Attachment # 6
September 14, 2005
Biosolid Management Plan
for
The City of Toledo

File Number: 89103
Permit Number: 101713

Facility address:
City of Toledo
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Toledo OR 97391

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I. Treatment Facility

Introduction:

The City of Toledo (pop. 3450) owns and operates a municipal sewage collection and treatment system under National Discharge Elimination System (NPDES) permit number (101713) issued August 6, 1999 expired on June 30, 2004, EPA number OR 002086-9. Wastewater processed by the sewage treatment works is principally of domestic origin. In 2001 the City of Toledo upgraded their activated sludge wastewater facility to include modification to existing basins, a new headwork, a new aerobic digester and a new secondary clarifier. The facility is located at 1105 SE Fir Street. The treatment facility is classified as Treatment System III and a Collection System II. There is no pretreatment program required for this facility. The raw sewage coming to the wastewater facility is 91% residential, 7.9 % commercial, 1.0 % industrial. Treated effluent from the treatment plant is discharged to Yaquina River, Lincoln County, Oregon.

A) Wastewater Processing:

Toledo operates an activated sludge plant with aerobic digesters. Designed average dry weather flow is approximately 0.710 million gallons per day (MGD). Early in the year, this facility runs in extended aeration mode until the plant starts to nitrify at which time plant personnel shift to plug flow mode.

Influent passes through the headwork which consists of bar screening and pista-grit removal, flow monitoring, automatic sampling, and flow splitting. The flow then is directed to Aeration Basin Treatment Unit (ABTU) #1 is 116,321 gallons (gal.), or ABTU#2 is 191,328 gal. Aeration basin effluent is transferred to one of two Secondary Clarifier Treatment Units (SCTU#1 is 139,300 gal., new SCTU#2 is 358,200 gal.) where solids are allowed to settle out. Portions of the solids are returned to the aeration basin and portions of the solids are wasted to the aerobic digesters. Toledo operates three Aerobic Digesters Treatment Unit (ADTU#1 114,000 gal., ADTU#2 191,328 gal., ADTU#3 (new) 200,000 gal.). Sludge can be removed from the digester directly, pumped to 92,000 gal. sludge storage tank, or pumped to one of four drying beds 30,270 gal. each, or 121,000 gal. total. Sludge receives further treatment by desiccation in one of two drying beds to achieve Class B biosolid prior to being land applied on a regional authorized biosolids sites. Clarifier effluent is directed to a two channel chlorine contact chamber for

disinfection and discharged to the Yaquina River. The old SCTU2 Clarifier has been converted a surge basin for high flows.

B) Solids Processing:

There are three (3) potential end routes for generating biosolids from this facility and they are:

1) Liquid Biosolids removed from the aerobic digesters,
2) Sludge Storage tank, and
3) Cake Biosolids from the air-drying beds

C) Solids Storage Structure:

From the aerobic digesters, sludge can be pumped to a truck for land application or to the sludge storage tank, or pumped to one of four (4) drying beds to receive further treatment by desiccation in the drying beds prior to being land applied. All Class B biosolids are land applied on a regional DEQ authorized land application sites**.**

D) Septage Receiving Facility:

Septage, only RV holding tanks, is received at the Toledo wastewater treatment facility. The city provides a public RV dump station which is located adjacent to the Butler Bridge sewer lift station.

E) Pretreatment Program:

The city's does not have an industrial wastewater pretreatment program. Pretreatment program help protect the environment and the area's wastewater collection, treatment facilities and biosolids quality by regulating potentially contaminated wastewater discharges from commercial and industrial activities.

II Solid Treatment Processes

The EPA's 40 CFR Part 503 and DEQ's OAR340-50 allow permittees to use EPA approved alternatives to satisfy Class A and B biosolids pathogen and vector attraction reduction criteria. The permittee must notify the Department in writing and get approval prior to any process change that would utilize pathogen reduction or vector attraction reduction alternatives other than their primary reduction alternatives contained in this management plan. The permittee must also certify that the alternatives used are EPA approved and that sampling and monitoring conforms to the 40 CFR 503 and OAR 340-050 regulations.

