

Investigations and deep groundwater development, Pak Phanang District, Chian Yai District and Hua Sai District, Nakhon Si Thammarat Province

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Abstract

Pak Phanang District, Chian Yai District and Hua Sai District, Nakhon Si Thammarat Province area is part of the royal-initiated Pak Phanang river basin development project. The people face problem with water quality in surface water and shallow groundwater with blackish and saline quality caused by the intrusion of saline water that a phenomenon occurs naturally on the coastal areas or may be contaminated with saline water aquifer to the fresh water aquifer because the groundwater well construction does not follow the standard model of Department of groundwater resources (DGR). Therefore, the Investigations and deep groundwater development to base rock due to obtain good groundwater quality and this project is example of groundwater adaptation for future especially same areas that risk of contamination from saline groundwater.

In this study, the methodology are desk study available data, hydrogeological analyzed, existing wells inventories and analyze the quality of groundwater, surface geophysical investigation by specific electrical resistivity method, Drilling for investigation and borehole logging. Identifying aquifer depth for aquifer packer test considering borehole logging data, design groundwater according to standard DGR. Quality analysis and Map Improvement groundwater to be more moderns

In the study area It can be divided aquifers into unconsolidated sand and gravel that groundwater potentials are 2-15 m³/hr. and water quality with total dissolved solid (TDS) 500-1,500 mg/l and greater than 1,500 mg/l. Another is consolidated aquifer that aquifer are siltstone sandstone and shale. Groundwater potentials are 10-20 m³/hr. Water quality with total dissolved solid (TDS) less than 500 mg/l and 500-1,500 mg/l founded on The depth from surface about 110-180 meters. Data from this study can be used to improve the groundwater map From the original, the water quality is within the criteria allowed for consumption and can be applied in groundwater management further.

Introduction

Continually from economic and agricultural expansion in the area of Pak Phanang District, Chian Yai District and Hua Sai District Nakhon Si Thammarat Province. There is an increase in groundwater drilling and groundwater quality has changed. In shallow groundwater chloride content (Cl) and total dissolved solids (TDS) were higher than the standard. The main purpose of this project is the Investigations and deep groundwater development to base rock about well depth more than 100 meters due to obtain good or fair water quality with TDS content less than 500 mg/l or 600-1,200 mg/l. In addition, Groundwater map was improved to moderns.



Methodology

1. Desk study available data, hydrogeological analyzed, existing wells inventories and analyze the quality of groundwater
2. A total of 539 groundwater samples were collected for Cl and Tds analysis and classified by depth of groundwater wells to determine trends in groundwater quality changes.
3. Exploring Geophysics with Specific Electrical Resistivity Method to estimate the depth of hard rock and located drilling point for groundwater well.
4. Drilling for investigation and groundwater well development, Borehole Geological logging to provide guideline for groundwater well and identify aquifers, water quality and quantity.
5. Collect water samples from wells that have been drilled and developed groundwater. The samples have been analyzed for major cations (Na, K, Mg and Ca), major anions (Cl, SO₄, HCO₃ and CO₃) and physical parameters such as TDS, TH, Ec and pH
6. Improve the groundwater map scale 1:100,000 in the study area. using data obtained from deep well drilling and analysis of groundwater quality.



Overall Results

From data collection wells and collecting groundwater samples from 539 wells for water quality analysis to monitor changes in chloride content and total dissolved solids, it was found that 97 samples of water quality were not suitable for consumption. It is found most at the well depth less than 100 meters. Therefore, 25 wells were drilled for investigation and groundwater well development at depth between 130-254 m., Borehole Geological logging to provide guideline for groundwater well and identify aquifers, water quality and quantity. It was found base rock about 110-180 m., groundwater potentials are 10-20 m³/hr. The groundwater quality with TDS content less than 500 mg/l or 600-1,200 mg/l.

Table 1 : 25 Groundwater well information and and groundwater quality.

