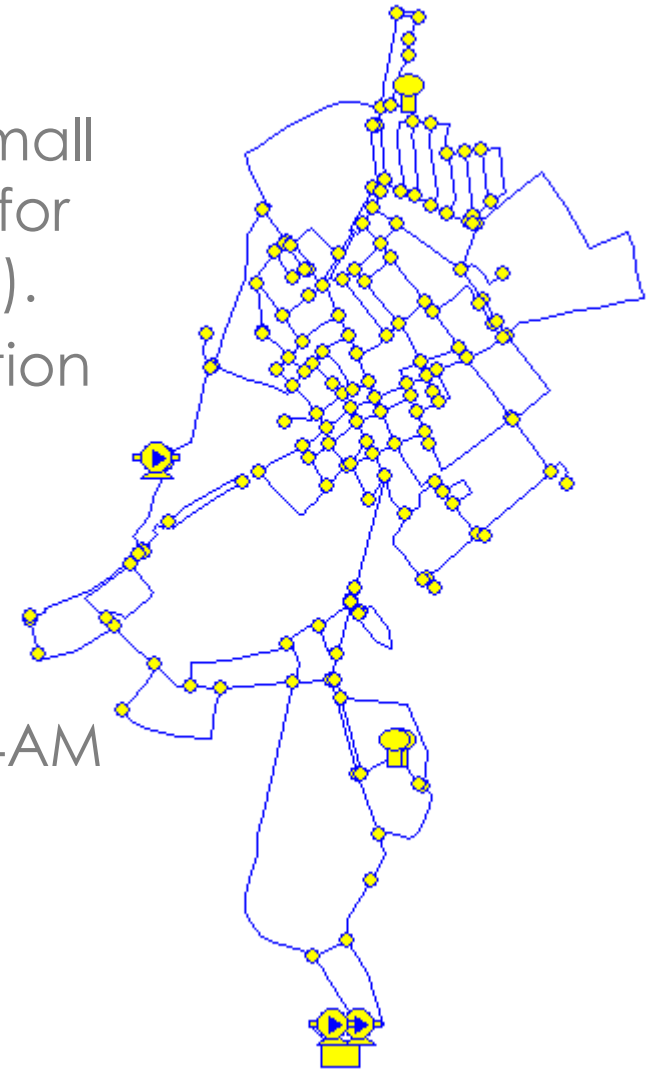


KYPIPE-WQSensor

Pipe2012 Tool for
Optimal Placement of Water Quality Sensors
for Small and Medium Water utilities

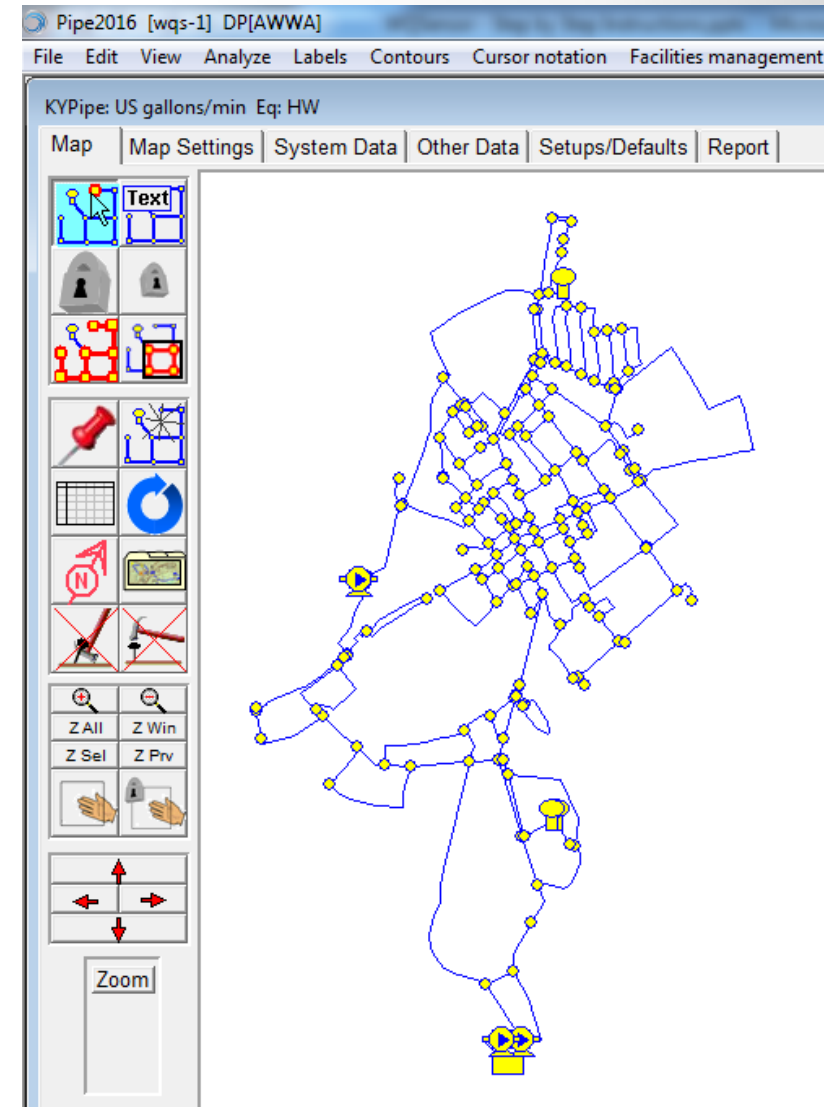
Optimal Water Quality Sensor Placement Tool

