# Biosolids Management Plan
# For
# The City of Molalla

## NPDES Permit No. 101514
## File No. 57613

September 10, 2013


**City of Molalla Wastewater Treatment Facility**
12424 S. Toliver Rd.
Molalla OR 97038

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## INTRODUCTION

This document updates and amends the 1999 Biosolids Management Plan (BSMP) for the City of Molalla's Wastewater Treatment Facility (Molalla WWTF). Molalla WWTF's biosolids program is governed by Oregon Administrative Rule (OAR) 340-050 and by the Code of Federal Regulations (CFR) Section 40, Part 503. The program is also guided by the Department of Environmental Quality's (DEQ's) Internal Management Directive (IMD): Implementing Oregon's Biosolids Program. The BSMP is being updated to address the requirements of OAR 340-050 and the IMD, but also to serve as a tool for Molalla WWTF's administration and operations staff involved with the biosolids program. The BSMP is scheduled for future updates at each renewal of the City's NPDES permit. The updated BSMP is part of the City's NPDES permit and is enforceable.

The City of Molalla owns and operates a wastewater collection and treatment system located at 12424 S. Toliver Road in Molalla, Oregon.. The treatment plant serves a population of about 8000 people. The wastewater that the city treats is primarily residential with a few restaurants and no major industrial dischargers. The designed average dry weather flow is 0.800 million gallons per day (MGD). Actual flows during the dry season averaged 0.899 MGD and during the wet season averaged 1.887 MGD. The peak flow design capacity is 4.000 MGD. Details of the treatment plant are provided in Appendix A.

Treated effluent is discharged November 1$^{st}$ to May 31$^{st}$ to the Molalla River at river mile 20. In summer effluent is beneficially reused for irrigation.

## SOLIDS MANAGEMENT HISTORY

The lagoon system of treatment allows the plant to go for long periods of time between solids removals from the lagoons. This longer storage and digestion time makes it hard to determine the quantity of solids that accumulate in the lagoon. However, due to the long term storage, the solids are in well-digested and fairly inert.

Between the time when the plant was put into service in 1978 and 1999 there was one poor attempt made at biosolids removal in 1989. It did not go well due to poor quality dredging equipment. To date the 1999 biosolids removal has been the only successful removal. They were able to remove approximately 712 dry tons and direct inject it into the neighboring field. In 2010 there was another poor attempt at removal by a contracted company that was only successful in removing approximately 55 dry tons of solids. They wet hauled the solids to another facility for processing which was very expensive.

Over time the solids have built up and have caused problems for the plant. Solids get disturbed by the agitation of the water by wind and rain, which increases the amount of solids entering number two lagoon. The buildup of solids also decreases the aerobic zone available in the pond, which decreases treatment efficiency and can lead to odor problems. Since we need to leave a nice cap of water over the sludge to avoid nuisance odors we cannot lower the level of water in number one lagoon below the sludge level.

Biosolids contain nutrients and organic matter that can be safe and beneficial to farmers. The recycling of biosolids by farmers is also economical for the farmer and the treatment plant. The farmer receives nutrients that he doesn't have to pay for and the treatment plant doesn't have to pay to haul it to a landfill.

## WASTEWATER TREATMENT FACILITY

### Liquids Processing

The City of Molalla wastewater treatment plant is an aerated lagoon system. It has one aeration basin and two lagoons operated in series. The first holding pond is approximately 11.4 acres. The second holding pond is 13.6 acres. Both ponds have an operating depth of 3 to 12 feet. The majority of the sludge builds up on the west end of number one lagoon.

The first stage of treatment is the headworks. The headworks is made up of a mechanical fine screen system with a manual bar rack for high flows. Its design capacity is 9.25mgd. The water then flows through a 12-inch Parshall flume to measure the flow before entering the aeration basin. The aeration basin adds dissolved oxygen and mixing with six ten hp mechanical aerators. The influent flow is mixed with the return waste skimmed off the DAFs and the backwash water from the filters. The aeration basin has a capacity of 1.33MGD. From there wastewater is pumped to number one lagoon by the transfer pump station. The transfer pump station is made up of two 112hp pumps and one 50hp pump.  It has a peak capacity of 11.23MGD.  Number one lagoon has a capacity of 45million gallons and gravity flows into lagoon number two with a capacity of 53Million gallons. From there two Dissolved Air Floatation units use a process of adding dissolved oxygen and polymer to float and settle solids. They have a design capacity of 2.0 mgd each. It then gravity flows through sand and anthracite coal filters where any floating impurities are trapped on the surface and the majority of other solids are caught in the sand and anthracite. Each filter has a design capacity of one million gallons a day. The filter effluent gravity flows into the chlorine contact basin. Calcium hypochlorite is used for disinfection. A chlorine solution is added to the line prior to entering the contact basin and is followed by an inline mixer. It is then pumped five miles to the discharge monitoring station by the effluent pump station, which consists of two 300hp vertical pumps rated for 5 MGD each. The discharge monitoring station is where ascorbic acid is added to dechlorinate the effluent before it discharges into the Molalla River.

There have been several upgrades made to the process since the facility's previously approved biosolids management plan in 1999. In 2000 an effluent pump station was built. It included two 300hp vfd controlled pumps and a 750kw backup generator. Construction of the effluent/irrigation line was also started. In 2002 the new transfer pump station was built. Along with the transfer force main. The new automated fine screen was also added in 2002 replacing the old comminuter at the headworks. In 2007 a new Dissolved Air Floatation (DAF) unit was installed along with the four sand and anthracite coal filters replacing the two old ones. In 2011 we upgraded the old chlorine gas system to a safer calcium hypochlorite system for disinfection. See attached facility drawings for more information (Appendix A).

**Solids Processing**

Solids flow into number one lagoon after the aeration basin where everything settles out. Most of the solids settle out in the first section of number one lagoon. This fast settling is attributed to the combination of aeration and the mixing of polymer left in solids removed from the DAF units. The majority of solids have been in the lagoons for several years. Solids break down anaerobically over a long period of time.

The solids are covered with a layer of water that keeps them from causing odor problems.
The City of Molalla plans to apply 289 dry tons per year in the years that solids are applied. When field application is not available the solids will be anaerobically digested in the bottom of number one lagoon.

**Septage Processing**

The City of Molalla does not receive septage at this time.

**Pretreatment Program**

The City of Molalla is not required at this time to implement an industrial wastewater pretreatment program, as the city does not currently have a significant source of industrial wastewater.

## BIOSOLIDS TREATMENT PROCESSES

Under 40 CFR Part 503 and Oregon Administrative Rules Chapter 340 Division 50, pathogen reduction and vector attraction reduction for biosolids must be met prior to land application. Vector attraction reduction requirements can also be met at the time of land application if biosolids are direct injected below the surface of the land or incorporated into the soil within 6 hours after application to the land. Biosolids are categorized as Class A or Class B depending on the method used to determine pathogen reduction. Biosolids may also be classified as exceptional quality (EQ) if the product meets: pollutant concentration limits in 40 CFR Part 503, one of the class A pathogen reduction alternatives in 40 CFR 503.32(a), and one of the vector attraction reduction options in 40 CFR 503.33(b) (1) through (8). To meet regulatory requirements, pathogen reduction method other than what is specified in this biosolids management plan.

The City of Molalla will certify in writing that Class B pathogen requirements and vector attraction reduction requirements are met. The City of Molalla will also notify the Department in writing and obtain written approval prior to any process change that would use a pathogen reduction or vector attraction reduction method other than what is specified in this biosolids management plan.

### Pathogen Reduction

Pathogen reduction requirements of 40 CFR Part 503 and OAR 340-050 are met through Alternative #1 for Class B biosolids in 40 CFR 503.32(b)(2): The geometric mean of the density of fecal coliform of seven representative samples shall be less than either 2 million Most Probable Number (MPN) or 2 million Colony Forming Units (CFU) per gram of total solids (dry weight basis).

### Vector Attraction Reduction

Vector attraction reduction requirements of 40 CFR Part 503 are met through Option #2 in 503.33(b)(2): Less than 17% additional volatile solids loss during bench-scale anaerobic batch digestion of the sewage sludge for 40 additional days at 30ºC to 37ºC (86ºF to 99ºF). Biosolids meet this requirement through years of anaerobic digestion in the bottom of number one lagoon.

## BIOSOLIDS STORAGE

### Treatment Facility

From the number one lagoon the liquid biosolids are pumped to a truck for land application. The lagoon can hold several years' accumulation of solids when land application is not available.

### Staging

There will be no staging of biosolids since the City of Molalla will load the truck and wet apply biosolids the same day.

### Field Storage

Field storage is not needed at this time because the City of Molalla plans to wet apply the biosolids.

## TRANSPORTATION

The City of Molalla owns the tanker truck used to transport biosolids from the wastewater treatment facility to authorized land application sites. The city of Molalla employees operate the tanker truck. The City of Molalla is able to handle the volume of biosolids produced through these transportation practices.

Liquid biosolids are loaded from the west end of number one lagoon at the treatment facility into a tanker truck for land application. For a map of the location of section one of lagoon one see the included map in appendix C on page 24. The biosolids will be pumped to the tanker truck by a dredge. The truck will be parked on the dike between lagoon #1 and lagoon #2 for filling. If any material is spilled it will go back into one of the lagoons. Any remaining material will be cleaned up immediately.

## REMEDIAL PROCEDURES

All spills into waters of the state or spills on the ground surface that are likely to enter waters of the state will be reported immediately to Oregon Emergency Response System (OERS) at 1-800-452-0311 and the Department's regional biosolids specialist at (503) 229-5347. All spills of 50 gallons or more on the ground surface will be reported to OERS and the Department's regional biosolids specialist within 24 hour(s) of the spill incident.

### Spill During Transportation of Biosolids

The City of Molalla is responsible for cleanup of any biosolids spills that occur while transporting to land application sites. If a spill occurs during the transport of biosolids between the wastewater treatment facility and the land application site, the City of Molalla will:

- Contain the spill.
- Post the area and set up temporary fencing if there is a potential for public exposure.
- Remove spilled biosolids with a vactor trailer.
- Cover the area with dry lime if needed
- Apply absorbent (e.g., sand) if needed
- Transport spilled product to a Department authorized biosolids land application or disposal site.

See spill contingency plan for more information (Appendix G).

## MONITORING AND REPORTING

### Monitoring and Sampling Program

All monitoring and reporting will be conducted in accordance with the City of Molalla's NPDES permit. Monitoring of biosolids generated by the Molalla WWTF is required only when the biosolids are dredged from the lagoons and land applied as a fertilizer and/or soil amendment for agricultural crops. The City conducted sampling, analysis, and measurement of solids in the 2 lagoons in July 2012 to determine if the solids accumulated meet the requirements for land application to agricultural land as allowed under federal and state biosolids rules. The solids sampling and analyses was conducted in accordance with Molalla's Biosolids Sampling Plan, approved by the Department on June 18, 2012, and presented in Appendix B. Results of the solids monitoring are provided in Appendix C and in the Biosolids Characteristics section of this BSMP.

**Record keeping and Reporting Procedures**

The City of Molalla as the preparer and land applier of biosolids is required to maintain records to demonstrate that federal and state biosolids requirements are met. Records will be kept on file by the City of Molalla, and will be available upon request by the Department. Monitoring and sampling records will be retained for a period no less than 5 years, unless otherwise required by the NPDES permit or a site authorization letter. The minimum required records include the following information:

- Pollutant concentrations of each parameter stated in the permit,
- Pathogen requirements for Class B biosolids as stated in the permit,
- Vector attraction reduction requirements as stated in the permit,
- Description of how the management practices in 40 CFR §503.14 and site restrictions in 40 CFR §503.32(b)(5) are met for each biosolids land application site (, and
- Certification that the information submitted is accurate to determine compliance with pathogen and vector attraction reduction requirements, and site restriction/management requirements.

**Annual Reporting**

A biosolids annual report is required to be submitted to the Department each year by February 19th or as required by the permit if bulk biosolids have been land applied, or biosolids derived products were sold or given away the previous year. The report will include information on biosolids handling activities and data (i.e., monitoring results, nutrient loading rates) from the previous calendar year. Some of the information required with the annual report includes:

- Daily site logs or records, including date, time, and quantity (gallon, pounds) of nitrogen/acre land applied.
- Map, including scale, showing the site and the land application location that coincides with the daily site application method
- Signed copy of the certification statement (see next section on Certification Statement).

**Certification Statement**

The City of Molalla is capable of meeting Class B pathogen reduction and vector attraction reduction requirements. As required under 40 CFR §503.17, the City of Molalla must retain a certification statement indicating whether compliance with pathogen reduction, vector attraction reduction, and certain site restrictions have been met. The certification statement must be retained for a period of five years, and must be submitted with the annual report that is due February 19th or as required by the permit. The City of Molalla will retain the following certification statement and it will be signed by a principal executive officer or ranking elected official or their duly authorized representative (e.g., individual or position having responsibility for the overall operation of the system, such as the position of plant manager, supervisor, superintendent or equivalent responsibility).

"I certify, under penalty of law, that the information that will be used to determine compliance with the Class B pathogen requirements in 40 CFR §503.32(b) alternative #1, the vector attraction reduction requirement in 40 CFR §503.33(b) option 2, and the site restrictions in 40 CFR §503.32(b)(5) for each site on which Class B sewage sludge was applied, was prepared under my direction and supervision in accordance with the system designed to ensure that qualified personnel properly gather and evaluate this information. I am aware that there are significant penalties for false certification, including the possibility of fine and imprisonment."

Signature______________________________________Date_________________________

The City of Molalla is also required as the land applier to certify that the management practices in 40 CFR §503.14 are being met. This certification includes that biosolids are being land applied at approved agronomic loading rates as specified in Department issued site authorization letters.

"I certify, under penalty of law that the management practices in 40 CFR §503.14 have been met for each site on which bulk biosolids is applied. This determination has been made under my direction and supervision in accordance with the system designed to ensure that qualified personnel properly gather and evaluate the information used to determine that the management practices have been met. I am aware that there are significant penalties for false certification, including the possibility of fine and imprisonment."

Signature______________________________________Date_________________________

## BIOSOLIDS CHARACTERISTICS

### Pollutant Characteristics

The following table is a representative biosolids analysis for pollutant characteristics. This data and all previous data indicate that pollutant concentrations for all regulated pollutants have been met.

| Parameter | Biosolids Analytical Result (mg/kg) | Sample Date | 40 CFR §503.13(b)(3) Pollutant Concentration Limits (mg/kg) |
|---|---|---|---|
| Arsenic (As) | 7.88 | 6/18/2012 | 41 |
| Cadmium (Cd) | 2.39 | 6/18/2012 | 39 |
| Chromium (Cr) | 35 | 6/18/2012 | - |
| Copper (Cu) | 277 | 6/18/2012 | 1500 |

| | | | |
|---|---|---|---|
| Lead (Pb) | 60.9 | 6/18/2012 | 300 |
| Mercury (Hg) | 1.76 | 6/18/2012 | 17 |
| Molybdenum (Mo) | 21.7 | 6/18/2012 | - |
| Nickel (Ni) | 20.9 | 6/18/2012 | 420 |
| Selenium (Se) | 4.06 | 6/18/2012 | 100 |
| Zinc (Zn) | 882 | 6/18/2012 | 2800 |

**Nutrient Characteristics and Other Parameters**

The following table is a representative biosolids analysis for nutrient characteristics and other parameters.

| Parameter/measurement unit | Biosolids Analytical Result | Sample Date |
|---|---|---|
| Total solids, percent | 9.2% | 6/18/2012 |
| Volatile solids, percent | 32.8% | 6/18/2012 |
| TKN, percent | 2.283% | 6/18/2012 |
| $NO_3$-N, percent | <0.027% | 6/18/2012 |
| $NH_4$-N, percent | 0.576% | 6/18/2012 |
| Phosphorus (P), percent | 2.130% | 6/18/2012 |
| Potassium (K), percent | 0.050% | 6/18/2012 |
| pH, standard unit | 7.0 | 6/18/2012 |

**LAND APPLICATION PLAN**

One hundred percent of biosolids generated by City of Molalla will be beneficially used through land application. The following biosolids land application plan outlines agronomic application rate and site crops, where biosolids are land applied, site selection criteria for a new site, and site and crop management practices.

**Agronomic Application Rate and Site Crops**

Class B biosolids are required to be land applied to a site at a rate that is equal to or less than the agronomic rate for the site. An agronomic rate is the whole biosolids application rate (dry weight basis) designed to provide the annual total amount of nitrogen needed by a crop and to minimize the amount of nitrogen passing below the root zone of the crop or vegetation to groundwater.

The annual application rate for pasture is 100 pounds available nitrogen (N) per acre, unless the application site demonstrates additional nitrogen is required to match crop uptake rates. The land application sites authorized for use can assimilate the total plant available nitrogen the biosolids provide on an annual basis. Specific site agronomic loading rates are stated in the Department issued site authorization letters.

## Site Inventory of Existing and Potential Sites

The City of Molalla currently has one site authorized by the Department for land application of Class B biosolids and one site that is pending Department approval. Details of these sites are listed in the table below. See Appendix F for maps and more site information.

*Biosolids Land Application Site Inventory*

| Field ID | Township Range and section | Tax lot numbers | Total acres | Spreadable Acres | Department Authorized Date |
|---|---|---|---|---|---|
| Jorgenson | T5S R2E S7 | 1000, 1100, & 1400 | 76.1 | 62.3 | 1999 |
| Johnson | T4S R2E S32 | 300 | 42.5 | 28 | Pending |

## Selection Criteria for a New Site

If necessary, the City of Molalla will locate additional sites for land applying biosolids. Prior to using any site for land application, the City of Molalla is required to receive a written site authorization letter from the Department. The following site conditions will be considered when determining the suitability of a site for land application:

- All sites will be located on agricultural or forestland in Clackamas County.
- A site should be on a stable geologic formation not subject to flooding or excessive run-off from adjacent land.
- Minimum depth to permanent groundwater should be four feet and the minimum depth to temporary groundwater should be one foot at the time when application of liquid biosolids occurs.
- Topography should be suitable for normal agricultural operations. Liquid biosolids should not be land applied on bare soils when the slope exceeds 12 percent. Dewatered or dried biosolids may be land applied on well-vegetated slopes up to 30 percent.
- Soil should have a minimum rooting depth of 24 inches.

## Public Notification

The City of Molalla is required to notify the public of the proposed land application activity. Each year prior to land application of biosolids, the City of Molalla should verify for those sites to be used for the year that the property owners who received prior notification have not changed. If a property owner has changed, notification of the land application activity should be made to the new property owner and documented. See Appendix E for copies of public notification documents used by the City of Molalla.

**Site Management Practices**

Site access restrictions and setbacks will be followed as outlined in the Department's site authorization letters. The City of Molalla will ensure that access is restricted by appropriate means as necessary, such as fencing or posting of signs at the land application site. Biosolids land application will not occur in those areas designated as buffer strips and will be achieved through accurate measurement of the buffer area prior to commencing land application.

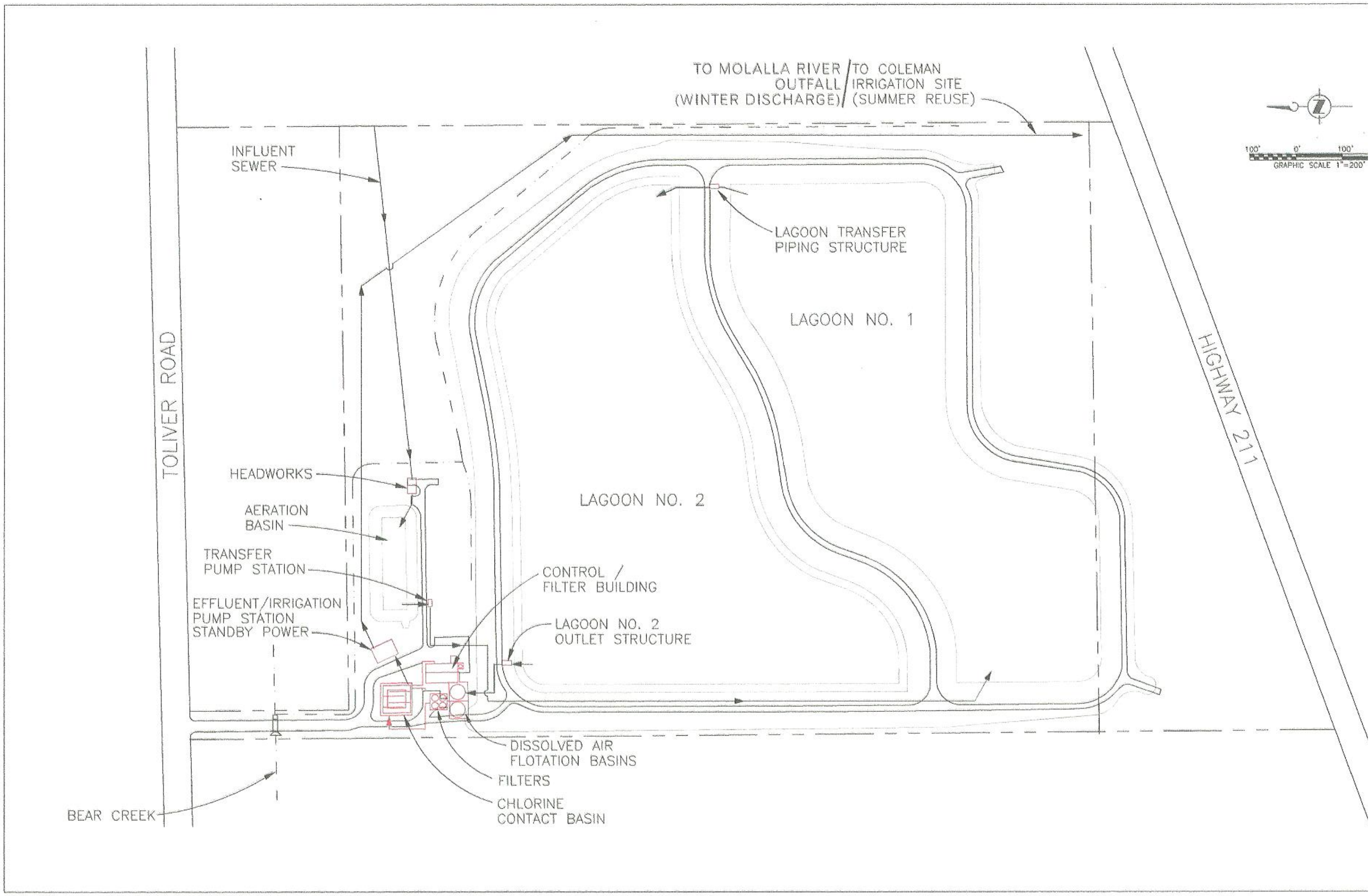
**Crop Management Practices**

The City will apply biosolids to pastured sites only during summer months and at rates that do not exceed 100 pounds of plant available nitrogen (PAN) per acre per year, or 100 lbs PAN/ac/yr. Soil conditions must be favorable for application such that runoff, leaching, or soil compaction does not occur. The timing of land application will take into consideration tilling and irrigation practices that may occur on an authorized site.

The overall management of nutrients at the land application sites takes into account the amount of biosolids land applied, the amount of commercial fertilizers used and the amount of residual nutrients in the soil. When additional sources of nitrogen (e.g., commercial fertilizer) are applied to a site, then the application of biosolids should be reduced to compensate for the additional nitrogen loading. For more information, see Appendix F and Appendix D.

## **APPENDIX A** BSMP Approval Letter From DEQ (Reserved)

**APPENDIX B** Wastewater Facility Design Specifications and Illustrations





TETRA TECH
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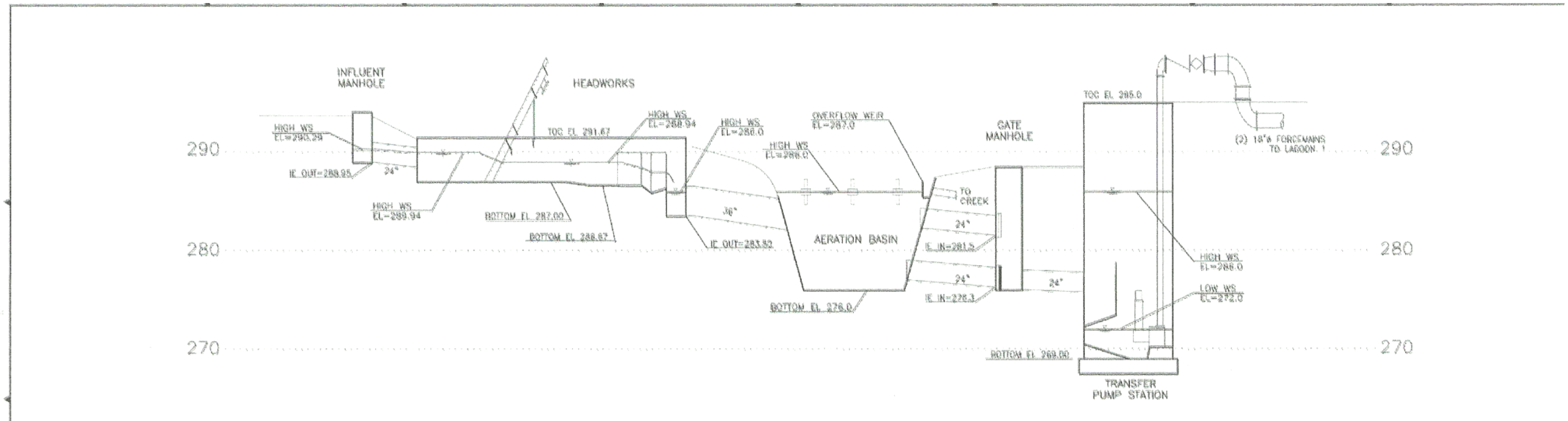
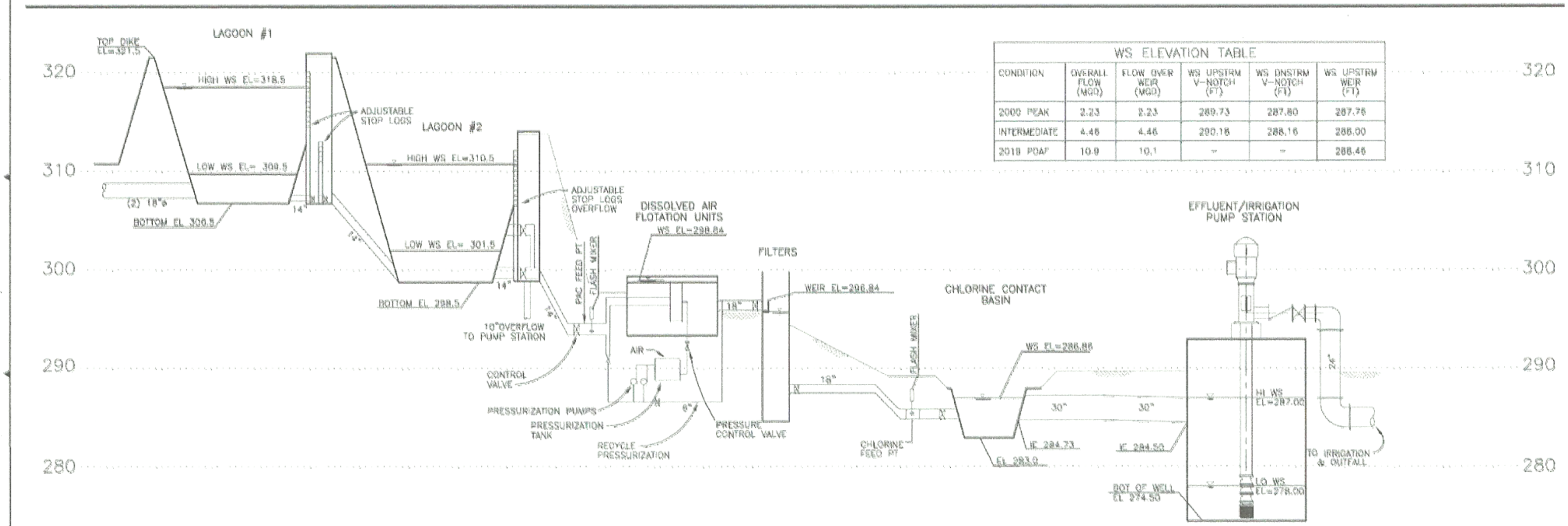
FIGURE 2
WWTP SITE PLA




