A Look at the Wastewater Treatment Plant Laboratory

This handout has been prepared based on deficiencies found while performing Performance Audit inspections at wastewater treatment plants for the Tennessee Department of Environment and Conservation in the Division of Water Pollution Control. Suggestions have been made in an effort to assist the operator of a wastewater treatment plant in performing his laboratory duties.

Every wastewater treatment plant has its own distinctive characteristics and needs. Many of the observations and suggestions provided may not apply to every facility.

The following are problems associated with records and reports.

1. Failure to keep permits and records at the wastewater treatment plant. **(NPDES Permit Part 1, 2.1.3)**
   All permits and records should be kept at the wastewater treatment plant. In most cases this is a requirement in the permits.

2. Failure to keep records for three years. **(NPDES Permit Part 1, 1.2.5)**
   All records and information resulting from the monitoring activities required by the permits are to be retained for a minimum of three (3) years, or longer, if requested by the Division of Water Pollution Control. This includes all worksheets and scrap pieces of paper where calculations for analyses are performed and calibration and maintenance of instrumentation.

3. Uncertainty of what to do with records past the 3-year period.
   They can either be archived or destroyed, only if this Division has not given instructions to retain them past the 3-year period.

4. Inadequate or no worksheets on which to record data.
   Refer to permit **(NPDES Permit Part 1, 1.2.4)**

5. Illegible and unorganized data is being recorded on worksheets. **(NPDES Permit Part 1, 2.1.3)**
   All work should be written in a manner where inspectors would be able to interpret the data. Only EPA approved methods may be used to perform the required analyses.

6. Failure to document calibration and maintenance of equipment. **(NPDES Permit Part 1, 1.2.5)**
   Documentation of calibration and maintenance of equipment should also be maintained.

7. Failure to monitor parameters at the required frequencies. **(NPDES Permit Part 1, 1.2.2)**
   Parameters should be monitored at their required frequencies (according to the permit). Analyses should not be locked into specific days during the week. These days should be changed to ascertain any potential problems that may occur during an entire week.

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8. Unable to understand what should be recorded on Monthly Operational Reports.
   All columns on an MOR should be filled out to the best of the operator's ability.
   (NPDES Permit Part 1, 1.3.1)

9. Uncertain whether a computer generated MOR is permissible or not.
   Should an operator want to submit his data on computer generated MORs, he should use the same format as the State provided MORs. The operator should provide both the MOR and the computer-generated MOR to the field office for approval.
   (NPDES Permit Part 1, 1.3.1)

   On the question of data storage, if it is written down on paper first then that is the permanent record and it must be maintained. Storage of data and other information generated on computer is acceptable but a very rigorous tracking system with passwords and control level f or data must be in place. Also, all records must be backed up on routine schedule and second disc or tape stored at a secure second location. These all have to be in place before electronic data is acceptable.

10. Failure to fill out DMRs correctly.
    The Discharge Monitoring Reports (DMRs) are not being filled out correctly, due to a misleading feature of the preprinted DMR form. The headings near the top of the sheet labeled (NPDES Permit Part 1, 1.3.1)

| AVERAGE | MAXIMUM | UNITS | MINIMUM | AVERAGE | MAXIMUM | UNITS |

    apparently have caused some misunderstanding as to the information required. The sampling intervals and units typed in the stippled gray portion to the right of each parameter listed should be followed, even where there is a conflict with the preprinted heading. For example, the entry for "Solids, Total Suspended, Effluent Gross Value", in the fourth column to the right, the monthly average value should be entered because "MO AVG." is typed in the stippled gray area (the preprinted column heading "MINIMUM" should be ignored.

11. Failure to calculate weekly averages correctly.
    Weekly averages should be reported by first averaging the data in each week, Sunday through Saturday, of the month then reporting the maximum value of those averages. If the week is not complete by the end of one month, then that week's data should be reported with the month in which the week ends.

12. Failure to submit DMRs and MORs in a timely manner.
    Discharge Monitoring Reports (DMRs) and Monthly Operational Reports (MORs) frequently arrive late. DMRs should be postmarked no later than 15 days after the completion of the reporting period. (MORs) are to be submitted, in the field office, by the 15th day of the month following data collection.
    (NPDES Permit Part 1, 1.3.1)

13. Failure to have a Quality Control program. **(NPDES Permit Part 1, 1.2.3)**
    A Quality Control program should be initiated by each facility. An acceptable QC program would incorporate both quality control (precise and accurate data, e.g. duplicates) and quality assurance (how close the data agrees, statistics are commonly used). Blanks are used to indicate contamination, duplicates measure precision, and spike samples measure accuracy. Duplicates should be analyzed at a frequency of at least 1 for every 10 samples analyzed.

