

Διαδικτυακό Σεμινάριο “Εισαγωγή στο EPANET”

ΠΡΟΣΚΛΗΣΗ



Το Κέντρο Αριστείας για Έρευνα και Καινοτομία «Κοίος» σας προσκαλεί στη διαδικτυακό σεμινάριο:

"Εισαγωγή στο λογισμικό EPANET"

Δευτέρα 27 Απριλίου 2020
10:00 – 12:00 π.μ.

Σύνδεσμος Zoom:
<https://ucy.zoom.us/j/99034036763?pwd=d0FObHNvWFJ4TFMzSIBNRng1VXVGdz09>



funded by:

POSTED ON: April 29, 2020 CATEGORIZED IN: Νέα και Ανακοινώσεις

Διεξήχθηκε την Δευτέρα 27/4/2020 διαδικτυακό εκπαιδευτικό σεμινάριο για τη μοντελοποίηση των δικτύων διανομής νερού μέσω του EPANET, στο πλαίσιο της Πράξης SmartWater2020. Στο σεμινάριο συμμετείχαν πέραν των 25 μηχανικών και τεχνικών από οργανισμούς παροχής νερού σε Κύπρο και Ελλάδα.

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November 27, 2019

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PREVIOUS POST

Προκλήσεις στην Αποδοτική Διαχείριση Υδάτινων Πόρων

NEXT POST

Παγκόσμιος διαγωνισμός για την έγκαιρη ανίχνευση και εντοπισμό διαρροών στις πόλεις

Introduction to EPANET

Pavlos Pavlou (M.Sc)
Research Engineer
KIOS Research and Innovation Center of Excellence
University of Cyprus

Monday 27/4/2020
10:00 – 12:00 a.m.

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- [A1 What is EPANET](#)
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- [A6 Water Network Design](#)
- [A7 EPANET Extended Simulations](#)





A1_ What is EPANET

EPANET

EPANET is developed by the United States Environmental Protection Agency's (EPA) Water Supply and Water Resources Division. It is a **public domain, water distribution system modeling software**.

<https://www.epa.gov/water-research/epanet>

- EPANET software
- EPANET manual



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EPANET

Application for Modeling Drinking Water Distribution Systems

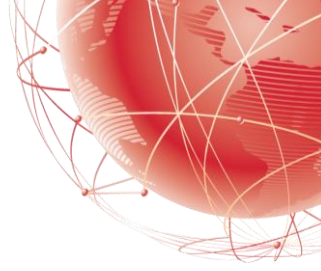
EPANET is a software application used throughout the world to model water distribution systems. It was developed as a tool for understanding the movement and fate of drinking water constituents within distribution systems, and can be used for many different types of applications in distribution systems analysis. Today, engineers and consultants use EPANET to design and size new water infrastructure, retrofit existing aging infrastructure, optimize operations of tanks and pumps, reduce energy usage, investigate water quality problems, and prepare for emergencies. It can also be used to model contamination threats and evaluate resilience to security threats or natural disasters.



EPANET (cont.)

Hydraulics

- Perform ***extended-period simulation*** of the hydraulic and water quality behavior
- Pressure/Consumption at each node
- Flow/Velocity at each pipe
- Water height at storage tanks
- Energy/Electricity cost at pumps
- Variety of valves (PRVs, FCVs,...)
- Can use time / rule-based controls (PLC).
- Model leakages



EPANET (cont.)

Quality

- Chemical concentration/Water quality in all components (Nodes, pipes, tanks , ...)
- Models movement of substance in network over time.
- Models growth/decay of substance (HOCL, TTHMs).
- Models water age.
- Models bulk/wall reactions.
- Models decay with different dynamics.
- Models substance injection.



EPANET Scenarios

- What happens if a valve is opened or closed.
- System's behavior under different flows and / or pressures.
- How does network pressure changes during the day and what is its magnitude.
- Sufficiency of water tanks in case of an emergency event (i.e. fire, interruption of the water supply into the tanks).
- Quality sensors placement.
- Most vulnerable locations within the network.
-



EPANET Formulas: Friction Losses – Head Loss



- **Hazen - Williams formula** *(for water and turbulent flow)*

$$h_L = \frac{K \times L \times Q^{1.852}}{C^{1.852} \times D^{4.871}}$$

[k: conversion factor for the unit system (k = 1.318 for US customary units, k = 0.849 for SI units)]

[C: roughness coefficient]

- **Darcy - Weisbach formula** *(all liquids and all flow regimes)*

$$h_L = f \frac{8 \times L \times Q^2}{g \times \pi^2 \times D^5}$$

[f: friction factor]

- **Chezy - Manning formula** *(mostly for open channel flow)*

$$h_L = \frac{4.66 \times n^2 \times L \times Q^2}{D^{5.33}}$$

[n = Manning's Roughness Coefficient]

EPANET Formulas: Friction Losses – Head Loss



Material	Hazen-williams C	Darcy-Weisbach ϵ	Manning's n
Cast Iron	130-140	0.85	0.012-0.015
Concrete or concrete lined	120-140	1.0-10	0.012-0.017
Galvanized Iron	120	0.5	0.015-0.017
Plastic	140-150	0.005	0.011-0.015
Steel	140-150	0.15	0.015-0.017
Vitrified Clay	110		0.013-0.015



A2_Why EPANET

EPANET

- EPANET is a useful tool to investigate what-if scenarios involving hydraulics and quality.
- EPANET is free to use, and is the state-of-art.
- It's easy to use!
- There is an active community working on EPANET.
- Demand-driven; cannot capture pressure-driven demands.
- Can be used in any new software tool.



EPANET (cont.)



(a) EPANET *Graphical User Interface (GUI)*

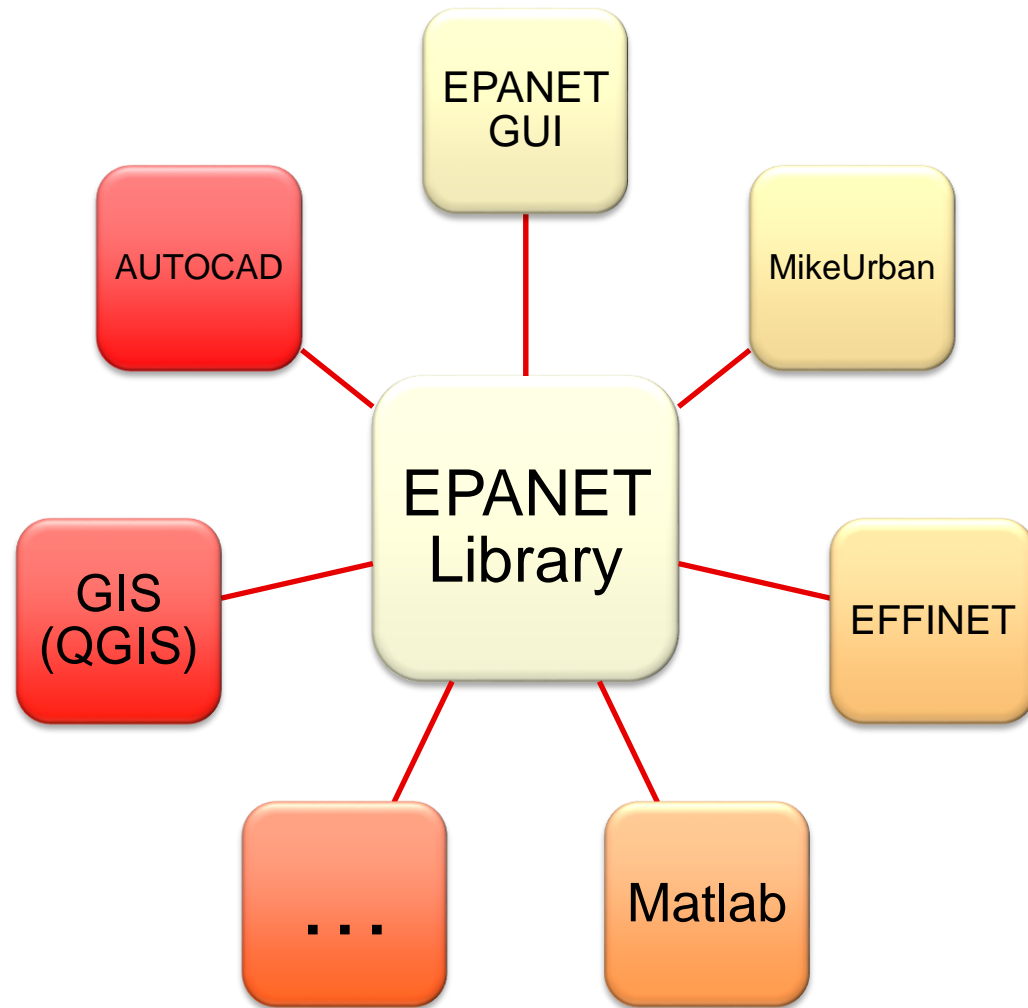
Standalone program that addresses the standard capabilities given by the EPANET Library.

(b) EPANET *open-source toolkit*

EPANET Libraries can be integrated in any programming language and are compatible with any operating system.

[i.e H2OMap and H2ONet (Innovyze), Mike Urban (DHI), WaterCAD and WaterGEMS (Bentley), WatDis (Transparent Blue)].

EPANET Library





A3_ EPANET COMPONENTS

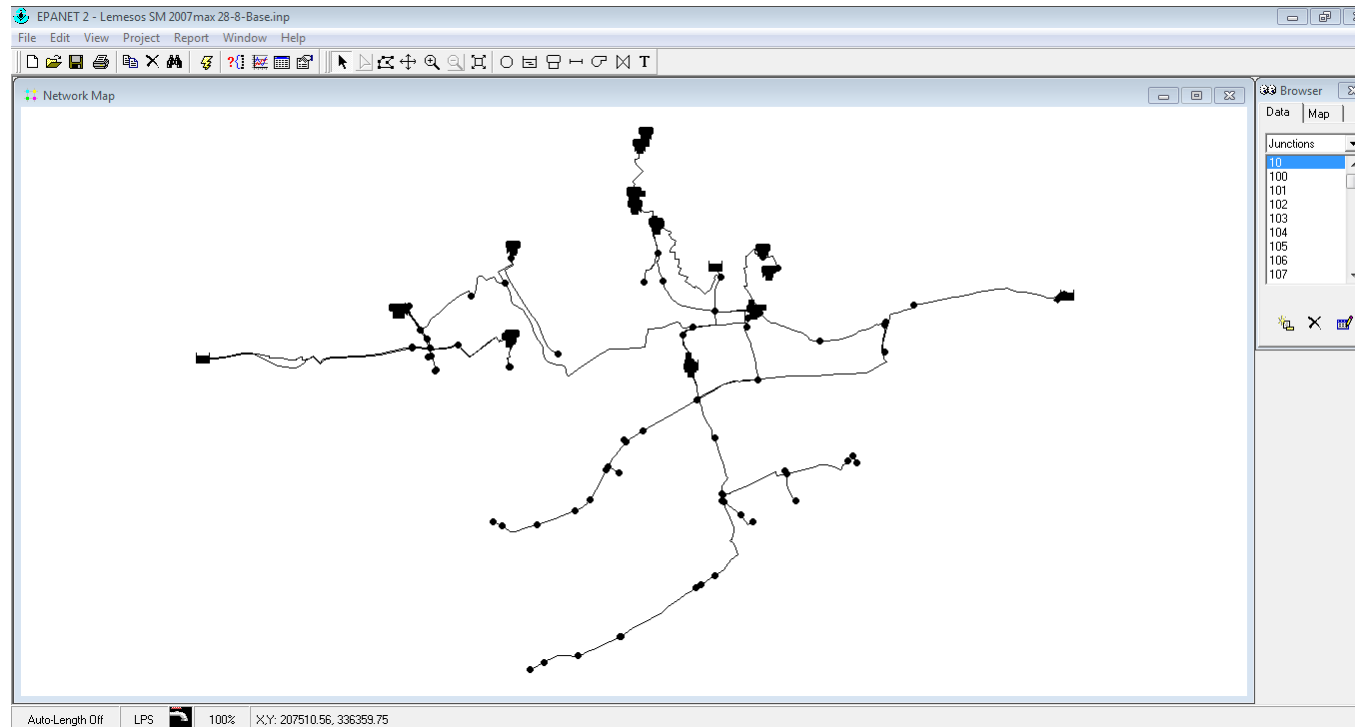
Components

Physical Components

- Nodes: Junctions, Reservoirs, Tanks.
- Links: Pipes, Pumps, Valves.

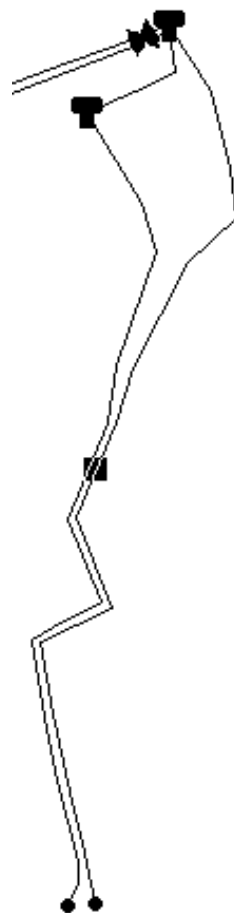
Non-Physical Components

- Controls
- Curves
- Patterns



Pipe

- Length
- Diameter [Inner Diameter]
- Roughness [i.e. for PVC pipe is 140 (H-W), 0.005 (D-W)]
- Initial status [open/closed/cv]
- Loss coefficient [minor/local losses]
- Bulk coefficient [water quality]
- Wall coefficient [water quality]



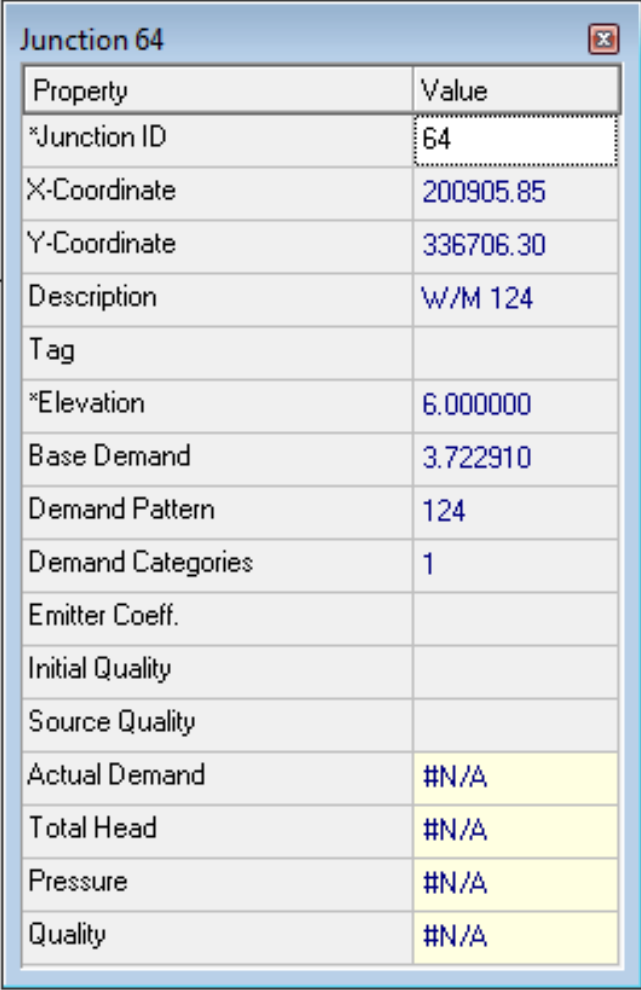
Property	Value
*Pipe ID	160
*Start Node	T-101
*End Node	128
Description	Outlet, Kato Polei
Tag	
*Length	528.473694
*Diameter	150.000000
*Roughness	1.000000
Loss Coeff.	0.000000
Initial Status	Open
Bulk Coeff.	
Wall Coeff.	
Flow	#N/A
Velocity	#N/A
Unit Headloss	#N/A
Friction Factor	#N/A
Reaction Rate	#N/A
Quality	#N/A
Status	#N/A



Junction

Pipe connections, consumers, points of substance injection, points of water entrance.

- Elevation
- Base Demand
- Demand Pattern
- Emitter Coefficient
(sprinklers/leaks)
Outflow depends on pressure $q = C \times p^y$
- Initial Quality
- Source Quality



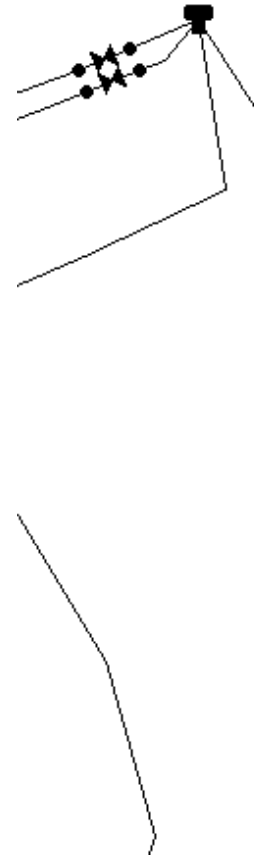
Property	Value
*Junction ID	64
X-Coordinate	200905.85
Y-Coordinate	336706.30
Description	W/M 124
Tag	
*Elevation	6.000000
Base Demand	3.722910
Demand Pattern	124
Demand Categories	1
Emitter Coeff.	
Initial Quality	
Source Quality	
Actual Demand	#N/A
Total Head	#N/A
Pressure	#N/A
Quality	#N/A



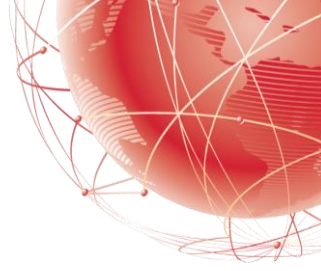
Tank

Water storage.

- Elevation
- Initial level
- Minimum level
- Maximum level
- Diameter
- Minimum volume
-



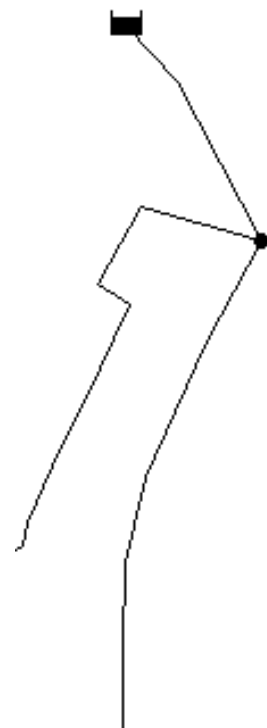
Property	Value
*Tank ID	T-101
X-Coordinate	199907.86
Y-Coordinate	341527.92
Description	Kato Polemidia (A
Tag	
*Elevation	104.000000
*Initial Level	3.500000
*Minimum Level	0.000000
*Maximum Level	4.000000
*Diameter	12.620000
Minimum Volume	0.000000
Volume Curve	
Mixing Model	MIXED
Mixing Fraction	
Reaction Coeff.	
Initial Quality	
Source Quality	
Net Inflow	#N/A
Elevation	#N/A
Pressure	#N/A
Quality	#N/A



Reservoir

Infinite sources of water, treatment plants. Reservoirs are not affected by the flows/pressures.

- Total Head (Elevation)
- Head Pattern
- Initial Quality
- Source Quality



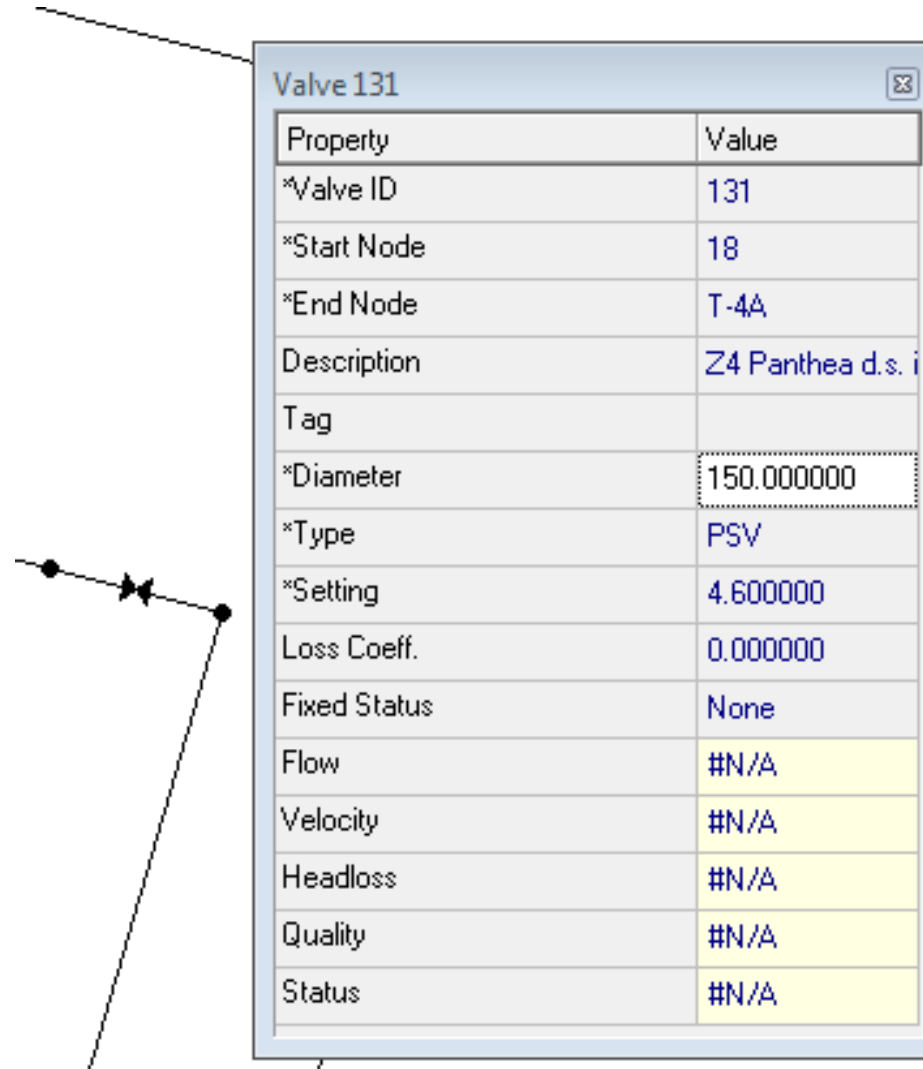
The diagram shows a network of pipes and nodes. A specific node is highlighted with a black square, and a line connects it to the 'Reservoir R-1' data table. The table lists various properties and their values for this reservoir.

Property	Value
*Reservoir ID	R-1
X-Coordinate	202967.11
Y-Coordinate	342575.03
Description	Treatment works
Tag	
*Total Head	155.000000
Head Pattern	
Initial Quality	
Source Quality	
Net Inflow	#N/A
Elevation	#N/A
Pressure	#N/A
Quality	#N/A



Valve

- Diameter
- Type [PRV, PSV, PBV, FCV, TCV, GPV]
- Setting
- Loss Coefficient
- Fixed status [None, Open, Closed]



The diagram shows a valve symbol in a piping system, represented by a line with two arrows pointing towards each other. A callout box titled "Valve 131" provides the following properties:

Property	Value
*Valve ID	131
*Start Node	18
*End Node	T-4A
Description	Z4 Panthea d.s. i
Tag	
*Diameter	150.000000
*Type	PSV
*Setting	4.600000
Loss Coeff.	0.000000
Fixed Status	None
Flow	#N/A
Velocity	#N/A
Headloss	#N/A
Quality	#N/A
Status	#N/A



Valve (cont.)