No.	Well No.	Moo	Tambon	Amphoe	Depth (m.)	perforated (m.)	Swl (m.)	Drawdown (m.)	Well Yield (m ³ /hr.)	Aquifer	TDS (mg/l)	Cl (mg/l)
1	6306C021	7	Tasorn	Hua Sai	230	180-230 open hole	10	9	15	Sandstone	1,410	510
2	6306C022	1	Tasorn	Hua Sai	195	183-195 open hole	10	7	15	Sandstone	1,210	430
3	6306C023	4	Ramkaew	Hua Sai	182	134-140, 168-180	90	2	15	Sandstone	2,460	1,000
4	6306C025	5	Kohpet	Hua Sai	168	156-168	26	10	15	Sandstone	1,170	410
5	6306C026	3	Nasaton	Hua Sai	213	204-210	20	20	14	Sandstone	1,200	450
6	6306B012	1	Chamao	Pak Phanang	159	139-159	18	20	12	Sandstone	910	250
7	6306B014	6	Chamao	Pak Phanang	132	119-124	16	34	15	Sandstone	1,090	230
8	6306B015	7	Chamao	Pak Phanang	130	118-130	12	36	15	Sandstone	1,220	370
9	6306B016	3	Chamao	Pak Phanang	141	125-141	15	16	15	Sandstone	1,030	260
10	6306B019	4	Kohthuaad	Pak Phanang	162	138-162	16	62	7	Sandstone	2,230	840
11	6306B020	2	Chamao	Pak Phanang	128	116-128	15	17	10	Sandstone	2,040	640
12	6306A017	12	Karaket	Chian Yai	165	134-146, 152-158	5	1	15	Sand/Gravel	838	240
13	6306A018	4	Maechaoyouhu	Chian Yai	210	14-150, 178-182, 202-206	16	8	12	Sandstone	826	100
14	6306A021	4	Thoungluejuek	Chian Yai	160	138-150	16	1	15	Sandstone	1,000	310
15	6306A022	11	Saimak	Chian Yai	178	168-174	15	1	15	Sandstone	1,240	400
16	6306A023	7	Kohthuaad	Pak Phanang	188	162-184	22	40	7	Sandstone	2,180	770
17	6306A024	7	Kohthuaad	Pak Phanang	170	142-166	27	35	6	Sandstone	2,830	980
18	6306A026	5	Kohthuaad	Pak Phanang	222	102-108, 186-198	19	19	15	Sandstone	2,390	940
19	6306A027	4	Kohthuaad	Pak Phanang	253	184-196, 235-247	22	20	10	Sandstone	1,360	490
20	6306C028	3	Kohthuaad	Pak Phanang	210	120-132, 192-208	10	17	10	Sandstone	1,480	540
21	6306C029	5	Bangrop	Hua Sai	250	162-168, 204-210	50	60	13	Sandstone	1,360	480
22	6306E028	5	Kohthuaad	Pak Phanang	254	102-108, 186-198	18.3	72	7	Sandstone	2,610	1,100
23	6306E031	8	Kohthuaad	Pak Phanang	174	169-171	18	72	7	Sandstone	1,430	490
24	6306E032	6	Kohthuaad	Pak Phanang	186	165-183	15	72	8	Sand/Gravel	1,470	530
25	6306E033	6	Kohthuaad	Pak Phanang	128	110-122	17	60	10	Sandstone	2,230	860

Conclusion

The sources of groundwater are divided unconsolidated sand and gravel that groundwater potentials are 2-15 m³/hr. and water quality with total dissolved solid (TDS) 500-1,500 mg/l and greater than 1,500 mg/l. Another is consolidated aquifer that aquifer are siltstone sandstone and shale. Groundwater potentials are 10-20 m³/hr. Water quality with total dissolved solid (TDS) less than 500 mg/l and 500-1,500 mg/l founded on the depth from surface about 110-180 meters.

In addition, the map showing the quality of groundwater with a unique chemical composition, such as the chloride content map and total dissolved solids has been improved. It was found that the overall water quality was in the acceptable criteria for consumption. which originally did not fit It can be consumed in shallow groundwater.