WS ELEVATION TABLE

| CONDITION | OVERALL FLOW (MGD) | FLOW OVER WEIR (MGD) | WS UPSTRM V-NOTCH (FT) | WS DNSTRM V-NOTCH (FT) | WS UPSTRM WEIR (FT) |
|---|---|---|---|---|---|
| 2000 PEAK | 2.23 | 2.23 | 289.73 | 287.80 | 287.76 |
| INTERMEDIATE | 4.46 | 4.46 | 290.18 | 288.16 | 288.00 |
| 2018 PDAF | 10.9 | 10.1 | – | – | 288.46 |

**TETRA TECH**

7080 SW Fir Loop
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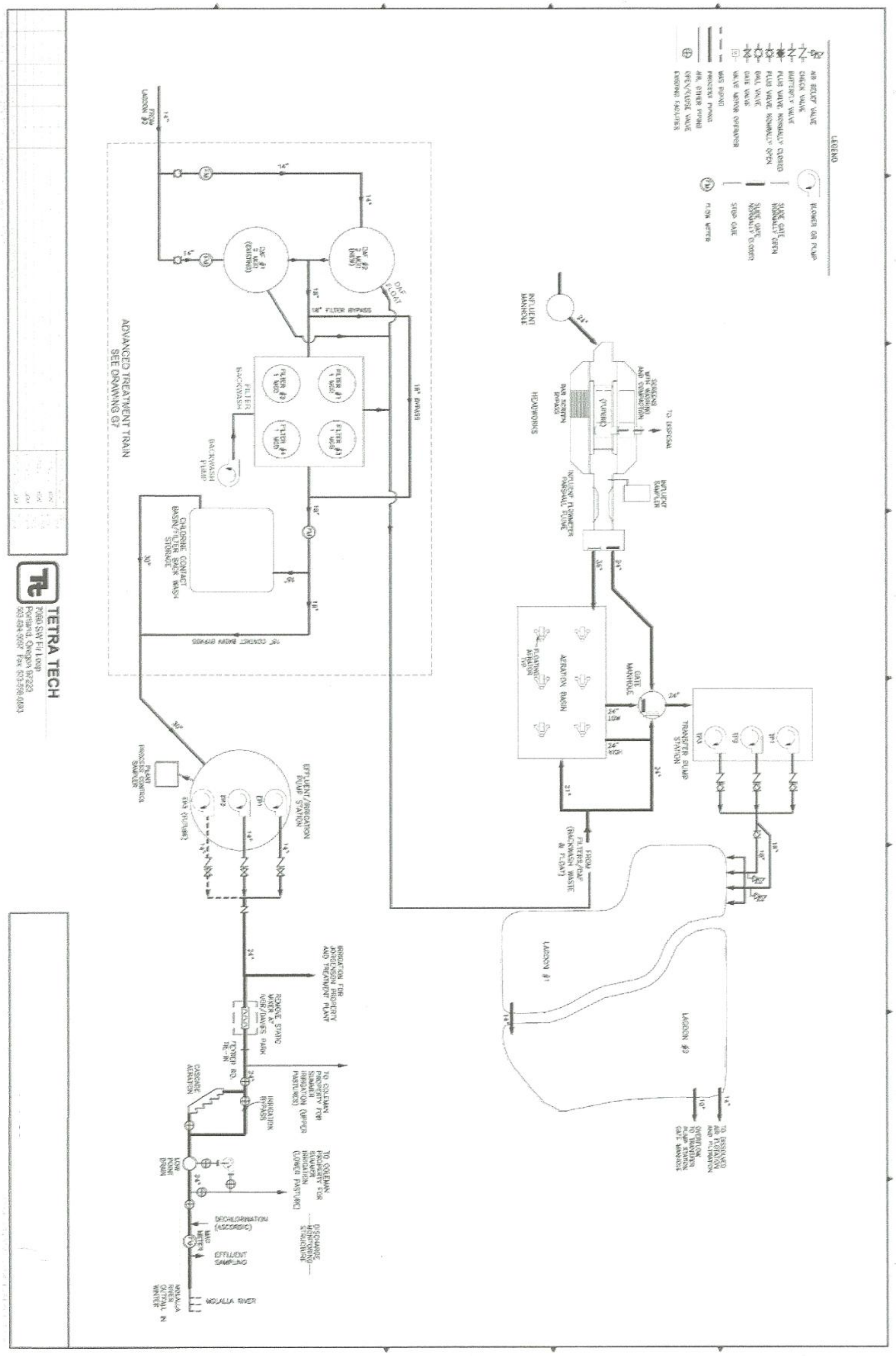
503-684-9097 Fax 503-598-0583


LEGEND
ADVANCED TREATMENT TRAIN
SEE DRAWING G7
HEADWORKS
AERATION BASIN
TRANSFER PUMP STATION
EFFLUENT/IRRIGATION PUMP STATION
LAGOON #1
LAGOON #2
MOLALLA RIVER
TETRA TECH

## FLOW DATA

### Existing and Projected Flows

| | 2005 | 2015 | 2025 |
|---|---|---|---|
| ADWF – Average dry weather flow | 0.80 mgd | 1.1 mgd | 1.4 mgd |
| MMDWF – Max month dry weather flow | 1.28 mgd | 1.7 mgd | 2.3 mgd |
| AWWF – Average wet weather flow | 1.50 mgd | 2.1 mgd | 3.0 mgd |
| MMWWF – Max month wet weather flow | 2.04 mgd | 3.1 mgd | 4.1 mgd |
| PDF – Peak day flow | 7.08 mgd | 8.8 mgd | 10.3 mgd |

## DESIGN DATA

### Effluent Quality

| | | |
|---|---|---|
| Required Effluent Quality | BOD5 < 10 mg/l | TSS < 10 mg/l |
| Anticipated Filter Effluent Quality | BOD5 < 5 mg/l | TSS < 5 mg/l |

### Headworks (2002 Construction)

| | |
|---|---|
| Type of screens | In-channel fine screens, perforated plate |
| Number of screens | 1 |
| Peak flow capacity, each | 9.25 mgd |
| Bypass screen | Manually cleaned screen |
| Screenings washing | Yes |
| Screenings compaction | Yes |
| Septage | Excluded |
| Headworks, influent flow measurement | |
| Number of flumes | 1 |
| Throat width | 24 inches |
| Peak flow capacity | 21.4 mgd |
| Minimum flow capability | 0.27 mgd |

### Aeration Basin (1980 Construction)

| | |
|---|---|
| Dimensions | |
| Size (bottom of basin) | 200 feet by 54 feet |
| Side slopes (horiz.vert) | 2:1 |
| Maximum side water depth | 10 feet with 2 feet freeboard |
| Basin volume, maximum | 1,300,000 gallons |
| Basin liner | Asphalt concrete |
| Aerators | |
| Type | Aspirating |
| Number | 6 |
| Horsepower, each | 10 horsepower |
| Basin outlet | Overflow weir to pump station |

### Transfer Pump Station (2002 Construction)

| | |
|---|---|
| Estimated PF from basin | 9.25 mgd |
| Main pump type | Centrifugal submersible w/vfd |
| Main pumps | |
| Operating | 1 |
| Standby | 1 |
| Main pump capacity each | 5800 gpm at 51 ft tdh |
| Jockey pump type | Centrifugal submersible w/vfd |
| Jockey pump number | 1 |
| Jockey pump capacity (one forcemain) | 2500 gpm at 49 ft tdh and 2100 gpm at 56 ft tdh |
| Station peak capacity | 7800 gpm (11.23 mgd) |
| Required operating volume | 4060 gal |
| Wet well levels | |
| Maximum W.S. el | 286.0 ft |
| Minimum W.S. el | 272.0 ft |
| Operating volume | 58,820 gal (includes aeration basin) |

### Transfer Forcemain (2002 Construction)

| | |
|---|---|
| Number | 2 |
| Material | HDPE |
| Size | 18 inch (nominal, ID) |
| Length | 1530 feet |
| Velocity at 2500 gpm | 3.2 feet/sec |
| Velocity at 2100 gpm | 2.8 feet/sec |
| Velocity at 7800 gpm | 4.9 feet/sec |
| Outlet to lagoon 1 | |
| Number/size | 4-ports/12-inch |

### Lagoon No. 1 (1980 Construction)

| | |
|---|---|
| Lagoon dimensions | |
| Surface area | 11.4 acres (at 6-foot (average) depth) |
| Maximum depth | 12 feet with 3 feet of freeboard |
| Working depth (max. to min.) | 9 feet |
| Lagoon volume, maximum | 137 acre-feet (45 mg) |
| Lagoon liner | Native clay |
| Aeration | None |
| Outlet | |
| Size | 10-inch |
| Type | Surface weir and fixed pipe on bottom of lagoon |

### Lagoon No. 2 (1980 Construction)

| | |
|---|---|
| Lagoon dimensions | |
| Surface area | 13.6 acres (at 6-foot average depth) |
| Maximum depth | 12 feet with 3 feet of freeboard |
| Working depth | 9 feet |
| Lagoon volume, maximum | 163 acre-feet (53 mg) |
| Lagoon liner | Native clay |
| Outlet | |
| Size | 14-inch |
| Type | Fixed pipes at two depths |

### Dissolved Air Flotation (DAF) (1980 Construction)

| | |
|---|---|
| Capacity | 2.0 mgd |
| Tank Diameter | 31 feet |
| Surface area | 755 square feet (sf) |
| Hydraulic loading rate | 2.50 gpm/sf, including recycle |
| Hydraulic capacity | 2.90 mgd, including recycle |
| Chemical feed rates | |
| Alum | 75 – 150 mg/l (not used) |
| Soda | 37 – 75 mg/l (not used) |
| Polyaluminum Chloride | 35 – 70 mg/l |
| Acid | 0 – 10 mg/l (not used) |
| Operating parameters | |
| Pressurized recycle flow | 350 to 700 gpm |
| Operating pressure | 45 to 80 pounds per square inch (psi) |
| Maximum horizontal velocity | 3.1 feet per second |
| Maximum daily sludge | 2280 pounds dry solids, 15,300 gallons |
| Recycle Pumps | |
| Number | 2 |
| Size | 20 HP |
| Flow | 350 gpm |
| Recycle Flow Meter (Existing) | |
| Type | Propeller |
| Size | 6 inch |
| Range | 0-2 MGD |
| Influent Flow Meter (FM-2) **(2007 Construction)** | |
| Type | Electromagnetic insertion type |
| Size | 12 inch |
| Range | 0-10 MGD |

### Dissolved Air Flotation (DAF) **(2007 Construction)**

| | |
|---|---|
| Capacity | 2.0 mgd |
| Tank Diameter | 38 feet |
| Surface area | 1,075 square feet (sf) |
| Maximum surface loading rate | 2.0 gpm/sf, including recycle |
| Hydraulic capacity | 3.1 mgd, including recycle |
| Chemical feed rates | |
| Polyaluminum Chloride | 35 – 70 mg/l |
| Operating parameters | |
| Pressurized recycle flow | 350-700 gpm |
| Operating pressure | 125 PSI |
| Maximum horizontal velocity | <3.1 FPS |
| Maximum daily sludge | 1,670 pounds dry solids, 10,000 gallons |
| Recycle Pumps | |
| Number | 2 |
| Size | 25 HP |
| Flow | 350 gpm |
| Recycle Flow Meter (FM-3) | |
| Type | **Propeller** |
| Size | 6 inch |
| Range | 0-2.5 MGD |
| Influent Flow Meter (FM-1) | |
| Type | **Doppler** |
| Size | 14 inch |
| Range | 0-14 MGD |

### Plant Air (Proposed)

| | |
|---|---|
| Air Compressor | |
| Type | Rotary Screw |
| Size | 15 HP |
| Output | 51 ACFM |
| Operating Pressure | 125 psig |

### Gravity Filters (1980 Construction) – To Be Abandoned

| | |
|---|---|
| Capacity | 2.1 mgd |
| Number of filters | 2 |
| Surface area, total | 310 square feet |
| Maximum loading rate | 5 gpm/sf |
| Hydraulic capacity | 2.2 mgd |
| Media | |
| Type | Gravel, sand, and anthracite coal |
| Depth | 22" gravel, 9" sand, 21" coal |
| Backwash / surface wash | Automatic on timer or pressure differential |
| Backwash rate | 20 gpm/sf |
| Surface wash | 10.5 gpm |

### Gravity Filters **(2007 Construction)**

| | |
|---|---|
| Capacity | 4.0 mgd |
| Number of filters | 4 |
| Surface area, total | 573 square feet |
| Maximum loading rate | 4.85 gpm/sf |
| Hydraulic capacity | 4.0 mgd |
| Media | |
| Type | Gravel, sand, and anthracite coal |
| Depth | 12" silica sand, 24" anthracite coal |
| Backwash control | Manual, timed or pressure differential |
| Backwash rate | 15 gpm/sf |
| Backwash flow (1 filter) | 2,147 gpm |
| Backwash duration | 4 – 8 minutes |
| Backwash volume | 8,600 – 17,200 gallons |
| Air Scour Blower | |
| Type | Rotary Positive Displacement |
| Size | 15 HP |
| Air scour rate | 3.0 scfm/sf |
| Air Scour flow (1 filter) | 429 scfm @ 4 psig |
| Backwash Flow Meter (FM-5) | |
| Type | **Transit Time** |
| Size | 16 inch |
| Range | 0-17 MGD |
| Filter Effluent Flow Meter (FM-4) | |
| Type | **Transit Time** |
| Size | 18 inch |
| Range | 0-23 MGD |

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## Disinfection (1980 Construction)

| | |
|---|---|
| Type | 150-pound gas cylinders |
| Chlorinator capacity | 100 ppd |
| Feed rate, minimum | 30 to 50 pounds / million gallons |
| Residual, minimum | 2 mg/l |
| Chlorine Contact Chamber | |
| Sidewater depth | 4 feet with 1 feet of freeboard |
| Volume | 67,500 gallons |
| Length to width ratio | 24 |

## Outfall to Bear Creek (1980 Construction) – To Be Abandoned

| | |
|---|---|
| Size and material | 18-inch concrete |
| Length | 270 feet |
| Single port | |
| Type | Perpendicular to streamflow |
| Stream gauge | |
| Type | Box culvert with 10' weir |
| Measurement | Manual staff guage |

## Effluent/Irrigation Pump Station (2000 Construction)

| | |
|---|---|
| Pumps | |
| Type | Vertical turbine |
| No. Of pumps | 2 + 1 future |
| Capacity | 500–7,000 gpm |
| Motor horsepower | 300 bhp |
| Motor control | VFD |
| Wet well | |
| Type | 12-ft id manhole |
| Operating volume, pump 1 on to pump off | 3,800 gal |
| Level control | Pressure transducer |
| Lift station (In Plant) | |
| Pump type | Submersible |
| No. Of pumps | 2 |
| Capacity, each pump | 175 gpm at 15 ft tdh |
| Motor horsepower | 3 bhp |
| Speed | 1750 rpm |
| Wet well | 8-ft ID manhole |
| Level control | Pressure transducer |

## Plant Standby Power Generator (2000 Construction)

| | |
|---|---|
| Reliability Class | I |
| Location | Eff/Irr Pump Station |
| Type | Diesel Engine |
| Size | 750 KW |
| Transfer Switch | Automatic |

## Plant Alarm System

| | |
|---|---|
| Type | After Hours via Auto Telephone Dialer |

## Effluent/Irrigation Forcemain (2000 & 2006 Construction)

| | |
|---|---|
| Material | PVC and HDPE |
| Size (Nominal Inside diameter) | 24 inches |
| Length | 27,000 feet (approx. entire length) |
| Capacity | |
| Design Capacity | 10.1 mgd |
| Design Velocity | 5.0 fps |
| Approx. Operating Range of Flows | 1.0 to 4.0 mgd |
| Operating Velocities | 0.5 to 2.0 fps |

## Discharge Monitoring Structure (2006 Construction)

| | |
|---|---|
| Dechlorination (for surface water discharge conditions only) | |
| Feed Solution | Ascorbic Acid |
| Chemical Feed Pumps | 2 – 13 gph (with 1000:1 Turndown) |
| Feed Control | Flow and Cl2 residual paced |
| Effluent Sampler: | |
| Type: Flow Paced or Time Composite | For Bacteria BOD, TSS, NH3, pH, |
| Continuous Monitoring/Recording: | |
| Temperature | Probe. |
| DO | Probe |
| Chlorine | Residual Analyzer (2) |
| Flow Measurement: | |
| Type | Electromagnetic Multi-port Insertion Type |
| Size | 12-inch |

## Molalla River Outfall (2006 Construction)

| | |
|---|---|
| Material (for outfall extension and diffuser) | HDPE |
| Size (Nominal ID) | 24 inches |
| Length | 23 feet |
| Diffuser Design | |
| Number of Ports | Three (Duckbill) |
| Diameter of Port | Eight inches |
| Minimum Summer Submergence | One inch |
| Minimum Winter Submergence | 12 inches |

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**APPENDIX C** Solids Sampling Plan

Oregon
John A. Kitzhaber, MD, Governor

Department of Environmental Quality
Northwest Region Portland Office/Water Quality
2020 SW 4th Avenue, Suite 400
Portland, OR 97201-4987
(503) 229-5263
FAX (503) 229-6957
TTY 711

June 18, 2012

Jon Patrick, Lead Operator
City of Molalla Wastewater Treatment Plant
12424 S. Toliver Road,
Molalla, OR 97038

Re: WQ-Clackamas County
City of Molalla Wastewater Treatment Plant
NPDES Permit No. 101514; File No. 57613
Approval of Lagoon Solids Sampling Plan

Dear Mr. Patrick:

The Department of Environmental Quality (DEQ) has completed the review of the Lagoon Solids Sampling Plan for the City of Molalla Wastewater Treatment Plant, revised and submitted to the DEQ on June 14, 2012. The City plans to dredge solids from one section of a lagoon in summer 2013 and must first sample the solids to determine if requirements for land application of biosolids can be met without further treatment. The revised sampling plan is hereby approved.

DEQ understands that the sampling plan will be made part of the proposed Biosolids Management Plan that must be submitted for DEQ review, public notice and approval *prior to* the land application of biosolids next year. Please submit the results of all solids analyses from the lagoon samples as soon as available.

If you have any questions about this approval or the required Biosolids Management Plan, please feel free to contact me by phone at 503.229.5347 or by email at schrandt.connie@deq.state.or.us.

Sincerely,

Connie M. Schrandt

Connie M. Schrandt
Soils/Land Application Specialist

Ec: Ron Doughten, DEQ-HQ

# Lagoon Solids Sampling Plan
# City of Molalla Water Pollution Control Facility
# 2012

The City of Molalla plans to dredge solids from Pond #1 at the wastewater plant and land-apply the solids at agronomic rates to two proposed pasture sites. No more than 290 dry tons of solids will be applied per year and the sampling will be conducted once per year. Should the city plan on hauling more than 290 dry tons for land application in the same year, the biosolids management plan and the sampling frequency may be revised.

For sampling purposes, the lagoon (Pond #1) was sectioned into four quadrants (see site map attached). Since the majority of solids are built up in quadrant #1 and the City intends to dredge biosolids from quadrant #1 only, quadrant #1 was further divided into 10 subsections. Three individual samples will be collected from each subsection: one for the composite bench scale anaerobic digestion test, one for Fecal Coliforms, and one for metals, pH, and nutrients. Samples for the bench scale test and the metals, pH and nutrients tests will be composited into one sample at the treatment plant prior to transporting to Alexin Analytical for analysis.

The samples will be collected from a boat with a sludge judge. The depth of the sludge blanket and the approximate depth of the sample below the surface of the sludge blanket will be recorded prior to collecting the samples. All the samples will be pulled from near the bottom of the sludge blanket because that is where we will be drawing solids. The samples will be received at Alexin Analytical within six hours after they are collected and a chain of custody report will be filled out showing the time, date, location, number of samples, name of person collecting the sample and what the sample will be tested for. If the sample is taken to the lab by someone other than the person sampling that will be noted on the chain of custody report as well as the time and date it is received by Alexin Analytical. Samples will be transported in a cooler with ice.

## Fecal Coliforms

Samples for fecal coliform testing will be collected from each of the 10 subsections in Quadrant #1 and placed in 100ml sterile bottles provided by Alexin Analytical. Each bottle will be labeled with the subsection it was sampled from.

Class B Biosolids must meet the fecal coliforms requirement of less than 2,000,000 MPN or CFU per gram of dry solids before it can be land applied (40 CFR Part 503.32(b)(2)). Results will be reported as MPN/100 g on a dry weight basis. See attached copy of EPA/625/R-92/013 Appendix F.

## Bench scale Anaerobic Digestion

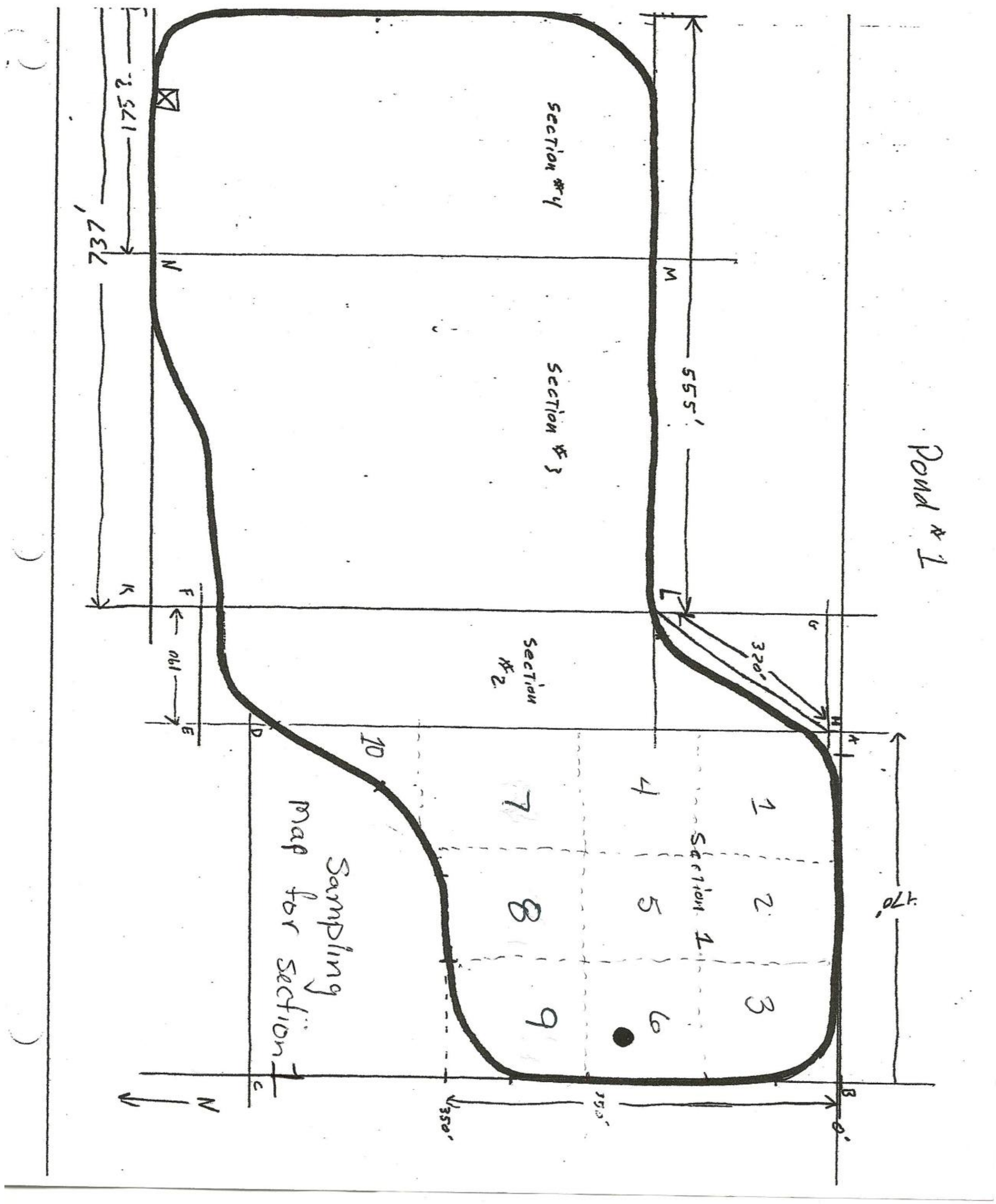
Samples for the bench scale anaerobic digestion test will be composited from each subsection of quadrant #1. One 500ml sample will be collected from each subsection and the sample containers will be completely filled and sealed tightly to void oxygen and maintain anaerobic conditions. These samples will be taken to the lab at the wastewater plant and composited into a one-liter container that will also be completely filled and sealed tightly to void oxygen and maintain anaerobic conditions.

Alexin Analytical will start the bench scale anaerobic digestion test the same day the samples are collected. The test consists of an initial total solids and total volatile solids determination, then subsamples of the composite are incubated under anaerobic conditions between 30 and 37 degrees Celsius for 40 days. The subsamples are tested again for total solids and total volatile solids with some samples being tested after the first 20 days. After the 40-day digestion period, volatile solids must be reduced by less than 17% to meet Vector Attraction Reduction requirements (40 CFR 503.33b opt. #2) described in the biosolids management plan. See attached copy of EPA /625/R-92/013 Appendix D.

### Metals, pH and Nutrients

One 1-liter composite sample will be made from the 100 ml sample containers from each subsection for nutrients, pH and metals. The specific metals to be analyzed are Arsenic, Cadmium, Copper, Lead, Mercury, Molybdenum, Nickel, Selenium and Zinc as required by 40 CFR Part 503.13. The composite sample will also be analyzed for the following nutrients: Total Kjeldahl Nitrogen (TKN), Nitrate-nitrogen (NO3-N), Ammonia-nitrogen (NH4-N), Phosphorous, Potassium and pH.

Nutrients, total solids and total volatile solids results will be reported as % dry weight and pH test results will be reported in standard units.


Pond # 1
Sampling Map for Section 1
Section #4
Section #3
Section #2
Section 1
737'
175?
555'
320'
190
170'
350'
0'
N
1
2
3
4
5
6
7
8
9
10

**EPA/625/R - 92 /013/Appendix D**

# Appendix D
# Guidance on Three Vector Attraction Reduction Tests

This appendix provides guidance for the vector attraction reduction Options 2,3, and 4 to demonstrate reduced vector attraction (see Chapter 8 for a description of these requirements).

## 1. Additional Digestion Test for Anaerobically Digested Sewage Sludge

### *Background*

The additional digestion test for anaerobically digested sewage sludge is based on research by Jeris et al. (1985). Farrell and Bhide (1993) explain in more detail the origin of the time and volatile solids reduction requirements of the test.

Jeris et al. (1985) measured changes in many parameters including volatile solids content while carrying out additional digestion of anaerobically digested sludge from several treatment works for long periods. Samples were removed from the digesters weekly for analysis. Because substantial amount of sample was needed for all of these tests, they used continuously mixed digesters of 18 liters capacity. The equipment and procedures of Jeris et al., although not complex, appear to be more elaborate than needed for a control test. EPA staff (Farrell and Bhide, 1993) have experimented with simplified tests and the procedure recommended is based on their work.

