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Detection of raveling layers of water well by electrical resistivity method and evaluation of the causes of sand making of deep well and it's confronting approach

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ABSTRACT

The collapse and destruction of the wall of drilled wells is one of the challenges of drilling water wells, leading to a shortening and reduction of well irrigation over time. This research has been carried out in an area where most of the drilled wells have faced the problem of sand generation in various dimensions. Many drill holes in Bardaskan City, Khorasan Province, their layers at depths of more than 90 meters, face the challenge of drilling, due to the presence of loam and silty sand, which first requires the drilling of wells at low distances and, secondly, the average life of the wells in these areas is generally less than 8 years and in most cases between 6 and 8 years of age. Furthermore, the problem of cutting or collapsing the tube, especially in the highest part of the first network, is also indirectly correlated with the generation of sand in the wells. The appearance of sand in a well is due to a variety of reasons, although the abundance of very fine-grained loamy and sandy materials is one of the main factors in the aqueous layers of the area. Using the geoelectric and specific resistance method, it is possible to identify layers that have silt and sand with the probability of collapse and determine the point of the layer with less fraying and determine the appropriate strategy to prevent the pipe wall shell from tilt or fill, affecting the well. In this investigation, six wells from the village of Hassan Abad in Bardaskan County, and two wells from the village of Hatiteh have been evaluated, as most of their wells face the problem of wall collapse. Using the geophysical method, the resistance of its canyoning layers has been identified and, by providing engineering solutions, a large amount of damage to the wells has been avoided.

KEY WORDS: Sand, silt, specific electrical resistance, Schlumberger, screen pipe, well collapse, tilt, well damage.

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Detección del desmoronamiento de capas de pozos de agua mediante el método de resistividad eléctrica y evaluación de las causas de la formación de arena en pozos profundos y su enfoque de confrontación

RESUMEN

El colapso y la destrucción de la pared de los pozos perforados es uno de los desafíos de la perforación de pozos de agua, lo que conduce a un acortamiento y reducción del riego del pozo con el tiempo. Esta investigación se ha llevado a cabo en un área donde la mayoría de los pozos perforados se han enfrentado al problema de la generación de arena en varias dimensiones. Muchos pozos de perforación en la ciudad de Bardaskan, provincia de Khorasan, sus capas a profundidades de más de 90 metros, enfrentan el desafío de la perforación, debido a la presencia de marga y arena limosa, que primero requiere la excavación de pozos a bajas distancias y, en segundo lugar, la vida promedio de los pozos en estas áreas generalmente tiene menos de 8 años y en la mayoría de los casos entre 6 y 8 años de edad. Además, el problema de cortar o colapsar el tubo, especialmente en la parte más alta de la primera red, también se correlaciona indirectamente con la generación de arena en los pozos. La aparición de arena en un pozo se debe a una variedad de razones, aunque la abundancia de materiales limosos y arenosos de grano muy fino es uno de los principales factores en las capas acuosas del área. Mediante el método de resistencia específica y geoeléctrica, es posible identificar capas que tengan limo y arena con la probabilidad de colapso y determinar el punto de la capa con menos deshilachado y determinar la estrategia adecuada para evitar que la carcasa de la pared de la tubería se incline o se llene, afectando el pozo. En esta investigación, se han evaluado seis pozos de la aldea de Hassan Abad, en el condado de Bardaskan, y dos pozos de la aldea de Hatiteh, que la mayoría de sus pozos enfrentan el problema del colapso de la pared. Mediante el método geofísico, se ha identificado la resistencia de sus capas de barranquismo y, al proporcionar soluciones de ingeniería, se ha evitado una gran cantidad de daños en los pozos.

PALABRAS CLAVE: Arena, limo, resistencia eléctrica específica, Schlumberger, tubería de pantalla, colapso de pozo, inclinación, daño de pozo.

Introduction

-The geographical location of Bardaskan city

The Bardaskan city with an approximate area of 7100 square kilometers on the northern margin of salt desert extends between 56 degrees and 14 minutes to 58 degrees and 15 minutes of eastern longitude and 34 degrees and 42 minutes of northern latitudes. The geographic location of the study area has been shown in Figure 1-1. This city has been limited from the north with Sabzevar city, from west with Khalilabad city, from north east with Kashmar and from south with Tabas in South Khorasan province and from west with Shahrood in Semnan province. Its center, Bardaskan city, is located in 57 degrees and 57 minutes of eastern longitude and 35 degrees and 15 minutes of northern latitudes and in 265 kilometers of southwest of Mashhad.

The height of the city is 985 meters above sea level, and according to the latest decisions, it has 3 sections including central, Anabad and Shahr Abad with 393 inhabited and inhabited villages. Shahrabad is a city in the area of Shahr Abad, the city of Bardaskan in Razavi Khorasan Province of Iran. Based on the general census of population and housing in 2016, the population of this city has been 2, 083 people (in 644 households).

The location of the city relative to the surrounding towns: North: Bardaskan, Northeast: Khalilabad and Kashmar, south east: Bajestan (Ahmadipour, Shaibani, & Mostafavi, 2019; Youli Li, 1999). This city as hydrologic is located in large-scale in Kalshoor basin - Salt Desert and in the small-scale in hydrologic unit of Darooneh. Height from sea level: 880 meters. Distance to city center: 14 kilometers (figure 1).

-Weather features

The northern areas of Bardaskan are mountainous and the southern and central parts is plain and its air is dry due to its proximity to the desert (Vearncombe. JR, 1989). The average annual precipitation is 150 millimeter. The air temperature of the city of Bardaskan is about 45 degrees in the warmest summer days and falls below zero at 5 ° Centigrade on the coldest nights of the winter.

