R & R Dairy Bewley
Dave & Joe Rocha
05/03

LAND USE SUMMARY

Tract No.	Field No.	Land Use	Acres
37	1	Pasture	2.3
	2	Pasture	3.7
	3	Pasture	5.5
	4	Pasture	4.8
	5	Pasture	4.6
	6	Pasture	8.1
	7	Pasture	2.6
	8	Pasture	5.3
	9	Pasture	5.6
	10	Pasture	20.9
	11	Pasture	12.0
	12	Pasture	2.6
	13	Woodland	11.0
	F	Farmstead	8.1
		TOTAL	**97.1**

SUMMARY

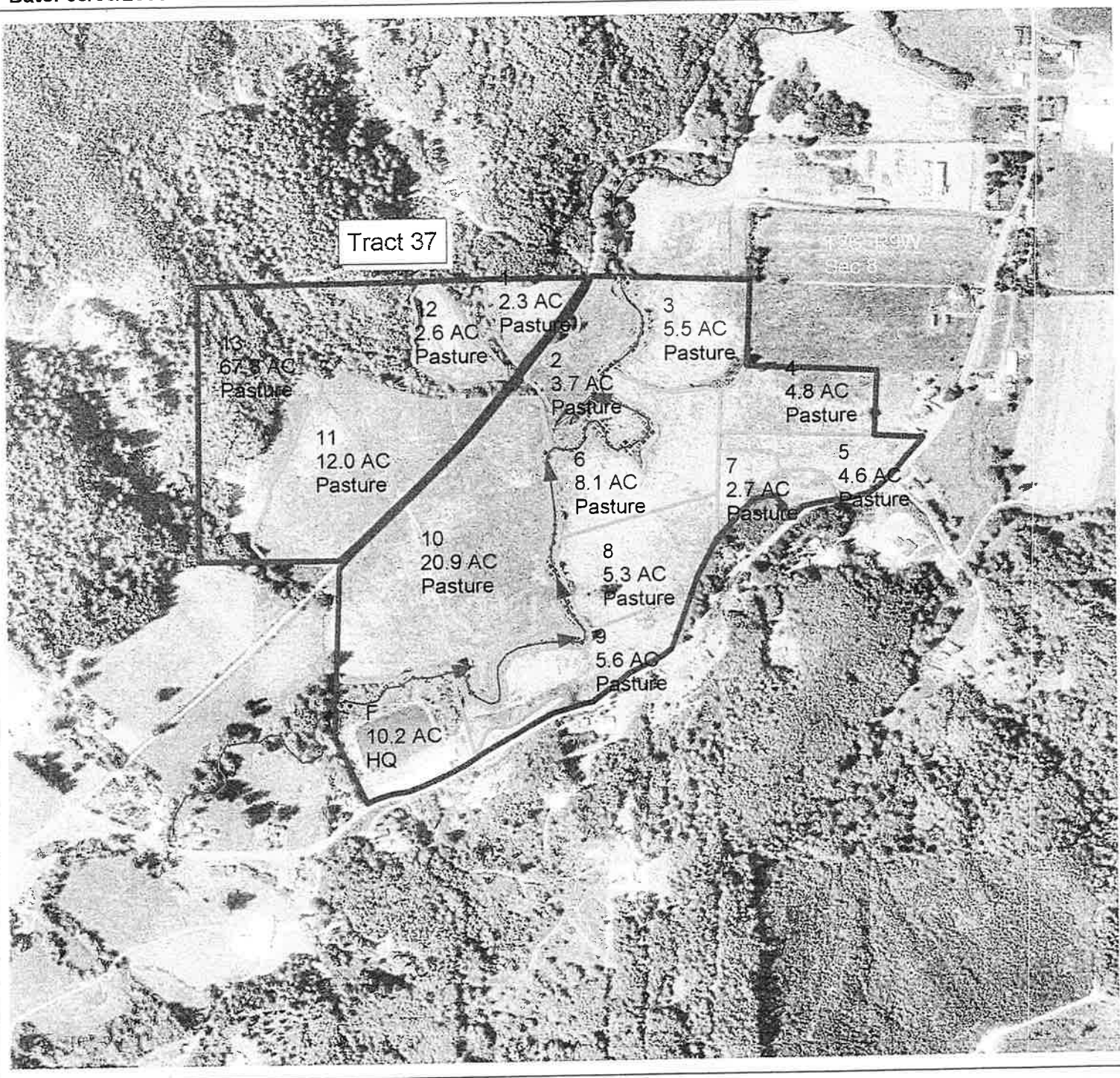
Pasture		78.0
Woodland		11.0
Farmstead		8.1
	TOTAL	**97.1**

C nservation Plan Ma

Mr. David Rocha
Heifer Operation
Tillamook County SWCD

Tillamook. OR
USDA-NRCS

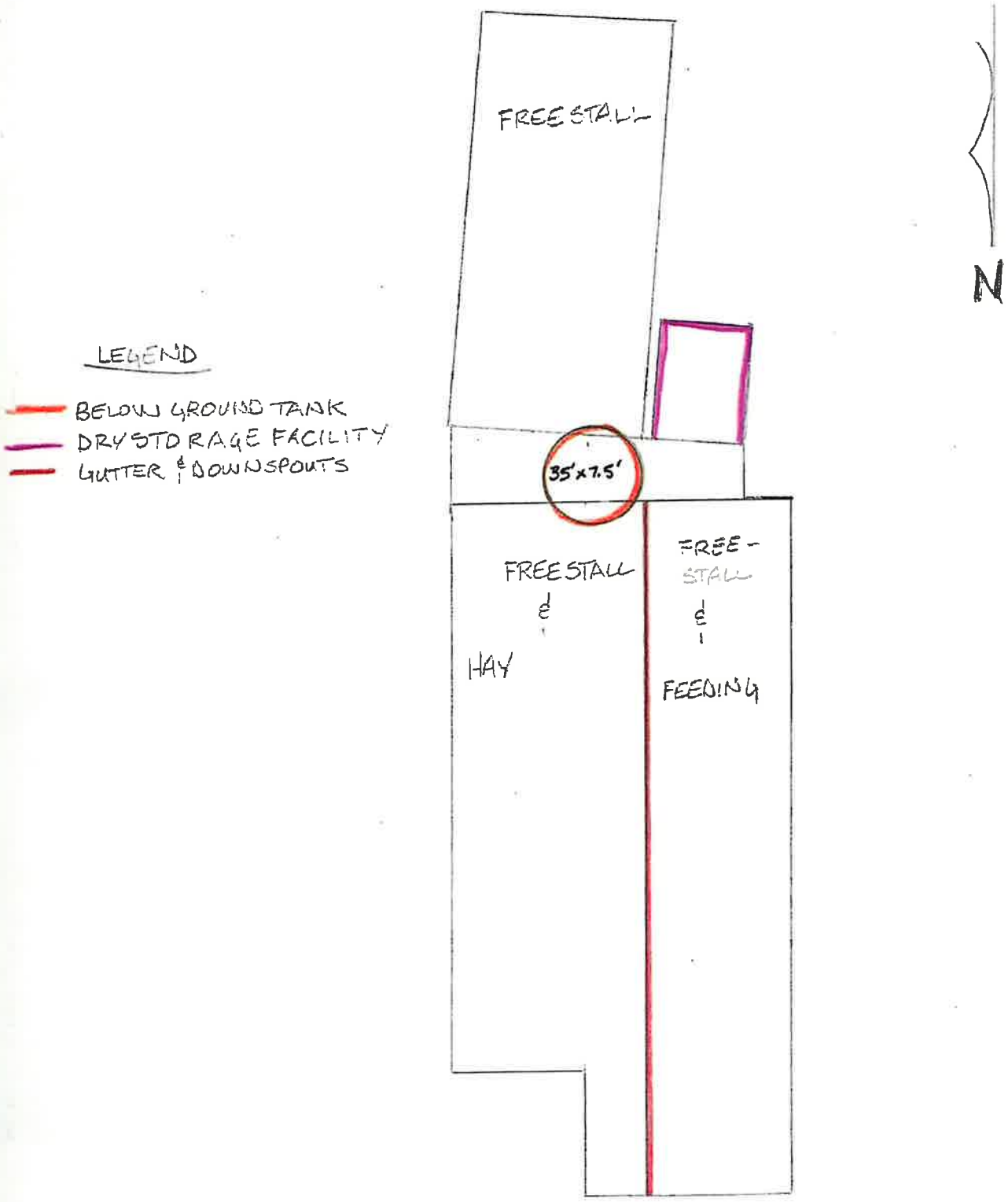
Date: 05/06/2003



OREGON R&R DAIRY

KWP 06-04-03

FARMSTEAD LAYOUT (HEIFER OPERATION)



SCALE: 1" = 50'

8330 is what we have from on Report

R & R Dairy
Dave & Joe Rocha
05/03

BUSINESS NARRATIVE

This operation is a Jersey heifer operation. It is located within the Tillamook River Watershed at 8385 Bewley Creek Road, Tillamook, Oregon. There will be 248-1,000 lb. units housed at the operation. The heifers will be confined for 151 days and on pasture for 214 days.

The operation consists of 75.4 acres of owned pastureland. Solid and liquid wastes from the operation will be applied to the pasture fields. All fields are out of the 100 year flood plain. Solid manure is transported and applied to the pasture units by tractor and a manure spreader. The liquid wastes is transported and applied to the pasture units with a tractor and tank wagon. The target yield is 6 tons of dry mater per acre per year. The pastures are in fair to good condition. The primary forage species are fescue, rye, and orchard grasses.

The wastes will be handled 98% solids and 2% liquids. The existing waste storage facilities consists of a below ground liquid waste tank and a solid manure storage facility. The 35' x 7.5' below ground liquid waste tank will store the liquid wastes from the 248-1,000 lb. units for 164 days. The 34' x 44' x 8' solid manure storage facility can store the solid manure from the 248-1,000 lb. units for 36 days. When climatic and soil conditions are not favorable and the solid manure storage facility is full, the solid manure will be transported to the compost facility at the Port of Tillamook. Roof water is diverted away from manure accumulation areas. All conservation practices installed will be maintained in accordance with the enclosed "Operation and Maintenance Worksheets.

Soils where manure will be applied are: Astoria, Brenner, Hebo, Knappa, Nehalem, and Nestucca silt loam soils. The Brenner , Nestucca, and Hebo silt loam soils are poorly drain. The Astoria, Knappa, and Nehalem silt loam soils are well drained.

Robert A. Pedersen
Basin Team Leader

Conservation Plan

Mr. Dave & Joe Rocha
570 3rd Street
Tillamook, OR 97141

Objective(s) To develop and implement a comprehensive nutrient management plan, that when implemented, the operation will be in compliance with ODA's CAFO rules, regulations, and permit conditions.

Farmstead

The major land use is the farmstead. The animal confinement buildings and the waste storage facilities are located within this land use. The operation is located in the lower Bewley Creek Watershed, a tributary to the Tillamook River Watershed. The soils are well drained. The average annual precipitation is 90 inches. There is a medium risk of manure runoff from the livestock confinement area. This Resource Management System will prevent manure runoff from the animal confimenent area.

Tract: 37

WASTE MANAGEMENT SYSTEM

A waste management system consisting of structural and vegetative practices for the collection, transfer, storage and land application of waste generated from the confined animal feeding operation will be installed, maintained, and managed. The identified practices will allow the management of the wastes during periods when direct application may contribute to surface and/or groundwater degradation. Conservation practices installed will be operated and maintained in accordance with the enclosed "OPERATION AND MAINTENANCE WORKSHEETS". Practices planned will be installed in accordance with the Practice Specifications provided.

Field	Planned Amount	Month	Year	Applied Amount	Date
F	1.0 no.	10	2004		
Total:	1.0 no.				

FILTER STRIP

A grass filter strip adjacent to the open water course will be established and maintained as part of the waste management plan to prevent manure from entering the open water course.
The filter strip will be 35 feet wide. The filter strip will be established in accordance with the enclosed NRCS Filter Strip Specification Sheet Code 393.

Field	Planned Amount	Month	Year	Applied Amount	Date
F	10.2 ac.	9	2003		
Total:	10.2 ac.				

WASTE STORAGE FACILITY (Below Ground Liquid Manure Tank)

A below ground liquid manure tank exists.
A 35' x 7.5' below ground liquid waste tank was installed. This facility will provide 164 days of liquid waste storage for the 248-1,000 lb. units.

Field	Planned Amount	Month	Year	Applied Amount	Date
F	7,216.0 cf.	7	1972	7,216.0 cf.	Sep-15-1972
Total:	7,216.0 cf.			7,216.0 cf.	

WASTE STORAGE FACILITY (Solid Manure Storage Facility)

A solid manure storage f ty has been installed.

A 33.5' x 44' x 8' solid manure storage facility was installed. This facility will provide 36 days of solid manure storage for the 248-1,000 lb. units.

Field	Planned Amount	Month	Year	Applied Amount	Date
F	5,984.0 cf.	5	2003	5,984.0 cf.	May-22-2003
Total:	5,984.0 cf.			5,984.0 cf.	

UNDERGROUND OUTLET (6 inch pipe)

A 6-inch underground PVC nonperforated pipe will be installed to outlet gutter downspouts in an area free of manure.

Field	Planned Amount	Month	Year	Applied Amount	Date
F	1,000.0 ft.	7	2004		
Total:	1,000.0 ft.				

ROOF RUNOFF MANAGEMENT (Gutters & Downspouts)

Gutters and downspouts will be installed on all existing animal confinement buildings that do not have adequate guttering.

Field	Planned Amount	Month	Year	Applied Amount	Date
F	1,200.0 ft.	7	2004		
Total:	1,200.0 ft.				

Pasture

The major land use is pastures. The grazing lands support a heifer operation. The landscape is the Bewley Creek Watershed, a tributaty to the Tillamook River Watershed. The soils vary from poorly to well drained. The annual precipitation is 90 inches. The pastures are in fair to good condition. The target yield is 6 tons of dry matter per acre per year. There is a moderate risk of manure runoff from waste application to the pasture fields when the soil and climatic conditions are not favorable. This Resourse Management System will improve the forage production and prevent surface and/or groundwater degradation associated with manure applications to the pasture fields.

Tract: 37

FILTER STRIP

A grass filter strip adjacent to the open water course will be established and maintained as part of the waste management plan to prevent manure from entering the open water course.

The filter strip will be 35 feet wide. The filter strip will be established in accordance with the enclosed NRCS Filter Strip Specification Sheet Code 393.

Field	Planned Amount	Month	Year	Applied Amount	Date
2	0.5 ac.	9	2003		
3	0.4 ac.	9	2003		
6	1.2 ac.	9	2003		
8	0.4 ac.	9	2003		
9	0.8 ac.	9	2003		
10	1.9 ac.	9	2003		
Total:	5.2 ac.				

NUTRIENT MANAGEMENT

Manure will be used for ge production. Soil tests will be used to d mine rates of application. Nutrient management will be implemented in accordance with the enclosed Nutrient Management Specification Sheet Code 590.

Field	Planned Amount	Month	Year	Applied Amount	Date
1	2.3 ac.	9	2004-2013		
2	3.7 ac.	9	2004-2013		
3	5.5 ac.	9	2004-2013		
4	4.8 ac.	9	2004-2013		
5	4.6 ac.	9	2004-2013		
6	8.1 ac.	9	2004-2013		
7	2.6 ac.	9	2004-2013		
8	5.3 ac.	9	2004-2013		
9	5.6 ac.	9	2004-2013		
10	20.9 ac.	9	2004-2013		
11	12.0 ac.	9	2004-2013		
12	2.6 ac.	9	2003-2013		
Total:	78.0 ac.				

SUBSURFACE DRAIN

A tile drainage system will be installed to manage the water table so manure can be applied on the pastures earlier in the spring and later in the fall without manure runoff occurring.

Field	Planned Amount	Month	Year	Applied Amount	Date
10	4,300.0 ft.	3	1983	4,200.0 ft.	Sep-12-1983
11	300.0 ft.	3	1982	452.0 ft.	May-12-1982
11	900.0 ft.	3	1983	1,381.0 ft.	May-12-1982
Total:	5,500.0 ft.			6,033.0 ft.	

WASTE UTILIZATION

Manure will be applied to the pastures in accordance with the enclosed Waste Utilization Conservation Practice Jobsheet(633 OR-JS).

Field	Planned Amount	Month	Year	Applied Amount	Date
1	2.3 ac.	9	2004-2013		
2	3.7 ac.	9	2004-2013		
3	5.5 ac.	9	2004-2013		
4	4.8 ac.	9	2004-2013		
5	4.6 ac.	9	2004-2013		
6	8.1 ac.	9	2004-2013		
7	2.6 ac.	9	2004-2013		
8	5.3 ac.	9	2004-2013		
9	5.6 ac.	9	2004-2013		
10	20.9 ac.	9	2004-2013		
11	12.0 ac.	9	2004-2013		
12	2.6 ac.	9	2004-2013		
Total:	78.0 ac.				

PRESCRIBED GRAZING

Pastures will be manage[illegible] accordance with the enclosed Prescribed [illegible]zing Specification Sheet Code 528A.

Field	Planned Amount	Month	Year	Applied Amount	Date
1	2.3 ac.	9	2003-2012		
2	3.7 ac.	9	2003-2012		
3	5.5 ac.	9	2003-2012		
4	4.8 ac.	9	2003-2012		
5	4.6 ac.	9	2003-2012		
6	8.1 ac.	7	2003-2012		
7	2.6 ac.	9	2003-2012		
8	5.3 ac.	9	2003-2012		
9	5.6 ac.	9	2003-2012		
10	20.9 ac.	9	2003-2012		
11	12.0 ac.	9	2003-2012		
12	2.6 ac.	9	2003-2012		
Total:	78.0 ac.				

CERTIFICATION OF PARTICIPANTS

Joe Rocha 10-1-03

Mr. Dave & Joe Rocha — Date

CERTIFICATION OF:

Basin Team Leader

Robert A. Pedersen — Date

CONSERVATION DISTRICT

Barbara Bosch - Secretary 10-1-03

Tillamook County SWCD — Date

NONDISCRIMINATION STATEMENT

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, sex, religion, age, disability, political beliefs, sexual orientation, or marital or family status. (Not all prohibited bases apply to all programs.) Persons with disabilities who require alternative means for communication of program information (Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at 202-720-2600 (voice and TDD).

To file a complaint of discrimination, write USDA, Director, Office of Civil Rights, Room 326W, Whitten Building, 14th and Independence Avenue, SW, Washington, DC 20250-9410 or call (202) 720-5964 (voice and TDD). USDA is an equal opportunity provider and employer.

U.S. DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

OPERATION AND MAINTENANCE WORKSHEET

WASTE STORAGE FACILITY (SOLID MANURE STORAGE FACILITY) CODE 313

For: Landowner/Operator R & R Dairy

Job Location: T 2S; R 9W;Sec 18

County Tillamook SWCD Tillamook Farm/Tract No. T-37

Prepared By Pedersen Date 05/03

A 33.5' x 44' x 8' solid manure storage facility

Operation and Maintenance Items

A properly operated and maintained waste storage structure is an asset to your farm. This waste storage structure was designed and installed for temporary storage of animal wastes. The estimated life span of this installation is at least 10 years. If at any time a structure is taken out of service, the Natural Resources Division of the Oregon Department of Agriculture should be contacted for guidance in decommissioning the structure to avoid environmental concerns. The 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. A good operation and maintenance plan includes:

⇒ Do not allow equipment that exceeds the design loading to operate within 20 feet of the structure

⇒ Immediately repair any vandalism, vehicular or livestock damage to the structure, earthen areas surrounding the structure, or any appurtenances.

⇒ Storage facility will be empty by October 1st to begin winter storage.

⇒ During de-watering of the structure, ensure that waste is spread at minimum rates in areas where crops are grown, spread waste no closer than 50 feet from open watercourses during the winter months and apply no manure within 35 feet of an open watercourse during the summer months. Avoid applying waste during heavy rainfall events.

⇒ Roofs of the solid manure storage facilities will be inspected annually.

⇒ All roof sections that are rusted and leaking will be repaired and/or replaced.

⇒ Loose roof sections on the solid manure storage facilities will be secured.

⇒ Broken trusses, beams, poles, gutters and downspouts will be repaired or replaced on the solid waste storage facilities.

U.S. DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

OPERATION AND MAINTENANCE WORKSHEET

WASTE STORAGE FACILITY
CODE 313

For: Landowner/Operator R & R Dairy.

Job Location: T 2S; R 9W; Sec 18;

County Tillamook SWCD Tillamook Farm/Tract No. T-37

Prepared By Pedersen Date 05/03

35' x 7.5' circular below ground liquid waste tank

Operation and Maintenance Items

A properly operated and maintained waste storage structure is an asset to your farm. This waste storage structure was designed and installed for temporary storage of animal wastes. The estimated life span of this installation is at least 10 years. If at any time this structure is taken out of service, the Natural Resources Division of the Oregon Department of Agriculture should be contacted for guidance in decommissioning the structure to avoid environmental concerns. The 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. A good operation and maintenance plan includes:

⇒ Do not allow equipment that exceeds the design loading to operate within 20 feet of the structure.

⇒ **WARNING: ENTERING AN UNVENTILATED TANK IS EXTEREMELY "HAZARDOUS" !** Do not allow human entry into the enclosed structure without safety equipment that includes ladders and breathing apparatus.

⇒ Continually maintain all pumps, agitators, piping, valves and all other electrical and mechanical equipment in good operating condition by following the manufacturer's recommendations.

⇒ Continually maintain grounding rods and wiring for all electrical equipment in good condition.

⇒ Facilities will be empty by October 1st to begin winter storage.

⇒ A one foot free board will be maintained to prevent spillage.

⇒ The waste storage facility will be inspected weekly to ensure structural integrity.

⇒ Perform daily inspections of waterlines, including drinking water or cooling water lines. Repair leaking lines immediately to prevent excess water from entering the waste storage system.

⇒ Depth markers are installed in the facility and maintained to assure the maximum volume will be maintained under normal operating conditions allowing for the volume necessary to contain the 25-year, 24-hour rainfall event.

⇒ The depth of all liquid manure will be recorded during each week's inspection.

⇒ Immediately repair any vandalism, vehicular or livestock damage to the structure, earthen areas surrounding the structure, or any appurtenances.

⇒ Pump out the facility within the first two years following construction to check for structural damage. If damage is noted, immediately seek a qualified engineer to assess the situation. Thereafter, it should be pumped out at least every five years to check for damages, remove gravel, rocks, sand, wire and other debris to maintain storage capacity.

⇒ Immediately remove all foreign debris within the structure that may cause damage to pumps and agitator.

⇒ During de-watering of the structure, ensure that waste is spread at minimum rates in areas where crops are grown, spread waste no closer than 50 feet from open watercourses during the winter months and apply no manure within 35 feet of an open watercourse during the summer months. Avoid applying waste during heavy rainfall events.

⇒ Dead animals will not be disposed of in the liquid waste storage facility.

U.S. DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

OPERATION AND MAINTENANCE WORKSHEET
ROOF RUNOFF MANAGEMENT

CODE 558

For: Landowner/Operator R & R Dairy

Job Location: T 2S; R 9W; Sec.18

County Tillamook SWCD Tillamook Farm/Tract No. T 37

Prepared By Pedersen Date 05/03

Gutters and Downspouts

Operation and Maintenance Items

Properly operated and maintained roof runoff facilities are an asset to the farm. Roof runoff facilities were designed and installed to control roof runoff. Estimated life span of this installation is at least 10 years. Facility life can be assured and usually increased by developing and carrying out a good operation and maintenance program.

This practice will require periodic maintenance and may require operational items to maintain satisfactory performance. A good operation and maintenance plan includes:

⇒ Perform weekly inspections of gutters, downspouts and above ground pipelines, and appurtenances for proper operation. Repair or replace if needed.

⇒ Periodically remove debris from gutters, downspouts and outlet facilities.

⇒ Protect downspouts from damage by livestock and equipment. Repair or replace damaged components as needed.

⇒ Keep gutters, downspouts, conveyance pipelines and ditches and appurtenances in good operating condition.

U.S. DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

OPERATION AND MAINTENANCE WORKSHEET

MANURE PUMP
CODE 634

Landowner/Operator: R & R Dairy

Job Location: T 2S; R 9W. Sec. 18

County Tillamook SWCD Tillamook Tract No. T-37

Prepared By: Pedersen Date 05/03

Operation and Maintenance Items

A properly operated and maintained manure pump is an asset to your farm. The manure pump was designed and installed transfer liquid waste. The estimated life span of this installation is at least 10 years. The life of the manure pump 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. A good operation and maintenance plan includes:

⇒ Preventive maintenance will be in accordance with the manufacturer's recommendations.

⇒ Periodically examine the pump for proper operation. Clean debris from the propeller, and promptly replace any defective or damaged parts.