Pathogen Reduction

To meet the Part 503 regulatory requirements, pathogen reduction must be met before vector attraction reduction or at the same time vector attraction reduction is achieved.

Class A Biosolids

With all Class A alternatives, microbial monitoring for fecal coliforms or *Salmonella* sp. is required (see section A and B below). This management plan lists the primary alternative and options employed by the permittee to meet Class A and B biosolids criteria.

A) Monitoring for Fecal Coliform or *Salmonella* sp.

Monitoring for Fecal Coliform or *Salmonella* sp. is required to detect growth of bacterial pathogens. Because Class A biosolids may be used without site restrictions, all Class A material must be tested to show that the microbial requirements are met at the time when it is ready to be used, disposed, sold or given away. In addition to meeting process requirements, Class A biosolids must meet one of the following requirements:

- Either the density of the fecal coliforms in the biosolids be less than 1,000 MPN per gram total solids (dry gram weight),
- *Or* the density of *Salmonella* sp. Bacteria in the biosolids be less than 3 MPN per 4 grams of total solids (dry weight basis).

Unlike Class B biosolids, Class A requirements are not based on an average value. Sampling for Class A biosolids consists of at least seven (7) discrete samples taken over a 2-week period. Test results are required before Class A material can be release for use or disposal. The microbial requirement that a Class A biosolids must meet is either:

- At the time of use or disposal, or;
- At the time the biosolids are prepared for sale or given away in a bag or other container for land application, or;
- At time the biosolid or material derived from the biosolid is prepared to meet the requirements in 503.10(b), 503.10 (c), 503.10 (e) or 503.10 (f).

B) Class A Pathogen Reduction Alternatives

Alt. 3) Sewage Sludge treated in known Processes 503.32(a) (5)

This requirement relies on comprehensive monitoring of bacteria, enteric viruses and viable helmith ova to demonstrate adequate reduction of pathogens:

- Either the density of the fecal coliforms in the sewage sludge be less than 1,000 MPN per gram total solids (dry gram weight), *Or* the density of *Salmonella* sp. Bacteria in the sewage be less than 3 MPN per 4 grams of total solids (dry weight basis).
- The density of enteric viruses in the sewage sludge must be tested prior to pathogen reduction treatment and then again after pathogen treatment at which time the enteric viruses must be less than 1 PFU per 4 grams of total solids (dry weight basis).
- The density of viable helmith ova in the sewage sludge must be tested prior to pathogen reduction treatment and then again after pathogen treatment at which time the viable helmith ova must be less than 1 PFU per 4 grams of total solids (dry weight basis).

Alt. 5) Processes to Further Reduce Pathogens (PFRP) #1 Composting. Using either the within vessel composting method or the static aerated pile composting method, the temperature of the sewage sludge is maintained at 55^0C (131^0F) for three days. Note: must meet Class A compost criteria at the same time you meet Class B compost pathogen reduction criteria.

Class B Biosolids

Class B biosolids can be met by using one of three alternatives, the two primary alternatives used by this facility are

- Alt. 1) Monitor sewage sludge for fecal coliform 503.32(b)(2), and;
- Alt. 2) Use Process to Significantly Reduce Pathogen (PSRP) 503.32(b)(3).

Alt. 1) Monitoring sewage sludge for fecal coliform 503.32(b) (2) requires that seven samples of treated sewage sludge (biosolids) be collected and that the geometric mean fecal coliform density of these samples be less than 2 million MPN per dry gram biosolid (dry weight basis).

Alt. 2) Use Process to Significantly Reduce Pathogen (PSRP) 503.32(b)(3)* considers sludge treated in one of the PSRPs listed in Appendix B of the 40 CFR Part 503 to meet Class B biosolid criteria for pathogen reduction.
For this facility the following PSRPs are primarily used:

- #1 Aerobic digestion, sludge is treated in air/oxygen for a specified residence time at a specified temperature. Values of the mean cell residence time and temperature shall be between 40 days at 20C (68F) and 60 days at 15C (59F)
- #2 Air Drying, sludge air dried on beds for minimum of 3 months (ambient temperature above 0C (32F) 2 out of the 3 months,
- #4 Composting, the temperature of the sewage sludge is raised to 40^0C (104^0F) or higher and remains at 40^0C or higher for 5 days. For 4 hours during the 5-day period, the temperature in the compost pile must exceed 55^0C (131^0F), and
- #5 Lime stabilization, sufficient lime is added to the sewage sludge to raise the pH of the sewage sludge to 12 with no further addition of alkali agent, and maintain sludge pH of 12 active-mix for 2-hours.

