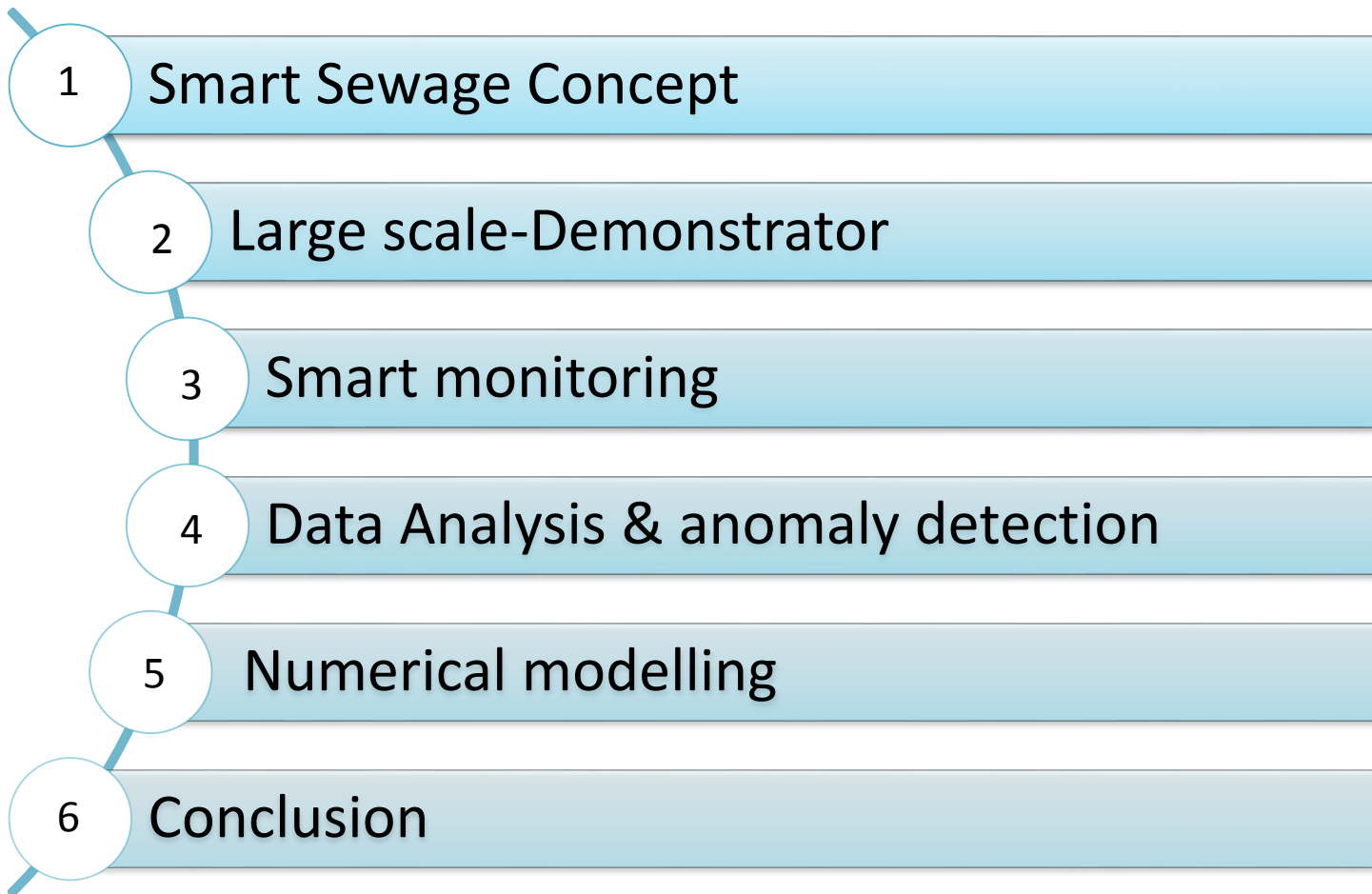


Smart City- Sewer System Monitoring for Better Characterization and Management

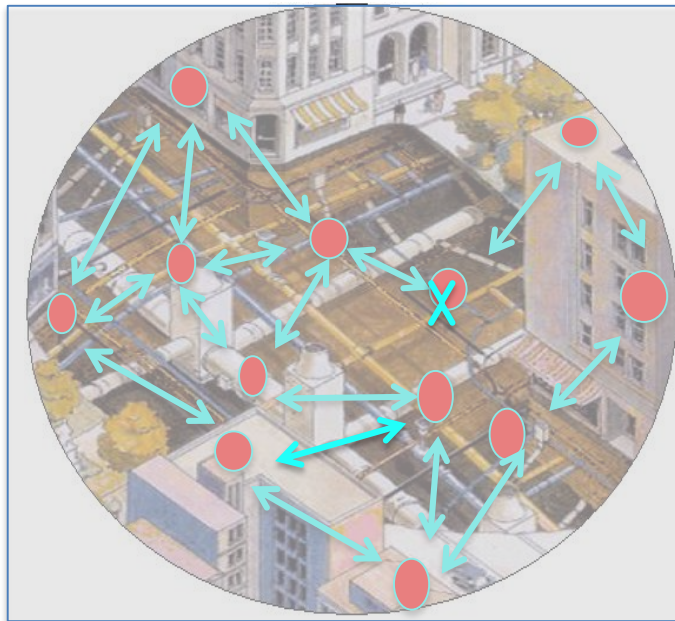
O. ABBAS, Y. ABOU RJEILY, I. SHAHROUR

*Laboratory of Civil Engineering and geo-Environment (LGCgE)
Lille 1 University, France*



