July 2012
Biosolids Management Plan (BMP)
for
Lincoln City
Wastewater Treatment Facility

Introduction

The City of Lincoln City owns and operates an activated sludge wastewater treatment facility with a design dry weather flow of 3.0 million gallons per day (MGD). The treatment facility is located at 5000 SE Port Ave. approximately ¼ of a mile east of Highway 101 on SE 54th St. in Section 26 of Township 7 South, Range 11 West of the Willamette Meridian, in Lincoln County, Oregon. The wastewater treatment facility went on-line in April 1981, and completed Phase 1A in September 2008. The Census population in 2000 was 7,437, with 5,110 service connections and an average monthly population equivalency of 10,148 in 2010. Wastewater processed by the treatment plant is principally of domestic origin. Septage is accepted at this wastewater treatment facility. There are no industrial dischargers. The treated effluent from the wastewater treatment facility is discharged into Schooner Creek at river mile 1.1 before entering the Siletz Bay.

Section I: Wastewater Treatment Process

A. Liquid Flow Stream

Wastewater entering the plant undergoes preliminary treatment as it passes through one of two ¼", perforated screens designed for up to 11.0 MGD and into a "Pista-Grit" grit removal system. The raw sewage flows to one of four 1.1 million gallon Sequencing Batch Reactors (SBR's) where it comes in contact with activated sludge. The secondary effluent is lifted by one of three 6.75 MGD screw lift pumps into a 0.343 million-gallon secondary clarifiers for further settling. Chlorine gas is introduced as the effluent flows through two 60,000-gallon chlorination chambers and then is De-Chlorinated with sulfur dioxide gas prior to being discharged into Schooner Creek.

The City intends to construct Phase 1B, planning to be completed in May 2012. This Phase will replace the existing secondary clarifier and chlorination/de-chlorination system with a new building housing fixed media filtration and UV-disinfection and in-plant water reuse pumps. The Digesters will be revamped with coarse-air diffusers and floating mixers, upgraded sludge pumping, and sludge thickening to increase the aerobic digestion holding time. Also planned is an alkalinity adjustment chemical system which will pump a 65% magnesium hydroxide solution into the raw sewage prior to the SBR's.

In 2010 the Lincoln City wastewater plant treated an average of 1.83 MGD of raw sewage. Of this flow approximately 35 % is domestic and 65 % is from commercial (hotels and restaurants).

B. Solids Flow Stream

The excess secondary solids (there are no primary clarifiers) are pumped daily to the primary 0.5 million-gallon aerobic digester. The sludge is then sent to the secondary 0.5 million-gallon mechanically aerated aerobic digester. Periodically the digesters are shut off, allowing the liquid and sludge to separate and the clear supernatant is decanted back to the aeration system for treatment leaving the thickened sludge. The residence time in the digesters averaged 28 days in 2010. The average daily temperature in 2010 was 14.1 degrees Celsius. The sludge from the secondary aerobic digester is pumped into either the West Sludge Lagoon (2.78 million-gallons) or the East Sludge Lagoon (3.31 million

gallons) for further treatment under anoxic conditions. In 2010 the East Lagoon had an average holding time of 232 days and the West Lagoon had a holding time of 349 days before being land applied. Liquid (from rainwater and passive dewatering of the sludge) is removed from the lagoons by a telescoping overflow valve and returned to the head-works for treatment.

The City of Lincoln City wastewater plant produced 4,135,630 gallons of liquid sludge (263.3 dry short tons or 238.8 dry metric tons) from the digesters in 2010.

When sludge is pumped from the secondary digester to the East or West Lagoon, six grab samples are taken throughout the pumping period to form a % total solids (% TS) and % volatile solids (% VS) composite sample. Six grab samples are also taken of the sludge being wasted to the primary digester that same day from a random SBR to form a % TS and % VS composite sample. Samples are taken annually from the lagoon that is scheduled to be hauled that year for all nutrient, metal, and fecal coliform characteristics.

Using two separate lagoons allows the City to remove biosolids annually in a batch process. After setting undisturbed with no new solids added for approximately 1 year, the lagoon is sampled by boat and 14 discreet samples are taken across the lagoon and combined to form a sample for nutrient and metals testing at a certified laboratory. Nine discreet samples are also obtained for fecal coliform testing. This testing is done at least twice in the Spring prior to

C. Septage Receiving Facilities

The wastewater plant received 705,664 gallons of septic tank, holding tank, chemical toilet and vault toilet waste in 2010. The septage is screened through a Lakeside Septage Acceptance Plant and is then pumped to the head-works for screening and treatment in the SBR's.

D. Pretreatment Program

The City of Lincoln City does not have any industrial users and so does not have an industrial pretreatment program.

SECTION II: SOLID TREATMENT PROCESSES

The EPA's 40 CFR parts 503 and the DEQ's Oregon Administrative Rules (OAR) 340-50 allow permittee to use EPA approved alternatives to satisfy Class A and B biosolid pathogen alternatives or vector attraction reduction option 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 alternative/option or other alternatives/options not contained in this biosolid management plan. The permittee must also certify that the alternatives and options used are EPA approved and that sampling and monitoring conforms to the 40 CFR Part 503 and OAR 340-050 regulations.

