

Pumping stations and water transport

Design exercise introduction
ct5550

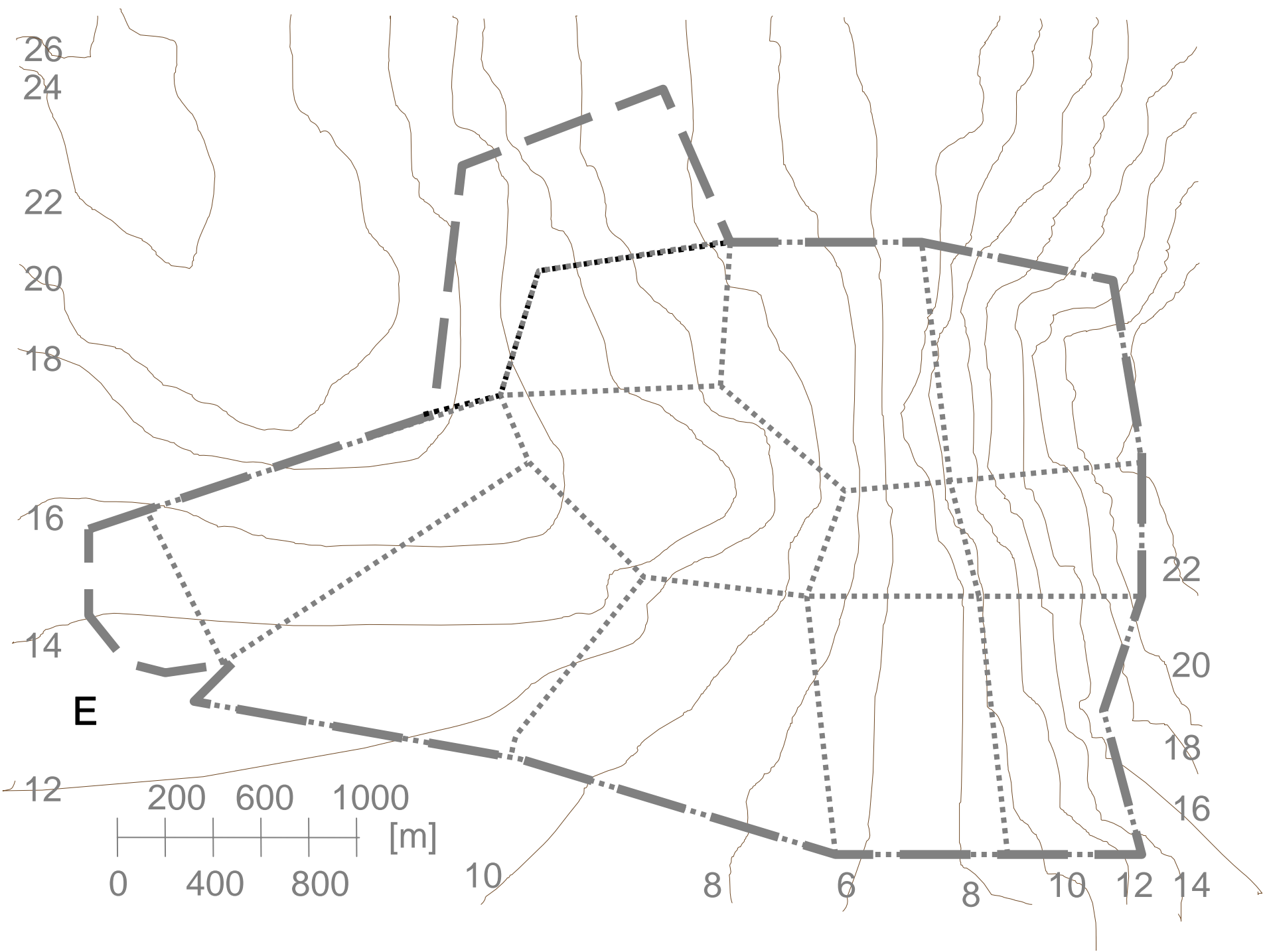
