attached:

1. Final Drawing
2. Soil Density Test
3. Permeability Test
4. Specific Discharge Calculations

Please let me know if you have any questions or comments.

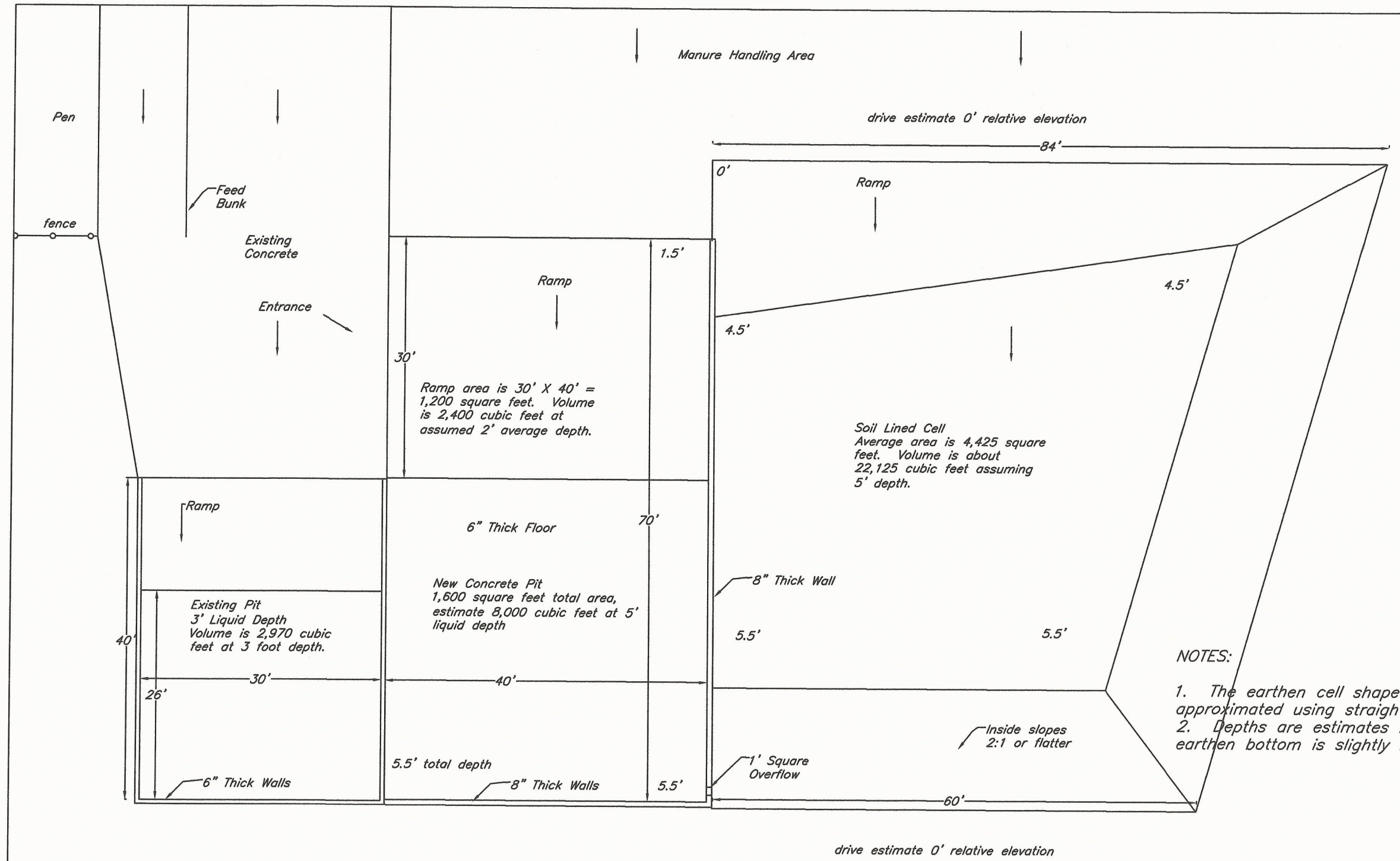
Regards,

John A. Fazio

John A. Fazio, P.E.

cc: Jos Poland

RECEIVED
AUG 28 2015
ODA - AREA V



NOTES:

1. The earthen cell shape is rounded and was approximated using straight lines.
2. Depths are estimates because ramps and earthen bottom is slightly irregular.

