

**ATTACHMENT #6b**  
Biosolid Analysis Year 2004

2004

Source	Toledo	Lab analysis #	Coffee Laboratories	Date	
File No.	89103			*used in spreadsheet	
Phone No.	(541) 336-2247				
Contact	Herb Jennings				

Nutrient and metals analysis are an average of representative sampling events taken over the year biosolids are land applied.  
 Nutrient and metal concentrations are determined from the current year's representative solids analysis.  
 Site loading rates for nutrients and metal must be adjusted based on current analysis to meet authorized site loading rates.

**COLOR KEY**

	requires entered value
	calculated value
	replace 1 with coefficient from selection

**SOLIDS ANALYSIS**

Cake Biosolid	1	0.85	Replace the 1 with the appropriate decimal
Liquid Biosolid	0.5	0.5	Dewater (10-50%) and Liquid
% Total Solids	2.9		
% Volatile Solids	69		

**PATHOGEN REDUCTION**

Class A Biosolid		Put X next to Class A if true
Class B Biosolid	X	Put X next to Class B if true
	Alt. 1	Cite 503.32 Alternative

Fecal Coliform <10 <2,000,000 /dry gr. Total Solids  
 org.-100ml/1 dry gr.

**VECTRO ATTRACTION REDUCTION (DIGESTION METHOD)**

Volatile Solids Reduction Method	Opt. 3	Cite 503.33 Option
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**Anaerobic D.** 1 0.2 Replace the 1 with the appropriate decimal  
**Aerobic D.** 0.3 0.3 Replace the 1 with the appropriate decimal  
**Drying Bed** 1 0.15 Replace the 1 with the appropriate decimal  
**Gal/yr.** 332500

\* Note If cake biosolids are generated then is total cubic yards instead of total gallons

Note biosolid cake conversion is 0.65 ton/ yd<sup>3</sup>

Pounds Equation

**Dry TS US ton/yr.** 40.209225  
**lb. TS/yr.** 80418.4500  
**Total US tons** 40.21

lb. TS/yr. = %TS x 8.34 x gal/yr.

0	Cubic yards hauled
0	Total US tons
0	Total Lb.s
0	Total Metric Tons

**Conversion**

US-> Metric tons multiply by 1.11  
 Metric -> US tons multiply by 0.9

**Total Metric tons** 36.1883025

**NUTRIENT ANALYSIS**

	%	mg/kg dry-wt.		
Total Organic	0.47	4700	Organic N = (%TKN-%NH4) Inorganic N = (%NH4 + %NO3)	
TKN	0.5	5000		
NH4	0.03	300		
NO3	0.039	390		
Phosphorus	0.23	2300		
Potassium	0.079	790		
	mg/kg dry-wt.	lb. / yr.	lb./ac-yr.	kg/ha
Phosphorus	2300	184.9624	2.60878	2.92183
Potassium	790	63.5306	0.89606	1.00359

**pH** 7

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NITROGEN	mg/kg dry-wt.	lb. / yr.	lb./ac-yr.	kg/ha
Total Organic	0.47	113.3900	1.5993	1.7912
TKN	0.5	120.6277	5.6713	6.3518
NH4	0.03	12.0628	0.1701	0.1906
NO3	0.039	31.3632	0.44236	0.49544
lb. mineralized organic N/dry ton			2.8200	
lb. inorganic N/dry ton			0.0152	
Total lb. available N/ ton			2.835	

**NUTRIENT LOADING**

Crop nitrogen loading rate N lb./acre	100.000	112	kg/ha
Total acres land applied for year.	70.9		
Number dry tons land applied per acre	0.57	1.27	metric ton/ha
lb. Nitrogen per dry ton	3.90		
Total lb. Org-N produced per year	113.39		
Total lb. NH4 produced per year	12.06		
Total lb. NO3 produced per year	31.36		
Total lb. Available N per year	156.82	#DIV/0!	lb. N / yd <sup>3</sup>
Min. number of acres required per year (Nitrogen)	1.57	0.00	lb. N / gallon

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**BIOSOLID METALS ANALYSIS AND CALCULATIONS**

Sample calculation:

$$(((5.0 \text{ mg As}/1000000 \text{ mg TS} \times 140000 \text{ lb. Total Solids}) = 0.07 \text{ lb. As/yr.}$$

$$(((5.0 \text{ mg As}/ 1000000 \text{ mg TS}) \times 140000 \text{ lb. TS}) / 52 \text{ ac} = 0.013 \text{ lb. As/ac-yr.}$$

$$(\text{EPA cumulative loading } 41 \text{ total lb. As/ac} / 0.013 \text{ lb. As/ac/yr.}) = 2719.3 \text{ yr. site life for As}$$

$$(0.013 \text{ lb. As/ac-yr.}) \times 1.12 \text{ conversion factor} = 0.015 \text{ kg/ha-yr.}$$

$$(2.6 \text{ tons biosolid is equivalent to a loading rate of } 100 \text{ lb. total available N/ac) .$$

