**SOLDOTNA WWTP LABORATORY**

**Soldotna, Alaska**

**Standard Operating Procedure**

**For**

**Total Suspended Solids**

**SOP Number: 003r05**

**Revision Date: 03-31-20**

**Prepared By: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date: \_\_\_/\_\_\_/\_\_\_**

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1. **SCOPE AND APPLICATION:**
   1. This SOP describes the procedure for determining Total Suspended Solids at the Soldotna Wastewater Treatment Plant (SM 2540D)
   2. This SOP will cover the determination of Total Suspended Solids for use as treatment process information as well as for permit requirements. The correct value of Total Suspended Solids is critical to evaluating the wastewater treatment process correctly.
   3. In addition the Total Suspended Solids is reported to the EPA through our DMR. The parameters reported can be found in our NPDES permit, # AK-002003-6.
2. **DEFINITIONS:** 
   1. DMR – Discharge Monitoring Report
   2. NPDES – National Pollution Discharge Elimination System
   3. EPA – Environmental Protection Agency
   4. WWTP – Wastewater Treatment Plant
   5. TSS - Total Suspended Solids
   6. VSS – Volatile Suspended Solids
   7. RAS – Return Activated Sludge
   8. AB – Aeration Basin
3. **HEALTH AND SAFETY:** 
   1. The microorganisms with in the samples are considered to be a bio-hazard. The microorganisms can, under certain circumstances, cause disease in humans.
   2. Treat all samples as potentially hazardous.
   3. Wear protective equipment when working with samples. Eye protection, lab coat and gloves are a must when working with samples.
4. **CAUTIONS:** None
5. **INTERFERENCES:**
   1. Improperly washed filters can bias the samples low (see section 10.1). Care must be taken when washing filters to insure correct TSS values.
   2. Large particles, such as grease balls or small rocks, could bias the true value high. When measuring the sample volumes the contents should be representative of the sample being tested.
6. **PERSONNEL QUALIFICATIONS:**
   1. Any person performing TSS determinations must read this SOP.
   2. The laboratory personnel using this method must be trained experienced and demonstrate proficiency in processing, maintaining, storing and disposing of biohazard material.
   3. Analyst must past proficiency samples annually. This can be satisfied by completing the annual DMR QA required by the EPA to maintain our NPDES permit.
7. **SPECIAL APPARATUS AND MATERIALS:**
   1. Filtration Apparatus: Plastic or Glass and two must be capable of holding 70 mm glass fiber filters and one must be capable of holding 47 mm glass fiber filters.
   2. 70 mm glass fiber filters (HACH or equivalent).
   3. 47 mm glass fiber filters (HACH or equivalent).
   4. Forceps: Smooth flat forceps, with out corrugations on the inner sides of tips.
   5. Vacuum manifold
   6. Vacuum pump
   7. Distilled Water
   8. Wash bottle
   9. 2 – 10 mL graduated cylinders
   10. 1 – 25 mL graduated cylinder
   11. 1 – 50 mL graduated cylinder
   12. 1 – 500 mL graduated cylinder
8. **INSTRUMENT OR METHOD CALIBRATION:** None
9. **SAMPLE HANDLING AND STORAGE:**
   1. Samples should be processed immediately after collection.
   2. Sample volumes are as listed below:
      1. 300 to 500 mL for effluent
      2. 50 mL for Influent
      3. 25 mL for AB 1 and AB 2
      4. 10 mL for both RAS and Digester samples
10. **PROCEDURE AND ANALYSIS:**
    1. **Filter preparation:**
       1. Turn on vacuum pump using switch located behind analytical balance. Make sure to check the oil level on the pump, which is located in the boiler room of the lab.
       2. For both 47 mm filters and the 70 mm filters use the appropriate filter funnel for the size of the filter.
       3. Using forceps, place filter into the appropriate filter funnel.
       4. Pour approximately 10 mL of DI water into the filter funnel and open blue handle valve to the on position. Allow water to completely pass through the filter. Repeat this step again.
       5. Remove the filter using forceps and place it into the bench top oven. Close the valve.
       6. It is recommended to wash several filters at a time so that the samples are can be processed immediately in the morning.
       7. Turn on the oven and dry the filters for one hour at 104oC. After the hour remove the filters and place into the desiccator to be used later.
    2. **Sample process:**
       1. Remove the labeled aluminum weigh dishes from the desiccator and place onto the counter.
       2. Place two of the large filter funnel and one of the small filter funnels onto the vacuum manifold and connect the manifold to the filter flask located right beside the manifold.
       3. Use 47 mm filters for the influent and effluent and 70 mm samples for the AB, RAS, and digester samples.
       4. Remove one filter at a time and place onto the analytical balance.
       5. Record weight on the appropriate data sheet as paper weight. Perform this for each of the filters needed for the day.
       6. Collect the samples and measure volumes for each sample (see section 9.2).
       7. Place filter into the appropriate filtration apparatus and close all valves on the manifold.
       8. Turn on vacuum pump using switch located behind analytical balance. Make sure to check the oil level on the pump, which is located in the boiler room of the lab.
       9. Pour sample into filtration apparatus. With the large filtration apparatus carefully add sample so to avoid overloading and there by having the sample go over the edge of the filter and bypassing the filtration.
       10. Rinse the graduated cylinder twice to insure the entire contents make it onto the filter.
       11. Allow the entire sample and rinse volume to pass through the filter. Using forceps remove filter from apparatus and place onto the labeled aluminum dish. Care must be taken to insure samples are not mixed up.
       12. Once all of the samples have been processed place samples into the 104oC oven and allow drying for one hour.
       13. Remove samples from the oven and place into the desiccator and allow to cool.
       14. Once cool remove samples one by one and place onto the analytical balance and record weight as dry weight on the appropriate data sheet.
       15. Every Wednesday and Friday, perform the VSS as follows. Once the dry weight is obtained place the filter into the muffle furnace located under the analytical balance.
       16. Once you have placed all of the samples into the furnace close the door and turn on. Allow the samples to stay in the furnace for a half an hour once the furnace reaches 550oC.
       17. Again remove the samples from the furnace using forceps and place into the desiccator. Be sure to use the appropriate gloves when removing the samples because the furnace will be extremely hot. The gloves are located under the desiccator in the cabinet.
       18. Allow samples to cool and repeat step 10.2.13.
       19. Once samples have been processed dispose of sample by placing into the trash.

