



Louisiana-Pacific Corporation

Western Division

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COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: Louisiana-Pacific Corporation
Project: L-P Lime Mud/Dregs / #SPSW960
Sample Matrix: Sludge

Service Request: K9507625
Date Collected: 9/7/95
Date Received: 12/7/95
Date Extracted: 12/18/95

Total Metals
Units: mg/Kg (ppm)
Dry Weight Basis

Sample Name: Lime Mud
Lab Code: K9507625-001
Date Analyzed: 12/19/95
Method Blank: K9507625-MB
12/19/95

NO Boron. OK!

Analyte	EPA Method	MRL	Reporting Unit	
Antimony	6010A	10	ND	ND
Arsenic	7060	1	2	ND
Barium	6010A	1	1240	ND
Beryllium	6010A	1	ND	ND
Cadmium	6010A	1	1	ND
Calcium	6010A	10	372000	ND
Chromium	6010A	2	123 ✓	ND
Cobalt	6010A	2	7	ND
Copper	6010A	2	103 ✓	ND
Iron	6010A	4	10800	ND
Lead	6010A	20	524 ✓	ND - 50 → 860
Magnesium	6010A	2	18500	ND
Manganese	6010A	1	3300	ND
Mercury	7471	0.2	ND	ND
Nickel	6010A	10	68 ✓	ND
Selenium	7740	1	ND	ND
Silver	6010A	2	ND	ND
Thallium	7841	1	ND	ND
Vanadium	6010A	2	4	ND
Zinc	6010A	2	313 ✓	ND
% Moisture	160.3 Modified	-	43.9	-

Approved By: Date: 12/19/95

3S30EPA/102094

07625ICP.JC1 - Sample 12/19/95

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COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Attn: Gary Markgard.

Client: Louisiana-Pacific Corporation
Project: L-P Lime Mud/Dregs/#SPSW960
Sample Matrix: Sludge

Service Request: K9507625
Date Collected: 9/7/95
Date Received: 12/7/95
Date Extracted: NA
Date Analyzed: 12/19/95

Sulfide, Reactive
EPA Method SW846 Sec. 7.3*
Units: mg H₂S/Kg (ppm)
Dry Weight Basis

Sample Name	Lab Code	Result
Lime Mud	K9507625-001	< 20
Method Blank	K9507625-MB	< 20

pH 10.5 - 11.0

Analytical methods, regulatory limits and action levels used in this report are from *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods*, SW-846, 3rd Ed., September 1986 and as amended by Update I, July 1992.

Regulatory limits 500 mg/Kg.

Approved By: Richard Young

Date: 12/22/95

40 CFR Part 503 and Land Application of Municipal Sewage Sludges

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Department of Soil and Environmental Sciences

In 1977, and again in 1987, Congress directed the United States Environmental Protection Agency (EPA) to develop guidelines and regulations for the safe use and disposal of municipal sewage sludges (Clean Water Act, Section 405(d)). After extensive consultations with industry, interest groups, and academia, the EPA promulgated 40 CFR Part 503 which was published in the Federal Register on February 19, 1993. Note, however that state or local regulators are free to impose and enforce rules stricter (but not less strict) than Part 503. 40 CFR Part 503 represents a minimum standard which, according to current scientific information, will allow safe use of the nutrients and beneficial organic properties of biosolids. *Table 1* lists the regulations and exclusions in the new rule. The EPA reports that it is confident that the Part 503 will protect the public from all "reasonably anticipated" danger because, according to the agency:

- There are virtually no effects on public health from land application in compliance with Part 503.
- Research found no evidence of any significant adverse effects of land application from past activities.
- The EPA will continue to study land application and is prepared to move quickly to revise Part 503 should problems arise.

Table 1 Sludge types and practices regulated by 40 CFR Part 503.

