

4.50

SITE SPECIFIC LAND APPLICATION PLAN FOR Mid Mountian

This Plan is a component of Fire Mountain Farms, Inc. Application for Coverage Under the General Permit for Biosolids Management Permit No. BT9902

Location:

Site Address (General Location):	19724 128th Ave. SE, Yelm, WA
GPS Coordinates of Site Entrances:	Latitude: 46° 54' 05.14"N Longitude: 122° 31' 05.12" W
Sec, Twp, Rge:	Section: 1 & 2, Township: 16N, Range: 2E, WM
Water Resource Inventory Area:	11 Nisqually
County:	Thurston

Table of Contents

Introduction	3
1.0 Past Biosolids Use	4
2.0 Maps	4
2.1 General Location Map	4
2.2 Site Map or Field Map	4
2.3 Soils Map	4
3.0 Seasonal and Daily Timing of Biosolids Applications	5
4.0 Biosolids Staging and Storage	5
5.0 Cropping Practices and Livestock Management	6
6.0 Other Nutrient Sources and Soil Amendments	7
7.0 Methods of Application	7
8.0 Determining and Validating Application Rates	8
8.1 Determining the Plant Available Nitrogen Requirement	8
8.2 Calculating the Application Rate	Error! Bookmark not defined.
9.0 Sampling Plan	9
9.1 Soil Sampling	10
9.2 Biosolids Sampling and Analysis	Error! Bookmark not defined.
9.3 Pathogen Reduction	12
9.4 Trace Elements	12
9.5 Vector Attraction Reduction Standard	12
10.0 Groundwater Protection Plan	12
11.0 Erosion Control Plan	13
12.0 Noxious Weed Plan	14
13.0 Restricting Site Access	14
14.0 Recordkeeping	14
15.0 Additional Information	14
Appendices	15

Introduction

This introduction is intended to give the reviewer a quick and general overview of this site and related items. Many elements of this introduction are more completely addressed later in this Site Specific Land Application Plan.

The goals of this plan include the following:

- Establish procedures to best manage biosolids storage and land application on the site.
- Ensure that consistent and uniform land application practices are performed and observed.
- Provide improved site soil characteristics through sound agronomic management.
- Establish procedures to meet the beneficial use of biosolids as defined in WAC 173-308.

This farm is currently used for beef cattle (cow calf operation), forage production (hay, silage, pasture) and timber production. The site consists of flat to rolling fields. The site has 1 residence located on it, the home is for the herdsman. Structures on site include barns, a machine shed and general livestock handling facilities.

Leaseholder Arrangements: No leaseholder for this site.

General Site Description: The site consists of flat to slightly sloping. This area consists of rocky soil deposited at the end of the last ice age. None of this property lies in either the 100 or 500-year flood zone. There have been no observations of threatened or endangered species on the site. The site is in current agricultural and forestry production. It is not expected that the application of biosolids will impact threatened or endangered species or critical habitat for such species. A list of threatened, endangered and species of concern as listed by the Department of Fish and Wildlife for Thurston County may be found in Appendix 7.D of this plan.

General Biosolids Handling: Biosolids will be delivered to the site during the application window. No storage units are located on this site but may be built in the future. Potential Staging areas are identified on Map 2D.

Ownership, Management, and Landowner Agreements

Owners are as listed below.

Owner	Parcel(s)	Zoning
Jason Abston 36625 Mountain Hwy E, Eatonville, Wa, 98328.	22601320000 22602430000 22602420000 22602130000	ARL – Agricultural Resource Lands
Jason Abston 36625 Mountain Hwy E, Eatonville, Wa, 98328.	22602130200 22602130100	RRR-5 Rural Residential/ Resource

This site is zoned as listed in the above table and conversion to other land uses is not allowed. There is no known conversion being planned.

See Appendix 1 for signed agreements from landowners (as distinguished from a lessee, farmer, or others entitled to use the land) that acknowledge the applicability and requirements of Chapter 173-308 WAC when their property is used for biosolids land application or storage.

1.0 Past Biosolids Use

No biosolids have been applied at this site that we or owner know of.

