



WISCONSIN WASTEWATER  
OPERATORS' ASSOCIATION

# Standard Methods for Sewage Sludge (...or what has changed)

**Rick Mealy**

WWOA, President-Elect

RGM Lab Consulting



## BACKGROUND

- Federal Register/Vol. 77, No. 97/ Friday, May 18, 2012/ Rules and Regulations
- EPA methods 1680, 1681 and 1682 were included as new methods.
- **Changes to NR 219 approved by NRB 10-23-2019**
- **Governor's approval 12/5/2019**

After a lot of muddlement in 2020 ( *Legislature opting to adjourn until 2021 on 2/21/20, COVID pandemic* )

Rule change finally published in the July Administrative Register, making it effective August 1, 2020

Register July 2020 No. 775



# 3 Main changes involved

**APPROVED METHODS**

**HOLDING TIME**

**USE OF GEOMEAN**



# APPROVED METHODS

# Wastewater method changes

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Federal Register / Vol. 77, No. 97 / Friday, May 18, 2012 / Rules and Regulations

TABLE IA—LIST OF APPROVED BIOLOGICAL METHODS FOR WASTEWATER AND SEWAGE SLUDGE

Parameter and units	Method <sup>1</sup>	EPA	Standard methods	AOAC, ASTM, USGS
Bacteria: 1. Coliform (fecal), number per 100 mL or number per gram dry weight	Most Probable Number (MPN), 5 tube, 3 dilution, or	p. 132 <sup>3</sup> ..... 1680 <sup>11,15</sup> . 1681 <sup>11,20</sup> .	9221 C E-2006.	
	Membrane filter (MF) <sup>2</sup> , single step	p. 124 <sup>3</sup> .....	9222 D-1997 .....	B-0050-85 <sup>4</sup> .
8. <i>Salmonella</i> , number per gram dry weight <sup>11</sup> .	MPN multiple tube	1682 <sup>23</sup> .		

Added 3 new EPA methods, 2 for Fecals, 1 for Salmonella

# NR 219...prior to this rule change

Table A  
List of Approved Biological Methods for Wastewater and Sewage Sludge

Parameter and units	Analytical Technology <sup>1</sup>	EPA	Standard Methods <sup>27</sup>	AOAC, ASTM, USGS
<b>Bacteria:</b>				
1. Coliform (fecal), number per 100 mL or number per gram dry weight	Most Probable Number (MPN), 5 tube, 3 dilution, or	p. 132 <sup>3</sup>	9221 C-2006	
		1680 <sup>11,15</sup> 1681 <sup>11,20</sup>	9221 E-2006	
	Membrane filter (MF) <sup>2</sup> , single step	p. 124 <sup>3</sup>	9222 D-1997	B-0050-85 <sup>4</sup>
8. <i>Salmonella</i> , number per gram dry weight <sup>11</sup>	MPN multiple tube	1682 <sup>23</sup>		

Wait...so if these methods were already in NR 219, why are these considered "new" changes?



# NR 219 Previous BioSolids Methods

The problem is a disconnect between Table A and Table EM

Table EM  
List of Approved Analytical Methods **for Sludge**

Parameter	Analytical Technology	Sample Preparation		Determinative Method			
		SW-8461	EPA <sup>4</sup>	SW-846 <sup>1</sup>	EPA <sup>2,3</sup>	Standard Methods [ed.] 8,9	Other
Fecal Coliform	Most Probable Number Membrane Filter					9221 E [18,19, 20,21], 9221 E-99, 9222 D, 9222 D-97	Appendix F <sup>10</sup>
Salmonella	Most Probable Number <del>Selective Media Culture</del>						9260 D.1 <sup>8</sup>  Appendix G <sup>10</sup>

Nothing!  
Nothing!

Nothing!  
Nothing!

OLD methods

Did anyone catch the difference in Std Methods approved editions between Tables A and EM?

