Assiut Univ. J. of Geology Printed ISSN 1687-4843
47(2), p-p1-22 (2018)

GROUNDWATER AS DRINKING WATER SOURCE IN THE AREA NORTH WEST OF ASSIUT GOVERNORATE, EGYPT

Abd El-Hay Aly Farrag, Abdalla M. El Ayyat and Mohamed Aly Ahmed
Department of Geology, Faculty of Science, Assiut University, Assiut 71516, Egypt

Received: 15/3/2018 **Accepted:** 15/7/2018 **Available Online:** 20/12/2018

The area north west of Assiut governorate is located between latitudes 27° 11' 60'' and 27° 39' 41.45'' north and longitudes 30° 38' 52.43'' and 31° 40' 34.59'' east between El Ebrahymia Canal and the Eocene limestone plateau. It comprises both the western young and the old alluvial plains of the Nile. The Quaternary water bearing sediments represent the main aquifer in th /e area. Fifty-seven groundwater stations for pumping drinking water have been selected for investigation. Each station contains more than one productive well having different depths. The chemical composition and physical characteristics of the groundwater in the area have been determined and evaluated. The variations in the chemicals cations and anions during the four seasons of 2012 with the groundwater depth have been carefully studied and charted. Evaluation of the drinking water has been carried out by comparing with both the local and international standers for drinking water. The results showed that the majority of pumped wells are acceptable for drinking purposes and the water from deeper wells having more better quality.

Keywords: Assiut governate, Quaternary aquifer, drinking water, international standards.

INTRODUCTION

Assiut Governorate is located at the central part of upper Egypt between latitudes 26°47' and 27°37'N and between longitudes 30°37' and 31°34' .It comprises 11 districts with a total area of 25,926 km^2 and the total number of population is about 4.408.441 (2016).

The groundwater represents an essential water source for drinking and domestic uses in most parts of Assiut Governorate. More than 700 groundwater wells distributed throughout the area have been used for drinking and domestic uses. Most of these wells penetrate the Quaternary water bearing sediments in the young alluvial plains of the Nile. Their depths range between 60 m and 200 m.

The present study deals with evaluation of the groundwater quality in the area northwest of Assiut Governorate as drinking water compared with the local and international standard recommended for this issue (Fig 1).

It comprises the area between Assiut and Dirout districts, bordered from the east by the Nile River and from the west by the Eocene limestone plateau. 82 water samples have been collected from wells having different depths located in 57 sites. Four localities were chosen to clear up the relation between the groundwater quality and water depths. These sites are Sanabu close to El-Ebrahymia Canal, (Dashlut and Eltatalyua) close to the desert fringes and Blote in between during three periods in 2012. The samples have been analyzed in Assiut drinking and waste water company.

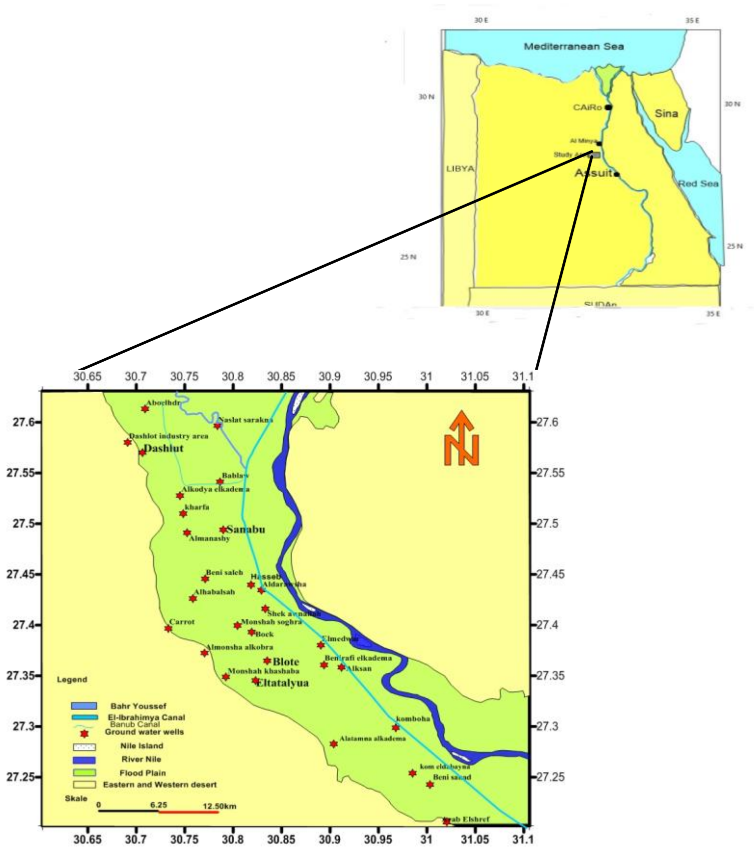

Fig. 1: Location map of the study wells.

Assiut Governorate is dominated by aird climate. The mean air temperature is about of 28^{o}C. The mean relative humidity is about 20 % .The evaporation rates are generally high with the range of 10 cm up to 95 cm/month and mean evapotranspiration rate of 185 cm/year while the rainfall is not significant throughout the year(Farag, 1982)[1].

Generally, Assiut Governorate is underlain and surrounded by sedimentary rocks having different degree of hardness. Most the study area is located within the western-young alluvial plain of the Nile. It is dissected by some irrigation canals and underlain by the Nile silts. The area is generally flat with mean elevation of +52 m.

To the west of the young alluvial plain of the Nile, the old alluvial plain of the Nile is present as terraces founded at different heights. These terraces were formed as a result of aggradations and degradation of the Nile Valley relative to the eustatic changes of the ultimate level of the Mediterranean (Ball,1939)[2].

GEOMORPHOLOGICAL AND GEOLOGICAL setting

Geomorphology: The calcareous structural plateau across which the Nile cuts its own way and separates it into eastern and western plateau, bordering the area at its western side. The western plateau has less altitude compared with the eastern one and its surface is more regular with the absence of well- marked drainage lines (Fig. 2).

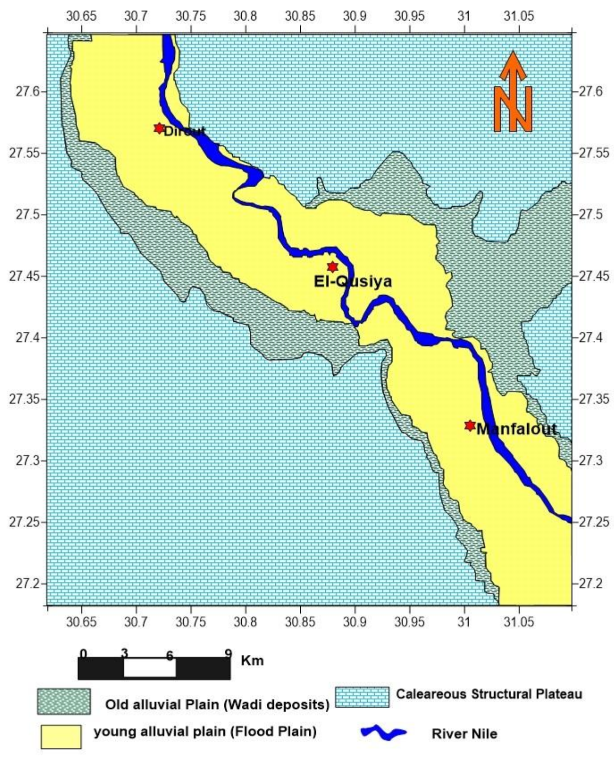

Fig. 2: Geomorphological map of the study area (after Said, 1981) [3].

