JARASH HINTERLAND SURVEY 2010 – AN OVERVIEW OF THE RESULTS

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Abstract

Jarash, ancient Gerasa, is an archaeological site and landscape of international importance. However, very little archaeological survey or excavation work has taken place in the immediate vicinity of the city walls and the archaeological evidence there was poorly recorded and little understood until the Jarash Hinterland Survey (JHS) commenced in 2005. The JHS was initiated in response to rapidly growing urban expansion into this hinterland threatening the unrecorded archaeological landscape. This baseline survey shows that this rapid urban development may be destroying ca. 10% of the archaeological sites around the city every year.

Introduction

Jarash is one of the best preserved Roman provincial cities to be found. It spreads over some 85 ha with a planned layout encircled by city walls. Its famous colonnaded streets and piazza, theatres, temples, churches, baths and hippodrome are visited by many thousands of tourists every year.

No city, ancient or modern, is a self sufficient island and an urban centre requires a hinterland that provides for its basic needs of food and water, agricultural surplus and building materials as well as a place to bury the dead.

The population of Jarash has doubled within 15 years from 21,000 in 1994 to 42,000 by 2009 and is still growing. Although the core archaeological park is protected, well over 100 new houses are being built beyond its perimeter every year and the pace of development and expansion is relentless. Not only is this rapid urbanisation destroying archaeological sites, it is destroying the rich agricultural land along the Wādī Jarash. It is because of this that the Jarash Hinterland Survey (JHS) project was instigated in 2005. The objectives of the JHS are to identify record and make mitigation and management recommendations for the archaeological sites threatened with destruction. It will also provide a richer basis for understanding the hinterland of ancient Gerasa and the relationship between city and country.

Three seasons of survey have now taken place in 2005, 2008 and 2010. We have previously reported on the first two seasons (Kennedy and Baker 2009b; Baker and Kennedy 2010) and this article provides a summary overview of the 2010 survey results. More detailed analysis and future publications will follow.

The original objective of the JHS was to survey an area of 10 sq km centred on the ancient city. However, it was clear from the outset that attempting to survey 7.5 sq km in the final 4 week season was over ambitious and the survey strategy was revised. In the final season the focus was on joining up the already surveyed areas to the W, E and S boundaries of the survey area; covering small gaps and assessing the areas furthest away from the ancient city. In some areas this provided a survey transect that ran from the City wall to the edge of the survey area and it also provided information on site type and density furthest out from the focus of the City. In addition to the 10 sq km area an area earmarked for housing development located just to the NW of the survey area was also subjected to a rapid walk-over survey. Although not meeting the original objective of covering 10 sq km the survey has provided a representative sample, information on site type and density furthest out from the focus of Gerasa and an archaeological overview of the Jarash Hinterland.

The general JHS area is covered with lime-

stone outcrops and has the deep red rendzina soil or terra rossa that is common on the limestone outcrops in the northwest of Jordan. The fields in both the north and south Wādī Jarash have more mixed topsoil indicative of centuries of cultivation. The 2010 survey area largely comprised agricultural land of ploughed olive groves, fields and rough grazing land.

The field survey was carried out by archaeologists walking intensively over the landscape looking for archaeological sites of any period. When a site was located, its position was marked by handheld GPS, colour digital photographs were taken and the site was recorded by written description, measurements and sketches on a specifically designed field recording form. If artefacts were present, these were collected to provide dating evidence. The field recording form is based on the JADIS record form and includes a section to identify and assess the level of threat to the archaeological sites. Due to extensive ongoing development almost every site has a high risk of being destroyed.

At the commencement of the project it was necessary to produce a suitable scale map of the survey area. The team had intended to use the 1977 1:50,000 UTM Sector 36 map as the primary map for the project coupled with rectified aerial photographs (APs) to produce a base map for the survey area. However, when checking the co-ordinates of fixed points on the ground with the GPS to assist with the rectification of APs it became apparent that the GPS co-ordinates derived from satellites did not agree with the UTM co-ordinates derived from the map. Further research determined that the UTM map is inaccurate and that the co-ordinates taken from the map may be up to 200m away from the co-ordinates obtained from the GPS. This is a known problem encountered by other survey teams (for example, Mortensen 1993; Flanagan and McCreery 1995). It should be noted that the error on the UTM map is variable, both on this particular map sheet and across Jordan. Therefore, there is no formula that can be applied to the GPS-derived co-ordinates to calculate the corresponding UTM map co-ordinates. The JHS has used enlarged Google Earth satellite aerial photographs as field survey base maps.

The survey team used hand-held GPS (Garmin 60CSx, Garmin 60C and a Garmin CS76) to locate the sites in the field. The GPS plots were cross checked by the field surveyors against the annotated field maps to ensure that all sites are correctly located.

