System Inspection Timelines for Pump outs

David Boyer

Clarification of the pump out schedule for system inspections

- For several years there has been confusion of the pump out schedule for system inspections.
- This discussion will clarify how the pump out schedule impacts the validity of a Title 5 inspection.

System Inspection (Section 15.301)

- Inspection at Time of Transfer: "……. a system shall be inspected at or within two years prior to the time of transfer of title to the facility served by the system. An inspection conducted up to three years before the time of transfer may be used if the inspection report is accompanied by system pumping records demonstration that the system has been pumped at least once a year during that time."
- The confusion lies as to how the "three years" is defined.
  - Does it mean each pump out must be done within a calendar year?
  - Does it mean the pump out must be done by the inspection anniversary date?

The three-year schedule

- MassDEP interprets this section to require that if a homeowner wishes to get the benefit of an additional year for the validity of the inspection, then:
  - The system must be pumped out once per year starting from the date of the inspection (i.e. by the anniversary date of the inspection).

Example

- System Inspected: April 22, 2018.
- To get the inspection to be valid for 3 years, pump outs need to occur at the following schedule:

  Pump out #1 between April 22, 2018 and April 22, 2019

  Pump out #2 between April 22, 2019 and April 22, 2020

  Pump out #3 between April 22, 2020 and April 22, 2021
- As long as the system meets this pump out schedule then the inspection is good until April 22, 2021. However, if any dates are missed then it *expired* on April 22, 2020.

Case Study:
Septage Hauler Enforcement Case

David Boyer

Septage Hauler Enforcement

- In 2015 DEP received a complaint from a competing septage hauling company regarding questionably low pump out costs from his competitor.
- DEP Strike Force inquired with nearby receiving POTWs and could not find a POTW that regularly accepted septage from the company in question.
- Upon confirming questionable disposal practices DEP Strike Force then coordinated with the Attorney General's office to review the allegations more carefully. The AG's office then assumed the lead of the enforcement case and filed a formal complaint in 2018.

Enforcement Findings

- The complaint alleged:
  - The septage hauler illegally discharged truckloads of septage into a manhole located at a sewerage pumping station within the town instead of properly discharging it at a designated receiving point in the sewerage system.
  - This was done as part of a plan to avoid paying fees and providing documentation to the POTW.
  - Additionally, the septage hauler installed and maintained an illegal underground storage tank to hold septage in order to facilitate these unauthorized discharges.
  - This practice occurred for years.

Enforcement Findings

- This fraudulent scheme violated rules put in place to prevent significant harm to the infrastructure. By circumventing these rules, the hauler forced residents and other ratepayers to pay for the upkeep costs resulting from its waste and gained an unfair advantage over its competitors who follow the rules.
- One of the customers of the septage hauler was a State Agency.

Settlement Agreement

- The Attorney General settled the case in late 2020:
  - $500,000 penalty ($350,000 is owed and $150,000 is suspended pending compliance)
  - "This company planned and carried out an illegal scheme to cheat the system and gain an unfair business advantage over competitors…."
  - "The company intentionally avoided thousands of dollars in costs to transport and treat the waste…"
  - The hauler is prohibited from seeking or performing any contracts with state or municipal entities for a 2-year period.

How does this impact the Board of Health?

- Section 15.502 requires that all septage haulers have a yearly permit issued by the BOH.

  The permit must designate the name of the POTW where the sewage is disposed of.
- Pumping records must be submitted to the BOH within 14 days of the pump out event.

- It's a very good idea to spot check your haulers from time to time.

QUESTIONS

Title 5 Sieve Analysis

MHOA

March 3, 2021

David Boyer, MassDEP

What is a Sieve Analysis?

- A sieve analysis is a gradation testing process established by geotechnical engineers to determine the percentage of the size of soil size particles of a sample (a.k.a. particle size analysis).

When do we need a Sieve Analysis?

- There are basically two instances in which you would need to use a sieve analysis:

1. Title 5 fill material for either replacement of unsuitable material as well as for a mounded soil absorption system due to high groundwater.

2. The "Title 5 Alternative to Percolation Testing" policy of 2006 which established the need to perform a particle size analysis for situations in which a standard percolation test cannot be performed due to high groundwater. This is only applied for upgrades and not new construction.

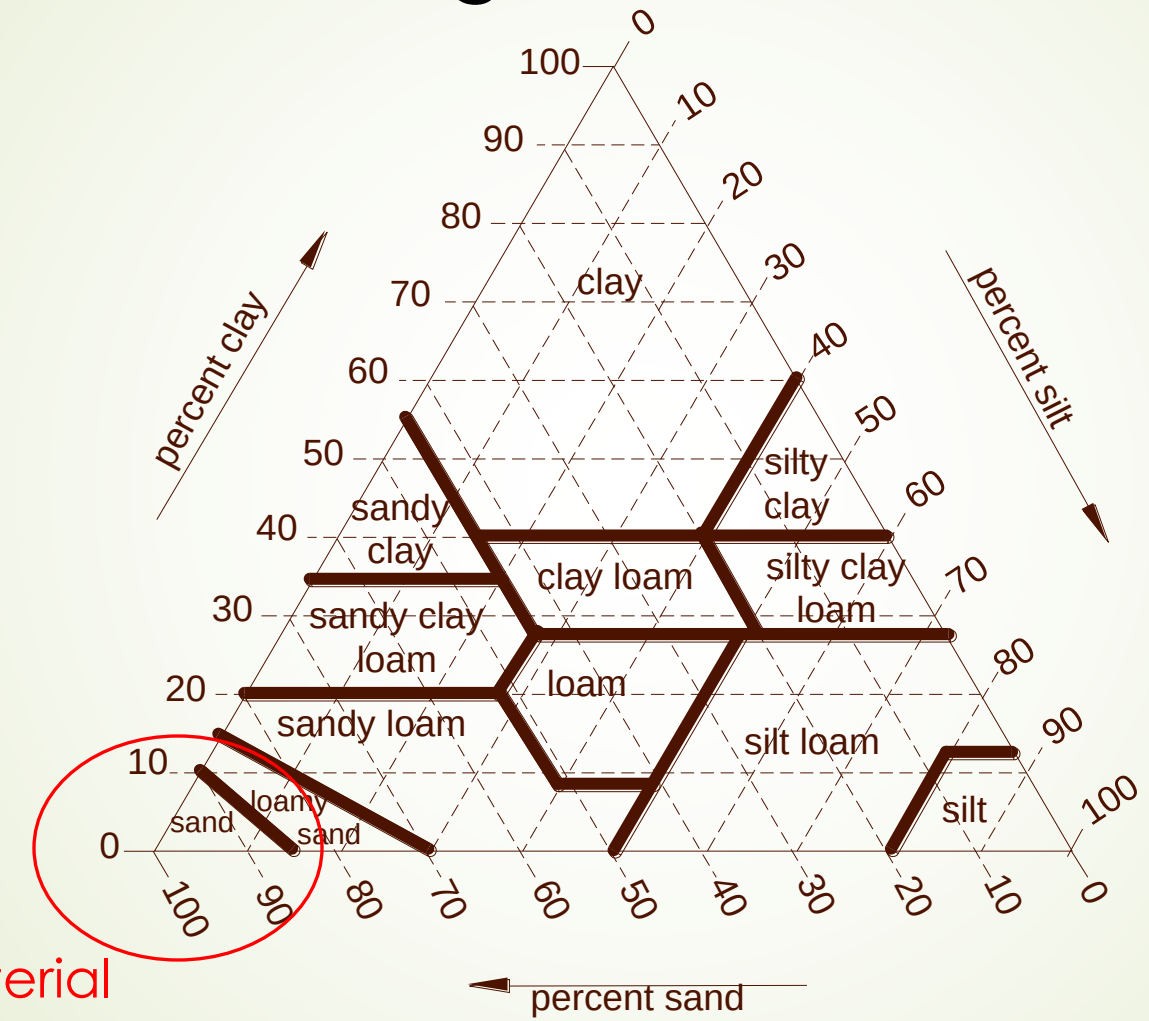
What's the Difference?

