CHAPTER 5

WASTEWATER CHARACTERISTICS

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The Lebanon Wastewater Treatment Plant (WWTP) is operated by Operations Management International, Inc. (OMI). OMI personnel monitor important wastewater characteristics for the plant and report these plant conditions to the City of Lebanon and to the Oregon Department of Environmental Quality (DEQ) on a monthly basis as required by their NPDES permit. This chapter summarizes data from the discharge monitoring reports (DMRs) and analyzes recent data to define the flows and loads that characterize the City's wastewater under current conditions. Current flow and load estimates are used along with the population projections presented in Chapter 2 to develop flow and load projections for future conditions. The flow and load projections serve as the basis for assessing the adequacy of existing treatment systems and sizing new treatment facilities.

CURRENT FLOWS AND LOADS

Analysis of flow and load data forms an important initial step in developing wastewater flow projections. The following assessment of current flow and load conditions for the Lebanon WWTP are based on operational data from November 2002 through October 2003. Please see the last paragraph in the <u>Flow Records and Measurement</u> section starting on page 5-2 for the explanation of why operational data before late 2002 was not used to calculate flows and loads.

Wastewater Flows

Because wastewater flows are typically quite variable, a number of different flow conditions are important in sizing and evaluating wastewater treatment plants. This section defines the flows of interest and develops estimates of monthly and peak flows.

Definitions. The flow rates and related parameters discussed in this chapter are defined below:

- The *average dry weather flow* (ADWF) is the average flow at the plant during the dry weather season, typically May through October.
- The *average wet weather flow* (AWWF) is the average flow at the plant during the wet weather season (November through April) during a year with average rainfall.
- The *maximum month dry weather flow* (MMDWF) is defined as the flow recorded at the plant when total rainfall quantities are at the 1-in-10 year probability level for the month of May. MMDWF is important in the design of effluent irrigation and storage systems.
- The *maximum month wet weather flow* (MMWWF) is defined as the plant flow when total rainfall quantities are at the 1-in-5 year probability level for the month of January.

- The *peak day flow* (PDF) is the flow rate that corresponds to a 24-hour storm event with a 1-in-5 year recurrence interval that occurs during a period of high groundwater and saturated soils.
- The *peak wet weather flow* (PWWF) is expected to occur during the peak day flow. The PWWF is the highest flow at the plant sustained for one hour. The PWWF dictates the hydraulic capacity of the treatment system. PWWF is also referred to as the peak instantaneous flow.
- *Infiltration and inflow* (I/I) refers to water that enters the wastewater collection system due to deterioration or illicit connections. Infiltration is groundwater that enters the system from the surrounding soil through defective pipes, joints, or manholes. Inflow is stormwater that directly enters the system from sources such as drainage connections, flooded manhole covers, and sewer defects that respond quickly to saturated ground conditions.

Flow Records and Measurement. When analyzing the flow monitoring records, it is important to identify any limitations or inconsistencies in the data or flow measurement equipment. For the Lebanon WWTP, the following factors must be considered when reviewing historical flow records:

- Much of the Lebanon collection network was constructed as a combined wastewater and stormwater system. Since there are still active remnants of the combined system, the influence of I/I on plant flows is significant.
- Only average flow over each 24-hour period is reported. Thus, significant rainfall late in the reporting period will tend to affect flows in the following reporting period.
- Raw sewage enters the plant via influent pump stations, which have a firm capacity of approximately 30 mgd. However, the secondary treatment capacity of the plant is only 12 mgd. As a result, plant staff may restrict influent flows by utilizing collection system storage capacity during extended periods of high flow. This practice can have the effect of decreasing the peak influent flow by surcharging the collection system and effectively spreading flows out over multiple days.
- Some sewers may be undersized relative to peak flows, which also attenuates flows through surcharging and increases the possibility of unrecorded overflows from the collection system.
- Lebanon has reported emergency overflows in the collection system during peak flow events in the past. The occurrence of overflows indicated that not all of the City's peak flow reaches the plant.