All co-ordinates given in our reports and the database are derived from GPS readings, using the WGS 84 co-ordinate system, and are the true UTM co-ordinates for the archaeological sites identified. The accuracy of the GPS reading is usually within +/-5m, but occasionally the accuracy was +/- 6m or 7m of the site. The level of accuracy is recorded in the GPS field log. It is important to note that the sites recorded by the survey should be located either from the supplied maps only or by GPS. If one tries to locate the sites by co-ordinates using the UTM Sector 36 S 1:50,000 map one will not find the sites as the UTM map is inaccurate by up to 200m.

The primary record for the JHS is a database, compatible with MEGA; copies for the 2010 season (as well as earlier seasons) along with the preliminary field reports may be consulted at the libraries of the DoA, CBRL and ACOR.

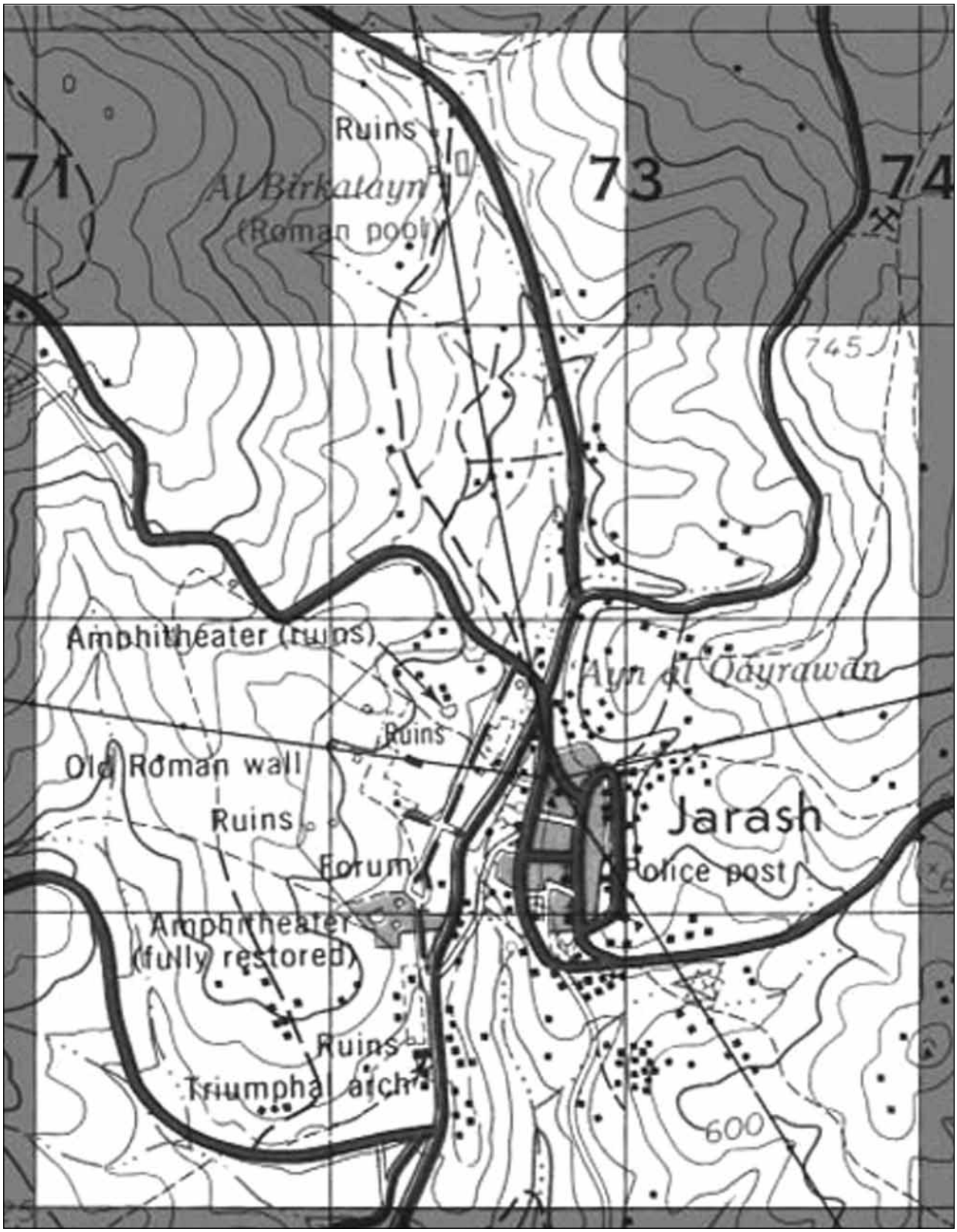
The 2010 Survey – Overview of the Results

A total area of 1.3 sq km was surveyed in 2010 and 519 new archaeological sites were recorded. The total area now covered by the survey amounts to 3.8 sq km and a total of 1141 sites have been recorded. It is estimated that at least 2 sq km of the remaining area is already built over (**Figs. 1, 2, Table 1**).