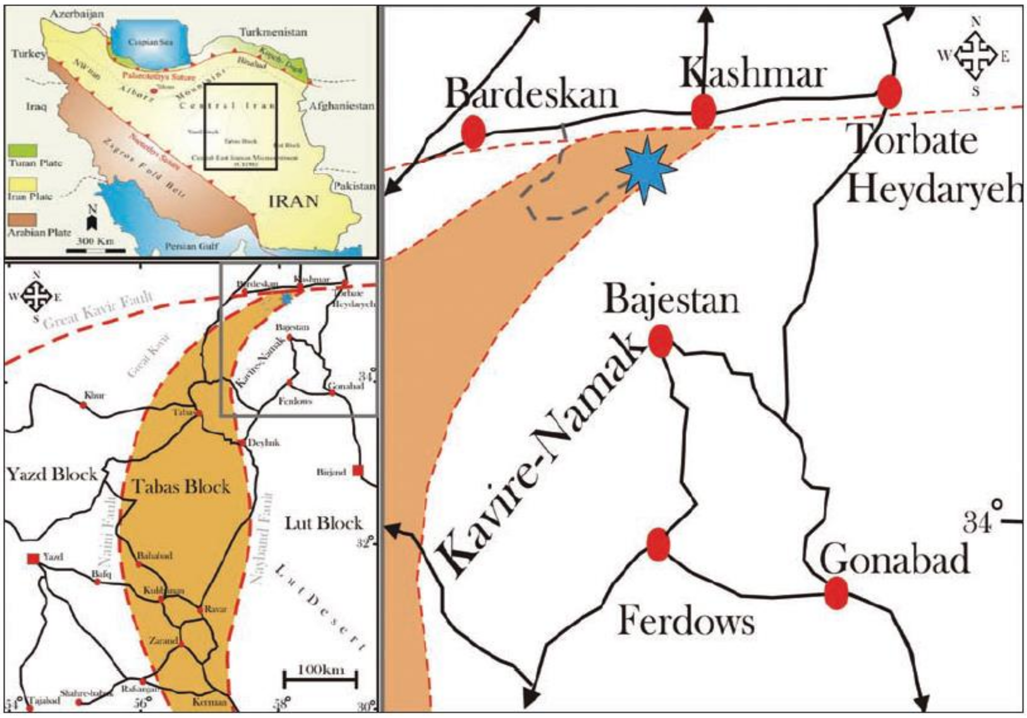


Figure 1. Geographic location of the study area (adapted from the maps of Khorasan Razavi Governorate, and Geological Survey).

Because of this, the temperature difference is high in different parts of the city. Its northern and eastern sides are relatively cold, but its western and southwest winds due to its proximity to deserts are hot and burning with dust. (Climatology.ir Comprehensive Iranian Meteorological and Climatic Site) (Teod, 2016).

-Climate

This city has been formed from two mountainous regions of the north and southern plains, including deserts, salt woods and salt deserts.
The Bardaskan area has been located in the northwest of central Iran and is part of the central Iranian sedimentary and structural zone. The position of the studied area relative to Iran's structural divisive units have been shown in Figure 1-2. In this range, different outcrops of Precambrian rock units up to the present day are observed (Jagat & Mahesh, 2018). The most extensive lithology of this region are formed of igneous rocks and metamorphoses. The precambrian stones of this region are located in a

wedge-shaped massif between the main faults of Taknar and Darooneh (pierpaolo Guarnieri, 2008).

The 1:100000 map of the Geology of Bardaskan city has been shown in Figure 1-3. One of the most influential masses of this area is the Precambrian penetrative mass that is made of granite, granifiers and granitoid, and is the equivalent of era granite. Another important intrusive mass is the granite area, whose time of influence has been determined as Eocene-Oligocene. According to the recent research on the age measurement of the zircon Uranium-galena in the Sarhangi Mountain located in the Tectonic zone of Kashmar-Kerman, the age of the intrusive bedrock (high silica) of Precambrian or Cambrian has been determined (535-575 million years) (Martin Stokes 2007; Samiei & Mobaraki, 2019).

The Soltanieh formations, Shirghast, Nior, Padeh, Sibazar, Bahram, Sardar, Jamal (Paleozoic units), Shemshak, red walnut layers, conglomerate-sandstone units, former Cretaceous unit, Ophiolite blend, Superphilic rocks, Diabase and Diabase tuffs , volcanic and pyrogenic rocks, Plagic limestones (Mesozoic units), Kerman Formation, Eocene Flicchi basin deposits, Eocene-Oligocene conglomerates and Neogene conglomera, red ganes and Pliocene-Ploshtoceen conglomers (tertiary units), and lateral ancient alluvium terraces, sandy hills and sandy lagoons, clay roofs, old alluviums, mud muddy- salty areas and young alluvials and cones (quaternary units) are within the scope of the study. One of the most important faults in this area is the Darooneh, Taknar, Maro andKalshoor faults, which Darooneh fault is the largest and most active fault in this area (Boomeri, 1998).

From a morphological perspective, the Bardaskan area can be studied in two separate parts. A part of the area located above the Darooneh fault is a mountainous region with a variety of deposits, while the southern part of the fault, with the exception of the southeast rough country which continue the outcrops of the Uzbek mountain is fallen area with an average elevation of 850 meters above sea level, which formed at a vast surface of quaternary deposits, such as alluvial tributaries, floating cones, clay and salt slabs (figure 2).