- Use of optimal water quality sensor placement tool is demonstrated on a small water distribution network model setup for extended period simulation (WQS-1.P2K).
- Network comprises one main pump station and a booster pump station and three elevated storage tanks.
- Mass injection rate of contaminant = 1000mg/min
- Duration of injection: 1 hour starting at 4AM
- Number of water quality sensors: 2



Optimal Water Quality Sensor Placement Tool

- Start Pipe2012 and open WQS-1.P2K model. This hydraulic network model was setup for extended period simulation (EPS) and was ensured to run without errors or serious warning messages.



Optimal Water Quality Sensor Placement Tool

- Press Shift-F7 key to launch optimal water quality sensor placement tool

The screenshot shows a software window titled "Optimal Sensor Placement Tool (CopyRight KYPIPE LLC 2012)". The window has a light blue title bar and a white main area. At the top, a text box displays the file path: "c:\d\source\epanet teva spot\stacey\p2k files\wqs-1.KYP\wqs-1". Below this, the interface is divided into several sections. On the left, there is a box for "Number of Sensors (max 5)" with a spin box set to "2" and a button labeled "Set/change default parameters". Below this is a button labeled "Generate INP File". At the bottom left are three buttons: "Run" (with a dotted border), "Abort", and "Exit". On the right, under the heading "Times", there are three input fields: "Sensor Tool Start Time:", "Process Start Time:", and "Process End Time:". At the bottom right, there is a large empty rectangular box, likely for output or logs.

Optimal Water Quality Sensor Placement Tool

- Enter 2 under “Number of Sensors” box
- Click on “Set/change default parameters” button and enter data or make changes as needed in the default parameter window.

Optimal Sensor Placement Tool (Copyright KYPIPE LLC 2012)

c:\d\source\epanet teva spot\stacey\p2k files\wqs-1.KYP\wqs-1

Number of Sensors (max 5)

Times

Sensor Tool Start Time:

Process Start Time:

Process End Time:

Default Parameters

Total Simulation Time (Hours)

WQ Computational Time (sec)

Mass Injection Rate (mg/min)

Injection Start Time (Hours)

Injection End Time (Hours)

Detection limit (mg/l)

www.kypipe.com

Optimal Water Quality Sensor Placement Tool

- Go back to the main menu and click on “Generate INP file” button. Then click on “Run” button.