PLAN VIEW
not to scale

REGISTERED PROFESSIONAL ENGINEER
18152PE
John A Fazio
OREGON
DEC. 6, 1995
JOHN A. FAZIO
exp 12/31/15

DATE
DESIGN 6/14
DRAWN 8/2015
CHECKED
APPROVED
TITLE

File: cell2014.dwg

FAZIO ENGINEERING
P.O. BOX 246
MILTON-FREEWATER, OR 98762
(541) 938-6084

FINAL PIT LAYOUT
POLAND DAIRY
MADRAS, OREGON

SHEET
1 OF 1

wallaceGROUP
applied earth & environmental science

Daily Field Report

Project Name: Lee Baggett On-Call
Date: April 1, 2015
Project No.: 10529-1
Bldg. Permit No.:
DFR/Report No.: 1
Project Address: 3845 NW Elm Lane, Madras, Oregon
Time Arrived: 9:00 AM
Client: Lee Baggett
Contractor: Lee Baggett
Time Departed: 10:30 AM
Equipment Observed: Smooth drum roller
Total Time: 3.5 hrs
Weather: Clear, 50s
Mileage: 100 mi
Reviewed By: Mark V. Herbert
Date Reviewed: 5/10/2015

Types of Tests/Observations

☐ AC Pavements	☐ Fabrication Plant	☐ Masonry	☐ Sample Pickup	☐ Other
☐ Anchor Bolts	☐ Fireproofing	☐ Metal Decking	☒ Soil / Aggregate	
☐ Batch Plant	☐ Foundations	☐ Pre-Post Tension	☐ Steel Erection	
☐ Concrete	☐ HS Bolting	☐ Reinforcing Steel	☐ Welding	

Documents Referenced: The Wallace Group Proctor WG1493

Observations/Remarks:

Arrived on-site at Poland Dairy Horizon Organic Farm as requested by Lee Baggett to perform in-place density testing on soil placed and compacted for the bottom of an overflow containment basin located at the east side of an existing concrete containment basin. The silty sand and gravel soil used was from an on-site stockpile and had been compacted with a vibratory smooth drum roller.

Four density tests were taken at random locations across the compacted area of the basin. During the course of the testing, rock was encountered at approximately 4 to 6 inches below the compacted surface. All four tests met or exceeded the 95% compaction requirement. See attached page for locations and results.

☒ Report items comply ☐ Report items do not comply ☐ Report items comply with exceptions ☐ In Progress / Not complete

Acknowledged by: _____

Representing: _____

Subject to review and revision by Professional Staff

Roy W. Ruch

The Wallace Group, Inc. Representative *Signature*

The Wallace Group, Inc. Representative *Print Name*

541.382.4707 ph 62915 NE 18th St, Ste 1, Bend, OR 97701 541.383.8118 fax

NUCLEAR DENSITY FIELD FORM

wallaceGROUP
applied earth & environmental science

PROJECT NO. 10529-1
JOB NAME LEE BAGGETT ON CALL - POLAND DAIRY
DATE 4-1-15
TECHNICIAN R RUCH
TEST LOCATIONS SELECTED BY: R RUCH
COMPACTION CONT ☐ DENSITY TESTING ☒
REVIEWED BY: Mark V. Herbert DATE: 5/10/2015

RESULTS REPORTED TO
LEE BAGGETT

STANDARD COUNT
Density
Moisture
Troxler Gauge SN 37797

Test No.	Probe Depth, in.	Approximate Location	Depth below FSG (Ft)	Water, pcf	Water, %	Wet Density, pcf	Dry Density, pcf	Proctor No.	Lab Maximum Density, pcf	Optimum Water Content, %	Relative Compaction, %	Specified Compaction, %
1	4"	BOTTOM OF CONTAINMENT BASIN – N. AREA	0	11.0	11.3	108.7	97.7	1493	102.8	16.2	95	95
2	6"	" E. AREA	0	12.4	12.8	110.7	98.1				95	
3	4"	" S. AREA	0	13.2	13.3	112.1	98.9				96	
4	4"	" W. AREA	0	10.7	11.0	108.2	97.5				95	