- Title 5 fill material is basically imported sand that meets a certain specification. It does not accept or analyze any soil that is smaller than a sand size particle (i.e., silts or clay).

- The particle size analysis for the "Alternative Perc" policy is to determine the entire range of soil of the sample for soil classification, so it does include silts and clays. (e.g., is it a "sandy loam" or a "silt loam").

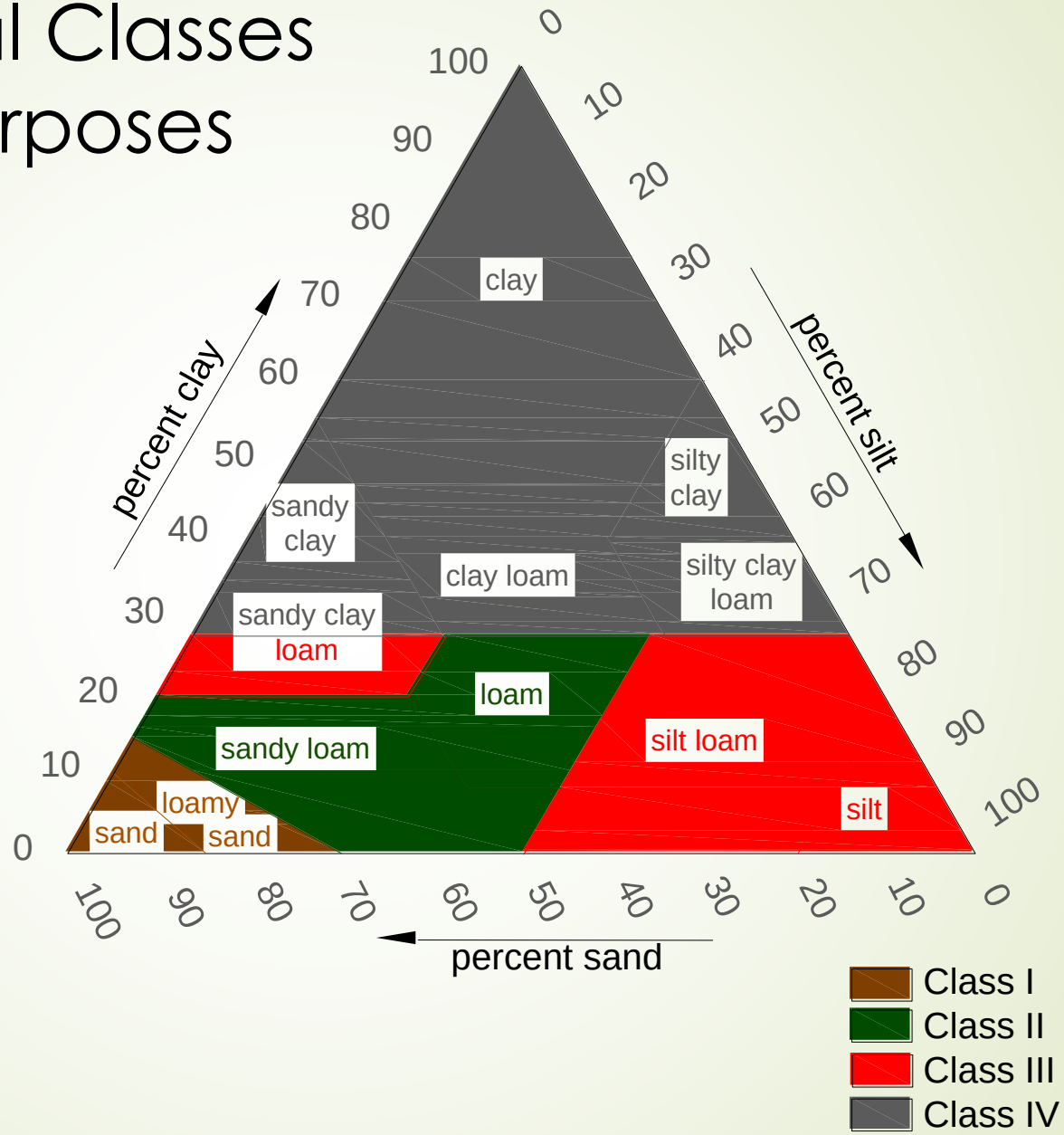
This presentation will focus on Title 5 fill material scenario (see Section 15.255)