⇒ Periodically clean and oil as needed to increase the life expectancy of the pump.

⇒ Immediately repair any vandalism or livestock damage. Do not allow livestock near equipment during operation.

U.S. DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

OPERATION AND MAINTENANCE WORKSHEET

MANURE TANK AGITATOR
CODE 634

Landowner/Operator: R & R Dairy Job Location: T 2S; R 9W; Sec. 18

County Tillamook SWCD Tillamook Tract No. T-37

Prepared By: Pedersen Date 05/03

Operation and Maintenance Items

A properly operated and maintained manure tank agitator is an asset to your farm. The manure agitator was designed and installed to stir the liquid waste and keep the solids in suspension so solid manure will not buildup in the bottom of the tank and reduce the designed storage capacity. The estimated life span of this installation is at least 10 years. The life of the manure agitator 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. A good operation and maintenance plan includes:

⇒ Preventive maintenance will be in accordance with the manufacturer's recommendations.

⇒ Periodically examine the agitator for proper operation. Clean debris from the propeller, and promply replace any defective or damaged parts.

⇒ Remove the agitator from the manure tank and periodically clean and oil as needed to increase the life expectancy of the agitator.

⇒ Immediately repair any vandalism or livestock damage. Do not allow livestock near equipment during operation.

U.S. DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

OPERATION AND MAINTENCE WORKSHEET

UNDERGROUND OUTLETS
Code 620

For: Landowner/Operator R & R Dairy

Job Location: T 2S; R 9W; Sec. 18

County Tillamook SWCD Tillamook Farm/Tract No. T-37

Prepared By Pedersen Date 05/03

Gutter Outlet

Operation and Maintenance Items

Properly operated and maintained under ground outlet for the guttering system is an asset to the farm. This outlet was designed and installed to convey roof runoff in an underground pipeline to where it can be released without causing erosion. The estimated life span of this installation is at least 10 years. The life of the practice can be assured and usually increased by developing and carrying out a good operation and maintenance program.

This practice will require periodic maintenance and may require operational items to maintain satisfactory performance. A good operation and maintenance plan includes:

⇒ Check all above ground connections, rodent guards, inlets and outlets to make sure they are functioning properly.

⇒ Maintain design depth of cover on all pipelines.

⇒ Avoid operation of tillage and sub-soiling equipment that could damage any component of the gutter outlet system.

⇒ Remove all foreign debris that hinders the gutter system operation.

⇒ Limit traffic over pipeline to designated sections that were designated for traffic loads.

⇒ Maintain vigorous growth of vegetative coverings. This includes reseeding, fertilization and application of herbicides when necessary. Periodic mowing may also be needed to control growth.

⇒ Eradicate of otherwise remove all rodents or burrowing animals. Immediately repair any damage caused by their activity.

⇒ Immediately repair any vandalism, vehicular livestock damage.

U.S. DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

OPERATION AND MAINTENANCE WORKSHEET

SUBSURFACE DRAINAGE
CODE 606

For: Landowner/Operator R & R Dairy

Job Location: T 2S; R 9W; Sec.18

County Tillamook SWCD Tillamook Farm/Tract No. T-37

Prepared By Pedersen Date 05/03

Operation and Maintenance Items

Properly operated and maintain subsurface drainage system is an asset to the farm. The drainage system was designed and installed to remove excess subsurface water with a system of buried conduits. The estimated life span of this installation is at least 10 years. The life of the practice can be assured and usually increased by developing and carrying out a good operation and maintenance program.

This practice will require periodic maintenance and may require operational items to maintain satisfactory performance. A good operation and maintenance plan includes:

⇒ Maintain the designed depth of cover. All settlement or cracks in the soil should be investigated to determine the cause and immediately repaired.

⇒ Avoid travel by heavy equipment over drain-lines when the soil is saturated except at designated crossings. Avoid travel over pipelines by tillage equipment when the soil is saturated. Limit traffic to sections that were designed for traffic loads.

⇒ Remove all foreign debris and trash that hinders system operation.

⇒ Immediately remove any obstructions or blockage of, trash racks, drain inlets or drain outlets.

⇒ Maintain all outlets, rodent guards, inlets and access man-holes in good operating condition.

⇒ Eradicate or otherwise remove all rodents and/or burrowing animals that have or can potentially damage any part of the system. Immediately repair any damage caused by their activity.

⇒ Immediately repair any vandalism, vehicular or livestock damage to any outlets and appurtenances.

U.S. DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

OPERATION AND MAINTENANCE WORKSHEET
IRRIGATION WATER CONVEYANCE

HIGH-PRESSURE UNDERGROUND, PLASTIC PIPELINE
CODE 430-DD

Landowner/Operator R & R Dairy Job Location: T 2S; R 9W; Sec 18

County Tillamook SWCD Tillamook Tract No. T-37

Prepared By Pedersen Date 05/03

Buried Manure Mainline

Operation and Maintenance Items

A properly operated and maintained waste application system is an asset to your farm. This waste application system was designed and installed for applying liquid wastes to the pasture and hayland fields. The estimated life span of this installation is at least 20 years. The 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. A good operation and maintenance plan includes:

⇒ Check to make sure all values and air vents are set at the proper operating condition so they may provide protection to the pipeline. Remove foreign materials and vegetation that can interfere with proper valve operation.

⇒ Maintain the designed depth of cover over the pipeline.

⇒ Limit traffic over the pipeline to designated sections that were designed for traffic loads.

⇒ Avoid travel over pipelines by tillage equipment when the soil is saturated.

⇒ Avoid any sub-soiling operation that may disturb the pipeline.

⇒ Maintain a vigorous growth of vegetative covering. This includes reseeding, fertilization and application of herbicides when necessary. Periodic mowing may also be needed to control height of vegetation.

⇒ Eradicate or otherwise remove all rodents or burrowing animals that can potentially damage or displace the pipe. Immediately repair any damages caused by their activity.

U.S. DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

OPERATION AND MAINTENANCE WORKSHEET

PRESCRIBED GRAZING
CODE 633

For: Landowner/Operator R & R Dairy

Job Location: T2S; R 9W; Sec.18

County Tillamook SWCD Tillamook Farm/Tract No. T-37

Prepared By Pedersen Date 05/03

Operation and Maintenance Items

Prescribed Grazing can provide economic and resource benefits if applied properly which are assets to the heifer operation. Proper Prescribed Grazing requires certain operational procedures to be followed and evaluated on an annual basis.

⇒ Pastures are reestablished when forage production falls below planned yield threshold.

⇒ A rotational grazing system is used to maintain plant vigor.

⇒ Pastures are clipped and dragged during the growing season to maintain plant vigor and spread the livestock droppings to prevent grass from becoming rank.

⇒ Manure and commercial fertilizer applied in accordance with soil and forage tests.

⇒ Pasture weeds are controlled.

⇒ Pasture grasses are not grazed below 2 inches during the growing season

⇒ Livestock are removed when the soils become wet in the fall.

U.S. DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

OPERATION AND MAINTENANCE WORKSHEET

NUTRIENT MANAGEMENT
CODE 590

For: Landowner/Operator R & R Dairy

Job Location: T2S; R 9W; Sec 18;

County Tillamook SWCD Tillamook Farm/Tract No. T-37

Prepared By Pedersen Date 05/03

Operation and Maintenance Items

Waste Utilization can provide economic and resource benefits if applied properly which are assets to the dairy operation. Proper waste utilization requires certain operational procedures to be followed and evaluated on an annual basis.

⇒ Manure application equipment is calibrated at least once per year to ensure uniform distribution and accurate application rates.

⇒ Records are maintained of manure applications.

⇒ Manure application equipment is cleaned up and residual material from the equipment is disposed of properly and in a place where surface runoff does not occur.

⇒ Nutrient management plans are reviewed annually and adjustments are made as needed.

⇒ Unnecessary exposure to manure is avoided. Protective clothing is worn when necessary.

U.S. DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

OPERATION AND MAINTENANCE WORKSHEET

WASTE UTILIZATION
CODE 633

For: Landowner/Operator R & R Dairy

Job Location: T 2S; R 9W;Sec. 18

County Tillamook SWCD Tillamook Farm/Tract No. T-37

Prepared By Pedersen Date 05/03

Operation and Maintenance Items

Waste Utilization can provide economic and resource benefits if applied properly which are assets to the dairy operation. Proper waste utilization requires certain operational procedures to be followed and evaluated on an annual basis.

⇒ Manure application equipment is calibrated at least once per year to ensure uniform distribution and accurate application rates.

⇒ Records are maintained of manure applications.

⇒ Manure application equipment is cleaned up and residual material from the equipment is disposed of properly and in a place where surface runoff does not occur.

⇒ Nutrient management plans are reviewed annually and adjustments are made as needed.

⇒ Unnecessary exposure to manure is avoided. Protective clothing is worn when necessary.

U.S. DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

OPERATION AND MAINTENANCE WORKSHEET

FILTER STRIP

CODE 393

For: Landowner/Operator R & R Dairy

Job Location: T 2S; R 9W; Sec.18

County Tillamook SWCD Tillamook Farm/Tract No. T-37

Prepared By Pedersen Date 05/03

Operation and Maintenance Items

A properly operated and maintained vegetated filter strip is an asset to your farm. This vegetative filter strip was designed and installed to remove sediment and pollutants from runoff. The estimated life span of this practice is at least 10 years. The life of this practice 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 maintenance and may also require operation items to maintain satisfactory performance. Some recommendations to assist you develop a good operation and maintenance program:

⇒ Maintain vigorous growth of vegetative covering. This includes reseeding, commercial fertilization and application of herbicides when necessary. Periodic mowing or grazing may also be needed to control height.

⇒ Where the filter strip is used to trap nutrients, periodic grazing or mechanical harvesting and removal of vegetation is needed.

⇒ Remove all foreign debris that hinders system operation.

⇒ Limit the traffic and do not use as a roadway.

⇒ Limit livestock usage to vegetative growth periods when they will not damage vegetative root system or compact the soil.

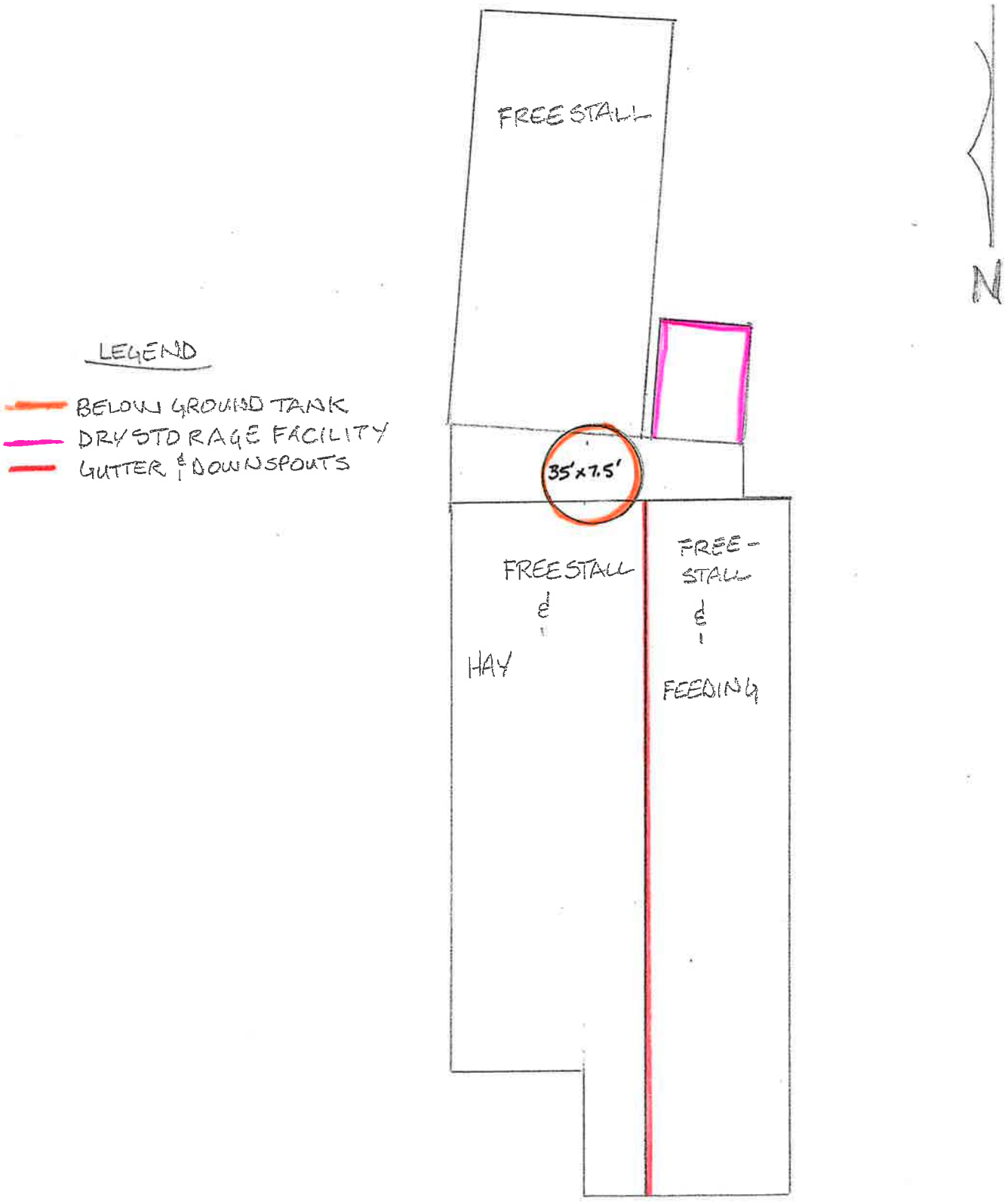
⇒ Immediately repair any vandalism, vehicular, or livestock damage.

⇒ Eradicate or remove all rodents or burrowing animals. Immediately repair any damage caused by their activity.

OREGON R&R DAIRY

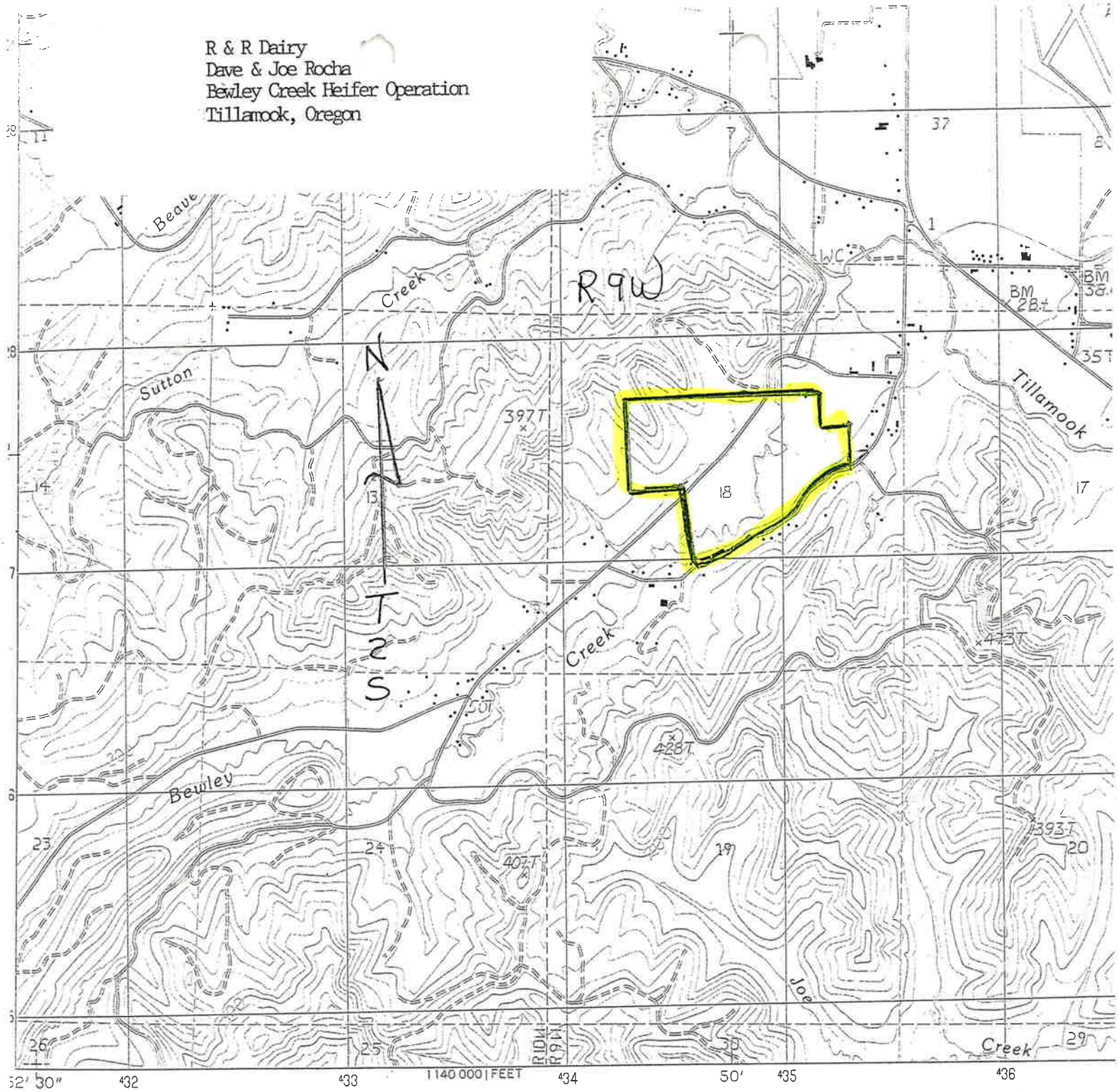
KWP 06-04-03

FARMSTEAD LAYOUT (HEIFER OPERATION)



SCALE: 1" = 50'

R & R Dairy
Dave & Joe Rocha
Bewley Creek Heifer Operation
Tillamook, Oregon



PRODUCED BY THE UNITED STATES GEOLOGICAL SURVEY
CONTROL BY .....USGS, NOS/NOAA, USCE
COMPILED FROM AERIAL PHOTOGRAPHS TAKEN 1980
FIELD CHECKED .....1982. MAP EDITED 1985
PROJECTION ..... LAMBERT CONFORMAL CONIC
GRID: 1000-METER UNIVERSAL TRANSVERSE MERCATOR .....ZONE 10
10,000-FOOT STATE GRID TICKS .....OREGON, NORTH ZONE
UTM GRID DECLINATION .....0°35' WEST
1980 MAGNETIC NORTH DECLINATION ..... 20° EAST
VERTICAL DATUM ... NATIONAL GEODETIC VERTICAL DATUM OF 1929
HORIZONTAL DATUM ..... 1927 NORTH AMERICAN DATUM
To place on the predicted North American Datum of 1983, move the projection lines as shown by dashed corner ticks (24 meters north / 97 meters east)
There may be private inholdings within the boundaries of any Federal and State Reservations shown on this map
No distinction made between houses, barns, and other buildings
Gray tint indicates area in which selected buildings are shown

SCALE 1:2

NORTH

1 .5 0 KILOMETER
1000 0 METERS
1 .5 0 MILES
1000 0 1000 2000 3000 4000 5 FEET

PROVISIONAL MAP
Produced from original manuscript drawings. Information shown as of date of photography.

CONTOUR INTERV
SUPPLEMENTARY CONTOUR
CONTROL ELEVATIONS SHOWN TO
OTHER ELEVATIONS SHOWN TO

To convert meters to feet m
To convert feet to meters m

SHORELINE SHOWN REPRESENTS THE APPRO
THE MEAN RANGE OF TIDE IS A

THIS MAP COMPLIES WITH NATIONAL
FOR SALE BY U. S. GEOLOGICAL SURVEY, DENVER, C

U. S. DEPARTMENT OF AGRICULTURE

SCS-CPA-15
(3-88)

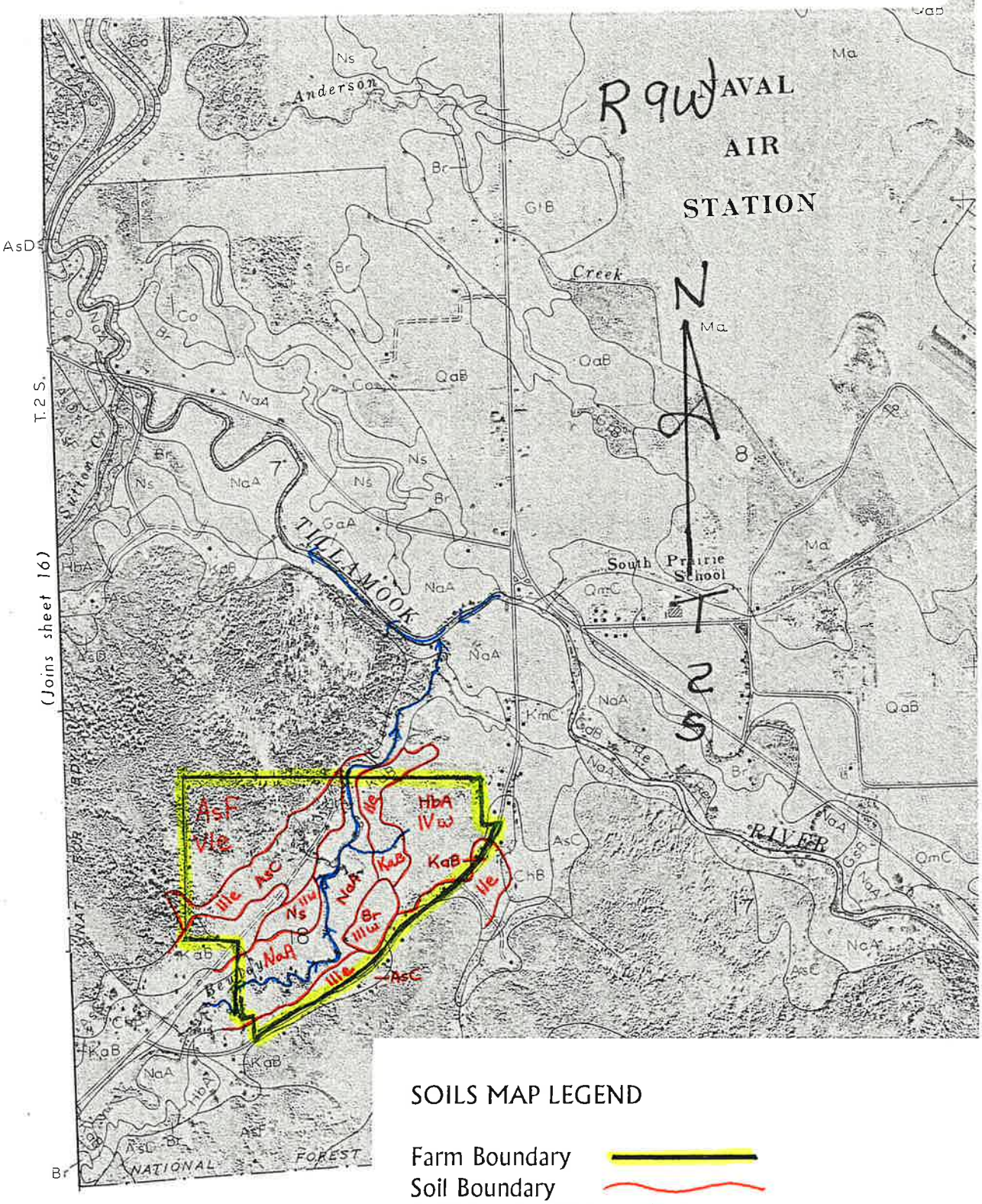
SOIL MAP

Owner R & R Daairy Operator Dave & Joe Rocha

County Tillamook State Oregon

Soil survey sheet (s) or code nos. 17 Approximate scale 1:20000

Prepared by U. S. Department of Agriculture, Soil Conservation Service cooperating with Tillamook County Soil & Water Conservation District



SOILS MAP LEGEND

Farm Boundary

Soil Boundary

Soil Mapping Unit HbA

Soil Capability Unit IVw

Open Water Course

R & R Dairy
Dave & Joe Rocha
05/03

SOIL DESCRIPTIONS

AsC - Astoria silt loam, 3-12% slopes, consist of well drained, clayey soils. It is over 60 inches deep and occurs on footslopes and terraces. Permeability and runoff are both moderate. Water erosion is a potential hazard. The available water capacity is 9-12 inches. The effective rooting depth is more than 60 inches. The Natural Resources Conservation Service (NRCS) capability classification is IIIe. These soils are suited for use as pastureland.

AsF - Astoria silt loam, 20-40% slopes, are well drained, silty loam clay soils. The erosion hazard is moderate. Runoff is medium. NRCS capability classification is VIe because of erosion. Permeability is moderate. This soil occupies the steep lower sloped areas of the Coast Range. Available water holding capacity is 11 to 15 inches. Effective rooting depth is greater than 60 inches. These soils are used primarily for timber production.