Remarks:

541.382.4707 Phone
62915 NE 18th St, Ste 1 Bend, OR 97701
541.383.8118 Fax

NUCLEAR DENSITY FIELD FORM

wallaceGROUP
applied earth & environmental science

PROJECT NO. 10529-1
JOB NAME LEE BAGGETT ON CALL - POLAND DAIRY
DATE 4-1-15
TECHNICIAN R RUCH
TEST LOCATIONS SELECTED BY: R RUCH
COMPACTION CONT ☐ DENSITY TESTING ☒
REVIEWED BY: Mark V. Herbert DATE: 5/10/2015

RESULTS REPORTED TO
LEE BAGGETT

STANDARD COUNT
Density
Moisture
Troxler Gauge SN 37797

Test No.	Probe Depth, in.	Approximate Location	Depth below FSG (Ft)	Water, pcf	Water, %	Wet Density, pcf	Dry Density, pcf	Proctor No.	Lab Maximum Density, pcf	Optimum Water Content, %	Relative Compaction, %	Specified Compaction, %
1	4"	BOTTOM OF CONTAINMENT BASIN – N. AREA	0	11.0	11.3	108.7	97.7	1493	102.8	16.2	95	95
2	6"	" E. AREA	0	12.4	12.8	110.7	98.1				95	
3	4"	" S. AREA	0	13.2	13.3	112.1	98.9				96	
4	4"	" W. AREA	0	10.7	11.0	108.2	97.5				95	

Remarks:

541.382.4707 Phone
62915 NE 18th St, Ste 1 Bend, OR 97701
541.383.8118 Fax

anderson perry & associates, inc.

Project	Poland Dairy	Job No.: W8058-45 (111)
Client	Fazio Engineering	Date Reported: 12/20/04
Report of	Permeability Testing	
Report to	Fazio Engineering, Atten Jon Fazio, PO Box 246, Milton-Freewater, OR 97862	

SAMPLE IDENTIFICATION

On November 18, 12, 2004, your personnel delivered a soil sample to our laboratory. Your instructions were to perform moisture density relationship curve and remolded falling head permeability tests. All testing was performed in general accordance with applicable ASTM procedures.

TEST RESULTS

Sample Number	Maximum Density, pcf	Optimum Moisture,%	Percent of Maximum Remolded	Permeability inches / second
22078	105.5	17.3	95.0	1.84×10^{-8}

REMARKS

ANDERSON•PERRY & ASSOCIATES, INC.

By _____

Wayne L. Couture S.E.T.
Laboratory Manager

File No. W8058-45-81(Poland)

AS A MUTUAL PROTECTION TO CLIENTS, THE PUBLIC, AND OURSELVES, ALL REPORTS ARE SUBMITTED AS THE CONFIDENTIAL PROPERTY OF OUR CLIENTS AND AUTHORIZATION FOR PUBLICATION OF STATEMENTS, CONCLUSIONS, OR EXTRACTS FROM OR REGARDING OUR REPORTS IS RESERVED PENDING OUR WRITTEN APPROVAL. SAMPLES WILL BE DISPOSED OF AFTER TESTING IS COMPLETE UNLESS OTHER ARRANGEMENTS ARE AGREED TO IN WRITING.

Specific Discharge Calculations 8/20/2015

General Equation: v = k * (H+d)/d
Where:
v=specific discharge (ft3/ft2/day)
k= coefficient of permeability (ft/day)
H=depth of liquid (ft)
d=thickness of liner (ft)

Permeability Results

Sample	value	units	value	units	value	units
Native at 95%	4.67E-08	cm/sec	1.32E-04	ft/day	1.53E-09	ft/sec
H	5.50	feet maximum at deep end				
d	1.00	feet (assumed)				
v (initial)	8.61E-04	ft3/ft2/day	280.57	gallons/acre/day		
v (final after manure)	8.61E-05	ft3/ft2/day	28.06	gallons/acre/day		

FAZIO ENGINEERING
P.O. Box 246
Milton-Freewater, OR 97862
(541) 938-6084

September 21, 2015

MA No.: 177789
Log No.: ~~15022~~ 15022

Maria Snodgress
Oregon Department of Agriculture
475 NE Bellevue Dr Suite 110
Bend, OR 97701

Re: Poland Dairy Manure Cell Certification

Dear Maria,

Please consider this letter and supporting documentation the construction certification for the new manure pit next to the existing pit. The original plan was to construct a concrete manure pit about 60 feet wide by 100 feet long and a 4.5 foot total depth with an access ramp. The final pit is generally the same size, but was divided into two cells. One cell is concrete and the other is soil lined. This final layout is better because it provides more flexibility. The general construction events were as follows.

