Wastewater Operator Certification Training

Module 13:
General Administration of Wastewater Treatment Plants

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Topical Outline

Unit 1 – Monitoring, Reporting, and Record Keeping

I. Data
   - A. Data Collection
   - B. Data Analysis
   - C. Data Presentation
   - D. Records

II. Reports
   - A. Frequency of Reports
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Unit 2 – Administration of Wastewater Treatment Plants

I. Administration
   - A. Management
   - B. Communication
   - C. Financial Management

II. Operations and Maintenance

III. Emergency Response and Safety
   - A. Emergency Response
   - B. Safety

Unit 1 – Monitoring, Reporting, and Record Keeping

Learning Objectives

- List the types of data collected at a plant.
- Analyze typical plant data.
- Describe methods for presenting plant data.
- Explain the frequency and types of reports utilized at a plant.

This unit covers the data that must be collected and the records that must be kept for the general administration of a wastewater treatment plant. Data is collected and records are kept for the following reasons:

- ✓ Track plant performance.
- ✓ Improve performance and efficiency of the plant.
- ✓ Provide the data needed to produce reports.
- ✓ Comply with regulatory agencies.

Data Collection

Data is collected at various locations within the plant. Small facilities may only sample at the headworks and outfall for reporting purposes. Large plants may collect data at each unit process for reporting on and monitoring plant operation. The facility permit will provide direction on the minimum locations where data should be collected.

Data is collected at various frequencies throughout the day, week, month, or year. The facility permit will dictate the minimum frequency some data must be collected. Facility size and data type will also play roles in the frequency of data collection. Small facilities might only collect a biological oxygen demand (BOD) sample once a month, while a large facility might collect a flow-proportioned sample daily. Chlorine residuals are tracked on a more frequent basis than an item such as the sludge blanket depth in a clarifier.

To collect the data, sensors are used at various places throughout the plant. These sensors are usually manometers or gauges. To accurately read a positive or negative meniscus, be sure to take the reading from the middle of the tube. To obtain an accurate reading from a dial gauge, place a reflective surface under the needle to control parallax. A more accurate reading can be obtained by using a dial gauge that prints the data on a chart. The two most popular chart recorders are strip and circular.

It is important to track BOD. If large variations appear in BOD samples, frequency of data collection should be increased to track the cause. Increasing the number of locations to isolate unit equipment performance is both an investigative tool and an operational tool. Additional data items to track through the collection of samples include:

- Temperature
- pH
- Suspended solids
- Volatile solids
- Oil and grease
- Nitrate
- Phosphorus
- Dissolved Oxygen
- Coliform
- Chlorine

Data collection is not limited to sampling results, it can also include:

- ✓ Weather conditions. Weather can have an effect on plant performance.
- ✓ Equipment usage. This should tie into the maintenance of the equipment.
- ✓ Operator observations. These can lead to insights as to why or how something happened or was prevented at the facility.
- ✓ Use of consumables, staff time, and other cost data. These three items deal with what it takes to operate the facility.

Data Analysis

Raw data is taken from a gauge or other instrument. To analyze the data, the following calculations are often used:

Mean is the central tendency or average of a group of numbers. The mean provides a single number that can be used to represent a range of values. A mean can often hide a problem number or outlier that exists in the dataset. Therefore, it is often helpful to know the numbers or range of numbers in the dataset. For example, it is possible for a plant to meet its monthly discharge limit but exceed its weekly discharge limit. In this case, knowing the range of values would help spot the week where the discharge limit was exceeded.

Table 1.1 Discharge Report

March 2002									
Date	Flow	Concentration BOD (mg/l)	Concentration TSS (mg/l)	Loading BOD (kg)	Loading TSS (kg)	Weekly BOD	TSS	Monthly BOD	TSS
4	7	18	20	477	530				
6	9	20	24	681	818				
8	8	22	31	666	939	608	762		
11	7	36	28	954	742				
13	6	53	30	1,204	681				
15	5	55	28	1,041	530	1,066	651		
18	9	41	30	1,397	1,022				
20	13	38	24	1,870	1,181				
22	17	33	19	2,123	1,223	1,797	1,142		
25	12	22	20	999	908				
27	9	20	24	681	818				
29	7	17	25	450	662	710	796	1,045	838
Monthly Limit	10	30	30	1,136	1,136				
Weekly Limit	10	45	45	1,703	1,703				

In this example, the monthly BOD discharge of 1,045 is within the limit of the plant; however, the weekly BOD discharge of 1,797 is over the weekly limit.

Caution: When using the automatic features in programs such as Microsoft Excel, the average feature will add the numbers in your data range and divide by the number of values in the range. This will not provide the correct number if, as an example, you collect readings twice a week but want to calculate your average daily reading. In this case, you would need to create a formula in the cell that would divide the sum of your readings by the number of days in the month.

