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The Archaeological Sites along the Ancient Course of Euphrates River

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Abstract

Many of archaeological sites within Al Hammar Marsh and surrounded area were selected to the current study. Multispectral QuickBird images(2006), characterized by high (0.6 m) spatial resolution, used to draw a detailed map for an especially prominent relict course of the Euphrates and for the archaeological sites, these maps used to describe these sites and to identify their temporary relationships with the ancient course of the Euphrates. The random distribution of archaeological sites near the ancient courses confirmed that these sites associated with river courses as a basic reason for their presence. Also, Repetition of settlements in several archaeological sites, and the synchronization of historical periods indicated to continue habitation in the south of Mesopotamian plain from the oldest period about 5000 BC until Islamic period.

Key words: Archaeology; Ur; Tell Al-Laham; Euphrates River; Hammar marsh; Iraq.

1. Introduction

A large number of the archaeological sites deployed in Al -Hammar marsh and the other present and former marshes of southern Iraq after drying operation in the early nineties of the last century, these sites represent prehistoric and early historic settlements. Others date to the earliest periods of Arab and Islamic settlement in the region.

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Many of these sites first became visible after draining and drying of these marshes in the early nineteen-nineties. Others no doubt remain buried under the sediments of the two great rivers that have flowed through this region for several thousands of years. Among these archaeological remnants, two of the most important urban centers of old Sumer, Ur and Eridu, still stand and tell us the stories of our past peoples and their great achievements in various aspects of life.

Archaeological Mounds ("Tells")

From at least ten thousand years ago to the present time, humans found the Mesopotamian alluvium a suitable place for their settlement and to perform various activities. In the earliest periods known from direct excavation, they lived in simple reed-and pisé-walled structures grouped in villages without differentiated architecture. The origins of these first villages, and their early growth into larger towns, small cities, and major urban areas, characterized by the complex social systems of the deep- rooted civilizations of Sumer and Akkad, is not well-understood, because those early levels are buried under the many later occupation layers represented by their remains in archaeological mounds. The complete excavation in the region, through eleven sequences of leveling followed by new temple construction, was conducted at Eridu in the 1950s [1, 2].

Most of these Tells were a flat area at the beginning of their evolution, then rose gradually with time to form many layers as a result of repeated settlements on the same site. The repeated settlements occur due to floods (consolidating permanent structures on high ground), conflicts and wars (for defense against raiders), economic control (walled cities could more easily regulate trade and taxes), control of livestock (herds and flocks could be separated from living areas, or brought inside for defense), and separation of living and market space from dirty industries, such as kilns, smelting, and tanning [3, 4]. As households (or entire populations) moved or migrated to other places, structures were often abandoned without repair, left exposed to vandalism, erosion, and colonization by plants and animals. When new people arrived, the mud brick structures were seldom reconstructed. Rather, their debris was leveled and used as a foundation for new structures. Over time, with repeated settlement, the entire site is raised up rise above the surrounding plain to form a human-made hill or Tell [5].

This study provides descriptions of the largest, best-known sites situated in close proximity to the relict river course under study, which may indicate possible time frames when the river was active, and shed light on the basic causes of river diversions and the effects of those diversions on the region.

2. Location of study area

The study area is located in the southern part of the Mesopotamian plain, south of Iraq. Precisely, located between Latitudes (30 º 30' 0"–31º0' 0" N), and Longitudes (46º0′ 0"–47º 30 0' 0" E), (Figure 1). It includes both the present-day Al-Hammar marsh and the westward basin surrounding the ancient cities of Ur and Eridu. Hor Al-Hammar extends south of the Euphrates River from Al-Qurna city and the Shatt Al-Arab in the east to Al-Nasiriyah city in the west. Ur is located about 7 km southwest of Al-Nasiriyah city, while Eridu is located about 18 km southwest of Ur.

Hor Al-Hammar occupied an area about 2800 km² and extended up to 120 km. After drying operation in the early nineties of the last century, very large numbers of archaeological sites appeared throughout the marsh and along the old course of the Euphrates River. Currently, the marsh includes many artificial channels, which were used to drain the water from it.

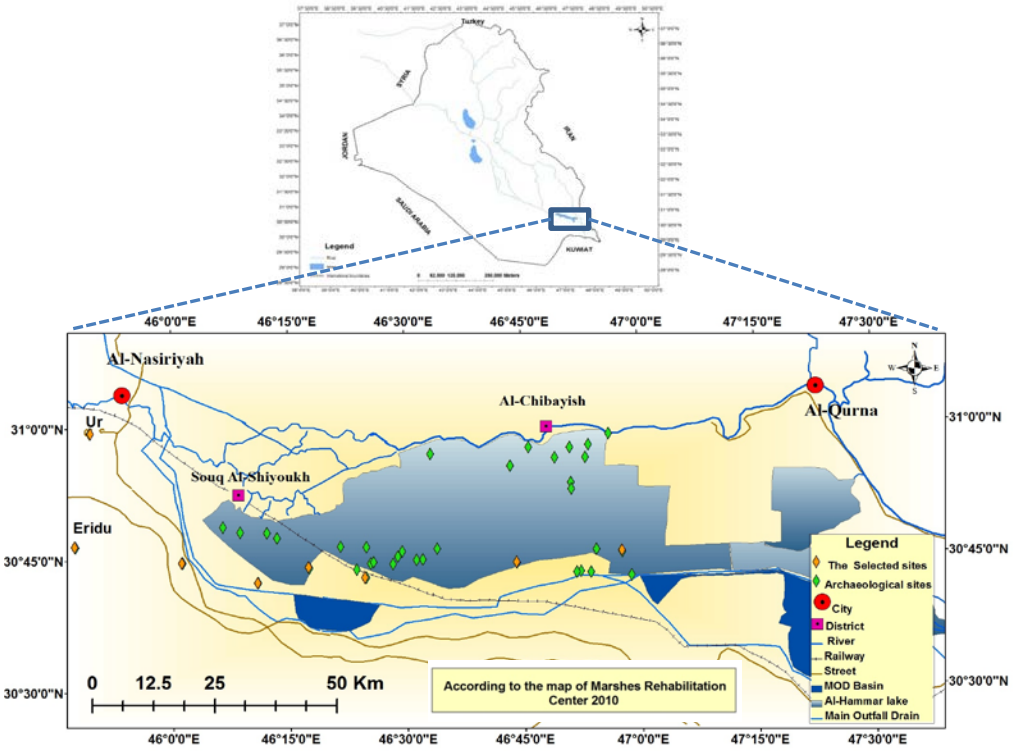

Figure 1: Location map of the study area.

3. Methods

Image Processing and Cartography

Multispectral QuickBird images (2006), characterized by high (0.6 m) spatial resolution, were entered as the base layer in Arc GIS version 9.3. Known Tells were first identified from an archaeological sites map (2010), acquired from the University of Thi-Qar- Marshes Rehabilitation Center/GIS department (Figure 1). The map was rectified against a previously geo-corrected Landsat image (1990) and then registered to the Quickbird images, in order to verify the Tells locations on the Quick bird imagery.