February 15, 2008

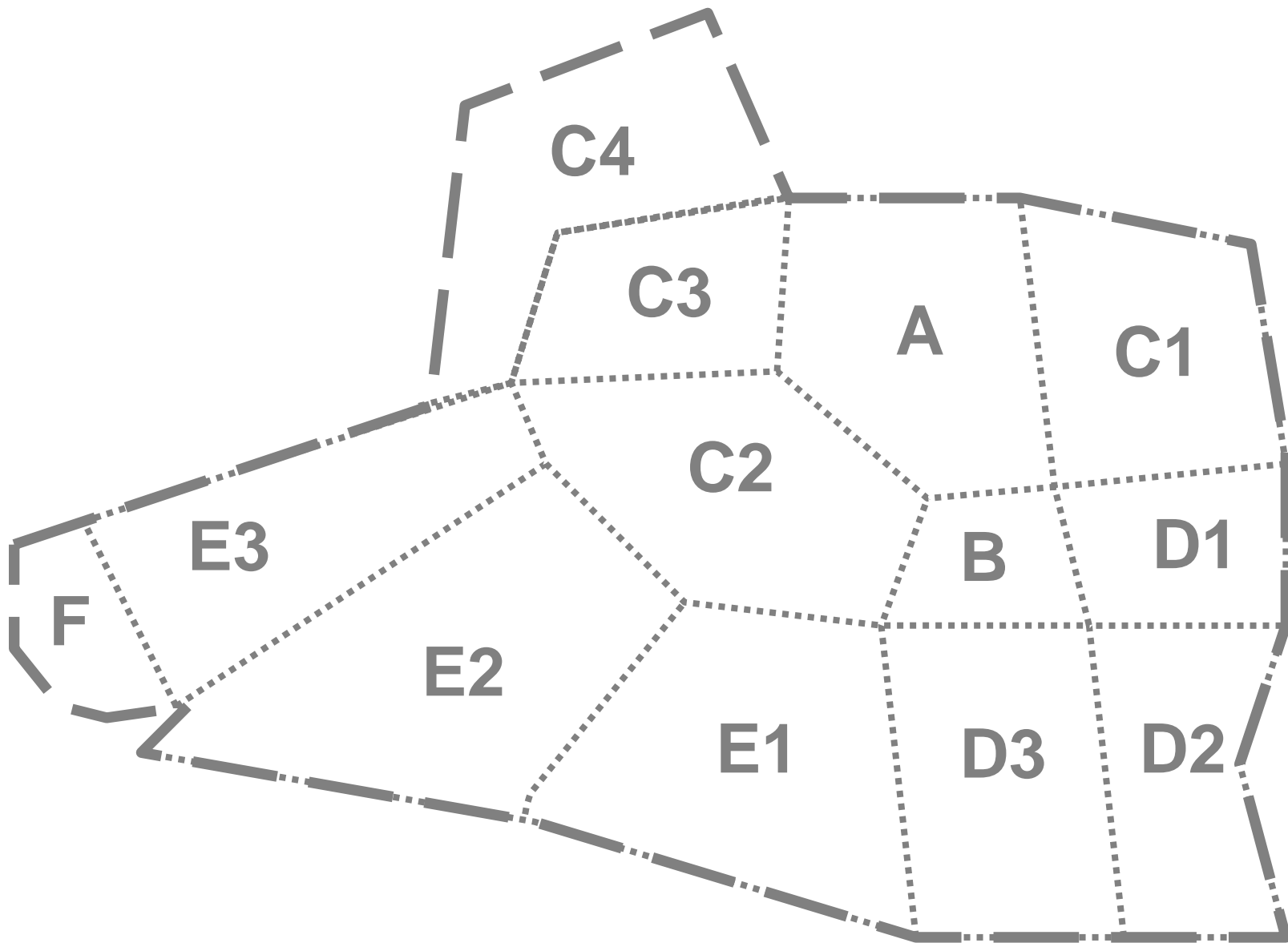
Goals exercise

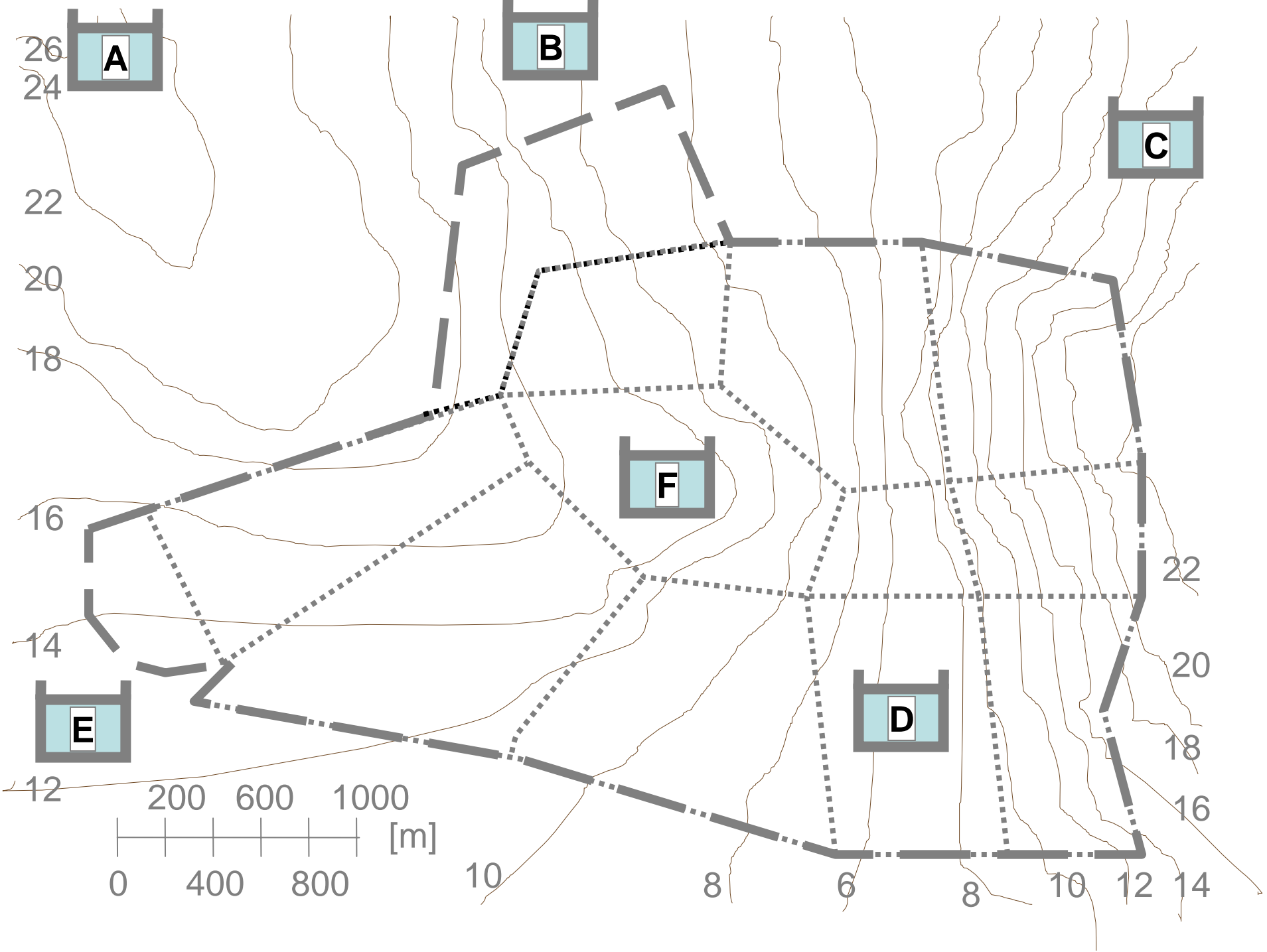
- Gain experience in handling a network calculation program
- Design a transport network
- Design a distribution network
- See a few pitfalls

