Durham University

Durham E-Theses

The Samarran Urban Layout: Inequality in the Abbasid period

CASAMAYOR MOLINA, FERNANDO

How to cite:

CASAMAYOR MOLINA, FERNANDO (2025) *The Samarran Urban Layout: Inequality in the Abbasid period*, Durham theses, Durham University. Available at Durham E-Theses Online: http://etheses.dur.ac.uk/16192/

Use policy

The full-text may be used and/or reproduced, and given to third parties in any format or medium, without prior permission or charge, for personal research or study, educational, or not-for-profit purposes provided that:

- a full bibliographic reference is made to the original source
- a link is made to the metadata record in Durham E-Theses
- the full-text is not changed in any way

The full-text must not be sold in any format or medium without the formal permission of the copyright holders.

Please consult the full Durham E-Theses policy for further details.

Academic Support Office, The Palatine Centre, Durham University, Stockton Road, Durham, DH1 3LE
e-mail: e-theses.admin@durham.ac.uk Tel: +44 0191 334 6107
http://etheses.dur.ac.uk

The Samarran Urban Layout: Inequality in the Abbasid period

An archaeological study of the residential buildings and their relationship with the urban plan



Fernando Casamayor Molina

Master by Research

Archaeology

2025

Will Time ever retrieve for me
my days in white palaces and courtyards?
There's no union with them momentarily,
nor do they have a minute for a visit.
A moment of merriment is not renewed
in memory without renewing my ardor for them.
A yearning, among many, left me awake
at night, as if it were one malady among many.

- Al-Buḥturī on his escape from Samarra. *Dīwān,* 3, p. 2015, II. 1-4 (Translation by Samer Mahdy Ali – University of Texas at Austin)

ACKNOWLEDGEMENTS

I wish to express my most immense gratitude to my supervisors, Professors Dan Lawrence and Derek Kennet, who not only advised me in the making of this dissertation but also help take the first steps in the world of academia. I also wish to thank the people of EAMENA, especially Dr William Deadman, Dr Ishiba Hinojosa Balino and Mr Ahmad Mohammed, who provided invaluable advice and support throughout my Master's. My time at the Department of Archaeology at Durham University, a total of four years, was filled with helpful and kind people, both staff and research students.

In the personal aspect, I want to thank my parents, who have been a constant positive presence throughout my studies and have supported me in any decision and at any low point.

Table of Contents

ACKNOWLEDGEMENTS 3
TABLE OF FIGURES 6
CHAPTER 1: INTRODUCTION 12
CHAPTER 2: HISTORICAL CONTEXT 13
The Abbasid Caliphate prior to 836 AD: a very brief summary 14
Samarra, a new capital 14
The Anarchy at Samarra 17
The Last Days of Samarra 18
The Samarran Urban plan: General aspects 18
The original city of Samarra: Surra Man Ra'ā 20
Cantonments 24
Madinat al-Mutawakkiliyya 28
Evidence for social inequality and class in Abbasid society 31
Food and Markets 32
Clothing 33
Houses and Neighbourhoods 33
Social life 35
Conclusion 36
CHAPTER 3: DATA AND METHODOLOGY 37
Inequality in archaeology 37
Data 41
Block 44
Blocks 46
Mansions 47
Palaces 47
Neighbourhood Identification and Inequality Assessment 48
Further issues with the Data 49
Methodology 50
Gini coefficients 51
House size and other parameters (statistical tests) 53
Distance 54
CHAPTER 4: THE ABBASID RESIDENCE - PALACES AND DWELLINGS 56
Abbasid Palaces 56
What is a palace? 56
The internal layout 60

The internal layout's origin: new and past theories 70
Ornamentation, material and decorative architecture 83
Abbasid dwellings 86
CHAPTER 5: PATTERNS IN HOUSE SIZE AND LAYOUT AT SAMARRA 92
Size 92
Spaces (Rooms and Courtyards) 96
Orientation 98
Shape 100
Number of Entrances 101
Water Systems (basins and cisterns) 102
Discussion – variables connection 104
The Samarran House: Conclusion 106
Chapter Conclusion 106
CHAPTER 6: INEQUALITY AT SAMARRA AT AN AREA LEVEL 108
Gini coefficients – Areas and Time Periods 108
All residential buildings (block, blocks, mansions and palaces) 108
Block and Blocks 111
Mansions 112
Conclusion 114
Urban structure of Samarra: neighbourhoods and service availability and accessibility 115
Madinat al-Mutawakkiliyya (Area T) 123
Cantonment of al-Dur (Area U) 149
Cantonment of al-Karkh (Area F) 157
Cantonment of al-Jawsaq (Area X) 162
Al-Waziriyya (Area G) 166
Original City North (Area H) 170
Original City South (Area J) 178
Cantonment of al-Matira (Area K) 202
Balkuwara cantonment (Area R) 209
Al-Istablat (Area M) 214
CHAPTER 7: INEQUALITY AT SAMARRA AT A SITE LEVEL 216
Temporal Analysis 216
Area analysis 220
Conclusion 223
CHAPTER 8: DISCUSSION AND CONCLUSION 224

BIBLIOGRAPHY 226
APPENDIX 1 238
APPENDIX 2 288
APPENDIX 3 301
APPENDIX 4 302

TABLE OF FIGURES

Figure 1: Avenues and the places it goes through. Northedge (2008, pp. 105-7) 20
Figure 2: Map of Samarra drawn by Herzfeld. Northedge 2008, Fig. 43 21
Figure 3: Map of Area H (original city north). 22
Figure 4: Map of Area J (City Central South). 24
Figure 5: Cantonments of Samarra. Northedge, 2008, Fig. 75 25
Figure 6: Cantonment of al-Karkh. Northedge, 2008, Fig. 76. 27
Figure 7: Cantonment-blocks from various locations. Kennet, 2001, Fig. 3 28
Figure 8: Map of Medinat al-Mutawakkiliyya 29
Figure 9: Minaret of the Abu Dulaf mosque. UNVESCO World Heritage Centre 30
Figure 10: North-West Madinat al-Mutawakkiliyya. (Northedge, 2008) 30
Figure 11: Areas of Samarra as presented in Northedge 2008 44
Figure 12: Different models of two-story houses (top - Edwards, 2006; bottom – Petruccioli, 2006, figs. 1.2 & 1.3) 45
Figure 13: Plan of Madinat al-Mutawakkiliyya with the identified units. Northedge, 2008, Fig. 96 52
Figure 14: GINI coefficient. INOMICS 52
Figure 15: Palace of Ctesiphon. Evidence of the Sasanian "central aisle" model (Reuther, 1930) 53
Figure 16: Two routes (A & B) going from a Block to a Market 54
Figure 17: Plan of Ukhaidir. Gardenvisits.com 61
Figure 18: Palace of Balkuwara, Samarra. Central aisle highlighted in orange. Samarra, a palatial city (smarthistory, fig. 6) 62
Figure 19: Palace of Dar al-Khilafa. In Yellow Dar al-amma, in Red: Al-jawsaq al-khaqani. Northedge, 2008, p. 134 64
Figure 20: Palace of Dar al-amma (Dar al-Khilafa) with the excavated areas highlighted in blue. Northedge, 1993, p 164, fig. 6) 64
Figure 21: Illustration of the Madinat al-Salam (current Baghdad) with the caliphal palace. Alsammarae, 2021 65
Figure 22: Palace of al-Ja'fari. Northedge, 2008, p. 215, fig. 94 66
Figure 23: Time periods and average sizes of mansions 69
Figure 24: Areas of Samarra and average size of mansions 70
Figure 25: Image of Dar al-amma edited by Professor Derek Kennet in his lecture at St Andrews (Slice 15, Kennet, 2022) 71

Figure 26: Image of Dar al-amma edited by Professor Derek Kennet in his lecture at St Andrews (Slice 15, Kennet, 2022) 71
Figure 27: Palace of Balkuwara with the three discussed features highlighted 71
Figure 28: Palace of Sur Ishnas with the three discussed elements highlighted....72
Figure 29: Non-Caliphal palaces of Samarra with highlighted areas. Northedge & Kennet, 2015 72
Figure 30: Chahar Taq of Atashgah (Niyasar). (Archnet) 73
Figure 31: Iwan of the Mosque of Isfahan (Wikimedia Commons) 74
Figure 32: Iwan of Ctesiphon. (San Diego Air and Space Museum) 75
Figure 33: Great Palace of Constantinople (Featherstone, 2013, Fig 3)....77
Figure 34: Palaces of Mshatta (Left – Schulz, 1993) and Khirbat al-Mafjar (right – Whitcomb & Taha, 2013)....78
Figure 35: South Facade of Mshatta (Museum of Isalmic Art, Berlin) 79
Figure 36: Mosaic of the bath complex of Khirbat al-Mafjar (Phys.org) 79
Figure 37: Palace of Dar al-Imara, Kufa 80
Figure 38: Map of Desert Qasrs in El-Sham (Genequand, 2020, p. 241) 81
Figure 39: Qusur al-Umawiyya. Archnet....82
Figure 40: Palace of Tulul al-Ukhaider. (Finster & Schmidtt, 1986)....82
Figure 41: The three styles of Stucco in Samarra. A, B and C (from left to right). (MIT) 84
Figure 42: From left to right, H356 (House no. 3), H7 (House no. 4), H8 (House no. 1).Drawings from Northedge (2008) 87
Figure 43: From left to right, K29, H14 , H7. Drawings from Northedge (2008)....88
Figure 44: Picture of the south wall of the Abbasid house. Picture taken by me in Jericho, Palestine 89
Figure 45: Plan of the Abbasid House in Hisham. Sparks et al, 2019, p. 309 (fig. 9) 90
Figure 46: Areas of Samarra and average size of mansions....91
Figure 47: Standard deviation of size across the site....93
Figure 48: Mean Size across different areas of the site....94
Figure 49: House size variability in the different areas of the site 95
Figure 50: House size across periods....96
Figure 51: Average spaces per area of the site 97
Figure 52: Graph with the evolution of orientation across time periods (in percetange) 98
Figure 53: Graph with Gini Values (blue), number of residences in each area (orange) and gini value for the entire site (green) 110
Figure 54: Gini values across time periods....111
Figure 55: Gini coefficient for Block and Blocks across different areas 113
Figure 56: Gini coefficients of mansions per area 114
Figure 57: Gini coefficients of mansions per time period 115
Figure 58: Mosques (in red) in Madinat al-Mutawakkiliyya 116
Figure 59: Mosques (in red) in military cantonments....117
Figure 60: Mosques (in red) in area K 117
Figure 61: Mosques (in red) in Area H....118
Figure 62: Markets in Balkuwara (Area R) 119
Figure 63: Markets in south Area J (Mutasim's city) 119
Figure 64: Markets in North Area T (Madinat al-Mutawakkiliyya) 120
Figure 65: Buildings J153 and J154. Northedge & Kennet, 2015, Fig. 116 & 117....121
Figure 66: Map of Madinat al-Mutawakkiliyya divided by Units identified by Northedge in Northedge 2008....123

Figure 67: Plan of Unit TA 124
Figure 68: Distribution of building types in Unit TA 125
Figure 69: Plan of Unit TB 125
Figure 70: Distribution of building types in Unit TB 126
Figure 71: Plan of Unit TC 127
Figure 72: Distribution of building types in Unit TC 128
Figure 73: Plan of Unit TD 128
Figure 74: Distribution of building types in Unit TD 129
Figure 75: Plan of Unit E 130
Figure 76: Building types in Unit TE 131
Figure 77: Plan of Unit TF 132
Figure 78: Distribution of building types in Unit TF 132
Figure 79: Plan of Unit TG 133
Figure 80: Distribution of building types in Unit TG 134
Figure 81: Plan of Unit TH 135
Figure 82: Distribution of building types in Unit TH 135
Figure 83: Plan of Unit TI 136
Figure 84: Distribution of building types in Unit TI 137
Figure 85: Plan of Unit TJ 138
Figure 86: Distribution of buildings in Unit TJ 138
Figure 87: Plan of Unit TK 139
Figure 88: Distribution of building types in Unit TK 140
Figure 89: Plan of Unit TL 140
Figure 90: Distribution of building types in Unit TL 141
Figure 91: Plan of Unit TM 141
Figure 92: Distribution building types in Unit TM 142
Figure 93: Plan of Unit TN 142
Figure 94: Distribution of building types in Unit TN 143
Figure 95: Plan of Unit TO 143
Figure 96: Relation between residences, water systems and service infrastructure 148
Figure 97: All units of al-Dur 150
Figure 98: Plan of Unit UA 151
Figure 99: Distribution of building types in Unit UA 151
Figure 100: Plan of Unit UB 152
Figure 101: Distribution of building types in Unit UB 153
Figure 102: Plan of Unit UC 153
Figure 103: Distribution of building types of Unit UC 154
Figure 104: Plan of Unit UD 155
Figure 105: Distribution of building types in Unit UD 155
Figure 106: Different periods of construction of al-Karkh 157
Figure 107: Units in Area F 158
Figure 108: Plan of Unit FA 159
Figure 109: Distribution of building types in Unit FA 159
Figure 110: Plan of Unit FB 160
Figure 111: Distribution of building types in Unit FB 160
Figure 112: Plan of Unit XA. 163
Figure 113: Distribution of building types in Unit XA 163
Figure 114: Plan of Unit XB 164

Figure 115: Distribution of building types in Unit XB 164
Figure 116: Two units of Area G.....166
Figure 117: Plan of Unit GA 167
Figure 118: Distribution of building types in Unit GA 168
Figure 119: Plan of Unit GB 168
Figure 120: Distribution of building types in Unit GB 169
Figure 121: Time periods in Area H.....170
Figure 122: Units of Area H 171
Figure 123: Unit HA 172
Figure 124: Distribution of building types in Unit HA 173
Figure 125: Plan of Unit HB 179
Figure 126: Distribution of building types in Unit HB 179
Figure 127: Plan of Unit HC 175
Figure 128: Distribution of building types in Unit HC 175
Figure 129: Plan of Unit HD 176
Figure 130: Building type distribution in Unit HD 177
Figure 131: Different periods of construction in Area J 179
Figure 132: Units in Area J 180
Figure 133: Plan of Unit JA.....181
Figure 134: Distribution of building types in Unit JA.....182
Figure 135: Plan of Unit JBA 183
Figure 136: Building type distribution in Unit JBA 183
Figure 137: Plan of Unit JBB 184
Figure 138: Building type distribution in Unit JBB 184
Figure 139: Plan of Unit JCA 185
Figure 140: Building type distribution in Unit JCA 185
Figure 141: Plan of Unit JCB 186
Figure 142: Building type distribution in Unit JCB 186
Figure 143: Plan of Unit JDA 187
Figure 144: Building type distribution of Unit JDA 188
Figure 145: Plan od Unit JDB 188
Figure 146: Building type distribution of unit JDB 189
Figure 147: Plan of Unit JDC 189
Figure 148: Building type distribution of unit JDC 190
Figure 149: Plan of Unit JDD 190
Figure 150: Building type distribution of unit JDD 191
Figure 151: Plan of Unit JDE 191
Figure 152: Building type distribution of unit JDE 192
Figure 153: Plan of Unit JDF 192
Figure 154: Building type distribution of unit JDF.....193
Figure 155: Plan of Unit JDG 193
Figure 156: Building type distribution of unit JDG 194
Figure 157: Plan of Unit JE 194
Figure 158: Building type distribution of unit JE 195
Figure 159: Plan of Unit JF 195
Figure 160: Building type distribution of unit JF 196
Figure 161: Plan of unit JG.....196
Figure 162: Building type distribution of unit JG 198

Figure 163: Plan of Unit JH 199
Figure 164: Building Type of Unit JH 199
Figure 165: Different periods of construction in Area K 203
Figure 166: Units in Area K 203
Figure 167: Plan of Unit KA 204
Figure 168: Building type distribution in Unit KA 205
Figure 169: Plan of Unit KB 206
Figure 170: Building type distribution in Unit KB 206
Figure 171: Plan of Unit KC 207
Figure 172: Building type distribution in Unit KC 207
Figure 173: Units in Area R. 209
Figure 174: Plan of Unit RA 210
Figure 175: Building distribution in Unit RA 210
Figure 176: Unit RB 211
Figure 177: Building distribution of Unit RB 211
Figure 178: Unit RC 212
Figure 179: Distribution of buildings in Unit RC 212
Figure 180: Plan of al-Istablat 214
Figure 181: Building distribution of al-Istablat 215
Figure 182: Unit size across time periods 217
Figure 183: Each Service Infrastructure category per period 220
Figure 184: Unit size variability per area 221
Figure 185: Average unit size per area. 221
Figure 186: Service Infrastructure in the Areas 223

Table 1: Elite buildings in Area H. 23
Table 2: Cantonments of Samarra with size, date and commander. 26
Table 3: Minor Projects built by al-Mutawakkil and their cost in dirhams (Data from Northedge, 2008, pp. 207 & 208) 34
Table 4: Sources used to identify features, and coded in the database. Northedge & Kennet (2015), pp. 10-11 41
Table 5: Types of buildings identified in Northedge & Kennet 2015. 42
Table 6: Time periods as established by Northedge (2008) and Northedge & Kennet (2015). 43
Table 7: Types of Mansions and their definition according to Northedge & Kennet 2015. 47
Table 8: Areas of Samarra and average size of mansions 69
Table 9: Size and relevant statistical tests in the different areas of Samarra 93
Table 10: Average size in square meters per time period. 95
Table 11: Mean number of spaces per time period. 96
Table 12_ Average number of spaces per area. 97
Table 13: Distribution of 4 different orientations and their percentages in various time periods. 98
Table 14: Orientation types per area. 100

Table 15: Shape types per time period. 100
Table 16: Shape types per Area. 101
Table 17: Average number of entrances per date. 102
Table 18: Average number of entrances per area. 102
Table 19: Houses separated by presence of basins or cisterns across time periods. 103
Table 20: Houses with and without basins divided by areas. 103
Table 21: Gini values for all buildings (residences) per area. 109
Table 22: Gini values across time periods. 110
Table 23: Gini coefficient for blocks in each of the areas. 112
Table 24: Gini coefficients for Mansions across different areas. 113
Table 25: Gini coefficients for mansions across time periods. 114
Table 26: Different variables and structures presented for Mutawakkiliyya. 145
Table 27: Distance (m) to service infrastructure not present in the units. 146
Table 28: Relationship between residences and service infrastructure in units of Area T. 147
Table 29: Relationship between units (with and without water systems) and service infrastructure. 149
Table 30: Units in area U with each presented variable. 156
Table 31: Distance from each unit to service infrastructure 156
Table 32: Units in Area F and discussed variables. 161
Table 33: Units and their distance to external service infrastructure (in case of absence). 162
Table 34: Architectural information of Area X 165
Table 35: Distances to service infrastracture from units in Area X 165
Table 36. Architectural information of units in Area G 169
Table 37: Architectural information of untis in Area H 177
Table 38: Distance to service infrastracture from different units in Area 178
Table 39: Structures not identified mentioned by Ya'qubi 197
Table 40: Structures identified mentioned by Ya'qubi 197
Table 41: Architectural information of units in Area J (Part 1) 200
Table 42: Architectural information of units in Area J (Part 2) 201
Table 43: Distance to service infrastracture outside of the untis in Area J 202
Table 44: Architectural information of the units in Area K 208
Table 45: K Units and distance to service infrastructure 209
Table 46: Distance and presence of service infrastructure 213
Table 47: Distance to services infrastracture 214
Table 48: Average Unit size 217
Table 49: Number of service infrastructure built during the different periods of Samarra 218
Table 50: Distance to service infrastructure across time periods 218
Table 51: Water systems across time periods 219
Table 52: service infrastructure across time periods 219
Table 53: Distribution of service inftrastracture across areas. 222

CHAPTER 1: INTRODUCTION

In 836 AD, the Abbasid Caliph al-Mu'tasim built in the location of an old Christian monastery (Ya'qubi, *Kitab al Buldan,* ET, p. 91) the city of Surra Man Ra'ā, what later would be known as Samarra. This initial settlement, seemingly dedicated to the Caliph and his new army, would soon become an architectural wonder, hosting over six thousand buildings and one of the main points for commerce, crafts and scholarly work in the Islamic world.

This dissertation was born from a first (and arguably premature) attempt to create a catalogue of the urban elite palaces in Samarra and what we can learn about Samarran society from them. The conclusion was that a variable palatial architectural style was used with a consecution of courtyards in the N-S axis and lateral rooms as the most common layout model. The connection of this model with the biggest palaces, avenues and even Caliphal palaces illustrated a possible link between a specific group and the ruling class. Other models, including those with a main courtyard instead of a consecution and irregular plans, were also present in the urban elite. This was more common among the smaller examples of urban palaces

Outside of the avenues, normally in clusters, regular or irregular, of the city. While the results looked promising, the need for a reconsideration of the used terminology, as well as the inclusion of smaller buildings, led to this thesis.

A new strand of archaeology has started using building sizes to assess inequality. Kohler et al. (2017) presented a new methodology on the distribution of wealth among households, tracing the connection between the domestication of plants and animals and inequality. They used Gini coefficients computed with the distribution of house sizes. Further studies in Southwest Asia, such as Basri & Lawrence (2020) or Squitieri & Altaweel (2022), have proven to be successful. The nature of Samarra and the quality of its data, as explained later in the dissertation, permits the examination of inequality in the Abbasid period through a very similar methodology. Moreover, the scale of the data allows for the study of within-site dynamics, such as across different areas and neighbourhoods. The resultant inequality presents in both the architectural and urban aspects, a product of this and other variables and explained in detail later, remain a crucial and yet-to-be-explored topic in Samarra and is, therefore, one of the keystones of this dissertation.

Therefore, the goals of this work are:

- Develop a further understanding of the Abbasid dwelling and urban palace, with the intention of delving into the nature of Abbasid social hierarchy.
- Develop a further understanding of Early Islamic urbanism, focusing on how social dynamics can be shown in the city.
- Assess inequality during the Abbasid period.

To achieve these goals, I have the following objectives:

- Observe architectural differences in different classifications of dwellings like layout, size, orientation, etc.
- Identify and classify the available urban water systems, service infrastructure and network in Samarra.
- Using different parameters such as Euclidian distance, Gini coefficients, heat maps or pertinent ratios to quantify inequality and social differences across Samarra.

It is my hope that this dissertation, with its multiple chapters, can offer new perspectives in the study of Samarra and the field of Early Islamic Archaeology.

Chapters 1 and 2 provide a brief but compelling historical and archaeological introduction to the Abbasid period and the site of Samarra. This is followed by Chapter 3, which focuses on the presentation of the data and the pertinent methodology. Chapter 4 delves into the Abbasid residence, referring to both the palaces and dwellings. The intention of this chapter is to contextualise evidence presented in later parts of the thesis as well as discuss and review present and past theories regarding the origins of these structures. Chapter 5 continues with architectural features but is centred on the study of patterns in the Samarran dwelling, something of original nature. The following two chapters, 6 and 7, address the inequality both at an area level and a site level. Maps, statistical methods and other calculations were employed to describe existing social differences in Samarra. The last chapter, discussion and conclusion, marks the end of the thesis, including the major arguments and a response to the research questions.

CHAPTER 2: HISTORICAL CONTEXT

The history of the Early Islamic period is highly complex. This chapter was conceived with the main purpose of facilitating the understanding of why Samarra was built, which groups held power (and which did not) and how the people lived during this period. It was not my intention to create an impeccable summary of the Abbasid Caliphate but rather a logical selection of episodes that help understand life in the city of Samarra and the people and events that led to its construction, framed in a way which provides useful context for the purposes of this thesis.

This chapter can be divided into three parts; the first is a chronological narration of the events in Samarra since its foundation (836 AD) until its abandonment by the court (892 AD), describing meaningful occurrences, key characters, relations and descriptions of the city and some of its structures. For the second part I provided a description of the different parts of Samarra, focusing on those that contain residential structures built between 836 and 892 AD. The third and last part isa comparably smaller segment on the daily life of the people in different parts of the Abbasid period, including their clothing, food, houses and social life. This last segment has been included with the intention of providing information regarding social inequality and class distribution in the Abbasid Caliphate, and how this was presented in the society.

These segments aim to offer an image of an unequal society, with substantial hierarchical distinctions, which also experienced substantial social changes in short periods of time. The city of Samarra was a massive project, both in terms of resource extraction, mobilization and ideological importance. The site is therefore one with significant potential for antagonism and conflict.

The Abbasid Caliphate prior to 836 AD: a very brief summary

The Abbasid Caliphate (750 – 1258 AD / 132 – 656 AH) sustained extensive military campaigns (Jamsari et al, 2013; Kennedy, 2013, Chapter 5), effective and totalitarian administration, and a cultural fluorescence unmatched in the history of the Islamic World. Departing from the tribal confederacy's Arab-centric identity, the Abbasids shifted power dynamics, favouring new converts to Islam and fostering inclusivity (Sirry, 2011; Riyadi & Putra, 2022). Unlike the decentralized Umayyad rule (Hitti, 1970; Nuhair, 2017; Meirison & Saharuddin, 2021; Saeed, 2023), the Abbasids established a centralized government (Kennedy, 1981; Marin-Guzman, 1994), asserting control over both internal and external affairs. Recognizing the societal tensions provoked by past discriminatory policies, they strategically integrated previously marginalized groups into governance (Garosi, 2022). The reign of al-Mansur (754-775 AD) was instrumental in shaping the Abbasid identity, epitomized by his dedication to administrative consolidation and the construction of Baghdad (Micheau, 2015). Under al-Mansur's successors, like al-Rashid, the Barmakids, an important aristocratic family, rose to prominence, overseeing the bureaucratic apparatus (Bosworth, 1994). The Caliphate achieved its "Golden Age" during Rashid's reign, becoming the world's cultural epicentre (Rusydi & Saepudin, 2023). However, tensions arose between this group and the military elite (the *abna*), leading to conflicts and the decline of Barmakid influence (Kennedy, 2016). The subsequent Great Civil War, between al-Mahdi and Al-Ma'mun, marked the end of the Abbasid Golden Age (El-Hibri, 2021, pp. 104-110), culminating in al-Mutasim's rise to power and signalling a shift in the Caliphate's trajectory and the birth of a new capital: Samarra.

Samarra, a new capital

The change in the ruling class, the new military, and the extreme centralisation of the state all happened within the context of a new city, Samarra (El-Hibri, 2021, pp. 131-132). Al-Mu'tasim built this new location to house his elite and distance itself from the old intra-elite conflicts in Baghdad. Samarra, a name from the original Arabic phrase Surra Man Ra'ā (سر من رأى), is, before all else, an elite city dominated by palaces of diverse sizes, and military encampments. The biggest and most important palatial structure was *Dar al-Khilafa* (caliph's residence), built by al-Mu'tasim around 839 AD. Each Caliph that would reign from Samarra would compete with previous rulers in constructing elaborate palatial complexes.

The new government was almost entirely based on the "slave" army. Although known as the Turks, this term included soldiers from multiple corners of the empire, including Armenians, Turks and Berbers (Ismail, 2007, pp. 261-275). For later periods, it is crucial to understand that this army was composed of foreigners unfamiliar with Iraq in terms of culture, agriculture, and commerce (El Hibri, 2021, p. 132). The military change brought a political shift, especially considering warfare's increased relevance. The Arabs in Egypt lost their right to the *aı ̄a* (salary), and they were kicked out of government (*diwan)* (Kennedy, 2015, p. 138)*;* only the Turks in Samarra had the right to receive it. By carrying out these and other policies, al-Mu'tasim achieved total economic and political centralisation, becoming the first Abbasid Caliph to do so (the efforts by the Umayyad Abd al-Malik to unify the Islamic world could be considered as an effective centralisation).

There was a synergy between the military and political class. Influential Turkish military leaders like Ashinas or Itakh became important provincial governors (Kennedy, 2015, p. 137) and were also given land in Samarra to build their palaces (Al-Ya'qubi, *Kitab al-Buldan*, ET p. 93). The provinces depended on Samarra, and their rulers remained in the Abbasid capital. Some old families, nevertheless, conserved their past influence and, to a certain extent, their political control. The Tahirids were kept as governors of Greater Khurasan and were still a powerful family in Baghdad (Kennedy, 2015, p. 134). The whole bureaucratic network induced by the Barmakids was still alive.

Regarding the military's new role in the Abbasid Caliphate, al-Mu'tasim gave the Turks a privileged place within the urban plan: the cantonments. The evidence for cantonments is found north of the caliphal palace and includes walled spaces, palaces, large rectangular enclosures and large houses (Northedge, 2008, pp. 144-145). Most cantonments had an avenue within their area, while others, like Area X, were organised based on two streets, N-S (Northedge, 2008, p. 144). Kennet argued that the cantonments housed around 138,640 troops in Samarra (Kennet, 2001, p. 176). Other residences were outside the main urban plan, close to hunting grounds/reserves (*al-Hayr*) or the Tigris river, possibly as summer/recreational residences. The city was built, in its majority, in fired mudbrick, although there is evidence of materials like stucco, wooden beams for the ceilings, and even marble in royal palaces (Sabba, 2022, pp. 28-29). Similarly to earlier sites in southern Iraq (Hritz, 2010; van Ess, 2017; Egberts et al, 2023), Samarra's location was highly dependent of an extensive canal network (Adamo & Al-Ansari, 2020; Brown, 2024). Nevertheless, the land was free from the influence and control of landlords, merchants and powerful families from Baghdad, allowing the Caliph to build with total liberty and creating a massive speculative movement (Kennedy, 2015, p. 142). The land was unoccupied and Mu'tasim used this fact to grant plots to his most trusted elite and obtain massive revenue from land sales. Moreover, the creation of a new commercial centre under the control of the government was very attractive for the Caliphate. The Turks saw themselves as dependent on the Caliph's favour but also part of the ruling class of Samarra (Gordon, 2000).

The changes in Islam and its impact in society were not restricted to the acceptance of early converts, but also, the base of Islam, the Qur'an, was being reconsidered. Mu'tazilism is a theological position which considers that the Qu'ran was created (by humans) and does not share the exact nature of God (Campanini, 2012). Consequently, the Imam, a position the Caliph now assumed, could interpret and even expand some

aspects of it, always to a limited extent. While this has been present in the Islamic world since before the Samarran Caliphs, it was with al-Ma'mun that it became politically pertinent (Kennedy, 2015, p. 141; Schwarb, 2011). The Samarran elite was deeply linked with this theological movement and any attack to either was an attack to the other. All the levels of the political and bureaucratic body followed this religious shift. Nyberg, in his famous *Encyclopaedia of Islam* (1938) attributes Mu'tazilism to the ongoing authoritative politics of the Abbasids. Ma'mum saw this religious movement as an opportunity to sediment his power in both a political and religious context (Campanini, 2012, p. 45). The figure of the Abbasid caliph bordered on divinity, sustained by a strong administrative system that they themselves created (Gilani & Tahir, p. 566). Even there has been a comparison traced between the Persian Kings and these monarchs due to their "monastic dignity" and "great pomp" (Hassan, 1947).

Through a policy based on protecting the Caliphate's frontier rather than expanding it (Kennedy, 2015, p. 143), Samarra would see a period of peace between its foundation and the death of al-Mutawakkil. Nevertheless, the secure situation of Samarra and the reduced external campaigns should not be misinterpreted as an eventless period. There were parts of the Caliphate where the Caliphs did not have much control. Eager to keep his troops active, al-Mu'tasim marched against northwestern Iran and the Caspian, where he would end victorious (El-Hibri, 2011). He would also have to face some opposition to his rule, mainly by Al-Abbas, Al-Ma'mun's son, who felt he was wrongfully removed from the heir line (See Appendix 3).

After eight successful years of reign, al-Mu'tasim died in 842 AD. His son al-Wathiq (842-847 AD) assumed the throne and reigned over the Abbasid Caliphate for five years until his death. Unfortunately, we do not possess very much information about the life or actions of this Caliph, only that no significant changes were implemented and that he left no appointed successors. Given the situation, the Samarran elite held a *shura* to choose the next Caliph (Al-Tabari, *Tarikh*, Vol. XXXIV, ET pp. 61-65). The son of al-Whatiq was still only a child, so they decided to appoint his brother, al-Ja'far. His reign was one of instability with multiple assassinations. Important leaders such as Ibn al-Zayyat and Itakh were killed between 847 and 849 AD (Al-Tabari, *Tarikh,* Vol. XXXIV, ET pp. 65-77 & 83-107); El-Hibri, 2021, p. 143). After the death by natural causes of Ashinas, the Turks lost their two most influential leaders, although there was no direct action. Mutawakkil also dismissed the second most powerful man in Samarra and the adviser who put him in charge, Ibn Abi Du'ad (Al-Tabari, *Tarikh,* Vol. XXIV, ET p. 117).

The absolutism seen in the political aspect was moved to the religious matter, and he passed a law limiting the rights of Jews and Christians (Afdillah, 2022). Eliminating two of three legs that supported Samarra, he also went against the military. He tried to move to a new city and abandon the demanding army. He tried Damascus, but the plague and revolts spear-headed by the Turks, who saw their livelihood in danger, prevented him from doing so (Al-Tabari, *Tarikh*, Vol. XXXIV, ET pp. 149-150). Instead, they built the city of al-Mutawakiliyya, located north of Samarra. In a moment of maximum political centralization, instability and discomfort between the Caliph and the inhabitants of his capital could destabilize the Caliphate. Samarra and the monumentality of its buildings was the embodiment of Abbasid power and Mutawakkil's caprice to achieve power through new constructions could alter the status quo present in the original city of Samarra.

Al-Mutawakkil managed his succession by appointing his three sons, who would reign in order, but in the meantime would oversee the provinces. However, this all was affected by the Turks discontent. Due to all these changes, they saw their style of life, commodities and spaces in danger and decided to murder al-Mutawakkil. His death would start the downfall of Samarra, and the start of nine years (861-870 AD) denominated The Anarchy at Samarra.

The Anarchy at Samarra

This period was characterised by a rapid turnover of Caliphs, with three cases out of four assassinated. The Turks were a privileged non-Muslim group in the capital of the Caliphate that depended on the favour of caliphs to maintain their livelihood. Therefore, they were forced to back the candidates that supported them, like al-Muntasir. This tension led to a civil war among the Turkish army. The Caliphs, with the help of the *Kuttab* and other military rival groups like the *Shakiriyya* from Baghdad (Al-Tabari, *Tarikh,* Vol. XXXV, ET pp. 10-12), strived to recover a real power and constantly tried to restrict the importance of the military but failed to do so. The first caliph after al-Mutawakkil was al-Muntasir (861-962 AD), who decided to give the Turks more importance in the political aspect of the government, as well as favouring the Alid family (Kennedy, 2015, p. 148). He died of natural causes in just six months.

The second caliph would be al-Musta'in, grandson of the founder of Samarra and chosen by the Turks. In an unexpected move, he decided to ally with the Baghdadi forces and rival factions within the Turks led by Wasif and Bugha and charge against the Turks, who would choose another ruler, al-Mu'tazz, as their Caliph (Al-Tabari, *Tarikh,* Vol XXXV, pp. 34-75). Samarra won the war, and al-Musta'in had to leave Iraq and find refuge in the Hijaz, while al-Mu'tazz assumed total power in 866 (Al-Tabari, *Tarikh*, Vol. XXXV, pp. 120-131). In 869 AD, the Turks decided that the Caliph was a restrictive figure for them and started taking control of different provinces, always controlled by Samarra. This year, the revolt of the Zanja, explained by Al-Tabari in his 36th volume, would plunge the Caliphate into deeper chaos. Al-Mu'tazz could not control his troops, as he mainly did not have the money for it; he would be deposed in 870 AD and al-Muhtadi (869-870 AD), son of al-Wathiq, would become Caliph. In a probable effort to prevent being killed, al-Muhtadi focused on gaining the love and respect of the ordinary people in Samarra (Kennedy, 2015, p. 150), something completely new in this city. The friction with his immediate court, especially regarding the economic issues, translated into further friction with the military, who saw their importance reduced. In 870, and after an armed conflict where al-Muhtadi fought bravely (Al-Tabari, *Tarikh*, Vol. XXXVI, pp. 91-95), the Turks would assassinate a Caliph for the last time.

The Last Days of Samarra

The Anarchy at Samarra finished with the death of al-Muhtadi. Numerous reasons made this possible, but rivalries and internal fights among the Turkish army could be considered the principal. Musa b. Bugha established himself as the absolute leader of the military and thus secured a place for himself and his followers in the new regime. Al-Mu'tamid would become the new caliph, always with the presence of his brother Abu Ahmad al-Muwaffaq, who would manipulate the caliph and have good relations with the military (Kennedy, 2015, p. 14). He faced a desperate situation, and the effective control of the Caliphate was significantly reduced. Provinces like Egypt and Syria were now in the hands of the Turkish Army, Khurasan was in the hands of the Saffarids (Hillenbrand, 1997), and the tribes in the Hijaz retook controlled fragments of the area. Al-Muwaffaq was given control of the remaining provinces and launched a series of military expeditions to recover them. The caliph divided the controlled land in two and gave the western half to his son, Ja'far, and the east provinces to al-Muwaffaq, who, in reality, would control everything. Al-Muwaffaq, who was stationed in Iraq, decided to imprison his son, Abu'l Abbas, who also played an essential role in the control and recovery of territory. Once he came back, his father was on the verge of death, and he assumed the name of al-Mu'tadid, and with the support of the military, he became the next caliph. As Baghdad was his base of operations, he abandoned Samarra, ending the occupation of the city after just 56 years of activity.

The primary sources used here, while they are the only ones available except from a few *qasidas,* could be considered product of Abbasid propaganda, meant to elevate the opinion and legacy of his contemporary rulers. The next sections, which focused on the urban plan, is also product of one author, Ya'qubi, whose observations could be considered limited or flawed (especially as he only saw one period of the city).

The Samarran Urban plan: General aspects

During its relatively brief existence of 56 years, this new capital managed to become one of the largest cities in the caliphate. It even rivalled Baghdad in terms of size and influence, housing a peak population of approximately 204868 people (Northedge, 2022, p. 231). The city of Samarra can be divided into 26 different areas.