Two radiometric enhancements were used on the satellite images (histogram equalization and histogram specification), to clarify small archaeological features such as the remains of ancient buildings and irrigation canals. ArcGIS (ArcMap, ArcCatalog) version 9.3, used to draw and design a set of maps to represent the known Tells along the relict Euphrates channel passing through the Al-Hammar marsh. A detailed map has been drawn for an especially prominent relict course of the Euphrates (Figure 2) that transits the southern edge of the plain through what was, until recent times, Lake Hammar.

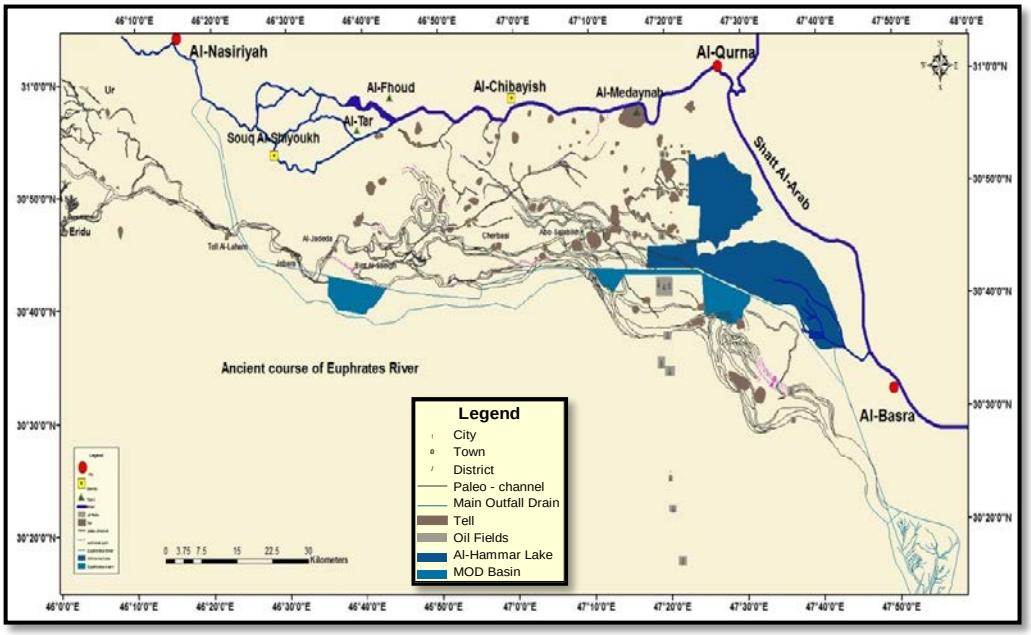

Figure 2: The ancient course of Euphrates with its branches.

Radiometric Enhancement of Imagery

1-Histogram Equalization

Histogram equalization has been applied using Arc GIS 9.3 software, on some of the scenes to clarify some features, especially buried channels, by increasing the contrast between those channels and surrounding sediments.

2-Histogram Specification:

This correction is more comprehensive than histogram equalization, through which it can draw the required histogram for the satellite image. It's used mainly to changes all the pixels in the image, through modification of its dynamic range to enhance its variation [6].

Histogram specification has been applied for all the scenes in the images of the study area, after which details of many archaeological sites became clearer. Further, many agricultural areas, irrigation systems and parts of river channels, were identified and clarified by this means.

4. Mapping Archaic Courses of the Euphrates River

The Euphrates River has undergone many channel diversions during its history, as a result of the environmental characteristics, climate changes, and human activity. The nature of the territory through which it passes in its lower courses (broad flood plain) is one of the most important contributors to its constant shifts. Past shift is marked by the remnants of valleys, old stream beds, and buried riverine sediments, which themselves reflect in

turn the great variations in the hydrological characteristics and contrasts in the geological and geomorphological settings of the Mesopotamian plain [7]. Through studying these ancient rivers and identifying their geological nature and geomorphological patterns, in addition to the reasons that led to their shift to other beds, we can better understand the geological situation of the region and the nature of the climate that prevailed in the past. One of the most notable of these is a relict channel pointed out by the authors in [2] during their excavations at Eridu, when he noticed an ancient and wide course located to the west of the city, which (within the Eridu basin) was mapped in several stages, corresponding to archaeological periods, by the author in [8]. The course was also noted by the authors in [9, 10, 11, and 12]. All of these studies confirmed the existence of such a course within the Eridu basin, but outside the basin, it was long submerged under Lake Hammar and remained unstudied.

This course, which appears clearly in the satellite images, extends along the edge of the western desert and southern pediment of Al-Batin Alluvial fan, continues southward until it reaches Tell Abu Shahrain (Eridu),then passes to the east of the site to exit a gap in the sand ridge that defines the northern rim of a shallow basin, to continue east along the southern edge of Al-Hammar marsh until it reaches the Khor Al-Zubair, to form with it a single channel flowing toward the Arabian Gulf. This study is the first effort to fully map this feature from the Eridu basin to Zubair, as well as to identify an additional relict course of the Euphrates and the many branches connected to both.

A primary means of identifying a relict River course in this area, and the one used in this study, is by following lines of meander scrolls as they transit the plain(Figure 3). Meander scrolls form when material is eroded from the concave portion of a meander, transported downstream, and deposited on the convex portion, or bar of a meander [13].

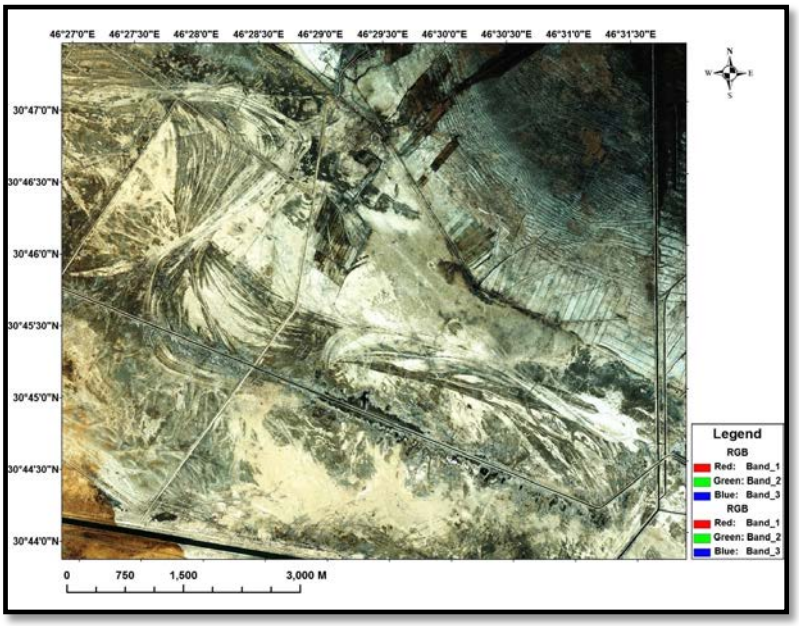

Figure 3: Meander scrolls and River Bars indicating an ancient course of the Euphrates. Source: QuickBird™ 2006.