- Pressure Reducing Valve (PRV)
- Pressure Sustaining Valve (PSV)
- Pressure Breaker Valve (PBV)
- Flow Control Valve (FCV)
- Throttle Control Valve (TCV)
- General Purpose Valve (GPV)

Setting:

- *Pressure (PRVs, PSVs, PBVs)*
- *Flow (FCVs)*
- *Loss coefficient (TCVs)*
- *Head loss curve (GPVs)*

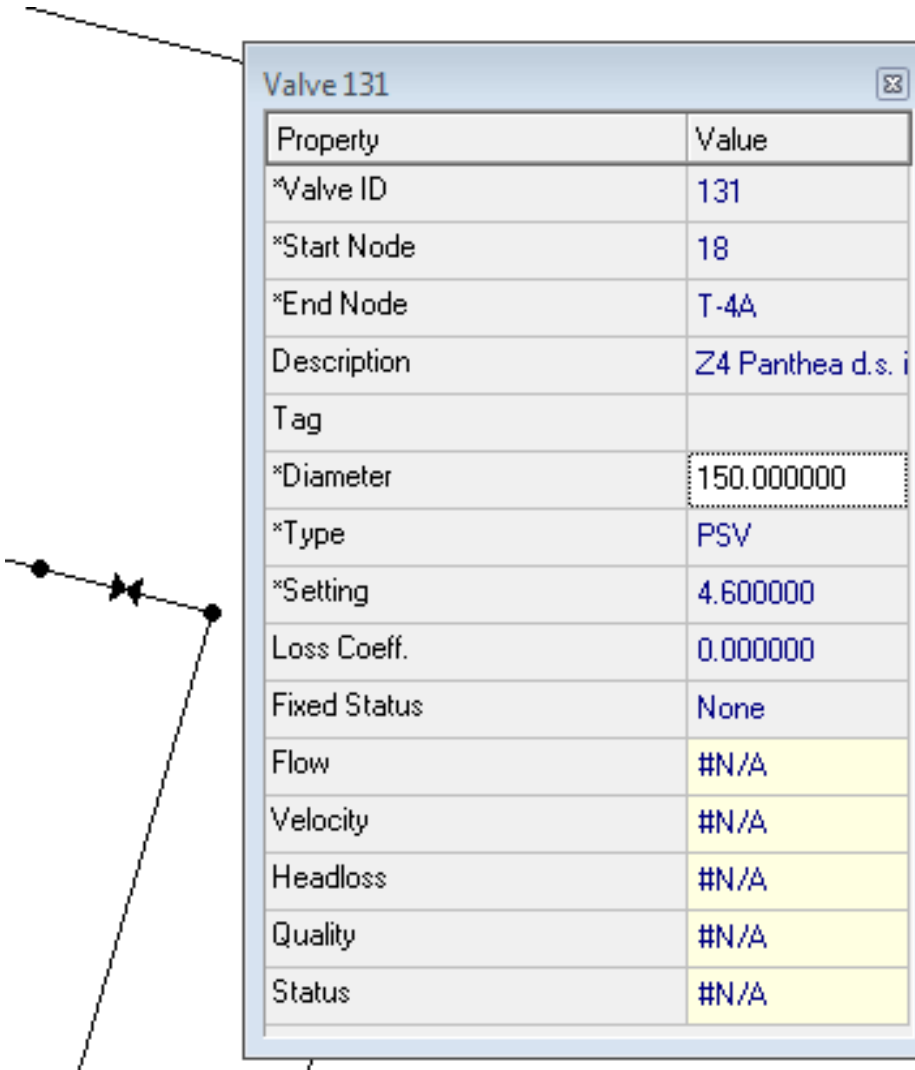


Property	Value
*Valve ID	131
*Start Node	18
*End Node	T-4A
Description	Z4 Panthea d.s. i
Tag	
*Diameter	150.000000
*Type	PSV
*Setting	4.600000
Loss Coeff.	0.000000
Fixed Status	None
Flow	#N/A
Velocity	#N/A
Headloss	#N/A
Quality	#N/A
Status	#N/A



Valve (cont.)

- PRV: Limits the pressure
- PSV: Maintains the pressure
- PBV: Simulate pressure drop (Not a physical device)
- FCV: Limits the flow
- TCV: Simulate a partially closed valve – head loss adjustment
- GPV: Simulate turbines or back-flow prevention valves – adjust flow - head loss curve

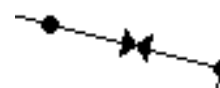


Property	Value
*Valve ID	131
*Start Node	18
*End Node	T-4A
Description	Z4 Panthea d.s. i
Tag	
*Diameter	150.000000
*Type	PSV
*Setting	4.600000
Loss Coeff.	0.000000
Fixed Status	None
Flow	#N/A
Velocity	#N/A
Headloss	#N/A
Quality	#N/A
Status	#N/A



Valve (cont.)

- PRVs, PSVs or FCVs cannot be directly connected to a reservoir or tank (use a length of pipe to separate the two).
- PRVs cannot share the same downstream node or be linked in series.
- Two PSVs cannot share the same upstream node or be linked in series.
- A PSV cannot be connected to the downstream node of a PRV.



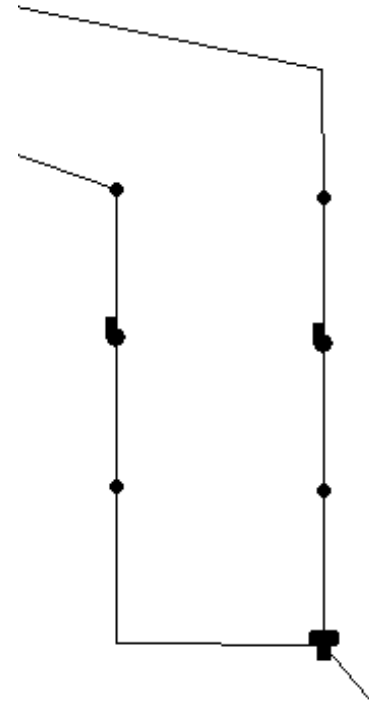
The diagram shows a pipe with a valve symbol. The valve symbol consists of a horizontal line with two arrows pointing towards each other in the center, indicating the valve's position and direction of flow.

Property	Value
*Valve ID	131
*Start Node	18
*End Node	T-4A
Description	Z4 Panthea d.s. i
Tag	
*Diameter	150.000000
*Type	PSV
*Setting	4.600000
Loss Coeff.	0.000000
Fixed Status	None
Flow	#N/A
Velocity	#N/A
Headloss	#N/A
Quality	#N/A
Status	#N/A

Pump

Increase hydraulic head, can be turned on/off and can compute energy consumption and costs.

- Pump Curve (head vs flow)
- Power
- Speed
- Pattern
- Initial status
-



Property	Value
*Pump ID	192
*Start Node	150
*End Node	143
Description	Z3-N to Z5-N
Tag	
Pump Curve	QH_MU_192_21
Power	
Speed	
Pattern	
Initial Status	Open
Effic. Curve	
Energy Price	
Price Pattern	
Flow	#N/A
Headloss	#N/A
Quality	#N/A
Status	#N/A



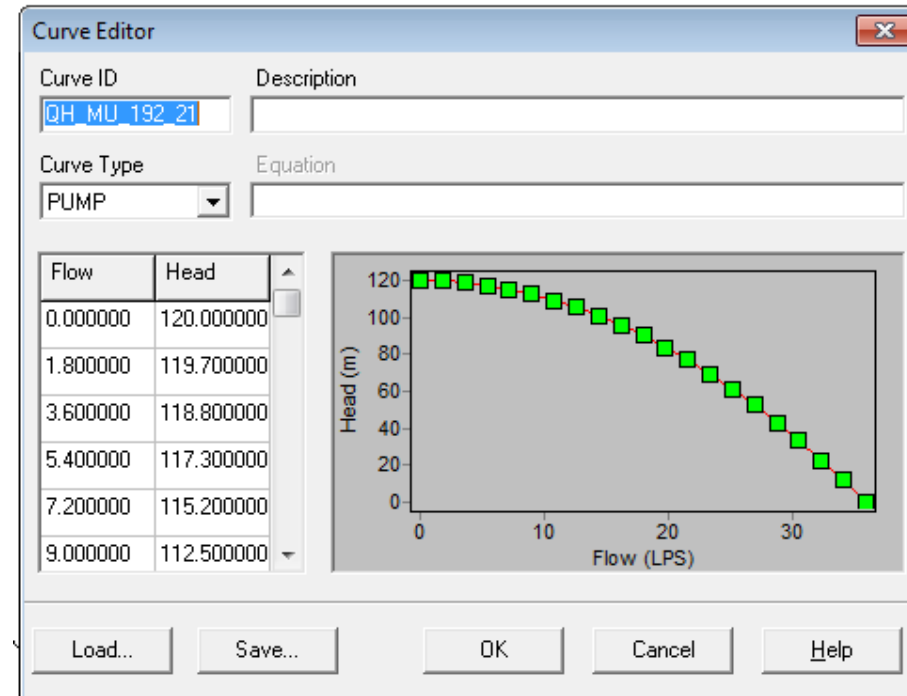
Curves

Type of Curves:

- Pump (pump)
- Efficiency (pump)
- Volume (tank)
- Head Loss (GPV)

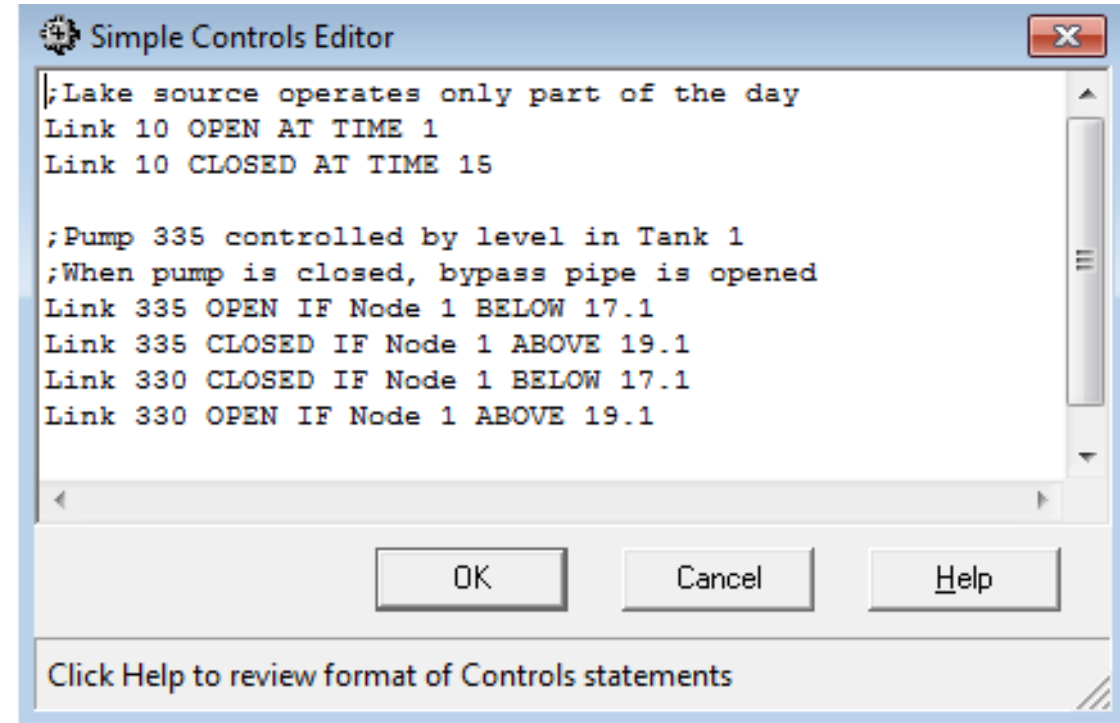
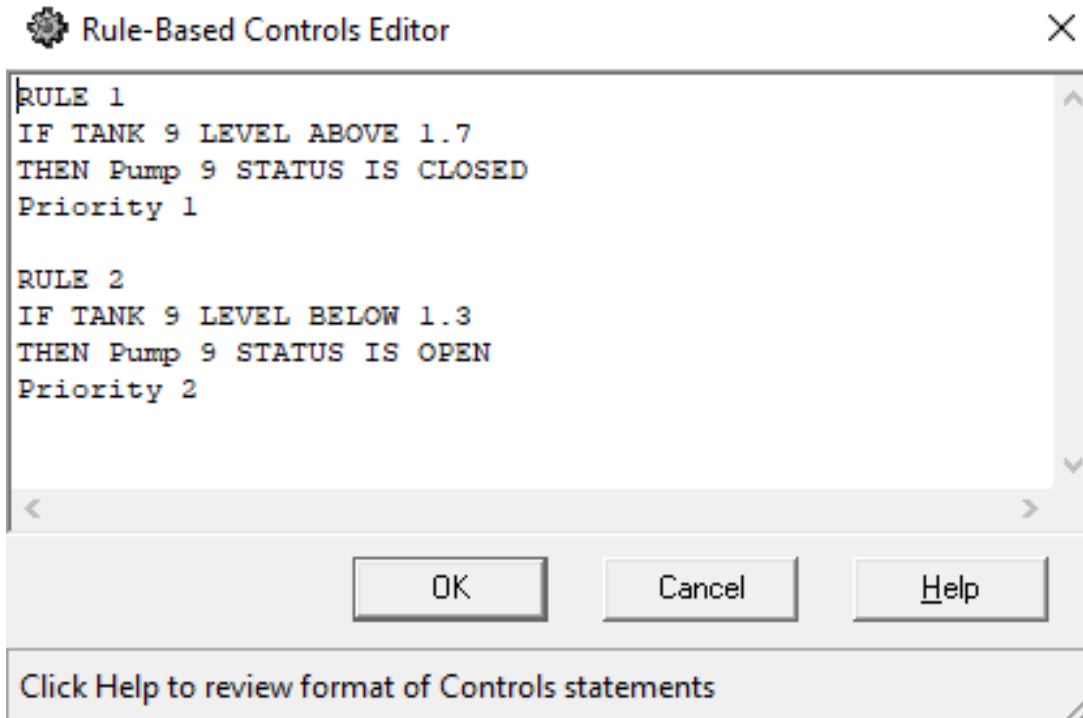
Pump Curve (Flow-Head):

- The head that the pump can perform, at a given flow.



Controls

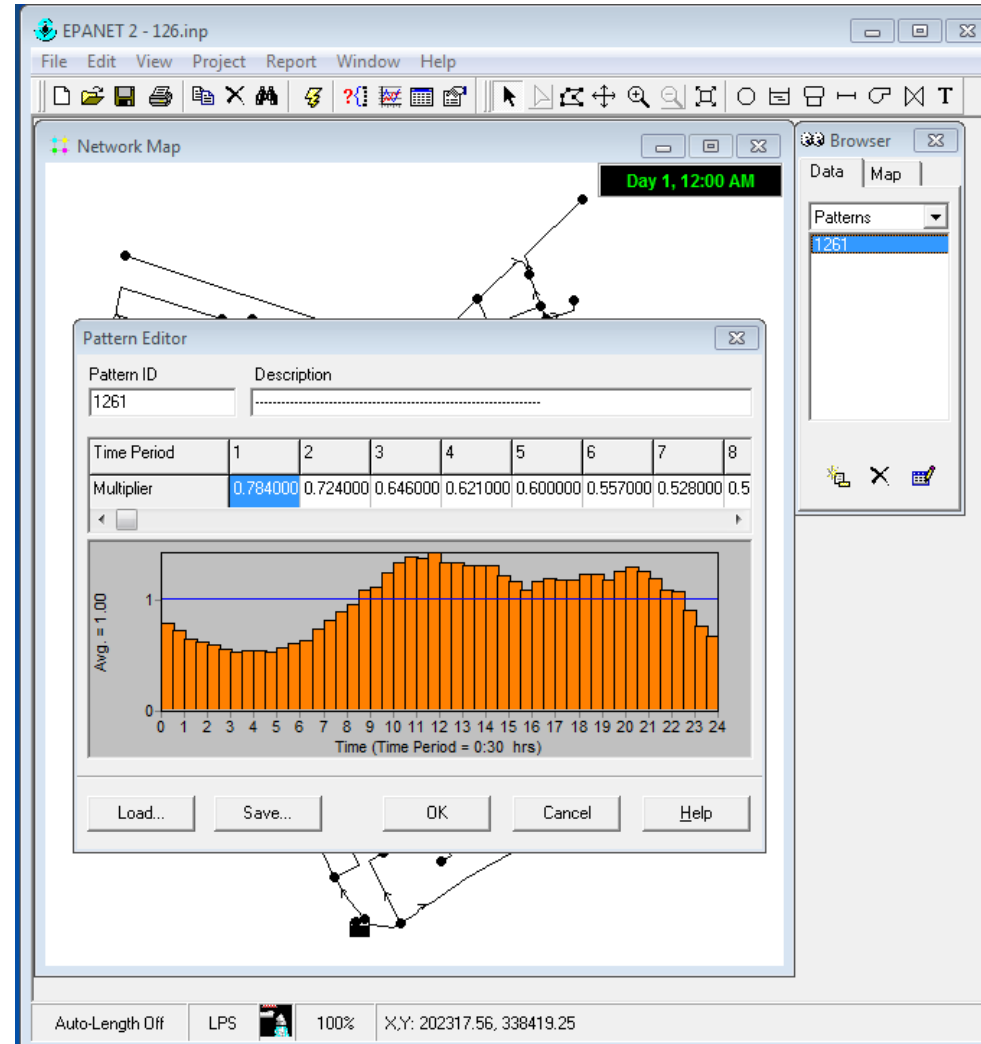
- Simple or Rule-Based



Pattern

Time Series Patterns

- Demand/Consumption Patterns (Nodes)
- Head/Pressure Patterns (Reservoir)
- Chemical concentration Patterns (Reservoir, Tank)



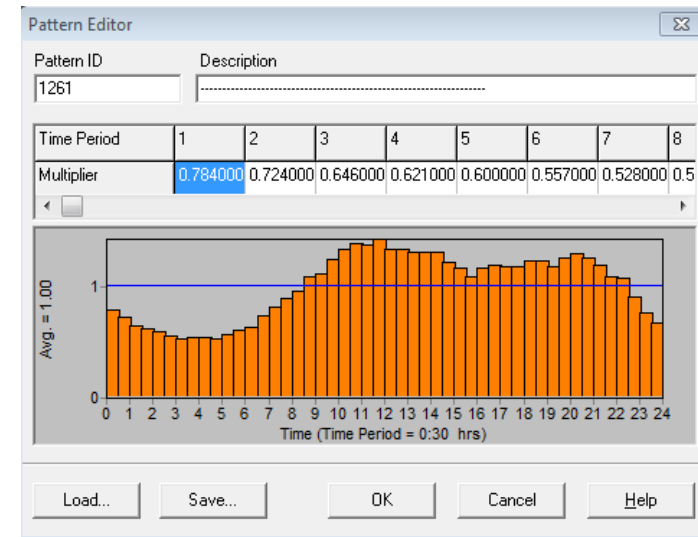
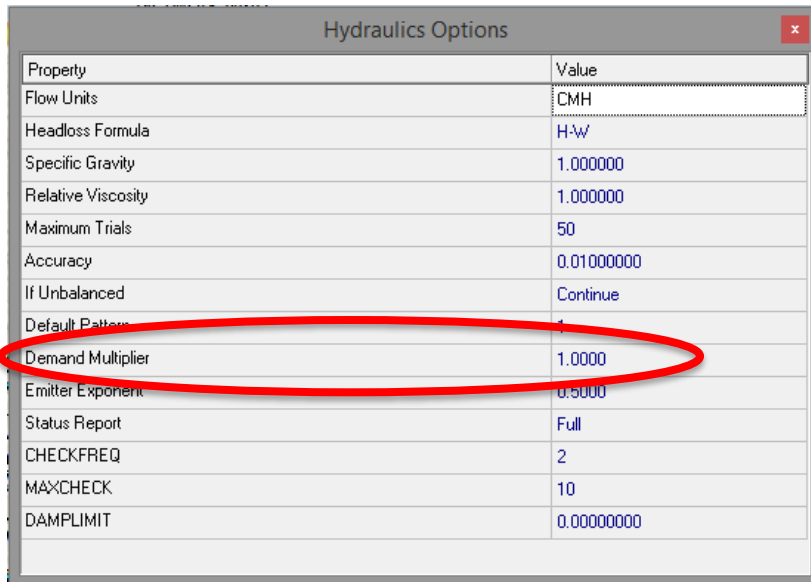
Demand Pattern – Design Scenario

A pessimistic outlook!!

The networks are designed for the worst case scenario:

The busiest time of the day during the busiest day of the week of the less favorable month with the biggest population served (30 years out). It is assumed that if it is capable of functioning at the moment of greatest demand, it will do so without problems the rest of the time. The way to represent this mathematically is by multiplying the coefficients:

$$f_{\text{Global}} = f_{\text{Daily}} \times f_{\text{Weekly}} \times f_{\text{Monthly}} \times f_{\text{Consumption not measured}}$$