A. Pathogen Reduction

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

The City uses an aerobic digestion system which reduces fecal coliform concentrations in wastewater solids. Future plant improvements may also include testing for enteric viruses, viable Helminth ova levels in the storage lagoons using a batch testing program as outlined in 40 CFR Part 503 Alternative 3 for production of Class A biosolids. Testing for fecal coliform concentrations in the biosolids will also be performed according to the 40 CFR Parts 503, but these samples will be discrete representative samples of the biosolid at the time of land application.

The City of Lincoln City wastewater plant produces Class B biosolids and uses Sewage Sludge Alternative 1: Monitoring of Fecal Coliform [503.32(b) (2)]. Pathogen reduction is measured by grabbing 9 individual samples from the lagoon prior to hauling. These samples are sent to an independent laboratory for testing by MPN per gram total solids (on a dry weight basis). Samples must have a geometric mean less-then 2 million colonies/dry gram weight before the biosolids meet the Class B biosolids pathogen reduction requirements.

Class A Biosolid:

With all Class A alternatives, microbial monitoring for fecal coliform or Salmonella *sp*. is required. This management plan lists the primary alternatives employed by the permittee to meet Class A and B biosolid criteria. Typically Class A biosolid can be met by using one of 6 EPA approved alternatives; the primary alternatives used by this facility are Alt. 5) Processes to Further Reduce Pathogens (PFRP) 503.32(a)(7) Pasteurization or Alt. 1 Thermally Treated Sewage Sludge 503.32(a)(3).

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 or disposed. In addition to meeting plant process requirements and one of the Class A biosolid pathogen reduction alternatives the Class A biosolid must meet one of the following requirements:

- Either the density of the fecal coliform in the sewage sludge must be less than 1,000 MPN per gram total solids (dry gram weight), or
- The density of *Salmonella* sp. Bacteria in the sewage must be less than 3 MPN per 4 grams of total solids (dry weight basis).

Unlike Class B biosolid Class A biosolid requirements are not based on an average value. Sampling for Class A biosolid consists of at least 7 discrete representative samples for fecal coliform concentrations taken from the biosolid to be land applied. Test results are required before Class A material can be released for use. The Class A biosolid microbial reduction requirement must be met at either:

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

ALT. 3) SEWAGE SLUDGE TREATED IN OTHER PROCESSES 503.32(A)(5)

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

- (i) Either the density of fecal coliform in the sewage sludge was determined to be less than 1000 Most Probable Number per gram of total solids (dry weight basis), or the density of salmonella sp. Bacteria in the sewage sludge was determined to be less than three Most Probable Number per four grams of total solids (dry weight basis) at the time the sewage sludge used or disposed; at the time the sewage sludge is prepared for sale or giveaway in a bag or other container for application to the land; or at the time the sewage sludge or material derived from sewage sludge is prepare to meet the requirements in 503.10(b), (c), (e) or (f).
- (ii)(A) The sewage sludge shall be analyzed prior to pathogen treatment to determine whether the sewage sludge contains enteric viruses.
- (B) If the density of enteric viruses in the sewage sludge was determined to be less than one Plaque-forming Unit per four grams of total solids (dry weight basis), the sewage sludge is Class A with respect to enteric viruses until the next monitoring episode for the sewage sludge.
- (C) When the analysis prior to pathogen treatment shows the density of enteric viruses in the sewage sludge was determined to be equal or more than one Plaque-forming Unit per four grams of total solids (dry weight basis), the sewage sludge is Class A with respect to enteric viruses when the density of enteric viruses in the sewage sludge after pathogen treatment is less than one Plaque-forming Unit per four grams of total solids (dry weight basis) and when the values or ranges for the operating parameters for the pathogen treatment process produces the sewage sludge that meets the enteric virus density requirement are documented.
- (D) After the enteric virus reduction in paragraph (a)(5)(ii)(C) is demonstrated for the pathogen process, then the sewage sludge continues to be Class A with respect to enteric viruses when the values for the pathogen treatment proves operating parameters are consistent with values or ranges of values documented in paragraph (a)(5)(ii)(C),
- (iii)(A) The sewage sludge shall be analyzed prior to pathogen treatment to determine whether the sewage sludge contains helminth ova.
- (B)The density of helminth ova in the sewage sludge was determined to be less than one per four grams of total solids (dry weight basis), the sewage sludge

is Class A with respect to helminth ova until the next monitoring episode for the sewage sludge.

- (C) When the analysis prior to pathogen treatment shows the density of helminth ova in the sewage sludge was determined to be equal or more than one per four grams of total solids (dry weight basis), the sewage sludge is Class A with respect to helminth ova when the density of helminth ova in the sewage sludge after pathogen treatment is less than one per four grams of total solids (dry weight basis) and when the values or ranges for the operating parameters for the pathogen treatment process produces the sewage sludge that meets the helminth ova density requirement are documented.
- (D) After the helminth ova reduction in paragraph (a)(5)(ii)(C) is demonstrated for the pathogen process, then the sewage sludge continues to be Class A with respect to helminth ova when the values for the pathogen treatment proves operating parameters are consistent with values or ranges of values documented in paragraph (a)(5)(ii)(C).