1. The contractor, Lee Baggett, completed the work about the end of February, 2015.
2. Wallace Group tested the proctor of the stockpiled soil material on 3/11/15. Density tests were conducted on 4/1/15.
3. I visited the site on 8/14/15 to take final measurements.

According to Lee Baggett, the subgrade was watered and compacted using a vibratory roller before liner construction. Additionally, the soil liner was constructed in two 6-inch lifts, each watered and compacted. The Wallace Group remarked that rock was encountered at 4-6 inches in places.

The soil permeability was previously tested during dairy construction. The specific discharge for the earthen pit was calculated to be about 76 gallons per acre per day after the manure sealing credit.

The following items are attached:

1. O&M and Final Drawing
2. Soil Proctor and Density Tests
3. Permeability Test
4. Specific Discharge Calculations

Please let me know if you have any questions or comments.

Regards,

John A. Fazio

RECEIVED
SEP 24 2015
ODA - AREA V

REGISTERED PROFESSIONAL ENGINEER
18152PE
OREGON
DEC. 6, 1995
JOHN A. FAZIO
12/31/15

John A. Fazio, P.E.

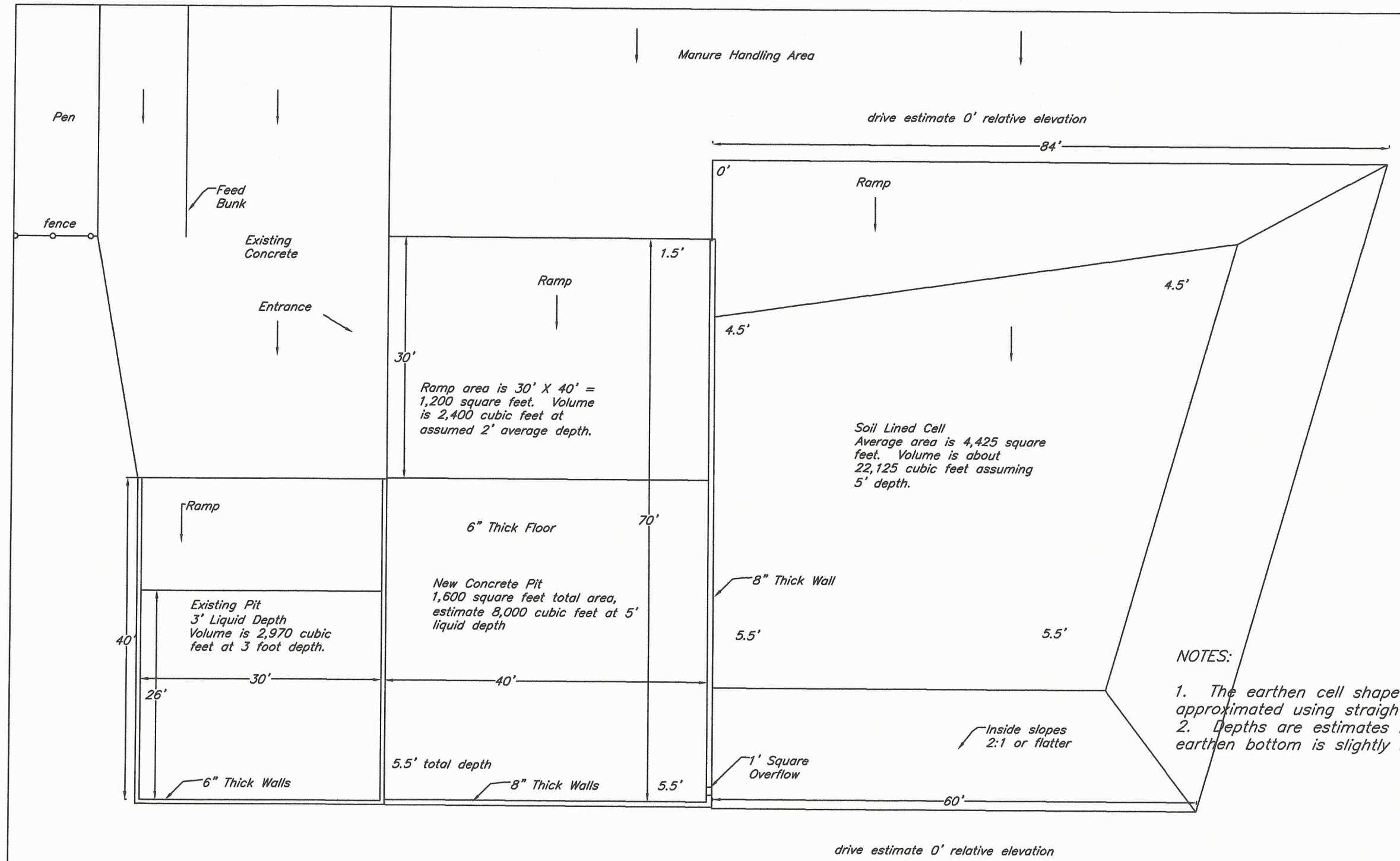
cc: Jos Poland

Manure Cells Operation and Maintenance

The two concrete manure cells can act as settling cells with slurry overflowing into the soil lined cell. Manure flows into the concrete cells unassisted, but can also be pushed in. When the second concrete cell is full, manure flows through a concrete overflow notch into the soil lined cell. Manure can be vacuumed from any of the three cells.