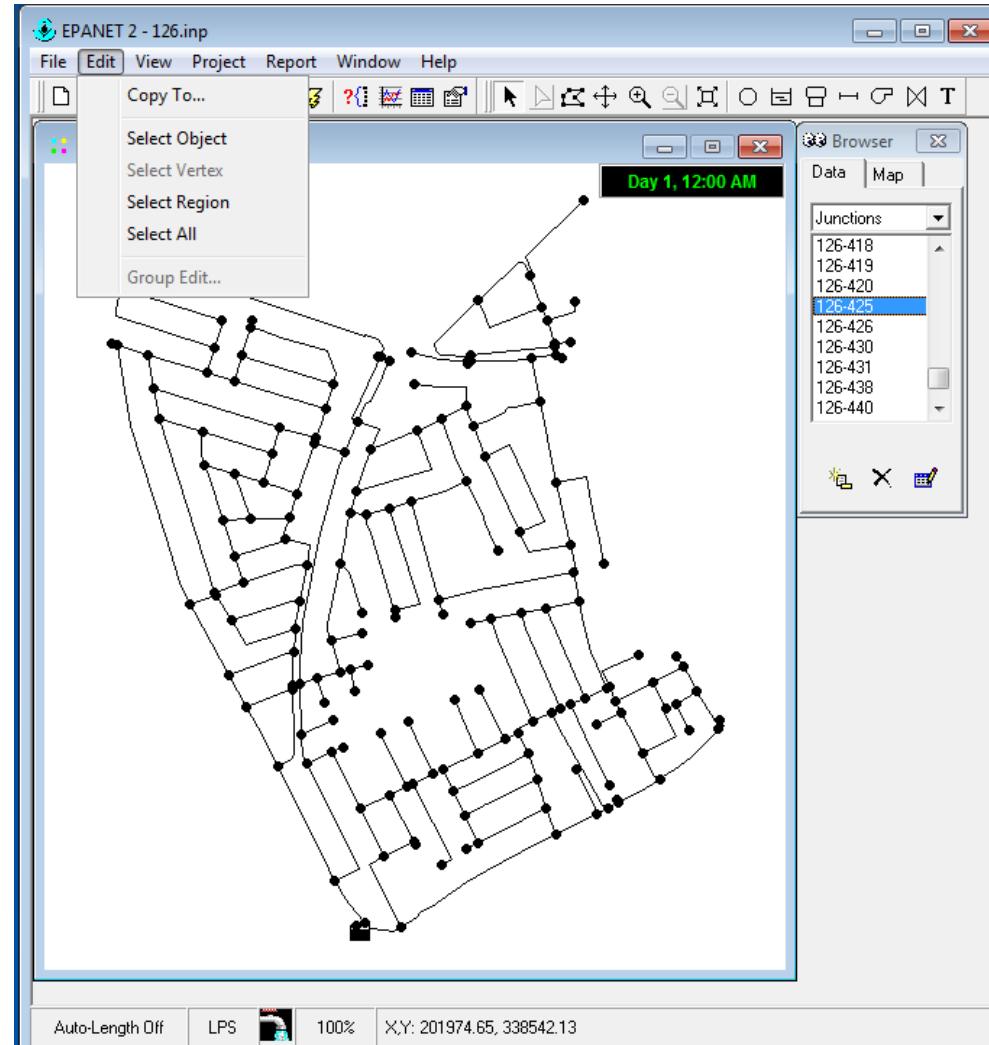




A4_EPANET MENU

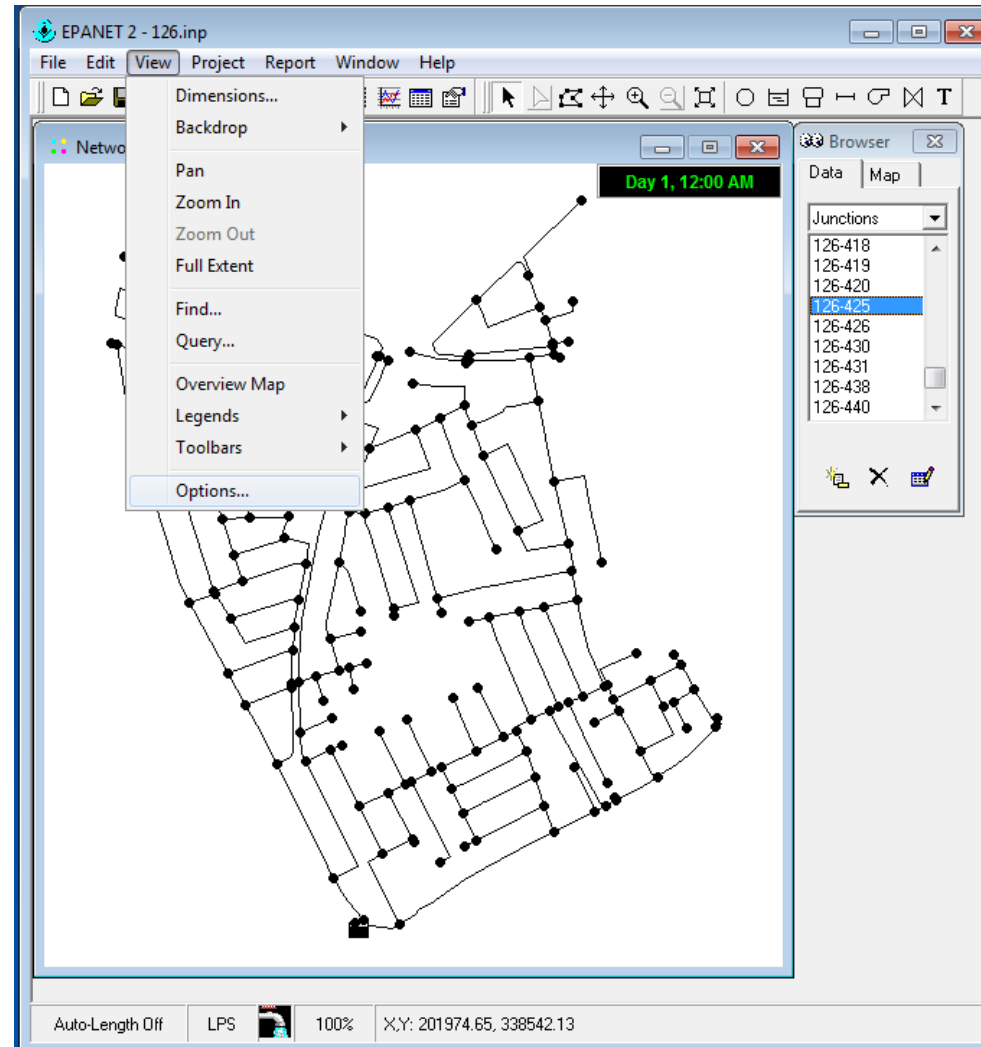
Edit Menu

- Copy in memory
- Select network elements



View Menu

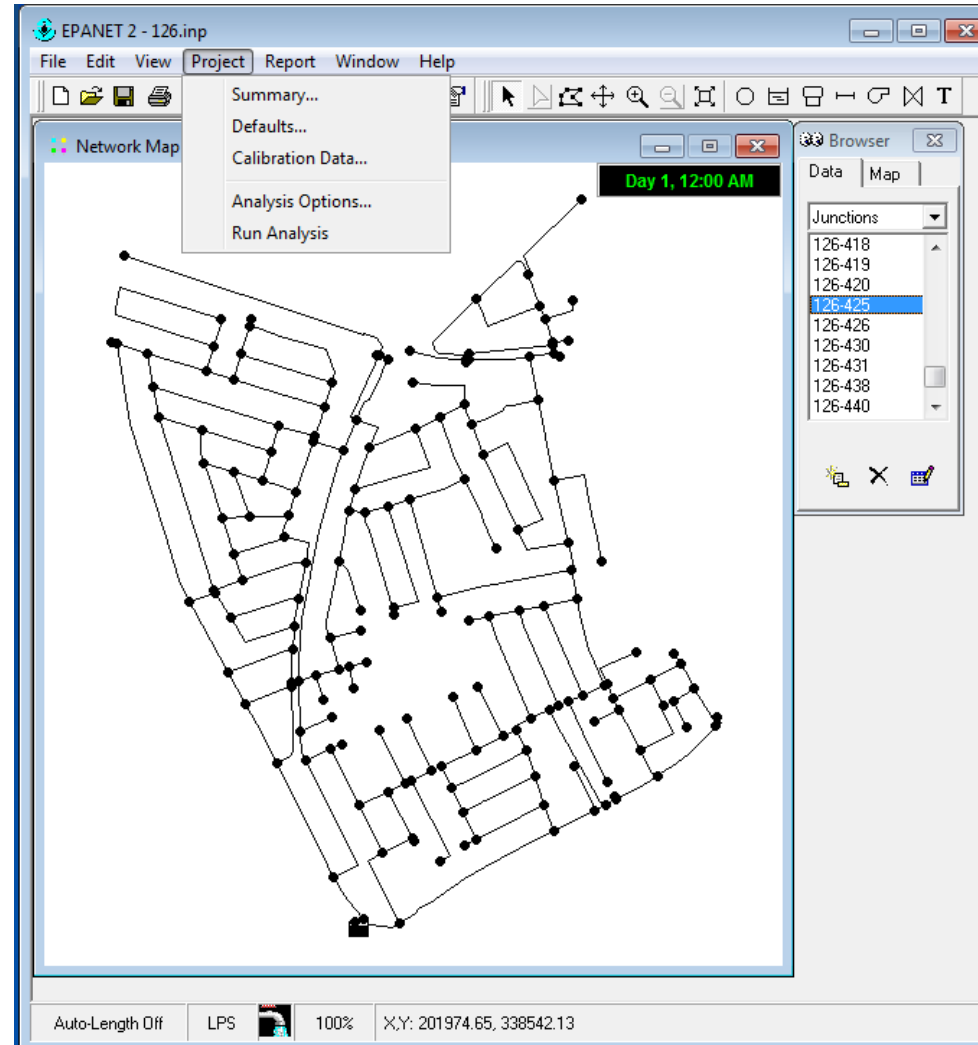
- Set map coordinates
- Add background image [e.g. map]
- Search network elements
- EPANET options





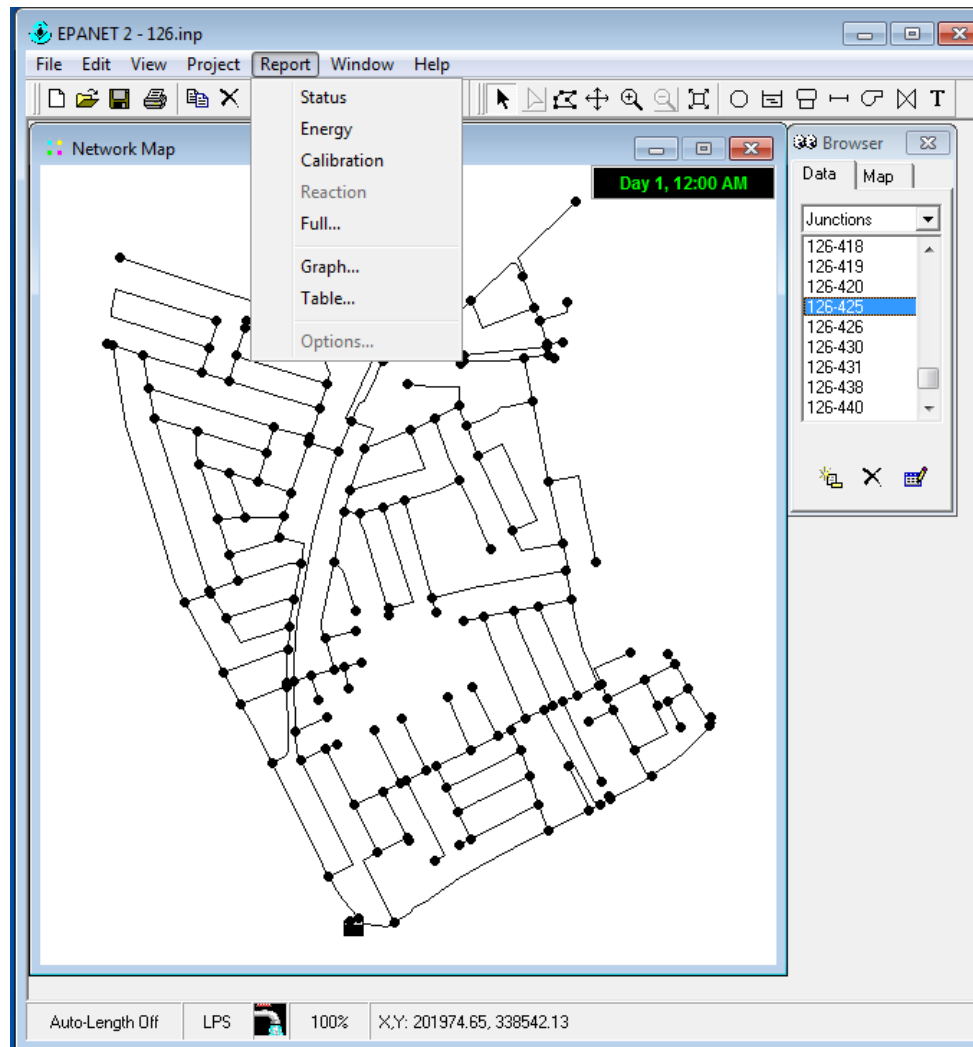
Project Menu

- Run simulation
- Specify default options
- Network summary
- Calibration tool



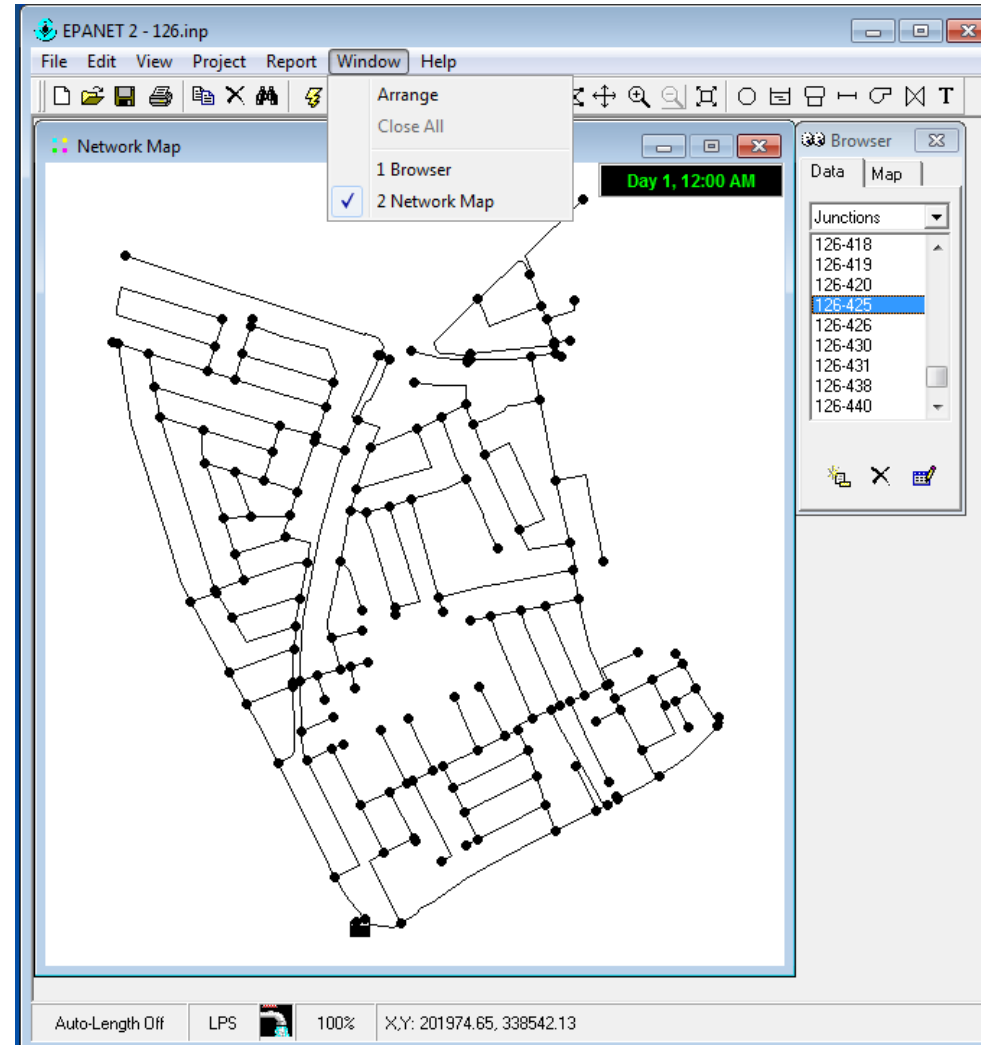
Report Menu

- Simulation results analysis
- Table of results
- Graphs
- Export results in files



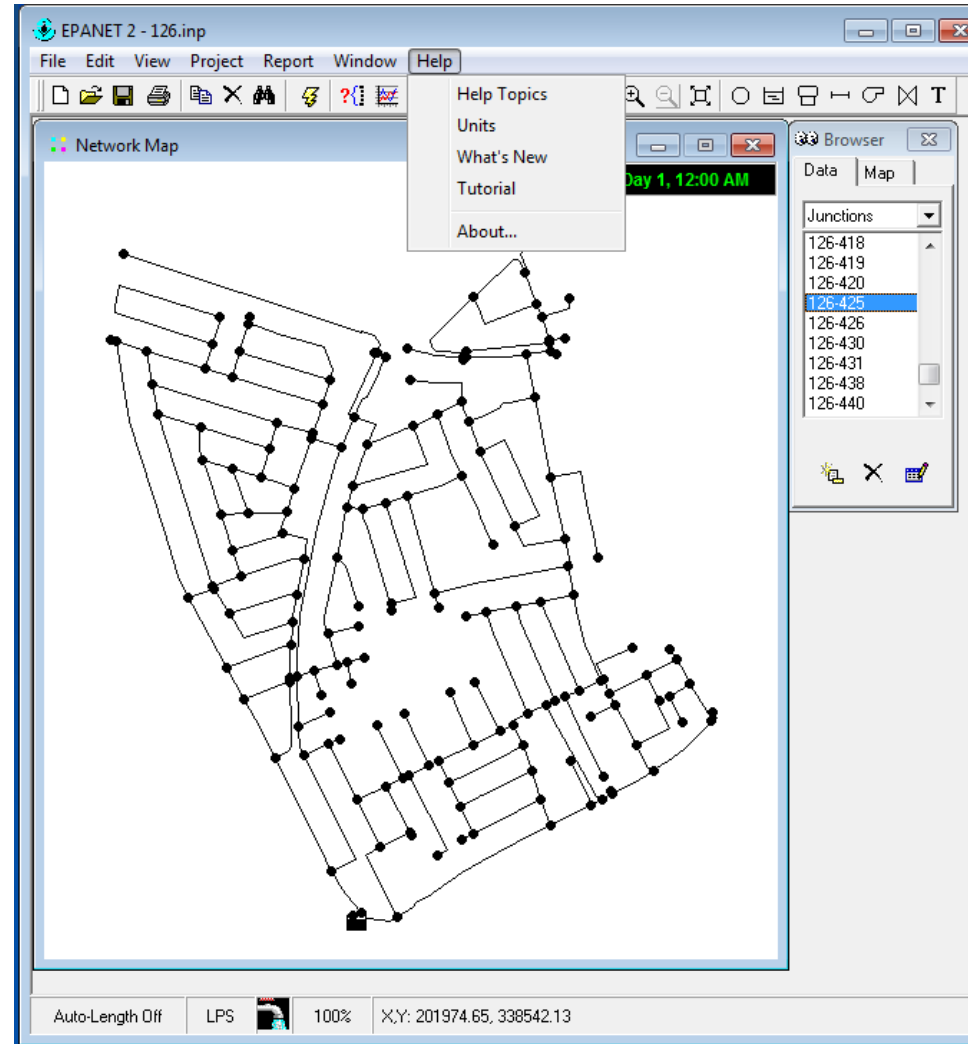
Window Menu

- Arrange Windows



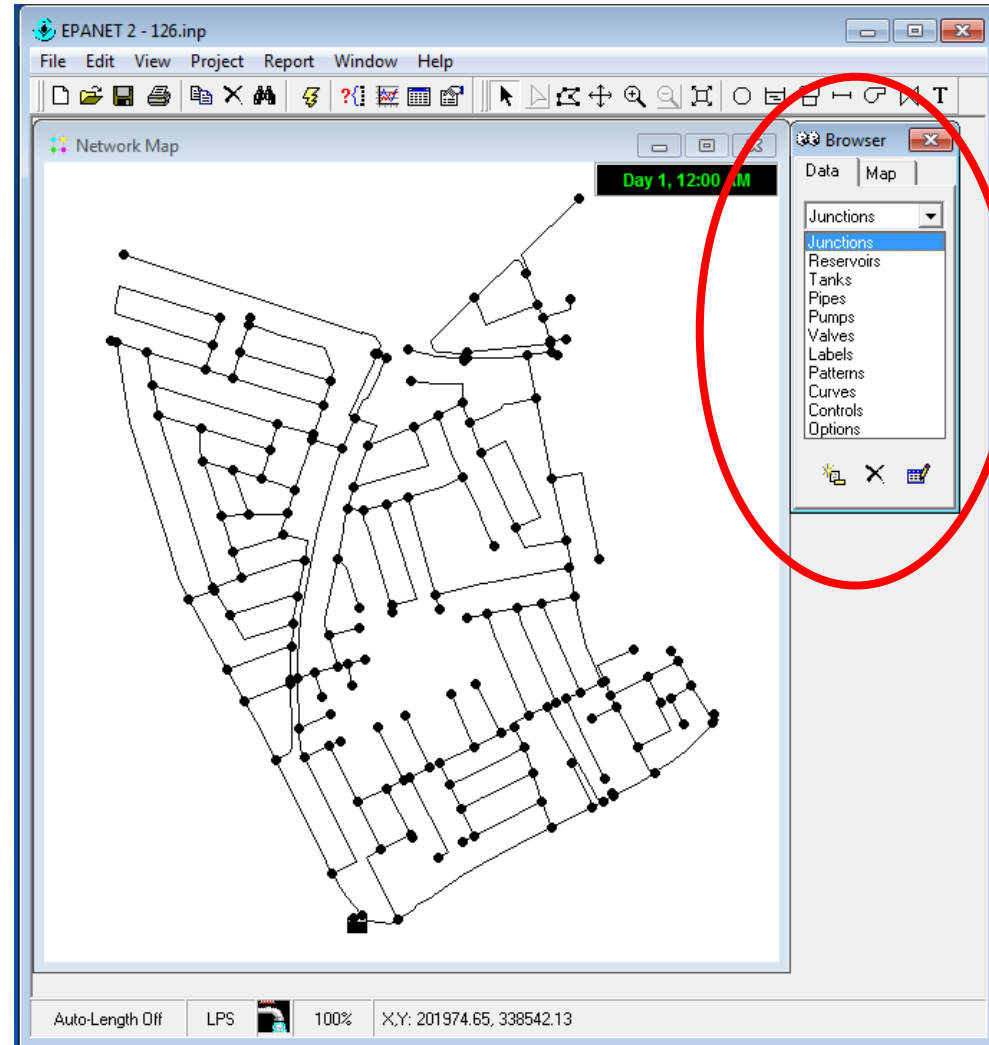
Help Menu

- Tutorials
- Help topics



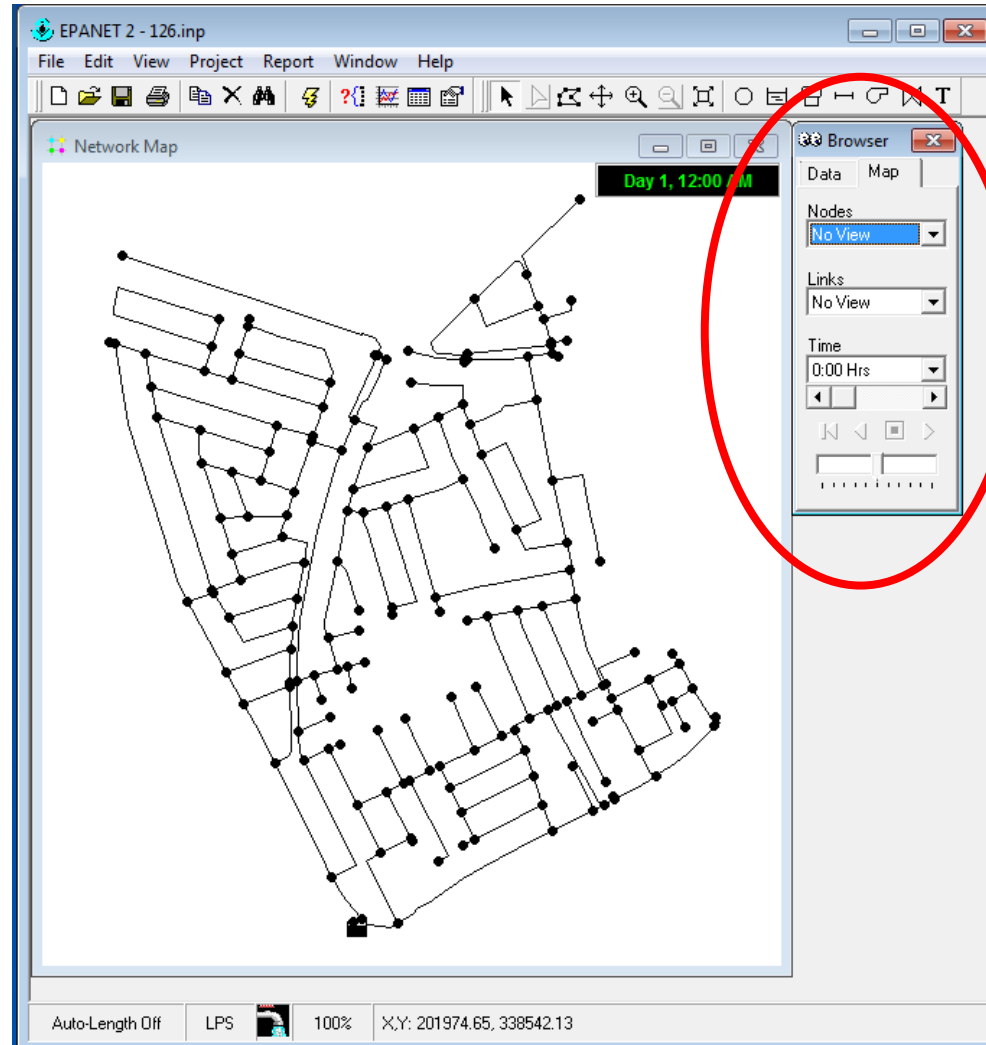
Data Browser

- Details of all the features
- Junctions
- Reservoirs
- Tanks
- Valves
- Patterns
- Curves
- Controls
- Options



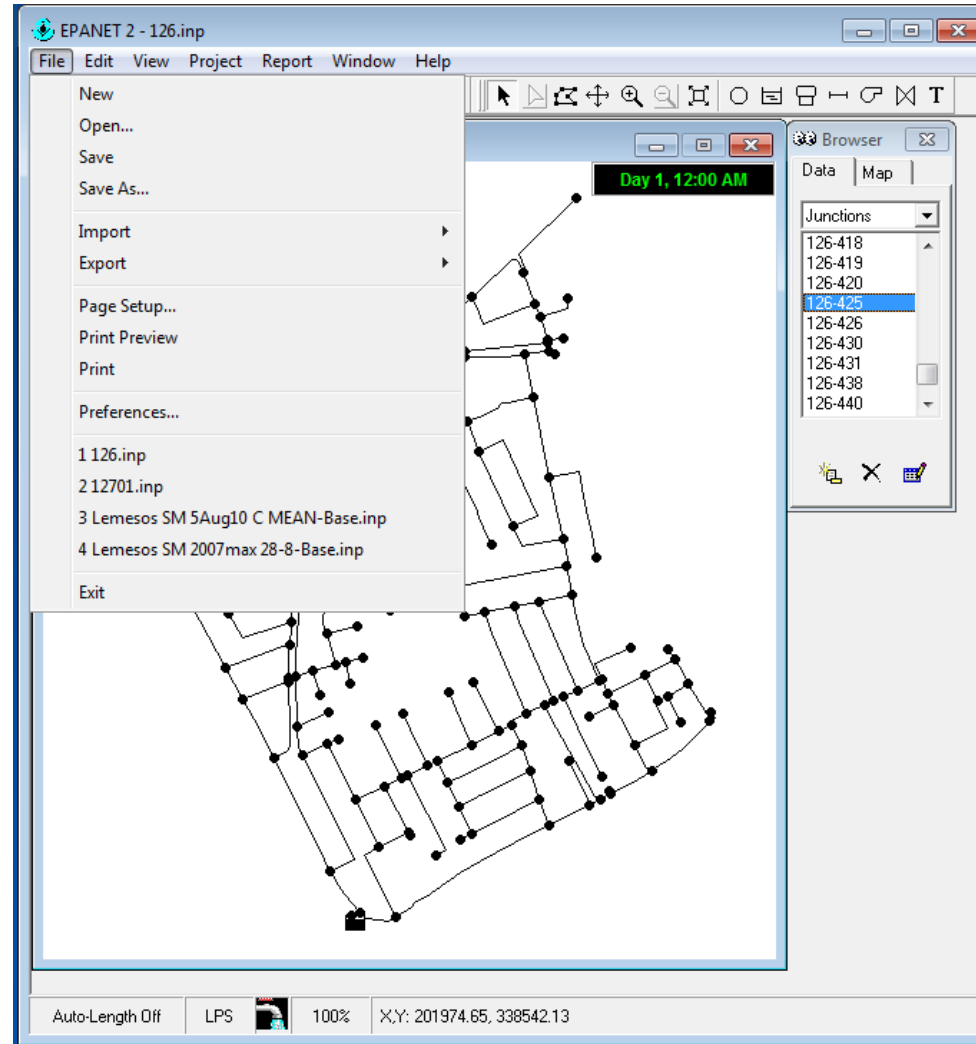
Map Browser

- What to view on the map [e.g. flows, velocities, elevations, pressures, heads]
- Play a time-lapse of the simulation