All of the above factors affect measurements during high plant flow conditions. However, there is potential for plant flow metering inaccuracies during low plant flow conditions as well. Prior to 2002, plant flow meter was a Parshall flume that relies on a radio frequency admittance probe to measure only the upstream water depth. This water depth is used to calculate the flow through the flume. As observed during a field evaluation of flow meter operation, a thin layer of biological growth that accumulates on the probe below the normal water level can cause false readings during low flow conditions. The probe may not distinguish between water held in the

biological growth layer above the water surface elevation and the actual water level in the channel, thus giving inaccurately high flow readings when the water level falls below the top of the biological growth. Although the probe is cleaned on a monthly basis during flow meter calibration, the field evaluation seemed to indicate a significant potential for the biological growth to occasionally inhibit accurate measurements. Further, it is reasonable to expect this problem to be more extreme during the summer when higher wastewater temperatures encourage biological growth. The significant effect of this situation is that the overall daily plant flows may have been overestimated, especially during the summer. Also, since plant loading estimates are calculated based on plant flows, overestimated plant flows will cause plant loads to be overestimated as well. However, this problem was eliminated in August 2002 with the installation of a new flow metering system. Thus the data sets since late 2002 are favored to describe the current flow and loading conditions at the Lebanon WWTP.

Rainfall Records. Since rainfall has a large effect on wastewater treatment plant flow rates, DEQ flow projection guidelines recommend that rainfall records and statistical analyses be considered when analyzing WWTP flows. Daily rainfall data are collected at the Lebanon WWTP.

The National Oceanic and Atmospheric Administration (NOAA) prepares statistical summaries of climatology data for selected meteorological stations. The meteorological station closest to Lebanon is located in Corvallis, approximately 20 miles to the west. The most recent climatological summary for areas of Oregon was prepared in 1980 and is based upon data collected from 1951 through 1980. Table 5-1 compares the average monthly total rainfall recorded at the Lebanon WWTP and rainfall statistics for the Corvallis Meteorological Station obtained from the climatological summary. The relative similarity in rainfall totals indicates that historical data from the Corvallis Meteorological Station provides a reasonable representation of rainfall distribution in Lebanon.

Flow Analysis. Analysis of plant influent flows provides the basis for developing flow projections for the system in the future.

The average dry weather flow (ADWF) is the average flow during the dry weather season months of May through October. Since little rainfall occurs during these months, rain dependent I/I sources do not significantly affect ADWF. The average wet weather flow (AWWF) is the average flow during the wet weather season months of November through April during a year with average rainfall. Table 5-2 presents a summary of the wet and dry season rainfall and flows for the period 1996 through 2003. Since the plant's flow metering accuracy was questionable during dry weather periods prior to August 2002, the selection of current flows for the Lebanon plant favors data collected after the installation of the new flow meter. Hence, based on the more recent period of record, the current ADWF is estimated to be 2.1 mgd and the AWWF is estimated to be 5.7 mgd. The relatively large difference between the ADWF and AWWF indicates that the seasonal variations in wastewater flow caused by rainfall dependent I/I are significant.

Table 5-1. Average Monthly Rainfall at Lebanon WWTP, 1996-2000and Statistical Rainfall Summary for the Corvallis Meteorological Station, 1951-1980

						1-in-10
	1996-2000	1996-2000	Greatest	Greatest	1-in-5 Year	Year
	LWWTP	Average	Monthly	Daily	Monthly	Monthly
	Average	Rainfall,	Rainfall,	Rainfall,	Rainfall,	Rainfall,
	Rainfall,	inches	inches	inches	inches	inches
Month	inches	(Corvallis)	(Corvallis)	(Corvallis)	(Corvallis)	(Corvallis)
January	8.58	7.48	13.59	3.06	11.01	13.94
February	6.97	5.24	13.67	4.57	6.80	8.32
March	4.52	5.41	10.34	1.83	6.42	7.81
April	2.51	3.38	7.01	1.38	3.46	4.26
May	3.72	2.46	6.02	1.30	2.78	3.49
June	1.36	1.44	5.27	1.17	1.86	2.50
July	0.45	0.31	1.16	0.56	0.54	0.82
August	0.48	0.94	4.86	1.44	1.39	2.24
September	1.68	1.56	3.68	1.10	2.32	3.15
October	4.96	3.72	9.87	3.00	4.87	6.09
November	8.37	6.79	16.89	4.80	8.80	10.95
December	7.55	7.91	18.38	3.30	10.76	13.01
Wet Season	38.52	36.21	18.38	4.80	11.01	13.94
Dry Season	12.64	10.43	9.87	3.00	2.78	3.49