### *Recommended Procedure*

The essentials of the test are as follows:

- Remove, from the plant-scale digester, a representative sample of the sewage sludge to be evaluated to determine additional volatile solids destruction. Keep the sample protected from oxygen and maintain it at the temperature of the digester. Commence the test within 6 hours after taking the sample.

- Flush fifteen 100-mL volumetric flasks with nitrogen, and add approximately 50 mL of the sludge to be tested into each flask. Frequently mix the test sludge during this operation to assure that its composition remains uniform. Select five flasks at random, and determine total solids content and volatile solids content, using the entire 50 mL for the determination. Seal each of the remaining flasks with a stopper with a single glass tube through it to allow generated gases to escape.

- Connect the glass tubing from each flask through a flexible connection to a manifold. To allow generated gases to escape and prevent entry of air, connect the manifold to a watersealed bubbler by means of a vertical glass tube. The tube should be at least 30-cm long with enough water in the bubbler so that an increase in atmospheric pressure will not cause backflow of air or water into the manifold. Maintain the flasks containing the sludge at constant temperature either by inserting them in a water bath (the sludge level in the flasks must be below the water level in the bath) or by placing the entire apparatus in a constant temperature room or box. The temperature of the additional digestion test should be the average temperature of the plant digester, which should be in the range of 30°C to 40°C (86°F to 104°F). Temperature should be controlled within + 0.15°C (0.27°F).

- Each flask should be swirled every day to assure adequate mixing, using care not to displace sludge up into the neck of the flask. Observe the water seal for the first few days of operation. There should be evidence that gas is being produced and passing through the bubbler.

- After 20 days, withdraw five flasks at random. Determine total and volatile solids content using the entire sample for the determination. Swirl the flask vigorously before pouring out its contents to minimize the hold up of thickened sludge on the walls and to assure that any material left adhering to the flask walls will have the same average composition as the material withdrawn. Use a consistent procedure. If holdup on walls appears excessive, a minimal amount of distilled water may be used to wash solids off the walls. Total removal is not necessary, but any solids left on the walls should be approximately of the same composition as the material removed.

- After 40 days, remove the remaining five flasks. Determine total and volatile solids content using the entire sample from each flask for the determination. Use the same precautions as in the preceding step to remove virtually all of the sludge, leaving only material with the same approximate composition as the material removed.

Total and volatile solids contents are determined using the procedures of Method 2540 G of Standard Methods (APHA, 1992).

Mean values and standard deviations of the total solids content, the volatile solids content, and the percent volatile solids are calculated. Volatile solids reductions that result from the additional digestion periods of 20 and 40 days are calculated from the mean values by the Van Kleeck equation and by a material balance (refer to Appendix C for a general description of these calculations). The results obtained at 20 days give an early indication that the test is proceeding satisfactorily and will help substantiate the 40-day result.

Alternative approaches are possible. The treatment works may already have versatile bench-scale digesters available. This equipment could be used for the test, provided accuracy and reproducibility can be demonstrated. The approach described above was developed because Farrell and Bhide (1993) in their preliminary work experienced much difficulty in withdrawing representative samples from large digesters even when care was taken to stir the digesters thoroughly before sampling. If an alternative experimental setup is used, it is still advisable to carry out multiple tests for the volatile solids content in order to reduce the standard error of this measurement, because error in the volatile solids content measurement is inflated by the nature of the equation used to calculate the volatile solids reduction.

Variability in flow rates and nature of the sludge will result in variability in performance of the plant-scale digesters. It is advisable to run the additional digestion test routinely so that sufficient data are available to indicate average performance. The arithmetic mean of successive tests (a minimum of three is suggested) should show an additional volatile solids reduction of ≤ 17%.

### *Calculation Details*

Appendix C, Determination of Volatile Solids Reduction by Digestion, describes calculation methods to use for digesters that are continuously fed or are fed at least once a day. Although the additional anaerobic digestion test is a batch digestion, the material balance calculations approach is the same. Masses of starting streams (input streams) are set equal to masses of ending streams (output streams).

The test requires that the fixed volatile solids reduction (FVSR) be calculated both by the Van Kleeck equation and the material balance method. The Van Kleeck equation calculations can be made in the manner described in Appendix C.

The calculation of the volatile solids reduction (and the fixed fractional solids reduction [FFSR]) by the mass balance method shown below has been refined by subtracting out the mass of gas lost from the mass of sludge at the end of the digestion step. For continuous digestion, this loss of mass usually is ignored, because the amount is small in relation to the total digesting mass, and mass before and after digestion are assumed to be the same. Considering the inherent difficulty in matching mass and composition entering to mass and composition leaving for a continuous process, this is a reasonable procedure. For batch digestion, the excellent correspondence between starting material and final digested sludge provides much greater accuracy in the mass balance calculation, so inclusion of this lost mass is worthwhile.

In the equations presented below, concentrations of fixed and volatile solids are mass fractions--mass of solids per unit mass of sludge (mass of sludge includes both the solids and the water in the sludge)– and are indicated by, the symbols lowercase y and x. This is different from the usage in Appendix C where concentrations are given in mass per unit volume, and are indicated by the symbols uppercase y and x. This change has been made because masses can be determined more accurately than volumes in small-scale tests.

In the material balance calculation, it is assumed that as the sludge digests, volatile solids and fixed solids are converted to gases that escape or to volatile compounds that distill off when the sludge is dried. Any production or consumption of water by the biochemical reactions in digestion is assumed to be negligible. The data collected (volatile solids and fixed solids concentrations of feed and digested sludge) allow mass balances to be drawn on volatile solids, fixed solids, and water. As noted, it is assumed that there is no change in water mass – all water in the feed is present in the digested sludge. Fractional reductions in volatile solids and fixed solids can be calculated from these mass balances for the period of digestion. Details of the calculation of these relationships are given by Farrell and Bhide (1993). The final form of the equations for fractional volatile solids reduction (mass balance [m.b.] method) and fractional fixed solids reduction (m.b. method) are given below:

$$FVSR(m.b.) = \frac{y_f(1-x_b)-y_b(1-x_f)}{y_f(1-x_b-y_b)} \quad (1a)$$

$$FFSR(m.b.) = \frac{x_f(1-y_b)-x_b(1-y_f)}{x_f(1-x_b-y_b)} \quad (1b)$$

where:

y = mass fraction of volatile solids in the liquid sludge
x = mass fraction of fixed solids in the liquid sludge
f = indicates feed sludge at start of the test
b = indicates "bottoms" sludge at end of the test

If the fixed solids loss is zero, these two equations are reduced to Equation 2 below:

$$FVSR(m.b.) = (y_f - y_b)/y_f(1-y_b) \quad (2)$$

If the fixed solids loss is not zero but is substantially smaller than the volatile solids reduction, Equation 2 gives surprisingly accurate results. For five sludges batch-digested by Farrell and Bhide (1993), the fixed solids reductions were about one-third of the volatile solids reductions. When the FVSR(m.b.) calculated by Equation 1a averaged 15%, the FVSR(m.b.) calculated by Equation 2 averaged 14.93%, which is a trivial difference.

The disappearance of fixed solids unfortunately has a relatively large effect on the calculation of FVSR by the Van Kleeck equation. The result is lower than it should be. For five sludges that were batch-digested by Farrell and Bhide (1993), the FVSR calculated by the Van Kleeck method averaged 15%, whereas the FVSR (m.b.) calculated by Equation 1a or 2 averaged about 20%. When the desired endpoint is an FVSR below 17%, this is a substantial discrepancy.

The additional digestion test was developed for use with the Van Kleeck equation, and the 17% requirement is based on results calculated with this equation. In the future, use of the more accurate mass balance equation may be required, with the requirement adjusted upward by an appropriate amount. This cannot be done until more data with different sludge become available.

## 2. Specific Oxygen Uptake Rate

### *Background*

The specific oxygen uptake rate of a sewage sludge is an accepted method for indicating the biological activity of an activated sewage sludge mixed liquor or an aerobically digesting sludge. The procedure required by the Part 503 regulation for this test is presented in Standard Methods (APHA, 1992) as Method 2710 B, Oxygen-Consumption Rate.

The use of the specific oxygen uptake rate (SOUR) has been recommended by Eikum and Paulsrud (1977) as a reliable method for indicating sludge stability provided temperature effects are taken into consideration. For primary sewage sludges aerobically digested at 18°C (64°F), sludge was adequately stabilized (i.e., it did not putrefy and cause offensive odors) when the SOUR was less than 1.2 mg $O_2$/hr/g VSS (volatile suspended solids). The authors investigated several alternative methods for indicating stability of aerobically digested sludges and recommended the SOUR test as the one with the most advantages and the least disadvantages.

Ahlberg and Boyko (1972) also recommend the SOUR as an index of stability. They found that, for aerobic digesters operated at temperatures above 10°C (50°F), SOUR fell to about 2.0 mg $O_2$/hr/gVSS after a total sludge age of 60 days and to 1.0 mg $O_2$/hr/g VSS after about 120 days sludge age. These authors state that a SOUR of less than 1.0 mg O2/hr/g VSS at temperatures above 10°C (50°F) indicates a stable sludge.

The results obtained by these authors indicate that long digestion times–more than double the residence time for most aerobic digesters in use today–are needed to eliminate odor generation from aerobically digested sludges. Since the industry is not being deluged with complaints about odor from aerobic digesters, it appears that a higher SOUR standard can be chosen than they suggest without causing problems from odor (and vector attraction).

The results of long-term batch aerobic digestion tests by Jeris et al. (1985) provide information that is helpful in setting a SOUR requirement that is reasonably attainable and still protective. Farrell and Bhide (1993) reviewed the data these authors obtained with four sewage sludges from aerobic treatment processes and concluded that a standard of 1.5 mg $O_2$/hr/g TS at 20°C (68°F) would discriminate between adequately stabilized and poorly stabilized sludges. The "adequately digested" sludges were not totally trouble-free, i.e., it was possible under adverse conditions to develop odorous conditions. In all cases where the sludge was deemed to be adequate, minor adjustment in plant operating conditions created an acceptable sludge.

The SOUR requirement is based on total solids rather than volatile suspended solids. This usage is preferred for consistency with the rest of the Part 503 regulation where all loadings are expressed on a total solids basis. The use of total solids concentration in the SOUR calculation is rational since the entire sludge solids and not just the volatile solids degrade and may exert some oxygen demand. Making an adjustment for the difference caused by basing the requirement on TS instead of VSS, the standard is about 1.8 times higher than Eikum and Paulsrud's recommended value and 2.1 times higher than Ahlberg and Boykos' recommendation.

Unlike anaerobic digestion, which is typically conducted at 35°C (95°F), aerobic digestion is carried out without any deliberate temperature control. The temperature of the digesting sludge will be close to ambient temperature, which can range from 5°C to 30°C (41°F to 86°F). In this temperature range, SOUR increases with increasing temperature. Consequently, if a requirement for SOUR is selected, there must be some way to convert SOUR test results to a standard temperature. Conceivably, the problem could be avoided if the sludge were simply heated or cooled to the standard temperature before running the SOUR test. Unfortunately, this is not possible, because temperature changes in digested sludge cause short-term instabilities in oxygen uptake rate (Benedict and Carlson [1973], Farrell and Bhide [1993]).

Eikum and Paulsrud (1977) recommend that the following equation be used to adjust the SOUR determined at one temperature to the SOUR for another temperature:

$$(SOUR)_{T1} / (SOUR)_{T2} = \theta^{(T1-T2)} \quad (3)$$

where:

$(SOUR)_{T1}$ = specific oxygen uptake rate at $T_1$
$(SOUR)_{T2}$ = specific oxygen uptake rate at $T_2$
$\theta$ = the Streeter-Phelps temperature sensitivity coefficient

These authors calculated the temperature sensitivity coefficient using their data on the effect of temperature on the rate of reduction in volatile suspended solids with time during aerobic digestion. This is an approximate approach, because there is no certainty that there is a one-to-one relationship between oxygen uptake rate and rate of volatile solids disappearance. Another problem is that the coefficient depends on the makeup of each individual sludge. For example, Koers and Mavinic (1977) found the value of θ to be less than 1.072 at temperatures above 15°C (59°F) for aerobic digestion of waste activated sludges, whereas Eikum and Paulsrud (1977) determined θ to equal 1.112 for primary sludges. Grady and Lim (1980) reviewed the data of several investigators and recommended that θ = 1.05 be used for digestion of waste-activated sludges when more specific information is not available. Based on a review of the available information and their own work, Farrell and Bhide (1993) recommend that Eikum and Paulsruds' temperature correction procedure be utilized, using a temperature sensitivity coefficient in the range of 1.05 to 1.07.

### Recommended Procedure for Temperature Correction

A SOUR of 1.5 mg $O_2$/hr/g total solids at 20°C (68°F) was selected to indicate that an aerobically digested sludge has been adequately reduced in vector attraction.

The SOUR of the sludge is to be measured at the temperature at which the aerobic digestion is occurring in the treatment works and corrected to 20°C (68°F) by the following equation:

$$SOUR_{20} = SOUR_T \times \theta^{(20-T)} \qquad (4)$$

where

θ = 1.05 above 20°C (68°F)
1.07 below 20°C (68°F)

This correction may be applied only if the temperature of the sludge is between 10°C and 30°C (50°F and 86°F). The restriction to the indicated temperature range is required to limit the possible error in the SOUR caused by selecting an improper temperature coefficient. Farrell and Bhide's (1993) results indicate that the suggested values for θ will give a conservative value for SOUR when translated from the actual temperature to 20°C (68°F).

The experimental equipment and procedures for the SOUR test are those described in Part 2710 B, Oxygen Consumption Rate, of Standard Methods (APHA, 1992). The method allows the use of a probe with an oxygen-sensitive electrode or a respirometer. The method advises that manufacturer's directions be followed if a respirometer is used. No further reference to respirometric methods will be made here. A timing device is needed as well as a 300-mL biological oxygen demand (BOD) bottle. A magnetic mixer with stirring bar is also required.

The procedure of Standard Method 2710 B should be followed with one exception. The total solids concentration instead of the volatile suspended solids concentration is used in the calculation of the SOUR. Total solids concentration is determined by Standard Method 2540 G. Method 2710 B cautions that if the suspended solids content of the sludge is greater than 0.5%, additional stirring besides that provided by the stirring bar be considered. Experiments by Farrell and Bhide (1993) were carried out with sludges up to 2% in solids content without difficulty if the SOUR was lower than about 3.0 mg $O_2$/g/h. It is possible to verify that mixing is adequate by running repeat measurements at several stirrer bar speeds. If stirring is adequate, oxygen uptake will be independent of stirrer speed.

The inert mineral solids in the wastewater in which the sludge particles are suspended do not exert an oxygen demand and probably should not be part of the total solids in the SOUR determination. Ordinarily, they are such a small part of the total solids that they can be ignored. If the ratio of inert dissolved mineral solids in the treated wastewater to the total solids in the sludge being tested is greater than 0.15, a correction should be made to the total solids concentration. Inert dissolved mineral solids in the treated wastewater effluent is determined by the method of Part 2540 B of Standard Methods (APHA, 1992). This quantity is subtracted from the total solids of the sludge to determine the total solids to be used in the SOUR calculation.

The collection of the sample and the time between sample collection and measurement of the SOUR are important. The sample should be a composite of grab samples taken within a period of a few minutes duration. The sample should be transported to the laboratory expeditiously and kept under aeration if the SOUR test cannot be run immediately. The sludge should be kept at the temperature of the digester from which it was drawn and aerated thoroughly before it is poured into the BOD bottle for the test. If the temperature differs from 20°C (68°F) by more than ±10°C (±18°F), the temperature correction may be inappropriate and the result should not be used to prove that the sewage sludge meets the SOUR requirement.

Variability in flow rates and nature of the sludge will result in variability in performance of the plant-scale digesters. It is advisable to run the SOUR test routinely so that sufficient data are available to indicate average performance. The arithmetic mean of successive tests-a minimum of seven over 2 or 3 weeks is suggested-should give a SOUR of ≤ 1.5 mg $O_2$/hr/g total solids.

## 3. Additional Digestion Test for Aerobically Digested Sewage Sludge

### Background

Part 503 lists several options that can be used to demonstrate reduction of vector attraction in sewage sludge. These options include reduction of volatile solids by 38% and demonstration of the SOUR value discussed above (see also Chapter 8). These options are feasible for many, but not all, digested sludges. For example, sludges from extended aeration treatment works that are aerobically digested usually cannot meet this requirement because they already are partially reduced in volatile solids content by their exposure to long aeration times in the wastewater treatment process.

The specific oxygen uptake test can be utilized to evaluate aerobic sludges that do not meet the 38% volatile solids reduction requirement. Unfortunately, this test has a number of limitations. It cannot be applied if the sludges have been digested at temperatures lower than 10°C (50°F) or higher than 30°C (86°F). It has not been evaluated under all possible conditions of use, such as for sludges of more than 2% solids.

A straightforward approach for aerobically treated sludges that cannot meet either of the above criteria is to determine to what extent they can be digested further. If they show very little capacity for further digestion, they will have a low potential for additional biodegradation and odor generation that attracts vectors. Such a test necessarily takes many days to complete, because time must be provided to get measurable biodegradation. Under most circumstances, this is not a serious drawback. If a digester must be evaluated every 4 months to see if the sewage sludge meets vector attraction reduction requirements, it will be necessary to start a regular assessment program. A record can be produced showing compliance. The sludge currently being produced cannot be evaluated quickly but it will be possible to show compliance over a period of time.

The additional digestion test for aerobically digested sludges in Part 503 is based on research by Jeris et al. (1985), and has been discussed by Farrell et al. (EPA, 1992). Farrell and Bhide (1993) explain in more detail the origin of the time and volatile solids reduction requirements of the test.

Jeris et al. (1985) demonstrated that several parameters–volatile solids reduction, COD, BOD, and SOUR–declined smoothly and approached asymptotic values with time as sludge was aerobically digested. Any one of these parameters potentially could be used as an index of vector attraction reduction for aerobic sludges. SOUR has been adopted (see above) for this purpose. Farrell and Bhide (1993) have shown that the additional volatile solids reduction that occurs when sludge is batch digested aerobically for 30 days correlates equally as well as SOUR with the degree of vector attraction reduction of the sludge. They recommend that a sewage sludge be accepted as suitably reduced in vector attraction when it shows less than 15% additional volatile solids reduction after 30 days additional batch digestion at 20°C (68°F). For three out of four sludges investigated by Jeris et al. (1985), the relationship between SOUR and additional volatile solids reduction showed that the SOUR was approximately equal to 1.5 mg $O_2$/hr/g (the Part 503 requirement for SOUR) when additional volatile solids reduction was 15%. The two requirements thus agree well with one another.

### Recommended Procedure

There is considerable flexibility in selecting the size of the digesters used for the additional aerobic digestion test. Farrell and Bhide (1993) used a 20-liter fish tank. A tank of rectangular cross-section is suggested because sidewalls are easily accessible and are easily scraped clean of adhering solids. The tank should have a loose-fitting cover that allows air to escape. It is preferable to vent exhaust gas to a hood to avoid exposure to aerosols. Oil and particle-free air is supplied to the bottom of the digester through porous stones at a rate sufficient to thoroughly mix the sewage sludge. This will supply adequate oxygen to the sludge, but the oxygen level in the digesting sludge should be checked with a dissolved oxygen meter to be sure that the supply of oxygen is adequate. Oxygen level should be at least 2 mg/L. Mechanical mixers also were used to keep down foam and improve mixing.

If the total solids content of the sewage sludge is greater than 2%, the sludge must be diluted to 2% solids with secondary effluent at the start of the test. The requirement stems from the results of Reynolds (1973) and Malina (1966) which demonstrate that rate of volatile solids reduction decreases as the feed solitis concentration increases. Thus, for example, a sludge with a 2% solids content that showed more than 15% volatile solids reduction when digested for 30 days might show a lower volatile solids reduction and would pass the test if it were at 4%. This dilution may cause a temporary change in rate of volatile solids reduction. However, the long duration of the test should provide adequate time for recovery and demonstration of the appropriate reduction in volatile solids content.

When sampling the sludge, care should be taken to keep the sludge aerobic and avoid unnecessary temperature shocks. The sludge is digested at 20°C (68°F) even if the digester was at some other temperature. It is expected that the bacterial population will suffer a temporary shock if there is a substantial temperature change, but the test is of sufficient duration to overcome this effect and show a normal volatile solids reduction. Even if the bacteria are shocked and do not recover completely, the test simulates what would happen to the sludge in the environment. If it passes the test, it is highly unlikely that the sludge will attract vectors when used or disposed to the environment. For example, if a sludge digested at 35°C (95°F) has not been adequately reduced in volatile solids and is shocked into biological inactivity for 30 days when its temperature is lowered to 20°C (68°F), it will be shocked in the same way if it is applied to the soil at ambient temperature. Consequently, it is unlikely to attract vectors.

The digester is charged with about 12 liters of the sewage sludge to be additionally digested, and aeration is commenced. The constant flow of air to the aerobic digestion test unit will cause a substantial loss of water from the digester. Water loss should be made up every day with distilled water.

Solids that adhere to the walls above and below the water line should be scraped off and dispersed back into the sludge daily. The temperature of the digesting sludge should be approximately 20°C (68°F). If the temperature of the laboratory is maintained at about 22°C (72°F), evaporation of water from the digester will cool the sludge to about 20°C (68°F).

Sewage sludge is sampled every week for five successive weeks. Before sampling, makeup water is added (this will generally require that air is temporarily shut off to allow the water level to be established), and sludge is scraped off the walls and redistributed into the digester. The sludge in the digester is thoroughly mixed with a paddle before sampling, making sure to mix the bottom sludge with the top. The sample is comprised of several grab samples collected with a ladle while the digester is being mixed. The entire sampling procedure is duplicated to collect a second sample.

Total and volatile solids contents of both samples are determined preferably by Standard Method 2540 G (APHA, 1992). Percent volatile solids is calculated from total and volatile solids content. Standard Methods (APHA, 1992) states that duplicates should agree within 5% of their average. If agreement is substantially poorer than this, the sampling and analysis should be repeated.

### *Calculation Details*

Fraction volatile solids reduction is calculated by the Van Kleeck formula (see Appendix C) and by a mass balance method. The mass balance (m.b.) equations become very simple, because final mass of sludge is made very nearly equal to initial mass of sludge by adjusting the volume by adding water. These equations for fractional volatile solids reduction (FVSR) and fractional fixed solids reduction (FFSR) are:

$$FVSR(m.b.) = (y_f - y_b) / y_f \qquad (5a)$$

$$FFSR(m.b.) = (x_f - x_b) / x_f \qquad (5b)$$

where:

y and x = mass fraction of volatile and fixed solids, respectively (see previous section on "Calculation details" for explanation of "mass fraction")

f and b = subscripts indicating initial and final sludges

This calculation assumes that initial and final sludge densities are the same. Very little error is introduced by this assumption.

The calculation of the fractional fixed solids reduction is not a requirement of the test, but it will provide useful information.

The test was developed from information based on the reduction in volatile solids content calculated by the Van Kleeck equation. As noted in the section on the additional anaerobic digestion test, for batch processes the material balance procedure for calculating volatile solids reduction is superior to the Van Kleeck approach. It is expected that the volatile solids reduction by the mass balance method will show a higher volatile solids reduction than the calculation made by using the Van Kleeck equation.

## 4. References

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# Appendix F
# Sample Preparation for Fecal Coliform Tests and *Salmonella* sp. Analysis

## 1. Sample Preparation for Fecal Coliform Tests

### *1.1 Class B Alternative 1*

To demonstrate that a given domestic sludge sample meets Class B Pathogen requirements under alternative 1, the density of fecal coliform from at least seven samples of treated sewage sludge must be determined and the geometric mean of the fecal coliform density must not exceed 2 million Colony Forming Units (CFU) or Most Probable Number (MPN) per gram of total solids (dry weight basis). The solids content of treated domestic sludge can be highly variable. Therefore, an aliquot of each sample must be dried and the solids content determined in accordance with procedure 2540 G. of the 18th edition of Standard Methods for the Examination of Water and Wastewater (SM).

Sludge samples to be analyzed in accordance with SM 9221 E. Fecal Coliform MPN Procedure and 9222 D. Fecal Coliform Membrane Filter Procedure may require dilution prior to analysis. An ideal sample volume will yield results which accurately estimate the fecal coliform density of the sludge. Detection of fecal coliform in undiluted samples could easily exceed the detection limits of these procedures. Therefore, it is recommended that the following procedures be used (experienced analysts may substitute other dilution schemes as appropriate).

For Liquid Samples:

1. Use a sterile graduated cylinder to transfer 30.0 mL of well mixed sample to a sterile blender jar. Use 270 mL of sterile buffered dilution water (see Section 9050C) to rinse any remaining sample from the cylinder into the blender. Cover and blend for two minutes on high speed. 1.0 mL of this mixture is 0.1 mL of the original sample or $1.0X10^{-1}$.

2. Use a sterile pipette to transfer 11.0 mL of the blended sample mixture to 99 mL of sterile buffered dilution in a sterile screw cap bottle and mix by vigorously shaking the bottle a minimum of 25 times. This is dilution "A." 1.0 mL of this mixture is 0.010 mL of the original sample or $1.0X10^{-2}$.

3. Use a sterile pipette to transfer 1.0 mL of dilution "A" to a second screw cap bottle containing 99 mL of sterile buffered dilution water, and mix as before. This is dilution "B." 1.0 mL of this mixture is 0.00010 mL of the original sample or $1.0X10^{-4}$.

4. Use a sterile pipette to transfer 1.0 mL of dilution "B" to a sterile screw cap bottle containing 99 mL of sterile buffered dilution water, and mix as before. This is dilution "C." Go to step 5 for MPN analysis (preferred) or 7 for MF analysis.

5. For MPN analysis, follow procedure 9221 E. in SM. Four series of 5 tubes will be used for the analysis. Inoculate the first series of 5 tubes each with 10.0 mL of dilution "B." This is a 0.0010 mL of the original sample. The second series of tubes should be inoculated with 1.0 mL of dilution "B" (0.00010). The third series of tubes should receive 10.0 mL of "C" (0.000010). Inoculate a fourth series of 5 tubes each with 1.0 mL of dilution "C" (0.0000010). Continue the procedure as described in SM.

6. Refer to Table 9221.IV. in SM to estimate the MPN index/100 mL. Only three of the four series of five tubes will be used for estimating the MPN. Choose the highest dilution that gives positive results in all five tubes, and the next two higher dilutions for your estimate. Compute the MPN/g according to the following equation:

$$\text{MPN Fecal Coliform/g} = \frac{10 \times \text{MPN Index/100 mL}}{\text{largest volume} \times \%\ \text{dry solids}}$$

Examples:

In the examples given below, the dilutions used to determine the MPN are underlined. The number in the numerator represents positive tubes; that in the denominator, the total number of tubes planted; the combination of positives simply represents the total number of positive tubes per dilution.

| Example | 0.0010 mL | 0.00010 mL | 0.000010 mL | 0.0000010 mL | Combination of positives |
|---|---|---|---|---|---|
| a | 5/5 | 5/5 | 3/5 | 0/5 | 5-3-0 |
| b | 5/5 | 3/5 | 1/5 | 0/5 | 5-3-1 |
| c | 0/5 | 1/5 | 0/5 | 0/5 | 0-1-0 |

For each example we will assume that the total solids content is 4.0%.