Geologically: The target area is occupied and surrounded by sedimentary rocks of Tertiary and Quaternary periods. The thickness of the sedimentary rocks is generally increasing toward the north. These rock and sediments can be distinguished into two groups, Eocene and post Eocene units. The Eocene rocks bordering the study area from the west and represented mainly by Drunka Formation. Its type locality is Gebel Drunka, west of Assiut City. Outside the type locality to the south it caps and interfingers with the Thebes Formation. To the north, it underlies the Minia Formation. It is assigned as Early Eocene (El Naggar, 1970) [4]and Hermina, 1989)[5].

The post-Eocene Rocks are widely distributed in Assiut environs and are mainly of Plio-Pleistocene sediments situated at various heights above the flood plain of the Nile. They cover both sides of the Nile banks at the foot of the scarps. According to Said (1990)[6] the main rock units belonging to this age are The Pliocene sediments of the Nile Valley which consist of a lower marine sequence (Eonile sediments) of Early Pliocene age, and an upper fluviatile sequence (Paleonile sediments) of Late Pliocene age. The Quaternary sediments lie unconformably over the Pliocene and the older sediments. The Quaternary facies are described from base to top as Protonile; Protonile/Prenile; Prenile and Neonile sediments.

CONOCO (1987)[7] classified the deposits of post-Eocene age into i) Issawia Formation (Pliocene deposits) composed of chocolate-brown, clays, overlain by a tuffaceous hard limestone bed and thick limestone breccia. ii) Wadi deposits which are composed mainly of coarse sand and sandy loam mixed with cobbles, gravels and rock fragments. iii) Fanglomerate dominated on alluvial fans and composed of conglomerates and breccias. iv) Sand dunes composed of fine quartz sand, silt and heavy minerals (Late Pleistocene to Holocene time). v) Nile silt (about 9m) composed of fine sands to silt, dominated by quartz grains and some heavy minerals (Figs. 3 and 4).

Time unit				Rock unit			Lithology	Description
Era	**Period**	**Epoch**		**Group**	**Sup-group**	**Formation**		
Cenozoic	Quaternary					Dandara		Silty clay
		Plio-Oligocene	Middle - late			Qena		Massive cross-bedded sandstone with clay lenses
			Early			Issawia/ Armant		Breccia and conglomerates
						Idfu		Cobbles and gravels in red clayey matrix
	Tertiary	Pliocene	Late			Madamud		Red brown clay, sandy silt and marl
			Early			Kom Elshelul		Clay and sand
		Eocene	Late	Maadi		Maadi		Clays , marls and sandy limestone
			Middle		Observatory S.G			Limestone, marl and shales
						Qarara		Marl, clays and sandstones
						Samalut		White nummulitic limestones
			Early	Minia Formation				Limestone and chalky limestone, hard limestone with chert bands
						Esna Shale		Shale
		Paleocene				Tarawan Chalk		Chalk
						Dakhla Shale		Shale
Paleozoic Mesozoic	Lat Cretaceous					Duwi		Phosphate, marl and sandstones
	Pre-Cretaceous					Nubian		Sandstones and conglomerates with Clay interbeds
Pre-Cambrian								Granitic and metamorphic rock

Fig. 3: Generalized stratigraphic section of the Nile Valley (Said 1983[8] and 1990[6])

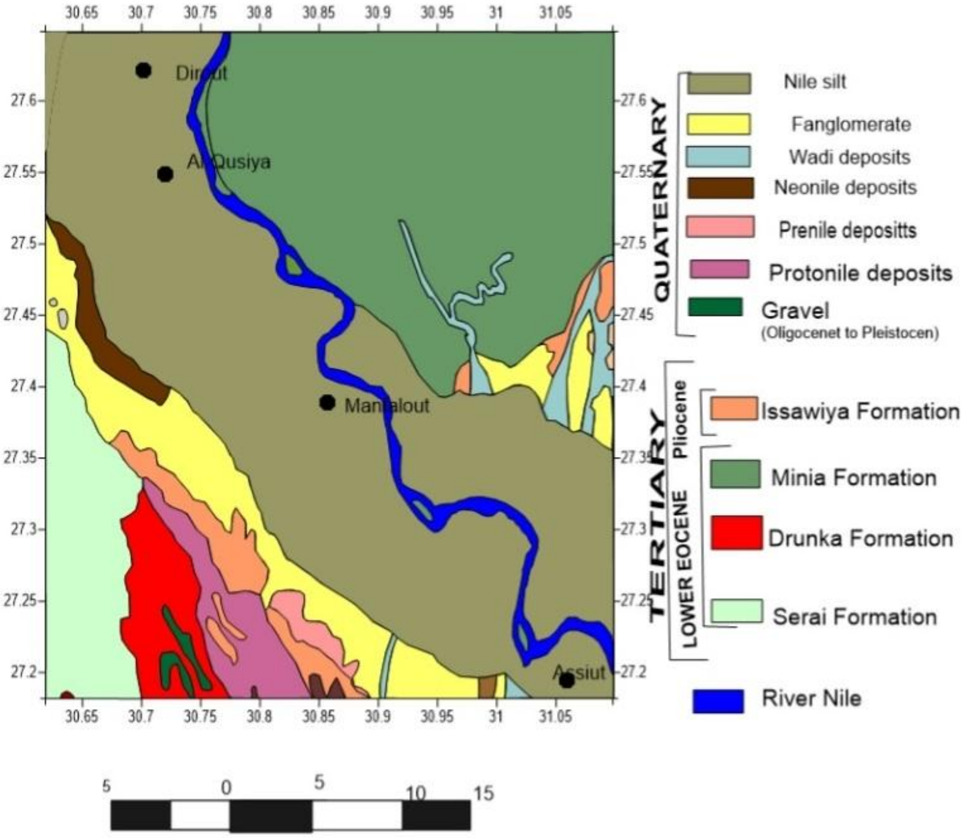

Fig. 4: The geological map of Assiut governorate (digitized after CONOCO, 1987).

Hydrogeological situation: Both the surface water and the groundwater are used for drinking and domestic uses. Most the groundwater wells penetrate the Quaternary water bearing sediments, which are mainly recharged from the local surface water system. The groundwater levels descend gradually from the south to the north. The groundwater in the area is influenced by the evaporation processes where the depths of the water are in the range between 3 to 7 m. The surface water plays an important role in recharging the groundwater. The Quaternary aquifer is overlain by alluvial deposits of the Nile and dominated by graded sand and gravel with thin interbeds of clay (Fig. 4). Its thickness as well as its width differs from one locality to another and it is mainly present under semi-confined conditions while close to western borders it is confined where the Nile silt is absent (Farrag, 1982)[1]. The sand and gravel of the Pleistocene age cover the surface of the old alluvial plains.