5. Mapping of the Archaeological Sites

In order to describe the archaeological sites which were selected within the study area, and to identify their relationships with the ancient course of the Euphrates located near each, a map was drawn for each site based on georeferenced imagery imported into Arc GIS 9.3 (ArcMap) software. Site names were identified from a map prepared by the Marshes Rehabilitation Center (2010) depicting 34 archaeological sites within Al-Hammar Marsh.

1 -Eridu (Tell Abu Shahrain)

The outer dimensions of the city of Eridu (Figure 4) do not appear clearly on the satellite images, but the combined upper and lower mound has taken almost oval shape its area approximately 423 m^2 and elevation is about 7 m above sea level, surrounded by a drainage channel, the architectural remains appear as regular geometric forms. A relict watercourse surrounds the site in the western and southern sides, in addition to the existence of many other channels, associated with the old River that spread to the west and northwest of the Tell. Architectural remains may also be seen in the depression adjacent to the northern side of the site, alongside a distinctive geomorphological feature: a crevasse splay extending from the old course of the Euphrates (Figure 5). Crevasse splays emerge as a result of the failure of a river levee, either through intentional cutting or due to high flooding.

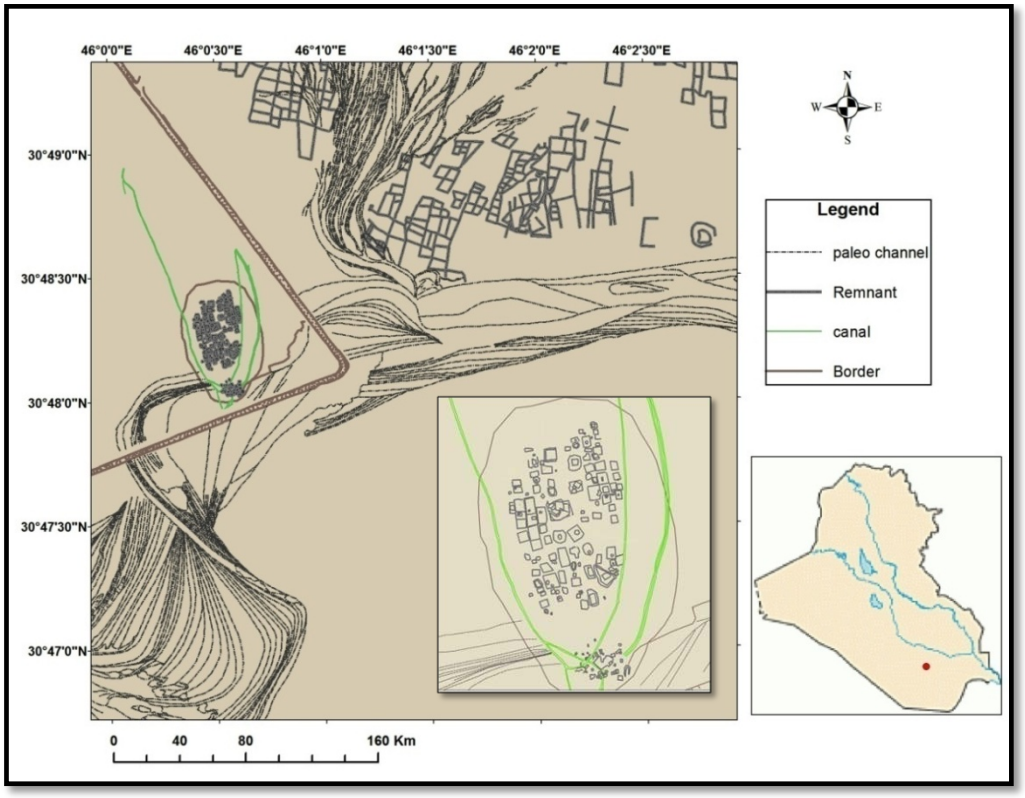

Figure 4: Map of Tell Abu Shahrain, with adjacent archaic course of the Euphrates.

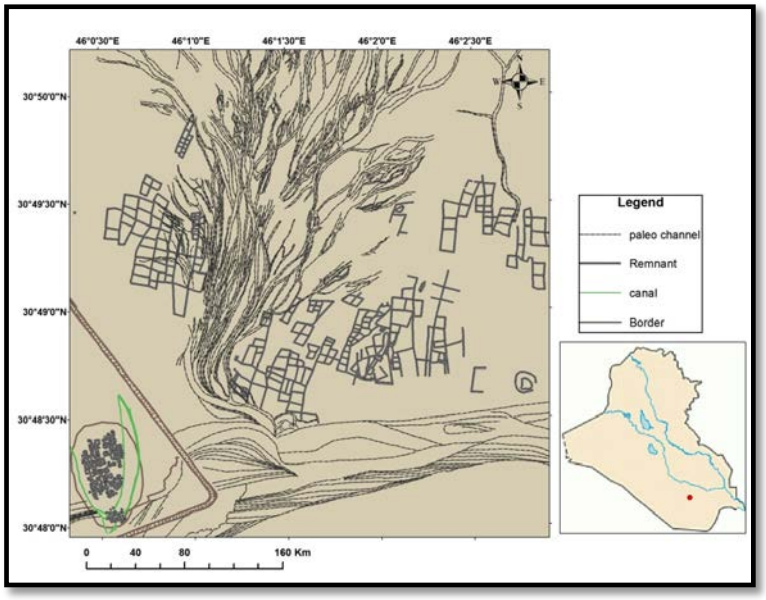

Figure 5: Map of crevasse splays near Tell Abu Shahrain.

2- Ur (Tell Al Muqqayir)

The ovoid-shaped Tell Al-Muqqayir, home of the ancient city of Ur (Figure 6) is characterized by clear features in the satellite images. The ziggurat, tombs, and temples of the high mound, as well as other structures sprawled across the surrounding lower mound, can be distinguished by the distinctive geometric forms characteristic of architectural remains. The area of Tell Al Muqqayir is about 678 m^2 and its elevation is 16m above sea level. Many ancient canals pass through and nearby the ancient city. The most prominent of these canals passes from the western mound, continuing around the southern end of the Tell (Figure 7). Thereafter, it continues south-eastward to Tell Al-Lahm. These canals coincide with canals identified by the author in [8].