Regulated	Excluded
land application systems	processing prior to use or disposal
surface disposal systems	industrial or hazardous sludges
monofills (sludge-only landfills)	sludges with > 50 ppm PCB's
sludge incineration systems	co-disposal or co-firing with municipal solid waste

Part 503 regulates land application and surface disposal systems separately. According to the rule, land application is "the spraying or spreading of sewage sludge onto the land surface; the injection of sewage sludge below the land surface; or the incorporation of sewage sludge into the soil so that the sewage sludge can either condition the soil or fertilize crops or vegetation grown in

sludge products are usually distributed widely in relatively small amounts for use as potting media or lawn and garden amendments. The other category, "Bulk sewage sludge," includes all other delivery alternatives. "Bulk sewage sludge" is usually applied in large quantities to an established site by professional applicators and is therefore easier to monitor.

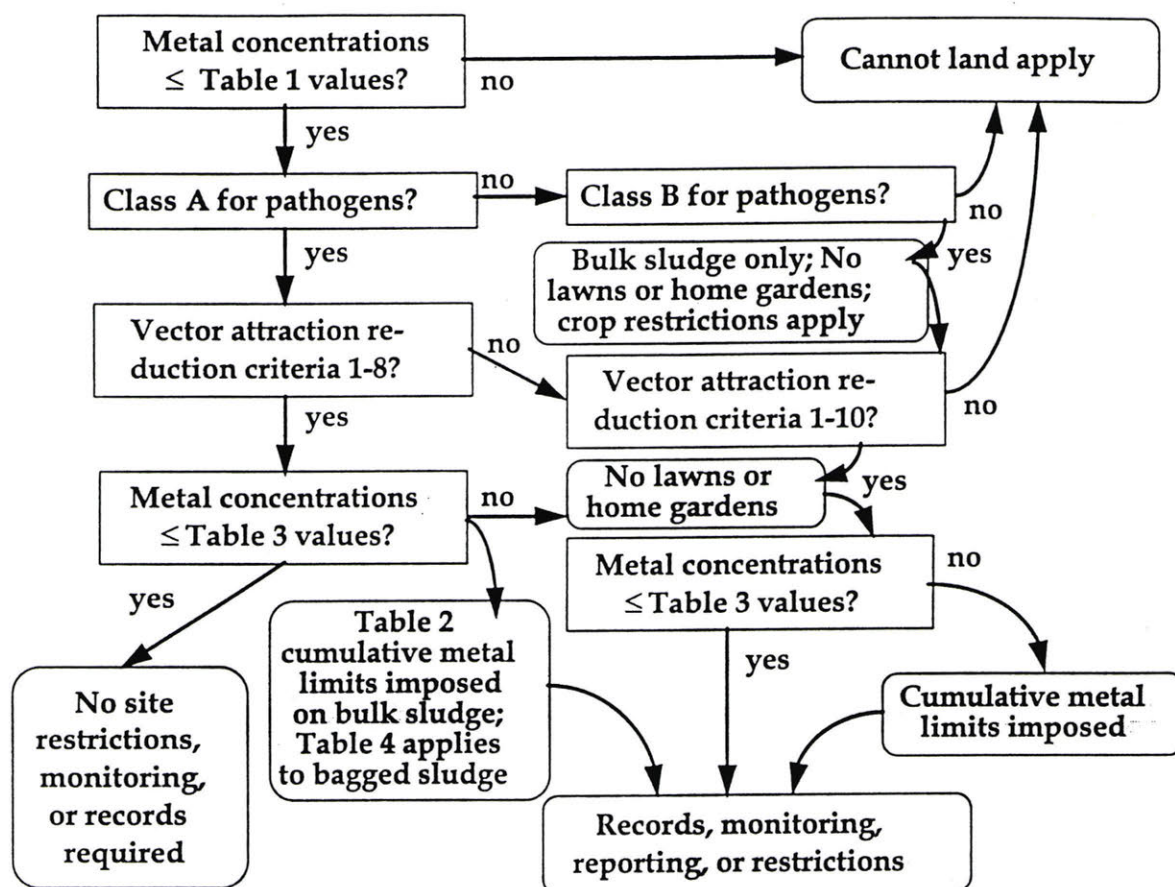


Figure 1 Selected land application components of 40 CFR Part 503.