Optimal Sensor Placement Tool (CopyRight KYPIPE LLC 2012)

c:\d\source\epanet teva spot\stacey\p2k files\wqs-1.KYP\wqs-1

Number of Sensors (max 5)

4

5

Network and user specified data

Number of Nodes

Number of Pipes

Deadend Nodes

Demand Nodes

Injection Nodes

Sensor Nodes

Mass Inj Rate (mg/min)

Injection Start Time (hrs)

Injection End Time (hrs)

Detection Limit (mg/l)

W/Q Comp Time (sec)

Times

Sensor Tool Start Time:

Process Start Time:

Process End Time:


Injection Node

Injection Node Name

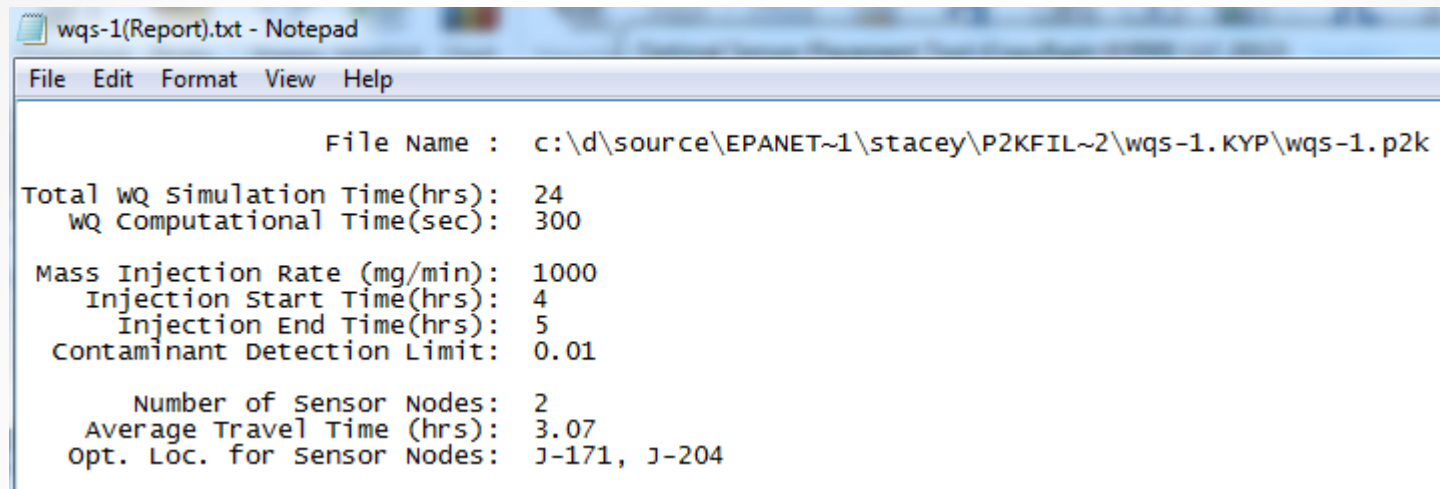
Optimal Sensor Locations

Ave Detection Time hrs

Optimal Water Quality Sensor Placement Tool

| | | | |
|---|--|---|--|
| <p>Number of Sensors (max 5) <input type="text" value="2"/></p> <p><input type="button" value="Set/change default parameters"/></p> | | <p>Times</p> <p>Sensor Tool Start Time: <input type="text" value="9:46:07 AM"/></p> <p>Process Start Time: <input type="text" value="9:46:40 AM"/></p> <p>Process End Time: <input type="text" value="9:46:50 AM"/></p> | |
| <p><input type="button" value="Generate INP File"/></p> | | <p><input type="button" value="Hydraulic Simulation Done"/></p> | |
| <p><input type="button" value="Run"/> <input type="button" value="Abort"/> <input type="button" value="Exit"/></p> | | <p></p> | |
| <p>Network and user specified data</p> <p>Number of Nodes <input type="text" value="169"/></p> <p>Number of Pipes <input type="text" value="244"/></p> <p>Deadend Nodes <input type="text" value="8"/></p> <p>Demand Nodes <input type="text" value="156"/></p> <p>Injection Nodes <input type="text" value="148"/></p> <p>Sensor Nodes <input type="text" value="161"/></p> <p>Mass Inj Rate (mg/min) <input type="text" value="1000"/></p> <p>Injection Start Time (hrs) <input type="text" value="4"/></p> <p>Injection End Time (hrs) <input type="text" value="5"/></p> <p>Detection Limit (mg/l) <input type="text" value="0.01"/></p> <p>WQ Comp Time (sec) <input type="text" value="300"/></p> | | <p><input type="button" value="WQ Simulation Done"/></p> <p>Sensor Node <input type="text" value="148 of 148"/></p> <p>Injection Node Name <input type="text" value="J-99"/></p> <p><input type="button" value="Sensor Selection Done"/></p> <p><input type="text" value="160"/> <input type="text" value="161"/> <input type="text" value=""/> <input type="text" value=""/> <input type="text" value=""/></p> | |
| | | <p>Optimal Sensor Locations</p> <p>Sensor Node1 <input type="text" value="J-171"/></p> <p>Sensor Node2 <input type="text" value="J-204"/></p> <p>Ave Detection Time <input type="text" value="3.07"/> hrs</p> | |
| <p><input type="button" value="Disclaimer"/></p> | | <p><input type="button" value="6 View Report"/></p> | |