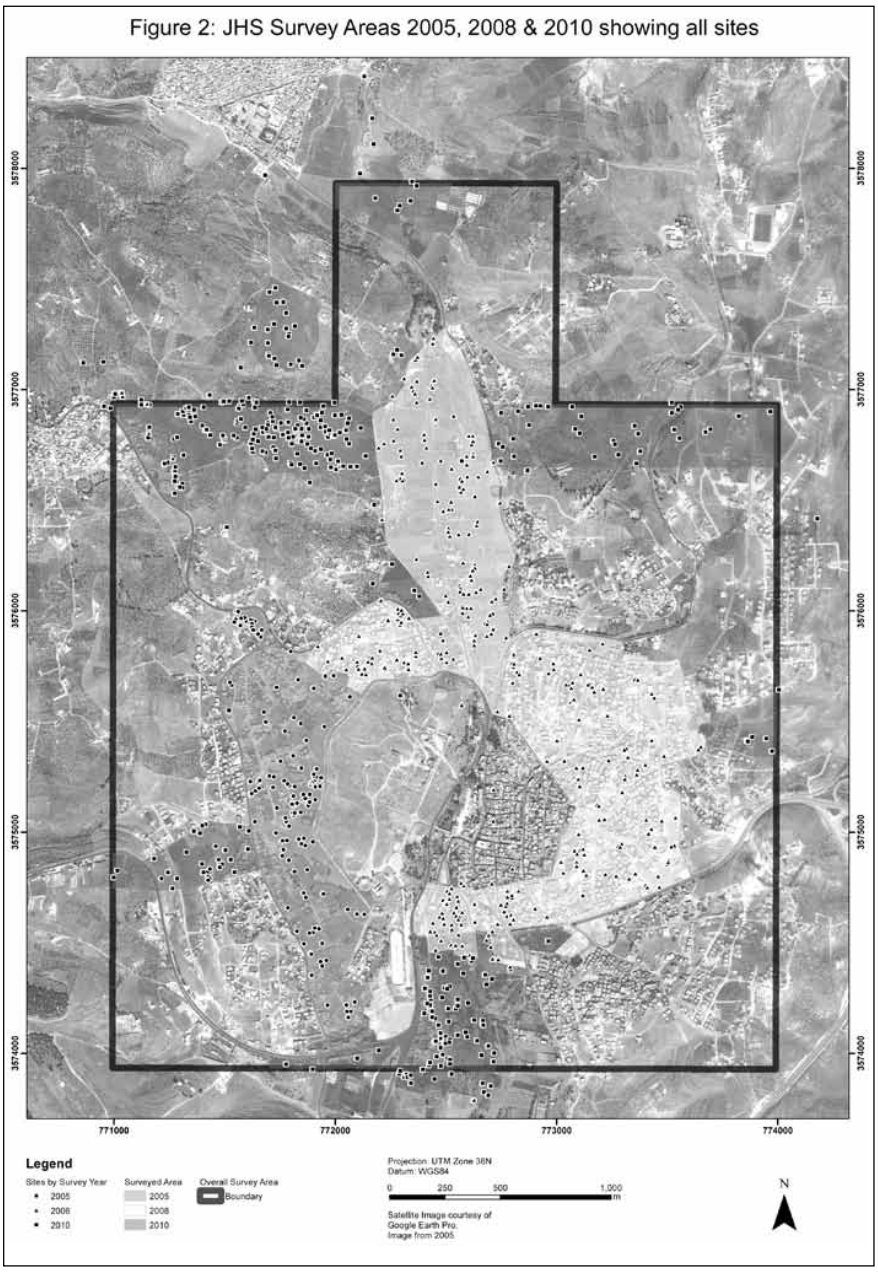
Examples of Site Types

Over 500 new sites were recorded in the 2010 season and over 1100 have been recorded over the three seasons. It is not our intention to describe or discuss all of the site types in detail here but to give a flavour of the types of sites recorded during the 2010 season. Our database can be interrogated by site type for full details and photographs of all of the recorded sites. Artefact analysis of the surface collections is still ongoing and will be completed during 2011 and the information added to the database in due course.

The JHS has provided a wealth of information on the occupation and exploitation of the immediate environs of Gerasa. During the 2010 season it was observed, as might be expected, that the survival rate for archaeological sites such as quarries, lithic scatters and olive and



1. Contour survey map showing whole area.



2. Overall survey map showing all sites and seasons.

wine presses was higher than in the more developed areas immediately adjacent to the city wall. While the results of the survey need to be analysed and assessed in detail it is apparent that spatial distribution of site types also reflects the topography and distance from the urban core. Several distinct areas of further research have emerged, for example water supply and management and tomb typologies. Analysis of the survey results is ongoing and we look forward to integrating the artefact data and producing more in depth publications in due course.

