



Characterization of raw water resources in northern and central Taiwan

F.C. Lo^a, K.L. Lin^b, T.Y. Pai^c, S.L. Lo^a, H.Y. Chiu^d, T.C. Chang^e, S.W. Lo^f, M.H. Liu^g,
C.A. Chang^d, S.C. Wang^g, C.F. Chiang^h, K.P. Chao^h, W.Y. Loⁱ, Y.L. Chu^j, H.M. Lo^{g,*}

^aGraduate Institute of Environmental Engineering, National Taiwan University, Taipei 10617, Taiwan, ROC,
emails: fangchenlo@hotmail.com (F.C. Lo), sllo@ntu.edu.tw (S.L. Lo)

^bDepartment of Environmental Engineering, Ilan University, Yilan 260, Taiwan, ROC, email: kllin@niu.edu.tw

^cMaster Program of Environment Education and Management, National Taichung University of Education, Taichung 40306,
Taiwan, ROC, email: bai@ms6.hinet.net

^dDepartment of Applied Chemistry, Chaoyang University of Technology, Taichung 41349, Taiwan, ROC,
emails: hychiu@ymail.com (H.Y. Chiu), cachang@cyut.edu.tw (C.A. Chang)

^eGraduate Institute of Environmental Engineering and Management, National Taipei University of Technology,
Taipei 10608, Taiwan, ROC, email: cchang@ntut.edu.tw

^fDepartment of Life Sciences, National Central University, Taoyuan 32001, Taiwan, ROC, email: shengwenlo1995@gmail.com

^gDepartment of Environmental Engineering and Management, Chaoyang University of Technology, Taichung 41349, Taiwan,
ROC, Tel.: +886 4 23323000; Fax: +886 4 23742365; emails: hmlo@cyut.edu.tw (H.M. Lo), jliu@cyut.edu.tw (M.H. Liu),
scwang1@cyut.edu.tw (S.C. Wang)

^hChina Medical University, 91 Hsueh-Shih Rd., Taichung 40402, Taiwan, ROC, emails: amur.chiang@gmail.com (C.F. Chiang),
kpchao@mail.cmu.edu.tw (K.P. Chao)

ⁱNational Taichung University of Science and Technology, 129 Section 3, San Min Rd., Taichung 404, Taiwan, ROC,
email: loeric0206@gmail.com

^jDepartment of Mechanical Engineering, National Taiwan University of Science and Technology, Taipei 106, Taiwan, ROC,
email: chu80108chu@hotmail.com

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ABSTRACT

Water quality standards of raw water resources are getting more stringent in Taiwan. This is due to the higher number of potential contaminants released to the water bodies leading to the potential risks to the human health. Raw water resources, including one river and three reservoirs representative of the major raw water resources in northern and central Taiwan, at four locations were selected to measure turbidity, electrical conductivity (EC), oxidation and reduction potential (ORP), pH, alkalinity, total organic compounds (TOC), zeta potential, particle size, Al, Fe and heavy metal contents. Natural organic matter (NOM) was also examined using high-performance size-exclusion chromatography to distinguish the different molecular weight distribution of organic compounds, such as humic acids, that might affect the subsequent raw water treatment. TOC is highly related to NOM, biochemical oxygen demand (BOD₅) and chemical oxygen demand, and the influent standard is 4 mg/L in Taiwan. EC, ORP, pH, alkalinity, TOC and zeta potential had values of 231.68–350.60 μS/cm, 210.5–271.55 mV, 8.17–8.58, 65.65–86.25 mg/L, 1.54–2.73 mg/L and –16.58 to –22.60 mV, respectively. However, average turbidity (128.24 NTU) and average particle size at the Daiji River (5,067.56 nm) were higher than those at the Shimen, Yongheshan and Liyutan Reservoirs (2.20–6.39 NTU and 1,105.12–1,627.26 nm, respectively). These measured data and metal contents (the latest three years' data, at least two seasons including summer and autumn) met the regulatory standards in Taiwan. Water quality index (WQI) containing dissolved oxygen solubility, faecal coliforms, pH, BOD₅, nitrates, total phosphates,

* Corresponding author.

temperature deviation, turbidity and total solids indicated good conditions for three reservoirs and medium condition for Daiji River. NOM, which might produce potential disinfectant by-products, had similar patterns and contained humic acids and low molecular weight acids (LMWs), with the intensity order of Yongheshan Reservoir > Shimen Reservoir > Liyutan Reservoir > Daiji River. The Carlson trophic state index and field-emission scanning electron microscope plot of filtered solid of raw water showed the potential risk of algae to drinking water safety.

Keywords: Raw water resources; Natural organic matter; WQI; Particle size; CTSI