# NR 219 Revised BioSolids Methods

TABLE EM  
List of Approved Analytical Methods for Sludge

Parameter	Analytical Technology	Sample Preparation		Determinative Method			
		SW-846 <sup>1</sup>	EPA <sup>4</sup>	SW-846 <sup>1</sup>	EPA <sup>2,3</sup>	Standard Methods [ed.] <sup>8,9</sup>	Other
Coliform (fecal), number per gram dry weight	Most Probable Number (MPN), 5 tube, 3 dilution, or		p. 132, <sup>16</sup> 1680, <sup>11,17</sup> 1681 <sup>11,18</sup>		p. 132, <sup>16</sup> 1680, <sup>11,17</sup> 1681 <sup>11,18</sup>	9221 E-2014	Appendix F <sup>10</sup>
	Membrane filter (MF) <sup>21,22</sup> single step		p. 124 <sup>16</sup>		p. 124 <sup>16</sup>		
<i>Salmonella</i> number per gram dry weight <sup>11</sup>	MPN multiple tube		1682 <sup>20</sup>		1682 <sup>20</sup>		



## It gets confusing!

### NR 219 v. 40 CFR Part 136

- In 40 CFR Part 136, Table IA is for wastewater AND sludge
- In NR 219, Table A says it's for wastewater AND sludge, BUT... there is a Table EM that addresses approved methods for sludge
- There is no Table EM in 40 CFR Part 136

#### NR 219

##### Table A

List of Approved Biological Methods for Wastewater and Sewage Sludge

##### Table EM

List of Approved Analytical Methods for Sludge

#### 40 CFR Part 136.3

Table IA—List of Approved Biological Methods for Wastewater and Sewage Sludge

*No Table Em*



# Confusion resolved: REVISED NR 219 rules

Now the approved methods (SM editions) in the two tables will agree!

NR 219.04

Table A

List of Approved Biological Methods for Wastewater and Sewage Sludge

Parameter and units	Analytical Technology <sup>1</sup>	EPA	Standard Methods <sup>25</sup>
<b>Bacteria</b>			
1. Coliform (fecal), number per 100 mL or number per gram dry weight	Most Probable Number (MPN), 5 tube, 3 dilution, or	p. 132 <sup>3</sup> 1680 <sup>11,15</sup> 1681 <sup>11,20</sup>	9221 E-2014
	Membrane filter (MF) <sup>2,5</sup> , single step	p. 124 <sup>3</sup>	9222 D-2015 <sup>29</sup>
7. <i>Salmonella</i> number per gram dry weight <sup>11</sup>	MPN multiple tube	1682 <sup>22</sup>	

TABLE EM  
List of Approved Analytical Methods for Sludge

Parameter	Analytical Technology	Sample Preparation		Determinative Method		
		SW-846 <sup>1</sup>	EPA <sup>4</sup>	SW-846 <sup>1</sup>	EPA <sup>2,3</sup>	Standard Methods [ed.] <sup>8,9</sup>
Coliform (fecal), number per gram dry weight	Most Probable Number (MPN), 5 tube, 3 dilution, or		p. 132, <sup>16</sup> 1680, <sup>11,17</sup> 1681 <sup>11,18</sup>		p. 132, <sup>16</sup> 1680, <sup>11,17</sup> 1681 <sup>11,18</sup>	9221 E-2014
	Membrane filter (MF) <sup>21,22</sup> single step		p. 124 <sup>16</sup>		p. 124 <sup>16</sup>	9222 D-2015 <sup>19</sup>
<i>Salmonella</i> number per gram dry weight <sup>11</sup>	MPN multiple tube		1682 <sup>20</sup>		1682 <sup>20</sup>	



# HOLDING TIMES

This is a tricky part to navigate, since NR 219 is not structured perfectly parallel to Federal Code



# NR 219 Table F – Holding Time

**Holding Time changes from 6 hrs to 8 hrs**

Table F  
Required Containers, Preservation Techniques, and Holding Times for wastewater

Parameter Number/Name	Container <sup>1</sup>	Preservation <sup>2,3</sup>	Maximum Holding Time <sup>4</sup>
<b>Table A — Bacterial Tests</b>			
1–5. Coliform, total, fecal and <i>E. coli</i>	PA, G	Cool, <10°C, 0.0008% Na <sub>2</sub> S <sub>2</sub> O <sub>3</sub> <sup>5</sup>	8 hours. <sup>22,23</sup>
8. <i>Salmonella</i>	PA, G	Cool, <10°C, 0.0008% Na <sub>2</sub> S <sub>2</sub> O <sub>3</sub> <sup>5</sup>	8 hours. <sup>22</sup>

**There is no Holding Time Table parallel in 40 CFR (federal rules) for Biosolids...  
...AND... you have to look at the footnotes!**



## Footnotes to NR 219 Table F (but it can also be extended to 24 hrs)

**22** Sample analysis should begin as soon as possible after receipt; sample incubation must be started no later than 8 hours from time of collection.