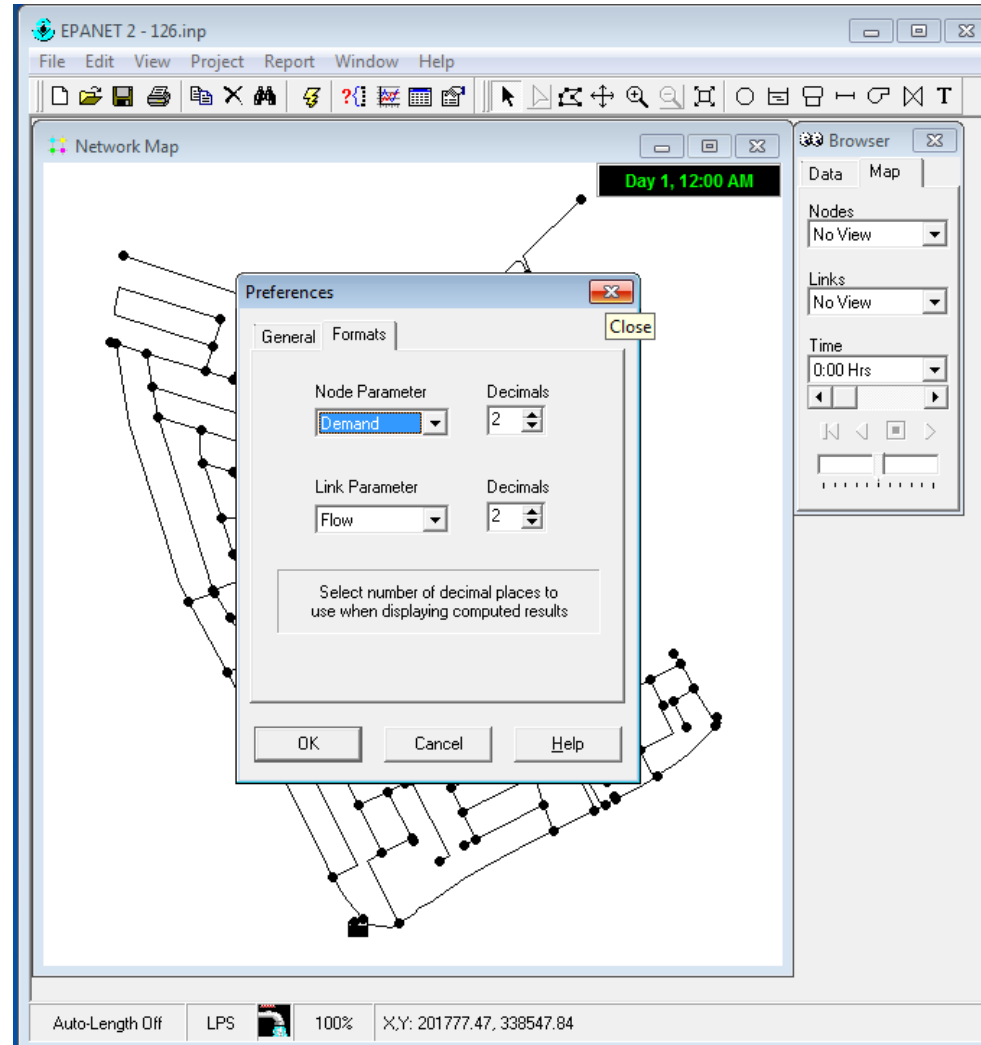
Preferences

- Specify system preferences



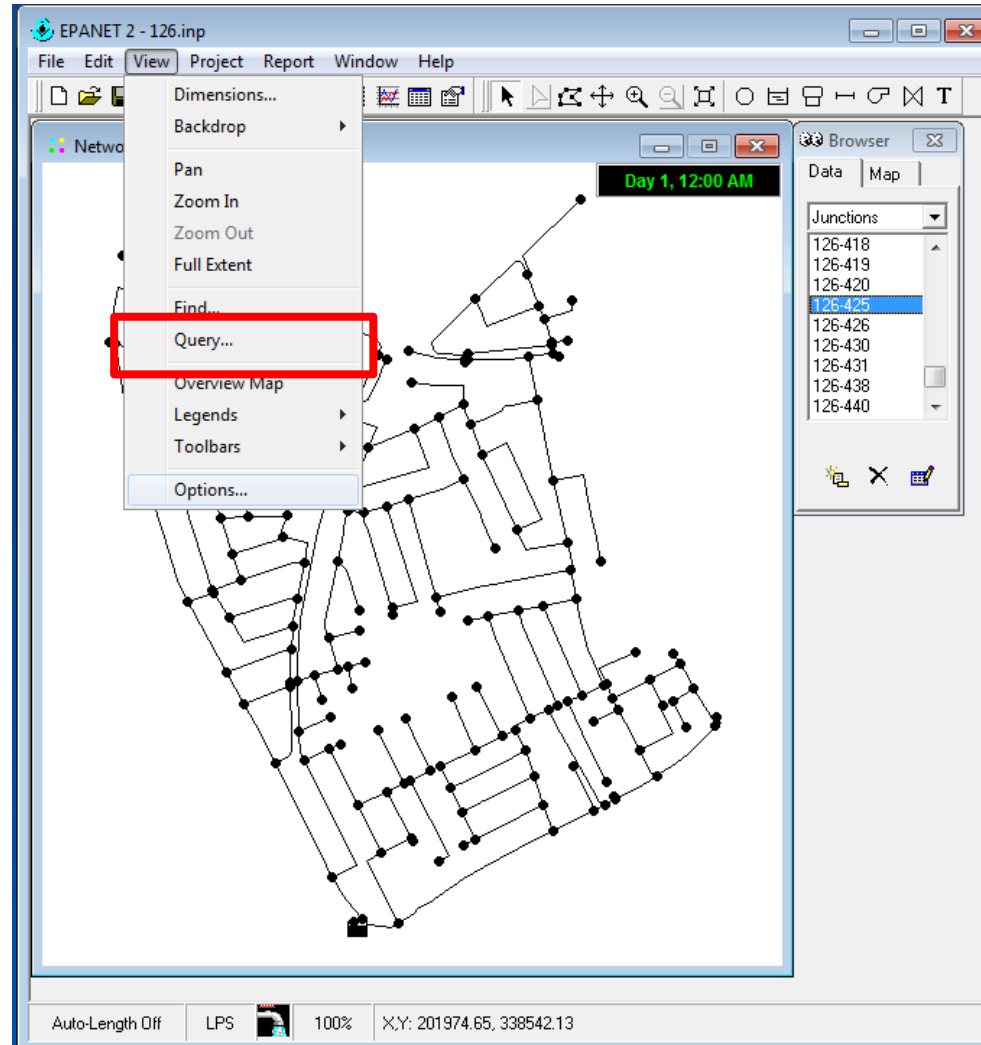
Preferences (cont.)

- General description
- Decimals



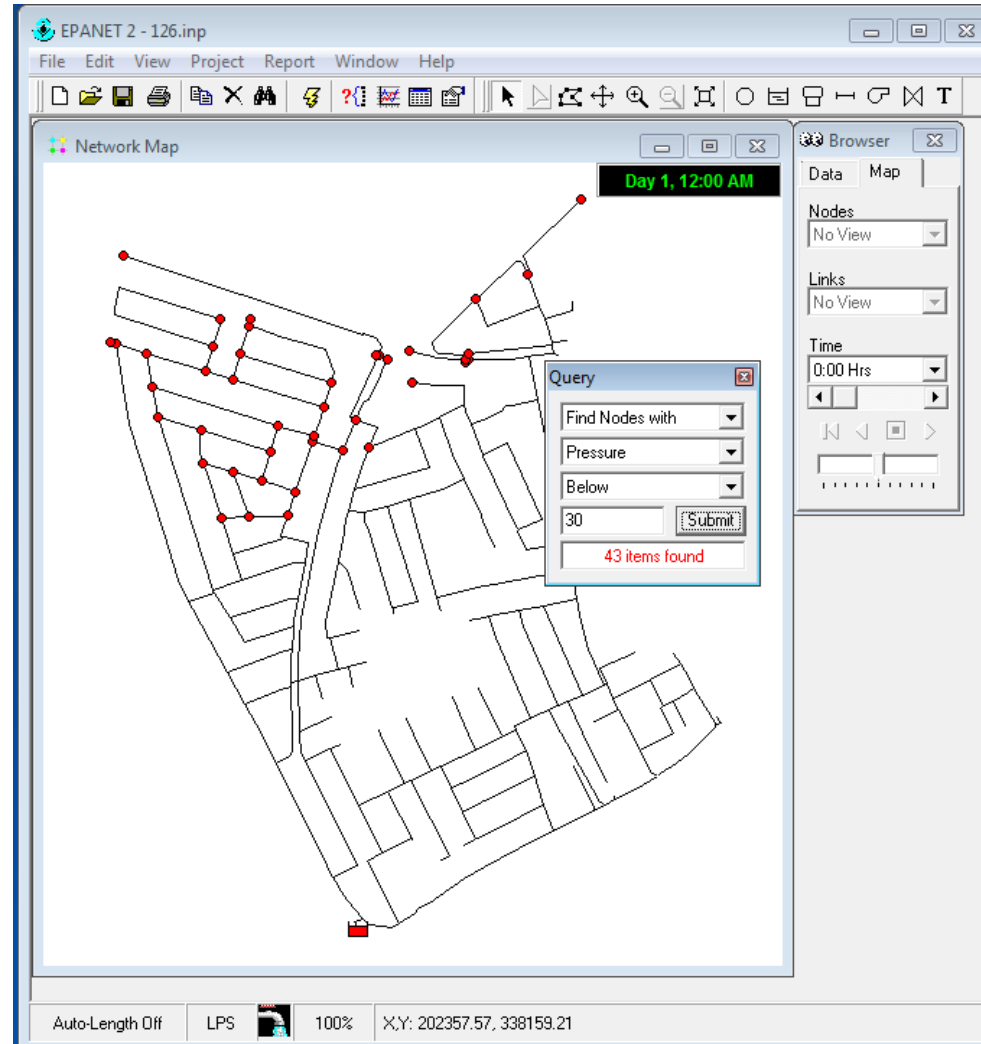
Query

- Query network components



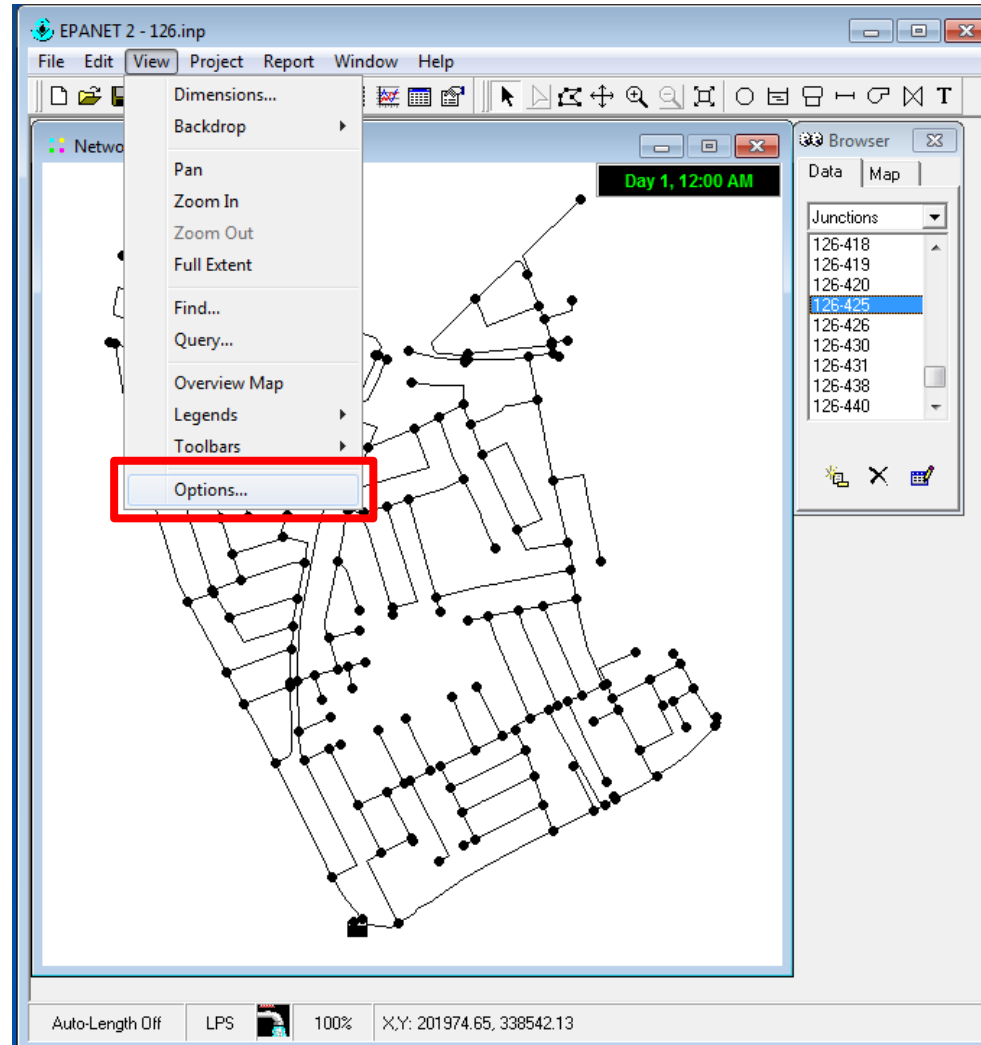
Query (cont.)

- Case Study:
Find all nodes with pressure below 30 meters.



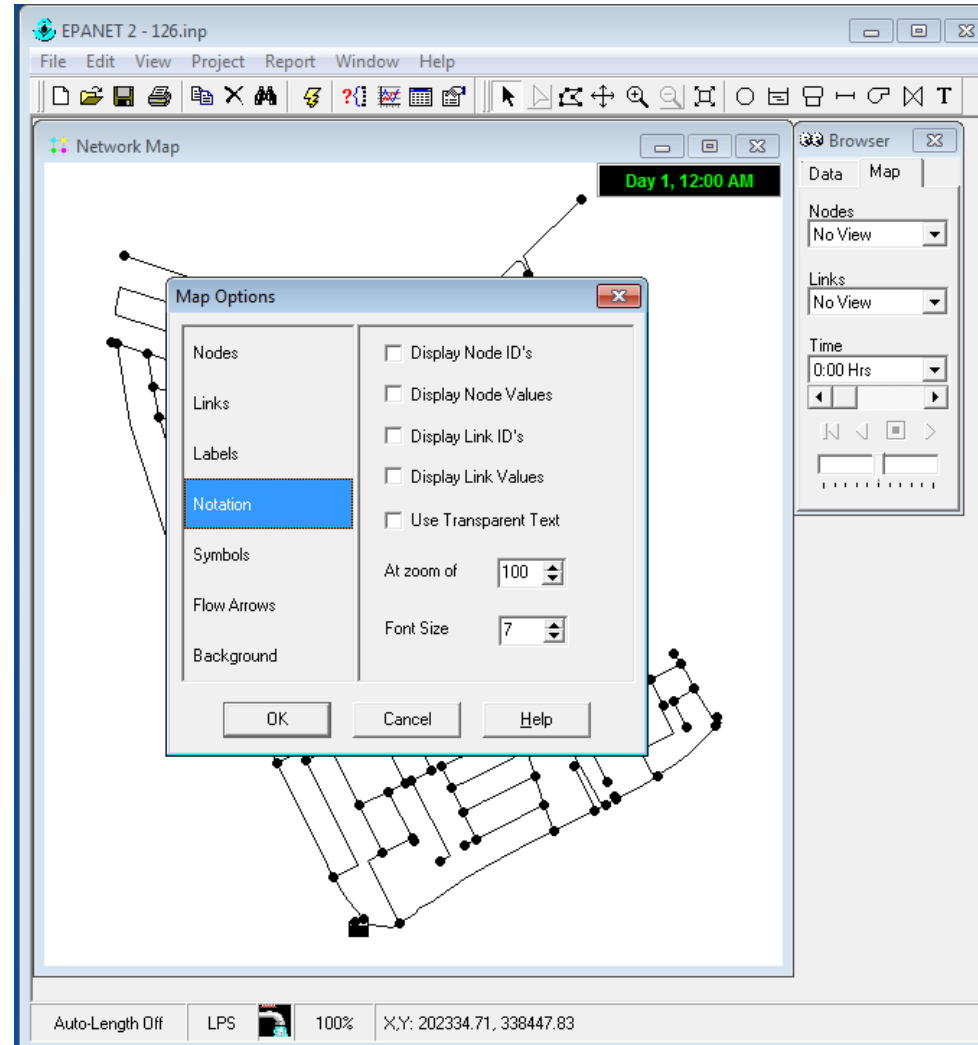
Options

- Open Options menu



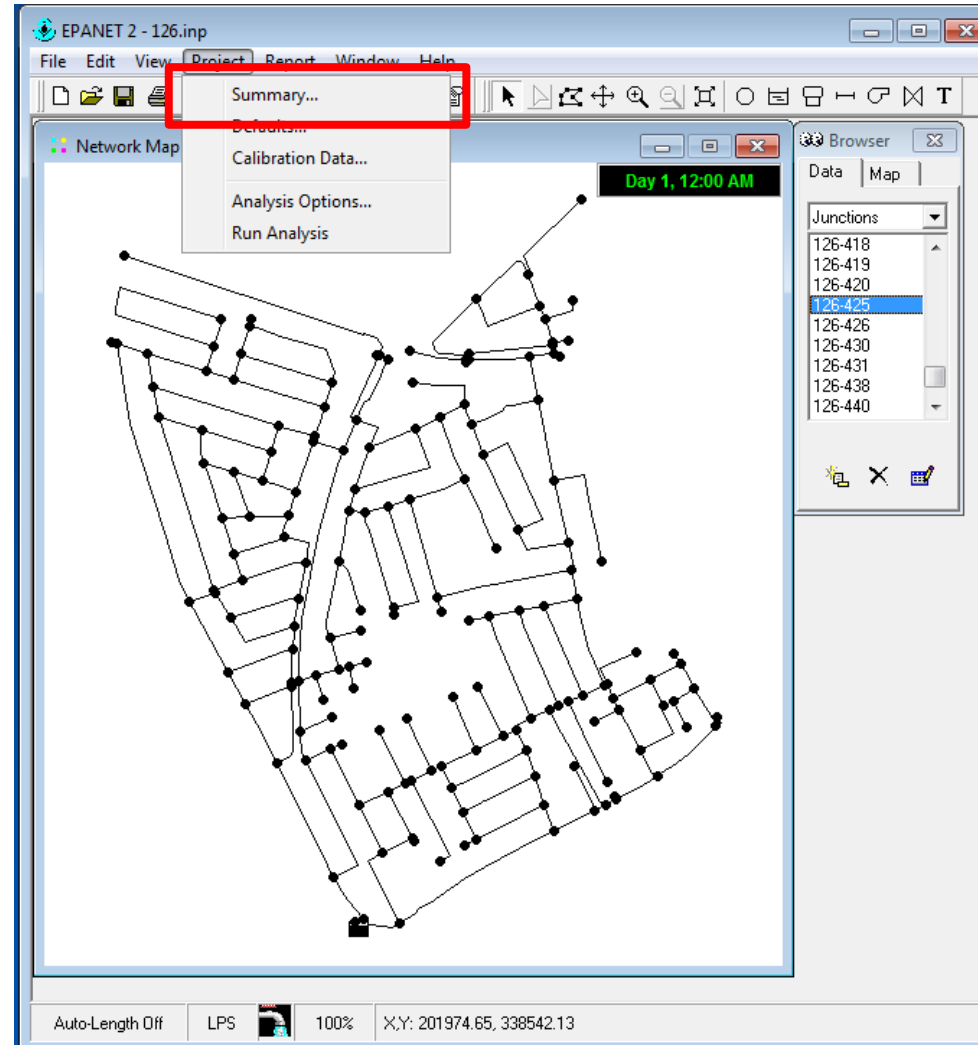
Options (cont.)

- Specify the style of the elements you view
- See node / link values
[based on Map Browser]
- Flows arrows
- Size of node / links relative to size



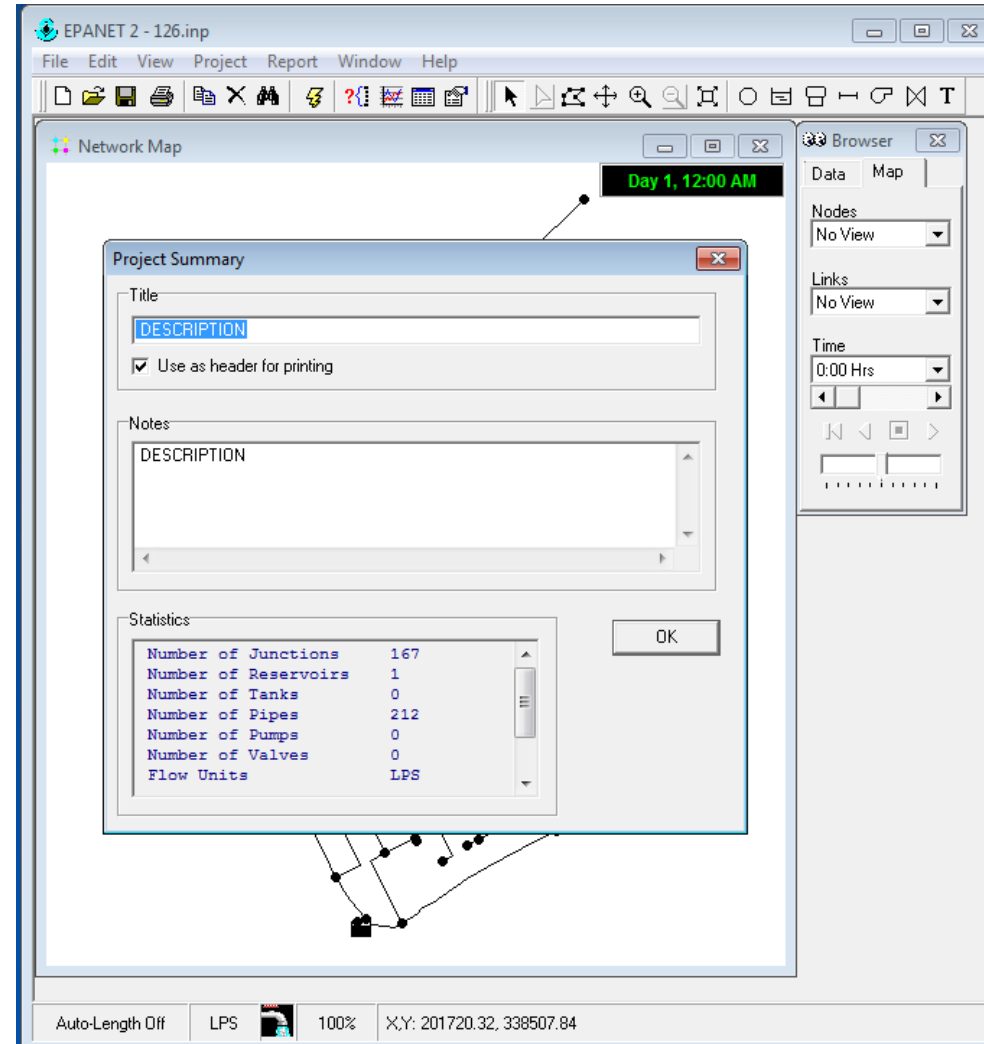
Summary

- Print network summary



Summary (cont.)

