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Survey of the Via Hadriana by the University of Delaware: the 1996 season

Steven E. SIDEBOOTHAM, Ronald E. ZITTERKOPF

The University of Delaware conducted the first season of an archaeological survey of the Via Hadriana in June-July 1996 (map figure 1). The goals of this survey, which will continue for several more seasons, are to locate precisely [using the Global Positioning System (GPS)] the route of the Via Hadriana, a Roman thoroughfare built originally in the second century A.D., which extended from Antinoopolis/Antinoë (Sheikh ‘Ibada) on the Nile (at 27° 48.2' N / 30° 52.8' E*) in Middle Egypt to Berenike (Baranis/Medinet al-Haras) on the Red Sea coast (at 23° 54.62' N/35° 28.42' E).

As its name implies, the road was built during the reign of the emperor Hadrian (A.D. 117-138) in conjunction with his founding of the city of Antinoopolis/Antinoë on the east bank of the Nile near the spot where his favorite, Antinoos, drowned in A.D. 130.1 An inscription in Greek dated A.D. 137 and first published in 1870 describes the road as safe, level and supplied with stations/lodgings, watch posts and *hydreumata* (fortified water points).2 Earlier scholars made only passing references to or cursory examination of the Via Hadriana.3

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The Via Hadriana was the latest and longest of the Roman roads to be constructed across the Eastern Desert which linked emporia on the Nile to their counterparts on the Red Sea coast. While much has been published and continues to appear on these other thoroughfares, the Via Hadriana has never been systematically and accurately plotted or studied.

The northern segment of the Via Hadriana is a trans-desert road between the Nile and the Red Sea which follows a generally west-east course similar to other Roman roads linking the Nile to the Red Sea. Once the Via Hadriana comes close to the coast, however, it veers south paralleling the Red Sea. The Via Hadriana does not follow the coastline or beach and does not appear to come closer than a few kilometers from the Red Sea coast until it passes through Safaga. Farther south, though not adequately studied, it does not seem to come within a kilometer or so of the coast again except at Quseir al-Qadim and, possibly, at Marsa Nakari (Nechesia?) until it terminates at Berenike.

The route the road took, somewhat removed from the coastline, may be due to several considerations. First, the wadis emptying into the Red Sea are often deep and difficult to traverse close to the coast and it would have been more practical to place the road farther inland where the wadis are shallower and easier to transit. Also, any drinking water supply for travellers and pack animals along the road would have been accessible farther from the sea towards the edge of the mountains and not adjacent to the coast where any wells sunk would have been brackish to salty and unpotable. Furthermore, a route staying in close proximity to the sea would be significantly longer because of the many bays, peninsulas and other irregularities of the coastline which it would traverse.

At least one section of the Via Hadriana made use of an earlier track. The survey discovered large numbers of lithic tools and cores at Makhareg (figures 2 and 3) and at several locations within a few hundred meters west of Makhareg. This suggests that there was prehistoric or early dynastic activity in the area though the lithics from Makhareg have not yet been studied or dated. That the course of the Via Hadriana, at least in part, made use of an earlier track is not unusual. Throughout the Eastern Desert, roads traversed the easiest and most direct passages between the Nile and the Red Sea, routes discovered and utilized by peoples long before the Roman period. This is true for sections of the Berenike-Nile roads, the Quseir-Nile road, the Abu Sha’ar-Nile road and the route between Edfu (Apollinopolis Magna) and the Red Sea coast at Marsa Nakari.
In addition to locating the route itself, the University of Delaware survey pinpointed and drew measured plans of stations and settlements along the road and will date activity along it through surface artifact (mainly ceramic) analysis. The ceramics could not be studied this season, but will be analyzed in the future.

Using GPS receivers, the survey accurately recorded approximately 230-240 km of the ca. 800 km long Via Hadriana during the 1996 season. Hundreds of GPS readings taken of cleared road segments and cairns lining the thoroughfare permit precise plotting of lengthy portions of the route. The survey also identified the existence of two previously unrecorded secondary road systems – and several stops/stations on them – affiliated with the Via Hadriana. The survey located stations, quarries and possible quarries and a number – two of which were substantial – of ramps/elevated road sections associated with the Via Hadriana. Many of the stations located by the survey were drawn in measured plan. These sites – all affiliated with the Via Hadriana – plus some discovered by the University of Delaware in previous surveys or by other institutional projects are listed below in tabular form.