Optimal Water Quality Sensor Placement Tool

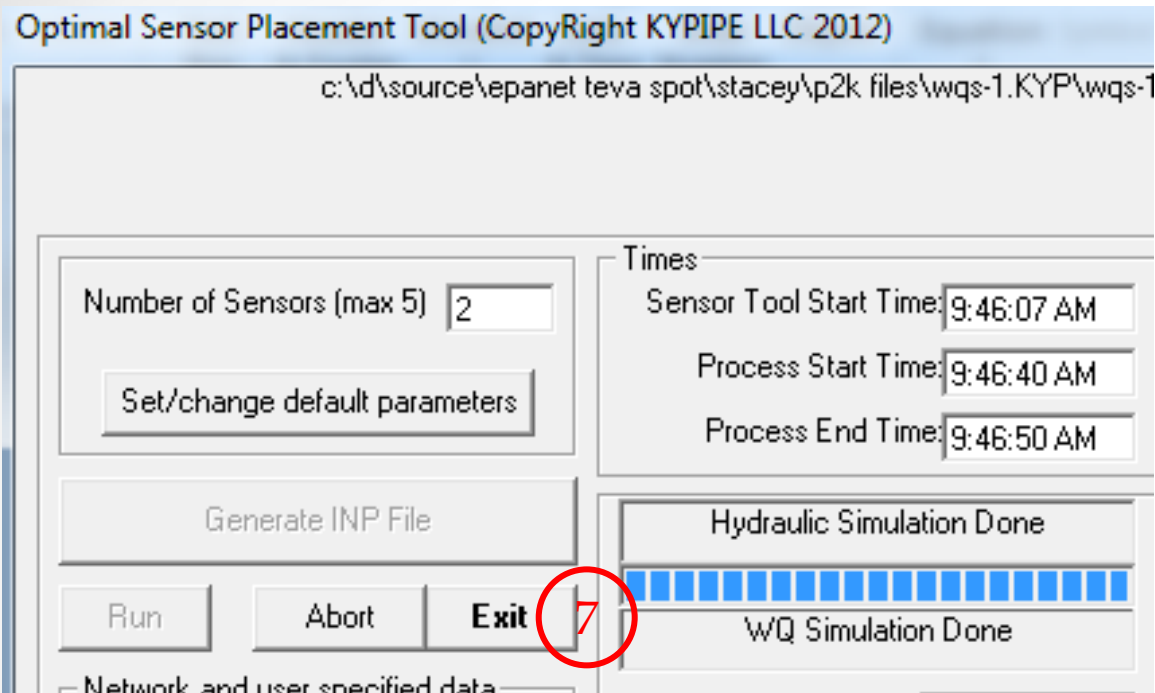


The image shows a screenshot of a Notepad window titled "wqs-1(Report).txt - Notepad". The window contains the following text:

```
File Name : c:\d\source\EPANET~1\stacey\P2KFIL~2\wqs-1.KYP\wqs-1.p2k
Total WQ Simulation Time(hrs): 24
WQ Computational Time(sec): 300
Mass Injection Rate (mg/min): 1000
Injection Start Time(hrs): 4
Injection End Time(hrs): 5
Contaminant Detection Limit: 0.01

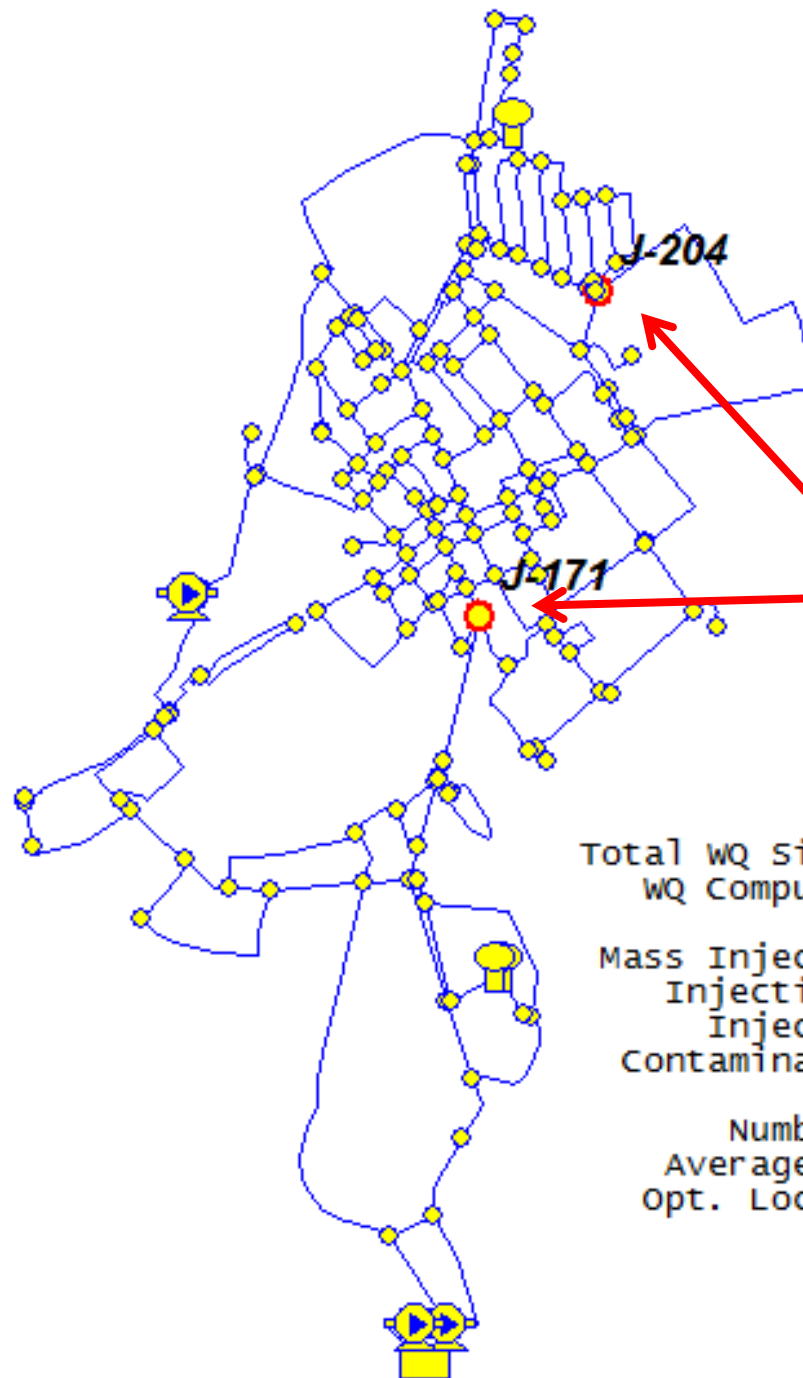
Number of Sensor Nodes: 2
Average Travel Time (hrs): 3.07
Opt. Loc. for Sensor Nodes: J-171, J-204
```


Optimal Water Quality Sensor Placement Tool



2 sensors placed.





Optimal Sensor Locations
highlighted on the network

Total WQ Simulation Time(hrs): 24
WQ Computational Time(sec): 300

Mass Injection Rate (mg/min): 1000
Injection Start Time(hrs): 4
Injection End Time(hrs): 5
Contaminant Detection Limit: 0.01

Number of Sensor Nodes: 2
Average Travel Time (hrs): 3.07
Opt. Loc. for Sensor Nodes: J-171, J-204