CHAPTER 2

FLOW PROJECTION

2.1 DEFINITIONS AND ABBREVIATIONS

Terminology used in this Section is defined as follows:

"AVERAGE DRY WEATHER FLOW (ADWF)": ADWF consists of average daily sewage flows and groundwater infiltration (GWI). The District's ADWF is 70 gallons per capita per day.

"CENSUS TRACT ": A defined area boundary developed for census purpose. The District is divided into 40 Census Tract areas. Population projections are provided by Census Tract. Each drainage basin comprises Census Tracts which are partially or wholly located within each basin boundary. Census tract information will be provided by request.

"DIURNAL FLOW": Fluctuation of flows over a 24-hour period.

"GROUNDWATER INFILTRATION (GWI)": Groundwater that infiltrates pipelines and manhole defects located below the ground surface. Groundwater infiltration is separate and distinguished from storm water inflow.

"INFLOW": Drainage that enters the collection system through direct illegal or permitted connections, such as, catch basins, downspouts, area drains and manhole covers. Inflow is separate and distinguished from infiltration. (See Storm water flow)

"INFLOW/INFILTRATION (I/I)": The wastewater component caused by rainfall-dependent inflow/infiltration (RDI) and groundwater infiltration (GWI)

"PEAK DRY WEATHER FLOW (PDWF)": PDWF consists of peak sewage flow plus GWI.

"PEAK WET WEATHER FLOW (PWWF)": PWWF consists of PDWF plus RDI/I.

"PEAKING FACTOR (PF)": PF is PDWF/ADWF.

"RAINFALL DEPENDENT INFLOW/INFILTRATION (RDI/I)": RDI/I consist of rainfall that enters the collection system through both RDI (infiltration) and SWI (inflow) sources.

"STORM WATER INFLOW (SWI)": SWI consists of rainfall runoff that enters the sewer system through direct connections such as catch basins, downspouts and area drains.

"SEWERAGE DRAINAGE BASIN": A drainage area which boundaries are determined by gravity flow. The District comprises 8 drainage basins and 44 sub-basins.

"TRIBUTARY AREA": The tributary area of a sewage system consists of all areas, which contribute flow to the sewer by gravity and/or force main discharge. These include sanitary sewer as well as I/I flows.

2.2 WASTEWATER FLOW RATE UNITS

Commonly used flow rate units are:

cfs	cubic feet per second
gpcd	gallons per capita per day
gpd	gallons per day
gpapd	gallons per acre per day
gped	gallons per employee per day
gpm	gallons per minute
mgd	million gallons per day

2.3 FLOW PROJECTIONS

Each tributary area has its own unique characteristics. For this reason, there is no one correct approach to the projection of flows within a service area. Procedures presented in this section for the development of flows are intended as guidelines. The Engineer is encouraged to use his own initiative and judgment for the projection of flows in conjunction with these guidelines.

When possible, the Engineer should measure flows to verify parameters used to project future flows including residential, industrial, commercial, and I/I flows. Key locations for monitoring flows include major trunk lines; major point source discharges and pump stations. The design engineer is required to submit a request to the District to measure flows.

The following parameters shall be evaluated to project wastewater flows and are discussed in further detail in this section.

(a) Tributary Area
(b) Population Estimate
(c) Land Use
(d) Per Capita Flows
(e) Residential Flows
(f) Commercial Flows
(g) Industrial Flows
(h) Major Point Source Discharge
(i) Inflow/Infiltration

2.4 TRIBUTARY AREA

The tributary area of a sewer includes all areas that will contribute flow to the system. It includes flows from the ultimately developed service area and basin-to-basin flow routings. Potential service areas, such as, areas served by septic should also be assessed for possible inclusion in the tributary area. The area may be limited by natural topography, natural or manmade barriers, political boundaries or economic factors. The drainage maps with the district's sewer location map are helpful to determining the tributary area.

2.5 POPULATION ESTIMATE

The population estimate for the tributary area is the basis for computing the design flow. It is customary to multiply the estimated population by the estimated per capita wastewater contribution. Because the population estimate is the basis for the computation of the design flow, it is important that it be as accurate as possible. Generally, population projections prepared for land use planning have shorter projection periods than are required for the design period for sewerage facilities. The population projections are available from the Census Tract. The installer's engineer may obtain this information from the District.

2.6 LAND USE

Land use can help to define population density and type of contributors to wastewater flows within the tributary area. Zoning maps and field review of land use can be used to verify the reasonableness of long-range projections. However, because land use planning is typically done in increments for shorter period than the design period for a sewer, their use should be limited primarily to confirmation of shorter-term flow projections.

2.7 RESIDENTIAL FLOWS

Residential flow may be estimated by multiplying the average household size, times the per capita flow. Per capita wastewater flows are less than per capita water consumption because of water loss to lawn irrigation, swimming pools, washing cars, etc. The per capita flows for the District are the following:

Connection Type	Household Size	Per Capita Flow
Single-Family Resident	2.63 persons	70 GPCD
Apartment/Multi-Dwelling	2.46 persons	65 GPCD
Mobile Home	2.42 persons	65 GPCD

2.8 COMMERCIAL AND INDUSTRIAL FLOWS

Commercial and industrial wastewater flows may vary significantly depending on the type, size, operational techniques, and whether or not the facility has on-site treatment. In addition, peak flows may be significant because of the method of operation and work shifts. Appendix A contains the typical wastewater flow for various commercial and industrial user classes within the District. The developer's engineer shall provide flow calculations and the basis for determining the flow subject to the District's approval. The District shall prevail in the event of conflicting opinions.

2.9 MAJOR POINT SOURCE DISCHARGES

Major point source discharges include flows from institutional, commercial and industrial establishments with average daily flows greater than 50,000 GPD. Existing major point source discharges in a tributary area should be identified from flow monitoring programs or sewer service charge billing records. The billing records are available from the District's Administration and Information Division. The installer's engineer is cautioned to confirm exact discharge locations of industrial wastewater and not only rely on the address on the permit. This is particularly true when the service area is small. Sometimes the discharge location and address location of the establishment are far apart. Major discharge for future point sources shall also be incorporated in the design flow if the information is available.

2.10 INFLOW/INFILTRATION

Design capacity shall include an allowance for extraneous flows, which inevitably become a part of the total flow. These flows include GWI through defective pipes and manholes. It also includes RDI/I flow through cross connections, faulty manholes, and submerged manhole covers.

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