Br - Brenner silt loams are poorly drained, strongly acid soils. These soils are on bottomlands in the lowest part of the floodplains. The erosion hazard is slight. Permeability is slow. Runoff is slow to ponded. NRCS capability classification is IIIw because of poor drainage. Available water holding capacity is 8.5 to 9.5 inches. Soils are well suited for pastures.

HbA - Hebo silt loam is a poorly drained soil formed in alluvium on terraces. Slopes are 0-3%. Permeability is very slow. The runoff rate is slow. Erosion hazard is slight. The surface and subsoil are both dark gray silty clays with an effective rooting depth of less that 20 inches. High water tables influence root depths. Available water holding capacity is 8-11 inches. NRCS capability classification is IVw because of wetness. Hebo soils are primarily used for pastures.

KaB - Knappa silt loam, 0-7% slopes, are very deep, well drained soils. The erosion hazard is slight. Permeability is moderate. NRCS capability classification is IIc because of climate. Effective rooting depth is more than 60 inches. Available water holding capacity is 10 to 12 inches. Soils are well suited for pasturelands. Should they be used for woodland, site indexes are 170 for Douglas Fir. Logging equipment limitations are moderate.

NaA - Nehalem silt loam, 0-3% slopes, are well to moderately well drained soils. These occupy level to gently undulating river floodplains. The erosion hazard is slight. Permeability is moderate. Runoff is slow. NRCS capability classification is IIc due to climate. Effective rooting depth is greater than 60 inches. Available water holding capacity is 11 to 12.5 inches. Nehalem soils are excellent for pastures. Manure application is restricted when flood potential is high.

Ns - Nestucca silt loams are somewhat poorly drained soils located on stream bottoms with shallow swales and depressions. The erosion hazard is slight. Permeability is moderately slow. NRCS capability classification is IIw because of poor drainage. Effective rooting depth is limited be a seasonal water table at 0-20 inches. Available water holding capacity is 11.5 to 12.5 inches. Soils are well suited for pastures. However, animal waste application is limited unless adequately drained during the wet season.

SOIL INTERPRETATIONS RECORD

AsC ASTORIA SILT LOAM, 3 TO 12 PERCENT SLOPES

THE ASTORIA SERIES CONSISTS OF WELL DRAINED SOILS FORMED IN COLLUVIUM WEATHERED FROM SEDIMENTARY ROCK IN FOOTHILL AREAS. THE SURFACE LAYER IS VERY DARK GRAYISH BROWN SILT LOAM ABOUT 19 INCHES THICK. THE SUBSOIL IS DARK YELLOWISH [illegible] SILTY CLAY LOAM ABOUT 31 INCHES THICK. THE SUBSTRATUM IS WEATHERED SEDIMENTARY ROCK AT ABOUT 50 INCHES. EVATIONS ARE 100 TO 1600 FEET. MEAN ANNUAL PRECIP. IS 70 TO 100 INCHES. MEAN ANNUAL AIR TEMP. IS 45 TO 52 DEGREES F. ROST FREE PERIOD IS 100 TO 210 DAYS.

ESTIMATED SOIL PROPERTIES

DEPTH (IN.)	USDA TEXTURE	UNIFIED	AASHTO	FRACT >3 IN (PCT)	PERCENT OF MATERIAL LESS THAN 3" PASSING SIEVE NO. 4	10	40	200	LIQUID LIMIT	PLASTICITY INDEX
0-19	SIL	ML	A-5	0	100	100	95-100	75-90	40-50	5-10
19-50	SICL	CL	A-6	0	100	100	95-100	75-95	35-50	15-30
50	WB									

DEPTH (IN.)	CLAY (PCT)	MOIST BULK DENSITY (G/CM3)	PERMEABILITY (IN/HR)	AVAILABLE WATER CAPACITY (IN/IN)	SOIL REACTION (PH)	SALINITY (MMHOS/CM)	SHRINK-SWELL POTENTIAL	EROSION FACTORS K	EROSION FACTORS T	WIND EROD. GROUP	ORGANIC MATTER (PCT)	CORROSIVITY STEEL	CORROSIVITY CONCRETE
0-19	18-27	0.85-0.95	0.6-2.0	0.19-0.24	3.6-5.5	-	LOW	.32	4	-	10-15	HIGH	HIGH
19-50	25-35	0.90-1.10	0.6-2.0	0.20-0.25	3.6-5.0	-	MODERATE	.20					
50													

FLOODING FREQUENCY	FLOODING DURATION	FLOODING MONTHS	HIGH WATER TABLE DEPTH (FT)	HIGH WATER TABLE KIND	HIGH WATER TABLE MONTHS	CEMENTED PAN DEPTH (IN)	CEMENTED PAN HARDNESS	BEDROCK DEPTH (IN)	BEDROCK HARDNESS	SUBSIDENCE INIT. (IN)	SUBSIDENCE TOTAL (IN)	HYD GRP	POTENTIAL FROST ACTION
NONE			>6.0			-		40-60	SOFT	-		B	-

SANITARY FACILITIES

SEPTIC TANK ABSORPTION FIELDS	MODERATE-DEPTH TO ROCK,PERCS SLOWLY
SEWAGE LAGOON AREAS	SEVERE-SLOPE
SANITARY LANDFILL (TRENCH)	SEVERE-DEPTH TO ROCK
SANITARY LANDFILL (AREA)	MODERATE-DEPTH TO ROCK
DAILY COVER FOR LANDFILL	FAIR-DEPTH TO ROCK,TOO CLAYEY

CONSTRUCTION MATERIAL

ROADFILL	POOR-LOW STRENGTH
SAND	IMPROBABLE-EXCESS FINES
GRAVEL	IMPROBABLE-EXCESS FINES
TOPSOIL	GOOD

WATER MANAGEMENT

POND RESERVOIR AREA	MODERATE-SEEPAGE,DEPTH TO ROCK,SLOPE
EMBANKMENTS-DIKES AND LEVEES	SEVERE-THIN LAYER
EXCAVATED PONDS AQUIFER FED	SEVERE-NO WATER
DRAINAGE	DEEP TO WATER
IRRIGATION	SLOPE
TERRACES AND DIVERSIONS	FAVORABLE
GRASSED WATERWAYS	FAVORABLE

BUILDING SITE DEVELOPMENT

SHALLOW EXCAVATIONS	SLIGHT
DWELLINGS WITHOUT BASEMENTS	MODERATE-SHRINK-SWELL
DWELLINGS WITH BASEMENTS	MODERATE-SHRINK-SWELL
SMALL COMMERCIAL BUILDINGS	MODERATE-SHRINK-SWELL,SLOPE
LOCAL ROADS AND STREETS	SEVERE-LOW STRENGTH
LAWNS, LANDSCAPING AND GOLF FAIRWAYS	SLIGHT

SOIL INTERPRETATIONS RECORD

AsF ASTORIA SILT LOAM, 20 TO 40 PERCENT SLOPES

THE ASTORIA SERIES CONSISTS OF WELL DRAINED SOILS FORMED IN COLLUVIUM WEATHERED FROM SEDIMENTARY ROCK IN MOUNTAINOUS AREAS. THE SURFACE LAYER IS VERY DARK GRAYISH BROWN SILT LOAM ABOUT 19 INCHES THICK. THE SUBSOIL IS DARK YELLOWISH BROWN SILTY CLAY LOAM ABOUT 31 INCHES THICK. THE SUBSTRATUM IS WEATHERED SEDIMENTARY ROCK AT ABOUT 50 INCHES. ELEVATIONS ARE 100 TO 1600 FEET. MEAN ANNUAL PRECIP. IS 70 TO 100 INCHES. MEAN ANNUAL AIR TEMP. IS 45 TO 52 DEGREES F. THE FROST FREE PERIOD IS 100 TO 210 DAYS.

ESTIMATED SOIL PROPERTIES

DEPTH (IN.)	USDA TEXTURE	UNIFIED	AASHTO	FRACT >3 IN (PCT)	PERCENT OF MATERIAL LESS THAN 3" PASSING SIEVE NO. 4	10	40	200	LIQUID LIMIT	PLASTICITY INDEX
0-19	SIL	ML	A-5	0	100	100	95-100	75-90	40-50	5-10
19-50	SICL	CL	A-6	0	100	100	95-100	75-95	35-50	15-30
50	WB									

DEPTH (IN.)	CLAY (PCT)	MOIST BULK DENSITY (G/CM3)	PERMEABILITY (IN/HR)	AVAILABLE WATER CAPACITY (IN/IN)	SOIL REACTION (PH)	SALINITY (MMHOS/CM)	SHRINK-SWELL	EROSION FACTORS K	EROSION FACTORS T	WIND EROD. GROUP	ORGANIC MATTER (PCT)	CORROSIVITY STEEL	CORROSIVITY CONCRETE
0-19	18-27	0.85-0.95	0.6-2.0	0.19-0.24	3.6-5.5	-	POTENTIAL LOW	.32	4	-	10-15	HIGH	HIGH
19-50	25-35	0.90-1.10	0.6-2.0	0.20-0.25	3.6-5.0	-	MODERATE	.20					
50													

FLOODING FREQUENCY	FLOODING DURATION	FLOODING MONTHS	HIGH WATER TABLE DEPTH (FT)	HIGH WATER TABLE KIND	HIGH WATER TABLE MONTHS	CEMENTED PAN DEPTH (IN)	CEMENTED PAN HARDNESS	BEDROCK DEPTH (IN)	BEDROCK HARDNESS	SUBSIDENCE INIT. (IN)	SUBSIDENCE TOTAL (IN)	HYD GRP	POTENTIAL FROST ACTION
NONE			>6.0			-		40-60	SOFT	-	-	B	-

SANITARY FACILITIES

SEPTIC TANK ABSORPTION FIELDS	SEVERE-SLOPE
SEWAGE LAGOON AREAS	SEVERE-SLOPE
SANITARY LANDFILL (TRENCH)	SEVERE-DEPTH TO ROCK,SLOPE
SANITARY LANDFILL (AREA)	SEVERE-SLOPE
DAILY COVER FOR LANDFILL	POOR-SLOPE

CONSTRUCTION MATERIAL

ROADFILL	POOR-LOW STRENGTH,SLOPE
SAND	IMPROBABLE-EXCESS FINES
GRAVEL	IMPROBABLE-EXCESS FINES
TOPSOIL	POOR-SLOPE

WATER MANAGEMENT

POND RESERVOIR AREA	SEVERE-SLOPE
EMBANKMENTS DIKES AND LEVEES	SEVERE-THIN LAYER
EXCAVATED PONDS AQUIFER FED	SEVERE-NO WATER
DRAINAGE	DEEP TO WATER
IRRIGATION	SLOPE
TERRACES AND DIVERSIONS	SLOPE
GRASSED WATERWAYS	SLOPE

BUILDING SITE DEVELOPMENT

SHALLOW EXCAVATIONS	SEVERE-SLOPE
DWELLINGS WITHOUT BASEMENTS	SEVERE-SLOPE
DWELLINGS WITH BASEMENTS	SEVERE-SLOPE
SMALL COMMERCIAL BUILDINGS	SEVERE-SLOPE
LOCAL ROADS AND STREETS	SEVERE-LOW STRENGTH,SLOPE
LAWNS LANDSCAPING AND GOLF FAIRWAYS	SEVERE-SLOPE

SOIL INTERPRETATIONS RECORD

Br BRENNER SILT LOAM

THE BRENNER SERIES CONSISTS OF VERY DEEP, POORLY-DRAINED SOILS FORMED IN MIXED ALLUVIUM. THEY OCCUR ON FLOODPLAINS. TYPICALLY, THE SURFACE LAYER IS VERY DARK GRAYISH-BROWN SILT LOAM, ABOUT 13 INCHES THICK. THE SUBSOIL IS DARK GRAYISH-BROWN SILT LOAM ABOUT 27 INCHES THICK. THE SUBSTRATUM IS DARK GREENISH GRAY SILTY CLAY EXTENDING BELOW 60 INCHES. MEAN ANNUAL PRECIP. IS 60 TO 90 INCHES. MEAN ANNUAL AIR TEMP. IS 48 TO 52 DEGREES F. FROST FREE PERIOD IS 160 TO 265 DAYS.

LANDSCAPE AND CLIMATE PROPERTIES

ANNUAL AIR TEMPERATURE	FROST FREE DAYS	ANNUAL PRECIPITATION	ELEVATION (FT)	DRAINAGE CLASS	SLOPE (PCT)
	160-265			P	0-3

ESTIMATED SOIL PROPERTIES

DEPTH (IN.)	USDA TEXTURE	UNIFIED	AASHTO	FRACT. >10 IN (PCT)	FRACT. 3-10 IN (PCT)	PERCENT OF MATERIAL LESS THAN 3" PASSING SIEVE NO. 4	10	40	200	CLAY (PCT)
0-13	SIL	ML	A-4	0	0	100	100	90-100	80-90	20-27
13-40	SICL, SIL	CL	A-6	0	0	100	100	95-100	85-95	18-30
40-60	SICL	MH, ML	A-6, A-7	0	0	100	100	95-100	85-95	27-50

DEPTH (IN.)	LIQUID LIMIT	PLASTICITY INDEX	MOIST BULK DENSITY (G/CM3)	PERMEABILITY (IN/HR)	AVAILABLE WATER CAPACITY (IN/IN)	SOIL REACTION (PH)	SALINITY (MMHOS/CM)	SAR	CEC (ME/100G)	CACO3 (PCT)	GYPSUM (PCT)
0-13	25-35	NP-5	0.90-1.20	0.6-2.0	0.19-0.21	3.6-5.5	-				
13-40	30-40	10-20	1.10-1.30	0.2-0.6	0.19-0.21	3.6-5.5	-				
40-60	35-55	10-20	1.10-1.30	0.06-0.2	0.15-0.17	3.6-6.5	-				

DEPTH (IN.)	ORGANIC MATTER (PCT)	SHRINK-SWELL POTENTIAL	EROSION FACTORS K	EROSION FACTORS T	WIND EROD. GROUP	WIND EROD. INDEX	CORROSIVITY STEEL	CORROSIVITY CONCRETE
0-13	5-10	LOW	.32	5	6	48	HIGH	HIGH
13-40		MODERATE	.24					
40-60		MODERATE	.24					

FLOODING FREQUENCY	FLOODING DURATION	FLOODING MONTHS	HIGH WATER TABLE DEPTH (FT)	HIGH WATER TABLE KIND	HIGH WATER TABLE MONTHS	CEMENTED PAN DEPTH (IN)	CEMENTED PAN HARDNESS	BEDROCK DEPTH (IN)	BEDROCK HARDNESS	SUBSIDENCE INIT. (IN)	SUBSIDENCE TOTAL (IN)	HYD GRP	POTENT'L FROST ACTION
FREQUENT	BRIEF	DEC-APR	+.5-1.0	PERCHED	DEC-APR	-		>60		-		D	-

SANITARY FACILITIES

SEPTIC TANK ABSORPTION FIELDS	SEVERE-FLOODING, PONDING, PERCS SLOWLY
SEWAGE LAGOON AREAS	SEVERE-FLOODING, PONDING
SANITARY LANDFILL (TRENCH)	SEVERE-FLOODING, PONDING
SANITARY LANDFILL (AREA)	SEVERE-FLOODING, PONDING
DAILY COVER FOR LANDFILL	POOR-PONDING

BUILDING SITE DEVELOPMENT

SHALLOW EXCAVATIONS	SEVERE-PONDING
DWELLINGS WITHOUT BASEMENTS	SEVERE-FLOODING, PONDING
DWELLINGS WITH BASEMENTS	SEVERE-FLOODING, PONDING
SMALL COMMERCIAL BUILDINGS	SEVERE-FLOODING, PONDING
LOCAL ROADS AND STREETS	SEVERE-LOW STRENGTH, PONDING, FLOODING
LAWNS, LANDSCAPING AND GOLF FAIRWAYS	SEVERE-PONDING, FLOODING

CONSTRUCTION MATERIAL

ROADFILL	POOR-LOW STRENGTH, WETNESS
SAND	IMPROBABLE-EXCESS FINES
GRAVEL	IMPROBABLE-EXCESS FINES
TOPSOIL	POOR-WETNESS

WATER MANAGEMENT

POND RESERVOIR AREA	SLIGHT
EMBANKMENTS DIKES AND LEVEES	SEVERE-THIN LAYER, PONDING
EXCAVATED PONDS AQUIFER FED	SEVERE-NO WATER
DRAINAGE	PONDING, FLOODING
IRRIGATION	PONDING, PERCS SLOWLY, FLOODING
TERRACES AND DIVERSIONS	PONDING
GRASSED WATERWAYS	WETNESS

SOIL INTERPRETATIONS RECORD

HDA HEBO SILTY CLAY LOAM, 0 TO 3 PERCENT SLOPES

THE HEBO SERIES CONSISTS OF VERY DEEP, POORLY DRAINED SOILS FORMED IN MIXED ALLUVIUM ON TERRACES. THE SURFACE LAYER IS VERY DARK GRAY SILTY CLAY LOAM ABOUT 4 INCHES THICK. THE UPPER PART OF THE SUBSOIL IS VERY DARK GRAY SILTY CLAY ABOUT 6 INCHES THICK. THE LOWER SUBSOIL IS DARK GRAY AND GRAY CLAY ABOUT 25 INCHES THICK. THE SUBSTRATUM IS OLIVE GRAY CLAY LOAM TO 60 INCHES. MEAN ANNUAL PRECIP IS 70 TO 100 INCHES. MEAN ANNUAL AIR TEMP. IS 48 TO 52 DEGREES F. FROST FREE PERIOD IS 210 TO 245 DAYS

LANDSCAPE AND CLIMATE PROPERTIES

ANNUAL AIR TEMPERATURE	FROST FREE DAYS	ANNUAL PRECIPITATION	ELEVATION (FT)	DRAINAGE CLASS	SLOPE (PCT)
	210-245			P	0-3

ESTIMATED SOIL PROPERTIES

DEPTH (IN.)	USDA TEXTURE	UNIFIED	AASHTO	FRACT >10 IN (PCT)	FRACT. 3-10 IN (PCT)	PERCENT OF MATERIAL LESS THAN 3" PASSING SIEVE NO. 4	10	40	200	CLAY (PCT)
0-4	SICL	ML, CL	A-6, A-7	0	0	100	100	95-100	85-95	27-35
4-35	SIC, C	CH	A-7	0	0	100	100	90-100	80-95	40-60
35-60	CL, SIC, SICL	CL	A-7	0	0	90-100	85-100	75-95	60-85	35-45

DEPTH (IN.)	LIQUID LIMIT	PLASTICITY INDEX	MOIST BULK DENSITY (G/CM3)	PERMEABILITY (IN/HR)	AVAILABLE WATER CAPACITY (IN/IN)	SOIL REACTION (PH)	SALINITY (MMHOS/CM)	SAR	CEC (ME/100G)	CACO3 (PCT)	GYPSUM (PCT)
0-4	35-45	10-20	1.20-1.35	0.2-0.6	0.19-0.21	3.6-5.0	-				
4-35	50-65	25-35	1.35-1.45	<0.06	0.14-0.17	3.6-5.0	-				
35-60	40-50	20-30	1.30-1.40	0.06-0.2	0.13-0.21	3.6-5.0	-				

DEPTH (IN.)	ORGANIC MATTER (PCT)	SHRINK-SWELL POTENTIAL	EROSION FACTORS K	EROSION FACTORS T	WIND EROD. GROUP	WIND EROD. INDEX	CORROSIVITY STEEL	CORROSIVITY CONCRETE
0-4	7-12	MODERATE	.28	5	7	38	HIGH	HIGH
4-35		HIGH	.24					
35-60		MODERATE	.32					

FLOODING FREQUENCY	FLOODING DURATION	FLOODING MONTHS	HIGH WATER TABLE DEPTH (FT)	HIGH WATER TABLE KIND	HIGH WATER TABLE MONTHS	CEMENTED PAN DEPTH (IN)	CEMENTED PAN HARDNESS	BEDROCK DEPTH (IN)	BEDROCK HARDNESS	SUBSIDENCE INIT. (IN)	SUBSIDENCE TOTAL (IN)	HYD GRP	POTENT'L FROST ACTION
NONE			+.5-1.0	PERCHED	NOV-JUN	-		>60		-		D	-

SANITARY FACILITIES

SEPTIC TANK ABSORPTION FIELDS	SEVERE-PONDING, PERCS SLOWLY
SEWAGE LAGOON AREAS	SEVERE-PONDING
SANITARY LANDFILL (TRENCH)	SEVERE-PONDING, TOO CLAYEY
SANITARY LANDFILL (AREA)	SEVERE-PONDING
DAILY COVER FOR LANDFILL	POOR-TOO CLAYEY, HARD TO PACK, PONDING

BUILDING SITE DEVELOPMENT

SHALLOW EXCAVATIONS	SEVERE-PONDING
DWELLINGS WITHOUT BASEMENTS	SEVERE-PONDING, SHRINK-SWELL
DWELLINGS WITH BASEMENTS	SEVERE-PONDING, SHRINK-SWELL
SMALL COMMERCIAL BUILDINGS	SEVERE-PONDING, SHRINK-SWELL
LOCAL ROADS AND STREETS	SEVERE-LOW STRENGTH, PONDING, SHRINK-SWELL
LAWNS, LANDSCAPING AND GOLF FAIRWAYS	SEVERE-PONDING

CONSTRUCTION MATERIAL

ROADFILL	POOR-LOW STRENGTH, WETNESS
SAND	IMPROBABLE-EXCESS FINES
GRAVEL	IMPROBABLE-EXCESS FINES
TOPSOIL	POOR-THIN LAYER, WETNESS

WATER MANAGEMENT

POND RESERVOIR AREA	SLIGHT
EMBANKMENTS DIKES AND LEVEES	SEVERE-PONDING
EXCAVATED PONDS AQUIFER FED	SEVERE-NO WATER
DRAINAGE	PONDING, PERCS SLOWLY
IRRIGATION	PONDING, PERCS SLOWLY
TERRACES AND DIVERSIONS	PONDING, PERCS SLOWLY
GRASSED WATERWAYS	WETNESS, PERCS SLOWLY

SOIL INTERPRETATIONS RECORD

KaB KNAPPA SILT LOAM, 0 TO 7 PERCENT SLOPES

THE KNAPPA SERIES CONSISTS OF VERY DEEP, WELL DRAINED SOILS FORMED IN ALLUVIUM ON TERRACES. THE SURFACE LAYER IS VERY DARK BROWN TO VERY DARK GRAYISH BROWN SILT LOAM 14 INCHES THICK. THE SUBSOIL IS DARK BROWN TO DARK YELLOWISH BROWN SILTY CLAY LOAM, ABOUT 54 INCHES THICK. THE SUBSTRATUM IS STRATIFIED ALLUVIUM. ELEVATIONS RANGE FROM 100 TO 350 FEET. MEAN ANNUAL PRECIP. IS 60 TO 100 INCHES. MEAN ANNUAL AIR TEMP. IS 49 TO 52 DEGREES F. THE FROST FREE PERIOD IS 145 TO 210 DAYS.