2.0 Maps

Mapping units will designate Fire Mountain Farm's area of biosolids land application. These maps denote both site and setback boundaries (road and property line) as well as anomalies (e.g. swales, slopes >15%, physical barriers, etc.). Fire Mountain Farms site application maps will show proposed staging/stockpiling locations, site acreage, site name, common name for site, and other identifying characteristics for each site. Maps are located in Appendix 2 of this plan. This site does not lie in either the 100 or 500 year flood zone.

2.1 General Location Map

- Appendix 2.A** – Vicinity Map
- Appendix 2.B** – Not Used

2.2 Site Map or Field Map

- Appendix 2.C** – Aerial Overview of Site, Field ID
- Appendix 2.D** – Residences, Wells, Roads, Sign, Field Id., Surface Water
- Appendix 2.E** – Not Used
- Appendix 2.F** – Flood map
- Appendix 2.G** – Zoning Map
- Appendix 2.H** – Topographic Map

2.3 Soils Map

- Appendix 3** – Soils Report (includes site soils map)

3.0 Seasonal and Daily Timing of Biosolids Applications

Biosolids applications at this site are limited yearly from March 1st until October 15th. Fire Mountain Farms may request approval from Ecology to proceed with land application activities outside of these dates if crop conditions and weather per MANURE SPREADING ADVISORY (MSA) {<https://www.wadairyplan.org/MSA>} are appropriate for application. An extension may be granted by Ecology for application at no greater than one week intervals. Requests will be sent to Ecology 7 calendar days ahead of application outside of dates. If there is not a response by the end of the 7 days application can proceed. From a practical standpoint, applications will normally occur during daylight hours and operations usually do not occur on weekends or holidays. There may be occasions where deviation from the normal schedule will be required, such as the need to apply biosolids so that a subsequent crop may be planted in a timely manner prior to rain or adaption to neighbor's requests.

4. Buffers

Buffers will be marked so they are easily visible during application (for example temporary flags or stakes). Surface water buffers will be increased to 150% of below when the potential for run off is heightened in early spring applications, (March 1st to April 15th), and late fall after September 30th.

Type	Buffer in Meters
Well	30.5
Residence	30.5
Wetland/ Creek	10
Un-delineated Wetland	10
Public roadways	2
Property boundary	2

4.0 Biosolids Staging and Storage

There is no structures on site. Staging or storage structures may be built in the future, storage plan will be submitted for approval prior to construction

Access points at the site all have lockable gates. Access to this site will also be restricted by informational signs that are shown in Appendix 5 of this plan. To insure that drivers follow procedures, Fire Mountain Farms has printed instruction sheets describing biosolids offloading procedures. These instruction sheets are sent to all biosolids suppliers. New drivers to the site are walked through these procedures. A triple check system is in place to assure all loads are accounted for: First, all loads are to be scheduled with the Operations Office prior to delivery. Second, all sources have been supplied numbered Delivery Tickets (these are numbered sequentially and if a number is missing, Fire Mountain Farms investigates what happened to it). See Appendix 6.C of this plan for an example.

Third, all deliveries are recorded on "Delivery Record Sheet" at sites. See Appendix 6.D for an example. Liquid biosolids has a similar three level record system, load out sheet, delivery sheet and truck sheets.

5.0 Cropping Practices and Livestock Management

Acreage and Number of Fields:

Field Acreage:

Field ID	Acers	Crop/Use	Alternative Crops
MM-1	16.24	Pasture	Timber
MM-2	4.39	Pasture/ Timber	Timber
MM-3	160.27	Pasture	Timber
Total	180.9		

Field boundaries may change within permitted area to coincide with cropping activities

Crops may change to any food, feed, fiber or fuel crop as markets and other factors change. Harvest will be in accordance with WAC 173-308-210.

Total Acreage:

Parcel Number	Acreage
22601320000	65
22602430000	120
22602420000	40
22602130200	10
22602130100	5
22602130000	25
Total	265

Livestock are managed on this site in an intensive pasture management system. This system requires many small fields with water available and frequent movement of cattle to new pasture. Application of biosolids is done when cattle are moved off of a field and not put back on that field for at least 30 days at minimum from last date of application. When grass is growing fast, there are still, 45 days between the times when cattle are moved off of a field until the crop is ready to pasture again. This results in 15 days to apply to the field.