Refer to page 659 of Chapter 18 in *Operation of Wastewater Treatment Plants, Volume II*. Review examples 1 and 2.

Range is the distance between the highest and lowest numbers in a dataset. The range is useful when used with a mean because it tells you how widely the highest and lowest numbers varied from the mean. You can calculate the range by subtracting the smallest value from the largest value, or, you may simply state the highest and lowest value.

Refer to page 660 of Chapter 18 in *Operation of Wastewater Treatment Plants, Volume II*. Review example 3.

In a range of numbers, median is the middle number, where 50% of the numbers are above and 50% are below the median, and mode is the most frequent number. An advantage of median and mode is that, unlike the mean calculation, median and mode are not influenced by outlying numbers.

Refer to page 660 of Chapter 18 in *Operation of Wastewater Treatment Plants, Volume II*. Review example 4.

Geometric mean is similar to the mean calculation; however, it minimizes the impact of outlying data values. The geometric mean can be calculated by using log probability paper, logarithm tables, an electronic calculator, geometric mean tables, or software such as Microsoft Excel. Some regulatory requirements specify the use of a geometric mean instead of a mean, median or mode.

Refer to pages 661-665 of Chapter 18 in *Operation of Wastewater Treatment Plants, Volume II*. Review 18.70, 18.71, 18.72, and 18.73. These examples use the same group of values as example 4 on page 660. Note that for example 4 on page 660:

Mean = 882	Mode = 240
Median = 250	Geometric Mean = 338

Rolling average or moving average is the averages for a certain time period plotted over time. As new data is added to the chart, old data is deleted, so that a certain time period is always visible on the chart. A rolling average smoothes out the fluctuations in the raw data, while providing a visual representation of trends.

Refer to page 667 of Chapter 18 in *Operation of Wastewater Treatment Plants, Volume II*. Review 18.8.

Spikes are values that fall outside the range of the expected dataset. An example of a spike is 7,200 from example 4 on page 660 of Chapter 18 in *Operation of Wastewater Treatment Plants, Volume II*.

Trends are the general direction or tendency of a group of numbers. Trends can be observed by plotting raw data, or by plotting rolling averages over time. Trends can be seen on the charts on page 667 of Chapter 18 in *Operation of Wastewater Treatment Plants, Volume II*.

Standard deviation is the measure of how widely values are dispersed from the average value. Variance is a measure of the variability of the numbers within the data.

Refer to pages 674 - 678 of Chapter 18 in *Operation of Wastewater Treatment Plants, Volume II*. Review 18.10.

Data Presentation

Data can often be difficult to interpret unless it is presented in a meaningful or visually appealing format. Options for presenting data are outlined below.

✓ Tables are good for presenting data that has independent and dependent variables that can be displayed in rows and columns. Table 1.1 Discharge Report in the Data Analysis section of this workbook is an example of a table.

✓ Graphs are good for visually displaying data. Pie graphs are good when presenting values as a percentage of the total. A bar graph is good for a limited number of data sets. Line graphs effectively show trends.

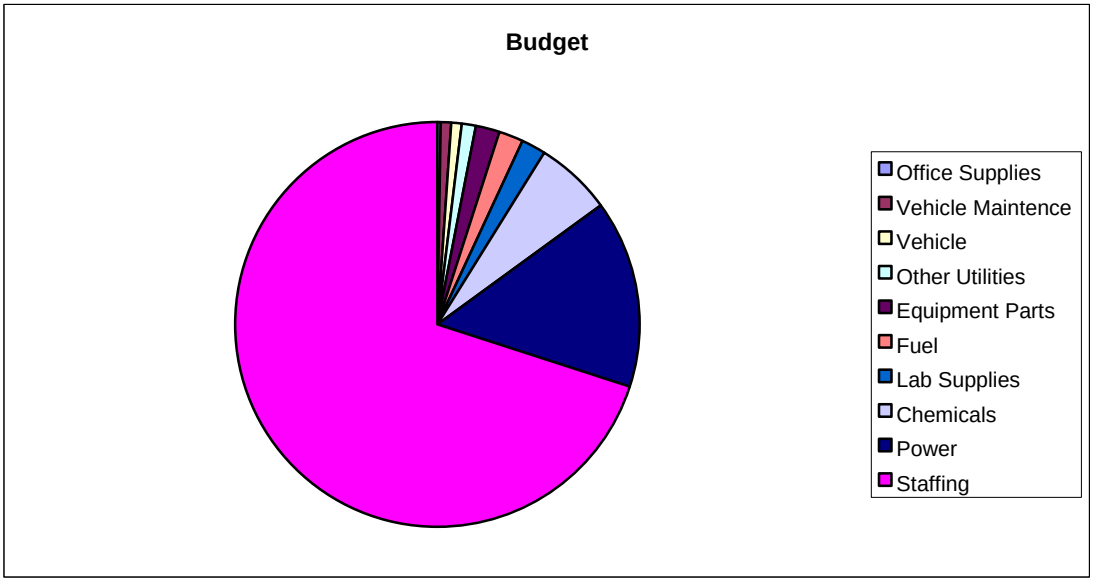

Figure 1.1 Pie Graph—Wastewater Treatment Plant Budget Allocations

A table that showed the start and anniversary dates of an employee along with their salary and notes, might not visually represent their salary increases over the years. However, the bar graph represents the increases in an easily understandable format.