14. Failure to have an SOP. **(NPDES Permit Part 1, 2.1.4)**
    Each facility should also have its own Standard Operations Procedure (SOP). An SOP would provide what is typically done at the laboratory and how operations are accomplished. This would include collection of samples to the actual method used for each laboratory analyses.

THE FOLLOWING ARE PROBLEMS ASSOCIATED WITH THE LABORATORY.

1. Failure to follow approved laboratory procedures. **(NPDES Permit Part 1, 1.2.3)**
   A laboratory manual should be available for reference to EPA approved methods (e.g. **Laboratory Methods for Wastewater Analyses**, 1986, current **Standards Methods for the Examination of Water and Wastewater**). The **40 *CFR* Part 136** provides the approved test procedures for the analysis of pollutants under the **Clean Water Act.** Only approved laboratory procedures should be used. Any deviation would make self-monitoring data questionable and in some cases invalid, thus, resulting in violations.

2. Failure to properly mark containers.
   If samples from more than one wastewater treatment plant are analyzed, containers should be marked distinctly to avoid any confusion between samples.

3. Using expired chemicals in analyses.
   Chemicals should not be used beyond the expiration date. Purchase according to need. It won't be a bargain if the reagents expire before they are opened.

4. Uncertainty of when reagents have expired.
   Write down the date received or contact the manufacturer on reagents that have no expiration date.

5. Storing food and drink in ovens or refrigerators where samples are kept.
   Food and drink should not be stored in refrigerators or ovens that also contain chemicals and wastewater samples. Chemicals should be kept away from foods, as it is an unnecessary safety hazard.

6. Failure to document dates, times and initials for collection and analyses. **(NPDES Permit Part 1, 1.2.4)**

The dates and times that the analyses were performed should be documented as should the name of the person who collected and analyzed the samples. This is especially important when transporting samples from one facility to another for analysis. The method of analyses should also be documented. This can either be referenced to the SOP or written directly on the daily worksheet.

7. Failure to adequately clean glassware.

Glassware should be washed thoroughly in a tub of soapy water, rinse well with tap water and follow with distilled water rinsing. Just rinsing the glassware is not considered cleaning.

8. Uncertain whether to purchase prepared reagents or prepare in-house reagents.

Some reagents such as sodium thiosulfate, 10%, used for preservation and chlorine removal for fecal coliform collection, can be prepared at the plant with minimal cost. Although prepared reagents tend to be costly they also can save valuable time.

9. Failure to properly label in-house prepared reagents.

The in-house prepared reagents should be labeled with date, time, initials, and possible health hazards. A log of the reagents prepared should be kept.

10. Failure to maintain a log for equipment. **(NPDES Permit Part 1, 2.1.4)**

A log should also be kept to record the temperatures of the ovens, waterbath and incubator. It's advantageous to place the log near the equipment being monitored, but can also be recorded on the daily worksheet. This log should include the date, time, temperature and the initials of whoever is doing the checking.

The following are problems frequently found with the <u>Settleable Solids (SS)</u> analysis.

Failure to follow EPA approved methodology.

Too frequently, deviation of the SS methodology has been found. For SS the appropriate methodology requires that the sample be shaken well, be poured into an Imhoff cone, be allowed to settle for 45 minutes, and then very slowly stirred to dislodge material adhering to the sides. The solids in the sample should then be allowed to settle for another 15 minutes then be read to the nearest 0.1 mL/L mark.

Laboratories typically have either the glass or the plastic cones. The lowest marking on the glass cone is the 0.1 mL/L mark. The plastic cones have a screw cap at the tip. The lowest marking is the 0.5 mL/L. You can't record < 0.1 mL/L if the lowest mark is 0.5 mL/L. If you happen to have a glass cone and a plastic cone, use the glass for the final and the plastic for the raw. Otherwise, you must property record what you see.

The following are problems frequently found with <u>Dissolved Oxygen (DO)</u> analysis.

1. Failure to run the raw DO analyses.
   Run both raw and final DO analyses and report both on the MOR.

2. Failure to collect DO sample properly.
   When collecting the sample be sure to collect the sample with a BOD bottle using the stopper. Fill the BOD bottle to near the top and then stopper immediately to avoid any further contact with the air. This assures that no air bubbles are caught between the stopper and the sample.