* The Department recommends the permittee still collect and run a geometric mean for fecal coliform density on a representative sample each year to ensure the pathogen reduction is less than 2 million MPN per dry gram biosolid (dry weight basis).

C) Vector Attraction

This facility primarily uses the following vector attraction reduction options:

Opt. 1) The % volatile solid reduction calculation to use for anaerobic digester sludge that is decanted and that does not have appreciable grit accumulation would be the Van Kleeck or Approximate Mass balance (AMB) equation depending upon the percent solids in the decantante (**Attachment 6A**).

To meet the biosolid vector attraction reduction requirements, an aerobic digester must provide a 40 day detention time at 20^0C in a completely mixed high rate digester in order to achieve a volatile solids reduction of 38 % or more. There are alternative volatile solid reduction methods that are deemed equivalent to the 38% volatile solid reduction criteria under the EPA's and the DEQ's regulations.

Opt. 3) When the 38% volatile solids reduction can not be met for aerobically treated solids, vector attraction reduction can be demonstrated by showing a less than 15% additional volatile solid loss during bench-scale aerobic batch digestion (2% TS or less) of the sewage sludge for 30 additional days at 20^0C (68^0F).

Opt. 4) The Specific Oxygen Uptake Rate (SOUR) for sewage sludge treated in an aerobic process shall be equal to or less than 1.5 milligrams (mg) of oxygen per hour per gram of total solids (2% or less total solids, dry weight basis) at a temperature of 20^0C.

Opt.5) Aerobic treatment of sludge for at least 14 days at over 40^0C (104^0F), during the process the average temperature must be over 45^0C (Compost).

Opt. 6) The pH of the sewage sludge shall be raised to a pH of 12 or higher by the addition alkali agent and without the addition of more alkali agent. The batch shall remain at a pH of 12 or, for two hours or more active mix; and at a pH of 11.5 of higher for an additional 22 hours.

Opt. 7) The sewage sludge must achieve 75% solid by drying prior to mixing with other materials. Sewage sludge treated in aerobic or anaerobic process (i.e. Sewage sludge that does not contain unstabilized solids generated in primary wastewater treatment).

Opt 10) Sewage sludge that is land applied shall be incorporated into the soil within 6 hours after application or placement on the land.

D) Batch Processes

Class A Biosolids

Alt. 5, PFRP Compost, compost pile must meet PFRP) of 3 consecutive days at a minimum pile temperature of 55^0C. (Note: Class A PFRP must be met within the Class B PSRP treatment parameter, EPA requirement).

Class B Biosolids
Alt. 3, # 4 PSRP) Compost, Process that Significantly Reduces Pathogens (PSRP) showing an average pile temperature of 45^0C and minimum temperature of 40^0C in the pile within 14 consecutive days.

Note: If the solids to be composted already have achieved Class B criteria, i.e. compost solids that have been aerobically digested and dewatered or air dried prior to composting; then Class B (PSRP) has been demonstrated through aerobic digestion (time and temperature) and the vector attraction reduction (>38 % VS reduction) satisfied prior to beginning the PFRP composting process. The composted biosolids in the compost have been tested for and found to meet Class B pathogen criteria.

III Biosolid Characteristics

Toledo's treatment works utilizes an activated sludge process. The treatment facility wastes activated sludge from the secondary clarifiers to the aerobic digester(s). The sludge undergoes a minimum of 60-days of digestion at a minimum temperature of 15^0C prior to removal and staff performing a volatile solids reduction calculation. For the past five- (5) years, the average volatile solids reduction criteria has been achieved by Toledo's wastewater treatment facility.