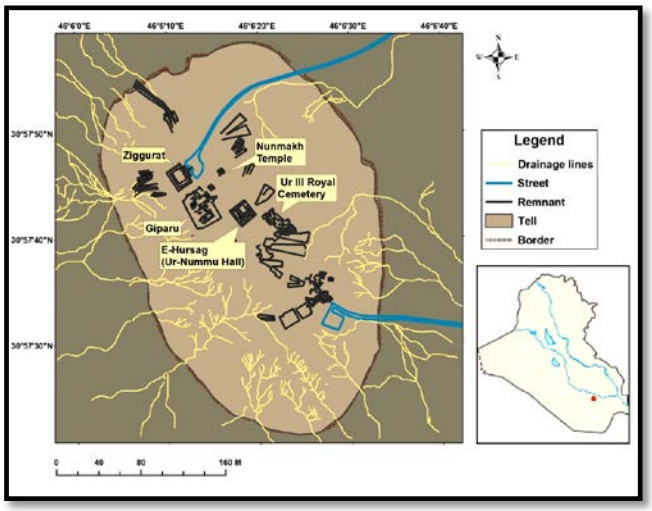

Figure 6: Map of Ur (Tell Al Muqqayar).

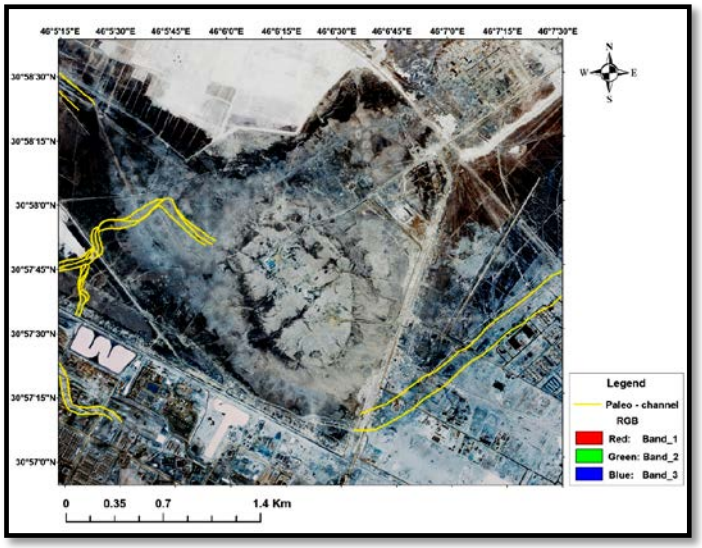

Figure 7: QuickBird^{TM} image of the paleochannels near Ur (after histogram specification-invert).

3– Kuara/Kisiga (Tell Al-Lahm)

Tell Al-Lahm (Figure 8) appears in satellite images as an oval form located along the same relict course of the Euphrates that passes Eridu to exit the Eridu basin. There are many interlaced channels passing both near to the tell and under it. The area of the main mound is about 768m^2; a smaller mound is situated nearby. The elevation of Tell Lahm is about 13m above sea level. Scattered archaeological remains, such as pottery fragments, bricks, and wall fragments, cover the surface of both these settlements; in some cases, the linear arrangement of the fired bricks indicate buried walls (Plate 1).

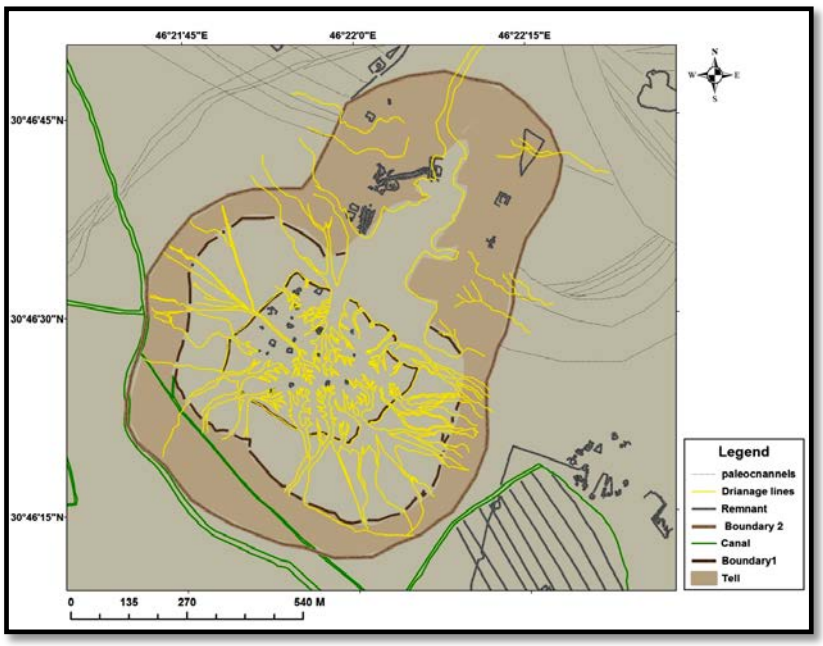

Figure 8: Map of Kuara (Tell Al-Laham).

Plate 1: Pottery sherds and broken fired brick capping Tell Al-Lahm.

4- Tell Jebarah

This site is located near Al- Khamesia village, about 37 km south from the current Euphrates River and its elevation about 6m above sea level. It takes a rectangular to oval shape, and another settlement is situated above it. The area of the main mound is approximately 222m^2, while the smaller mound is about 79 m^2. A large portion of the main mound disappears under a relict course of the Euphrates, which passes near the archaeological sites mentioned above, but the upper portion of the high mound appears completely (Figure 9).

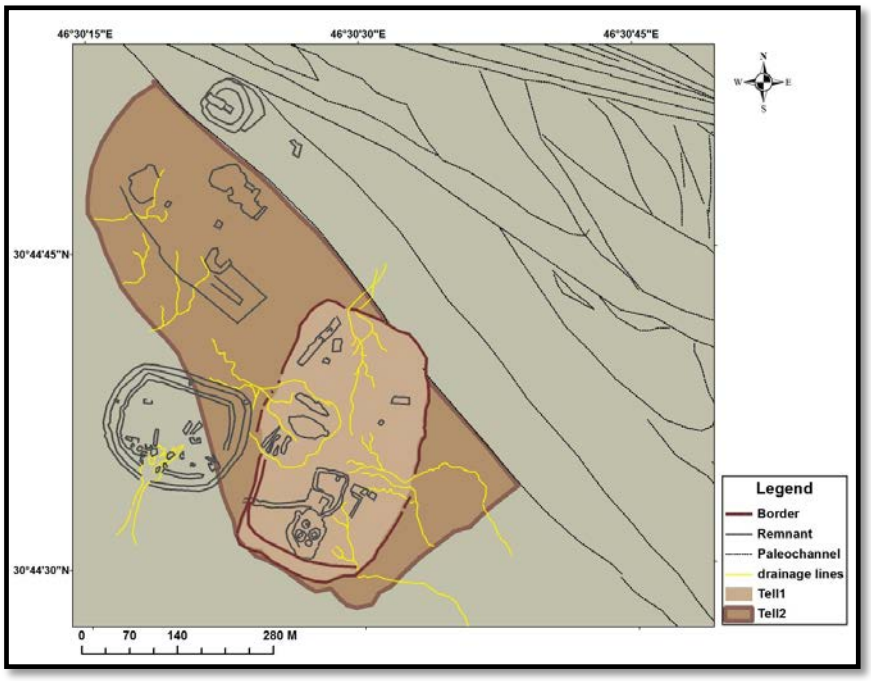

Figure 9: Map of Tell Jebarah.