ALT. 5) USE OF PROCESSES TO FURTHER REDUCE PATHOGENS (PFRP) 503.32(A)(7)

This requirement relies on the process to demonstrate adequate reduction of pathogens to meet Class A biosolid criteria:

- Sludge has been treated in one of the PFRPs listed in Appendix B of the 503 regulation, and
- Either the density of the fecal coliform 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).

BATCH PROCESSES: CLASS A BIOSOLIDS

Note: Class A PFRP must be met within the Class B PSRP treatment parameter, EPA requirement).

CLASS B BIOSOLID:

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) Monitor 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:

- **#2** Air Drying, sludge air dried on beds for minimum of 3 months (ambient temperature above 0 (insert degrees) C (32F) 2 out of the 3 months.
- **#3** Anaerobic digestion sludge is treated in the absence of air for a specified residence time at a specified temperature. Values of the mean cell residence time and temperature shall be between 15 days at 35C to 55C (131C) and 60 days at 20C (68F), and
- **#4** Composting, the temperature of the sewage sludge is raised to 40C (104F) or higher and remains at 40C or higher for 5 days. For 4 hours during the 5-day period, the temperature in the compost pile must exceed 55C (131F).

B. Vector Attraction Reduction

The purpose of Vector Attraction Reduction (VAR) processes is to eliminate the transport of pathogens to humans or animals by vector transmission. Vectors include insects, rodents, and birds. Biosolids that are stabilized to reduce or eliminate vector attraction are also much less likely to produce offensive odor. Biosolids that do not meet minimum VAR reduction standards may not be surface-spread on agricultural fields. In this case, tilling is required to protect public health.

The EPA 503 Rule allows 10 options for meeting the VAR requirement. In the future Lincoln City may producing Class A biosolids using the biosolids dryer; VAR reduction will be met using Option 7 (4OCFR §503.33(b)(7)): drying of biosolids to 75 percent or better. When the dryer is not being run, the Lincoln City will meet VAR reduction in one of several other ways using the their aerobic digestion system and solid storage facility.

Under most conditions, the plant digesters capacity should satisfy VAR by achieving a 38 percent reduction in volatile solids (Option 1, 40CFR §503.33(b)(1)).

The City of Lincoln City wastewater plant uses Option 1: Reduction in Volatile Solids Content [503.33 (b) (1)] for reducing vector attraction. At least 38% reduction in volatile solids during sludge treatment must be obtained prior to land application. The average volatile solids content of the waste activated sludge composites is compared with the average volatile solids content of the land applied biosolids to calculate the % reduction.

This facility may in the future satisfies the 503.33 Vector attraction reduction criteria by generating cake biosolid (Heat Drier that will produce >90% TS typically). This process is covered under 503.33 option (7): the percent total solids (TS) of secondary treatment sewage sludge shall be equal to or greater than 75 percent based on the moisture content and total solids.

This facility can also use the following as back up vector attraction reduction options:

Opt. 1) The % volatile solid reduction calculation to use for anaerobic digester that is decanted and that does not have appreciable grit accumulation would be the Van

Opt. 3) Option 3, aerobically digested biosolids are batch-tested at 20 degrees C for 30 additional days in the laboratory. If volatile solids are reduced by less than 15 percent, VAR is demonstrated to be achieved.

Opt.4) Specific Oxygen Uptake Rate at 20C (68F) is #1.5 mg oxygen/hr//g total sewage sludge solids (<2%TS). Liquid sewage sludge from aerobic processes run at temperature between 10 to 30C.

Opt.5) Aerobic treatment of the sludge for at least 14 days at over 40C (104F) with the average temperature of over 45C (Compost).

Opt. 7) 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). Vector attraction determination is not required for biosolids that are land filled.

Opt. 8) 90% solid by drying prior to mixing with other materials. Sewage sludge treated in aerobic or anaerobic process (i.e. Sewage sludge that contains unstabilized solids generated in primary wastewater treatment).

Opt. 9) after being removed from the digester the liquid biosolids would be injected below the ground surface within 8 hours for Class A, 1 hr for Class B.

Opt. 10) after being removed from the digester the liquid biosolids would be plowed into the soil within 8 hours for Class A and 6 hrs for Class B. Incorporation: sewage sludge placed on a surface disposal site must be covered with soil or other material at the end of each operating day.

SECTION III: SOLIDS STORAGE STRUCTURE:

Aerobically digested sludge can be transferred to sludge storage ponds; in the future the solids may be further processed through drier process system and/or to drying beds. Heat dried and air-dried biosolids from the facility can be stored at the facility for up to 2 years. Biosolids drying normally is accomplished seasonally between May and September with the land application of the dried biosolids occurring during the months of July, August, September, and October. If solids are land applied in September and October then ½ the agronomic loading rate would be approved agronomic loading on all sites due the short growing season. If biosolids are stored for more than 1 year at this facility then the biosolids need to be tested for pathogen criteria at the time the biosolid used or be taken to an approved landfill (no pathogen test required).