Trace Elements

The presence of trace elements, sometimes referred to as heavy metals, in sewage sludges stems from the contaminants discharged into the sewage system as well as the effectiveness of sewage treatment. All sewage sludges contain trace elements, but concentrations tend to be lower than they once were since government regulations have reduced the amount of metals discharged by industry into the sewage system.

EPA regulations limit the concentrations of 10 heavy metals in land-applied sewage sludges. Numerical limits are expressed for each of the elements in four tables which are gathered together in *Table 3*, below. If the concentrations of all trace elements in a given sewage sludge fall below the metal concentrations listed in Part 503 Table 3, there are *no* trace element restrictions and *no* site-

mation is collected and maintained by sludge applicators, it is a good idea for landowners to keep duplicate records to guarantee their ability to receive sludge from any applicator, now and in the future.

Because bagged sludges are often distributed widely in small amounts, the EPA does not require cumulative record keeping for these products. Instead it limits the total amount of each metal that can be applied in a single year to the values listed in Part 503 Table 4. Annual loading limits for a particular bagged product will be constrained by the metal with the highest concentration relative to its corresponding Part 503 Table 4 annual bagged sludge limit.

Pathogens

Pathogens are discharged into sewers by infected individuals. Most are destroyed during wastewater treatment, but sufficient numbers remain in sewage sludge to infect people who work with or eat produce from sludge amended fields. Once in the soil, they will gradually die over time (see Table 4). Because many pathogens are difficult to isolate and can be dangerous in concentrations that are too small to easily measure, regulators restrict the concentrations of more common indicator organisms that suggest the presence of pathogens in biosolids. 40 CFR Part 503 regulations control the concentrations of fecal coliforms or *Salmonella* sp., enteric viruses, and helminth ova.

Table 4 Pathogen survival times on plants and soils (USEPA, 1985).

Pathogen	Soil		Plants	
	Absolute Maximum	Common Maximum	Absolute Maximum	Common Maximum
Bacteria	1 year	2 months	6 months	1 month
Viruses	6 months	3 months	2 months	1 month
Helminths	7 years	2 years	5 months	1 month

Fecal coliforms are a class of bacteria excreted in human fecal matter that, while not necessarily pathogenic themselves, suggest the presence of other, harder to distinguish bacteria that can cause disease. Helminths include roundworms and tapeworms. Two quality classes, Class A and Class B, are included in the regulations, where Class A is the more highly treated. Class A quality can be reached through temperatures and/or pH elevation, or through one of the so-called "Processes to Further Reduce Pathogens" (PFRPs). The PFRPs include, among other alternatives, a description of the composting management practices

process. This helps to prevent pathogen regrowth. In addition, alternatives 9 and 10 require the applicator to certify that vector attraction reduction is done properly.

"High Quality Biosolids"

If a sewage sludge or sewage sludge product falls under pathogen Class A, meets the trace element limits in Part 503 Table 3, and meets one of vector attraction reduction alternatives 1-8, there are *no restrictions or record keeping requirements whatsoever* associated with its use. Because the EPA anticipates sufficient demand for high quality sludge to prevent waste through over-application, even the requirement for application at agronomic rates is waived. Manufacturers of these high quality sludges are likely to expect a higher price from the farmer or other consumer for these products. *Figure 1* illustrates many of the significant components of 40 CFR Part 503. However, in most cases applicators will continue to report to the regional water boards or county authorities regardless of biosolids quality.