Table 5-2. Summary of Lebanon WWTP Wet and Dry Season Rainfall and Influent Flow

		Rainfall Total,	Average of Plant	Maximum 24-hour Average
Season	Water Year ^a	inches	Influent, mgd	of Plant Influent, mgd
Dry Weather	1996 ^b	15.34	2.63	6.28
	1997 ^b	16.30	2.63	4.93
	1998 ^b	11.77	3.33	8.68
	1999 ^b	7.36	2.31	3.97
	$2000^{\rm b}$	9.93	2.39	4.40
	2001 ^b	9.29	2.36	4.07
	2002	7.95	2.10	3.18
	2003	6.58	1.74	4.64
Wet Weather	1997	47.01	6.33	12.06
	1998	28.39	4.84	9.70
	1999	39.21	6.89	13.87
	2000	31.58	4.30	9.06
	2001	18.08	3.27	5.23
	2002	40.73	6.07	12.83
	2003	47.47	5.66	13.11

^aWater year runs from the preceding November through October.

^bPlant flow metering accuracy was questionable during these dry weather periods.

Analysis of the per capita ADWF also indicates that infiltration presents a significant impact on the system. At an ADWF of 2.1 mgd and a current service area population of 13,626, the unit ADWF is approximately 155 gallons per capita per day (gcd). Current wintertime water usage in Lebanon averages approximately 90 gcd, suggesting that the remainder of the ADWF is derived from I/I sources. Due to the high precipitation in Western Oregon, communities often exhibit a relatively high unit ADWF, as shown in Table 5-3. Lebanon's unit ADWF is within the normal range.

			Unit ADWF,
City	ADWF	Population	gcd ^a
Lebanon	2.1	13,626	155
Grants Pass	4.5	25,000	180
McMinnville	3.8	24,400	156
Albany	6.5	43,200	150
Corvallis	6.5	50,900	128
Brookings	1.0	9,400	106

Table 5-3. Comparison of Unit ADWF

^aGallons per capita per day.

The maximum month dry weather flow (MMDWF) is defined by DEQ as the flow that would be expected to occur when rainfall is at the 1-in-10 year probability level for the wettest month of the dry weather season. (October is the wettest dry weather month for the area but the average May rainfall is used for this analysis because groundwater levels are higher in the spring). From Table 5-1, the 1-in-10 year May rainfall at the Corvallis Meteorological Station is 3.49 inches. DEQ guidelines for projecting the MMDWF rely on relating the monthly average flow for January through May against the total rainfall for each respective month. Data from the 2003 season was used. By approximating a linear relationship, as illustrated in Figure 5-1, the MMDWF is estimated to be approximately 4.4 mgd. Similarly, the maximum month wet weather flow (MMWWF) is defined by DEQ as the flow expected to occur when rainfall is at the 1-in-5 year probability level for the month of January. The 1-in-5 year January rainfall is 11.01 inches (Table 5-1). As illustrated in Figure 5-1, the MMDWF is estimated at 8.3 mgd.

The peak day flow (PDF) is defined as the daily average plant flow rate that occurs during the 1-in-5 year, 24-hour storm event. For the Lebanon area, this is approximately 3.5 inches of rainfall, based on isopluvial map found in the NOAA Atlas 2, Volume X. Figure 5-2 presents flows and corresponding rainfall totals from significant wet season storm events between Jan 2000 and Jan 2004. In order to ensure that soils were saturated and infiltration/inflow was significant, this analysis considered only those days with over 0.75-inch of recorded rainfall and with at least one inch of cumulative rainfall in the previous 4 days. Since the available data was limited to 24-hour total flows and rainfalls, it is possible that influent flows corresponding to a single rainfall event would be reflected in two days of influent data. This could lead to an understatement of the influent flows associated with the rainfall event. In order to reduce the potential for an underestimate, the timing of higher influent flows was adjusted to correspond to the greater rainfall event.



Figure 5-1. LWWTP Monthly Influent Flow Versus Rainfall, January - May 2003

Figure 5-2. Influent Flow Versus Rainfall for Significant Events, 2000-2004



The DEQ methodology for estimating the PDF assumes that there is an approximately linear relationship between influent flow and rainfall, where influent flows steadily increase with larger rainfall events. Figure 5-2 clearly shows that the expected linear relationship is not present in the historical flow data. Instead, the graph indicates that plant flows are restricted to approximately 14 mgd regardless of the size of the rainfall event. A review of flow meter charts showing instantaneous flow measurements on peak flow days indicates that the influent flows exhibit very little diurnal variation and tend to plateau at rates well below the capacity of the influent pump station. This observation indicates that the actual peak flow rate is significantly attenuated by a combination of factors including flow restrictions at the influent pump station, the capacity of the secondary treatment processes, flow restrictions in the collection system, and overflows from the collection system.