A. Digester Size Detention Time

As mentioned in I.(B.) “Solids flow stream” the sludge is held in two, 0.5 million-gallon aerobic digesters which had a residency time of 28 days in 2010. This holding time is

expected to be increased after the addition of a sludge thickener in Phase 1B scheduled for completion in May 2012. After this time the sludge is pumped into one of two sludge storage lagoons. The West Lagoon holds 2.78 million-gallons and the East Lagoon holds 3.31 million-gallons. The lagoons are "batch fed" on a 2-year cycle (filled one year and hauled and applied to DEQ approved fields the following year).

B. Additional Treatment During Storage

The material in the lagoons are held in a facultative state (no mechanical air or mixing is applied) during which time normal biological activity reduces the volatility of the biosolids.

Section IV: Biosolids Sampling and Monitoring

All tests shall be performed using sampling and analytical methods under 40 CFR 503.8; the Environmental Protection Agency (EPA) POTW Sludge Sampling and Analysis in Sewage Sludge (EPA/625/R-52/013) guidance (1992), and EPA's POTW Sludge Sampling Procedures and Protocols for the National Sewage Sludge Survey (1989) document.

The POTW Sludge Sampling and Analysis Attraction in Sewage Sludge (EPA/625/R-52/013) guidance 1992 document is available on the internet http://www.epa.gov/npdes/pubs/owm012.pdf;

The POTW Sludge Sampling Procedures and Protocols for the National Sewage Sludge Survey (1989) document can be ordered over the internet at http://yosemite.epa.gov/water/owrccatalog.nsf.

1) Aerobic Digester

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

Number and type of sample taken per day: Composite of 7 or more discrete samples collected throughout the pump over sampling period.

Sample storage and transport: Samples are stored at 4 degrees C in ice chest or refrigerator. Samples are transported in ice chest to maintain temperature during delivery to laboratory. Pathogen samples are delivered to lab within 6 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).

2) Storage Lagoons

Sample location: See POWT Sludge Sampling and Analysis Attraction in Sewage Sludge (EPA/625/R-52/013); guidance (1992), take representative sample from the storage lagoons.

Number and type of sample taken per day: Composite of 7 or more discrete samples collected throughout the pump over sampling period.

Sample storage and transport: Samples are stored at 4 degrees C in ice chest or refrigerator. Samples are transported in ice chest to maintain temperature during delivery to laboratory. Pathogen samples are delivered to lab within 6 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).

3) Drying Beds

Sample location: See POWT Sludge Sampling and Analysis Attraction in Sewage Sludge (EPA/625/R-52/013); guidance (1992).

Number and type of sample taken per batch: Several discrete samples from each ADB in service are mixed together to form a composite sample.

Sample storage and transport: Samples are stored at 4 degrees C in ice chest or refrigerator. Samples are transported in ice chest to maintain temperature during delivery to laboratory. Pathogen samples are delivered to lab within 6 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).

The lagoon sampling is carried out in a grid pattern, which contains 14 sample sites which are composite for Total Solids, Volatile Solids, pH, Arsenic, Cadmium, Copper, Lead, Mercury, Molybdenum, Nickel, Potassium, Selenium, Zinc, Ammonia Nitrogen, Nitrate-Nitrite Nitrogen, Total Kjeldahl Nitrogen, and Total Phosphorus testing. There are 9 grab sites are for fecal coliform samples.

The grid is set up by placing 3-foot stakes at each “fill valve” located on the center dike between the lagoons with another set of stakes set on the opposite shore. Three stakes are set at each of the north and south banks at an equal distance. The samples are taken at the “cross section” of the stakes. The time and depth of each sample is noted at the time of sampling.

Sampling is done from a boat using an 8-foot x 1-inch clear plastic tube with a ball valve attached to the top. At the designated grid location, the sludge sampler is slowly pushed through the sludge blanket to the bottom of the lagoon and the valve is closed. After withdrawing the tube the sample is released into a 500-ml sample container, water is not considered part of the sample. The sample tube is rinsed with available surface water between samples.

The samples are immediately taken to the wastewater plant lab where the composite samples are mixed, tested for pH, and poured into the sample container provided by the contract laboratory. The fecal coliform samples are individually mixed and poured into the containers provided by the contract laboratory. The samples are iced and packed into a cooler for same day delivery to the contract laboratory. All chain-of-custody paperwork is completed as needed and filed with the sample data at the wastewater plant.

The laboratory shall use the following methods (or an optional EPA approved biosolid test method) SM 2540 G; SM 3114 C/EPA 7062; EPA 213.2/EPA 7131; EPA 218.2/EPA 7191; EPA 220.1/ EPA 7210; EPA 239.2/EPA 7421; EPA 245.1/EPA 7470; EPA246.2/EPA 7481; EPA 249.2/EPA 7521; EPA 270.2/EPA 7740; EPA 289.1/EPA 7950; EPA 351.3; EPA 353.3; EPA 350.2; EPA 365.3; EPA 258.1/EPA 7610; EPA 150.1/EPA 9040; SM 9221 CE.

Monitoring Program

The following tests are run at the Lincoln City Wastewater Plant Laboratory.

