CE 3372 – Water Systems Design
Demand Estimation
Exercise Set 3

Exercise

1. Figure **??** is a layout of a hydraulic network model for the Somewhere USA subdivision. The blue line segments are pipes and are labeled (P1, P2, ...). The blue circles are nodes and are labeled (N1, N2, ...). The yellow polygons represent the lots assigned to each node; for example, node N2 supplies the six (6) lots located near the node.

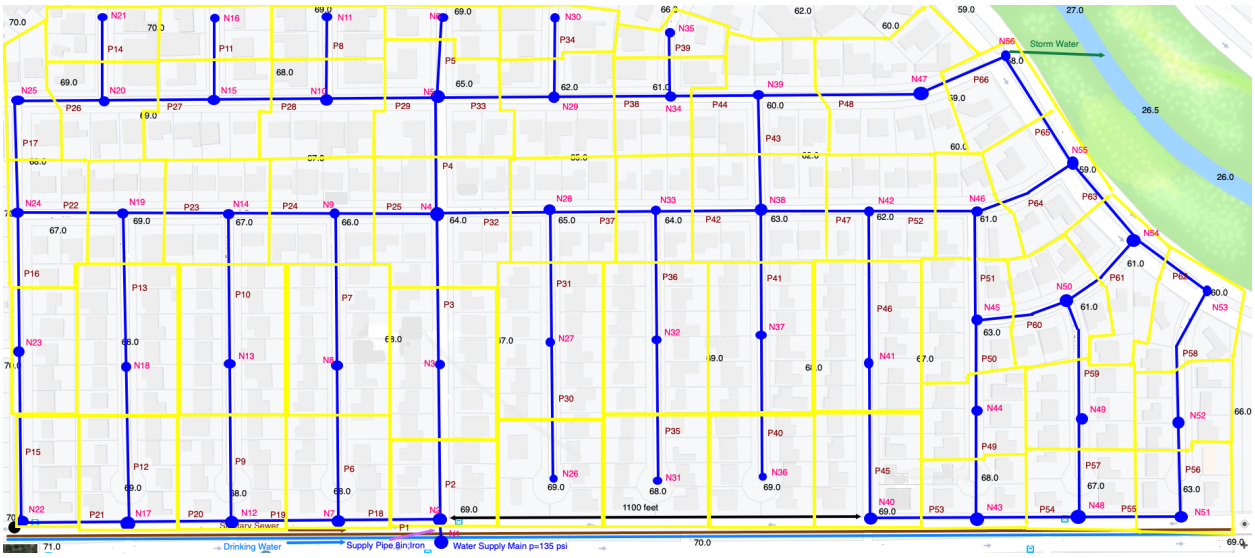

Figure 1: Hydraulic Model Network for Somewhere USA

a) Determine the number of lots served by each node, these will constitute the by-node service unit equivalent (SUE).

b) Estimate the average daily demand (ADD), by-node, for distribution system using San Marcos, Texas water system design guidelines.

c) Estimate the maximum daily demand (MDD), by-node, for the distribution system using San Marcos, Texas water system design guidelines.

d) Estimate the maximum daily demand (MDD) + fire flow, by-node for the distribution system using San Marcos, Texas water system design guidelines.

   This estimate requires locating fire hydrants on the drawing (not supplied). For simplicity in planning apply the following parts of the San Marcos manual:

First consider flow per hydrant - it is unlikely the whole area will be on fire at once (unless it is in Los Angeles in January 2025) but a decent worst case would be 1000 gpm/hydrant (which should nicely oversize a system). The alternative is to find the ISO standards that are

1.4 Water Design Demands

The developer's engineer is responsible for sizing all new waterlines within the development and submitting these sizing calculations to the City for acceptance. The developer's engineer will recommend one of the following 3 methods to City Staff for sizing. The final decision will be made by City Staff on which method shall be used.

a) Sizing of off-site waterlines shall conform to the Water Distribution System Master Plan, where applicable.
b) In other instances, computer modeling is the required method for sizing water lines.
c) The minimum requirement is for the design engineer to submit hand calculations justifying the size of the proposed waterlines.

The following criteria are to be used in sizing new waterlines.

Table 1: Design Parameters

Hazen Williams Coefficient (PVC)	150
Hazen Williams Coefficient (DI)	130
Service Unit Equivalent (SUE)[1]	
Single-family residential	1.0 SUE per unit
Multi-family residential	0.66 SUE per unit
Average Day Demand	0.24 gal/min/SUE
Maximum Day Demand	0.70 gal/min/SUE
Peak Hour Demand	0.4 gal/min/SUE
Maximum Pressure	110 psi
Minimum Pressure[2]	35 psi
Note 1 *Refer to General Code of Ordinance Chapter 86 Article 5: DIVISION 4. - IMPACT FEE ORDINANCE OF THE SAN MARCOS CITY CODE for required SUE parameters.*	
Note 2 *Lines shall be sized to provide for either the peak hour demand plus a fire flow demand. Fire flows shall conform to Insurance Standards Office (ISO) standards. The fire marshal has identified minimum fire flow requirements based on type of construction for use in determining line sizing. In all instances, a minimum fire flow of 1000 gpm will be required for design purposes. When the City determines that a waterline needs to be larger than required to facilitate future services in the area, the City may require that a waterline may be oversized.*	

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Figure 2: Fire Flow guidelines - here we interpret as 1000 gpm/hydrant as a conservative value

e) Estimate the peak hourly demand (PHD), by-node, for the distribution system using San Marcos, Texas water system design guidelines.

Use your estimates to produce a completed version of Table **??**. Save the table (in a file) – you will need it later in the design project RP-1.

Table 1: Node Demands for Somewhere USA Distribution System

Node ID	SUE	ADD	MDD	MDD+Fire	PHD
N1	0	0	0	0	0
N2	6	...	...	...	...
N3	11	...	...	...	...
N4	...	...	...	...	...
N5	...	...	...	...	...
N6	...	...	...	...	...
N7	...	...	...	...	...
N8	...	...	...	...	...
N9	...	...	...	...	...
N10	...	...	...	...	...
N11	...	...	...	...	...
N12	...	...	...	...	...
N13	...	...	...	...	...
N14	...	...	...	...	...
N15	...	...	...	...	...
...	...	...	...	...	...
...	...	...	...	...	...
...	...	...	...	...	...
N47	...	...	...	...	...
N48	...	...	...	...	...
N49	...	...	...	...	...
N50	...	...	...	...	...
N51	...	...	...	...	...
N52	...	...	...	...	...
N53	...	...	...	...	...
N54	...	...	...	...	...
N55	...	...	...	...	...
N56	...	...	...	...	...