Metal Analysis	mg/kg dry-wt.
Arsenic	9.17
Cadmium	2.29
Chromium	47.4
Copper	441
Lead	57.3
Mercury	7.16
Molybdenum	0.01
Nickel	58.9
Selenium	4
Zinc	933

	Biosolid concentration	Ceiling Limits	Ceiling Limits	City's Yearly	Yearly Loading	Yearly Loading
	mg/kg	503.13	503.13	lb. Metal per	lb./ac-yr.	kg/yr.
Metals	mg/kg	Table 1 Conc.	Table 1 metal	ton biosolids		
Arsenic	9.17	75	0.150	0.01834	0.01040	0.012
Cadmium	2.29	85	0.170	0.00458	0.00260	0.003
Chromium	47.4	1200	2.400	0.09480	0.05376	0.060
Copper	441	4300	8.600	0.88200	0.50021	0.560
Lead	57.3	840	1.680	0.11460	0.06499	0.073

<b>Mercury</b>	7.16	57	0.114	0.01432	0.00812	0.009
<b>Molybdenum</b>	0.01	75	0.150	0.00002	0.00001	0.000
<b>Nickel</b>	58.9	420	0.840	0.11780	0.06681	0.075
<b>Selenium</b>	4	100	0.200	0.00800	0.00454	0.005
<b>Zinc</b>	933	7500	15.000	1.86600	1.05826	1.185

There is no Ceiling limit for Chromium, table value is a past limit that is no longer valid, used here for loading calculations only.

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Metals	Analysis Biosolid conc. mg/kg	Cumulative Pollutant Limits		Yearly lb. Metal per ton biosolids	Biosolid Loading lb./ac-yr.	Biosolid Loading kg/ha-yr.
		CFR 503.13 Table 2 mg/ha	40 CFR 503.13 Table 2 metal lb./ton biosolid			
<i>Arsenic</i>	9.17	41	0.082	0.018	0.0181	0.020
<i>Cadmium</i>	2.29	39	0.078	0.005	0.0045	0.005
<i>Chromium</i>	47.4	1200	2.400	0.095	0.0936	0.105
<i>Copper</i>	441	1500	3.000	0.882	0.8708	0.975
<i>Lead</i>	57.3	300	0.600	0.115	0.1131	0.127
<i>Mercury</i>	7.16	17	0.034	0.014	0.0141	0.016
<i>Molybdenum</i>	0.01	75	0.150	0.000	0.0000	0.000
<i>Nickel</i>	58.9	420	0.840	0.118	0.1163	0.130
<i>Selenium</i>	4	100	0.200	0.008	0.0079	0.009
<i>Zinc</i>	933	2800	5.600	1.866	1.8423	2.063

There are no limits for Chromium or Molybdenum under Table 2, Mo concentration comes from Table 1. Ceiling Limit.

Metals	Biosolid Analysis mg/kg	Pollutant Conc. Limits		Loading lb./ac-yr.	Loading kg/ha-yr.	Site Life in years
		Table 3 mg/ha	Table 3 lb. Metal per /ton biosolid			
<i>Arsenic</i>	9.17	41	0.082	0.00026	0.00029	141518
<i>Cadmium</i>	2.29	39	0.078	0.00006	0.00007	539048
<i>Chromium</i>	47.4	1200	2.400	0.00134	0.00150	801311
<i>Copper</i>	441	1500	3.000	0.01244	0.01393	107659
<i>Lead</i>	57.3	300	0.600	0.00162	0.00181	165716
<i>Mercury</i>	7.16	17	0.034	0.00020	0.00023	75151
<i>Molybdenum</i>	0.01	75	0.150	0.000000282	0.00000	237388393
<i>Nickel</i>	58.9	420	0.840	0.00166	0.00186	225700
<i>Selenium</i>	4	100	0.200	0.00011	0.00013	791295
<i>Zinc</i>	933	2800	5.600	0.02632	0.02948	94989

There are no limits for Chromium or Molybdenum under Table 3, Mo concentration comes from Table 1. Ceiling Limit.

**40 CFR 503.13 Tables 1-4.**

**T1, Ceiling loading, bulk biosolids sold or given away, bag or container, can not exceed pollutant concentration Table 1.**

**T2, Cumulative Loading, has to meet Table 1 and 2 limits, no lawn/garden Class A no ability to tract.**

**T3, Pollutant Concentration , bulk biosolid land applied on agriculture land, forest,  
public contact site or reclamation site has to meet Tables 1 &3.**

**T4, Annual Pollutant loading Rate, for land application of Class A biosolid  
given away in bag or container, has to meet Table 1 & 4.**