3. Uncertainty of which DO meter calibration to use.
   Air Calibration for the meter is acceptable by EPA. If the air calibration method is used then the membranes must be kept fresh. Change the membrane at a minimum of once per month. If air bubbles are visible under the membrane, then the membrane must be changed. Follow manufacturer instructions for proper maintenance and calibration.

   Winkler method is considered the better of the two methods used to calibrate the DO meter. Three bottles should be filled with distilled water. The first and third bottles should be titrated as required by the EPA approved method to determine the DO. The second bottle is used to adjust the setting on the meter to the averaged DO value found by titration of the other two bottles.

4. Failure to standardize the titrant.
   If the titrant, 0.0375 N sodium thiosulfate is used in the Winkler method, then it must be standardized daily according to the approved methodology.

   Another option is to titrate with a 0.03750N phenylarsine oxide (PAO) solution. This can be purchased pre-standardized. PAO solutions are stable. No further standardization would be necessary.

5. Failure to store DO probes properly.
   DO probes can be stored in a BOD bottle containing at least 1 inch of water. Refer to the operations manual for the DO probe and meter or contact the YSI service center for assistance regarding proper maintenance of the equipment. Keep this bottle clean.

The following are problems frequently found with the Biochemical Oxygen Demand/Carbonaceous Biochemical Oxygen Demand (BOD/CBOD)

1. Uncertainty of when to seed the sample.
   If an effluent composite sample is collected before disinfection, no seeding or dechlorination in the CBOD method is required.

   If an effluent composite sample is collected following disinfection, this requires seeding and, when appropriate, checking the sample for any residual chlorine prior to setting up the CBOD samples.

2. Failure to adequately dechlorinate a sample.
   Just allowing the samples to sit for a short period of time in order to dissipate any residual chlorine is not as effective as chemical de-chlorination. Chemical dechlorination also eliminates the chlorine in a shorter period of time. Failure to properly dechlorinate would result in artificially low results.

3. Failure to allow the samples to come to room temperature before making dilutions.
   Since composite samples are kept at $6^{o}C$ or below, the samples should be warmed to $20 \pm 1^{o}C$ (comparable to $68^{o}F$) before making dilutions. This may be accomplished by allowing the samples to come to room temperature (approximately $68^{o}F$) or by setting the sample bottles in a warm water bath. Samples with initial DO's greater than 9.0 mg/l at $20\ ^{o}\ C$ (e.g. stream samples) are considered supersaturated with oxygen. These samples may be vigorously shaken or aerated with clean, compressed air to bring down to saturation, less than or equal to 9.0 mg/l. Refer to Standard Methods for additional information. The samples should be brought to room temperature, set up and analyzed within two hours of collection.

4. Introducing contamination into the sample.
   Cross-contamination, which can produce inaccurately high results, can be avoided by properly rinsing the graduated cylinders between measuring sample volumes. Specific graduated cylinders can be delegated for each influent, effluent and stream sample. Clean, Clean, Clean!!!

5. Failure to adequately stir the sample prior to making dilutions.
   Sample should be stirred thoroughly to obtain a representative sample.

6. Failure to set up the appropriate amount of dilutions.
   At least three dilutions should be set up for both influent and effluent samples with a duplicate performed on every tenth sample.

7. Uncertainty of the purpose of the glucose-glutamic acid check.

   To check the quality of the dilution water it is recommended that a glucose-glutamic acid check be implemented. A typical value of 198 PPM $\pm$ 30.5 has been found for the glucose-glutamic acid concentration. This should be done periodically along with a known sample, if possible, in order to establish laboratory control limits.

   A low value could be indicative of a toxic affect caused from trace metals in the dilution water (e.g. copper).

   A high value could be indicative of several factors (e.g. contamination from improper rinsing of glassware after cleansing and imprecise measurement of standards).

   Should the measurement fall outside the previously given range, the tests should be reported and flagged as to the findings. The problem should then be investigated in order to determine and eliminate the source.

8. Failure to follow the BOD criteria for reporting results.

   Follow the BOD criteria for reporting the results. EPA approved methodology states that the initial DO must be less than or equal to 9.0 mg/l. The samples must deplete at least 2.0 mg/L DO and must leave 1.0 mg/L final DO. Results from dilutions that do not meet these criteria are considered invalid and should be discarded.