The soil lined manure cell requires additional activities identified as:

1) Avoid driving on the soil liner during wet saturated periods that may cause rutting and displacing the liner.
2) During the dry season, remove dried manure and settled solids as needed.
3) Leave some manure on top of the liner trying not to damage the soil liner.
4) Smooth and repair the soil liner as needed.
5) Eradicate burrowing animals and vegetation that could damage the soil liner.



NOTES:

1. The earthen cell shape is rounded and was approximated using straight lines.
2. Depths are estimates because ramps and earthen bottom is slightly irregular.

PLAN VIEW
not to scale

REGISTERED PROFESSIONAL ENGINEER
18152PE
John A Fazio
OREGON
DEC. 6, 1995
JOHN A. FAZIO
exp 12/31/15

DATE
DESIGN 6/14
DRAWN 8/2015
CHECKED
APPROVED
TITLE

File: cell2014.dwg

FAZIO ENGINEERING
P.O. BOX 246
MILTON-FREEWATER, OR 98762
(541) 938-6084

FINAL PIT LAYOUT
POLAND DAIRY
MADRAS, OREGON

SHEET
1 OF 1

62915 NE 18th Street, Suite 1
Bend, OR 97701
541.382.4707
www.wallacegroup-inc.com

Moisture Density Curve

Client: Lee Baggett
Project: Poland Dairy
Location: Unknown
Material Type: Silty Sand and Gravel
Material Supplier: Onsite Soil
Material Source: Onsite Soil
Sample Location: Stockpile