Quarries

A total of 145 quarry sites were recorded in the 2010 survey season, more than in previous seasons. Factors contributing to this higher count include the fact that the 2010 survey areas were less developed and built-up than in previous seasons, meaning that more sites are likely to have survived (**Fig. 3**).

Many of the quarry sites were simple cut edges strung out along the natural limestone terrace outcrops. However, such apparently dispersed evidence can often be regarded as part of

Table 1: showing types and numbers of sites.

Type of Site	**2005**	**2008**	**2010**	**Total**
Quarries	31+	45	145	221+
Rock Cut Tombs	67	64	72	203
Rock Cut Graves	17	7	3	27
Mausolea	5	2	2	9
Sarcophagi	26	15	6	47
Inscriptions /Petroglyphs	8 / 0	3 / 0	0 / 2	11 / 2
Artefact Scatters	10	79	75	164
Caves / Rock Shelters	2	11	50	63
Traditional Houses	2	7	6	15
Mills and Water management	9	29	54	92
Architectural Fragments	34	98	31	163
Milestones	0	4	0	4
Olive / Wine Presses	0 / 0	5 / 0	3 / 9	8 / 9
Platforms	0	4	0	4
Monumental Structures	0	2	0	2
Tracks / Roads	0	0	4	4
Cupholes / Basins	0	0	12 / 22	12 / 22
Other: including terraces, cairns, unspecified structures	16	20	23	59
Total Number Sites	**227+**	**395+**	**519+**	**1141+**

3. Aerial photograph of the large quarry S of the 'Ajlūn road.

a single area of exploitation, within which there are larger areas of extraction alongside small quarried areas and cut edges. This is both the result of evidence being hidden by later slope-wash, giving a more dispersed appearance to the visible remains, and by the selective extraction

of suitable stone. The recent exposure of quarried faces by tomb robbers indicates that up to 2m of soil has accumulated in some areas since the Classical period (**Fig. 4**).

Two incised marks were noted on the rock at limestone quarries. These are in the form of small weathered crosses. They may have been made by a quarry master or overseer to mark the best area of limestone, or where a team was to start work.

Although most quarrying was likely to have been for building material there are intriguing hints of a more specific quarry product in the 2010 survey area. In a group of four sarcophagi NE of al-Birkatayn there were two that were unfinished and at a quarry SW of al-Birkatayn sarcophagi sized blocks were marked out in the quarry face but had not been removed (**Fig. 5**).

5. Abandoned and half-removed blocks site 716.1.

Tombs

The majority of Classical rock cut tombs and burial features located in 2010 survey were on Abū aṣ-Ṣuwwān. These were of high status, located as they are close to one of the main entrances to Gerasa beside the Gerasa – Philadelphia road. Several tombs were also recorded on the E side of the Abū aṣ-Ṣuwwān plateau and many of these tombs had been remodelled as dwellings and some may in fact have originated as natural caves or had possibly been quarried out as flint mines.

Several rock cut tombs were recorded in the NW transect and it was noticeable that the quality and hence status of the tombs increased the closer one moved towards the main road along Wādī ad-Dayr and al-Birkatayn (the *Via Sacra*) (**Fig. 6**).

4. Quarry site 601 showing robber activity searching for tombs and depth of colluvium (2m vertical scale).

6. Tomb 745 with sarcophagus.

Two mausolea were recorded in the 2010 survey area. One at Abū aṣ-Ṣuwwān already in the care of the Department of Antiquities and one in the NW development area which comprises a rock cut tomb and a built structure with a mosaic floor.

The reduction in numbers of sarcophagi from 41 in earlier seasons to just 6 in 2010 probably reflects the survey areas being further away from the focus of settlement and high status burial.

Prehistoric cairns of probable Early Bronze Age date were recorded at the NW, NE and SE boundaries of the survey area and in the NW it was apparent that a megalithic landscape survives beyond the survey boundary. The best example of a prehistoric burial monument was a kerbed façade cairn of EB date found at the NW perimeter of the survey area.

Architectural Fragments

Only 31 architectural fragments were located by the 2010 survey, as opposed to 34 in 2005 and 98 in 2008, which reflects the focus of the survey on areas further away from the city. The frequency of architectural fragments increased the closer one came to Gerasa and most were observed as re-used masonry in field terrace walls. The distribution of architectural fragments is a clear indicator that the 2010 survey area encompassed a more rural landscape.

Artefact Scatters

Only a few dense pottery and artefact scatters were located by the 2010 survey, a total of 75 artefact scatters were recorded, and a third of these were lithic scatters, with a marked decrease in the number of sherds the further one moved out from the city. In the NW survey transect one artefact scatter perhaps represents a Roman – Byzantine farmstead but in general the sherd scatters in the NW were very low density. The NE and SW survey areas were notable for the lack of pottery. In the South Wādī Jarash the density and range of pottery increased as one moved N towards the city.