Smart sewage Concept

- GIS construction
- Smart monitoring
- Numerical modeling



Storage
Analysis
Control



Security
Optimization

Large-scale demonstrator of smart city

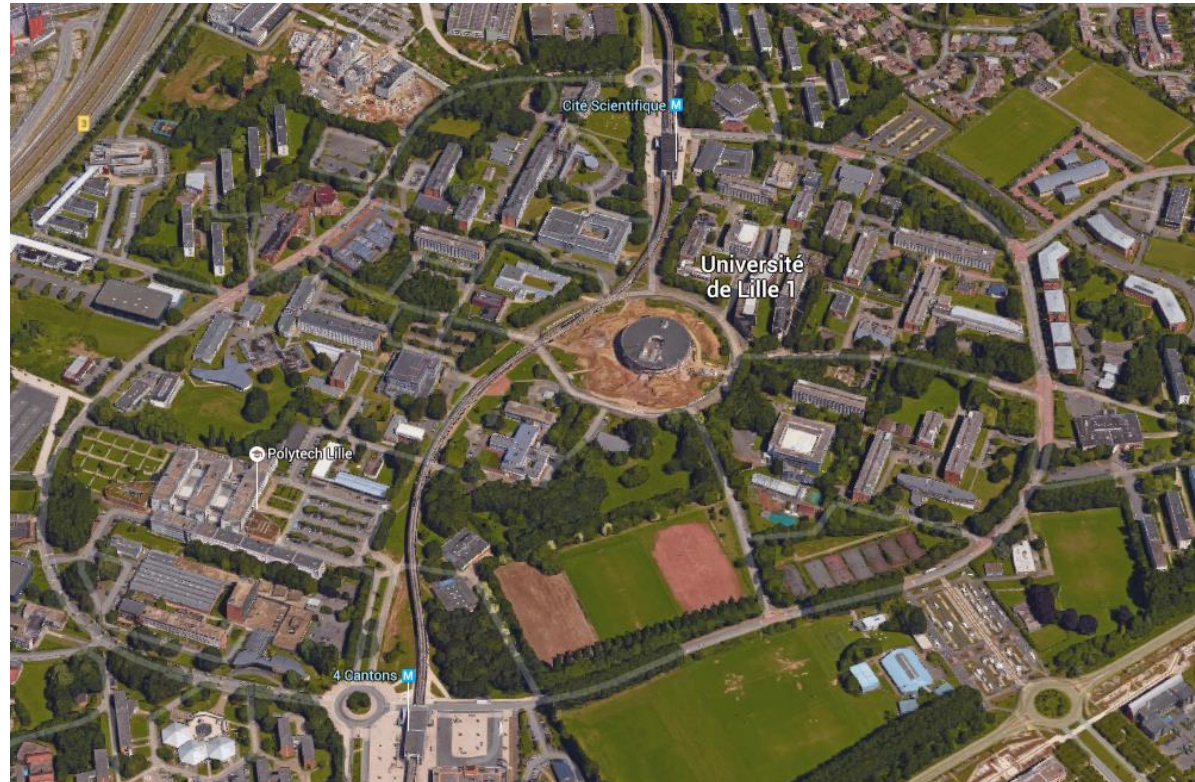
Small City

Campus of Lille 1 University / VILLENEUVE D'ASCQ, LILLE

- 110 hectares
- 25000 users
- 140 buildings
- 100 km urban networks

Variety

- Usage
- Quality



Construction of GIS system

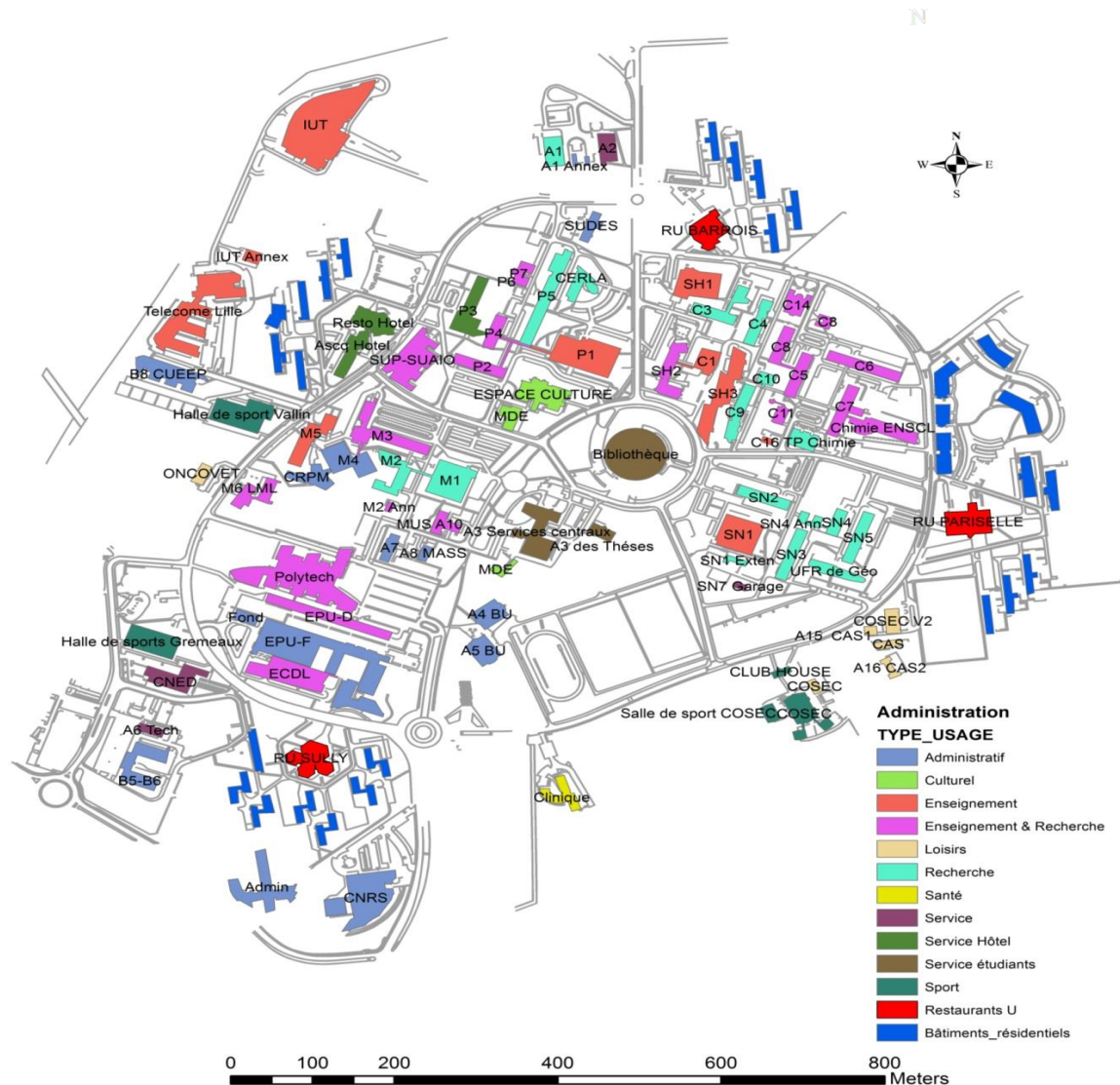
- Patrimoine
- Maintenance

GIS Data Base

140 Buildings

- ✓ Administration
- ✓ Activities
- ✓ Teaching and research

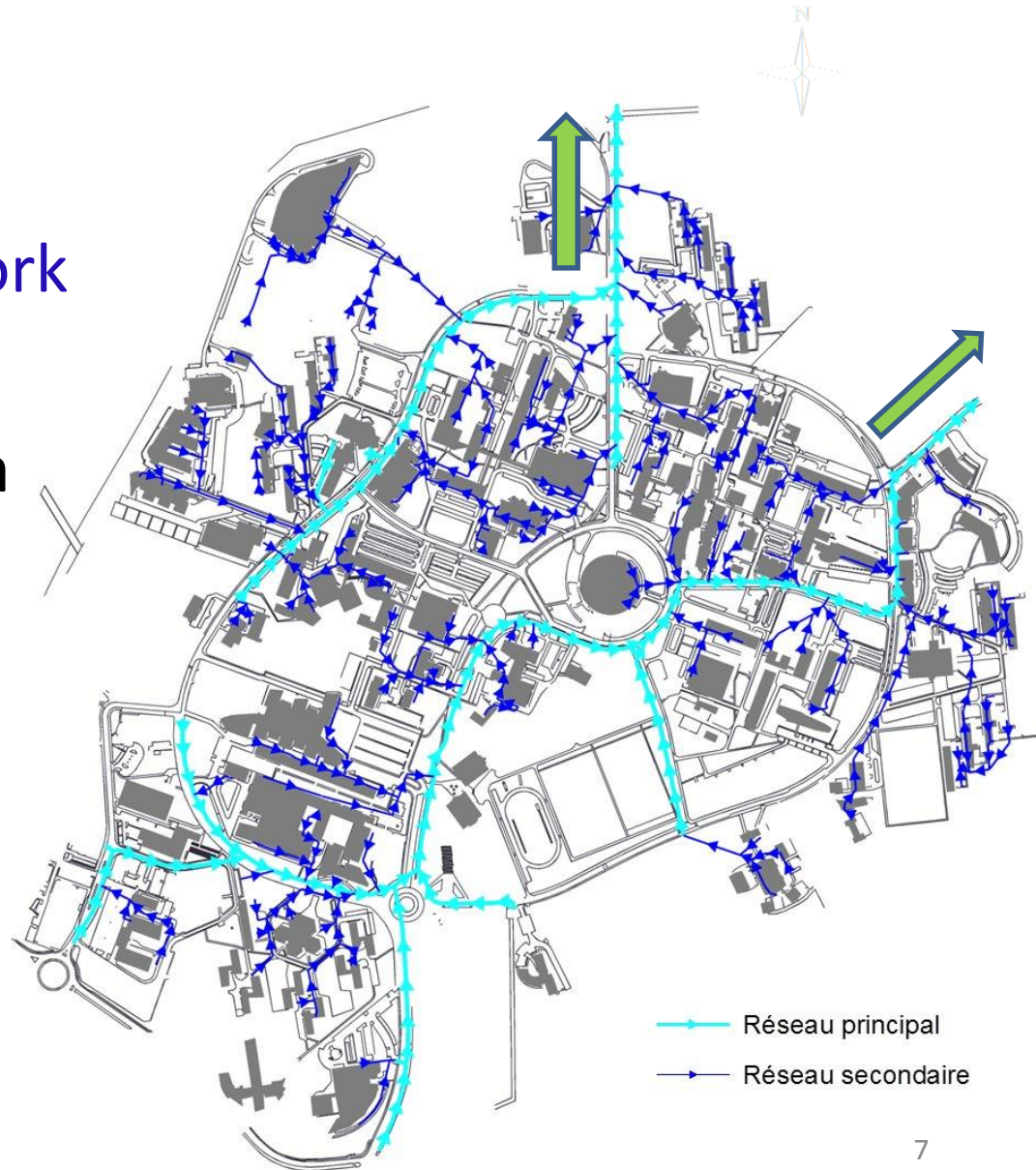