5–Tell Al Jadeda

Tell Al-Jadeda (Figure 10) is located near Al-Saadoon village, south of Al-Hammar Marsh, about 25km south of the current Euphrates River, and about 9km east of Tell Jebarah. The approximate area of this Tell is about 700m^2 and its elevation about 3m above sea level. Situated directly above the ancient course of the Euphrates, archaeological remains appear scattered over the Tell surface. It is transected by an industrial canal that was used to drain the water from the marsh.

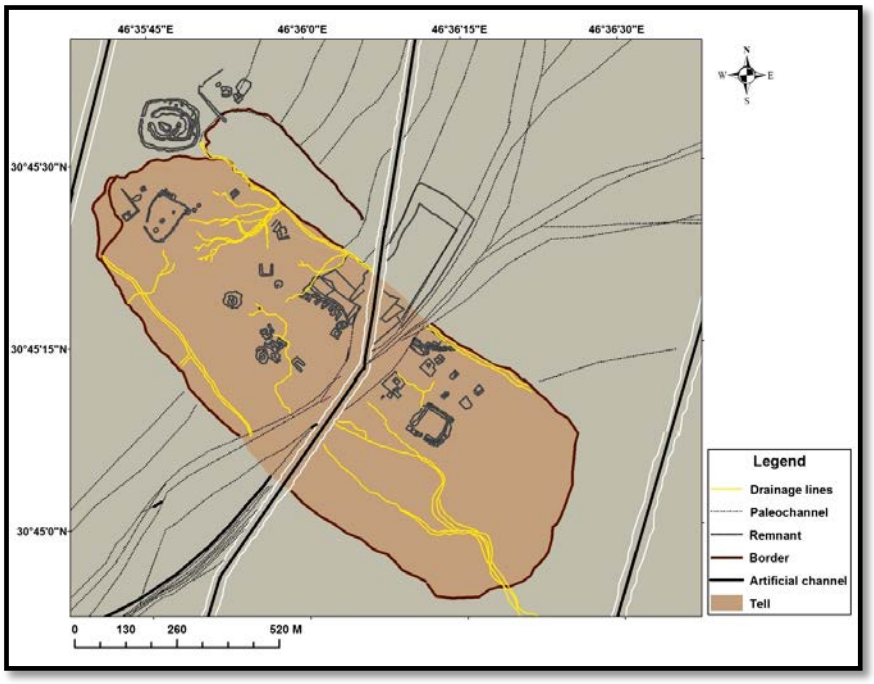

Figure 10: Map of Tell Al-Jadeda.

6– Tell Bint Al-Saeigh

This Tell is located in the Al-Maleh marshlands south of Al-Hammar marsh, about 23km south of the current Euphrates River. The approximate area of the main mound is about 320 m^2 and its elevation about 4m above sea level. It is situated near one of the river channels which branched from the ancient course of Euphrates (Figure 11). A few architectural remains appear on the surface, but the Tell was transected by a drainage canal that has distorted any archaeological features.

7– Tell Jerbasi

Tell Jerbasi (Figure 12) represents a cluster of archaeological mounds located in the Jerbasi marshlands at the southern edge of Al-Hammar marsh, about 21km south of the current course of the Euphrates River. The approximate area of the circular central Tell is about 476m^2 and its elevation about 1m above sea level. Archaeological remains are noted at the surface, as well as many narrow drainage channels that surround the Tell and extend in parallel to connect with ancient River course.

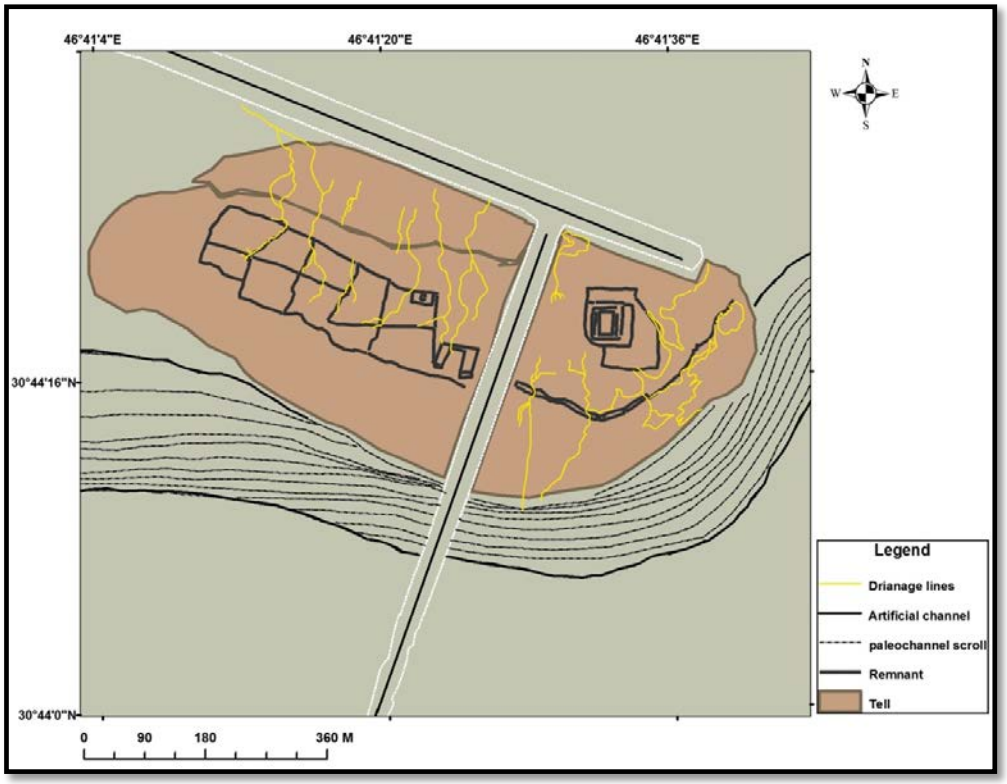

Figure 11: Map of Tell Bint Al-Saeigh.