Safi town

- Based on existing town in Yemen
- Mildly accentuated ground level
- Fast growing town
- One capture, treatment and pumping location
- One projected new location

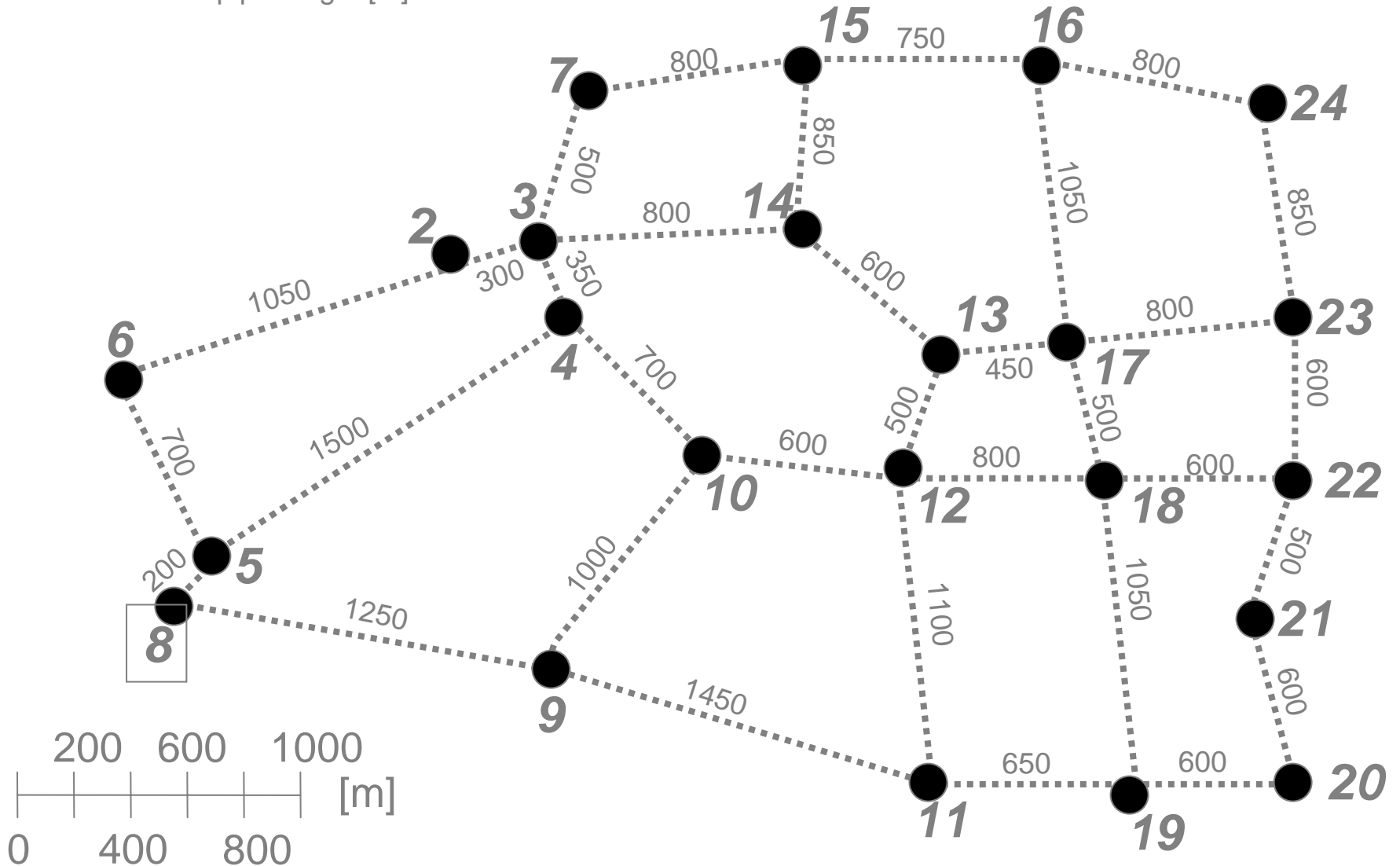




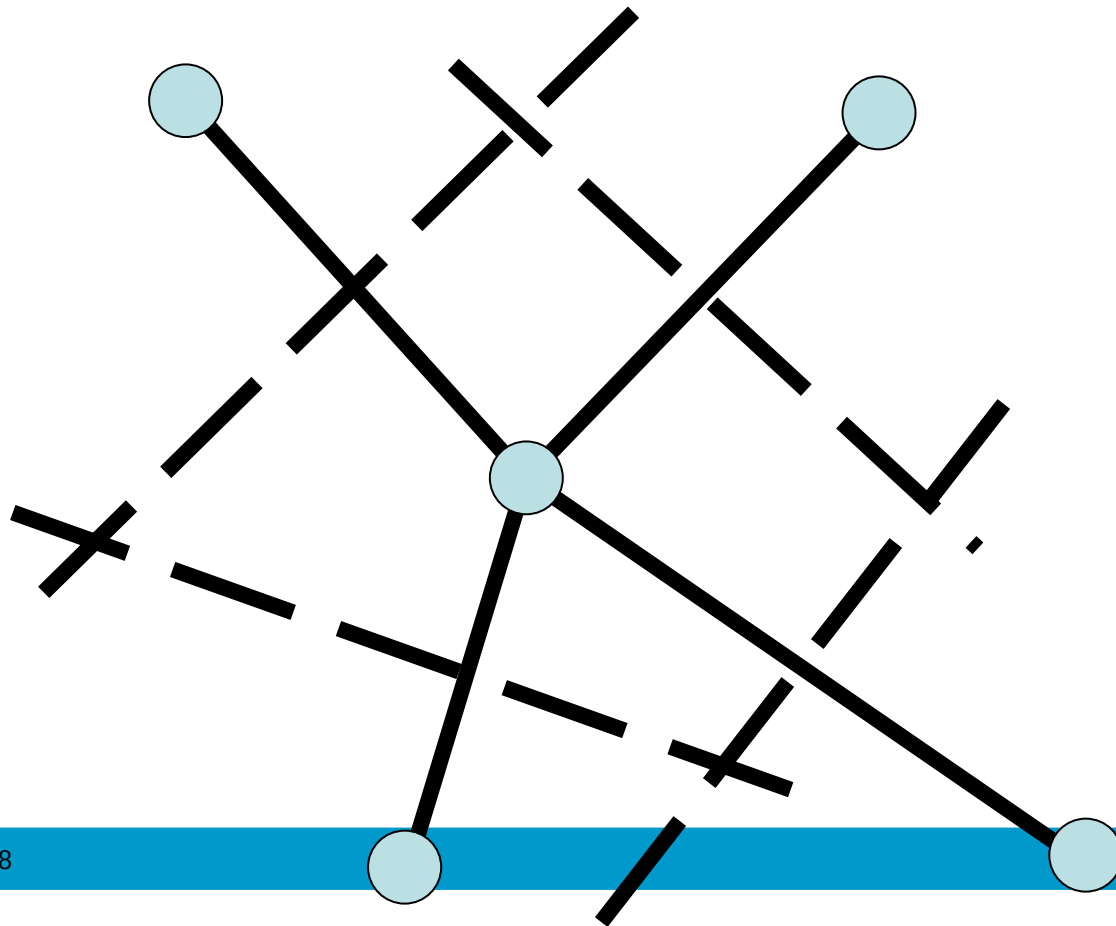


7 = node number

1050 = pipe length [m]



Demand allocation to nodes



Data

- Combination of location of primary and secondary sources
- Variation in population density
- ALEIDse (Student edition) as calculation program, Alternative is EPANET
- PVC pipes as standard material (PN10)

Instructions, discussion, questions

- Black Board CT5550, Communication, Discussion board
- Afternoons during rest period
- Room 4.65 if I'm available: make an appointment and/or send an e-mail