- Print network summary

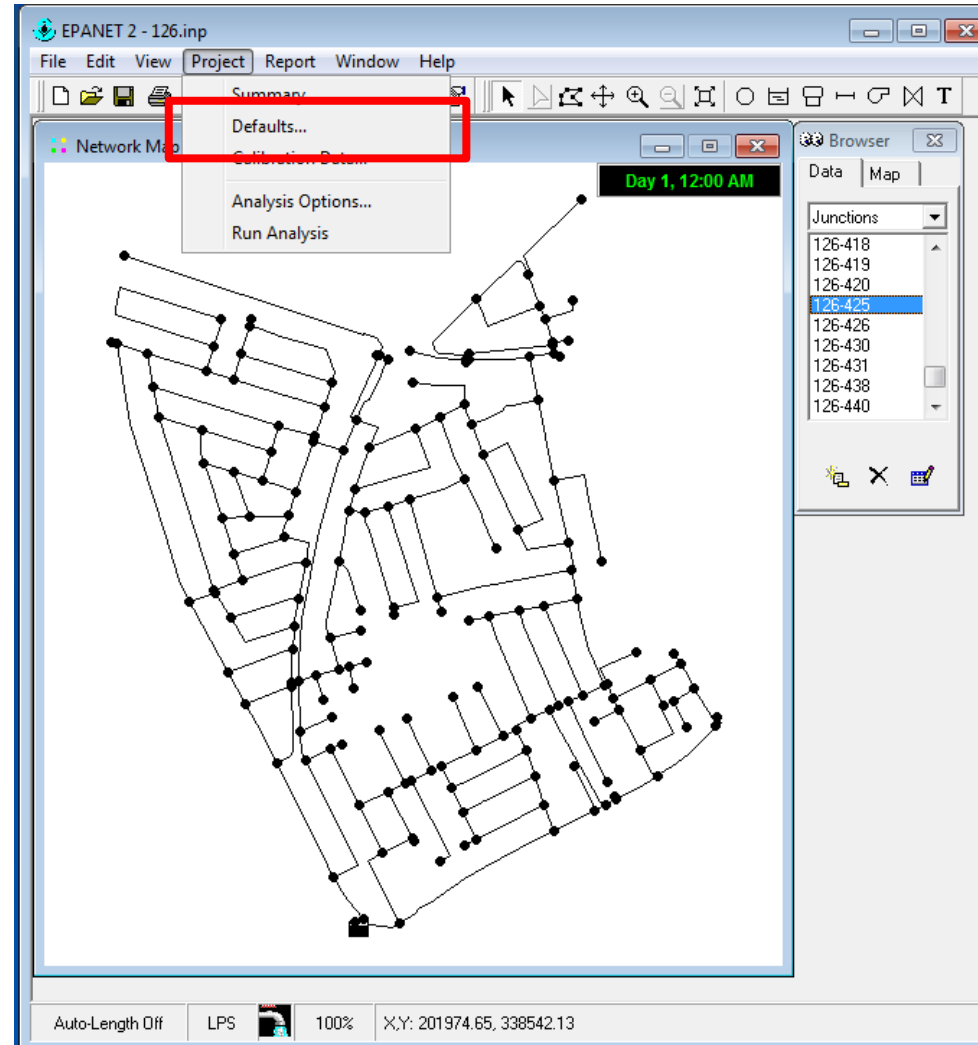




A5_EPANET NETWORK ANALYSIS

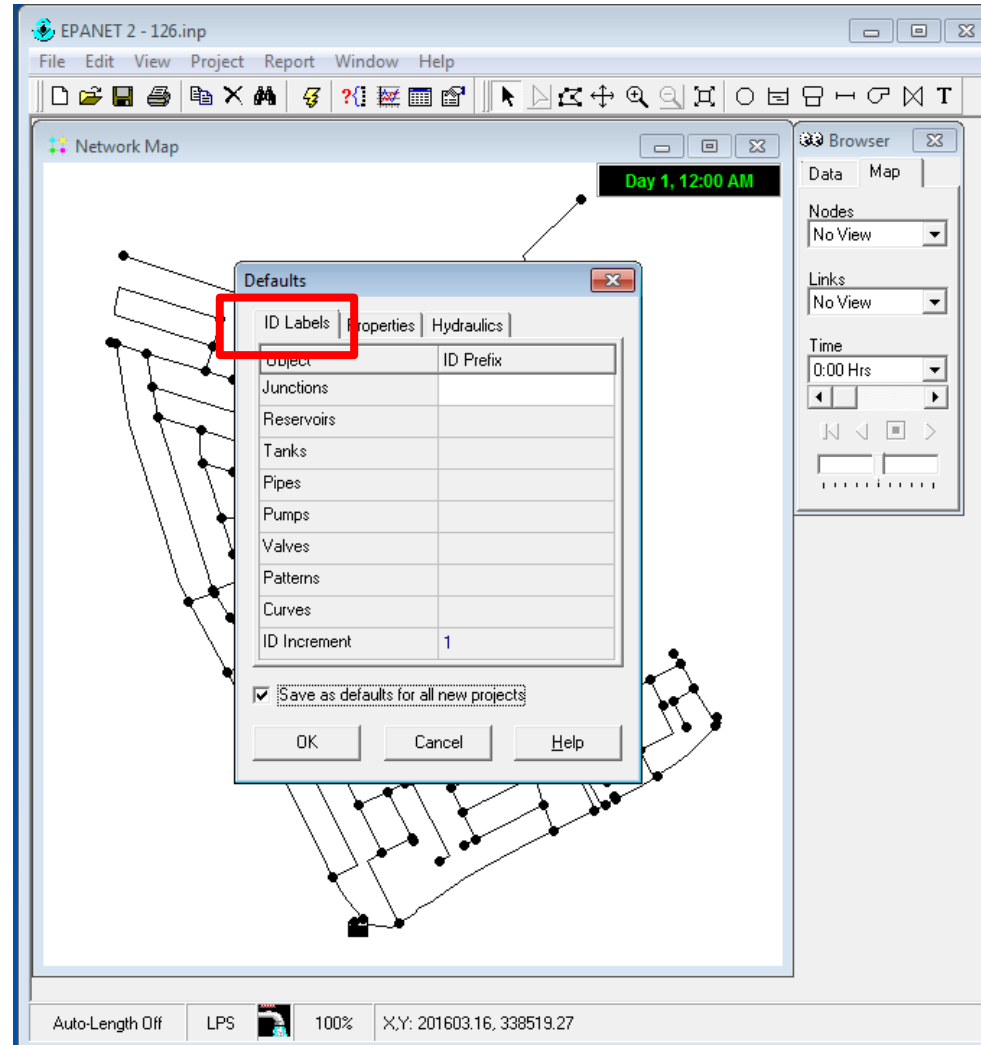
Defaults

- Set the defaults



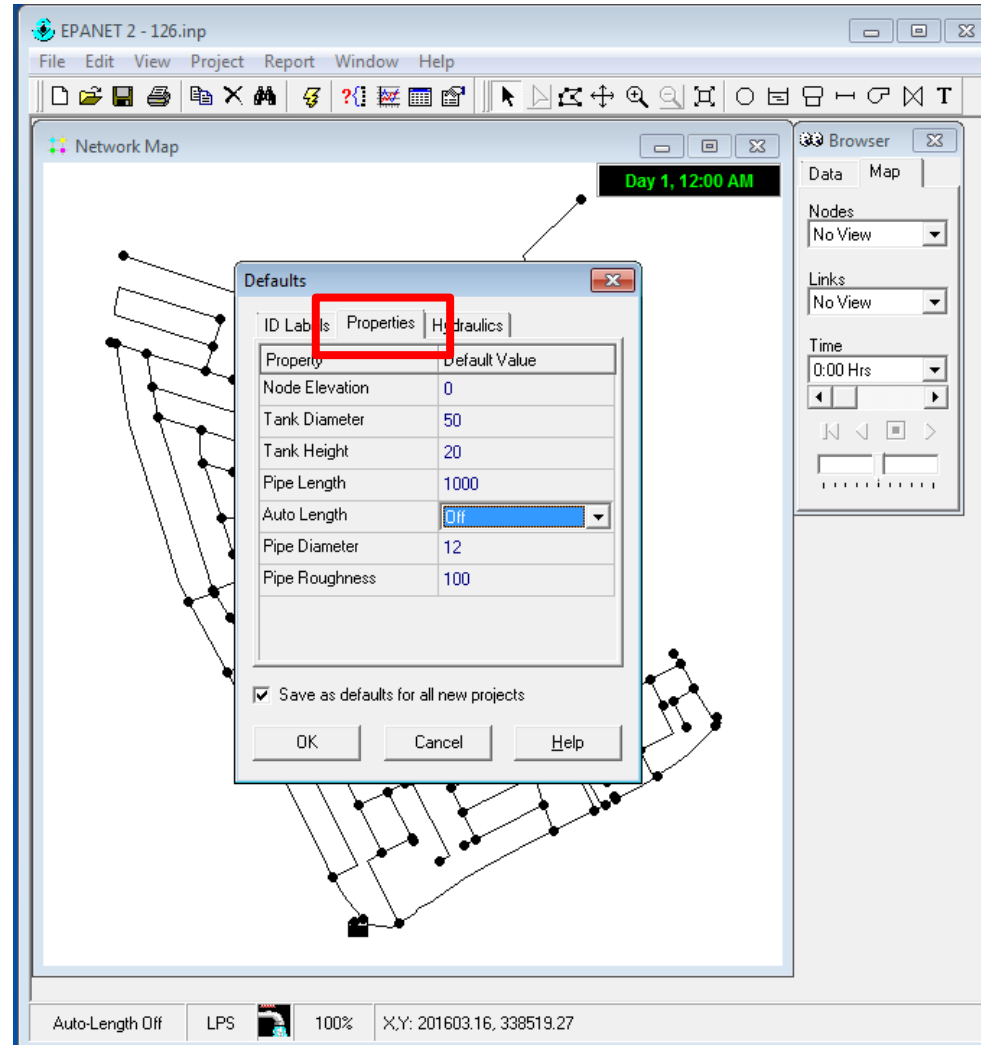
Defaults (cont.)

- Set the defaults



Defaults (cont.)

- Set default values
 - Auto length
- [ON]



Defaults (cont.)

- Litres per second (LPS)

Flow: liters/second

Pressure: column meters of water

Diameter: millimeters

Length: meters

Elevation: meters

Dimensions: meters

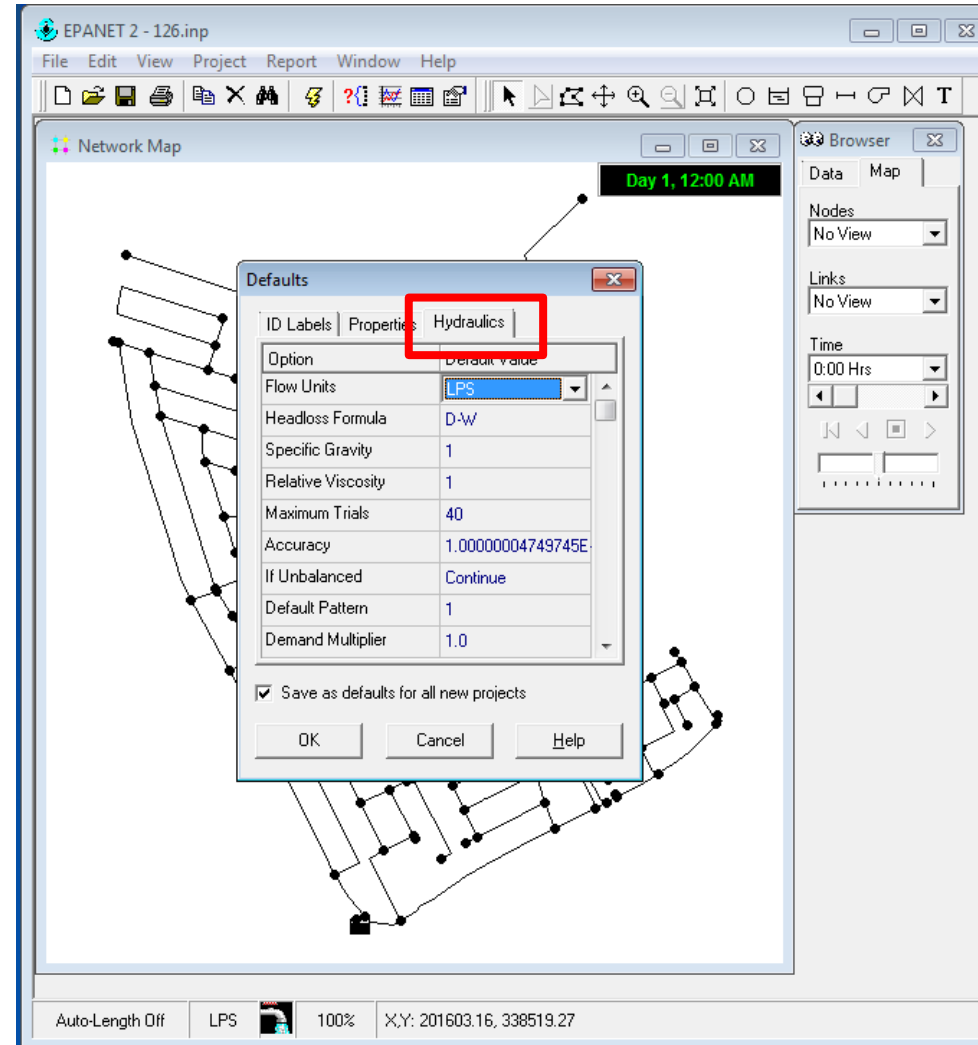
- Headloss Formula

D-W

H-W

C-M

- Increase maximum trials or increase accuracy if problem in convergence



Hydraulics



Defaults

ID Labels Properties Hydraulics

Option	Default Value
Flow Units	LPS
Headloss Formula	D-W
Specific Gravity	1
Relative Viscosity	1
Maximum Trials	50
Accuracy	0.01
If Unbalanced	Continue
Default Pattern	1
Demand Multiplier	1

Save as defaults for all new projects

OK Cancel Help

EPANET 2 - 126.inp

File Edit View Project Report Window Help

Network Map

Day 1, 12:00 AM

Hydraulics Options

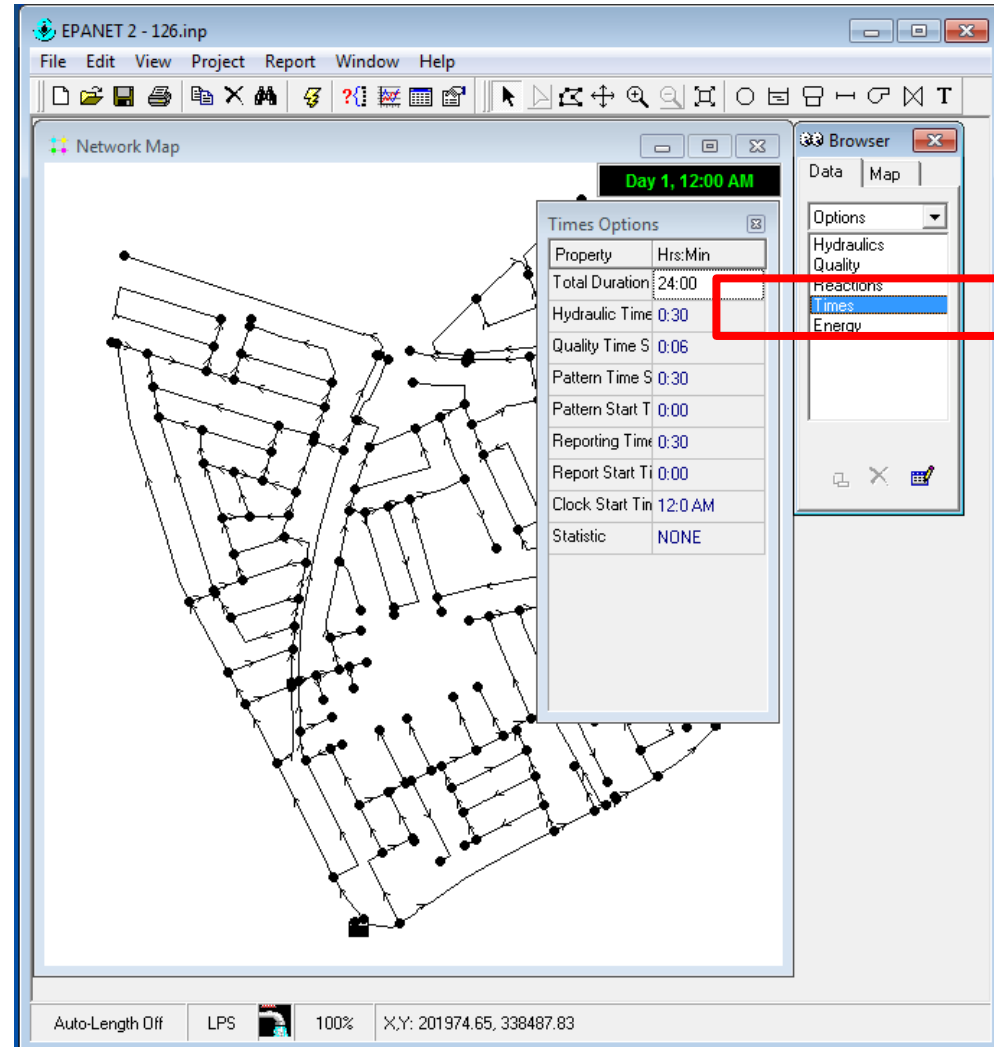
Property	Value
Flow Units	LPS
Headloss Form	D-W
Specific Gravit	1
Relative Visco	1
Maximum Trial	40
Accuracy	1.00000004
If Unbalanced	Continue
Default Pattern	1
Demand Multipl	1.0
Emitter Expon	0.5
Status Report	Full
CHECKFREQ	2
MAXCHECK	10
DAMPLIMIT	0

Options
Hydraulics
Reactions
Times
Energy

Auto-Length Off LPS 100% X,Y: 201974.65, 338487.83

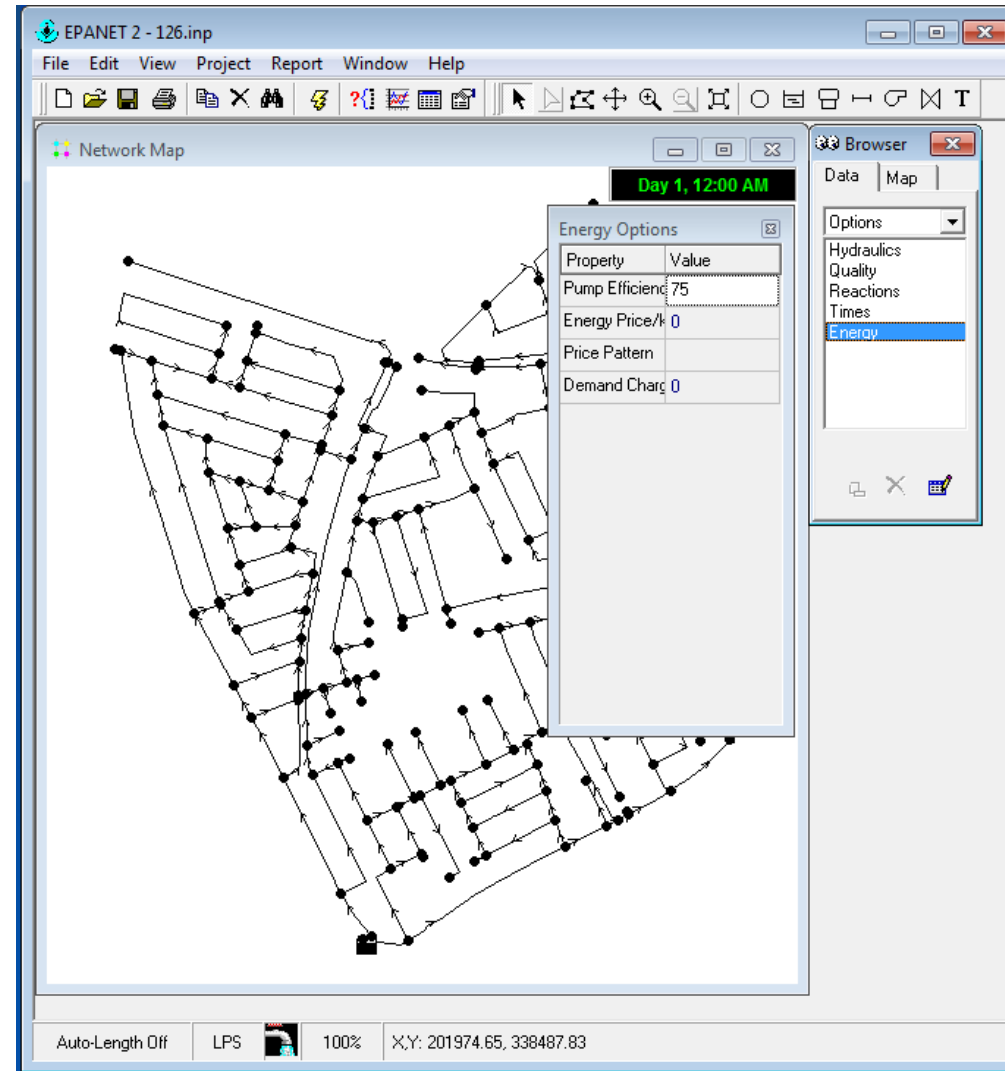
Times

- Times Attributes
- Simulation time
- Hydraulic step
- Quality step
- Pattern step



Energy

- Energy Attributes
- Efficiency
- Cost
- Price pattern



Quality - Reactions



- Numerical method to simulate how substances propagate and react (decay/grow) in the network
 - Chlorine
 - Water age
 - Trihalomethanes (THMs)
- Reactions occur within the bulk water and at the pipe walls

The screenshot displays two side-by-side software windows. The left window is titled 'Quality Options' and contains a table with the following data:

Property	Value
Parameter	Chlorine
Mass Units	mg/L
Relative Diffusivity	1.0
Trace Node	
Quality Tolerance	0.01

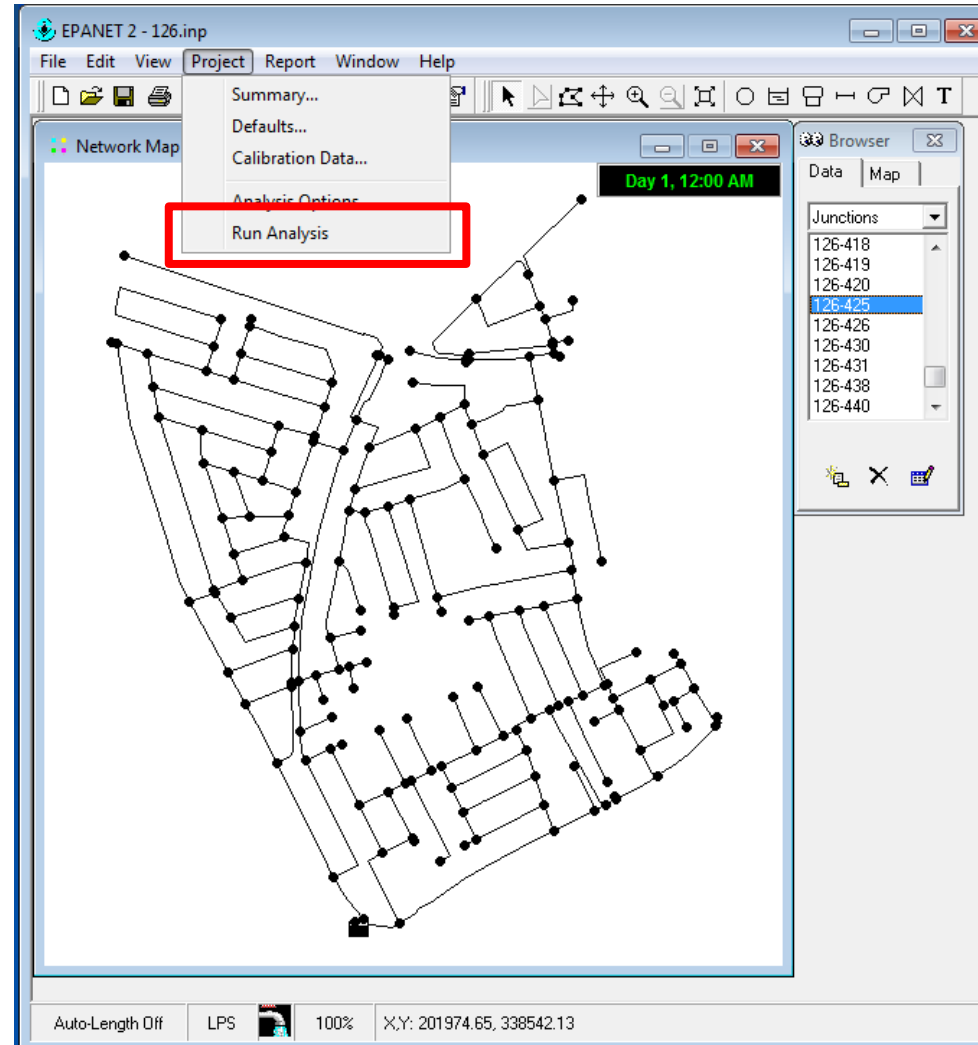
Below this table is a vertical 'Options' menu with 'Quality' selected. The right window is titled 'Reactions Options' and contains a table with the following data:

Property	Value
Bulk Reaction Order	1
Wall Reaction Order	First
Global Bulk Coeff.	-5
Global Wall Coeff.	-1
Limiting Concentration	0.0
Wall Coeff. Correlation	0.0

Below this table is a vertical 'Options' menu with 'Reactions' selected.