Table 1.2 Employee Raw Data

17540	6/1/85	Start at the WEC Purification Facility
18080	6/1/86	Anniversary
20000	6/1/87	Anniversary and cost savings implementation
22000	6/1/88	Anniversary and passed the class III
23000	6/1/89	Anniversary
23650	6/1/90	Anniversary
25000	6/1/91	Anniversary and passed the class II
25025	6/1/92	Anniversary - back on probation
26300	6/1/93	Anniversary - off probation
27500	6/1/94	Anniversary and passed the class I

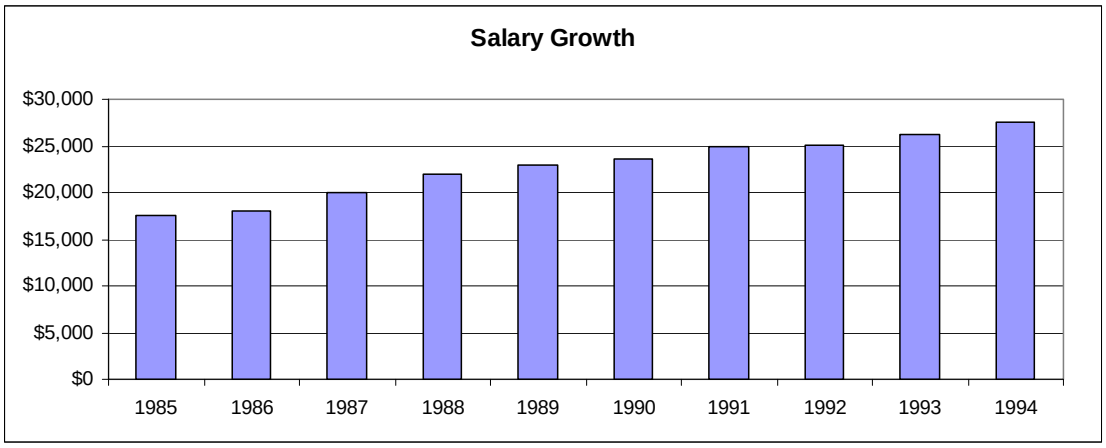

Figure 1.2 Bar Graph—Salary History

On the next page is a table showing flow vs. rainfall. This data is more useful when shown as a line graph. The line graph is on the page following the table.