Some fields will be cut for hay or silage.

Forested areas will be managed for timber production on a 40 to 60 yr rotation. If timber is remove and converted to crops stumps will be removed and a crop planted. Most of the timber has been recently cut and site replanted. Application methods will change as trees develop. Timber acres will be calculated by area to be covered (i.e. road length* spreading width)

6.0 Other Nutrient Sources and Soil Amendments

Pasturing cattle does return some nutrients to the soil. This addition of nutrients is taken into account when determining biosolids application rates. Lime may be applied to this site as a soil amendment. This addition of lime acts to bring the soil-pH into a range that supports optimal pasture growth. Other products may be used to supplement biosolids application when needed. For example, biosolids is low in potassium and cobalt or soil may need supplements to adjust soil pH for optimal plant growth. This is further addressed in the section on calculating application rates where all nutrient and soil amendments will be accounted for. Additional organic or inorganic Nitrogen applications, excluding Pasture application from the cattle will be submitted in the same manner as biosolids application.

7.0 Methods of Application

Fire Mountain Farms has a wide variety of application equipment and methods for field applying biosolids. Some of the equipment is very specialized (such as the timber liquid application setup) and others are more common in typical agricultural production. Land application of biosolids will be conducted with equipment that is suitable for the site and also for the material being land applied. Land application methods will provide for an even and consistent distribution in accordance with the calculated application rate (see Subsection 9.2). Quality management of biosolids requires the flexibility to adjust to various site conditions.

Equipment that may be used includes:

- Rear- and side-discharge manure spreaders for dewatered biosolids.
- Spray irrigation equipment for liquid biosolids.
- Drag hose systems for liquid biosolids.
- Other equipment as approved by Ecology.

Buffer widths have been noted on attached maps and will not generally change with application method. However, from a practical standpoint, some methods of application will require increased setbacks to insure biosolids do not enter the buffer area. For example, using a “big gun” (a sprinkler-type system designed to apply liquid materials) could require the setback of an additional distance if wind is determined to be an operational concern. Compliance may also be met on a calm day by stationing a crew member in the field to closely monitor the operations and maintenance of setbacks. Along with buffers comprised of an approved setback distance, vegetated buffers may also be used to protect sensitive areas from biosolids. Fire Mountain Farms considers the method of application to be less of a factor in the setting of buffers than other aspects such as field slope, type of vegetation, permeability of soil and sensitivity of buffered areas.

Currently Fire Mountain Farms has the following equipment:

For de-watered biosolids:

- Knight side slingers (5)
- Meyers rear discharge
- Big A with FarmCo box
- John Deere hydro push

For liquid applications:

- Truck spread with splash plates
- Nuhn 5000 gallon tank spreader
- Terigater 4000 gallon spreader
- Hard hose reel (2)
 - With big gun
 - With 120ft spray bar
- Drag hose system
 - With airway aerator
 - With sod injector
 - With 7-shank injector
 - With splash plate

Due to the rocky soil on site the airway aerator may not be suitable so liquid applications would be by splash plate or big gun. Knight or Meyer spreaders are normally used for de-watered material. The method of application will be matched with the type of biosolids being delivered, the crop and soil conditions. For example, the 7-shank injector is only usable with liquid biosolids being applied to annual crops, whereas the Meyer works best for very dry biosolids (total solids content of 40% or greater). There may be occasions such as soil condition, crops being grown, new seeding, equipment availability, characteristics of the biosolids being delivered or other factors that may require use of different application equipment.

When biosolids must be incorporated to meet the vector attraction reduction (VAR) standard for Class B biosolids, one of the following methods will be used:

- Injection with drag-hose system
- Incorporation with tillage tool such as a disk harrow

8.0 Determining and Validating Application Rates

The subsections below detail the process to set desired nitrogen levels for a given crop, determine how much nitrogen is available in biosolids being applied, and how to calculate volume of biosolids to apply to a given field.

Ecology reserves the right to exercise professional judgment when evaluating proposed application rates and the site suitability so as to ensure biosolids rule requirements and the goals and objectives of this plan are met.