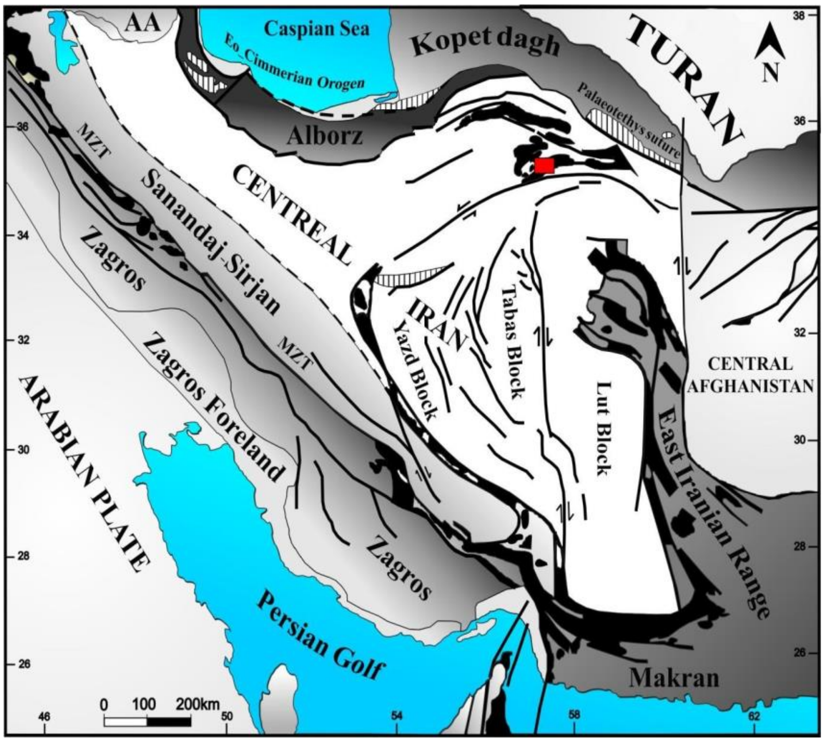
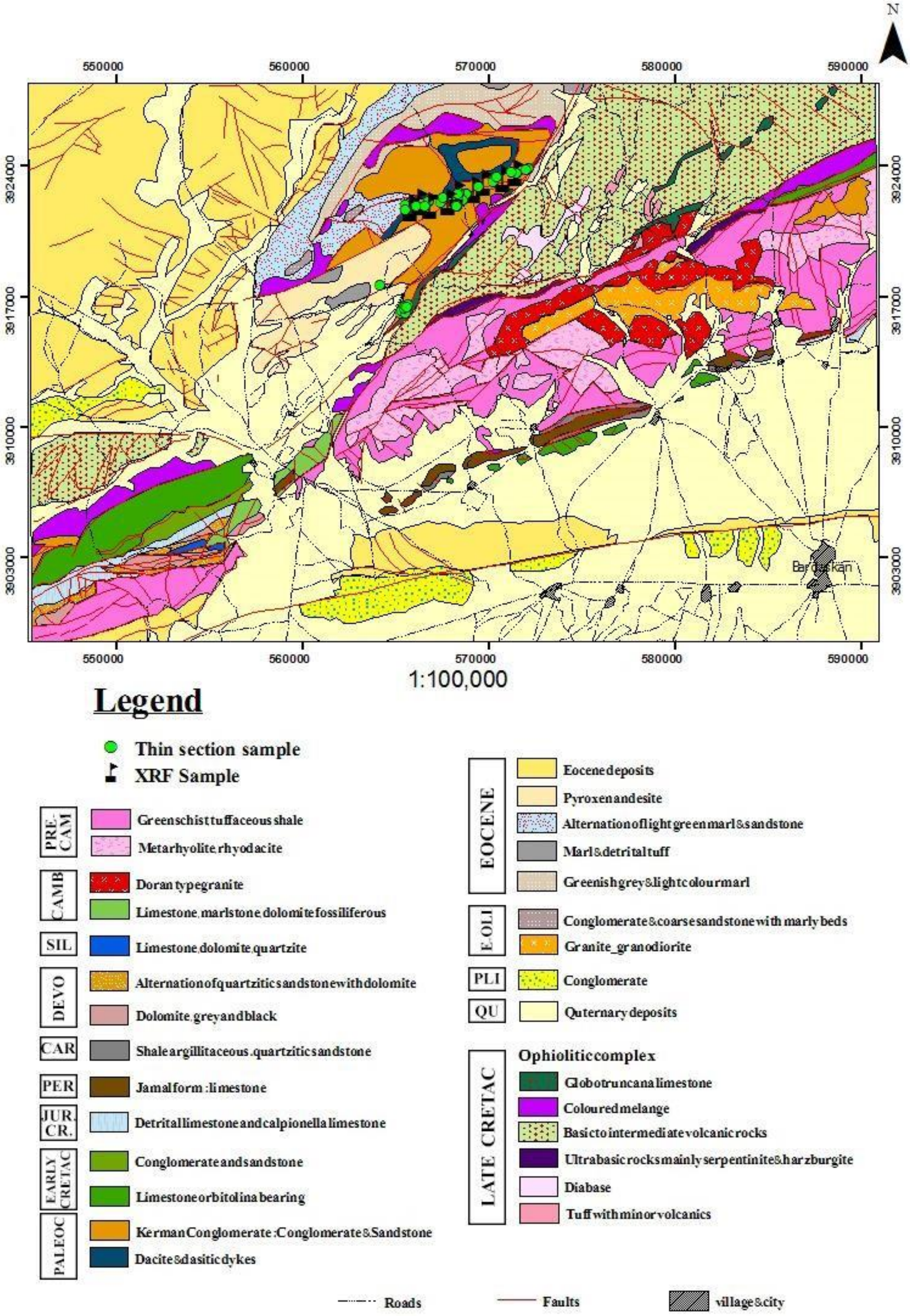


Figure 2. Division of structural units of Iran map, representing neighboring countries, (Berberian and King 1981; Angiolini 2007) (Red quadrangle represents the studied area).