Flint Scatters

More flint was recovered during the 2010 survey season than in the previous two seasons and two areas proved to be particularly rich in lithics. The first was the South Wādī Jarash, in particular the mid and upper terraces on the east side and the lowest terraces on the west side. The second area is the well known and partially excavated 'mega-site' of Abū aṣ-Ṣuwwān, literally 'Father of Flint' first recorded by G. Lankester Harding in 1948. The latter site has been excavated in the 1980s and 1990s and is still under investigation by Dr Maysoon Al-Naher (Al-Naher 2010), who provided much helpful advice and comments on the JHS lithic assemblages. The Abū aṣ-Ṣuwwān lithic scatters recorded by the JHS form part of an extensive archaeological site, spread over an area of ca. 26 acres. The Abū aṣ-Ṣuwwān site is dated broadly to the Pre Pottery Neolithic and in particular PPNA and PPNB, much of the activity is of seventh millennium BC date and contemporary with 'Ayn Ghazāl and al-Bayḍa.

Previous descriptions (e.g. Harding 1948; Kirkbride 1958) of Abū aṣ-Ṣuwwān indicate a long period of occupation from the Palaeolithic and there are several obvious reasons for this. Primarily the spectacularly rich abundance of good quality flint nodules in the conglomerate limestone and the reliable water supply of the River Jarash (ancient Chrysorhoas = Golden River). Kirkbride (1958) mentions possible Palaeolithic occupation in some of the caves on the E side of the Abū aṣ-Ṣuwwān plateau overlooking the Wādī Jarash. Most of these caves have been converted for later use as Roman tombs, cisterns and later still in the modern period as houses and temporary houses. It is not always possible to determine which caves are natural in origin and which have been quarried out. It is also possible that some of these caves are in fact flint quarries rather than simply occupation or tomb caves.

Small assemblages of flint, including a ground stone axe fragment, were also located and collected in other areas of the survey – implying low-level knapping of prehistoric date throughout most of the survey area with some scatter densities suggesting occupation sites.

Surface flint collection and field observation on Abū aṣ-Ṣuwwān indicates a blade-dominated industry suggesting the bulk of both flint production and occupation activity is of Pre-Pottery Neolithic date (PPNA – B). Particularly diagnostic of this period are the long-blade or naviform cores, several of which were identified as well as long blades and backed or crested blades. Several complete or slightly damaged basalt hammer stones and pestles were also observed within the lithic scatter as well as broken basalt fragments. Also of Neolithic date were opposed multi-platform cores, borers, burins, perforators, flint knives, notched blades, and truncation on blades and scrapers. Some of the more significant tools collected included a double-retouched flint knife, two serrated sickle blades with high sickle gloss and a double waisted lunular tanged scraper and two rough-out examples of this tool (**Fig. 7**).

The site of Abū aṣ-Ṣuwwān is unfortunately being both ploughed intensively and built upon in some areas.

On the East side of the South Wādī Jarash the lithic scatters were not as abundant as on Abū aṣ-Ṣuwwān. However, the mid terrace level produced a number of diagnostic flint and chert lithics characteristic of the Upper Palaeolithic, Epipalaeolithic (possibly Natufian) and Pre-Pottery Neolithic industries.

On the W side of the South Wādī Jarash on the lowest terrace, only 5m from the present water course, two further small flint scatters were encountered. The assemblages include flakes, debitage, truncated flakes, small cores, scrapers, blades, bladelets and microliths suggests flint knapping in this zone. The presence of arched or lunulate microliths (sickle blades) and the diagnostically micro-lithic nature of the assemblage imply a pre-Neolithic date as this type of reduction sequence is more characteristic of Epipalaeolithic assemblages **(Fig. 8)**.

The presence of these sites so close to the river bed on the lowest wadi terrace is of interest. The lithic material appears to be *in situ* as one would expect such small flakes of debitage and the microliths to have been washed away and disturbed rather than being in a distinct assemblage indicating *in situ* knapping.

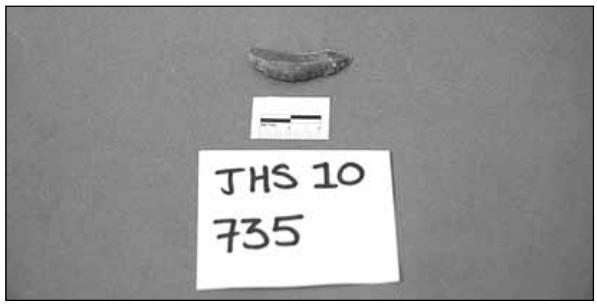
It is clear from the lithic scatters and the mills in the South Wādī Jarash, as well as the other water management features recorded by the survey, that the water supply of Gerasa was very different to what we see today.