Early Abbasid archaeological evidence (prior to the main urban phase at Samarra), coupled with canal systems dating back to Sasanian and Umayyad times, has been uncovered in the area (Northedge, 2008, pp. 49-80). Notably, the octagonal city of Al-Qadisiyya (discussed in Northedge, 2008, pp. 81-90) was constructed by the Abbasid caliph Harun al-Rashid to the south of the eventual city's location. This archaeological record is further enriched by textual sources. The octagonal enclosure is discussed in Yaqut's Mu'jam al-Buldan, al-Ya'qubi´s Kitab al-Buldan (pp. 256-257) and mentioned in Tabari III, pp. 1180 & 1184. These texts not only describe the site but also provide insights into the palatial life within it and the possible motivations behind its construction.

The original city of Samarra (Surra Man Ra'ā) forms the core of what we now recognize as Abbasid Samarra. The archaeological record primarily reflects the state of Samarra at the end of the 9th century, around the time it was abandoned by the court. Consequently, much of our knowledge relies on textual sources, notably al-Ya'qubi's *Kitab al-Buldan*, as well as brief descriptions or references in Yaqut's Mu'jam *al-Buldan* (under "Samarra"), Al-Ya'qubi II (pp. 472-4), and al-Mas'udi's Muruk VII (pp. 121-2).

Samarra, originally situated within former hunting grounds and on the site of a Christian monastery (Ya'qubi, *Kitab al-Buldan*, ET, p. 91), featured the primary palace, Dar al-Khilafa, to the north, linked to the Friday Mosque positioned in the town's centre to the south by a 7 km-long main avenue. Subsequent periods saw the construction of additional avenues, with *Shari' al-A'azam* emerging as the city's main thoroughfare. Military cantonments flanked the avenue to the east and west, while high-ranking officials resided outside the primary urban layout in their own palaces and complexes. This city layout bears similarities to Baghdad, specifically the rabad of al-Harbiyya, as noted by Northedge (2022, p. 215). Ya'qubi (p. 263) illustrates the expansion of construction by the common people, reminiscent of Baghdad, where "the people spread out and built broad residences." The layout of Samarra during this period can be understood as a result of both the Caliph's planning and preferences (Northedge, 2008, p. 97-100), as well as unregulated growth fuelled by building projects that motivated this city's development (Kennedy, 2015, p. 142).

The expansion led by al-Mutawakkil (847-861 AD) and the construction of Madinat al-Mutakiliyya north of Samarra (859 AD), also known as the city of Mutawakkil, had a profound impact on Samarra. It doubled the city's size and the number of structures within it. Initially, al-Mutawakkil attempted to relocate the capital to Damascus, but he encountered fierce opposition from the Turks. As a result, he made the decision to establish a new city to the north of Samarra. According to the accounts of the historian and geographer al-Ya'qubi, Mutawakiliyya closely resembled the original Samarra in its layout and design. A prominent feature of Mutawakiliyya was its grand avenue, stretching over 7.1 kilometers and adorned with 20 grand mansions. This avenue connected the al-Karkh avenue to the al-Ja'fari complex. On the western side of this avenue, al-Mutawakkil erected a new congregational mosque named Abu Dulaf, which was accompanied by an adjacent market. Notably, the dominant architectural feature in this city was the cantonments, serving as evidence of a militarized settlement. Apart from the Abu Dulaf Mosque, the mansions, and two *musallas*, there were few structures of other types, reinforcing the notion of a military presence.

A comprehensive analysis of the general plan of Samarra has already been made (Northedge, 2008), and therefore there is no need to go into extensive detail, but I believe the reader might benefit from context and certain basic information regarding the urban layout and elements of the city of Samarra. Different time periods are explained in the following paragraphs, which include urban expansions of the city. However, it is important to mention the continuous occupation of the whole city, rather than a movement of people to the newly built areas. Ya'qubi, in *Kitab al-Buldan* (ET, pp. 87-95), explains the process of transformation from temporal settlement to permanent, as well as the constant influx of population. There is no uncovered evidence so far that might suggest otherwise.

The original city of Samarra: Surra Man Ra'ā

The foundation of Samarra has been documented by Al'Yaqubi (*Kitab al-Buldan,* ET, pp. 87-102). With a few paragraphs, he acknowledges the relevance of the Caliph on the initial distribution of land, "He assigned to each one of his companions the construction of a palace" and "Then he marked out the allotments for the general, the secretaries, and the people, and set out the congregational mosque" (Northedge, 2008, p. 98). These lines suggest an involvement of Mu'tasim on the original planning of Samarra, supplying land to different groups based on ethnicity and craft. Ya'qubi, nevertheless, does not mention any specific architectural requirements Mu'tasim imposed but rather seems that people had a certain degree of freedom to do what they wanted. Other sources, like the poet al-Isfahani in his book *Aghani*, describe how Mu'tasim just gave him the money (1000 dinars) to build his house (VI, p. 204) (Northedge, 2008, p. 98), but does not mention any architectural requirements linked with this loan.

The process of land distribution was not random. Probably with the intention of safeguarding peace in his new city, he separated his new army, the Turks, from the Arab population (Al'Yaqubi, *Kitab al-Buldan,* ET, pp. 92-93). Some of the cantonments were separated from the civilian population, while others were not (Fig. 1). The relation that these last military groups, like the *Faraghina*, might have had with the populations is currently unknown, and it is therefore not clear whether this shared space was provoked by the nature of the planning process or if these military groups provided support for the *shurta* (police).

The original city is defined by a series of parallel avenues, seven in total, described by Al-Tabari (*Tarikh*, III, p. 1503) and drawn originally by Herzfeld (Fig. 1). These elements acted as divisionary lines, combined with a horizontal division marked by a wadi (*Wadi Uvragun b. Riyah*), and now the modern city (Northedge, 2008, p. 100 & al-Ya'qubi, *Kitab al Buldan*, ET p. 262). Each of the avenues has a certain width and length, connecting different element of the cities with a varied importance. Some of them, like *Shari' al-Khalij* or *Shari' al-Hayr al-Jadid,* connect the cantonments, others, like *Shari' al-Khalij,* connect the cantonments with *suqs* and merchant quarters, and others, like *Shari' al-A'zam* acted as the main arteries of the city, connecting all type of enclosures.

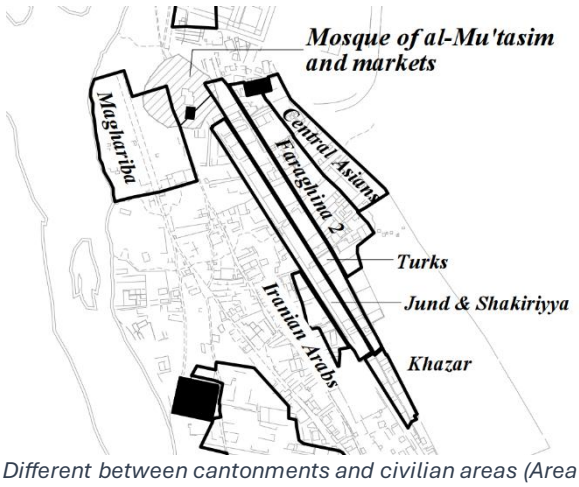


Figure1: Different between cantonments and civilian areas (Area J). Northedge 2008, Fig. 75.

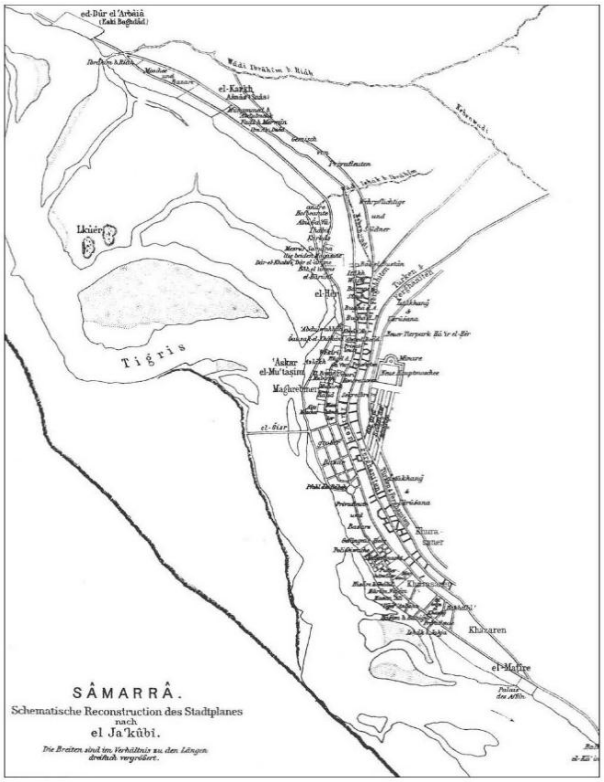


Figure 2: Map of Samarra drawn by Herzfeld. Northedge 2008, Fig. 43.

Ya'qubi describes the city through the avenues, identifying them as dividing lines. This description seems more of an enumeration of places, houses and neighbourhoods, rather than an accurate map. Northedge, on the other hand, divides the original city in reference to the *Wadi Uvragun b. Riyah* and establishes two areas: Area H (North) and Area J (South). There is some textual evidence that suggests a substantial control over the building of Samarra, few passages by Ya'qubi (*Kitab al Buldan*) explain some of rules the Caliph imposed on his city, most of them regarding separation between groups: "Then he drew the boundaries for the land-grants for the military officers, the bureaucrats, and the populace" (ET, p. 92); "Al-Mu'tasim kept the land-grants for the Turks separate from those of all other people" (ET, p. 93); "The land-grants for all the Turks and the non-Arabs from Farghana were kept far from the markets and the crowds of the wide avenues and long lanes. There was not a single merchant or other ordinary person interspersed among them in their estates and lanes" (ET, p. 93). Ya'qubi also mentions the importance that commerce and craft production spaces had in the planning, always looking back to Baghdad: "The boundaries of the markets were spacious; each type of trade was set up in a separate area, and each group of tradesmen was confined to that area, as the markets in Baghdad had been planned" (ET, p. 92); "From every country al-Mu'tasim summoned workers and craftsmen who were skilled at construction, farming, […]. He (Mu'tasim) settled them with their families in these places, and they received land-grants there. He set up markets there for those who practiced their professions in the city." (ET, p. 98).

Apart from the land distribution, Ya'qubi mentions that Mu'tasim built palaces in the cultivated areas (ET, p. 98). It is however unclear if he is talking about the Caliphal Palaces or other structures. Another very relevant feature of Samarra present both in the

textual and archaeological sources is the water system. Northedge (2008) identified a series of qanats and canals placed across the whole site. Some of them are prior to Samarra while others are contemporaneous to the Abbasid city. Ya'qubi, nevertheless, mentions that "wells had to be very deep, and were salty, unpatable" (ET, p. 97) and explains that "everyone's drinking water came from the Tigris and was carried in bags on mules and camels. (ET, p. 97). The question is whether these wells were the qanats, and if Ya'qubi was telling the truth, why were they built.

The north part (Area H – Fig. 2) includes a series of palaces of prominent characters (Table 1) connected through streets and avenues. It is possible that the abundance of this type of building reflects the residential nature of this part of the city.



Figure 3: Map of Area H (original city north).

Building / owner	Type of Building
Najah b. Salama	Mansion (4)
Abu al-Wazir	Mansion (2)
al-Burj	Palace
al-Badi	Palace
al-Ahmadi	Palace
al-Gharib	Palace
Ahmad b. Isra'il	House
Old Palace of Wasif	Palace
Sima Dimashqi	Mansion (2)
Barmash	Mansion (2)
Itakh	Mansion (1)
al-'Abbas b. 'Ali b. al-Mahdi	Mansion (2)
Bugha al-Saghir	Mansion (1)
Bugha al-Kabir	Mansion (2)
Abd al-Wahhab b. 'Ali b. al-Mahdi	Mansion (1)
Al-'Umari	Palace
Darb al-Wathiq	Mansion (2)
Dar al-Khilafa	Caliphal Palace

Table 1: Elite buildings in Area H.

Each of these structures was built through a process of land distribution according to the idea the Caliph had of his city. Other buildings not shown in this list include "Mansions" of different size, residential blocks ("blocks"), *maydans*, a couple workshops and the ambiguous "building" and "enclosure". While Northedge does not specify anything regarding neighbourhoods, it seems that this area was a rich residential neighbourhood, hosting different prominent members of the elite with their own congregational mosque. The only exception to is the group of regular blocks on the northeast segment, which the different in size and unusual organization. Moreover, these are of mansions and palaces are placed next to the Caliphal palace, Dar al-Khilafa, with a possible connection with the Caliph. The internal divisions within this area, discussed elsewhere in this dissertation, might be carried out through streets and avenues, acting these as dividing elements.

The south part (Area J – Fig. 4) contains the Diwan al-Kharaj (registry / administrative centre), the prison, the *Majlis al-Shurat* (the police), the Great Market, vegetable markets (*mawadi' al-rattabin*), small markets (suwayqa), slave markets and smaller mosques. Residential areas for sellers and crafters were located around the great market. These were all placed along the avenues on the west side. On the east side, far from the Tigris, lived part of the *Faraghina, Turks, Shakiriyya* and *Jund.* To the south there were some residential spaces for the Khurasanis, the Arabs, and the people of Qumm and Isfahan, and some other elite houses, similar to those in Area H. Some examples are *Ishaq b. Yahya b. Mu'adh, Hashim b. Banijur, 'Ujayf b. 'Anbasa,* or *Dar Bukhtishu*. These elite residences were also in other parts of the south city, such as *Dar Afshin, Al-Hasan b. Sahl*

or Jabal J'afar al-Khayyat. Generally, the civilian housing was placed, at least during the first period, near the markets and congregational mosque (Northedge, 2008, p. 128). These spaces included, as mentioned by Yaqubi (*Kitab al-Buldan,* ET, p. 96), include "military officers, bureucrats, notables, and ordinary people". Nevertheless, there is some evidence of civilian population living in the outskirts of the city (Northedge, 2008, p. 130).

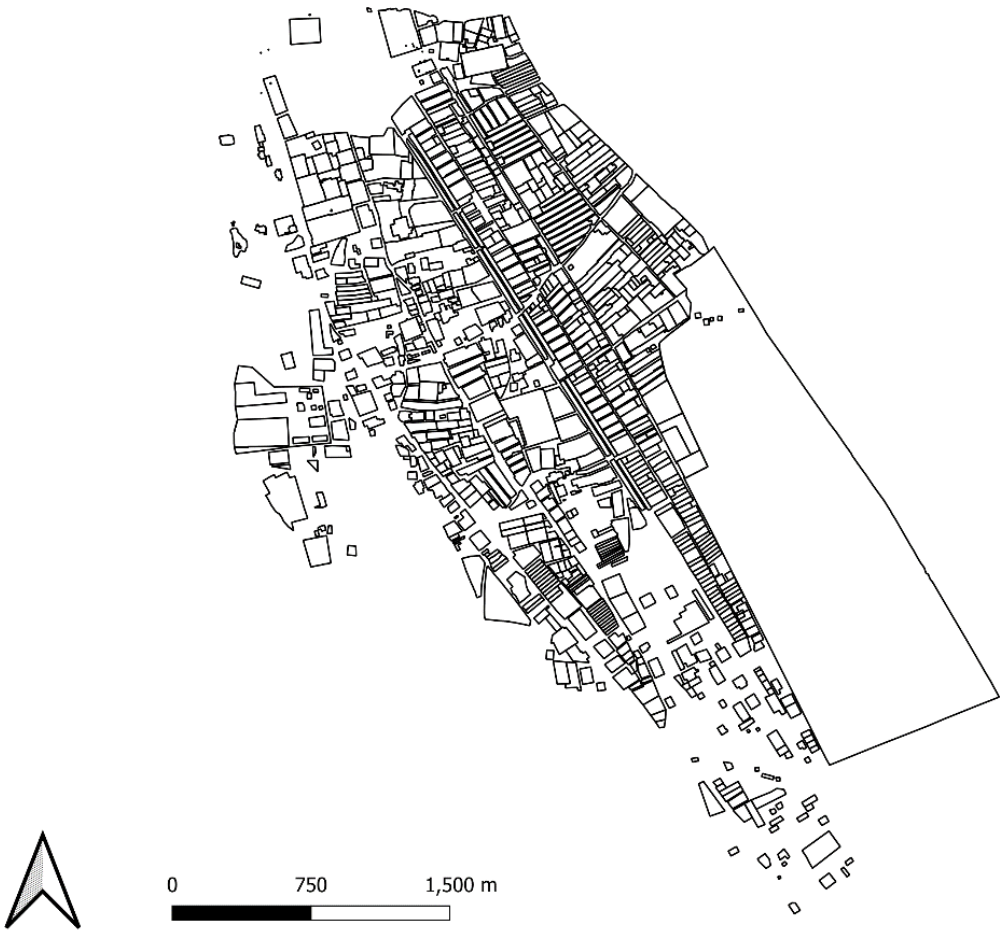


Figure 4: Map of Area J (City Central South).

Cantonments

As Kennet (2001, p. 157) and Northedge (2008, p. 173) point out, the creation of military allotments (*qati'a*) took place through the concession of land to important members of the Turks and other military group leaders. A total of eleven cantonments have been documented, surveyed and studied (Fig. 5 & Table 2).

The identification of a cantonment is reliant on the textual sources. A thorough discussion on the ownership and the process of determining whether this is a cantonment or not can be found in Kennet (2001) and Northedge (2008, pp. 173-191). The material remains of these locations have mainly been used to examine the structure and extent of the Abbasid army and the numerous groups within it, such as the Turks, *al-Ushrusaniyya*, *al-Faraghina*, *al-Jund*, *al-Maghariba*, *al-Shakiriyya*, and the *Sa'alik*. Taking into consideration the organization of the blocks (referring to the barracks) and the palaces of the officials, these authors have quantified the population in these areas.

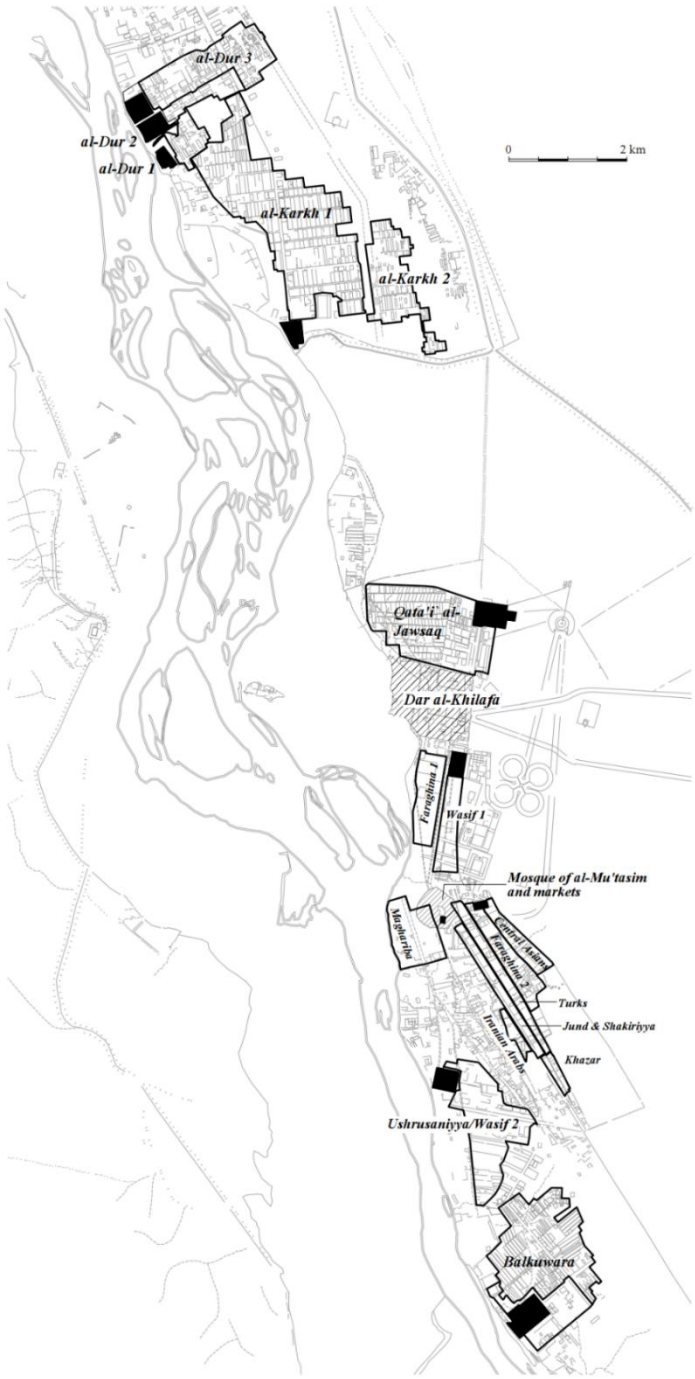


Figure 5: Cantonments of Samarra. (Northedge, 2008).

Cantonment Name	Size	Period of Construction	Commander / owner
al-Karkh (AREA F)	500 ha of built structures	Samarra 1	Sur Ashnas
al-Dur (AREA U)	264 ha	Samarra 4	Unknown
al-Jawsaq (AREA X)	270 ha	Samarra 1	Khaqan 'Urtuj
Cantonment of Wasif (AREA H)	61.8 ha	Samarra 1	al-Wasif
Cantonment of Maghariba (AREA J)	83.1 ha	Samarra 1	Maghariba (military group)
Cantonment of Jund and Shakiriyya (AREA J)	88.6 ha	Samarra 1-2	al-Muntarad?
al-Waziriyya (AREA G)	101.05 ha	Samarra 1	Abu al-Wazir
Cantonments on the East Side	96.7 ha	Samarra 1	Unknown
Cantonment of the Khazar	12.8 ha	Samarra 1	Unknown
Cantonment of al-Afshin (AREA K)	317.39 ha	Samarra 1	al-Ashfin
Balkuwara (AREA R)	265 ha	Samarra 2	al-Mutawakkil / al-Mu'tazz

Table 2: Cantonments of Samarra with size, date and commander.

While there are significant similarities, each cantonment follows a singular layout. The location within the city and the presence of avenues and palaces are changing variables in each example. Cases like *al-Karkh* (Fig. 6) are organised by a series of vertical and horizontal avenues, creating a grid-like layout. Others like *al-Jawsaq* (Fig. 7) are organised in tight horizontal rows on the west side, while the east follows a vertical axis with north-east orientation. In the case of *Ushrusaniyya,* the elongated barracks have a W-E orientation and placed next to a vertical but no horizontal avenue. This model is quite extended across Samarra: *Maghariba, East Side* and *Afshin* all follow a similar layout. The structuring of the cantonments is also dependant on the presence of palaces and their influence. *Al-Dur* is the clearest example, together with *al-Karkh* and *Balkuwara*, of the "avenue palace model", a major street that in this case, connects the main cantonment building with the main city avenue. As happened in civilian areas, the avenue is flanked by "Mansions". Nevertheless, it should not be assumed that this is a constant in cantonment building, as most locations have their palaces in different zones of the area.



Figure 6: Cantonment of al-Karkh. Northedge, 2008, Fig. 76.

The most important element of these areas are the blocks or barracks, interpreted as spaces for the soldiers and their families. Kennet (2001, p. 160) divides this group of buildings into cantonment-block and cantonment-house types (Fig. 7), based on size and layout. The first type are rectangular buildings divided by an internal N-S wall, with a series of rooms in each side, while the second is a square structure with a main courtyard. The size of this spaces varies depending on the cantonment and the area within the cantonment. This contrast has been used to theorise on the size of the army, although a bigger space does not directly correlate to more soldiers, as they could have brought their family with them or any other reason. Even in some cases like al-Karkh, it is possible to divide the cantonment through the size of the cantonment blocks (676 – 1296 m^2 in al-Karkh 1 vs 95 – 227 m^2 in al-Karkh 2), identified as the "basic unit of construction" (Kennet, 2001, p. 163). Variations in the sizes is also used to compare the multiple cantonments.

The lack of excavations, limits set by the textual sources, and destruction of the archaeological record prevent a more solid interpretation and theory regarding both the structure of the army and the role the military played in Samarra and its urban plan. However, assuming that the size and volume of constructions are a sign of power, it is

possible to determine which groups or commanders held more influence within the city's dynamics.

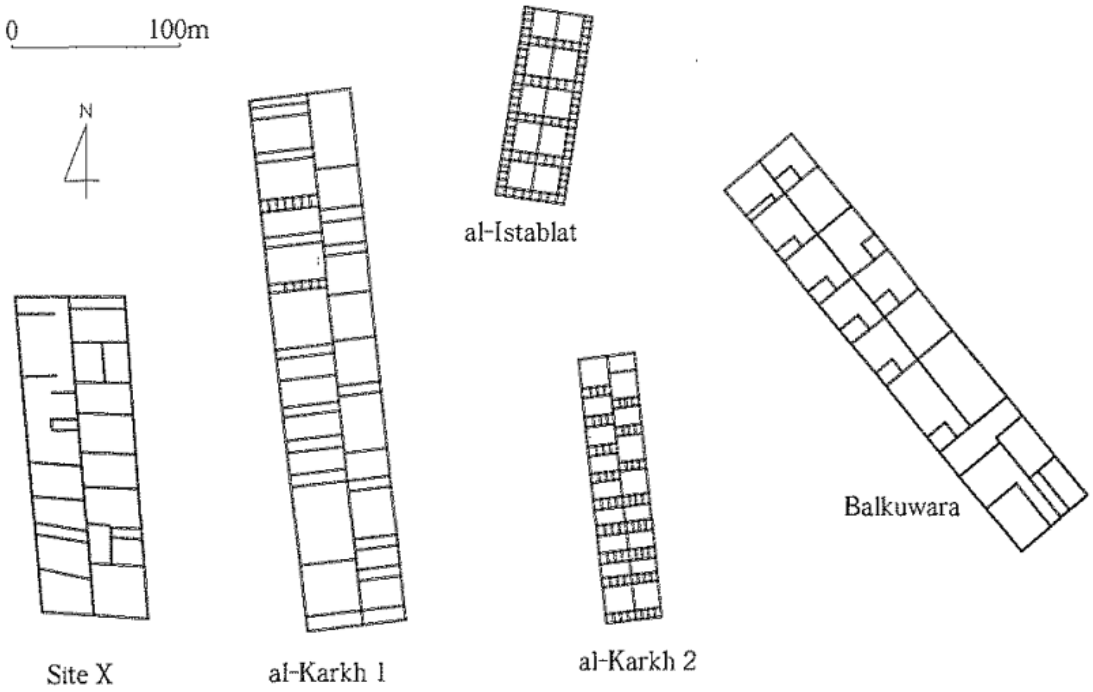


Figure 7: Cantonment-blocks from various locations. Kennet, 2001, Fig. 3.

Madinat al-Mutawakkiliyya

The city built by al-Mutawakkil (Fig. 8) corresponds to the third period of construction (Samarra 3) and is based on a central avenue that connects the original city with the Caliphal palace of al-Ja'fari. As with the rest of the settlement, Mutawakkiliyya is described by Ya'qubi. The most prominent building is the caliphal palace of al-Ja'fari, situated north of the city and south of a canal (*Al-Nahr al-Ja'fari*). This building, described more extensively elsewhere in this dissertation, is one of the biggest structures of the whole of Samarra, covering an area of 211 hectares.



Figure 8: Map of Medinat al-Mutawakkiliyya.

As an embodiment of religious power, Mutawakkil built the *Abu Dulaf* Mosque. Its measures are of 214 x 135m with its characteristic 34 metres high spiral minaret (Fig. 9). Apart from some plaster in one of the piers, there are no traceable repairs or later additions to the structure. There are ten smaller mosques disseminated across the city and within the palace of al-Ja'fari. Two rectangular *musallas* (spaced outside of mosques used for prayer) were located east of the city. In the North-East segment there is a cantonment near the al-Rasasi river. This military encampment has its own dividing avenue, with bigger structures on the southeast corner, small dwellings in the north east and middle sized cantonments. This model is seen in some of the other cantonments in Mutawakkiliyya, like that south of al-Mahuza (Unit TC), while there are cases with cantonments with a horizontal dividing avenues (Unit TD) (Fig. 10). The main avenue, *al-Shari' al-A'zam,* has twenty mansions to its sides. Behind these structures there are a series of smaller residential houses in a grid or row layout. These sections are called Units by Northedge (2008, p 220). The layout of these smaller houses and mansions varies depending on their location and size.



Figure 9: Minaret of the Abu Dulaf mosque. UNESCO World Heritage Centre.

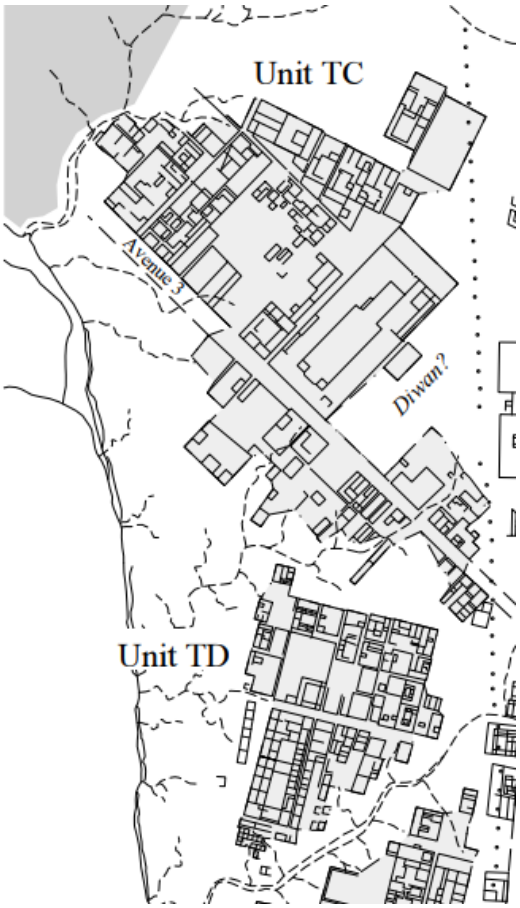


Figure 10: North-West Madinat al-Mutawakkiliyya. (Northedge, 2008).

Some authors, for example Ibn Seraption, al-Ya'qubi and al-Tabari, describe some elements of the urban layout, including some buildings that never got built, such as the central markets (Northedge, 2008, p. 220). However, what the sources tell us clearly is that there was a migration, driven by Mutawakkil (Al-Ya'qubi, *Kitab al Buldan*, ET, p. 100), from the original city to Mutawakkiliya. The reasons behind this was to reassure his power and influence: "Now I know that I am a king, for I have built myself a city in which I have taken up residence" (Al-Ya'qubi, *Kitab al Buldan,* ET, p. 100). The ministries were also moved, including the army, land tax, finances and country estates. Northedge (2008, p. 218) suggests these were located in the cantonment south of the *Abu Dulaf* Mosque

Evidence for social inequality and class in Abbasid society

The identity and life of the people during the Abbasid Caliphate, including what they ate, how they dressed, their houses and how their society was organised has been documented through different contemporary sources and authors such as al-Jahiz (*Kitab al-Bukhala', Kitab al-Bayan wa'l-Tabyin, Kitab al-Hayawan*), Ibn Qutayba (*Kitab 'Uyun al-Akhbar, Kitab al-Ashriba, Kitab al-Maysir wa'l-Qidah*), Al-Ya'qubi (*Kitab al-Buldan*), Abu-Hayyan at-Tawhidi (*Al-Imtāʿ wa al-Mu'ānasa,, Mathalib al-Wazirain*), and many others which will be cited in their corresponding section. A clear inequality and social organization within this society is manifested through different foods, garments, housing, access to services (for example latrines) and leisure activities (for example hunting and festivities). In this section the primary sources are predominantly taken from Ahsan (1973), whose thorough analysis of social life under the Abbasids provides a "catalogue" of the primary sources and their content. Nevertheless, each primary work cited here has been checked in order to maintain rigour.

In the next chapters, I will delve into the relations between architecture, urbanism and inequality, and so, as a justification for this endeavour, I decided to describe how inequality is present in other aspects of the Abbasid daily life and what the primary sources tell us about it. Housing and Neighbourhood are especially relevant, but all the other parameters are connected to social differences in the Abbasid society.

Moreover, if we understand the Abbasid city as divided by ethnicities, craft or religion, each of these groups ate a specific type of food, which I consider a reflection of inequality and relevant to this dissertation. Some aspects of the entertainment, like polo or horseracing, influence the urban plan and have a direct relation with caliphal power. Other aspects, like clothing or indoor games, while they do not have an implication in the urban plan and its possible inequality, reflect how social hierarchy was very much present in every aspect of society and act as a justification for the study of inequality in the Abbasid context. All the included elements have a direct correlation with the goals of this study and set an appropriate historical framework to understand the evidence and discussion presented in later chapters.

Food and Markets

The works of Abu Muhammad al-Muzaffar b. Nasr b. Sayyar al-Warraq (*Kitab al-Tabikh wa Islah al-aghdiyat al-ma'kulat*), Sabi (*Kitab al* Wuzara') and the manuscripts attributed to Kamal al-Din b. al-'Aldim and Muhammad b. al-Hasan b. Muhammad b. 'Abd al-Karim al-Katib al-Baghdadi include a thorough description of the cooking and table customs in the Abbasid period in Iraq and other locations of the Caliphate. Meat, such as chicken, was popular among the elite, and was consumed in dishes like *mutajjan, maqlu, jamida* or *halawiyya* in important events (anecdote of Caliph Mu'tadid and his famous banquets: Sabi, *Wuzara*, p. 20). In the case of fish, the ones coming from the Tigris were considered better than those from the Mediterranean and thus they were more expensive (Warraq, *Kitab al-Tabikh wa Islah al-ghdiyat al-ma'kulat,* fol. 21a). The most popular, such as the *shabbut*, the *shaluk*, *ushbur* and the *barastuj*, and their provenience were all mention as a distinction for class in the sources (Jahiz, *Hayawan,* III, pp. 107, 149-151 & 259-260; Khawarizmi, *Mafatih al-'Ulum,* p. 101). The smaller fish and dishes prepared with them were reserved for the lower class (Khawarizmi, *Mafatih al-'Ulum,* pp. 62-64). Dessert was also an indicator of social class; sweets such as Zalabiya, Khabis or Faludhaj were common among the elite while the poor only ate dates and fruits. Sweeteners like sugar or honey were, however, common among the general population (Jahiz, *Kitab al-Bukhala,* pp. 26, 110, 272). These authors also mention what type of foods the lower class ate. Bread, pickles, small fish, locusts, dates, oil cakes and *sawiq* were the most common. The rich, on the other hand, ate more complex meals like *Harisa*, *Kebab*, animal heads and *Judhab* (Ahsan, 1973, pp. 156-159), normally cooked with expensive flavouring like *murri* and *azfar al-tib* (Tabikh, pp. 12-13).

Despite the fact that many ingredients and dishes were used by specific segments of the population, there were others that could be seen in most tables of Iraq. Bread, usually made of rice flour, vegetables (Raghbib, *Muhadarat,* II, p. 612), certain spices (Tabikh, p. 9ff), milk, and oil were used and consumed by the Caliph and the homeless. The prices of groceries varied depending on the region, level of production and political situation. It was common for prices to raise in areas with military conflict, as the recollection and transport were more dangerous. Specific foods were also considered a symbol of identity. Christians living in Abbasid territory consumed mainly fish, which lead to a certain control of the markets and the fishing industry on certain days of the week (Jahiz, *Hayawan*, IV, p. 43ff) resulting in price rises on those days (Ahsan, 1973). This tells us that there was no separation in the markets and probably other common spaces for Muslims and Christians and that the last group had the ability of influencing the economy of a city.

Suqs, or markets, are described extensively by Ya'qubi in *Kitab al Buldan* as key elements of the urban plan and the life of the people. Normally, each specific activity had a space within the market (darb) and included objects and crafts from Spain to China (Al-Ya'qubi, *Kitab al-Buldan*, p. 253). In the countryside or smaller towns, it was common for mobile or temporary markets to sell the local produce or popular crafts (Ahsan, 1973, p. 200).

Clothing

As happened with food, clothes were a distinctive feature that indicated social class. A series of pieces of clothing would be worn by everybody, for example turbants (‘*imama*), clothes worn next to the body (*shi’ar*) and those “external” are the *dithar*. Within the last category, general clothing would include a mantle (rida’), a long garment (*jubba*), a waist coat (*sudra*), a robe (*taylasan*) and many others (Ahsan, 1973, pp. 60-61). Nevertheless, the variation on the material and decoration is what contributed to the use of clothing as a separation of class (Ibn al-Jawzi, *Ziraf*, pp. 85-86; Jahiz, *Kitab al-Bayan,* III, pp. 114-115)

Clothing also served to identify multiple groups within Abbasid society. The *Sufids* tended to wear woollen clothes and various clothes like the *taylasan* or the *qamis* with patches (Maqqari, *Nafkh al-Tib*, III, p. 128; Ibn al-Jawzi, *Talbis,* pp. 216-219). The soldiers, divided by their ethnicity, also had differences in their clothes. In the case of Mu’tasim’s Turks army, these soldiers wore “magnificent” clothes as a symbol of superiority respect the rest of the army (Mas’udi, *Muruj,* VII, p. 361) (Ahsan, 1973). Normally soldiers would wear turbans and coats (Jahiz, *Rasa’il*, I, p. 19) and other military groups like the Khourasani would wear a distinctive piece of clothing named bazbakand (Jahiz, *Rasa’il*, I, p. 19). The *Dhimmis* (Christians and Jews) were forced to wear a specific set of clothes that differenced them from the rest of the people. A cap, a *zunnar* or a *khatam* were normal attires while they were not allowed to wear a turban (Ahsan, 1973, p. 94).