The prominent geotechnical face of this area is the Darooneh fault with the east-west trend, which is the separation factor of two logistical sections. There are no permanent rivers in Bardaskan, but several seasonal rivers such as Dahan Qaleh, Anabod (Kal Asyab), Ebrahim Abad and the Bardaskan (Kaal) River Noahar are in the stream where the recent river flow from the slopes of Bijjord Mountain, 21 km north Bardskan originates from north to south (figure 3). This river after passing through the Bardaskan city crosses the Sir River and creating Shoor River that feeds the groundwater table of the Bardaskan plain (Harris, 1987).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Legend
Thin section sample
XRF Sample
PRE-CAM
Greenschisttuffaceousshale
Metarhyolite,rhyodacite
CAMB
Dorantypegranite
Limestone,marlstone,dolomitefossiliferous
SIL
Limestone,dolomite,quartzite
DEVO
Alternationofquartziticsandstonewithdolomite
Dolomite,greyandblack
CAR
Shaleargillitaceous,quartziticsandstone
PER
Jamalform :limestone
JUR. CR.
Detritallimestoneandcalpionellalimestone
EARLY CRETAC
Conglomerateandsandstone
Limestoneorbitolinabearing
PALEOC
KermanConglomerate :Conglomerate&Sandstone
Dacite&dasiticdykes
EOCENE
Eocenedeposits
Pyroxenandesite
Alternationoflightgreenmarl&sandstone
Marl&detritaltuff
Greenishgrey&lightcolourmarl
E.OLI
Conglomerate&coarsesandstonewith marlybeds
Granite_granodiorite
PLI
Conglomerate
QU
Quternarydeposits
LATE CRETAC
Ophioliticcomplex
Globotruncanalimestone
Colouredmelange
Basictointermediatevolcanicrocks
Ultrabasicrocksmainlyserpentinite&harzburgite
Diabase
Tuffwithminorvolcanics
Roads
Faults
village&city

Figure 3. Geological map 1:100000 in Bardaskan city (Hajat, 2011).

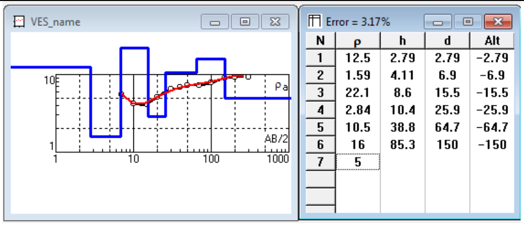
1. Materials and Methods: Geophysical Studies Method

The method used in this research is the schlumberger method, which is based on the transferring electrical current to the ground and measuring the potential difference created between two points to obtain the specific resistance of different depths of the earth (Craig Hardgrove 2009). The device used is a geoelectric device with power of 1000 watts and resolution of 0.00001 mW and mA. The distance between points A and B from each other had been 600 to 800 meters, and the Electric erect sondage method has been used (table 1).

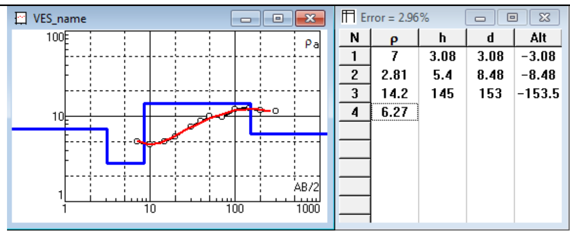
Table 1. GPS positioning of the soundages.

Position of sondages	latitude	Longitude	Sondage name
Point 1 Allameh Well 3	3889736	0579428	S_1
Point 2 Allameh well 3	3889645	0579320	S_2
Point 3 Zarein Well 2	3888919	0579741	S_3
Point 4 Shahid Oftadeh well	3889540	0578285	S_4
Point 5 Bagher Khaan well 1	3889120	0580324	S_5
Point 6 Bagher Khaan well 1	3889209	0580314	S_6
Point 7 Shahid Ali Nejad well	3891370	0577482	S_7
Point 8 Allameh Mashhadi Well (Sultan)	3885683	0564003	S_8
Point 9 Shahid Norouzi Hatitieh Well	3890927	0578696	S_9
Point 10 Hatitieh well 2	3894324+	0579415	S_{10}

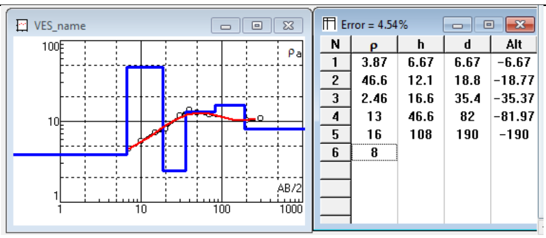
In this study, due to specific resistance measurements in a relatively large number of measured points, to find out how to extend the zones with ravelling layers and silt wind stones, specific resistance data with exploratory wells and drilled wells in the drilling area have been Integrated, the work what the researcher followed and used in this research (Bauer, 1995). And the layering characteristics of the wells are characterized by the separation of ravelling layers, which are usually at a depth of more than 130 meters, and the following results are obtained from the ground layer scan (figure 4):



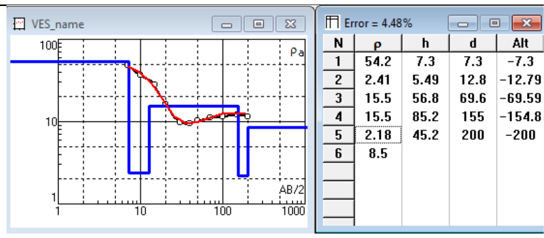
Allameh 3 well
(e.sounding 1)