8.1 Determining the Plant Available Nitrogen Requirement

Agronomic rates for biosolids application will be determined using one or a combination of the following methods:

- Recommendation of professional agronomist or forester.
- As prescribed in farm plans on file with Thurston County Conservation District.
- As recommended by Washington State University (WSU) Cooperative Extension guidance.
- Production estimate based on potential of soil as determined by NRCS Soils Surveys, WSU or other Cooperative Extension guidance.
- As determined by actual production data using WSU rates per production unit or the following formula. Calculation of nitrogen requirement for crop production such as hay or pasture will be as follows:

$$\text{Dry matter yield (DmY)} \times (\%N) = \text{N-uptake}$$
$$(\%N) = \text{Crude Protein} / 6.25$$

Example:

$$\text{DmY} = 4500 \text{ lb, Crude Protein} = 18.75\%, \%N = 18.75 / 6.25 = 3\%$$
$$\text{N-uptake} = 4500 \times .03 = 135 \text{ lb nitrogen utilization}$$

- Rates will be adjusted as indicated by biosolids nutrient data, soil sampling and post-harvest soil nitrate testing. Record of past production is the preferred method, but when that is not available (i.e., new site or new crop), Fire Mountain Farms will base application rate on the best available recommendation. Fire Mountain Farms, Inc. will use the Department of Ecology document, Biosolids Management Guidelines for Washington State, to assist with the calculations as appropriate. The Fire Mountain Farms Application Report (see Appendix 6.A of this plan) will be used to record and document application rates.

8.2 Calculating the Application Rate

Application rates are calculated using Worksheet for Calculation Biosolids Application Rates in Agriculture (PNW0511e), Excel spreadsheet based off of PNW0511e (aka Cogger/Sullivan Worksheet). See Appendix 7.A of this plan for an example. This spreadsheet allows input values for previous applications of biosolids, ammonium retention, and mineralization rate.

Ecology shall have 14 calendar days for review of information regarding agronomic rate recommendations. The 14-day review period shall begin after all necessary information to calculate the recommendation is received in writing by the designated Ecology staff member. If Ecology does not respond within 14 days of receiving all necessary information upon which a recommendation is based application can proceed as proposed.

- Information that maybe needed to support application rates
 - Cogger-Sullivan Spread sheet
 - What crop grown, harvested as,
 - Other inputs, Irrigation, commercial products, lime
 - Previous yields and expected yields
 - Animals: type, size, time on field
 - Soil test results
 - Biosolids analytical data and type

Proposed application rates with anticipated application after September 15th shall not exceed application rates recommended per an appropriate fertilizer guide for fall application. In addition, application occurring after September 15th must include information received from the current season's fall soil samples.

8.3 Verifying the Application Rate

When applying biosolids, application rates are calculated in gallons per acre for both dewatered and liquid applications. For dewatered biosolids, each application unit is assigned a volume amount, and the number of loads per field is determined. For less experienced operators, the square feet of area to be covered will be determined. Depending on which applicator is being used, the correct area will be covered by varying speed and width of spread. More experienced operators will check the maximum number of loads per field and set travel area and width so as to come out at that number or less. The typical application rate procedure works like this: the supervisor determines rate and maximum number of loads for a field. This is entered on the "Application Report" and the report is given to the operator with a conservative factor built in (typically 1 to 3 loads less than specification). For liquid applications, a determination of the number of dry tons required is calculated. Then, using the percent total solids of the biosolids, the gallons per acre can be determined. The percent total solids will be checked periodically and an adjustment to the agronomic rate will be made if needed. When using the drag-hose system, a flow meter is mounted in the tractor and a read out is displayed in acres per hour. For example, if an application rate requires 30,000 gallons per acre and a flow rate of 1000 gpm (gallons per minute), the tractor speed is set to two acres per hour. All of this information is recorded on the "Liquid Application Report" located as Appendix 6.B of this plan.

9.0 Sampling Plan

Sections below describe soil sampling and biosolids sampling procedures.

9.1 Soil Sampling

The collection of soil samples and observation of crop response will assist with the determination of correct biosolids application rates. The fall post-harvest soil nitrate test helps to gauge the effectiveness of the biosolids application rates by measuring the concentration of Nitrate-N remaining in the top one foot of soil at the end of the growing season and before soils become saturated. We will follow Oregon State University/ Washington State University guidance #EM 8832-E "Post-harvest Soil Nitrate Testing, for Manured Cropping Systems west of the Cascades" by D.M. Sullivan & C.G. Cogger for sampling Protocol and analyzing sampling results. Results will be provided to Dept. of ecology within 14 days of receiving results.

