

# Exploration and Design for Managed Aquifer Recharge in Dong Khwang Village, Dong Ma Fai Subdistrict, Muang District, Sakon Nakhon Province, Northeast Thailand.

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The Nam Kam River Basin, located in the northeastern part of Thailand, covers an area of approximately 2,500 square kilometers, extending over two provinces: Sakon Nakhon and Nakhon Phanom. Climate change is highly visible nowadays and recently plays a significant role in this region, resulting in a decade of flash floods and intense drought. Floods and droughts, moreover, have a brutal impact on communities in terms of socio-economic and environmental issues. Consequently, several projects have been undertaken in this area to ensure sustainable water management. In 2021, the Department of Groundwater Resources began the Exploration and Design for Managed Aquifer Recharge Project. The purpose of this study is to investigate the Aquifer Recharge Ponds system known as Managed Aquifer Recharge (MAR), and provide water management guidelines for local decision-makers or policymakers in this area.

The methods of this study include data collection, field research, the development of an aquifer recharge pond system, and the evaluation of the aquifer recharge performance by conducting a numerical groundwater flow model. The 2-dimensional geophysical data correlated with the lithologic data from 30-m and 12-m boreholes revealed that the uppermost unit is clayey sand (10 meters below the surface), underlying by the gravelly sand unit (10 to 22 meters deep), and the weathered siltstone unit (22 to 30 meters deep), respectively. The infiltration rate of this area is ca. 0.3 - 0.6 meters per day. The MAR system is composed of two ponds: a settling pond (50x80 square meters of surface area with a 5-meter depth) and a recharge pond (40x80 square meters of surface area with a 5-meter depth). The system was constructed in Dong Khwang Village, Dong Ma Fai Subdistrict, Muang District, Sakon Nakhon Province. According to the numerical results, the aquifer's recharge rate is ca. 112,600 cubic meters per year, which already include an additional rate from four recharge wells constructed to increase the system capacity and create a direct pathway for conveying water to deeper aquifers.

Furthermore, the recharge rate at the demonstration site provides an estimate of the recharge rate at the sub-district level. A selected area of 0.4 square kilometers, accounting for 1 percent of the overall aquifer recharge suitable area, has the ability to reduce flooding and resolve recurrent drought problems by storing roughly five million cubic meters of groundwater in the aquifer. As a result, the local administrative organization will utilize this study as an effective guideline for sustainable water management at the local subdistrict scale.

**Keywords;** Artificial recharge, Groundwater recharge, Nam Kam Basin.

## LIST OF RECOMMENDED KEYWORDS

Agriculture  
Analytical solutions  
Aquitard  
Arid regions  
Arsenic  
Artificial recharge  
Biological conditions Bioremediation  
Carbonate rocks  
Chlorinated hydrocarbons Climate change  
Coastal aquifers  
Comment  
Compaction  
Conceptual models  
Confining units  
Contamination  
Crystalline rocks  
Developing countries  
Diffusion  
Drilling  
Earthquake  
Ecology  
Editorial  
Equipment/field techniques Fractured rocks  
Foundations (pedagogy)  
General hydrogeology  
Gender issue  
Geographic information systems  
Geologic fabric  
Geomorphology  
Geophysical methods  
Geotechnical problems  
Geostatistics  
Groundwater age  
Groundwater density/viscosity  
Groundwater development  
Groundwater exploration  
Groundwater flow  
Groundwater hydraulics  
Groundwater management  
Groundwater monitoring  
Groundwater protection  
Groundwater recharge/water budget Groundwater  
statistics Groundwater/surface-water relations Health  
Heterogeneity  
History of hydrogeology  
Hydraulic fracturing  
Hydraulic properties  
Hydraulic testing  
Hydrochemical modeling  
Hydrochemistry  
Hydrogeology Journal  
Igneous rocks  
Injection wells  
Inverse modeling  
Island hydrology  
Karst  
Laboratory experiments/measurements Landfills  
Legislation  
Lineaments  
Matrix diffusion  
Metamorphic rocks  
Microbial processes  
Mining  
Multiphase flow  
Nitrate  
Numerical modeling  
Organizations  
Over-abstraction Paleohydrology  
Profile (eminent hydrogeologist)  
Radioactive isotopes  
Radon  
Rainfall/runoff  
Regional review  
Remote sensing  
Reply  
Review (book)  
Salinization  
Salt-water/fresh-water relations  
Satellite imagery  
Scale effects  
Sedimentary rocks  
Socio-economic aspects  
Soil processes  
Solute transport  
Stable isotopes  
State of Science  
Statistical modeling  
Subsidence  
Tectonics  
Thermal conditions  
Tracer tests  
Transboundary aquifer  
Unconsolidated sediments  
Unsaturated zone  
Urban groundwater  
Volcanic aquifer  
Vulnerability mapping  
Waste disposal  
Water-resources conservation  
Water supply  
Well enhancement  
Wetlands