LANDSCAPE AND CLIMATE PROPERTIES

ANNUAL AIR TEMPERATURE	FROST FREE DAYS	ANNUAL PRECIPITATION	ELEVATION (FT)	DRAINAGE CLASS	SLOPE (PCT)
	145-210		100-350	W	0-7

ESTIMATED SOIL PROPERTIES

DEPTH (IN)	USDA TEXTURE	UNIFIED	AASHTO	FRACT. >10 IN (PCT)	FRACT. 3-10 IN (PCT)	PERCENT OF MATERIAL LESS THAN 3" PASSING SIEVE NO. 4	10	40	200	CLAY (PCT)
0-14	SIL	ML	A-4	0	0	100	100	80-100	60-90	15-25
14-68	SICL, SIL	ML	A-6	0	0	95-100	95-100	95-100	80-95	22-35

DEPTH (IN.)	LIQUID LIMIT	PLASTICITY INDEX	MOIST BULK DENSITY (G/CM3)	PERMEABILITY (IN/HR)	AVAILABLE WATER CAPACITY (IN/IN)	SOIL REACTION (PH)	SALINITY (MMHOS/CM)	SAR	CEC (ME/100G)	CACO3 (PCT)	GYPSUM (PCT)
0-14	30-35	5-10	1.10-1.30	0.6-2.0	0.19-0.21	3.6-5.5	-				
14-68	35-40	10-15	1.20-1.35	0.6-2.0	0.19-0.21	3.6-5.5	-				

DEPTH (IN)	ORGANIC MATTER (PCT)	SHRINK-SWELL POTENTIAL	EROSION FACTORS K	EROSION FACTORS T	WIND ERDD. GROUP	WIND ERDD. INDEX	CORROSIVITY STEEL	CORROSIVITY CONCRETE
0-14	8-12	LOW	.37	5	6	48	HIGH	HIGH
14-68		MODERATE	.37					

FLOODING FREQUENCY	FLOODING DURATION	FLOODING MONTHS	HIGH WATER TABLE DEPTH (FT)	HIGH WATER TABLE KIND	HIGH WATER TABLE MONTHS	CEMENTED PAN DEPTH (IN)	CEMENTED PAN HARDNESS	BEDROCK DEPTH (IN)	BEDROCK HARDNESS	SUBSIDENCE INIT (IN)	SUBSIDENCE TOTAL (IN)	HYD GRP	POTENT'L FROST ACTION
NONE			>6.0			-		>60		-		B	-

SANITARY FACILITIES

SEPTIC TANK ABSORPTION FIELDS	MODERATE-PERCS SLOWLY
SEWAGE LAGOON AREAS	MODERATE-SEEPAGE,SLOPE
SANITARY LANDFILL (TRENCH)	MODERATE-TOO CLAYEY
SANITARY LANDFILL (AREA)	SLIGHT
DAILY COVER FOR LANDFILL	FAIR-TOO CLAYEY

BUILDING SITE DEVELOPMENT

SHALLOW EXCAVATIONS	SLIGHT
DWELLINGS WITHOUT BASEMENTS	MODERATE-SHRINK-SWELL
DWELLINGS WITH BASEMENTS	MODERATE-SHRINK-SWELL
SMALL COMMERCIAL BUILDINGS	MODERATE-SHRINK-SWELL
LOCAL ROADS AND STREETS	SEVERE-LOW STRENGTH
LAWNS, LANDSCAPING AND GOLF FAIRWAYS	SLIGHT

CONSTRUCTION MATERIAL

ROADFILL	POOR-LOW STRENGTH
SAND	IMPROBABLE-EXCESS FINES
GRAVEL	IMPROBABLE-EXCESS FINES
TOPSOIL	GOOD

WATER MANAGEMENT

POND RESERVOIR AREA	MODERATE-SEEPAGE,SLOPE
EMBANKMENTS DIKES AND LEVEES	MODERATE-PIPING
EXCAVATED PONDS AQUIFER FED	SEVERE-NO WATER
DRAINAGE	DEEP TO WATER
IRRIGATION	SLOPE,ERODES EASILY
TERRACES AND DIVERSIONS	ERODES EASILY
GRASSED WATERWAYS	ERODES EASILY

TILLAMOOK AREA, OREGON

USDA-SCS
7-86

SOIL INTERPRETATIONS RECORD

NaA NEHALEM SILT LOAM, 0 TO 3 PERCENT SLOPES

THE NEHALEM SERIES CONSISTS OF WELL DRAINED SOILS FORMED IN MIXED ALLUVIUM ON FLOODPLAINS. TYPICALLY THE SURFACE LAYER IS VERY DARK GRAYISH BROWN OVER DARK BROWN SILT LOAM ABOUT 17 INCHES THICK. THE SUBSOIL IS DARK BROWN SILTY CLAY LOAM ABOUT 20 INCHES THICK. THE SUBSTRATUM IS DARK BROWN SILTY CLAY LOAM TO 60 INCHES OR MORE. ELEVATIONS RANGE FROM 10 TO 750 FEET. THE MEAN ANNUAL PRECIP. IS 50 TO 100 INCHES. MEAN ANNUAL AIR TEMP. IS 48 TO 53 DEGREES F. FROST FREE PERIOD IS 160 TO 265 DAYS.

LANDSCAPE AND CLIMATE PROPERTIES

ANNUAL AIR TEMPERATURE	FROST FREE DAYS	ANNUAL PRECIPITATION	ELEVATION (FT)	DRAINAGE CLASS	SLOPE (PCT)
	160-265		10-750	W	0-3

ESTIMATED SOIL PROPERTIES

DEPTH (IN)	USDA TEXTURE	UNIFIED	AASHTO	FRACT. >10 IN (PCT)	FRACT. >3 IN (PCT)	PERCENT OF MATERIAL LESS THAN 3" PASSING SIEVE NO. 4	10	40	200	CLAY (PCT)
0-17	SIL	ML, CL-ML	A-4	0	0	100	100	90-100	70-90	15-25
17-37	SIL, SICL	CL	A-6, A-7	0	0	100	100	90-100	75-95	20-35
37-60	SICL, SIL, L	CL, CL-ML	A-6, A-4		0-5	85-100	80-100	80-95	60-90	20-35

DEPTH (IN.)	LIQUID LIMIT	PLASTICITY INDEX	MOIST BULK DENSITY (G/CM3)	PERMEABILITY (IN/HR)	AVAILABLE WATER CAPACITY (IN/IN)	SOIL REACTION (PH)	SALINITY (MMHOS/CM)	SAR	CEC (ME/100G)	CACO3 (PCT)	GYPSUM (PCT)
0-17	25-35	5-10	1.10-1.20	0.6-2.0	0.19-0.21	4.5-6.0	-				
17-37	30-45	10-20	1.20-1.30	0.6-2.0	0.19-0.21	4.5-5.5	-				
37-60	25-40	5-15	1.25-1.35	0.2-0.6	0.19-0.21	4.5-5.0	-				

DEPTH (IN.)	ORGANIC MATTER (PCT)	SHRINK-SWELL POTENTIAL	EROSION FACTORS K	EROSION FACTORS T	WIND EROD. GROUP	WIND EROD. INDEX	CORROSIVITY STEEL	CORROSIVITY CONCRETE
0-17	5-10	LOW	.32	5	6	48	HIGH	HIGH
17-37		MODERATE	.37					
37-60		LOW	.37					

FLOODING FREQUENCY	FLOODING DURATION	FLOODING MONTHS	HIGH WATER TABLE DEPTH (FT)	HIGH WATER TABLE KIND	HIGH WATER TABLE MONTHS	CEMENTED PAN DEPTH (IN)	CEMENTED PAN HARDNESS	BEDROCK DEPTH (IN)	BEDROCK HARDNESS	SUBSIDENCE INIT. (IN)	SUBSIDENCE TOTAL (IN)	HYD GRP	POTENT'L FROST ACTION
RARE			>6.0			-		>60		-		B	-

SANITARY FACILITIES

SEPTIC TANK ABSORPTION FIELDS	SEVERE-PERCS SLOWLY
SEWAGE LAGOON AREAS	MODERATE-SEEPAGE
SANITARY LANDFILL (TRENCH)	MODERATE-FLOODING, TOO CLAYEY
SANITARY LANDFILL (AREA)	MODERATE-FLOODING
DAILY COVER FOR LANDFILL	FAIR-TOO CLAYEY

CONSTRUCTION MATERIAL

ROADFILL	FAIR-LOW STRENGTH
SAND	IMPROBABLE-EXCESS FINES
GRAVEL	IMPROBABLE-EXCESS FINES
TOPSOIL	GOOD

WATER MANAGEMENT

POND RESERVOIR AREA	MODERATE-SEEPAGE
EMBANKMENTS DIKES AND LEVEES	SEVERE-PIPING
EXCAVATED PONDS AQUIFER FED	SEVERE-NO WATER
DRAINAGE	DEEP TO WATER
IRRIGATION	FAVORABLE
TERRACES AND DIVERSIONS	ERODES EASILY
GRASSED WATERWAYS	ERODES EASILY

BUILDING SITE DEVELOPMENT

SHALLOW EXCAVATIONS	SLIGHT
DWELLINGS WITHOUT BASEMENTS	SEVERE-FLOODING
DWELLINGS WITH BASEMENTS	SEVERE-FLOODING
SMALL COMMERCIAL BUILDINGS	SEVERE-FLOODING
LOCAL ROADS AND STREETS	SEVERE-LOW STRENGTH
LAWNS, LANDSCAPING AND GOLF FAIRWAYS	SLIGHT

TILLAMOOK AREA, OREGON

USDA-SCS
1-88

SOIL INTERPRETATIONS RECORD

NS NESTUCCA SILT LOAM

THE NESTUCCA SERIES CONSISTS OF VERY DEEP, SOMEWHAT POORLY DRAINED SOILS FORMED IN MIXED ALLUVIUM ON FLOODPLAINS. THE SURFACE LAYER IS DARK BROWN OVER VERY DARK GRAYISH BROWN, MOTTLED SILT LOAM ABOUT 14 INCHES THICK. THE SUBSOIL IS DARK GRAYISH BROWN, MOTTLED AND GLEYED SILTY CLAY LOAM ABOUT 27 INCHES THICK. THE SUBSTRATUM IS DARK GRAY, MOTTLED AND GLEYED SILTY CLAY TO 60 INCHES OR MORE. ELEVATIONS RANGE FROM 10 TO 750 FEET. MEAN ANNUAL PRECIP IS 80 TO 100 INCHES. MEAN ANNUAL AIR TEMP IS 48 TO 52 DEGREES F. FROST FREE PERIOD IS 160 TO 245 DAYS.

LANDSCAPE AND CLIMATE PROPERTIES

ANNUAL AIR TEMPERATURE	FROST FREE DAYS	ANNUAL PRECIPITATION	ELEVATION (FT)	DRAINAGE CLASS	SLOPE (PCT)
	160-245		10-750	SP	0-3

ESTIMATED SOIL PROPERTIES

DEPTH (IN)	USDA TEXTURE	UNIFIED	AASHTO	FRACT >10 IN (PCT)	FRACT 3-10 IN (PCT)	PERCENT OF MATERIAL LESS THAN 3" PASSING SIEVE NO 4	10	40	200	CLAY (PCT)
0-14	SIL	CL-ML	A-4	0	0	100	100	90-100	75-95	18-27
14-41	SICL, SIL	CL	A-6, A-7	0	0	100	100	95-100	85-95	25-35
41-60	SIC, CL, L	CL	A-7, A-6	0	0	100	95-100	85-100	65-95	20-45

DEPTH (IN)	LIQUID LIMIT	PLASTICITY INDEX	MOIST BULK DENSITY (G/CM3)	PERMEABILITY (IN/HR)	AVAILABLE WATER CAPACITY (IN/IN)	SOIL REACTION (PH)	SALINITY (MMHOS/CM)	SAR	CEC (ME/100G)	CACO3 (PCT)	GYPSUM (PCT)
0-14	20-30	5-10	1.10-1.25	0.6-2.0	0.19-0.21	4.5-5.5	-				
14-41	35-45	15-20	1.25-1.40	0.2-0.6	0.13-0.21	4.5-5.5	-				
41-60	30-50	10-25	1.35-1.45	0.06-0.6	0.15-0.17	4.5-5.5	-				

DEPTH (IN)	ORGANIC MATTER (PCT)	SHRINK-SWELL POTENTIAL	EROSION FACTORS K	EROSION FACTORS T	WIND EROD. GROUP	WIND EROD. INDEX	CORROSIVITY STEEL	CORROSIVITY CONCRETE
0-14	4-8	LOW	.32	5	6	48	HIGH	HIGH
14-41		MODERATE	.32					
41-60		MODERATE	.28					

FLOODING FREQUENCY	FLOODING DURATION	FLOODING MONTHS	HIGH WATER TABLE DEPTH (FT)	HIGH WATER TABLE KIND	HIGH WATER TABLE MONTHS	CEMENTED PAN DEPTH (IN)	CEMENTED PAN HARDNESS	BEDROCK DEPTH (IN)	BEDROCK HARDNESS	SUBSIDENCE INIT (IN)	SUBSIDENCE TOTAL (IN)	HYD GRP	POTENT'L FROST ACTION
FREQUENT	BRIEF	NOV-APR	1.0-2.0	PERCHED	DEC-APR	-		>60		-		D	-

SANITARY FACILITIES

SEPTIC TANK ABSORPTION FIELDS	SEVERE-FLOODING, WETNESS, PERCS SLOWLY
SEWAGE LAGOON AREAS	SEVERE-FLOODING, WETNESS
SANITARY LANDFILL (TRENCH)	SEVERE-FLOODING, WETNESS
SANITARY LANDFILL (AREA)	SEVERE-FLOODING, WETNESS
DAILY COVER FOR LANDFILL	POOR-WETNESS

CONSTRUCTION MATERIAL

ROADFILL	POOR-LOW STRENGTH
SAND	IMPROBABLE-EXCESS FINES
GRAVEL	IMPROBABLE-EXCESS FINES
TOPSOIL	GOOD

BUILDING SITE DEVELOPMENT

SHALLOW EXCAVATIONS	SEVERE-WETNESS
DWELLINGS WITHOUT BASEMENTS	SEVERE-FLOODING, WETNESS
DWELLINGS WITH BASEMENTS	SEVERE-FLOODING, WETNESS
SMALL COMMERCIAL BUILDINGS	SEVERE-FLOODING, WETNESS
LOCAL ROADS AND STREETS	SEVERE-LOW STRENGTH, FLOODING
LAWNS, LANDSCAPING AND GOLF FAIRWAYS	SEVERE-FLOODING

WATER MANAGEMENT

POND RESERVOIR AREA	SLIGHT
EMBANKMENTS DIKES AND LEVEES	MODERATE-WETNESS
EXCAVATED PONDS AQUIFER FED	SEVERE-NO WATER
DRAINAGE	FLOODING
IRRIGATION	WETNESS, PERCS SLOWLY, FLOODING
TERRACES AND DIVERSIONS	WETNESS
GRASSED WATERWAYS	WETNESS

U.S. Department of Agriculture
Natural Resources Conservation Service

ANIMAL WASTE MANAGEMENT WORKSHEET

Version 1.7

10/2/2003
STATE: OREGON

CLIENT: R & R Dairy Bewley Creek Heifer Operation)
ASSISTED BY: Pedersen CHECKED BY:

ANIMAL WASTE MANAGEMENT SYSTEM INVENTORY

ANIMAL INVENTORY

Type of Animal	Number of Animals	Average Weight (lbs.)	Animal Units (1,000 lb.)	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
HEIFERS (12-24 Months)	450	550	247.5	0.31	0.04	0.24	76.73	9.90	59.40	1.30	151	214
Totals-	450	550	247.5	0.31	0.04	0.24	76.73	9.90	59.40	1.3		

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.
HEIFERS (12-24 Months)	100%	0%	0%	0%	0%	0%	100%	100%	100%	100%	100%	100%	
	450	450	450	450	450	450	450	450	450	450	450	450	1,733
													0
													0
													0
													0
													0
													0
													0
													0
													0
													0
Total AUM's Available>	193						285	285	285	198	198	198	1,402
Total AUM's Needed>>>	248	0	0	0	0	0	248	248	248	248	248	248	1,733
Total AUM's>>>>>>>>>>	-55	0	0	0	0	0	-43	-43	-43	-50	-50	-50	-331

ANIMAL WASTE MANAGEMENT WORKSHEET
Version 1.7

CLIENT: R & R Dairy Bewley Creek Heifer Operation)
ASSISTED BY: Pedersen CHECKED BY:

ANIMAL WASTE MANAGEMENT SYSTEM INVENTORY

WEATHER STATION TILLAMOOK 1 W

Month	25Yr-24Hr	6.08	Lot Runoff Factors as a Percent of Monthly Precipitation	
	Monthly Average in Inches			
	Precipitation	Evaporation	Paved	Unpaved
October	7.48	1.42	50%	20%
November	12.80	0.75	60%	25%
December	14.25	0.68	60%	25%
January	13.46	0.48	60%	25%
February	10.45	0.78	50%	25%
March	10.35	1.26	45%	15%
April	6.03	1.90	40%	15%
May	4.24	3.22	40%	10%
June	3.16	3.40	35%	10%
July	1.44	3.91	30%	0%
August	1.73	3.52	40%	10%
September	3.69	2.54	45%	15%
Annual	89.08	23.78		

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	0
Unpaved Lot Area >>	0
Roof Area >>>	
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>>>>>>>>>>>>>>>>	0

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	0.0	0	0.00	0	0.0
Equipment Wash		0	0.00	0	0.0
Flushwater		0	0.00	0	0.0
Miscellaneous		0	0.00	0	0.0
Total>>>				0	0.0

CROP DATA

Field Number	Acres	Crop	Condition	Yield Units	Target Yield	Nutrients Removed in Pounds per Acre Nitrogen N	Phosphorous P_2O_5	Potassium K_2O
T37 1,11,12	16.9	Hay/Pasture Mix 16 % Protein	50% DM	Ton	6.00	307	85	235
2,10	24.6	Hay/Pasture Mix 16 % Protein	50% DM	Ton	6.00	307	85	235
3,6,8,9	24.5	Hay/Pasture Mix 16 % Protein	50% DM	Ton	6.00	307	85	235
4,5,7	12.0	Hay/Pasture Mix 16 % Protein	50% DM	Ton	6.00	307	85	235
Off-Farm								

ANIMAL WASTE MANAGEMENT WORKSHEET
Version 1.7

CLIENT: R & R Dairy Bewley Creek Heifer Operation)
ASSISTED BY: Pedersen CHECKED BY:

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
HEIFERS (12-24 Months)	Free Stall	Chopped Straw	7.00	2.70	0.39	95	668

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
HEIFERS (12-24 Months)	Dry Scrape System	98%	409	8	6	315	1	36	14,719
Total Solids>>>			409	8	6	315	1		14,719

U.S. Department of Agriculture
Natural Resources Conservation Service

ANIMAL WASTE MANAGEMENT WORKSHEET
Version 1.7

10/2/2003
STATE: OREGON

CLIENT: **R & R Dairy Bewley Creek Heifer Operation)**
ASSISTED BY: **Pedersen** CHECKED BY:

ANIMAL WASTE MANAGEMENT SYSTEM PRODUCTION

MONTHLY VOLUMES

Month	Runoff in Cubic Feet				Facility	Manure		Bedding		Solids Separated		Solids in Liquids		Total Solids	Total Liquids
	Roof Area Square Feet 0	Paved Slab Area Square Feet 0	Unpaved Lot Area Square Feet 0	Silage Pit Surface Area, SF 0	Water Use Cubic Feet	Solids Cubic Feet	Liquids Cubic Feet	Cubic Feet	Pounds	Cubic Feet	Pounds	Cubic Feet	Pounds	Cubic Feet	Cubic Feet
October	0	0	0	0	0	1,067	8,907	0	0	0	0	0	0	0	8,907
November	0	0	0	0	0	1,033	8,620	2,864	20,048	12,266	441,580	250	9,012	12,266	450
December	0	0	0	0	0	1,067	8,907	2,959	20,716	12,675	456,299	259	9,312	12,675	458
January	0	0	0	0	0	1,067	8,907	2,959	20,716	12,675	456,299	259	9,312	12,675	458
February	0	0	0	0	0	964	8,045	2,673	18,711	11,448	412,141	234	8,411	11,448	433
March	0	0	0	0	0	1,067	8,907	2,959	20,716	12,675	456,299	259	9,312	12,675	458
April	0	0	0	0	0	1,033	8,620	0	0	0	0	0	0	0	8,620
May	0	0	0	0	0	1,067	8,907	0	0	0	0	0	0	0	8,907
June	0	0	0	0	0	1,033	8,620	0	0	0	0	0	0	0	8,620
July	0	0	0	0	0	1,067	8,907	0	0	0	0	0	0	0	8,907
August	0	0	0	0	0	1,067	8,907	0	0	0	0	0	0	0	8,907
September	0	0	0	0	0	1,033	8,620	0	0	0	0	0	0	0	8,620
Annual	**0**	**0**	**0**	**0**	**0**	**12,566**	**104,873**	**14,415**	**100,906**	**61,739**	**2,222,617**	**1,260**	**45,360**	**61,739**	**63,744**

DAILY NUTRIENT PRODUCTION

Type of Animal	Pounds/Day of Nutrients from LIQUIDS			Pounds/Day of Nutrients from SOLIDS			Pounds/Day of Nutrients from GRAZING		
	N	P_2O_5	K_2O	N	P_2O_5	K_2O	N	P_2O_5	K_2O
HEIFERS (12-24 Months)	1.53	0.45	1.43	75.19	22.23	70.15	76.73	22.68	71.58
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

ANIMAL WASTE MANAGEMENT WORKSHEET

Version 1.7

CLIENT: **R & R Dairy Bewley Creek Heifer Operation)**
ASSISTED BY: **Pedersen** CHECKED BY:

ANIMAL WASTE MANAGEMENT SYSTEM PRODUCTION

MONTHLY NUTRIENT PRODUCTION

Month	Pounds of Nutrients from LIQUIDS			Pounds of Nutrients from SOLIDS			Pounds of Nutrients from GRAZING			Pounds of Nutrients going OFF-FARM			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	N	P_2O_5	K_2O
October	0	0	0	0	0	0	2,378	703	2,219	0	0	0	2,378	703	2,219
November	46	14	43	2,256	667	2,104	0	0	0	0	0	0	2,302	680	2,147
December	48	14	44	2,331	689	2,175	0	0	0	0	0	0	2,378	703	2,219
January	48	14	44	2,331	689	2,175	0	0	0	0	0	0	2,378	703	2,219
February	43	13	40	2,105	622	1,964	0	0	0	0	0	0	2,148	635	2,004
March	48	14	44	2,331	689	2,175	0	0	0	0	0	0	2,378	703	2,219
April	0	0	0	0	0	0	2,302	680	2,147	0	0	0	2,302	680	2,147
May	0	0	0	0	0	0	2,378	703	2,219	0	0	0	2,378	703	2,219
June	0	0	0	0	0	0	2,302	680	2,147	0	0	0	2,302	680	2,147
July	0	0	0	0	0	0	2,378	703	2,219	0	0	0	2,378	703	2,219
August	0	0	0	0	0	0	2,378	703	2,219	0	0	0	2,378	703	2,219
September	0	0	0	0	0	0	2,302	680	2,147	0	0	0	2,302	680	2,147
Annual	**232**	**68**	**216**	**11,354**	**3,356**	**10,592**	**16,419**	**4,854**	**15,317**	**0**	**0**	**0**	**28,005**	**8,279**	**26,126**

ANIMAL WASTE MANAGEMENT WORKSHEET

Version 1.7

CLIENT: **R & R Dairy Bewley Creek Heifer Operation)**
ASSISTED BY: **Pedersen** CHECKED BY:

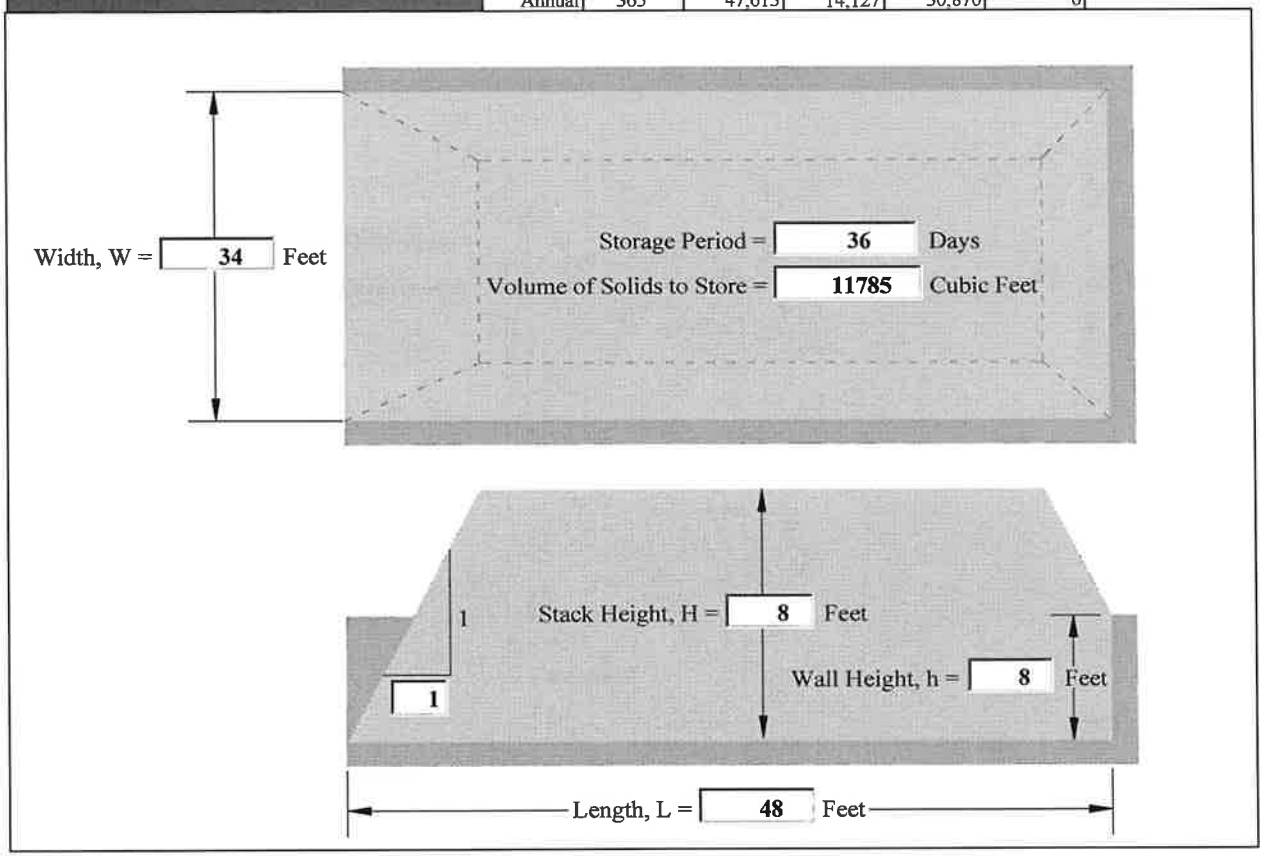
ANIMAL WASTE MANAGEMENT SYSTEM STORAGE

SOLIDS STACKING FACILITY

Solids Storage Facility Parameters	Value
Storage Period, Days=	36
Stacking Width, W in Feet=	34
Stacking Height, H in Feet=	8.00
Wall Height, h in Feet=	8.00
Stack Side Slope (X:1)=	1.00
Existing Storage, Cubic Feet=	0
Surface Area of Existing Storage, SF=	0
25 Year-24 Hour Storm Runoff, CF=	0
Volume Needed, Cubic Feet=	11,785
Design Volume, Cubic Feet=	11,968
Is Facility Covered?	YES

