Chapter 13

Soil and Septage Waste Sampling and Testing Requirements

13.1 Soil Fertility Test

A standard soil fertility test shall be performed using soil sample(s) taken from the land site where septage waste is applied or will be applied. In order to perform the soil analysis, it is important to take a composite soil sample that is representative of the location. Basic parameters in a soil sample report should include, among others:

- Soil pH.
- Soil nutrient levels of phosphorus, potassium, magnesium, and calcium reported in parts per million (ppm) or pounds per acres (lbs/ac).
- Phosphorus shall be analyzed using the P1 (Bray and Kurtz P1) or Mehlich 3 Test.
- Cation exchange capacity (CEC usually reported in meq/100 g).
- Base saturation (usually reported as percent of exchangeable bases).
- Recommendations for lime.
- Recommendations for nitrogen, phosphorus and potassium.

Note: It is not necessary to get nitrate nitrogen (NO_3 – N) analysis unless it is part of a standard soil fertility test with no extra fees. See section 5.3.1 for a discussion about nitrate-nitrogen testing.

13.2 How to Sample Soils

A summary description of how to take a soil sample for a soil fertility test is given in Appendix K. Additional information about soil sampling[3] is also available in the Septage Program website under Related Links.

13.2.1 Time of Soil Sampling

Soil sample may be taken at any time in the cropping year provided the soil is not frozen or saturated with water.

Sampling in Fall: Although soil samples can be taken at any time during the year, it is highly recommended that soil samples be taken in the fall of each year. Soil samples taken in the fall gives the licensee or land manager enough time to get the test results from the laboratory and plan for spring and summer cropping the following year. Furthermore, it allows the licensee to submit to MDEQ, in a timely manner, the annual soil sample reports with the cropping plan and annual license fee due in March of the following year.

13.2.2 Frequency of Soil Sampling

An annual soil fertility test shall be provided for each field where septage waste is land applied. Annual soil sampling is not required for “reserve” land sites where septage waste will not be applied for at least 12 months or more. However, before you use a “reserve” land site or field for septage waste application, a current soil test report and cropping plan for the reserve fields shall be submitted to the MDEQ for review and approval. See Section 7.5 for an explanation of a reserve land site or field.

13.2.3 Number of Composite Soil Samples

At least one composite sample shall be taken from each field. A composite sample is made up of several core samples depending on the size of the field. However, the more core samples you take to make a composite sample the better it represents the field.

For a field of 10 acres and where the soil is homogenous, about 15 - 20 core samples should be collected to form one composite sample for laboratory analysis. For larger fields, more core samples should be taken to make a composite sample. Where there is significant soil variability within a field, more than one composite soil sample may be taken from the field and analyzed. The soil sample(s)

collected for the fertility test should be representative of the entire field where septage has been applied or will be applied. If the soil sample(s) is not "representative," then the soil test results from the laboratory will not provide correct nutrient and lime recommendations.

13.2.4 Information to submit to Soil Laboratory with Soil Sample

Provide the following information when a soil sample is taken to the soil testing laboratory for analysis:

- Land Site ID number (numerical) and Field Identification (alphabetical) where sample was taken.
- Date soil sample was taken.
- The number of acres represented by the soil sample.
- Previous crop grown at the site **before** septage waste application.
- Crop that will be grown **after** septage waste application.
- Expected yield of the crop that will be grown following septage waste application.
- Depth of tillage (subsurface injection or surface soil incorporation depth).
- Indicate whether manure* will be applied or has been applied to the land site or field.

13.3 Soil Sampling by MDEQ

The MDEQ may take soil sample(s) from any field at any MDEQ authorized land site at any time for analysis. The soil test report(s) obtained from such sampling(s) can be evaluated and compared with the soil test report(s) submitted by the licensee.

13.4 Septage Waste Characteristics

According to Part 117, domestic septage is defined as "*Liquid or solid material removed from a septic tank, cesspool, portable toilet, type III marine sanitation device, or similar storage or treatment works that receives only domestic sewage. Domestic septage does not include liquid or solid material removed from a septic tank, cesspool, or similar facility that receives either commercial wastewater or industrial wastewater and does not include grease removed from a grease interceptor, grease trap, or other appurtenance used to retain grease or other fatty substances contained in restaurant waste.*"

The general septage characteristics as reported by USEPA[5, 6] are shown in Table 13-1. This table is presented as a guide only.