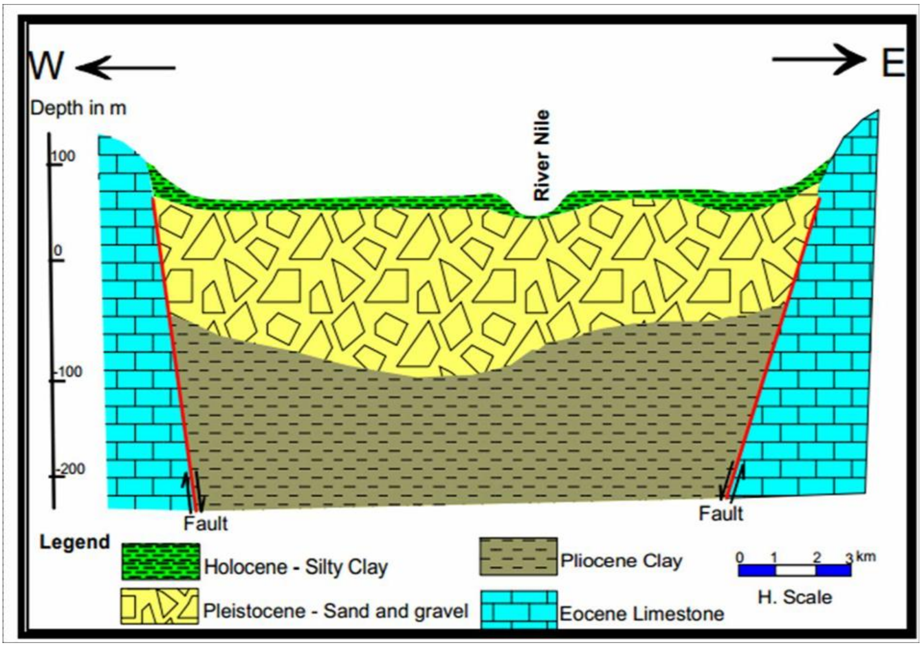

Fig. 5: Hydrogeological cross section for the area south of Assuit city (after Farrag, 1982).

MATERIALS AND METHODS

Some field and laboratory measurements and analysis have been carried out on 82 selected groundwater samples collected from wells located in Eltatalyua, Blote, Sanabu and Dashlut sites, northwest of Assiut during 2012. The water samples have been collected in polyethylene bottles. The main physical and chemical parameters of the collected samples have been measured and determined including: the turbidity, total dissolved solids (TDS), hydrogen ion concentrations (pH) in addition to the concentrations of the major ions (calcium Ca^{2+}), magnesium (Mg^{2+}), bicarbonate $(HCO_3)^-$, chloride $(Cl)^-$, iron (Fe^{2+}), manganese (Mn^{2+}) and ammonia (NH_3). The chemical analyses have been carried out in the laboratories of the drinking and wastewater company of Assiut. Electrical conductivity meter has been used to estimate the total dissolved solids (TDS). Ca^{2+} and Mg^{2+} have been determined using the titration with standard versenate (EDTA) solution using Eriochrome Black T (EBT) as indicator. Carbonate and bicarbonate have been determined by the titration with standard solution of hydrochloric acid. Chlorides have been determined using standard solution of silver nitrate.

The groundwater wells in the area have been classified into three categories according to their depths (G_1), (G_2) and (G_3). G_1 including the wells having depths of 80 m or less, G_2 comprises wells of depths from 80 to 120 m and G_3 for those of more than 120 m respectively. To study the change in the groundwater characteristics with time during the year 2012 three periods have been determined (P_1, P_2 and P_3), which are corresponding to the periods; January to April, May to August and September to December respectively. A discussion of the result has given in the following part (Tables 1, 2 and Figs. 6A , 6B and 7A to 7H).

Table 1: The physical and chemical data of the groundwater in selected localities in the study area during 2012.

ID	Time period	Dashlut			Sanabu			Blote			Eltatalyua		
		$1G_1$	$1G_2$	$1G_3$	$2G_1$	$2G_2$	$2G_3$	$3G_1$	$3G_2$	$3G_3$	$4G_1$	$4G_2$	$4G_3$
Turbidity (NTU)	P1	0.64	0.9	0.67	4	1.1	0.46	3	0.9	1.5	1	1.2	1.5
	P2	1.1	4	3	4.3	1.5	1	2.5	1.5	3	1.3	2	1.5
	P3	1.5	3	2	4	1.9	0.9	3.3	1.9	5	1.8	2.5	1.2
PH	P1	7.2	7.6	7	7.5	6.8	7	7.7	7.8	7.5	7.4	7.3	7.4
	P2	7.2	7.8	7.3	7.2	7	7.1	7.5	7.8	7.8	7.5	7.4	7.4
	P3	7.4	7.7	7.4	7.3	6.9	7.2	7.9	7.9	7.4	7.8	7.5	7.5
TDS mg/l	P1	890	680	655	700	320	340	500	520	450	575	480	455
	P2	900	760	650	720	400	380	550	585	498	550	510	440
	P3	910	750	670	710	375	375	520	610	540	600	520	620
Mn^{2+} mg/l	P1	0	0.1	0.1	0.6	0.2	0.1	0.1	0.2	0.3	0	0.1	0
	P2	0.2	0.2	0.1	0.7	0.2	0.2	0.35	0.1	0.3	0.2	0.2	0.2
	P3	0.1	0.1	0.1	0.4	0.2	0.1	0.1	0.1	0.1	0.4	0.2	0.1
Fe^{2+} mg/l	P1	0.3	0.2	0.1	0.1	0.3	0.3	0.6	0.1	0.4	0.2	0.2	0
	P2	0.1	0.1	0.1	0.4	0.3	0.3	0.6	0.2	0.4	0.3	0.3	0.2
	P3	0.4	0.1	0.1	0.4	0.3	0.3	0.8	0.25	0.5	0.4	0.3	0.35
NH_3 mg/l	P1	0.2	0.3	0.3	0.5	0.2	0.1	0.2	0.2	0.2	0	0.1	0.1
	P2	0.1	0.3	0.1	0.1	0.3	0.2	0.3	0.3	0.3	0.2	0.2	0.3
	P3	0.3	0.3	0.3	0.3	0.4	0.1	0.5	0.3	0.3	0.3	0.2	0.2
Mg^{2+} mg/l	P1	12	19.2	18	36	9.6	19.2	19.2	26.4	16.8	26.4	24	23.28
	P2	43.2	33.6	31.2	31.2	19.2	12	24	30	21.6	26.4	26.4	24
	P3	45.6	26.4	34.8	36	19.2	21.6	26.4	33.6	24	40.8	24	33.6
Ca^{2+} mg/l	P1	70	56	58	80	40	32	64	72	60	64	64	57.2
	P2	104	80	72	80	40	40	68	64	46	64	64	60
	P3	80	76	72	100	40	44	60	56	52	100	64	72
HCO_3^{2-} & CO_3^{2-} mg/l	P1	400	360	365	300	150	150	120	200	200	220	210	190
	P2	400	360	340	300	190	190	180	280	280	230	220	190
	P3	390	350	320	310	160	230	190	320	410	280	230	340
CL^{1-} mg/l	P1	110	100	105	75	25	30	30	30	30	30	20	25
	P2	100	80	70	48	30	35	30	28	35	29	25	40
	P3	120	120	100	80	35	40	60	25	30	25	30	20

Table (2): Egyptian standards 2007 [9]and **WHO Guidelines 2004**[10]

Parameter	**Egypt Standards**	**WHO Guidelines**
PH	6.5 – 8.5	6.5 – 8.5
Turbidity	1 NTU	*
TDS	1000 mg /l	600 mg /l
Fe^{2+}	0.3 mg /l	0.3 mg /l
Mn^{2+}	0.4 mg /l	0.1 mg /l
Ammonia	0.5 mg /l	*
Ca^{2+}	*	100
Mg^{2+}	*	50
Cl^{1-}	250 mg /l	250 mg /l
Total alkalinity	*	*

Turbidity: It is the clarity of water and it is a measure of the extent to which light is either absorbed or scattered by suspended material or impurities in water. The maximum turbidity value recommended by the Egyptian standards for drinking water is 1NTU.