Table 1.3 Flow vs. Rainfall Raw Data

	Hour																									
Date	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	Rain Fall	Avg
1	27.7	19.9	14.9	14.0	13.0	12.9	14.7	26.1	43.5	39.8	32.6	31.1	29.1	26.8	27.4	26.3	26.2	28.3	30.7	35.4	38.4	38.9	36.0	34.2	26.3	0.00	27.83
2	28.3	19.3	16.0	14.1	12.2	13.2	14.8	25.8	42.6	39.7	34.1	31.9	31.0	29.8	29.1	28.9	29.0	29.4	32.3	34.4	35.8	33.9	32.3	30.7	26.4	0.01	27.85
3	27.9	23.3	16.0	14.5	13.7	12.9	13.2	14.7	19.7	31.2	41.6	44.7	42.4	41.4	37.0	34.3	31.8	33.0	35.0	36.4	36.7	34.8	33.0	32.4	28.0	0.00	29.23
4	27.0	20.9	17.7	15.1	13.2	13.0	12.3	13.5	17.3	25.8	39.0	43.9	42.7	42.8	41.1	38.8	36.4	36.1	36.5	38.6	40.8	40.7	38.7	33.8	29.0	0.00	30.23
5	27.8	19.2	15.5	14.6	13.4	13.2	16.9	32.6	48.4	45.6	37.7	35.2	33.0	31.8	31.2	29.6	28.7	29.5	30.8	37.5	38.8	38.8	37.9	33.4	28.6	0.38	30.04
6	25.9	19.7	16.1	13.7	12.5	12.3	15.5	26.0	43.6	39.6	32.2	29.5	28.9	25.6	22.5	23.4	21.4	25.4	26.1	34.0	42.4	36.1	38.8	33.0	25.4	0.00	26.84
7	26.4	19.5	14.7	13.3	13.3	12.7	16.1	25.9	43.5	39.8	32.3	28.7	26.5	26.1	25.1	23.3	24.2	26.6	28.2	36.7	37.8	38.7	39.9	29.4	25.6	0.00	27.03
8	28.0	19.3	14.5	12.8	12.0	12.0	14.6	25.8	45.0	37.5	32.1	27.9	27.8	26.3	25.1	24.2	22.1	23.2	26.9	30.8	39.6	38.8	36.7	34.3	25.4	0.00	26.56
9	26.7	17.8	15.0	13.8	12.1	11.8	14.8	25.6	43.4	39.7	33.6	32.2	30.8	27.4	27.6	26.7	25.2	26.0	25.5	29.9	32.8	30.1	28.3	24.6	24.7	0.00	25.88
10	23.8	20.6	17.1	14.8	13.1	11.9	12.2	14.4	17.3	29.6	40.9	43.8	45.0	41.5	39.4	34.9	32.6	32.0	35.6	35.6	36.3	34.9	32.3	31.2	27.6	0.02	28.78
11	27.6	23.4	16.3	15.0	13.6	12.5	11.9	13.4	18.2	26.8	41.9	43.6	44.2	41.0	40.3	34.3	34.6	34.3	36.5	39.0	41.7	41.5	38.3	34.3	29.0	0.00	30.17
12	24.6	19.5	15.1	12.8	12.1	11.9	14.5	26.4	43.0	38.3	34.1	32.4	31.5	31.4	29.9	29.0	28.4	30.0	32.4	36.0	38.1	39.3	37.4	33.1	27.0	0.07	28.39
13	27.3	19.4	15.3	13.5	13.0	13.2	16.7	27.0	46.6	41.0	35.4	32.4	30.7	29.4	28.0	26.0	26.1	28.3	31.1	35.3	37.7	38.4	37.3	33.9	26.9	0.31	28.45
14	27.7	20.7	14.8	13.7	12.9	13.0	14.8	27.2	44.7	40.0	32.8	31.6	29.0	29.4	28.8	27.7	28.6	29.6	30.8	37.0	38.4	37.2	37.0	34.3	26.9	0.04	28.40
15	29.0	19.4	15.6	13.9	12.8	12.6	15.6	25.8	43.2	39.4	34.0	32.5	28.9	31.5	27.5	25.5	24.3	24.6	27.7	31.3	38.2	39.9	38.6	32.4	26.1	0.00	27.67
16	28.0	20.2	14.9	13.3	12.7	12.4	15.4	25.6	43.8	39.6	35.0	32.7	31.6	31.5	29.0	28.0	26.7	27.9	32.0	35.4	35.3	33.4	32.4	30.9	26.3	0.02	27.82
17	29.4	21.6	18.8	22.7	21.5	18.2	19.9	25.5	32.7	47.0	46.1	49.8	49.1	46.2	42.3	40.9	33.4	34.8	36.2	39.3	39.2	36.0	33.3	32.7	32.7	0.95	34.03
18	29.7	23.7	18.9	16.6	14.0	13.7	13.4	14.5	18.7	28.6	42.2	45.6	42.6	44.0	38.6	36.5	33.1	33.0	36.6	37.5	37.0	37.6	36.5	31.9	28.9	0.00	30.18
19	28.9	24.7	16.2	14.5	13.8	13.4	13.9	19.1	27.1	31.9	40.4	43.2	41.1	39.4	36.6	33.6	32.4	31.6	34.8	39.8	39.8	42.7	40.1	35.1	29.2	0.00	30.58
20	29.0	19.4	16.0	13.9	13.1	13.0	15.9	26.8	45.8	40.7	34.0	31.5	33.1	23.7	27.6	26.1	21.6	24.1	27.0	30.9	38.4	41.8	37.5	34.0	26.2	0.00	27.70
21	28.6	19.5	15.2	13.6	12.5	12.9	15.4	26.4	45.3	40.9	31.9	30.4	30.1	28.3	28.0	26.8	27.6	26.8	31.6	36.1	38.4	39.4	37.1	33.4	26.6	0.00	28.17
22	28.4	20.2	15.4	13.6	12.7	12.6	16.2	27.4	45.6	40.3	32.9	33.0	33.8	31.8	35.9	37.9	42.1	43.7	42.5	42.5	42.9	42.8	39.5	36.0	30.5	0.79	32.07
23	30.2	20.4	16.6	14.9	13.9	14.0	16.4	27.7	48.2	41.2	34.1	31.9	30.5	29.5	27.9	26.5	26.5	27.5	32.9	35.4	36.7	35.5	34.3	31.1	26.9	0.00	28.49
24	29.1	22.3	18.5	16.4	15.0	13.6	13.8	15.7	21.5	31.5	45.0	45.1	42.7	41.0	37.9	34.7	33.4	32.8	36.7	37.7	40.3	34.4	34.3	31.1	28.9	0.00	30.19
25	29.8	24.9	17.4	15.5	14.6	12.6	12.7	14.2	18.8	28.4	43.9	45.3	47.0	41.3	43.2	41.9	38.6	37.8	37.7	40.2	41.3	42.5	39.1	34.6	30.6	0.27	31.80
26	29.3	20.3	16.0	14.0	13.0	12.4	15.7	27.1	48.0	36.9	32.6	32.3	28.0	28.2	26.8	27.2	25.3	26.3	30.0	34.9	39.5	41.6	37.3	34.0	26.7	0.00	28.19
27	28.5	19.1	15.5	13.8	13.0	13.1	15.7	27.1	46.5	40.0	32.6	30.1	27.0	26.8	26.0	24.5	26.0	28.7	30.8	36.0	36.7	40.9	38.5	33.3	26.3	0.00	27.93
28	27.8	18.6	16.0	14.4	12.9	12.8	15.6	27.0	46.3	41.1	33.1	32.0	31.1	30.2	28.7	27.2	25.3	28.1	30.1	35.8	38.7	39.8	38.0	34.7	27.0	0.00	28.56
Max	30.2	24.9	18.9	22.7	21.5	18.2	19.9	32.6	48.4	47.0	46.1	49.8	49.1	46.2	43.2	41.9	42.1	43.7	42.5	42.5	42.9	42.8	40.1	36.0	32.7	0.95	37.22
Min	23.8	17.8	14.5	12.8	12.0	11.8	11.9	13.4	17.3	25.8	31.9	27.9	26.5	23.7	22.5	23.3	21.4	23.2	25.5	29.9	32.8	30.1	28.3	24.6	24.7	0.00	22.18
Avg	27.9	20.6	16.1	14.5	13.4	13.0	14.9	23.4	37.4	37.2	36.4	35.9	34.6	33.0	31.7	30.2	29.0	30.0	32.3	36.1	38.5	38.2	36.4	32.8	27.5	0.10	28.89