1) The aerobic digesters are tested for pH and temperature once each week.
2) Monthly, grab samples are taken from the primary and secondary digesters and tested for total and volatile solids.
3) Every time sludge is being transferred to the storage lagoon a set of six-80 ml grab samples are taken of the waste sludge being pumped to the primary digester and composited for total and volatile solids testing.
4) Each time sludge is being transferred to the storage lagoon a set of six-80 ml grab samples is taken at the sample site in the digester building and composited for total and volatile solids testing.
5) During biosolids field application, a set of 7-80 ml samples will be taken during the filling of 1 tanker truck each round, and composited for a daily total and volatile solids test sample.
6) A contract laboratory runs the following analysis on our biosolids on an annual basis; Total Solids, Volatile Solids, Arsenic, Cadmium, Copper, Lead, Mercury, Molybdenum, Nickel, Potassium, Selenium, Zinc, Ammonia Nitrogen, Nitrate-Nitrite Nitrogen, Total Kjeldahl Nitrogen, Total Phosphorus, and Fecal Coliform by dry weight. pH is tested at the Lincoln City Wastewater Facility laboratory within 15 minutes of completion of the lagoon sampling/compositing process.

Section V: Biosolid Analysis

Biosolid Chemical Analysis

Two sets of biosolids samples were core-sampled from the above mentioned West Sludge Lagoon grid pattern in the spring of 2010. Lincoln City's wastewater plant aerobic digestion produced 263 dry short tons (or 239 dry metric tons) in 2010. We sample from the "full" lagoon annually prior to land application, the other lagoon is designated for filling and is not sampled.

The test results for 2010 were averaged to obtain the following results.

SOLIDS CONTENT AND pH	
Total Solids	4.25%
Volatile Solids	58.2%
pH	6.5

Metal Concentrations		
Constituent	Result	Pollutant Concentration Limit Criteria (mg/kg) [Part 503, Table 3]
As, mg/kg	13.7	41
Cd, mg/kg	2.6	39
Cr, mg/kg	54	NA
Cu, mg/kg	611	1500
Pb, mg/kg	44.0	300
Hg, mg/kg	3.5	17
Mo, mg/kg	7.6	75 (ceiling concentration)
Ni, mg/kg	30.4	420
Se, mg/kg	< 5.0	100
Zn, mg/kg	915	2800

The site life could be limited to the metal that exceeds the pollutant Concentrations in the table above. Currently copper is the most limiting metal based on loading from Lincoln City's 2010-biosolid analysis (Attachment C).

Biosolid Nutrient Analysis:

For the year 2010, the Lincoln City's biosolids contained about (2436) pounds (lb.) total nitrogen (N) of which about (42) lb. was in the nitrate form (NO3-NO2) and (1310) lb. was in the ammonia form (NH3). The biosolid was a pH of approximately 7. From the analysis the Lincoln City needs approximately (40) acres to land apply on to handle their annual biosolid nitrogen production.

Nutrients		
	Results	lbs./dry ton
Nitrogen, TKN %	4.9	97.9
Ammonia Nitrogen %	1.01	20.1
Nitrate Nitrogen %	0.01	0.2
Available Organic N		11.6

Available Inorganic N		10.0
Total Available N		21.6
Total Phosphorus %	2.24	44.7
Potassium %	0.22	5.5

Nitrogen Calculations:
Available Organic N = TKN – (NO-3 + NH4-N) X 15%
Available Inorganic N = NH4-N X 50%
Total available N= Available Organic N + Available Inorganic N

Where:
TKN = Total Kjeldahl Nitrogen lbs/ton
NO3-N = Nitrate-Nitrite Nitrogen lbs/ton
NH4-N = Ammonia Nitrogen lbs/ton

Section VI: Biosolids Beneficial Reuse Program

Transportation and Land Application:

The City of Lincoln City contracts with a contractor who is competent in the pumping, hauling, and application of biosolids. The work is done under the City's direction and proceeds in the following manner:

A floating dredge is placed into the appropriate lagoon and hose lines are run from the dredge through a traveling screen and into an 18,000 gallon mixed "frac" tank where the biosolids are then loaded into individual tanker trucks of approximately 7000 gallon capacity are loaded to legal road limits. They typically use 6 tanker trucks working from 7:00 a.m. to 7:00 p.m. Each time a set or "round" of trucks are loaded, 1 set of 7 grab samples are taken from the mixed baker tank to form a composite sample. The sample is taken immediately to the WWTP lab and a 100 ml sample is drawn from the composite and stored at 4 degrees C. Each composite sample from each "round" are subsequently added together to form a daily composite. The daily composite is then tested for % total solids and % volatile solids. Each individual "round" is also tested on a % moisture balance to assist with proper field application rates.

All loading is done in the fenced area of the WWTP and all material associated with truck loading is confined in the plant.

Lincoln City's biosolids are land applied on 201.6 acres of DEQ approved sites in Lincoln and Polk Counties. The City of Lincoln City land applies on farmlands in the State of Oregon to beneficially use our biosolids.

Prior to applying the biosolids the fields are staked to mark all set-backs necessary to meet all restrictions stated in each fields DEQ application approval letter.