Garments were also used to show where someone was from and were described by geographers and writers like Maqsidi or Ibn Hawqal. They varied depending on the country or region; for example, in what is now the modern Saudi Arabi people tended to not use the *qamis* (Muqassasi, *Ahsan al-Taqasim*, p. 174) while in Iraq people combined this piece of clothing with *taylasan* and long turbans (Ibn Hawqal, *Kital Surat al-ard*, p. 232). Syrians, for example, considered the rida’ as a central element of their clothing (Muqassasi, *Ahsan al-Taqasim*, p. 183).

Houses and Neighbourhoods

The house, including its attributes, and its location reflected the position of the household within society. We know, thanks to the geographical work of Al-Ya’qubi (*Kitab al-Buldan*) and the literary work of Azid (*Hikayat Abi al-Qasim*), that some neighbourhoods in Baghdad were occupied primarily by members of the elite such Ma’muniya, Zahir of Dar ‘Awn, while other neighbourhoods like Nahr al-Dajaj or some parts of Harbiyah were inhabited by the poorer population. Moreover, each segment of the city had a similar group living within it (Ibn Qutayba, *‘Uyun al-Akhbar*, s.v. Baghdad), forming quarters based on shared ethnicity or craft. The importance of neighbourhoods for the people is accentuated by the contemporary authors (Jahiz, *Kitab al-Bukhala*, p. 75 & Bayhaqi, *Mahasin*, p. 225) and with the following saying: فالجار هو الأول والبيت هو التالي / the neighbour comes first and then the house (expansion in standard Arabic done by me of the original

segment from Tha'alibi, *al-Tamthil wa'l-Muhadara,* p. 297: الجار ثم الدار ; Ahsan, 1993, p. 364: "the consideration of the neighbour is the first and the house is the next").

This phenomenon is of great interest for this dissertation as, based on this historical setting, we can expect a more similar and homogenous layout within urban quarters than in the whole city of Samarra. It is also expected that each neighbourhood has a series of facilities that correspond to the ethnicity or craft of the residents. The quarter of Dâr al-Rûm, where the Christians of Baghdad lived (Micheau, 2015, p. 411), was probably planned and had different facilities to al-Karkh, where the great market occupied a great part of the neighbourhood (Al Ya'qubi, *Kitab al Buldan*, ET p. 79) and two canals, Saraˆt and Nahr 'Iˆsaˆ, divided its territory. Therefore, an aspect to examine is whether there are notable architectural differences, apart from size, in the different neighbourhoods. The complete destruction of Abbasid archaeology in Baghdad and the lack of small residence evidence in Rāfiqa (only palaces complex and an industrial and commercial zone have been excavated so far (Siegel, 2017; Heidemann, 2006)) limits a proper comparison. The sources (Al-Ya'qubi, *Kitab al Buldan*, pp. 255-268; Ali b. al-Jahm & Walid b. 'Ubayd al-Buhturi Qasidas; Al-Tabari, Vol. 33-36; Ibn al-Faqih al-Hamadhani Kitab al Buldan Fol. 90 & 143-151) do not give concise explanation of architectural differences in the different wards. Because of this, the architectural remains of Samarra present themselves as a promising case study for the elaboration of a Abbasid dwelling typology and a revision of the dynamics attributed to an Islamic city (see Chapter 3 for further discussion).

We also have evidence for the price of individual residences from textual sources. These varied based on the location, size, and material of construction. The price of some minor palaces (elite residences) built by al-Mutawakkil in Samarra range between 50,000 to 10 million *dirhams* (Table 4).

Name of Palace	**Cost (*dirhams*)**
Al-Badi'	10,000,000
Al-Ghard	1,000,000
Al-Ja'fari al-Muhdath	10,000,000
Al-Jawsaq al-Ibrahimi	2,000,000
Maydan al-Sahn	500,000
Al-Mukhtar	5,000,000
Al-Qalaya	50,000
Al-Tall	5,000,000
Al-Wahid	2,000,000
Bustan al-Itakhiyya	10,000,000
Al-Birka	2,000,000

Table 3: Minor Projects built by al-Mutawakkil and their cost in dirhams (Data from Northedge, 2008, pp. 207 & 208).

For smaller houses, prices could be 400 or 500 *dirhams* (Tanukhi, *Nishwar,* I, p. 39), considered the acceptable or even minimum amount that a normal house could cost (Ahsan, 1973, p. 365). The poorer people lived in buildings called *kukh* (huts) which were normally made of mud and thus prone to collapse and abandonment (Al-Tabari, *Tarikh*, III, p. 530; Beg, 1972, p. 142). In the case of Samarra, no current works have identified any buildings as *kukh*. This is likely due to the remote sensing approach and lack of

excavations, although there is evidence of different materials (mudbrick and fired brick) being used in buildings of different size. Due to its rapid and extensive construction I anticipate that, in many cases, the materials used were based on what was available at the moment in a deserted area. Northedge (2008, p. 259) explains that the cost of using unfired materials was not elevated and accommodates the purpose of building a gigantic city in a very short amount of time. Siegel (2017, p. 72) follows a similar line of thought proposing that, in the case of Abbasid Raqqa, "fired bricks had been used only in building elements when greater static stability was necessary" and traces a connection between this practice and local tradition (Miglus & Strommengerm p. 5-6; Kalla, 1999, pp. 133-134). In the context of this dissertation, data regarding the material used is not available for each building, and so it will only be analysed in the examples where it is specified in Northedge's data (2008 & 2015).

Renting out of property also took place at Samarra, although contrary to today's standard, this was not the "affordable" option. Taliqani, in his book *Amthal al-Baghdadiya* (77, p. 7) mentions the expression أثقل من إيجار المنزل / heavier than the rent of the house (Ashlan, 1973, p. 366), which might suggest that this was meant for people of an upper class that possibly did not want to commit to a certain place.

Some houses included beautiful gardens (when space permitted it), latrines or two stories, while others, normally those of the poor, had none or very few amenities. I will discuss in more detail the structure, material, and elements of the Abbasid dwelling in the following chapter.

Social life

The form of social life during the Abbasid Caliphate was again highly dependent on the social position. The elite and the Caliph enjoyed hunting, polo (*la'b bi-sawlajan*), *tabtab* (part of the *Furusiyya* games (Jahiz, *Rasa'il,* II, p. 376)) , and horse racing as their two main amusements, and so they built reserves (*al-Hayr*), and racecourses (*al-haba*) with view mounds (tells) to watch the games in cities like Samarra (Northedge, 2008, pp. 151-152; Al-Tabari, III, p. 1824). They also organised racing events that attracted people from all over the Caliphate (*falamma kana yawm al-halba:* Al Tabari, III, p. 1372). Horse racing has been popular in the Islamic World since the time of the Prophet Muhammad and was used as part of military training (Jashirayi, *Wuzara'*, p. 207). Other more accessible and popular activities were pigeon-flying (Jahiz, *Hayawan*, II, pp. 256-257), wrestling, running, swimming, weightlifting (Ibn al-Jawzi, *Al-Muntazam*, VI, p. 341), and animal fighting (which was enjoyed by every social class) (Ahsan, 1973, pp. 290-312).

Indoor games were also popular. Chess, backgammon or *shadghulli* were played by many people within Abbasid society and their best players were considered celebrities (Mahfuz, *Shatranj*, pp. 7-8). There were also specific games for women (Ahsan, 1973, pp. 327-328).

Despite a troubled history, with assassinations and fights for power, Samarra became the capital of the Caliphate and the world for fifty-six years. The intricate interplay of the multiple spaces and buildings that define Samarra projects an image of monumentality and complex urbanism. As occurred with Baghdad, Samarra and its relevance is profoundly linked with their builders, the Caliphs. They were the maximum figure of authority, enjoyed the biggest palaces and the most luxurious commodities; but they also embodied the centralization of the Abbasid state and expressed their power through construction and urban growth. The Abbasid capital became a hub for intellectual, political and religious activities that witnessed the birth of scholars and poets, while conserved it very distinct military nature. The Turks and other military groups, inherently connected to Samarra, occupied key areas of the city connected with the main palaces via kilometric avenues. This diversity and consequent hierarchy of the city reflects this period's society that, as demonstrated, was dominated by inequality and social differences in access to resources and relevant locations, residences, types of food and leisure activities.

Conclusion

This chapter has examined the historical events and contexts that led to the construction of Samarra and the broader inequality in the Abbasid period. The establishment of Samarra as the political and administrative centre marked an important shift within the government and the ruling class. The new capital embodied the complex interplay of ethnic and class differences that was present across multiple elements of the Abbasid society. Architecturally speaking, Samarra was a showcase for both the absolutism and isolation of the caliphs, who sedimented their power through inaccessible monumental constructions. The factionalism within the military, the corruption and internal fights in the government and the reliance on *ghilman* resulted in a convoluted fifty-six years that defined the fate of Samarra.

The history of Samarra reflects trends of wealth disparity and social stratification common in the Abbasid period. While this city is evidence of the architectural and cultural knowledge of the Abbasids, this achievement is overshadowed by internal conflict. Recognising this duality is crucial to comprehend the relevance and true nature of Samarra.

The next chapter will delve into the different type of buildings first introduced here, how they were classified and what methodology I will follow to assess their organization and interaction with the rest of the urban plan.

CHAPTER 3: DATA AND METHODOLOGY

Inequality in archaeology

Inequality, as a social phenomenon and a theoretical concept, is perceptible in industrial, pre-industrial and ancient contexts in various ways. In recent years, economists (Bowles, 2012; Stiglitz, 2016), politicians (Lopez & Dubrow, 2020; Brady et al, 2016), philosophers (Sunajko, 2016; Coleman, 1974), and urban planners (Zhou & Shi, 2022; Heinrich & Million, 2021; Tsoulouvis, 1996) have delved into the nature of inequality and how it can be measured. Access to resources (Van Tubergen & Volker, 2015), individual and collective freedom of choice (Dougherty, 2018), house size (Smith et al, 2014), accumulation of wealth (Lam et al, 2020) or a combination (Kaas et al, 2019) are some of the parameters that these disciplines have considered. Some values are dependent on the physical organization of a territory and, to a certain extent, a qualitative analysis of what constitutes an appropriate place for living and what not. Dennehy et al (2016) identify urban services and classify them into groups:

- Infrastructure: Transportation, Water disposal, electricity, transportation, telephone, mobile data […]
- Administration: Security, economic regulation, information provision
- Recreation: Parks, malls, stadiums, convention centres, museums, public and private events
- Health: Medical care, education, poor relief, social services
- Religious: churches, temples, shrines, mosques
- Commercial: shops and markets.

It is assumed that combining all these services with a high degree of accessibility guarantees a more just and equal society. However, as seen in the archaeological record, the reality is more complex.

Mulder et al (2009) and Bowles et al (2010) defines three categories of wealth: material, embodied and relational. Material is defined physical assets that concede a certain degree of wealth, such as land, food, luxurious or prestigious goods and possessions. Embodied encompasses intangible concepts like health, skills, knowledge that can differentiate a person. And the last is relational, which is inherently based on the cultural context of the civilization as it the person's position within a society. The sociopolitical dynamics within a group of people and their relation with the space conditions greatly the way a person is positioned. Each of these three concepts compenetrate each other and help discuss the global inequality seen nowadays in the archaeological context.

Whether this inequality is born from a "natural" greedy characteristic of the human species (Grof, 1996) or product of institutionalised societies based in urban control (Childe, 1950), archaeology has the ability to quantify and assess the extent of these claims (Beck & Quinn, 2022, p. 573). Beck and Quinn (2022) help building this bridge from the theoretical framework of inequality into the material realm of archaeology. These authors improve this transition by acknowledging that inequality is the final product of the fluctuation of accumulation, access and action of past societies. These three categories could be considered an expansion of Bowles' classification, permitting the collaboration of diverse archaeological subdisciplines such as architectural archaeology, bioarchaeology, network analysis or palaeobotany, among others. The variety of evidence and methodology employed in these disciplines allows, to an extent, for a more accurate description of social hierarchy. For example, in the recent special issue of World Archaeology published in 2023 (Issue 4: Archaeology of Inequality), various authors use different proxies such as house size, historiographical evidence, monumental architecture, or settlement patterns (among others). All these results into the collaboration of not only many archaeological subdisciplines but of the conjunction of theory and practice. It must be noted, that these categories have, or must have, a degree of flexibility. Monumental architecture can be present in many different ways, or even not be present, in societies which share a very similar degree of inequality. Another relevant aspect of these groups is in what waythey can represent inequality. More accumulation does not have to be directly proportional to either equality or inequality, but a direct consequence on the type of landscape the people live in, the process of food distribution and the available resources. A civilization with more accumulated goods than another does not have to mean it is wealthier or more equal, but they have more access to goods due to trade or fertile land. Other features of Beck's and Quinn's system seem more direct, like resource procurement, which theoretically is a clear symbol of wealth. Nevertheless, what we might catalogue of efficient is again highly dependent on the landscape and can pose a challenge when trying to obtain a quantitative measurement. However, this model encapsulates previous discussions and arguments like Bowles (2010), Smith (2018), Wengrow & Graeber (2015), Kay et al (2022), Squitieri & Altaweel (2022), Fochesato et al (2019), Drennan et al (2010) and Lobo et al (2020).

I believe that these three terms lead to the concept of quality of life (QOL). This was first introduced by Phillips (2006) and Nussbaum & Sen (1993) and later to archaeology by Munson & Scholnick (2022), who propose the evaluation of how well the needs of people living in ancient (and modern) societies are met. This model allows to first identify what services are of need in these societies and through archaeological evidence, with the consequent limitations, measure how accessible these are. This is complemented by the capabilities approach, introduced by Sen (1993) and discussed by Munson & Schlonick (2022). The model is based on "beings and doings", which revolves around accessibility. While Beck's and Quinn's proposition helps assess the general level of equality and inequality in a civilization, this quantifies their accessibility, which contributes to the analysis of inequality.

More specifically to this thesis, house size is one of the most relevant proxies. Selecting an appropriate proxy in the archaeological record is one of the main issues in the study of inequality. The use of house size as an indicator of wealth and social status is grounded in the premise that larger homes typically denote greater access to resources, higher social

standing, and the ability to afford more extensive construction and decoration. Conversely, smaller homes often indicate limited economic means and lower social status. However, while house size can be valuable in studying ancient civilisations, it has limitations and potential drawbacks. One significant limitation is the assumption that house size directly correlates with wealth and social status. Various factors, such as cultural norms, religious beliefs, family size, and communal living arrangements, can influence this relationship, which might not always align with economic status.

Additionally, the archaeological record can be incomplete or biased. Larger and more durable structures are more likely to survive and be excavated, while smaller, potentially poorer homes may have deteriorated or been overlooked. This can lead to an overrepresentation of wealthier households in the archaeological record, skewing our understanding of the true extent of social inequality. In the case of Samarra, the vast amount of recorded architectural evidence does offer a good window into different "styles of life" represented by houses of different sizes. Moreover, house size alone does not account for the quality of life or access to resources, as it is only one more variable. Similarly, smaller houses might have belonged to economically comfortable individuals who chose to live modestly for cultural or personal reasons.

Residences must not be considered as isolated structures, they are features of a complex urban plan. Archaeological work on defining ancient neighbourhoods has been carried out with a particular focus on Mesoamerica (Smith, 2010; Thompson et al, 2011; York et al, 2011; Storey et al, 2012; Gomez-Chavez, 2012; Smith et al, 2015; Chase, 2021; Thompson et al, 2021). The arguments of neighbourhood formation in these cities are not only based in the streets but also by social structures and cultural and economic ties between the inhabitant. He also highlights the importance of additional non-residential structures in neighbourhoods. Neighbourhoods are then a location within the urban landscape based on ethnicity and the economic production process of a city, where elements that allow for daily life to happen are present. This space can be divided by a street, a compound, political, natural (based on landscape), cultural or religious boundaries. People in these ancient cities, as in many modern ones, feel a certain connection with their neighbourhoods, bonds based on traditions or shared experiences that create a sentiment of belonging. Neighbourhoods are a materialization of a both tangible and intangible relation between the urban landscape and the people.

Nevertheless, there are certain complications with the use of urbanism and architectural layout as a way of defining a society. It is certainly easy, as explained beforehand, to fall into false and simplified dichotomies of elite vs non-elite based on an insufficient urban analysis. For example, just because part of a site is elevated in respect to the rest, it does not directly have to translate into a social hierarchy. Decisions regarding city placement or house building are in fact dependent on the topography, functionality, aesthetic (*venustas*), past influences and cultural elements that sometimes can translate into an apparent illogical decision. Path dependency, a concept found in spatial analysis (Martin, 2021; Moulaert & Mehmood, 2015), assesses the impact of past decisions that can affect the future construction of a city. Features like the initial location of the city, the division of the site (industrial areas, military cantonments, etc.), establishment of reference points (Roman forums, churches in Byzantine North Africa, etc.), and the pre-existence or construction of roads or transportation networks. In archaeology, this method has been

employed to define the classic maya city (Chase & Chase, 2014), discuss movement networks (Verhagen et al, 2019;) and included in the relation between complex systems, agent-based modelling and archaeology (Cegielski & Rogers, 2016; Schoon et al, 2011; Bentley & Maschner, 2003).

Ramzy (2015) very correctly considers the dichotomy of planned and unplanned and its origin in the geometry, size, accessibility and visibility, but with her three examples (Ur, Mohenjo Daro and Kahun) revealing examples, she also argues in favour of a localised idea of planning, depending on considerations inherent to the land and culture of the civilizations. This principle can be applied the other way around. Cities such as Harappa, Teotihuacan or Caral, are found to hold a certain degree of "egalitarianism", on many occasions due to their similar buildings and absence of palatial structures (Morton et al, 2012; Vidale, 2010; Miller, 1985; Akulov, 2018). However, social hierarchy is not always visible in urbanism, as for example homeless people did not have houses and therefore are not reflected on the plan. The previously described terms of community and its physical space, the neighbourhood, seem highly heterogenous and dependent on external and internal, past and present influence.

To date there has been no analysis of inequality at Samarra, and no formal quantitative spatial analysis at all. Past efforts like Northedge (2022) or Kennet (2001) have tried to calculate how many people lived in certain parts of the city by looking at specific buildings, and others like Saba (2022) have delve into the relation of the elite and the populace through various architectural features like decoration and spaces. Nevertheless, these are just small pieces of the monumental puzzle that is Samarra. The vast amount of evidence of all type of structures, residential and non-residential, are a window to life during the Abbasid period. While the extent site can be disconcerting, there are certain ways that can permit a methodological dissection of the social dynamics of the city.

Data

The data used for this dissertation is that collected by Alastair Northedge and Derek Kennet in the book "Archaeological Atlas of Samarra" (2015). This publication is divided into three volumes. The first is a catalogue of major structures, which includes brief descriptions, size, material (only in some cases), possible mentions of buildings in historical texts and, in very few cases, material assemblage. The second volume is a complete catalogue of the whole site. It provides an ID, a name (description of the site), a type (mansion, palace, qanat, etc.), sheet (where this building appears in Vol. 3), coordinates, area (in m^2), commentary, date, and present state. The third volume includes an annotated map which covers the whole site. This major survey was carried out in three different phases. The first was photogrammetric cartography from air photographs, which included the use of KLM coverage (1961) and CORONA Imagery, among others. Thirty-seven ground control points in the photographs were linked with the Iraq Universal Transverse Mercator grid (1979) and corrected on University College mainframe computer (Northedge & Kennet, 2015, p. 9). The second phase included the digitisation of the observable sites using AutoCAD. This was achieved in 1997 after some initial tests in 1989-91 and overcoming complications with raster images in 1995. Finally, the third step, still in progress, is the construction of a GIS.

Stereoscopic photogrammetric plotting from 1953 photography
Monocular photogrammetric plotting from 1928 photography
Stereoscopic photogrammetric plotting from 1924 photography of the modern city of Samarra
Department of Antiquities and Heritage 1:2000 plans
Mesopotamian Expeditionary Force 6" maps
Iraq 1:50,000 maps
Project's ground survey
Excavation and other archaeological plans
Trace from air photo mosaic
Trace from CORONA satellite imagery

Table 4: Sources used to identify features, and coded in the database. Northedge & Kennet (2015), pp. 10-11.

The spatial analyses explained thoroughly later in this chapter were done using a GIS map constructed by Dr William Deadman (based on the data from "Archaeological Atlas of

Samarra" and Prof. Macquire Gibson's work from 2005 to 2006) as part of the EAMENA project at Durham University. Some parts were incomplete (some buildings were missing or misclassified), and I have cleaned and improved the dataset using published sources. This required the identification of missing or wrongfully classified elements, making corrections to the original AutoCAD files, and drawing polygons in a GIS environment.

Samarra encapsulates many different buildings (Table 5) across different areas (Fig. 11) and time periods (Table 6). Not all of them are relevant to this dissertation, but I consider it important to at least mention the complexity of the Samarran urban plan. Regarding the residential structures, I use the following categories (from Northedge & Kennet, 2015) for my analysis: Block, Blocks, Mansion (1-5), House and Palace. Nevertheless, I decided to combine some of these categories to facilitate the analysis. Due to the overwhelming difference in examples and their similar layout, Block and Blocks have been combined. House stands between Block and Mansion, but I decided to combine it with Mansion, as I consider their similarity in layout and size to facilitate the presentation of results and discussion. The layout and architectural variation analysis will be carried out in Chapter 4.

BUILDING TYPE	DESCRIPTION
Block	Group of small Abbasid houses
Blocks	Space containing multiple "block"
Mansion 1-5	Large residential building
Palace	Monumental Abbasid building
Mosque	Archaeological Mosque
Storehouse	Building intended for storage
Bath (Hammam)	Heated bath
Market (Suq)	Linear Market structure
Maydan	Narrow rectangular wall space
Workshop	An identifiably non-residential building used for work purposes
Canal	Surface canal
Qanat (Kehriz)	Subterranean water channel

Table 5: Types of buildings identified in Northedge & Kennet 2015.

Time periods are certainly a complex issue with Samarra. The city was only the capital of the Caliphate for 56 years, with four periods of expansion. This is a key feature as the objective is to look at contemporaneous structures to assess inequality and layout. Settlements prior to the Mu'tasim city have been found, although I have chosen not to include them as they do not provide the right kind of data. Due to the complexity of the site and the methodology employed by Northedge, there are some buildings that have an ambiguous classification. For example, Samarra 1-2, Samarra 1? Or Samarra 2-4. In city-wide analyses, removing these might not affect grandly the analysis, but in more focalised ones its impact is important. Therefore, when necessary, various results will be presented, linking these structures with each of the possible time periods. I do not aim to change the

classification of these buildings, and therefore the discussion will consider both possibilities as equally plausible.

TIME PERIOD	DATES
Samarra 1	836-842 AD (Reign of Mu'tasim)
Samarra 2	847-859 AD (Early Reign of Mutawakkil)
Samarra 3	859-861 AD (al-Mutawakkiliyya)
Samarra 4	861-892 AD (Anarchy at Samarra)

Table 6: Time periods as established by Northedge (2008) and Northedge & Kennet (2015).

The areas of Samarra were delineated through a combination of the identification of urban features described by historians and geographers in the archaeological record, and an archaeological survey of the available remains (Northedge, 2008). Some of these areas have highlighted areas called "Units", often used by Northedge to refer to cantonment or group of building in larger areas. Kennet (2001) also divided some of the cantonments into different areas These could be considered as neighbourhoods but are not always present across the site, although they will be used in Chapter 4. Not all type of residents lived in every area of the Abbasid city, some of them were purely military cantonments (Areas F or X), other were Abbasid towns (Area E), and other were mixed areas where military and civilian residents lived (Area J and T. It is important to remember that some of these areas are a product of archaeological research and consequent classification and therefore it is not clear whether the inhabitants of Samarra conceived the organization of the city in this specific way. For example, Northedge divides the original city into two areas, H and J, using the wadi as the division line. While this facilitates the classification of buildings within Samarra, it does not necessarily correlate to the reality of how the city worked. This research aims to reconsider some of these divisions based on access to resources, including water systems (qanats and canals), mosques (congregational and smaller examples), markets, the topography of the natural landscape, and buildings with similar architectural features.

Area Letter	Area of the city
A	Al-Jaʿfari and its approaches
B	The unbuilt security zone between al-Jaʿfari and the town of al-Mutawakkiliyya
C	Al-Mahuza and the town west of the Abu Dulaf Mosque
D	Shaykh Wali (Karkh Fayruz)
E	The Abbasid township on the banks of the Nahr al-Rasasi
F	The cantonment of the Turks at al-Karkh, stretching north from Sur Ashnas
G	Cantonment at Hawi al-Busat
H	The northern half of the central city, located to the north of the modern city of Samarra, as far as the Caliphal palace
I	The area round the village of al-Huwaysh, on the west bank of the Tigris
J	The southern half of the central city, south of modern Samarra
K	The cantonment of al-Afshin at Matira, today known as Jubayriyya
L	The archaeological site of Matira, today known as Jubayriyya
M	Al-Istablat and the west bank of the Tigris south of al-Huwaysh
N	The Glassworks (site of al-Qadisiyya)
O	Area of the Octagon
P	The site of al-Muʿtasim's City on the Qatul, east of the Octagon
Q	Al-Musharrahat and surrounding elements
R	Balkuwara and its cantonment
S	Remains north of the Nahr al-Rasasi, including modern al-Dur
T	The city of al-Mutawakkiliyya
U	The cantonments of al-Dur (Dur al-Arabaya)
V	The west bank of the Tigris north of al-Huwaysh
W	The old city of Samarra within its walls
X	The cantonment north of the Caliphal Palace, attributed to Khaqan Urtuj
Y	The remains east of the central city, that is, the area of al-Hayr
Z	Features crossing multiple lettered areas, such as the major canals, and for features located entirely outside the survey area

Figure 11: Areas of Samarra as presented in Northedge 2008.

Block

The building type Block is defined by Northedge & Kennet (2015) as a "group of small Abbasid houses, commonly in a rectangular block". The number of people that might have lived within this space is yet to be properly assessed, as the use of space is not well defined. Some preliminary work has been conducted by Northedge (2022), who follows al-Ṣābiʾ's formula for calculation the average house population to argue that there were approximately eight people residing in each of the houses (pp. 226-227). This model has multiple flaws, as it assumes that all areas of Samarra had similar block houses, family size, access to resources, ownership of the house, use of space, personal preferences, professions, etc. Even if the blocks looked the same or had the same size, that is not reason enough to assume that the space was used in the same way. The block, both as a small community and as physical space is varied and subject to multiple variables including and not limited to availability of recourses and construction materials, type of landscape, cultural or personal preferences, distance to markets/mosques/storehouses/workshops, moment of construction and origin (religion and ethnicity) of the resident. It is also not sure that all the instances within the Block complex are residential, or whether the people or families that live there had a significant connection or where at least from the same social group. Another issue with the data is the possibility of a second storey.

A more extensive segment of the Abbasid house will be presented later, but it is important to explain how the available sources have conditioned the way I have organised and interpreted the data. Houses in Abbasid Baghdad are allegedly of two storeys, with people even spending their time on the roof during the summer months (Al-Khafaf, 1992, p. 30 & pp. 53-54). The measurement of size and calculation of population has been done according to the ground plan, what omits the possibility of more people, living in a building. With a second floor, the house as a proxy for social differences acquires a degree of complexity that is not reflected in the way the data is presented, as it is uncertain whether the second story would imitate the ground plan. Ahsan (1973, pp. 370-375) talks about how size and location directly influenced the layout of the dwellings, meaning the houses had a certain degree of flexibility and were subject to various parameters. Although not specific to the Abbasid period, Edwards (2006) and Petruccioli (2006) talk about the variability in two storey houses and how, while keeping the courtyard, can be very different (Fig. 12)

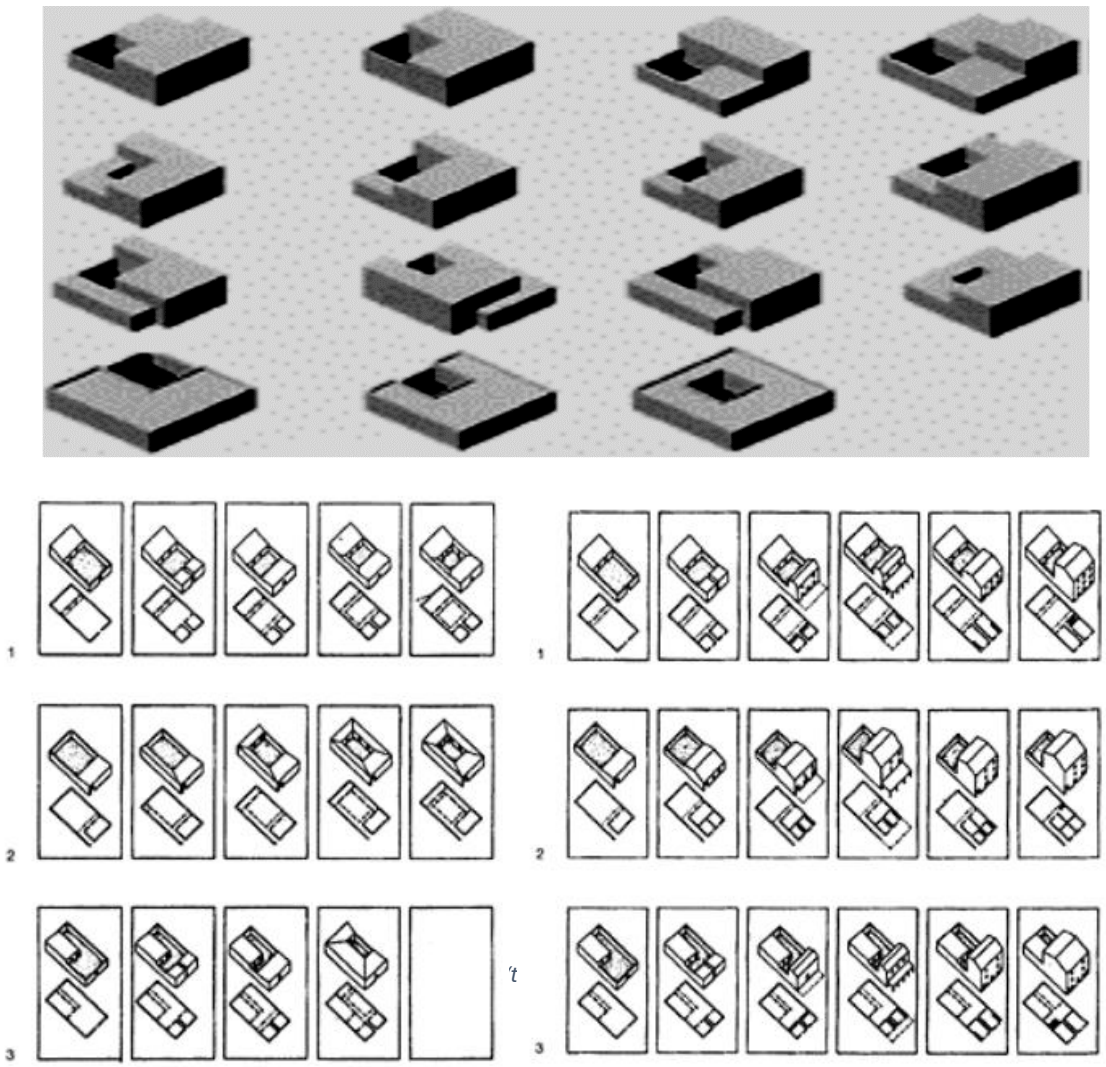


Figure 12: Different types of courtyard buildings. Edwards 2006, Figure 2.

For this analysis, I assume that this building type had a second story and was very similar to the ground plan. While no evidence of staircases has been found (or not enough examples), the historical sources mention many examples in other Abbasid cities, what makes it logical to presume there were second story houses in Samarra. The size measurement will therefore remain untouched. This is especially meaningful for the calculation of the Gini coefficients. A second floor reflects wealth and therefore could change the results and further discussion. Basri & Lawrence (2020) have acknowledged this issue and produced two set of Gini values; the first excluded a second floor while the second included it. However, due to the lack of archaeological evidence in Samarra for a second floor and a still-forming definition of the layout plan of the Samarran house I have decided to treat the second story plan as identical to the ground plan. This decision produces an underestimation of the inequality of Samarra, as very probably not all the houses had the exact same plan across a 40km long city, but this is the most convenient solution with the available data and time.

Going back to the building type itself, chapters 3 present evidence for a varied layout, orientation and size not only of blocks but all residential structures in Samarra. Chapter 4 delves into the organization of these buildings, looking whether they are placed next to each other within the urban plan forming clusters, or they were closer to mosques or mansions. Examples of Abbasid houses outside of Samarra, like Raqqa or Jericho, will be discussed in chapter 3 as well as a comparison to the examples in Samarra with the purpose of contributing to the definition of the Abbasid House. However, for this dissertation, I assume that the residents of this type of building belong to the same or very similar social class. Further work needs to be carried out to dissect these structures and observe any differences among the layouts.

Blocks

I mentioned before that I would include blocks within the category, but I still think is important to explain what these buildings were. Blocks are defined by Northedge & Kennet (2015) as "area of unclear block construction, which would include several "block" units". The line between the Block and Blocks categories is not clear and the difference in numbers in each group suggests that rather than two different models, this is a product of an incomplete or imperfect classification of these buildings. We cannot be certain if this distinction is a product of the analysis of the architectural remains or if this was a real differentiation the inhabitants of Samarra were aware of. Besides, there are certain connotations to this model that can affect the inequality in Samarra. Assuming that the people from Samarra knew these bigger communities existed, we do not know what motivated them to live there. Neither of these models appear in the historical texts. One plausible option is that with the intention groups of people would get together and shared spaces in order to afford the land, this might suggest that this type of buildings were inhabited by poorer people than those who lived in the block type. Another possibility is that the blocks were occupied by pre-defined small communities, e.g. artisans, which would focus more on the physical distribution of land and people of Samarra. Another option is the creation of independent, more exclusive communities,

were wealthier people lived. As happened with the previous category, use of space is not clear; more space could mean more families or space for other type of activities.

Mansions

Mansions are differentiated from other residential buildings due to their size. Apart from this, Northedge & Kennet (2015) do not give a further material differentiation from blocks. They are divided into five different categories by Northedge & Kennet (2015): Mansion 1 to 5 (Table 7). As happened with the blocks, they do not have a set layout, although the consecutive courtyards with rooms to their side is especially frequent in Samarra 3 (see Chapter 4 and Appendix 2). Mansions were occupied by both military leaders and an urban elite that I am to study and identify with this thesis.

MANSION TYPE	SIZE
Mansion 1	"Very large residential building other than that defined as a palace"
Mansion 2	>8000 square meters
Mansion 3	5000-8000 square meters
Mansion 4	2000-5000 square meters
Mansion 5	<2000 square meters

Table 7: Types of Mansions and their definition according to Northedge & Kennet 2015.

Independently of their size, this type of structure is labelled as a residential building. As briefly mentioned in the introduction, I attempted to create a category based on layout and location which derived into a simple categorization of the architectural sample into three groups (consecutive courtyard, (main) courtyard and irregular) that do not offer a full explanation of the mansions of Samarra. Nevertheless, this was a first step towards the understanding of an urban elite not necessarily linked with the Caliph or the military leaders. The term Mansions has a specific connotation, denoting a level of wealth. However, the variety in layout (including presence or absence of spaces), location and size (relative to the monumental size of the city) seems to indicate than rather a homogenous group, this group was composed by different type of people who arrived in the city in different periods and who had different positions within society. A further discussion and a catalogue of these residences can be found in Chapter 4 and Appendix 2

Palaces

Palaces are defined by Northedge & Kennet (2015) as: “Monumental residential building identified as belonging to a member of the Abbasid family”. This was assumed based on historical sources, past excavations (Herzfeld) and observation of plausible features based on size and layout. This definition is based on the examples appearing on the chapter “The Palaces of the Abbasids at Samarra” by Northedge in “A Medieval Islamic City

Reconsidered" (Robinson (eds), 2001). This group includes the palaces of the caliphs, like al-Ja'fari or Dar al-Khilafa, but also the secondary residences like al-Musharrahat, first described by Herzfeld as a hunting palace (Northedge, 2001, p. 55). Some examples of this group will be described and analysed in Chapter 3 as part of the discussion of Abbasid palatial architecture.

They are not as common as the mansions or blocks, but they can play many other functions in this thesis. Previous authors like Northedge or Saba have argued that the Bab al'Amma of Dar al-Khilafa was a point of reunion for the citizens of Samarra. That theory will be considered and approach quantitatively with the calculation of Euclidian distance and buffer zones between houses and the palaces. Further information can be found later this chapter.

Neighbourhood Identification and Inequality Assessment

Previous work on the division of Samarra has been carried out extensively by Northedge (2008). He divided the city into different areas based on the topographical elements (division between areas H and J due to the wadi), specific functions (cantonments), palatial complexes (area A includes all of al-Ja'fari) or specific time periods. Moreover, he was able identify different "units" within some parts of the city. For example, he divided al-Mutawakkiliyya into eight different units, TA-TH (Fig. 13).

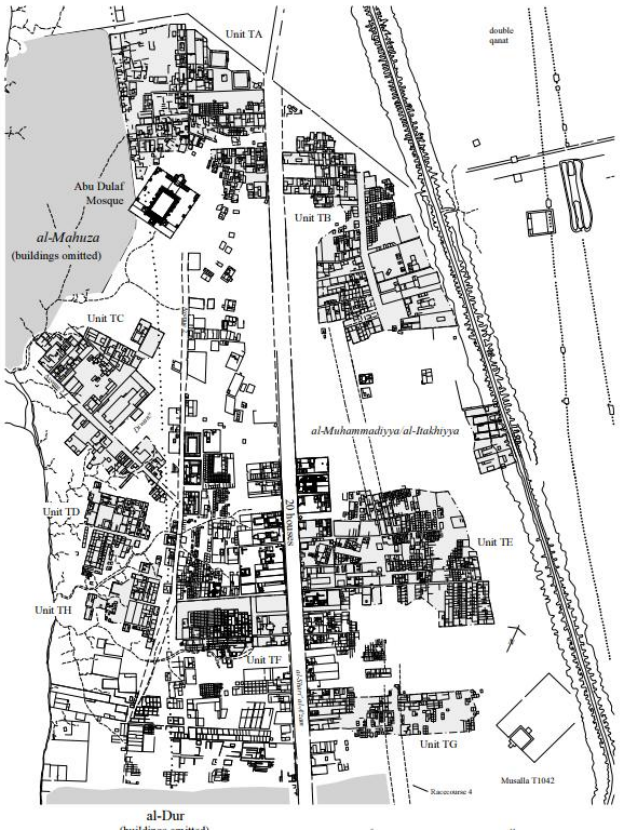


Figure 13: Plan of Madinat al-Mutawakkiliyya with the identified units. Northedge, 2008, Fig. 96.