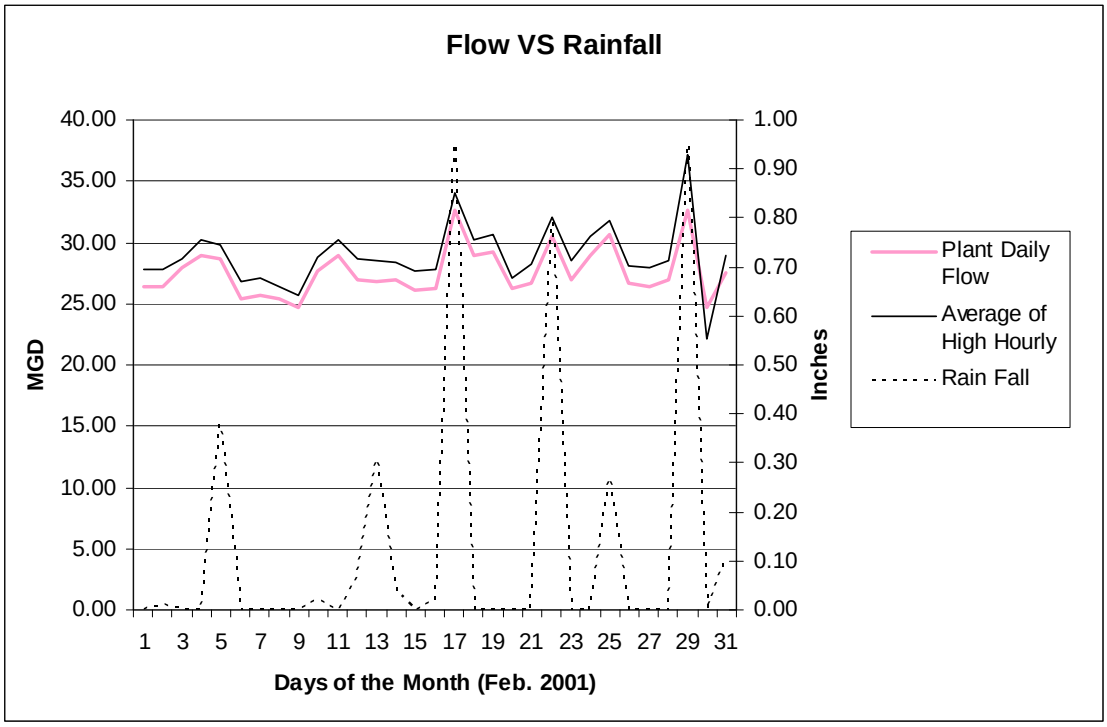

Figure 1.3 Line Graph—Flow vs. Rainfall

✓ Charts are developed to assist with routine calculations. Charts are useful when looking up the parshall flume going from the depth of liquid to the calculation of the rate of flow, or, when calculating the pounds of solids from percent solids vs. flow.