Application rates are initially determined using the Worksheet for Calculation Biosolids Application Rates in Agriculture by Craig Cogger, WSU and Dan Sullivan, OSU.

The tanker trucks use gravity or tank pressure across splash-plates to evenly apply biosolids on the fields. The tanker truck speed-up or slow-down to adjust the amount of material per acre they apply. A "% moisture balance" is used to determine the application rate for total available N per acre. The application rate is adjusted throughout the day using the most recent moisture balance test results available.

After each days application the area of the field that was applied to is measured using GPS equipment and the composite sample that was created from "1 truck load per round per day" is tested using Standard Methods 20th Ed. Section 2540 B and 2540 E pages 2-55 and 2-58 as written in the "Lincoln City WWTP Laboratory Manual" and together with the volume applied from the tankers is used determine the actual application rate.

When a field has been completed a stake is be driven in near the entrance to that field with the date of the last application. The field shall not be grazed on by any farm livestock for a period of 30 days. No public access will be made available to the general public for a period of 365 days.

Site Selection

Lincoln City selects application sites mainly in Lincoln and Polk Counties based upon this criteria:

1. Travel distance between plant and field
2. Minimal slope of land
3. Maximum distance to water bodies
4. Soil suitability (i.e. well drained)
5. Crop type (N uptake rates)
6. Access from road for tanker trucks
7. Farm management practices

All adjacent landowners are notified by registered mail of Lincoln City's intent to apply biosolids to any new fields as part of the field application approval requirements of DEQ.

The following table contains Lincoln City's biosolids sites which are currently in use and management information for the approved land application sites based on the 2010 Lincoln City's Annual Biosolids Report. All fields have a 100 lb. available N per acre per year limitation.

Site Name	Site Location	Site No.	Net Acres	lbs. N /acre/ year
Kosydar	Lincoln Co, Siletz Valley, Sec21-T9N-R10	1	23.8	53.6
19586 Siletz River Hwy		2	12.0	51.6

Wyscaver	Lincoln Co, Siletz Valley, Sec4&33-T10S- R9W	1	10.9	58.5
7373 Logsden Road		2	10.7	59.5
Soares	Lincoln Co., Siletz Valley, Sec 8-T9N-R10	1	23.3	55.0
16311 South Siletz Hwy		2	9.8	0
		3	4.0	0
		4	19.7	0
Jahn	Polk Co., Grande Ronde, Sec 10-T6S-R8	1	13.8	0
30125 Salmon River Hwy		2	13.0	0
		3	8.8	0
		4	4.0	0
Statz	Lincoln Co., Siletz Valley, Sec 22-T9N-R10	1	13.0	0
19585 Siletz River Hwy		2-3	21.4	0
		4	13.4	0
Total	5	15	201.6	

Long term biosolids application rates and site restrictions are contained in the biosolids site authorization letters. References to the OAR 340-50, The EPA 40 CFR Part 503, site setbacks, site agronomic loading rates, land application restrictions and site restrictions are also detailed out in the site authorization letters. Any field which is to be used more than 2 consecutive years shall be soil tested for possible nitrogen build-up prior to the 3 years application.

Section VII: Contingency Options

A. Process Failure

Due to the length of on site storage, process failure is very unlikely. The sludge is held in a single lagoon as a batch process. The "full" lagoon is tested for Class B pathogen and vector attraction parameters along with pollutant levels annually prior to land application.

If the biosolids do not meet the pathogen reduction requirements the sludge will be lime stabilized as per Alternative 2: Use of a Process to Significantly Reduce Pathogens prior to land application or by another Department approved 40 CFR 503 process.

If the biosolids do not meet the vector attraction requirements the biosolids will be tested for its ability to meet Option 4: Specific Oxygen Uptake Rate for Aerobically Digested Sewage Sludge, Option 6: Addition of Alkali or by another Department approved 40 CFR 503 process.

B. Spill During Transport

In the event biosolids are spilled between the treatment facility and the land application sites the driver will notify the City of Lincoln City and we shall with assistance of the contracted hauling company, contain the spill, lime, absorb (using sand) and remove the spilled biosolids with a front end loader or shovels and dispose of the spillage at an authorized application or disposal site (usually taken to the field for application). All spills into waters of the State or spills on the ground surface that are likely to enter waters of the State shall be reported immediately to the Oregon Emergency Response System (OERS) at 1-800-452-0311 and our regional DEQ biosolids coordinator at 503-378-8240, ext. 282.

All accidental spills of 25 gallons or more on the ground surface outside the Wastewater facility shall be report to the regional biosolids coordinator. Any amount of biosolids spilled during transport will be immediately reported to the transporting company project manager and the City of Lincoln City WWTP (**Attachments E &F**).

VIII. Reporting

A. Daily Reporting and Recordkeeping (40 CFR 503.17& 40 CFR 503.18):
Each year prior to land application of biosolids the City of Lincoln City shall check to see if contiguous property owners have changed. The City of Lincoln City shall keep a record of contact (date, and/or written log of phone call with name and number, and/or a photocopy of postcard with name and address, etc.) with any new contiguous property owners, which notifies them of the biosolids land application. The City of Lincoln City shall keep this information on file at the wastewater plant.