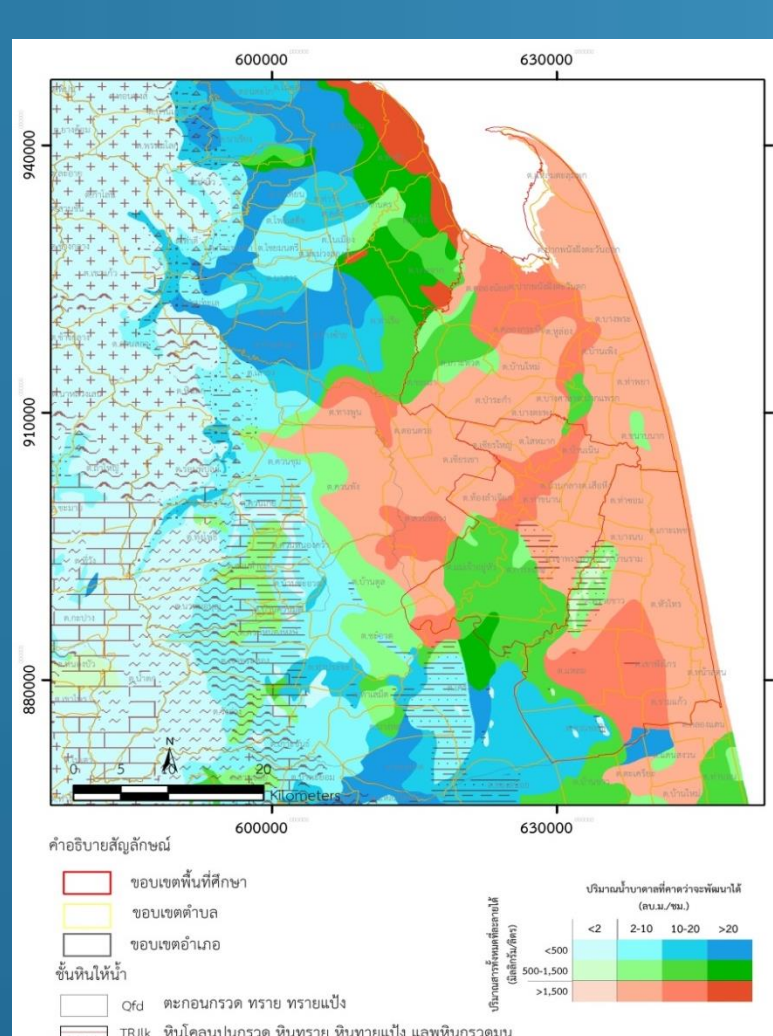


Figure 3: A map showing TDS (original) with a well depth less than 100 meters

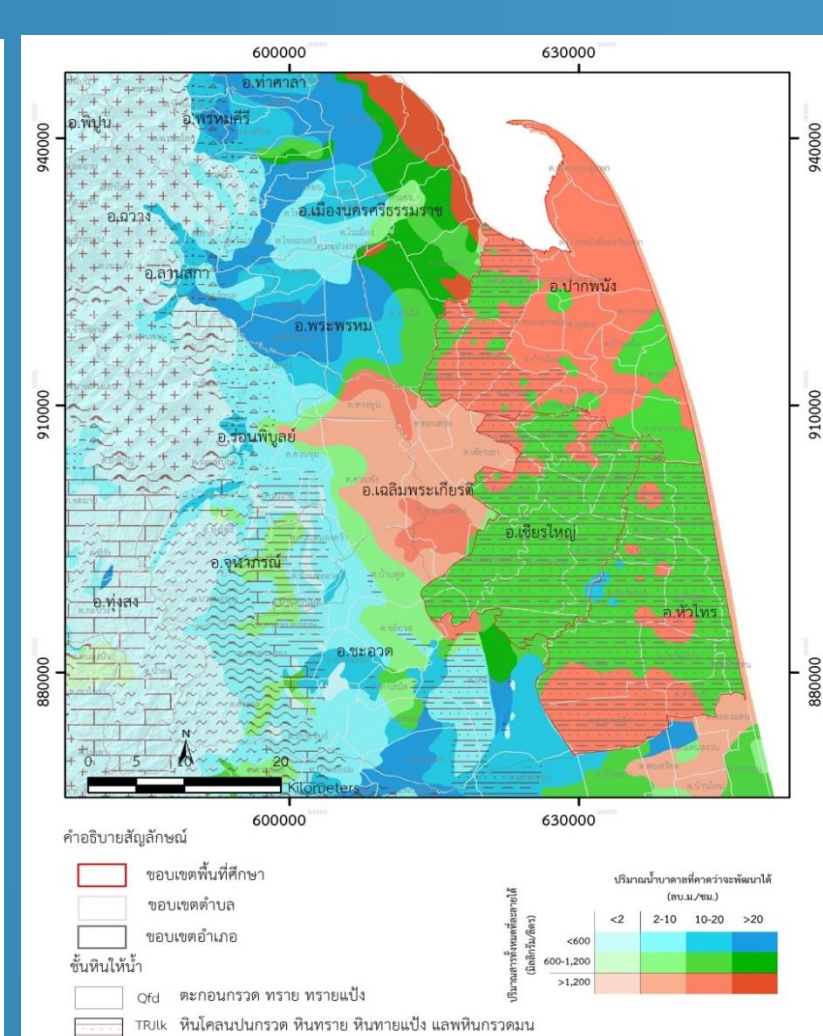