Unfortunately, this internal division is not carried out in all the areas across Samarra, leaving out some parts of areas H or J. In this case, identifying units is not a difficult task; separating them, which forms clusters, clearly facilitates it. Nevertheless, the idea of a unit does not directly entail a neighbourhood. I understand a neighbourhood to be a space which includes certain features linked with the culture of the civilization that ensure daily life. For example, in an Early Islamic context, I would expect a hammam, market, mosque (not necessarily a congregational one), and residential houses of similar size, among other features. Differences in neighbourhoods could include variation in the presence of services, distance to them (in case they are not placed within the neighbourhood, e.g. water source), type of resident, and house size. Whether the units Northedge identified are neighbourhoods or just mere aggrupation of spatial data that made the analysis easier will be considered here. Moreover, this method will be replicated for other areas of Samarra. A list of services or relevant landmarks of the urban landscape will be listed, identifying them in the urban map with the idea of assessing whether they are frequent enough to form neighbourhoods or, in fact, they are not identified enough to form a logical division of the areas.

Once the neighbourhoods were identified, I counted the number of service and residential infrastructure, measured the area of the neighbourhood and measured the (Euclidean) distance to service infrastructure not present within it. This provided an appropriate framework to study the nature of each of the neighbourhoods in various areas and determine the levels of quality of life in each part of Samarra.

Further issues with the Data

Although a herculean effort, Northedge and Kennet's data is not exempt from certain complications. The first and most apparent is the considerable number of structures catalogued with vague terms, like "Building", "Complex" or "Complex building", which I have decided to leave outside of this thesis. Further identification is hardly viable without archaeological excavations, and even then may not be possible due to the destruction provoked by recent (Late $20^{th}/21^{st}$ century) urban and agricultural growth. Nevertheless, it is to be remembered that among these vague classifications, there could be buildings from specific types that could alter the arguments proposed here. Systematic biases in the types of residence or infrastructure which have not been identified could influence the results of the analyses. Due to the methodology followed by Northedge, it is highly unlikely that palaces or big residences have been left unclassified.

The lack of a basis or convincing explanation regarding typology is part of the same problem. Northedge (p. 227) explains that "the typology is based purely on the plans of the buildings and not on function; it is possible that, in some cases, buildings with quite different functions have been classified under the same type [..]. In particular, not all work buildings have been successfully identified, and many remain under the undistinguished title of "building"". A clear example is the Block category. Its description is "Group of

small Abbasid houses, commonly in a rectangular block", which assumes that all the spaces and buildings within that block are residential and are connected. It does not offer information regarding the organisation within this space. For example, are all the houses in a block for the same family or was it an Abbasid interpretation of a Roman *insula*? It also fails to consider whether one of these internal buildings was a shop, a storehouse or a stable.

Another pressing issue with the data relates to the dating. The presence of multiple structures (Northedge & Kennet, 2015, p. 227) which cover the same period or are between two periods increases the difficulty of a complete site analysis. Northedge & Kennet (p. 228) explain that "The date is given without justification. The dating is generally based on the stratigraphic situation of the building in its area and the historical description of the city. Regarding the many buildings that have not been visited, the dating is quite vague and subject to correction". The lack of justification makes this analysis subject to revision, which could change significantly the arguments proposed here. While the complete dataset offers evidence as early as the chalcolithic and as late as modern times, the portion of data used for this dissertation is all between 836 and 892 AD, the 56 years Samarra was the capital of the Abbasid Caliphate (Samarra 1-4).

As with many other archaeological datasets, the dataset is flawed and dependent on the surviving archaeological record. Nevertheless, this site is one of the biggest and extensive evidence of architecture in the Early Islamic world, documented by a comprehensive and thorough catalogue of the archaeology and architecture of Samarra that permits further research and understanding of the site and the Abbasid period.

Methodology

The methodology used in this dissertation is complex, as it responds to different research questions and approaches. Regarding the assessment of inequality in the urban plan (Chapter 5), I have employed Gini coefficients, Euclidean distance and Nearest Neighbour Analysis, all undertaken in QGIS and R Studio. As part of this, I have also identified various neighbourhoods across Samarra, both previously identified by Northedge and unidentified, and assessed the residential and service infrastructure within it.

For the architectural analysis (Chapter 4), which also addresses inequality and social dynamics, I employed the data in the second volume of "The Archaeology Atlas of Samarra" and added some new categories, including the number of spaces (courtyards and rooms), orientation, shape, number of entrances, and water features (basins and cisterns). The whole list can be found in Appendix 1. With this data I have employed a series of statistical tests like (multiple) linear regression, ANOVA test and Tukey HSD test.

Gini coefficients

This statistical measure ranges from 0 to 1, where 0 equals perfect inequality, and 1 is perfect inequality. This is used widely in social sciences to study the wealth and income distribution in different contexts, including neighbourhoods of cities (Yunbo, 2009; Bakare, 2012; Kolluru & Semenenko, 2021). The use of Gini to study income inequality was first theorised in 1951 by R. R. Schutz and has been discussed further on many occasions (Mehran, 1976; Dagum, 1998; Rogerson, 2013; Jenkins, 2017). For this dissertation, Gini coefficients are used with house size, employing this as a proxy for social hierarchies and differences among the population of Samarra. The use of Gini coefficients in the humanities can be traced back to Milanovic et al. (2007) work, which then reached archaeology through publications like Smith et al (2014), Kohler et al (2017), Roland (2021), Thompson et al. (2023), Smith & Wesselbaum (2023) or Canuto et al. (2023) and mentioned and assessed by Fochesato et al. (2019). More specifically, using residence size as a proxy for inequality in the Near East has provided solid results (Basri & Lawrence, 2020; Squitieri & Altaweel, 2022 & 2023).

Issues with house size as a proxy for material wealth

Inequality can take different forms, including accumulation of material culture, proximity to religious landmarks or house size. The use of house size as a proxy for wealth carries multiple difficulties that have been longed discussed by multiple authors using various types of evidence (Pailes 2014; Smith et al, 2014; Hayden & Cannon, 1984; Smith, 2018: Chapters 2, 3, 4, 6 and 7)

An important criticism is the separation and differences between production, income and wealth. Gini does not take into consideration if a house was used entirely as a residence and assumes it did not include areas for labour, animals or space for service. Different uses depict different social status, as a blacksmith who has his workshop in his house is not the same as someone who can waste some space to keep their horses (Netting, 1982). The Gini coefficient sees all this space as equal and two houses with totally different income might have the same value. Production, referring to the need to produce to survive, is linked with the lower class, while the higher class uses their space for leisure or aesthetic purposes. This difference, inherent to a class-divided society, is not reflected in this methodology. While this could be carried out by separating out industrial spaces in buildings from domestic ones, the evidence for the first type is too scarce.

The reasons this method was used for Samarra is based on both the dataset and the archaeological and historical knowledge of the Abbasid capital. The vast number of buildings that are all contemporary with a recorded plan and measurements made this site an ideal candidate.

How were the Gini coefficients calculated?

The Gini was calculated using R studio for four different types of buildings: Palaces (referring to caliphal/Abbasid complexes), Mansions (theorised as belonging to an urban elite), Block (residential unit – various houses within). These were grouped into different spaces: neighbourhoods, areas and the whole city. This was carried out to find any patterns in the different locations within Samarra and possibly find groups of people that we might associate together. For this, I expect more wealth disparity across the whole city than in any given neighbourhood. As explained beforehand, neighbourhoods are locations where people of analogous social condition, ethnicity, or religion lived, in comparison to the whole of big areas of it, that might include different groups. Moreover, the Gini coefficient, combined with house size distribution, can help determine, with the pertinent interpretation if multiple social groups lived within an area of Samarra.

In mathematical terms, Gini coefficients follow a simple formula with two elements: A (the area between the Lorenz curve and the line of perfect equality) and B (under the line of perfect equality). A + B is understood as the total area.

$$G = \frac{A}{A + B}$$

In a more accurate mathematical expression:

$$GINI = 2\int_0^1 \big(x - L(x)\big)dx$$

L is defined as the Lorenz Curve

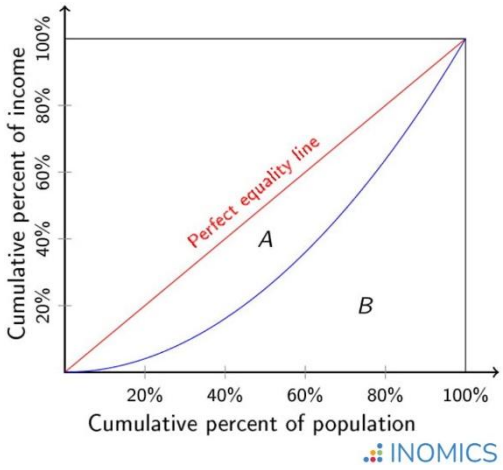


Figure 14: GINI coefficient. INOMICS



Figure 15: Fessel, na

House size and other parameters (statistical tests)

House size is used to measure spatial variability (Chapter 4) and is considered a proxy for material wealth in this study. The square meters were obtained initially from the second volume of "Archaeological atlas of Samarra" (Northedge & Kennet, 2015). To obtain the new data (orientation, shape, number of entrances, water features) I individually look at every single plan (Northedge & Kennet, 2015) and counted every room and courtyard and observed the rest of the variables in the plans provided in the third volume of "Archaeological Atlas of Samarra" (Northedge & Kennet, 2015). In order to see the correlation between various of these parameters I conducted the following tests with R Studio:

- ANOVA Test: This was used to assess if there were statistically significant differences in house sizes across the different variables (categorical). This test compares the means of multiple groups in order to show whether the differences are because of chance or meaningful. It uses the F test (comparison of individual variance with general variance) to obtain statistical significance (Bevans, 2024).
- Tukey HSD: This test is normally carried out when the ANOVA results indicate a statistically significant difference among groups, normally with the objective of specifying what portions of the data do so. It calculates the Honestly Significant Significance, which is the minimum difference between the calculated means for it to be statistically significant.
- Linear Regression: This method is used to calculate the relationship between two continuous variables with the following equation:

$$Y=\beta 0+\beta 1X+\epsilon$$

Where Y is the response variable, X the predictor variable, β1 is the slope, β0 the slope and ϵ the variable

- Multiple Linear Regression: This follows the same principle as the linear regression, although we add βnXn to the equation. This also produces an

(adjusted) R-squared value that indicates the proportion of variance explained by each of the variables.

Distance

A basic but effective analysis is to measure the Euclidian straight-line distance from multiple types of buildings with relevant non-residential structures from within the urban plan, e.g. mosques, markets (*suqs*), workshops, farms, fortifications, racecourses, stables, and baths. Spatial distance can be used to assess access to services (religious, sanitary, leisure) (Dennehy et al, 2014; Smith et al, 2017; Smith, 2017). It can help alongside size, layout and location to define social classes. For example, if a series of blocks of a specific size and layout are close to workshops we assume that there might have been a certain connection between the two buildings. The used parameter is the straight-line distance between two structures and does not take into consideration routes or streets. In fact, the only known streets of Samarra are the avenues described by Ya'qubi. The main problem with these is that they clearly connect the N-S extremes with certain buildings like mansions or markets to the sides but seem to be inefficient to connect buildings passed the first line of structures. For example, in Fig. 16 I drew two possible routes: A (blue) and B (purple) that connect a block (residential structure) with a market (suq) in Madinat al-Mutawakkiliyya. As visible, route A is shorter, despite not using the avenue. While route B seems easier, as it has a long straight segment, but takes longer. With an average temperature of 29 degrees Celsius across the whole year and a maximum of c. 50, with very low precipitation, walking long distances seem unfeasible. The description that Ya'qubi gives of Samarra is itself centred on the avenues, but does not mean that they were the only way of transport in the city. This oversimplification just tries to explain that using street analysis in Samarra has currently various difficulties attached. Taking all this into consideration and in order to avoid making any major mistakes, I decided to use the straight-line distance.



Figure 16: Two routes (A & B) going from a Block to a Market.

Of course, distances are not ultimate proof of the relation between people and the urban plan, but they offer an interesting evolution of the city during the different periods and how the people, new and old residents, adapted to these changes.

Euclidian distances were calculated using QGIS by creating two sets of polygons and, with a buffer of 1000m, record all the connections for block(s), mansions and caliphal palaces. Future work will carry out sensitivity analysis by using various distances (500m, 750m and 1500m). The landmarks included in this analysis were:

- Mosques
- Racecourses
- Mosque
- Congregational Mosques
- Storehouses
- Markets (suqs)
- Workshops

For example, Table 8 shows all the possible mosques within a 1000m buffer of T119 (Mansion 4). Then, this method was applied to various type of buildings during different times periods.

T119	mansion 4	T86	mosque	407.7566063
T119	mansion 4	T1	mosque	258.7431352
T119	mansion 4	T156	mosque	392.0290806
T119	mansion 4	T66	mosque	474.3598845
T119	mansion 4	T270	mosque	637.4245995

Table 8: Mosques within 1000m of T119.

CHAPTER 4: THE ABBASID RESIDENCE - PALACES AND DWELLINGS

This dissertation's measure of inequality focuses on residential structures and their relation to other elements in the urban plan. Therefore, I deemed it appropriate to dedicate a chapter to these residential buildings to understand their layout, possible influences, and decoration. These aspects will help us understand the spaces where people lived, how architectural layout and decoration differences manifested the Abbasid society's social hierarchy, and what connections the Abbasids might have had with past and contemporary civilisations. The present chapter aims to offer a recompilation of the knowledge around Abbasid palaces and houses, propose new theories regarding its origins, and advocate for the immeasurable value of houses and dwellings in understanding the Early Islamic period.

Abbasid Palaces

What is a palace?

Previous attempts to define an Abbasid palatial culture are worthy of high praise, among which the chapter on palaces by Hillenbrand (1994) can be highlighted. Grabar (2023) reevaluated the available evidence for Umayyad palaces to create a solid interpretation of the seventeen accessible royal residences. Grabar's reflection is especially significant to this dissertation as he is the first to break with the idea of a fixed definition of early Islamic palaces first proposed by authors like Stern, Creswell, Herzfeld, and Sauvaget (p. 93). In these lines, Hillenbrand identifies four different types of palaces: a country villa, an administrative centre, a royal residence, and a modest retreat (1994, p. 382). Additional work has been done with the purpose of tracing the origin of Umayyad and Abbasid palaces, looking especially at Roman (Hillenbrand, 1986), Byzantine (Ettinghausen, 1972), Sasanian (Bier, 1993 & Northedge, 2011), Parthian (Novak, 2012), and even Ancient Near Eastern examples (Winter, 1993). Authors like Westbrook (2013) have proposed a more unifying model with a provisional chronology identifying multiple architectural elements and the use of spaces traceable to these periods. Limited by the rarity of Islamic palaces, their state of conservation and the lack of proper excavations have led to the reutilization of the same examples, providing little new additions to our understanding of an Early Islamic palace.

The difficult task of creating a typology that includes all the examples has steered the scholarly work into understanding Caliphal structures as the referent and maximum representation of power and, thus, of palaces. This focus on monumental structures does

not have to be directly correlated with bad academic practice but with the bias created by the process of preservation and survival inherent to archaeology. Numerous factors, such as environmental and human, influence the conservation of a structure. The last includes those factors dealing with the social organization of a civilization and the distribution of resources. Excepting some examples like Mohenjo Daro or Harappa (Jansen, 1993 & Vidale, 2010) in the Indus Valley, we can assume that the best materials, best architects, and the most extensive number of workers are used in the construction of those buildings occupied by the highest strata of society. The use of mudbrick in palace construction, discussed with more detail elsewhere in this chapter, hugely limits the evidence available, permitting only access to those which instead never suffered other periods of occupation after their abandonment, like Samarra, or those which were deemed the most important by their contemporary and later societies.

Therefore, we cannot take for granted that all the palaces in the Umayyad and Abbasid eras looked or were built for the same purpose as those preserved today. Furthermore, the literary sources (*Qasidas:* Ali b. al-Jahm & 'Ubayd al-Buhturi; Ibn Khaldun & Ibn Bibi) seem to describe the palaces with a certain mystique and even with a literary language that seems closer to a tale than to an actual description. Interestingly, there is much that language itself can contribute to the understanding of an Early Islamic palace. In his work, Northedge (2001, pp. 29-30) explores the concept of an Islamic palace and how English speakers perceive it. He points out that three Arabic terms, *qasr*, *dar*, and *qati'a*, describe what we might call a palace. Each of these terms captures a distinct aspect of a palace, whether it pertains to its residential function or alludes to its grand scale. The word *qasr* defines the palace in multiple ways. It could be traceable to the Roman term *castrum* (fort) and is also traceable to the Arabic root qāf ṣād rā (ق ص ر), which is linked with concepts such as restricted, limit, prevent, withheld, etc. Northedge, guided by Conrad Lawrence (1981), advises us to avoid this term (2001, p. 29). Nevertheless, when looking at examples of desert *qasrs* used by Hillebrand (1994, pp. 387-388), descriptions like "Rooms flush within the outer walls lack windows and must have been plunged in a permanent penumbra", "no provision was made for running water" or "latrines were few and awkwardly placed", make one think that the best way to define these palaces is with the terms listed above. The question arising from this situation is whether we should consider these buildings palaces, which inevitably leads to whether there is a way of defining a palace, as it seems that even in Arabic, there are multiple terms to describe just one concept.

Grabar (1993) deals with this problem for the Umayyad palaces (p. 93). He recognizes the lack of "direct evidence" that can give these structures the status of palaces, having to resort to the size, inscriptions, ornamentation, or descriptive poems (pp.93-95). From an architectural point of view, there is a significant challenge in combining the semi-nomadic lifestyle of the Umayyad princes and other members of the royal structures with structures such as Mshatta, and it is even more of a challenge to create a category big enough to include Khirbat al-Mafjar, with its Bath Hall, and the desert *qasrs.* From an archaeological point of view, this approach is perhaps even more flawed. As argued above, the bias of archaeological preservation limits the surviving evidence, and therefore, using elements like inscriptions, specific ornamentation or features of these sites is dependent on their preservation, which might represent just a percentage of the total group.

This same methodology has been used in the definition of Abbasid palaces. Commonly, a connection has been made between power expression and monumentality. Identifiable first in Mshatta and Hisham, the Abbasid Caliphs expanded their court (Bennison, 2018), inevitably increasing the palaces' size. The appearance of enormous structures built by Caliphs, such as those in Baghdad, Raqqa, or Samarra, are some available examples. The denomination of Samarra as a "palatial city" is arguably born from its monumental size and from that of its numerous palaces, which predisposes us to believe that Abbasid palaces are inherently colossal. It is true that, when comparing the smallest palaces (within the group of what Northedge & Kennet (2015) call "Mansions") to other early Islamic structures, one could argue that size plays an important role. Still, in the city context, there is a considerable difference, finding structures from the "Mansion" group oscillating from 907m^2 to 140,733m^2.

Another aspect that Grabar considers essential is the ornamentation. Subsequently, in the Abbasid context, scholars like Milwright (2017), Dahmani (2020) and Saba (2015 & 2022) have studied the internal features of these spaces, elucidating the elements that contribute to or relate to the secluded nature of the caliphs and their expression of power through a restrictive archaeology. However, it is imperative to recognise that the essence of a palace cannot be solely defined by its dimensions, internal spaces, ownership, or adornments. Palaces do not exist in isolation; they must be understood as dynamic components of an urban plan intricately intertwined with sociopolitical dynamics rooted in a specific cultural and geographical context.

The changing political scene of the Early Islamic period and their consequent varied ways of power depiction, both in a rural and urban context and in a civilian and military context, needs to be considered as a defining factor of a palace and contributes to its heterogeneous nature. The involvement of military groups, such as the *Abna, the Shakiriyya,* and the *Khurasaniyya* in Baghdad, or the Turks in Samarra, deals with residences belonging to the military, like Sur Ashnas or Sur 'Isa, both in Samarra, that are not defensive structures. The growing absolutism of the Abbasid caliphs and the consequent palatial layout and ornamentation do not have to be necessarily applicable to the broader elite, military, or civilian, being another reason why we must be careful when addressing the palaces of a period as a single unit. The location of a palace and its relation to its surroundings is also a feature that advocates for various palaces, as Dar al-Khilafa is different from the Palace of the Golden Gate and al-Ukhaydir due to how their surrounding space was conceived.

Finally, I wanted to briefly explore the re-use of Early Abbasid palaces and what this might entail. The clearest example of this phenomenon is Samarra, where each caliph built their structure, leaving behind the residences of their predecessors (Hillenbrand, 1994, p. 378). There is limited evidence of caliphs, especially Mutawakkil, destroying palaces from previous periods to obtain materials. Some examples are Haruni Palace (Northedge, 2005, pp. 301-302), al-Mukhtar and al-Bahdi (*Tarikh* al-Tabari, Ser. III, Vol. III, p. 1438). Nevertheless, the fate of structures like Dar al-Khilafa, Balkuwara or al-Ja'fari during the reign of other caliphs and after the abandonment of Samarra puts into question the restrictive nature that we have assigned to these buildings. While it is true that the layout and the ornamentation indicate a projection almost divine of the caliph's identity, palaces might have been reused by members of the elite and/or regular citizens who benefited from their fortified nature. This could explain the use of mudbrick and other cheap materials in constructing caliphal palaces: the Caliph wanted his palace to last as long as his reign so no one could enjoy what he enjoyed. Nevertheless, there is

evidence of palaces being used after their abandonment, which are still preserved. *Qasr al-Ashiq* in Samarra was abandoned by the Caliph just before his return to Baghdad and was allegedly occupied by the royal family and by farmers and regular citizens of Samarra till at least the 13th century (Northedge & Kennet, 2015, pp.188-189). Evidence of this last presence was found through pottery and added structures like a wall with squared towers and a series of rooms (Northedge & Kennet, 2015, pp.188-189). Due to the lack of archaeological excavations in other examples, we cannot assume this was an exception or the norm. Still, we must be careful when examining the presence of these palaces in the urban plan, as their role might change in a few years.

The question now is whether the caliphs knew this was their residences' destiny or they were just indifferent to it. The afterlife of a palace plays an integral part in the decision whether to build it or not, especially as these structures could be considered the legacies of the rulers. Assuming that the Caliphs knew their palaces would not hold the intended status for posterity, considering these residences as a product of their absolutism and separation from their subjects might not be the most accurate way to describe these buildings. I am not implying that the palaces would become public access after the caliph's death. Still, re-utilizing and modifying existing spaces is inherently human (Sulivan III, 2008), and there is no reason to believe it was different during the Early/Middle Abbasid period. If the Caliphs did not pay much attention to what happened with their palaces outside of their reign or lifetime, it is fair to assume that these were a product of the self-centered nature of the Abbasids. However, the possibility that the Caliphs were unaware of the future of their constructions or indifferent to it is difficult to believe, as many of them were particularly interested in this type of construction. Another relevant question is whether this exact process applies to smaller palaces which did not belong to the caliphal family; if it was the fortified nature of the caliphal residences that people were looking for, or was it a sense of admiration or curiosity that pushed them to occupy these constructions.

The city of Samarra, distinguished by its size, level of preservation, and extensive archaeological work, presents a unique opportunity to gain insight into the physical characteristics of an Early Islamic city and how people interacted within this urban space. Samarra permits using a varied and ample database, but a crucial analysis has been omitted. Examining these palaces and their interplay with other aspects of urban planning can give us a deeper understanding of how an Early Islamic city operated, revealing insights into its power dynamics.

Before delving into the complexity of Samarra's urban plan and the role of the residential buildings, the following segments of this chapter will focus on each of the defining aspects of these structures, including internal layout, traceable origins, and material and ornaments. In the following chapters, a quantitative approach will be used to explore the location of palaces, their distance to key elements of the urban plan, and their relationship with their immediate surroundings.

The internal layout

During the Abbasid period, the palaces were buildings and complexes with multiple facilities, contributing to their independence. Their internal layout has been briefly commented on by Hillenbrand (1994, pp. 390-408) and extensively by Creswell (1989), although with some limitations, using both description of palatial complexes and the elaboration of a narrative surrounding the size and caliphal absolutism. In rare cases, this inaccessibility was portrayed through the consecution of spaces, especially courtyards, halls, and gardens. Moreover, this feature is thought to be potentiated by additional buildings, such as mosques or bathhouses, within the caliphal enclosure. Far from being a general rule (this disposition is scarce in Samarra), it is also not sure how applicable this organisation is in the smaller and the non-caliphal palaces. There are, however, a few features that seem to be repeated across multiple examples.

Examining the internal layout of Abbasid Palaces demonstrates the importance of the courtyard. This space is present in diverse examples within Islamic and non-Islamic architecture (Zhang, 2020), acting as an organising feature controlling the disposition of the internal layout of buildings of different sizes. In the Abbasid palaces, the courtyard is also a depiction of power. As far as we know, certain features are exclusive to the caliphal palaces, like a monumental door and a reception hall, normally acceded through the courtyards, reception pools, polo grounds and bathhouses. I wish to discuss examples from Samarra and other locations to provide the reader with a solid description of a caliphal palace and how these features are shown differently across the various cases. Due to this dissertation's word count constraints, I was forced to leave out some examples. Among them, the most important are the Palaces in ar-Raqqa (ar-Rāfiqa) and the Octagon of al-Qadisiya (Samarra).

Ukhaydir

One of the first examples of the Abbasid palatial building was the fortress of al-Ukhaydir. This building, constructed under the order of Isa Ibn Musa, was located on a crucial caravan trade route just 193km south of Baghdad (Abdulrazzaq et al., 2019, pp. 16924-5). The complex (175 x 169m), first discovered and documented by Gertrude Bell (1914) and reviewed by numerous authors (Creswell, 1989; Ettinghausen & Grabar, 1987 & Hillebrand, 1994), was enclosed by a limestone masonry wall of 19 meters high and 2.6 meters thick. This outside wall comprises semi-circular towers and four circular towers, one in each corner. The central gate, north of the complex, was the first evidence of the arched portal of the pishtaq style (Jamal, 2019). This led to the primary residential (112 x 82m) area through a vaulted entrance hall and reached the Great Hall. This included a pointed barrel vault with pointed arches on the sides. Following this space, an open courtyard decorated with blind arches called the “Court of Honour” would act as the core of the palace. Following the path, the throne hall was entered through a vaulted Iwan, framed by a Persian pishtaq (a rectangular elevation) (Jamal, 2019). Private audiences and other official businesses will be carried out in this space. We can refer to this series of structures as the “central aisle”, which is meant for people who visit the ruler of the

palace and must go through a series of dependencies that do not include the owner's private life. The living quarters or *bayts* are in each corner of the inner enclosure, with a courtyard in the middle and two symmetrical groups of three rooms to the north and south. The separation between the ceremonial and private life is clearly shown in the plan. The caliph or ruler is separated from his guests or the public world through the consecution of halls and courtyards and a complete separation of its private quarters. These are “lateral aisles," including living quarters and other daily life spaces like storehouses or mosques.

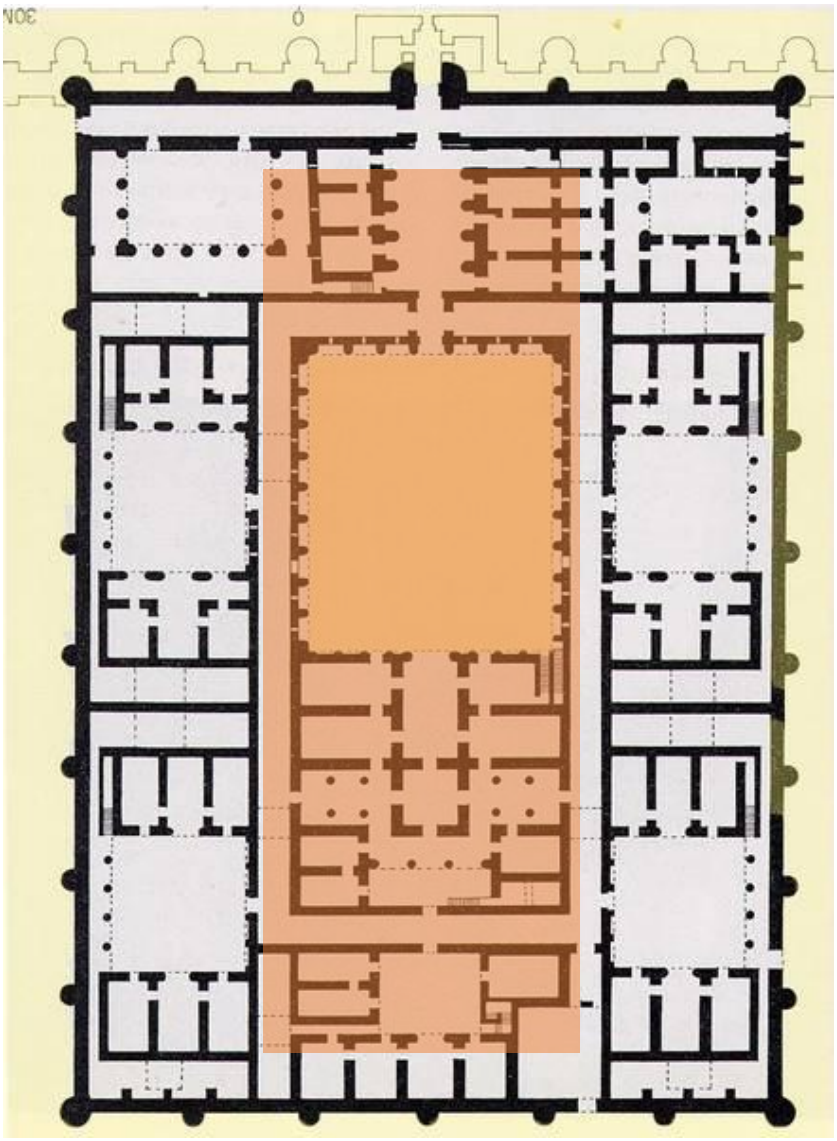


Figure 17: Plan of Ukhaidir. Gardenvisits.com.

Balkuwara

To expand on the idea of the “central aisle”, the most explicit examples that depict this theory are the Caliphal palaces of Balkuwara (Fig 18) and Dar al-Khilafa (Fig 19). The

palace of Balkuwara is located 7km south of Samarra and was built by the third caliph of Samarra, al-Mutawakkil, for his son al-Mutazz. Despite the differences in size, presence of green areas and number of dependencies, the palace of Balkuwara and Ukhaydir are, to an extent, very similar. The consecutive courtyards create a sense of awe with the central axis in both examples. The Samarran complex measured 260,397 square meters and was enclosed by a wall with 160 semi-circular towers. The entrance gate, flanked by two circular towers, leads to two consecutive *charbagh,* Persian gardens separated by two perpendicular waterways which divide the space into four segments (Wilson, 1976). The gardens were divided by monumental gates with Iwans, giving this outer space a heavy Persian taste. Once visitors cross these lengthy gardens, they reach the central courtyard, similar to the Court of Honour in Ukhaidir. Following the "central aisle", the visitor would finally reach the Caliph and audience hall. This space had a cruciform plan with a central domed sustained by four Iwans. Although it has a different plan, this space is comparable to the throne hall of Ukhaidir. Following this space, there is an extra garden. Due to its inaccessibility from other parts of the compound, I believe this was possibly a private space for the Caliph and his family to enjoy. While the space is symmetrically distributed to both sides of the central aisle, the interior has different uses. The north side was used for polo grounds, while the south was used for small enclosures to house the military, each with its respective courtyard. Finally, following Ukhaidir's plan to an extent, the palace of Balkuwara had two mosques on the lateral aisles to the north and south of the first garden. Taken to a more extravagant and monumental style, the plan, the symmetry and the essence of Ukhaydir were transmitted to Balkuwara.

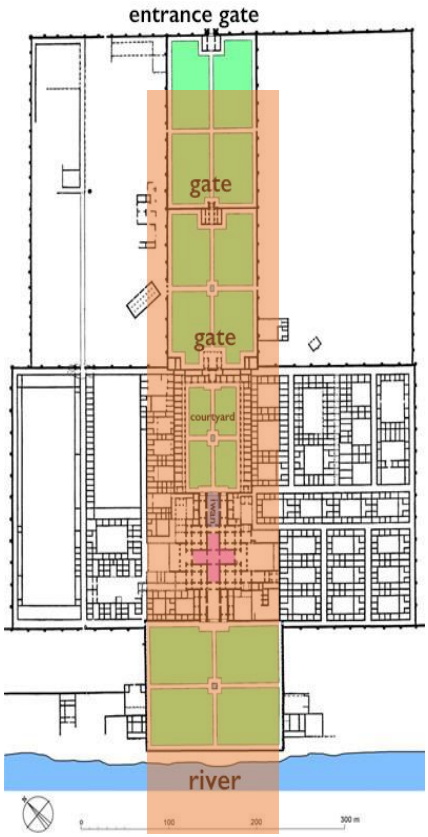


Figure 18: Palace of Balkuwara, Samarra. Central aisle highlighted in orange. Samarra, a palatial city (smarthistory, fig. 6).

However, the following example, Dar al-Khilafa, is placed in the middle between the described model and a more irregular plan. When looking at Dar al-Khilafa and its distribution, one would have the impression that the person did not think this whole thing through. Nevertheless, planning and organisation were involved in the construction of Dar al-Khilafa. Built by Mu'tasim north of the original city of Samarra, this structure is the most enormous palatial complex built during the Early Islamic period. First, we can identify two palaces (Fig. 19), Dar al-amma to the south, the main palace, and Al-jawsaq al-khaqani, a smaller structure to the north. The second enclosure, although uncertain, seems to be linked with the private life of the caliph, separated by the rest of the complex.

The Dar al-Amma palace is orientated on the W-S axis, preceded by a series of gardens and pools on the west end and dependencies on the north and south axes. The visitor would first pass through the Bab'al-Amma, the complex's main entrance. The door comprises a triple Iwan, the central one the only real access to Dar al-Amma. The central *Iwan* with an arched dome and stucco. This space was used to carry on executions, such as the crucifixion of the Turks general al-Ashfin, sentences, and any message or ruling directed to the public; this was the main point of contact between the ruler class and the citizens of Samarra. After passing through the monumental *Iwan,* the visitor would face a series of transverse halls leading to a courtyard, followed by the audience hall. This plan followed a cruciform plan, with four pillared halls and a central dome chamber. Herzfeld considered the domed chamber the central element of this complex, available through courtyards from different entry points. Following the central axis to the east, the visitor would reach the Central Courtyard (350 x 180m), called the Great Esplanade by Herzfeld. This space was surrounded by arched niches and stucco mouldings (Northedge, 1993, p. 146). Finally, a smaller pool or *serdab* of probably private use marked the end of the palace. While the central aisle is present, the order of the elements varies from the other two examples. In Ukhaydir and Balkuwara, the majority of the central aisle is dedicated to awe the visitor through the use of monumental structures and open spaces; meanwhile, in Dar al-Khilafa, the open spaces seem to be restricted for the private use of the Caliph and the royal family. Further excavation (Fig. 20) and reconsidering the use of each might modify this theory. Still, until now, the perception obtained from Dar al-Khilafa is a palatial complex designed to fulfil the caliph's desires and whims rather than sediment his power.

The "lateral aisles" contribute to this idea. Instead of including military cantonments within the palatial complex as Balkuwara did, Mu'tasim decides to move this out south of the enclosure and build himself a monumental *serdab* and a Haren. It is understood that these areas were inaccessible to regular visitors and were restricted to the caliph and men of his highest confidence. Suppose we assume that the Al-jawsaq al-khawani was indeed the residential quarters of the palace. In that case, Dar al-Khilafa resembles a more leisure complex rather than an administrative centre.

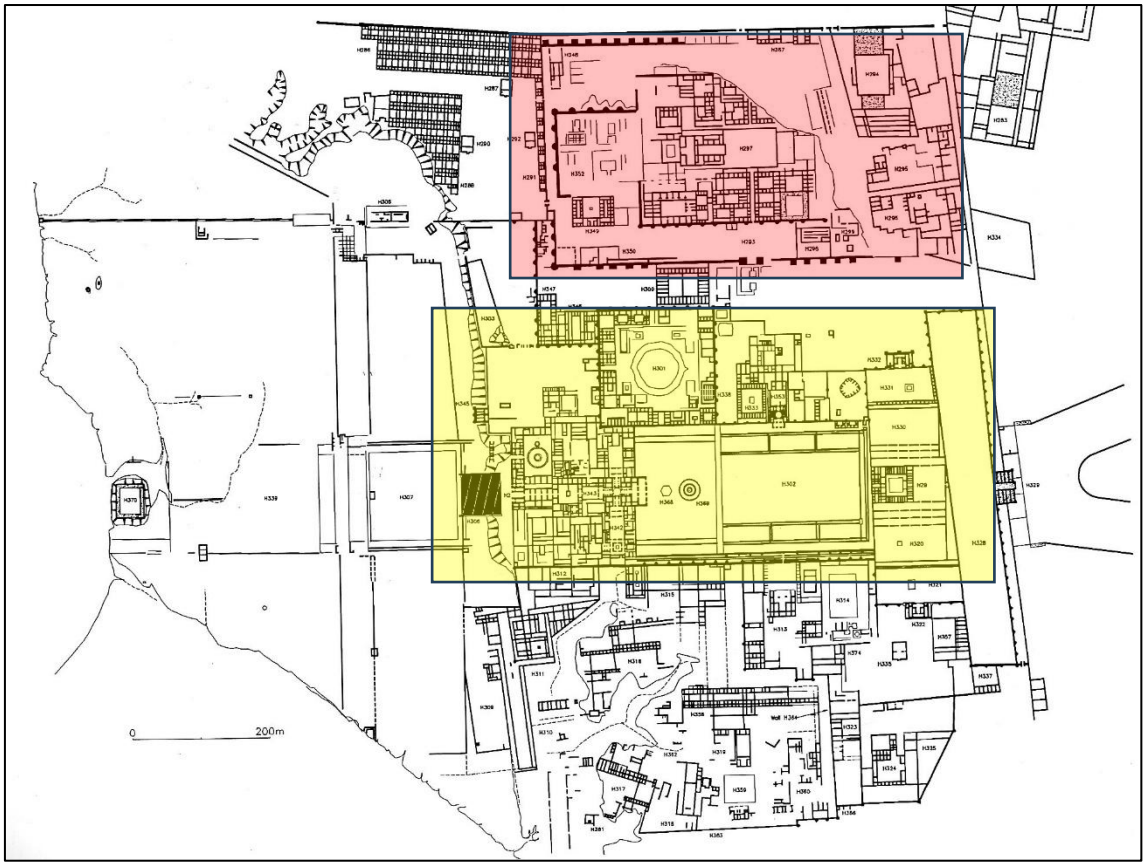


Figure 19: Palace of Dar al-Khilafa. In Yellow Dar al-amma, in Red: Al-jawsaq al-khaqani. Northedge, 2008, p. 134.

