American University of Beirut
Department of Geology
Geol 330Q Field & Lab Methods in Hydrogeology
Final Exam

NAME:_____ spring 2000

(20 points) 1.
Some of the project presentations made in class mentioned the following hydrogeological concepts and facts: alkalinity, seawater intrusion, and groundwater conditions in the Greater Beirut Area.

(5 points) A. What is alkalinity?

(5 points) B. Name the two major aquifers in the Greater Beirut Area.

(5 points) C. Give average values for the density and TDS of seawater.

(5 points) D. What chemical element is commonly used as an indicator of seawater intrusion into fresh groundwater?

(20 points) 2.
A well is pumped for 1½ hours at a rate of 0.06 m^3/min. The diameter of the well = 20 cm, static water level before the start of pumping = 1820 m amsl, and the pumping water level at the end of the pumping period = 1680 m amsl. Find :

(15 points) A. the volume of groundwater pumped from the aquifer.

(5 points) B. the discharge rate of groundwater pumped from the aquifer.

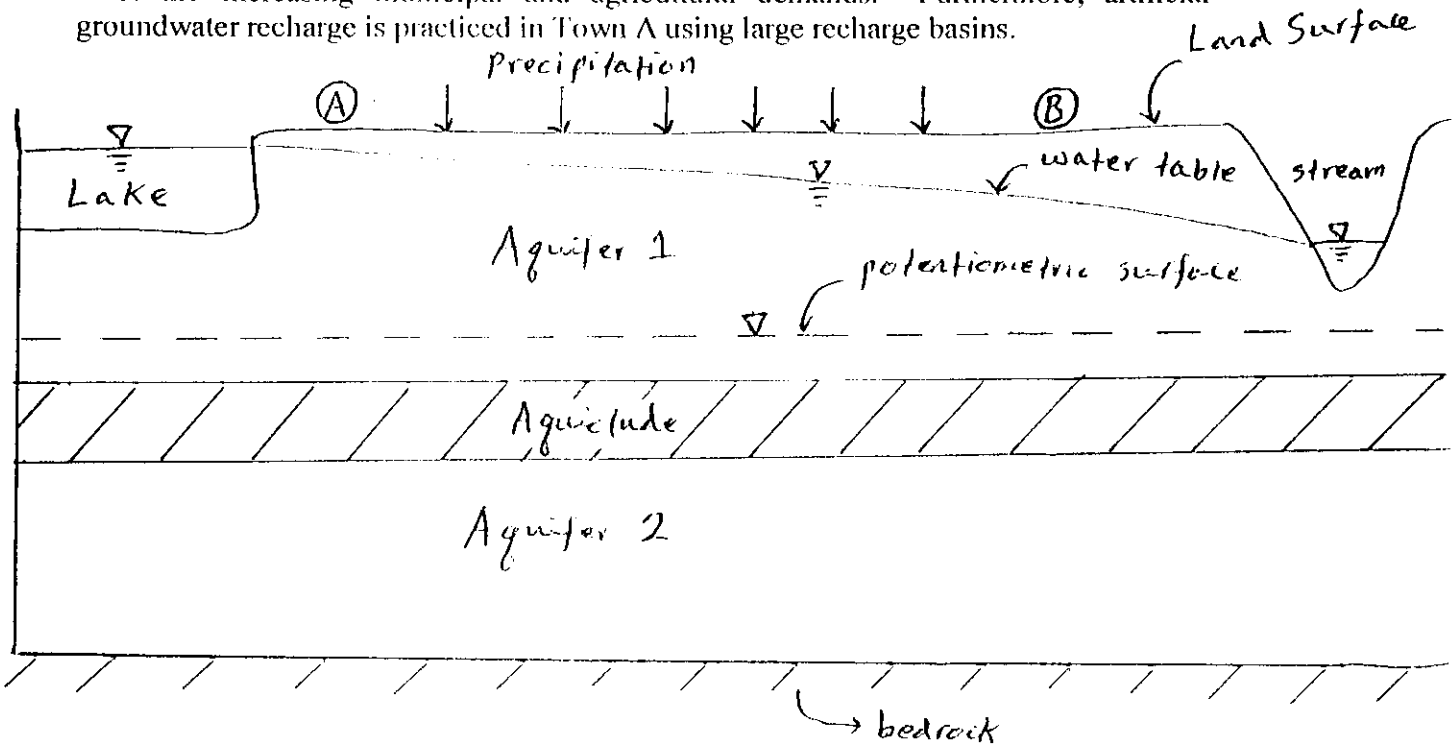
(20 points) 3.
Below are listed chemical analyses of groundwater obtained from 5 wells in an aquifer. Comment on the suitability of groundwater of each well for drinking.