Figure 4: A map showing TDS (update) with a well depth more than 100 meters

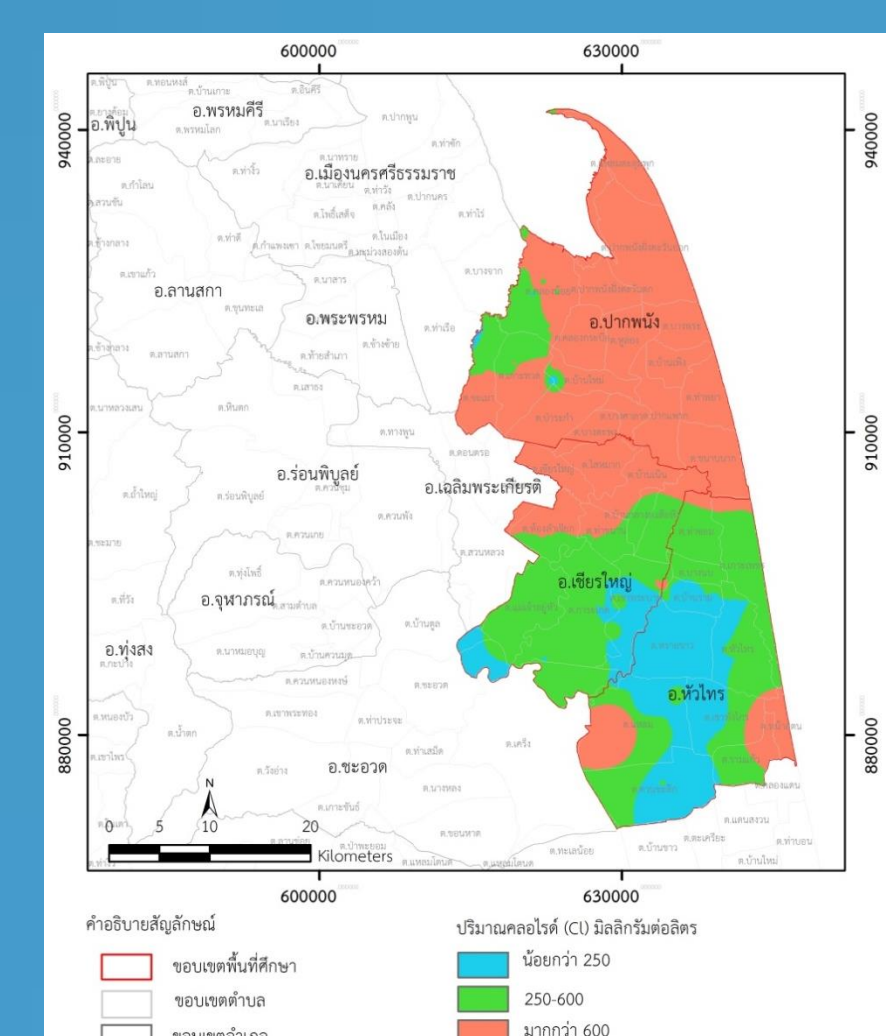


Figure 5: A map showing Chloride content (original) with