The turbidity in the first group (G_1) ranged between 0.64 and 4.3 NTU.

In the first period P_1, the highest turbidity value was 4 NTU however the lower value was 0.46 NTU. During the second period P_2 turbidity value ranged between 1 and 4.3 NTU, while during the third period P_3 ranged between 0.9 and 5 NTU.

The turbidity values in the second group (G_2) ranged between 0.9 and 4 NTU.

The turbidity values in the third group (G_3) during the studied period ranged between 0.46 and 5 NTU.

Generally, the turbidity values in most of the groundwater wells in the study area having slightly high values compared with the Egyptian standard for drinking water (1 NTU). It is noticed that the turbidity decreases with the increase of depth of the groundwater wells (Fig.1 and Fig. 6A).

Fig. 6A: Variation in turbidity during 2012 in Dashlut, Sanabu, Blote and Eltatalyua

Hydrogen ion concentration (pH), it is a way to measure the intensity of acidity or alkalinity on a scale of 0 to 14, with 7 represents is neutral. Less than 7 indicates increasing acidity and numbers greater than 7 indicate increasing alkalinity. pH values during the studied periods in the area is slightly fluctuated between 7 and 7.9, which lies within the accepted limits according to the Egyptian standard for drinking water under law No. 458 of 2007 and WHO of 2004 (6.5-8.5) (Fig. 6B).

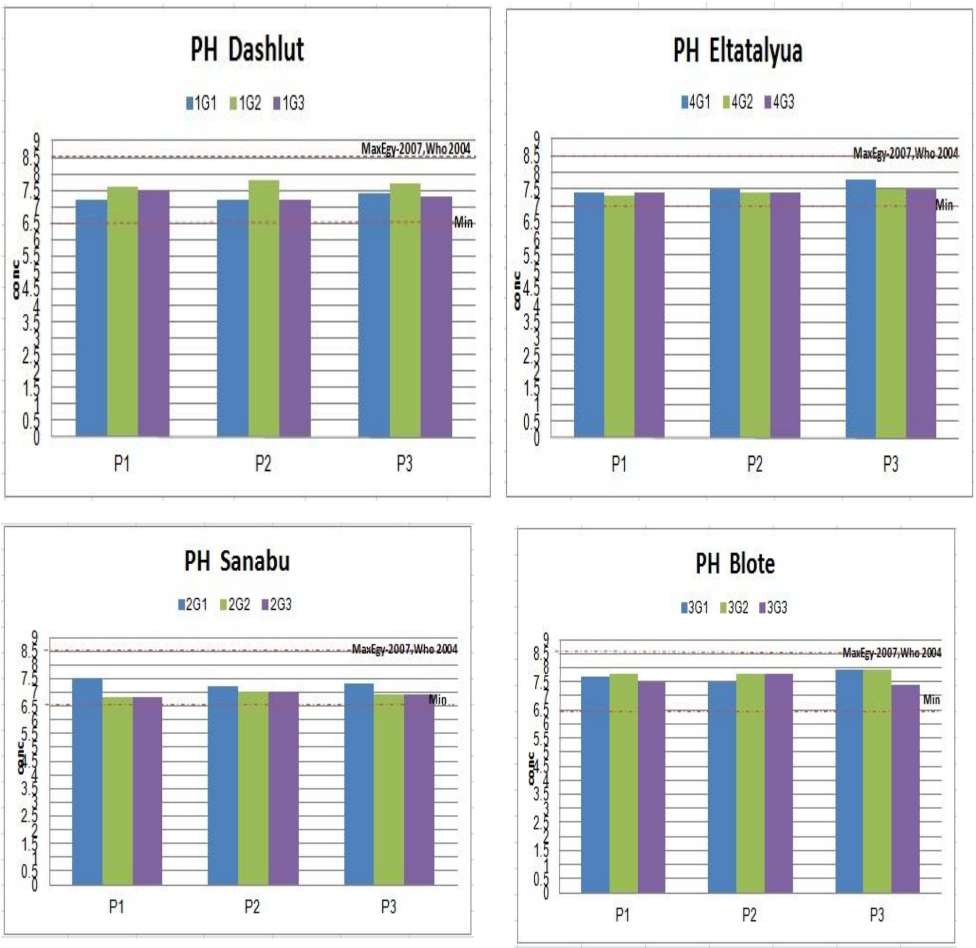

Fig. 6B: Variation in pH during 2012 in Dashlut, Sanabu, Blote and Eltatalyua

Total dissolved solids (TDS): The total dissolved solid is a measure of the amount of the dissolved material (inorganic salts and organic materials) in water

TDS values ranged between 320 and 910 mg/l. In most of shallow wells (G1) TDS values are higher than (G2) and (G3) (Fig. 1 and Fig. 7A).

Generally, TDS values in study area increase during P_2 and its highest value was recorded in the western part of the study area. TDS values in the all studied periods have been increase toward the desert fringes and decrease toward El-Ibrahimyya Canal due to ground water recharging.

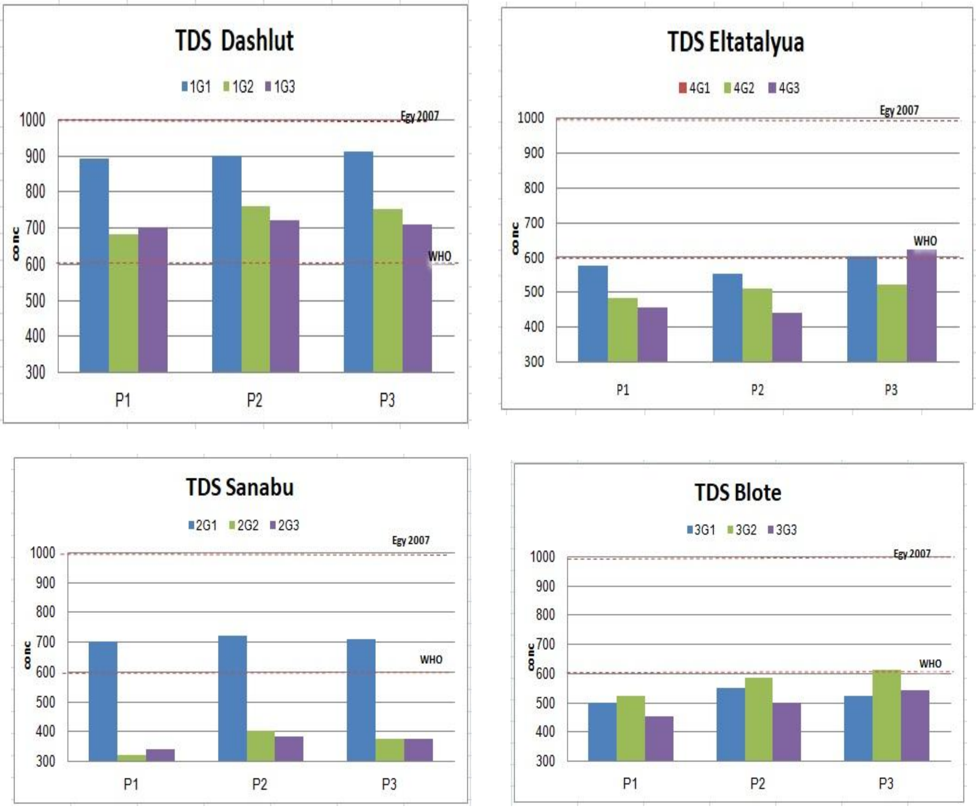

Fig. 7A: Variation in TDS during 2012 in Dashlut, Sanabu, Blote and Eltatalyua

Calcium Content (Ca^{++}): Calcium is an indicator of groundwater hardness and its high concentrations in water may affect its acceptability to the consumes in terms of taste and scale deposition (WHO, 1996)[11].