Each year prior to land application of biosolids the source operators shall check to see if contiguous property owners have changed. As needed 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 notify them of the biosolid land application practice. Operator shall provide this documentation in the annual biosolid report.

The City is responsible to keeping and maintaining daily site logs. These are records of the daily land application of biosolid at the site where biosolid are land applied. Daily log should clearly show the date, time, location where each load was land applied at the site. 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.

B. 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. Also included copies of all biosolids analysis for the year biosolid are land applied.

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 Lincoln City's Annual Biosolid Report (in the year's annual report appendix).

The Annual Biosolids 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 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, splash plate, irrigation cannon).

The annual report shall have a signed copy of the certification statements for pathogen reduction, vector attraction reduction and biosolids management practices. Person signing statements should be the operator of record at the treatment plant. The operator shall show how the vector attraction reduction was met. Certification of pathogen reduction is required and is satisfied by submittal of test results in the Annual Biosolids Report. All the previous year's biosolids sampling and analysis that is required by the permit shall be included in the City of Lincoln City Annual Biosolids Report.

VIII. Certification Statement

A. The City of Lincoln City's wastewater treatment facility is capable of meeting their primary alternatives for achieving Class B biosolids pathogen and vector attraction reduction criteria. Signed Class B biosolids and vector attraction certification statements shall accompany all biosolids that are land applied. Class B biosolids annual biosolids analysis shall be provided upon request. Certification statements must also show conformance with nutrient and land application loading rates where applicable. (**Attachment D**).

Attachment B:

Kleeck or Approximate Mass Balance (AMB) equation depending upon the percent solids in the decantante (**Attachment B**).

Lincoln City's Volatile Reduction Calculation:

%VS Reduction =
%VS raw - %VS stabilized / %VS raw – [%VS raw X %VS stabilized]

where:
VS Reduction = percent reduction of volatile solids
VS raw = Volatile fraction in waste activated sludge to digester sample
VS stabilized = Volatile fraction in land applied biosolids sample

Calculation of the % volatile solids reduction is to be based on comparison of a representative grab sample of total and volatile solids entering each digester (a weighted blend of the primary and secondary clarifier solids) and a representative composite sample of the solids existing the digester withdrawal line. Composite samples of the influent shall consist of at least four samples; each collected at approximately even intervals over an eight-(8) hour period.

Typically in the past we've used the Van Kleeck equation for digesters. The assumption 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)

VSfFeed 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)

Because the Aerobic digester is cleaned regularly the assumption is that there is no grit accumulation in the digestive process.

Assumptions: Fixed Solids and Volatile Flows Streams.

Attachment D

Lincoln City BMP
NPDES # 101122
File # 50677

CERTIFICATION STATEMENT:

"I certify, under penalty of law, that the information used to determine compliance with the Class B Pathogen Reduction requirements in 40 CFR Part 503 Sec. (b)(1) and the Vector Attraction Reduction requirements in 40 CFR Part 503.33 Sec. (b)(1) was prepared under my direction and supervision in accordance with the system designed to ensure that qualified personnel properly gather and evaluated this information. I certify that all Class B biosolids land applied has met the above mentioned Pathogen and Vector Attraction Reduction requirements. I also certify that all Class B biosolids were land applied at agronomic rates. I am aware that there are significant penalties for false certification including the possibility of fine and imprisonment.

Signature _____ Date_____

Attachment E

Lincoln City's
SPILL RESPONSE PLAN

In the event biosolids are spilled between the treatment facility and the land application sites the driver will notify the City of Lincoln City and we shall with assistance of the contracted hauling company, contain the spill, lime, absorb (using sand) and remove the spilled biosolids with affront end loader or shovels and dispose of the spillage at an authorized application or disposal site (usually taken to the field for application). All spills into waters of the State or spills on the ground surface that are likely to enter waters of the State shall be reported immediately to the Oregon Emergency Response System (OERS) at 1-800-452-0311 and our regional DEQ biosolids coordinator at 503-378-8240, ext. 282.

Any amount of biosolids spilled during transport will be immediately reported to the transporting company project manager and the City of Lincoln City WWTP.

WWTP Office	541/996-2172
City of Lincoln City Public Works	541/996-2154
City of Lincoln City, City Hall	541/996-2151
City of Lincoln City Police Dept.	541/994-3636

If the spill can be contained and properly cleaned up by the driver:

Driver's Responsibilities:

Step 1 **Clean up spill**
Step 2 **Immediately report to transport company project manager**
Step 3 **Continue on trip if possible without spilling additional biosolids**
Step 4 **Complete and incident report upon the completion of the truck trip and submit completed report the City of Lincoln City WWTP**

If the spill is greater than is practical for the driver to clean up:

Drivers Responsibilities:

Step 1 **Immediately report spill and amount to transport company project manager and their office.**
Step 2 **Remain with vehicle and warn all pedestrians and motorists to stay away from the spill area. Indicate traffic hazard involved and someone call 911 to notify the police and/or the fire department.**
Step 3 **Upon arrival of police or fire department, the driver will inform them of the nature of material spilled and request the area be blocked off to both pedestrians and vehicles to prevent property damage or any serious personal injury**.