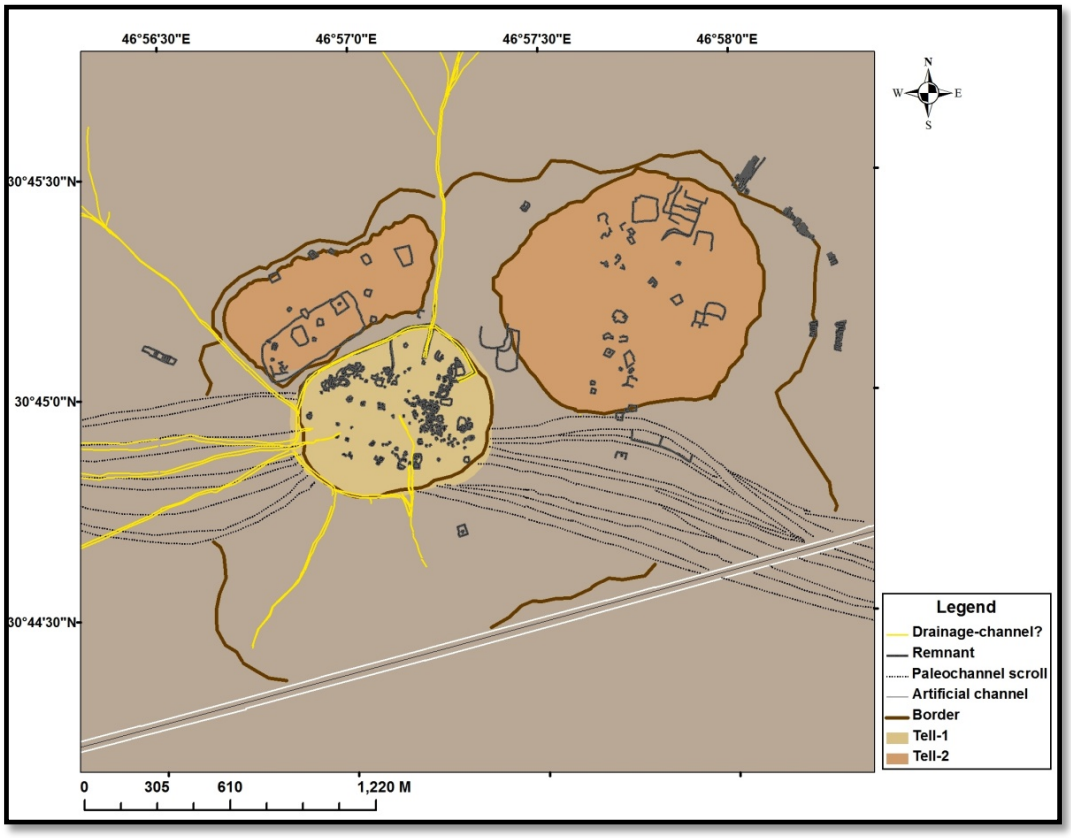

Figure 12: Map of Tellol Jerbasi.

8–Bit Iakin (Tell Abu Salabikh)

The main mound of Tell Abu Salabikh (Figure 13) is characterized by two layers or more, these are observed in satellite image through the circular lines surrounded the main Tell. The site is located in Abu Salabikh Township, about 21 km south of the current Euphrates River, and adjacent to the same ancient course that passes by the previous archaeological sites. The approximate area of the Tell is about 268m^2 and its elevation about 3m above sea level. Architectural remains are visible only on the upper layer. Large, relict agricultural areas near extend eastward from the site.

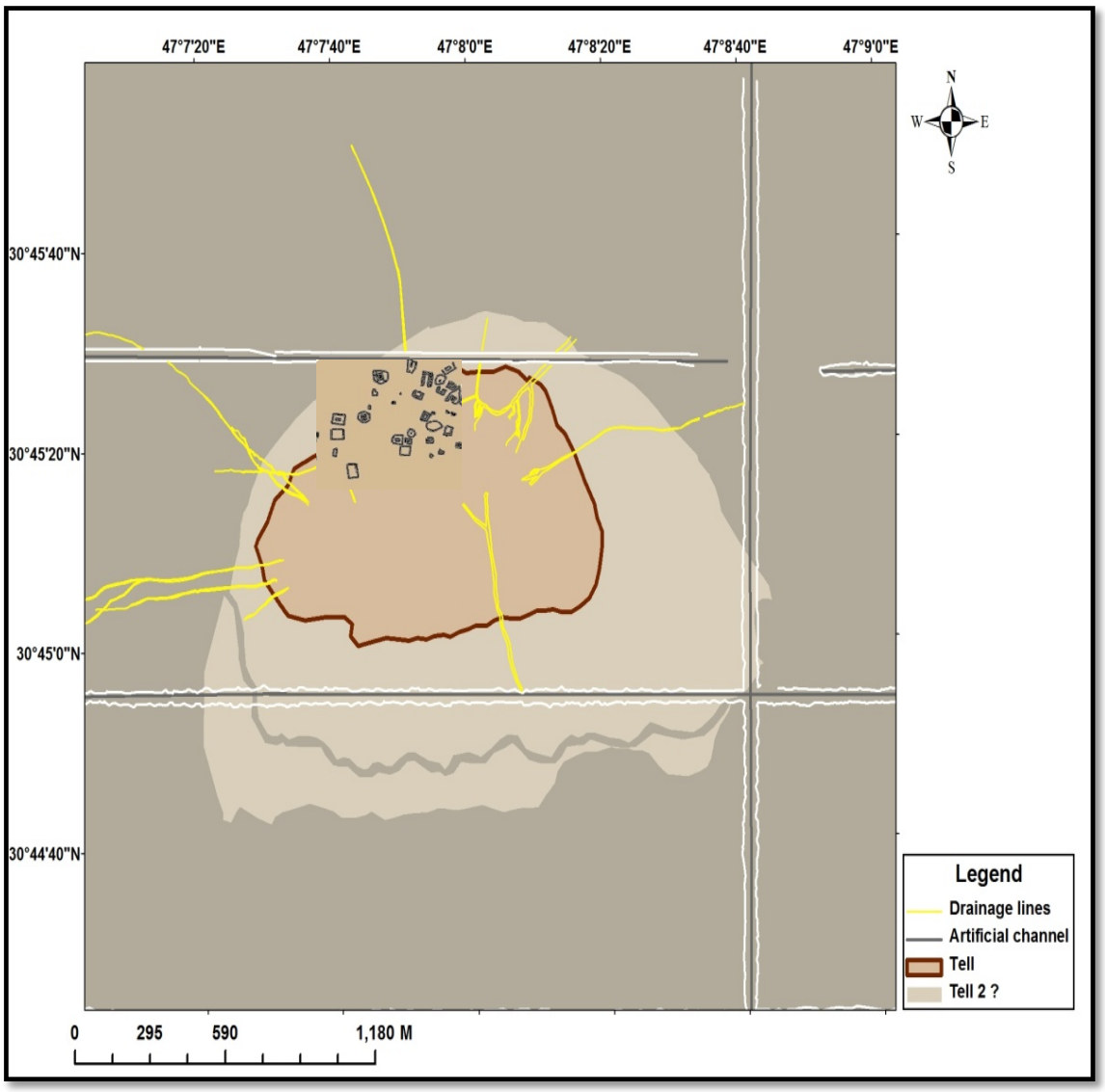

Figure 13: Map of Tell Abu Salabikh.