66 % built before
1975



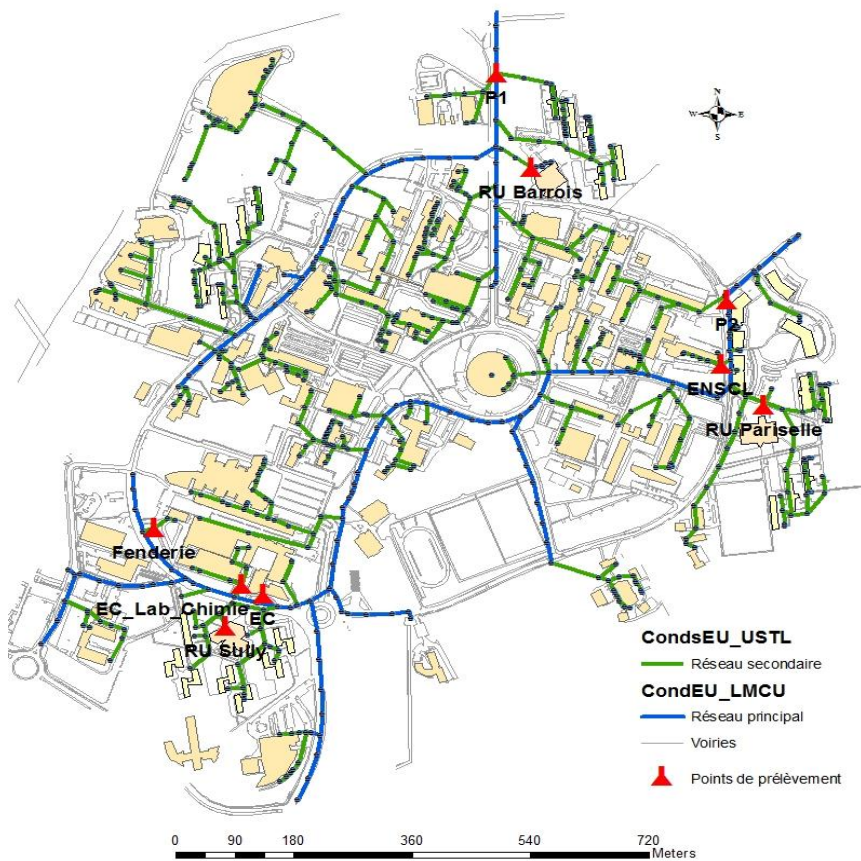
Sewage Network

- ✓ 4 Km primary network
- ✓ 12 Km Secondary network

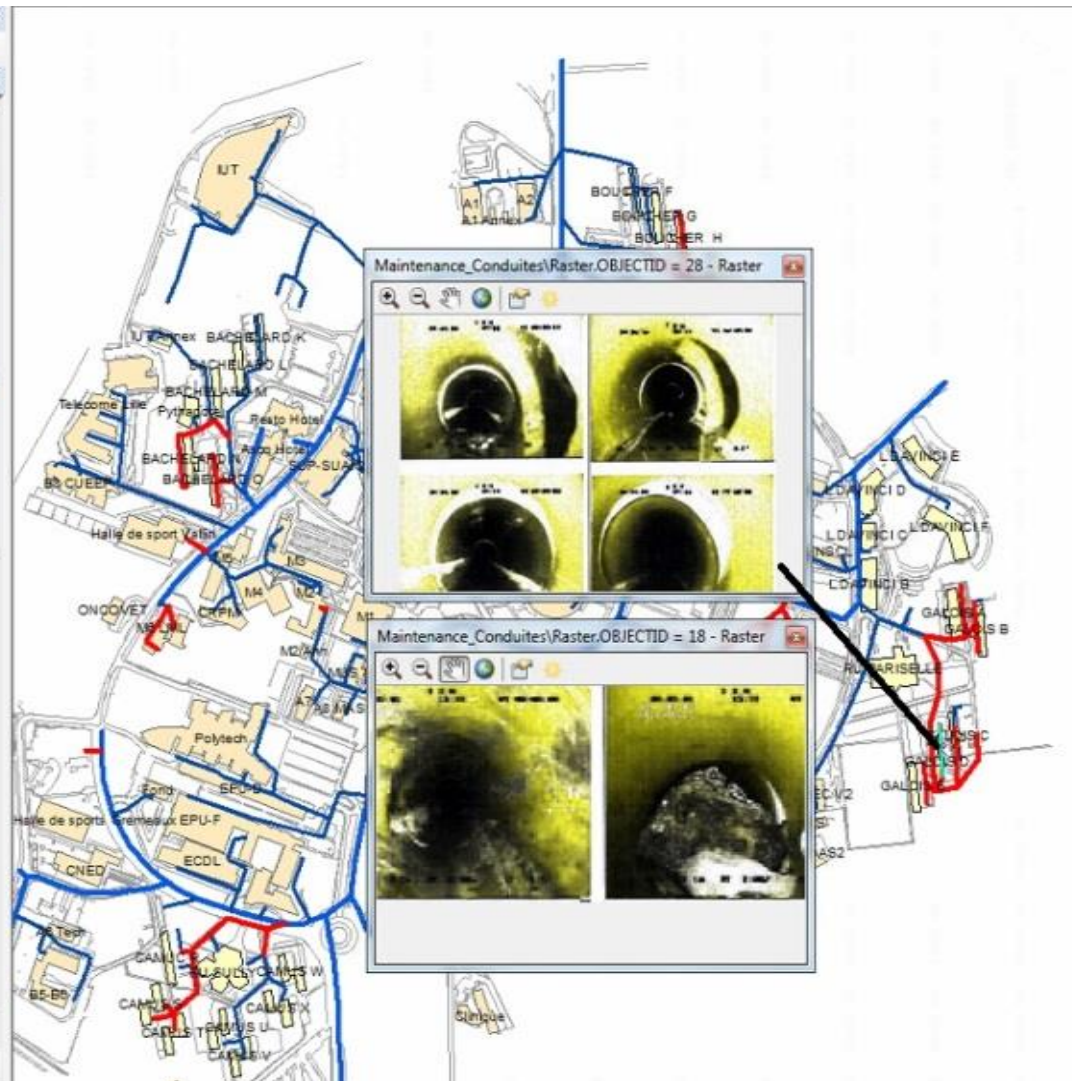
Diameter = 100 to 250 mm



Sewage Network



Sewage Network-Maintenance

[illegible]

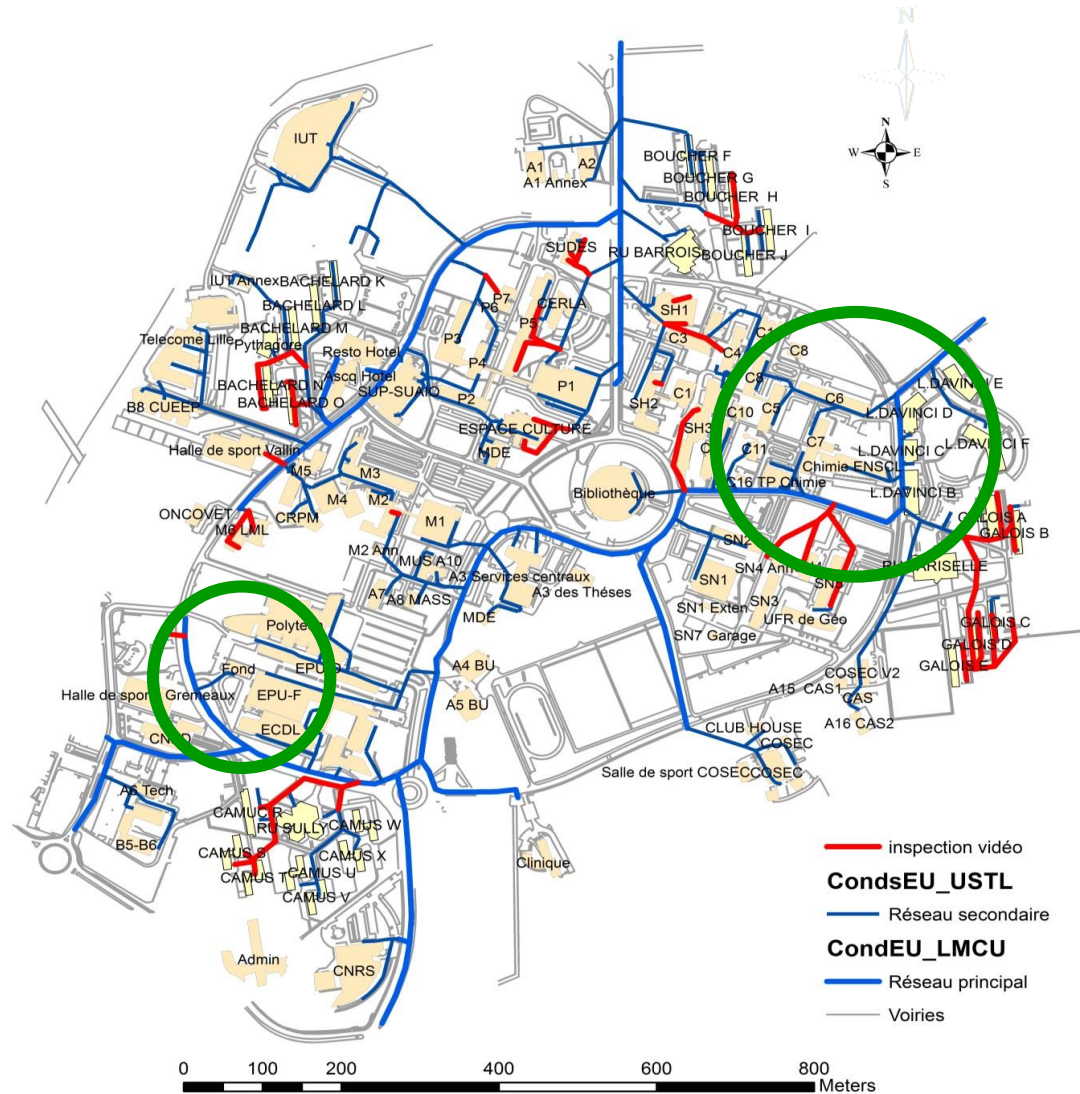
Sewage Network-Maintenance

➤ video Inspection

- Type of failures
- Degree de gravity



- Localize vulnerable areas
- Evaluation on long term



Monitoring system

➤ Site instrumentation

Instrumentation of studied site

- Surface 30 Hec
- Real time monitoring
 - Hydraulic Parameter
 - Quality Parameter