**23** For fecal coliform samples for sewage sludge (biosolids) only, the holding time is extended to 24 hours for the following sample types using either EPA Method 1680 (LTB-EC) or 1681 (A-1):

- Class A composted,
- Class B aerobically digested,
- Class B anaerobically digested

*Class A, B refers to the quality of the biosolids with respect to pathogens*



## 8 v. 24 hr Hold Time

So....for Fecal Coliforms only...

**IF**

- You use EPA Methods 1680 or 1681 (*i.e. not Std Methods*)

**AND** you are analyzing any of the following biosolids:

- Class A composted,
- Class B aerobically digested, or
- Class B anaerobically digested.

**THEN...**

- The Holding Time can be extended to 24 hrs



## What the Methods Say

Standard Methods 9221E (MFT) and 9222D (MPN) direct the user to Standard Methods 9060A,B for Holding Time requirements:

### 9060 B. Preservation and Storage

1. *c. Nonpotable water for compliance purposes:*

**For bacterial samples in wastewater sludge (fecal coliforms and *Salmonella* sp.) the regulatory holding time is 24 h.**

Statutes → Administrative Code (NR xxx) → Methods



# QUESTIONS ON USE OF GEOMEAN

**(but what else to do?)**



# No geometric mean for Class A sludges

NR 204.07(6)(a) is **incorrect** with respect to federal code:

- a geometric mean cannot be used for Class A samples.

NR 204.07(6)(a). The sludge shall have a fecal coliform density  $\leq 1,000$  (MPN) / g of total solids on a dry weight basis. **Compliance shall be demonstrated by calculating the geometric mean of at least 7 separate samples;**

Federal Code (40 CFR Part 503) 503.32 Pathogens.

(a) *Sewage sludge—Class A.* (1) The requirement in §503.32(a)(2) **and the requirements in either §503.32(a)(3),** (a)(4), (a)(5), (a)(6), (a)(7), or (a)(8) shall be met for a sewage sludge to be classified Class A with respect to pathogens.

(b) *Sewage sludge—Class B.* (1)(i) The requirements in either §503.32(b)(2), (b)(3), or (b)(4) shall be met for a sewage sludge to be classified Class B with respect to pathogens.



# No geomean for Class A sludges?

The **ONLY** mention of geomean is in Class B – Alternative 1

Federal Code (40 CFR Part 503) 503.32 Pathogens.

(a) *Sewage sludge—Class A.*

**503.32 (a)(3)** *Class A—Alternative 1.* (i) Either the density of fecal coliform in the sewage sludge shall be <1000 MPN/g of total solids (dry weight basis), **or** the density of *Salmonella* sp. bacteria shall be < 3 MPN/ 4g of total solids (dry weight basis) at the time the sewage sludge is used or disposed;

(b) *Sewage sludge—Class B.*

(2) *Class B—Alternative 1.*

(i) **7 representative samples** of the sewage sludge used/disposed shall be collected.

(ii) The **geometric mean of the density** of fecal coliform in the samples ... shall be less than either 2,000,000 MPN/ g of total solids (dry weight) or 2,000,000 CFU/g of total solids (dry weight basis).



## Armchair lawyer time...

- If you can't perform a geomean, what is the alternative?
- A single (*hopefully representative*) sample?
- Does that even make sense?
- Wouldn't we WANT good data (*i.e., based on multiple samples*)?
- Just because federal code doesn't mention doing a geomean on 7 samples, does that mean it's precluded?
- And...if it's an error in NR 219 to allow it, and NR 219 is state law, isn't it therefore allowed? ***Who wants to go before an ALJ and argue against this position?***
- Just sayin' ....





# Collecting samples for pathogen testing

- Class B cake storage (geomean)...fairly simple...collect from several different locations
- Class A liquid storage...again simple...representative sampling  
(refer to **Steve Warrner's presentation**)
- Lagoon Sampling...consider one lagoon, two lagoons, etc.

## Re-testing

### Retesting for re-growth

● If distribution or land application does not occur **soon after testing**, (think bagging, storage, etc.) RETESTING for pathogens is required prior to distribution, bagging, land application.

- Sludge storage implications... (*vector attraction*)
- Have a backup plan



*Because I can't NOT mention it...*

# Vector Attraction Reduction

**(Class A & B biosolids landspreading  
requires some measure of VAR)**

# Vector attraction: FLIES!!!



Vector attraction: BIRDS!!!



Vector attraction: and of course...RATS!!!



Vector attraction: and more RATS!!!





THANK  
YOU

**Rick Mealy**

 **(608) 220-9457**



[rickmealy1@gmail.com](mailto:rickmealy1@gmail.com)