6. Discussion

Seen from above, these sites are located adjacent to and/or above an ancient course of Euphrates River. Many of these Tells also appeared as several layers within the same mound, such as Tell Jebarah, where the upper layer

appears as a rectangular form, and differs from the lower layer.

The presence of these sites in several layers could reflect re-occupation or settlement on these sites at different periods of time, as can be observed through the archaeological remains related to different historical periods that are spread on and erode from layers at many archaeological sites, and as confirmed shown by archeological excavations at locations such as Ur, and Eridu. No comprehensive excavations have been conducted at Tell Lahm, but historical (cuneiform) texts, site reconnaissance [14,15], and soundings [16] show repeated occupation as of the Early Dynastic (mid 3rd millennium BCE). The other sites were visited briefly by Georges Roux in the late 1950s [15], but no systematic survey has since been published.

The Composition of the Tell in the most part resulting from the cultural activity, which their deposits consist of the residue of collapsed mud brick structures, stone, some lime plaster, and organic refuse. These represent primary components transform with time to the secondary sediments under the effect of natural and cultural processes to form the body of Tell [4]. The approximate areas for the archaeological sites calculated by using Arc GIS (ArcMap) represent only those portions of Tells sites exposed in satellite images. The entirety of each site, including outlying suburbs and agricultural areas, were not uniformly visible for several reasons. First, as at Tell Jebarah, the shifting of River itself may have obscured the record. Taphonomic factors such as architectural collapse and erosion by flood, rain, and wind may have removed or hide large parts of these sites and/or distorted their original features. In addition, recent, industrial-scale human activities have played a significant role in their deformation; especially the construction of drainage canals that directly Tell Bint Al-Saeigh, Tell Al-Jadeda, and Tell Jerbasi. Other urban activities such as roads, bridges, railways, and oil fields have changed the surface features of the area. This is especially true around Eridu (earthworks, roadways, and conversion of the Eridu basin as an irrigation return water spillway), Ur (Talil airbase tourism infrastructure), Tell Lahm (power lines transecting the main mound; adjacent highway and railway), and Tell Abu Salabikh (drainage canals; oil fields).

The distinct locations to the number of archaeological sites near the old course of the Euphrates or near the canals indicate human association with the rivers as one of the important water sources since ancient times, which represent the main factor controlling in his staying in the same settlements or emigration to other places. Also represent the main axis to emergence the humanitarian civilizations and its prosperity, where were used mainly in the irrigation of farmlands, that appeared clearly in the wide areas and in different locations in the study area, which indicate that these cities are primarily agricultural civilizations, the most prominent of these farmlands are near Tell Abu Salabikh (Figure 14).

The satellite images also showed many canals, streams and irrigation systems, which reflect the organization of irrigation system and the great efforts made by the ancient population of Mesopotamia in order to deliver the water to their towns and agricultural lands, especially that the agriculture in Iraq since the ancient times were dependent on a permanent irrigation system, which requires the provision of water to irrigate the plants throughout the year [17]. The dry climate that prevailed in the most of the southern parts of Iraq in some periods which may be led to collapse many civilizations in Mesopotamian plain also led to digging many channels to supply the water continuously. In addition to replacing these canals with new ones because of its dryness or due

to the accumulation of sediments, this is clear through a large number of canals that overlapped with each other to form an extensive network covered most of the sites in Al-Hammar marsh. The most prominent of these canals that appeared clearly in the northwest side from Ur, and many canals located to the west and south of the city. When it follows the path of these canals through satellite images, it shows that their headwaters are from the old course of the Euphrates, which is located to the west of the city and parallel to the edge of the western desert. Also, another canal identified through satellite images, located south of Ur, extended from the north-east then bend towards the southeast and continues toward the west (Figure 7).

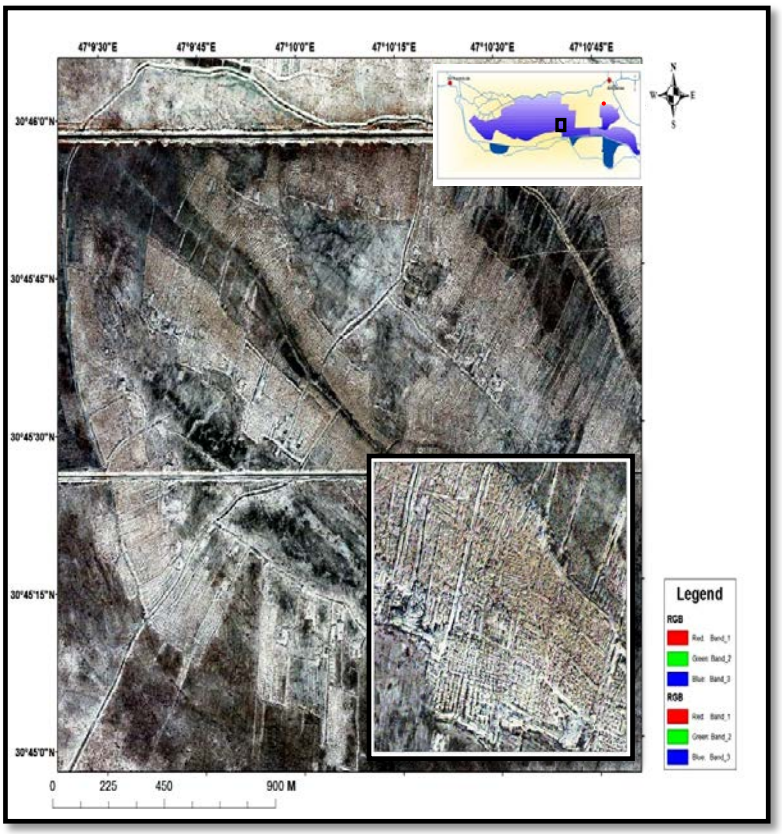

Figure 14: Satellite image (QuickBird 2006) of relict agricultural lands near Tell Abu Salabikh.

7. Determining the Relative Ages of Relict River Courses

The temporal relationship between the history of the Euphrates River and the dates of strongly associated archaeological sites is a beginning tool to estimate the relative age of ancient courses and to identify the approximate periods during which they were present in the region. Periodized chronologies based on excavated sequences of pottery assemblages, validated (where possible) by radiocarbon dating, are used to identify the earliest settlement phases during which time archaeological sites were inhabited. In Mesopotamia, the historical period, for which documentary evidence (such as King Lists) may be used to tie settlement periods to calendar dates, extends back nearly 5, 000 years.

The settlement at individual sites may endure several centuries or even millennia, and often comprise many

archaeological layers per site. Each has special remnants and distinctive architectural styles or pottery different from those of other periods. These may reflect the political, economic or social changes which occurred within certain periods or inventions and developments within specific fields. Therefore, determination the historical period come from estimation the number of years for each relict layer, which varies depending on the kind of construction material used, how often architecture was leveled and re-built, population, etc.