Calcium concentration in the ground water in the study area fluctuates between 32 mg/l and 104 mg/l , Its content in the shallow groundwater wells (G_1) is more higher than that in those of more depths(G_2 and G_3, Fig. 7B). It is generally high during the P_1 compared with the other periods (Fig. 7B).

Generally Ca^{2+} concentrations in the groundwater increase during P_1 and P_3 and its highest values were recorded in the western part of the study area in well 1G1 (104 mg/l). In all studied periods, Ca^{2+} concentrations has general increase toward the desert fringes toward the limestone rocks while it decrease toward El-Ibrahmiya Canal which recharge the groundwater .

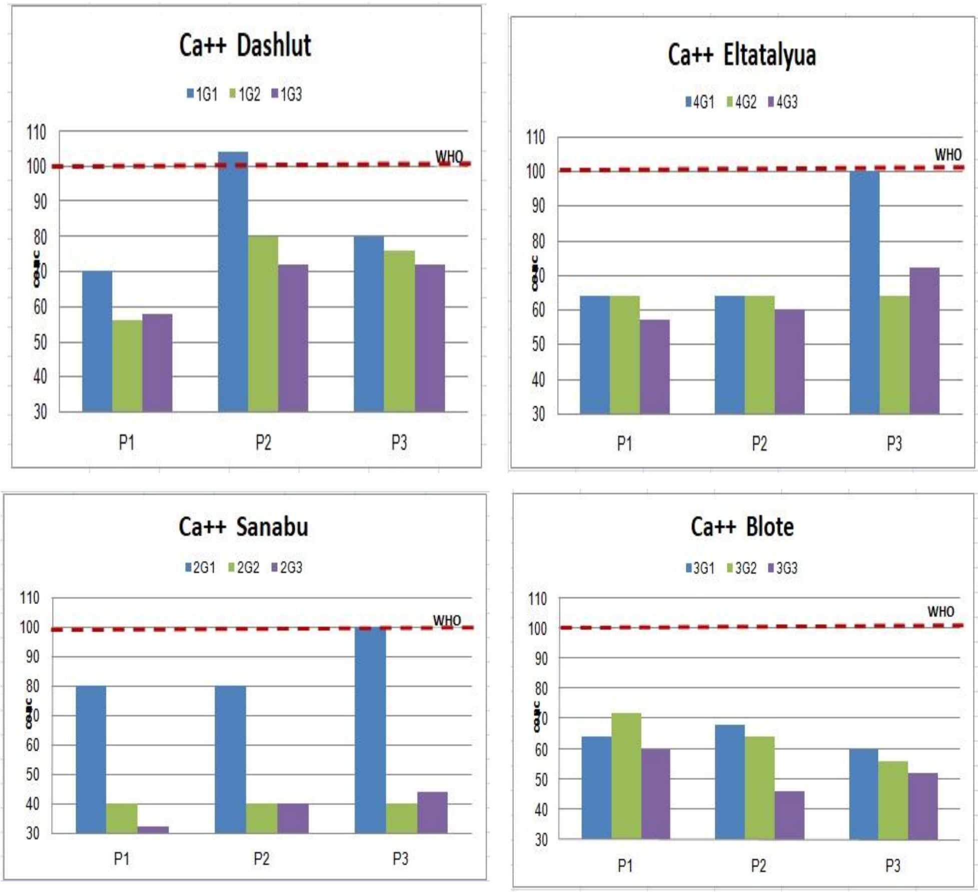

Fig. 7B: Variation in Ca^{2+} during 2012 in Dashlut, Sanabu, Blote and Eltatalyua.

Magnesium content (Mg^{2+}): Magnesium is one of the most common elements in the earth's crust. It is mainly present as dolomite $CaMg(CO_3)_2$ and magnesite$(MgCO_3)_2$, and it is used as an antacid medicine.

In the groundwater, its concentration ranges between 9.6 mg/l up to 45.6 mg/l. It is present with higher concentration in most of shallow wells (G_1) compared with those in G_2 and G_3 and its value is more higher during P_1 than that P_2 and P_3 in groundwater wells closed to El-Ibrahmiya Canal (Fig. 7C).

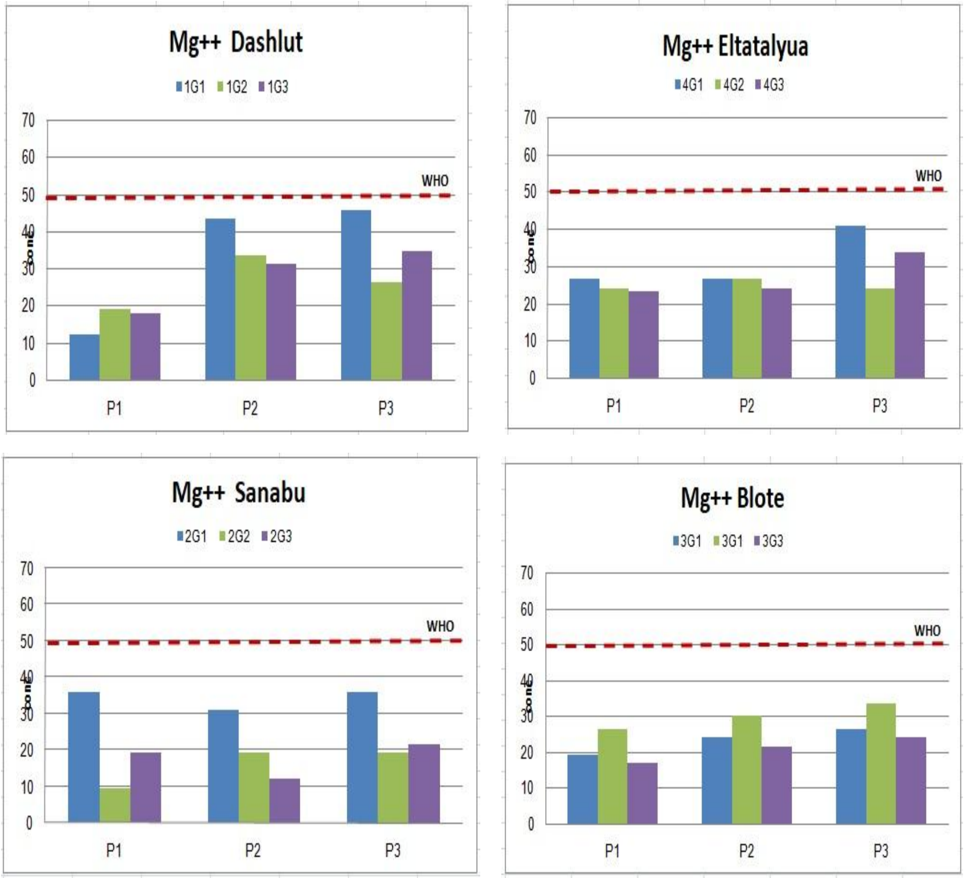

Fig. 7C: Variation in $\mathbf{Mg^{2+}}$ during 2012 in Dashlut, Sanabu, Blote and Eltatalyua

Chloride ($\mathbf{Cl^{1-}}$), it is the most common major anion occured naturally in all types of waters. It is a good indicator of groundwater quality. Its ions occur if the groundwater contacts with highly soluble chloride minerals such as halite (NaCl) or Sylvite (KCl).