Soil Textural Triangle



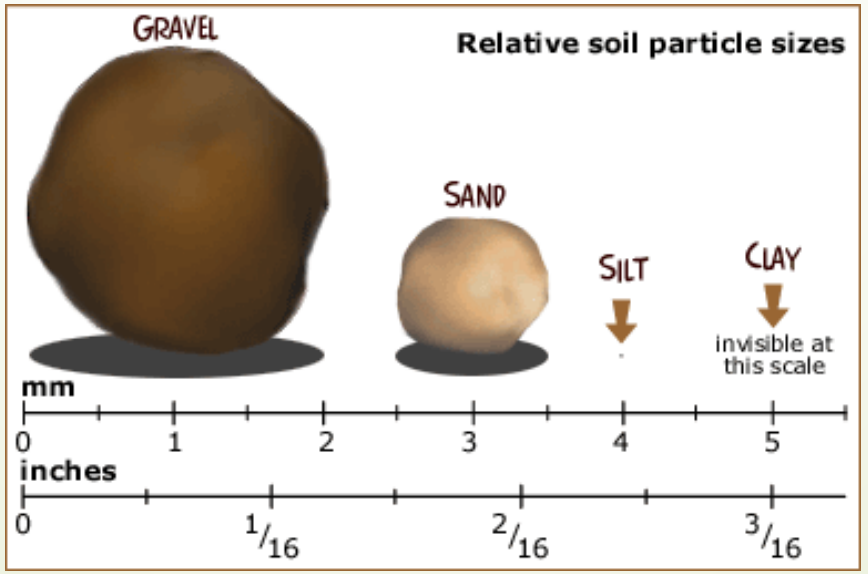
Title 5 fill material

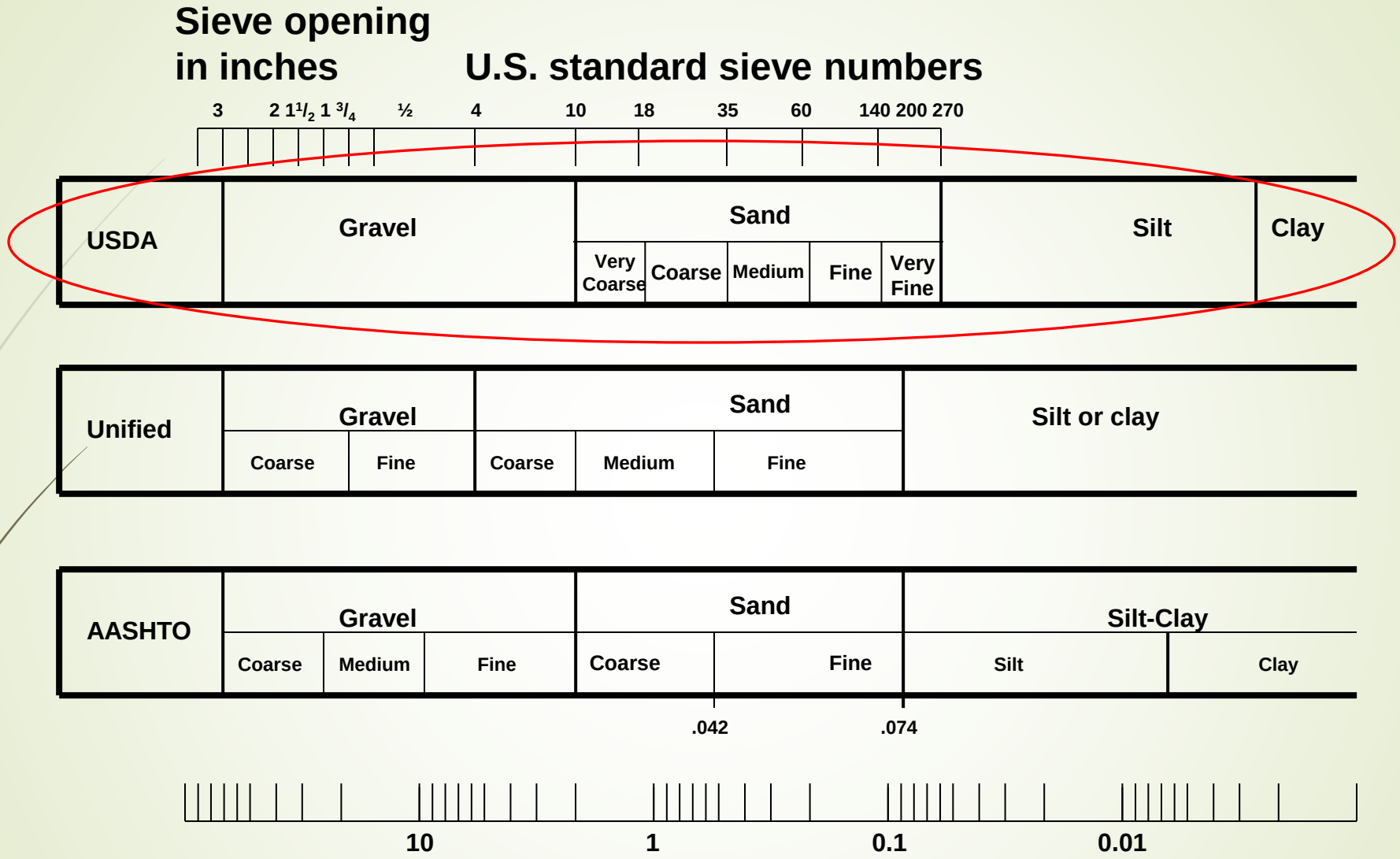
Title 5 Textural Classes for Design Purposes

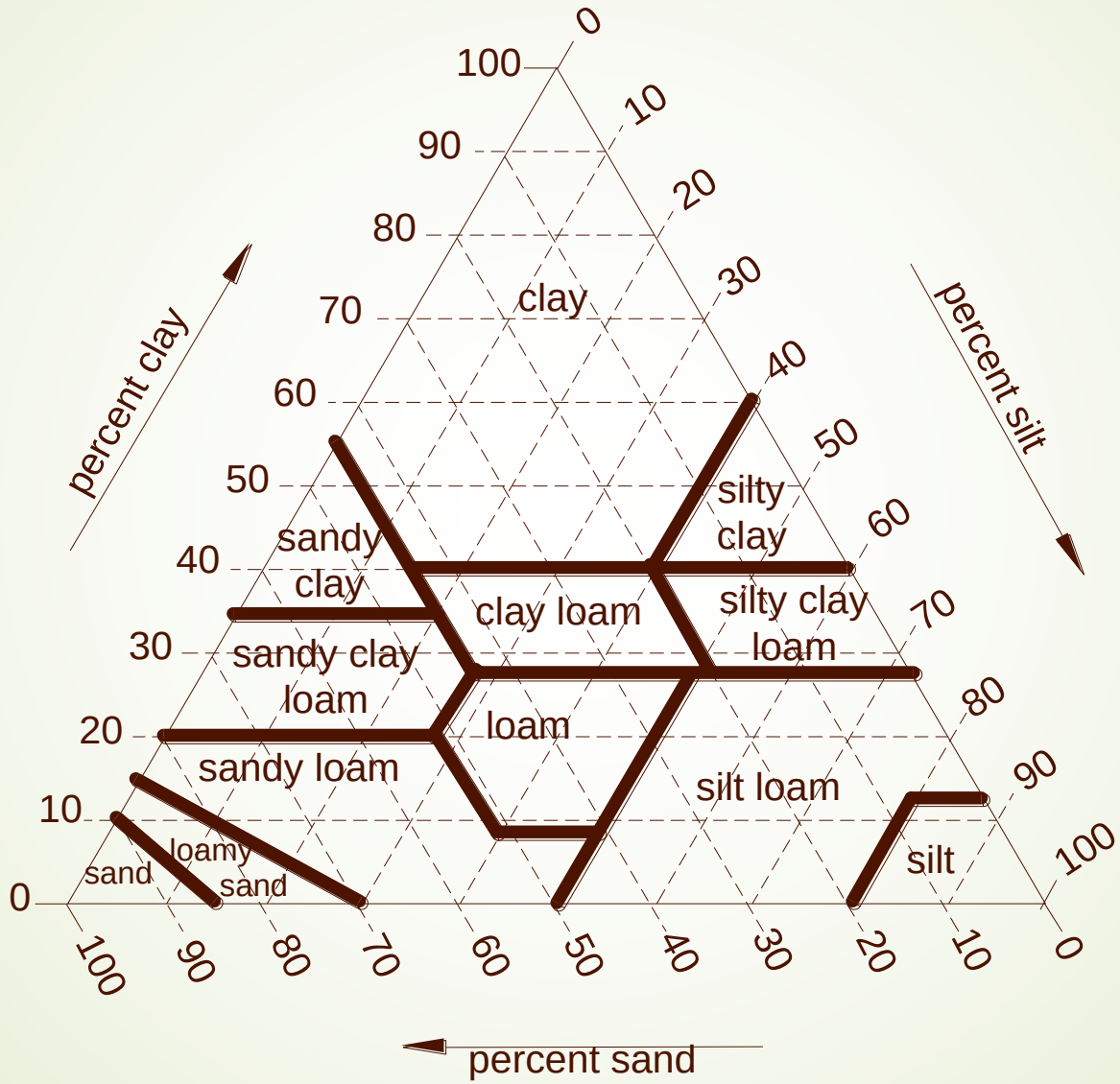


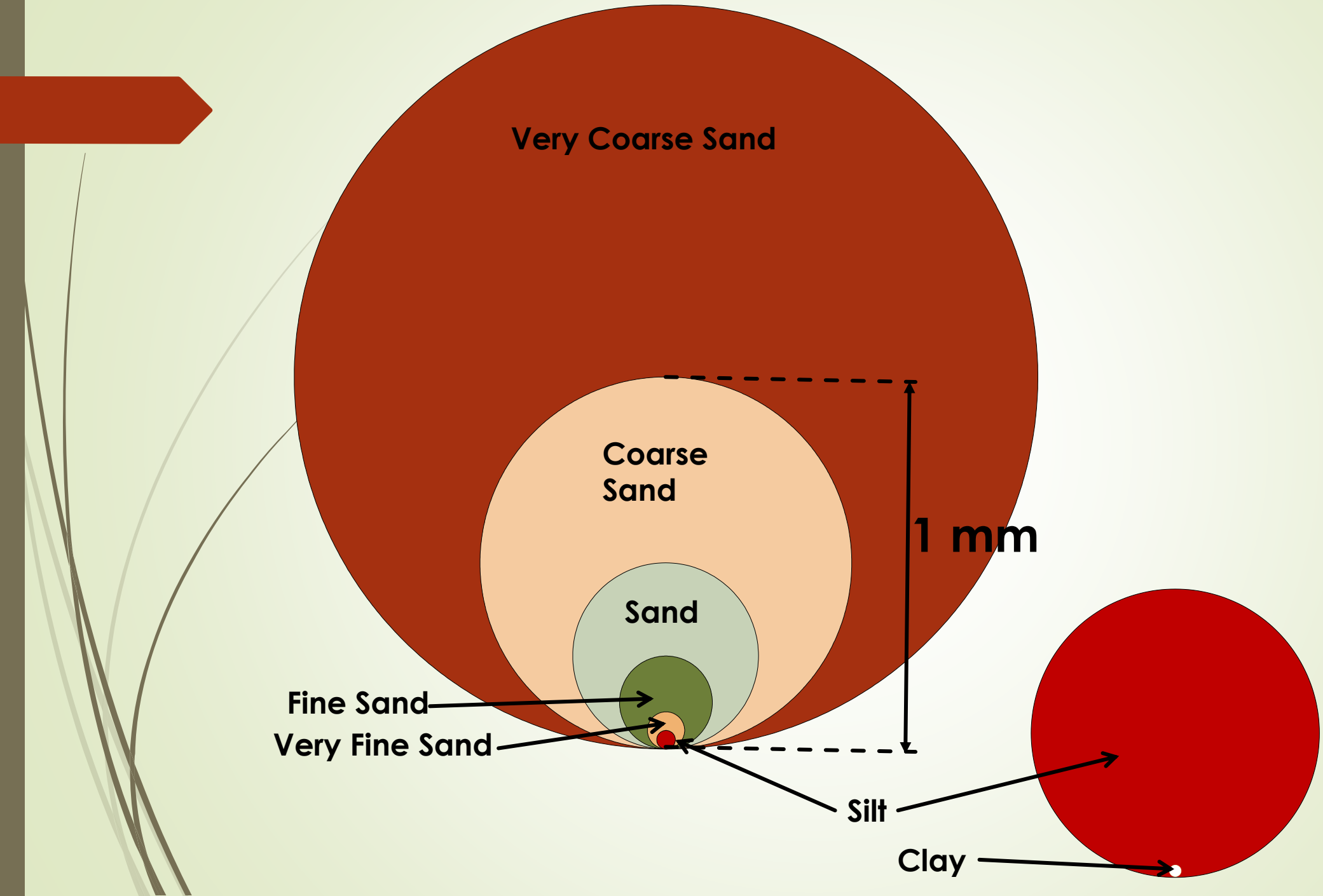
What is Soil?