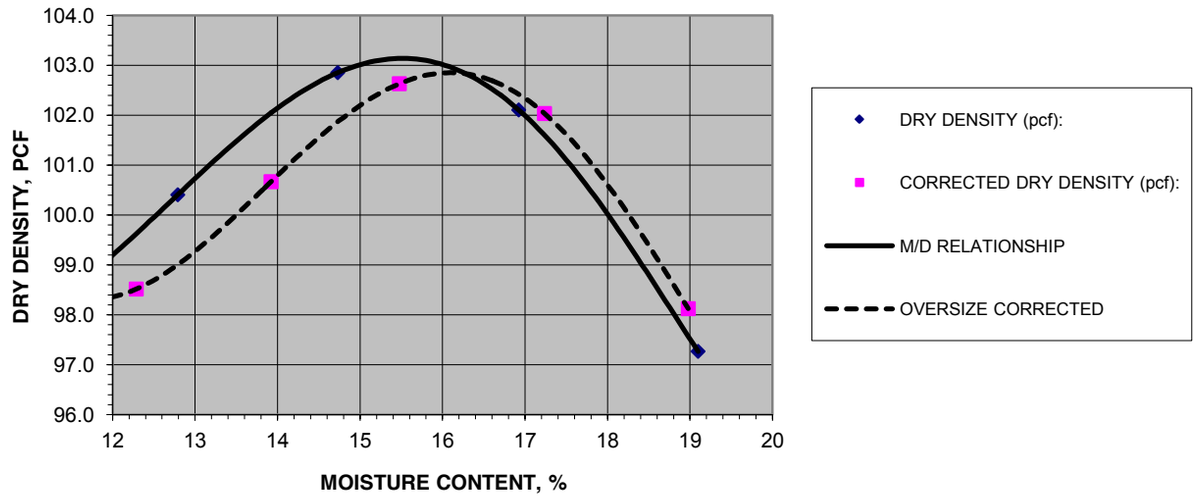
Project No.: 10529 - 1
Lab No.: WG1493

Sampled By: Client
Received By: SMW
Tested By: SMW
Reviewed By:

Date Sampled: 6-Mar-15
Date Received: 6-Mar-15
Date Tested: 11-Mar-15
Date Reviewed: 12-Mar-15

Test Procedure: ASTM D698 **Method:** A
Oversized Material (%): 20% **Correction Required:** [X] yes [ ] no

MOISTURE/DENSITY RELATIONSHIP CURVE



MOISTURE DENSITY RELATIONSHIP VALUES

Maximum Dry Density, pcf	103.2	**@ Optimum Moisture, %**	15.5
Corrected Maximum Dry Density, pcf	102.8	**@ Optimum Moisture, %**	16.2

MATERIAL DESCRIPTION

Sand and Gravel - Brown

COARSE SIZE PERCENTAGES

Retained 3/4-inch	-
Retained 3/8-inch	-
Retained # 4	20%

Note: Data and results shown above include ASTM Test Methods D698 or D1557, C127, and D2216, as well as **AASHTO T99 or T180**. This report pertains only to the material tested and/or inspected and is not to be reproduced without prior authorization of Wallace Group. If part of a larger document, this report is not to be removed or reproduced separately. and shall not be distributed to other parties without Client's permission.

Figure 1

62915 NE 18th St, Ste 1
Bend, OR 97701
541.382.4707
www.wallacegroup-inc.com

COARSE AGGREGATE
SPECIFIC GRAVITY AND ABSORPTION
ASTM C127

Client :	Lee Baggett	Project No.:	10529 - 1
Project Name:	Poland Dairy	Lab No.:	WG1493
Material Type:	Silty Sand and Gravel	Tested By:	SMW
Sample Location:	Stockpile	Date Analyzed:	3/16/2015
		Reviewed By:	

	Sample # 1	Sample # 2
A Oven Dry Mass	1527.4	
B SSD Wt. In Air	1810.0	
C SSD Wt. In Water	870.3	
A-C	657.1	
B-C	939.7	
* Bulk Specific Gravity A / B-C	1.63	
Bulk Specific Gravity SSD B / B-C	1.93	
Apparent Specific Gravity A / A-C	2.32	
Absorption Test B-A	282.6	
Percent Absorption B-A / A X 100	18.5	

Note: Data and results shown above include ASTM Test Method C127.

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Daily Field Report

Project Name: Lee Baggett On-Call
Date: April 1, 2015
Project No.: 10529-1
Bldg. Permit No.:
DFR/Report No.: 1
Project Address: 3845 NW Elm Lane, Madras, Oregon
Time Arrived: 9:00 AM
Client: Lee Baggett
Contractor: Lee Baggett
Time Departed: 10:30 AM
Equipment Observed: Smooth drum roller
Total Time: 3.5 hrs
Weather: Clear, 50s
Mileage: 100 mi
Reviewed By: Mark V. Herbert
Date Reviewed: 5/10/2015

Types of Tests/Observations

☐ AC Pavements	☐ Fabrication Plant	☐ Masonry	☐ Sample Pickup	☐ Other
☐ Anchor Bolts	☐ Fireproofing	☐ Metal Decking	☒ Soil / Aggregate	
☐ Batch Plant	☐ Foundations	☐ Pre-Post Tension	☐ Steel Erection	
☐ Concrete	☐ HS Bolting	☐ Reinforcing Steel	☐ Welding	

Documents Referenced: The Wallace Group Proctor WG1493

Observations/Remarks:

Arrived on-site at Poland Dairy Horizon Organic Farm as requested by Lee Baggett to perform in-place density testing on soil placed and compacted for the bottom of an overflow containment basin located at the east side of an existing concrete containment basin. The silty sand and gravel soil used was from an on-site stockpile and had been compacted with a vibratory smooth drum roller.