1. **DATA ANALYSIS/CALCULATIONS:** 
   1. Calculations will be performed by the excel spread sheet that is being used.
   2. If the spread sheet can not be used that day perform calculation for TSS as follows:

(Dry weight – Paper weight) \* 1000 = TSS in mg/L

(Sample volume/1000)

* 1. Calculate the VSS as follows:

(VSS Dry weight – Paper weight) \* 1000 = VSS in mg/L

(Sample volume/1000)

* 1. Calculate percent VSS as follows:

(VSS in mg/L / TSS in mg/L) \* 100 = %VSS

* 1. Calculate lbs per day as follows:

MGD \* mg/L \* 8.34 lbs/gal = lbs/day

1. **RECORDS MANAGEMENT:** 
   1. The NPDES permit for the City of Soldotna Wastewater Treatment Plant has an allowable limit for TSS to be discharged (see chart below). If this limit is violated notify the Utilities Manager immediately.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Effluent Characteristic | Units of Measure | Average Monthly Limits | Average Weekly Limits | Maximum Daily Limits |
| Total Suspended Solids (TSS) | mg/L  lbs/day | 30  270.2 | 45  405.3 | 60  540.4 |

* 1. Data will be recorded promptly, legibly, and in indelible ink on the appropriate forms. Completed forms are archived by the Utilities manager.
  2. For the spread sheet that is printed make sure to place it in the appropriate three ring binder.