For example a:

The MPN index/100 mL from Table 9221.4 is 80. Therefore:

$$MPN/g = \frac{10 x 80}{0.00010 \times 4.0} = 2.0 \times 10^6$$

For example b:

The MPN index/100 mL from Table 9221.4 is 110. Therefore:

$$MPN/g = \frac{10 \times 110}{0.0010 \times 4.0} = 2.8 \times 10^5$$

For example c:

The MPN index/100 mL from Table 9221.4 is 2. Therefore:

$$MPN/g = \frac{10 x 2}{0.0010 \times 4.0} = 5.0 \times 10^3$$

5. Alternately the membrane filter procedure may be used to determine fecal coliform density. This method should only be used if comparability with the MPN procedure has been established for the specific sample medium. Three individual filtrations should be conducted in accordance with SM 9222 D. using 10.0 mL of dilution "C," and 1.0 mL and 10.0 mL of dilution "B." These represent 0.000010, 0.00010, and 0.0010 mL of the original sample. Incubate samples, and count colonies as directed. Experienced analysts are encouraged to modify this dilution scheme (e.g. half log dilutions) in order to obtain filters which yield between 20 and 60 CFU.

6. Compute the density of CFU from membrane filters which yield counts within the desired range of 20 to 60 fecal coliform colonies:

$$\text{coliform colonies/g} = \frac{\text{coliform colonies counted} \times 100}{\text{mL sample} \times \text{\% dry solids}}$$

For Solid Samples:

1. In a sterile dish weigh out 30.0 grams of well mixed sample. Whenever possible, the sample tested should contain all materials which will be included in the sludge. For example, if wood chips are part of a sludge compost, some mixing or grinding means may be needed to achieve homogeneity before testing. One exception would be large pieces of wood which are not easily ground and may be discarded before blending. Transfer the sample to a sterile blender. Use 270 mL of sterile buffered dilution water to rinse any remaining sample into the blender. Cover and blend on high speed for two minutes. One milliliter of this sample contains 0.10 g of the original sample.

2. Use a sterile pipette to transfer 11.0 mL of the blender contents to a screw cap bottle containing 99 mL of sterile buffered dilution water and shake vigorously a minimum of 25 times. One milliliter of this sample contains 0.010 g of the original sample. This is dilution "A."

3. Follow the procedures for "Liquid Samples" starting at Step 3.

Examples:

Seven samples of a treated sludge were obtained prior to land spreading. The solids concentration of each sample was determined according to SM. These were found to be:

| Sample No. | Solids Concentration (%) |
|---|---|
| 1 | 3.8 |
| 2 | 4.3 |
| 3 | 4.0 |
| 4 | 4.2 |
| 5 | 4.1 |
| 6 | 3.7 |
| 7 | 3.9 |

The samples were liquid with some solids. Therefore the procedure for liquid sample preparation was used. Furthermore, the membrane filter technique was used to determine if the fecal coliform concentration of the sludge would meet the criteria for Class B alternative 1. Samples were prepared in accordance with the procedure outlined above. This yielded 21 individual membrane filters (MF) plus controls. The results from these tests are shown in Table 1

Table 1. Number of Fecal Coliform Colonies on MF Plates

| Sample No. | 0.000010 mL Filtration | 0.00010 mL Filtration | 0.0010 mL Filtration |
|---|---|---|---|
| 1 | 0 | 1 | 23 |
| 2 | 2 | 18 | TNTC |
| 3 | 0 | 8 | 65 |
| 4 | 0 | 5 | 58 |
| 5 | 0 | 1 | 17 |
| 6 | 0 | 1 | 39 |
| 7 | 0 | 1 | 20 |

The coliform density is calculated using only those MF plates which have between 20 and 60 blue colonies whenever possible. However, there may be occasions when the total number of colonies on a plate will be above or below the ideal range. If the colonies are not discrete and appear to be growing together results should be reported as "too numerous to count" (TNTC). If no filter has a coliform count falling in the ideal range (20 - 60), total the coliform counts on all countable filters and report as coliform colonies/g. For sample number 2 the fecal coliform density is:

$$\text{coliform colonies/g} = \frac{(2+18)\times 100}{(0.000010 + 0.00010) \times 4.3} = 4.2 \times 10^6$$

Sample number 3 has two filters which have colony counts outside the ideal range also. In this case both countable plates should be used to calculate the coliform density/g. For sample number 3, the fecal coliform density is:

$$\text{coliform colonies/g} = \frac{(8+65)\times 100}{(0.00010 + 0.0010) \times 4.0} = 1.6 \times 10^6$$

Except for sample number 5, all of the remaining samples have at least one membrane filter within the ideal range. For these samples, use the number of colonies formed on that filter to calculate the coliform density. For sample number 1, the fecal coliform density is:

$$\text{coliform colonies/g} = \frac{23\times 100}{0.0010 \times 3.8} = 6.0 \times 10^5$$

Coliform densities of all the samples were calculated and converted to $\log_{10}$ values to compute a geometric mean. These calculated values are presented in Table 2.

**Table 2.** Coliform Density of Sludge Samples

| Sample No. | Coliform Density | $\log_{10}$ |
|---|---|---|
| 1 | $6.0 \times 10^5$ | 5.78 |
| 2 | $4.2 \times 10^6$ | 6.63 |
| 3 | $1.6 \times 10^6$ | 6.22 |
| 4 | $1.4 \times 10^6$ | 6.14 |
| 5 | $4.0 \times 10^5$ | 5.60 |
| 6 | $1.0 \times 10^6$ | 6.02 |
| 7 | $5.1 \times 10^5$ | 5.71 |

The geometric mean for the seven samples is determined by averaging the $\log_{10}$ values of the coliform density and taking the antilog of that value.

$(5.78 + 6.63 + 6.22 + 6.14 + 5.60 + 6.02 + 5.71)/7 = 6.01$

The antilog of $6.01 = 1.03 \times 10^6$

Therefore, the geometric mean fecal coliform density is below 2 million and the sludge meets Class B Pathogen requirements under alternative 1.

### *1.2 Class A Alternative 1*

Part 503 requires that, to qualify as a Class A sludge, treated sewage sludge must be monitored for fecal coliform (or *Salmonella* sp. and have a density of less than 1,000 MPN fecal coliform per gram of total solids (dry weight basis). The regulation does not specify total number of samples. However, it is suggested that a sampling event extend over two weeks and that at least seven samples be collected and analyzed. The membrane filter procedure may not be used for this determination. This is because the high concentration of solids in such sludges may plug the filter or, render the filter uncountable. The total solids content for each sample must be determined in accordance with procedure 2540 G. of SM.

For Liquid Samples:

1. Follow procedure 9221 E. in SM. Inoculate at least four series of five tubes using ten fold serial dilutions. Prepare the sample as described for "Class B Alternative 1, Liquid Samples," except inoculate each of the first series of tubes with 10.0 mL of the blender contents (the concentration of the enrichment broth must be adjusted to compensate for the volume of added sample). This is equivalent to adding 1.0 mL of sludge to the first series of tubes. Inoculate the remaining tubes and complete the analysis in accordance with SM.
2. Calculate the MPN as directed in Step 4 above.

For Solid Samples:

1. Follow procedure 9221 E. in SM. Inoculate at least four series of five tubes using ten fold serial dilutions. Prepare the sample as described for "Class B Alternative 1, Solid Samples," except inoculate each of the first series of tubes with 10.0 mL of the blender contents (the concentration of the enrichment broth must be adjusted to compensate for the volume of added sample). This is equivalent to adding 1.0 g of sludge (wet wieght) to the first series of tubes. Inoculate the remaining tubes and complete the analysis in accordance with SM.
2. Calculate the MPN as directed in step 4 above.

## 2. Sample Preparation for *Salmonella* sp. Analysis

*Salmonella* sp. quantification may be used to demonstrate that a sludge meets Class A criteria, instead of analyzing for fecal coliforms. Sludges with *Salmonella* sp. densities below 3 MPN/4 g total solids (dry weight basis) meet Class A criteria. The analytical method described in Appendix F of this document describes the procedure used to identify *Salmonella* sp. in a water sample. Similarly, the procedures for analysis of *Salmonella* sp. in SM (Section 9260 D) do not address procedures for sludges, the sample preparation step described here should be used, and the total solids content of each sample must be determined according to method 2540 G in SM.

For Liquid Samples:

1. Follow the same procedure used for liquid sample preparation for fecal coliform analysis described under "Class A Alternative 1." However, the enrichment medium used for this analysis should be dulcitol selenite broth (DSE) as described in Appendix G of this document or dulcitol selenite or tetrathionate broth as described in SM. Only three series of five tubes should be used for this MPN procedure. Use a sterile open tip pipette to transfer 10.0 mL of well mixed sample to each tube in the first series. These tubes should contain 10.0 mL of double strength enrichment broth. Each tube in the second series should contain 10.0 mL of double strength enrichment broth. These tubes should each receive 10.0

mL of the blended mixture. The final series of tubes should contain 10.0 mL of single strength enrichment broth. These tubes should each receive 1.0 mL of the blended mixture. Complete the MPN procedure as described in Appendix G or SM as appropriate.

2. Refer to Table 9221.IV. in SM to estimate the MPN index/100 mL. Calculate the MPN/4 g according to the following equation:

$$\textit{Salmonella}\text{ sp. MPN/4 g} = \frac{\text{MPN Index/100 mL x 4}}{\text{\% dry solids}}$$

For example:

If one tube in the first series was identified as being positive for *Salmonella* sp. and no other tubes were found to be positive, from Table 9221.IV one finds that a 1-0-0 combination of positives has an MPN index/100 mL of 2. If the percent of dry solids for the sample was 4.0, then:

$$\textit{Salmonella}\text{ sp. MPN/4g} \quad \frac{2 \times 4}{4.0 = 2} = 2$$

For Solid Samples:

1. Follow the procedure for solid sample preparation for fecal coliform analysis described under Class A Alternative 1 above. However, the enrichment medium used for this analysis should be dulcitol selenite broth (DSE) as described in Appendix G or dulcitol selenite or tetrathionate broth as described in SM, and only three series of five tubes should be used for this MPN procedure. Use aseptic technique to weigh out and transfer 10.0 g of well mixed sample to each screw cap tube in the first series, shake vigorously to mix. These tubes should contain 10.0 mL of double strength enrichment broth. Likewise, each tube in the second series should contain 10.0 mL of double strength enrichment broth. These tubes should receive 10.0 mL of the blended mixture. The final series of tubes should contain 10.0 mL of single strength enrichment broth. These tubes should receive 1.0 mL of the blended mixture. Alternately, because the calculated detection limit is dependent upon the total solids content of the sample, samples with total solids contents >28% can be blended as described above and the blender contents can be used for inoculating the initial series of tubes. When this option is chosen, the final series of tubes will contain 0.1 mL of the blender contents. Complete the MPN procedure as described in Appendix G or SM as appropriate.

2. Refer to Table 9221.IV. in SM to estimate the MPN index/100 mL. Calculate the MPN/4 g according to the following equation:

$$\textit{Salmonella}\text{ sp. MPN/4g} = \frac{\text{MPN Index/100mL x 4}}{\text{\% dry solids}}$$

# Appendix D: Sample Results and Agronomic Rate Calculation

*NOTE: This is adapted from Pacific Northwest Extension publication number, PNW0511e.*

Enter information in these cells as applicable

You must enter information in these cells to determine an application rate

Cells of this color are calulations for your use

Version 20-Dec-07

## GENERAL INFORMATION

| | | |
|---|---|---|
| Biosolids Source | | |
| Field Number/ID | | |
| Dry tons biosolids available (= wet tons x % solids) | 290 | dry tons |
| Acres available | | acres |

## BIOSOLIDS DATA

| | | | | |
|---|---|---|---|---|
| Ammonia/ammonium-N | 5,760 | mg/kg | 12 | #/dry ton |
| Nitrate-N | | mg/kg | 0 | #/dry ton |
| Total Kjeldahl N | 22,830 | mg/kg | 46 | #/dry ton |
| Percent solids | 10% | | | |
| Organic nitrogen | | mg/kg | 0 | #/dry ton |

## NITROGEN (N) CREDITS

| **PREVIOUS BIOSOLIDS APPLICATIONS** | Last Year | 2 Years Ago | 3 Years Ago | 4 Years Ago |
|---|---|---|---|---|
| Dry tons applied/acre to site | | | | |
| Organic N concentration (mg/kg) | | | | |
| N credit (#/dry ton) | 0 | 0 | 0 | 0 |
| N credit (#/acre) | 0 | 0 | 0 | 0 |

| **OTHER CREDITS NOT ACCOUNTED FOR** | | | |
|---|---|---|---|
| Nitrate-N applied in irrigation water | 0 | #/acre | |
| N applied at seeding (starter fertilizer) | 0 | #/acre | |
| Preplant nitrate-N in root zone (east of Cascades) | | #/acre | NOTE: not required if accounted for in the nitrogen recommendation in Cell B30 |
| Plowdown of cover or green manure crop | | #/acre | NOTE: not required if accounted for in the nitrogen recommendation in Cell B30 |
| Previous manure applications | | #/acre | NOTE: not required if accounted for in the nitrogen recommendation in Cell B30 |
| Total N credit | 0 | #/acre | |

## NITROGEN FERTILIZER RECOMMENDATION

| | | |
|---|---|---|
| Nitrogen recommendation **(via guidelines, agronomist, etc.)** | 100 | # N/acre/yr |

## ESTIMATED BIOSOLIDS PLANT-AVAILABLE NITROGEN

| | | |
|---|---|---|
| Percent of ammonium-N retained after application **(see Table 1)** | 55% | |
| Percent of organic N mineralized in Year 1 **(see Table 2)** | 15% | |
| Estimated plant-available N in biosolids | 6 | # N/dry ton |
| Amount of plant-available N needed from biosolids | 100 | # N/acre |

## AGRONOMIC BIOSOLIDS APPLICATION RATE

| | | |
|---|---|---|
| Dry tons per acre = | 15.8 | dt/acre |
| Wet tons per acre = | 157.8 | wt/acre |
| Cubic yards per acre = | 187.8 | $yd^3$/acre |
| Cubic feet per acre = | 5,071.0 | $ft^3$/acre |
| Gallons per acre = | 37,933.1 | gallons/acre |
| Acre-inches per acre | 1.40 | acre-inches/acre |

## ACREAGE NEEDED

| | | |
|---|---|---|
| Acres needed | 18.4 | acres |

Alexin Analytical LABORATORIES, INC.

Professional Laboratory Services

13035 SW Pacific Hwy
Tigard, OR 97223
Tel.: (503) 639-9311 Fax: (503) 684-1588

# ANALYSIS REPORT

ORELAP Accredited Lab#: OR-100013

Reported: 07/13/2012
Received: 06/27/12 to 07/02/12
Sampled By: Jon Patrick
Work Order: Multiple Work Orders

CLIENT
**Molalla**
Attn: Jon Patrick
PO Box 248
Molalla OR, 97038
Phone: (503) 829-5407

**Project:** Biosolids Plan
Project # : NPDES #101514
Permit # : -
PO # : -

Sampling Location: Lagoon 1
Sample Matrix: Sludge

| Lab Number | Sample Name | Sampled: 6/27/12 9:00 | Sample Type |
|---|---|---|---|
| **2179004-01** | **Fecal Section #1** | | **Grab** |

| Microbiological Analysis | Method | Result | Units | MRL | Analysis Date/ Time |
|---|---|---|---|---|---|
| *Fecal Coliform* | SM 9221E | 3.0 | MPN/g | 0.0 | 06/28/2012 10:47 |

| Wet Chemistry | Method | Result | Units | MRL | Analysis Date/ Time |
|---|---|---|---|---|---|
| *Total Solids* | SM 2540-B | 5.5 | Weight % | 0.1 | 07/03/2012 9:00 |

| Lab Number | Sample Name | Sampled: 6/27/12 9:00 | Sample Type |
|---|---|---|---|
| **2179004-02** | **Fecal Section #2** | | **Grab** |

| Microbiological Analysis | Method | Result | Units | MRL | Analysis Date/ Time |
|---|---|---|---|---|---|
| *Fecal Coliform* | SM 9221E | 2.2 | MPN/g | 0.0 | 06/28/2012 10:46 |

| Wet Chemistry | Method | Result | Units | MRL | Analysis Date/ Time |
|---|---|---|---|---|---|
| *Total Solids* | SM 2540-B | 9.0 | Weight % | 0.1 | 07/03/2012 9:00 |

| Lab Number | Sample Name | Sampled: 6/27/12 9:00 | Sample Type |
|---|---|---|---|
| **2179004-03** | **Fecal Section #3** | | **Grab** |

| Microbiological Analysis | Method | Result | Units | MRL | Analysis Date/ Time |
|---|---|---|---|---|---|
| *Fecal Coliform* | SM 9221E | 5.6 | MPN/g | 0.0 | 06/28/2012 10:45 |

| Wet Chemistry | Method | Result | Units | MRL | Analysis Date/ Time |
|---|---|---|---|---|---|
| *Total Solids* | SM 2540-B | 14.0 | Weight % | 0.1 | 07/03/2012 9:00 |

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Alexin Analytical LABORATORIES, INC. Professional Laboratory Services

13035 SW Pacific Hwy
Tigard, OR 97223
Tel.: (503) 639-9311 Fax: (503) 684-1588

# ANALYSIS REPORT

ORELAP Accredited Lab#: OR-100013

Reported: 07/13/2012
Received: 06/27/12 to 07/02/12
Sampled By: Jon Patrick
Work Order: Multiple Work Orders

CLIENT
**Molalla**
Attn: Jon Patrick
PO Box 248
Molalla OR, 97038
Phone: (503) 829-5407

**Project:** Biosolids Plan
Project # : NPDES #101514
Permit # : -
PO # : -

Sampling Location: Lagoon 1
Sample Matrix: Sludge

| Lab Number | Sample Name | Sampled: 6/27/12 9:00 | | Sample Type | |
|---|---|---|---|---|---|
| **2179004-04** | **Fecal Section #4** | | | **Grab** | |
| Microbiological Analysis | **Method** | **Result** | **Units** | **MRL** | **Analysis Date/ Time** |
| *Fecal Coliform* | SM 9221E | 7.8 | MPN/g | 0.0 | 06/28/2012 10:30 |
| Wet Chemistry | **Method** | **Result** | **Units** | **MRL** | **Analysis Date/ Time** |
| *Total Solids* | SM 2540-B | 12.0 | Weight % | 0.1 | 07/03/2012 9:00 |

| Lab Number | Sample Name | Sampled: 6/27/12 9:00 | | Sample Type | |
|---|---|---|---|---|---|
| **2179004-05** | **Fecal Section #5** | | | **Grab** | |
| Microbiological Analysis | **Method** | **Result** | **Units** | **MRL** | **Analysis Date/ Time** |
| *Fecal Coliform* | SM 9221E | <2.2 | MPN/g | 0.0 | 06/28/2012 10:28 |
| Wet Chemistry | **Method** | **Result** | **Units** | **MRL** | **Analysis Date/ Time** |
| *Total Solids* | SM 2540-B | 7.7 | Weight % | 0.1 | 07/03/2012 9:00 |

| Lab Number | Sample Name | Sampled: 7/2/12 9:00 | | Sample Type | |
|---|---|---|---|---|---|
| **2184004-01** | **Section 6** | | | **Grab** | |
| Microbiological Analysis | **Method** | **Result** | **Units** | **MRL** | **Analysis Date/ Time** |
| *Fecal Coliform* | SM 9221E | < 2.2 | MPN/g | 0.0 | 07/03/2012 11:25 |
| Wet Chemistry | **Method** | **Result** | **Units** | **MRL** | **Analysis Date/ Time** |
| *Total Solids* | SM 2540-B | 7.6 | Weight % | 0.1 | 07/03/2012 9:00 |

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# ANALYSIS REPORT

ORELAP Accredited Lab#: OR-100013

Reported: 07/13/2012
Received: 06/27/12 to 07/02/12
Sampled By: Jon Patrick
Work Order: Multiple Work Orders

CLIENT
**Molalla**
Attn: Jon Patrick
PO Box 248
Molalla OR, 97038
Phone: (503) 829-5407

**Project:** Biosolids Plan
Project # : NPDES #101514
Permit # : -
PO # : -

Sampling Location: Lagoon 1
Sample Matrix: Sludge

| Lab Number | Sample Name | Sampled: 7/2/12 9:00 | Sample Type |
|---|---|---|---|
| **2184004-02** | **Section 7** | | **Grab** |

| Microbiological Analysis | Method | Result | Units | MRL | Analysis Date/ Time |
|---|---|---|---|---|---|
| *Fecal Coliform* | SM 9221E | < 2.0 | MPN/g | 0.0 | 07/03/2012 11:23 |

| Wet Chemistry | Method | Result | Units | MRL | Analysis Date/ Time |
|---|---|---|---|---|---|
| *Total Solids* | SM 2540-B | 8.6 | Weight % | 0.1 | 07/03/2012 9:00 |

| Lab Number | Sample Name | Sampled: 7/2/12 9:00 | Sample Type |
|---|---|---|---|
| **2184004-03** | **Section 8** | | **Grab** |

| Microbiological Analysis | Method | Result | Units | MRL | Analysis Date/ Time |
|---|---|---|---|---|---|
| *Fecal Coliform* | SM 9221E | 1.6 | MPN/g | 0.0 | 07/03/2012 11:22 |

| Wet Chemistry | Method | Result | Units | MRL | Analysis Date/ Time |
|---|---|---|---|---|---|
| *Total Solids* | SM 2540-B | 11.1 | Weight % | 0.1 | 07/03/2012 9:00 |

| Lab Number | Sample Name | Sampled: 7/2/12 9:00 | Sample Type |
|---|---|---|---|
| **2184004-04** | **Section 9** | | **Grab** |

| Microbiological Analysis | Method | Result | Units | MRL | Analysis Date/ Time |
|---|---|---|---|---|---|
| *Fecal Coliform* | SM 9221E | < 1.5 | MPN/g | 0.0 | 07/03/2012 11:20 |

| Wet Chemistry | Method | Result | Units | MRL | Analysis Date/ Time |
|---|---|---|---|---|---|
| *Total Solids* | SM 2540-B | 12.0 | Weight % | 0.1 | 07/03/2012 9:00 |

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# ANALYSIS REPORT

ORELAP Accredited Lab#: OR-100013

Reported: 07/13/2012
Received: 06/27/12 to 07/02/12
Sampled By: Jon Patrick
Work Order: Multiple Work Orders

CLIENT
**Molalla**
Attn: Jon Patrick
PO Box 248
Molalla OR, 97038
Phone: (503) 829-5407

**Project:** Biosolids Plan
Project # : NPDES #101514
Permit # : -
PO # : -

Sampling Location: Lagoon 1
Sample Matrix: Sludge

| Lab Number | Sample Name | Sampled: 7/2/12 9:00 | Sample Type |
|---|---|---|---|
| **2184004-05** | **Section 10** | | **Grab** |

| Microbiological Analysis | Method | Result | Units | MRL | Analysis Date/ Time |
|---|---|---|---|---|---|
| *Fecal Coliform* | SM 9221E | <1.8 | MPN/g | 0.0 | 07/03/2012 11:15 |

| Wet Chemistry | Method | Result | Units | MRL | Analysis Date/ Time |
|---|---|---|---|---|---|
| *Total Solids* | SM 2540-B | 10.4 | Weight % | 0.1 | 07/03/2012 9:00 |

ND = None detected MRL = Minimum Reporting Limit

Approved by: [signature]
Scott Dickman
Lab Director

Approved by: [signature]
Ruth Carpenter
Microbiology Technical Director

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# ANALYSIS REPORT

ANALYSIS REPORT

Alexin Analytical Laboratories, Inc.
Professional Laboratory Services

C L I E N T
Molalla
PO Box 248
Molalla OR 97038

phone: 503-829-5407
fax: 503-829-4298

Date Reported: 8/17/12
Date Sampled: 6/8/12
Date Received: 6/18/12
Lab Number: **2170011**
Page: 1 of 1

Sampling Location: Lagoon #1 Section #1
Sampled by: Jon Patrick

| Sample ID | | **40 Day bench scale** |
|---|---|---|
| Laboratory Sample # | | 2170011-01 |
| | | **Results** |
| Contaminant | Method | |
| **Vector Attraction Reduction** | CFR-40 Part 266 p. 497 | **12.1%** |

| Sample ID | | **Metals, pH, Nutrients** | |
|---|---|---|---|
| Laboratory Sample # | | 2170011-02 | |
| | | **Results** | dry |
| Contaminant | Method | ppm | mg/kg |
| **Arsenic** | EPA 200.9 | **0.725** | 7.88 |
| **Cadmium** | EPA 200.7 | **0.220** | 2.39 |
| **Chromium** | EPA 200.7 | **3.22** | 35.0 |
| **Copper** | EPA 200.7 | **25.5** | 277 |
| **Lead** | EPA 200.7 | **5.60** | 60.9 |
| **Mercury** | EPA 245.1 | **0.162** | 1.76 |
| **Molybdenum** | EPA 200.9 | **<2.00** | <21.7 |
| **Nickel** | EPA 200.7 | **1.92** | 20.9 |
| **Selenium** | EPA 200.9 | **0.374** | 4.06 |
| **Zinc** | EPA200.7 | **81.1** | 882 |
| **pH** | EPA 150.1 | **7.0** | pH units |
| **Total Kjeldahl Nitrogen** | EPA351.3 | **2100** | 2.283% |
| **Ammonia Nitrogen** | SM4500-NH3 F | **530** | 0.576% |
| **Nitrate** | SM4500-NO3 D | **<25.0** | <0.027% |
| **Phosphorus** | EPA365.3 | **1960** | 2.130% |
| **Potassium** | SM3111B | **46** | 0.050% |
| **Total Solids** | SM2540-B | **9.2%** | |
| **Volatile Solids** | SM2540-E | **32.8%** | |

Approved By

Scott Dickman
Lab Director

*This report reflects the results for this sample only.*
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# Appendix E: Public Notification Documents

Letter to Neighbors

Dear Neighbor,

The city of Molalla Wastewater Treatment Plant is going to be delivering biosolids to a property in your area.

Biosolids are a natural and organic byproduct of wastewater treatment. Through various treatment processes solids are stabilized, bacteria are killed and odors are reduced. Biosolids are a beneficial source of nutrients to the soil. Biosolids application can improve soil characteristics and greatly improve plant growth. Applications of biosolids reduce the need for chemical fertilizers. There is a flyer attached with more information.

The use of biosolids is regulated by the Oregon Department of environmental Quality and the U.S. Environmental protection Agency to protect public health and the environment. The biosolids will be tested and meet all the requirements for class b biosolids before they are applied.

I will personally be out to survey the site and mark setbacks from wells, property lines, water sources and roadways. DEQ staff will also visit the site to ensure that all requirements are met prior to any application.

I would be happy to meet with you personally or discuss over the phone any questions or concerns you may have about the application of biosolids. Please call me at
(503) 829-5407

You can also contact Paul Kenedy from Oregon Department of Environmental Quality with your questions or concerns. His number is 1(541) 687-7439.

City of Molalla
Wastewater Treatment Plant
Lead Operator
Jon Patrick

## Fact Sheet

# Biosolids: A Beneficial Resource

### Background

Biosolids are the nutrient-rich organic solids that are derived from the treatment of domestic wastewater at municipal wastewater facilities. Once biosolids have been treated to meet state and federal regulations, they can be beneficially used for land application or, in some cases, sold or given away like compost.

### Recognizing the value of biosolids

Since 1978, DEQ has addressed the need to effectively manage the beneficial use of biosolids. Oregon's policy supports the land application of treated domestic wastewater biosolids, biosolids-derived products and domestic septage when managed in a manner that protects public health and maintains or improves environmental quality.

### What is regulated?

The land application of biosolids, biosolids-derived products and domestic septage is a highly regulated practice. Regulatory requirements are established under Oregon Administrative Rules chapter 340, division 50. The state rules incorporate most of the federal technical biosolids regulations, including requirements for pathogen reduction, vector attraction reduction, and limits for trace pollutants. Monitoring is also required for several nutrients.