Four density tests were taken at random locations across the compacted area of the basin. During the course of the testing, rock was encountered at approximately 4 to 6 inches below the compacted surface. All four tests met or exceeded the 95% compaction requirement. See attached page for locations and results.

☒ Report items comply ☐ Report items do not comply ☐ Report items comply with exceptions ☐ In Progress / Not complete

Acknowledged by: _____

Representing: _____

Subject to review and revision by Professional Staff

Roy W. Ruch

The Wallace Group, Inc. Representative *Signature*

The Wallace Group, Inc. Representative *Print Name*

541.382.4707 ph 62915 NE 18th St, Ste 1, Bend, OR 97701 541.383.8118 fax

NUCLEAR DENSITY FIELD FORM

wallaceGROUP
applied earth & environmental science

PROJECT NO. 10529-1
JOB NAME LEE BAGGETT ON CALL - POLAND DAIRY
DATE 4-1-15
TECHNICIAN R RUCH
TEST LOCATIONS SELECTED BY: R RUCH
COMPACTION CONT ☐ DENSITY TESTING ☒
REVIEWED BY: Mark V. Herbert DATE: 5/10/2015

RESULTS REPORTED TO
LEE BAGGETT

STANDARD COUNT
Density
Moisture
Troxler Gauge SN 37797

Test No.	Probe Depth, in.	Approximate Location	Depth below FSG (Ft)	Water, pcf	Water, %	Wet Density, pcf	Dry Density, pcf	Proctor No.	Lab Maximum Density, pcf	Optimum Water Content, %	Relative Compaction, %	Specified Compaction, %
1	4"	BOTTOM OF CONTAINMENT BASIN – N. AREA	0	11.0	11.3	108.7	97.7	1493	102.8	16.2	95	95
2	6"	" E. AREA	0	12.4	12.8	110.7	98.1				95	
3	4"	" S. AREA	0	13.2	13.3	112.1	98.9				96	
4	4"	" W. AREA	0	10.7	11.0	108.2	97.5				95	

Remarks:

541.382.4707 Phone
62915 NE 18th St, Ste 1 Bend, OR 97701
541.383.8118 Fax

anderson perry & associates, inc.

Project	Poland Dairy	Job No.: W8058-45 (111)
Client	Fazio Engineering	Date Reported: 12/20/04
Report of	Permeability Testing	
Report to	Fazio Engineering, Atten Jon Fazio, PO Box 246, Milton-Freewater, OR 97862	

SAMPLE IDENTIFICATION

On November 18, 12, 2004, your personnel delivered a soil sample to our laboratory. Your instructions were to perform moisture density relationship curve and remolded falling head permeability tests. All testing was performed in general accordance with applicable ASTM procedures.

TEST RESULTS

Sample Number	Maximum Density, pcf	Optimum Moisture,%	Percent of Maximum Remolded	Permeability inches / second
22078	105.5	17.3	95.0	1.84×10^{-8}

REMARKS

ANDERSON•PERRY & ASSOCIATES, INC.

By _____

Wayne L. Couture S.E.T.
Laboratory Manager

File No. W8058-45-81(Poland)

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Specific Discharge Calculations 9/21/2015

General Equation: v = k * (H+d)/d
Where:
v=specific discharge (ft3/ft2/day)
k= coefficient of permeability (ft/day)
H=depth of liquid (ft)
d=thickness of liner (ft)

Permeability Results

Sample	value	units	value	units	value	units
Native at 95%	4.67E-08	cm/sec	1.32E-04	ft/day	1.53E-09	ft/sec
H	5.50	feet maximum at deep end				
d	1/3	feet (assumed)				
v (initial)	2.32E-03	ft3/ft2/day	755.38	gallons/acre/day		
v (final after manure)	2.32E-04	ft3/ft2/day	75.54	gallons/acre/day		