Conversion charts can be real time savers. Examples of these include:

- The staff gauge reading to flow rate of a parshall flume.
- The degree Fahrenheit to degree Centigrade for temperature.
- The depth of the liquid in a basin to the volume of contents.
- The pump run time to gallons pumped.

Refer to pages 672 - 674 of Chapter 18 in *Operation of Wastewater Treatment Plants, Volume II*. Review 18.93.

Records

Once data is collected, it is usually maintained and stored in some form of organized manner. Record is the name we give to the documents or files used to collect and store data. After records have been generated, they should be easy to locate. Records that are in an electronic format are often easier to archive than hardcopy records. Records must be kept for as long as is legally required, or for as long as they are useful. There are various types of records that are kept at a plant.

- ✓ Operational records are the most extensive records kept by an operator. These records have the biggest impact on the ongoing functioning of the facility. Operational records include bench sheets, laboratory results, operator's logs, daily/weekly status board, and trend charts.

- ✓ Physical plant records do not change as quickly as other types of records because the plant is not in a constant state of change. However, these records are very useful for maintenance and repairs. Physical Plant records include design/as-built plans and specifications, building plans, and other site construction or modification documents.

- ✓ Inventory records include what has been brought on site and what has been used or has left the site. They are updated as goods and services are purchased. Good inventory records help ensure the availability of repair parts, the timely ordering of chemicals, and the availability of specialty tools. Inventory records may consist of:

Consumables	Non-Consumables
• Utilities	• Equipment (equipment has supplemental records)
• Fuels	• Vehicles
• Chemicals	• Office Furniture
• Parts	

- ✓ Maintenance records provide insight into plant reliability and problem areas. Maintenance records include what has been done to the facility and its components. These records will vary in scope depending on the item being maintained. The grounds records may include the dates of lawn mowing, chemical applications and watering. Vehicles, on the other hand, should have more extensive records for such items as oil changes, lubrication, gas usage, brake work, and filter changes. If you have commercial motor vehicles (CMVs), which weigh more that 17,000 pounds, additional vehicle records are required.

- ✓ Equipment records track such items as spare parts, warranty dates, preventative maintenance schedules, and emergency maintenance. Equipment records usually contain information that is specific to a piece of equipment. These records may include the original cost, where it was obtained, and who is responsible for maintenance.

- ✓ Financial records are used to track the costs of operating the facility, track current costs to the current budget, and develop future budgets. They include invoices, petty cash, and vouchers for smaller facilities. For larger/autonomous organizations, the records would also include payroll, accounts receivable, accounts payable, reserve funds, capital improvement funds, general ledger, bonds, and grants.

- ✓ Personnel records are maintained on employees throughout employment. Personnel records start when someone is hired, and usually include items such as performance reviews, performance expectations, goals, and accomplishments. They may also include the person's knowledge, skills, and abilities as well as progress toward additional certifications. Additional employee paperwork is required if you have CMVs. Personnel are one of the plant's biggest assets. Personnel records will encompass not only employee work histories (salary, performance, discipline, knowledge, skills and abilities), but will also show how the staffing level of the facility has been determined. Employee records are confidential and need to be stored in a secure location. If there is a problem employee, personnel records should contain the documentation that shows the problem and how the problem has been addressed.

- ✓ Procurement records give a history of the cost of goods over time. They are useful during audits because they can show that you acquired your services at a low cost. The cost data available in procurement records also assists with the development of budgets.

- ✓ Other records such as wastewater sources, laboratory data, chlorination station data, accident reports, and customer complaints.

 Other records:

The data captured in data records is summarized into reports so that plant operations can be monitored, decisions can be made, and regulatory requirements can be met.

Frequency of Reports

Reports are produced at various times depending on the use of the report. Reports are usually produced at the following intervals:

- ✓ Daily reports are often a narrative of what is happening at the plant. They can be created separately, or available from within the various bench sheets or logs that record a process.

- ✓ Monthly reports are often a summary of daily reports. Examples of monthly reports include the discharge monitoring report and the monthly budget report.

- ✓ Annual reports are usually an additional summation of data from the monthly reports. Annual reports are useful when reviewing the current budget against the proposed yearly budget. Additional examples of annual reports include the annual sludge applications report (if land applying) and the review of revenue generated by pretreatment programs.

- ✓ Ad hoc reports are created as needed. Examples of reports created on an ad hoc basis may include projected chemical use, projected manpower application, and comparisons of planned and emergency maintenance to budget.