Since the available flow monitoring data does not provide a basis for estimating the actual PDF, it is necessary to review other sources of information for an indication of this flow. In 1997, the City contracted for a study on flow monitoring and modeling of the existing West Side Interceptor. This interceptor serves a large portion of the existing collection system. The flow monitoring and modeling showed an average dry weather flow of 520 gpm and a peak wet weather flow of 5,700 gpm, indicating a peaking factor of more than 10:1. Although this is a relatively high PWWF:ADWF peaking factor, comparable peaking factors are experienced at other wastewater treatment plants in Western Oregon. Table 5-4 identifies some peaking factors experienced at other wastewater treatment plants in Oregon. The findings of this study lend credence to the assumption of a 10:1 peaking factor for the system as a whole.

Community	Peaking Factor PWWF:ADWF
City of Medford	5:1
City of Coos Bay Plant No. 1	14:1
City of Coos Bay Plant No. 2	8:1
South Suburban Sanitary District	5.4:1
City of Albany	8.5:1
City of Creswell	12.5:1
City of Canyonville	10.5:1

 Table 5-4. Peak Wet Weather Flow Peaking Factors

Based on a PWWF:ADWF peaking factor of 10:1, the PWWF for the Lebanon WWTP is approximately 21 mgd. Using the analytical method for estimating PWWF prescribed in the DEQ guidelines, the PDF can be interpolated from a probability chart. This analytical technique assumes that the peak day, peak hour, and maximum month flows will occur in the same year such that the recurrence probabilities associated with each of the flow parameters are as follows:

- Average annual flow is exceeded half the time (50% probability)
- MMWWF is exceeded during one month (8.3% probability)
- PDF is exceeded on one day (0.27% probability)
- PWWF is exceeded during one hour (0.011% probability)

The resulting flow values are plotted on Figure 5-3 according to their probability. Through interpolation, the estimated peak day flow is approximately 15 mgd. Table 5-5 summarizes all of the current wastewater flows derived from this analysis.

Another useful flow analysis parameter is the wet weather I/I rate for the community in terms of gallons per acre per day (gpad). Since the wet weather I/I rate is approximately equal to the difference between the PWWF and ADWF, the I/I rate for Lebanon is 18.9 mgd. Based on an estimated 2,700 acres of developed land as reported in Chapter 2, this I/I rate corresponds to 7,100 gpad. This I/I rate is very high relative to the 1,500 gpad typically associated with new construction.



Figure 5-3. Flow Probability Analysis

Flow Parameter	Flow Rate, mgd	Peaking Factor
Average Dry Weather Flow (ADWF)	2.1	1.0
Average Wet Weather Flow (AWWF)	5.7	2.7
Maximum Month Dry Weather Flow (MMDWF)	4.4	2.1
Maximum Month Wet Weather Flow (MMWWF)	8.3	4.0
Peak Day Flow (PDF)	15.0	7.1
Peak Wet Weather Flow (PWWF)	21.0	10.0

Table 5-5. Current Wastewater Flows

BOD and TSS Loads

Biochemical oxygen demand (BOD) and total suspended solids (TSS) are indicators of the organic loading on a wastewater treatment facility. BOD is a measure of the amount of oxygen required to biologically oxidize the organic material in the wastewater over a specific time period. A 5-day BOD test is conventionally used for wastewater testing. As its name suggests, TSS is a measure of the particulate material suspended in the wastewater. The BOD and TSS loading on the WWTP influence the following:

- <u>Treatment process sizing</u>. The size of biological treatment units, such as aeration basins, is approximately proportional to a plant's organic loading.
- <u>Aeration system sizing</u>. Treating higher BOD loads requires higher capacity aeration equipment. A wastewater treatment facility's aeration system is typically sized to provide oxygen during peak day BOD loading conditions.
- <u>Sludge production</u>. BOD and TSS removed by the plant are converted into sludge. Higher BOD and TSS loads result in increased sludge quantities.