Table 13-1.Septage Waste Characteristics

Wastewater Parameter	**Septage** mg/L	**Sewage** mg/L	**Relative Strength Ratio** (Septage : Sewage)
Compatibles:			
5 – day BOD	6,500	220	30 : 1
Chemical Oxygen Demand	32,000	500	65 : 1
Total Suspended Solids	13,000	220	60 : 1
Total Kjeldahl Nitrogen	600	40	15 : 1
Ammonia Nitrogen	100	25	4 : 1
Total Phosphorus	210	8	25 : 1
Oil and Grease	5,500	100	55 : 1
Toxics:			
Arsenic	0.140	0.003	50 : 1
Cadmium	0.100	0.003	33 : 1
Chromium	0.500	0.050	10 : 1
Copper	4.800	0.061	95 : 1
Cyanide	0.470	0.041	10 : 1
Lead	1.200	0.049	25 : 1
Mercury	0.005	<0.0002	>25 : 1
Nickel	0.500	0.021	25 : 1
Silver	0.100	0.005	20 : 1
Zinc	10.000	0.175	55 : 1

Domestic septage contains nutrients, heavy metals, and pathogens. The characteristics of the septage waste that haulers pump in Michigan may vary from location to location and from load to load. For purposes of this discussion, a location means a region of a county or state and load means an individual residential septic system. The emphasis in this manual is on nitrogen, phosphorus, and to some extent, pathogens.

13.5 Septage Waste Sampling

Septage waste can be analyzed in a laboratory that analyzes this type of waste or residuals. Always find out if the laboratories where you want to have your septage waste analyzed does that type of analysis. Basic parameters to consider include among others:

- Total Kjeldahl Nitrogen (TKN).
- Ammonium-Nitrogen (NH_4-N).
- Nitrate-Nitrogen (NO_3 –N).
- Total phosphorus.
- Potassium.

Note: There is no requirement for routine septage waste analysis. However, haulers can obtain septage waste analyses on their own for their individual nutrient management plan.

MDEQ may require septage waste analysis when the situation demands such a need. The determination to sample septage waste will be handled on a case by case basis. Meanwhile, MDEQ uses the USEPA estimate of 0.0026 lbs N/gallon of septage waste as the guideline involving nitrogen content in septage waste. See Chapter 5 for additional information on agronomic application rate calculations.

13.6 How to Take a Septage Waste Sample

Follow the instructions from the laboratory about the method of sampling and safe handling of the waste from the time of sampling to the time the sample gets to the laboratory for analysis. Some of the following guidelines may assist you:

- Identify the type or category of septage waste (e.g., holding tank waste, portable toilet waste, food establishment septage, regular septic tank waste). If it is taken from a septage waste storage facility, indicate that the septage waste is from a storage facility and indicate the types of septage waste in the storage facility.
- Take a sample from the homogenous mix of each type or category of septage waste from the septic tank, pump vehicle tank or mixed septage waste in a storage facility.

13.7 Food Establishment Septage (FES)

FES is material pumped from a grease interceptor, grease trap, or other appurtenance used to retain grease or other fatty substances contained in restaurant wastes and that is blended into a uniform mixture, consisting of not more than one part of restaurant-derived material per 3 parts of domestic septage, prior to land application or disposed of at a receiving facility.

<u>Mixing Ratio</u>: FES shall be mixed with regular domestic septage in no greater than 1:3 ratio, that is, one part of FES to three parts of domestic septage[1].

1 Part FES + 3 Parts of Domestic Septage = Septage/FES Mixture

FES shall not be land applied unless mixed in the ratio described above. Mixing may occur in the septage waste storage facility, in the pump vehicle tank, or other device designed for proper mixing.

13.8 FES Testing for Land Application

FES waste shall not be land applied unless testing for cadmium and polychlorinated biphenyls (PCB) has been conducted of the mixed septage waste in a storage facility in accordance with the requirements in 40 CFR Part 257.3-5[1,4] or soil testing in that location. For additional information of the testing requirements of cadmium and PCB, see the Septage Program website.

13.9 References

1. Michigan Septage Law. Part 117, Septage Waste Servicers, NREPA, 1994 PA 451, as amended. Enacted 2004.

2. Recommended Chemical Soil Test Procedures for the North Central Region. 1998. North Central Regional Research Publication No. 221 (Revised). Missouri Agricultural Experiment Station SB 1001.

3. Sampling Soils for Fertilizer and Lime Recommendations. 1998. Michigan State University Extension Bulletin E- 498

4. U.S. Environmental Protection Agency. Federal Septage Law, CFR 40, Part 257.3 – 5. Criteria for Classification of Solid Waste Disposal Facilities and Practices.

5. U.S. Environmental Protection Agency. 1994. Guide to Septage Treatment and Disposal. EPA-625-R-94-002

6. U.S. Environmental Protection Agency. 1984. Handbook: Septage Treatment and Disposal. EPA-625-6-84-009