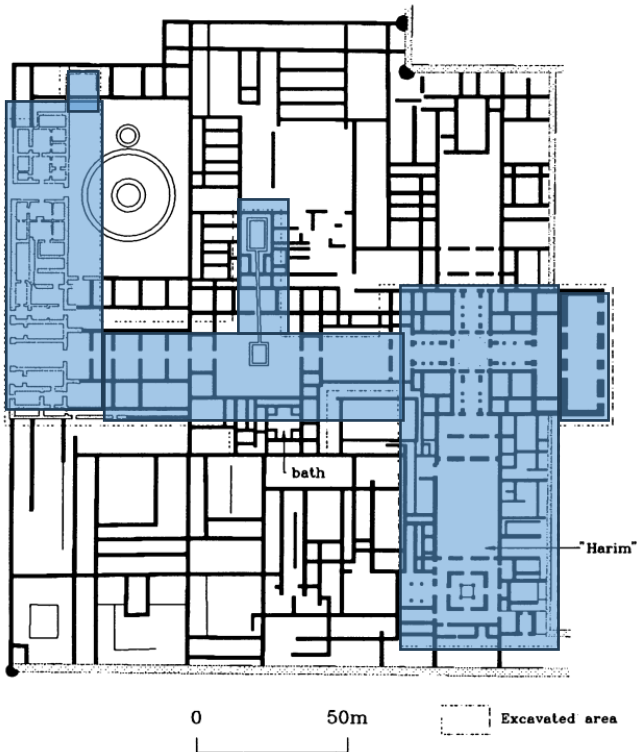


Figure 20: Palace of Dar al-amma (Dar al-Khilafa) with the excavated areas highlighted in blue. Northedge, 1993, p 164, fig. 6).

Palace of the Golden Gate

The study of Abbasid Baghdad always faces the same insurmountable challenge: the lack of meaningful archaeological remains. Earlier in this chapter, I discussed the limitations of the Early Islamic textual sources, but, in this case, it is all we have. The caliphal palace is described as a square building with a central dome of dark green colour on the outside with a statue of a soldier on a horse wielding a spear (Ettinghausen & Grabar, 1996, p. 88) and a golden entrance (Al-Ya'qubi, *Kitab al-Buldan,* ET p. 74). This domed chamber, of cruciform plan, was connected to four courtyards by four *Iwans,* each aligned with the city's axis. The residential quarters might have been placed in the corners. No comprehensive plan has survived or been elaborated. However, this palace and its surroundings will gain some relevance later in this chapter.

If we assume that this description is, to some extent, faithful to how the palace was, we are dealing with a completely different type of palace. Instead of a central axis, the palace is conceived with its centre as the core. This is probably linked to the city of Baghdad and its location.

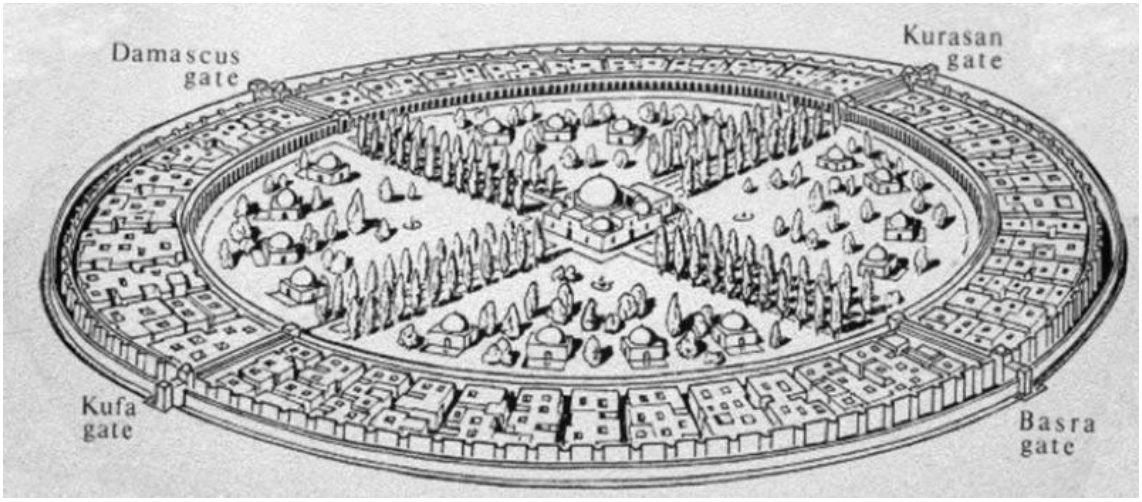


Figure 21: Illustration of the Madinat al-Salam (current Baghdad) with the caliphal palace. Alsammarae, 2021.

Qasr al-Ja'fari

With a total area of 1,861,602 square meters, this is one of the biggest palatial complexes of the Abbasid and Early Islamic periods. Al-Mutawakkil built it as part of his building program in Medinat al-Mutawakilliya. He only lived here for a few months until his assassination; he also was probably buried here (Northedge, 2008, p. 223). The irregular shape of the complex stands out compared to the other caliphal structures, which had a rectangular plan. The visitor would enter the main enclosure through a gate on the east side, which leads to a courtyard with apartments to the north and south. Across this space, five small corridors flanked with multiple courtyard apartments north and south would

take the visitor to a small reception hall with a courtyard to the west to finally reach the principal building of the complex, the main reception hall, a square of 115m which overlooks the Tigris. Behind it, a rectangular enclosure (838 x 1,060m) is considered the private residence of the Caliph and his family. While the reception hall is at the very end of the complex, overlooking the complex, the visitor had to go through a large section of courtyard apartments that were very similar to those in other areas of the city. There is no use for large empty spaces like in Balkuwara, and no evidence of who occupied this space. To the north of the central axis, as part of the independent nature of caliphal complexes, there are a series of storehouses big enough to supply the whole palace. Outside the principal block are additional structures like courtyard apartments and large enclosures of unknown use.

This palace is in direct contrast to Mutawakkil´s Balkuwara, which used gardens and open spaces to depict power. Moreover, the residences or cantonments were placed on the side aisles, not the central axis. The reasons behind these changes are unknown, but they are an interesting reflection of how two palaces built by the same person within the same period could be so different.

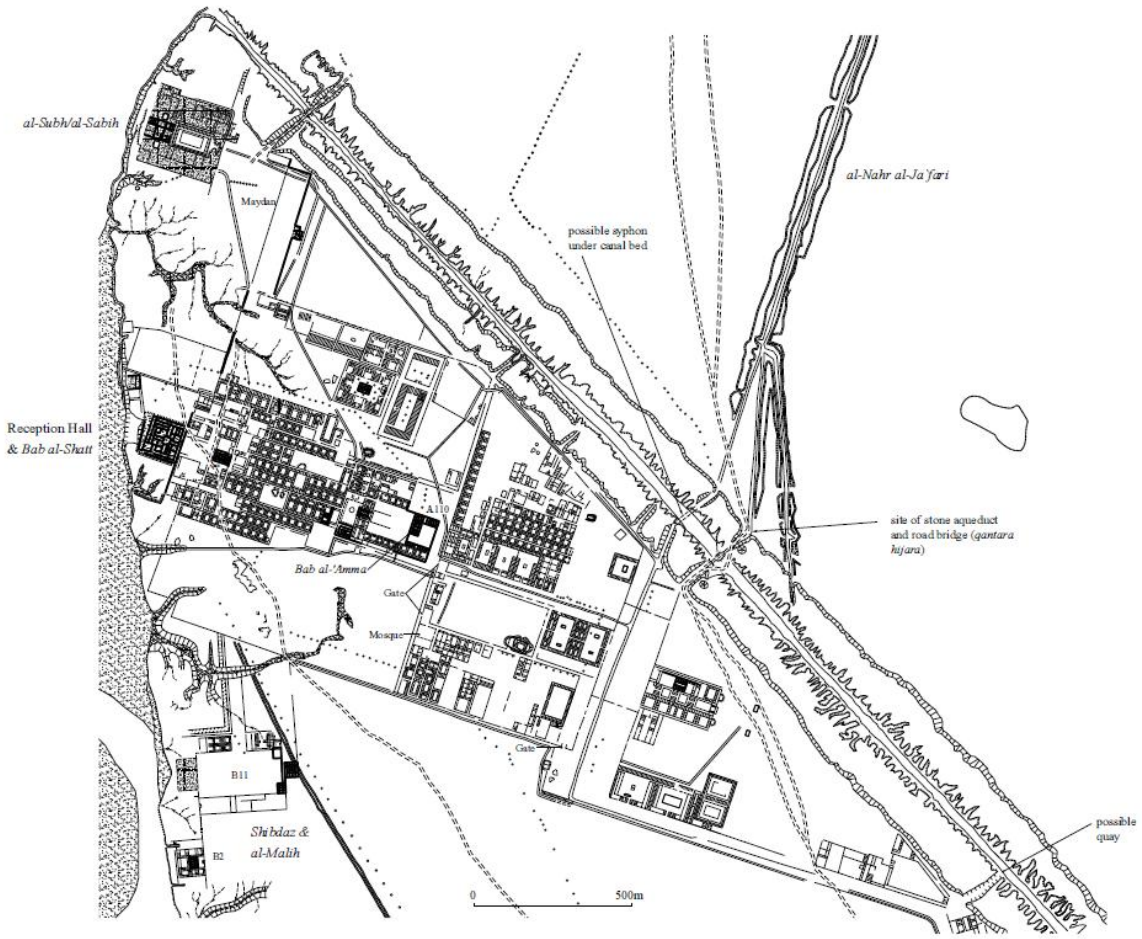


Figure 22: Palace of al-Ja'fari. Northedge, 2008, p. 215, fig. 94.

So far, only descriptions of caliphal palaces have been presented, and as previously discussed, this is just a part of the whole picture. Unfortunately, the available evidence for the non-caliphal palaces is mainly restricted to Samarra, although the sample size is big enough to elaborate a solid argument. The extrapolation of the central aisle theory to non-caliphal structures has proved to be with certain modifications to the term itself. When deciding whether a palace follows this model or not, I look for the presence of a reception hall surrounded by courtyards to the north and south and apartments or rooms to the east and west. This layout is present in many ways. On some occasions, the examples are straightforward, while in other cases, the presence of different elements, position within the building or orientation might make it less transparent. I created the "Yes?" and "No?" categories in those indeterminate cases. The categories are as follows:

- Palace (ID or name)
- Size (m^2)
- Central aisle model
    - Yes
    - Yes?
    - No?
    - No
- Description (Internal layout)

The layout of these palaces, as well as their size, is varied. There is a significant number of palaces which follow the "central aisle" model (Fig. 7). Still, with just 54.62% of the total sample, we cannot assume that the layout of the caliphal palaces in Samarra was fully transmitted to the non-caliphal palaces. Further archaeological work might offer a new interpretation of several non-caliphal palaces that could confront some of these points. The large sample, rare in almost any archaeological record, depicts what palace construction in Samarra was like. The variety of available non-caliphal palaces contributes to the arguments presented above in different ways. The presence of these structures in other parts of the landscape, with various sizes (Fig. 8), internal layouts, and shapes, is evidence of a heterogeneous palatial culture that extends from the smallest palace to the caliphal examples. Further analysis of this sample will be carried out in the following chapters.

CENTRAL AISLE (YES)	104 (45.81%)
CENTRAL AISLE? (YES?)	20 (8.81%)
NOT CENTRAL AISLE? (NO?)	9 (3.96%)
NOT CENTRAL AISLE (NO)	94 (41.41%)

A defining element of this type of building is its size and distribution. While this dissertation also analyses mansion size variability in different areas and periods, it is

crucial to observe changing trends in both temporal and spatial dimensions (Tables 8 & 9 and Fig. 23). The data suggest an apparent decline over time in size. Samarra 1 Mansions stand the biggest ones with an average size of 30631 square meters, which contrasts with the smaller Mansions of Samarra 4 (11322 square meters). This data has special interests as it was expected that the interest of Mutawakkil in monumentality and the need to create a new elite (as he assassinated the original) would translate into bigger urban palaces. It is possible that this urban elite lost power over the curse of time or that this social group was composed of various groups that had access to new constructions dependent on the political and historical changes in the city and government.

TIME PERIOD	NUMBER OF PALACES
Samarra 1	27
Samarra 2	49
Samarra 3	80
Samarra 4	32

Table 8: Number of Palaces per time period

TIME PERIOD	SIZE (m2)
Samarra 1	30631,63
Samarra 1 or 2	17161,556
Samarra 1 or later	22649,667
Samarra 1-2	13232
Samarra 2	11713,592
Samarra 3	12974,538
Samarra 4	11322,438

Table 9: Time periods and average sizes of mansions

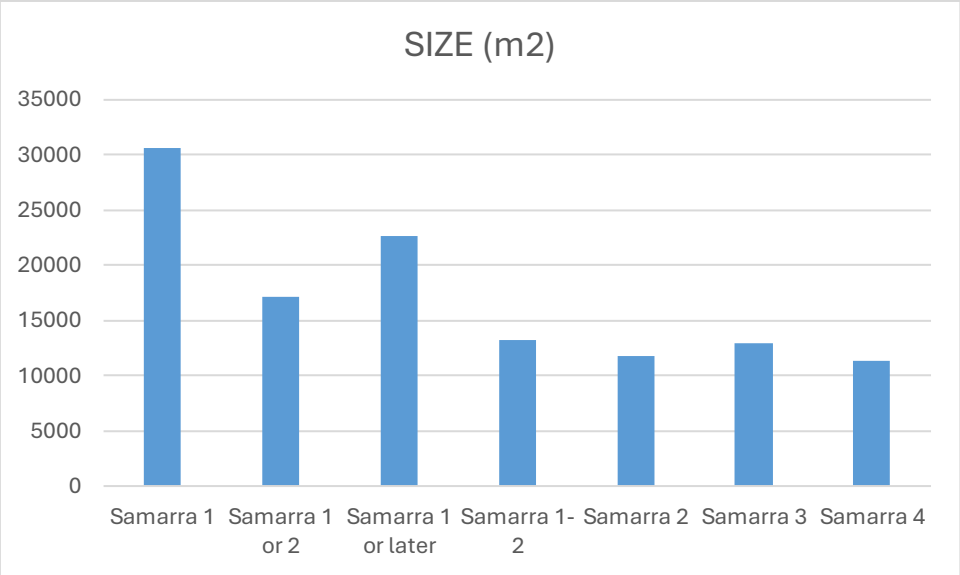


Figure 23: Time periods and average sizes of mansions.

When looking at areas (Table 10 and Fig. 24), the distribution of big mansions is concentrated mainly in cantonments, with areas K and F leading the table. However, it would be inaccurate to connect bigger mansions with cantonment palaces, as there are other military areas like M or U which are on the lower side of the table. However, I believe there is a slight trend that suggests that big mansions are more common in military areas; which speaks of the importance the military leaders had in Samarra.

area	Average Size (m2)
D	5348.5
L	5455
C	6069.8
M	6709.14
E	8639.67
G	9680.5
T	12769.44
U	13737
H	13779.28
R	14062.5
V	14616
Y	16234
X	16996.17
P	18122
J	20658.13
A	29640
K	32024.14
F	36055.5

Table 8: Areas of Samarra and average size of mansions.

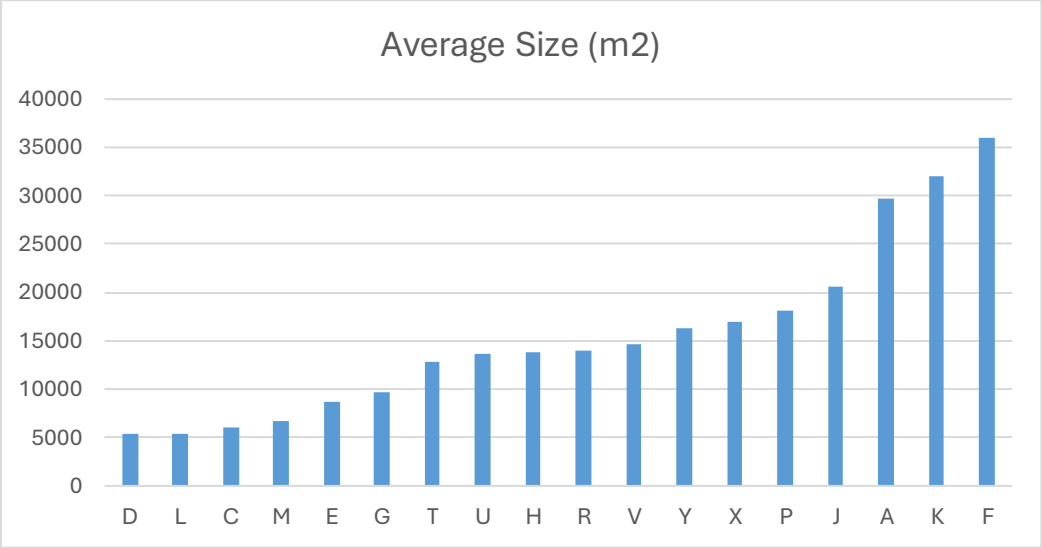


Figure 24: Areas of Samarra and average size of mansions.

The internal layout's origin: new and past theories

Sasanian Palaces

Derek Kennet, in the conference "Representations of Power: Palaces, Temples, and Cities in the Global Early Middle Ages", which took place in St Andrews in 2022, suggested that many of the palaces in Samarra reveal the repetition of three elements: courtyard, *iwan* and dome (Fig. 25). This model is seen in caliphal palaces like Dar al-Khilafa, al-Ja'fari or Balkuwara (Fig. 26) and in other palaces such as Sur Isa (Fig. 27), houses numbers 1-6. Nevertheless, there are other cases where only one or two of these structures are visible. Examples shown in Figs. 28 & 29 and those described in the non-caliphal palaces table are evidence of this.

This theory, the basis of the "central aisle" model, includes elements from Sasanian palatial structures. The first evidence of these structures can be traced back to the 3rd century, to the Sasanian Palaces of Bishapur, Atashkada and Qal' a-ye Doktar. These structures included a domed reception, courtyards and *iwans* (Westbrook, 2013, p. 356). The model was preserved in later Sasanian palaces, such as the palace of Shapur II, Qasr-e Shirin or Ctesiphon. These examples were constituted by an apsidal hall leading to an axially aligned courtyard (Daryaee, 2009) and a square central hall aligned axially with two consecutive courtyards (Canepa, 2021). These structures, while dependent on local traditions and local affordances, were also influenced by Roman palaces (Westbrook, 2013, p. 373). Some of the available evidence is the similarities with Roman peristyle courtyards, the reception halls, and the Greek-style stucco (Westbrook, 2013, p. 366). An upper floor, or at least remains that suggest a second floor, has been found in palaces/fortresses like Tepe Ozbaki, Taq-e Kesra, 'Ali Qapu, or Godin Tepe. This disposition has been traced to buildings in the Late Bronze Age (Encyclopaedia Irenaica: Palace Architecture) and continued during the Early Iron Age buildings (Hasanlu Teppe

– Young, 1966, pp. 48-71;) and the Achaemenid period (*Apadana* - Encyclopaedia Irenaica: Achaemenid Dynasty)

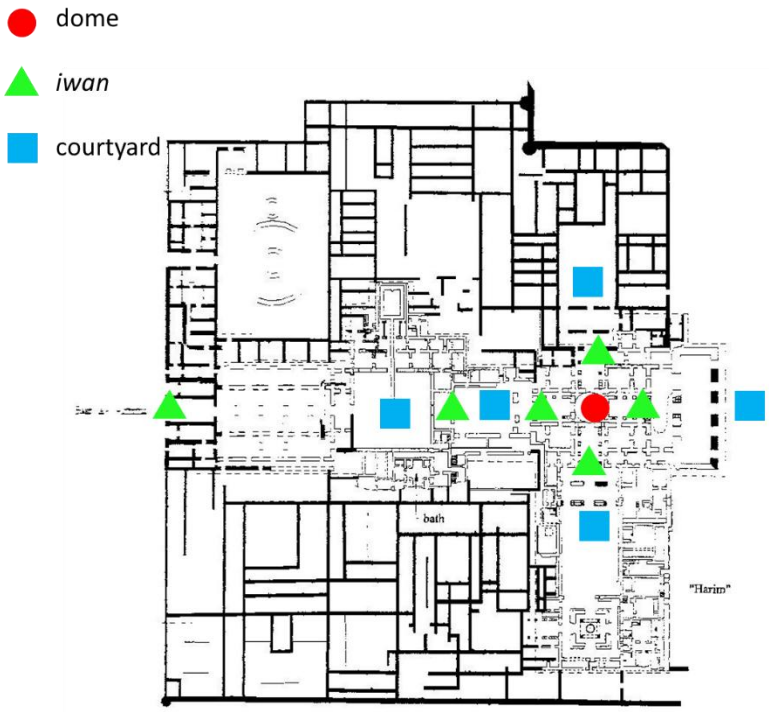


Figure 25: Image of Dar al-amma edited by Professor Derek Kennet in his lecture at St Andrews (Slice 15, Kennet, 2022).

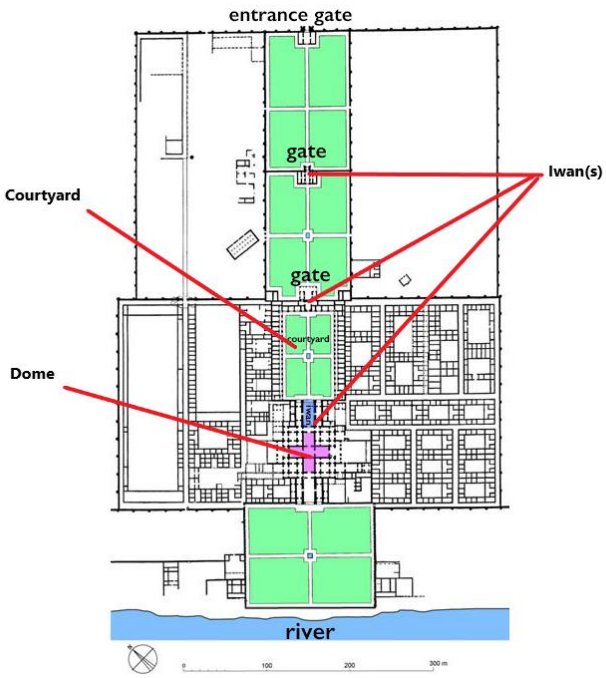


Figure 26: Palace of Balkuwara with the three discussed features highlighted.

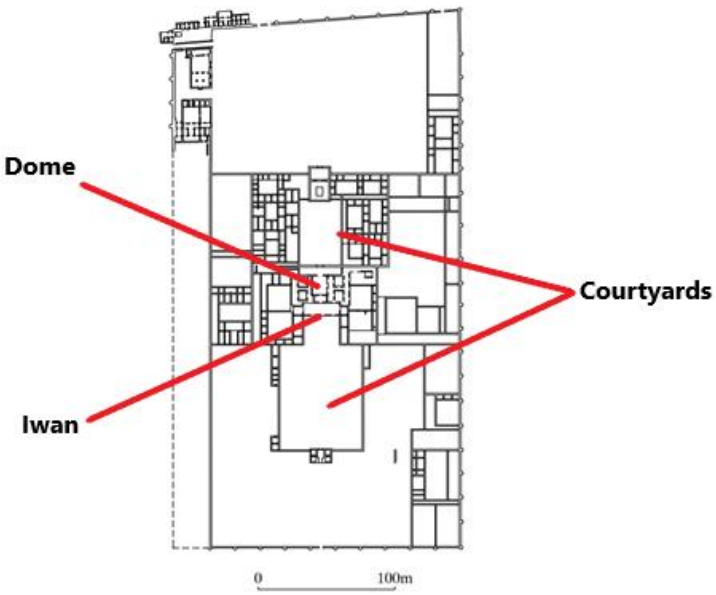
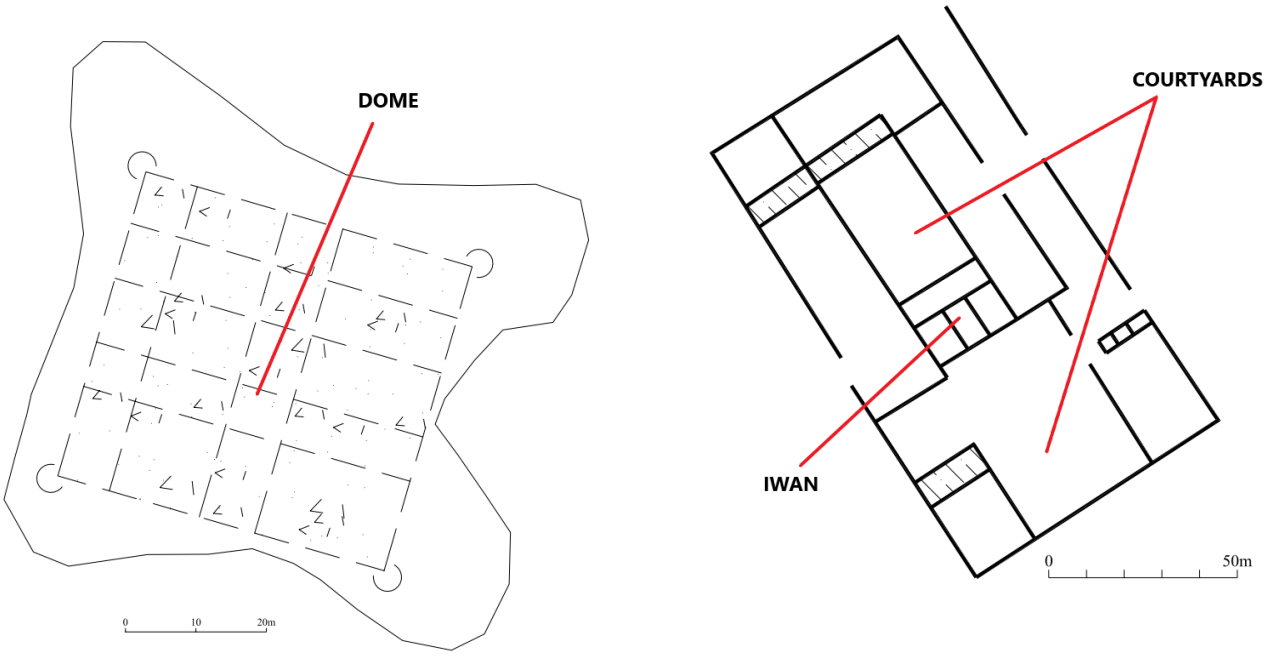


Figure 27: Palace of Sur Ishnas with the three discussed elements highlighted.



Figures 28 & 29: Non-Caliphal palaces of Samarra with highlighted areas. Northedge & Kennet, 2015.

Another element characteristic of Sasanian architecture is the *Chahar Taq.* This feature comprises four vault arches, and a dome in the middle is commonly found as part of broader structures of all different natures (Fig. 30). The *Chahar taq* has been found in religious contexts, as part of fire temples (Schippmann, 1972, p. 3), like the Azar Barzin Mehr Firetemple (Hoseini & Branch, 2012), or in a more secular environment, as part of palaces like in the palace of Firuzabad (Huff, 1971) or the Palace of Šāpūr I at Bishapur (Grishman, 1956). Due to the continuous use of the architectural concept of four axial arches with a dome, there is no conclusive evidence of what these structures might have been used for. During the pre-Islamic period, the chahar taq was used for the first time in Ardashir-Korra (Encyclopaedia Iranica: ARDAŠĪR-ḴORRA). Built by Ardasir before he became ruler, the structure included a cruciform plan. It would not be till the construction of the palace of Shapur I that the *Chahar taq* would be surrounded by an ambulatory (Grishman, 1956, p. 11 & Huff, 1972, p. 530). Other examples like Takht-I Suleiman, Kuh-I Khwaja, and Qal'ehi Yazdigigird would later follow (Bier, 1993). Palaces would be the only secular space where this feature appeared, and Caravanserais would also contain a *chahar taq.*

During the Islamic period, the *chahar taq* remained a heterogenous element of early Islamic architecture, present in mosques, mausoleums, garden pavilions and palaces (Encyclopedia Irenaica: *chahartaq*). It was usually accompanied by a dome in mosques and tombs (Encyclopaedia Irenaica: Domes). A few of the most important and relevant examples are those in the Samarran palaces: Balkuwara, Istabalat, Qasr al-Aseq and Jawsaq al-Kaqani, but it also could be found in kiosks (*kūšk*) in Tahmalaj, in the Marv region (Pugachenkova, 1958, p. 167) (Encyclopaedia Irenaica: *chahartaq*). In the mentioned palaces, the *Chahar Taq* would generally be placed in the throne rooms, which could be acceded from one of the four axial entrances, similar to Bisapur and Firuzabad,

where there was a domed chamber with four entrances leading to *iwans.* Nevertheless, the absolute incomprehension of the role of the *chahar taq* and its constant appearance on different types of buildings leads us to believe that it was not a feature reserved for palaces but rather a sign of power.



Figure 30: Chahar Taq of Atashgah (Niyasar). (Archnet).

A crucial argument towards the assimilation theory of Sasanian structure in early Islamic palaces is the presence of *Iwans* or *Ayvans.* This structure is possibly the most studied and commented on of the Early Islamic and Sasanian periods. The origins of the term and what we consider an *iwan* is the subject of debate, as it appears in the primary sources with different meanings. The first meaning is that of a chamber, space, or hall open from one side, the second one refers to an elevated part of a palace or royal building, and the third is directly to define a palace, as was the case for Ctesiphon (Tabari, II, p. 1056) and the fourth is in referral to the Mamluks description of the cities of Damascus and Cairo (Encyclopaedia of Islam: *Iwan*). For this dissertation, the term would be the one adopted by art historians everywhere (de la Plaza Escudero et al., 2023 & Ettinghause & Grabar, 1996; among many others), referring to the vaulted hall opened to one side (fourth side) and covered on the other three (Fig. 31). This concept, of Parthian origin, was widely used in example across the Sasanian empire (Mirsalami et al., 2021), being the *Iwan* in Ctesiphon the most relevant and most preserved (Fig. 32). As happened with the *Chahar taq,* the *Iwan* is seen both in a secular and religious context, where it is more common. However, we will focus on the first aspect.



Figure 31: Iwan of the Mosque of Isfahan (Wikimedia Commons).

In the Islamic period, the Iwan, generally in groups of threes, was used to separate the public from the private. It plays both a stylistic and symbolic function in that it accentuates entering a new world every time you advance through the rooms of the Abbasid palaces. Similarly, the dome, traceable to the Sasanian *Chahar Taq*, became not only the most inaccessible architectural feature but also, from the outside, the most distinctive, like the Green dome of the Palace of the Golden Temple.

Identifying the Sasanian palaces as the origin of the Abbasid structures is not exempt from certain complications. First, the information regarding the palaces is minimal, often restricted to inaccurate drawings, like the case of Imaret-I Khusraw (Oscar Reuther, 1938), Damghan (Schmidt, 1937) or even Bishapur (Salles & Grishman, 1956). Many of these plans and maps are without scale, like the Sasanian palaces of Kish (Bier, 1993, p. 57). The limited sources lead to the wrongful identification of features and connections with early Islamic structures; notorious cases include the completion of Khusraw´s plan with elements of Ukhaydir (Bell, 1914 & Bier, 1993, p. 59). Second, the activities within the palace are yet to be fully understood. The product of this situation is the constant re-categorization of structures, especially between the categories of temple and palace (Bier, 1993, p. 58). Inscriptions, such as the Pahlavi (Fatemeh, 2022), offer some insights into the religious nature of political power through the descriptions of rituals and sacrifices conducted by the royal family in Kaba Zardasht or with the evidence of two fire temples within the complex in Tepe Nush-I Jan. As Bier correctly points out (1991, p. 58), the presence of chapels would explain a more hybrid palatial model, something not always present in Abbasid examples. In the case of Samarra, mosques were not incorporated within the Caliphal residence or next to it, while in Madinat al-Salam or Ukhaidir, or even Umayyad examples like Tulul al-Ukhaider (Finster & Schmidt, 1976), the mosque was adjacent or within the enclosure. There is no real understanding of what a Sasanian palace was or what conditions the argument of its role in creating the Islamic palatial culture.



Figure 32: Iwan of Ctesiphon. (San Diego Air and Space Museum).

The repetition of architectural features or the continuation of the use of a space does not directly translate into the preservation of a Sasanian identity during the Early Islamic period. Various authors in the past have argued towards an Umayyad court that followed the Sasanian system (Grabar, 1952; Ettinghausen, 1972). Umayyad palaces, such as Qasr al-Hayr al-Gharbi and Khirbat al-Mafjar, both contain statues of members of royalty with Persian attires displayed on the façade of the audience hall (Northedge, 2011, p. 30). Moreover, the palace in Amman shows an arrangement of architectural features possibly more based on Parthian and Sasanian elements rather than local (Almagro, 1987, p. 183). The throne in this palace could be magnificent compared to Sasanian and posterior Abbasid examples.

In a more specific way, the Sasanian influence on the Abbasids has been assessed using Samarra as a case study. Northedge (2011) examined the use of spaces of Sasanian origin during the lifespan of Samarra and its different periods and changes. Many of the structures, such as the Sasanian palace, were incorporated by caliphs into the urban plan and used as references for their palaces, as in the case of al-Ja'fari. Other of the assessed were the hunting practices and their connection with the Sasanians, fundamental aspect of Samarran identity, which were described by Northedge as "It may be that the Abbasids at Samarra having inherited a tradition of Sasanian hunting parks, exploited them rather differently" (2011, p. 41).

The conclusion obtained from this analysis is that while architectural features continue, we cannot be sure that these spaces and constructions were used similarly. A combined evaluation of the *Iwan* and the *Chahar Taq* in both a secular and religious context would help understand the symbolism behind these two features.

Abbasid and Byzantine examples coexisted in time, allowing for an exchange of themes (Westbrook, 2013). This exchange did not only occur between Abbasid and Byzantine complexes but also between Byzantine and Sasanian. Some evidence of this last connection includes the palace of Shapur II with an apsidal and a courtyard similar to the Roman peristyle (Westbrook, 2013). Other examples are provided within this paradigm, including the palaces of Kosrow II and Ctesiphon. Westbrook argues that the probable presence of Roman architects at Bishapur, reception halls, a courtyard, and the stucco frieze is evidence of Western influence (Westbrook, 2013). I do not intend to analyse whether there is a Western influence in Sasanian structures or if this is just a product of looking at evidence from a Western perspective. As I have considered in this dissertation, when identifying specific patterns in palatial construction and assessing any influences, the simple repetition of a layout is not enough. In evaluating the Abbasid internal layout, I delved into the impression the architecture might have caused to a visitor, all within the context of each building and its reason for construction. The suggestion of Ancient Egypt was contextualised in a framework of interaction through the presence of texts, migrations and trade. To correctly argue about the communication of these two civilisations and the possible sharing of architectural knowledge, one must understand not only all of the parts of a palace but also its role within its political, social, and economic context. We are not entirely confident about the structure of a Sasanian palace, how it functioned or how people within the Sasanian Empire perceived it (Genito, 2016, p. 46). Moreover, the understanding of Byzantine palaces is minimal due to the scarce archaeological evidence, such as the Great Palace of Constantinople, and textual sources (Mango & Lavin, 1960).

Despite the study of Byzantine and Late antique palaces being more focused on its connection with Roman elements (Westbrook, 2019) and the Holy Roman Empire (Nicolai, 2019), it is worth briefly reviewing what the evidence might suggest for the relevance of Byzantine structures had on Abbasid palaces. Among all of the surviving palaces, such as the Palace of Antiochos, Palace of Blachernae, the Boukoleon Palace, or the Palace of Lausus, the one which matches the absolutism and grandiosity of the Abbasid caliphal examples is the Great Palace of Constantinople (Fig. 27). This palace, in use since the 330 AD, was built by Constantine I and became a symbol of Christianism and the Byzantine Empire (Coleman, 1968; Westbrook, 2006 & Klein, 2006). The main problem with this palace is that is now disappeared; there are no archaeological traces of it, and our interpretation is based on a 10th-century source, De Cremoniis, by Constantine VII. Despite this, efforts can be carried out to interpret the few available remains (Westbrook, 2006). Westbrook uses spoliation and ascriptions (p. 51) to trace a link with cultural forms and architectural features of the Roman Empire, among them, the centralised *triclinium* layout (pp. 51-52), but, admittedly, fails to understand the further evolution of the palace. In these lines, others (Cartwright, 2018) have adventured to list a series of spaces that could have been expected to be here, such as a throne room, audience and reception halls (the *Chrysotriklinos* and the *Magnaura* – richly decorated with gold (Brownworth, 2010)), roman baths, churches, a mosaic peristyle, a university, barracks for the army and a polo field.