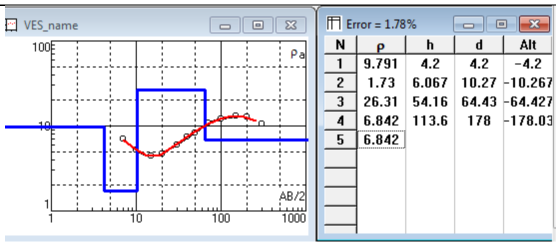
Allameh 3 Well Secondary takeover
(e.sounding 2)



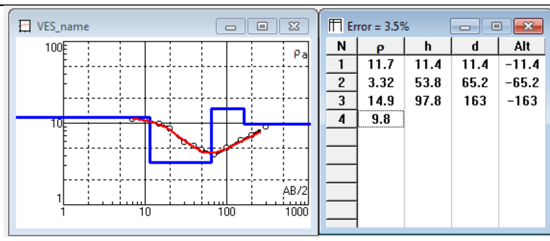
Zarein well 2 ((e.sounding 3)



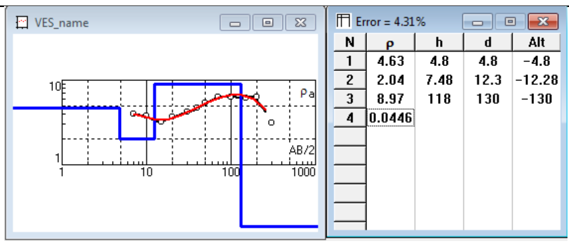
Shahid Oftadeh well ((e.sounding 4)



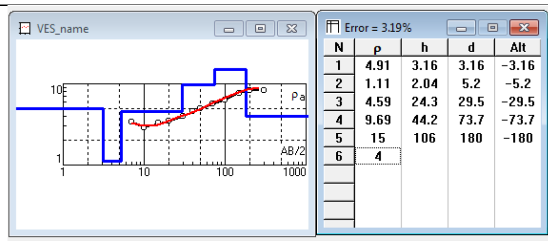
well 1 Bagher Khaan first impression
(e.sounding 5)



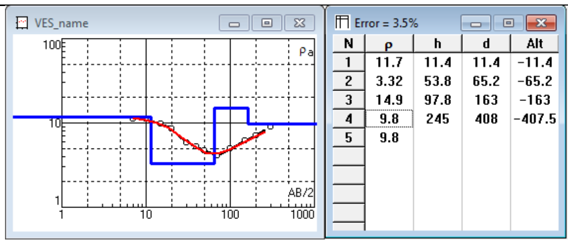
well 1 Bagher Khaan first impression
(e.sounding 6)



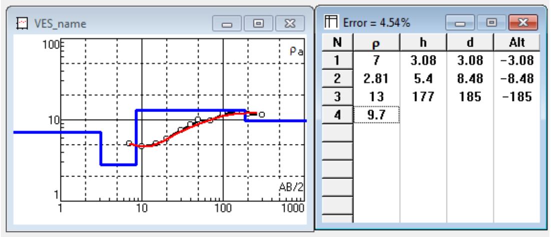
Shaheed Ali Nejad's Well
(e.sounding 7)



Allameh Mashhadi Well (Sultan)
(e.sounding 8)



Shahid Norouzi Hatitieh Well
((e.sounding 9)



Hatitieh well 2 ((e.sounding 10)

Figure 4. Specific resistance of performed soundings tables

By studying 8 done sondages near the Hassanabad wells, it was found that the aqueous layer starts at an average of 80 meters and extends to a depth of about 150 meters to 170 meters, and then with a drop of layer resistance to less than 10 we see that is located between the resistance of 4-10 and the experience of the excavations and the samples obtained from the well represents the wind and silt sand, which caused the state of the ravination of the well, although this layer also has some water that exceeds collapse, only in one well with a specific resistance drop of less than 1 gane soil sample was present with a very low percentage of silt.

Since the gane mud is also very unstable and along with a percentage of silt and wind sanding form a faint layer, where any drilling in it leads to destruction and shortening of useful life and a sharp decrease in well flow.

In the Hatitieh wells of the cemeter No. 9 and No. 10, which have a depth of about 170 meters from the ravelling layer with a resistance of 8-10, with a fine sand content plus sand and silt, its aggregation has been taller than that of Hasanabad and the phenomenon of collapse of the well in these two wells is slower and its shelf life has been about 6 years.

In a mixture of clay and other minerals with a calcium carbonate content of between 35% and 65% is said gane , If the hardening or melting occurs in them, the word Marleston or Marlit refers to them (Akiko Hashimoto 2008), In ganes, minerals of calcite and clay are the main mineral with other minerals such as quatz, albite, etheringite and tomazite and etc. The size of the particles and minerals in the ganes is in size of clay, silt, sand, and sometimes even in grain size. Thus, ganes, based on the type of mineral, texture and the percentage of particles, form different gane groups that have different chemical, physical, mechanical and erosion features. Ganey rocks have been considered as one of the most problematic sedimentary rocks due to the formation conditions and behavior that they show during exploitation (figure 5).

Divergence is a phenomenon of physics and chemistry, in which the particles of the clay adjacent to their adhesion water are lost and repel each other, so that the particles are suspended in water and easily and with very little energy is washed out of environment. The potential for divergence and erosion in a given soil depends on several factors, including mineralogy, soil chemistry, and soluble salts in the pore water of the soil and adjacent water. Such soils, even in comparison with non-adherent soft soils such as soft sand, are rapidly eroded by the flow of water at a slow pace. Divergent clay soils particles react in the water also and soil particles are suspended in water (A. Gomez-Villar 2000).