The survey also partially traced two other secondary road systems south of the west-east (Antinoopolis-Bir Hawashiya) portion of the Via Hadriana. One of these secondary roads bifurcated (at 27° 58.15' N / 31° 27.35' E) from the Via Hadriana towards the southwest at a point just west of Tal’at al-Arta (figure 4) where Wadi Tal’at al-Arta debouches into a broad plain. Another secondary road branched from the Via Hadriana to the east at a point east of Makhareg. One of the road stations on one of these secondary thoroughfares was a well and associated structures at Ujra Zena; another unnamed station was found at the intersection of these two roads. One Ma’aza bedouin informant mentioned the existence of a stop farther west at Abu ’Uegela investigation of which will be undertaken later. Based upon bedouin descriptions of its location, however, it must also have been affiliated with one of the secondary road systems mentioned above.

In addition, the survey investigated the Roman-Byzantine mining settlement at Umm Howeitat/Hayatat (26° 33.29' N / 33° 54.38’ E) which lay west of the Via Hadriana between Wadi Safaga and Quei.
## Sites

<table>
<thead>
<tr>
<th>Site name</th>
<th>Type of site</th>
<th>GPS coordinates</th>
<th>Dates</th>
</tr>
</thead>
<tbody>
<tr>
<td>Antinoopolis/Antinoë (Sheikh 'Ibada)</td>
<td>Urban Nile emporium</td>
<td>27° 48.16' N / 30° 52.85' E</td>
<td>Roman-Byzantine</td>
</tr>
<tr>
<td>Quarry in Wadi al-'Ibada</td>
<td>3 small limestone quarries</td>
<td>27° 51.07' N / 30° 56.57' E</td>
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</tr>
<tr>
<td>Large ramp in Wadi al-'Ibada</td>
<td>part of road</td>
<td>27° 51.41' N / 30° 57.62' E</td>
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<tr>
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<td>unidentified structures</td>
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<tr>
<td>Makhareg</td>
<td>wells/associated structures</td>
<td>27° 53.10' N / 31° 17.28' E</td>
<td>uncertain</td>
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<tr>
<td>Unnamed station</td>
<td>station on secondary route</td>
<td>27° 53.11' N / 31° 25.07' E</td>
<td>unknown</td>
</tr>
<tr>
<td>Ujra Zena</td>
<td>station on secondary route</td>
<td>27° 53.11' N / 31° 31.53' E</td>
<td>unknown</td>
</tr>
<tr>
<td>Ta’al al-Arta</td>
<td>road station</td>
<td>27° 58.75' N / 31° 28.03' E</td>
<td>uncertain</td>
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<tr>
<td>Large ramp east of Ta’al al-Arta</td>
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<td>27° 59.40' N / 31° 28.31' E</td>
<td>uncertain</td>
</tr>
<tr>
<td>Mahattit Ziyar Romaniya*</td>
<td>stop on road</td>
<td>28° 03.11' N / 31° 32.52' E</td>
<td>Roman-Byzantine</td>
</tr>
<tr>
<td>Umm Suwagi</td>
<td>cistern/associated structures</td>
<td>28° 16.77' N / 31° 53.96' E</td>
<td>Roman-Byzantine</td>
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<td>28° 12.58' N / 32° 22.28' E</td>
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</tr>
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<td>27° 58.64' N / 33° 12.90' E</td>
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</tr>
<tr>
<td>Milaha al-Nakhl</td>
<td>settlement near road</td>
<td>27° 33.66' N / 33° 25.27' E</td>
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</tr>
<tr>
<td>Abu Sha’ar al-Qibli</td>
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<td>27° 22.14' N / 33° 37.98' E</td>
<td>Roman-Byzantine</td>
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<tr>
<td>Quei ±</td>
<td>hydreuma</td>
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</tr>
<tr>
<td>Quseir al-Qadim ±±</td>
<td>Red Sea port</td>
<td>26° 09.42' N / 34° 14.54' E</td>
<td>1st-2nd, possibly 3rd C. A.D.</td>
</tr>
<tr>
<td>Umm Howeitat</td>
<td>gold mining settlement near road</td>
<td>25° 26.58' N / 34° 34.16' E</td>
<td>3rd C. B.C. &amp; Roman ?</td>
</tr>
<tr>
<td>Marsa Dabr/Marsa Nabilah</td>
<td>hydreuma</td>
<td>25° 18.86' N / 34° 44.24' E</td>
<td>unknown</td>
</tr>
<tr>
<td>Nechesia (?) ± Marsa Nakari</td>
<td>Red Sea port/hydreuma</td>
<td>24° 55.50' N / 34° 57.74' E</td>
<td>1st-2nd &amp; mid-4th-5th C. A.D. on Ptolemaic-1st-2nd &amp; 4th (?) C. A.D.</td>
</tr>
<tr>
<td>Wadi Lahma</td>
<td>hydreuma</td>
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<td>unknown</td>
</tr>
<tr>
<td>Berenike ±</td>
<td>Red Sea port</td>
<td>23° 54.62' N / 35° 28.42' E</td>
<td>Ptolemaic-5th/6th C. A.D.</td>
</tr>
</tbody>
</table>