a well depth less than 100 meters

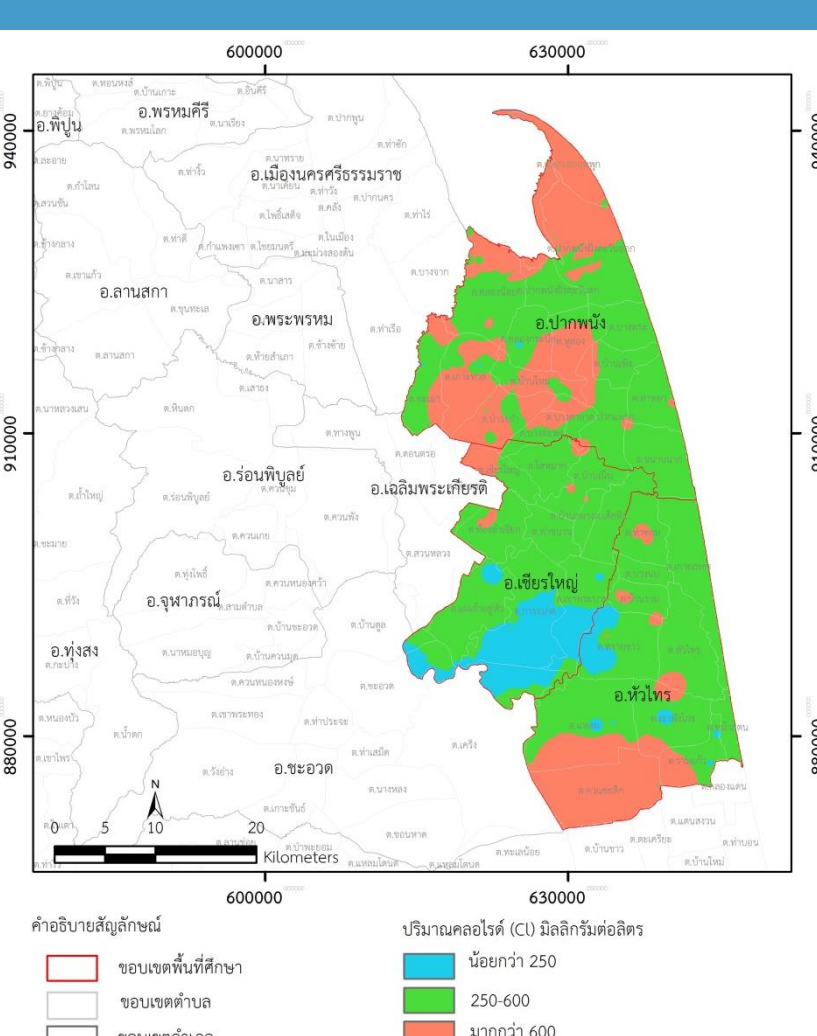


Figure 6: A map showing Chloride content (update) with a well depth more than 100 meters