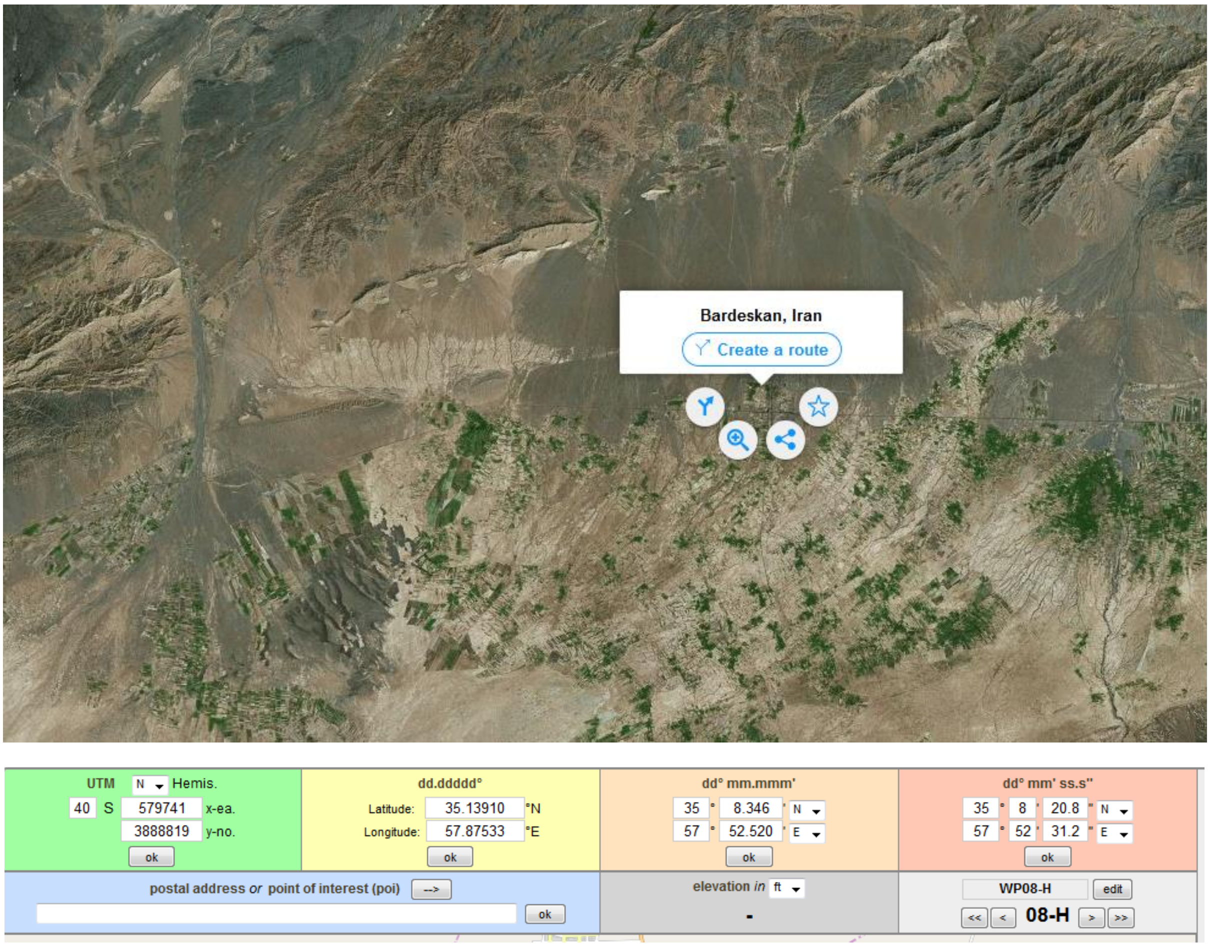


Figure 5. Aerial map of Exploratory well and location of electrical sondages and conversion of GPS units.