MONTHLY SOLIDS VOLUME STACKED IN FACILITY

Month	Number of Days	Manure CF	Bedding CF	Solids to Store CF	Normal Runoff CF
October	31	0	0	0	0
November	30	9459	2,807	6,133	0
December	31	9775	2,900	6,337	0
January	31	9775	2,900	6,337	0
February	28	8829	2,620	5,724	0
March	31	9775	2,900	6,337	0
April	30	0	0	0	0
May	31	0	0	0	0
June	30	0	0	0	0
July	31	0	0	0	0
August	31	0	0	0	0
September	30	0	0	0	0
Annual	365	47,613	14,127	30,870	0



ANIMAL WASTE MANAGEMENT WORKSHEET

Version 1.7

CLIENT: **R & R Dairy Bewley Creek Heifer Operation)**
ASSISTED BY: **Pedersen** CHECKED BY:

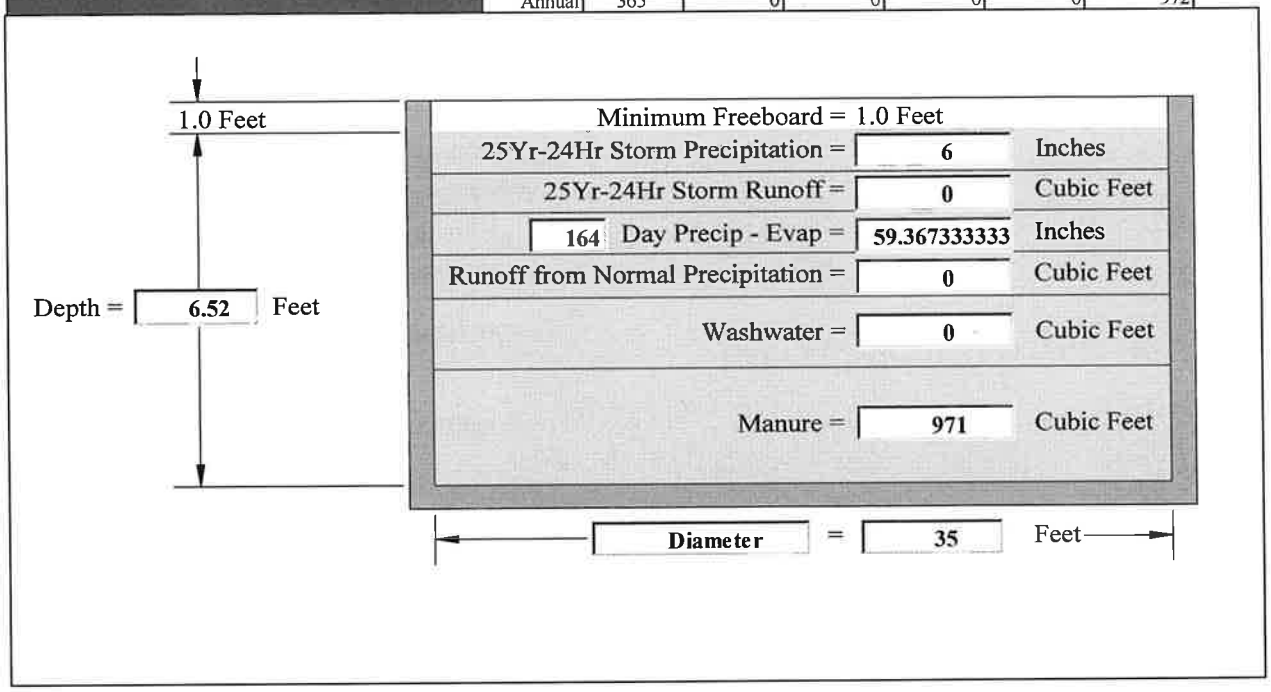
ANIMAL WASTE MANAGEMENT SYSTEM STORAGE

TANK

Tank Parameters	Value
Storage Period, Days=	164
Tank Diameter, Feet=	35
Existing Storage, Cubic Feet=	0.00
Surface Area of Existing Storage, SF=	0
25 Year-24 Hour Storm Runoff, CF=	0
Volume Needed, Cubic Feet=	6,279
Design Volume, Cubic Feet=	6,269
Is Tank Covered?	YES
Tank Dimensions?	Circular

MONTHLY INFLOWS INTO TANK

Month	Number of days	Rain-Evap on Tank CF	Rain-Evap on Existing Storage, CF	Normal Runoff CF	Washwater CF	Manure CF
October	31	0	0	0	0	0
November	30	0	0	0	0	193
December	31	0	0	0	0	199
January	31	0	0	0	0	199
February	28	0	0	0	0	180
March	31	0	0	0	0	199
April	30	0	0	0	0	0
May	31	0	0	0	0	0
June	30	0	0	0	0	0
July	31	0	0	0	0	0
August	31	0	0	0	0	0
September	30	0	0	0	0	0
Annual	365	0	0	0	0	972



U.S. Department of Agriculture
Natural Resources Conservation Service

ANIMAL WASTE MANAGEMENT WORKSHEET

Version 1.7

10/2/2003
STATE: OREGON

CLIENT: **R & R Dairy Bewley Creek Heifer Operation)**
ASSISTED BY: **Pedersen**
CHECKED BY:

ANIMAL WASTE MANAGEMENT SYSTEM APPLICATION

MANAGEMENT CRITERIA FOR TRACTOR SPREADER APPLICATION OF SOLIDS

To apply **61,739** cubic feet of solids generated from the operation it will take approximately **157** 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	Inches of Solids to Apply	Travel Length per Load Needed in Feet	Loads per Acre
			Bushels	CF	Feet	PPM	Lbs/100CF					
T37 1,11,12	16.9	Hay/Pasture Mix 16 % Protein	**317**	**394**	**15**	**2,210**	**13.79**	**307**	1.00	1.1	295	10
2,10	24.6	Hay/Pasture Mix 16 % Protein	**317**	**394**	**15**	**2,210**	**13.79**	**307**	1.00	1.1	295	10
3,6,8,9	24.5	Hay/Pasture Mix 16 % Protein	**317**	**394**	**15**	**2,210**	**13.79**	**307**	1.00	1.1	295	10
4,5,7	12	Hay/Pasture Mix 16 % Protein	**317**	**394**	**15**	**2,210**	**13.79**	**307**	1.00	1.1	295	10
0												
0												
0												
0												
0												

MANAGEMENT CRITERIA FOR BIG GUN SPRINKLER APPLICATION OF LIQUIDS

To apply **476,809** gallons of liquids generated from the operation it will take approximately **26** 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						
T37 1,11,12	16.9	Hay/Pasture Mix 16 % Protein	**300**	**250**	1/2 Circle	**47**	**0.39**	**307**	1.00	50.72	1.45	86.04	0.04
2,10	24.6	Hay/Pasture Mix 16 % Protein	**300**	**250**	1/2 Circle	**47**	**0.39**	**307**	1.00	50.72	1.45	86.04	0.04
3,6,8,9	24.5	Hay/Pasture Mix 16 % Protein	**300**	**250**	1/2 Circle	**47**	**0.39**	**307**	1.00	50.72	1.45	86.04	0.04
4,5,7	12	Hay/Pasture Mix 16 % Protein	**300**	**250**	1/2 Circle	**47**	**0.39**	**307**	1.00	50.72	1.45	86.04	0.04
0													
0													
0													
0													
0													

MANAGEMENT CRITERIA FOR TANK WAGON APPLICATION OF LIQUIDS

ANIMAL WASTE MANAGEMENT WORKSHEET

Version 1.7

CLIENT: **R & R Dairy Bewley Creek Heifer Operation)**
ASSISTED BY: **Pedersen** CHECKED BY:

ANIMAL WASTE MANAGEMENT SYSTEM APPLICATION

To apply **476,809** gallons of liquids generated from the operation it will take approximately **119** 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
T37 1,11,12	16.9	Hay/Pasture Mix 16 % Protein	**4,000**	**15**	**47**	**0.39**	**307**	1.00	16.71	26	113.4
2,10	24.6	Hay/Pasture Mix 16 % Protein	**4,000**	**15**	**47**	**0.39**	**307**	1.00	16.71	26	113.4
3,6,8,9	24.5	Hay/Pasture Mix 16 % Protein	**4,000**	**15**	**47**	**0.39**	**307**	1.00	16.71	26	113.4
4,5,7	12	Hay/Pasture Mix 16 % Protein	**4,000**	**15**	**47**	**0.39**	**307**	1.00	16.71	26	113.4
0											
0											
0											
0											
0											

U.S. Department of Agriculture
Natural Resources Conservation Service

ANIMAL WASTE MANAGEMENT WORKSHEET

Version 1.7

10/1/2003
STATE: OREGON

CLIENT: **R & R Dairy Bewley Creek Heifer Operation)**
ASSISTED BY: **Pedersen**
CHECKED BY:

ANIMAL WASTE MANAGEMENT SYSTEM UTILIZATION

NUTRIENTS AVAILABLE AFTER STORAGE

Nutrient Source	Type of Operation: Dairy Type of Storage Facility	Pounds of Nutrients Available			Percent Nutrients Retained After Storage			Pounds of Nutrients Retained After Storage		
		N	P_2O_5	K_2O	N	P_2O_5	K_2O	N	P_2O_5	K_2O
Liquids	Tank (Covered)	232	68	216	**80%**	**90%**	**90%**	185	62	195
Solids	Solids Storage Facility (Roofed)	11,354	3,356	10,592	**75%**	**90%**	**90%**	8,515	3,021	9,533
Grazing	NONE	16,419	4,854	15,317	**100%**	**100%**	**100%**	16,419	4,854	15,317

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	Broadcast (Incorporated 7 or more days after application)	185	62	195	**70%**	**100%**	**100%**	130	62	195
Solids	Broadcast (Incorporated 7 or more days after application)	8,515	3,021	9,533	**70%**	**100%**	**100%**	5,961	3,021	9,533
Grazing	Grazing	16,419	4,854	15,317	**85%**	**100%**	**100%**	13,956	4,854	15,317

NUTRIENTS AVAILABLE AFTER DENITRIFICATION

Nutrient Source	Location: Coast Soil Drainage Class	Pounds of Nutrients Available			Percent Nutrients Retained After Denitrification			Pounds of Nutrients Retained After Denitrification		
		N	P_2O_5	K_2O	N	P_2O_5	K_2O	N	P_2O_5	K_2O
Liquids	Moderately Well Drained	130	62	195	**82%**	**100%**	**100%**	106	62	195
Solids	Moderately Well Drained	5,961	3,021	9,533	**82%**	**100%**	**100%**	4,888	3,021	9,533
Grazing	Moderately Well Drained	13,956	4,854	15,317	**82%**	**100%**	**100%**	11,444	4,854	15,317

CLIENT: **R & R Dairy Bewley Creek Heifer Operation)**
ASSISTED BY: **Pedersen** CHECKED BY:

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
T37 1,11,12	16.9	Hay/Pasture Mix 16 % Protein	22%	23	0	22%	1,075	4	22%	2,518	8
2,10	24.6	Hay/Pasture Mix 16 % Protein	32%	34	0	32%	1,564	5	32%	3,662	12
3,6,8,9	24.5	Hay/Pasture Mix 16 % Protein	31%	33	0	31%	1,515	5	31%	3,548	12
4,5,7	12.0	Hay/Pasture Mix 16 % Protein	15%	16	0	15%	733	2	15%	1,717	6
0											
0											
0											
0											
0											
Off-Farm			0%	0		0%	0		0%	0	
		TOTALS-	100%	106	0	100%	4,888	16	100%	11,444	37

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
T37 1,11,12	16.9	Hay/Pasture Mix 16 % Protein	214	103	326	307	85	235	-93	18	91
2,10	24.6	Hay/Pasture Mix 16 % Protein	214	103	326	307	85	235	-93	18	91
3,6,8,9	24.5	Hay/Pasture Mix 16 % Protein	208	100	317	307	85	235	-99	15	82
4,5,7	12.0	Hay/Pasture Mix 16 % Protein	205	99	313	307	85	235	-102	14	78
0											
0											
0											
0											
0											
Off-Farm											

U.S. DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

NUTRIENT MANAGEMENT SPECIFICATION SHEET

CODE 590

Landowner/Operator .R & R Dairy

Job Location: T 2S; R 9W; Sec. 18

County: Tillamook SWCD Tillamook Farm/Tract No. T-37

Field No. 1,2,3,4,5,6,7,8,9,10,11,12

Prepared By: Pedersen Date: 05/03

⇒ Purpose:

⇒ To budget and supply nutrients for plant production.

⇒ To properly utilize manure and organic by-products 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.

Specifications:

⇒ Manure is applied to the surface of permanent pastures in accordance with the enclosed Waste Utilization Conservation Practice Jobsheet.

⇒ A target yield of 6 tons of dry matter per acre per yield is planned to utilize the nitrogen in the manure and/or commercial applied fertilizer.

⇒ Manure and commercial fertilizer is applied in accordance with soil tests.

⇒ Manure and/or commercial fertilizer is applied in split applications.

⇒ Soil tests are taken at least every 3 years.

⇒ Manure test are taken annually. Samples will be collected from the equipment that applies the manure and wastewater to the fields.

⇒ No more than 307 lbs. of nitrogen is applied per acre per year in accordance with the below Nutrient Distribution, unless soil and forage tests justifies higher rates.

Manure Application Equipment to be used:

317 Bushel Manure Spreader

6,000 gallon Tank wagon

Manure Nutrient Distribution

Field #	Grazing cycles/year	# of N by Livestock	# of N supplied by grazing/ac/yr	Loads of solid/yr	#of N per field/yr solids	#of N per acre from solids	Loads of Liquid/yr	#of N per field/year liquid	#of N per acre from liquid	Total # of N per acre/year
1.	10	342	**149**	**4**	217	**94**	**3**	31	**13**	**256**
2.	10	549	**148**	**7**	380	**103**	**4**	41	**11**	**262**
3.	10	795	**146**	**10**	543	**99**	**6**	61	**11**	**256**
4.	10	687	**143**	**9**	489	**102**	**6**	61	**13**	**258**
5.	10	657	**143**	**8**	435	**94**	**5**	51	**11**	**248**
6.	10	1,174	**145**	**15**	815	**101**	**10**	102	**13**	**259**
7.	10	373	**143**	**5**	272	**104**	**3**	31	**12**	**259**
8.	10	766	**145**	**10**	543	**102**	**6**	61	**11**	**258**
9.	10	813	**145**	**10**	543	**97**	**7**	71	**13**	**255**
10.	10	3,113	**149**	**39**	2,119	**101**	**24**	245	**12**	**262**
11.	10	1,788	**149**	**22**	1,195	**100**	**14**	143	**12**	**261**
12.	10	388	**149**	**5**	272	**104**	**3**	31	**12**	**265**
TOTAL		**11,445**		**144**	**7,823**		**91**	**929**		

⇒

⇒ Records are maintained of manure and/or commercial fertilizer applications.

⇒ Nutrient management plans are reviewed annually and adjustments are made as needed.

⇒ Manure is not applied within 35 feet of an open watercourse.

DESIGN APPROVAL:

Practice Code No.	Practice	Lead Discipline	Controlling Factor	Units	JOB CLASS				
					I	II	III	IV	V
590	Nutrient Management	CED-EE & BCSD-Agron	Area	Acres	160	320	640	All	All

This practice is classified as Job Class I

Design approved by: /s/ Robert A. Pedersen Date: 10/01/03

Job Title: Basin Team Leader

CLIENTS ACKNOWLEGEMENT STATEMENT:

The client acknowledges that:

a. They have received a copy of this specification and under-stands the contents and requirements.

b. The following information must be provided NRCS by the client before this practice can be certified as applied:

☒ Nutrient management application records including soil, water, plant and organic by-product test results.

☒ Documentation showing amount, rate, form and application method of nutrient applied

☒ Annual review of nutrient management including adjustments made.

c. It shall be the responsibility of the client to obtain all necessary permits and/or rights, and to comply with all ordinances and laws pertaining to the application of this practice.

d. Maintain records of nutrient application as required by state and local regulations.

Accepted by:/s/ Joe Rocha Date: 10/1/03

CERTIFICATION;

I have completed a review of the nutrient management and the specification's application and certify this practice has been applied.

Certification by:/s/_____ Date: _____

Job Title: _____

Natural Resources Conservation Service, Oregon

WASTE UTILIZATION SPECIFICATION SHEET

Client Dave & Joe Rocha.

Location: 8385 Bewley Creek Road, Tillamook, Oregon

Tract No. 37

Prepared By Pedersen Date 05/02/03

Perform the following operations:
❑ Have your technical assistance provider review the resource management system plan for your operation at least once every 5 years.
❑ Maintain records for all waste applications.
❑ Calibrate application equipment to apply wastes in accordance with the recommended amount and timing specified on the nutrient budget specification sheet, NRCS practice code 590, for the crop being grown.
❑ Chemical analysis of soils, plant tissue and waste should be used annually to monitor and adjust amounts of waste applied. Refer to Oregon State University Extension Service publication EC1478, "Soil Test Interpretation Guide" for guidance in getting soil tested and interpreting soil test results. Refer to Oregon State University Extension publication EM8585, "Manure Application Rates for Forage Production" and EM8768, "Calculating Dairy Manure Nutrient Application Rates" for guidance in getting animal waste tested for nutrient concentrations and computing application rates.
❑ Apply waste in a manner that will cover no more than 25 percent of the leaf surface with solids unless clean water applications are planned immediately after wastes are applied. For pasture/hayland it is best to apply waste 7 days after harvesting forage by haying or grazing.
❑ To reduce odor problems, apply waste in mid morning when temperatures are warming and air is rising rather than in the afternoon or evening when air is cooling and settling. Avoid applications during periods of fog.
❑ Do not apply waste directly into an open watercourse or where waste is likely to enter an open watercourse. Observe all waste application setbacks identified in the resource management system plan.
❑ Do not apply waste to fields where there is no growing crop. If applications are needed during fall and winter periods due to unforeseen circumstances, such as the storage facilities being full, use the following guidelines for waste applications: a) Only spread waste on fields that are growing a crop, preferably grass. b) Increase all waste application setbacks identified in the resource management system plan by 35 feet. c) Don't apply waste during any rainfall event that will cause runoff. d) Use maximum travel rates for the traveling big gun sprinkler and solids spreader. e) Use soil tests, such as the Pre-sidedress Soil Nitrate test, to determine if additional applications of waste are needed on those fields receiving emergency winter applications.
❑ Do not apply waste to fields with frozen or snow covered soil conditions unless provisions are made to control runoff.
❑ Do not spread waste on fields where soils are saturated, ponded, flooded and/or during times when waste is likely to runoff into open watercourses.
❑ Be aware of the location of sensitive areas, concerns of neighbors or concerns of the public which require special application procedures
❑ Handle all waste material with caution. Wear appropriate protective clothing.
❑ Clean up residual materials from equipment and dispose of properly.
❑ Equipment used in waste utilization should be regularly inspected and maintained as needed in accordance with equipment operation and maintenance guidelines from the manufacturer or provided by NRCS.
Additional Guidance and Notes:

633 OR-Specification

Natural Resources Conservation Service, Oregon — February 2002

WASTE UTILIZATION SPECIFICATION SHEET

DESIGN APPROVAL:

Practice Code NO.	PRACTICE	LEAD DISCIPLINE	CONTROLLING FACTOR	UNITS	JOB CLASS				
					I	II	III	IV	V
633	Waste Utilization	BCSD-Agron & CED-EE	Area	Acres	20	40	80	180	All

This practice is classified as Job Class III

Design Approved by:/s/ Robert A. Pedersen Date: 10/01/03

Job title: North Coast Basin Team Leader

CLIENTS ACKNOWLEDGEMENT STATEMENT:

The Client acknowledges that:

a. They have received a copy of the specification and understand the contents and requirements.

b. The following information must be provided to NRCS by the client before this practice can be certified as applied:
   - ❑ Waste application records which include the date, crop, type of waste applied, and amount of waste applied.
   - ❑ Calibration records for waste application equipment.
   - ❑ Analysis of nutrient concentrations in solid and liquid wastes.

c. It shall be the responsibility of the client to obtain all necessary permits and/or rights, and to comply with all ordinances and laws pertaining to the application of this practice.

Accepted by:/s/ Joe Rocha Date: 10/01/03

CERTIFICATION:

I have completed a review of the information provided by the client and certify this practice has been applied.

Certification by:/s/_____ Date:_____

Job title:_____

United States Department of Agriculture

NRCS Natural Resources Conservation Service

Waste Utilization

Conservation Practice Jobsheet

633 OR-JS

Natural Resources Conservation Service, Oregon

February 2002

Client Max R & R Dairy _____ Date 05/02/03

Definition

Waste Utilization is the beneficial use of agricultural wastes such as manure and wastewater or other organic residues.

Purpose

The ultimate purpose of waste utilization is to insure the proper use of agricultural wastes while protecting soil, water, air, plant, and animal resources. Agricultural wastes can be used to provide nutrients for crops, forage, and fiber production and forest products. Agricultural waste also can be used as an amendment to improve or maintain soil structure, provide feedstuff for livestock, or provide a source of energy. The focus of this job sheet will be the use of agricultural wastes to provide fertility for crops, forage, and fiber production and forest products; and to supply organic material to the soil.

Where used

Waste utilization is used where agricultural wastes (primarily animal manure and polluted runoff from livestock and poultry operations) are generated and collected as part of a resource management system. Wastes can be used as a source of fertility on cropland and pastureland, and occasionally on forest land or rangeland. Use of the Soil Condition Index (SCI) can be used to determine the effects of organic material on soil quality.