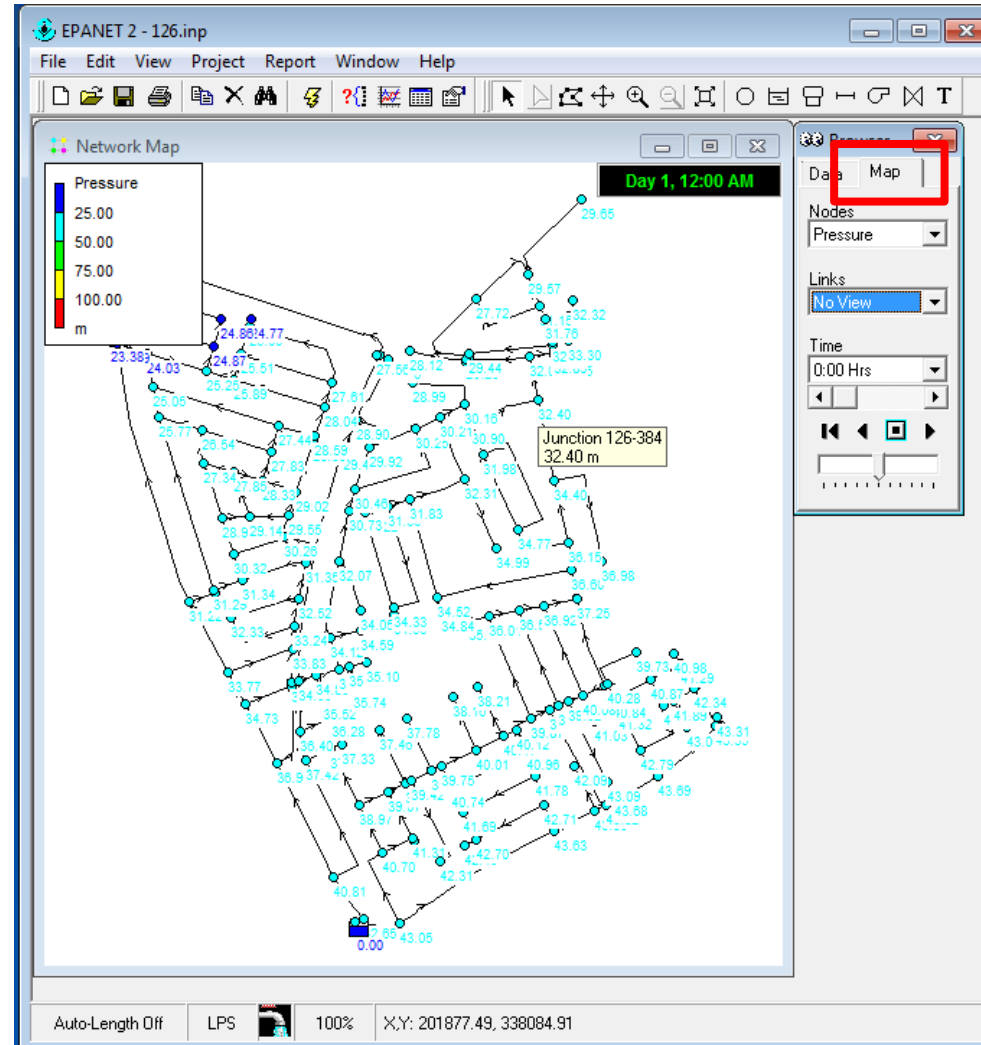
Run Analysis

- Run simulation



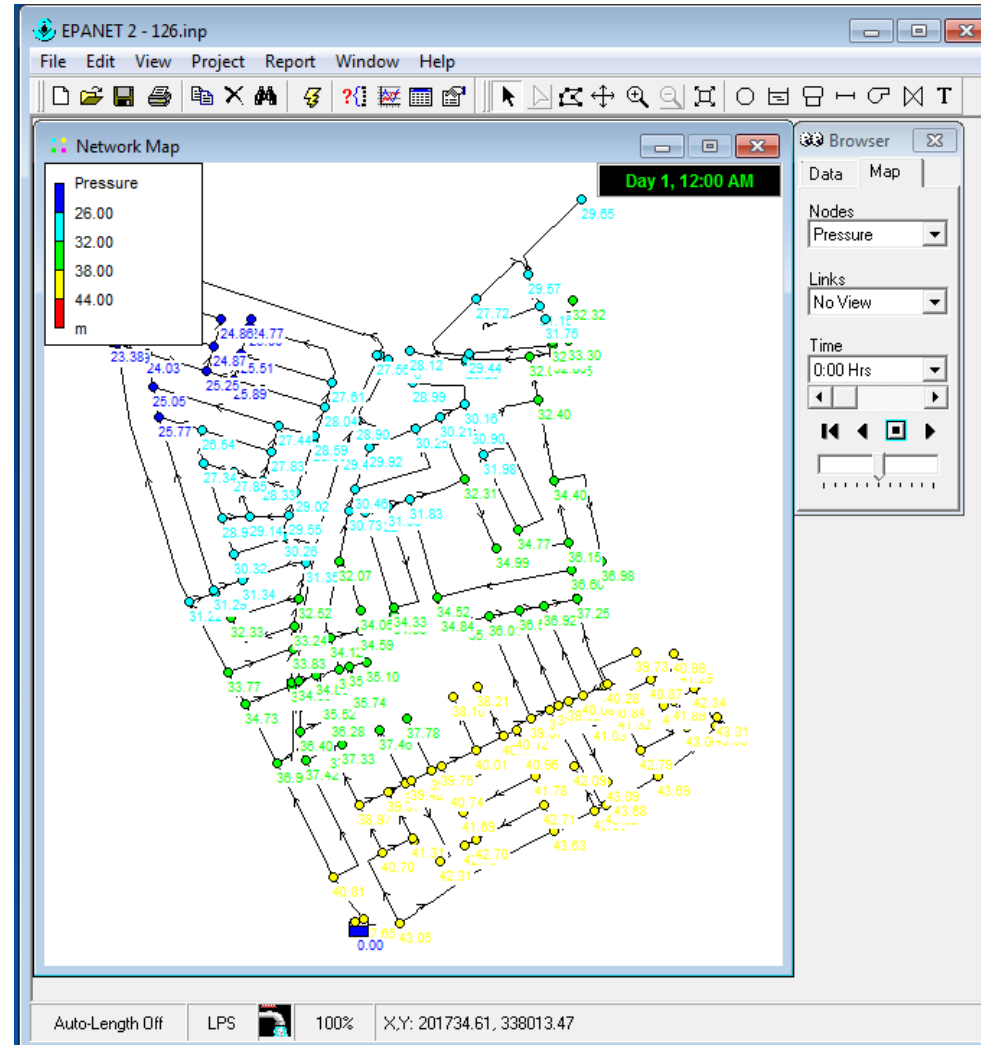
Run Analysis (cont.)

- Legend with automatic colors
- View results by hovering at a node / link



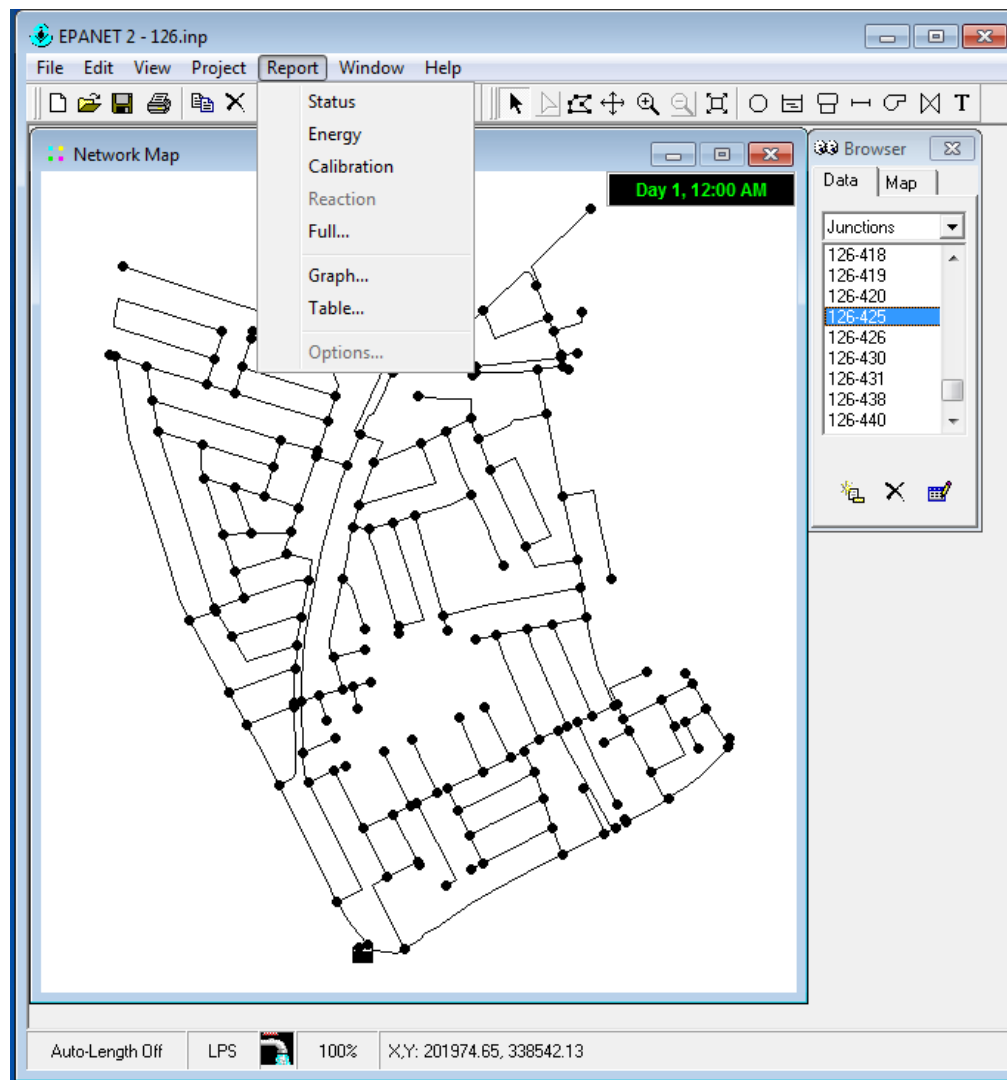
Run Analysis (cont.)

- Updated legend colors



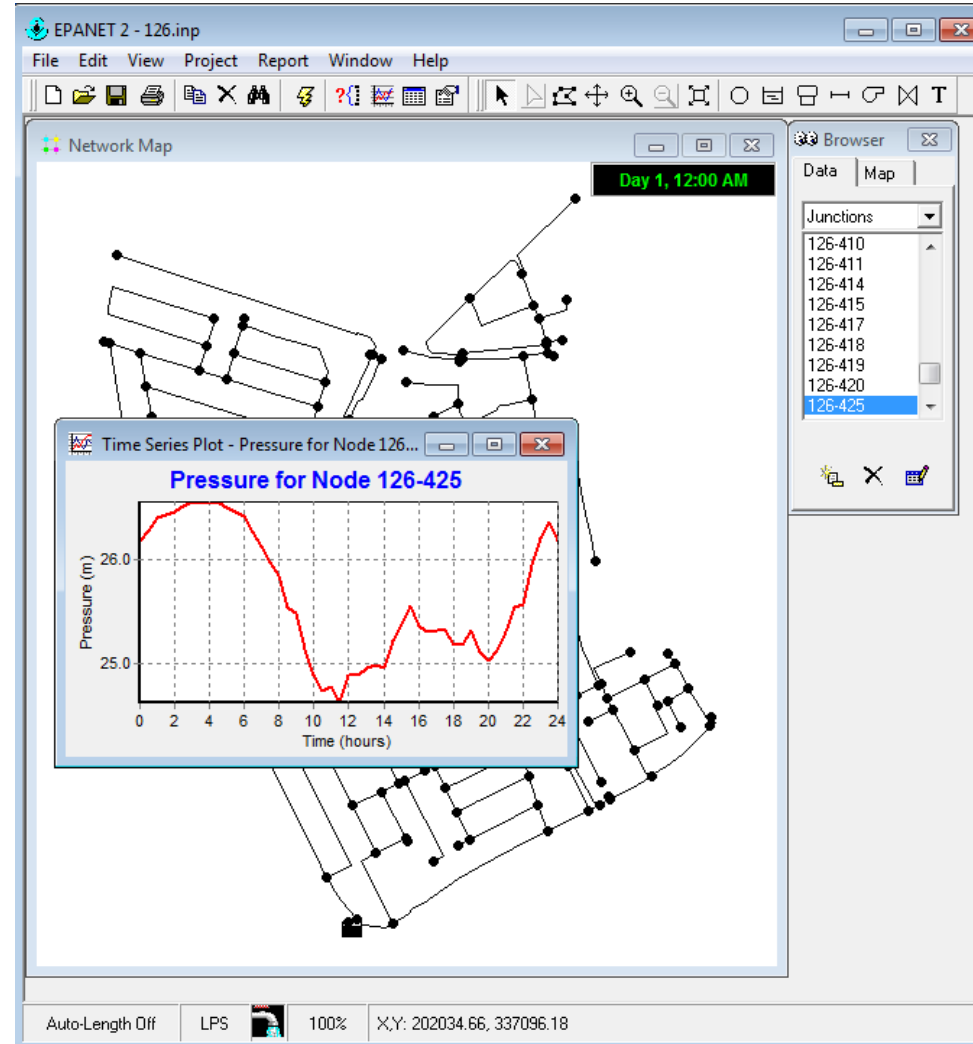
Results

- Simulation results
- Table of results
- Graphs
- Export results in files



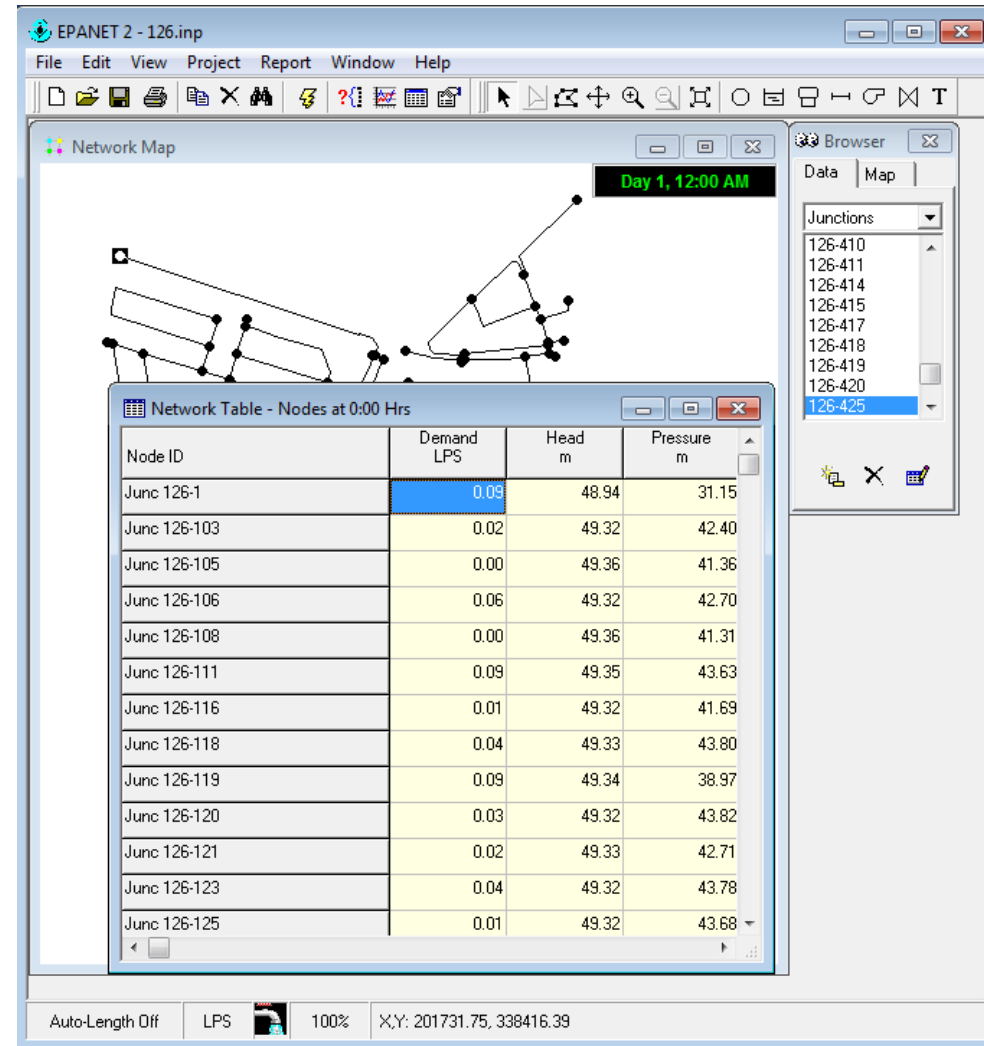
Results

- View simulated time-series results



Results

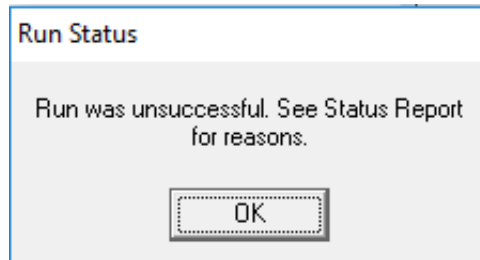
- View results in table form



The screenshot displays the EPANET 2 software interface. The main window shows a network map with a time display of "Day 1, 12:00 AM". A "Network Table - Nodes at 0:00 Hrs" window is open, showing a table of node data. The table has four columns: Node ID, Demand LPS, Head m, and Pressure m. The first row, Junc 126-1, is highlighted in blue. To the right of the table is a "Browser" window showing a list of junctions, with "126-425" selected.

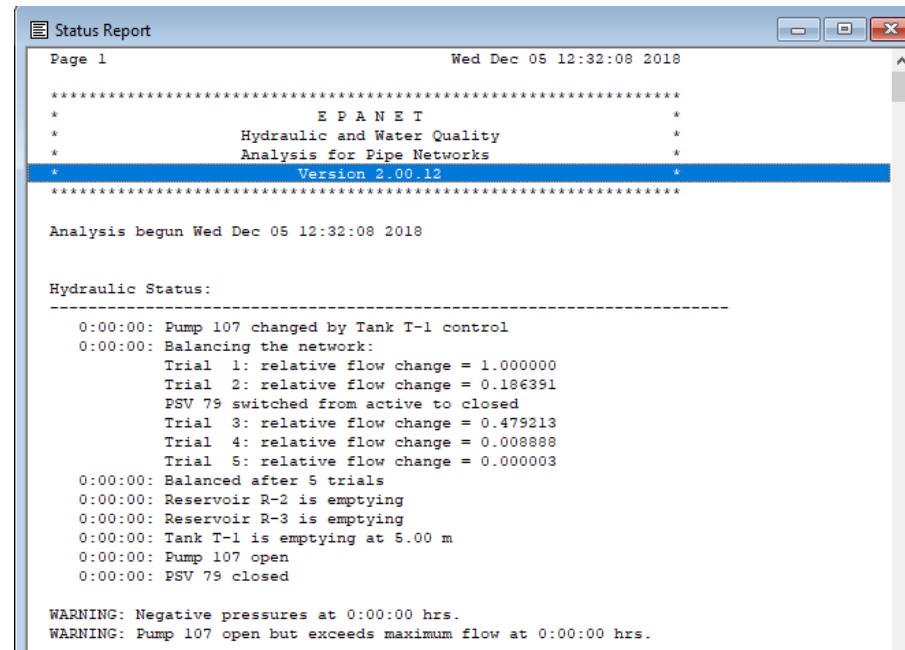
Node ID	Demand LPS	Head m	Pressure m
Junc 126-1	0.09	48.94	31.15
Junc 126-103	0.02	49.32	42.40
Junc 126-105	0.00	49.36	41.36
Junc 126-106	0.06	49.32	42.70
Junc 126-108	0.00	49.36	41.31
Junc 126-111	0.09	49.35	43.63
Junc 126-116	0.01	49.32	41.69
Junc 126-118	0.04	49.33	43.80
Junc 126-119	0.09	49.34	38.97
Junc 126-120	0.03	49.32	43.82
Junc 126-121	0.02	49.33	42.71
Junc 126-123	0.04	49.32	43.78
Junc 126-125	0.01	49.32	43.68

Type of Errors/Warnings



Hydraulic Status:

```
-----  
0:00:00: Pump 107 changed by Tank T-1 control  
0:00:00: Balancing the network:  
0:00:00: System ill-conditioned at node 1  
0:00:00: Reservoir R-2 is closed  
0:00:00: Reservoir R-3 is closed  
0:00:00: Tank T-1 is closed at 5.00 m  
0:00:00: Pump 107 open
```





A6_Water Network Design

Exercise A6.1_Drawing Elements



Steps:

1. Set Defaults

- ID Labels: Set ID increment to 1
- Properties: Choose default values for some properties
- Hydraulics: Choose Flow Units and Headloss formula

2. Display options

- View – Options

3. Draw the network

- First import nodes (reservoir, junctions, tank)
- Draw links (pipes, valves, pumps)

4. Set object properties

5. Add patterns, controls and curves

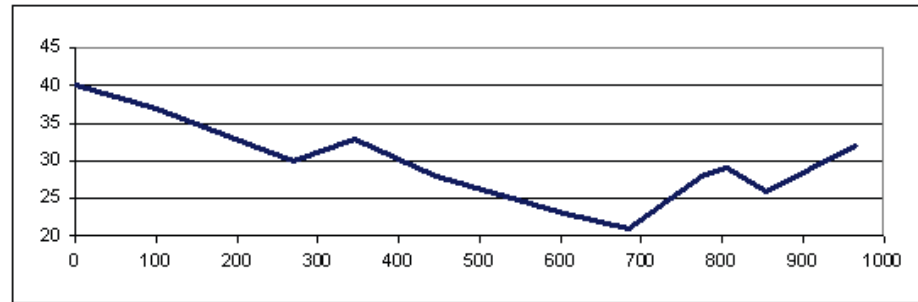
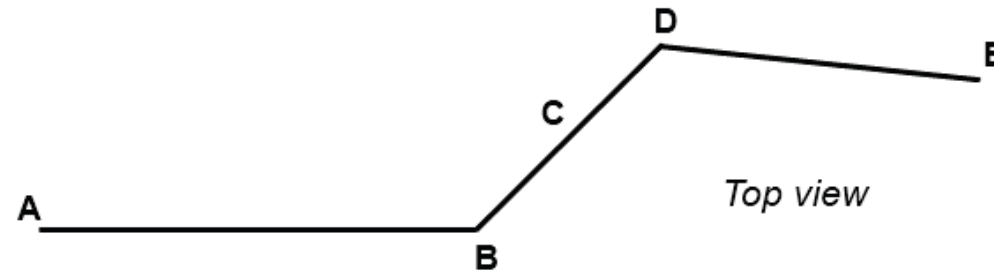
6. Set time options

7. Run analysis

Exercise A6.1_Drawing Elements (cont.)



A. Design the following gravity system in galvanized iron knowing that at point E consumption is 5 l/s and that A is a comparatively infinite source of water. Diameter of the pipeline is 125 mm and pipe roughness is 120 (H-W) [Set these values as default].

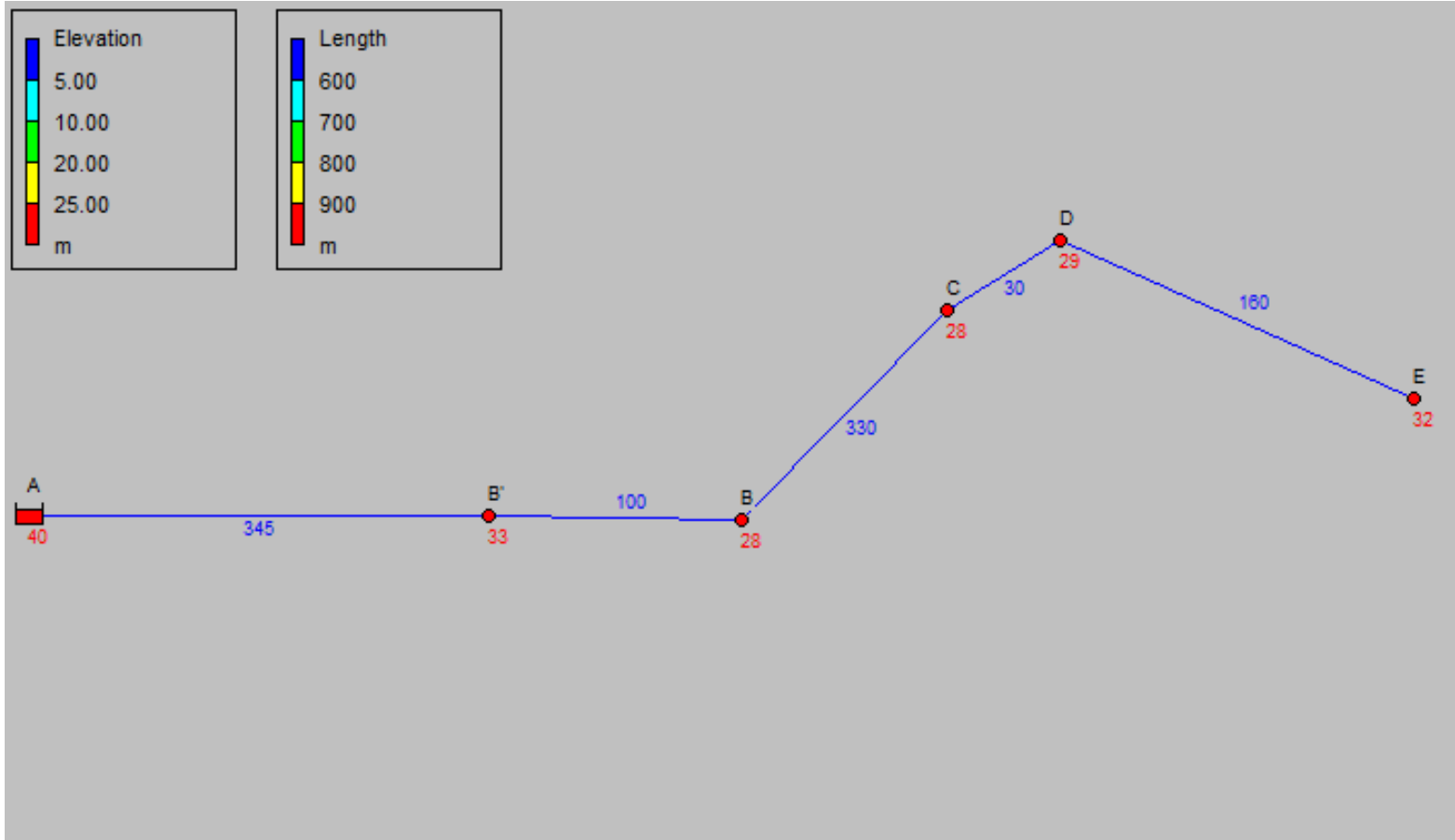


Elevation	40	37	32	30	33	28	23	21	28	29	26	32
Length	0	100	220	50	75	100	160	80	90	30	50	110
Chainage	0	100	220	270	345	445	605	685	775	805	855	965
	A				B				C	D		E

Exercise A6.1_Drawing Elements (cont.)