### How biosolids are used

Land applying biosolids can have several benefits. The organic matter in biosolids can improve the quality and overall characteristics of cultivated soil. The additional nutrients provided by biosolids can improve plant growth. Approximately 95% of biosolids generated in Oregon are land applied on DEQ-approved sites for agricultural purposes such as hay and pasture. In 2001, biosolids from 108 domestic wastewater treatment facilities were land applied on 18,618 acres, which is about 0.11% of all Oregon land in farms. Biosolids are also used for silvicultural and horticultural activities. DEQ works with wastewater treatment facilities to ensure that management of biosolids and land application activities are adequately addressed through a National Pollutant Discharge Elimination System (NPDES) or Water Pollution Control Facility (WPCF) permit, a biosolids management plan, and site authorization letters. Good agronomic practices and site management activities ensure the protection of public health and the environment.

*Land application of biosolids at an Oregon farm.*

### Biosolids Management Plans

Facilities are required to manage and operate their biosolids operations under a biosolids management plan. These plans are specific to each facility and are considered an extension of the facility's NPDES or WPCF permit. Together with a facility's permit and land application site authorizations, the plan provides assurance that biosolids processing and management activities are addressed in a comprehensive manner and problems with compliance are minimized. Plans must be current and on file with the permit. Each site used for land application of biosolids must be authorized by DEQ before use. Prior to authorizing a land application site, a facility must submit specific site information to DEQ for evaluation, and then DEQ will conduct a field visit. Notification to neighbors about the land application activity is also required. Any site that may be sensitive to residential housing or have runoff potential will be subject to a public comment process.

State rules also outline best management practices regarding use limitations, criteria for site selection and approval, and application.

### For more information

For program information, please contact the program coordinator. For specific wastewater treatment facility and land application site information, please contact the appropriate regional specialist (list at right).

### Alternative formats

Alternative formats of this document can be made available. Contact DEQ's Office of Communications & Outreach, Portland, for more information at (503) 229-5696, or call toll-free in Oregon at 1-800-452-4011, ext. 5696.


DEQ

State of Oregon
Department of
Environmental
Quality

**Water Quality Division**
**Biosolids Program**
811 SW 6th Avenue
Portland, OR 97204
Phone: 503-229-5472
800-452-4011
Fax: 503-229-6037
Contact: Ron Doughten
*www.oregon.gov/DEQ/*


**Program staff**

**Headquarters, Portland**
Ron Doughten
Program Coordinator
503-229-5472

**Northwest Region, Portland**
Connie Schrandt
503-229-5347

**Western Region, Eugene**
Paul Kennedy
541-687-7439

**Eastern Region, Bend**
Paul Devito
541-633-2029

Jayne West
541-633-2028

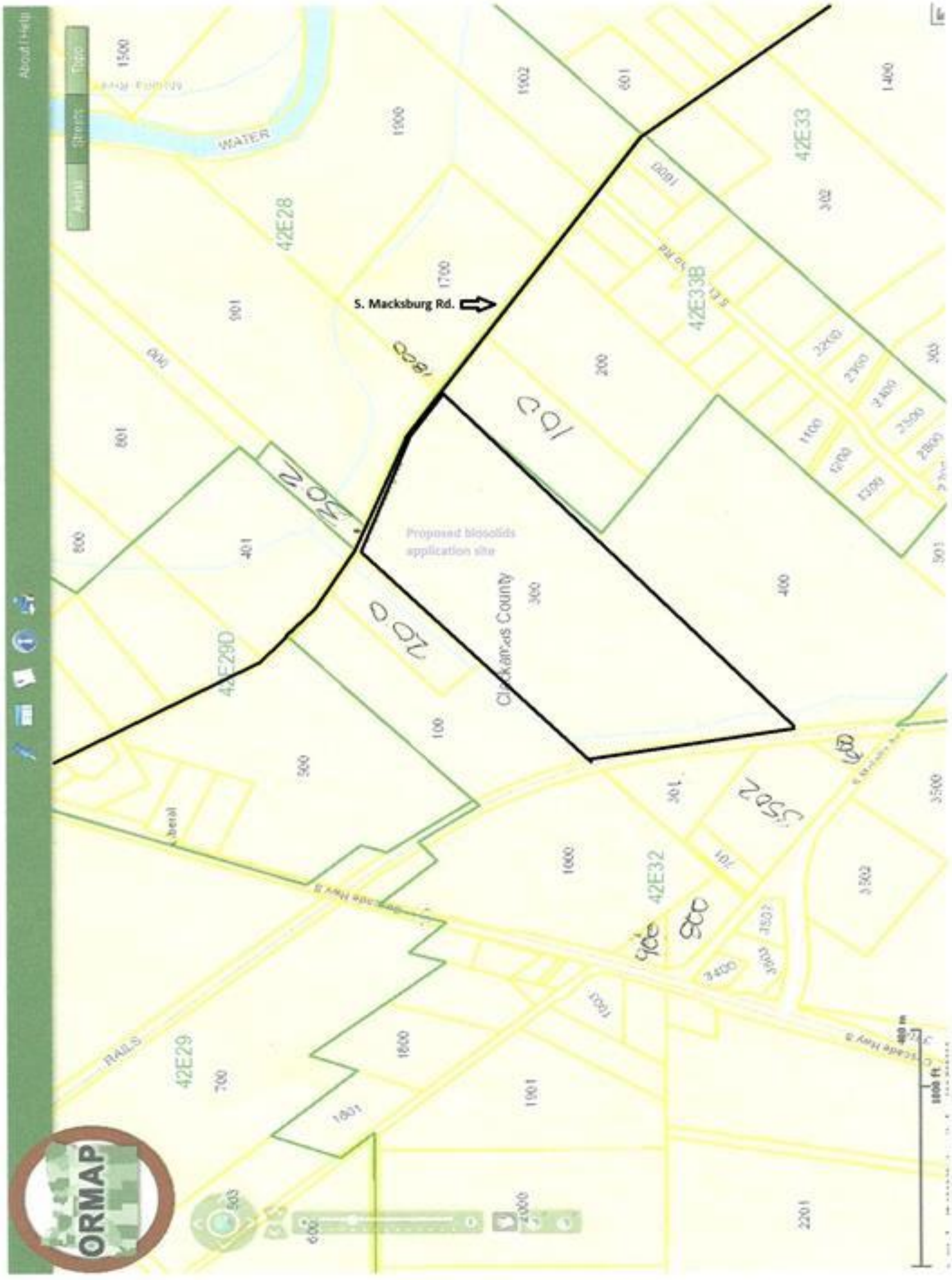
**Eastern Region, Pendleton**
Steve McMillan
541-278-4617

Duane Smith
541-278-4607

Heidi Williams
541-278-4608

**Eastern Region, The Dalles**
Carl Nadler
541-298-7255 x227


05-WQ-002
Last updated: 8/9/2011
By: Ron Doughten




http://www.ormap.net/flexviewer/index.html

5/1/2013

## **Appendix F** Proposed Site Authorization Information

# Biosolids Land Application Site Approval for City Of Molalla Wastewater Treatment Plant

The City of Molalla would like to have the following site approved for biosolids application. The site is owned by Brad Johnson and zoned EFU. The field is used for hay. We intend to apply biosolids after the last cutting, or between cuttings.

## Site Information:

**Site Owner:** Brad Johnson
**Address:** 32113 S. Palmer Rd. Molalla, OR 97038
**Phone:** 503-819-4173

### Site Location:

**Site:** 14220 S. Macksburg Rd. Molalla, OR 97038
**Site Zoning:** EFU
**Property Size:** 42.53 Acres
**Net Property after Buffers:** 28.8

**Nearest Residences:** There is a residence on the property. The nearest residence that is not on the property is approximately 200 feet from the application area. There are also residences on the adjacent parcels. There are three residences across Macksburg road to the north of the property. There are four properties to the south across the railroad tracks. There are two to the West. We will leave at least 200-foot buffer from every well and a minimum of 10 feet from the fence line.

**Surrounding Property use:** The surrounding properties are rural residences on larger parcels. The adjacent property to the South East is an open field. There are railroad tracks on the south side and Macksburg road on the north side.

**Buffer Areas:** There will be a ten-foot buffer from the property line and a 20-foot buffer from the road on the Macksburg Road side. There will also be a buffer of a minimum of 75 feet to the creek. There will be a 200-foot buffer to any wells including the one on the site. The only well that was within 200 feet of the proposed application area was the well on the property. The next two closest wells are across the street and across the creek. They are both approximately 240feet from the proposed application area. We adjusted the application area to meet the buffer requirement for the well on site. See attached map with well locations marked on it.

## Agricultural and Crop Management Information:

**Intended Crop:** The intended crop is hay.
**Nitrogen assimilative capacity of hay**: 100 pounds of nitrogen per acre (based on Oregon State University Extension Service publications PNW 508-E and FG 63)
**Harvest method:** baled hay and then pasture for cows
**Irrigation Practices:** It will be irrigated intermittently to keep the grass green. It will not be irrigated after the biosolids application for a length of time to be determined later.
**Fertilizer use:** It will be fertilized as needed in conjunction with biosolids application and not to exceed the nitrogen required.
**Application Timing:** The City of Molalla will apply Biosolids from June until the end of September of each year. (Immediately after the hay is cut)

## Soil Information:

**Soil Types:** 22 Conser Silty Clay Loam
20 Coburg Silty Clay Loam
See attached soil descriptions for more information

## Biosolids Land Application Information:

**Biosolids Characteristics:** See attached lab results for information on nutrients, solids pH and metals. The tables below summarize the data.

| **Parameter** | **Biosolids Analytical Result (mg/kg)** |
|---|---|
| Arsenic (As) | 7.88 |
| Cadmium (Cd) | 2.39 |
| Chromium (Cr) | 35 |
| Copper (Cu) | 277 |
| Lead (Pb) | 60.9 |
| Mercury (Hg) | 1.76 |
| Molybdenum (Mo) | 21.7 |
| Nickel (Ni) | 20.9 |
| Selenium (Se) | 4.06 |
| Zinc (Zn) | 882 |

| Parameter/measurement unit | Biosolids Analytical Result | Sample Date |
|---|---|---|
| Total solids, percent | 9.2% | 6/18/2012 |
| Volatile solids, percent | 32.8% | 6/18/2012 |
| TKN, percent | 2.283% | 6/18/2012 |
| $NO_3$-N, percent | <0.027% | 6/18/2012 |
| $NH_4$-N, percent | 0.576% | 6/18/2012 |
| Phosphorus (P), percent | 2.130% | 6/18/2012 |
| Potassium (K), percent | 0.050% | 6/18/2012 |
| pH, standard unit | 7.0 | 6/18/2012 |

## Public Participation Information:

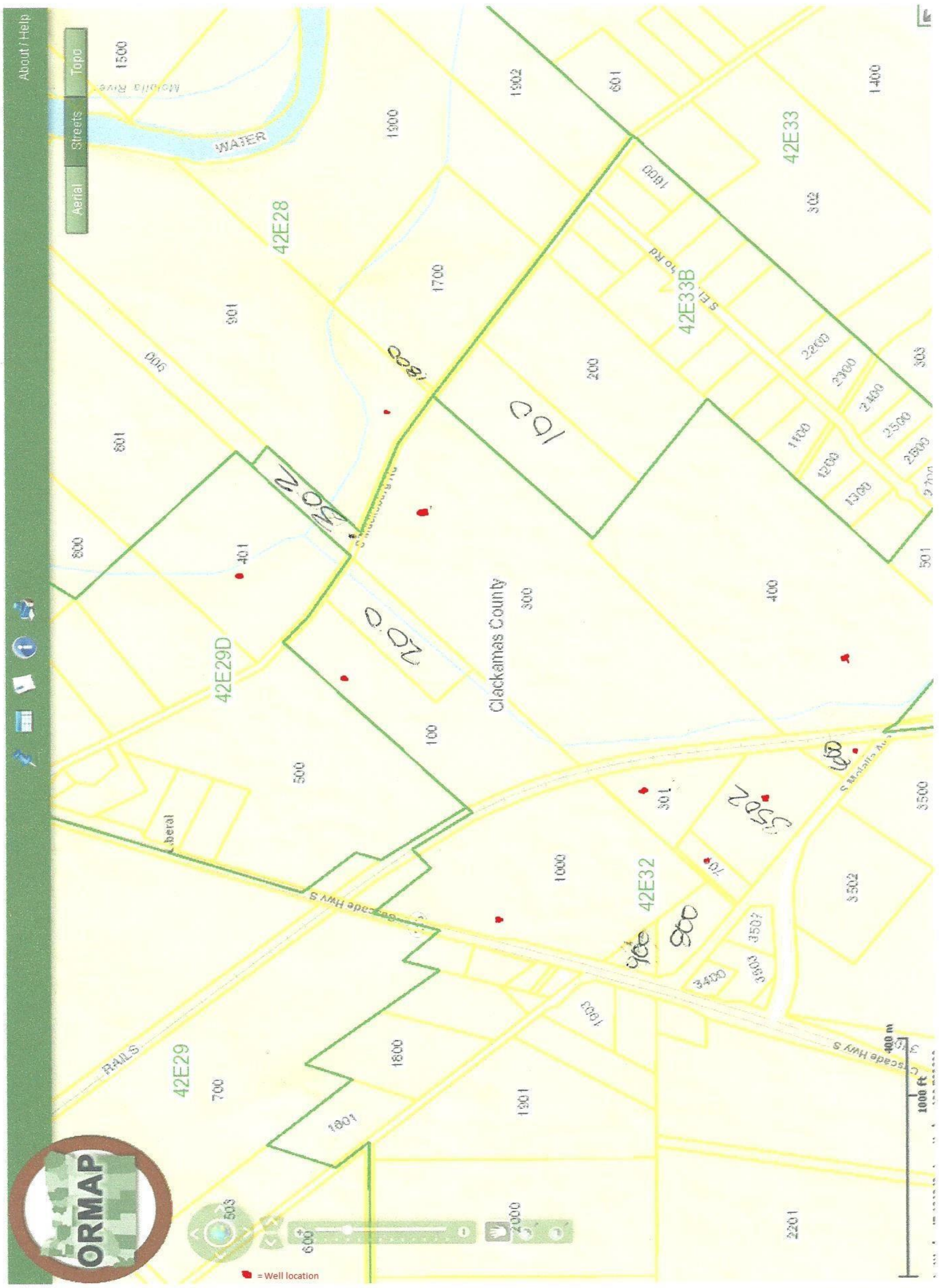
People with adjacent properties were contacted by mail. The letters were mailed on July 6$^{th}$. A letter with my phone number was mailed explaining what biosolids are and showing the proposed application location. I will also attach a copy of the biosolids information flyer from the Oregon DEQ website. I talked with the neighbors in adjacent properties on May 2$^{nd}$ and 3rd, 2013 to verify well distances from the application site. See the attached mailing list and contacts as well as a copy of the letter.

Comments and Complaints:
One person Called me about the biosolids but did not leave any contact information in their message, so I am waiting for a follow up call from them. Another Person called on 6/12/13 and talked for about an hour about biosolids and the process of applications. She wanted to know how we keep it from contaminating ground water. Her name is Ann Gross. I explained that we did not apply biosolids until the water table was more than 48 inches from the surface. Another lady called but wouldn't give a name and she just called to ask where it was going to be applied because she was having a hard time reading the map. She then asked if it would stink. I told her it might have some odor but not as bad as pig or chicken manure.

# Names and addresses of neighbors and owner information from Clackamas County Tax Records

| | Neighboring tax lot and property owner information | | | |
|---|---|---|---|---|
| **map & tax lot** | **owner** | **co-owner** | **co-owner** | **mailing address** |
| 42E32 00100 | PRICE JEFFREY H | | | 13976 S MACKSBURG RD, MOLALLA, OR 9703 |
| 42E32 00200 | BODUNOV STEPAN F | BODUNOV FENIA | | 13990 S MACKSBURG RD, MOLALLA, OR 97038 |
| 42E32 00400 | GOTTSACKER PATRICIA J | JOHNSON LINDA L | LANTZ DEBORA M | PO BOX 1388, MANZANITA, OR 97130 |
| 42E32 01000 | DUNTON MICHAEL LYNN & DENISE MARI | | | 29086 S HWY 213, MOLALLA, OR 97038 |
| 42E32 00301 | WILLAMETTE EGG FARMS LLC | | | 31348 S HWY 170, CANBY, OR 97013 |
| 42E32 03502 | GINGERICH FAMILY LTD PRTNRS | | | PO BOX 910, CANBY, OR 97013 |
| 42E32 00701 | KIRK LOIS E | | | 2326 SW MCGINNIS AVE, TROUTDALE, OR 97060 |
| 42E32 00600 | STEVENS TERRY & CINDY | | | 29410 S MOLALLA AVE, MOLALLA, OR 97038 |
| 42E32 00302 | HUNT KENNETH N & WREATHA-JEAN | | | PO BOX 870, MOLALLA, OR 97038 |
| 42E29D 00401 | HUNT KENNETH N & WREATHA-JEAN | | | PO BOX 870, MOLALLA, OR 97038 |
| 42E28 00901 | NUNN CALVIN L & BETH A FOX-NUNN | | | 14231 S MACKSBURG RD, MOLALLA, OR 97038 |
| 42E28 01700 | MORRISON LIANNE & ROBERT | | | 14251 S MACKSBURG RD, MOLALLA, OR 97038 |
| 42E28 01800 | GROHS ANNA | | | PO BOX 1036, MOLALLA, OR 97038 |
| 42E33B 00100 | GROHS ANNA | | | PO BOX 1036, MOLALLA, OR 97038 |
| 42E33B 00200 | GROHS ANNA | | | PO BOX 1036, MOLALLA, OR 97038 |
| 42E32 00300 | JOHNSON BRADLEY R | JOHNSON CONNIE LEA | | 32113 Palmer Rd. Molalla, OR 97038 |
| | | | | |

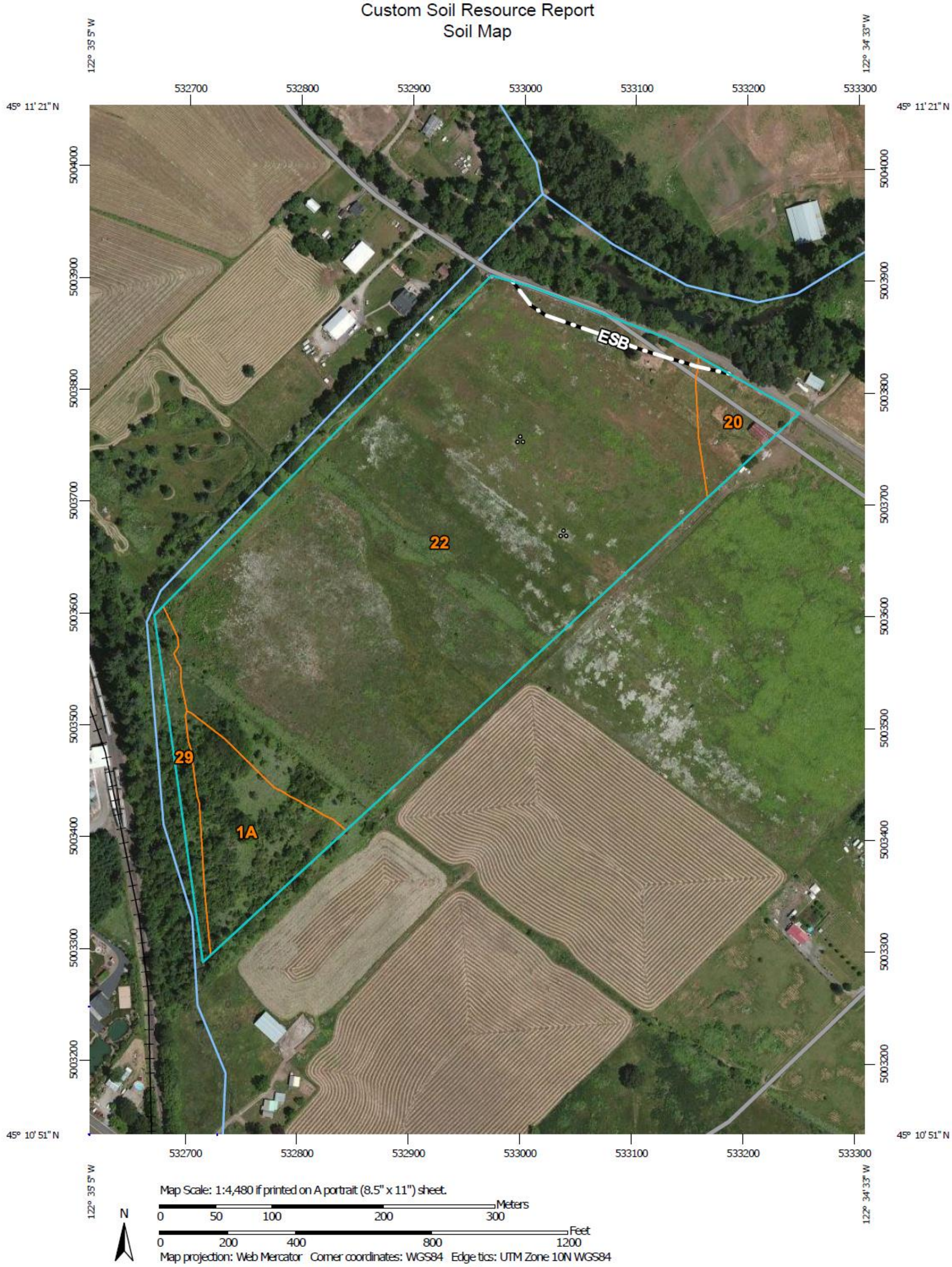
# Vicinity Map with well locations for Tax lot 42E32 00300




5/1/2013

http://www.ormap.net/flexviewer/index.html

Custom Soil Resource Report
Soil Map




8

## MAP LEGEND

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

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

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

**Water Features**
- Streams and Canals

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

**Background**
- Aerial Photography

## MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:20,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

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

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

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

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

Soil Survey Area: Clackamas County Area, Oregon
Survey Area Data: Version 7, Aug 20, 2012

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

Date(s) aerial images were photographed: Jul 8, 2010—Sep 4, 2011

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





# Map Unit Legend

| Clackamas County Area, Oregon (OR610) | | | |
|---|---|---|---|
| **Map Unit Symbol** | **Map Unit Name** | **Acres in AOI** | **Percent of AOI** |
| 1A | Aloha silt loam, 0 to 3 percent slopes | 3.4 | 8.9% |
| 20 | Coburg silty clay loam | 1.5 | 3.8% |
| 22 | Conser silty clay loam | 32.8 | 84.6% |
| 29 | Dayton silt loam | 1.1 | 2.8% |
| **Totals for Area of Interest** | | **38.8** | **100.0%** |

# Clackamas County Area, Oregon

## 1A—Aloha silt loam, 0 to 3 percent slopes

**Map Unit Setting**

*Elevation:* 150 to 400 feet
*Mean annual precipitation:* 40 to 60 inches
*Mean annual air temperature:* 52 to 54 degrees F
*Frost-free period:* 165 to 210 days

**Map Unit Composition**

*Aloha and similar soils:* 85 percent
*Minor components:* 5 percent

**Description of Aloha**

**Setting**

*Landform:* Terraces
*Landform position (three-dimensional):* Tread
*Down-slope shape:* Linear
*Across-slope shape:* Linear
*Parent material:* Stratified glaciolacustrine deposits

**Properties and qualities**

*Slope:* 0 to 3 percent
*Depth to restrictive feature:* More than 80 inches
*Drainage class:* Somewhat poorly drained
*Capacity of the most limiting layer to transmit water (Ksat):* Moderately high (0.20 to 0.57 in/hr)
*Depth to water table:* About 18 to 24 inches
*Frequency of flooding:* None
*Frequency of ponding:* None
*Available water capacity:* High (about 11.9 inches)

**Interpretive groups**

*Farmland classification:* Prime farmland if drained
*Land capability classification (irrigated):* 2w
*Land capability (nonirrigated):* 2w
*Hydrologic Soil Group:* C/D

**Typical profile**

*0 to 8 inches:* Silt loam
*8 to 51 inches:* Silt loam
*51 to 80 inches:* Silt loam

**Minor Components**

**Huberly**

*Percent of map unit:* 3 percent
*Landform:* Swales on terraces
*Landform position (three-dimensional):* Tread
*Down-slope shape:* Linear
*Across-slope shape:* Linear

**Dayton**

*Percent of map unit:* 2 percent

*Landform:* Terraces
*Landform position (three-dimensional):* Tread
*Down-slope shape:* Linear
*Across-slope shape:* Linear

## 20—Coburg silty clay loam

**Map Unit Setting**

*Elevation:* 100 to 1,500 feet
*Mean annual precipitation:* 40 to 60 inches
*Mean annual air temperature:* 52 to 54 degrees F
*Frost-free period:* 165 to 210 days

**Map Unit Composition**

*Coburg and similar soils:* 85 percent
*Minor components:* 6 percent

**Description of Coburg**

**Setting**

*Landform:* Terraces
*Landform position (three-dimensional):* Tread
*Down-slope shape:* Linear
*Across-slope shape:* Linear
*Parent material:* Mixed silty and clayey alluvium

**Properties and qualities**

*Slope:* 0 to 3 percent
*Depth to restrictive feature:* More than 80 inches
*Drainage class:* Moderately well drained
*Capacity of the most limiting layer to transmit water (Ksat):* Moderately high (0.20 to 0.57 in/hr)
*Depth to water table:* About 18 to 30 inches
*Frequency of flooding:* None
*Frequency of ponding:* None
*Available water capacity:* High (about 11.4 inches)

**Interpretive groups**

*Farmland classification:* All areas are prime farmland
*Land capability classification (irrigated):* 2w
*Land capability (nonirrigated):* 2w
*Hydrologic Soil Group:* C

**Typical profile**

*0 to 20 inches:* Silty clay loam
*20 to 60 inches:* Silty clay loam

**Minor Components**

**Conser**

*Percent of map unit:* 5 percent

*Landform:* Terraces
*Landform position (three-dimensional):* Tread
*Down-slope shape:* Linear
*Across-slope shape:* Linear

**Cove**

*Percent of map unit:* 1 percent
*Landform:* Flood plains
*Landform position (three-dimensional):* Dip
*Down-slope shape:* Linear
*Across-slope shape:* Linear

## 22—Conser silty clay loam

**Map Unit Setting**

*Elevation:* 100 to 1,500 feet
*Mean annual precipitation:* 40 to 60 inches
*Mean annual air temperature:* 52 to 54 degrees F
*Frost-free period:* 165 to 210 days

**Map Unit Composition**

*Conser and similar soils:* 85 percent
*Minor components:* 2 percent

**Description of Conser**

**Setting**

*Landform:* Terraces
*Landform position (three-dimensional):* Tread
*Down-slope shape:* Linear
*Across-slope shape:* Linear
*Parent material:* Mixed silty and clayey alluvium

**Properties and qualities**

*Slope:* 0 to 3 percent
*Depth to restrictive feature:* More than 80 inches
*Drainage class:* Poorly drained
*Capacity of the most limiting layer to transmit water (Ksat):* Moderately low to moderately high (0.06 to 0.20 in/hr)
*Depth to water table:* About 0 to 18 inches
*Frequency of flooding:* RareNone
*Frequency of ponding:* None
*Available water capacity:* High (about 9.6 inches)

**Interpretive groups**

*Farmland classification:* Farmland of statewide importance
*Land capability classification (irrigated):* 3w
*Land capability (nonirrigated):* 3w
*Hydrologic Soil Group:* C/D