Conservation Management Systems

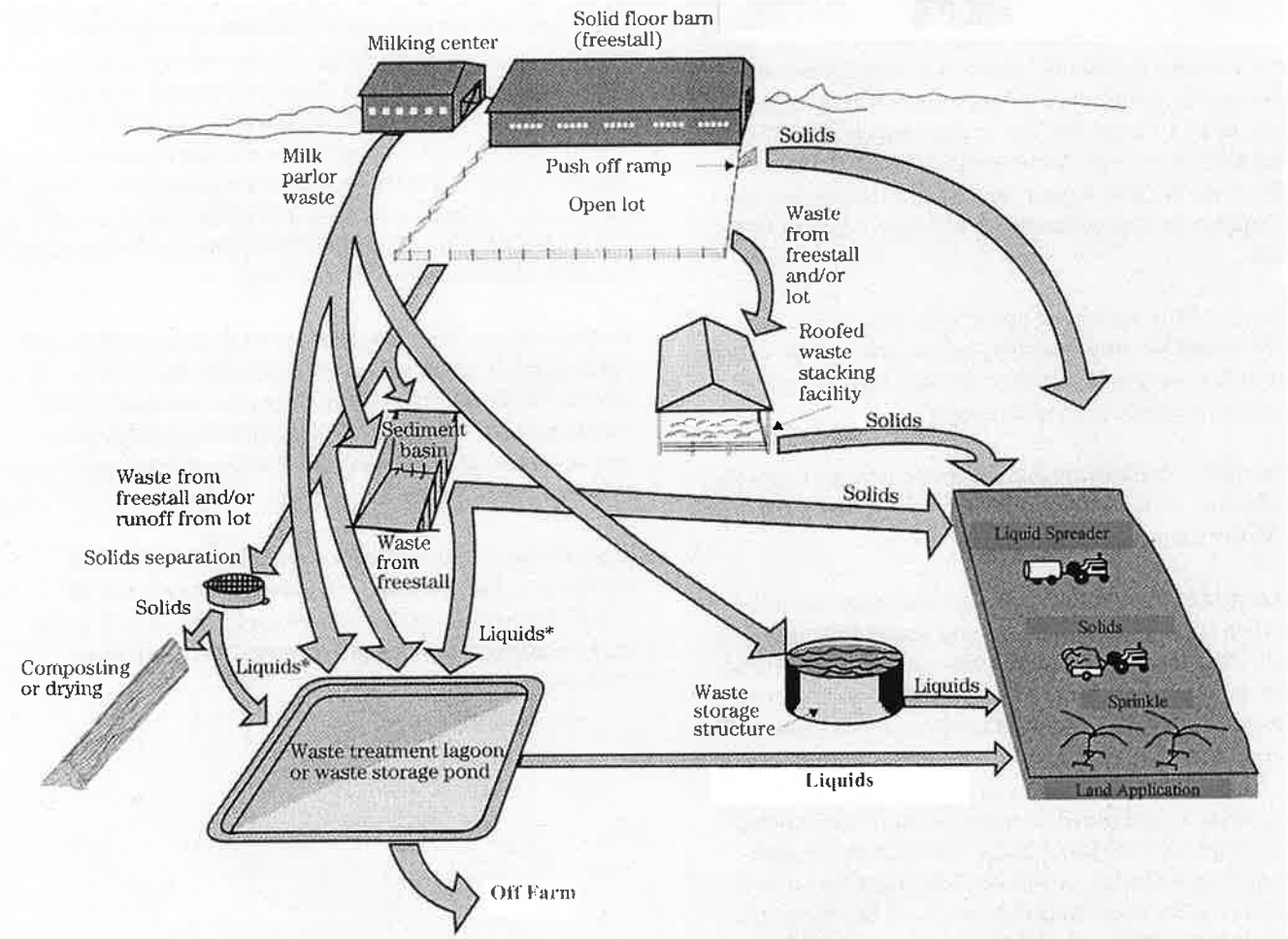
Waste utilization is generally one of several components of a resource management system used to manage manure and polluted water from livestock and poultry operations. Where the wastes are used to supply the fertility needs of crop and pasture, waste utilization is done as part of an overall resource management plan for the enterprise.

Waste Utilization Planning

Waste utilization components of the conservation plan will contain the following information:

- field map and soil map
- crop rotation or sequence
- results of soil, water, plant, and organic material samples analyses
- expected yield
- sources of nutrients to be applied
- nutrient budget, including credits of nutrients available
- recommended nutrient rates, form, timing, and method of application
- location of designated sensitive areas
- guidelines for operation and maintenance

Waste utilization is most effective when used with other conservation practices such as cover crop, residue management, conservation buffers, irrigation water management, nutrient management, pest management, and conservation crop rotation.



* Liquids from lot runoff discharged to waste storage pond only

Schematic of a Resource Management System for a Dairy

Operation and maintenance

Operation and maintenance activities shall include record keeping for 5 years or longer that includes the following:

- Quantity of manure and other agricultural wastes produced, and their nutrient content.
- Soil test results.
- Dates and rates of waste application where land applied, and the dates and amounts of waste removed from the system due to feeding, energy production, or export from the operation.
- Waste application methods.
- Crops grown and yields (both yield goals and measured yield).
- Other tests as needed, such as determining the nutrient content of the harvested product.
- Calibration of the application equipment.
- Changes in soil condition(SCI).
- Plan map showing fields where waste is applied.

Specifications

Site specific requirements for waste utilization are listed on specification sheets. Specifications are prepared in accordance with the NRCS Field Office Technical Guide. See NRCS practice standard, Waste Utilization, code 633. Use NRCS's Agricultural Waste Management Field Handbook or locally accepted references for procedures to calculate values such as residual nitrogen from past waste applications, and to estimate available nutrients in wastes where lab analyses are not available.

Natural Resources Conservation Service, Oregon

WASTE UTILIZATION WORKSHEET

Spreader Equipment Calibration

(Using Bucket, Pan or Tarp)

Name:_____ Date:_____

Operator:_____ Spreader ID:_____

Perform the following operations to calibrate the solids spreader equipment:

- ✓ Place buckets, pans, or tarps in the application area to collect the applied or spread waste material.
- ✓ Spread waste material over the application area using the spreading pattern normally used in the field. Make sure the spreader is traveling at the speed it typically travels over the collection area. Record engine rpm and gear settings used.
- ✓ Collect and weigh the waste material and calculate the average application rate. Use this worksheet to record the weights and calculations.

Note: Use Tarps instead of buckets or pans when using dry stack manure or separated solids as the variability in the weight will be less.

Data and Calculations:

Steps	ID of Bucket, Pan or Tarp					
	A	B	C	D	E	F
1. Date of calibration test-						
2. Engine RPM during spreading -						
3. Gear selected during spreading -						
4. Weight of empty bucket (lb) =						
5. Weight of bucket with waste (lb) =						
6. Weight of Waste (lb) - line 5 – line 4 =						
7. Collection Area (sq ft) - Area of the top of the bucket, pan or tarp used to collect the waste =						
8. Waste Applied (lb/sq ft) - line 6 ÷ line 7 =						
9. Covert to tons per acre - line 8 x 21.78 =						
10. Average Application Rate (tons per acre)- Sum of values in cells A9 through F9 divided by the total number of calibrations completed =						

Additional Notes:

633 OR-Specification

Natural Resources Conservation Service, Oregon — February 2002

WASTE UTILIZATION WORKSHEET

Spreader Equipment Calibration

(Using a Full Spreader Load)

Name:_____ Date:_____

Operator:_____ Spreader ID:_____

Perform the following operations to calibrate the solids spreader equipment:

- ✓ Determine the weight of the waste material loaded in the spreader by using truck scales to weigh the spreader equipment when it is empty and full.
- ✓ Spread the loaded spreader on the field using consistent speed and spreader settings to cover the field uniformly. Spread in a rectangular pattern so the area calculation will be simple. Record engine rpm and gear settings used.
- ✓ Measure the length and width covered by the full load and compute the application rate in tons per acre using this worksheet.

Data and Calculations:

Steps	ID of Calibration Test					
	A	B	C	D	E	F
1. Date of calibration test-						
2. Engine RPM during spreading -						
3. Gear selected during spreading -						
4. Weight of empty spreader (lb) =						
5. Weight of loaded spreader (lb) =						
6. Weight of Waste in spreader (lb) - line 5 – line 4 =						
7. Length of spreading area (ft) =						
8. Width of spreading area (ft) =						
9. Area spread (sq ft) - line 7 x line 8 =						
10. Waste applied (lb/sq ft) – line 6 ÷ line 9=						
11. Convert to tons per acre - Line 10 x 21.78=						
12. Average Application Rate (tons per acre) – Sum of values in cells A11 through F11 divided by the total number of calibrations completed =						

Additional Notes:

Natural Resources Conservation Service, Oregon

WASTE UTILIZATION WORKSHEET

Tank Equipment Calibration

(Using a Full Tank Load)

Name:_____ Date:_____

Operator:_____ Spreader ID:_____

Perform the following operations to calibrate the tank equipment:

- ✓ Determine the maximum capacity of the tank equipment from the manufacturer's maintenance manual or the owners manual for the equipment.
- ✓ Fill the tank and reduce the volume of the tank by the appropriate amount if the tank is not filled to its maximum capacity. Normally a tank spreader is only filled to about 80 percent of its maximum capacity and therefore the maximum rated capacity of the tank should be multiplied by 0.8 to reflect the volume of the loaded tank during the calibration exercise.
- ✓ Spread the loaded tank on the field using consistent speed and settings to cover the field uniformly. Try to spread in a rectangular pattern so the area calculation will be simple. Record engine rpm and gear settings used.

Data and Calculations:

Steps	ID of Calibration Test					
	A	B	C	D	E	F
1. Date of calibration test-						
2. Engine RPM during spreading-						
3. Gear selected during spreading-						
4. Maximum rated capacity of tank (gallons) =						
5. Volume of filled tank (gallons)- Line 4 x ____ % of tank filled ÷ 100% =						
6. Length of spreading area (ft) =						
7. Width of spreading area (ft) =						
8. Area spread (sq ft)- line 6 x line 7 =						
9. Waste applied (gal/sq ft)- line 5 ÷ line 8 =						
10. Convert to gallons per acre - Line 9 x 43,560 =						
11. Average Application Rate (gallons per acre) – Sum of values in cells A10 through F10 divided by the total number of calibrations completed =						

Additional Notes:

633 OR-Specification

Natural Resources Conservation Service, Oregon — February 2002

WASTE UTILIZATION WORKSHEET

Traveling Big Gun Sprinkler Calibration

(Using Catch Cans)

Name:_____ Date:_____

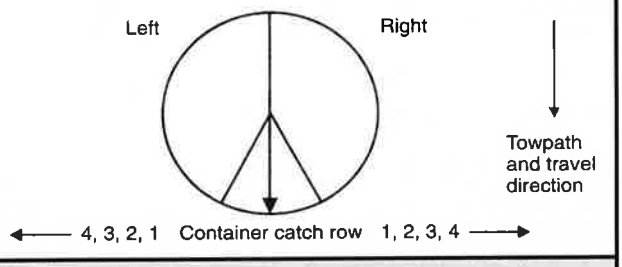
Perform the following operations to calibrate the traveling big gun sprinkler:

- ✓ Use 5 to 10 catch cans to collect the sprinkler-irrigated waste. Use straight-sided buckets for catch cans. Two pound coffee cans work well. Make sure all of the catch cans have the same diameter.
- ✓ Place one of the catch cans on a level surface and fill it with water to a known depth (1-3 inches). Pour the water from the catch can into a large measuring cup. Determine how many measuring cups of water are equal to an inch of water in the catch can.
- ✓ Place at least five catch cans across the towpath of the big gun sprinkler. Try to space the catch cans uniformly from the center of the towpath to the outer edge of the wetted area of the sprinkler. Stake the catch can in place or put a rock in the bottom of the catch can to keep it upright. Allow the traveling big gun sprinkler to completely pass over the catch cans. Use the measuring cup previously used to calibrate the catch cans to measure the amount of liquid collected in each can and convert the volume to inches. Be sure to add together the amount measured from the catch cans that would receive overlap from the adjacent towpath. For example, if catch can #4 will receive liquids from the adjacent towpaths, add the amount from container #4 on the left to container #4 on the right side to compute the total amount applied at the location of container #4 on the right and left sides of the towpath.

Catch Can Calibration:

Example: 1 inch = 5 Cups
1 cup = 0.2 Inches

Your Catch Cans: 1 inch = _____ Cups
1 cup = _____ Inches



Travel Rate Setting During Test:

Data and Calculations:

Catch Can ID	Volume of Liquid							
	Cups	Inches	Cups	Inches	Cups	Inches	Cups	Inches
1.								
2.								
3.								
4.								
5.								
6.								
7.								
8.								
9.								
10.								
Average =								

Natural Resources Conservation Service, Oregon

WASTE UTILIZATION WORKSHEET

Nitrogen Based Waste Application

Name:_____ Date:_____

Example:

Corn silage is being grown and the recommended nutrient application from the nutrient budget worksheet is 200 pounds of nitrogen(N) per acre. A traveling big gun sprinkler will be used to make 1 application of liquids from a non-agitated waste storage pond and a tractor spreader will be used to make 1 application of solids from a dry stacking facility that will not be incorporated into the field.

Waste application rates and amounts:

Steps	Example		Your Calculations			
	Liquid	Solids	Liquid	Solids	Liquid	Solids
1. Type of waste-	Dairy	Dairy				
2. Crop receiving waste-	Corn Silage	Corn Silage				
3. Desired nitrogen application rate, lb/acre-	100	100				
4. Nutrient concentrations in storage from laboratory analysis or from Table 1-1: **Nitrogen (N)-**	lb/1000 gal 4	lb/ton 9	lb/1000 gal	lb/ton	lb/1000 gal	lb/ton
Phosphorus (P_2O_5)-	1	4				
Potassium (K_2O)-	6	19				
5. Plant availability of nitrogen from Table 1-1 in percent-	100 %	100 %	%	%	%	%
6. Nitrogen retained, in percent, after application from Table 1-2-	75 %	70 %	%	%	%	%
7. Calculate nitrogen availability- line 4 N x line 5 x line 6 ÷ 10,000=	lb/1000 gal 3	lb/ton 6.3	lb/1000 gal	lb/ton	lb/1000 gal	lb/ton
8. Determine nitrogen application rate from the nutrient application charts: **Nitrogen (N)-**	inches/acre 1.75	tons/acre 17	inches/acre	tons/acre	inches/acre	tons/acre
9. Determine the amount of phosphorus and potassium applied from nutrient concentration data on line 4 and nutrient application charts: **Phosphorus (P_2O_5)-**	lb/acre 50	lb/acre 70	lb/acre	lb/acre	lb/acre	lb/acre
Potassium (K_2O)-	250	300				
10. Total Nutrients Applied, lb/acre: **Nitrogen (N)-** (Sum of liquids and solids from line 3)	200 lb/acre		lb/acre		lb/acre	
Phosphorus (P_2O_5)- (Sum of liquids and solids from line 9)	120 lb/acre		lb/acre		lb/acre	
Potassium (K_2O)- (Sum of liquids and solids from line 9)	550 lb/acre		lb/acre		lb/acre	

633 OR-Specification

Natural Resources Conservation Service, Oregon — February 2002

WASTE UTILIZATION WORKSHEET

Phosphorus Based Waste Application

Name:_____ Date:_____

Example:

Corn silage is being grown and the recommended nutrient application from the nutrient budget worksheet is 100 pounds of phosphorus(P_2O_5) per acre. A traveling big gun sprinkler will be used to make 1 application of liquids from a non-agitated waste storage pond and a tractor spreader will be used to make 1 application of solids from a dry stacking facility that will not be incorporated into the field.

Waste application rates and amounts:

Steps	Example		Your Calculations			
	Liquid	Solids	Liquid	Solids	Liquid	Solids
1. Type of waste-	Dairy	Dairy				
2. Crop receiving waste-	Corn	Corn				
3. Desired phosphorus application rate, lb/acre-	50	50				
4. Nutrient concentrations in storage from laboratory analysis or from Table 1-1: **Nitrogen (N)-**	lb/1000 gal 4	lb/ton 9	lb/1000 gal	lb/ton	lb/1000 gal	lb/ton
Phosphorus (P_2O_5)-	1	4				
Potassium (K_2O)-	6	19				
5. Determine phosphorus application rate from the nutrient application charts: **Phosphorus (P_2O_5)-**	inches/acre 1.0	tons/acre 14	inches/acre	tons/acre	inches/acre	tons/acre
6. Plant availability of nitrogen from Table 1-1 in percent-	100 %	100 %	%	%	%	%
7. Nitrogen retained, in percent, after application from Table 1-2-	75 %	70 %	%	%	%	%
8. Calculate nitrogen availability- line 4 N x line 6 x line 7 ÷ 10,000=	lb/1000 gal 3	lb/ton 6.3	lb/1000 gal	lb/ton	lb/1000 gal	lb/ton
9. Determine the amount of nitrogen and potassium applied from nutrient concentration data on line 8, line 4 and the nutrient application charts: **Nitrogen (N)-**	lb/acre 75	lb/acre 75	lb/acre	lb/acre	lb/acre	lb/acre
Potassium (K_2O)-	150	250				
10. Total Nutrients Applied, lb/acre: **Nitrogen (N)-** (Sum of liquids and solids from line 9)	150 lb/acre		lb/acre		lb/acre	
Phosphorus (P_2O_5)- (Sum of liquids and solids from line 3)	100 lb/acre		lb/acre		lb/acre	
Potassium (K_2O)- (Sum of liquids and solids from line 9)	400 lb/acre		lb/acre		lb/acre	

Natural Resources Conservation Service, Oregon

WASTE UTILIZATION WORKSHEET

Table 1-1

Typical Manure Nutrient Concentrations for Different Handling Systems

The table below shows typical values of the nutrient content of manure from different animal waste handling systems. You can use them as a rough estimate of the nutrient content of your manure. Because manure nutrient content varies widely among farms and even over time on the same farm, it is recommended to test your manure to get realistic nutrient content numbers for your farm. Refer to Oregon State University Extension Publication PNW 505, "Which test is best?" for more information on manure testing.

Typical nutrient content, solids content, density, and nitrogen availability of animal manure at the time of application:

Solids from:	Nitrogen N (lb/Ton)[2]	Phosphorus P_2O_5 (lb/Ton)[2]	Potassium K_2O (lb/Ton)[2]	Solids (Percent)	Bulk Density (lb/cubic yard)	Nitrogen Availability (Percent)[1]
Broiler with litter	73	64	66	70	900	40-70
Laying Hen	37	57	47	40	1400	40-70
Sheep	18	9	35	28	1400	25-50
Horse	9	6	16	37	1400	0-20
Beef	12	6	17	23	1400	20-40
Dairy:						
Dry Stack	9	4	19	35	1400	20-40
Separated Solids	5	2	3	19	1100	0-20
Liquids from:	**Nitrogen N (lb/1,000gal)**	**Phosphorus P_2O_5 (lb/1,000gal)**	**Potassium K_2O (lb/1,000gal)**	**Solids (Percent)**	**Density (lb/gal)**	**Nitrogen Availability (Percent)[1]**
Dairy:						
Holding Tank	21	14	24	8	9.2	75-85
Pond, no agitation	4	1	6	<1	8.4	85-95
Pond, agitated	12	7	18	4	9.0	80-90

1 Nitrogen available in the first growing season after application. For a field that has received manure annually for 4 years or more, consider 100% of the nitrogen available.

2 Manure is at the moisture content typically found in storage.

Table 1-2

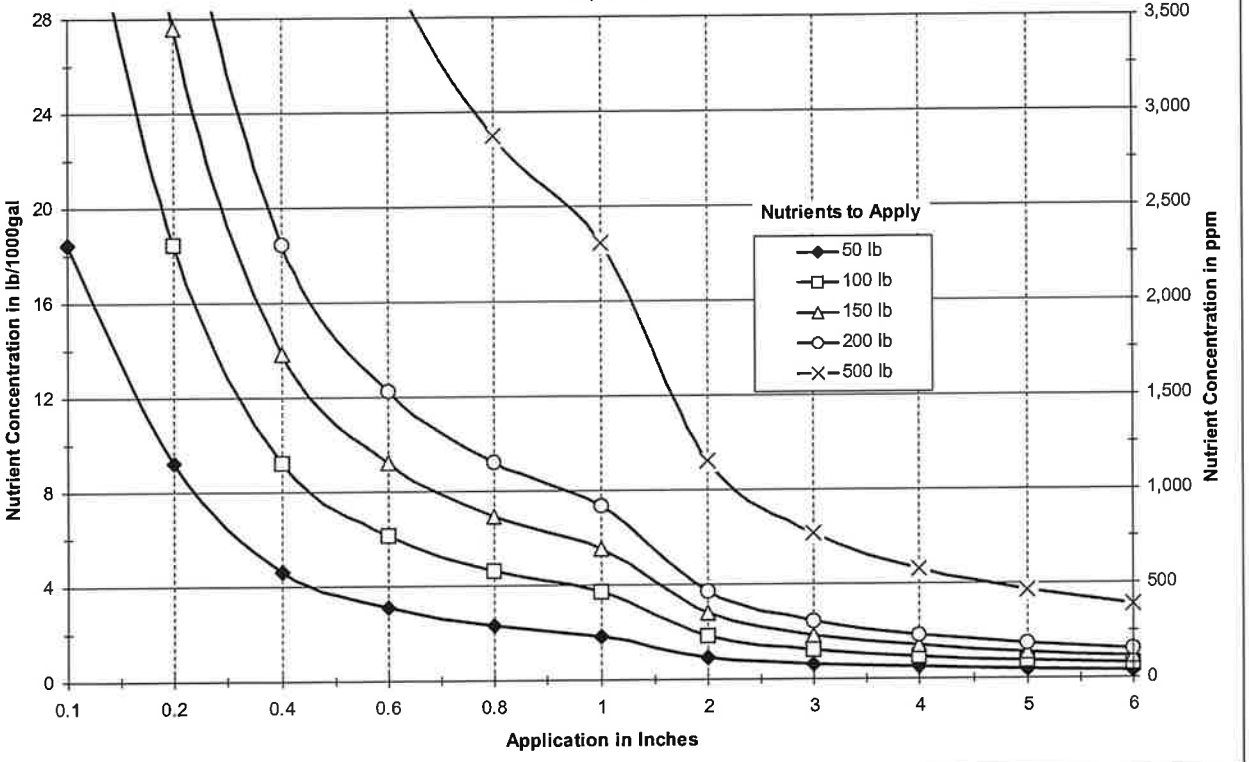
Typical Nutrient Availability After Application

Typical nutrient content of animal manure retained after application:

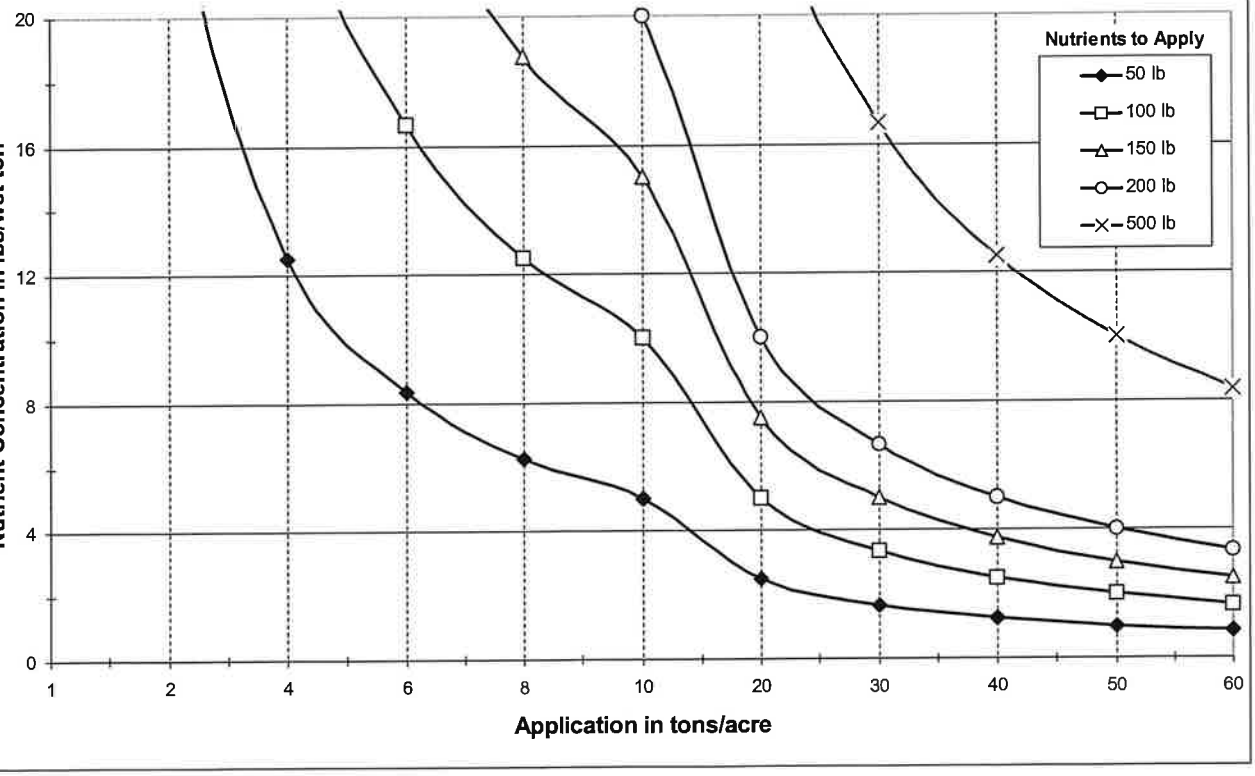
Application Method	Percent of original nutrient content of manure retained after application		
	N	P_2O_5	K_2O
Injection	95%	100%	100%
Sprinkling	75%	100%	100%
Broadcast (Incorporated 1 day after application)	90%	100%	100%
Broadcast (Incorporated 4 days after application)	80%	100%	100%
Broadcast (Incorporated 7 or more days after application)	70%	100%	100%

WASTE UTILIZATION WORKSHEET

NUTRIENT APPLICATION CHART for LIQUIDS



NUTRIENT APPLICATION CHART for SOLIDS



Natural Resources Conservation Service, Oregon

WASTE UTILIZATION WORKSHEET

Waste Application Record

Name:______________________________ Field ID:____________________

Crop:______________________________ Acres:__________ Seeding Date:__________

Date	Crop Stage	**Waste Type** Liquids **(L)**, Solids **(S)**, Separated Solids **(SS)**, Etc.	**Amount Applied** (Loads, Inches, Tons, Hours of Operation, Etc.)	Notes

U.S. DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

PRESCRIBED GRAZING SPECIFICATION SHEET

CODE 528A

Landowner/Operator: R & R Dairy

Job Location: T 2S; R 9W; Sec. 18

County: Tillamook SWCD Tillamook County Farm/Tract No. T-37

Field No.: 1-12

Prepared By: Pedersen Date: 05/03

⇒ Purpose:

⇒ Improve or maintain the health and vigor of the forage stand

⇒ Maintain and improve water quality

⇒ Maintain or improve animal health and productivity.