- Soil is made up of individual particles, which are classified by the size of the particle.
- There are many classification schemes as seen in the next slide, but soil scientists use the USDA scale.
- Soil particles are typically < 2 mm in size, and do not include the portion of the soil that is organic.




Sieve opening in inches
U.S. standard sieve numbers
3
2 1/2
1 3/4
½
4
10
18
35
60
140
200
270
USDA
Gravel
Sand
Very Coarse
Coarse
Medium
Fine
Very Fine
Silt
Clay
Unified
Gravel
Coarse
Fine
Sand
Coarse
Medium
Fine
Silt or clay
AASHTO
Gravel
Coarse
Medium
Fine
Sand
Coarse
Fine
Silt-Clay
Silt
Clay
.042
.074
10
1
0.1
0.01
Grain size in millimeters


percent clay
percent silt
percent sand
clay
silty clay
sandy clay
clay loam
silty clay loam
sandy clay loam
loam
sandy loam
silt loam
loamy sand
sand
silt
0
10
20
30
40
50
60
70
80
90
100


Very Coarse Sand
Coarse Sand
Sand
1 mm
Fine Sand
Very Fine Sand
Silt
Clay

USDA Textural Classes

> 2 mm		Gravel or larger (not soil)
> 1 mm	< 2.00 mm	Very Coarse Sand
> .5 mm	< 1.00 mm	Coarse Sand
> .25 mm	< .50 mm	Sand (Medium)
> .1 mm	< .25 mm	Fine Sand
> .05 mm	< .10 mm	Very Fine Sand
> .002 mm	< .05 mm	Silt
	< .002 mm	Clay

Very Coarse Sand

Coarse Sand

Medium Sand

Fine Sand


Very Coarse
Coarse
Medium
Fine
Very Fine

Title 5 fill: When do we need a sieve analysis?
310 CMR 15.255

Title 5 fill: Most common application is a mounded system to meet the groundwater offset

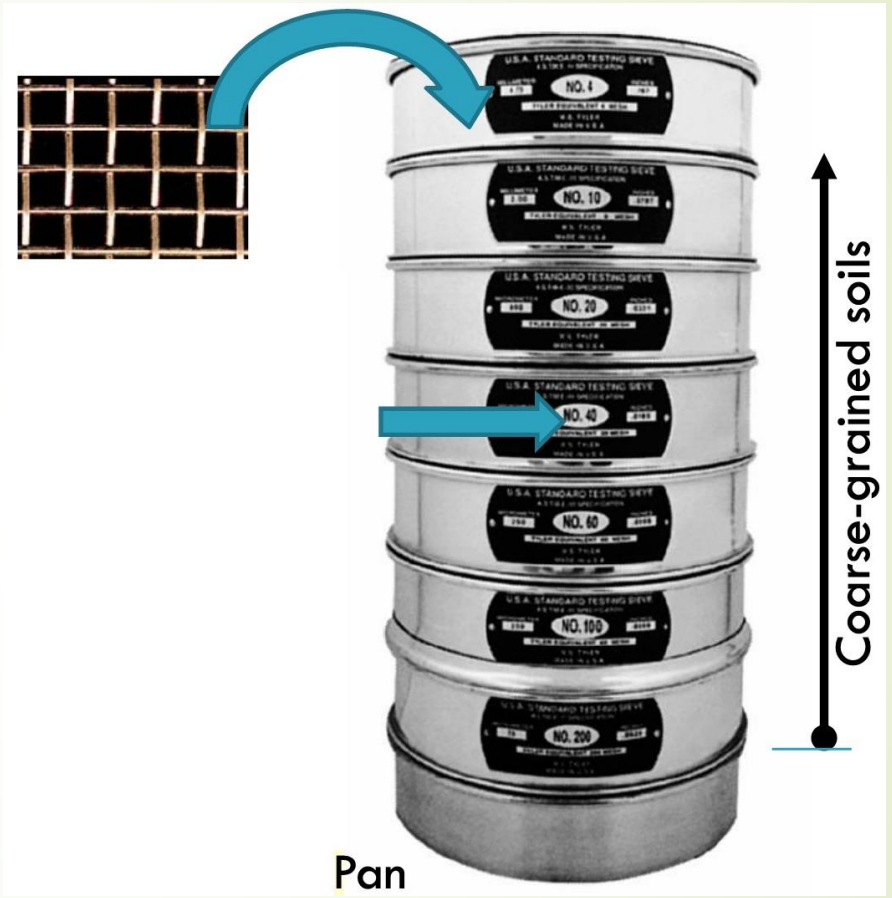
Figure 1: A mound system for distributing treated wastewater to the soil.

The sieve analysis

Similar to the old sand box toys, the sieve analysis uses gradation pans to determine the particle sizes.

These precision screen openings are made to only allow a specific size particle to pass through.

The desired pans are stacked on top of one another with the courser screens on top.