**Typical profile**

*0 to 7 inches:* Silty clay loam
*7 to 48 inches:* Silty clay loam
*48 to 60 inches:* Loam

**Minor Components**

**Cove**

*Percent of map unit:* 2 percent
*Landform:* Flood plains
*Landform position (three-dimensional):* Dip
*Down-slope shape:* Linear
*Across-slope shape:* Linear

## 29—Dayton silt loam

**Map Unit Setting**

*Elevation:* 150 to 400 feet
*Mean annual precipitation:* 40 to 50 inches
*Mean annual air temperature:* 52 to 54 degrees F
*Frost-free period:* 165 to 210 days

**Map Unit Composition**

*Dayton, thick surface, and similar soils:* 90 percent
*Minor components:* 5 percent

**Description of Dayton, Thick Surface**

**Setting**

*Landform:* Terraces
*Landform position (three-dimensional):* Tread
*Down-slope shape:* Linear
*Across-slope shape:* Linear
*Parent material:* Stratified glaciolacustrine deposits

**Properties and qualities**

*Slope:* 0 to 2 percent
*Depth to restrictive feature:* 12 to 24 inches to abrupt textural change
*Drainage class:* Poorly drained
*Capacity of the most limiting layer to transmit water (Ksat):* Very low to moderately low (0.00 to 0.06 in/hr)
*Depth to water table:* About 0 inches
*Frequency of flooding:* None
*Frequency of ponding:* None
*Available water capacity:* Low (about 4.5 inches)

**Interpretive groups**

*Farmland classification:* Farmland of statewide importance
*Land capability classification (irrigated):* 4w
*Land capability (nonirrigated):* 4w

*Hydrologic Soil Group:* D

**Typical profile**

*0 to 7 inches:* Silt loam
*7 to 21 inches:* Silty clay loam
*21 to 60 inches:* Clay

**Minor Components**

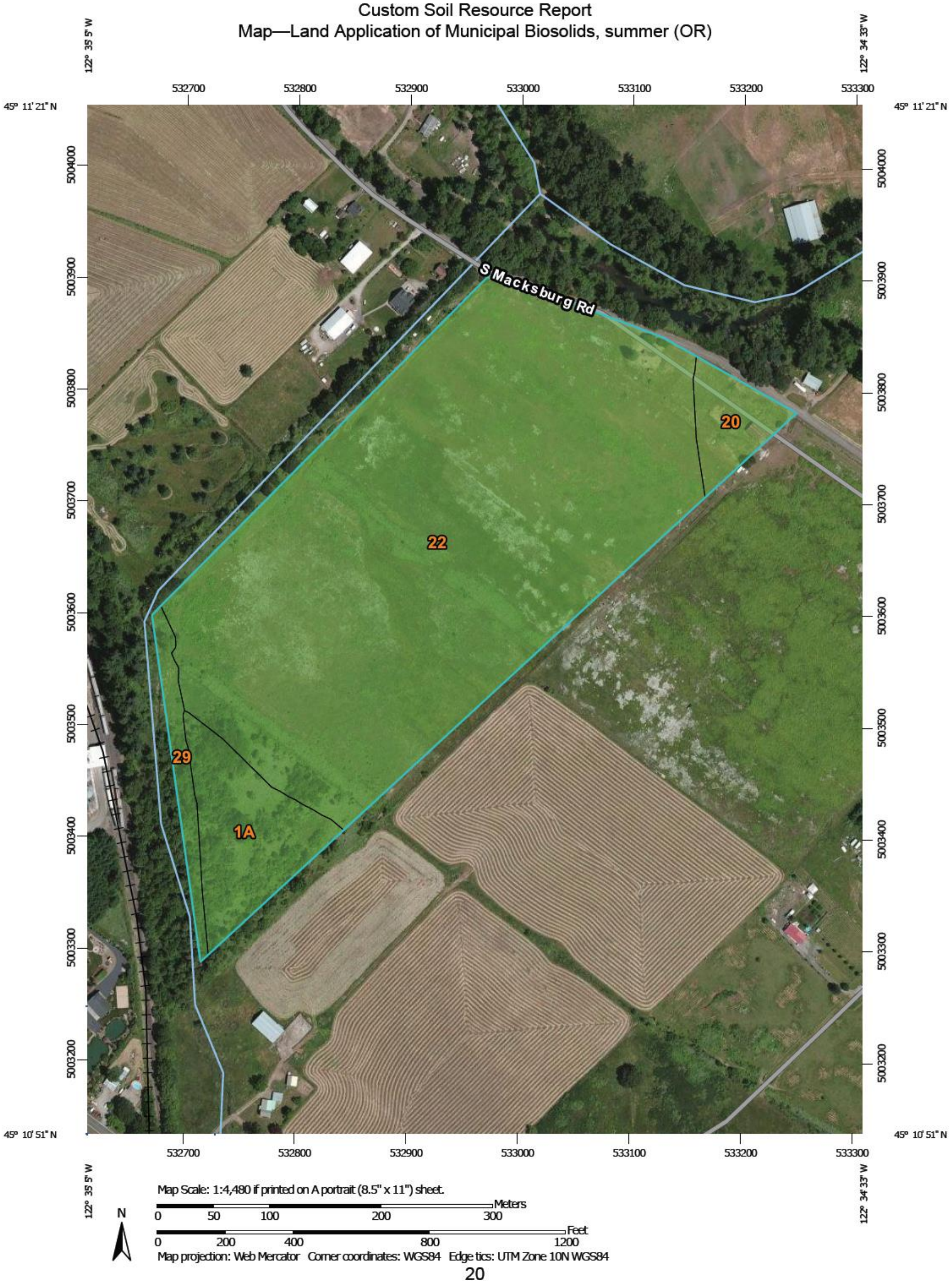
**Concord**

*Percent of map unit:* 3 percent
*Landform:* Terraces
*Landform position (three-dimensional):* Tread
*Down-slope shape:* Linear
*Across-slope shape:* Linear

**Huberly**

*Percent of map unit:* 2 percent
*Landform:* Swales on terraces
*Landform position (three-dimensional):* Tread
*Down-slope shape:* Linear
*Across-slope shape:* Linear

Custom Soil Resource Report
Map—Land Application of Municipal Biosolids, summer (OR)




20

## Tables—Land Application of Municipal Biosolids, summer (OR)

| Land Application of Municipal Biosolids, summer (OR)— Summary by Map Unit — Clackamas County Area, Oregon (OR610) | | | | | | |
|---|---|---|---|---|---|---|
| **Map unit symbol** | **Map unit name** | **Rating** | **Component name (percent)** | **Rating reasons (numeric values)** | **Acres in AOI** | **Percent of AOI** |
| 1A | Aloha silt loam, 0 to 3 percent slopes | Not limited | Aloha (85%) | | 3.4 | 8.9% |
| | | | Huberly (3%) | | | |
| | | | Dayton (2%) | | | |
| 20 | Coburg silty clay loam | Not limited | Coburg (85%) | | 1.5 | 3.8% |
| | | | Conser (5%) | | | |
| | | | Cove (1%) | | | |
| 22 | Conser silty clay loam | Not limited | Conser (85%) | | 32.8 | 84.6% |
| | | | Cove (2%) | | | |
| 29 | Dayton silt loam | Not limited | Dayton, thick surface (90%) | | 1.1 | 2.8% |
| | | | Concord (3%) | | | |
| | | | Huberly (2%) | | | |
| **Totals for Area of Interest** | | | | | **38.8** | **100.0%** |

| Land Application of Municipal Biosolids, summer (OR)— Summary by Rating Value | | |
|---|---|---|
| **Rating** | **Acres in AOI** | **Percent of AOI** |
| Not limited | 38.8 | 100.0% |
| **Totals for Area of Interest** | **38.8** | **100.0%** |

## Rating Options—Land Application of Municipal Biosolids, summer (OR)

*Aggregation Method:* Dominant Condition

*Component Percent Cutoff: None Specified*

*Tie-break Rule:* Higher

## Biosolids Facts and Agreement

I, the undersigned, do hereby certify that I have read and understand the following information and requirements regarding the disposal of biosolids on my property:

**Origin**

Digested municipal biosolids is the result of treating human wastes under controlled conditions. This reduces chances of odor and disease. This material is well suited as a soil amendment and for supplementing crop nitrogen requirements.

**Precautions**

Because of the origin of the biosolids, it is necessary to take certain precautions with its application and disposal to prevent contamination of surface or groundwater's and reduce the possibility of nuisance odor conditions. Care must be taken to maintain a minimum 50 foot setback from a ditch, channel, pond or waterway. A minimum setback of 200 feet must be maintained from downgradient springs, infiltration galleries, water withdrawal points from surface waters and wells.

Other precautions include maintaining buffer zones adjacent to property lines and residential areas. The amount of distance necessary to make up a buffer zone will very with local conditions and the method of biosolids application.

**Responsibility**

It is the city's responsibility to insure the proper handling and disposal of all biosolids generated at the sewage treatment plant. Precautions must be taken in transporting the biosolids from treatment plant to the application site to prevent leaking or spilling the biosolids onto highways, streets, roads, or waterways.

**Access**

The land owner/controller must limit access to the biosolids site for 12 months following application if the biosolids is not worked into the soil. Access is assumed to be controlled if the site is located on rural private land.

**Cropping**

As a general guideline, crops grown for direct human consumption (fresh market fruits and vegetables) should not be planted sooner that 18 months after biosolids application. If the crop is to be treated or processed prior to marketing so that disease causing organisms are not a concern, the DEQ may allow biosolids application within 18 months.

Other crops, such as grains, may receive biosolids applications up to 60 days prior to harvest. There are no time restrictions for non-edible crops such as grass and nursery stock.

**Grazing**

Application of digested biosolids is allowed on pasture and forage crops. However, Federal regulations prohibit "animals whose products are consumed by humans" from grazing for at least 30 days after biosolids application. This is especially true for dairies, where animal contact or direct intake of biosolids, through grazing, could result in milk contamination.

**Application of Municipal Biosolids**

The application of digested biosolids on agricultural land should be managed to utilize its fertilizer value to the maximum extent possible. The recommended amount of biosolids to be applied to you land is based on nitrogen requirements of the crop(s) you plan to grow and will very depending on the amount of nitrogen in the biosolids.

It is important to use only the amount of nitrogen, either from biosolids or from commercial fertilizer, which your crop requires. The amount of commercial fertilizer you would normally use must be reduced by the amount available in the biosolids to be applied on your land. If too much nitrogen is applied, whether from biosolids or commercial fertilizer, it can leach into groundwater and cause pollution.

Determining the proper amount of sludge to be applied is the responsibility of the treatment plant staff. However, it is important that the landowner provide accurate information on the crop to be grown, so that proper correct application rates might be chosen.

---

Brad Johnson

Print name of site owner 14588 S. Macksburg Rd.

14220 S. Macksburg Rd. Molalla, OR 97038

Site Description (address) 12310 S. Oak grove Rd,

[signature] 5/29/13

Signature of site owner Date

---

Jonathon Patrick

Molalla Plant Superintendent

[signature] 5/29/13

Signature of Superintendent Date

## **Appendix G** Existing Site Authorization Information

Oregon
John A. Kitzhaber, M.D., Governor

Department of Environmental Quality
Northwest Region Portland Office
2020 SW 4th Avenue, Suite 400
Portland, OR 97201-4987
(503) 229-5263
FAX (503) 229-6957
TTY (503) 229-5471

August 25, 1999

KERN BUCKNER BIOSOLIDS MANAGER
CITY OF MOLALLA WASTEWATER TREATMENT FACILITY
PO BOX 248
MOLALLA OR 97038

Re: WQ-SDS-Clackamas County
Molalla Wastewater Treatment Facility (WWTF)
Biosolids Land Application Authorization Modification
T.R. Jorgenson Site
TL1000, 1100 & 1400; S07; T5S; R2E WM Clackamas County
NPDES Permit No. 101541
Site ID # 57613

Dear Mr. Buckner:

This letter is in response to your request of August 12, 1999, for a modification of the May 7, 1999, Department of Environmental Quality (Department) authorization letter for the above-described site. The modification is necessary due to the change in the planned method of application of biosolids to the silage corn field and due to the resulting change in the volatilization rate of ammonia.

The application method is proposed to change from a combination of truck spreading and spray irrigation to soil injection. This change will result in a change in ammonia volatilization from 50% to 15%.

The Department approves this change in biosolids application method. Accordingly, items 13. and 3. of the Department's May 7, 1999, site authorization letter are modified as follow.

13. Biosolids land application shall be by soil injection.

3. Based on the City's latest biosolids analysis of 1998 (assuming a 22.5% mineralization rate, a total solids content of 4% and an ammonia volatilization rate of 15%), existing crop, topographic and soil conditions of the field, up to 196.2 kilogram (kg) of available nitrogen (467,985 liter (l) (18.91 dry megagram (Mg))) of biosolids per ha (175 pounds (50,031 gallons (8.43 dry tons)) per acre) per year can be applied to areas of the T.R. Jorgenson silage corn site acceptable for receiving biosolids. Changes in biosolids characteristics or cropping practices will necessitate appropriate adjustments in the application rate to maintain nitrogen application consistent with crop demands.

It is noted that the date of the last biosolids sample analysis for the Molalla WWTF was August 18, 1998. Since the federal biosolids regulations require a minimum of one complete sample analysis per year, including pathogens, vector attraction, pollutants and nutrients, Molalla should resample the lagoon biosolids and obtain sample results prior to land application. The results of the nutrient analysis should be used to recalculate the biosolids application rate for the Jorgenson silage cornfield. The results of the new analysis should be reported to the Department at the time of the submittal of the annual report for 1999.

All other applicable conditions of the Department's May 7, 1999, site authorization letter remain in effect. If you have any questions regarding this modification, please contact me at 229-5616.

Sincerely,

Bruce W. Henderson

Bruce W. Henderson
Biosolids Specialist
Northwest Region

cc: Doug Peters, Water Quality Division, Headquarters, DEQ
T.R. Jorgenson
12305 South Highway 211
Molalla, OR 97038

Oregon

# FAX COVER SHEET

DEPARTMENT OF ENVIRONMENTAL QUALITY

NORTHWEST REGION

DATE: 8/24/99 TIME: 1755

TO: Kern Buckner

FROM: Bruce Henderson

TELEPHONE:(503) 229.5616 EXTENSION: —

FAX NUMBER (503)229-~~6945~~ 6957

COVER PAGE PLUS 2 PAGES

MESSAGE: Please replace the earlier version of this letter (8/24/99) with the current letter (8/25/99) for both fax and mail delivery. The new letter contains correct data for item 3. Please note that since the biosolids sample results are over 1 year old, a new sample should be taken and analyzed. Results of nutrient analysis should be used to recalculate application rate.

2020 SW Fourth Avenue
Suite 400
Portland, OR 97201-4987
(503) 229-5263 Voice/TDD

Oregon
John A. Kitzhaber, M.D., Governor

Department of Environmental Quality
Northwest Region Portland Office
2020 SW 4th Avenue, Suite 400
Portland, OR 97201-4987
(503) 229-5263
FAX (503) 229-6957
TTY (503) 229-5471

August 24, 1999

KERN BUCKNER BIOSOLIDS MANAGER
CITY OF MOLALLA WASTEWATER TREATMENT FACILITY
PO BOX 248
MOLALLA OR 97038

Re: WQ-SDS-Clackamas County
Molalla Wastewater Treatment Facility
(WWTF)
Biosolids Land Application
Authorization Modification
T.R. Jorgenson Site
TL1000, 1100 & 1400; S07; T5S; R2E WM
Clackamas County
NPDES Permit No. 101541
Site ID # 57613

Dear Mr. Buckner:

This letter is in response to your request of August 12, 1999, for a modification of the May 7, 1999, Department of Environmental Quality (Department) authorization letter for the above-described site. The modification is necessary due to the change in the planned method of application of biosolids to the silage corn field and due to the resulting change in the volatilization rate of ammonia.

The application method is proposed to change from a combination of truck spreading and spray irrigation to soil injection. This change will result in a change in ammonia volatilization from 50% to 15%.

The Department approves this change in biosolids application method. Accordingly, items 13. and 3. of the Department's May 7, 1999, site authorization letter are modified as follow.

13. Biosolids land application shall be by soil injection.

3. Based on the City's latest biosolids analysis of 1998 (assuming a 22.5% mineralization rate, a total solids content of 4% and an ammonia volatilization rate of 15%), existing crop, topographic and soil conditions of the field, up to 196.2 kilogram (kg) of available nitrogen (311,990 liter (l) (12.6 dry megagram (Mg))) of biosolids per ha (175 pounds (33,354 gallons (5.6 dry tons)) per acre) per year can be applied to areas of the T.R. Jorgenson silage corn site acceptable for receiving biosolids. Changes in biosolids characteristics or cropping practices will necessitate appropriate adjustments in the application rate to maintain nitrogen application consistent with crop demands.

All other applicable conditions of the Department's May 7, 1999, site authorization letter remain in effect. If you have any questions regarding this modification, please contact me at 229-5616.

Sincerely,

Bruce W. Henderson

Bruce W. Henderson
Biosolids Specialist
Northwest Region

cc: Doug Peters, Water Quality Division, Headquarters, DEQ
T.R. Jorgenson
12305 South Highway 211
Molalla, OR 97038

Oregon
John A. Kitzhaber, M.D., Governor

Department of Environmental Quality
Northwest Region
2020 SW Fourth Avenue
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Portland, OR 97201-4987
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May 7, 1999

KERN BUCKNER BIOSOLIDS MANAGER
CITY OF MOLALLA WASTEWATER TREATMENT FACILITY
PO BOX 248
MOLALLA OR 97038

Re: WQ-SDS-Clackamas County
Molalla Wastewater Treatment Facility (WWTF)
Biosolids Land Application Authorization Modification
T.R. Jorgenson Site
TL1000, 1100 & 1400; S07; T5S; R2E WM Clackamas County
NPDES Permit No. 101541
Site ID # 57613

Dear Mr. Buckner:

**This letter is a modification of the May 3, 1999, Department of Environmental Quality (Department) authorization letter for the above-described site. The modification is necessary due to the change of crop from hay to silage corn and due to a change in the volatilization rate of ammonia from 15% to 50%.**

As you are aware, I evaluated the T.R. Jorgenson site with you on October 29, 1998, to determine if the site would be suitable for the land application of pre-aerated lagoon stabilized liquid biosolids from the Molalla WWTF. At a later time you provided the Department of Environmental Quality with a request for authorization to land apply biosolids to a 25.2 hectare (ha) (62.3-acre) silage corn site on the 30.8 ha (76.1-acre) property referenced above.

The property consists of three tax lots. Tax Lot 1000 has 19.6 ha (48.5 acre) of usable area of the total area of 22.6 ha (55.88 acre). Tax Lot 1100 has 0.6 ha (1.4 acre) of usable area of the total area of 1.0 ha (2.35 acre). Tax Lot 1400 has 5.0 ha (12.4 acre) of usable area of the total area of 7.2 ha (17.87 acre).

The request included information characterizing soils, topography, biosolids, crop type, crop management, annual available nitrogen loading (agronomic loading rate), documentation of public notification, and a signed agreement between the City and the owner, Mr. Jorgenson.

DEQ-1

Based upon evaluation of the site and the information submitted, I am pleased to advise you that the T.R. Jorgenson property described above is authorized for the seasonal application of pre-aerated lagoon stabilized liquid biosolids from the Molalla WWTF provided:

1. Biosolids processing and handling will comply with Oregon biosolids rules and guidelines (OAR 340-50-005 to OAR 340-50-080) and all other applicable statutes, rules, and federal regulations, including the federal biosolids regulations (40 CFR Part 503).

2. Biosolids volatile solids content shall be monitored to assure that the vector attraction reduction requirements of the federal biosolids regulations are met. Also, solid waste debris contained in the lagoon biosolids shall either be removed through screening or mechanically reduced in size through grinding so as not to create nuisance conditions at the land application site.

3. Based on the City's latest biosolids analysis of 1998 (assuming a 22.5% mineralization rate and a total solids content of 4%), existing crop, topographic and soil conditions of the field, up to 196.2 kilogram (kg) of available nitrogen (357,179 liter (l) (14.44 dry megagram (Mg))) of biosolids per ha (175 pounds (38,185 gallons (6.44 dry tons)) per acre) per year can be applied to areas of the T.R. Jorgenson silage corn site acceptable for receiving biosolids. Changes in biosolids characteristics or cropping practices will necessitate appropriate adjustments in the application rate to maintain nitrogen loadings consistent with crop demands.

4. If other sources of nitrogen are applied to the field, the biosolids application rate must be reduced so that commercial, animal manure or green chop nitrogen plus biosolids nitrogen does not exceed the agronomic loading rate of any field within the site.

5. The above Condition 3. notwithstanding, the application rate shall not exceed 46,770 l per ha (5000 gallons per acre) per hour or 215,757 l per ha (23,066 gallons per acre) per day. The resting period between applications should be at least 48 hours. Weather conditions should be considered and the resting period adjusted upward for inclement weather.

6. Biosolids land application shall cease when precipitation exceeds 0.6 centimeter (cm) (1/4 inch) per hour or when 2.5 cm (one inch) or more of precipitation occurs in a 24-hour period. Land application shall be withheld from the site for at least one day for every consecutive day of precipitation where a 0.6 cm (1/4 inch) per hour or 2.5 cm (one-inch) per 24-hour precipitation event occurs.

7. Biosolids shall be applied evenly and thinly in a manner that will prevent ponding and runoff.

8. Biosolids land application shall cease when the ground surface is frozen or snow covered. Application can resume as soon as the ground surface has thawed and the soil has sufficiently dried.

9. Areas where biosolids have been applied shall be clearly marked by flag pins or stakes which note the date when biosolids were last applied.

10. A 30-day interval shall follow the application of biosolids prior to grazing livestock on any field or prior to the harvesting of crops from biosolids areas that are to be fed to animals.

11. Public access to the site shall be restricted for at least 12 months after biosolids land application have ceased.

12. Biosolids land application is authorized on a seasonal basis (May 15th through November 15th, yearly). Care should be taken to avoid wet soil conditions, particularly in concave areas and during the early and late parts of the approved biosolids land application period, at the time of application.

13. Biosolids land application shall be via spray irrigation or truck application. Biosolids land application via spray irrigation shall not occur when wind speeds exceed 15 mph. Regardless of wind speed, spray irrigation of biosolids shall cease when wind drift causes biosolids to settle onto non-authorized areas.

14. For truck application, a 15 meter (m) (50 foot) minimum setback shall be maintained from the following features and points of biosolids land application: the top of the ditch bank along State Highway 211, located along the south site perimeter; the culvert outlet, located near the northeast site corner; and from the top of the bank of Bear Creek, located along the north site perimeter.

    For spray irrigation of liquid biosolids, a minimum 23 m (75 foot) setback shall be observed from water features, including the bank of Bear Creek and the culvert outlet referenced above, and points of biosolids land application.

15. A minimum setback of 61 m (200 feet) shall be maintained from all wells and other water sources and points of biosolids application. This includes the four domestic wells located near the northwest, northeast and southwest site corners and adjacent to the property residence located along State Highway 211 near the south site boundary.

Also, when using spray irrigation for the land application of biosolids, a minimum setback of 91-m (300 feet) shall be maintained from all occupied structures and major roadways. This includes the two residences located within the south part of the property and adjacent to the southwest corner of the property. Additionally, this includes State Highway 211 along the south boundary of the property.

16. Immediately following land application, the biosolids tanker operator shall wash down (at the application site) areas of equipment coated with biosolids to prevent biosolids from leaking onto public highways.

17. The City's truck operator shall clean up any spillage of biosolids. Spillages that cannot be completely cleaned up must be covered with dry lime and posted where appropriate.

18. The Department shall be notified within one hour, through the Oregon Emergency Response System (OERS), of any spills of more than 189 l (50 gallons) or other threats to the environment that may occur. Failure to provide prompt notification may be considered cause for taking enforcement action against the City. The telephone number of OERS is 1-800-452-0311 (24 hour per day service).

19. In the event an odor problem is reported to the Department after biosolids have been land applied at the Jorgenson site, immediate steps, such as, but not limited to, the addition of liming materials, must be taken to counteract that condition.

20. The City shall maintain daily records for the biosolids land application site which indicate (on a field map grid system) where, when, and what volume of biosolids were land applied to a particular site.

21. Site records shall indicate the date, location and amount of biosolids applied, segments of each field that received biosolids, amount of nutrients applied to each area receiving biosolids and the type of crop grown. These data shall be maintained at the Molalla WWTF and be made available to the Department for review upon request.

22. The Department shall have the right to (at reasonable times): enter the City's place of biosolids land application and record keeping to review biosolids management operations and records, obtain copies of any records required under the terms of this authorization and the City's biosolids management plan, inspect any monitoring equipment required under this authorization, inspect any collection, transport, or land application vehicles, and obtain any photographic documentation or evidence deemed appropriate.

23. The City shall provide the Department with an annual report that comprehensively describes biosolids handling activities, including at the Jorgenson site, during the yearly reporting period. The report shall be submitted annually by February 19th, following the calendar year of the report.

24. The Department may impose any additional restrictions or conditions deemed necessary to assure adequate biosolids management. Any variations from the City's Department approved biosolids management plan and this authorization letter must receive prior written approval from the Northwest Region Office.

25. This authorization is subject to revocation should health hazards, environmental degradation, or nuisance conditions develop as a result of inadequate biosolids treatment or site management. This authorization is considered to be part of your approved biosolids management plan. Therefore, if operations are not conducted in accordance with terms specified under this authorization, the Department will initiate an enforcement action that may lead to the assessment of a civil penalty.

If you have any questions regarding this authorization, please contact me at 229-5616.

Sincerely,

Bruce W. Henderson

Bruce W. Henderson
Biosolids Specialist
Northwest Region

cc: Doug Peters, Water Quality Division, Headquarters, DEQ
T.R. Jorgenson
12305 South Highway 211
Molalla, OR 97038

Oregon
John A. Kitzhaber, M.D., Governor

Department of Environmental Quality
Northwest Region
2020 SW Fourth Avenue
Suite 400
Portland, OR 97201-4987
(503) 229-5263 Voice
TTY (503) 229-5471

May 3, 1999

KERN BUCKNER BIOSOLIDS MANAGER
CITY OF MOLALLA WASTEWATER TREATMENT FACILITY
PO BOX 248
MOLALLA OR 97038

Re: WQ-SDS-Clackamas County
Molalla Wastewater Treatment Facility (WWTF)
Biosolids Land Application Authorization
T.R. Jorgenson Site
TL1000, 1100 & 1400; S07; T5S; R2E WM Clackamas County
NPDES Permit No. 101541
Site ID # 57613

Dear Mr. Buckner:

As you are aware, I evaluated the T.R. Jorgenson site with you on October 29, 1998, to determine if the site would be suitable for the land application of pre-aerated lagoon stabilized liquid biosolids from the Molalla WWTF. At a later time you provided the Department of Environmental Quality (Department) with a request for authorization to land apply biosolids to a 25.2 hectare (ha) (62.3-acre) hay field site on the 30.8 ha (76.1-acre) property referenced above.

The property consists of three tax lots. Tax Lot 1000 has 19.6 ha (48.5 acre) of usable area of the total area of 22.6 ha (55.88 acre). Tax Lot 1100 has 0.6 ha (1.4 acre) of usable area of the total area of 1.0 ha (2.35 acre). Tax Lot 1400 has 5.0 ha (12.4 acre) of usable area of the total area of 7.2 ha (17.87 acre).

The request included information characterizing soils, topography, biosolids, crop type, crop management, annual available nitrogen loading (agronomic loading rate), documentation of public notification, and a signed agreement between the City and the owner, Mr. Jorgenson.

