Tables S1 – S4

Table S1. Common water quality contaminants and hydraulic parameters

Classes of contaminants		Example of common measurement parameters
Physical		Turbidity, electrical conductivity, total hardness, temperature, oxidation reduction potential (ORP), dissolved oxygen (DO), refractive index etc
Chemical	Inorganic	pH, DO level, disinfectants, metals, fluoride, nutrients, engineered nanomaterial/nanoparticles
	Organic	Total organic carbon (TOC), hydrocarbon, volatile organic compounds, pesticides, disinfection by products
Microbiological		Algae, protozoa, pathogenic microorganisms (bacteria and viruses), biological oxygen demand (BOD)
Hydraulics		Flow rate, pressure, valve status, water level in reservoir tank, sensor alarms, pump status (on / off and variable speed)

Table S2. World Health Organisation Limits of Safe Drinking Water

Water Quality Parameters	Water Safe Range	Unit of Measurement
pH at 25℃	6.5-8.5	pH
Turbidity	0.03-5	NTU
Electrical Conductivity	300-800	micro S/cm
ORP		mV
Dissolved Oxygen	13-14	milligram
Temperature	-	degree Celsius
Lead (Pb)	0.0003 - 0.010	mg/l
Escherichia coli	100-250	ml
Pesticides	0.0001-0.0003	mg/L
Chlorine (Cl2)	0.5 – 2.99	mg/L

Table S3. Summary of Science and Engineering Research Direction Related to WQAD

S/N	Research Focus	Study
1	Sensor development for detection of contaminants	(Hall 2009; Raich 2013, 1-33; Tatari et al. 2016; Zulkifli, Rahim, and Lau 2017, 2657-2689)
2	Optimal sensor placement for contamination and leak detection in WDS	(Eliades, Kyriakou, and Polycarpou 2014, 602-611; Mukherjee, Diwekar, and Vaseasht 2017, 91-102; Propato, Cheung, and Piller 2006, 1-8; Rathi and Gupta 2014, 181-188; Rosich, Sarrate, and Nejjari 2012, 776-781; Casillas et al. 2013, 14984-15005; Berry et al. 2006, 218-224; R. Murray et al. 2010, 1-92)
3	Real-time monitoring via WSN	(Allen, Preis, and Iqbal 2013; Lambrou et al. 2014, 2765-2772; Zabasta et al. Sept 2014, 42-47)
4	Identification of the source of contaminants	(Deuerlein, Meyer-Harries, and Guth 2017, 53-59; Propato, Cheung, and Piller 2006, 1-8; Klise et al. 2016, 4016001)
5	Optimal response after detection of contaminants to mitigate adverse effects on public health	(Mukherjee, Diwekar, and Vaseasht 2017, 91-102; Rasekh and Brumbelow 2014, 12–25)
6	Anomaly detection using AI and data mining techniques	Deng and Wang, 2017; Inoue, Yamagata, Chen, Poskitt, and Sun, 2017; Tian, Jiang, Guo, and Wang 2012; Vries, van den Akker, Vonk, de Jong, and van Summeren, 2016; Zohrevand et al. 2016; Zhang et al. 2014; Zhang, Zhu, Yue, and Wong 2017.

Table S4. Confusion Matrix for Two-class Scenario

	Predicted class		
Actual class		Class =Anomaly = Yes	Class = Not Anomaly= No
	Class = Anomaly = Yes	True Positive (TP)	False Negative (FP)
	Class = Not Anomaly = No	False Positive (FP)	True Negative (TN)

Figures S1 – S3

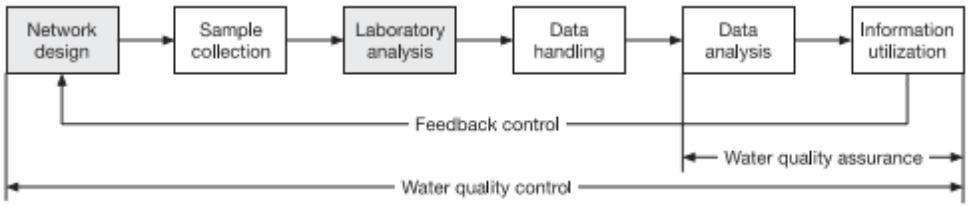

Figure S1. Traditional WQM framework (Adu-Manu et al. 2017)

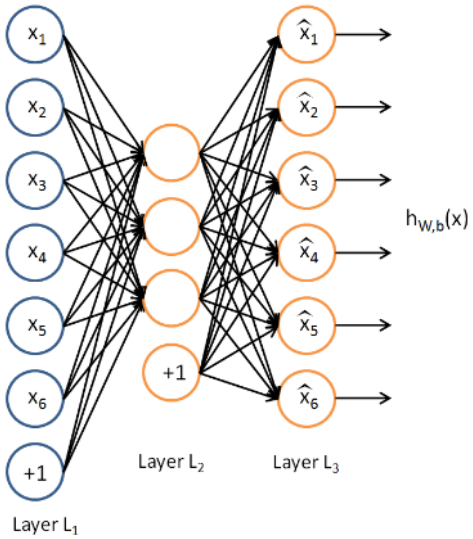

Figure S2. Architecture of autoencoder learning algorithm (Andrew Ng 2011)

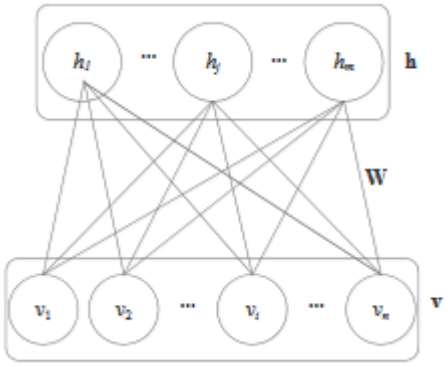

Figure. S3. Restricted boltzmann machine model (Chu et al. 2017)