⇒ Attain grazing and management efficiency to promote economic stability.

Specifications:

⇒ Pastures are managed to assure at least 6 tons of dry matter is produced per acre per year.

⇒ Pastures are reestablished when forage yields fall below 4 tons of dry matter per acre per year.

⇒ A rotational grazing system is used. There are 12 pasture units used in the rotation. The pasture units are stripped grazed. A 21 day re-growth period is used during the normal years. During low rainfall years, the re-growth period various between 30 to 35 days.

⇒ Noxious weeds such as Tansy Ragwort and Canada Thistle are controlled in accordance with an Integrated Pesticide Management Plan.

⇒ Pastures are clipped and dragged at least twice during the growing season.

⇒ Manure and commercial fertilizer applications are based on soil tests. Soil tests will be taken at least every 3 years. Nitrogen applications will not exceed 307 lbs. of nitrogen per acre per year unless soil tests and forage production justifies higher application rates.

⇒ Manure is applied to pastures in accordance with the enclosed Waste Utilization Conservation Practice and Nutrient Management Specification Sheets.

⇒ Spring grazing is delayed until the grasses have at least 6 inches of growth and the soil is firm.

⇒ Pastures are not grazed below 2 inches any time during the growing season.

⇒ Excess forage will be cut for silage. See Forage harvest Management Specification Code 511.

⇒ Livestock are removed from the pastures in the fall when the ground becomes wet and the grasses have at least 3 inches of growth going into the winter.

DESIGN APPROVAL:

This practice is classified as Job Class III

Design approved by: /s/ Robert A. Pedersen Date: 10/1/03

Job Title: Basin Team Leader

CLIENTS ACKNOWLEGEMENT STATEMENT:

The client acknowledges that:

a. They have received a copy of this specification and understands the contents and requirements.

b. It shall be the responsibility of the client to obtain all necessary permits and/or rights, and to comply with all ordinances and laws pertaining to the application of this practice.

Accepted by:/s/ _____ Date: 10-1-03

CERTIFICATION;

I have completed a review of the prescribed grazing practice and the specification's application and certify this practice has been applied.

Certification by:/s/_____ Date: _____

Job Title: _____

U.S. DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

FILTER STRIP SPECIFICATION SHEET
CODE 393

Landowner/Operator: R & R Dairy

Job Location: T 2S; R 9W; Sec. 18

County: Tillamook SWCD Tillamook Farm/Tract No. T-37

Field No. F,2,3,6,8,9,10

Prepared By: Pedersen Date 05/03

Purpose: To reduce manure runoff into an adjacent open watercourse and the resulting fecal and organic contamination in the watercourse.

Specifications:

⇒ A 35 foot grass filter strip will be maintained adjacent to all open water courses that flow through the farm.

⇒ No manure will be applied to the filter strip area.

⇒ Noxious weeds such as Tansy Ragwort and Canada Thistle are controlled in accordance with an Integrated Pesticide Management Plan.

⇒ Excessive accumulation of sediment and/or manure will be removed. The filter strip will be harrowed at least once each year prior to May 1st to shape and maintain at least a 1 % grade sloping away from the existing open water courses. Filter strip grade will be maintained to allow the runoff to occur along the entire length of the filter strip and not occur in only certain areas of the filter strip.

⇒ Depressions will be prevented from forming in the filter strip area where manure and sediment can be trapped.

⇒ Debris will not be allowed to accumulate in the filter strip.

⇒ Filter strips will be clipped, dragged, and or grazed at least twice during the growing season.

⇒ Grass will be at least 3 inches high by October 15th.

DESIGN APPROVAL

This practice is classified as Job Class II

Design approved by: Robert A. Pedersen Date: 10/1/03

Job Title: Basin Team Leader

Client Acknowledgement Statement:

The client acknowledges that:

a. They have received a copy of this specification and under-stands the contents and requirements.

b. It shall be the responsibility of the client to obtain all necessary permits and/or rights, and to comply with all ordinances and laws pertaining to the application of this practice.

Accepted by:/s/ Joe Rocha Date: 10-1-03

Certification:

I have completed a review and checked out the filter strip practice specifications and certify that the practice has been applied in accordance with specifications.

Certified by: /s/_____ Date:_____

Job Title:_____

SOIL AND MANURE SAMPLING INSTRUCTIONS FOR ANIMAL WASTE MANAGEMENT SYSTEMS

SOIL SAMPLES — Job Sheet 5

Spring Soil Samples

- Spring soil samples are to be collected the last 2 weeks of March or the first 2 weeks in April when soils are not saturated.
- Soil samples are to be collected on fields that have not received manure applications within the last 30 days.
- Collect several samples (about 10 one-fourth cup samples) of soils from just below the thin sod layer to a depth of 6 to 9 inches and add to bucket.
- Mix the samples in the bucket and remove a 1 cup from the mixture and place into a sample bag.
- The bag should be labeled with ;
  farm or operator name
  sample date
  field and tract (see NRCS plan map)
  sample depth (0 to 9 inches)
- Keep soil sample cool (small cooler with some ice) in the field until sample can be put in refrigerator or into freezer. Soil can be stored in refrigerator for up to 1 week or can be stored in a freezer for longer periods.
- Ship samples to lab (see shipping instructions below).

Fall Soil Samples

- Fall soil samples are to be collected during the last 2 weeks in September or the first 2 weeks in October on soils that are not saturated.
- Soil samples are to be collected on fields that have received normal manure applications during the current year.
- Sample soils and ship as outlined in the spring soil sample section above.

MANURE SAMPLES

Liquid Manure Samples

- Liquid manure samples should be sampled after agitating the storage facility for the first application made in the spring (March-April) and for the last application in the fall (September-October).
- Put a bucket in the path of the gun or carefully take bucket sample of liquid manure from the liquid manure tank wagon .
- Fill a sample bottle with some of the liquid manure from the bucket and keep cool while in the field. (you can put the sample in a small cooler with some ice)
- Label the sample with the farm or operator name, date, and liquid manure sample.
- Freeze the sample until ready to ship to the lab.

EM 8832-E
May 2003
$2.00

Post-harvest Soil Nitrate Testing

for Manured Cropping Systems West of the Cascades

D.M. Sullivan and C.G. Cogger

Contents

What's in this publication?

This publication describes the use of post-harvest soil nitrate testing as a tool for assessment of nitrogen (N) management in manured cropping systems west of the Cascade Mountains in Oregon, Washington, and south coastal British Columbia.

The first section of this publication gives general information on the test and is designed for use by growers and dairy operators. This section gives a brief introduction to soil sampling, but does not provide all of the technical details. The focus is on how to use the post-harvest test to improve nutrient management. This section describes:

- What the post-harvest test measures
- How to collect soil samples
- Units used in soil nitrate testing
- How to interpret soil nitrate test results for grass and silage corn crops

In addition, background information explains the rationale for the test:

- How to use the post-harvest test as a management tool (page 3)
- Crop and soil response to excess plant-available N (page 4)

Dan M. Sullivan, Extension soil scientist, Oregon State University, and Craig G. Cogger, Extension soil scientist, Washington State University.

OREGON STATE UNIVERSITY
EXTENSION SERVICE

How to use the post-harvest test as a management tool

Sampling depth and timing are critical. Interpretation tables for this test apply only to samples taken to a 12-inch depth. Surface soil (0 to 12 inches) typically contains the highest nitrate-N levels and requires the least time and effort for sample collection. Samples must be taken before heavy fall rains move nitrate below the 12-inch depth. The target sampling period generally is August 15 to October 15.

To get the most value from this test, it is important to understand:

- How the test fits into an overall nutrient management program
- Limitations to interpretation of test results
- How *not* to use the test

Using the test as part of a nutrient management program

The post-harvest test is but one measure of success in nutrient management. Post-harvest nitrate test data should be assessed in the context of the current N management plan and records of manure application. Successful N management involves a number of components, including:

- Assessing crop N needs
- Planning manure application to meet crop N needs
- Applying manure according to the plan
- Recording manure application amount and estimated plant-available N amount
- Measuring crop yield and N content
- Monitoring success of the plan

All components of the nutrient management system should be evaluated together.

Limitations to test results

Interpretive values for post-harvest soil nitrate are:

- Calibrated only for high-rainfall portions of the Pacific Northwest (west of the Cascades). Extrapolation to other environments is not recommended.
- Provided only for corn silage and grass hay/silage crops. Field research has been used as the basis for interpretive levels for these crops. Applicable research data are not available for other crops to determine post-harvest nitrate-N levels associated with good crop and nutrient management practices. However, the test may be used for relative comparisons among fields planted to another crop (e.g., comparisons among grass pasture fields).
- Based on the assumption that summer irrigation is less than, or close to, evapotranspiration to ensure that significant nitrate leaching does not occur before the fall test.
- Designed for fields with a history of applied manure (more than 3 consecutive years of regular manure application). Lower post-harvest soil nitrate test values are attainable where only fertilizer N is used, or where manure is applied infrequently.
- Based on good management of the crop and normal yields. Crop moisture stress, insect damage, or plant disease will reduce crop yield and crop uptake of nitrogen, thus increasing post-harvest soil nitrate test levels.

How *not* to use the post-harvest test

The test will *not*:

- Detect a shortage of plant-available nitrogen for crop production. Continual mineralization of nitrogen (conversion of organic N forms to plant-available N forms in the soil) can provide enough plant-available nitrogen for a crop without accumulation of nitrate-N in soil.
- Determine the source(s) of excess plant-available N. Sources of N may include manure slurry, lagoon water, fertilizer, soil organic matter, or previous crop residues.
- Predict crop response to fall manure or N fertilizer applications. The test does not predict the amount of plant-available N that will be mineralized from soil organic matter or crop residues in the fall.

Table 1.—Average calendar date when cumulative rainfall (after September 1) reaches 5 inches west of the Cascades.[a]

Cumulative rainfall after Sept. 1	Calendar date to reach specified cumulative rainfall							
	Medford (OR)	Salem (OR)	Tillamook (OR)	Coupeville (WA)	Centralia (WA)	Lynden (WA) Abbotsford (BC)	Agassiz (BC)	Comox (BC)
(inches)								
3	10 Nov	20 Oct	26 Sep	31 Oct	8 Oct	1 Oct	26 Sep	10 Oct
5	29 Nov	1 Nov	8 Oct	24 Nov	23 Oct	15 Oct	9 Oct	25 Oct
7	16 Dec	13 Nov	18 Oct	15 Dec	4 Nov	27 Oct	19 Oct	6 Nov

[a]Average daily precipitation data for many other locations is available at: Western Regional Climate Center (http://wrcc.dri.edu) or Environment Canada (http://www.msc-smc.ec.gc.ca/climate/climate_normals/index_e.cfm).

3 inches of cumulative fall rainfall. The starting date for calculating cumulative fall rainfall is September 1. Include inches of irrigation water applied after September 1 in your estimate of cumulative rainfall.

Table 1 shows the average calendar date when cumulative fall rainfall (after September 1) reaches 5 inches at a variety of locations. For most locations, sampling prior to October 15 is acceptable in an average year. In high rainfall areas (coastal areas and the Cascade foothills), plan to sample earlier. A late October sampling date usually is acceptable in lower rainfall areas of southern Oregon, the Puget Sound islands, Olympic Peninsula, or Vancouver Island.

Units used in soil nitrate testing

In this publication, interpretation of a post-harvest soil nitrate test (Tables 3 and 4) is based on units of parts per million (ppm). Some labs report soil test nitrate-N in units of lb/acre by assuming a standard value for soil bulk density. If the lab reports nitrate-N results in pounds per acre, ask them to provide a conversion factor to express data in units of ppm. The conversion factor assumed by laboratories usually is between 3 and 4, because 1 acre-foot of dry soil usually weighs about 3.5 million pounds (3.5 lb per acre-foot = 1 ppm).

Table 2.—Units used to report soil nitrate analyses.

Name	Interpretation	Equivalent units
nitrate-N or NO_3-N	N present in the nitrate form, soil dry weight basis	mg/kg or ppm (dry weight basis)

Interpreting soil nitrate test results

Data quality and variability

The first step in evaluating your soil nitrate data is to verify data quality. Determine whether the sample collection method, timing of sample collection, sample preservation, and laboratory analysis methods are acceptable. Reject data that did not result from reasonable protocols. For example, Tables 3 and 4 should not be used for soil samples collected in November after heavy fall rains.

Make sure that you understand the units used to report test results. See Table 2 for an explanation of units found in soil test reports.

Table 3.—Silage corn. Suggested interpretation for post-harvest soil nitrate-N (0- to 12-inch depth).[a]

If post-harvest nitrate-N is less than 20 ppm (less than approximately 70 lb N per acre)

- Continue present N management.

If post-harvest nitrate-N is 20 to 45 ppm (approximately 70 to 160 lb N per acre)

- Reduce or eliminate sidedress N fertilizer application. Use the pre-sidedress nitrate test (PSNT). Apply sidedress N only when PSNT indicates a need.
- Reduce lagoon water application after August 1.
- Keep records to document crop yield, dry matter, and crop N removal. Total applied manure-N + fertilizer-N should be less than 125 percent of documented crop N removal.
- Reduce manure application on fields where corn follows grass sod plow-down.
- Plan to reduce manure-N application by 10 to 25 percent.
- Improve whole farm N balance.

If post-harvest nitrate-N is greater than 45 ppm (greater than approximately 160 lb N per acre)

- Apply only starter N (20 to 40 lb N/acre at planting).
- Plan not to sidedress N fertilizer in June. Apply sidedress N only when PSNT indicates a need.
- Eliminate lagoon water application after August 1.
- Keep records to document crop yield, dry matter, and crop N removal. Apply manure N at a rate less than or equal to crop N removal (approximately 200 lb total N per acre).
- Eliminate manure application on a few fields or a few strips within a field next year to determine the contribution of mineralized N vs. current-season application of manure.
- Plan to reduce manure-N application by 25 to 40 percent.
- Consult experts to improve whole farm nutrient balance.

[a]The post-harvest test values listed above are for the *end* of a growing season. Management changes (if needed) should be implemented in future years. Interpretive values assume near-optimum crop yields. If yield is below average, improve agronomic practices to increase crop yield and crop N uptake.

Detailed suggestions for soil sampling and planning

Collecting, preserving, and analyzing the soil sample

Tools for field sampling

Collect a sample that is representative of the entire sampling depth. For example, a representative sample for a 0- to 12-inch depth has the same amount of soil from the soil surface (0 to 6 inches) and from the bottom of the sampling depth (6 to 12 inches).

Always use a tool specifically designed for soil sampling. Don't use a shovel, because the samples won't be uniform with depth. Tools for soil sampling often are called soil probes or augers. There are several kinds available.

Push probes are tubes that you push into the soil. They have a T-shaped handle attached to a cylindrical tube (about 1 inch diameter) with a beveled tip. The tube collects a cylinder, or "core," of soil. Push probes work well in soft, uncompacted soils.

Hammer probes are designed for hard or compacted soils. They have a sliding weight (hammer) instead of a T-handle to drive the probe into soil.

Soil test consultants often use hydraulic probes mounted on a tractor or pickup to sample soils. These reduce the time and effort of sampling in hard soils. Gravelly and rocky soils are difficult to sample. A hydraulic probe with a rotating auger can sample some gravelly soils.

A mud auger or bucket auger is the best tool for hand-sampling at sites that are difficult to sample with push probes. Use an auger for compacted, muddy, rocky, or dry soils. Augers can be purchased from several manufacturers. A 2- to 4-inch diameter mud auger (open-sided) works best for most situations because it is easy to remove the sample from the bucket. Use a larger diameter auger for soils with large rocks. Augers sample a 4- to 6-inch depth. You will need to take several bites from the same hole to sample to 12-inch depth. You will collect a larger sample volume, about 5 to 10 times that collected with a push tube. Because of the extra effort required for auger sampling, use this method only if other sampling methods are difficult or impossible.

Field sampling protocol

Plan ahead. Use field maps and soil maps to divide the farm into different management units. A management unit is usually a field, but you may want to subdivide a large field if sections can be managed separately for nutrient application. The simplest approach is to collect a composite sample from the entire management unit. You may choose to restrict sampling to the dominant soil type if the management unit has soils that differ markedly in visual appearance (soil color, texture, organic matter).

Alternatively, you can restrict your sampling to a representative area (usually about an acre in size) within the management unit. Choosing a representative area within the field where manure application rate, timing, and uniformity are well documented is essential. If you use the "representative area" sampling approach, record the sampling location using a GPS receiver or record the distance from a fixed location (e.g., fenceline).

Avoid large buffer zones that are sometimes present adjacent to water bodies or roads, especially with big gun manure applicators. Avoid small atypical areas such as:

- Swales
- Very rocky or shallow soil (less than 12 inches deep)
- Site of an old manure pile or a feeding, watering, or resting area for livestock
- Abandoned field roads
- Field edges

Find out how the lab reports soil test data. Standard units for soil nitrate-N are parts per million (ppm, Table 2). If you aren't familiar with the lab, it's a good idea to obtain a copy of a sample laboratory report.

Because you will use sample results to compare post-harvest soil nitrate across years, laboratory consistency over time is a major issue. A standard reference sample (soil sample with known concentration of nitrate) can help you assess laboratory variability. Consider submitting a standard reference sample (approximately 50 to 100 g dry weight) with a nitrate-N concentration of 20 to 45 ppm with each batch of soil samples. Keep track of test results for the standard reference sample over time. If you note a major error in the nitrate concentration reported for the standard reference sample, then the test data is questionable.

Standard reference samples are available from the North American Proficiency Testing Program (see "For more information," page 15). Standard reference samples must be dried, ground, and thoroughly mixed.

We do not recommend that you split a field sample to check laboratory consistency. The one-time nature of such comparisons, the uncertainty of obtaining a homogeneous sample, and the uncertainty of sample preservation in-transit to the lab limit the interpretation of split-sample data.

Developing a sampling plan

Nutrient management plans can be voluntary, required by regulatory agencies, or a part of an agreement with a conservation planning agency (e.g., Natural Resources Conservation Service or conservation district). If your nutrient management plan is not voluntary, consult the agency that supervises your nutrient management plan to determine whether they have specific requirements for how often fields must/should be sampled. Suggestions given here for sampling frequency are general in nature and are not intended to serve as policy for any agency.

Representative fields for long-term monitoring

Representative fields are fields that you sample every year to track trends in sample values over time. Select fields that represent typical management practices. Criteria that can be used to choose representative fields include: (1) records or estimates of annual manure application rate, (2) number of years of continuous manure application, (3) soil test values for P and K. On dairies where P and K fertilizers are not routinely applied, soil test values above 75 ppm P (Bray P1 method) and 400 ppm K (ammonium acetate method) usually reflect substantial manure application in the past.

Sample the representative fields every year to assess trends over time. If you grow corn silage and perennial grass forage, plan to sample at least four grass fields and four corn fields each year. At a small dairy (fewer than four fields), sample all fields each year.

Other fields

Periodically, you will need to evaluate the fields not designated as "representative" fields. Consider sampling all fields every 3 years. Compare whole farm soil data to representative field data.

If you have only a few fields with elevated soil test N, then focus management on those fields. If all fields on the farm give similar test data, then focus your N management efforts at the whole farm level. If representative fields consistently have test values of less than 15 ppm (grass) or less than 20 ppm (corn) over a 3-year period, and all other fields sampled have similar test values, consider reducing the number of post-harvest soil nitrate tests.

What other soil tests can be used to provide information to guide N management for corn?

Soil nitrate testing in spring and early summer can assist with N management for silage corn. Test soil ammonium + nitrate-N several weeks after a spring manure application to track early-season N availability. Test soil nitrate when corn is at the four- to six-leaf stage (pre-sidedress nitrate test, PSNT) to determine the need for sidedress N application to corn.

How much variability should I expect in post-harvest nitrate-N test values for the same grass field sampled between August 15 and October 15?

It all depends on weather, soil biology, and crop management. A good stand of actively growing grass can maintain nitrate-N concentrations of less than 15 ppm throughout the post-harvest sampling period. Where soil is dry in late summer, increased N availability may occur for 2 or 3 weeks following the first heavy rain. It may be useful to take several soil nitrate tests from the same field in the fall to document changes in nitrate concentration with time. Soil nitrate values given in the interpretive table in this publication are for typical precipitation and sampling date.

Ammonium-N is plant-available. Why doesn't the post-harvest test include ammonium-N analysis?

Post-harvest ammonium-N analyses cost money, and they do not yield reliable interpretive information. Ammonium-N does not accumulate in soils supplied with an excess of plant-available N. It is rapidly converted to nitrate. Soil samples taken at least 30 days after manure application usually have negligible ammonium-N concentrations unless soil has remained dry.

Drying of soils after sampling releases ammonium-N from microbial biomass. Most dried soils have 2 to 20 ppm ammonium-N that is caused by the soil drying process. Dry soil ammonium-N concentrations are poorly correlated with other indices of N availability in controlled experiments.

Should post-harvest nitrate tests be used for fields with organic soils?

Other methods should be used to assess the success of nutrient management plans on organic soils. Goals for post-harvest nitrate-N of less than 20 ppm are difficult if not impossible to attain on organic soils, which contain more than 20 percent organic matter. These soils formed as organic matter accumulated under natural poorly drained conditions. Soil organic matter decomposition and N mineralization processes are greatly accelerated under typical farming practices such as artificial drainage and tillage.

Should I measure or estimate soil bulk density to estimate post-harvest nitrate-N in units of pounds per acre?

The variation in bulk densities among soils typically is less than the variation associated with soil nitrate sampling and testing. Interpretive information in this publication is based on units of parts per million (ppm; mg per kg dry soil). You can approximate soil nitrate-N in the surface foot of soil by assuming typical bulk density (ppm x 3.5 = lb/acre). This conversion factor is based on the weight of 1 acre-foot of soil at a bulk density of 1.3 g cm^3 (1 acre-foot = 3.5 million lb). Organic soils (more than 20 percent organic matter) have lower bulk density (0.6 to 0.8 g cm^3).

What is whole farm nutrient management?

The goals of whole farm management are: (1) to move toward a balance of nutrient imports and exports, and (2) to utilize nutrients on the farm at agronomic rates that minimize nutrient losses to the environment. Managing nutrients at the whole farm level requires knowledge of the major nutrient imports, major nutrient exports, crop

For more information

OSU Extension Service publications

Hart, J. 2002. A List of Analytical Laboratories Serving Oregon, EM 8677.

Marx, E.S., J. Hart, and R.G. Stevens. 1996. Soil Test Interpretation Guide, EC 1478.

Marx, E.S., N.W. Christensen, J. Hart, M. Gangwer, C.G. Cogger, and A.I. Bary. 1996. The Pre-sidedress Soil Nitrate Test (PSNT) for Western Oregon and Western Washington, EM 8650.

Sullivan, D.M., C.G. Cogger, and A.I. Bary. 1997. Which Test Is Best? Customizing Dairy Manure Nutrient Testing, PNW 505.

Sullivan, D.M., C.G. Cogger, and A.I. Bary. 1997. Date, Rate, and Place: The Field Book for Dairy Manure Applicators, PNW 506.

Many OSU Extension Service publications, as well as additional gardening information, may be viewed or downloaded from the Web (http://eesc.oregonstate.edu).

Copies of many of our publications and videos also are available from OSU Extension and Experiment Station Communications. For prices and ordering information, visit our online catalog (http://eesc.oregonstate.edu) or contact us by fax (541-737-0817), e-mail (puborders@oregonstate.edu), or phone (541-737-2513).

WSU Cooperative Extension publications

Bary, A.I., C.G. Cogger, and D.M. Sullivan. 2000. Fertilizing with Manure, PNW 533.

Daniels, C.H. 2002. Analytical Laboratories and Consultants Serving Agriculture in the Pacific Northwest, EB1578E.

Visit the WSU Cooperative Extension publications Web site at http://pubs.wsu.edu

Other resources

Gavlak, R.G., D.A. Horneck, and R.O. Miller. 1994. Plant, Soil and Water Reference Methods for the Western Region, WREP 125 (University of Alaska-Fairbanks).

Johnson, L., J. Harrison, F. Hoisington, and M. Bueler. 2002. Nitrate levels in grass silage. Washington State Dairy News 11(2). Available at: http://www.puyallup.wsu.edu/dairy/. Verified 1 August 2002.