Post-harvest soil nitrate testing is performed by collecting soil cores at multiple locations throughout the field, and combining the cores together to form a composite sample. The depth of each core will be labeled. These samples will be dried or refrigerated or frozen to stop biological activity that could change results before shipping to laboratory for analysis.

Post-harvest, *report-card*, trends will be compared to threshold goals to determine biosolids application rates for the following year. Additional biosolids land application will be determined by considering the following the trend nitrate testing, previous agronomic rate of N applied, weather conditions for the growing season, other farming practice that could upset current trend point. Oregon State University/ Washington State University guidance #EM 8832-E "Post-harvest Soil Nitrate Testing, for Manured Cropping Systems west of the Cascades" by D.M. Sullivan & C.G. Cogger recommendations for Nitrate-N within the top foot will be used for residual goal. Fields with a 10 year history of Biosolids application will have percent organic matter checked. Resampling intervals will depend on organic material levels. Fields with substantial lime stabilizer biosolids application will have soil pH tested.

Due to the complicated nature of soil nitrogen processes, an alternate method of determining biosolids land application rates may be used with Dept. of Ecology's concurrence. That method would include conducting spring pre-application sampling for soil Nitrate-N and Ammonium-N prior to biosolids application, with those results subsequently used to determine appropriate application rates using the PNW0511e spreadsheet or similar. Once those calculations are complete and the results submitted, Ecology will consider allowing land application rates on a field by field basis.

See the soil Sampling plan and Analysis Plan for more detailed soil collection and testing information. A sampling and analysis plan detailing the procedures for the collection of soil samples may be found in Appendix 8A of this plan.

Biosolids Sampling and Analysis

Documenting that biosolids meet the standards for land application in WAC 173-308 is performed by either the biosolids generator (e.g. wastewater treatment plant) or by Fire Mountain Farms, Inc. If biosolids quality is changed by Fire Mountain Farms after receipt through the process of blending multiple biosolids sources, Fire Mountain Farms will follow Ecology's Policy on Mixing Different Non-Exceptional Quality Biosolids-2008. A sampling and analysis may/ will be submitted To Ecology for approval. An overview of biosolids sampling requirements is being presented here.

9.2 Pathogen Reduction

Pathogens are organisms, such as certain types of bacteria that have the potential to cause disease in humans. Biosolids must be processed to meet certain pathogen reduction standards. The pathogen reduction requirement for biosolids received at this site shall be met by one of the alternatives listed in WAC 173-308-170 (5) through (7). When biosolids from multiple sources are mixed on-site, documentation of pathogen reduction will be provided through the collection of seven samples that are representative of the blended biosolids and analyzed for fecal coliform. These samples will be delivered to a State of Washington accredited laboratory following a chain-of-custody protocol. Pathogen reduction shall be considered to have been accomplished if the geometric mean of the seven fecal coliform samples is less than 2,000,000 MPN/g-total solids (dry weight basis).

9.3 Trace Elements

At a minimum, biosolids land applied at the site, must meet the Ceiling Concentration Limits for pollutants found in Table 1 of WAC 173-308-160 (1). It is a policy of Fire Mountain Farms to only accept biosolids that meet the more restrictive Pollutant Concentration Limit found in Table 3 of WAC 173-308-160 (3).

9.4 Vector Attraction Reduction Standard

Vector attraction is the characteristic of biosolids that may attract insects and animals (vectors) capable of transmitting disease. In general, biosolids meeting vector attraction prior to arriving at the site will have gone through a process to reduce volatile solids or has physical properties such as high pH that reduces vector attraction. To meet vector attraction reduction (VAR) after biosolids arrive at the site, a physical process such as injection or incorporation of the biosolids will be performed as part of the application procedure.