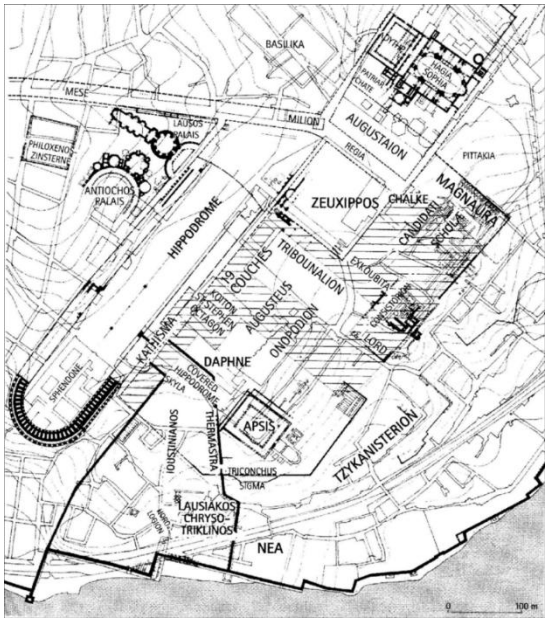


Figure 33: Great Palace of Constantinople (Featherstone, 2013, Fig 3).

The scarce archaeological evidence and its comparison to Abbasid examples can be, to an extent, complemented by an analysis of the surrounding buildings of the Great Palace. Interestingly, this palace was located next to Hagia Sophia, the point of peregrination and the physical manifestation of the power of Christianity (Sahin, 2019; Otzig & Adisonmez, 2023), and to the hippodrome, a place of chariot racing and other types of entertainment (Giatsis, 2000). In a comparable case, like Dar al-Khilafa, while there is a similar racing structure east of Mu'tasim's complex, the palace was separated from the Friday Mosque and connected via an avenue. The religious component of each of these political models is not the topic of this dissertation. Thus, it will not be considered here, but the differences between each complex are apparent, and it seems there is little evidence of the adoption of each other's palatial culture.

Umayyad Palaces

In previous scholarly work (Hillenbrand, 1994), the two palaces described as closest to Abbasid complexes are Mshatta and Khirbat al-Mafjar (Hisham Palace) (Fig. 34).

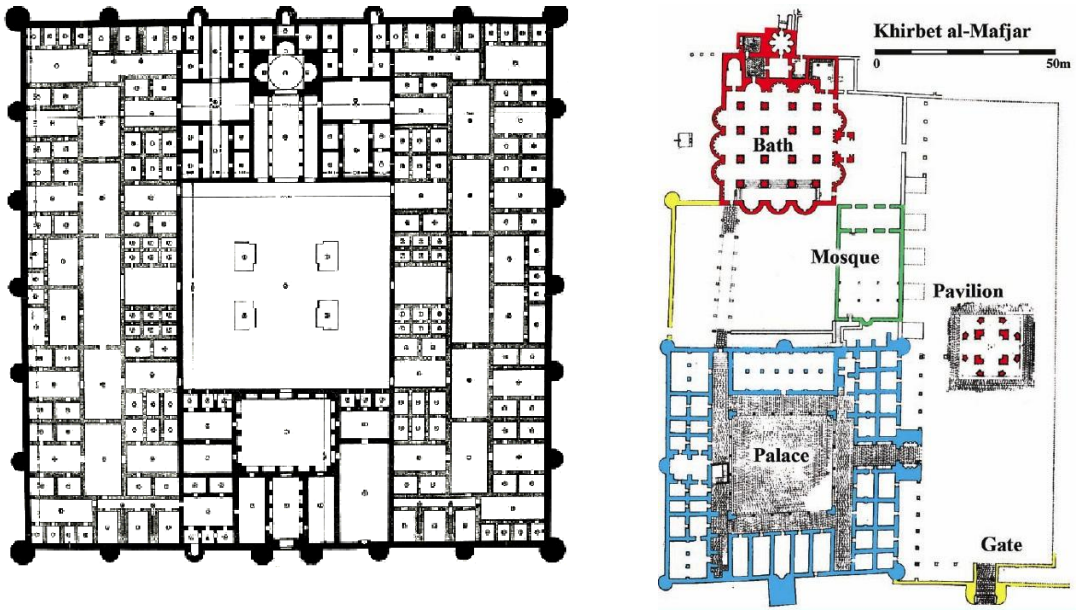


Figure 34: Palaces of Mshatta (Left – Schulz, 1993) and Khirbat al-Mafjar (right – Whitcomb & Taha, 2013).

Mshatta, built during the short reign of the caliph al-Walid II, is a 144 square meters palace made of baked brick delimited by walls 3-5 meters high and twenty-five towers. The interior presents a clear "central aisle" model, with a consecution of courtyards similar to Ukhaydir. The entrance to the south leads to an entrance hall and a small courtyard, with a mosque to the east and living quarters to the west. In the centre of the enclosure and following the central axis, the central courtyard is the palace's core. To the north, a triple-arched gate led past to a colonnaded hall with a triple *Iwan*, which marked the entrance to the Throne room, a space with a vaulted brick roof. As in previous examples, the caliph and his family's residential quarters are located west and east of this space. The lateral sides of the enclosure are characterised by a series of courtyard apartments connected in an N-S axis. Mshatta has drawn the attention of numerous scholars (Creswell, 1989; Hillenbrand, 1994, pp. 385-390; Rollind & Streetly, 1998, pp. 201-214 & Yeomans, 1999, p. 39), not only for its plan but also for its southern façade (Fig. 29). The floral geometric and animal themes, which have been used to link this enclosure with the Sasanian and Byzantine models (Meinecke, 2014), are now exhibited in the Museum for Islamic Art in Berlin.



Figure 35: South Facade of Mshatta (Museum of Isalmic Art, Berlin).

The Palace area of Khirbat al-Mafjar, built by al-Walid II in the Wadu al-Byway'ima (Jericho, Palestine), was a doubled floor enclosure with a very similar layout to Mshatta. The main differences are the more minor extension of the "side aisle", a less complex distribution of the courtyard apartments and a generally different orientation. Like other palaces, it had an attached mosque, but in this case, the baths were located outside the main palatial area, almost the same size as the central courtyard. The baths are characterised by mosaics preserved in situ (Fig. 36) and a distribution similar to Roman baths (Hamilton, 1949). Outside of these famous examples, other palaces with identical layouts were built during this period, such as the Palace complex of Kufa (Fig. 37).

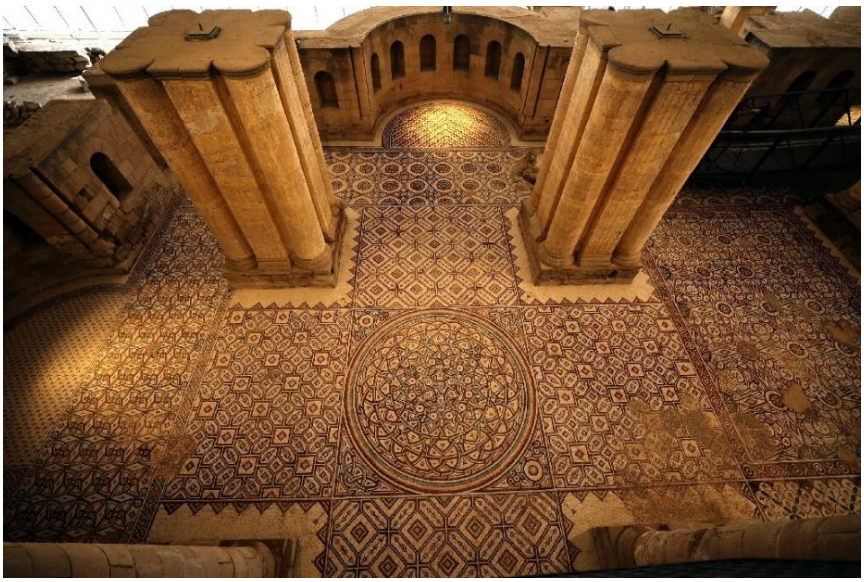


Figure 36: Mosaic of the bath complex of Khirbat al-Mafjar (Phys.org).

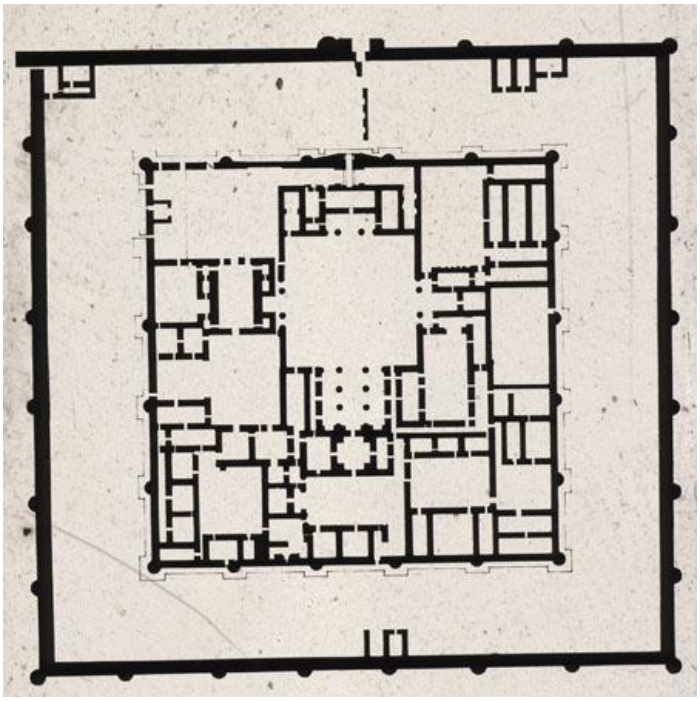


Figure 37: Palace of Dar al-Imara, Kufa.

While the beautiful Although the aments, size, and layout of the Umayyad palaces may suggest that they were similar to the Abbasids, Mshatta, Kufa, and Khirbat al-Mafjar are the exceptions (Hillenbrand, 1994, p. 385). Hillenbrand argues that these palaces are the product of al-Walid II's preference and love for palaces. This reinforces the idea that the Early Islamic examples are highly variable and that Jabal Said or Usais are better examples (1994, p. 385).

The desert *qasrs,* previously introduced, were common in El-Sham and created by the Umayyads as part of their effort to control the landscape through irrigation (Genequant, 2020). Genequant, in his chapter, argues about abandoning the term palace or castle and pushes for the use of "Umayyad aristocratic settlement" (p. 240). This argument comes with certain complications; first, the separation between palace and aristocratic settlement, in reality, makes no sense. Irene Winters states in the first lines of her paper Seat of Kingship […] (1993): "By folk definition, the palace is where the ruler resides". Maybe, a more appropriate definition for the Early Islamic context would be: "The palace is where the elite resides". Moreover, we cannot assume that just because a building is not of monumental size or shows the luxury proper of a wealthy caliph, it is not a palace. As Western scholars, we need to abandon preconceptions that we might have inherited from our own culture regarding elite structures and broaden our understanding of a palace.

The functions performed by these enclosures vary from possible hunting lodges, summer emplacement for the caliph and the royal family, and agricultural states. This heterogeneity is straightforwardly portrayed in the layout in cases like Jabal Said or Usais, mentioned by Hillenbrand, Umm el-Walid, Qasr al-Hayr el-Gharbi, al-Humayma, and many more (Fig. 38), they all tend to have the same layout: a porticoed many courtyard with rooms that were interconnected to each other (Fig. 39) (Hillenbrand, 1994, p. 388). It is clear that these structures are very different to Abbasid rural structures like Ukhaydir,

and while the plan could be compared to some structures in Samarra, its simplicity (Almamoori, 2015), its popularity among different parts of the Islamic world and further (Zhang, 2020), its convenience for the climate of the region (Sthapak & Bandyopadhyay, 2014) and difference in purpose seems that there may be no direct correlation

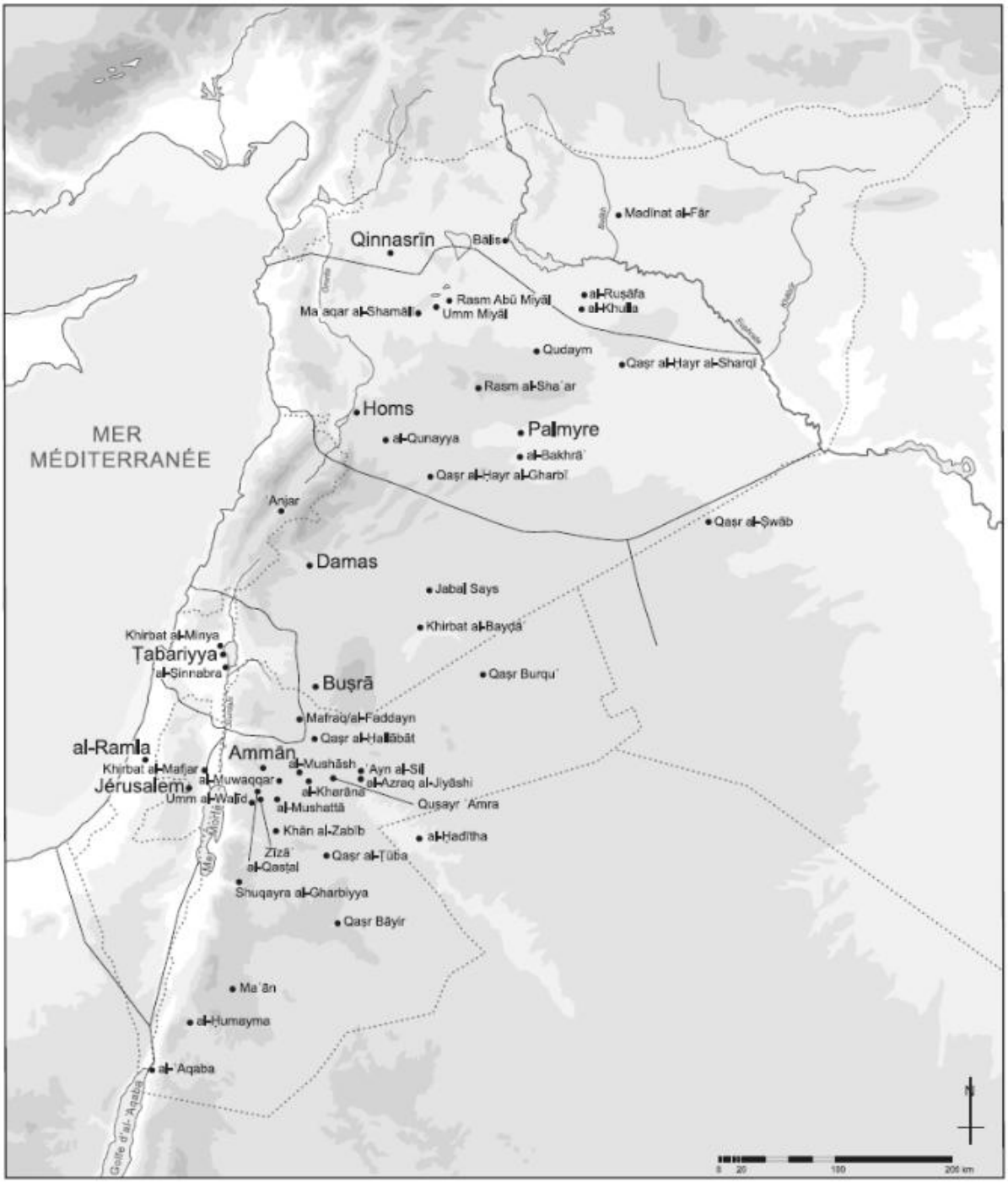


Figure 38: Map of Desert Qasrs in El-Sham (Genequand, 2020, p. 241).

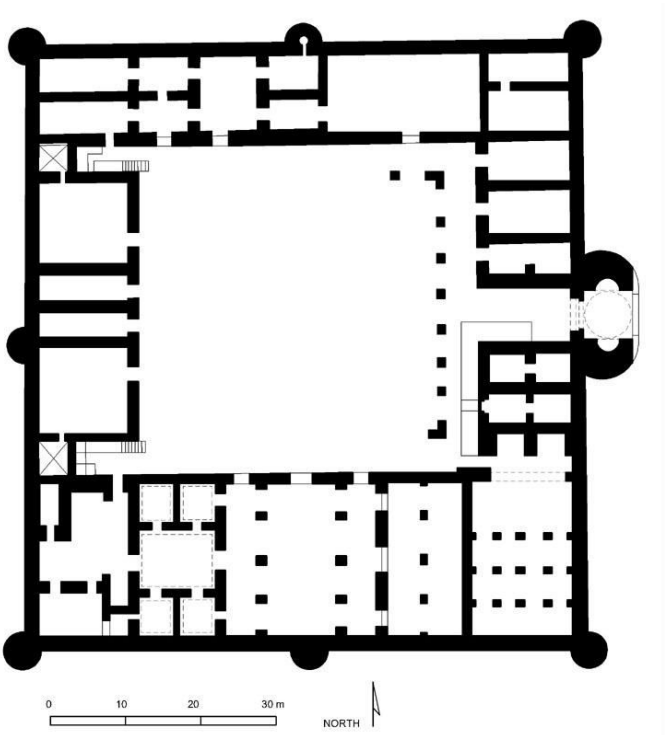


Figure 39: Qusur al-Umawiyya. Archnet.

Some examples follow this same layout but are bigger and better accommodate the definition of a palace, like Khirbat al Minya. Other rural palaces, like Tulul al-Ukhaider, present a more elaborate yet irregular plan (Fig. 40).

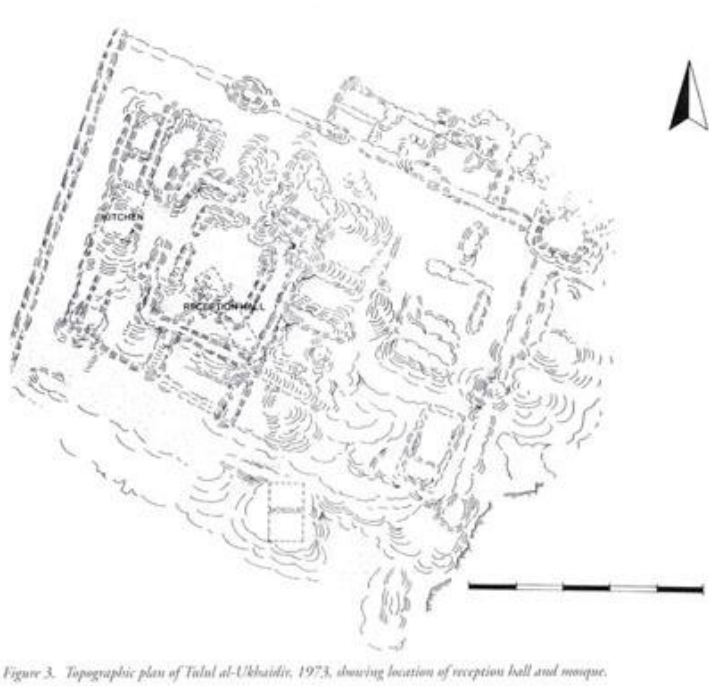


Figure 3. Topographic plan of Tulul al-Ukhaidir, 1973, showing location of reception hall and mosque.

Figure 40: Palace of Tulul al-Ukhaider. (Finster & Schmidtt, 1986).

One possible interpretation from the comparison between desert palaces and the palaces of al-Walid II is a transition towards using palaces reflective of growing absolutism. From a type of palace that lacks proper light entry points to enormous complexes with intricate baths, there has been a change in how the people conceived a palace. It is theorised that this model inspired the Abbasid Caliphs to do their monumental structures, among many others. Another interpretation, probably less feasible, is based on the versatility of the term palace. There does not have to be a linear modification of the palatial culture (from small and humble to monumental and luxurious) but just that these buildings were conceived as different palaces and, therefore, not replicable in urban contexts. Envisioning the idea of "types of palaces in the Early Islamic World" as a chronology with homogenous and organised changes might not be the most appropriate way of dealing with a group as varied and ample as this. Therefore, the alleged rejection of Abbasid palaces to Early Umayyad forms and the continuation of later Umayyad forms might not be based on a timeline but on the Abbasids' perception of Umayyad palaces and power depiction.

Ornamentation, material and decorative architecture

In most cases, the chosen materials, baked and raw mudbrick, have been the subject of recent discussion (Saba, 2022) regarding the relevance of impermanence and how it affects the legacy and message these palaces want to transmit. The idea of immortality and power through architectural perdurance is a constant in multiple civilizations, and it is, to an extent, reasonable to question other possible dynamics. Nevertheless, the use of mudbrick in early Islamic constructions goes back to the times of the Prophet, as palaces, markets, and residential buildings in Medina have been found to be made of mudbrick (King, 1991, pp. 99-100). The first Mosque in the Islamic faith, thought to be Muhammad's own house, was built in mudbrick (King, 1989, p.75). Therefore, this material has a symbolic value beyond the purely architectonic. Other examples of palaces in the Early Islamic period, such as Ukhaydir, Mshatta, the Palace of the Golden Gate or Al-Ahmadi, were built with raw/fired mudbrick. Even when looking at the origins of these structures, this material choice matches a building tradition visible since the Ancient Near East (Erarslan, 2020). Moreover, the rapid construction of Samarra, its size and vast extension did not permit, even during a period of total control of the Caliphate, the import of stones, which were mainly unavailable in Iraq and only visible to a reduced extent in Northern Mesopotamia due to its proximity to the mountains (Shareef & Sani, 2021).

The ornamentation in Early Abbasid palaces is a crucial part of the idea of restrictive architecture. Although important, the study of ornamental features is minimal due to the poor archaeological record and restricted to the caliphal palaces. Specific materials have been recovered from the pillared hall and domed chamber of Dar al-Khilafa, as well as other monumental palaces such as Balkuwara and al-Haruni. Other sources like *Muruj al-dhahab* or *Kitab al-hadaya wa'l-tuhaf* (discussed by Northedge, 2005, pp. 29-32 & 267-358), describe the palaces of Samarra as richly decorated. The following table includes the multiple pieces of evidence discovered.

Decorative stone pavements	Wooden ceilings with carved and painted decoration
Ceramic tide pavements and revetments	Furnishing
Wall panels	Glass inlay components
Stone columns and column capitals	Glazed tiles
Decorative moulding, including carved stucco and carved marble	Glass mosaic (*millefiori* technique)
Wall paintings	Coloured glass window.
Wooden doors with carved decorations	Gold leaf and mother-of-pearl

Among these, stuccos are the most famous and relevant to the broader study of Islamic decorative architecture (Samarra Horizon). Usually, the stuccos depict a series of different scenes, including vegetal motifs, geometric patterns, and human and animal representations in rarer cases. Herzfeld recognised the different stuccos during his excavations in Dar al-Khilafa and decided to group them into three distinct groups (Burgio et al., 2007) (Fig. 41). The first has vegetal motifs in deep relief, including vine leaves within hexagons surrounded by geometrical patterns. The second combines various vegetal types with elongated geometrical patterns. The third is the bevelled style, characterised by abstract drawings and bevelled cuts. The best example we are currently aware of is the reception hall of Dar al-Khilafa. According to Herzfeld pictures and further research (Northedge, 1993; Northedge, 2006; Saba, 2015), this space was decorated with stucco panels painted in blue, with white marble, blue mosaics (millefiori technique) and friezes. The dome, probably made of wood and decorated with beautiful blue and gold friezes, would contain a series of windows providing the enclosure with natural light. When looking down, a stunning mosaic made using the *opus sectile* technique would contribute to elaborating an intricate space full of decoration and influences from diverse locations.



Figure 41: The three styles of Stucco in Samarra. A, B and C (from left to right). (MIT).

Some *qadis* talk about the importance of marble, a common element in Greek architecture that imitates water flowing and creates a paradise in the desert and a recurrent theme in Samarra. Golds and pearls are mentioned in these written sources and directly oppose the architectural record. Another common element was the Solomonic themes (Milwright, 2007, p. 179; Northedge, 2008, p. 284), present in the use of precious metals by the pools, as was the case of the Palace of al-Burj. Another text source that corroborated the magnificence of the Abbasid palaces is the visits of Byzantine ambassadors (Milwright, 2007, p. 179). There is also evidence of the continuation of Umayyad and Sasanian craftsmanship using glass mosaic cubes found in mosques and palaces and stucco layers on the walls (Milwright, 2007, p. 182 & Debevoise, 1941, p. 45). Concerning Ancient Egypt, the rulers chose to use human figures, generally of enemies, to portray their power, as is the case of the palace of Malqata with a figure of the king with two slaves (Pagliari, 2011, p. 106). A similar idea was used in the thrones and audience halls, like the Palace at Medinet Habu (Holscher, 1941, fig. 19, 30 & 31). Stucco was also used widely in Ancient Egypt, and some patterns like the lotus flower and other vegetal motifs originated in Egypt and then moved to Mesopotamia (Debevoise, 1941, p. 50).

The archaeological record demonstrated that the isolation of Samarra was a problem in the importation of marble, stone, or wood (timber), which was commonly available only to the wealthiest members. The themes of surfaces included abstract designs, imitation of veined marble, human figures, animals and vegetative forms. It is nevertheless unwise to extrapolate the complexity of these decorations to non-caliphal palaces, smaller caliphal examples, or complexes outside of Samarra. It is, however, too early to affirm that each palace had a different decoration, as common themes or techniques could be found.

The rest of the information available is minimal, although it gives us an approximate image of how a few very selected palaces might have looked but does not allow generalisations. Some carving styles originated in Samarra, specifically Style C, and were repeated in wood carvings and door carrying across the caliphate (Eittenghausen & Grabar, 1996, pp. 117-119). The decorative architecture has a certain consistency, with elements added with the adoption of bigger palace sizes. The palaces of the 8th century are scarce, and only enough data is available on two of them to carry out an exhaustive analysis: The Palace of the Golden Gate in Madinat al-Salam and Ukhaydir in Karbala. The share techniques, the presence of heavy pillars forming arched niches in vaulted rooms, as well as the use of blind arches for the decoration of large spaces and surfaces, traditional for the Sasanian sources (Eittenghausen & Grabar, 1996, p. 91). In the palaces of Samarra, the significant change of size brings the use of monumental doors, generally formed by a brick three-way entrance. The vaulted rooms and the domed chambers are sustained by wooden (timber) ceilings, accompanied by gardens and fountains, maintaining the idea of palaces as a paradisial location preserved through the early Abbasid Period.

Abbasid dwellings

The archaeological analysis of Abbasid or early Islamic houses has been limited, including both a landscape and an architectural approach. Regarding the transition from late antiquity to early Islam, the Rashidun and Umayyad settlements of North Africa have been surveyed and studied on multiple occasions by scholars like Leone (2007, 2013), Walmsley (2007) or Fenwick (2013). These publications are, however, within a specific framework: Leone's and Walmsley's work focuses on the transition and evolution of urban landscapes from late antique to early Islamic, while Fenwick's traces the effects and urban evolutions in a transitional period in the landscape (650-800 AD). Neither tries to create a typology of the Abbasid or the Early Islamic house. Probably the closest someone has come to creating a comprehensive typology of the homes and dwellings of any period within the Early Islamic period is Samihah Wi'am Baz (2023). In her book "Early Islamic Homes", Wi'am offers a catalogue of domestic structures, including Amman, Jarash, Nahal Mitnan, Pella and Umm el-Jimmal, followed by a short and rather insufficient 21 pages discussion of the archaeological material: building material, building layout, function of household and relation of the building to street. While this work is promising, the author clarifies the limitations of this work (p. 108): "Further study is required to reconstruct an exhaustive catalogue of housing in both urban and rural sites from this period". Although I will return to the theories and evidence present in this and other publications, I wish to briefly discuss what the textual sources tell us about Abbasid dwellings.

In the first chapter, I briefly address how houses and their location remarkably depict Abbasid society. The house was usually composed of one or more stories, depending on the social class and location (Ashan, 1973, p. 370). The Flat-roofed houses were typical in different places (Ashan, 1973, p. 373), and later, the Hira style became the most common among elite housing (Ashan, 1973, p. 373). The general size conditioned, in many cases, what features the dwelling would have. For example, the bigger examples in Baghdad enjoyed a garden (Mas'udi, *Muruk al-Dhahab*, VIII, p. 31). Within the house, the historical sources (al-Raqiq al-Nadim, *Qutub al-SUrur fi awsaf al-khumur*) tell us about the space meant for the visitors, denominated Dihliz. Ashan (1973, p. 375) argues it acts as the intermediate space between the external and internal parts of the house. Interestingly, a similar space can be found in modern-day Andalusian houses denominated *Zaguan*, from the Arabic *usṭuwān*.

The houses, as the palaces, were decorated with stucco (Milwright, 2017; Creswell, 1979, 243 & 258; Dahmani, 2015), with friezes and cornices in the ceiling (Ashan, 1973, p. 377) and ornamented (in different styles windows and door frames. The material was subject to the social hierarchy; some buildings used raw mudbricks, others were kiln-burnt (*ajurr*) and other were sun-dried bricks (*libn*). This material was largely available on the shores of the Tigris, is an excellent insulator (Binici et al., 2007) and presents malleability (Love, 2013, p.272). In the east, probably due to local affordances, other materials like stones, tiles, gypsum or wood were common in house building (Ashan, 1973, p. 381).

The plan of the houses, while some authors like Kühnel or the publications from the Iraqi Department of Antiquity (*Hafriyat Samarra* (1936-1939)) or even textual sources like Al-

Ya'qubi (*Kitab al*-Buldan, ET pp. 96-97) argue that the plan is very similar, the data collected by Northedge & Kennet (2015) demonstrates either way. The group of buildings labelled as "House" by Northedge & Kennet (2015) correspond to those excavations by the Directorate-General of Antiquities (or the German expedition). Fig. 42 shows three examples of these dwellings: H7, H8, H356. Fig. 43 shows multiple examples of the 1911 German expedition: K29, H14, H27, and J6. Even in this incredibly reduced sample, the disparity in size and layout is visible. Some present the "central aisle" model; others have a central courtyard, similar to a Roman peristyle; others show a two-room layout, and others have irregular quarters. The differences also grow when we move to the total sample, 1874 structures identified by Northedge & Kennet (2015) as groups of small houses.

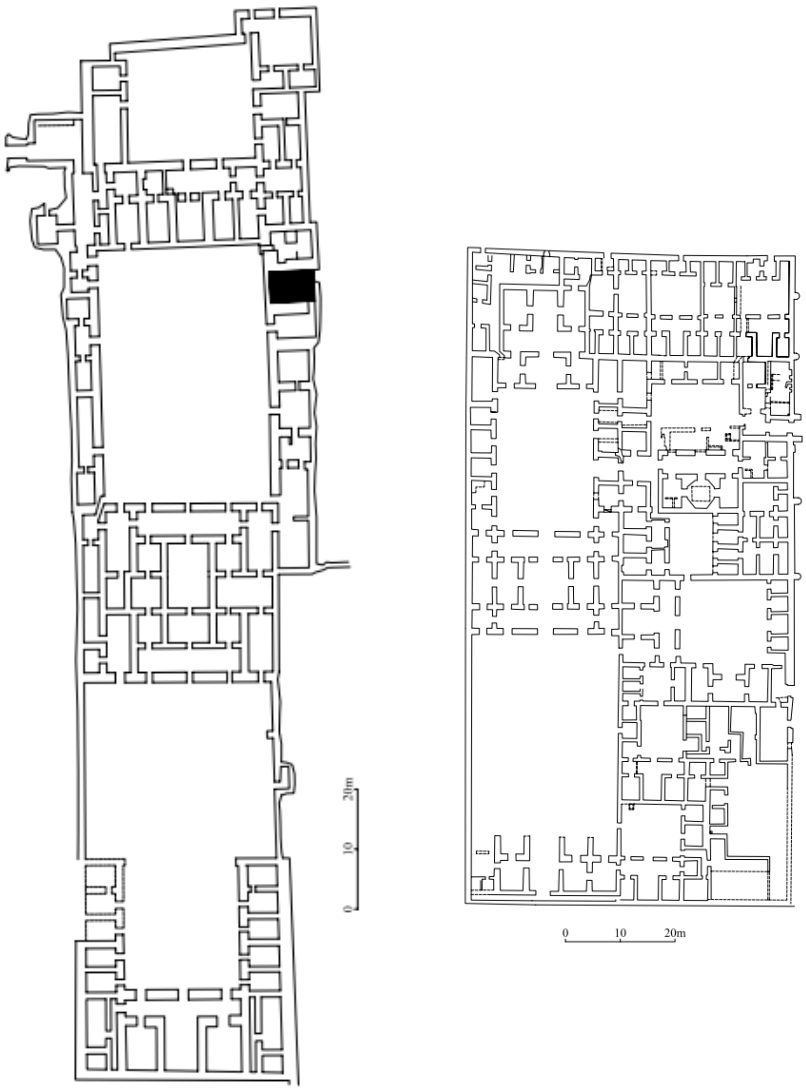


Figure 42: From left to right, H356 (House no. 3), H7 (House no. 4), H8 (House no. 1). Drawings from Northedge (2008).

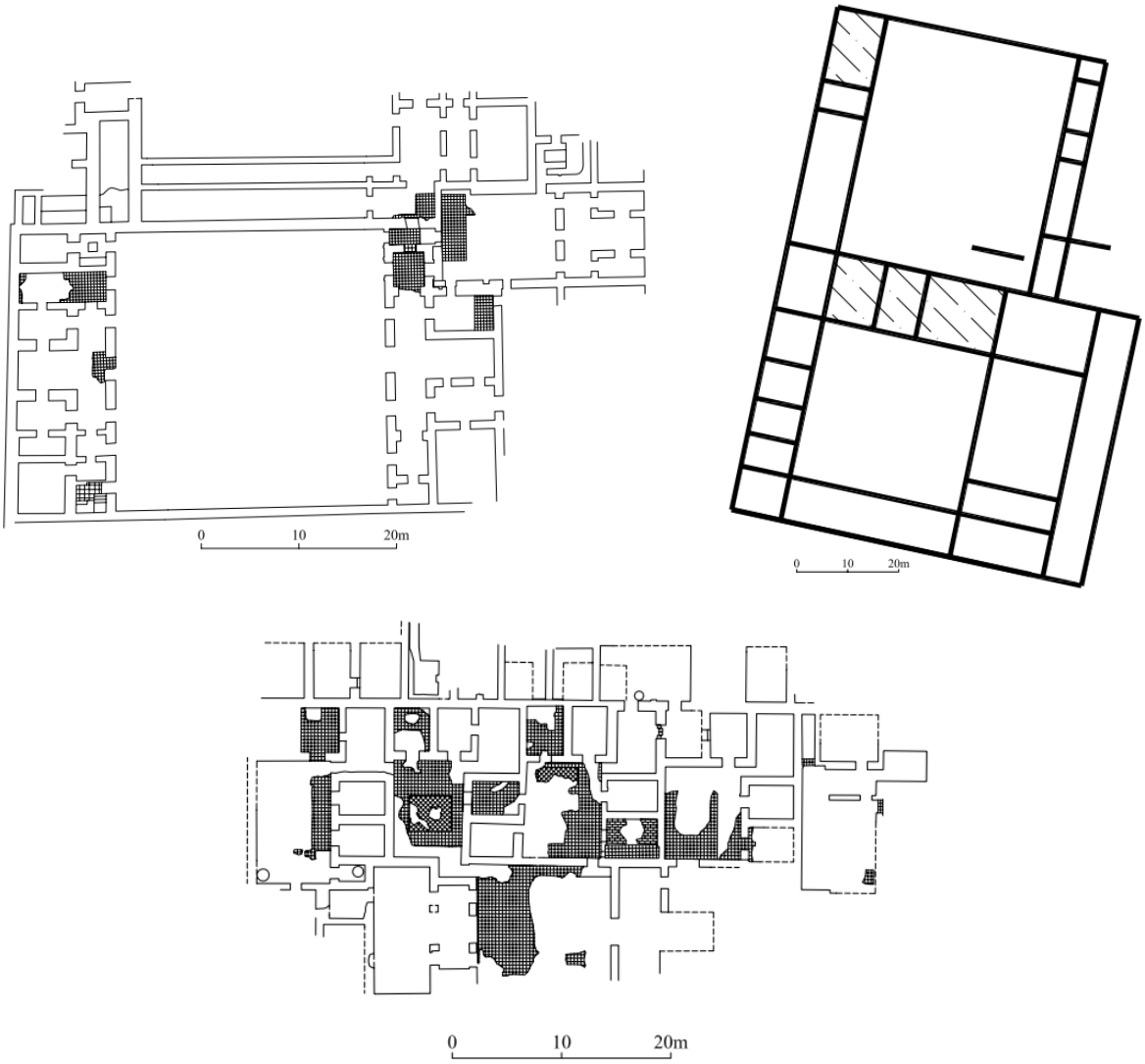


Figure 43: From left to right, K29, H14 , H7. Drawings from Northedge (2008).

Many of the cited cases present domes (octagonal), with *Iwans* or porticoes with reception blocks, no clear separation between private and public areas (with some exceptions such as H7) and one of the various styles of stucco identified by Herzfeld, mainly Bevelled Style. The material culture is incredibly restricted, with most pottery restricted to kilns or pre-Abbasid structures like Tells or Sasanian enclosures (Northedge & Kennet, 2015, p. 5; Falkner, 1988). In this chapter, I do not intend to create a solid typology of the Abbasid house in Samarra and elsewhere (something I am pursuing in future publications) but instead show through archaeological evidence the profound variability of these dwellings. Outside of Samarra, some other examples of Abbasid housing (although not to the same extent), such as the residence in Hisham Palace. It is known that the Umayyad palace complex was used as an agricultural state between 730 and 950 AD. On the north side of the complex, some meters apart from the bath, there is an elite Abbasid dwelling (Fig. 44). The plan (Fig. 45) includes a central courtyard (A), rooms designated for women

where cosmetics have been found (E and F), private rooms and halls (B and G), a toilet (H), and storage and cooking spaces (H and J) (Al Nasher in Sparks et al, 2019, p. 309 (Figure 9)). The applicability of this layout to Samarra or other examples in the Abbasid Caliphate, urban or rural, is still unclear. Including more examples outside of the Middle East (for example, from North Africa and the Caucasus) will help understand any possible points in common.