² Studied previously by the University of Delaware and/or Leiden University

²² Excavated and published by the Oriental Institute, University of Chicago

* Site name given by University of Delaware Survey

It is evident that not all the settlements and stations along the Via Hadriana have been identified. For example, the distance between Makhareg/Makhareg Gharb and Antinoopolis would have been too great for the ancient traveler unless there had been an intermediate station. Several Ma’a’za bedouin informants indicated the existence of such a station in Wadi Ba’aytharaan, but the survey was unable to locate the position of this installation. Likewise, the distance between Bir Hawashiya and Abu Sha’ar al-Bahri would also have necessitated one or, possibly, two additional stops to accommodate travelers. The survey lacked sufficient time during this first season to investigate adequately this region.
A University of Delaware-Leiden University survey in February 1997 visited a gold mining settlement, with a fort (*ca.* 25.6 m E-W × *ca.* 21.5 m N-S) (figure 5), at Umm Howeitat in the Wadi Mubarak between Quseir al-Qadim and Marsa Dabr/Marsa Nabiyyah (figures 6 and 7). Umm Howeitat appeared to be joined to the Via Hadriana by a trunk road. There should be other stops/settlements/stations on the Via Hadriana between Quseir al-Qadim and Umm Howeitat and between Marsa Nakari and Berenike. The survey will carefully investigate these areas in coming seasons.

### Description of the road

This season the survey concentrated on the northern portion of the Via Hadriana and did not venture south of Marsa Dabr/Marsa Nabiyyah (*ca.* 30 km north of Marsa ‘Alam). All road sections investigated this season were unpaved. The highway was a series of flat surfaces cleared of surface detritus, large stones, etc. which were collected at the edges forming, in many instances, windrows or cairns or both. Some road sections no longer preserved the windrows and cairns and in those areas where they survive they varied considerably in size. Some were barely noticeable piles of sand while others comprised huge boulders lining the route (figure 8).

Cairns of piled stones of varying sizes lined both sides of much of the route. Some were barely noticeable or differentiated from the windrows on which they sat while others were quite substantial in size. The survey located many hundreds of these cairns and measured representative samples. Dimensions ranged from *ca.* 0.55 m × 0.60 m to *ca.* 0.70 m × 1.50 and *ca.* 0.90 m × 1.40 m; the cairns were round, oval, square or rectangular in plan. Most cairns measured by the survey fell into a size range of *ca.* 0.55-0.70 m × 0.60-0.70 m. In some sandy areas without boulders and cobbles on the surface on the northern trans-desert portion of the road, there appeared to be deliberate attempts to import stones to line the roads which were of very different color from the underlying sandy terrain over which the route passed. This effort may have been undertaken to facilitate travelers in route identification.

This method of road construction is typical of the Eastern Desert and can be seen along many extant route sections throughout the region.

It is worthy of note that the other major Roman trans-desert Nile-Red Sea road systems intersect the Via Hadriana near the Red Sea coast. While all the Roman routes in the Eastern Desert cross stark terrain, the northern west-east trans-desert portion of the Via Hadriana traverses an extremely bleak landscape. There is less vegetation along this route than others in the region; even today few if any bedouin or their flocks inhabit the area.

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7 Murray (*supra* n. 3), p. 149 mentions the small fort at Marsa Dabr. For references to the settlement at Umm Howeitat see C.J. Alford, « Gold Mining in Egypt », Transactions of the Institution of Mining and Metallurgy eleventh session 10, 1901-1902, p. 12 and Wright, Herbert, December 1993 (*supra* n. 6), p. 7-8.