Instrumentation of studied site



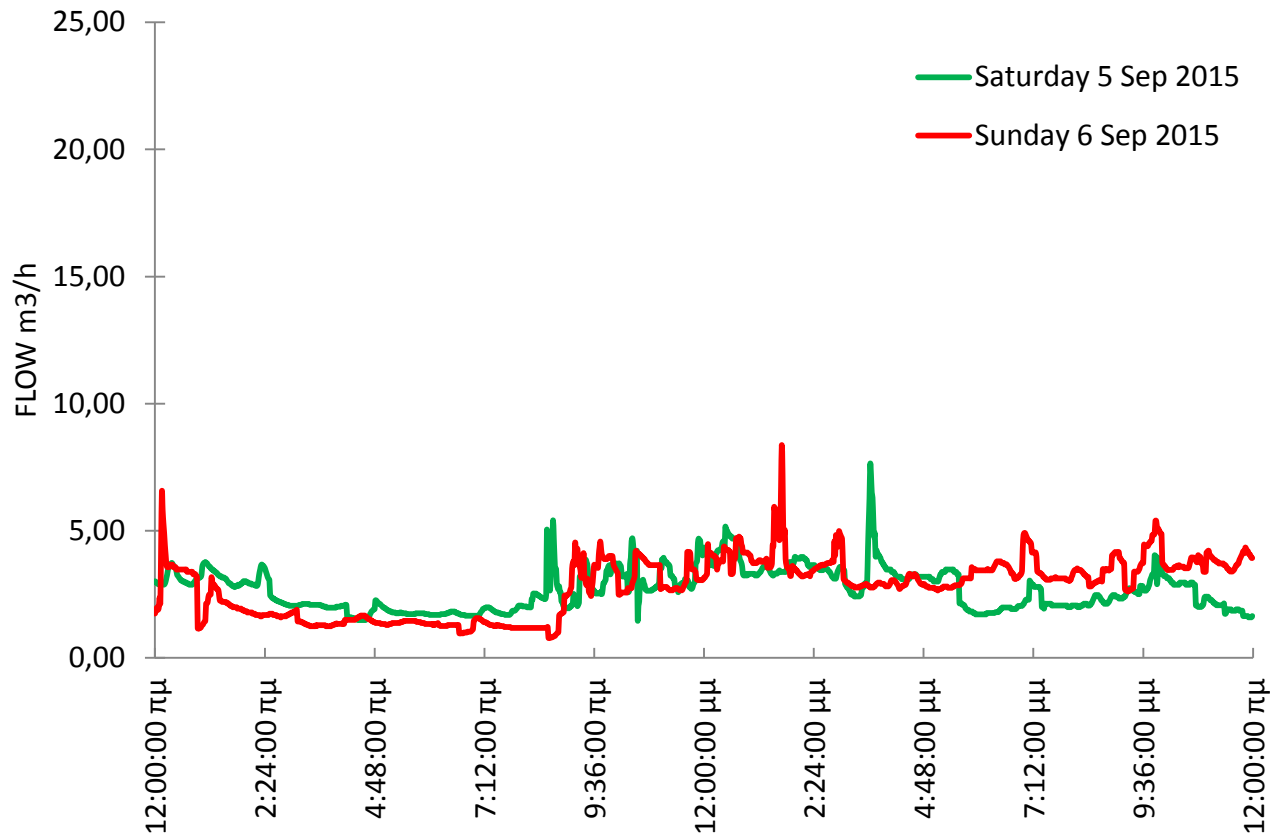
**Transmetteur
Pack Battery**



Data analyses

- Normal Function
- Anomaly detection

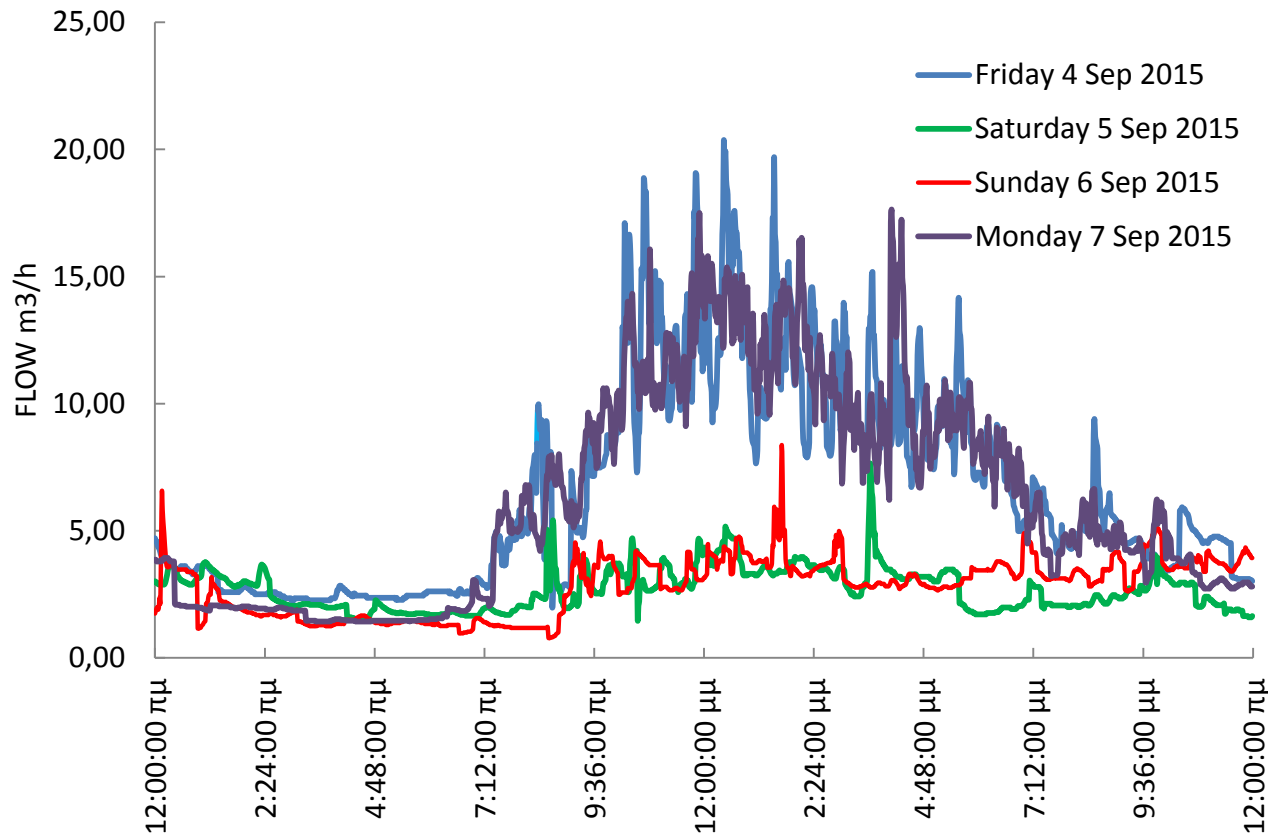
Wastewater flow pattern



Average flow
2.7 m³/h
(Weekend)

Maximum Flow
7.5 m³/h
(Weekend)

Wastewater flow pattern



Average Flow

2.7 m³/h (Weekend)

6.3 m³/h (Jour ouvrable)

Maximum Flow

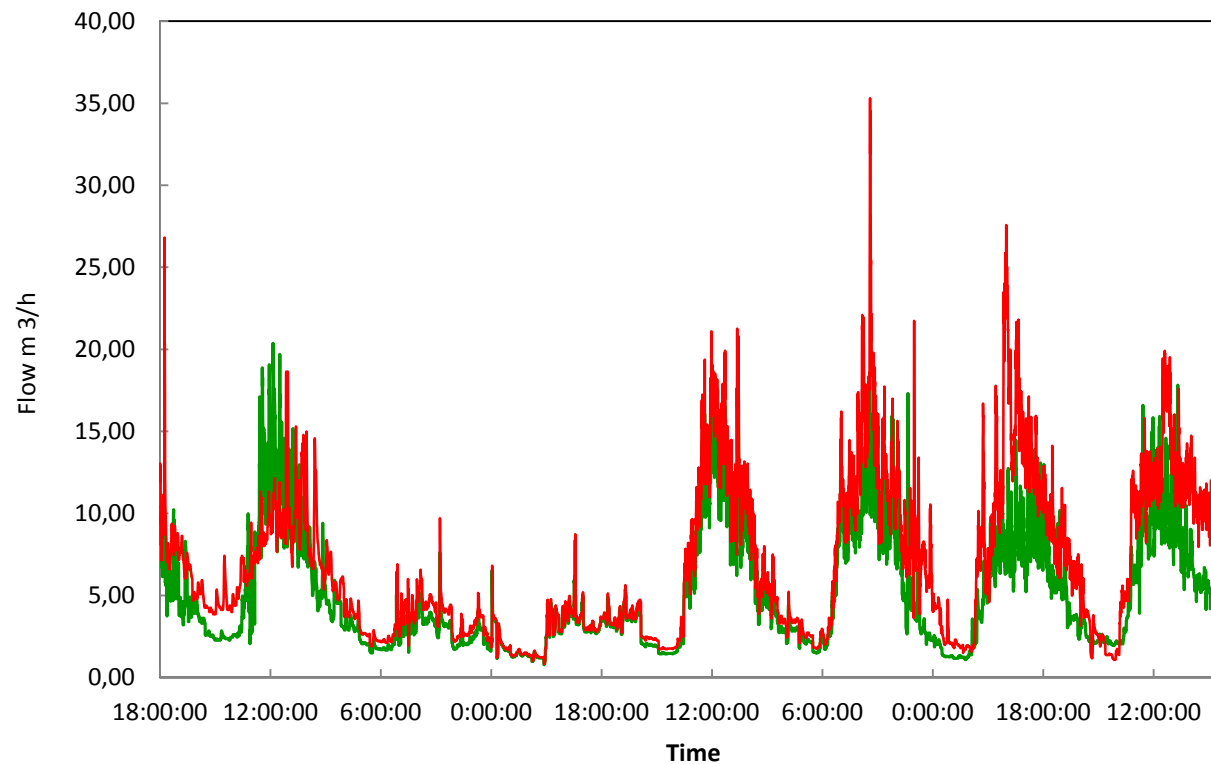
7.5 m³/h (Weekend)