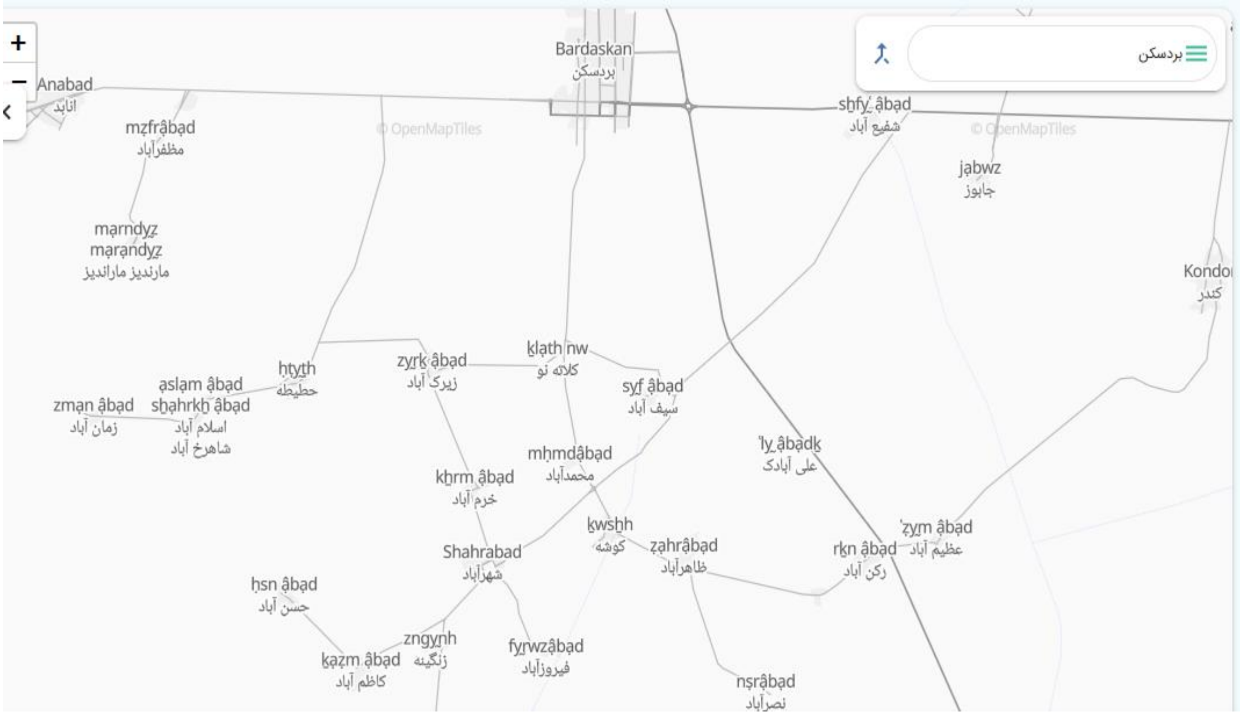


Figure 6. The ways accessing to location of studies map.

In order to detect the ravelling layer and with windy sand and silt and providing water extraction strategies, it has been found that, with surveys and geophysical field studies, it has been found that there is only one main aqueous layer in the vicinity of the well, which is buried in the middle depths of 70 to 160 meters, where the ravelling layer is located below this aqueous layer (figure 6) (Amanlou & Mostafavi, 2017; Banaei, 2019; Bassey & Edoamodu, 2018; Obidoa & Ugueche, 2017).

Which is located at a depth of 150 meters, with more silt and a percentage of clay and wind sands, and a small amount of drainage water that has made the collapse of the layer intense.

Drilling in this raveting layer is usually difficult for drilling machines and usually causes tilt of the wellbore or drilling time, and the life of most of these drilling sites in the raveting layer is less than 6 years, because wind sands and silt penetrate into the tube and causes the well to fill up and or by pulling this wind and silt sand into the tubing and pumping with water into the bubble, the space around the pipe wall is depleted and suddenly collapse the massive mass of soils around the pipework and the wellbore.

The collapse phenomenon is also found in wells with gane mud layers, and in wells with sandstone and silt layers, but in the case of silt sand pits this phenomenon has been reported more. However, the following factors, individually or in combination of several factors, can cause the well to sand up:

1-Select an inadequate location to install a grid pipe or install a pump.

2 - Very low cross-section for water entry in rectangular tubes or saw blades.

3- The width of the grooves is usually between 3 and 8 millimeters, which is between 2 and 3 times the maximum diameter of the particles in the majority of the region's aqueous layers.

4-Use a sandblast against the grid by closing the bridge.

5-Failure to reach the "sand filter" against the grid by bridging.

6- Failure to develop adequate or proper well

7-Over-well discharge, especially if the well is not fully developed.

Among the above factors, the maximum effect on the sanding of wells is 2, 3, and 4. However, in spite of the lack of proper sandblasting, the well can be expanded naturally and the amount of sand gravity is very low, if the water cross-section and the width of the slots are appropriate. (Grizni, 2019; Heidary & Riahi, 2018; Rashid & Al-Marzoqi, 2019)

Providing a solution to prevent collapse of the well wall and counteracting the excavation of wells is as follows:

1- The best point for drilling a well with a aqueous layer containing gravel and coarse sand should be determined by geophysical operations and the clay layer of silt or silty sandy, raveling from the aqueous layer be separated to avoid additional excavation in this layer.

2- Preferably, instead of Lattice tubes, use a screen pipe in wells with a depth of less than 150 meters.

3- If you use the lattice walls, you should surely to use of two lattice tubes that between fiiled with gravel and coarse sand, that in which case the space between the wall pipe is sufficient and the wall grooves are appropriate to the soil texture (table 2). Table of reconstruction of wells according to sediment type and its extension (Yazd Regional Water Company) (Ahmadipour et al., 2019; Mostafavi, 2015; Mostafavi, Eissazadeh, & Piryaei, 2019; Rahman & Vaheed, 2018; Samira Eissazadeh & Taskhiri, 2019; Shamsipur et al., 2012).

Table 2. Comparison of different wells and recovery methods.

Recovery method	The well wall has deposits of iron deposits	The well wall is deposited with carbonate deposits	The well wall has no precipitate but has sand making and silt making	New wells
ultrasonic		***		
Explosive		***		
Air injection (jet)	***		***	***
Water injection (jet)	***		***	***
Jet sonar		***		
Nitrogen shock		***		***
Eco-fide-co2		***		
brushing	***	***		
pistoning	***	***	***	***
Acid washing	***	***		

Drilling mud solvent				***
Chlorination	***	***	***	***

Experience has shown that if the water velocity in the well does not exceed 3 centimeters / second, the minimum particle displacement is carried out, and thus the amount of wells' sandwiching is greatly reduced. This value has been selected and implemented as standard for many years in America, Europe, Australia, Japan, and so on (Barbosa, 2018; Kumar & Gapta, 2017; Márquez & Gunzalez, 2017; Modaresi & Kazemi, 2019; Salimian & Mirzaei, 2018).

In the table 3, the cross-section of the grid section of gas or saw blade has been presented in a common 12-inch tube. Additionally, the maximum water that can be fitted to each meter of the latched tube according to the International Standard for Mineralization has been also mentioned.

Table 3. The extracted water from the well based on Screen pipe.