Chloride concentration in the groundwater samples in the study area varies from 20 mg/l to 120 mg/l .Its concentration increases close to the western borders especially at the central part of the study area ,which may attributed to presence of some chloride minerals there . In steed of these localities it′s concentration is generally low through the studied area, In most location it′s concentration is slightly higher in the shallow wells (G_1)(Fig. 7D), which may due to contamination processes closed to the ground surface.

Generally Cl^{1-} concentrations in study area increase at the western parts of the study area while it decrease in the middle and eastern parts at the flood plain area .The groundwater in the studied wells is suitable for drinking uses regarding to their Cl^{1-} contents according to the Egyptian standards for drinking water (250 mg/l).

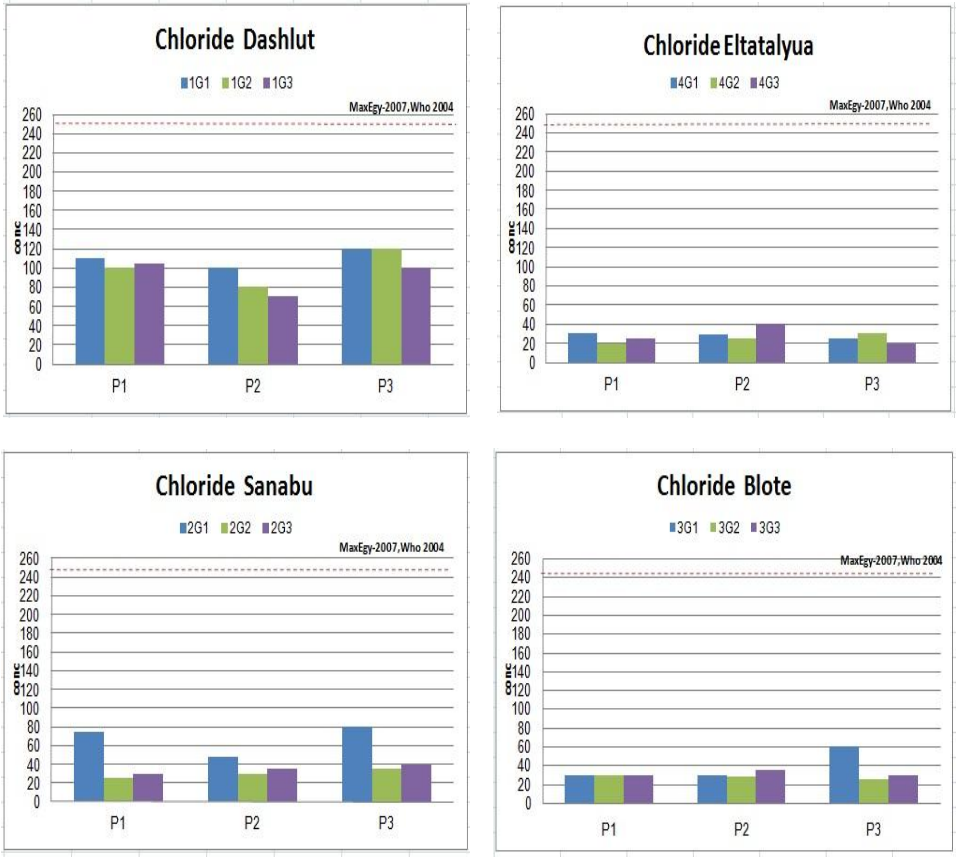

Fig. 7D: Variation in Chloride during 2012 in Dashlut, Sanabu, Blote and Eltatalyua

Total Alkalinity (HCO_3^{1-} & CO_3^{1-}, The bicarbonate ions content in groundwater is normally derived from dissolution of carbonate minerals as calcite ($CaCO_3$) and dolomite Ca Mg $(CO_3)_2$. It is also derived from carbon dioxide in the atmosphere, soils and by dissolution of carbonate rocks (Davis and Dewiest, 1966)[12]. The high concentration of HCO_3^- indicates intense chemical weathering processes taking place in an aquifer. In the studied samples, total alkalinity concentration varies from 120 mg/l to 410 mg/l.

Studying the distribution of the total alkalinity all over the studied periods, it can be seen that a slightly decrease in the values of the first period (P_1) compared to the next periods (P_2, P_3) (Fig. 7E). This supports the fact that some chemical elements are more or less encountered in the high recharge seasons of the El-Ibrahimyya Canal.

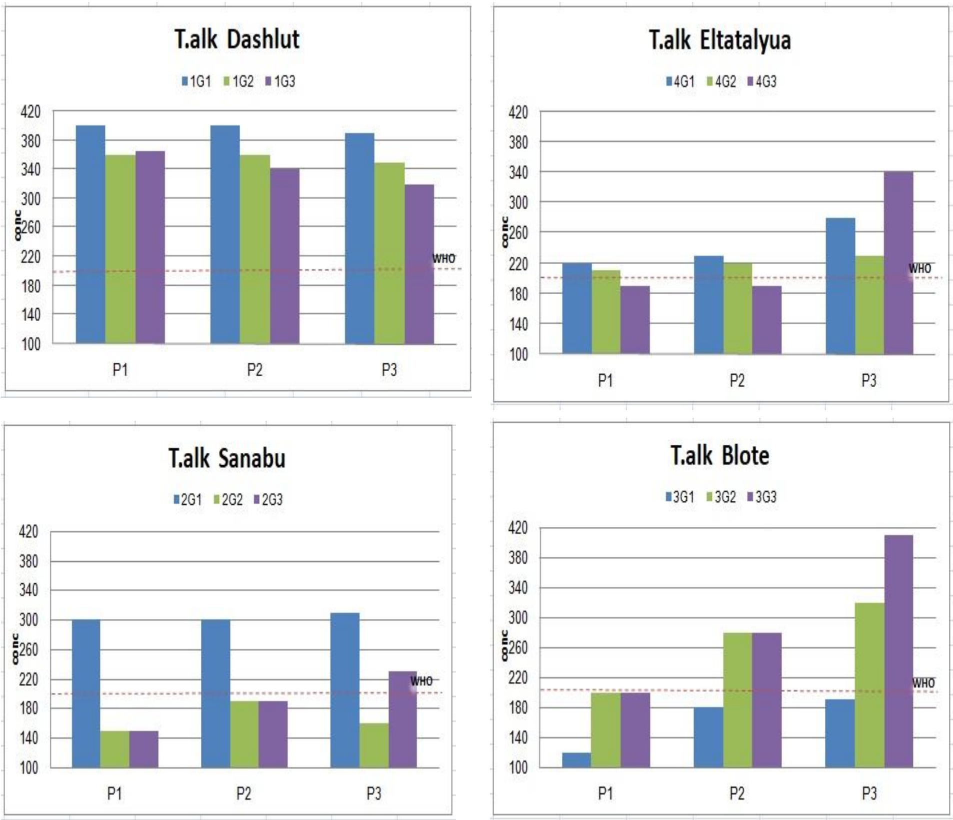

Fig. 7D: Variation in **Total Alkalinity** during 2012 in Dashlut, Sanabu, Blote and Eltatalyua

(Iron)Fe^{2+}: Iron is a metal that occurs naturally in soils, rocks and minerals in the aquifer. The groundwater contact with these solid materials dissolving them, releasing their constituents, including Fe^{2+}. The natural sources for iron in the groundwater are pyrite (FeS_2), magnetite (Fe_3O_4) sandstone rocks and sulfides or iron clay minerals. Iron content in the ground water in the area but it is generally less than fluctuate 1.5 mg/l. The groundwater in the study area has Fe^{2+} concentration lies within the acceptance limits according to the Egyptian standard for drinking water (0.3 mg/l) (Fig. 7F) except for (G_1) wells (2, 3). The slightly decrease in the Fe^{+2} in the first period of measurements in some wells is related to the seasonal recharge of the groundwater aquifer which encountered with the high season of the El-Ibrahimya Canal.