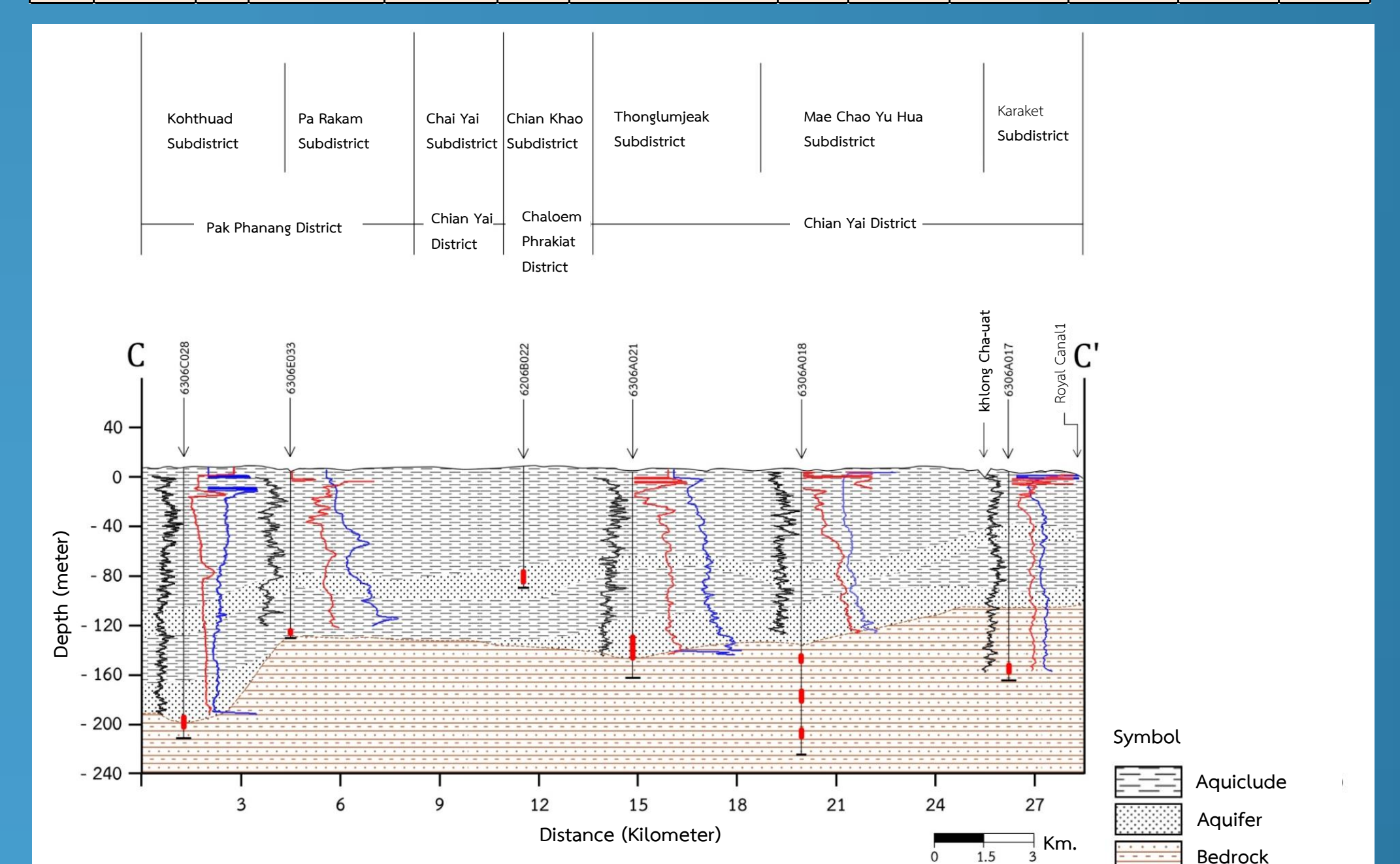


Figure 2 : Hydrogeological cross-section (line C-C')

Reference

- 1) Department of Groundwater Resources. (2004), complete report. "The project to study the potential of groundwater the Pak Phanang Basin area due to the royal initiative". Bureau of Potential and Equilibrium Assessment of Groundwater Resources. Department of Groundwater Resources.
- 2) Todd, D.K. (1980). Groundwater Hydrology. (2nd ed.). John Wiley. New York.