Enforcement

The Regional Administrator of the EPA is currently responsible for monitoring compliance with 40 CFR Part 503 in California. It is possible that the California Integrated Waste Management Board or, more likely, the Regional Water Quality Control Boards, will assume responsibility for enforcing the regulations at some time in the future. Currently, the EPA plans to incorporate enforcement activities into the National Pollution Discharge Elimination System (NPDES) licensing program for sewage treatment plants, but sewage treatment facilities, sludge processors, and applicators cannot wait until they are approached by a permitting authority to initiate compliance with Part 503.

The records required by Part 503 must be kept after July 20, 1993. All other requirements must be met by February 19, 1994, unless a sewage sludge processing facility requires substantial construction to comply with the regulation, in which case requirements must be met by February 19, 1995. In the case of bulk biosolids, the applicator is responsible for supplying the owner or lease holder of the land receiving the material with the information needed to comply with site management restrictions. For "sludge sold or given away in a bag or other container for application to land" the person preparing the bagged product must include appropriate information on the package label.

References

USEPA. 1985. Health effects of land application of municipal sewage sludge. EPA/600/1-85/015. 78 pp.

USEPA. 1993. Standards for the use and disposal of sewage sludge. 40 CFR Part 503.

APPENDIX - PATHOGEN TREATMENT PROCESSES (USEPA, 1993)

Processes to Significantly Reduce Pathogens (PSRP)

1. **Aerobic digestion:** Sewage sludge is agitated with air or oxygen to maintain aerobic conditions for a specific mean cell residence time at a specific temperature. Values for the mean cell residence time and temperature shall be between 40 days at 20 degrees Celsius and 60 days at 15 degrees Celsius.
2. **Air drying:** Sewage sludge is dried on sand beds or on paved or unpaved basins. The sewage sludge dries for a minimum of three months. During two of the three months, the ambient average daily temperature is above zero degrees Celsius.
3. **Anaerobic digestion:** Sewage sludge is treated in the absence of air for a specific mean cell residence time at a specific temperature. Values for the mean cell residence time and temperature shall be between 15 days at 35 to 55 degrees Celsius and 60 days at 20 degrees Celsius.
4. **Composting:** Using either the within-vessel, static aerated pile, or windrow composting methods, the temperature of the sewage sludge is raised to 40 degrees Celsius or higher and remains at 40 degrees Celsius or higher for five days. For four hours during the five days, the temperature in the compost pile exceeds 55 degrees Celsius.
5. **Lime stabilization:** Sufficient lime is added to the sewage sludge to raise the pH of the sewage sludge to 12 after two hours of contact.

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 degrees Celsius or higher for three days; Using the windrow composting method, the temperature of the sewage sludge is maintained at 55 degrees or higher for 15 days or longer. During the period when the compost is maintained at 55 degrees or higher, there shall be a minimum of five turnings of the windrow.
2. **Heat drying:** Sewage sludge is dried by direct or indirect contact with hot gases to reduce the moisture content of the sewage sludge to 10 percent or lower. Either the temperature of the sewage sludge particles exceeds 80 degrees Celsius or the wet bulb temperature of the gas in contact with the sewage sludge as the sewage sludge leaves the dryer exceeds 80 degrees Celsius.
3. **Heat treatment:** Liquid sewage sludge is heated to a temperature of 180 degrees Celsius or higher for 30 minutes.
4. **Thermophilic aerobic digestion:** Liquid sewage sludge is agitated with air or oxygen to maintain aerobic conditions and the mean cell residence time of the sewage sludge is 10 days at 55 to 60 degrees Celsius.
5. **Beta ray irradiation:** Sewage sludge is irradiated with beta rays from an accelerator at dosages of at least 1.0 megarad at room temperature (*ca.* 20 degrees Celsius).
6. **Gamma ray irradiation:** Sewage sludge is irradiated with gamma rays from certain isotopes, such as Cobalt 60 and Cesium 137, at room temperature (*ca.* 20 degrees Celsius).
7. **Pasteurization:** The temperature of the sewage sludge is maintained at 70 degrees Celsius or higher for 30 minutes or longer.