Water Management: Springs, Channels, Cisterns and Mills

Water management features were far more frequent in the 2010 survey areas. The less disturbed nature of the landscape away from the focus of settlement preserved significant evidence of Classical period water management.

Five spring sites were observed in 2010, although only two of them were in the survey area. A major spring north of al-Birkatayn at ash-Shawāhid, a spring at Mukhayyam Sūf near Khirbat al-Maṣṭaba and ad-Dayr Spring in the northwest represent the main northern springs. Rock cut water channels were located which fed the water south to al-Birkatayn reservoir, Wādī

7. Selection of blades from Abū aṣ-Ṣuwwān.



8. Epipalaeolithic (Natufian) sickle blade from Site 735 on the lowest terrace of the west bank of the South Wādī Jarash.

ad-Dayr and Gerasa.

In 2008, the remains of a stone water channel constructed of individual U-shaped blocks were located in the Wādī ad-Dayr to the north of the City. This site was scattered over a large area along the middle of the wadi, with many of the blocks built into later agricultural terrace walls.

In 2010, another dump of stone water channel blocks was discovered at the W edge of Wādī ad-Dayr close to the city. These blocks are virtually the only remains of what was once a complete channel running along the W side of the wadi, which survived until about 35 years ago.

Along with these blocks, which represent two water channels in the middle and along the W side of the Wādī ad-Dayr, the survey identified more remains of at least one major rock cut channel with smaller subsidiaries running roughly N-S along the W edge of Wādī ad-Dayr. It is clear that there was a major channel at the W side of the wadi and it is possible that the ash-Shawāhid spring on the W side of the wadi N of al-Birkatayn fed the channel. Like the channel identified in the centre of Wādī ad-Dayr in 2008, perhaps fed by the al-Birkatayn reservoir, it is likely to have played an important role in the supply of water to Gerasa and for irrigating the fertile soils of the wadi.

South of the city a complex of rock-cut water channels was discovered, running N-S along both edges of the Abū aṣ-Ṣuwwān ridge. Only a short stretch of channel was noted on the developed W side but a series of least five roughly parallel channels 10-15m apart were noted on the E side of the ridge where more bedrock was exposed (**Fig. 9**).

The channels are much obscured by slope-wash, but can in general be followed for 100m or so N-S. They all roughly follow the contour, occasionally joining or diverging, which made the direction of flow impossible to gauge without detailed levels but our impression was that they flowed S away from Gerasa. The channels are also linked with caves or tombs that have been reused as cisterns or small reservoirs (as noted by Diana Kirkbride in 1958) (**Fig. 10**).

A third water channel feature is a rock-cut tunnel located in a limestone bluff only 10m above the river on the E side of the South Wādī Jarash. The tunnel aqueduct can be traced for at least 60m, but disappears to the S below slope-wash and the road constructed between 2005 and 2008 (**Fig. 11**).

Over thirty cisterns, wells and reservoirs or birkets were located in 2010. Different methods of water collection were observed. One system of collecting water was the utilisation of a quarried outcrop as a collection area with the water flowing down into a rock cut cistern. Water was also collected using small rock-cut channels to feed into a cistern. Some of these examples utilised old quarry beds as a silt trap before water ran off through more channels into the main cistern tank.

The majority of cisterns tended to be bell-

9. Aerial view of site 744 water channel complex and associated cave birkets 767, 786, 788. The channels can be seen as linear scars in the limestone.

10. Channel 744.2 along the top of cave cistern 786.

11. Rock-cut tunnel aqueduct, site 666.

shaped and are still in use. Several examples of caves and tombs re-used as cisterns were also recorded. This particular phenomenon seems to be concentrated on the S side of Jarash.

One new mill site of similar design to three of the examples already recorded by the JHS was discovered in 2010, bringing the total number of mills in the South Wādī Jarash to five (**Fig. 12**).

Mill sites are very difficult to date; research by Alison McQuitty and others (McQuitty 1995; Greene 1995) has shown that ones that have a Roman appearance might actually be 19th century in date. There is evidence for such mills to have been built and used anywhere between the Classical and Ottoman periods and for the restoration of derelict mills in the Late Ottoman period (Rogan 1995). Excavation would be necessary in order to understand the JHS mills' development and date.

12. Mill site 663.

Cups and Basins

Cups and basins were recorded throughout the 2010 survey area in greater numbers than in previous seasons, again reflecting the survey areas being further away from the ancient city and less developed.

There were noticeable differences in the location of the cups and basins and there was considerable variation in size. The wine presses also had cups and basins associated with them and these examples can be associated with the use of the press.