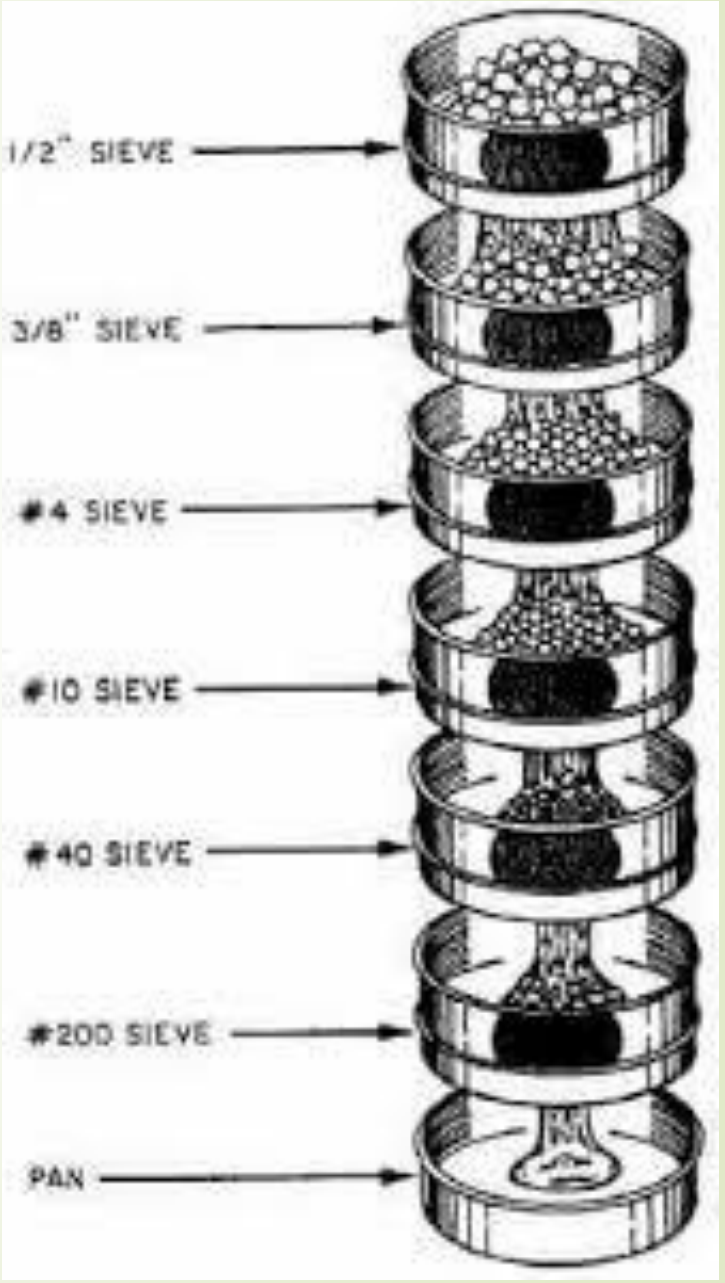
The initial weighed soil sample is then placed on the top sieve and the entire stack is inserted into a mechanical shaker.

As the soil gets shaken, each screen only holds particles that are larger than the screen opening allowing smaller particles to pass downwards to the next screen, and so on.

Before shaking

After shaking

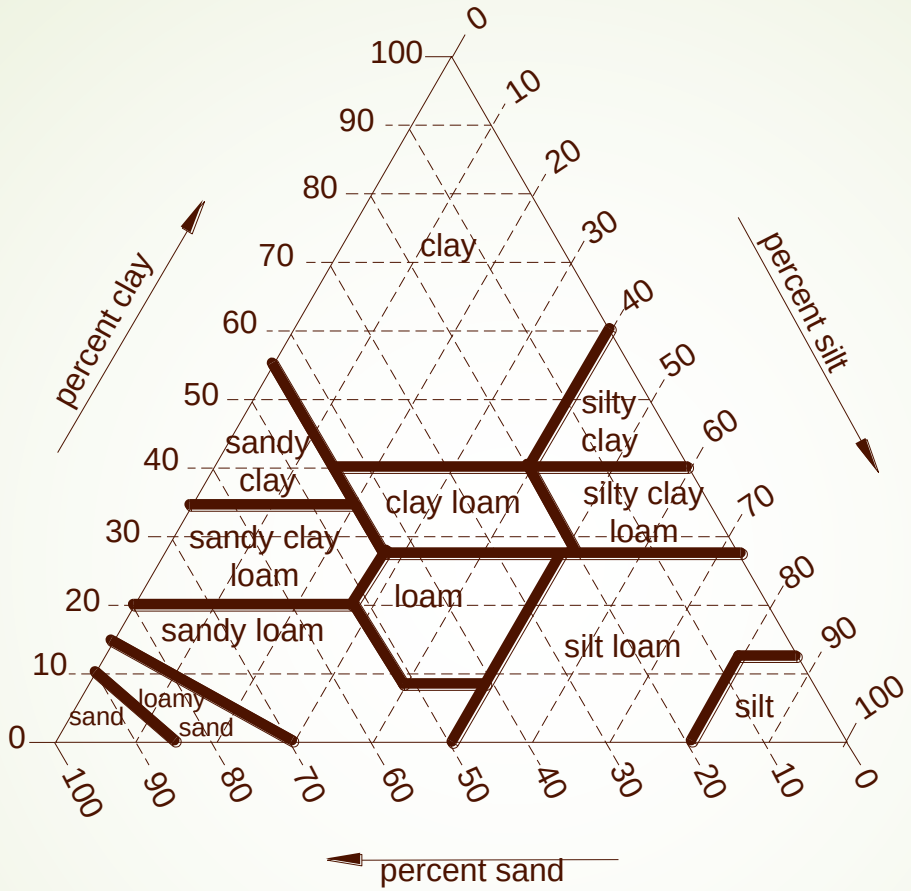
The soil that is retained on each screen is then weighed.



Measuring Soil Texture (Particle Size Analysis)

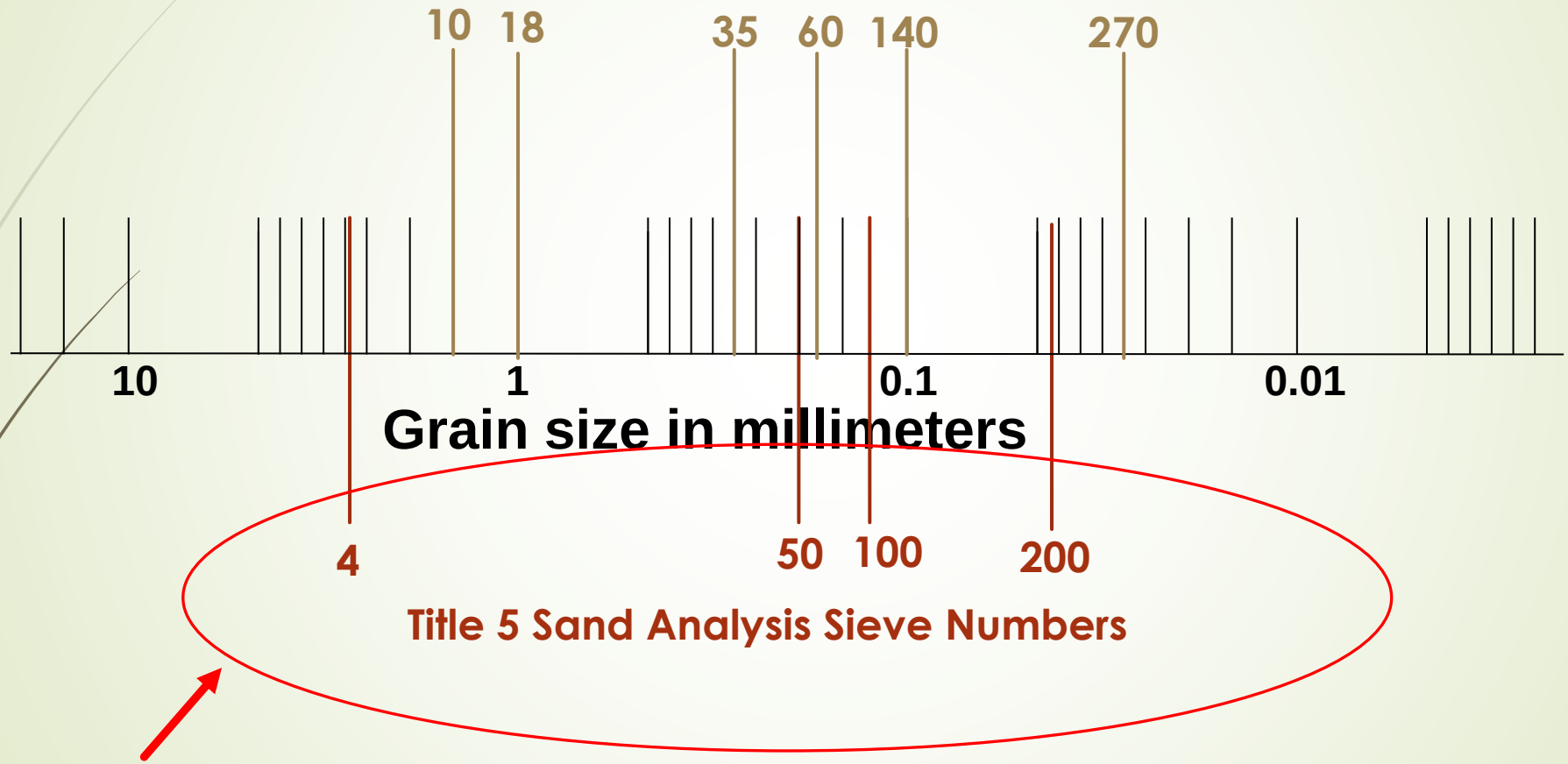
Determining the amount of silts and clays for Soil Classification is a very different approach and uses a wet method.