- Hints:
1. First import the nodes and afterwards the pipes.
 2. Always place a node in the intermediate highest points (i.e. Node B' at 345m from A).

By placing an extra node in high points you will be able to verify that the pressure is sufficient.

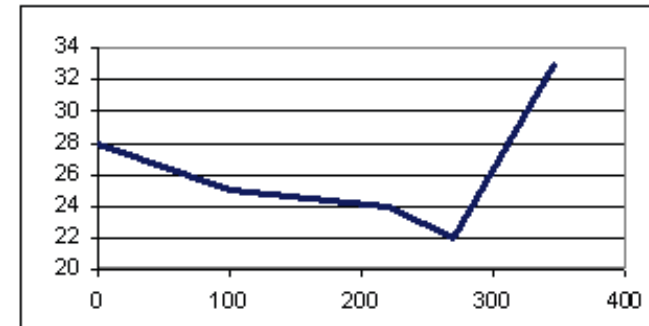
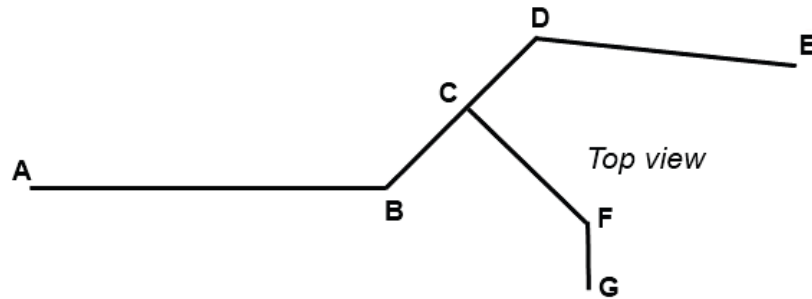


Exercise A6.1_Drawing Elements (cont.)



B. A branch line must be added to the design, to supply a second town, point G, with 7 l/s. Modify the design according to the new data.

Redesign some pipes in order to have pressure above 5 m in nodes E, G and B' and above / close to 10 m to the rest of the nodes. For the new members, Diameter is 150 mm and pipe roughness is 120 (H-W).



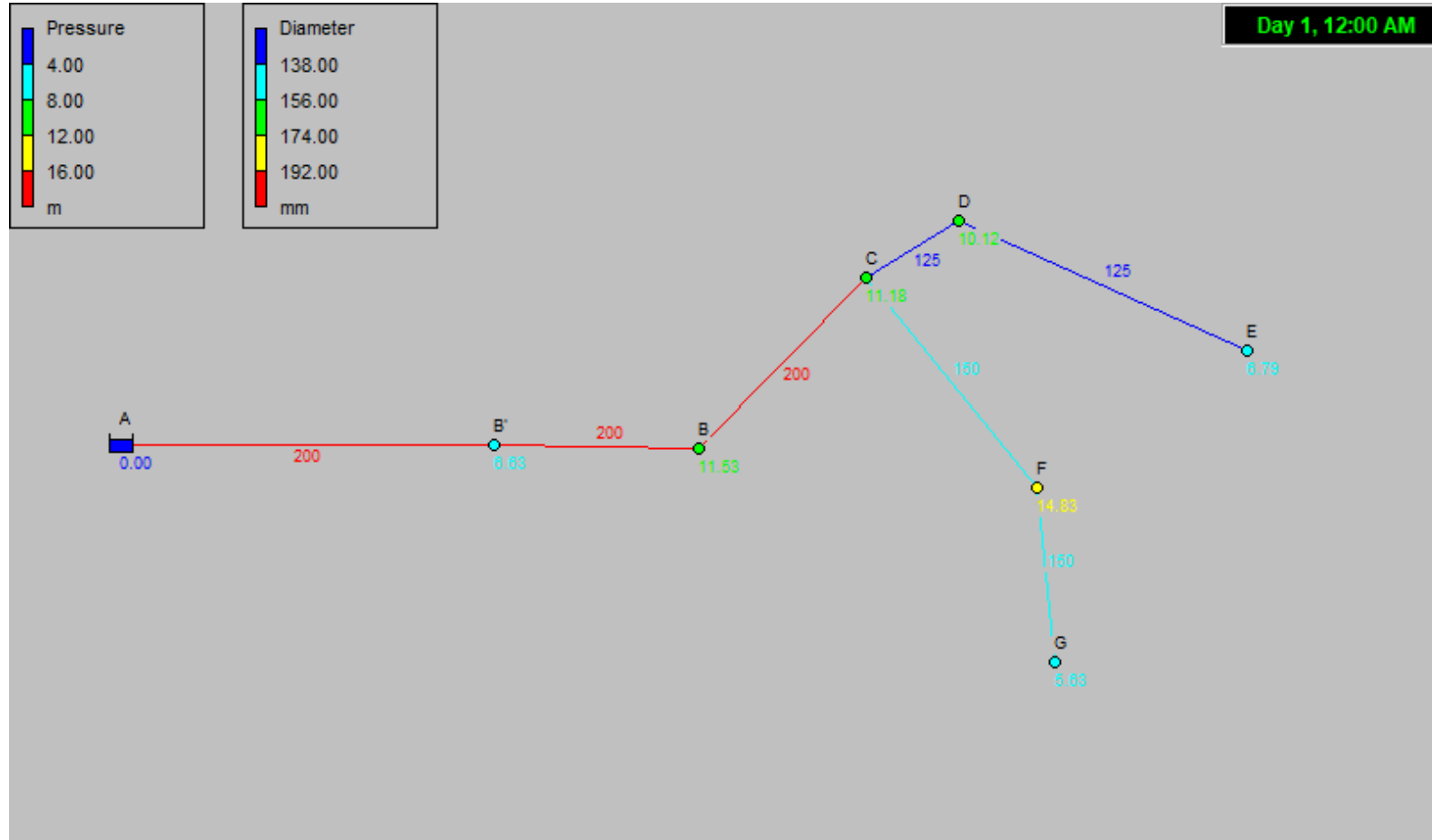
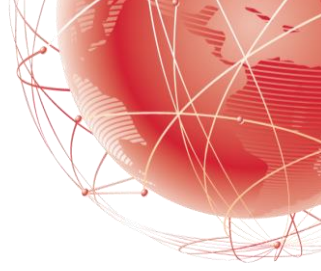
Elevation	28	25	24	22	33
Length	0	100	120	50	75
Chainage	0	100	220	270	345

C

F

G

Exercise A6.1_Drawing Elements (cont.)



Exercise A6.1_Drawing Elements (cont.)

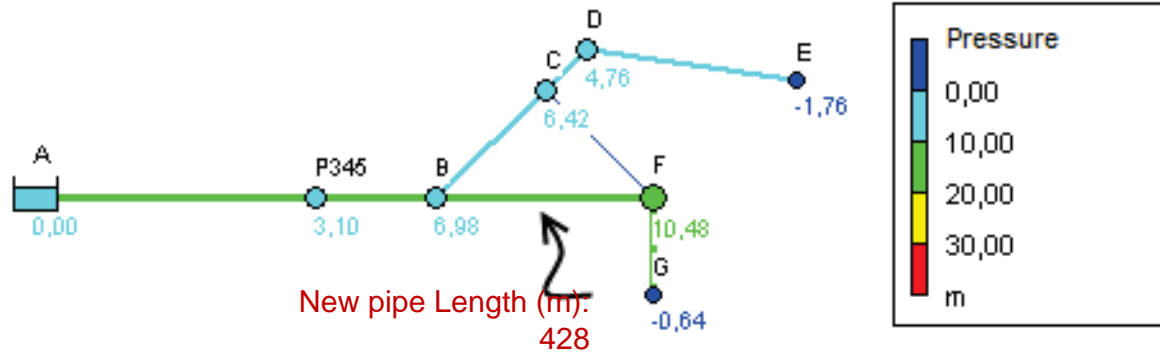


C. Load the demand pattern and run a 72 hr. simulation.

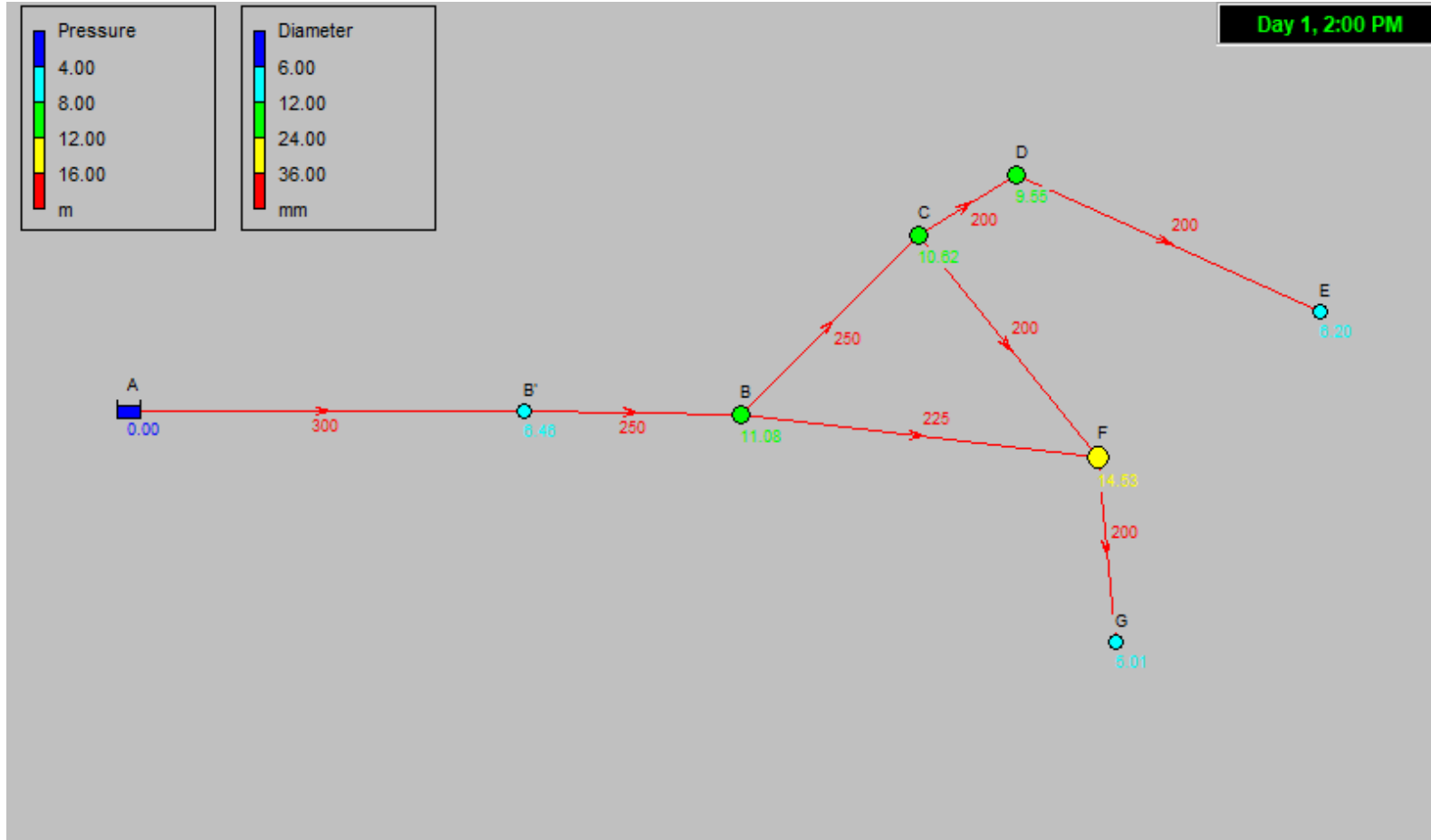
Is there any change? Is there any negative pressure (if yes, at which time step?)

Optimize network (change diameters and / or add new pipes).

Property	Hrs:Min
Total Duration	72
Hydraulic Time Step	1:00
Quality Time Step	0:05
Pattern Time Step	1:00
Pattern Start Time	0:00
Reporting Time Step	1:00
Report Start Time	14:00
Clock Start Time	12 am
Characteristics	M...



Exercise A6.1_Drawing Elements (cont.)



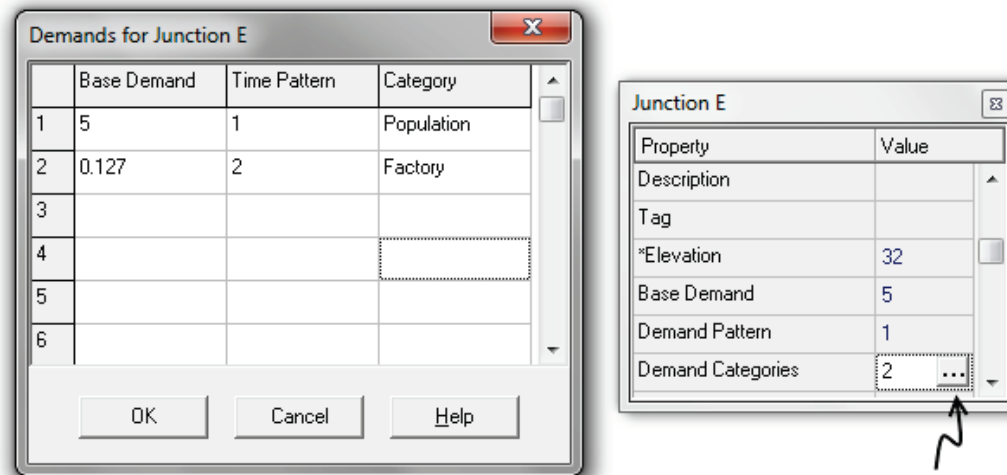
Exercise A6.1_Drawing Elements (cont.)

D. New factory at point E with a base demand of 0,127 l/s

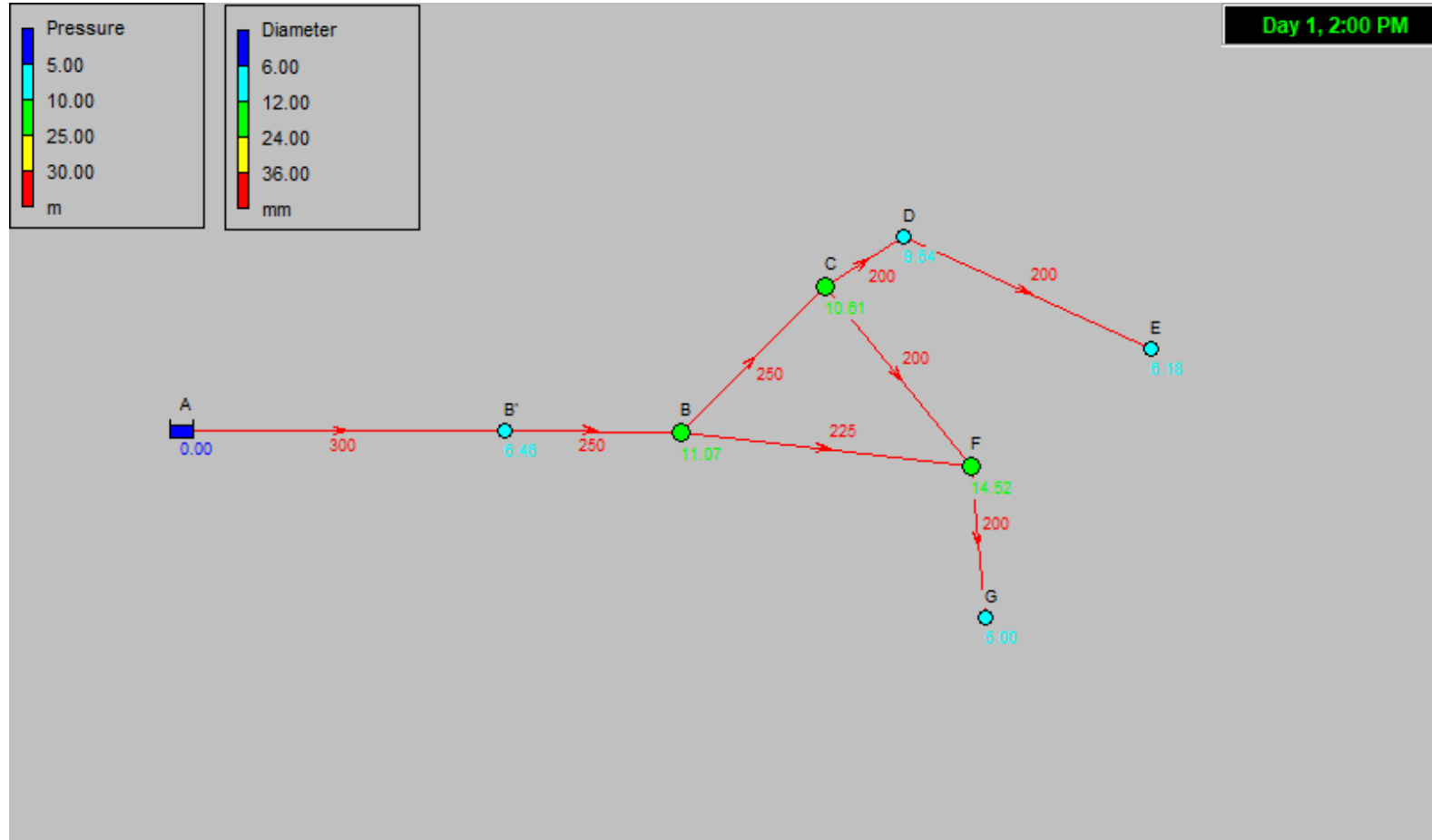
(Add the new factory demand pattern).

Is this factory affecting the system?

Is it necessary to enlarge the current system?



Exercise A6.1_Drawing Elements (cont.)





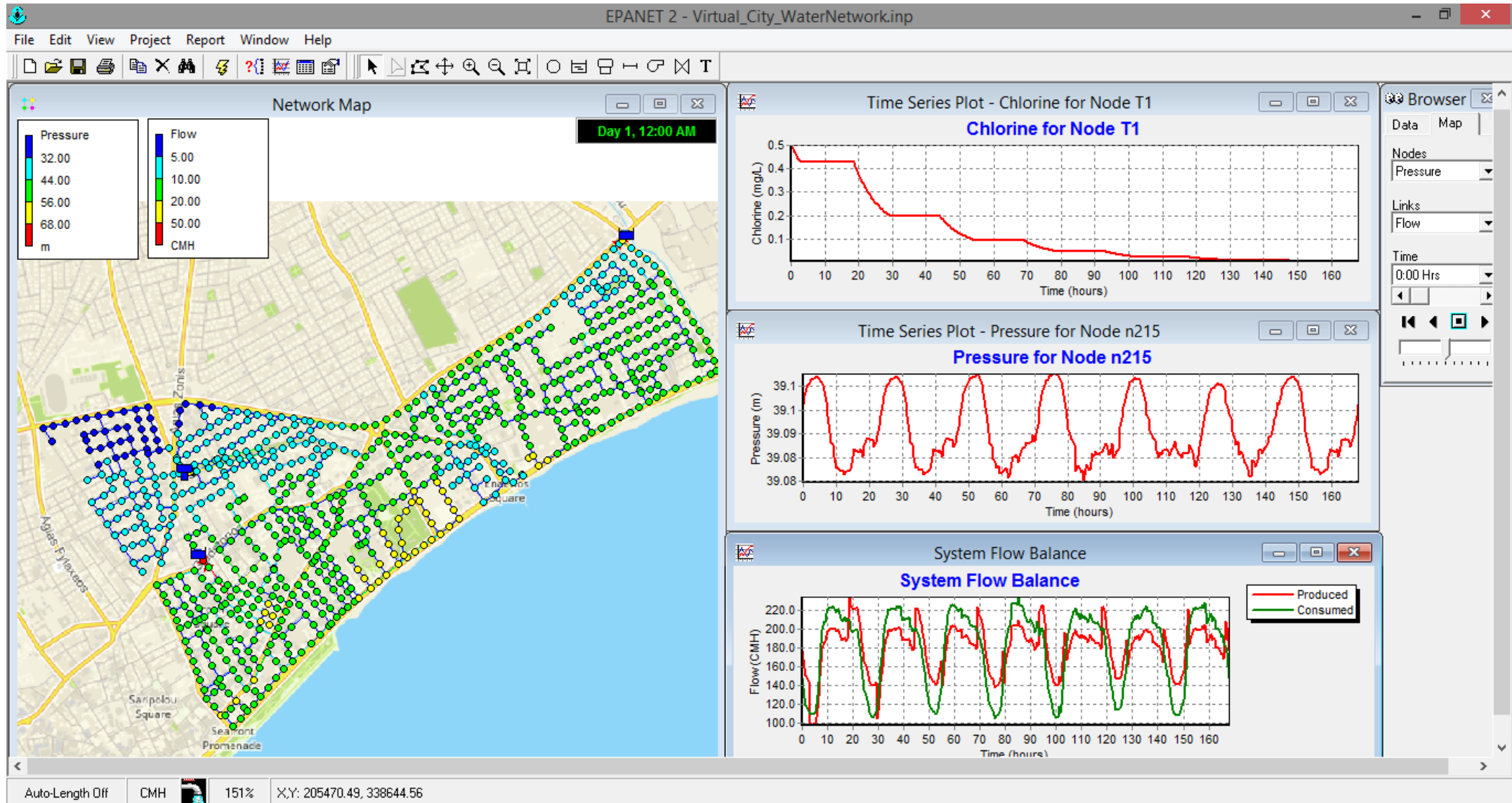
A7_EPANET EXTENDED SIMULATIONS

EPANET SCENARIOS

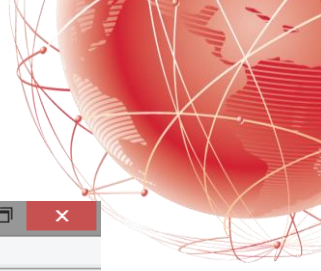


- Network analysis
 - Coordinates, Elevations, Demand Categories, Patterns
 - Tank, valve, pump, reservoir properties
 - Sub-DMAs: tank area, PRV area
 - Load map
- PRV - Active/Inactive - Pressure change
- Tank Capacity (closed pump)
- Pump control – Energy cost relationship
 - System flow graph
 - Energy cost table
- Chlorination scenario
 - Bulk coefficient: - 0.2378
 - Select reservoir/tank – Set Initial Quality (Concentration)
- Contamination scenario
 - Select node – Set Source Quality/Setpoint Booster

EPANET Graphs



EPANET Tables



EPANET 2 - Virtual_City_WaterNetwork.net

File Edit View Project Report Window Help

Network Map Day 1, 1:00 PM

Demand: 0.00, 0.50, 1.50, 3.00, CMH
Flow: 5.00, 10.00, 20.00, 50.00, CMH

Network Table - Nodes at 0:00 Hrs

Node ID	Demand CMH	Head m	Pressure m	Chlorine mg/L
Junc n1	0.27	102.11	28.90	0.00
Junc n2	0.14	102.11	28.24	0.00
Junc n3	0.16	102.11	28.94	0.00
Junc n4	0.61	102.11	33.85	0.00
Junc n5	0.19	102.12	36.55	0.00
Junc n6	0.20	102.11	31.20	0.00
Junc n7	0.31	102.11	26.19	0.00
Junc n8	0.25	102.12	37.63	0.00
Junc n9	0.33	102.11	32.85	0.00
Junc n10	0.07	102.11	27.77	0.00

