



Contamination and distribution of nitrate in the groundwater system of limestone aquifers in Saraburi – Lopburi Karst Area, central Thailand

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Saraburi-Lopburi Area is the largest “Karst Topography” area, which limestone were produced for commercials in Thailand. Groundwater (GW) system of the limestone aquifers in karst area usually form caves and underground conduits, developing unique GW turbulent flows and rapid vertical infiltration, make the aquifers change in very dynamic and be vulnerable to contamination by the pollution sources. The area also consists of large area of field crop and livestock productions as well as numerous of Agro-industrial plants, which can release nitrogen contaminant to the GW system. In recent study, Ion-Chromatography (IC) and ICP-OES were performed to analyze the water quality from 55 GW production wells and springs to confirm the nitrate contamination. The results from 3 collections in Dry Season (December 2013) to Rainy Season (September 2014), show 1-141 mg/L of average NO_3^- concentrations with consistent of seasonal variation of the concentrations about <25% deviation of 1σ in all moderate to high (>10 mg/L NO_3^-) contaminated water. The nitrate as Nitrogen concentration ($\text{NO}_3^- \text{N}$) show spatially distribution for 3 groups. The low concentration (<3 mg/L $\text{NO}_3^- \text{N}$) group, coverage 32.7% of the area, was located in SE part of the study area and the small area near Pasak Jolasid and Sap Lek Reservoir in the NE and NW part of study area respectively. The moderate concentration group (3-10 mg/L $\text{NO}_3^- \text{N}$), coverage 56.4% of the area, was included most area in the western and central parts of study area. The high concentration group can be defined by excess NO_3^- concentration to the EPA Maximum Contaminant Level (MCL) (>10 mg/L $\text{NO}_3^- \text{N}$), as well as above Thai National Standard of GW Quality for Drinking Purpose (>45 mg/L NO_3^-). It dispersed in small elongate area, coverage 10.9% of the area, in the northern part of study area near Huai Som and Huai Sap Takhian Stream Channels. The abruptly elevate of NO_3^- concentration including their spatial distribution of the highly contaminated GW indicate point source of the nitrogen contaminant relate with the stream channels and underground conduits, controlling by the geological structures.

Keywords: Nitrate; Contamination; Groundwater; Limestone Aquifers; Saraburi; Lopburi