   The blank oxygen depletion should be 0.2 mg/L or less as required by EPA approved methodology. Otherwise, an investigation should be initiated to determine the cause. Check for soap residue due to improper rinsing. The results still can be reported but must be marked that the blank is outside the guidelines.

9. Uncertainty of which nitrification inhibitor to use.

   There are two nitrification inhibitors available for use in the CBOD analysis method, **2-Chloro-6 (Trichloromethyl) Pyridine** and **Nitrification Inhibitor, Formula 2533™**. The biggest difference between the two is that Formula 2533™ is more soluble than the other, thereby yielding better results.

   The dispenser cap for the nitrification inhibitor is well worth the money.

10. Failure to properly monitor the temperature of composite samplers.

    The temperature of the composite samplers are not generally monitored or maintained at the required temperature of 6°C. During the collection of composite samples, the temperature of the samplers must maintain temperatures at 6°C or below (but above freezing 0°C).

11. Failure to properly monitor the temperature of the BOD incubator.
    The BOD incubator temperature must be maintained at $20^{o} \pm 1^{o}C$. A log should be kept for each piece of equipment to record the date, time, temperature, and the initials of whoever was checking it. It is just as easy to record the temperature on the daily worksheet.

The following are problems frequently found with the pH analysis.

1. Failure to compensate for temperature.
   Since pH is temperature dependent, an automatic temperature compensator (ATC) probe must be use or the temperature measured and manually set on the instrument.

2. Failure to properly store the pH electrode.
   Store electrodes according to manufacturer instructions! Orion states using pH 7 buffer with 1 gram of KCl (potassium chloride).

3. Using expired pH standards.
   Do not use expired pH standards. Plan to buy what can be used before the expiration date.

4. Failure to properly calibrate the meter.
   A two-point calibration is a requirement. A two-point calibration brackets the normal pH range found at the plant. It provides a line on which the best possible data point for the sample can be found. If the sample falls outside the calibrated range then the instrument should be recalibrated.

   If you have the capability to perform a 3-point calibration, follow manufacturer procedures.

5. Failure to use fresh standard solutions for calibration of the pH meter.
   Prepare fresh standard solutions for each daily use for calibration. If stock bottles are used, be sure to cap the bottle after pouring out an amount used for standardizing. **Never** pour used reagent back into the stock bottle. This is a big source of contamination. This method could jeopardize the integrity of the sample, which is directly related to the calibration of the meter.

6. Improper calibration procedure used in calibrating the pH meter.
   Start by adjusting the standardize (calibrate) knob with a pH 7 buffer. The slope or calibrate function on the meter should be set with a second buffer. This buffer depends on the desired range, either above pH 7 (e.g. pH 10) for the higher pH range, or below pH 7 (e.g. pH 4) for the lower pH range.

7. Failure to rinse the electrode prior to reading the sample.
   Be sure to rinse the electrode well after standardizing the meter and prior to reading the pH of the sample. This eliminates cross-contamination.

8. Failure to stir the sample.
   Stirring the sample at a rate of about one revolution/second is necessary in obtaining a quick and accurate reading.

9. Failure to run the sample immediately after collection.
   Don't collect the pH sample until it is ready to be run. The analysis should be run immediately. According to EPA, this generally means within 15 minutes of collection.

10. Failure to have a backup probe.
    An extra pH probe should be available in the event that the current probe malfunctions.

11. Uncertainty of how to maintain an electrode.
    The electrolyte should be added to the new electrode, through a filler hole in the side, when it is ready for use. After the electrolyte has been added, it should not be used for at least one hour. Be sure to rinse off any excess electrolyte and pat dry the electrode. Do not rub the electrode vigorously because it could affect the probe. This will assure that none of the electrolyte is introduced into the sample. The electrolyte is a caustic that causes an obvious increase in the pH.

    Be sure to take the filler hole cap off when taking readings. This cap may be replaced when not in use to prevent evaporation of the electrolyte.

The following are problems frequently found with the <u>Total Suspended Solids (TSS)</u> analysis.

1. Failure to adequately shake the sample.
   The biggest problem with the TSS is that operators are not shaking the sample well enough prior to analysis. This is necessary to obtain a representative sample.

2. Uncertainty of why results are too **high**. (When comparing results to State results.)
   Frequently, sample volumes are too high for the amount of solids in the sample. This requires longer filtration periods for elimination of the liquid. Prolonged filtration times may produce high results due to excessive solids on the clogged filter. By reducing the sample size, more satisfactory results should be obtained.