Mahler, R.L. and T.A. Tindall. 1994. Soil Sampling, Bulletin 704 (University of Idaho Cooperative Extension System, Moscow, ID).

Midwest Plan Service. Livestock and Poultry Environmental Stewardship (LPES) Curriculum. Available at: http://www.lpes.org/. Verified 14 January 2002.

North American Proficiency Testing Program. Standard Reference Soil Samples (Soil Science Society of America, 677 S. Segoe Rd., Madison, WI 53711; phone: 608-273-8080; Web: http://www.soils.org).

Published May 2003.

EC 1478 • Reprinted March 1998
$1.50

Soil Test Interpretation Guide

E.S. Marx, J. Hart, and R.G. Stevens

Regular soil testing is an important element in nutrient management. You can use soil tests as a diagnostic tool or to identify trends through time. To obtain meaningful test results, you must sample soil correctly, at the same time each year, and you must maintain records. For more information, see EC 628, *How to take a soil sample. . .and why* (see "For more information," page 7).

Soil testing laboratories use different test methods, which may influence results and sufficiency ranges. Therefore, the sufficiency ranges in this publication are accurate only for the test methods listed.

Soil tests used to evaluate fertility measure the soil nutrients that are expected to become plant-available. They do not measure total amounts of nutrients in the soil. Measurements of total nutrient content are not useful indicators of sufficiency for plant growth, because only a small portion of the nutrients are plant-available.

Adequate soil nutrient levels vary depending on plant species. Similarly, plant tolerance of excessive nutrient levels, nutrient imbalances, or less-than-optimum growing conditions varies. If excessive nutrient levels exist, review management to determine the cause.

Nutrient concentrations vary with soil depth. Depth of sampling, therefore, affects test results. To determine the proper sampling depth, you must consider the purpose of the soil test. To estimate nutrient availability for a crop prior to planting, sample soil to the depth where most root activity will occur. Shallow sampling sometimes is used to evaluate surface conditions in perennial crops where fertilizers have been applied to the soil surface. Deep sampling may be necessary to diagnose problems in orchards.

Soil test values do not vary greatly from year to year. Drastic changes in test values may indicate an unrepresentative soil sample or a laboratory error. When in doubt, submit a new sample or ask the lab to repeat the analysis.

This publication provides general guidelines for interpreting soil test results. Fertilizer guides for many individual crops are available from your county office of the OSU Extension Service or Washington State University Cooperative Extension, or from Extension and Experiment Station Communications, Oregon State University (see "For more information").

Nitrogen (N)

Plant-available nitrogen (nitrate and ammonium)

Plant-available forms of nitrogen are nitrate (NO_3^--N) and ammonium (NH_4^+-N). Soil concentrations of NO_3^--N and NH_4^+-N depend on biological activity, and therefore fluctuate with changes in conditions such as temperature and moisture. Nitrate is easily leached from the soil with high rainfall or excessive irrigation. Soil tests can determine NO_3^--N and NH_4^+-N concentrations at the time of sampling, but do not reflect future conditions.

When you collect samples for nitrogen testing, keep them cold, or dry them immediately to prevent NO_3^--N and NH_4^+-N concentrations from changing.

E.S. Marx, former research assistant in soil science, and John Hart, Extension soil scientist, Oregon State University;
and Bob Stevens, Extension soil scientist, Washington State University.

OREGON STATE UNIVERSITY EXTENSION SERVICE

Cations

Of the three primary cations (potassium, calcium, and magnesium), potassium requires the most management attention. Few crops have responded to calcium and magnesium in the Pacific Northwest.

If extremely high levels of a single cation exist, plant deficiencies of other cations may occur due to competition for plant uptake.

The soil test ranges in Tables 3, 4, and 5 are for the ammonium acetate extraction method. If a sodium bicarbonate ($NaHCO_3$) extraction is used, test values may be slightly lower.

Potassium (K)

Excessive soil potassium levels can result in elevated K levels in grass forage crops, which may be detrimental to animal health.

Table 3.—Extractable potassium (K).

	K
low	<150 ppm* <0.4 meq/100 g soil
medium	150–250 ppm 0.4–0.6 meq/100 g soil
high	250–800 ppm 0.6–2.0 meq/100 g soil
Excessive	>800 ppm >2.0 meq/100 g soil

*See Table 13 (page 7) for conversions from ppm to meq/100 g soil.

Calcium (Ca)

Calcium deficiencies usually are found only on very acid soils. They can be corrected by liming with calcium carbonate ($CaCO_3$).

Table 4.—Extractable calcium (Ca).

	Ca
low	<1,000 ppm* <5 meq/100 g soil
medium	1,000–2,000 ppm 5–10 meq/100 g soil
high	>2,000 ppm >10 meq/100 g soil

*See Table 13 (page 7) for conversions from ppm to meq/100 g soil.

Magnesium (Mg)

Magnesium deficiencies on acid soils can be corrected by liming with dolomitic lime.

Magnesium toxicity can occur on serpentine soils in southwest Oregon.

Table 5.—Extractable magnesium (Mg).

	Mg
low	<60 ppm* <0.5 meq/100 g soil
medium	60–180 ppm 0.5–1.5 meq/100 g soil
high	>180 ppm > 1.5 meq/100 g soil

*See Table 13 (page 7) for conversions from ppm to meq/100 g soil.

Sulfate-sulfur (SO_4^{2-}-S)

Plants absorb sulfur in the sulfate (SO_4^{2-}-S) form. In high rainfall areas west of the Cascades, SO_4^{2-} is readily leached, and soil test data are not well correlated with plant growth. In arid regions east of the Cascades, soil test information may be useful. Also, irrigation water may contain significant amounts of sulfate-sulfur. Plant analysis often is useful for diagnosing sulfur deficiency.

Table 6.—Sulfate-sulfur, east of the Cascades.

	SO_4^{2-}-S (ppm)
low	<2
medium	2–10
sufficient	>10

Micronutrients

Deficiencies of micronutrients other than boron and zinc are uncommon. Availability of most micronutrients is largely pH-dependent; availability decreases as pH increases (except for molybdenum, which becomes more available as pH increases). Deficiencies rarely occur in soils with pH below 6.5.

Soil testing for micronutrients other than boron and zinc is recommended only when a deficiency is suspected. If you suspect a micronutrient deficiency, plant tissue testing may be a better diagnostic tool than soil testing.

pH, lime requirement (LR)

Soil pH is a measure of soil acidity. Most crops grow best if the soil pH is between 6.0 and 7.5.

Table 9.—Soil pH ranges.

	pH
strongly acid	below 5.1
moderately acid	5.2–6.0
slightly acid	6.1–6.5
neutral	6.6–7.3
moderately alkaline	7.4–8.4
strongly alkaline	above 8.5

Soil pH can be increased by liming. The soil pH test indicates *if* lime is needed. The lime requirement test determines *how much* lime is needed. Accurate lime recommendations cannot be made without performing an SMP or similar test.

SMP* lime requirement test

The SMP lime requirement test is used to estimate the amount of lime required to raise the pH of 6 inches of soil. The SMP test is performed by mixing soil with a buffered pH 7.5 solution and determining the pH of the mixture. During the reaction, the soil's reserve acidity lowers the pH of the SMP solution. Soils with low SMP values have high reserve acidity and high lime requirements.

Some soils may have a low pH (<5.3) and a fairly high SMP buffer value (>6.2). This condition can be caused by the application of fertilizer. In this case, the low pH value is temporary, and the pH of the soil will increase as the fertilizer completes its reaction with the soil.

Sandy soils also may have a low pH and high SMP buffer value. This condition occurs because sandy soils have low amounts of reserve acidity due to low cation exchange capacity (CEC). In such cases, a light application of lime (1 to 2 t/a) should suffice to neutralize soil acidity.

Table 10 is used to determine the amount of lime required, based on the SMP test, to raise soil pH to a desired level. The target pH is determined by the crop to be grown and possibly by other factors.

*SMP stands for Shoemaker, MacLean, and Pratt—the people who developed the test.

Without an SMP or similar test, there is no way to know how much lime is required to adjust soil pH to a desired level. Accurate lime recommendations cannot be made solely on the basis of soil pH.

Table 10.—SMP lime requirement—field scale.

SMP buffer	Tons/acre of 100-score lime needed to raise pH of surface 6 inches of soil to the following pH's			
	5.3	5.6	6.0	6.4
6.7	—	—	—	—
6.6	—	—	—	1.1
6.5	—	—	1.0	1.7
6.4	—	—	1.1	2.2
6.3	—	—	1.5	2.7
6.2	—	1.0	2.0	3.2
6.1	—	1.4	2.4	3.7
6.0	1.0	1.7	2.9	4.2
5.9	1.4	2.1	3.3	4.7
5.8	1.7	2.5	3.7	5.3
5.7	2.0	2.8	4.2	5.8
5.6	2.3	3.2	4.6	6.3
5.5	2.6	3.6	5.1	6.8
5.4	2.9	3.9	5.5	7.3
5.3	3.2	4.3	6.0	7.8
5.2	3.6	4.7	6.4	8.3
5.1	3.9	5.0	6.9	8.9
5.0	4.2	5.4	7.3	9.4
4.9	4.5	5.8	7.7	9.9
4.8	4.8	6.2	8.2	10.4

Example: If the "SMP buffer" value is 5.9, the amount of lime needed to raise the pH to 6.0 is 3.3 tons of 100-score lime/acre.

Table 11.—SMP lime requirement—gardens.

If the SMP lime requirement test is	Apply this amount of lime (lb/1,000 ft²)
5.4 or below	250
5.5–6.0	150–250
6.0–6.5	100–150
above 6.5	0

Some plants, such as blueberries, rhododendrons, azaleas, and cranberries, grow best in acid soils. Fertilizers such as ammonium sulfate can help maintain acidic conditions.

For more information

Hart, J. *Analytical Laboratories Serving Oregon*, FG 74 (Oregon State University, Corvallis, reprinted 1997). No charge

Hart, J. *How to take a soil sample. . .and why,* EC 628 (Oregon State University, Corvallis, revised 1995). No charge

Marx, E.S., N.W. Christensen, J. Hart, M. Gangwer, C.G. Cogger, and A.I. Bary, *The Pre-sidedress Soil Nitrate Test (PSNT) for Western Oregon and Western Washington*, EM 8650 (Oregon State University, Corvallis, reprinted 1997). 75¢

Fertilizer guides for individual crops are available. Request our catalog to see a complete listing.

World Wide Web

You can access our Educational Materials catalog and many of our publications through our Web page at eesc.orst.edu

To order the publications listed above, send the publication's complete title and series number, along with a check or money order for the amount listed, to:

Publication Orders
Extension & Station Communications
Oregon State University
422 Kerr Administration
Corvallis, OR 97331-2119
Fax: 541-737-0817

If you would like additional copies of this publication, *Soil Test Interpretation Guide*, EC 1478, send $1.50 per copy to the above address.

You may order up to six no-charge publications without charge. If you request seven or more no-charge publications, include 25 cents for each publication beyond six.

We offer discounts on orders of 100 or more copies of a single title. Please call 541-737-2513 for price quotes.

Table 13.—Conversions.

To convert column 1 into column 2, *divide* by	**Column 1**	**Column 2**	**To convert column 2 into column 1, *multiply* by**
390	ppm K	meq K/100 g soil	390
200	ppm Ca	meq Ca/100 g soil	200
121	ppm Mg	meq Mg/100 g soil	121
230	ppm Na	meq Na/100 g soil	230
1	meq/100 g soil	cmol/kg soil	1
2*	lb/acre (7 inch depth)	ppm	2*
3.65*	lb/acre (1 foot depth)	ppm	3.65*
43.56	lb/acre	lb/1,000 sq ft	43.56
43,560	square feet	acres	43,560
2.471	acres	hectares	2.471

*These values vary with soil bulk density.

EM 8585 • April 1996
$1.00

NUTRIENT MANAGEMENT
FOR DAIRY PRODUCTION

Manure Application Rates for Forage Production

J. Hart, E.S. Marx, and M. Gangwer

Most dairies can supply all the nitrogen, phosphorus, potassium, and other nutrients needed for forage production by applying manure to forage crops. As a manager, your goal is to match nutrient supply with crop needs by deciding when and how much manure to apply.

This publication explains how to estimate the amount of manure to apply for forage production. To do so, you need:

- A current manure analysis for your dairy (or see EM 8586, *Dairy Manure as a Fertilizer Source*)
- A list of forage crops to be produced
- A soil test from each field where manure will be applied

Too much manure results in excess plant uptake of nutrients such as potassium. High-potassium grass forages can lead to health problems, especially in dry cows. In addition, excess manure contributes to nutrients and microorganisms in runoff water and potential nutrient leaching to groundwater.

John Hart, Extension soil scientist; E.S. Marx, research assistant in soil science; and Mike Gangwer, Extension agent, Marion County; Oregon State University.

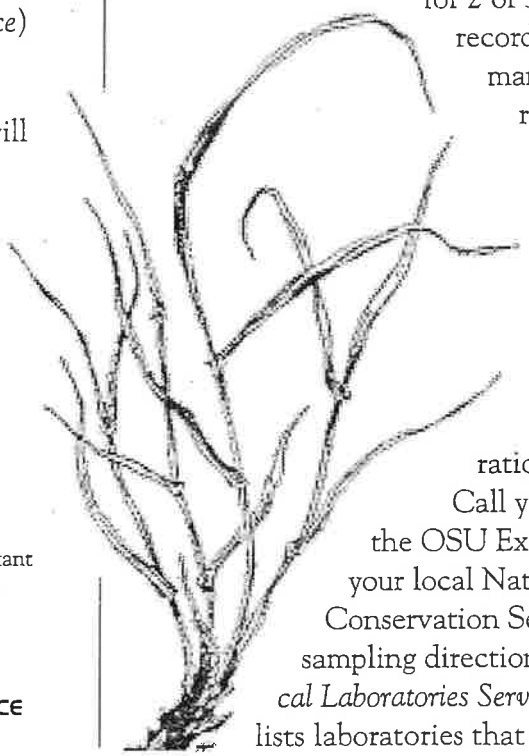
OREGON STATE UNIVERSITY EXTENSION SERVICE

The application rates in this publication are based on soil tests and growing conditions in western Oregon.

Manure analysis

Analyzing your manure is critical to determining the correct application rate. If you don't test your dairy's manure, you can only guess its nutrient value.

Manure testing in western Oregon has shown more variation among dairies than within one dairy. Develop a manure nutrient history for your dairy by testing manure two or three times a year for 2 or 3 years. These records will help you manage nutrient resources.



Also test manure when you expect a change in nutrient content; for example, when you make a large change in the ration.

Call your county office of the OSU Extension Service or your local Natural Resource Conservation Service office for sampling directions. *A List of Analytical Laboratories Serving Oregon* (FG 74) lists laboratories that test manure.

Table 1.—Approximate nitrogen removal by perennial forage crops and suggested nitrogen application rates.

Crop	Average yield per cutting (t/a)	N removal rate for average yield per cutting (lb N/a)	Suggested N application rate (lb N/t of forage*)
Orchard grass	1.4	70	50–60
Perennial ryegrass	1.2	60	50–60
Tall fescue	1.4	70	50–60

*All rates are on dry matter basis unless noted otherwise.

6. Now move down to the line labeled "effluent acre-inches to apply." Estimate the number of acre-inches of effluent to apply (about 0.3 acre-inch). Remember that you will need about 10 percent more nitrogen because no line exists for the 60 lb N/a required by ryegrass. Your final result will be about 0.4 acre-inch.

Note: If you know your own yield per cutting, you can figure your nitrogen need more accurately. To do so, multiply your tons per acre per cutting by the "suggested N application rate (lb N/t of forage)" in Table 1. The result is your N removal rate. Use the line in the appropriate figure that is closest to that rate.

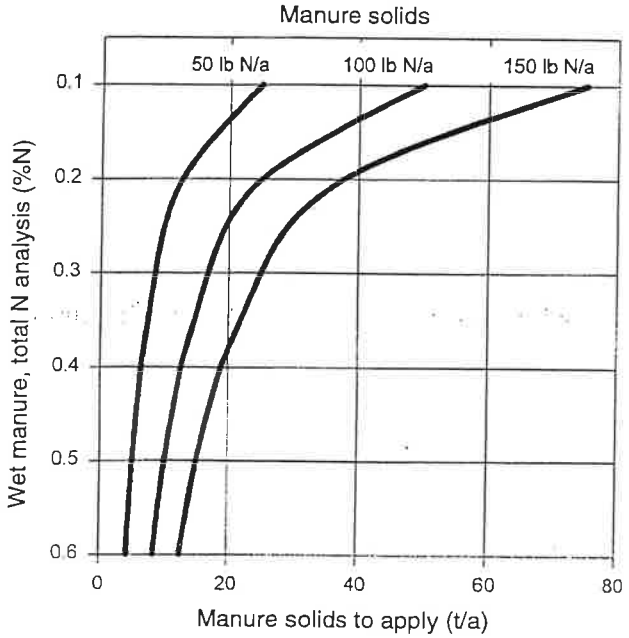


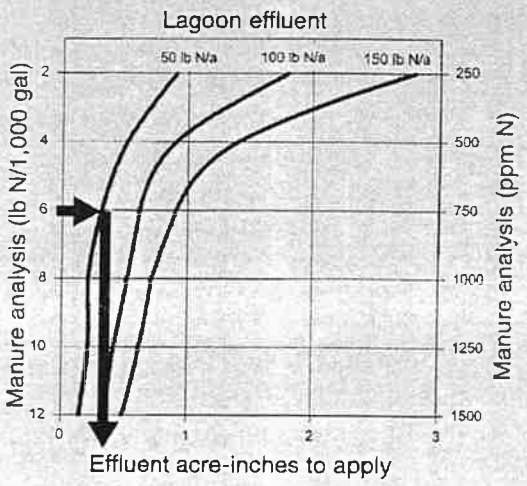
Figure 3.—Determining application rate for manure solids.

Example

Crop: perennial ryegrass

Manure: lagoon effluent

1. Average yield per cutting = 1.2 t/a (Table 1).
2. Nitrogen removal rate = 60 lb N/a per cutting (Table 1).
3. Find the lagoon effluent graph (Figure 2).
4. Use the 50 lb/a line because it is closest to the 60 lb/a you need to apply.
5. Your manure test shows 6 lb/1,000 gal. Find this line on the left of the graph. Move across to the 50 lb/a line.
6. Move down to the bottom line to find the number of acre-inches to apply (0.3 acre-inch).



Special cases

The manure application rates in this publication are based on the assumption that manure already has been applied to fields for at least 4 consecutive years, not including the current year.

If your fields have received manure for less than 4 years, increase rates as shown in Table 3 if you use reception tank, separated solids, or dry stack material. Lagoon effluent provides sufficient available N for any situation when applied during the growing season.

Checking your application rate for silage corn

With silage corn, you can confirm that you applied sufficient manure by using the pre-sidedress soil nitrate test (PSNT). When the corn is 12 inches tall or at the five-leaf development stage, sample soil between rows to a depth of 12 inches. Have the sample analyzed for nitrate nitrogen (NO_3-N).

Compare the soil test results to Table 4. Apply the appropriate amount of lagoon effluent or fertilizer N to the growing crop based on the PSNT and Table 4.

It is important to handle samples properly. For more information, see *The Pre-sidedress Soil Nitrate Test (PSNT)*, EM 8650.

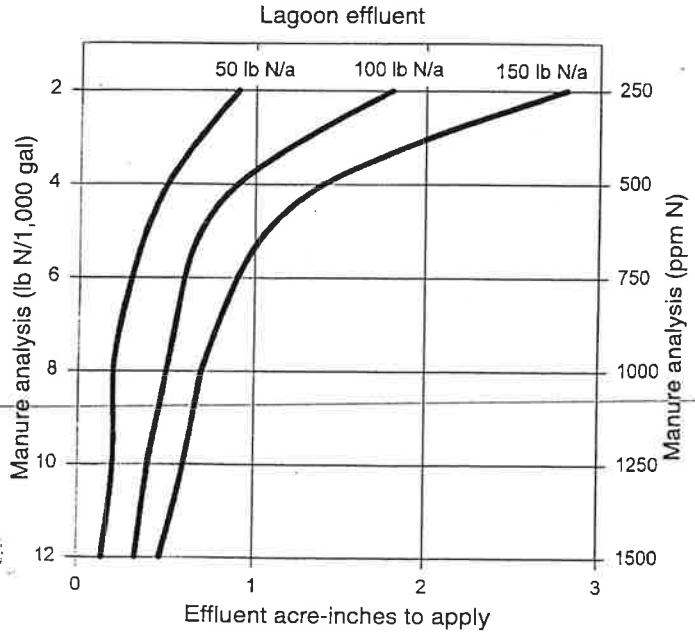


Figure 5.—Determining application rate for lagoon effluent.

Table 3.—Manure application rates based on number of years field has received manure.

If your field has received manure this many years:	Multiply suggested application rate by:
0	3.0
1	2.5
2	2.0
3	1.5
4 or more	Use suggested rates

Table 4.—Amount of nitrogen to apply for silage corn production based on the PSNT.

PSNT (ppm)	Nitrogen (lb/a)
0–10	100–150
10–20	50–100
20–25	0–50
above 25	0

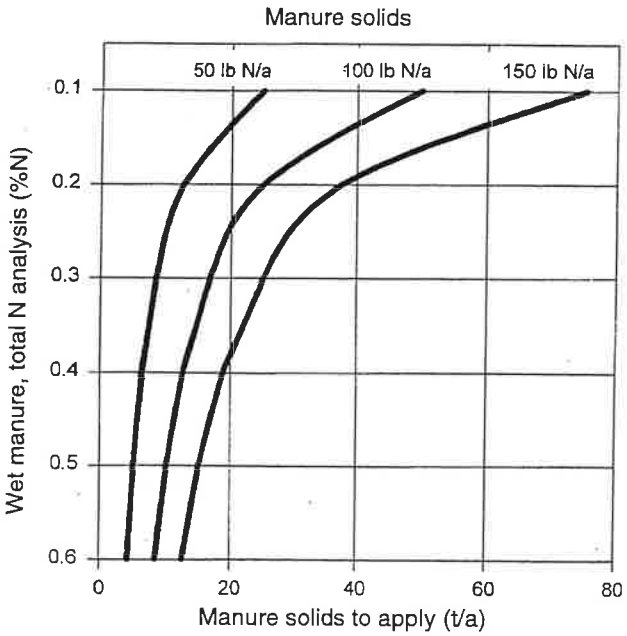


Figure 6.—Determining application rate for manure solids.

Corn stalk nitrate testing at harvest

1. Collect 10 mature corn plants by cutting the stalks just above the brace roots. Select representative plants away from edges of the field.
2. Cut an 8-inch section of stalk from the bottom of each harvested plant.
3. Remove the dried outer leaves from each 8-inch section.
4. Split each section of stalk lengthwise to aid in drying.
5. Place the split stalks together in a bag and send to a lab for nitrate nitrogen (NO_3-N) analysis.
6. Use Table 6 to interpret results.

Table 6.—Interpretation of corn stalk nitrate tests.

Stalk NO_3-N concentration at harvest	Interpretation
<3,500 ppm	N may have limited yield
3,500–5,500 ppm	N sufficient for optimum yield
>5,500 ppm	N supplied in excess of crop demand

For more information

OSU Extension Service publications

To order copies of the following publications, or additional copies of this publication, send the publication's complete title and series number, along with a check or money order for the amount listed, to:

Publication Orders
Extension and Experiment Station Communications
Oregon State University
422 Administrative Services
Corvallis, OR 97331-2119
Fax: 541-737-0817

We offer discounts on orders of 100 or more copies of a single title. Please call 541-737-2513 for price quotes.

You may order up to six no-charge publications without charge. If you request seven or more no-charge publications, include 25 cents for each publication beyond six.

Hart, J. *A List of Analytical Laboratories Serving Oregon*, FG 74 (Oregon State University, Corvallis, revised 1996). No charge

Hart, J., G. Pirelli, L. Cannon, and S. Fransen. *Pastures Fertilizer Guide*, FG 63 (Oregon State University, Corvallis, 1993). No charge

Hart, J., M. Gangwer, M. Graham, and E. Marx. *Dairy Manure as a Fertilizer Source*, EM 8586 (Oregon State University, Corvallis, reprinted 1996). 75¢

Marx, E., N.W. Christensen, J. Hart, M. Gangwer, C.G. Cogger, and A.I. Bary. *The Pre-sidedress Soil Nitrate Test*, EM 8650 (Oregon State University, Corvallis, 1996). 75¢

Other publications

Marx, E. *Evaluation of Soil and Plant Analyses as Components of a Nitrogen Monitoring Program for Silage Corn* (Masters thesis, Oregon State University, 1995).