Based upon evaluation of the site and the information submitted, I am pleased to advise you that the T.R. Jorgenson property described above is authorized for the seasonal application of pre-aerated lagoon stabilized liquid biosolids from the Molalla WWTF provided:

DEQ-1

1. Biosolids processing and handling will comply with Oregon biosolids rules and guidelines (OAR 340-50-005 to OAR 340-50-080) and all other applicable statutes, rules, and federal regulations, including the federal biosolids regulations (40 CFR Part 503).

2. Biosolids volatile solids content shall be monitored to assure that the vector attraction reduction requirements of the federal biosolids regulations are met. Also, solid waste debris contained in the lagoon biosolids shall either be removed through screening or mechanically reduced in size through grinding so as not to create nuisance conditions at the land application site.

3. Based on the City's latest biosolids analysis of 1998 (assuming immediate biosolids soil incorporation, a 22.5% mineralization rate and a total solids content of 4%), existing crop, topographic and soil conditions of the field, up to 134.5 kilogram (kg) of available nitrogen (215,757 liter (l) (8.72 dry megagram (Mg))) of biosolids per ha (120 pounds (23,066 gallons (3.89 dry tons)) per acre) per year can be applied to areas of the T.R. Jorgenson hay field site acceptable for receiving biosolids. Changes in biosolids characteristics or cropping practices will necessitate appropriate adjustments in the application rate to maintain nitrogen loadings consistent with crop demands.

4. If other sources of nitrogen are applied to the field, the biosolids application rate must be reduced so that commercial, animal manure or green chop nitrogen plus biosolids nitrogen does not exceed the agronomic loading rate of any field within the site.

5. The above Condition 3. notwithstanding, the application rate shall not exceed 46,770 l per ha (5000 gallons per acre) per hour or 215,757 l per ha (23,066 gallons per acre) per day. The resting period between applications should be at least 48 hours. Weather conditions should be considered and the resting period adjusted upward for inclement weather.

6. Biosolids land application shall cease when precipitation exceeds 0.6 centimeter (cm) (1/4 inch) per hour or when 2.5 cm (one inch) or more of precipitation occurs in a 24-hour period. Land application shall be withheld from the site for at least one day for every consecutive day of precipitation where a 0.6 cm (1/4 inch) per hour or 2.5 cm (one-inch) per 24-hour precipitation event occurs.

7. Biosolids shall be applied evenly and thinly in a manner that will prevent ponding and runoff.

8. Biosolids land application shall cease when the ground surface is frozen or snow covered. Application can resume as soon as the ground surface has thawed and the soil has sufficiently dried.

9. Areas where biosolids have been applied shall be clearly marked by flag pins or stakes which note the date when biosolids were last applied.

10. A 30-day interval shall follow the application of biosolids prior to grazing livestock on any field or prior to the harvesting of crops from biosolids areas that are to be fed to animals.

11. Public access to the site shall be restricted for at least 12 months after biosolids land application have ceased.

12. Biosolids land application is authorized on a seasonal basis (May 15th through November 15th, yearly). Care should be taken to avoid wet soil conditions, particularly in concave areas and during the early and late parts of the approved biosolids land application period, at the time of application.

13. Biosolids land application shall be via spray irrigation or truck application. Biosolids land application via spray irrigation shall not occur when wind speeds exceed 15 mph. Regardless of wind speed, spray irrigation of biosolids shall cease when wind drift causes biosolids to settle onto non-authorized areas.

14. For truck application, a 15 meter (m) (50 foot) minimum setback shall be maintained from the following features and points of biosolids land application: the top of the ditch bank along State Highway 211, located along the south site perimeter; the culvert outlet, located near the northeast site corner; and from the top of the bank of Bear Creek, located along the north site perimeter.

    For spray irrigation of liquid biosolids, a minimum 23 m (75 foot) setback shall be observed from water features, including the bank of Bear Creek and the culvert outlet referenced above, and points of biosolids land application.

15. A minimum setback of 61 m (200 feet) shall be maintained from all wells and other water sources and points of biosolids application. This includes the four domestic wells located near the northwest, northeast and southwest site corners and adjacent to the property residence located along State Highway 211 near the south site boundary.

Also, when using spray irrigation for the land application of biosolids, a minimum setback of 91-m (300 feet) shall be maintained from all occupied structures and major roadways. This includes the two residences located within the south part of the property and adjacent to the southwest corner of the property. Additionally, this includes State Highway 211 along the south boundary of the property.

16. Immediately following land application, the biosolids tanker operator shall wash down (at the application site) areas of equipment coated with biosolids to prevent biosolids from leaking onto public highways.

17. The City's truck operator shall clean up any spillage of biosolids. Spillages that cannot be completely cleaned up must be covered with dry lime and posted where appropriate.

18. The Department shall be notified within one hour, through the Oregon Emergency Response System (OERS), of any spills of more than 189 l (50 gallons) or other threats to the environment that may occur. Failure to provide prompt notification may be considered cause for taking enforcement action against the City. The telephone number of OERS is 1-800-452-0311 (24 hour per day service).

19. In the event an odor problem is reported to the Department after biosolids have been land applied at the Jorgenson site, immediate steps, such as, but not limited to, the addition of liming materials, must be taken to counteract that condition.

20. The City shall maintain daily records for the biosolids land application site which indicate (on a field map grid system) where, when, and what volume of biosolids were land applied to a particular site.

21. Site records shall indicate the date, location and amount of biosolids applied, segments of each field that received biosolids, amount of nutrients applied to each area receiving biosolids and the type of crop grown. These data shall be maintained at the Molalla WWTF and be made available to the Department for review upon request.

22. The Department shall have the right to (at reasonable times): enter the City's place of biosolids land application and record keeping to review biosolids management operations and records, obtain copies of any records required under the terms of this authorization and the City's biosolids management plan, inspect any monitoring equipment required under this authorization, inspect any collection, transport, or land application vehicles, and obtain any photographic documentation or evidence deemed appropriate.

23. The City shall provide the Department with an annual report that comprehensively describes biosolids handling activities, including at the Jorgenson site, during the yearly reporting period. The report shall be submitted annually by February 19th. following the calendar year of the report.

24. The Department may impose any additional restrictions or conditions deemed necessary to assure adequate biosolids management. Any variations from the City's Department approved biosolids management plan and this authorization letter must receive prior written approval from the Northwest Region Office.

25. This authorization is subject to revocation should health hazards, environmental degradation, or nuisance conditions develop as a result of inadequate biosolids treatment or site management. This authorization is considered to be part of your approved biosolids management plan. Therefore, if operations are not conducted in accordance with terms specified under this authorization, the Department will initiate an enforcement action that may lead to the assessment of a civil penalty.

If you have any questions regarding this authorization, please contact me at 229-5616.

Sincerely,

Bruce W. Henderson

Bruce W. Henderson
Biosolids Specialist
Northwest Region

cc: Doug Peters, Water Quality Division, Headquarters, DEQ
T.R. Jorgenson
12305 South Highway 211
Molalla, OR 97038

Priority

## BIOSOLIDS APPLICATION SITE WORKSHEET

1. **Site:** B, Slim's farm land next to treatment plant

2. **Site Owner:** T.R. Jorgenson

3. **Vicinity:**
   **A)** 12305 S. Hwy 211, Molalla, OR. 97038 (503) 829-7707
   **B)** T5S, R2E, Section 7
   **C)** Tax lot#: 1000 (55.88 acres), 1100 (2.35 acres) & 1400 (17.87 acres)
   **D)** County: Clackamas

4. **Area of Land:**
   **A) Major set backs to consider:**
   **1.** Bear Creek on North side of property
   **2.** Ditch along Hwy 211
   **3.** Culverts
   **4.** Wells: I talked to the neighbors closest to the application site and found that there are four wells that will require additional setbacks. The four wells have been noted on the sketch map of the site. A 200 foot set back will be observer from all wells.
   **B) Gross:** 76.1 acres
   **C) Useable:** 68 acres
   **D) Buffers and set backs:** 5.7 acres
   **E) Net land:** 62.3 acres

5. **Soil Type:**
   **A)** 1A- Aloha Silt Loam
   **B)** 3-Amity Silt Loam
   **C)**

6. **Crop:**
   **A) Type:** Corn, irrigated
   **B) Method of Harvest (silage/Pasture):** Silage

7. **Nitrogen Requirement:** 175 lb./acre (as per OSU Extension Services web page)

8. **Anticipated Nitrogen To Be Applied By Owner:** None

9. **Method of Application:** Truck or sprinkler

10. **Time of Year For Application:** Spring (May - June)

## Organic Load Rates

Site: B, T.R. Jorgenson ("Slim")
Crop type: Silage corn
Nitrogen needed for this crop: 175 lb./acre
Date of Application: Spring (May-June)
Method of Application: truck/sprinkler
Class of Sludge: B
Available Acres on this site (after buffers considered): 62.3 acres

Type of Digestion: Facultative

Total solids (TS): 6 %
TS applied: 4 %
Volatile solids: 46 %

| Parameters | mg/kg wet | mg/kg dry | % (w/w) | lb./Ton | *APLR, Kg/ha/yr. | APLR lb./acre/yr. | **PAR, lb./acre/yr. | Ceiling conc. mg/kg, dry |
|---|---|---|---|---|---|---|---|---|
| Mercury (Hg) | 0.33 | 5.5 | 0.00055 | 0.011 | 0.85 | 2.0995 | 0.145 | 57 |
| Arsenic (As) | 1 | 16.7 | 0.001667 | 0.03333 | 2.0 | 4.94 | 0.440 | 75 |
| Lead (Pb) | 8.9 | 148.3 | 0.014833 | 0.29667 | 15 | 37.05 | 3.918 | 840 |
| Zinc (Zn) | 129 | 2150.0 | 0.215 | 4.3 | 140 | 345.8 | 56.792 | 7500 |
| Copper (Cu) | 39.2 | 653.3 | 0.065333 | 1.30667 | 75 | 185.25 | 17.258 | 4300 |
| Nickel (Ni) | 2.2 | 36.7 | 0.003667 | 0.07333 | 21 | 51.87 | 0.969 | 420 |
| Cadmium (Cd) | 0.4 | 6.7 | 0.000667 | 0.01333 | 1.9 | 4.693 | 0.176 | 85 |
| Chromium (Cr) | 3 | 50.0 | 0.005 | 0.1 | 150 | 370.5 | 1.321 | 3000 |
| Selenium (Se) | 0.34 | 5.7 | 0.000567 | 0.01133 | 5.0 | 12.35 | 0.150 | 100 |
| Molybdenum (Mo) | 0.3 | 5.0 | 0.0005 | 0.01 | 0.9 | 2.223 | 0.132 | 75 |
| TKN | 2160 | 36000.0 | 3.6 | 72 | | | | |
| Organic N | 1950 | 32500.0 | 3.25 | 65 | | | | |
| NH4-N | 210 | 3500.0 | 0.35 | 7 | | | | |
| NO3-N | 0 | 0.0 | 0 | 0 | | | | |
| NO2-N | 0 | 0.0 | 0 | 0 | | | | |
| P | 1100 | 18333.3 | 1.833333 | 36.6667 | | | | |
| K | 33.2 | 553.3 | 0.055333 | 1.10667 | | | | |

Available-N
NH4-N: (0.5250)(20)(0.5) = 5.25 lb/DT
NO3-N: 0
Org-N (5.4-0.525)(20)(0.225) = 21.9375 lb/DT
Total-N: 27.19
AAR: 175/27.19 = 6.44 DT/A/Y
(6.44)(2000)(100/4)(1/8.345)(1/1.01) = 38,185 g/A/Y

* **APLR**: Annual Pollution Load Rate is a limit the EPA sets on the amount of pollutant applied to the land (503.13 Table 4).

****PAR**: Pollutant Application Rate is the amount of each pollutant applied to the land as determined by the agronomic load rate.

**Ceiling Concentration** is the application limit set by the EPA which let biosolids be applied with out calculating site life. If any pollutant is above this level a cumulative polutaion load rate must be calculated.

**2. Nitrogen Requirements:**

A. Crop Nitrogen Requirements (lb./acre): 175 lb./acre
B. Supplemental Fertilizer N (lb./acre): 0 lb./acre

**3. Total Available Nitrogen (TAN) in sludge, lb./ton (dry):** 13.25 lb./dry ton

Organic N: 9.75 lb./ton
NH4-N: 3.5 lb./ton
NO3-N: 0 lb./ton

TAN calculation biased on a mineralization rate of 0.15 and a volatilization factor of 0.5

**4. Agronomic Loading Rate** (N required for crop / TAN):
With respect to Nitrogen the sludge can be applied at a rate of 78398 gal./acre/yr.

| | | |
|---|---|---|
| 13.208 | ton/acre | (N req., lb/A) / (total N, lb/DT) |
| 26415 | lb./acre | (DT/A)(2000lb./T) |
| 78398 | gal./acre | (lb/A )(1/8.34)(1/1.01)(100/%TS appl.) |

↑ 4%

**5. Fertilizer P and K values for the sludge:**

P= 484.3 lb. P /acre
K= 14.6 lb. K /acre

sludge load rates

**6. Cumulative Pollutant Loading Rates (CPLR)(Does not need to be calculated if pollutant levels are below table 1 of 40 CFR 503.13):**

The treatment plant does not apply sludge every year, so instead of determining the CPLR in terms of years we will calculate the total amount of pollutants applied to date. If the total amount applied to date reaches 90% of the CPLR we will know to watch the next applications and possibly choose a new site for the next application of sludge.

| Pollutant | CPLR (lb./acre) * 100% | 90% | conc. mg/kg (dry) | application rate (lb./acre) | total amount of pollutant applied on last application date (lb./acre) | Total amount of pollutant applied to date (lb./acre) |
|---|---|---|---|---|---|---|
| Mercury (Hg) | 15 | 13.4 | 8.25 | 26,415 | 0 | 0.217924528 |
| Arsenic (As) | 37 | 33 | 25.00 | 26,415 | 0 | 0.660377358 |
| Lead (Pb) | 268 | 240.8 | 222.50 | 26,415 | 0 | 5.877358491 |
| Zinc (Zn) | 2,500 | 2,229 | 3225.00 | 26,415 | 0 | 85.18867925 |
| Copper (Cu) | 1,339 | 1,204 | 980.00 | 26,415 | 0 | 25.88679245 |
| Nickel (Ni) | 375 | 337.1 | 55.00 | 26,415 | 0 | 1.452830189 |
| Cadmium (Cd) | 35 | 31.2 | 10.00 | 26,415 | 0 | 0.264150943 |
| Chromium (Cr) | 2,677 | 22,408 | 75.00 | 26,415 | 0 | 1.981132075 |
| Selenium (Se) | 89 | 80.3 | 8.50 | 26,415 | 0 | 0.224528302 |
| Molybdenum (Mo) | | | 7.50 | 26,415 | 0 | 0.198113208 |

* CPLR is the Cumulative Pollutant Loading Rate. This is a value from Table 2 of 40 CFR 503.13.

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**7. Fecal Coliform Count, MPN method (geometric mean of seven samples):**

55.0 per g TS (dry)

Seven Samples: (MPN/100 mL)

| | | |
|---|---|---|
| 220 | 220 | 220 |
| 220 | 220 | |
| 220 | 220 | |

Class B biosolids must have less than 2,000,000 MPN, so these are class B biosolids.

**8. Site Characteristics:**

A) Gross tax lot: 76.1 acres

B) Useable amount of land: 68 acres

C) Area of all buffers and set backs: 5.7 acres

D) Net land area: 62.3 acres

D) Total galons per 62.3 acres that can be applied at this site: 4884192.78 gallons

1000: 48.5 + 1400: 12.9
1100: 1.4

1200: hay
2000
15%: yolu

**9. Vector Attraction Reduction:** Option II (Method described in the EPA document "Environmental Regulations and Technology, Control of Pathogens and Vector Attraction in Sewage Sludge". EPA/625/R-92/013, Dec. 1992 )

Five samples from different locations and depth in pond: Percent volatile solids reduction from day 0 to day 40 at 35 degrees C.

| 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|
| 0.93% | -0.46% | 3.35% | 16.20% | 2.51% |

Average: 4.55% Volatile solids reduction in 40 days at 35 degrees C.

Option II is achieved when there is less than 17% reduction in VS, so in this case option II has been met and no further vector attraction Reduction steps need to be taken.

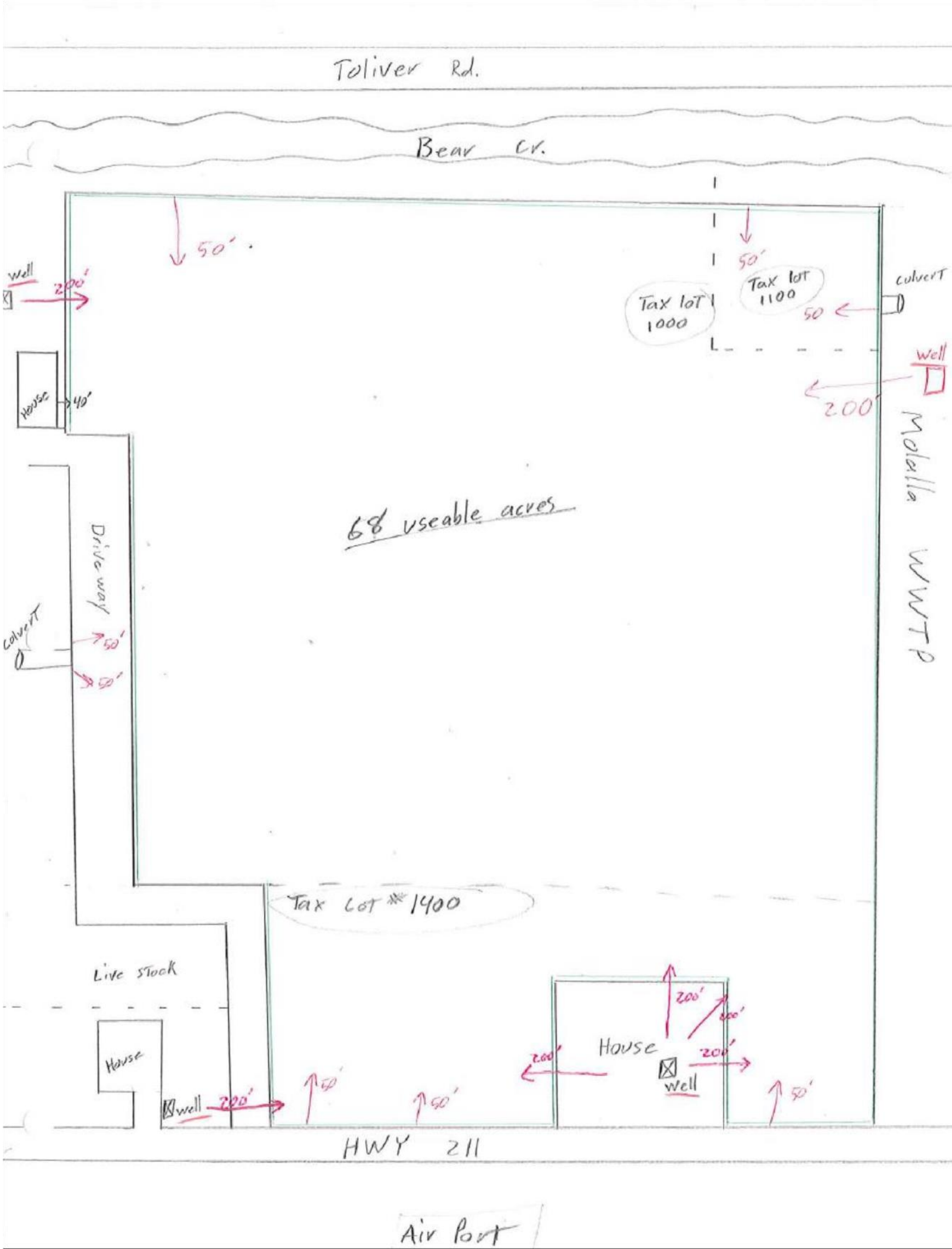
sludge load rates

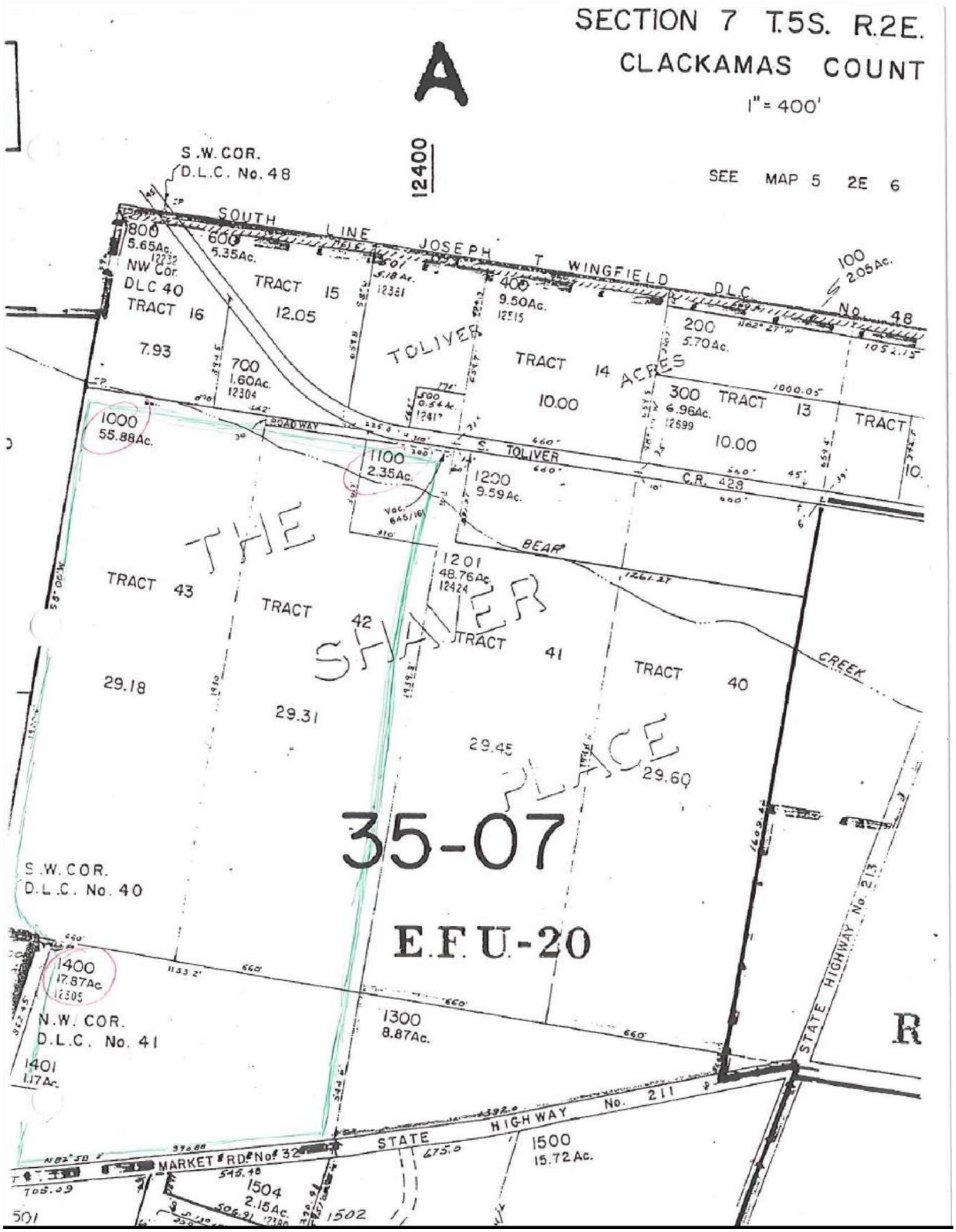
I certify under, penalty of law, that the Class B pathogen requirement in 503.32(b)(2)(ii) and the vector attraction reduction requirement in 503.33(b)(2) have been met. This determination has been made under my direction and supervision in accordance with the system designed to ensure that qualified personnel properly gather and evaluate the information used to determine that the pathogen requirements and the vector attraction reduction requirements have been met. I am aware that there are significant penalties for false certification including the possibility of fine and imprisonment.