   A constant weight must be demonstrated prior to reporting the results. This is to ensure that all the moisture has been eliminated. If this is not accomplished then erroneously high results may be obtained.

   The drying oven should be kept clean to minimize contamination of samples.

3. Uncertainty of why results are too **low**. (When comparing results to State results.)
   Solids can be lost under the filter paper when pouring in the sample. Wetting the filter paper with distilled water prior to pouring the sample will lessen the possibility of the solids being lost under the filter rather than collected on the filter.

   Filtered samples should not be placed directly on the oven rack. The filters could stick to the rack and lose fibers, which could change the weight of the sample. They could also gain contaminants or spill the filter contents. Aluminum weighing dishes are recommended.

4. Lack of good laboratory technique.
   Don't use fingers to pick up crucible or filter. The oil on your fingers adds weight. Use tongs instead.

5. Uncertainty of when to change the desiccant.
   Make sure that the color indicator desiccant is changed when the color turns to pink.

   An option would be to obtain the non-color indicator and mix it with the color indicator desiccant. This would incorporate cost with performance.

6. Failure to properly monitor the temperature of the drying oven.
   The oven should be maintained at a temperature between 103 - 105^{o}C at all times.

7. Failure to perform quality control procedures
   A duplicate should be performed once every 10th sample.

   A distilled water blank should be analyzed with every 10th sample for quality assurance.

The following are problems frequently found with the <u>Total Chlorine Residual</u> analysis.

1. Failure to calibrate the instrument prior to use.
   The Instrument should be calibrated prior to each use. Chlorine or $KMnO_4$ standards may be used. There are several companies that manufacture pre-made standards.

2. Uncertainty of the proper method to use.
   The permit limit must be considered when deciding the appropriate method to use. The low limits presently being given require the lowest possible detection limits that a method can provide. DPD, electrode and amperometric methods are currently the methods that provide the lowest detection limits available.

   Iron, manganese, nitrates and organic mercaptans can interfere with DPD readings giving a false positive for chlorine. Some facilities are unable to use the colorimeter due to these interferences.

   The amperometric method requires greater skill than the colorimetric method but there are less problems with these interferences.

3. Uncertainty of what the lowest reportable value should be.

   The amperometric method requires greater skill than the colorimetric method but there are fewer problems with these interferences.

   The current instrument detection limit is 0.05 mg/L. Many permit limits lie below this value. Many operators have been reporting <0.1 mg/L. This was the old detection limit and should not be used anymore. If the value in the permit limit is within the capability of the instrument, it is preferable that the operators report the actual value that is obtained.

   Be aware that the detection limit can change and become even lower as the technology improved instruments become available.

The following are problems frequently found with the <u>Ammonia as Nitrogen (NH_3-N)</u> analysis.

1. Failure to properly preserve samples.

   Samples should be preserved properly with acid when the analysis is not performed immediately; this generally means within 15 minutes. (1.0 mL of sulfuric acid per liter of sample.)

2. Failure to adequately shake the sample.

   Thoroughly shaking the sample is necessary to obtain a more representative sampling.

3. Failure to distill samples.

   Distillation is required to remove impurities that would interfere with the analyses and produce erroneous results. Contrary to popular belief, the probe method does not eliminate the need to distill (as stated in Standard Methods). The 40CFR part 136 takes precedence over the Standard Methods. It requires distillation for all methods unless comparability has been shown.

   Also, as footnote 6 states for Table 1B, 40 CFR part 136, "Manual Distillation is not required if comparability data on representative effluent samples are on file to show that this preliminary distillation step is not necessary; however, manual distillation will be required to resolve any controversies."

   Remember, this is a statistical analysis. The guidance that we provide says to collect 3 samples over a given month. Then, each sample be divided into replicates to be distilled and undistilled before analysis.

   To do this, we recommend that you preserve the sample that you collect for the "undistilled" analysis. By the way, this allows you 28 days in which to analyze the sample. Good to remember if you ever have a problem.

   Oh, and if you decide to distill, it's suggested that the distillation apparatus be set up in a place where it can remain (preferably under a working ventilation hood) and

doesn't have to be dismantled after every use. This will eliminate a few headaches.

Did you say Ammonia-free water? Hopefully, someone has found something out there to assist in this matter. Personally, I've had difficulty coming up with something. So, next best consideration. Let's limit the exposure to the atmosphere. Remember, not only does the air that we breathe have oxygen, it also has nitrogen which is a component of ammonia. So, when you distill the water minimize the exposure to the air as it is distilled off.