8 For published examples from other Eastern Desert routes see J.J. Hester, P.M. Hobler, J. Russell, « New Evidence of Early Roads in Nubia », *AJA* 74/4, 1970, p. 385-389, plates 99, 4 and 100, 2; Sidebotham *Antike Welt* (*supra* n. 4), p. 182, abb. 11; *Sidebotham, Zitterkopf, Riley* *AJA* (*supra* n. 4), p. 600; *Sidebotham, Zitterkopf Expedition* (*supra* n. 4), p. 42.
Given the extremely barren landscape and the great difficulty and depths one had to excavate to obtain water, the question arises as to the reason for building a road across the desert and parallel to the Red Sea coast at this point in the second century A.D. when there were already a number of roads linking Nile emporia to the Red Sea coast. Given its route, the role of the Via Hadriana, unlike that of the other thoroughfares, may have had less to do with commerce, mining and quarrying and may have been constructed placing far more emphasis (than the other Roman roads in the Eastern Desert) on military and administrative requirements. It might be that the north-south coastal route provided a land communication link directly among the Red Sea ports themselves which were otherwise and previously perhaps only connected by ships plying the coastal route. Continued survey work along the Via Hadriana may help answer this question.

Road widths measured along the Via Hadriana varied from ca. 9.7 m to ca. 30 m. The larger widths tended to appear on the west-east, northern trans-desert (Antinoopolis-Bir Hawashiya) part of the route which seems to contain both the widest and best preserved road segments. This may be due to the route’s proximity to Antinoopolis. More likely, however, clear route identification would have been more important on the trans-desert portions of the route where the likelihood of a traveler becoming lost was greater than on the coastal road. On the latter thoroughfare one merely had to travel parallel to the coast; there was much less likelihood of becoming lost as the Red Sea was generally visible in the distance.

The survey discovered no extant milestones along the Via Hadriana. The absence of milestones appears to be a typical feature of Eastern Desert routes in the Roman period their place being taken, presumably, by numerous cairns and, in some cases, signal towers extant along their courses. While Roman milestones or putative milestones have been recorded from areas east of the Nile in the Delta and immediately west of the Nile in Nubia, none has been found, thus far, along the Berenike-Nile roads, the Marsa Nakari (Nechesia?) – Nile road, the Quseir – Nile road, or the road between Abu Sha’ar and the Nile.

Sections of the Via Hadriana preserved features not seen on other Roman roads in the Eastern Desert. Along the north-south coastal segment of the Via Hadriana, in the vicinity of Abu Gariya (figure 9) and Bir Abu Sha’ar al-Qibli, cairns were very closely spaced along the edges of the windrows, but in several instances the cairns lay several meters outside of the windrows. This unusual situation, which the survey did not encounter on the northern trans-desert (Antinoopolis-Bir Hawashiya) portion of the route, may be interpreted as follows. These cairns may have originally formed the edge of an earlier road, perhaps the earliest construction of the Via Hadriana. It may be that a subsequent improvement of the thoroughfare created a narrower highway (formed by the extant windrows) inside and along

9 MURRAY (supra n. 3), p. 150, however, sees it mainly as a commercial highway.
10 For milestones or possible milestones found in desert areas east and just west of the Nile see U. MONNERET DE VILLARD, La Nubia romana, Rome, 1941, p. 34 (= CIL III Supplement 14148); CIL III Supplement 6633; HESTER, HOBLER, RUSSELL, AJA (supra n. 8), p. 385-389 and plates 99.3, 100.5.
11 MURRAY (supra n. 3), Plate XI and p. 149 mentions the site as Wâdî Abu Ẹariah.
the course of the earlier route. Alternatively, this might also be evidence that two separate crews constructed this portion of the route. One crew might have collected the larger stones to build the cairns and a second crew then cleared the route of the smaller stones creating a narrower path as defined by the resulting windrows.

There were also other noteworthy features along the coastal portion of the route. There were, for example, two separate roads leading north out of Wadi Quei — one at 26° 21.30' N / 34° 07.26' E, the other at 26° 21. 34' N / 34° 07.91' E — which joined several hundred meters north of the wadi (at 26° 22.01' N / 34° 07.59' E) to form an intersection.

Another distinctive stretch of road exists between Bir Hawashiya and Abu Sha’ar al-Bahri (at 28° 11.1' N / 32° 30.0' E). Here in a rather flat, wide wadi a section of the road had a double set of parallel and abutting windrows. The width of the northern one was 20.2 m and the southern one was 16.5 m. The reason for two parallel, abutting road sections is uncertain; perhaps one represents an earlier segment and the other a later segment.