Annually, Toledo has generated approximately 40 dry tons of biosolids. For the year 2004, Toledo land applied 40 tons (36 dry metric tons) of Class B biosolids. Under the 40 CFR Part 503, Toledo is required to sample biosolids one time per year. Frequency of monitoring depends on the amount biosolids generated that is marketed to be sold or given away, or land applied. Frequency depends on the amount of bulk biosolids applied to the land, or the amount of sewage sludge received by a person who prepares biosolids that is sold or

given away in a bag or other container for application to the land (dry weight basis), or the amount of biosolids (excluding domestic septage) placed on a surface disposal site.

Sampling

The following are sampling reference publications: "Sludge Sampling and Analysis guidance Document", (EPA 1993) and ASTM Standard E 300-86, "Standard Practice for Sampling Industrial Chemicals" (ASTM 1992a).

1) Aerobic Digesters

Sample location: Sample port on discharge line from the digester to the tanker.

Number and type of sample taken per day: Class B Biosolids, composite of 7 or more discrete samples collected throughout the pump over sampling period.

Sample storage and transport: Samples are stored at 4^0C in an ice chest or refrigerator. Samples are transported in an ice chest to maintain proper temperature during delivery to laboratory. Pathogen samples are delivered to lab within 24 hours of sample collection.

Sample analysis method: EPA 9045; EPA 160.3;EPA 160.4; SM 4500-NH3B; EPA 353.2; EPA 365.3; EPA 351.3; SW-846 7060; SW-846 6010; SW-846; SW-846 7481; SW-847 7471; SW-846 7740; SM 18th, 9221E.1; SM 18:9260D.1; ASTM D 4994-89; EPA 600/1-87/014; EPA 8240; EPA 1613; EPA 8270; EPA 1613B; EPA 1668 (may include one or more of the referenced methods).

3) Sludge Thickening process

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Sample location: Center of 8 quadrants from the basin.

Number and type of sample taken per event: Composite from all sampling points in each digester. Sample includes the entire proposed sludge column to be dredged (not the water cap above the sludge layer).

Sample storage and transport: Composite sample is stored at 4 ^{0}C in an ice chest or refrigerator. Samples are transported in an ice chest to maintain temperature during delivery to laboratory. Pathogen samples are delivered to lab within 10 hour of sample collection.

Sample analysis method: EPA 9045; EPA 160.3;EPA 160.4; SM 4500-NH3B; EPA 353.2; EPA 365.3; EPA 351.3; SW-846 7060; SW-846 6010; SW-846; SW-846 7481; SW-847 7471; SW-846 7740; SM 18th, 9221E.1; SM 18:9260D.1; ASTM D 4994-89; EPA 600/1-87/014; EPA 8240; EPA 1613; EPA 8270; EPA 1613B; EPA 1668 (may include one or more of the referenced methods).

4) Air Drying Beds (ABD)

Sample location: Center of 4 quadrants from each ADB in service.

Number and type of sample taken per batch: Four discrete samples from each ADB in service are mixed together to form a composite sample, a minimum of 6 times per year.

Sample storage and transport: Samples are stored at 4^0C in an ice chest or refrigerator. Samples are transported in an ice chest to maintain temperature during delivery to laboratory. Pathogen samples are delivered to lab within 10 hour of sample collection.

Sample analysis method: EPA 9045; EPA 160.3;EPA 160.4; SM 4500-NH3B; EPA 353.2; EPA 365.3; EPA 351.3; SW-846 7060; SW-846 6010; SW-846; SW-846 7481; SW-847 7471; SW-846 7740; SM 18th, 9221E.1; SM 18:9260D.1; ASTM D 4994-89; EPA 600/1-87/014; EPA 8240; EPA 1613; EPA 8270; EPA 1613B; EPA 1668 (may include one or more of the referenced methods).

5) Compost

Sample location: Random depths and locations within the compost pile

Number and type of sample taken per batch: 7 discrete samples are mixed together to form a composite sample for metal analysis; NOTE for Class A Biosolid require seven (7) discrete samples for pathogen testing.

Sample storage and transport: sample is stored at 4^0C in an ice chest or refrigerator. Samples are transported in an ice chest to maintain proper temperature during delivery to laboratory. Pathogen samples are delivered to lab within 10 hour of sample collection.