Well No.	TDS (mg/l)	pH	Cl (mg/l)
462	460	5.6	6
122A	2414	6.3	5
290	389	7.2	8
201	not measured	3.7	12
214	424	5.9	5

(10 points) 4.
A confined aquifer is heavily pumped and the average annual rate of drawdown in the aquifer is 5.5 meters. The elevation of the potentiometric surface of the aquifer is 470 meters above the top of the aquifer (top of the aquifer is the bottom of the confining layer). Calculate the length of time required for the aquifer to be converted to an unconfined aquifer.

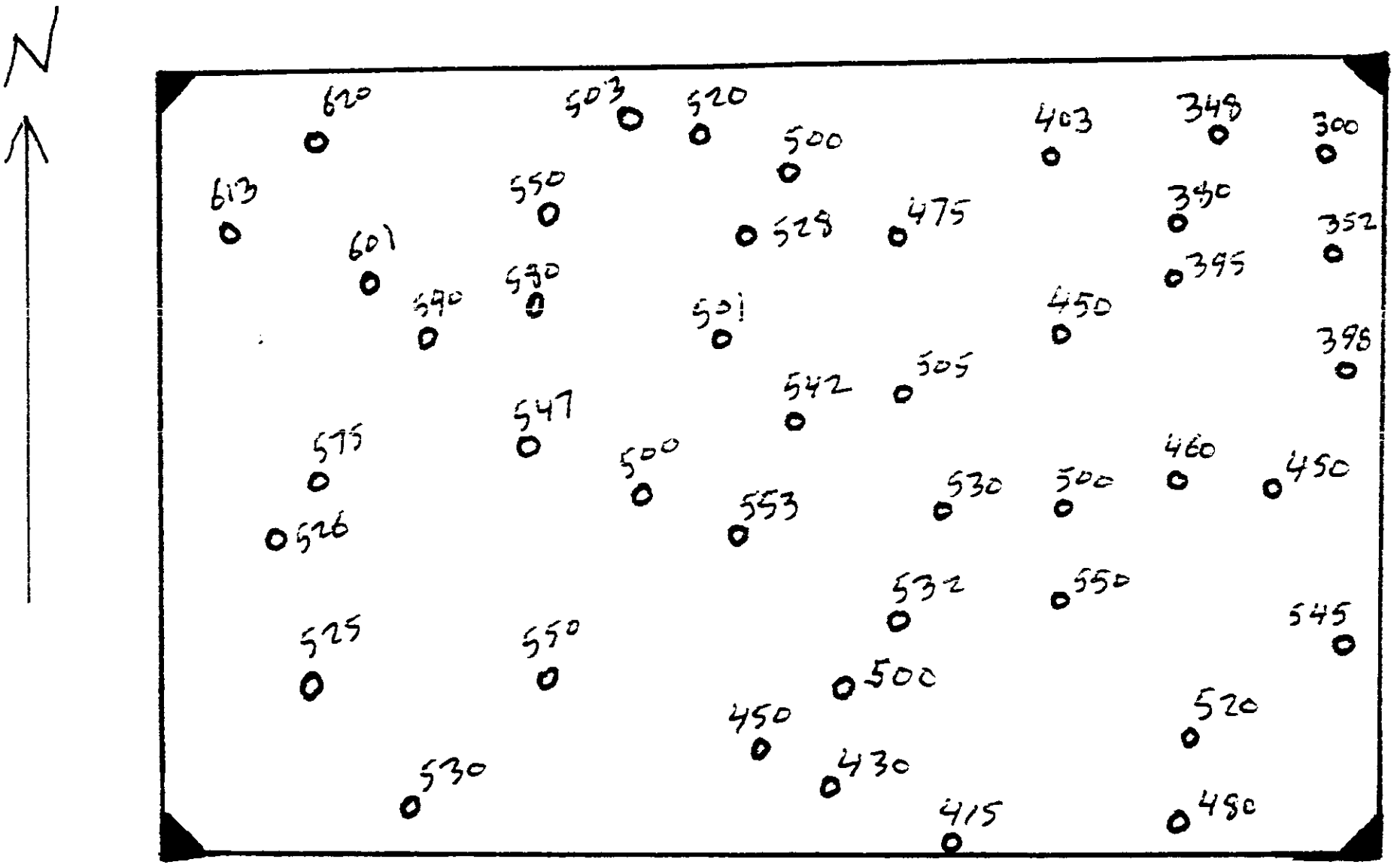
(10 points) 5.

Use the diagram below to write a conceptual groundwater budget (groundwater balance) for Aquifer 1. Note that groundwater is pumped from several wells in Towns A and B to meet the increasing municipal and agricultural demands. Furthermore, artificial groundwater recharge is practiced in Town A using large recharge basins.



(20 points) 6.

The map on the next page shows aquifer thikness (in meters) at several wells penetrating one aquifer. Construct a thickness (isopach) map for the aquifer using a contour interval of 50 meters, and starting with contour line 350 meters.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