A wet method is needed for silts and clays due to the fact of their difficulty in shaking through the sieves.



Once you know the % Sand, % Silt, and % Clay then you use the graph to determine the Class Soil.

Particle Size Analysis Sieve Numbers



Title 5 fill material focuses on these four sieve sizes: #4, 50, 100, and 200

The criteria:

- Section 15.255 requires:
  - Fill must be clean and cannot have organic matter
  - Fill cannot contain Remediation Waste (as defined by 310 CMR 40.000)
  - Fill cannot have material larger than 2 inches.
  - No more than 45% of the sample weight can be retained on the #4 sieve.

The Analysis:

- Example #1 Lab Report:

Percentage retained on #4 sieve = 2%

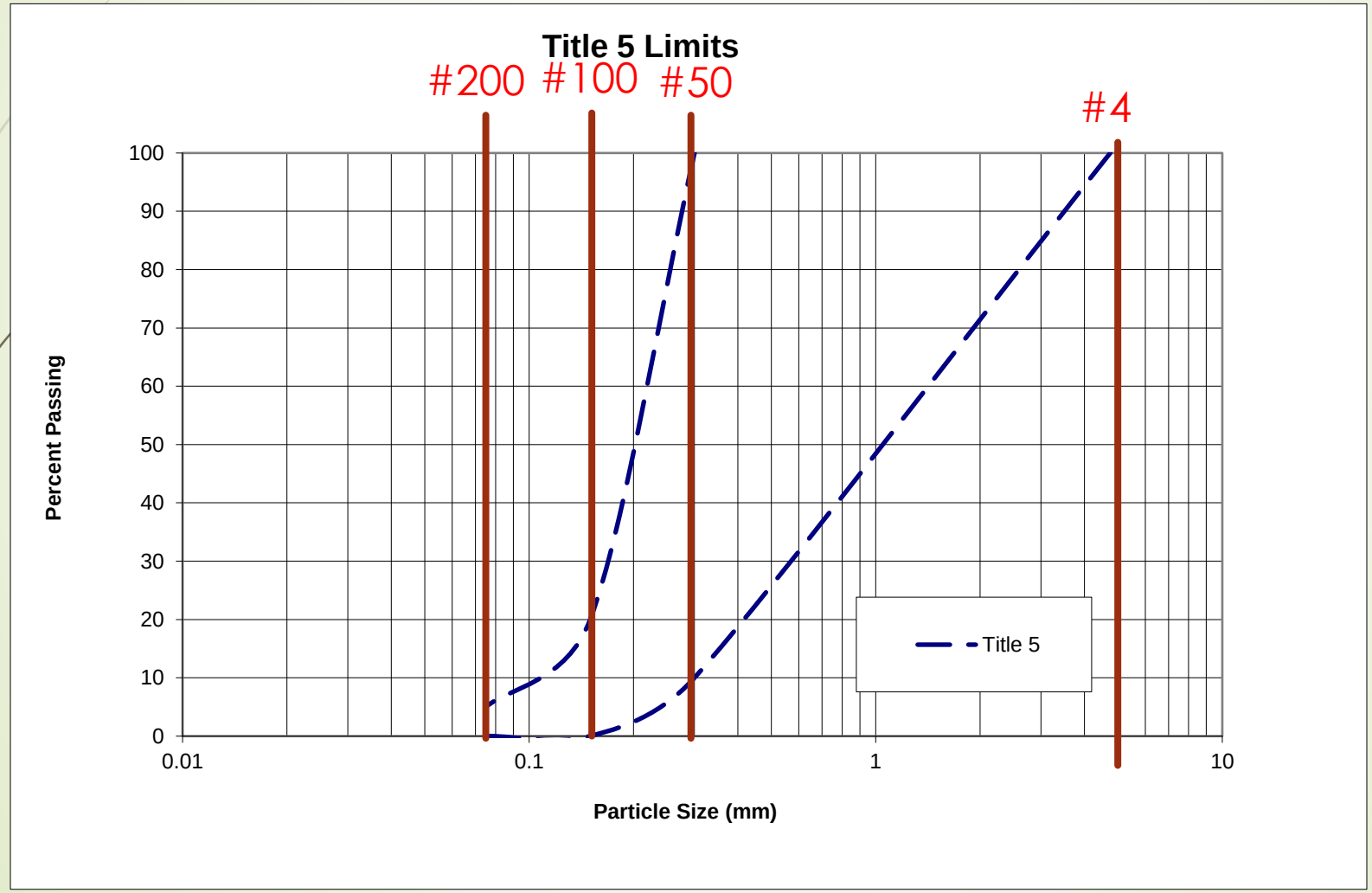
Sieve Size (mm)	Sieve #	% Passing by weight
4.75	4	100
2.00	10	97
0.85	20	87
0.425	40	58
0.3	50	38
0.15	100	11
0.075	200	4.1

As mentioned, only the #4, 50, 100, and 200 results are needed.

Is this material acceptable Title 5 fill?