Sample analysis method: EPA 9045; EPA 160.3;EPA 160.4; SM 4500-NH3B; EPA 353.2; EPA 365.3; EPA 351.3; SW-846 7060; SW-846 6010; SW-846; SW-846 7481; SW-847 7471; SW-846 7740; SM 18th, 9221E.1; SM 18:9260D.1; ASTM D 4994-89; EPA 600/1-87/014; EPA 8240; EPA 1613; EPA 8270; EPA 1613B; EPA 1668 (may include one or more of the referenced methods).

Biosolid Analysis:

Biosolid Chemical Analysis:

From the Toledo's 2004 biosolids analysis the following is a representative sampling of the biosolid metal concentration.

Metal	lb. /acre-yr.	site life
Arsenic (As)	0.00026141518	
Cadmium (Cd)	0.00006539048	
Chromium (Cr)	0.00134801311	
Copper (Cu)	0.01244107659	
Lead (PB)	0.0016	165716
Mercury (Hg)	0.0002	75151
Molybdenum (Mo)	0.000002	237388393
Nickel (Ni)	0.0016	225700
Selenium (Se)	0.00011791295	
Zinc (Zn)	0.026	94989

The site life would be limited to 75151 years based on the Mercury loading Toledo's 2004-biosolid analysis **(Attachment 6B)**.

Biosolid Nutrient Analysis:

For the year 2004, the biosolids contained about (156) pounds (lb.) total nitrogen (N) of which about (31) lb. was in the nitrate form (NO3-NO2) and (12) lb. was in the ammonia form (NH3). Other nutrients include (184) lb., phosphorus (P), (63.2) lb., potassium (K), and had a pH of approximately 6. From the analysis Toledo needs approximately (2) acres available for land application to handle their annual biosolids nitrogen production.

IV Biosolids Beneficial Reuse Program

Transportation and Land Application:

Biosolids are off-loaded into a tanker truck at the plant. The biosolids loading area is impounded in case of accidental spillage of biosolids during the truck loading process. This area has a drain that ties back into the facility. During the summer months, Toledo's biosolids are land applied on several sites. For the year 2004, Toledo land applied onto several DEQ authorized sites totaling about 71 acres. The biosolid land application sites are capable of assimilating Toledo's annual total nitrogen production. The perennial agronomic biosolid land application rate for pastures and grass is 100 lb. available N per acre–yr. The agronomic land application rate for annual ryegrass, the predominate crop utilized by Toledo's land application program, is 100 lb. available N per acre–yr.

Land application: Toledo land applies on authorized pastures and farmlands. All DEQ site authorizations for Toledo are part of Toledo's Biosolid Management Plan. The Toledo currently has 71 acres that are authorized for land application.

Biosolids Site management Information:

Site	Use/ acres	lb. N/acre	lb. N/site
Hughs D	2.8 ac/ Hay	100	201
Hughs S2	7.1 ac /Hay	100	700
Kosydar I	6 ac /Pasture	100	600
Kosydar II	9 ac/ Hay	100	900
Howard I	18 ac / Hay	100	1800
Jimmy's Place	28 ac /Hay	100	2800
Total	70.9 ac		7001

Long term biosolid application rates and site restrictions are contained in the biosolid site authorization letter. References to the OAR 340-50, The 40 CFR Part 503, site setbacks, site agronomic loading rates, land application restrictions and site restrictions are also detailed out in the site authorization letter.

V Contingency Options

In the event biosolids are spilled between the treatment facility and the land application site, Toledo's sewage treatment works shall contain the spill, lime, apply absorbent (for example sand) and remove spilled sludge solids with a front end loader or shovels and dispose of the spillage at a DEQ authorized application or disposal site. All spills into waters of the state or spills on the ground surface that are like to enter waters of the state shall be reported to immediately to Oregon Emergency Response System (OERS) at 1-800-452-0311 and your regional biosolids coordinator at (541) 440-3338 ext. 228. All spills of 25 gallons or more on the ground surface shall be report to the regional biosolids coordinator.

VI Reporting

Daily Reporting and Recordkeeping (40 CFR 503.17& 40 CFR 503.18):

Each year prior to land application of biosolids; the source operators shall check to see if contiguous property owners have changed. The operators shall keep a record of contact (date, and/or written log of phone call w/ name and number, and/or xerox of postcard w/ name and address, etc.,) with contiguous property owners which notifies them of the biosolids land application practice. Operator shall provide this documentation in the annual biosolid report.