Figure 44: Picture of the south wall of the Abbasid house. Picture taken by me in Jericho, Palestine.

Outside of The Abbasid period, Wi'am (2023, p. 80) argues that in the Umayyad period, the courtyard acted as a central element of the building, concentrating all the features like drains or cisterns needed to habit the house. With five sites from Jordan-Palestine, she argues that rooms are separated into pairs depending on the function (p. 89). The separation between public and private, as well as agricultural/stabling/industrial activities and living spaces in these examples, seems to be something we see in the Abbasid house in Hisham.

Very briefly, Wi'am talks about the relationship between buildings and streets, something of incredible relevance to this dissertation. Due to the discussed examples, segments of this subchapter are dedicated to the relevance of Roman and Vitruvian use of spaces in the cities like Jarash or Pella during the Islamic period (p. 94; Walmsley, 1996, p. 143), with the consequent of "privatisation" of the public space; something already present during the vandal period in North Africa as discussed by Leone (2013). In some cases, avenues or streets would not change (Wi'am, 2023, p. 95).

The connection with the classical period seems clear. The use of the courtyard as the central piece, organising the rest of the layout with specific-function rooms, is recurrent in Roman houses from the west and East (Hales, 2003, pp. 1-8). In cities with a Roman past, the relationship between Islamic and Classical architecture seems relatively

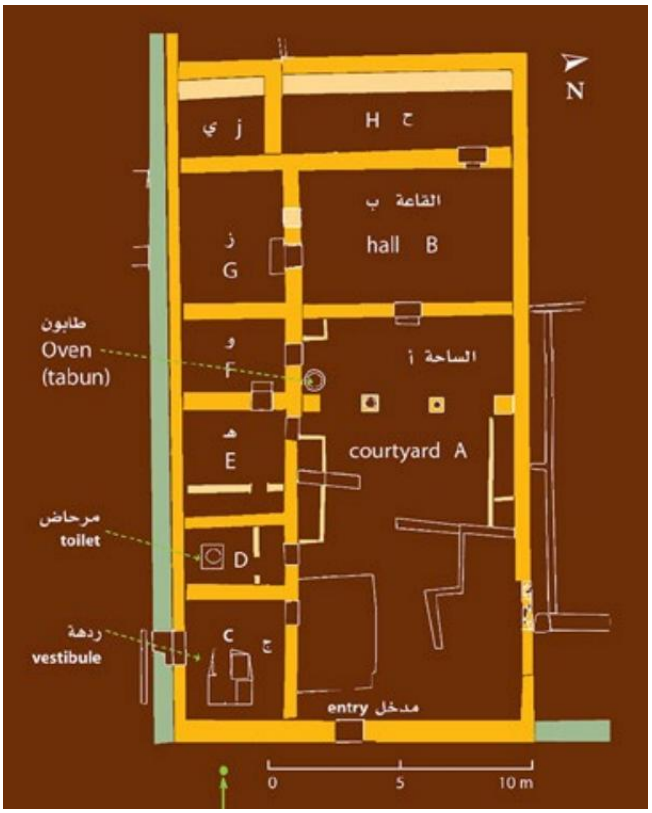


Figure 45: Plan of the Abbasid House in Hisham. Sparks et al, 2019, p. 309 (fig. 9).

straightforward, but the question is whether this is replicable in locations without Roman presence. In other words, and more relevant to this dissertation, can we trace Roman or classical influence in Samarra? This same principle applies to other cities newly formed in the Early Islamic World, such as Fustat or Raqqa. Moreover, we must not discard the possibility of different civilisations influencing the Abbasid home. The courtyard as a pivotal element of the house is present in diverse periods in Ancient Mesopotamia (House at Ur Al-Dawoud, 2006 in Abbas et al, 2016; Penn Museum, 1927; Pfälzner, 2001,p. 91 Jabel Aruda – Driel & Driel-Murray, 2023), Ancient Egypt (Moeller, 2016, Chapter 9), or Hellenistic civilisations (Nevett, 2023, Chapter 7) (Fig. 46). Moreover, if we introduce a second story in the equation, something that might or might not be present, the model can vary significantly. The courtyard house is present in various societies across different periods (Edwards et al., 2006), and its use as evidence of architectural influence might be inadequate.

Other aspects of the practicality of this layout should be considered (Abass et al., 2016). The courtyard model, independently of its origin, is a highly functional layout that provides all rooms in the house with daylight and constant airflow (Zamani et al., 2018). Studies (Soflaei et al., 2017; Edwards et al., 2005, Chapter 14) have also focused on the positive environmental impact that the courtyards have. Whether the Abbasids were aware of this model's past use or they just knew it worked is still unknown. As happens nowadays, the citizens of Samarra probably had individual preferences regarding their houses, which would explain the disparity in their layout (see Appendix 4). This bias could be based on the knowledge passed down from past civilisations, specific needs that needed to be accommodated (family size, crafts, etc.), personal taste, or a combination of

all. Abbasid residences include a high degree of complexity and variability that, in combination with complex urban planning, requires further analysis.

To fully comprehend the extent of the nature of Abbasid dwellings and houses, we need to move beyond a simple (although necessary) layout analysis. Moreover, as I hopefully have argued here, the architectural influence does not always have to be with the closest civilisation. Just because Baghdad was built next to Ctesiphon, we cannot conclude that Sasanian themes were present in the Abbasid palaces. As is the intention of this dissertation, including architectural/archaeological and spatial analysis offers a thorough interpretation of how buildings were built and why they were built like that and in that specific location. Processes of urbanism can be highly complex, and house building is a product of an individual and collective perspective on how life was meant to take place (Cowgill, 2004). With this idea in mind, I want to discuss this premise in the following two chapters in the Abbasid context through the study of Samarra and its residences.

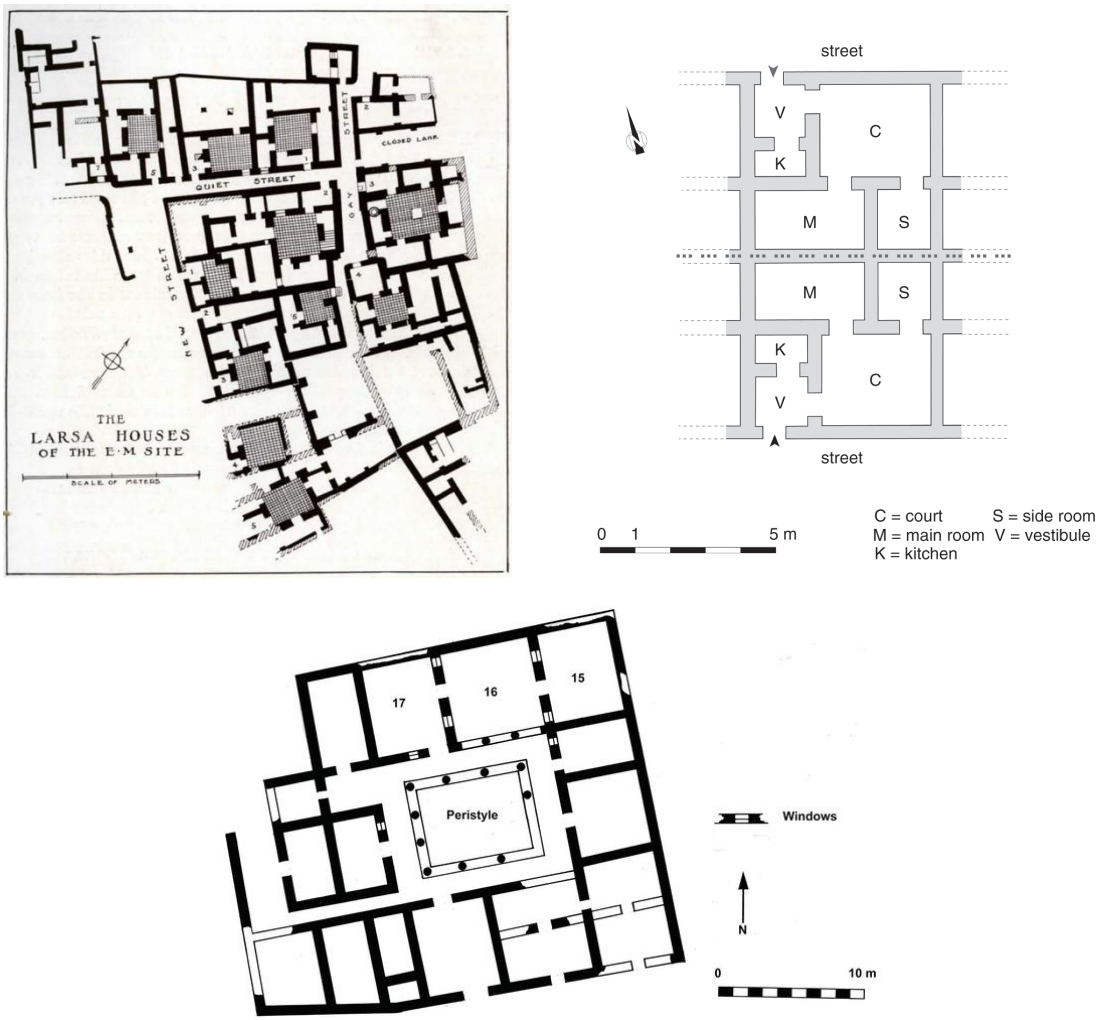


Figure 46: Examples of houses from Mesopotamia, Ancient Egypt and Hellenistic civilisations. See citations above.

CHAPTER 5: PATTERNS IN HOUSE SIZE AND LAYOUT AT SAMARRA

Defining the Samarran house is no easy task. The levels of current destruction, use of 1950s imagery and lack of archaeological excavation delimits the extent of what we can learn from the Abbasid capital. Moreover, some of the current plans are based on weak interpretations of the remains that might not portrait the real space division. Nevertheless, a dataset this big deserves to be properly addressed and studied. As the buildings categories Mansion (1-5) and House were linked with an urban elite (civilian and military) or middle-high class, the classes block and blocks are understood to be inhabited by a lower class or soldiers. The use of space remains the biggest challenge in this section.

Size is key for this analysis, with the use of Gini coefficients and quartile differences as main methodology. This is complemented by the evaluation of the visible layout, which includes shape, distribution of rooms and presence of courtyards, and water features (basins and cisterns). The evidence shows a highly heterogeneous plan, with elongated rectangular shapes more common within cantonments and irregular or rectangular shapes across the rest of areas. Courtyards remain key, as happened with the mansions and palaces, but are found in different sizes and shapes.

Size

The first step is to measure the disparity between the different areas. I employ statistical methods, including quartiles and standard deviation, to uncover patterns within the urban plan. The data used here are listed in Appendix 4.

AREA	MEAN	MEDIAN	S. DEV.	Q1	Q3
A	5511	5021	3154	3147	7676
B	5177	5177	795	4896	5458
C	5753	4764	4850	2420	6168
D	7819	7116	3911	5615	8313
E	4727	3381	3765	2187	6023
F	7900	6228	5123	4116	10900
G	6847	5074	4554	3348	10368
H	10360	6080	10183	2584	14815
J	4961	3799	4726	2202	5658
K	6789	5618	7885	3136	8566
M	4156	4571	903	4426	4658
O	7144	7144	577	6940	7348
Q	4793	4974	901	4672	5322

R	9503	8268	5497	5201	13715
T	3688	2410	4957	1254	3971
U	3101	2351	2531	1528	3845
X	5270	5066	2471	3477	6761

Table 9: Size and relevant statistical tests in the different areas of Samarra.

Examining the standard deviation (Fig. 47), Area H exhibits the greatest variation, contrasting sharply with Area O. These findings highlight diverse dynamics across the cantonments. Notably, Area U, predominantly developed during Samarra 4, demonstrates significantly lower variability compared to Area F. Additionally, the cantonments in Areas K and R also manifest notable disparities. As for civilian zones, apart from H, Areas J and T exhibit comparable levels of disparity.

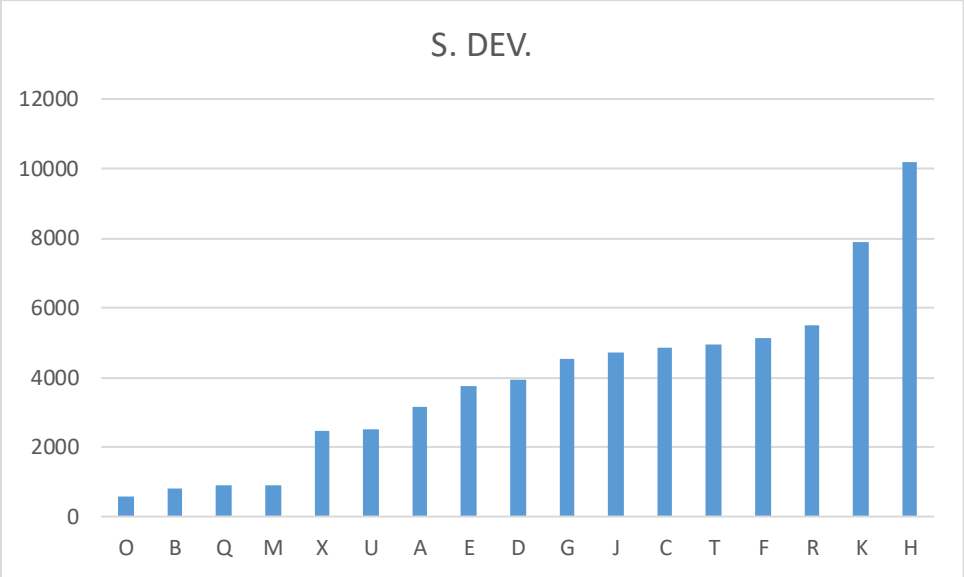


Figure 47: Standard deviation of size across the site.

The average house size for each area provides valuable insights. As shown in Fig. 48, Area H, initially hypothesized as the "rich neighbourhood," has the largest average block size in all of Samarra, followed by cantonments R and F. Interestingly, Madinat al Mutawakkiliyya (Area T), a product of the Caliph's ambition for grandeur and power, has one of the smallest average house sizes in Samarra. Another significant area is J, located in the southern part of the original city, which falls on the middle-low end of the scale, contrasting sharply with the northern part of the original city (Area H).

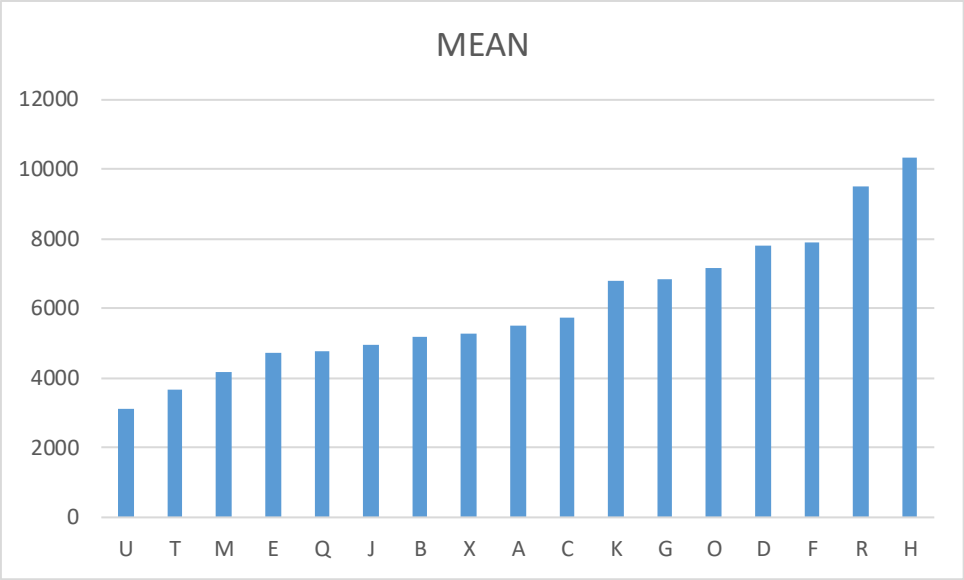


Figure 48: Mean Size across different areas of the site.

Area U, built during a period of civil war, ranks at the bottom of the list, while the cantonments of al-Dur (Area X) and al-Karkh (Area F) have much larger average house sizes. This internal disparity in average sizes suggests a clear difference, though its cause remains uncertain. It is unclear whether this variation resulted from Mu'tasim's preference for specific military groups or was simply a consequence of the varying sizes of these groups. Available space was not a constraint, as evidence shows that cantonments of different extents indicate no obvious reason for the differences in average house sizes. Multiple authors (Gordon, 2000; Kennet, 2001; Northedge, 2008 & 2022) have discussed the number of soldiers per room, whether they brought their families, and the overall urbanism of the military cantonments. Nevertheless, combining this analysis with access to resources can help identify a more accurate number and a hierarchy within the military groups of Samarra. These discussions are primarily based on textual sources, and further archaeological information will provide additional insights.

Quartiles are key in providing insights into the distribution of house sizes (Fig. 49). Q1 corresponds to 25% of the sample while Q3 is the 75% of the sample. The gap between these two values can show the uniformity in each of the areas. A lower value translates into less disparity and less socio-economic diversity while a higher value means a higher diversity. Fig. shows the difference between Q3 and Q1 for each of the areas.

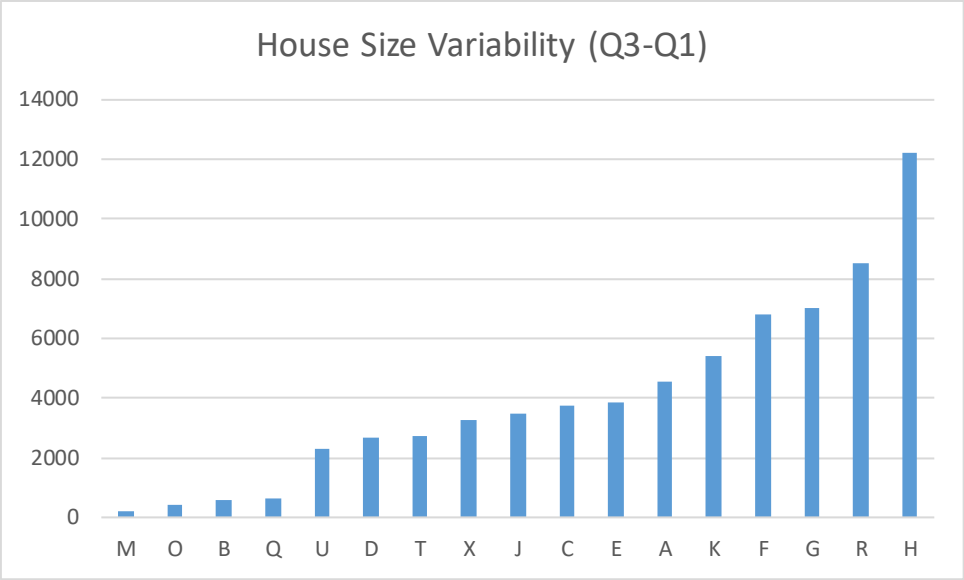


Figure 49: House size variability in the different areas of the site.

The high variability observed in areas like H, R, F or K suggests two possible scenarios. One is that there were multiple social classes within this area, and the other is that they were product of a more organic growth. The textual sources, as previously discussed, describe Samarra as a city with high involvement from the Caliphs, what makes the first option the most plausible. At the same time, those areas with low variability like U or T have not much architectural disparity. Area U, a cantonment, is expected to present this type of numbers, but Area T, a space that includes a whole new city, is rather a surprising result.

Using these as divisionary elements, I divided the sample into different sizes. Different areas have different layouts, directly affecting block organisation and placement. The expected premise is that civilian areas, while more chaotic, show more defined clusters or differentiated areas than the cantonments. Each cantonment is not built the same or during the same period. The results presented in the previous chapter suggest variations in the shape and layout between cantonments, which might translate into spatial and organisational variation.

The time period analysis shows a clear decrease in house size in Samarra (Table 12 and Figure 50).

TIME PERIOD	AVERAGE SIZE (m2)
Samarra 1	6896.52
Samarra 2	6243.6
Samarra 3	3765.13
Samarra 4	2770.05

Table 10: Average size in square meters per time period.

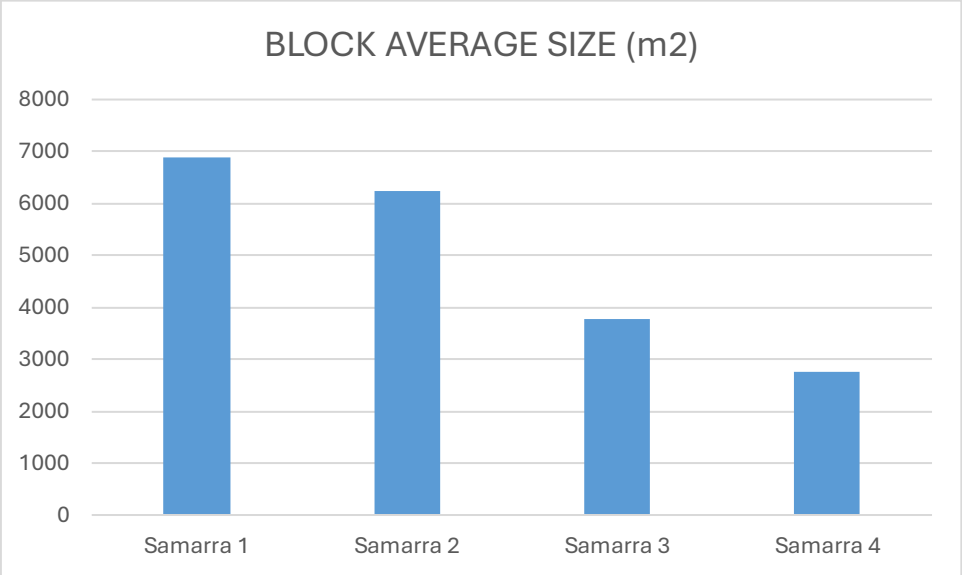


Figure 50: House size across periods.

Spaces (Rooms and Courtyards)

As depicted in Table 13, the number of spaces fluctuates across the time periods in Samarra. The first two periods, which include all the dwellings within the Original City, remain similar, while there is a significant increase in the third period, attributed to Madinat al-Mutawakiliyya—the last period returns, with a slight drop, to the initial value.

TIME PERIOD	MEAN NUMBER OF SPACES
Samarra 1	14.2
Samarra 2	15.6
Samarra 3	24.7
Samarra 4	11

Table 11: Mean number of spaces per time period.

The data regarding the areas is more complex (Fig. 51 & Table 14). Neither the cantonments (R, M, X, U and F) nor the civilian/mixed areas (H, T and J) are homogeneous. For example, the cantonments in Area F have significantly more rooms per house (20) than the contents in Area X (9). There is no shared feature between the areas with higher number of spaces, rather than some cantonments (M, A and F), although it is not enough to consider the cantonments as areas with more spaces within their dwellings due to the low numbers of Areas K, X or U.

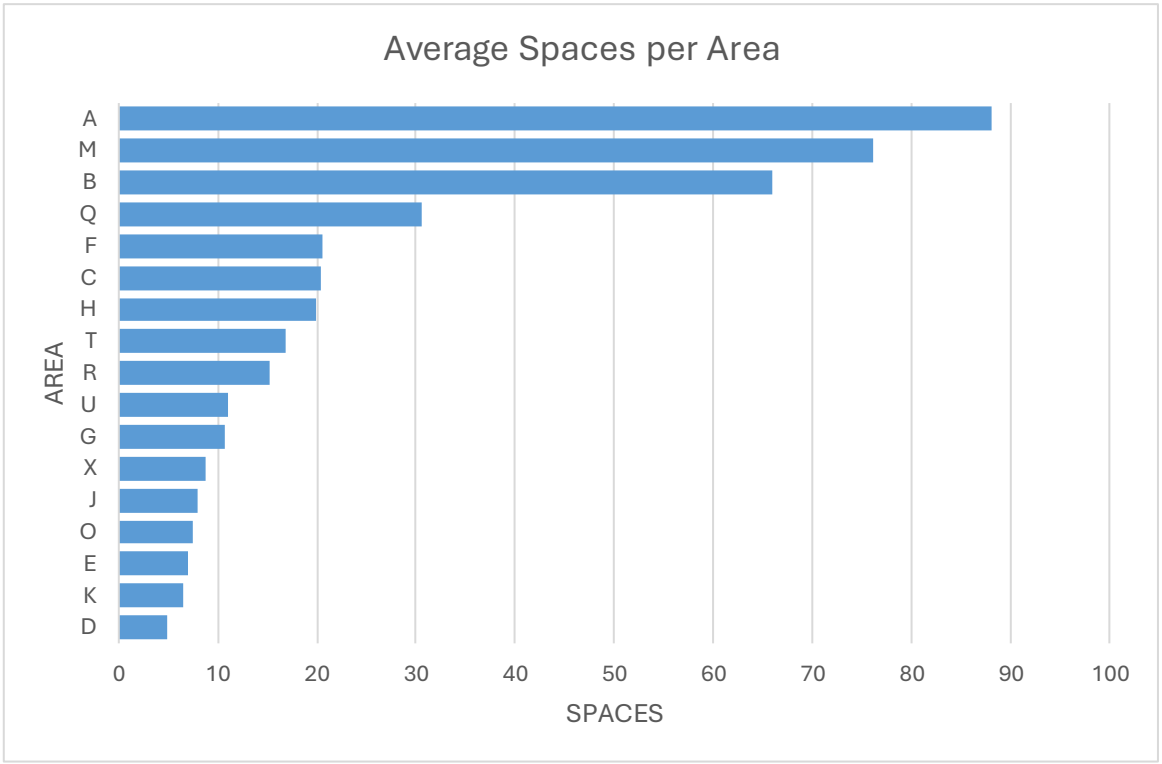


Figure 51: Average spaces per area of the site.

AREA	Average number of SPACES
A	88.1
M	76.1
B	66
Q	30.5
F	20.6
C	20.4
H	19.99
T	16.9
R	15.2
U	11
G	10.6
X	8.7
J	8
O	7.5
E	7.1
K	6.5
D	4.9
Grand Total	**15.9**

Table 12_ Average number of spaces per area.

Orientation

The choice for orientation is not restricted to personal/state preference but also depends on the landscape layout, presence of water, or climate adaptation. The following table (15) and Figure (52) show the distribution of orientations across time periods.

DATE	NE-SW	% of Period	N-S	% of Period	NW-SE	% of Period	W-E	% of period	Grand Total
Samarra 1	173	30.35%	263	46.14%	9	1.58%	125	21.93%	570
Samarra 2	138	25.74%	209	32.28%	142	26.01%	56	10.26%	546
Samarra 3	68	23.29%	24	8.21%	169	57.88%	31	10.62%	292
Samarra 4	38	22.49%	0	0%	131	77.51%	0	0%	169

Orientations	TOTAL	%
NE-SW	417	26.46%
N-S	496	31.47%
NW-SE	451	28.62%
W-E	212	13.45%
TOTAL	1576	100%

Table 13: Distribution of 4 different orientations and their percentages in various time periods.

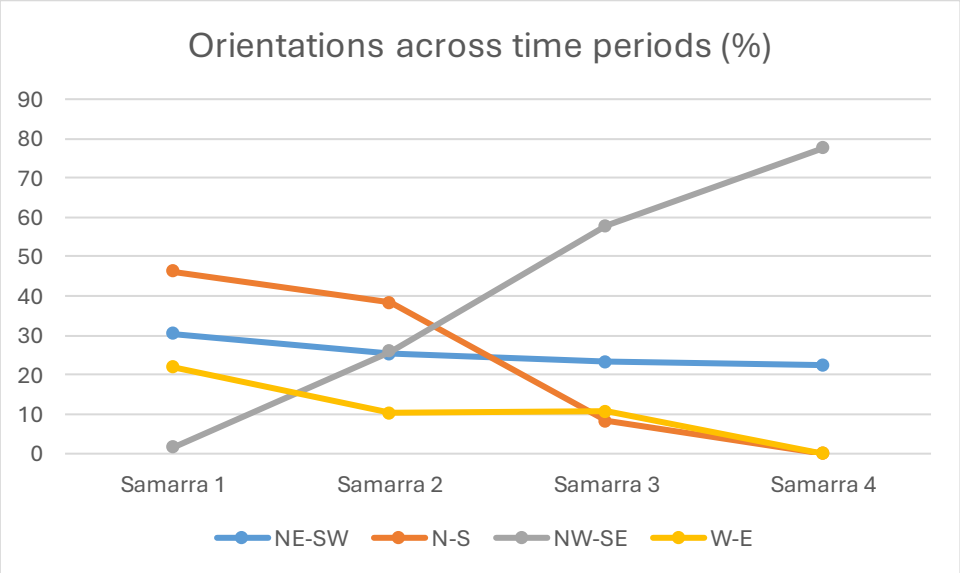


Figure 52: Graph with the evolution of orientation across time periods (in percentage).

The general data indicates a preference for the N-S across the whole site, with 31.47%, followed closely by NW-SE (28.62%). W-E, with just 13.75%, is the least common one. However, this dynamic is not maintained across all the periods. Both N-S and NE-SW show a declining trend over the years, becoming less and less relevant, while NW-SE grows in importance over the years, reaching its peak in Samarra 4. W-E remains the least popular in periods 2 and 4, and the second least popular in periods 1 and 3.

The evidence depicts the first two periods as heterogeneous in terms of orientation, with a more or less even distribution. However, the building of Madinat al-Mutawakkiliyya and the later Anarchy at Samarra transformed the concept of the Samarran house and the NW-SE orientation became the most popular by a large margin.

The orientation distribution per area exhibits distinct orientation patterns (Table 16). N-S is majorly present in the largest number of areas (5), present in both military cantonments (M and F) and mixed/civilian areas (H and E). Area J, characterised by an important mix of civilian and military compounds, is the only area where NE-SW is the most common orientation. NW-SE has a similar dynamic to N-S with 4 areas of both civilian (T) and military (U, R, Q). There is, therefore, no clear preference for the different types of areas across Samarra.

AREA	**NE-SW**	**%**	**N-S**	**%**	**NW-SE**	**%**	**W-E**	**%**
X	51	30.9%	101	61.21%	3	1.82%	10	6.06%
U	39	21.91%	0	0%	139	78.09%	0	0%
T	68	26.25%	15	5.79%	169	65.25%	7	2.70%
R	23	17.16%	6	4.48%	105	78.36%	0	0%
Q	0	0%	0	0%	15	100%	0	0%
O	2	100%	0	0%	0	0%	0	0%
M	0	0%	35	100%	0	0%	0	0%
K	0	0%	5	4.27%	18	15.38%	94	80.34%
J	250	72.89%	14	4.08%	48	13.99%	31	9.04%
H	0	0%	36	53.73%	0	0%	31	46.27%
G	0	0%	1	2.7%	0	0%	36	97.3%
F	0	0%	346	99.71%	0	0%	1	0.29%

E	0	0%	47	58.02%	0	0%	34	41.98 %
D	0	0%	3	42.86%	0	0%	4	57.14 %
C	0	0%	10	27.03%	0	0%	27	72.97 %
B	0	0%	0	0%	0	0%	2	100 %
A	0	0%	9	29.03%	0	0%	22	70.97 %

Table 14: Orientation types per area.

Shape

As with orientations, the shape of dwellings can be highly dependent on a series of factors not linked to personal choice but rather to the surrounding natural landscape. However, it remains an important indicator of the level of coordination and possible caliphal involvement within the lower class of Samarra. Unlike orientations, there is a clear preference for the rectangular shape across all periods, with an 84.25% of dominance as the lowest value (Table 17).

DATE	**Irregular**	% of Period	**Rectangular**	**% of Period**	**Squared**	**% of Period**	**Trapezoidal**	**% of Period**
Samarra 1	29	5.09%	516	90.53 %	1	0.18%	24	4.21 %
Samarra 2	27	4.95%	507	92.86 %	0	0%	12	2.2 %
Samarra 3	34	11.64 %	246	84.25 %	7	2.40%	5	1.71 %
Samarra 4	10	5.92%	154	91.12 %	5	2.96%	0	0%

Table 15: Shape types per time period.

In the areas, while the Rectangular shape remains the most dominant, there are a few exceptions (Table 18). For example, in Area C, there is more evidence of irregular dwellings, while in Areas H and D, the distribution is more equal, with both irregular and trapezoidal gaining importance.

AREA	Irregular	% of AREA	Rectangular	% of AREA	Squared	% of AREA	Trapezoidal	% of AREA
X	8	4.85%	153	92.73%	0	0%	4	2.43%
U	11	6.18%	162	91.01%	5	2.81%	0	0%
T	34	13.13%	215	83.01%	6	2.32%	4	1.54%
R	4	2.99%	128	95.52%	0	0%	2	1.50%
Q	0	0%	15	100%	0	0%	0	0%
O	1	50%	1	50%	0	0%	0	0%
M	0	0%	35	100%	0	0%	0	0%
K	5	4.27%	104	88.89%	0	0%	8	6.84%
J	28	8.16%	290	84.55%	1	0.29%	24	7%
H	23	34.33%	39	59.21%	0	0%	5	7.46%
G	3	8.11%	34	91.89%	0	0%	0	0%
F	6	1.73%	341	98.27%	0	0%	0	0%
E	17	20.99%	63	77.78%	0	0%	1	1.23%
D	1	14.29%	3	42.86%	0	0%	3	42.86%
C	18	48.65%	11	29.73%	3	8.11%	5	13.51%
B	0	0%	2	100%	0	0%	0	0%
A	0	0%	29	93.55%	1	3.26%	1	3.23%

Table 16: Shape types per Area.

Number of Entrances

Identifying entrances remains a big challenge. Not all are clearly indicated; therefore, many have been classified as unknown. The data of those with clear entrances depicted a preference for one entrance per building (table 19).

DATE	AVERAGE N. of ENTRANCES
Samarra 1	1.01
Samarra 2	1.02
Samarra 3	1.04
Samarra 4	1.02

Table 17: Average number of entrances per date.

The four periods of Samarra remain very similar, which is something new in this whole dissertation. Regarding the areas, there is a slight increase in some areas (E, A, D), but nothing significant or close to 2 (Table 20).

AREA	**Average of N. of ENTRANCES**
E	1.3
A	1.3
D	1.3
C	1.1
K	1.1
H	1
J	1
U	1
R	1
X	1
F	1
T	1
G	1
M	1
B	1

Table 18: Average number of entrances per area.

Water Systems (basins and cisterns)

This section briefly addresses the presence of basin or cistern remains within dwellings; it does not include evidence for qanats or canals found within buildings. The evidence

shows a very low percentage of houses with evidence of basins or cisterns that is steady across the different periods (Table 21).

DATE	NO	YES	% of YES
Samarra 1	555	15	2.7%
Samarra 2	529	17	3.2%
Samarra 3	285	7	2.46%
Samarra 4	169	0	0%

Table 19: Houses separated by presence of basins or cisterns across time periods.

Nevertheless, the Area analysis provides an interesting perspective on the cisterns and basins (Table 22). Most examples are in areas J and H, characterised by civilian and military dwellings. These architectural features may be more linked with the civilian spaces of Samarra rather than the cantonments, where the evidence is significantly reduced.

AREA	NO	YES
X	162	3
U	178	0
T	257	2
R	133	1
Q	13	2
O	2	0
M	35	0
K	116	1
J	329	14
H	52	15
G	36	1
F	346	1
E	81	0
D	7	0
C	37	0
B	2	0
A	26	5

Table 20: Houses with and without basins divided by areas.

Discussion – variables connection

The question is whether there is a significant connection between these variables, e.g., size influences the number of rooms and vice versa. I ran a multiple regression on R Studio, analysing the influence of spaces, shape, orientation, and number of entrances on dwelling size. The results included an overall model with a p-value < 2.2e-16 (<0.05), which makes the variance in dwelling size dependent on the combination of the architectural features although theAdjusted R-Squared of 0.131 means this relationship only explains just over 13% of the observed pattern. While this small percentage might suggest that the other untested factors significantly influence dwelling size, it is worth exploring.

Spaces (courtyard and rooms) had a coefficient of 57.723 with a p-value of 2e-16. This implies that each additional space increases the dwelling size by approximately 57.72 square meters. Rectangular shapes are associated with smaller residences, indicated by a coefficient of -1007.195 with a p-value of 0.00899 , while the other shapes did not have statistically significant values. Regarding orientation, NE-SW, NW-SE, and W-E all have statistically significant coefficients.

This model shows that the number of spaces has the most positive effect on dwelling size, followed by specific orientations (NE-SW and NW-SE). However, based on the adjusted R-squared, other factors may have contributed to the size of these houses. However, I decided to corroborate these results with more specific tests.

For the relation between Date and Size, I ran an ANOVA Test and a Tukey HSD Post-Hoc Test that provided the following results:

```
                            Df  Sum Sq  Mean Sq F value Pr(>F)
SAMARRAN_DWELLINGS$DATE  14 4.285e+09 306055163  14.81 <2e-16
Residuals        1842 3.807e+10 20670338
```

The F-value (14.81) with a P-value under 0.05 suggest that the periods significantly influence house size variation. More specifically, the Tukey HSD pointed to the size evolution from Samarra 1 to Samarra 3 and 4.

The following ANOVA and Tukey HSD analysed the relation between House Size and Shape.

```
                           Df  Sum Sq Mean Sq F value Pr(>F)
SAMARRAN_DWELLINGS$SHAPE  5 1.149e+08 22986891  1.007 0.412
Residuals        1851 4.224e+10 22822583
```

The P-value over 0.05 prevents us from rejecting the null hypothesis (there is no connection between shape and size). Therefore, no evidence exists that shape directly influences house size.