BOD and TSS Records. Daily BOD and TSS concentrations are recorded approximately twice per week. However, there were inconsistencies in the loading data collected prior to 2002. These inconsistencies were likely related to the flow monitoring problems discussed earlier in the last paragraph in the <u>Flow Records and Measurement</u> section starting on page 5-2. As a result, data recorded after the new metering flow system was installed, i.e. August 2002 onwards, were selected for this analysis since they provide more accurate measurements. The daily plant loading for BOD and TSS from November 2002 to October 2003 is shown in Figures 5-4 and 5-5 respectively. As illustrated in Figures 5-4 and 5-5, the highest BOD and TSS loading recorded for this period occurred in the early fall. Investigation into the rainfall data revealed that the high concentrations of BOD and TSS correspond to the first major storm event that occurs at the end of a dry season. Thus, the spikes in the BOD and TSS levels are likely due to the flushing of accumulated solids from the sewer system after the extended dry, low flow period.



Figure 5-4. Daily Plant Loading: Biological Oxygen Demand (BOD)

Figure 5-5. Daily Plant Loading: Total Suspended Solids (TSS)



Unit Loading Values

The development of unit loading values provides the basis for future loading projections. Analysis of loading levels and population allows for the calculation of the unit design values for the wastewater loads. The average unit loading value in pounds per capita per day (pcd) can be applied to the population projections to estimate future sanitary loads. Table 5-6 presents the unit design loads for BOD and TSS for the WWTP at Lebanon. These values are very consistent with textbook average loading rates for communities with largely residential and commercial developments. Table 5-7 reports the estimated maximum and average BOD and TSS loads.

		Average BOD,	Average TSS,	BOD Unit	TSS Unit
Period	Population	ppd	ppd	Load, pcd	Load, pcd
2003 Wet Weather	13,140	2,300	2,500	0.18	0.19
2003 Dry Weather	13,140	2,250	2,100	0.17	0.16
Average	13,140	2,300	2,300	0.18	0.18

Table 5-6.	Unit Design	Loads
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	BOD load,	Peaking	TSS load,	Peaking	Ammonia,	Peaking
Parameter	lbs/day	Factor	lbs/day	Factor	lbs/day	Factor
Dry weather season						
Average	2,300	1.0	2,100	1.0	300	1.0
Max month	3,100	1.4	3,300	1.6	400	1.2
Max week	3,500	1.5	3,400	1.6	400	1.3
Peak day	4,400	2.0	4,400	2.1	400	1.3
Wet weather season						
Average	2,300	1.0	2,500	1.0	1,100	1.0
Max month	3,200	1.4	3,200	1.3	2,200	2.1
Max week	4,000	1.7	4,600	1.8	2,900	2.7
Peak day	4,900	2.1	5,600	2.2	3,400	3.2
Average						
Average	2,300	1.0	2,300	1.0	700	1.0
Max month	3,200	1.4	3,300	1.4	1,300	1.9
Max week	3,700	1.6	4,000	1.7	1,600	2.4
Peak day	4,700	2.0	5,000	2.2	1,900	2.8

 Table 5-7. Current Plant Influent Loading

Nutrients. Nutrients of primary concern at a wastewater treatment facility are nitrogen and phosphorus. Typically, the majority of the nitrogen in raw sewage is in the form of ammonia; concentrations range from 15 to 30 mg/L. The City samples influent wastewater for ammonia approximately twice per week, though there are several months throughout the period for which data was not available.

The City does not sample influent wastewater for phosphorus. Raw sewage phosphorus concentrations are usually between 4 and 8 mg/L, with the majority of the phosphorus in a soluble form, such as phosphate. Figure 5-7 presents the daily plant loading for ammonia in the Lebanon WWTP and the seasonal loading statistics are also provided in Table 5-6. Note that the measured ammonia loads are significantly higher than would be expected at a municipal treatment plant, indicating that there may be inaccuracies in the data.





FLOW AND LOAD PROJECTIONS

The flow and load projections are based on current flows and loads and anticipated community growth. As identified in Chapter 2, the population of Lebanon is expected to grow at a rate of 1.71 percent per year to 19,450 by the year 2024. Assuming that land development will progress at a similar rate, the year 2024 developed land base will be 3,800 acres. At this rate, the existing UGB will be fully developed by the year 2056 at a population of 33,500. Using this information, following are flow and load projections for the year 2024 and build-out conditions.

To complete the projection analysis, the current flows, loads, population, and developed land acreage were used to create unit design values. For example, based on the current ADWF of 2.1 mgd and the current population of 13,626, the unit ADWF value is approximately 155 gallons per capita per day. Similarly, based on the current average BOD loading of 2,300 pounds per day, the unit value is 0.18 pounds of BOD per capita per day (Table 5-5). The unit design values were used in conjunction with projected future populations and developed land acreages to estimate future flows and loads for the City.