Most biosolids, prior to being received at the site, shall meet one of the vector attraction reduction (VAR) requirements in WAC 173-308-180 (1) through (6). If

the VAR requirement has not been met prior to the biosolids arriving at the site, one of the VAR requirements in WAC 173-308-210 (4) (a) or (4) (b) shall be met at the time of biosolids application and WWTP will be provided with confirmation documentation that VARs was met.

10.0 Groundwater Protection Plan

Fire Mountain Farms will not apply to fields where depth to the water table is less than three feet, or during a time when water table is near three feet and rising.

Determining depth to the water table:

1. Review Natural Resource Conservation Service, (NRCS), soil surveys for depths to water table
2. Those soil types that have water table that comes within 36 inch of the surface will have depth monitored prior to application.
3. Monitoring will be with temporary bore holes or permanent monitoring wells.
 - a. Temporary bore holes will be drilled, observation made, then refilled.
 - b. Permanent monitoring points may be installed
4. Locations of monitoring points will be proposed to Ecology for approval.
5. Locations of monitoring points will be submitted to Ecology for approval.

6. Field log will be kept on observations made at monitoring points. Copy of this log will be submitted to Ecology as part of Annual Report and will include at a minimum field conditions and weather, date, location information, and depth to water.

7. After five years of observation if water table has not been observed at a monitoring point Fire Mountain Farms may close that monitoring point after conferring with Ecology.

11.0 Erosion Control Plan

NRCS has not classed this land as "highly erodible". There are permanently vegetated strips next to streams and ditches. The current agricultural and forestry activities do not deem it necessary for an erosion control plan. Biosolids will be applied at agronomic rates and managed consistent with established farming practices. Typical farming practices designed to reduce erosion potential are in place.

12.0 Noxious Weed Plan

Sites are managed for specific crops with standard farming practices in place to control noxious weeds. There are no known specific concerns on this farm.

13.0 Restricting Site Access

A copy of Fire Mountain Farms' informational sign can be found in Appendix 5 of this plan. Signs will be placed as noted on the map listed as Appendix 2.D.

Signs will be placed at all normal points of access and at least every quarter mile along roadways that border application areas. Signs will also be placed at other points along the boundary where it is deemed appropriate by Fire Mountain Farms or as requested by DOE. Entering improved property without permission of land owner or person who has right of possession (lease holder) is a violation of state law. The posting of signs noting the site is restricted adds an additional measure for protection for those who might violate the law and also signals to all that the land is not open for public access.

14.0 Recordkeeping

Fire Mountain Farms shall keep specific records of land application activities. These records shall be available for inspection by Ecology upon request. As a minimum, the following information shall be included in the land application site records:

Fire Mountain Farms will maintain the following information as required. Forms for maintaining this information are located in Appendices 6 and 7 of this plan.

- Sampling and analysis data obtained or used to make decisions on land application.
- The source of biosolids delivered.
- The amount of biosolids delivered.
- The amount of biosolids applied and to which field.
- The number of acres on which biosolids were applied.
- The rate of application.
- The date biosolids were applied.
- The targeted vegetation and its nitrogen requirement.
- Information on how site management and access restrictions were met, including for livestock.
- Information on how vector attraction reduction requirements were met if biosolids were required to be tilled or injected.

15.0 Additional Information

See the following appendices of this Site Specific Land Application Plan for more information.

Appendices

1. Land Owners Agreements
2. Site Maps
 - A. Vicinity Map
 - B. Not Used
 - C. Aerial Overview of Site, Field ID
 - D. Residences, Wells, Roads, Signage Field Identification Map Surface Water, Wells
 - E. Not Used
 - F. Flood Map
 - G. Zoning Map
 - H. Topographic Map
3. Soils Report (includes site soils map)
4. Well Logs
5. Informational Sign
6. Forms
 - A. Land Application Report
 - B. Liquid Application Report
 - C. Haul Delivery Ticket
 - D. Delivery Record Sheet
7. Spreadsheets/Charts
 - A. Agronomic Rate Spreadsheet Example
 - B. Trace Elements Spreadsheet
 - C. Grazing Plan and Control Chart Example
 - D. Priority Habitat and Species List
8. Sampling and Analysis Plan
 - A. Soil sampling Plan
 - B. Biosolids Sampling Plan (may be submitted at a later date)
9. Post-Harvest Soil Nitrate Testing

10. Spill Plan Example