Before the broad application of radiocarbon and other dating methods beginning in the 1970s, for the earliest prehistoric periods, for which there is no architectural or pottery remains, the duration of an archaeological layer was estimated from the thickness of the accumulated debris in each layer [3].

For the purposes of this study, the chronology providing approximate ages of archaeological sites follows the author in [18, Fig 84], which provides a comprehensive review of adjustments made since the publication of Iraq [19] (Table 1 and 2). Years are expressed as calendar years BCE/CE. For historical periods, these follow the so-called "Short Chronology." Where available, all dates reflect best-available radiometric correction (Cal BCE).

It is observed through the approximate ages of the six archaeological sites, that the oldest of these sites is Tell Abu Shahrain (Eridu) (6500 BCE), and Tell Al- Muqqayir (Ur) (3000 BCE), while the oldest known ages for the remaining archaeological sites range from the later Early Dynastic through Old Babylonian periods (2400–1700 BCE).

Occupation periods are roughly synchronized across sites, such as the 'Ubaid horizon which is reflected at Eridu, Ur, and (possibly) Tell Al-Jadeda [20]. This is consistent with any or any combination of several possible environmental factors (to be discussed later in this chapter): deeper sedimentation to the southeast, a southeastward-prograding River delta, and/or marine recursion. Thus, the age of the first course can be determined approximately, based on the "pottery ages" of the archaeological sites which were located on it.

The oldest Tell is Eridu (Ubaid); the next Ur, Kuara, and possibly Abu Salabikh (Early Dynastic); joined by Al-Jadeda during the Akkadian; and followed by the remaining sites during the Old Babylonian, by which time Ur is no longer occupied. Kuara and BitIakin thrive until their destruction in 707 BCE; T. Jerbasi also ceases to be occupied then and so may have met the same fate. Meanwhile, two new sites are found at Tell Al-Jadeda and Bint Al-Saiegh.

A large part of the greater site of Eridu is located on top of part from the ancient course, this means that this part is older than the city, While the period in which the River began to dry was identified depending on the dates of both Tell Al-Jadeda and Jerbasi because they located completely and directly on the ancient River course, i.e. they established after River drying.

This indicates that the River began to dry before construction these tells, approximately older than 6500 BCE and gave the conclusion that this ancient course of Euphrates was present in the region since the Pleistocene era as pointed out by many studies until the Holocene about 8000–7000 B.P.

Table 1: Chronology of Historical Periods along the Lower Euphrates (after Pournelle 2003, Fig 87).

Aprx. Calendar Age BCE (CE)	Historical Period	Associated Site	Associated Personages
6500–5100	Ubaid 0–2	Oueili; Abu Shahrain/*Eridu;* Haji Muhammad	
5100–4200	Ubaid 3–5	Al-Ubaid; Abu Shahrain/*Eridu;*Warka/*Uruk*	
4200–3800	Early-Middle Uruk	Warka/*Uruk*, Abu Shahrain/*Eridu*	
3400–3000	Late Uruk/JamdatNasr	Warka/*Uruk*	Enmerkar
3000–2400	EarlyDynastic I-III	Tello/*Girsu*, Warka/*Uruk*; Muquayyar/*Ur;*Lahm/*Kuara*,	Gilgamesh, Dumuzid, Pu-abi (Shubad),Ur-Nanshe, Urukagina
2400–2000	Akkadian-Ur III	Al Hiba/*Lagash*, Warka/*Uruk*, Muquayyar/*Ur;*Lahm/*Kuara*	Sargon, Rimush, Manishtushu, Naram-Sin, Sharkalisharri, Gudea
2000–1763	Issin-Larsa	*Isin*, Senkereh/*Larsa*, Muquayyar/*Ur*, Lahm/*Kuara*	Ishme-Dagan, Enlil-bani, Damiq-ilishu; Rim-Sin
1763–1600	Old Babylonian	Babylon/Babil, Mashkan-shapir, Jadeda, Lahm/Kuara	Hammurapi
1600–911	Kassite	Lahm/*Kuara*	
911–612	Neo-Assyrian	Lahm/**Kuara*, Abu Salabikh/**Dur Yakin*	Nebuchadnezzar I, Shalmaneser III, Sargon II, Sennacherib, Marduk-apla-iddina II (Merodach-Balladan)
625–539	Chaldean (Neo-Babyl.)	Abu Salabikh, Jebarah	Nebuchadnezzer II, Nabonidus
539–331	Achaemenid	Abu Salabikh, Jebarah, Khayaber/*CharaxSpasinou*	Cyrus (Persia),Alexander, Seleucus (Greece)
148– (226)	Parthian	Khayaber/*CharaxSpasinou*, Mughlub/*Forat*	
(226) – (636)	Sassanian	Khayaber/*CharaxSpasinou*, Mughlub/*Forat*, Zubayr	Artabanus II
(636) – (1700)	Islamic	Zubayr, Basra	Buwayyidi

*Seats of Marduk-apla-iddina II (Merodach-Balladan); destroyed 709 BC by Sargon II .

Table 2: Historical Periods Associated with Archaeological Sites in this Study (after Pournelle 2003, Fig 87).

Site Name	Ancient Name	Ubaid	Uruk	ED	Akkad-Ur III	Issin-Larsa	OB	Kassite	Neo-Assyrian	Chaldean (Neo-Bab)	Achemaenid	Sassanian	Islamic
T. Abu Shahrain	Eridu	X	X								X		
T. Muquayyar	Ur			X	X	X							
T. Al-Lahm	Kuara/Kisiga			X	X	X	X	X	X	X			
T.Jebarah										X	X		
T.Jadeda		?			X		X						
T.BintAlSaiegh			?				X			X	X	X	X
T.Jerbasi							X	X	X	X			
T.Abu Salabikh	Dur Yakin			?	?		X	X	X	X			

8. Conclusions

1- Exist many of agriculture lands and random distribution of archaeological sites near the ancient courses, confirmed that these sites associated with river courses as a basic reason for their presence, that related their transformation to other regions or destroyed it, with the dryness or diversion these rivers.

2- Euphrates River diverted gradually from its ancient course south of Al-Hammar marsh to its current course toward Al-Qurna city. This confirmed through many ancient courses and river branches existed within the marsh that connected with an ancient course and tended toward the north –east.

3- Repetition of settlements in several archaeological sites, and the synchronization of historical periods, indicated to continue habitation in the south of Mesopotamian plain from the oldest period about 5000 BC until Islamic period and no exist any clear stopping periods in the habitation comprises all selected sites.

4- Euphrates River was present in the region since the Pleistocene era until the Holocene about 8000–7000 B.P.

This study recommends using radiocarbon ^{14}C and OSL dating methods on the samples from different locations on the ancient courses of the Euphrates and Tigris Rivers to determine their ages and identify the direction of river diversion. It recommends also to study the archaeological sites that appeared recently in the marshes depending on the recent excavation reports and identify their ages to clarify the relationships with the river courses.

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