Maximum allowed discharge	Cross section at 1 meter	Number of grooves	Cross section of each groove	Groove width	Groove length	Row number
(Liters per second)	Lattice (Square centimeters)	Per meter	(Square centimeters)	(Millimeter)	(centimeter)	grooves
0.12-0.18	40-60	10	4-6	2-3	20	4
0.18-0.27	60-90	15	4-6	2-3	20	6
0.24-0.36	80-120	20	4-6	2-3	20	8
0.30-0.45	100-150	25	4-6	2-3	20	10

The solution to the cross-sectional entry of water with low entry rates has been solved over the years in Europe and the US by using screen tubes. For example, the strongest screen tube with a minimum cross-sectional area of 594 centimeters and a 0.5 millimeter groove has a cross-sectional area of 1122 centimeters per square meter of screen (Al-Khalifah, 2018; Eslami & Ahmadi, 2019; Gujirat & Kumar, 2018; Kimasi, Shojaei, & Boroumand, 2019; Timakhov & Kasparov, 2018). Thus, for example, the above-mentioned example, for taking 36 liters per second at a speed of 3 centimeter per second, requires only a 22-meter screen tube with a 0.25 millimeter groove or just 12 meters with a 0.5 millimeter groove. (Discharge allowed for each screen meter with a 0.25 millimeter groove is 1.78 and a 0.5 millimeter is 3.36 liters per second) (figure 7).

Figure 7. Advantages of using screen pipe instead of lattice tubes.

1. Severe reduction or removal of sand.

2. Reduced cost of operation due to the decrease in water loss due to the reduction in network losses, each 15 liters per second water drained from a depth of 5 meters, approximately 1 kilowatts of electricity (with good efficiency of 75% of the system), or the equivalent of gasoline is consumed in an hour. Thus, with the decrease in water level due to the use of a screen pipe, the cost of exploitation during the life of the well dramatically decreases.

3. The lack of a need for a large sedimentation tube due to the introduction of much less sediment into the well.

4. Screen tube gravity is much slower than lattice tubing because the total volume of water containing salts in the lattice tube enters a low cross-sectional area, and as a result, the density of sediments in the front and around the grooves is much larger than the screen pipe, which cross-sectional area of entrance is between about 5 to 12 times

the lattice tubes, and as a result, the speed and thickness of the mass fraction also decrease (Nakhaee & Arab Nasrabadi, 2019; Timakhov & Kasparov, 2018; Upikang, 2017).

5. One of the problems with latching wells is to cut or assemble the tube, especially at the top of the first grid. In general, in common lattice or screen pipes, with the same groove density across the grid or screen, the water velocity at the top of the lattice or screen is maximum and reaches zero to the bottom. In lattice tubes, due to the very high flow rate and (turbulent floe), the ratio of the poisson ratio of the earth's layers has increased of normal mood (about 0.25 for sand and 0.5 for clay) and as a result, a greater proportion of the soil weight above the layer is applied horizontally to the tube, and when the force exceeds the resistance of the tube, it bends or tear into the pipe.

This is especially true in the upper part of the highest lattice tube or the sheathed pipe in front of the most permeable layers. In addition to the aforementioned, which is gradual, in well-sanded wells due to rapid sand discharge, cavities are generated especially on the back of the tube and in the upper part of the layers, which can also lead to excessive collapse of collapse, and finally, cut the tube. This problem is commonly used in rotary drilling wells with sand filters (Rasouli, Mohammadali, & Houshmandan, 2019).

However, in the screen tube, due to the laminar flow state (not the turbulence mode), a change in the natural poisson number of layers has not been deposited or the magnitude of its increase is negligible and, as a result, this risk does not exist or its amount is significantly reduced and also, the problem of creating cavities behind the tube is also excluded due to the low input speed .

6- Since the two above mentioned 4 and 5 are in fact the main factors determining the useful life of a well, the useful life of the wells using the screen pipe is much greater than the wells with the lattice tube.

Conclusion

Due to specific resistance data, layers obtained from the wells of Hassan Abad and Bardaskan villages show a resistance range of 4-10 in the deep layers after the aqueous semi-deep and deep layer, as well as evaluation of soil samples drilled from new wells excavated to a depth of more than 180 meters indicate this:

1. A windy sand and silt layer with a specific resistance of 4-10 can be identified, that this resistance range can be used to determine the ravelling layer in the wells of the surrounding villages in geophysical operations, due to the fact that the resistance of the sweet aqueous layer of this region begins from the resistance range 12, it can be interpreted that a drop in resistance of less than 10 is very likely to occur in this region of silt or clay soil or silt gane or sand silt and with collapse of well (Farah & Kalsoum, 2018; Jafari & Mostafavi, 2019; Kaltas & Javidoglu, 2019; Riahi, 2018; Samiei & Mobaraki, 2019; Tasnim & Farasat, 2018)

2. The gane mud layer that has a very low percentage of silt (less than 10%) exists only in a well sample in the Bardaskan of Hatiteh village , whose true resistance to this layer was less than 1 and due to the presence of calcium carbonate and other calcareous compounds faced with water dissolved in it and causes cavities in gane to form, which also causes the instability of the soil around the pipe, and because of the lime dissolution of this layer and the formation of large water cavities on the turbine, it does not accumulate until it is pumping and so the water rushes into these cavities and causes decreasing of watering of the well.

3. The lowering of the wells watering mentioned above was due to the high drilling in the ravining layer, which was lower than the main aqueous layer, and the lack of use of the screen pipe or the double glazing of the well tubes and the absence of injections of the gravel pack between the two walls.

4. The cause of tilt of the well during or after the drilling and tilt of the pipe wall and the overall destruction of the well, has been too much drilling in the ravining layer, which by removing the wind sand and silt along with water from the well and emptying around the tube wall, the massive masses of the soil around the well has fallen suddenly and causes tilt of the pipes wall.

5. Another important reason for the sand making of the wells in these two villages is the existence of a large number of grooves per square meter and the size of the pipe wall groove that is between 3 and 8 millimeter and usually between 2 and 3 times the standard size.

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