There were several raised road sections which formed ramps/elevated road segments along the west-east trans-desert portion of the Via Hadriana. These are not unique among the Roman road systems in the Eastern Desert; there is one in the Wadi Umm Huweis on the Mons Claudianus-Barud road ca. 10 km south of the station at Barud at 26° 44.29' N / 33° 37.67' E. This impressive structure is ca. 54 m long and 2.7 m wide. There is another, which is more of an elevated road section across a small wadi, in the Wadi Dunqash between the stations of Abu Midrik and Samut on the Berenike Nile roads at 24° 51.3' N / 33° 47.4' E. A double elevated road section occurs along the route between Marsa Nakari (Nechesia?) on the Red Sea coast and the gold mines at Sukkari. These unusual features built of cobbles located at 24° 57.28' N / 34° 44.99' E are ca. 6.5 m apart. The upper one has a definite length of 17.1 m and a probable length of 41.1 m; the lower one is 42.8 m long. Other ramps exist in quarry areas at Mons Claudianus and Mons Porphyrites as well as at the emerald mining region of Middle Sikait (24° 39.4' N / 34° 48.5' E).

The two substantial ramps/elevated road segments located by the survey along the Via Hadriana occur along the northern trans-desert portion of the route between Antinoopolis and Bir Hawashiya. One is just east of Tal’at al-Arta at 27° 59.4' N / 31° 28.3' E and measured ca. 60-70 m long x ca. 4.3-5.1 m wide (figure 10). It connected high ground on the east down to the floor of the wadi to the west. Adjoining the southern edge of the wadi wall, its built-up height varied from ca. 0.9-2.2 m. The other ramp/elevated road section, ca. 85 m long, was in the Wadi al-‘Ibada at 27° 51.41' N / 30° 57.62' E. It abutted the northern side of a wadi wall and directed the road around the northern edge of a very steep portion of the Wadi al-‘Ibada.
Stations, settlements, hydreumata

The survey discovered no hydreumata on the west-east trans-desert portion of the route between Antinoopolis and Bir Hawashiyia although Ma’aza bedouin informants indicated that there was a hydreuma in Wadi Ba’aytharaan (noted above); this was not located by the survey during the 1996 season. The stops on this northern trans-desert portion of the Via Hadriana which the survey investigated [Makhareg Gharb, Makhareg, Tal’at al-Arta, Mahattit Ziyar Romaniya, Umm Suwagi and Bir Hawashiyia, plus the two on the secondary road system noted above: Ujra Zena and the unnamed station] all lacked extant fortification walls. They were wells with associated structures. Some, but not all, had huts and cisterns or other hydraulic features. Some, such as Makhareg, had also been used in recent times.

The dearth of fortifications at the stations along this northern trans-desert part of the Via Hadriana contrasts with all other Eastern Desert roads from the Roman period. The lack of fortified water points (hydreumata) was clearly not due to the costs entailed in erecting such structures. The very length and careful construction of the route indicates that the resources were available for the task. One must tentatively conclude that the lack of hydreumata along this section of the route was deliberate and indicated that the authorities perceived no threats requiring their construction. This was clearly not the case along the coastal portion of the route where there are a series of hydreumata. It may be that the dearth of hydreumata along the northern portion and their presence along the coastal segment have chronological implications. Perhaps the ones along the coast either pre or postdate construction of the northern trans-desert segment. Future seasons of work along the road may shed light on this dichotomy between the northern trans-desert segment of the Via Hadriana lacking hydreumata on the one hand and the coastal route with hydreumata on the other.

The well-stops on this northern route had similar features. Evidence indicated very deep wells with huge piles of sand and other detritus excavated from the wells being piled up around them to form huge mounds. Placed invariably in wadi bottoms, a number of these had been badly damaged or destroyed by seyls (Tal’at al-Arta and Umm Suwagi) or by bulldozing (Bir Hawashiyia). It seems that only the latter and, perhaps, Umm Suwagi had been previously recorded by an earlier scholar as stops on this northern trans-desert portion of the Via Hadriana.13

In addition to hydreumata, the coastal route may also have preserved unfortified settlements and road stations. Known hydreumata on the route paralleling the Red Sea coast include Abu Sha’ar al-Qibli, Abu Gariya, Wadi Safaga (figures 11 and 12)14 and Marsa Dabr. Measured plans of none of these except for Abu Sha’ar al-Qibli15 had been previously published. In the summer of 1990 the University of Delaware survey had noted wall lines at the stop at