1. **QUALITY CONTROL:**
   1. Every year the Soldotna WWTP must participate in the DMR QA as part of our NPDES permit. Part of the DMR QA test set is the TSS PE sample. This test must be performed and we must pass the sample to be able to report data for the year.
2. **CORRECTIVE ACTION:**
   1. If the above PE sample comes back as unacceptable the test must be performed again. Review the procedure and make any changes necessary.
3. **REFERENCES:**
   1. Method 2540 D, Standard Methods for the Examination of Water and Wastewater 18th Edition, 2005
4. **FORMS AND DATA SHEETS:** 
   1. SS Worksheet

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **TOTAL SUSPENDED SOLIDS 2020** | | | | | | | |
| DATE: |  |  | TIME: 0800 |  |  | SIGNATURE: | |
|  |  |  |  |  |  |  |  |
| **SAMPLE** | **Effluent** | **Influent** | **AB1** | **AB2** | **RAS** | **Digester** |  |
| **ML** | **500** | **50** | **25** | **25** | **10** | **10** |  |
| **Dried WT** |  |  |  |  |  |  |  |
| **Paper WT** |  |  |  |  |  |  |  |
|  | **0** | **0** | **0** | **0** | **0** | **0** |  |
|  | **0** | **0** | **0** | **0** | **0** | **0** |  |
| **S.S.mg/L** | **0.00** | **0** | **0** | **0** | **0** | **0** |  |
|  |  |  |  |  |  |  |  |
| **VOLATILE SUSPENDED SOLIDS** | | | | | | | |
| **SAMPLE** | **Effluent** | **Influent** | **AB1** | **AB2** | **RAS** | **Digester** |  |
| **ML** | **500** | **50** | **25** | **25** | **10** | **10** |  |
| **RESIDUAL** |  |  |  |  |  |  |  |
| **Paper WT** |  |  |  |  |  |  |  |
|  | **0** | **0** | **0** | **0** | **0** | **0** |  |
|  | **0** | **0** | **0** | **0** | **0** | **0** |  |
| **FIXED** | **0** | **0** | **0** | **0** | **0** | **0** |  |
| **VOLATILE** |  |  |  |  |  |  |  |
| **%** | **#DIV/0!** | **#DIV/0!** | **#DIV/0!** | **#DIV/0!** | **#DIV/0!** | **#DIV/0!** |  |
|  |  |  |  |  |  |  |  |
|  | **SETTLEOMETER/AB#1** | | |  | **SETTLEOMETER/AB#2** | | |
|  | 5 min |  |  |  | 5 min |  |  |
|  | 10 min |  |  |  | 10 min |  |  |
|  | 15 min |  |  |  | 15 min |  |  |
|  | 20 min |  |  |  | 20 min |  |  |
|  | 25 min |  |  |  | 25 min |  |  |
|  | 30 min |  | **Rise Time** |  | 30 min |  | **Rise Time** |
|  | 35 min |  |  |  | 35 min |  |  |
|  | 40 min |  |  |  | 40 min |  |  |
|  | 45 min |  |  |  | 45 min |  |  |
|  | 50 min |  |  |  | 50 min |  |  |
|  | 55 min |  |  |  | 55 min |  |  |
|  | 60 min |  |  |  | 60 min |  |  |
|  |  |  |  |  |  |  |  |
|  | **SVI AB#1** | #DIV/0! |  |  | **SVI AB#2** | #DIV/0! |  |
|  |  |  |  |  |  |  |  |
| **RAS/** |  |  | **DIGESTER/30 min** | |  |  |  |
| **Rise Time** |  |  | **Rise Time** |  |  | **Day Before** |  |
|  |  |  |  |  |  |  |  |
| **Gal. Waste** |  |  | **Lbs. Waste** | **0** |  | **Change %** | **#DIV/0!** |