Several tombs had small basins and cups associated with them, perhaps associated with libations or offerings for the dead. Cups and basins were also noted at quarry sites. Where the quarry faces have been reused for tombs it is unknown whether the cups and basins are associated with the quarry or the tomb. Small water reservoirs may be associated with the quarry sites as pot holders for jars and amphorae or for water to help with the quarrying, especially if heat and quenching or soaking of wooden wedges to assist with block removal was employed.

Elsewhere larger rock cut basins as well as natural solution holes appear to have acted as small localised cisterns or watering holes (**Fig. 13**).

Many of the cups and basins, particularly the

13. Cup and basin site 624.

cups, may have been used as mortars for grinding up cereals or acorns (Younker 1995). The sites where acorns have been found in stratified deposits are all prehistoric and they were perhaps a staple food when agriculture was just becoming established. There are also several ethnographic examples of pastoral nomads grinding and processing acorns in times of food shortages and acorns being processed for food is a well-established practice. It is important to note that water is also required for processing acorns, which may explain the groups of several cupholes together.

Wine Presses

Nine wine presses were recorded in 2010. The majority of these are simple treading floor and vat installations. Pamela Watson's paper on wine presses found in the Pella Hinterland is an excellent reference for the types of wine presses also found in the Jarash Hinterland (Watson 2004).

The most complex wine press installation found is located only 25m S of the 'Ajlūn Road at the S end of the survey area. This example features two treading floors, a settling basin with a hollow on the bottom for sediment or lees to settle in between one of the treading floors and the main large square vat. At the S end of the installation is another smaller rectangular basin, which may be a settling tank and another deep square vat. All of the wine presses are cut into limestone bedrock and there was no trace of any mosaic floors, usually considered a Byzantine feature (E Oweis, pers comm.), suggesting they are all Roman in date.

The simple wine presses consist of a treading

14. Wine press site 833 viewed to the north from the large 4.3m x 4.3m tank or vat. The scales are on the eastern of the two northern treading floors, rock cut channel leading from the W vat associated with the western of the two northern treading floors is entering the main central vat at the left of the picture. The basin with a depression in the bottom for settling lees is on the S side of the eastern of the two northern treading floors. Note that this basin is lower on the side of the large vat and higher on the side of the treading floor.

floor with a rock cut channel leading down into a deeper basin or vat. Some of the wine presses have rock cut post holes arranged around the vat and these presumably were used as post holes for a structure, pot or jar holders or for some kind of mechanism to help with pressing and processing the grapes or for water (**Fig. 14**).

Olive Presses

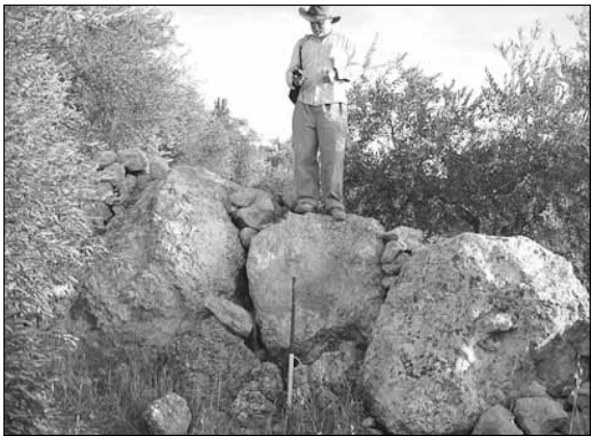
Three, possibly four, olive presses were recorded by the JHS10 survey, one of them, a complex installation, is at Khirbat al-Maṣṭaba. Khirbat al-Maṣṭaba is the first concentration of Classical settlement remains located to the N of the city walls. A lever and weight press and a lever and screw press were identified. All of the sites are cut into bedrock and no above ground structural elements were located. It is of note that the olive and wine presses were generally at the boundaries of the survey area giving an insight into the agricultural – urban interface in the Classical landscape **(Fig. 15)**.

Iron Age Walls

Two massive walls constructed of megalithic boulders were located in the NW survey transect. These two massive walls run parallel to each other and although they have the appearance of Iron Age fortified walls it was unclear what was being enclosed or defended. It is pos-

sible other parts of an enclosure have been destroyed by agriculture and further investigation is recommended. Another single example of a megalithic wall, presumably of Iron Age date was recorded in the NW development area (**Fig. 16**).

15. Site 563, robbed olive press viewed to E, showing large plaster lined vat, two external rock cut basins and cut in the bedrock at the left. In the interior of the vat, the niche in the wall to hold the pressing beam is at the fallen masonry.



16. Megalithic Iron Age wall site 2052.

Traditional Houses

The majority of the traditional houses recorded date to the Circassian settlement of Jarash in the late 19th century though it is of note that this traditional building style continued into the 20th century. Six traditional mud bonded stone buildings were recorded during 2010, half of them ruined. While reassessing the 2005 survey area to determine the rate of development it was noted that one traditional house had been largely demolished. The 19th and 20th century traditional houses at Jarash are disappearing rapidly and all must be considered endangered.