Types of Reports

There are several types of reports that are useful at a wastewater facility. Some of these reports include:

- ➢ Permit reports. The main permit report is the Discharge Monitoring Report (DMR). The DMR is also known as NPDES report forms.

- ➢ Plant Performance reports. Plant performance reports are produced to assist plant personnel monitor the performance of the plant and the cost of operation.

➢ Management reports. Management reports may include plant performance reports, as well as OSHA compliance reports and chemical inventory on-hand.

Other reports:

Key Points – Unit 1

- The types of data collected at a wastewater treatment plant include:
  - BOD
  - Flow
  - Solids
  - Nutrients (nitrogen and phosphorus)
  - Vacation days
  - Equipment usage

- Data can be analyzed for:
  - Mean
  - Geometric mean
  - Range
  - Median
  - Mode
  - Average
  - Rolling average
  - Spikes
  - Trends
  - Standard Deviation

- Data should be presented in a manner that best describes (shows) the important information.
  - Tabular form
  - Pie charts
  - Graphs
  - Bar Chats

- Data is stored in records

Unit 2 – Administration of Wastewater Treatment Plants

Learning Objectives

- List the main roles of a plant administrator.
- Outline the main types of plant operations and maintenance.
- Name the main components of an emergency response and safety program.

Management

A manager at a wastewater facility must wear many "hats" throughout a typical day. Managers have many responsibilities including:

- ✓ Planning. Planning includes short-term and long-term planning. Planning can be as simple as the date of the next plant picnic, or as complex as when and how different parts of the facility will be replaced.

- ✓ Organizing. When organizing the staffing chart as the plant is being built, break down the anticipated routine tasks and allow time for those tasks to be completed. In addition, allow time for non-routine tasks to be completed. Plant size will determine how many divisions the plant will be divided into. A very large facility may be divided into management, wet side operations, dry side operations, and dedicated maintenance personnel. A small facility may have a sole operator/manager.

  If the plant organization is already in place, take time to reassess where current staff are spending their time. Look at whether any tasks need to be reassigned, supplemented, or eliminated.

- ✓ Staffing. By combining the planning effort with the organization plan, you can determine the number of people needed at your facility. Once open positions have been identified, you must use a selection process to choose candidates for the position. Candidates often come from other facilities. If they are not from another plant, you may need to train the personnel you hire so that they have the skills required to perform the job requirements. This training may include an orientation to your facility as well as on-the-job training. It may also be necessary to work with the new hire to obtain certifications and schedule attendance at training sessions that are necessary to obtain certification.

When assessing plant staffing requirements, be sure to analyze working hours, benefits, shift schedules, and emergency response plans. You will also need to assess or develop the following policies and procedures:

- Disciplinary procedures
- Sexual harassment policies
- Accident procedures
- Probation timeframes
- Compensation levels
- Required levels of training or certification
- Performance evaluations
- Items required in personnel records

Communication

Effective managers encourage open communication up, down, and across the organization. There are various types of communication. They include written and oral communication. Oral communication at a plant is very important, but it should be kept informal and brief. It usually involves asking someone to collect samples, discussing routine operational issues and information, or dealing with an emergency. Written communication includes items that need to be documented to support other reports or to maintain an operational record of the plant. It includes work schedules, policy and procedures, and data recording.

Communication often occurs at meetings. Meetings can be classified as internal or external. Meetings can also be classified as either formal or informal. Formal meetings are usually set in advance, have an agenda and a particular purpose. The overall tone of a formal meeting is structured. Informal meetings are not as structured and usually do not contain a formal agenda.

In the space provided to the right of each meeting, indicate whether the meeting is formal or informal.

Internal meetings include:	External meetings include:
❖ Staff meetings _____	❖ City, town or council meetings _____
❖ Training sessions _____	❖ Civic group meetings _____
❖ Safety meetings _____	❖ Regulatory personnel meetings _____
❖ Change of operator information meetings (should be conducted at the beginning of each shift). _____	❖ Contractor meetings _____
	❖ Supplier meetings _____

Financial Management

A manager is responsible for the financial health of the facility. Because a township or municipality may need to dip into reserve funds to cover any revenue shortfalls, a facility should try, at a minimum, to break even. Building a utility reserve or sinking fund is a good way to address future revenue shortfalls and anticipated or emergency equipment replacement.

Budgets are often conducted on a yearly basis, with six month or quarterly reviews. Budgets help control costs and allocate funds within the plant. A budget should include costs for:

- ✓ Personnel
- ✓ Energy
- ✓ Replacement of equipment
- ✓ Subcontractors
- ✓ Consumables

Once costs have been determined, revenues need to be considered. Rates control the amount of revenue collected from customers. If a facility has a homogenous collection system, such as all residential connections, there is often a single rate that applies to all customers. These rates are often reviewed annually, and are billed to customers on monthly, bimonthly, or quarterly intervals. If a facility has a pretreatment program, it often enhances plant revenue because customers with above average BOD, solids, nutrient or toxic loads are charged higher rates.