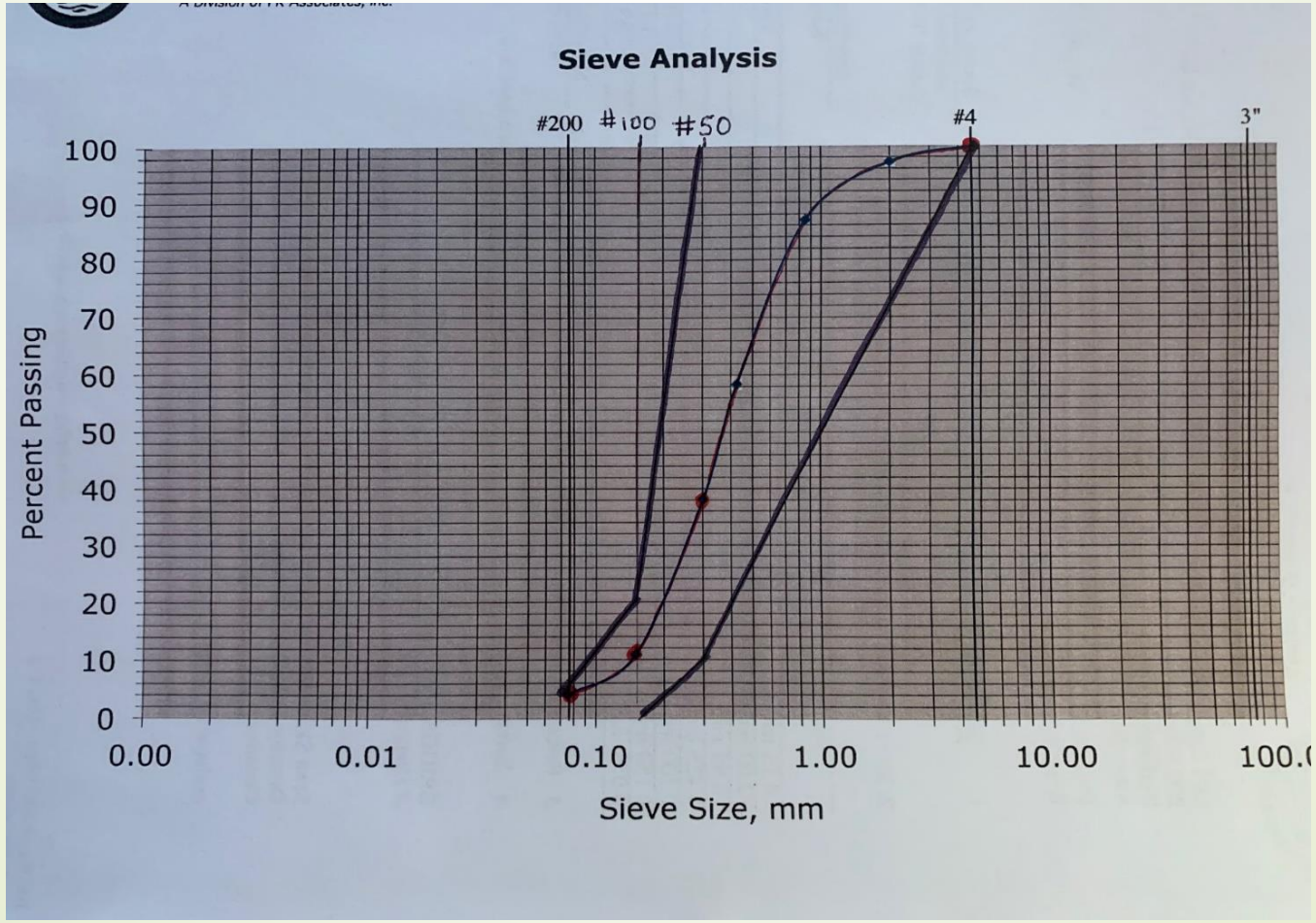
Particle Size Distribution Graph

Method #1: Graph it! The four numbers need to fall between the two blue dashed lines. The graph is shown in Section 15.255



Particle Size Distribution Graph

Method #1: The soils testing laboratory will typically provide the graph for you. The graph shows that all four numbers falls between the Title 5 parameters and is Acceptable



Particle Size Distribution Range

Method #2: A little quicker.

Compare the values with the acceptable range in Section 15.255.

Sieve Size	% that must Pass	Lab results (% passing)
#4	100%	100 **OK**
#50	10 - 100%	38 **OK**
#100	0 – 20%	11 **OK**
#200	0 – 5%	4.1 **OK**

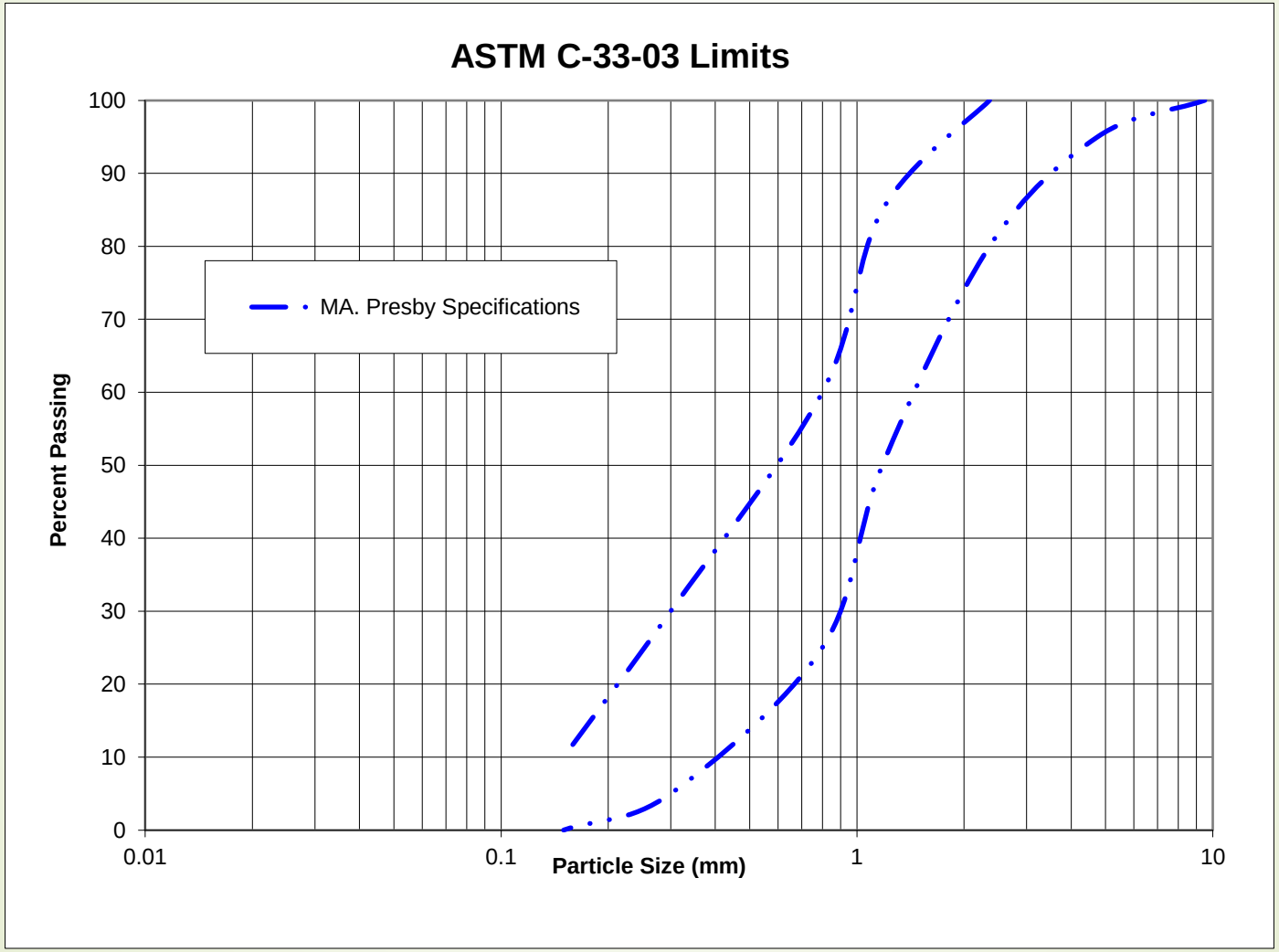
Percentage retained on #4 sieve = 2% **OK, must be < 45%**