Table 2 — Nominal (minimum) wall thicknesses

Dimensions in millimetres

Nominal outside diameter	Nominal (minimum) wall thickness							
	Pipe series S							
	S 20 (SDR 41)	(S 16,7) (SDR 34,4)	S 16 (SDR 33)	S 12,5 (SDR 26)	S 10 (SDR 21)	S 8 (SDR 17)	S 6,3 (SDR 13,6)	S 5 (SDR 11)
d_n	Nominal pressure PN based on service (design) coefficient $C = 2,5$							
	PN 6	PN 6	PN 8	PN 10	PN 12,5	PN 16	PN 20	PN 25
12	—	—	—	—	—	—	—	1,5
16	—	—	—	—	—	—	—	1,5
20	—	—	—	—	—	—	1,5	1,9
25	—	—	—	—	—	1,5	1,9	2,3
32	—	—	1,5	1,6	1,9	2,4	2,9	3,7
40	—	1,5	1,6	1,9	2,4	3,0	3,7	4,6
50	1,5	1,6	2,0	2,4	3,0	3,7	4,7	5,8
63	1,9	2,0	2,5	3,0	3,8	4,7	5,6	6,8
75	2,2	2,3	2,9	3,6	4,5	5,6	6,7	8,2
90	2,7	2,8	3,5	4,3	5,4	6,7	—	—
	Nominal pressure PN based on service (design) coefficient $C = 2,0$							
	PN 6	PN 7,5	PN 8	PN 10	PN 12,5	PN 16	PN 20	PN 25
110	2,7	3,2	3,4	4,2	5,3	6,6	8,1	10,0
125	3,1	3,7	3,9	4,8	6,0	7,4	9,2	11,4
140	3,5	4,1	4,3	5,4	6,7	8,3	10,3	12,7
160	4,0	4,7	4,9	6,2	7,7	9,5	11,8	14,6
180	4,4	5,3	5,5	6,9	8,6	10,7	13,3	16,4
200	4,9	5,9	6,2	7,7	9,6	11,9	14,7	18,2
225	5,5	6,6	6,9	8,6	10,8	13,4	16,6	—
250	6,2	7,3	7,7	9,6	11,9	14,8	18,4	—
280	6,9	8,2	8,6	10,7	13,4	16,6	20,6	—
315	7,7	9,2	9,7	12,1	15,0	18,7	23,2	—
355	8,7	10,4	10,9	13,6	16,9	21,1	26,1	—
400	9,8	11,7	12,3	15,3	19,1	23,7	29,4	—
450	11,0	13,2	13,8	17,2	21,5	26,7	33,1	—
500	12,3	14,6	15,3	19,1	23,9	29,7	36,8	—
560	13,7	16,4	17,2	21,4	26,7	—	—	—
630	15,4	18,4	19,3	24,1	30,0	—	—	—
710	17,4	20,7	21,8	27,2	—	—	—	—
800	19,6	23,3	24,5	30,6	—	—	—	—
900	22,0	26,3	27,6	—	—	—	—	—
1000	24,5	29,2	30,6	—	—	—	—	—

NOTE 1: The nominal wall thicknesses conform to ISO 4065:1996.
 NOTE 2: To apply an overall service (design) coefficient of 2,5 (instead of 2,0) for pipes with nominal diameters above 90 mm, the next higher pressure rating, PN, shall be chosen.
 NOTE 3: The PN 6 values for S 20 and S 16 are calculated with the preferred number 6,3
 NOTE 4: The pipe series S 16,7 in brackets is intended to be phased out by the end of the year 1999.

Third part of the exercise

- Design distribution area
- Unique for the Netherlands
- Water quality = high velocity and short residence time



4 storage buildings

Shopping area

Main pipe, 300 kPa guaranteed

Special destination

60 0 60 120 Meters

Data distribution network

- 380 connections planned
- 20 4 storage buildings (80 connections, 20 TU) rest connections 29 TU
- Fire fighting 30 m³/h for houses, hydrant covering 50 meter. 60 m³/h for all other areas
- Maximum section length 120 connections

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