4. Uncertainty of when the distillation procedure may be omitted.
   If distillation is to be omitted, comparability study must be performed and the data kept on file at the facility. The undistilled sample results must lie within $\pm$ 10 % of the distilled sample results. If so then the distillation process may be omitted. The comparability data should be repeated periodically (minimum once per year).

5. Failure to properly calibrate the instrument.
   Instrument calibration is required prior to running the analysis. At least two standards should be used to bracket the sample. If the sample falls outside this range, then the sample can be diluted or new standards prepared.

The following are problems frequently found with <u>Fecal Coliform</u> analysis.

1. Failure to use the approved method.
   Only use approved methods outlined in the 40CFR part 136. Don't get confused with total Coliform.

2. Failure to use a microscope with the appropriate magnification.
   A microscope with magnification of 10X to 15X is required to obtain a valid colony count. This magnification is necessary to determine the presence of small colonies in a sample that might otherwise be missed.

3. Failure to monitor the temperature of the water bath.
   Maintain the temperature of the water bath at a uniform and constant temperature of 44.5 $\pm$ 0.2 ^{o}C at all times.

   The thermometer must be graduated in 1/10 of ^{o}C which is needed for the $\pm$ 0.2 ^{o}C and **kept** clean**.**

4. Failure to follow proper sterilization procedures.
   0.1 mL of a 10% sodium thiosulfate solution should be added to each sample bottle prior to sterilization. Do not use the preservative N-10 (0.1005-0.0995) sodium thiosulfate. This is potentially harmful to the fecal coliform culture since this is stronger than the 10% (approximately 0.03N) solution stated in the EPA approved procedures.

   The sterilization procedure should be done for 15 - 20 minutes at 121^{o}C (250^{o}F).

If you have to use a pressure cooker as an autoclave, do not close the petcock until steam comes out of the ports. When the sterilization period is complete, turn steam supply off; allow glassware to slowly cool before removing.

5. Failure to properly collect the sample.
   While collecting the sample in the sterilized bottle, care must be taken to eliminate other sources of contamination (e.g. unsterilized dippers used to pour the sample into the sterilized sample bottles).

6. Uncertainty whether to use distilled water in place of buffered dilution water.
   Do **NOT** use distilled water in place of the buffered dilution water. EPA approved methodology requires the use of buffered dilution water in the procedures. The method shows you how to prepare this.

7. Failure to prepare the appropriate number of dilutions.
   Many operators are preparing only one dilution. Prepare three dilutions of the sample in order to obtain a 20 to 60-colony count.

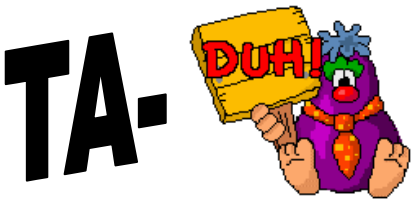
8. Performing analysis with faulty equipment.
   Avoid using a leaking filter apparatus. This could give erroneously low results.

9. Failure to perform quality control
   It is recommended that a positive control sample be set up at least once per month as a quality control check (e.g. 1 mL of effluent prior to chlorination).

   Perform duplicate samples at least once every 10 samples.

10. Failure to perform analyses due to high flow conditions.
    Sampling during high flow events occasionally has been avoided by the operator due to frequently obtaining TNTC (Too Numerous To Count) data. (This is a violation of the permit since representative sampling is required at a specified frequency.) At several plants this occurrence is the norm rather than the exception. Operators who have worked at these plants for a number of years can probably guess as to the appropriate dilutions that could be used to obtain 20 - 60 colony counts. It's better to indicate what actually happens at the plants rather than indicate no problems. These problems would lend proof that there is a need for plant renovations.

11. Failure to report data correctly.
    There are specific guidelines that should be followed when reporting data. TNTC is not to be reported on the MOR. These guidelines are provided upon request or may be found in ***EPA Microbiological Methods for Monitoring the Environment Water and Wastes,*** EPA-600/8-78-017, December 1978.



The following are problems frequently found with the <u>E. coli</u> analysis.

1. Failure to use the methods approved for wastewater.
   Actually, TA-DA!

   The new Federal Register just came out in March 2007. You have the Colilert, Colilert 18 and mColiBlue 24 approved for E. coli analyses. Yipee! Well, there are others listed as well. But, these particular methods have fought long and hard for "approval".

2. Failure to use appropriate temperature.
   Follow instructions. Don't assume E. coli can be used at the same temperature as fecal coliform or visa versa.