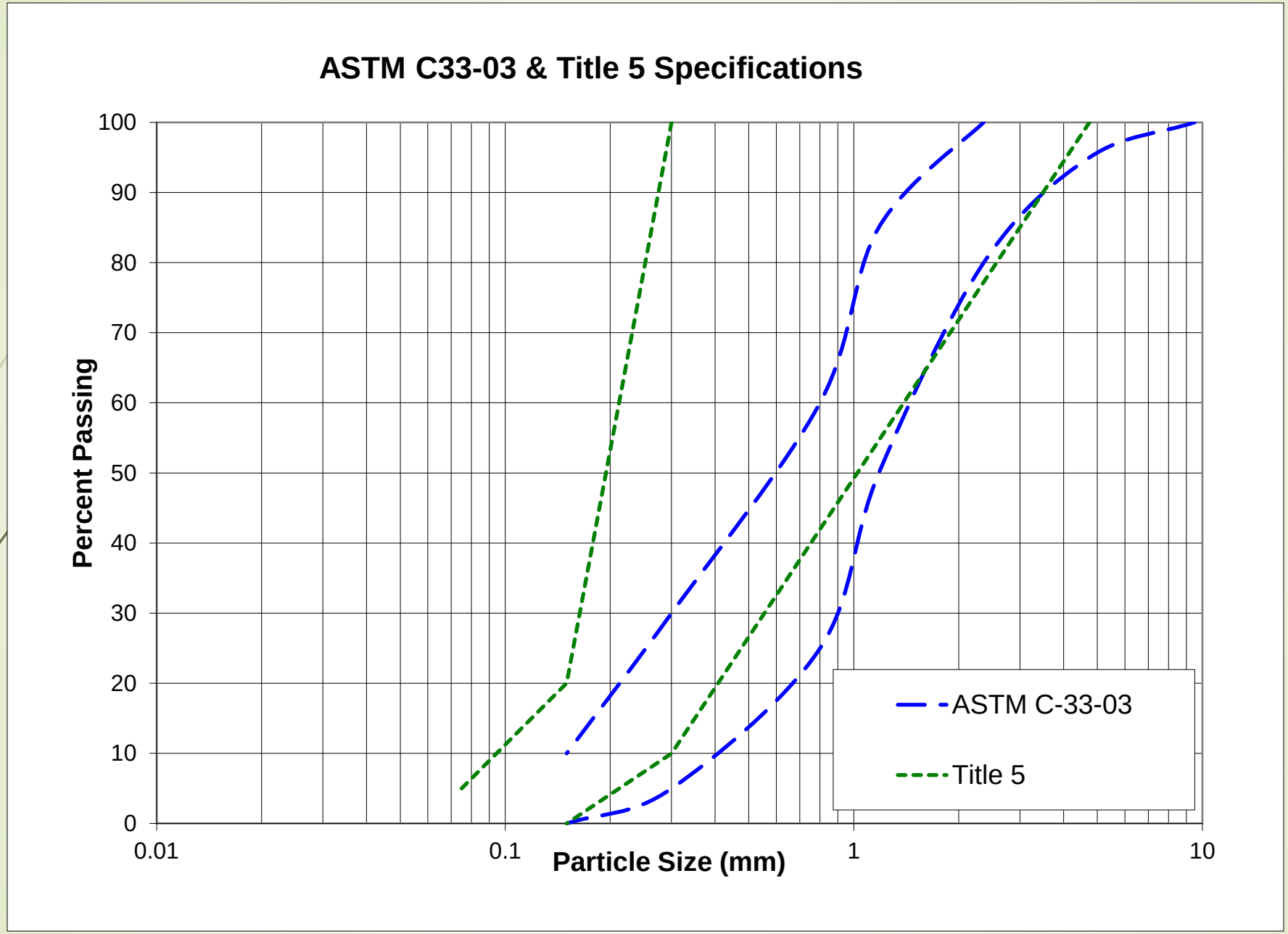
Fill material is **Acceptable**

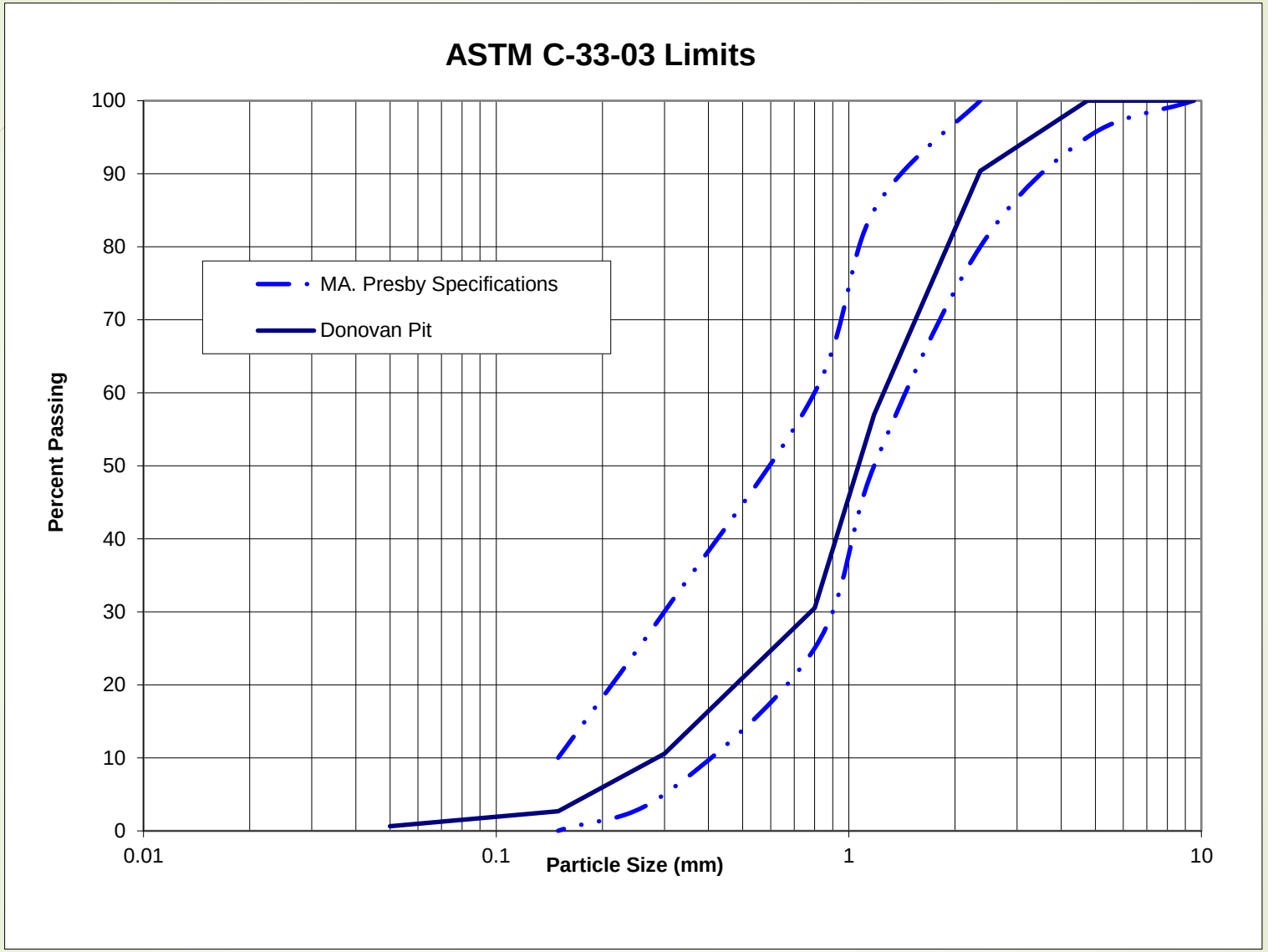
Reviewing the Results

- If you graph the curve and it falls outside of the Title 5 fill parameter lines in Method #1, then the material is Unacceptable.
- If the % passing for the #4, 50, 100, and 200 sieve is outside of the range provided in Method #2, then the material is Unacceptable.
- Unnacceptable material would need to be removed.

We can use this same method to determine if other soil material meets specifications such as for the Presby C-33 sand




ASTM C33-03 & Title 5 Specifications
Percent Passing
100
90
80
70
60
50
40
30
20
10
0
0.01
0.1
1
10
Particle Size (mm)
ASTM C-33-03
Title 5


ASTM C-33-03 Limits
100
90
80
70
60
50
40
30
20
10
0
Percent Passing
MA. Presby Specifications
Donovan Pit
0.01
0.1
1
10
Particle Size (mm)

How many samples are needed?

- For a single-family residential home, only one sample is needed.
- For systems over 2,000 gpd, take a sample for each day of delivery.
- The sample should be dry.
- The sample must be taken from the in-place fill.
- DO NOT ACCEPT A SLIP FROM THE GRAVEL PIT.

How to take a sample

- Typically, this is either the engineer's responsibility or the system installer's responsibility. But you should witness obtaining the sample.
- A sample size of about a 1-quart to a 1-gallon zip lock bag is sufficient or about the volume of a coffee can.
- The sample should be representative of what is arriving at the site
- Recommend that you use a Field Book to log applicable information:

How much does a sieve analysis cost?

- For a standard Title 5 sieve analysis, cost is about $60 per sample.
- For a comprehensive particle size analysis for Soil Classification, cost is about $85 per sample.

Acknowledgments

- Mickey Spokas – Program Coordinator, UMass Amherst, Off Campus Soil Programs

Thank You