Annual Reporting

The Annual Biosolid Report is due February 19 of each year for the previous years land applied biosolids. Part of this report is the submittal of the daily site logs, which have the date, time, and quantity gal-lb. N/acre land applied for each day-tank-batch land applied. Site logs shall have a scaled map showing the site and the land application location that coincides with the daily site loading methods (truck spreader bar, irrigation cannon). Daily records should clearly show the location of daily biosolid loading site log.

Annual Report shall have a signed copy of the certification statements for pathogen reduction, vector attraction reduction and biosolids has been land applied at approved agronomic loading. Person signing statements should be the operator of record at the treatment plant. The operator shall shown how the vector attraction reduction was met i.e., volatile solids reduction was achieved by time and temperature, the Van Kleeck equation filled out with digester records (MCRT), bench scale test, sour test or any other EPA approved alternative method appropriated for biosolid generated at your facility. Certification of pathogen reduction is required and is satisfied by submittal of test results in the Annual Biosolid Report. All the previous year's biosolids sampling and analysis that is required by the permit shall be included in Toledo's Annual Biosolid Report (in the year's annual report appendix).

VII Certification Statement

Toledo's facility is capable of meeting their primary alternatives for achieving Class A or B biosolid pathogen and vector attraction reduction criteria. As required under 40CFR 503.17 a signed Class A and/or B biosolid and vector attraction certification statements shall accompany all biosolids that are land applied **(Attachment C).** For Class A or B biosolid annual biosolid analysis must be provided upon request. Certification statements must also show conformance with nutrient and land application loading rates where applicable.

Attachment 6A:

Calculation of the % volatile solids reduction for the aerobic digesters is to be based on comparison of a representative grab sample of total and volatile solids entering the digestion process (a weighted blend of the primary and secondary clarifier solids) and a representative composite sample of the solids existing the sludge holding tanks.

Typically in the past we've used the Van Kleeck equation for digesters. The assumption is that there is no grit accumulation in the digester. This volatile solids equation assumes the fixed solids input equals the fixed solids output. The Van Kleeck equation is appropriate if the digester decatante is low in total solids. The Van Kleeck equation can be used to calculate the volatile solids reduction for a digester that decants provided VSb equal VSd

FVSR: Fractional Volatile Solids Reduction

$$FVSR = 1 - VSb * (1-VSf) / VSf (1- VSb)$$

VSf Feed Sludge Fractional Volatile Solid, (kg/kg)
VSb Digested Sludge (digester bottom) Fractional Volatile Solids, (kg/kg)
VSd Decantate Fractional Volatile Solids

For this equation to be valid VSb must equal VSd.

For digesters with decant withdrawal (decant high in solids) and no grit accumulation, where the volatile and fixed concentrations are known for all streams as well as the volumetric flow rates for the decant and digester sludge then the Approximate Mass Balance equation should be used.

FVSR: Fractional Volatile Solids Reduction

$$FVSR = Fyb - Byb – Dyd / Fyb$$

Fyb (F) Feed Sludge Volumetric Flow Rate (m3/d)
(yb) Feed Sludge Volatile Solids Concentration (kg/ m3)

Byb (B) Digester Sludge (bottom) Volumetric Flow Rate (m3/d)
(Bb) Digester Sludge (bottom) Volatile Solids Concentration (kg/ m3)

Dyd (D) Decantate Volumetric Flow Rate (m3/d)
(yd) Decantate Volumetric Solids Concentration (kg/ m3)

Assumptions: Fixed Solids and Volatile Flows Streams.

Attachment 6C:

"I certify, under penalty of law, that the pathogen requirements in [insert either 503.32(a) or 503.32(b)], the management practices in 503.14 and the vector attraction reduction requirements in [insert 503.33(b) (1) through 503.33(b) (10)] 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 vector attraction reduction requirements have been met. I also certify that all biosolids were land applied at the approved agronomic loading rate noted in the respective Department site authorization letter. I am aware that there are significant penalties for false certification including the possibility of fine and imprisonment."

Signature……. Date…….