Caves and Rock Shelters

50 cave and rock shelters were recorded by the survey. While these are by definition natural some had been enhanced by the later addition of walls and doors for use as dwellings and animal pens. The rock shelters range from small natural solution caves to large caves that could have been inhabited by several people. The majority of these caves have been disturbed by later use for burials, occupation and storage. However, some caves appear to be undisturbed and could potentially contain Palaeolithic occupation deposits (**Fig. 17**).

Petroglyphs

Apart from the crosses interpreted as quarry master's marks two other interesting symbols cut into the bedrock were recorded. Both of these petroglyphs were recorded in the NW survey areas and were carved into bedrock outcrops with no clear association with any other apparent site. The illustrated example differs from the other example which is a ca. 0.5m diameter

17. Cave shelter 767, with additions from later occupation.

circle incorporating a cup into its circumference and it does not have a cross. Their date and function is obscure. However, at both examples liquid could channel around the groove and into the cup hole suggesting they are for libations, presumably of a religious nature (**Fig. 18**).

Summary Discussion

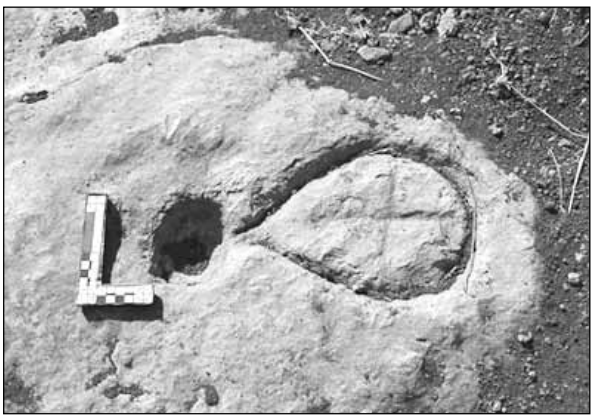
The survey has shown that intensive urban development in the immediate environs of Gerasa has destroyed many of the sites one would have expected, especially quarries, tombs and artefact scatters. Site density suggests that between 300 and 1000 archaeological sites have probably been destroyed by construction work.

At the outer limits of the survey area, the number of sites decreases, even artefact scatters, despite the fact that this is a less developed area. This may indicate that the intensity of activities of the inhabitants of Gerasa was falling off steeply within a relatively short distance.

It was also at the far limits of the survey area that earlier, prehistoric features such as Iron Age megalithic walls and Bronze Age kerb cairns survive. It seems probable that such sites that may have existed closer to Gerasa have been destroyed by Roman quarrying and later activity. Some prehistoric pottery sherds were recovered in small numbers from throughout the survey area.

Some sites of previously unrecorded type were located in 2010, notably a rectangular fortified watchtower overlooking the Wādī ad-Dayr and a substantial circular structure beside a small wadi.

There was a marked increase in the number of wine presses and – to a lesser extent, olive presses. No definite farms or villas could be identified by structural remains but an artefact scatter strongly suggests an area of Roman – Byzantine occupation in the NW survey area. An artefact scatter and rijm in the South Wādī Jarash may also represent a Byzantine – Islamic occupation site. Water management sites were also recorded in greater numbers in 2010. The absence of specific evidence of farms need not be due to destruction. It is possible farming within a kilometre or two of the city was undertaken from the town itself. However, the increase in wine and olive presses towards the outer limits of the survey indicates that enough agricultural land was in production to require these facilities.



18. Petroglyph site 2003.

We assessed the actual impact of development by re-visiting sites (excluding quarried outcrops) surveyed in previous seasons to try and quantify the actual rate of site destruction by new development.

Of the 223 sites surveyed in 2005, 188 of these sites were visited again in 2008. In 2008 we found the condition of 121 sites remained unchanged, 31 had been damaged and 35 had been destroyed by new development. This means that at least 35% of the sites recorded in 2005 had been damaged or completely destroyed by 2008.

In 2010 we revisited 50 sites in the 2005 survey area that survived in 2008 and 31 sites in the adjacent 2008 survey area at the NW of the city. The condition of 45 sites remained unchanged, 6 had been damaged and 21 had been destroyed by new development. This means that between 2005 and 2010 at least 42% of the sites recorded by the survey in this area had been damaged or completely destroyed. From these figures we can extrapolate that 10% of the archaeological sites within the immediate environs of Jarash are being destroyed every year. If this rate continues, 85% of all sites beyond the city walls could be destroyed within the next 5 years (**Figs. 19, 20**).

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19. 2010 view NE over the JHS 2005 survey area showing increasing development to the west of the ancient city.

20. 2010 view south over the S end of Wādī Dayr to the ancient city showing new development encroaching onto agricultural land and threatening archaeological sites recorded by the JHS08 survey along the so-called Via Sacra to al-Birkatayn.

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