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13 Murray (supra n. 3), Plate XI p. 149. Umm Suwagi may be Ghallah on Murray’s map.
14 Murray (supra n. 3), Plate XI p. 149 mentions the site.
Abu Sha’ar al-Bahri. This site, had, according to bedouin informants, been destroyed by bulldozer in the late 1980s and the survey could not determine from the sparse remains the type of road stop located here. The survey was also unable to determine the type of road stop which had existed at Milaha al-Nakhl — an oasis settlement which probably lay off the Via Hadriana a few kilometers to the west — because it, too, had been bulldozed in the early 1990s. Other stations, destroyed by flash floods (scyls) over the centuries and no longer extant, such as the hydreuma at Quei, were partly visible earlier in this century.

The extant hydreumata were typically quadrilateral in plan with exterior defensive walls built of stacked stones. Interior structures and rooms abutted the interior faces of the defensive walls or were free standing. Cisterns and/or wells or other hydraulic installations were prominent features of the interiors of all hydreumata except that at Marsa Dabr which was too badly damaged to determine the existence let alone location of such interior hydraulic remains.

Dating the installations proved problematical during the 1996 season for several reasons. First, no pottery specialist was available. Thus, diagnostic sherds collected from Makhareg Gharb, Makhareg, Tal’at al-Arta, Mahattit Ziyar Romaniya, Umm Suwagi and Bir Hawashiya must await study until next season. Second, the survey found little or no diagnostic surface pottery at several of the sites including Abu Sha’ar al-Bahri, Milaha al-Nakhl, Wadi Safaga and Marsa Dabr/Marsa Nabiyyah. Dates of sherds gathered previously on other projects at some of the sites (including Antinoopolis, Abu Sha’ar al-Qibli, Abu Gariya, Quseir al-Qadim, Marsa Nakari and Berenike) have been published elsewhere (these appear in the table) or await publication.
Conclusion

Substantial sections of the northern west-east trans-desert portion of the Via Hadriana together with many of the stations along this segment have now been plotted and drawn in measured plan. Sections of the north-south portion of the road paralleling the Red Sea coast plus some of the stations as far south as Marsa Dabr/Marsa Nabiyah have also been plotted and drawn in measured plan. The survey could not record route segments which passed through military areas north and south of Safaga.

The survey will have several more seasons of work to complete the project. The final result should be as accurate a map of the course of the Via Hadriana as possible given current state of its preservation and affordable GPS technology allow. The survey will also publish measured plans, photographs, GPS coordinates and dates (from ceramic analysis) of the extant stops on the road and an analysis of the road’s purpose and relationship with other Roman thoroughfares in the Eastern Desert.
Fig. 1. Map of the Eastern Desert showing the Via Hadriana and associated roads. Drawing by R.E. Zitterkopf, 1997.
Fig. 2. Plan of Makhareg. Well with embankments. Drawing by R.E. Zitterkopf.

Fig. 3. Makhareg looking north-northwest. Photo by S.E. Sidebotham.
Fig. 4. Ta‘alat al-‘Arta looking south. Photo by S.E. Sidebotham.

Fig. 5. Fort at Umm Howeitat looking southeast. Photo by S.E. Sidebotham.
Fig. 6. Plan of hydreuma at Marsa Dabr/Marsa Nabiyyah. Drawing by R.E. Zitterkopf.

Fig. 7. Hydreuma at Marsa Dabr/Marsa Nabiyyah looking northeast. Photo by S.E. Sidebotham.
Fig. 8. Cleared section of Via Hadriana on northern trans-desert section just east of Antinoopolis/Antinoe (Sheikh 'Ibada). Photo by S. E. Sidebotham.

Fig. 9. Plan of the hydreuma at Abu Gariya. Drawing by R.E. Zitterkopf.

A  Modern well  
B  Cistern  
C  Remains of plastered basin  
D  External basin  
E  Mounds of sand and debris  
F  Later breach through perimeter wall for access to well  
G  Windbreak
Fig. 10. Ramp west of Tal al-Arta looking south. Photo by S.E. Sidebotham.

Fig. 11. Plan of hydreuma at Wadi Safaga. Drawing by R.E. Zitterkopf.
Fig. 12. Hydreuma at Wadi Safaga looking northwest. Photo by S.E. Sidebotham.