20 m³/h (Working day)

Daily Flow-Dry weather

Semaine du 3 au 10 Septembre 2015

Semaine du 24 Septembre au 1 Octobre 2015

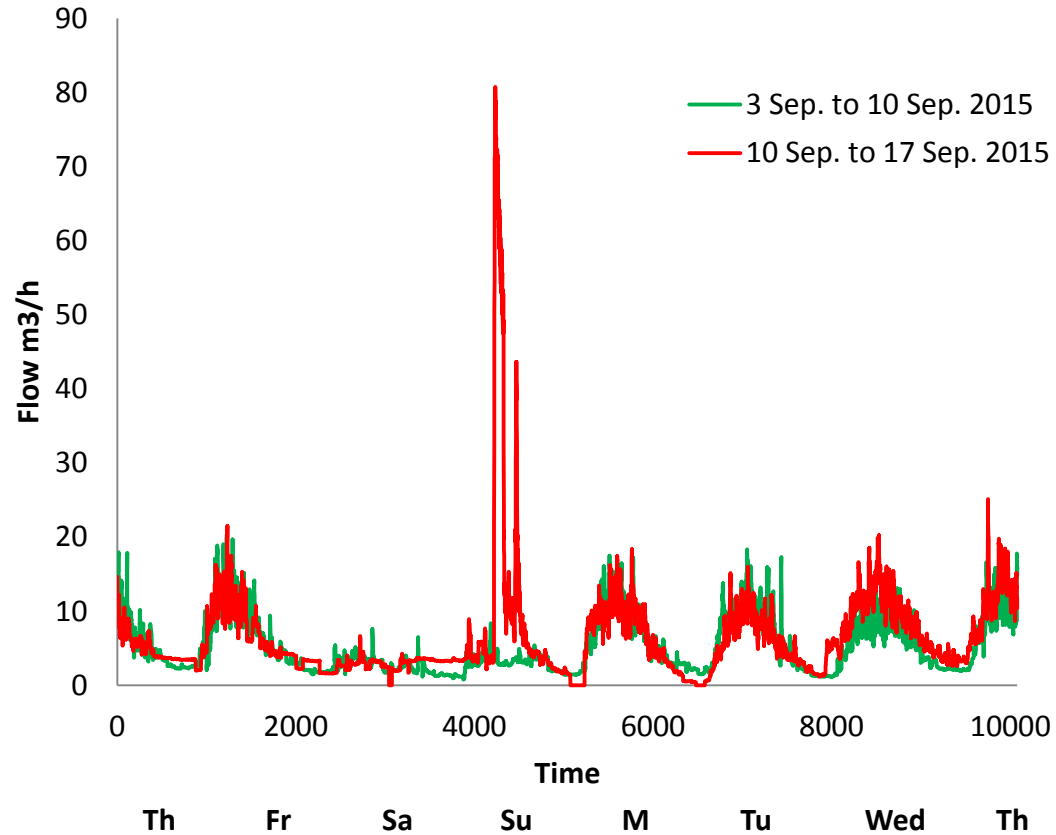


Débit moyen

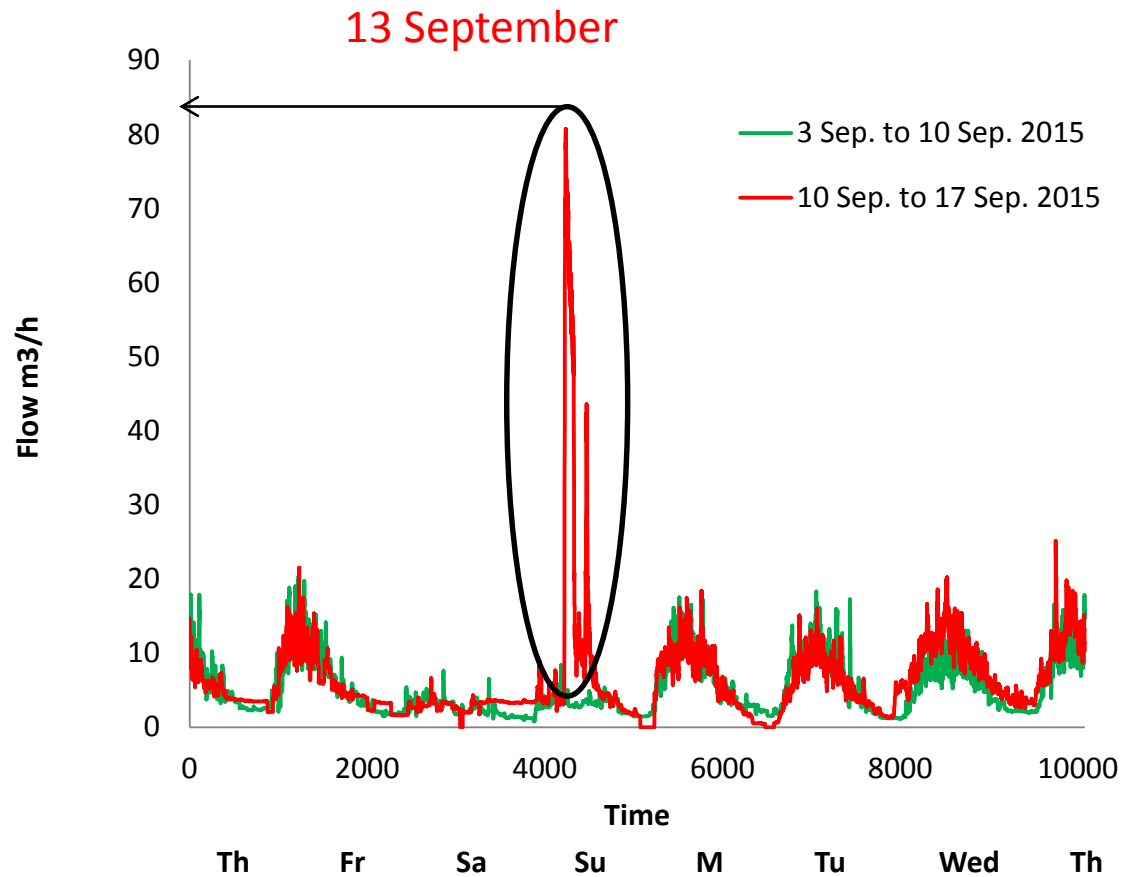
5,78 m³/h

6,98 m³/h

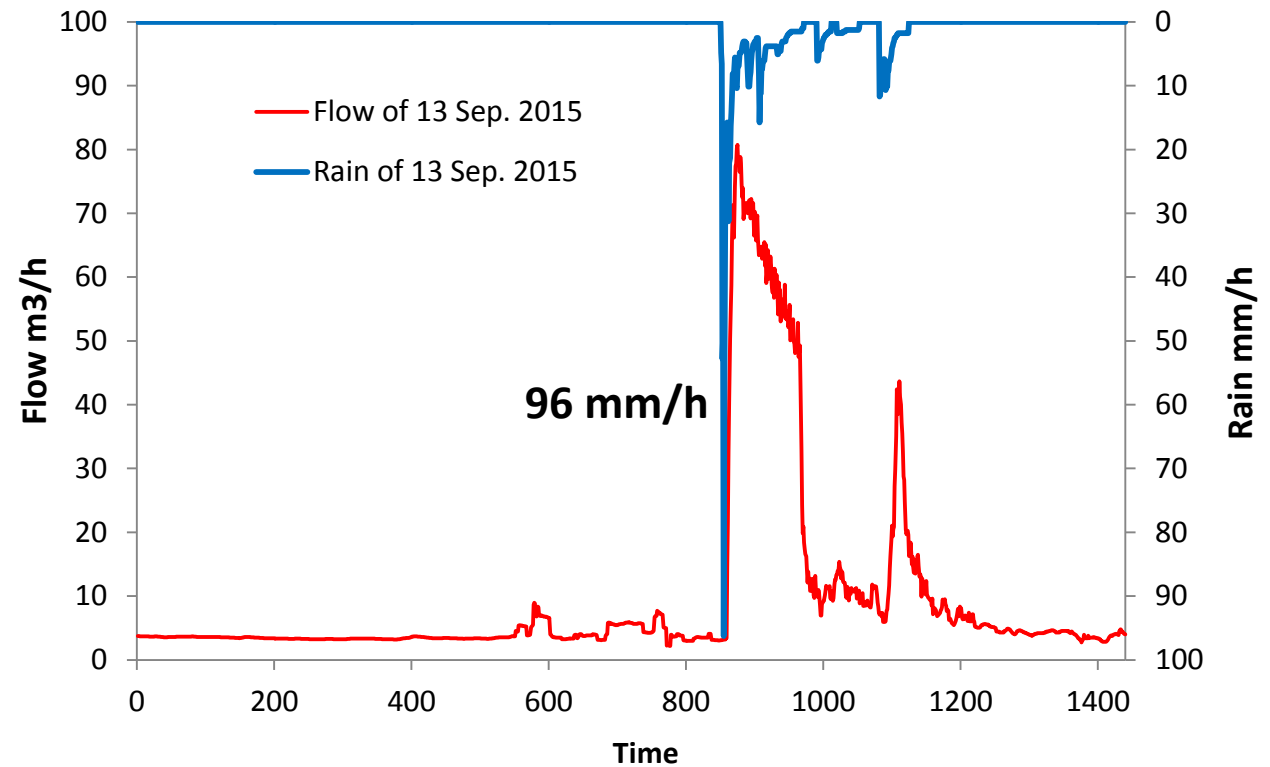