Kevin Buckner — Name of biosolids manager

[signature] — Signature of biosolids manager

12/25/98 — Date


Toliver Rd.
Bear Cr.
50'
50'
Well
200'
Tax lot 1000
Tax lot 1100
50
culvert
Well
200'
House
40'
Molalla WWTP
68 useable acres
Drive way
culvert
50'
50'
Tax Lot # 1400
Live stock
House
200'
200'
House
200'
200'
Well
well
200'
50'
50'
50'
HWY 211
Air Port

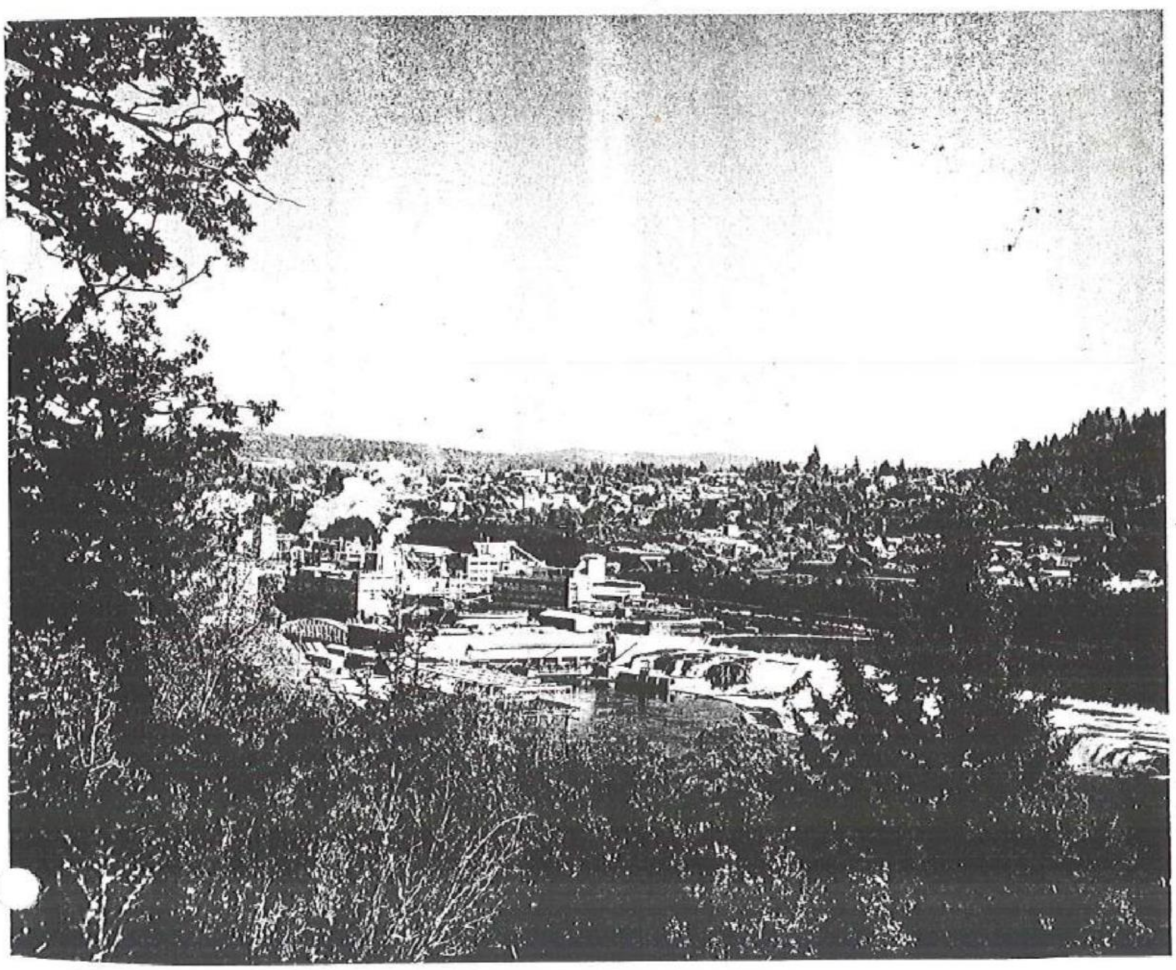

SECTION 7 T.5S. R.2E.
CLACKAMAS COUNT
1" = 400'
A
12400
SEE MAP 5 2E 6
S.W. COR.
D.L.C. No. 48
SOUTH LINE JOSEPH T WINGFIELD D.L.C. No. 48
800
5.65Ac.
600
5.35Ac.
100
2.05Ac.
NW Cor.
DLC 40
TRACT 16
7.93
TRACT 15
12.05
400
9.50Ac.
TOLIVER TRACT 14 ACRES
10.00
200
5.70Ac.
700
1.60Ac.
12304
300
6.96Ac.
TRACT 13
10.00
TRACT
1000
55.88Ac.
ROAD WAY
1100
2.35Ac.
S. TOLIVER
C.R. 428
1200
9.59Ac.
BEAR
CREEK
1201
48.76Ac.
12424
THE SHAVER PLACE
TRACT 43
29.18
TRACT 42
29.31
TRACT 41
29.45
TRACT 40
29.60
35-07
E.F.U-20
S.W. COR.
D.L.C. No. 40
1400
17.87Ac.
N.W. COR.
D.L.C. No. 41
1401
1.17Ac.
1300
8.87Ac.
STATE HIGHWAY No. 211
STATE HIGHWAY No. 213
MARKET RD. No. 32
1500
15.72 Ac.
1504
2.15Ac.
1502
501
R

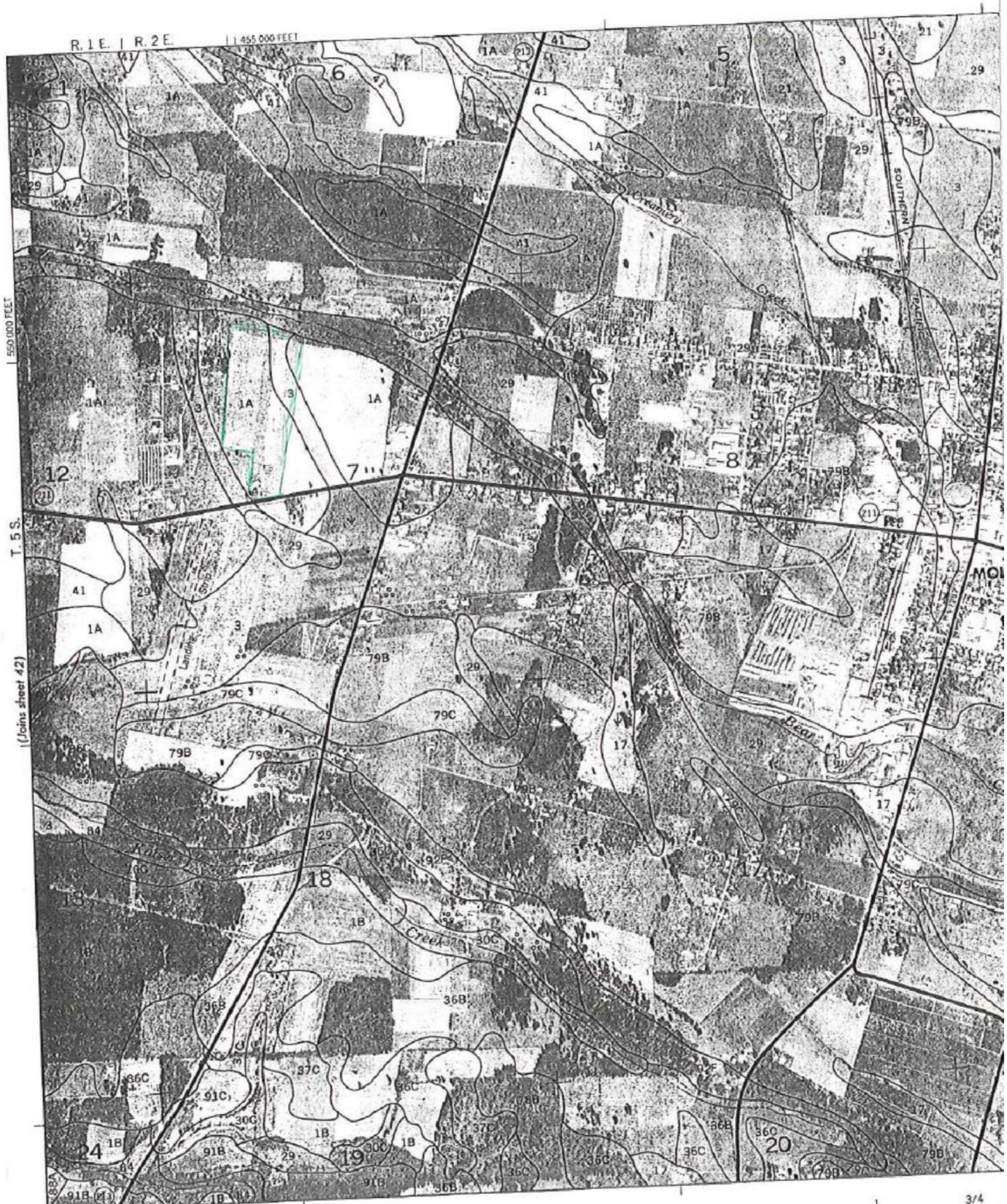
United States
Department of
Agriculture

Soil
Conservation
Service

In cooperation with
United States
Department of
the Interior,
Bureau of Land
Management, and
Oregon Agricultural
Experiment Station

# Soil Survey of Clackamas County Area, Oregon




R. 1 E.
R. 2 E.
455 000 FEET
550 000 FEET
T. 5 S.
(Joins sheet 42)
SOUTHERN PACIFIC
Creek
1A
3
29
41
79B
79C
1B
36B
36C
37C
91B
91C
17
84
21
1
5
6
7
8
12
13
18
19
20
24
3/4

give properties of the soils and the limitations, capabilities, and potentials for many uses. The Glossary defines many of the terms used in describing the soils or miscellaneous areas.

## Map Unit Descriptions

**1A—Aloha silt loam, 0 to 3 percent slopes.** This deep, somewhat poorly drained soil is on broad valley terraces. It formed in stratified glaciolacustrine deposits. The vegetation in areas not cultivated is mainly Douglas-fir, Oregon white oak, snowberry, rose, tall Oregon-grape, grasses, and forbs. Elevation is 150 to 350 feet. The average annual precipitation is about 40 to 60 inches, the average annual air temperature is 52 to 54 degrees F, and the average frost-free period is 165 to 210 days.

Typically, the surface layer is very dark grayish brown silt loam about 8 inches thick. The upper 27 inches of the subsoil is dark brown, dark grayish brown, and yellowish brown silt loam, and the lower 16 inches is dark grayish brown and dark brown loam. The upper 9 inches of the substratum is dark brown loam. Below this are dark grayish brown, stratified very fine sandy loam and silt loam. The lower part of the subsoil and the upper part of the substratum in places are slightly brittle and weakly cemented.

Included in this unit are small areas of Woodburn, Quatama, Huberly, and Dayton soils. Included areas make up about 15 percent of the total acreage.

Permeability of this Aloha soil is moderately slow. Available water capacity is 11 to 13 inches. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. The water table is at a depth of 12 to 24 inches in winter and early in spring. This soil is droughty in summer.

Most areas of this unit are used for crops, mainly sweet corn, bush beans, winter wheat, and pasture. Among the other crops grown are filberts, strawberries, and grass seed. Some areas of the unit are used for homesite development and wildlife habitat. This unit is subject to increased use as homesites. Where the unit has been used as homesites, as much as 80 percent of the area not covered by buildings or other impervious material has been disturbed. The disturbed areas have been covered by as much as 20 inches of fill material or have had as much as 30 inches of the original profile removed by cutting and grading. The fill material is most commonly from adjacent areas of Aloha soils that have been cut or graded.

This unit is suited to crops. It is limited mainly by wetness and droughtiness. Most climatically adapted crops can be grown if drainage is provided. Tile drainage can be used to reduce wetness if a suitable outlet is available. In summer, irrigation is required for maximum production of most crops. Sprinkler irrigation is a suitable method of applying water.

Excessive cultivation of the soil in this unit can result in the formation of a tillage pan, which can be broken by subsoiling when the soil is dry. Returning all crop residue to the soil and using a cropping system that includes grasses, legumes, or grass-legume mixtures help to maintain fertility and tilth. Grain and grasses respond to nitrogen; legumes respond to phosphorus, boron, sulfur, and lime; and vegetables and berries respond to nitrogen, phosphorus, and potassium. When the soil is wet, grazing and other activities that cause trampling result in compaction of the surface layer, poor tilth, and excessive runoff.

If this unit is used for homesite development, the main limitations are wetness and the moderately slow permeability. Drainage is needed if roads and buildings are constructed. Wetness is reduced by installing drain tile around footings. Septic tank absorption fields do not function properly during rainy periods.

Preserving the existing plant cover during construction helps to control erosion. Topsoil can be stockpiled and used to reclaim areas disturbed by cutting and filling. Drainage is needed for best results with most lawn grasses, shade trees, ornamental trees, shrubs, vines, and vegetable gardens. Plants that tolerate wetness and droughtiness should be selected if drainage and irrigation are not provided.

This map unit is in capability subclass IIw.

**1B—Aloha silt loam, 3 to 6 percent slopes.** This deep, somewhat poorly drained soil is on broad valley terraces. It formed in stratified glaciolacustrine deposits. The vegetation in areas not cultivated is mainly Douglas-fir, Oregon white oak, snowberry, rose, tall Oregon-grape, grasses, and forbs. Elevation is 150 to 350 feet. The average annual precipitation is about 40 to 60 inches, the average annual air temperature is 52 to 54 degrees F, and the average frost-free period is 165 to 210 days.

Typically, the surface layer is very dark grayish brown silt loam about 8 inches thick. The upper 27 inches of the subsoil is dark brown, dark grayish brown, and yellowish brown silt loam, and the lower 16 inches is dark grayish brown and dark brown loam. The upper 9 inches of the substratum is dark brown loam. Below this are stratified very fine sandy loam and silt loam. The lower part of the subsoil and upper part of the substratum in places are slightly brittle and weakly cemented.

Included in this unit are small areas of Woodburn, Quatama, Huberly, and Dayton soils. Included areas make up about 15 percent of the total acreage.

Permeability of this Aloha soil is moderately slow. Available water capacity is about 11 to 13 inches. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. The water table is at a depth of 12 to 24 inches in winter a early in spring. This soil is droughty in summer.

nd ... Brushy plants such as alder and salal limit
al regeneration of Douglas-fir.
his unit is used for homesite development, the main
tions are slope, moderately slow permeability,
-swell potential, and the hazard of erosion.
vation for roads and buildings increases the risk of
on. Preserving the existing plant cover during
truction helps to control erosion. Roads and
ings should be designed to offset the limited ability
e soil in this unit to support a load.
this unit is used for septic tank absorption fields, the
limitation is the moderately slow permeability. The
pness of slope is a concern in installing septic tank
orption fields.
his map unit is in capability subclass VIe.

**E—Alspaugh clay loam, 30 to 50 percent slopes.** deep, well drained soil is on high terraces and ng uplands. It formed in alluvium and colluvium ived dominantly from andesite and tuff. The native etation is mainly Douglas-fir, red alder, salal, ckenfern, and swordfern. Elevation is 800 to 1,800 t. The average annual precipitation is about 60 to 85 hes, the average annual air temperature is 48 to 52 grees F, and the average frost-free period is 140 to 0 days.

Typically, the surface layer is dark brown clay loam out nches thick. The subsoil is dark brown and ddish brown clay about 29 inches thick. The bstratum to a depth of 60 inches or more is reddish own very gravelly clay.

Included in this unit are small areas of McCully, inney, and Aschoff soils. Included areas make up about 0 percent of the total acreage.

Permeability of this Alspaugh soil is moderately slow. vailable water capacity is about 5.5 to 9.5 inches. ffective rooting depth is 60 inches or more. Runoff is apid, and the hazard of water erosion is severe.

This unit is used for timber production, wildlife habitat, nd recreation.

This unit is suited to the production of Douglas-fir. The site index for Douglas-fir ranges from 143 to 159. On the basis of a site index of 150, the potential production per acre of merchantable timber is 9,480 cubic feet from an even-aged, fully stocked stand of trees 60 years old or 86,800 board feet (International rule, one-eighth-inch kerf) from an even-aged, fully stocked stand of trees 80 years old.

The main concerns in producing and harvesting timber are slope and the hazard of erosion. Conventional methods of harvesting trees are difficult to use on this unit because of the steepness of slope. Highlead or other cable logging methods can be used. Use of these methods is limited during November through March. Roads need heavy base rock for year-round use. Roads ar idings can be protected from erosion by constructing water bars and by seeding cuts and fills.

Brushy plants such as alder and salal limit natural regeneration of Douglas-fir.

This map unit is in capability subclass VIe.

**3—Amity silt loam.** This deep, somewhat poorly drained soil is on broad valley terraces. It formed in stratified glaciolacustrine deposits. Slope is 0 to 3 percent. The vegetation in areas not cultivated is mainly Douglas-fir, Oregon white oak, wild rose, willow, and grasses. Elevation is 150 to 350 feet. The average annual precipitation is about 40 to 50 inches, the average annual air temperature is 50 to 54 degrees F, and the average frost-free period is 165 to 210 days.

Typically, the surface layer is very dark grayish brown silt loam about 15 inches thick. The subsurface layer is dark gray silt loam about 7 inches thick. The subsoil is grayish brown and light olive brown silty clay loam about 13 inches thick. The substratum to a depth of 60 inches or more is olive brown silty clay loam.

Included in this unit are small areas of Woodburn, Aloha, Dayton, and Huberly soils. Included areas make up about 15 percent of the total acreage.

Permeability of this Amity soil is moderately slow. Available water capacity is about 11 to 13 inches. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. The water table is at a depth of 6 to 18 inches in winter and early in spring. This soil is droughty in summer.

Most areas of this unit are used for cultivated crops and pasture. The main cultivated crops are sweet corn and bush beans. Among the other crops grown are winter wheat, blackberries, filberts, and grass seed. This unit is also used for homesite development, wildlife habitat, and recreation.

This unit is suited to crops. It is limited mainly by wetness. Most climatically adapted crops can be grown if drainage is provided. Tile drainage can be used to reduce wetness if a suitable outlet is available. In summer, irrigation is required for maximum production of most crops. Sprinkler irrigation is a suitable method of applying water.

Excessive cultivation of the soil can result in the formation of a tillage pan, which can be broken by subsoiling when the soil is dry. Returning all crop residue to the soil and using a cropping system that includes grasses, legumes, or grass-legume mixtures help to maintain fertility and tilth. Grain and grasses respond to nitrogen; legumes respond to phosphorus, boron, sulfur, and lime; and vegetables and berries respond to nitrogen, phosphorus, and potassium. When the soil is wet, grazing and other activities that cause trampling result in compaction of the surface layer, poor tilth, and excessive runoff.

If this unit is used for homesite development, the main limitations are wetness and the moderately slow permeability. Drainage is needed if roads and buildings are constructed. Wetness is reduced by installing drain tile around footings. Septic tank absorption fields do not function properly during rainy periods.

Preserving the existing plant cover during construction helps to control erosion. Topsoil can be stockpiled and used to reclaim areas disturbed by cutting and filling. Drainage is needed for best results with most lawn grasses, shade trees, ornamental trees, shrubs, vines, and vegetable gardens. Plants that tolerate wetness and droughtiness should be selected if drainage and irrigation are not provided.

This map unit is in capability subclass IIw.

**4E—Andic Cryaquepts, moderately steep.** These moderately deep to deep, very poorly drained soils are along drainageways of high mountainous uplands. They formed in colluvium derived dominantly from andesite and basalt mixed with volcanic ash. Slope is 5 to 30 percent. The native vegetation is mainly red alder, mountain alder, and devilsclub with scattered western hemlock and western redcedar (fig. 5). Elevation is 2,700 to 4,000 feet. The average annual precipitation is 80 to 100 inches, the average annual air temperature is 40 to 45 degrees F, and the average frost-free period is 30 to 90 days.

No single profile of Andic Cryaquepts is typical, but one commonly observed in the survey area has a surface layer of cobbly sandy loam about 7 inches thick. The subsoil is very gravelly sandy loam about 19 inches thick. The substratum to a depth of 60 inches or more is compacted, slightly brittle very cobbly sandy loam. In some areas of similar included soils, the surface layer is silt loam or loam. Depth to bedrock is 30 to 60 inches or more.

Included in this unit are small areas of Highcamp, Soosap, and Kinzel soils and Rock outcrop. Also included are small areas of organic soils in the more

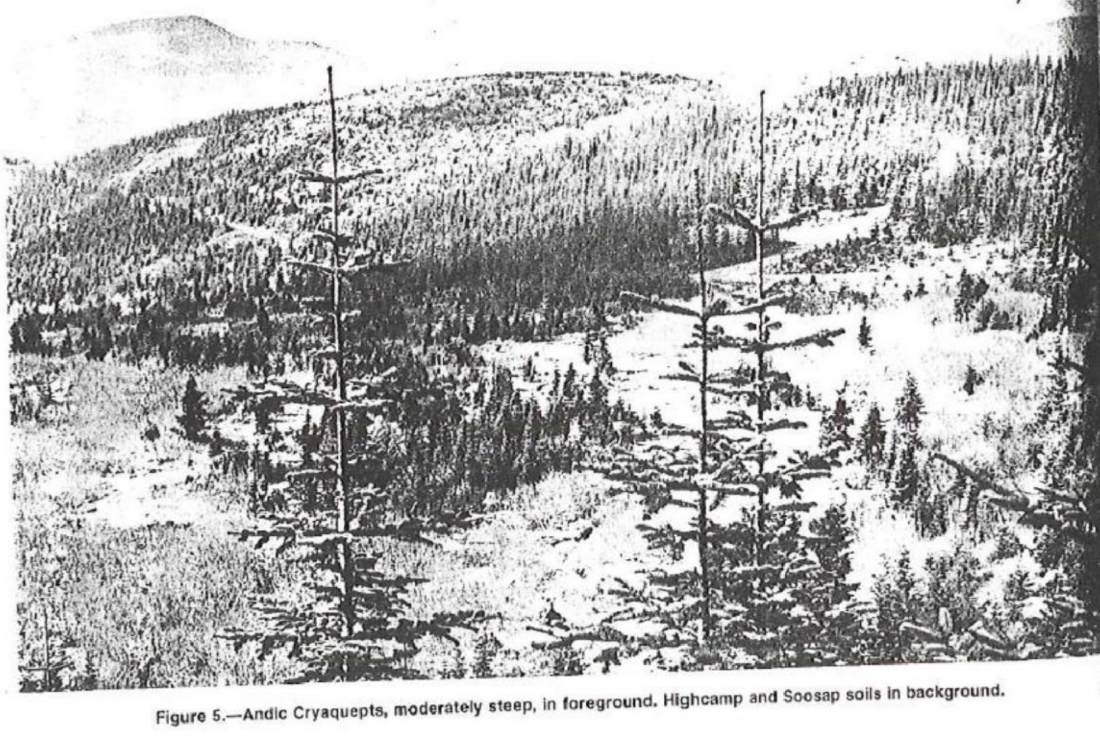


**Figure 5.—Andic Cryaquepts, moderately steep, in foreground. Highcamp and Soosap soils in background.**

**Biosolids Facts and Agreement**

I, the undersigned, do hereby certify that I have read and understand the following information and requirements regarding the disposal of biosolids on my property:

**Origin**

Digested municipal biosolids is the result of treating human wastes under controlled conditions. This reduces chances of odor and disease. This material is well suited as a soil amendment and for supplementing crop nitrogen requirements.

**Precautions**

Because of the origin of the biosolids, it is necessary to take certain precautions with its application and disposal to prevent contamination of surface or groundwater's and reduce the possibility of nuisance odor conditions. Care must be taken to maintain a minimum 50 foot setback from a ditch, channel, pond or waterway. A minimum setback of 200 feet must be maintained from downgradient springs, infiltration galleries, water withdrawal points from surface waters and wells.

Other precautions include maintaining buffer zones adjacent to property lines and residential areas. The amount of distance necessary to make up a buffer zone will very with local conditions and the method of biosolids application.

**Responsibility**

It is the city's responsibility to insure the proper handling and disposal of all biosolids generated at the sewage treatment plant. Precautions must be taken in transporting the biosolids from treatment plant to the application site to prevent leaking or spilling the biosolids onto highways, streets, roads, or waterways.

**Access**

The land owner/controller must limit access to the biosolids site for 12 months following application if the biosolids is not worked into the soil. Access is assumed to be controlled if the site is located on rural private land.

**Cropping**

As a general guideline, crops grown for direct human consumption (fresh market fruits and vegetables) should not be planted sooner that 18 months after biosolids application. If the crop is to be treated or processed prior to marketing so that disease causing organisms are not a concern, the DEQ may allow biosolids application within 18 months.

Other crops, such as grains, may receive biosolids applications up to 60 days prior to harvest. There are no time restrictions for non-edible crops such as grass and nursery stock.

**Grazing**

Application of digested biosolids is allowed on pasture and forage crops. However, Federal regulations prohibit "animals whose products are consumed by humans" from grazing for at least 30 days after biosolids application. This is especially true for dairies, where animal contact or direct intake of biosolids, through grazing, could result in milk contamination.

**Application of Municipal Biosolids**

The application of digested biosolids on agricultural land should be managed to utilize its fertilizer value to the maximum extent possible. The recommended amount of biosolids to be applied to you land is based on nitrogen requirements of the crop(s) you plan to grow and will very depending on the amount of nitrogen in the biosolids.

It is important to use only the amount of nitrogen, either from biosolids or from commercial fertilizer, which your crop requires. The amount of commercial fertilizer you would normally use must be reduced by the amount available in the biosolids to be applied on your land. If too much nitrogen is applied, whether from biosolids or commercial fertilizer, it can leach into groundwater and cause pollution.

Determining the proper amount of sludge to be applied is the responsibility of the treatment plant staff. However, it is important that the landowner provide accurate information on the crop to be grown, so that proper correct application rates might be chosen.

---

T. R. JORGENSEN

Print name of site owner

12305 ~~12129~~ S. Hwy 211, Molalla, OR. 97038

Site Description (address)

[signature]

Signature of site owner

12-29-98

Date

---

Dennis St. Clair

Molalla Plant Superintendent

[signature]

Signature of Superintendent

1/4/99

Date

SLUDGE SITE EVALUATION WORKSHEET (SEE ATTACHED MAP FOR PROFILE LOCATIONS)

Kern Buckner

Site No: 2 Examiner: BW Henderson w/ Date: 10/29/98

Owner: Shim Jorgensen Acres: 1100: 1.50 / 1000: 50, 2.35 / 35.85 Crop: Silage Corn Irrigated?: yes *

T.L.: 1100 / 1000 Sec: 7 TWP: 5S R: 2E Co: Clackamas

Sludge Generator: Molalla WWTF Application Method: truck

* effluent reuse water from Molalla WWTF

140→170N

| Factor | Test Pit | | | |
|---|---|---|---|---|
| | Pit 1 | Pit 2 | Pit 3 | Pit 4 |
| Landscape Position | low Valley terrace - Valley soils w/ gvls & cbbls, - M ≥ 12" & ESD ≥ RDS: ≥ 2' - 0-3% slope - plowed land - 2 possible wells on prop (residences) & one adj well - 50' buffers; ditches along road & adj to Bear Cr. & Bear Cr. - Seasonal appl. 5/15 to 10/15 w/ caution in May & early June: wet soils → trafficability & ponding / runoff | | | |
| % Slope | | | | |
| Direction of Slope | | | | |
| Topsoil Texture | | | | |
| Topsoil Color | | | | |
| Probable CEC | | | | |
| %/Type Coarse Frag. | | | | |
| Rooting Depth (In) | | | | |
| Effective Soil Depth (In) | | | | |
| Depth to Evid. of Sat (In) | | | | |
| Type Groundwater | | | | |
| Depth to Rap. Drain. Mat. (In) | | | | |
| Other | | | | |

## SITE CRITERIA

- o Stable Landform
- o No Flooding
- o No Run Off to Nearby Land
- o Perm. G.W. to be 48" at Sludge Appl.
- o Temp. G.W. to be 12" at Sludge Appl.
- o Slope = 12% for Wet Sludge
- o 24" + Rooting Depth
- o 24" + To Rapidly Draining Materials

## BUFFERS

**Residential:**

Injection = None

Truck Spread = 0' - 50'

Spray = 300' - 500'

**Major Highways:**

Surface Water = 50'

Water Source = 200'

MPR:h
WH583
1/28/86

# Appendix H: Spill Contingency Plan

# 2012 Biosolids Spill Contingency Plan
# For the City of Molalla

## Spills During Hauling:

**Amounts over 50 gallons:**

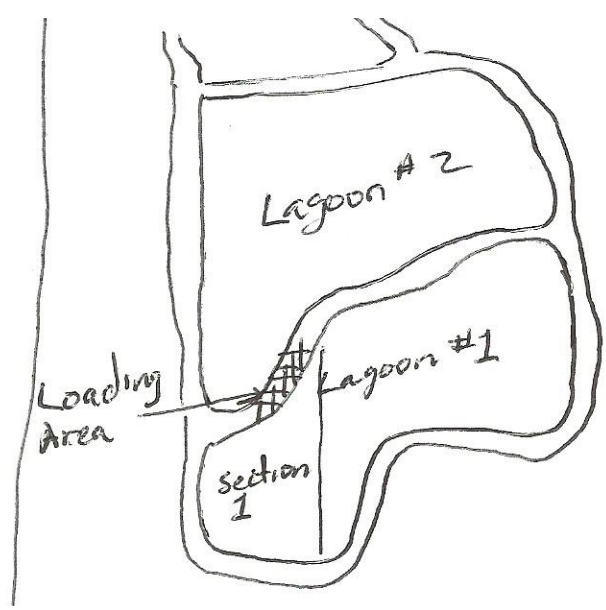
- Call Oregon Emergency Response System at 1 (800) 452-0311.
- Call the Head of Public Works for the City of Molalla at (503) 793-7026.
- Have him send the vactor trailer to suck up as much as possible.
- Try to contain the Spill with berms.
- Try to stop the leak.
- If possible contain area with caution tape.

**Amounts under 50 gallons:**

- Put out berms or containment materials
- Notify Head of Public Works for the City of Molalla at (503) 793 7026  Use vactor trailer to suck up the spill.
- Apply absorbent material to remaining amount.
- Apply lime to the surface after it is sucked up to kill pathogenic material.

## Spills During Loading:

The truck will be parked on the dike between number one and number two lagoons. There will be a layer of liner material laid down on the dike prior to the truck driving in to load. Any spilled material will naturally flow back into one of the two lagoons. The remaining residue will be washed back into the lagoons with a hose to avoid nuisance conditions. See map of loading area.



## Notes:

Biosolids contain Pathogenic organisms. Avoid contact with skin. Always wash hands thoroughly after any contact.

## Spill containment Equipment:

Check the spill containment equipment before start of hauling each day to make sure that everything is in the truck and in usable condition. It is also necessary to do a pre trip inspection on the vehicle every day before use.

**Checklist:**

4 spill containment booms
1 50lb sack of lime
2 50lb sacks of absorbent material
1 copy of spill containment plan with contact info 1 exposure
kit gloves suit face shield mask.