Flow Projections

Sanitary flow generated in the Lebanon WWTP service area comes from a combination of residences, businesses, and schools. Businesses and schools are expected to grow at approximately the same rate as the overall population. Therefore, future flows can be projected by applying unit design flow values to an estimate of the future population. For example, based on the year 2024 population estimate of 19,450 and the ADWF unit value of 155 gallons per capita per day, the year 2024 ADWF will be 3.0 mgd. This basic flow projection technique is used for the ADWF, AWWF, MMDWF, and MMWWF.

Projection of the future peak wet weather flows requires additional consideration due to the variability of I/I rates among existing and future developments. The peak flows are estimated using current wet weather I/I rates for existing portions of the collection system while using lower rates in areas with new sewers. The current PWWF of 21 mgd is greatly influenced by the presence of collection system deficiencies and remnants of the formerly combined stormwater/wastewater system in the older parts of town. As noted earlier, the wet weather I/I rate in Lebanon is estimated at over 7,000 gallons per acre per day (gpad) compared to a more typical rate of 1,500 gpad for new development. Since improved construction materials and techniques in new portions of the collection system should exclude most I/I sources, the projections of future peak wet weather flow must account for lower wet weather I/I rates in new developments. Therefore, for the purposes of the PWWF projections, new developments are assigned the wet weather I/I rate that the City used in the design calculations for the new West Side Interceptor: 3,000 gpad.

Similar to the PWWF, the PDF is sensitive to I/I rates in the collection system. To maintain consistency with the growth of the PWWF relative to the ADWF, the PDF is estimated by interpolating a linear relationship between the peak wet weather flow, average annual flow, and MMWWF on a logarithmic flow probability chart. The flow projections are summarized by period in Table 5-8.

Parameter	Year 2024, mgd	Build-Out, mgd
Average Dry Weather Flow (ADWF)	3	5
Average Wet Weather Flow (AWWF)	8	14
Maximum Month Dry Weather Flow (MMDWF)	7	12
Maximum Month Wet Weather Flow (MMWWF)	12	21
Peak Day Flow (PDF)	20	26
Peak Wet Weather Flow (PWWF)	26	36

 Table 5-8.
 Lebanon WWTP Design Flow Projection

Load Projections

Future plant loads summarized in Table 5-9 are estimated by applying unit design factors to the year 2024 population of 19,450 and the build-out population of 33,500.

	Year 2024			Build-Out			
	BOD,	TSS,	Ammonia	BOD,	TSS,	Ammonia	
Parameter	lbs/day	lbs/day	lb/day	lbs/day	lbs/day	lb/day	
Annual Average	3,500	3,500	1,100	6,100	6,100	1,800	
Maximum Month	4,900	4,900	2,100	8,500	8,500	3,500	
Maximum Week	5,600	5,900	2,700	9,700	10,300	4,400	
Peak Day	7,000	7,700	3,100	12,100	13,300	5,100	

Table 5-9. Projected Plant Influent Loads

WASTEWATER CHARACTERISTICS SUMMARY

Table 5-10 summarizes the flow and load projections developed in previous sections.

Wastewater Characteristics Factor	Present	2024	Build-Out
Flows:			
Average Dry Weather Flow (ADWF), mgd	2.1	3	5
Average Wet Weather Flow (AWWF), mgd	5.7	8	14
Maximum Month Dry Weather Flow (MMDWF), mgd	4.4	7	12
Maximum Month Wet Weather Flow (MMWWF), mgd	8.3	12	21
Peak Day Flow (PDF), mgd	15	20	26
Peak Wet Weather Flow (PWWF), mgd	21	26	36
Loads:			
BOD			
Average, ppd	2,300	3,500	6,100
Max month, ppd	3,200	4,900	8,500
Max week, ppd	3,700	5,600	9,700
Peak day, ppd	4,700	7,000	12,100
TSS			
Average, ppd	2,300	3,500	6,100
Max month, ppd	3,300	4,900	8,500
Max week, ppd	4,000	5,900	10,300
Peak day, ppd	5,000	7,000	12,100
Ammonia			
Average, ppd	700	1,100	1,800
Max month, ppd	1,300	2,100	3,500
Max week, ppd	1,600	2,700	4,400

Table 5-10. Wastewater Characteristics Summary