Detection of abnormal events



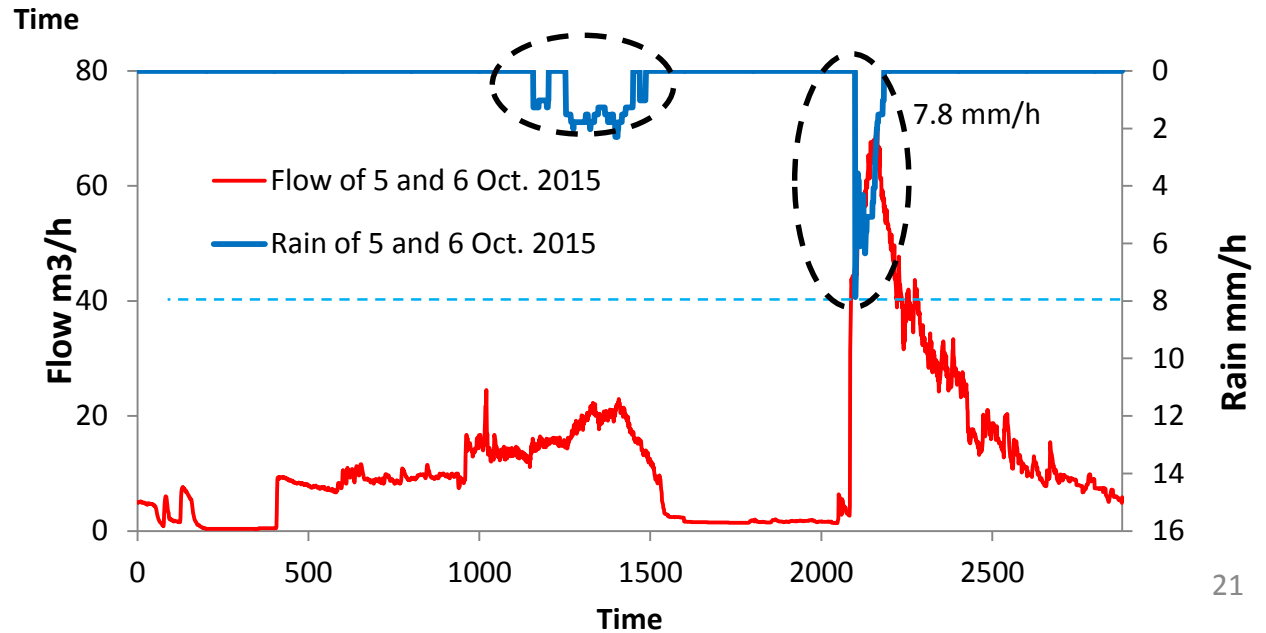
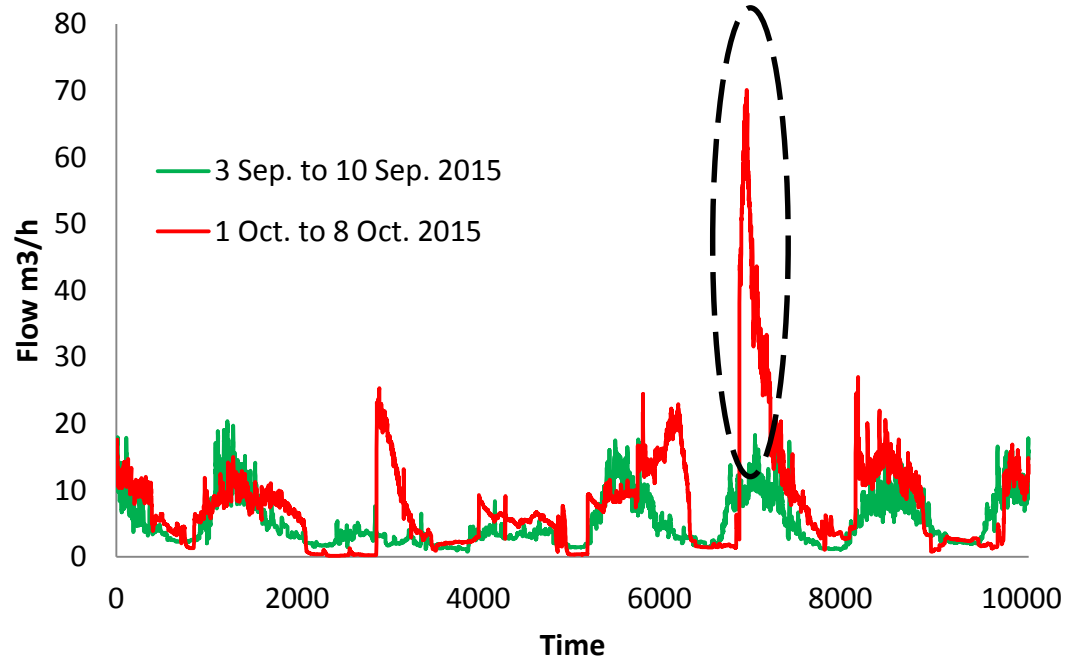
Detection of abnormal events



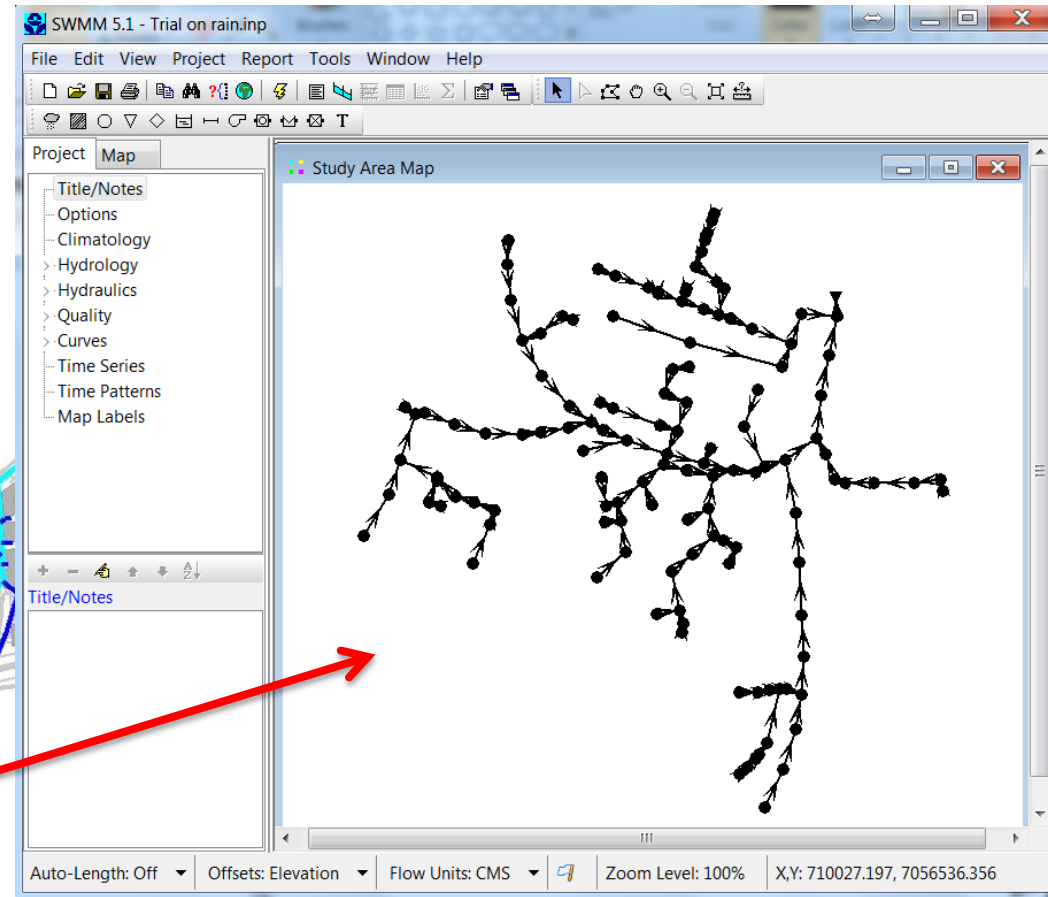
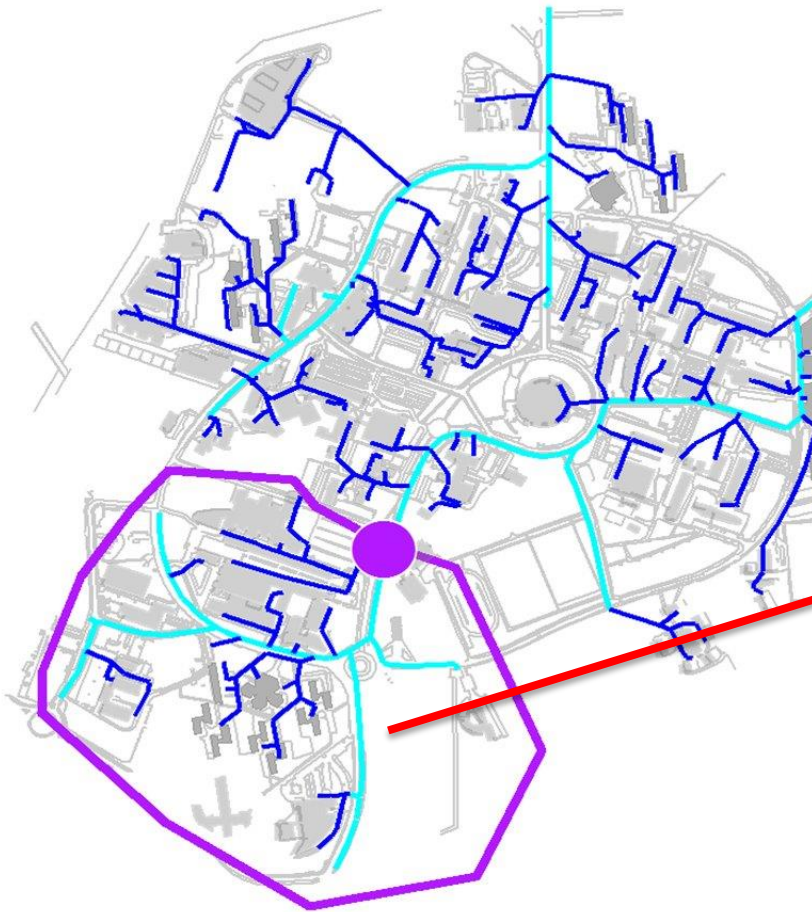
Detection of abnormal events