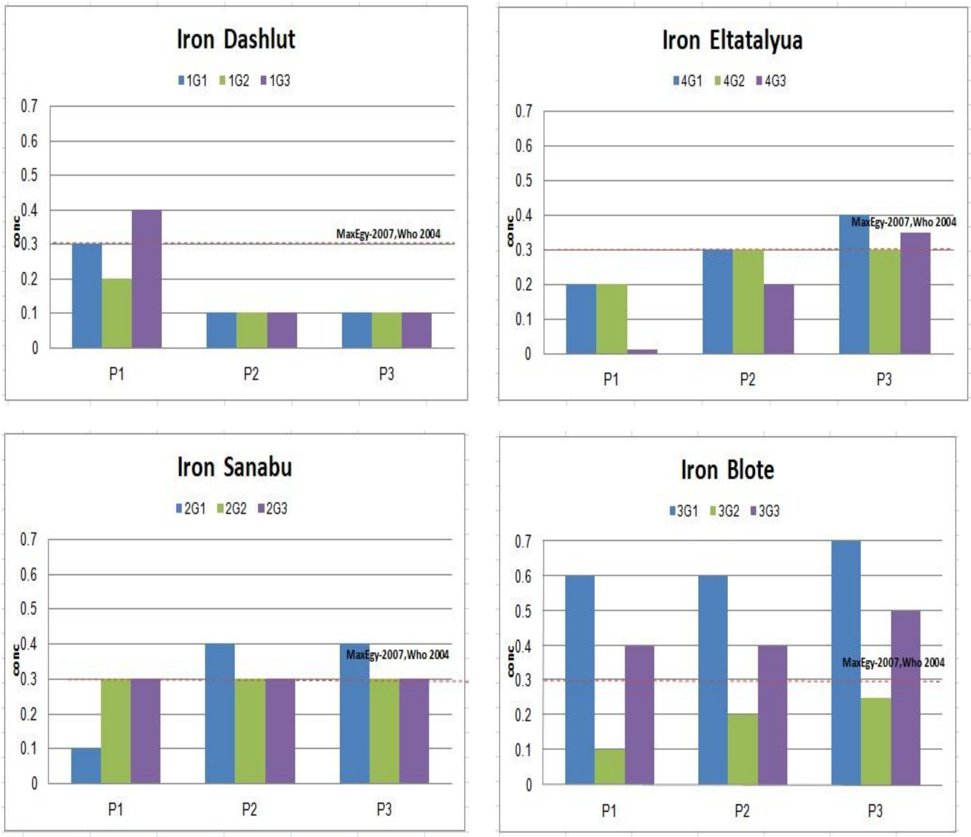

Fig. 7F: Variation in **Fe^{2+}** during 2012 in Dashlut, Sanabu, Blote and Eltatalyua

Mn^{2+} Manganese: Manganese resembles iron in its chemical behavior and in its occurrence in natural water. Although the geochemistry of manganese is similar to that of iron, the manganese concentration in unpolluted waters is typically less than half the iron concentration. Manganese content in the groundwater in the study area is lesser than 1 mg/l

In the study area, Mn^{2+} concentration lies within acceptance limits according to the Egyptian standard for drinking water (0.4 mg/l) (Fig. 7G), except for (G_1) well (2).

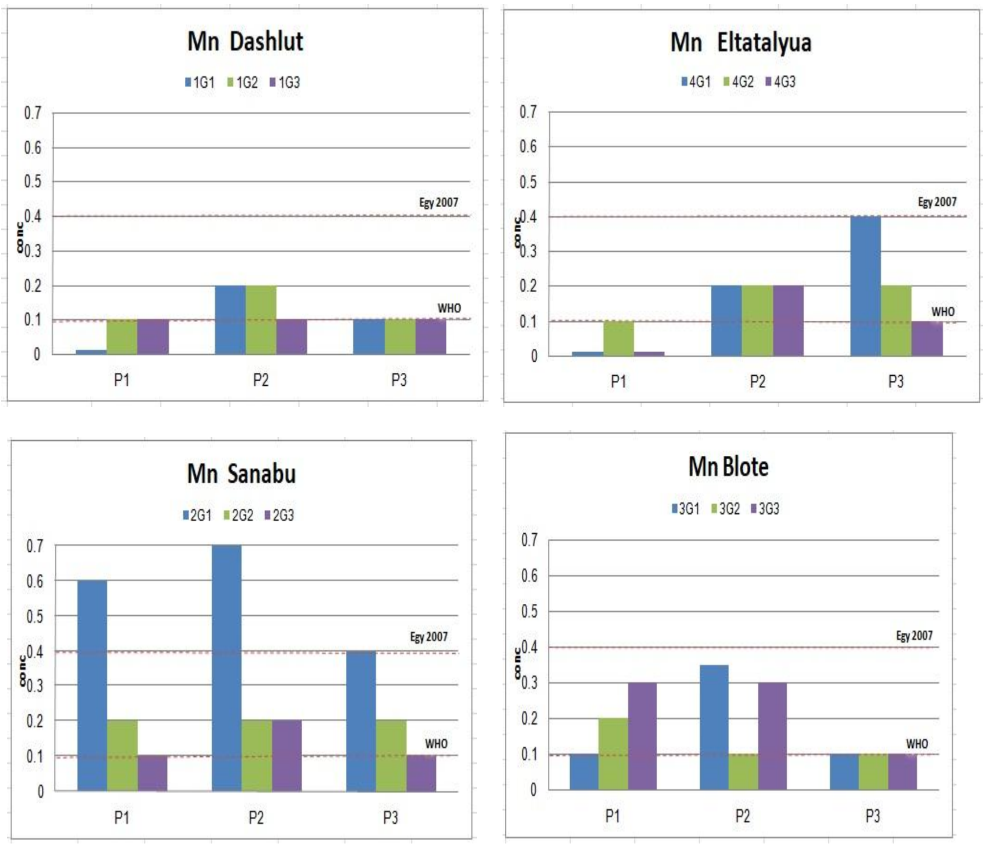

Fig. 7G: Variation in Mn^{2+} during 2012 in Dashlut, Sanabu, Blote and Eltatalyua

Ammonia NH_3: Generally the presence of ammonia in groundwater indicates that a source of ammonia is in close proximity to the water intake. The anthropogenic sources of ammonia that could be near a water intake are generally some sort of animal or human waste product (Bittner, 1997)[13]. Ammonia content in the groundwater in the study area is lesser than 0.5 mg/l (Fig. 7H).

The ammonia concentrations exist in few wells due to the geologic depositions of peat and lignite and anaerobic conditions deep below the surface. These deposits are rich in ammonia, but it cannot be nitrified because there is no oxygen present at these depths (Follet, 1989)[12].