As income arrives at the municipal or plant level, it is usually allocated to operating funds, sinking funds (plant improvements), or maintenance funds. Funds for special projects like plant construction and upgrades are often available from such sources as:

- ✓ EPA
- ✓ State Revolving Loan Fund (SRF)
- ✓ Rural Utility Service (RUS—formerly the Farmers Home Administration)

Operations and Maintenance

Plant operations can be classified as normal or abnormal. Normal operations are when processes are functioning properly. Abnormal operations are when a process is not working properly, or when equipment is not available. Guidelines for plant operations should be included in the plant Operations and Maintenance (O&M) manual or Standard Operating Procedures (SOP) manual.

The two types of maintenance are preventative and emergency. Preventative maintenance helps to maintain the continued operation of the plant without disruptions. Good preventative maintenance also helps to preserve emergency funds. Emergency maintenance should be avoided because it often costs more and is more time consuming than preventative maintenance.

Automation has become more widespread at wastewater facilities. Such automation includes Supervisory Control and Data Acquisition (SCADA) systems. These systems can increase the accuracy and timeliness of data as well as reduce operational costs. SCADA systems are made up of:

- ✓ Sensors
- ✓ Instrumentation
- ✓ Field units
- ✓ Remote terminal units (RTU)

The sophistication of the system determines how much control and integration is available at remote site(s).

 Preventative maintenance tips

Emergency Response

Emergency response plans are required because of regulations, natural disasters, and unforeseen events. To deal with natural disasters, emergency response plans should cover power generation, staffing, and continued operation of the plant. Emergency response plans should also be prepared to deal with events such as spills, accidents, and injuries.

Safety

Program Contents

An emergency response plan is closely tied to a plant's safety program. A safety program should cover[1]:

- Operator participation
- Process safety information
- Chlorine and sulfur dioxide hazards
- Process technology
- Equipment information
- Process hazard analysis
- Operating procedures
- Training
- Contractor work
- Pre-start-up safety review
- Mechanical integrity
- Hot work
- Management of change
- Incident investigation
- Emergency planning and response
- Compliance audits

 Other safety program topics

Education

One of the best ways to avoid being injured is to be knowledgeable of the dangers associated with working at a wastewater treatment facility. It has been shown that proper training can reduce accidents and injuries. Training can raise the awareness of the inherent dangers of working at a wastewater facility and can highlight the human factors that may affect safety. Safety training should cover:

- ✓ What are the dangers?
- ✓ The best ways to avoid the dangers.
- ✓ How to respond if someone is injured (may include first aid training).
- ✓ Special topics such as reading placards, working in confined spaces, and handling hazardous materials.

 Key safety training topics

Regulations

Regulations often mandate how much education or certification is needed. The Federal Occupational Safety and Health Administration (OSHA) has regulations to protect workers in the following areas:

- ✓ Physical, chemical, and health hazard communication. This includes labeling and training. The physical workplace is generally covered in 29 CFR 1910.21-98. Specific equipment is covered throughout the section.

- ✓ Workers Right-to-Know. This includes Material Safety Data Sheets (MSDS). These are required for almost any chemical or compound used in the plant. Right-to-Know is an OSHA standard that can be found at 29 CFR 1910.1200.

- ✓ Confined spaces. The regulations for confined spaces should be covered thoroughly with plant personnel because the regulations may cover an area not normally thought of as a confined space. An example is inspecting the lining of a lagoon that has been emptied. This might be considered a confined space under the regulations. OSHA standards on confined spaces can be found at 29 CFR 1910.146.

Reporting

OSHA requires the reporting of some accidents and injuries. However, it is recommended that all accidents or injuries be reported to the safety manager of the facility. Refer to pages 759 - 760 of Chapter 20 in *Operation of Wastewater Treatment Plants, Volume II*.

Key Points – Unit 2

- Administrators/managers are responsible for:
  - Planning, organizing and staffing operations.
  - Overseeing human resource policies.
  - Communicating plant policies and operational information to employees.
  - Ensuring communication occurs between employees.
  - Financial management/budgeting.
  - Setting up Operations and Maintenance plans, procedures and SOPs that outline routine and emergency plans.
  - Overseeing Emergency Response Procedures.
  - Ensuring adherence to regulations (safety and operational - including reporting).
  - Creating safety programs that include:
    - Operator participation.
    - Process safety information
    - Chemical safety information
    - Training

[1] John Brady, William Garber and James F. Stahl, “Chapter 20: Treatment Plant Administration,” in *Operation of Wastewater Treatment Plants, Volume II*, (Sacramento, CA: California State University, Sacramento Foundation, 2001), pp. 749 - 750.