Detection of abnormal events

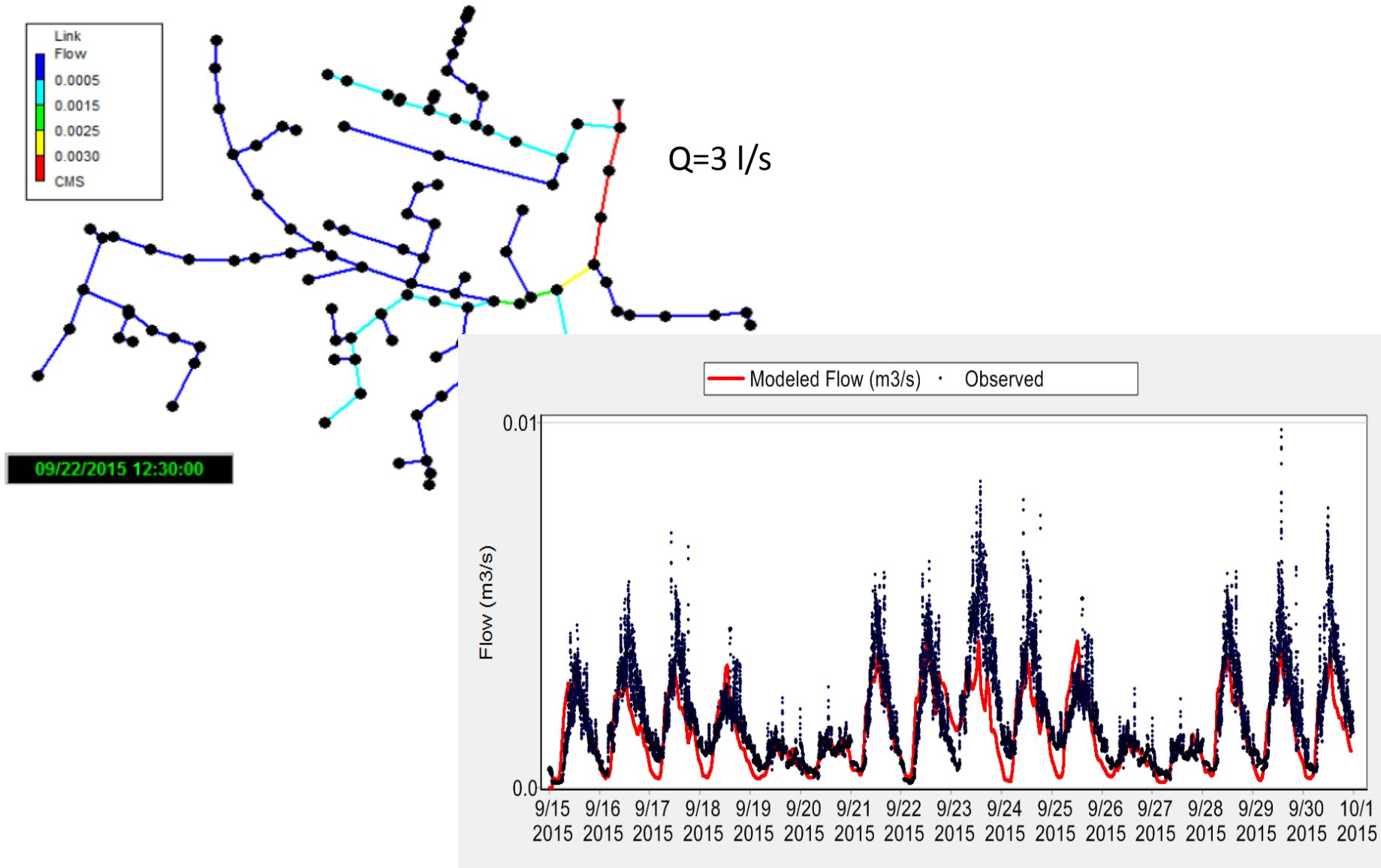


Wastewater flow modelling

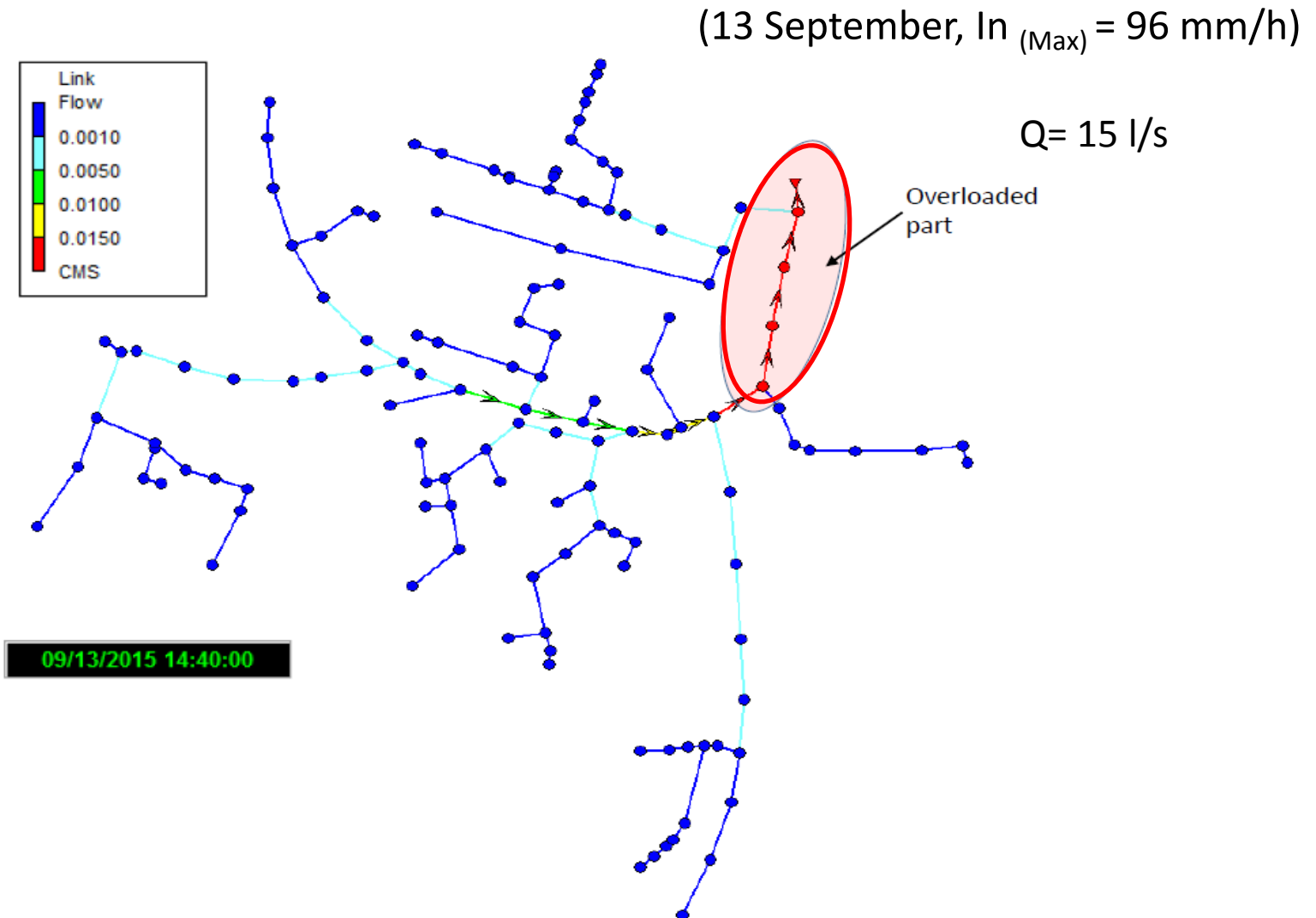


Code EPA-SWMM

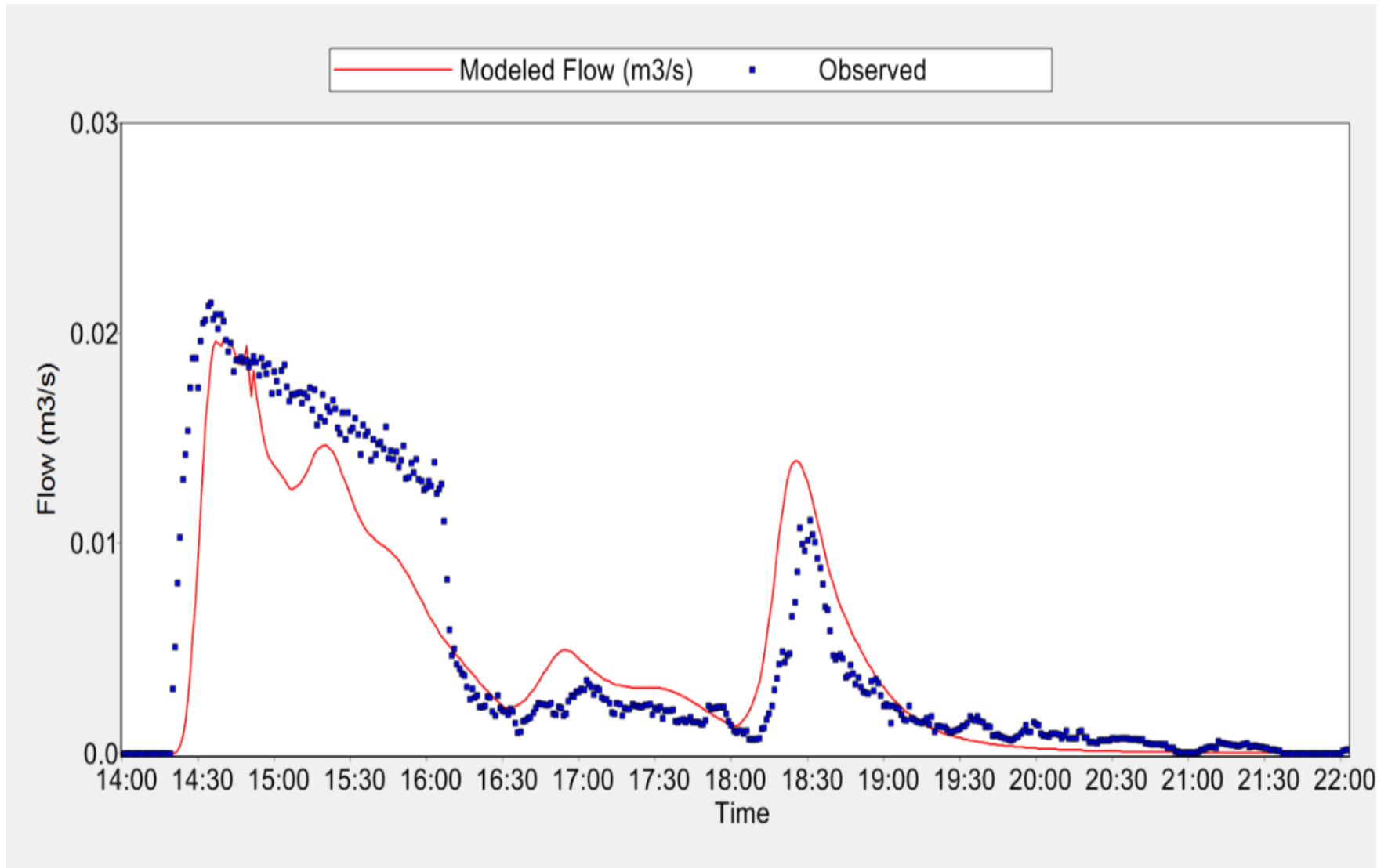
Dry periode



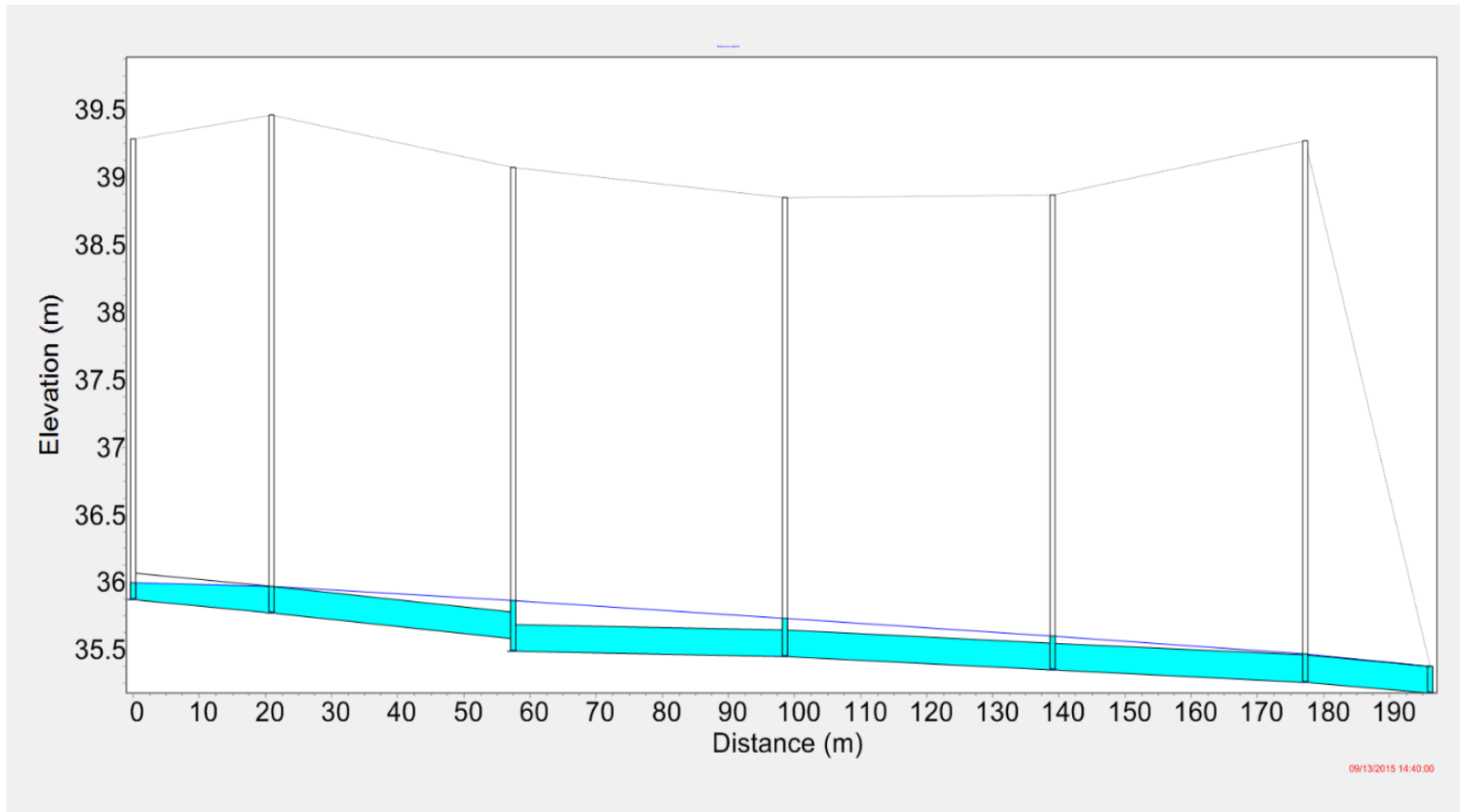
Period with a significant rainfall event



Period with a significant rainfall event



Period with a significant rainfall event



Difficulties



Access

Conclusion

- Numerical Data base
- Real time monitoring system
- Hydraulic model
- Feedback experience

Thank you!