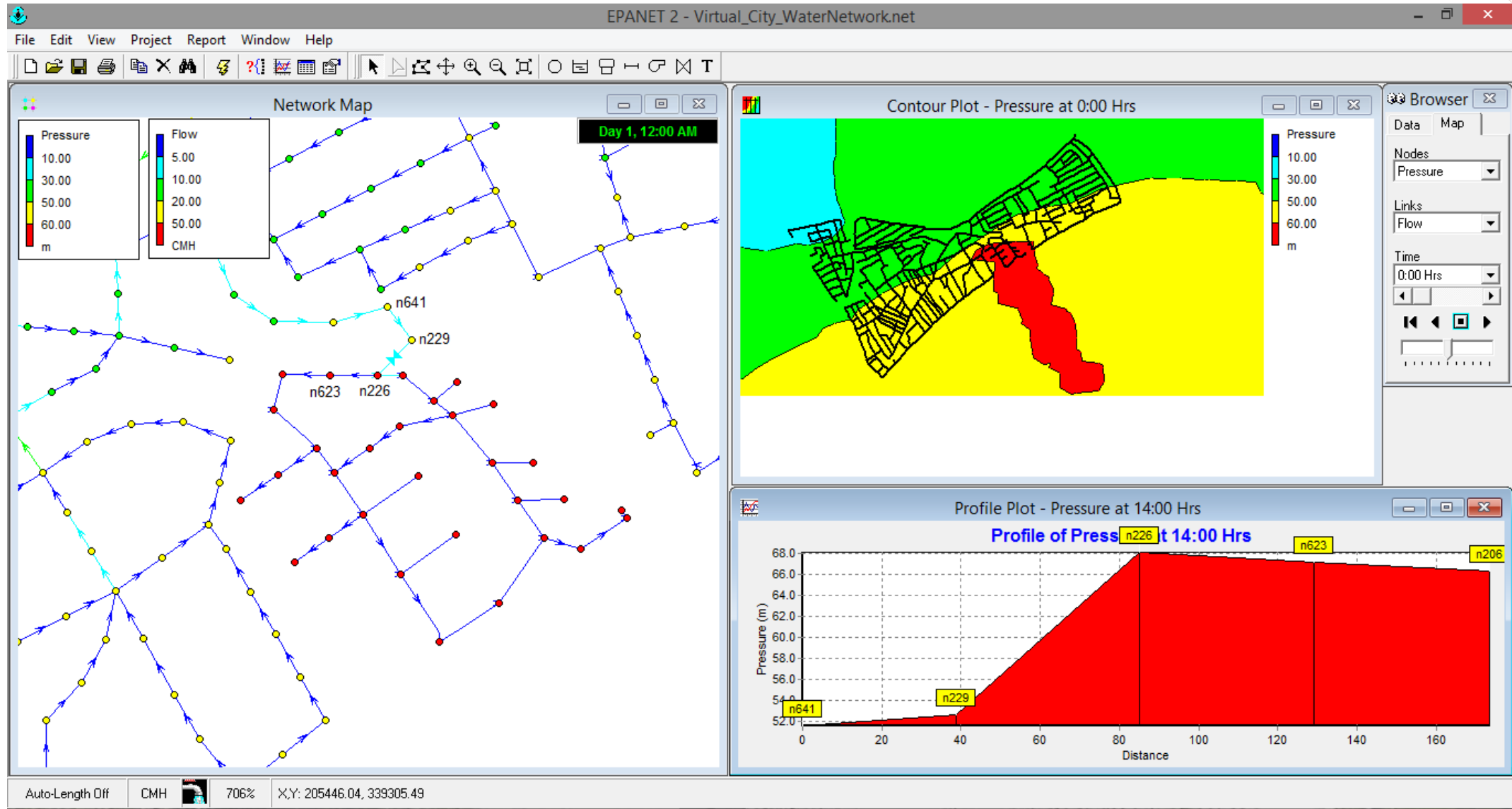
Network Table - Links at 0:00 Hrs

Link ID	Flow CMH	Velocity m/s	Unit Headloss m/km	Chlorine mg/L	Status
Pipe p1	-9.89	0.09	0.05	0.00	Open
Pipe p2	15.69	0.25	0.66	0.00	Open
Pipe p3	-17.22	0.15	0.14	0.00	Open
Pipe p4	-0.29	0.01	0.00	0.00	Open
Pipe p5	0.11	0.00	0.00	0.00	Open
Pipe p6	0.16	0.01	0.00	0.00	Open
Pipe p7	0.94	0.03	0.02	0.00	Open
Pipe p8	-0.25	0.01	0.00	0.00	Open

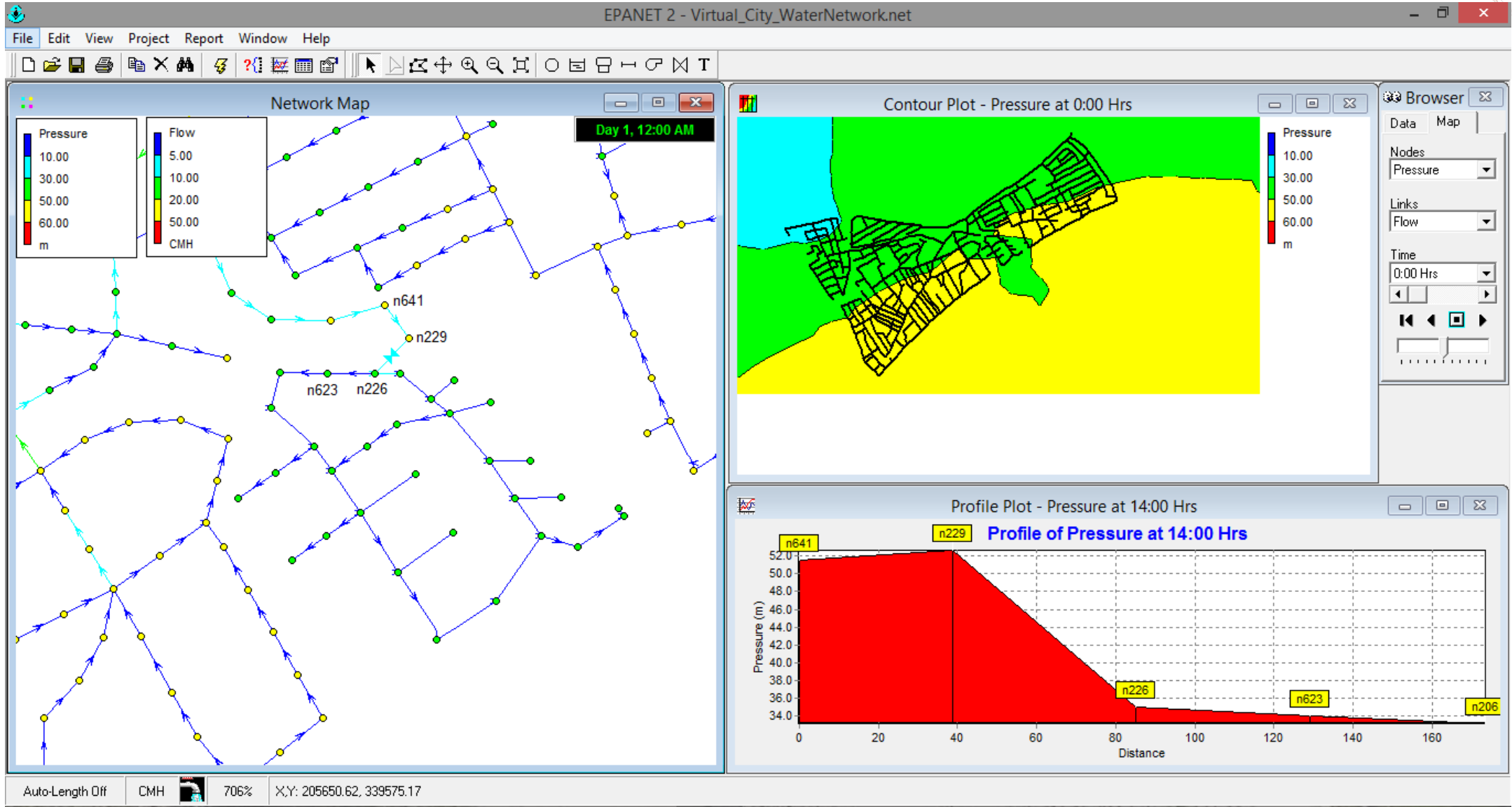
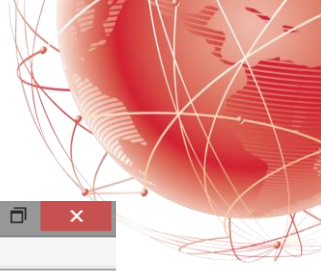
Browser: Data Map
Nodes: Demand
Links: Flow
Time: 13:00 Hrs

Auto-Length Off CMH 384% X,Y: 203898.77, 338794.53

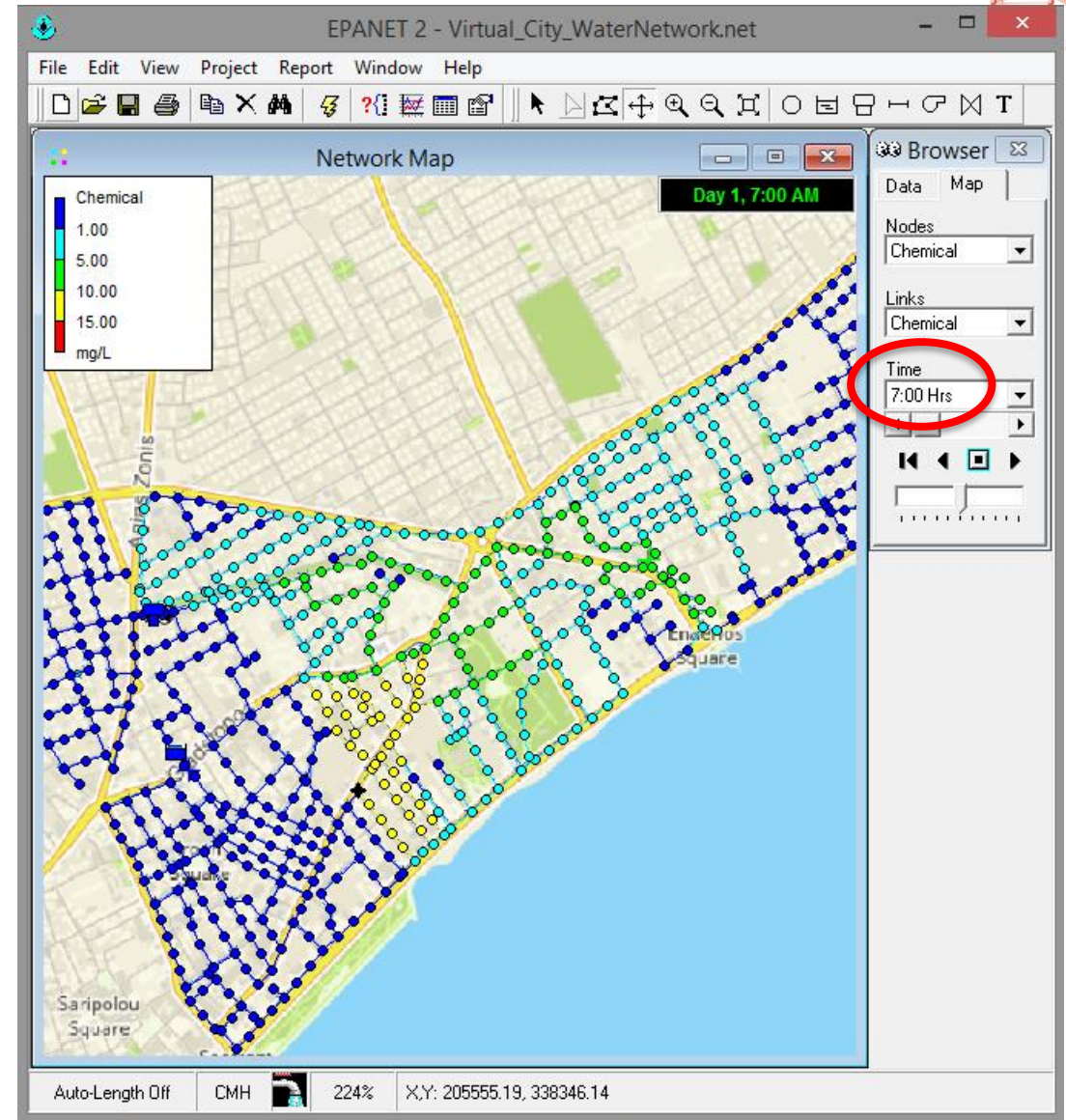
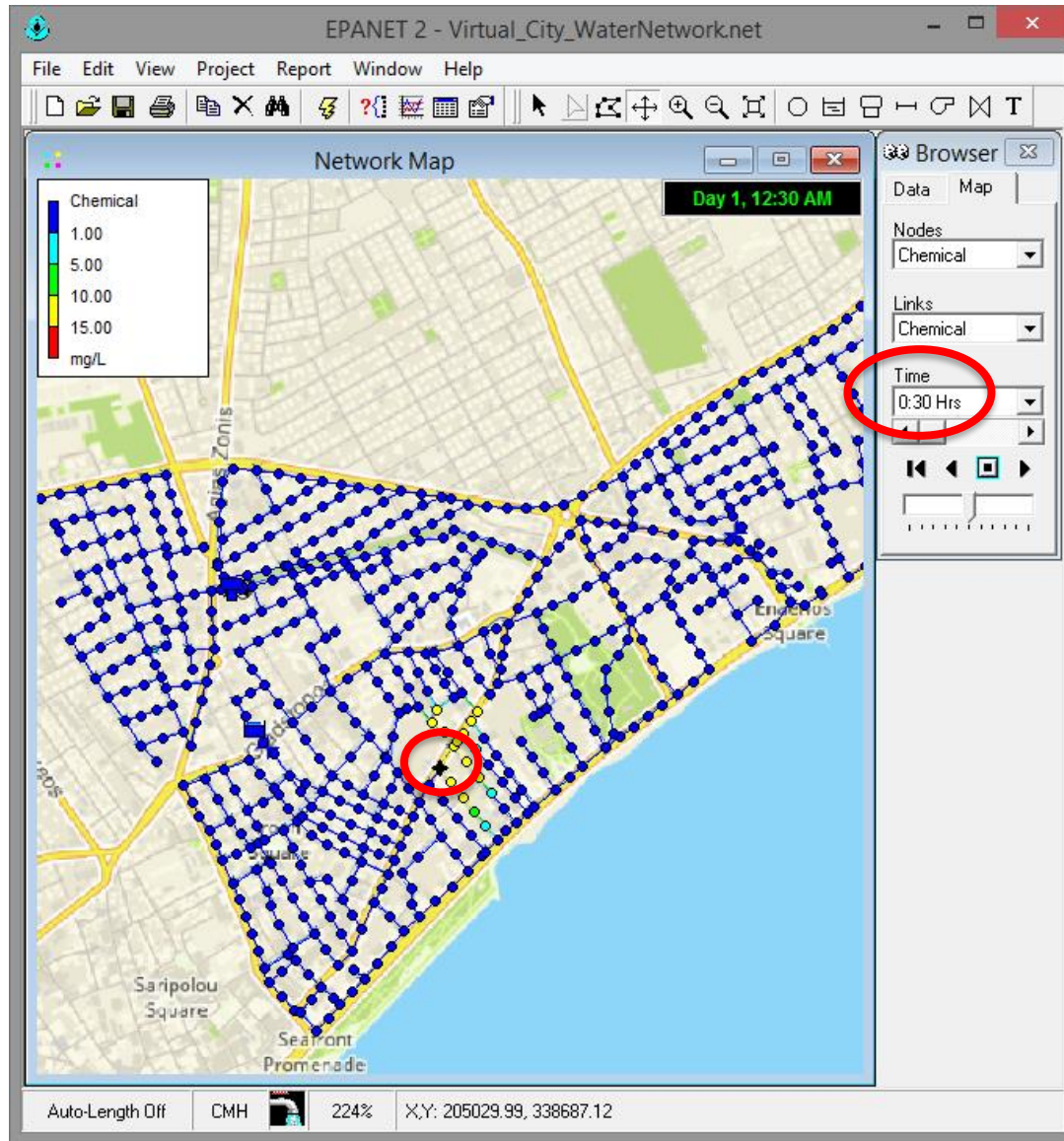
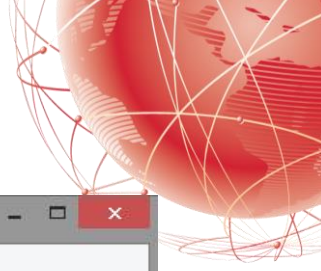
PRV Inactive – Pressure Profile



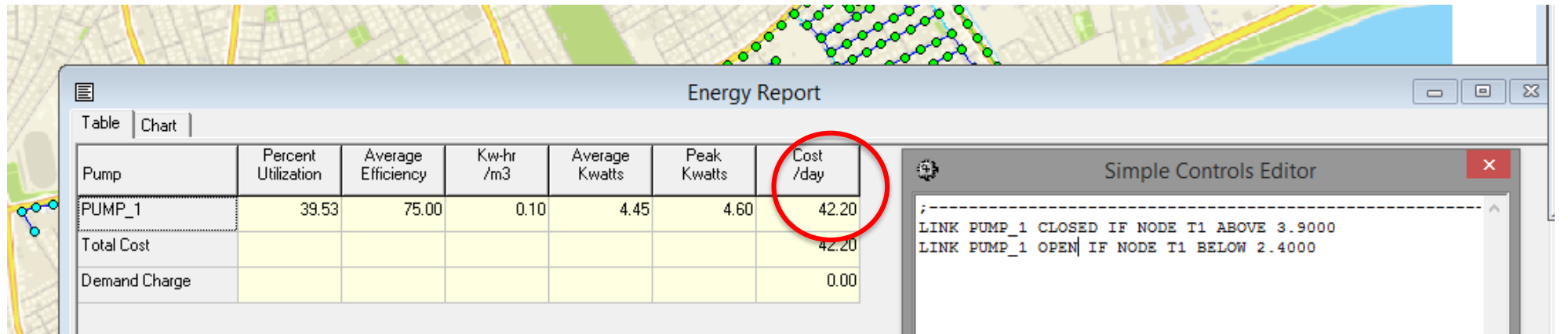
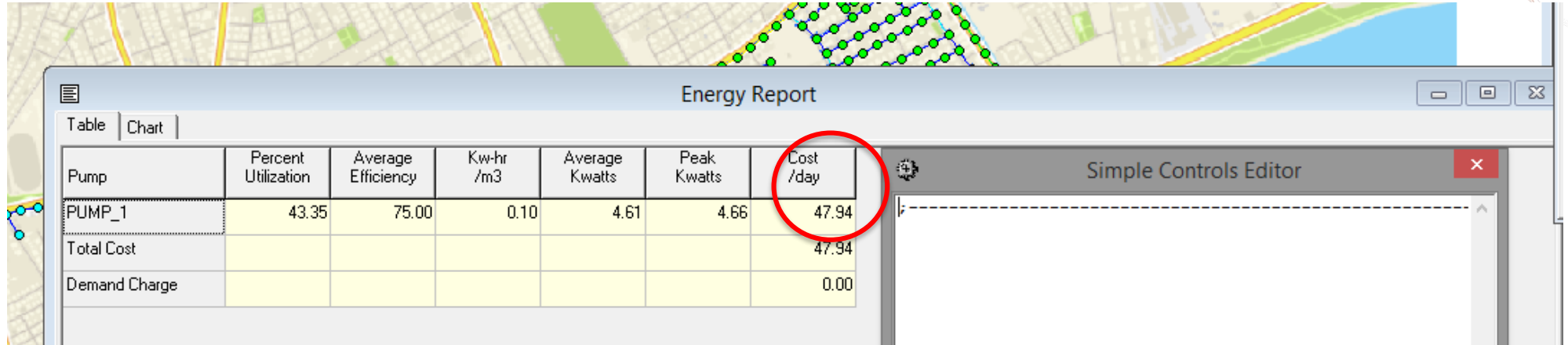
PRV Active – Pressure Profile



Chemical Spread



Pump Controls – Energy Cost



Acknowledgments



Research Projects

- **KIOS CoE**: Teaming for Excellence Project
- Interreg V-A Greece-Cyprus, **SmartWater2020**
- CyRPF Enterprises, **WaterAnalytics**
- ERC Advanced Grant, **Fault-Adaptive**
- ERC Proof-of-Concept, **SmartTap**
- 7th Framework Program, **EFFINET**

Partners

- Water Board of Limassol
- Cyprus Water Development Department
- PHOEBE Research and Innovations Ltd



Introduction to EPANET

Pavlos Pavlou (M.Sc)
Research Engineer
KIOS Research and Innovation Center of Excellence
University of Cyprus

Thank
you

Monday 27/4/2020
10:00 – 12:00 a.m.

Ερωτηματολόγιο για Εκπαιδευτικό Σεμινάριο "Εισαγωγή στο ERANET" (27/4/2020)

16 Responses 05:12 Average time to complete Active Status

1. Σε πόσο βαθμό είστε ευχαριστημένοι από το Εργαστήριο "Εισαγωγή στο ERANET";

Promoters	10
Passives	6
Detractors	0



2. Θα μπορού να χρησιμοποιήσω τις γνώσεις αυτές στη δουλειά μου

Promoters	7
Passives	8
Detractors	1



3. Πόσο πιθανό είναι να συμμετάσχετε σε παρόμοια σεμινάρια του ΚΟΙΟΣ στο μέλλον;

Promoters	12
-----------	----

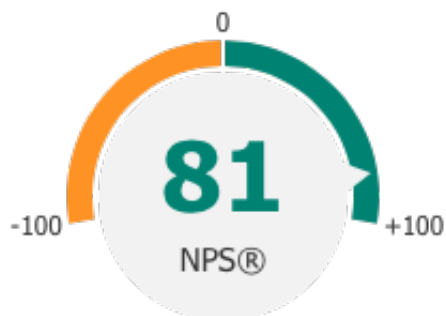


Passives	4
Detractors	0



4. Πόσο πιθανό είναι να εισηγηθείτε αυτά τα εργαστήρια σε κάποιο συνάδελφο;

Promoters	13
Passives	3
Detractors	0



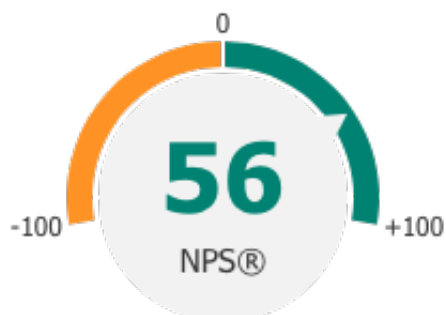
5. Πόσο ευχαριστημένοι είστε από την ποιότητα της παρουσίασης και του ομιλητή;

Promoters	13
Passives	3
Detractors	0



6. Η διάρκεια του σεμιναρίου ήταν κατάλληλη και επαρκής;

Promoters	9
Passives	7
Detractors	0



7. Πόσο ευχαριστημένοι είστε από τη χρήση του Zoom για διαδικτυακά εκπαιδευτικά σεμινάρια;

Επιχειρησιακά Σεμινάρια,

Promoters	12
Passives	3
Detractors	1



8. Τι σας άρεσε περισσότερο από την παρουσίαση;

6
Responses

Latest Responses

"Τα παραδείγματα που μας παρουσιάσατε ήταν πολύ ...
"ότι δόθηκαν παραδείγματα και τα διάφορα σενάρια."

9. Αν δεν σας άρεσε κάτι, τι ήταν αυτό;

3
Responses

Latest Responses

"Ήταν πολλά τα θέματα και λίγος ο χρόνος, ειδικά αν..."

10. Ποιά θέματα σχετικά με το EPANET ή άλλα παρεμφερή τεχνολογικά θέματα θα θέλατε να παρουσιάσουμε στο μέλλον;

3
Responses

Latest Responses

11. Πόσο συχνά θα θέλατε να διοργανώνουμε αυτά τα διαδικτυακά σεμινάρια;

6 φορές το χρόνο	1
4 φορές το χρόνο	3
3 φορές το χρόνο	10
2 φορές το χρόνο	3



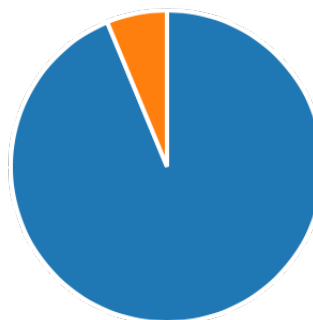


12. Έχετε κάποια άλλη εισήγηση για να βελτιώσουμε τα σεμινάρια;

5
Responses

Latest Responses

13. Επιθυμείτε να ενημερώνεστε για μελλοντικά σεμινάρια μέσω email;



14. Ονοματεπώνυμο

15
Responses

Latest Responses

"Σοφία Αριστάρχου"
"ΜΙΧΑΛΗΣ ΟΙΚΟΝΟΜΟΥ"
"Νταίζη Μπακ"

15. Οργανισμός

15
Responses

Latest Responses

"Τμήμα Αναπτύξεως Υδάτων"
"ΤΜΗΜΑ ΑΝΑΠΤΥΞΕΩΣ ΥΔΑΤΩΝ"
"Τμήμα Αναπτύξεως Υδάτων"

16. Email

Latest Responses

15
Responses

Latest responses

"saristarchou@wdd.moa.gov.cy"

"moikonomou@wdd.moa.gov.cy"

"dback@wdd.moa.gov.cy "

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Terms of use (<https://go.microsoft.com/fwlink/?linkid=866263>)