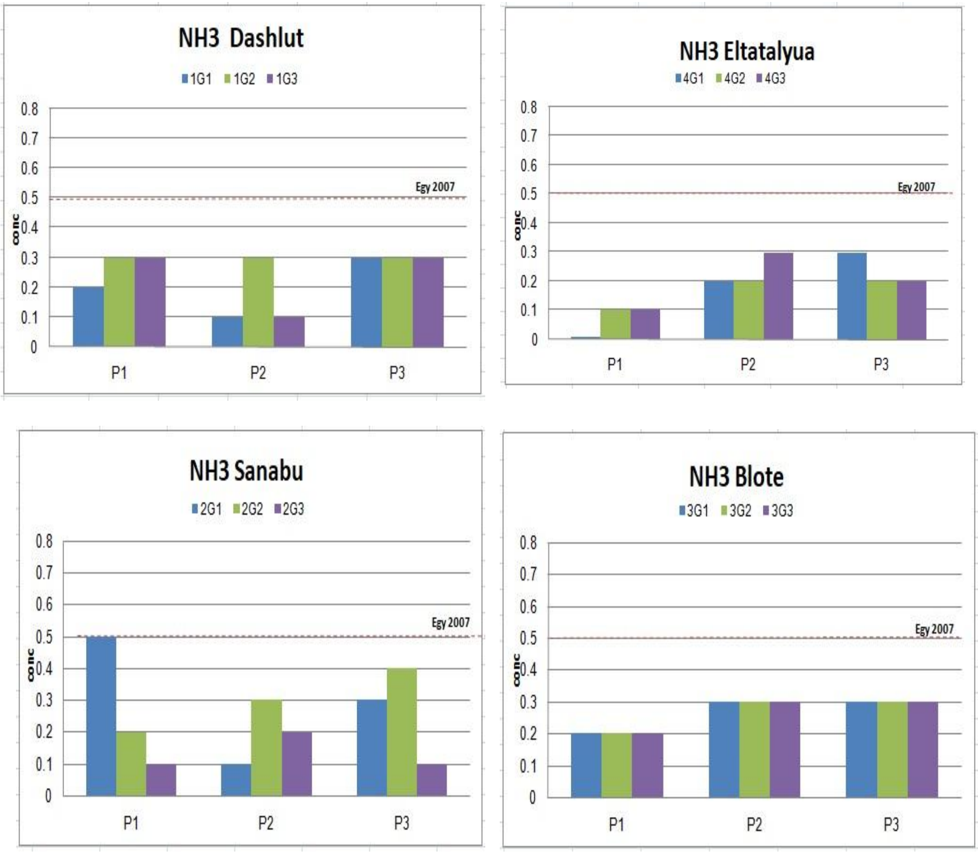

Fig. 7H: Variation in **Ammonia** during 2012 in Dashlut, Sanabu, Blote and Eltatalyua

CONCLUSION

The groundwater in the area north west of Assiut Governorate is mainly pumped from the Quaternary aquifer. The present study deals with the groundwater quality as drinking source. The study showed that the most of the ground water wells containing water are accepted for drinking and the water composition is controlled by both of its depth and the period of its extracting during the year. The groundwater in the more deeper wells are having more better quality.

REFERENCES

[1] Farrag, A. A, (1982): Hydrogeological studied on the Quaternary water-bearing sediments in the area between Assiut and Aswan. M. Sc. Thesis. Geol. Dept., Assiut Univ., Egypt.

[2] Ball., (1939): contribution to the geography of Egypt. Survey Dept, Cairo.

[3] Said, R., (1981): The geological evolution of the River Nile, Springer Verlag, New York. Inc, 151 pp.

[4] El Naggar, Z. R., (1970): On a proposed lithostratigrphic subdivision for the Late Cretaceous-Early Paleogene succession in the Nile Valley, Egypt, U.A.R.7th Arab. Petrl. Cong., Kuwait, 64(B.3): pp. 1-50.

[5] Hermina, M. H., (1989): Geology of the surroundings of Kharga, Dakhla and Farafra Oases. In Said, R.(ed.): Geology of Egypt, Rotterdam (Balkema), pp. 16-22.

[6] Said, R, (1990): The Geology of Egypt, Balkema, Rotterdam, Broodfield , 734.

[7] CONOCO, (1987): Geological Map of Egypt (Scale 1:500000), sheet: NG 36 NW Assiut.

[8] Said, R, (1983):Proposed classification of the quaternary of Egypt ; J.Afr.Earth Sci,vo1.1pp.41-45

[9] Egyptian Higher Committee for Water (EHCW), (2007): Egyptian standards for drinking and domestic uses. (In arabic), Cairo.

[10] World Health Organization (WHO), (2004): Guidelines for drinking-water quality, 3rd Edition; V. 1: Recommendations. Geneva, Switzerland.

[11] World Health Organization (WHO); (1996): Guidelines for Drinking-water Quality, 2 ed. Health Criteria and Other Supporting Information, V. 2 (WHO), Geneva, Switzerland, p. 973

[12] Davis, S. N. and Dewiest, R. J. M, (1966): Hydrogeology, John Wiley and Sons Inc., NY. P: 463.

[13] Bittner, A, (1997): Nepal Drinking Water Quality Assessment: Nitrates and Ammonia. Civil and Environmental Engineering Dept., University of Michigan, 70 pp.

[14] Follet, R. F, (1989): Nitrogen Management and Groundwater Protection. Elsevier Science Publishing Company Inc.

المياه الجوفية كمصدر لمياه الشرب فى منطقة شمال غرب محافظة أسيوط

قسم الجيولوجيا – كلية العلوم – جامعة أسيوط

تقع منطقة الدراسة بالمسطحات النيلية الحديثة للسهل الفيضى لنهر النيل شمال غرب محافظة أسيوط بين ترعة الإبراهيمية والهضبة الجيرية التركيبية بين خطى عرض ٢٧ ١١ ٦٦ و ٢٧ ٣٩ ٤٥ شرقاً وبين خطى طول ٣٠ ٣٨ ٥٢ و ٣١ ٤٠ ٣٤ شمالاً. وتهدف الدراسة الحالية الى تقييم المياه الجوفية بالمنطقة كمصدر لمياه الشرب والتى تستخرج من خزان وادى النيل الرباعى المحبب والسائد بالمنطقة.وقد أخذت الدراسة تركيز بعض العناصر للمياه كأحد اهم العوامل لتقييم تلك المياه كمصدر للشرب وتشمل تركيز كل من الأيونات التالية (الأملاح الكلية الذائبة ، وأيونات الكالسيوم والماغنسيوم ، الحديد ،المنجنيز ، الأمونيا ، القلوية الكلية (الكربونات والبيكربونات) والكلوريدات). تم مقارنة تلك التركيزات بما هو مسموح به طبقاً لمقننات مياه الشرب المصرية ومنظمة الصحة العالمية ، وإلى جانب تقييم المياه تم التعرف على مدى تأثر جودة المياه بعمق الأبار المنتجة وببعد تلك الأبار عن مصادر تغذية المياه المحلية بالمنطقة وأهمها ترعة الإبراهيمية وفروعها. حيث تم جمع عينات المياه الجوفية وتحليلها بمواقع عديدة بمنطقة الدراسة الى جانب اختيار أبار بأعماق متباينة فى نفس الموقع.

وتبين من الدراسة أن الأبار الأقل عمقاً (٨٠ متر فأقل) هى الأكثر تأثراً بالمياه السطحية بالمنطقة وً أن الأبار الأكثر عمقاً (١٢٠ متر فاكثر) هى الأكثر جودة لمياه الشرب وأن الأبار المجاورة للهضبة الجيرية التركيبية تقل جودتها لتأثرها بالرواسب الجيرية وبرواسب البلايوسين بالمنطقة.