Step 4 **Driver will request police or fire department personnel to protect area while driver reports to the transport company's office and the City of Lincoln City.**
Step 5 **Complete an incident report and submit completed report to the City of Lincoln City WWTP**.

Transport Company's Responsibilities:

Step 1 **Transport Company will notify their project manager**.
Step 2 **Contact a "Spill Response Company" if necessary**.
Step 3 **Contact the City of Lincoln City WWTP at 541/996-2172**
Step 4 **Contact the DEQ within an hour of spill incident, if unable to contact the City of Lincoln City within ½ hour of incident at:**
DEQ Salem Office 503/378-8240
OERS 1-800-452-0311
Step 5 **Submit completed spill report to the City of Lincoln City WWTP.**

City of Lincoln City Responsibilities:

Step 1 **WWTP is contacted 541/996-2172, or Duty Operator pager 541/996-6185 #349**
Step 2 **Contact DEQ 503/378-8240 and/or OERS 1-800-452-0311**
Step 3 **Contact Public Works Director 541/996-2154 and/or City Manager 541/996-2151.**
Step 4 **In most cases City of Lincoln City WWTP personnel will report to spill location to inspect incident and ensure proper cleanup.**
Step 5 **Completed spill report is shared with affected departments.**

City of Lincoln City responder's responsibilities:

Step 1 **Contain spill if it has not been done.**
Step 2 **Cleanup: If the spill has been contained on an impervious paved surface, material should be scrapped from the surface and loaded with flat edged shovel or backhoe. Any material remaining on paved surfaces should be absorbed onto a compatible material (i.e. sand or dirt). If the spillage has reached earth, all affected soil should be collected and/or placed into dump truck for return to plant or taken to farm site. If biosolids is contaminated with fuels, oils, or other debris which precludes land application, contaminated biosolids are to be hauled to a DEQ approved site for disposal.**

Description of Lincoln City's
Bulk (Class B) Biosolids

What are Bulk Biosolids?

Biosolids are biologically stabilized residuals derived from secondary treatment of domestic wastewater from the City of Lincoln City wastewater treatment facility.

These residuals have undergone aerobic digestion, a controlled process recognized by the EPA and the Oregon Department of Environmental Quality (DEQ) to make them suitable for transport and land application. Digestion processes and biosolids quality have been regularly monitored to assure Federal and State pathogen [40 CFR Part 503.32(b) (2)], vector attraction [40 CFR Part 503.33(b) (1)], and trace metal pollutant [40 CFR Part 503.13(b) (1) levels are within regulatory standards

The Oregon Environmental Quality Commission (EQC) and the Environmental Protection Agency (EPA) actively promote biosolids recycling via land application. The City of Lincoln City's biosolids are a beneficial recyclable material, which improve soil tilth, fertility, and stability.

Test information the City of Lincoln City's biosolids quality, including pollutant scam data, is available upon request from the City of Lincoln City (541) 996-2172 and DEQ (503) 378-8240.

Are Biosolids Considered Hazardous? - No.

The City of Lincoln City's biosolids are not considered RCRA subtitle C hazardous waste nor are they a toxic, biological, or radioactive waste.
In the event of a spill call the City of Lincoln City at 541/996-2172.

Guidelines for Biosolids Driver Protection

The City of Lincoln City's bulk Class B biosolids present little threat to hauler health and safety, but the potential exists for disease-causing microorganisms to remain in solids transported from our wastewater treatment facility to farm sites. The following safety practices shall be observed to minimize exposure:

- Wash hands before eating, drinking, or smoking.
- Use waterless disinfectant soap for washing at sites where water is not available.
- Avoid rubbing eyes, nose, and mouth after handling biosolids.
- Do not smoke, eat, or drink in biosolids loading at unloading areas.
- Wear gloves during solids loading and off-loading operations.
- Wear protective clothing when there will be more than casual contact with biosolids (e.g. during the clean-up of spilled materials).
- When clothing or body parts are exposed to biosolids, shower and change into clean clothes before leaving work.

Immediately clean and disinfect cuts or scrapes. Keep all wounds protected from contamination.

Attachment F

LINCOLN CITY
SPILL RESPONSE FORM

SPILL DESCRIPTION			
Date spill occurred:	Time spill occurred:		
Who discovered spill:			
Description of spill incident:			
Factors that may have contributed to spill. Example: equipment failure, road conditions, etc.:			
Estimated Amount of Biosolids Spilled:			
B. NOTIFICATIONS			
Agency	Time Notified	Contact Person's Name	Who Performed Notification
911			
Transport Company			
City of Lincoln City			
DEQ			
OERS			
WWTP			
Other			

LINCOLN CITY

SPILL RESPONSE FORM

C. POTENTIAL IMPACTS OF SPILL
Injuries
Environmental
Health
Other
D. CLEAN-UP ACTIONS
Who performed the clean up?
Describe clean-up activities and results:
Where was spill material delivered?
Date/Time clean-up was completed
Name of person completing this report form
Date/Time this spill report form was completed

Return completed form to:
Joe Whisler
WWT Supervisor
City of Lincoln City
P.O. Box 50
Lincoln City, OR 97367