To assess the connection between Orientation and Size, I carried out another ANOVA and Tukey HSD test:

```
                                Df  Sum Sq  Mean Sq F value Pr(>F)
SAMARRAN_DWELLINGS$ORIENTATION   4 1.951e+09 487733634   22.35 <2e-16
         Residuals            1852 4.041e+10 21818899
```

The high F-value (22.35) with a P-value under 0.05 (>2e-16) indicated that the variation in house size is significantly influenced by orientation. The Tukey HSD specifies that NE-SW and NW-SE are linked with smaller houses while N-S and W-E are linked with bigger houses.

Although the data available is sparse, I also assessed the role of the courtyard in a quantitative way and calculated a liner regression to observe the relation between courtyard and size. The results are the following:

```
Coefficients:
                    Estimate Std. Error t value
(Intercept)             4287.45   119.43  35.90
SAMARRAN_DWELLINGS$`N. of COURTYARDS`  455.85   22.11  20.62
                    Pr(>|t|)
(Intercept)              <2e-16 ***
SAMARRAN_DWELLINGS$`N. of COURTYARDS`  <2e-16 ***


Residual standard error: 4310 on 1855 degrees of freedom
Multiple R-squared: 0.1865,       Adjusted R-squared: 0.186
F-statistic: 425.2 on 1 and 1855 DF, p-value: < 2.2e-16
```

The results imply that, with the given data, each additional courtyard is associated with an increase of approximately 455.85 square meters in the dwelling size. Despite having a low P-value, the Adjust R-squared is only 0.186, meaning that only 18.65% of the variance in dwelling size can be explained by the change in the number of courtyards.

The Samarran House: Conclusion

Overall, the domestic architectural landscape is marked by a complex interplay of several variables, highlighting the role of size, orientation and spaces. The varied results provide no solid argument for defining a specific type, either in the general context or exclusive to areas. Some trends are observed in the periods and areas regarding size and spaces, but they do not add up to a clear pattern. Therefore, it is possible that the dwellings, as a whole, were not part of a caliphal project but rather delegated to the private owners of the land or military groups. This dynamic contributes to the general inequality of Samarra, as individuals or groups (military) with variant available resources were responsible for building their own houses. Ya'qubi mentions various times that Mu'tasim was heavily invested in the construction of the city and the land distribution (*Kitab al Buldan,* ET, pp. 91-93 & 98), although he does credit the "populace" for house-building: "People resumed building and built more durably and elaborately when they realized that this had become a real city […] (*Kitab al Buldan,* ET, p. 98). Interestingly, the data does not reflect a significant change in either size or number of spaces that could be attributed to the "elaborately" segment of the passage, as the houses have very similar spaces in both periods and are bigger on average during Samarra 1.

Further investigation includes a more thorough layout analysis, focusing on the differentiation of room space and courtyards, which can facilitate comparisons and provide a solid interpretation of the Samarran house. Another complicated but necessary next step is reclassifying a big part of the dataset named with uncertain terms like building or complex. Due to the difficulty of conducting fieldwork in Samarra, I suggest elaborating well-done AutoCAD drawings of each house, measurements of each defined space and elaborating a comparison of spaces with very similar or equal sizes. Moreover, this analysis needs to be complemented by understanding the role of the dwelling in the urban plan and how it is connected to multiple elements of the city. Exploring the duality of the house is the next step in the study of Samarra.

Chapter Conclusion

In this chapter, I have presented different types of evidence, including historical, ornamental, archaeological and architectural, that have contributed to the idea of the Abbasid residence in Samarra. The results suggest that mansions and blocks, architecturally speaking, followed utterly different trends in both layout and size, and they shifted across the site and periods.

The palace, both caliphal and non-caliphal, is a product of both the past and the contemporary, dependent on the preferences of caliphs who were mesmerised by the idea of water control in the desert and monumentality. The beautiful ornaments, extensive halls, and decorated sedans brought the multi-layered nature of Abbasid governance into materiality in the context of absolutism. In terms of layout, mansions (urban non-caliphal palaces) seem to replicate the Caliphal palaces with the central aisle model, but due to

their abundance, the area and time period also influence them. Prematurely, it is possible to affirm that these were bigger in military areas, affirming the importance that the historical sources tell us about the Turkish commanders.

On the other hand, the blocks do not appear to follow any clear patters, apart from orientation and number of entrances, with size not being highly dependent on the architectural features presented here. While the issue surrounding this urban elite is slowly being resolved, the nature of the Samarran dwelling, especially the non-military one, remains a total mystery. As proved, the historical texts do not seem to be an accurate source for understanding the actual role the residences in Samarra played. The following chapter aims to use this evidence to understand and study the functioning of Samarra and the inequality.

CHAPTER 6: INEQUALITY AT SAMARRA AT AN AREA LEVEL

In Chapters 4 and 5, I meticulously dissected the Abbasid house and palace in Samarra, delving into their unique layouts, potential origins, and architectural diversity. This in-depth analysis has unveiled a complex housing model intricately intertwined with its location, purported functionality, and era. Urban palaces or mansions have presented similar variations in layout. The consecution of two or three courtyards with rooms to the sides seems to be a constant, especially during the reign of Mutawakkil; however, it is still combined with other layout models.

Nevertheless, buildings are not merely individual structures standing in isolation but integral components of a complex urban plan that reflects the intricate interplay of functionality, aesthetics, and community needs. Each building contributes to the city's overall character and rhythm, reflecting the nature and purpose of Samarra and its caliphs. In this chapter, I will delve into the inequality present in Samarra using different elements of its urban plan, including house size, distance to relevant city features, and existing water systems. Each segment will include a small discussion section focusing on a specific data set. Meanwhile, at the end of the chapter, there will be a final discussion.

Gini coefficients – Areas and Time Periods

Before I delve into each neighbourhood or unit, I decided to present the Gini coefficients for both the areas and time periods as an introduction to the inequality levels in Samarra. These have been calculated for the whole city and the different types of buildings in both period and area distribution.

All residential buildings (block, blocks, mansions and palaces)

The results of this analysis are expected to present the highest inequality of all the sites, as they include different types of buildings that have been assumed to belong to different social classes. It is also expected that the value of an area is small to that of the whole city, as one area is theorised to include a similar type of population (military group or civilian population). The results indicate a medium level of inequality across the areas, with the majority of the most populated areas are between 0.39 and 0.48, with some exceptions like U, H and A. Interestingly, each of these areas is a different type: palatial complex, civilian/mixed area and military cantonment. As a note, those with civilian presence (J, H and T) are on the more unequal side of the dataset, although the presence of cantonments with these values prevents us from any solid conclusions.

AREAS	GINI	N. RESIDENCES	CIVILIAN/MILITARY/MIXED	DIF. BETWEEN CITY GINI AND AREA GINI
A	0,9	34	MIXED	-0.31
B	0,57	5	MILITARY	0.02
C	0,38	42	CIVILIAN	0.21
D	0,22	9	MILITARY	0.37
E	0,4	81	CIVILIAN	0.19
F	0,39	369	MILITARY	0.2
G	0,42	40	MILITARY	0.17
H	0,75	122	MIXED	-0.16
J	0,48	390	MIXED	0.11
K	0,48	154	MILITARY	0.11
M	0,46	43	MILITARY	0.13
R	0,43	147	MILITARY	0.16
T	0,59	353	MIXED	0
U	0,53	218	MILITARY	0.06
V	0,1	4	CIVILIAN	0.49
X	0,29	171	MILITARY	0.3
ALL AREAS	0,59	2185		

Table 21: Gini values for all buildings (residences) per area.

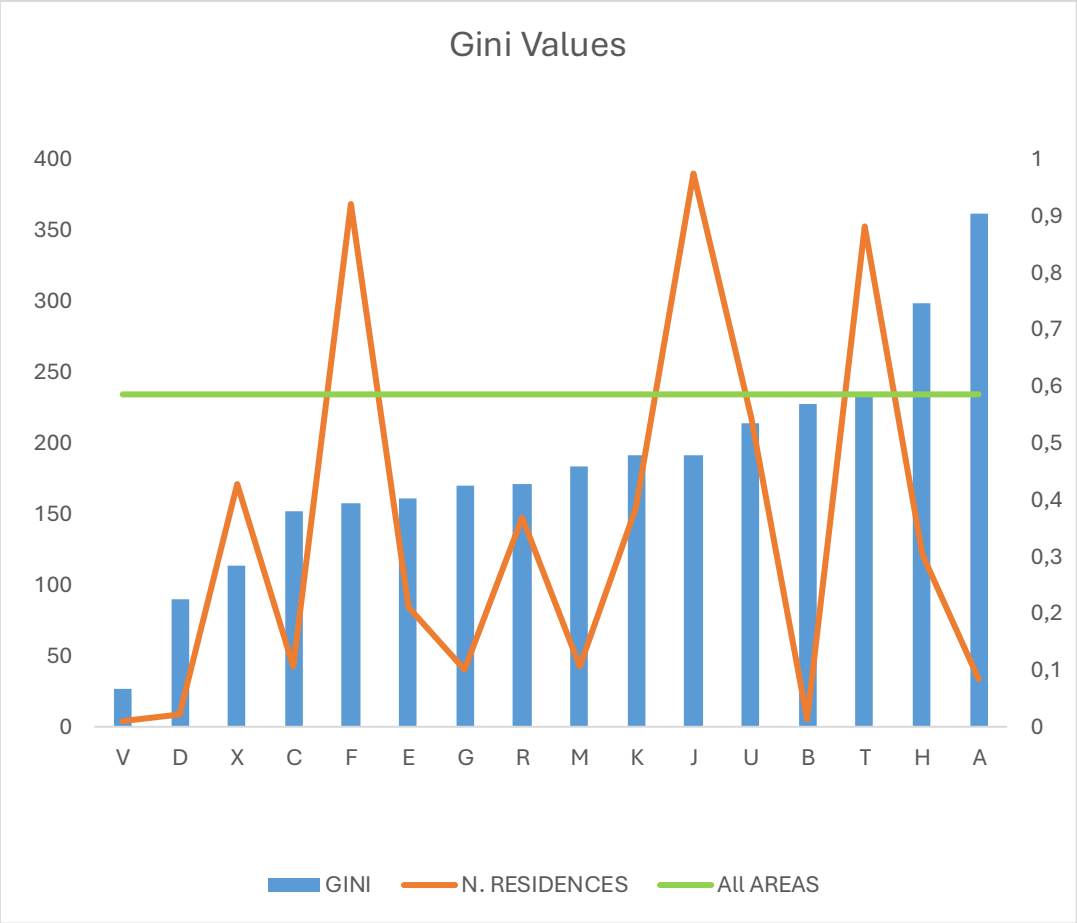


Figure 53: Graph with Gini Values (blue), number of residences in each area (orange) and gini value for the entire site (green).

The time period analysis (Table 22 & Figure 54) depicts one period, Samarra 3, with an elevated value (0.7635). this period, linked with the new construction of al-Mutawakkiliyya is therefore the most varied in terms of residence size. The result suggests a higher level of inequality is the product of a higher number of different social groups occupying the new city.

TIME PERIOD	GINI	N. OF RESIDENCES
Samarra 1	0.46	622
Samarra 2	0.47	640
Samarra 3	0.76	390
Samarra 4	0.51	211

Table 22: Gini values across time periods.

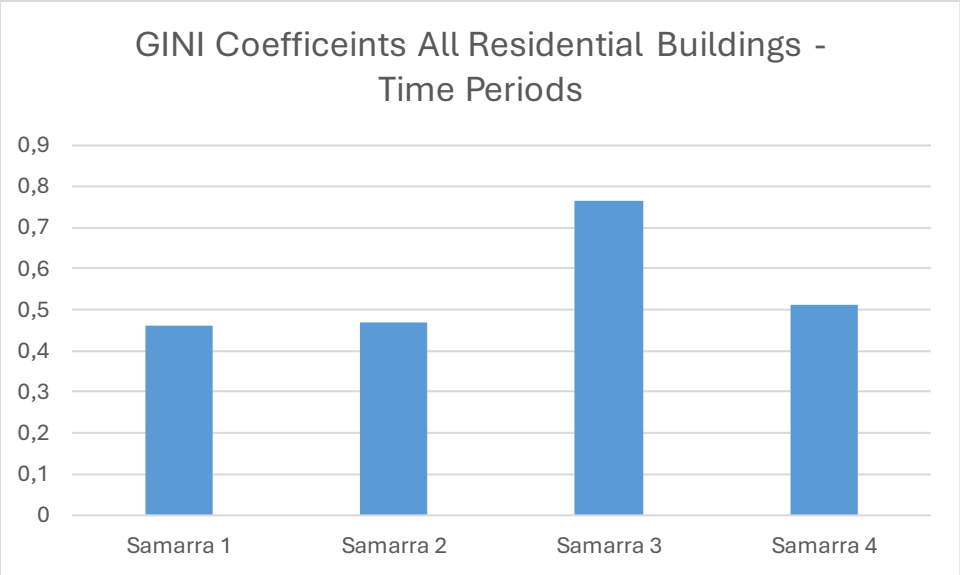


Figure 54: Gini values across time periods.

Block and Blocks

Block and blocks are theorised to be the place of residence of the lower class of Samarra, including both soldiers and civilians. The differences in each of the areas can shed light into the level of homogeneity within various part os Samarra as well as the quality of life for the various groups of blocks.

Although with lower values, the Gini coefficients for blocks and blocks remain close to each other, fluctuating between 0.24 and 0.5 (Table 25 & Fig. 55). The second figure permits the identification of five subgroups. Form left (smallest) to right (biggest):

- Areas B, Q, M are the smallest subgroup with values between 0.05 and 0.09.
- The second group is formed by areas D and X, cantonments with values 0.233 and 0.245.
- The third group is formed by the areas A, R, F, U, and G, all cantonments with values between 0.31 and 0.36.
- The fourth group comprises areas J, E, C and K. These are civilian/mixed areas and military cantonments with values between 0.4 and 0.41.
- Finally, the last group comprises two areas, H and T. These are two civilian/mixed areas with values between 0.48 and 0.50.

The distribution of these groups entails, not surprisingly, that the cantonments present less size variability and, therefore, a less unequal urban plan. On the other hand, civilian or mixed areas house various groups where a higher inequality is expected. In these areas, the coefficient is approximately 0.5, which is an equilibrium between perfect equality and inequality, probably suggesting the coexistence of both similar and different sizes.

AREA	GINI COEFFICIENT	N. of BLOCKS
AREA A	0.32	31
AREA B	0.05	2
AREA C	0.41	37
AREA D	0.23	7
AREA E	0.4	81
AREA F	0.35	359
AREA G	0.37	37
AREA H	0.49	68
AREA J	0.4	360
AREA K	0.41	147
AREA M	0.1	35
AREA Q	0.09	15
AREA R	0.33	144
AREA T	0.5	273
AREA U	0.36	185
AREA X	0.25	165

Table 23: Gini coefficient for blocks in each of the areas.

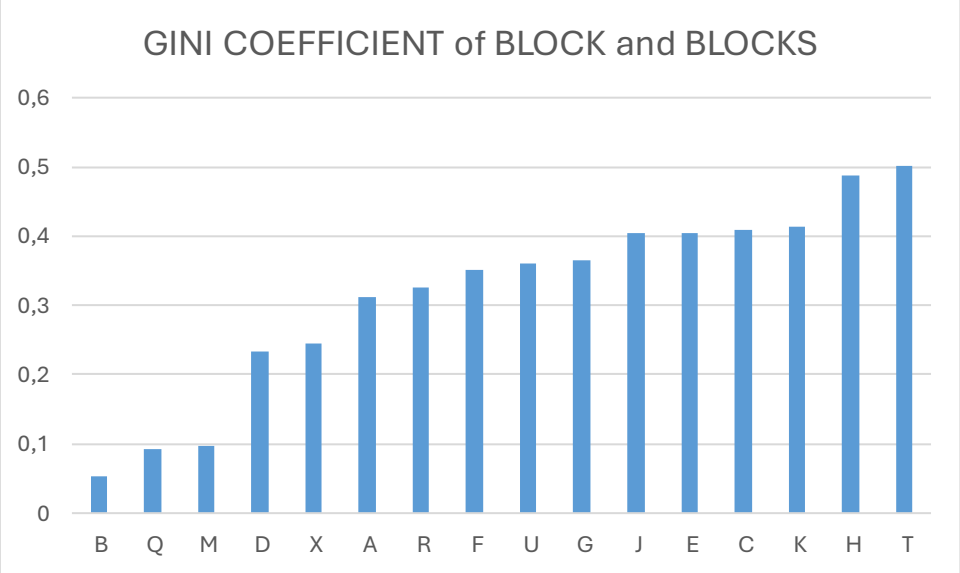


Figure 55: Gini coefficient for Block and Blocks across different areas.

Mansions

Mansions theoretically belong to an under-identified urban elite. However, we do not know how diverse this social group was or what social hierarchies might have affected them. The data per area (Table 26 & Fig. 56) suggests a noticeable change from the block and block categories. Most of the areas have a Gini coefficient of around 0.5, with exceptions both under (M with 0.2263) and over (U with 0.6776). Instead of showing different subgroups, the figure depicts one group with outliers usually provoked by a few

examples (D, E or C), linked with possible sampling issues resulting in low numbers of mansions. The meaning of this result for Samarra's inequality and social hierarchy is that this urban class varied within its areas. Still, the levels of inequality were quite similar to other city regions.

AREA	GINI	N. of MANSIONS
C	0.1	5
D	0.05	2
E	0.07	3
F	0.50	10
G	0.39	2
H	0.51	43
J	0.52	30
K	0.57	7
M	0.23	7
T	0.54	80
U	0.68	33
X	0.17	6

Table 24: Gini coefficients for Mansions across different areas.

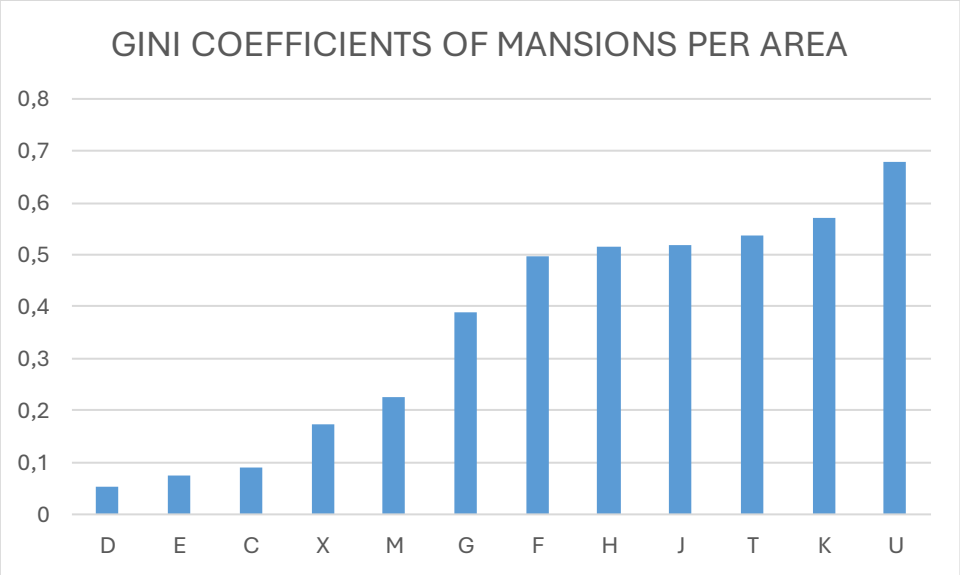


Figure 56: Gini coefficients of mansions per area.

When looking at the time periods, the situation is no different (Table 27 & Fig. 57). While the size might increase during the various periods, the dynamics and consequent inequality seem to be maintained during the first three periods. This means that the change that motivated the change in size during the third period affected Mansions of all sizes and, therefore, all social groups. The inequality, which is higher than with the blocks, remains the same until the fourth period. Probably, the fight for power and general instability fomented the inequality.

TIME PERIOD	GINI	N. of MANSIONS
Samarra 1 (only)	0.58	34
Samarra 1 and Samarra 1/2	0.55	66
Samarra 2 (only)	0.44	50
Samarra 2 and Samarra 1/2	0.5	79
Samarra 3	0.54	80
Samarra 4	0.62	40

Table 25: Gini coefficients for mansions across time periods.

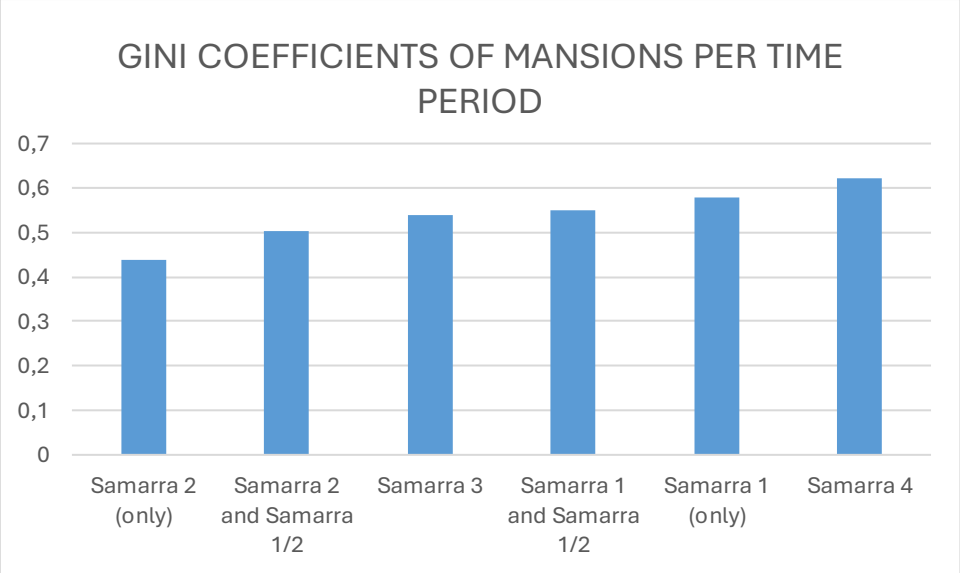


Figure 57: Gini coefficients of mansions per time period.

Conclusion

The evidence shows different dynamics for blocks and mansions. The first group depends more on the area and time period, with observable differences between military cantonments and civilian areas. On the other hand, mansions seem to generally have the same dynamic across the whole site. The Gini coefficients are generally around 0,5, and

while under the city average, which was expected, is still a high value. This results in aicty which shows a general level of inequality between its areas but also within its areas. It is possible that multiple groups, with different average residence houses, lived within these areas.

implying that Samarra enjoyed a stratified and more or less homogeneous urban plan in which residences were similar sizes to the ones next.

However, the next part of this chapter will corroborate this affirmation and focus on analysing inequality in each neighbourhood using both Gini coefficients and service infrastructure accessibility.

Urban structure of Samarra: neighbourhoods and service availability and accessibility

Multiple authors like Ibn Khaldun (*Muqaddimah*), al-Muqaddasi (*Ahsan al-Taqasim fi Ma'rifar al-Aqalim*), Ibn Jubayr or Ibn Battuta (*Rihla*) have written during different periods, cities, and settlements across the Islamic worlds. All seem to mention key structures commonly found across neighbourhoods like mosques, markets, hammams, water supply, public ovens or bakeries, hospitals, police (*Shurta*) and educational institutions. While the archaeological record of Samarra is one of the most complete and extensive we have, not all these structures have been found. Only mosques, markets, water supply, and the shurta were found, although these features are generally too scarce to be properly used as a divisionary element. In the case of mosques, a considerable number have been identified across Madinat al-Mutawakkiliyya (Fig 58). However, none have been found in Area J and only a congregational mosque has been identified south of Dar al-Khilafa and some other cantonments (Fig. 59-61). Festival mosques (*musallas*) have been left out, as by definition, they are not involved in daily life prayer.

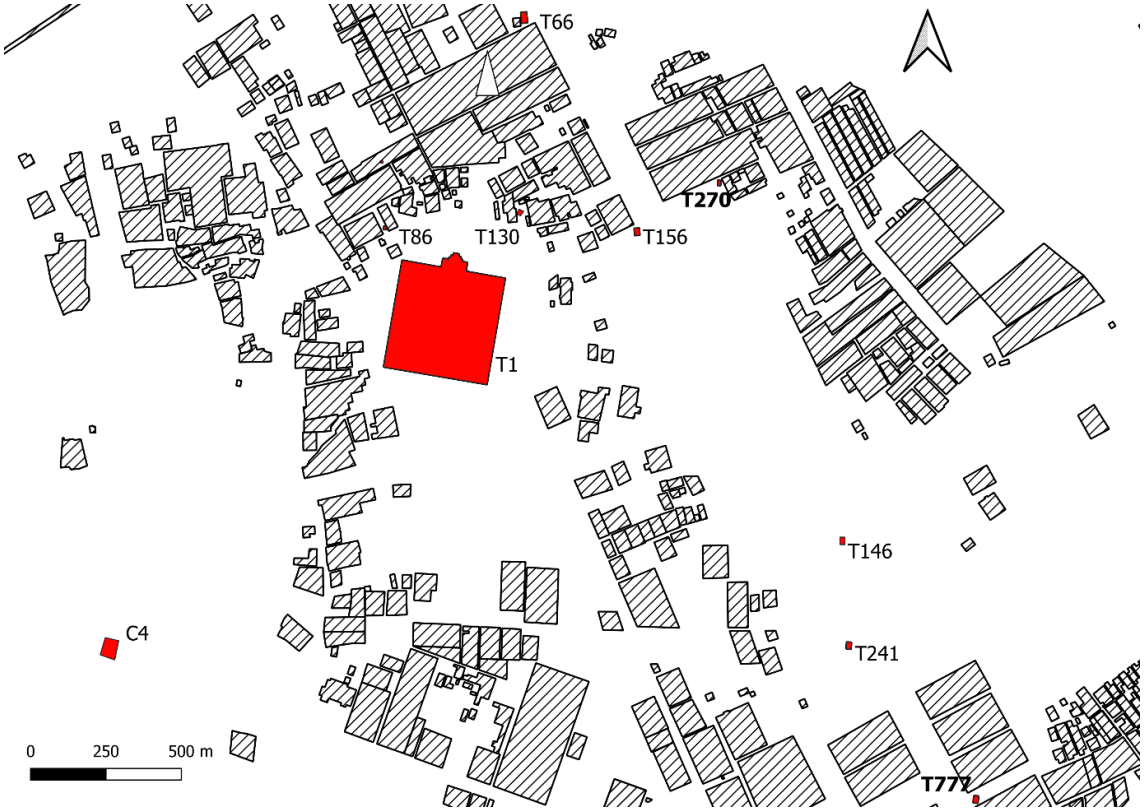


Figure 58: Mosques (in red) in Madinat al-Mutawakkiliyya



Figure 59: Mosques (in red) in military cantonments

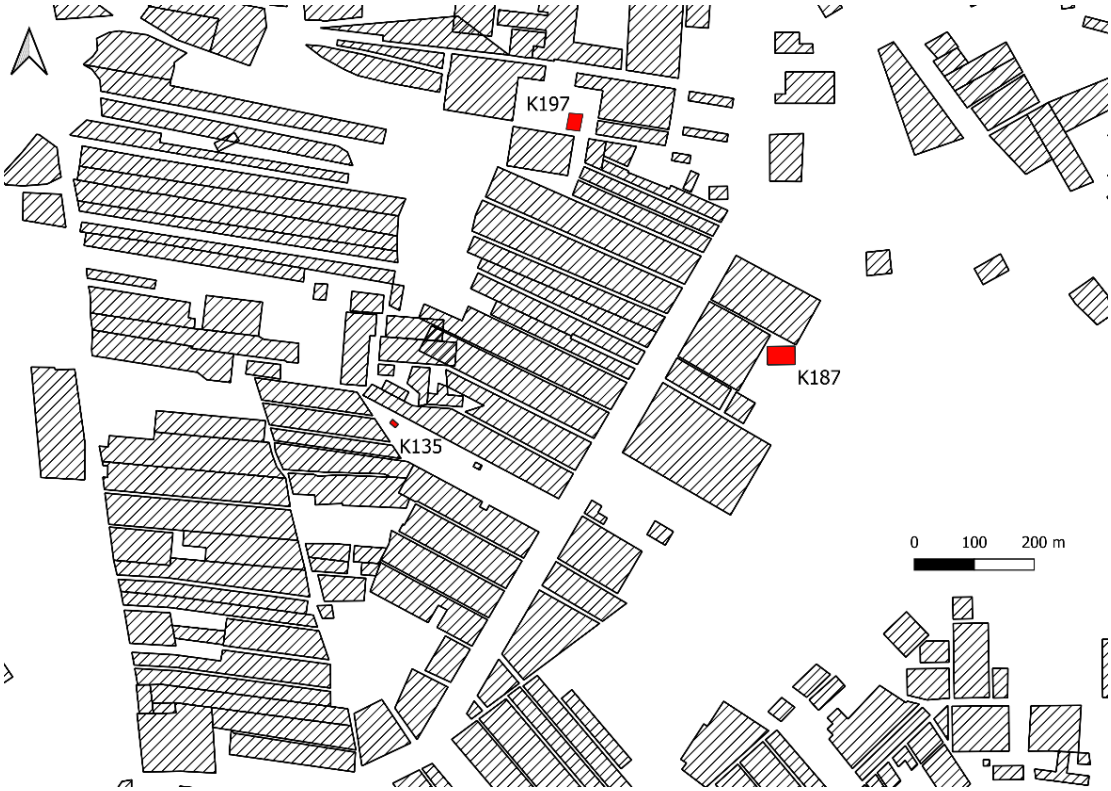


Figure 60: Mosques (in red) in area K

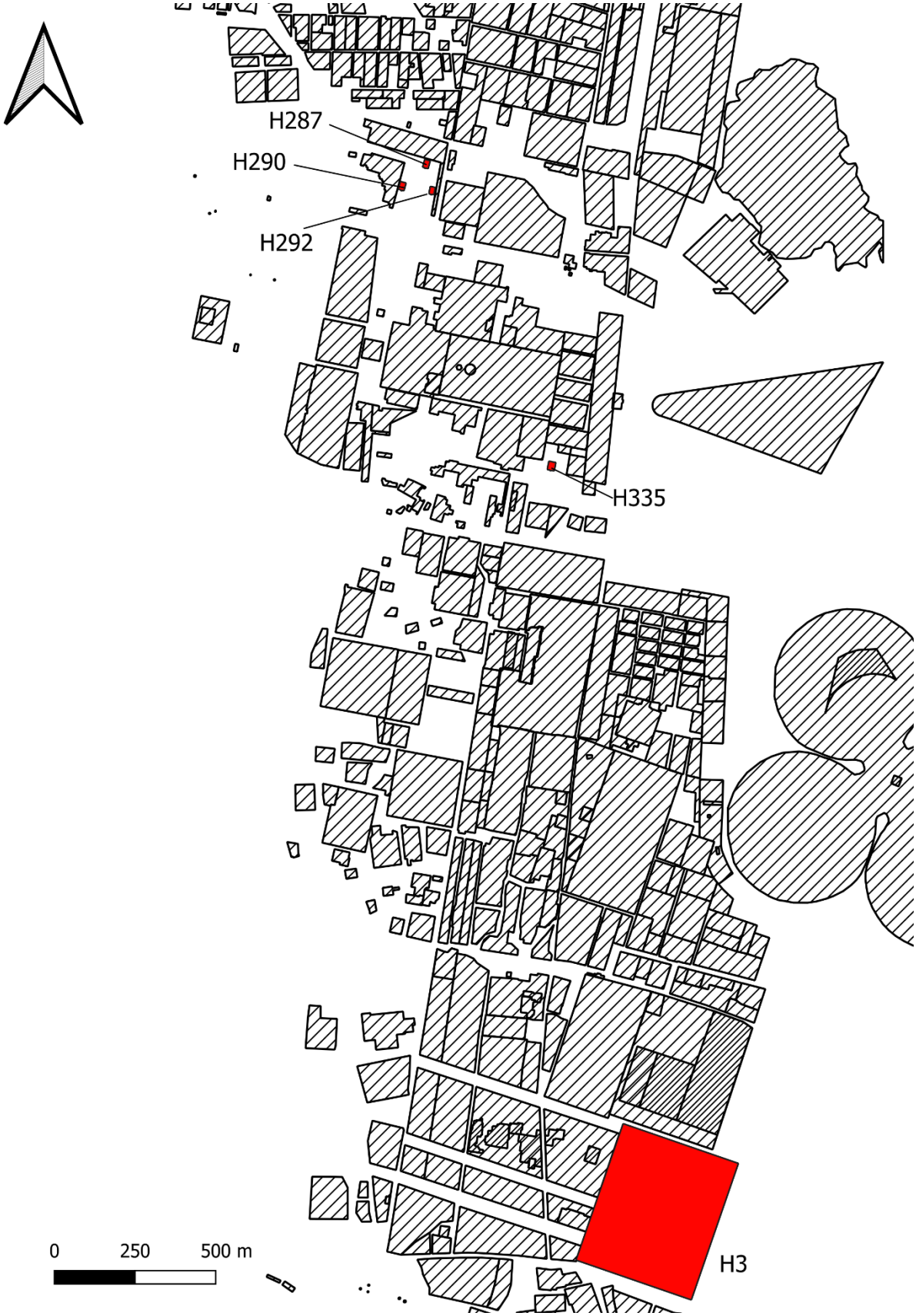


Figure 61: Mosques (in red) in Area H

There were even fewer markets, with only sixteen if we count the central market. Most of the markets (6) were in Balkuwara (Fig. 62), Mutasim's city had three (counting the

central market) (Fig. 63), Madinat al-Mutawakkiliyya had four (Fig. 64), and al-Dur cantonment had only one

.

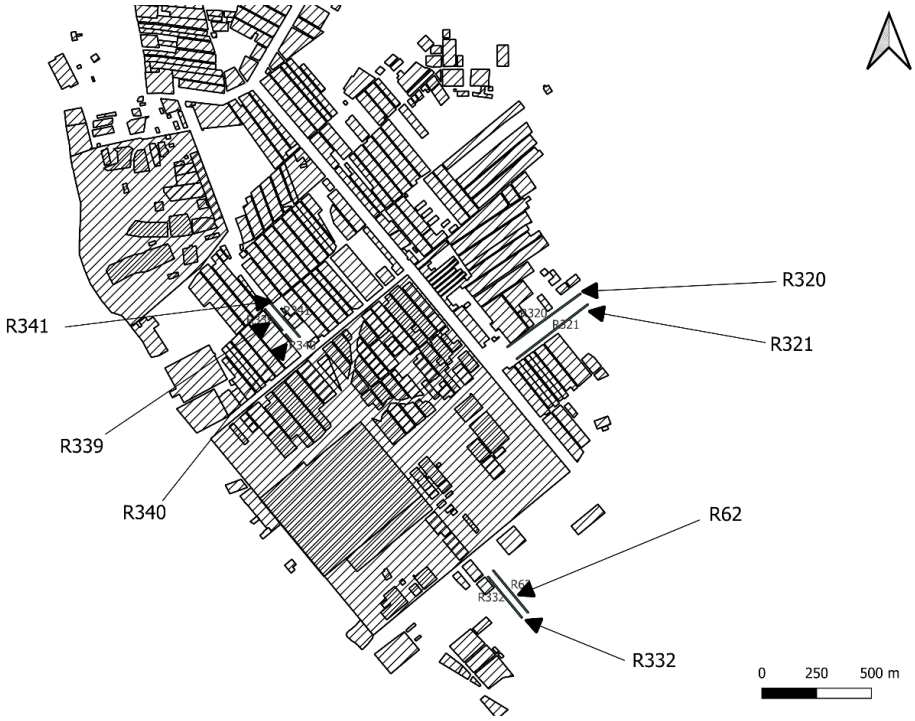


Figure 62: Markets in Balkuwara (Area R)

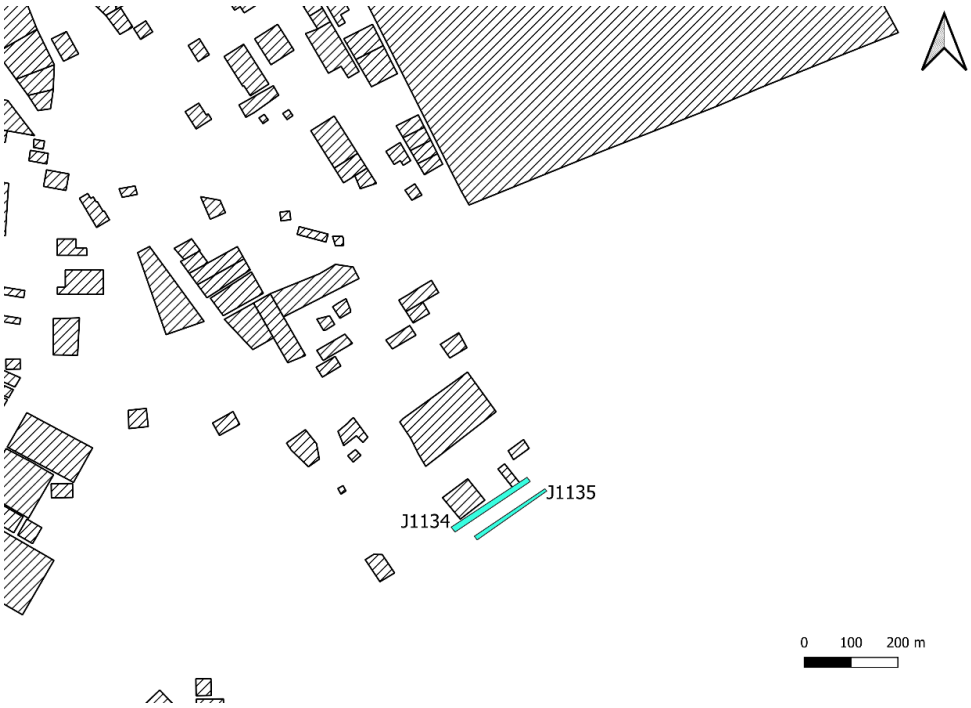
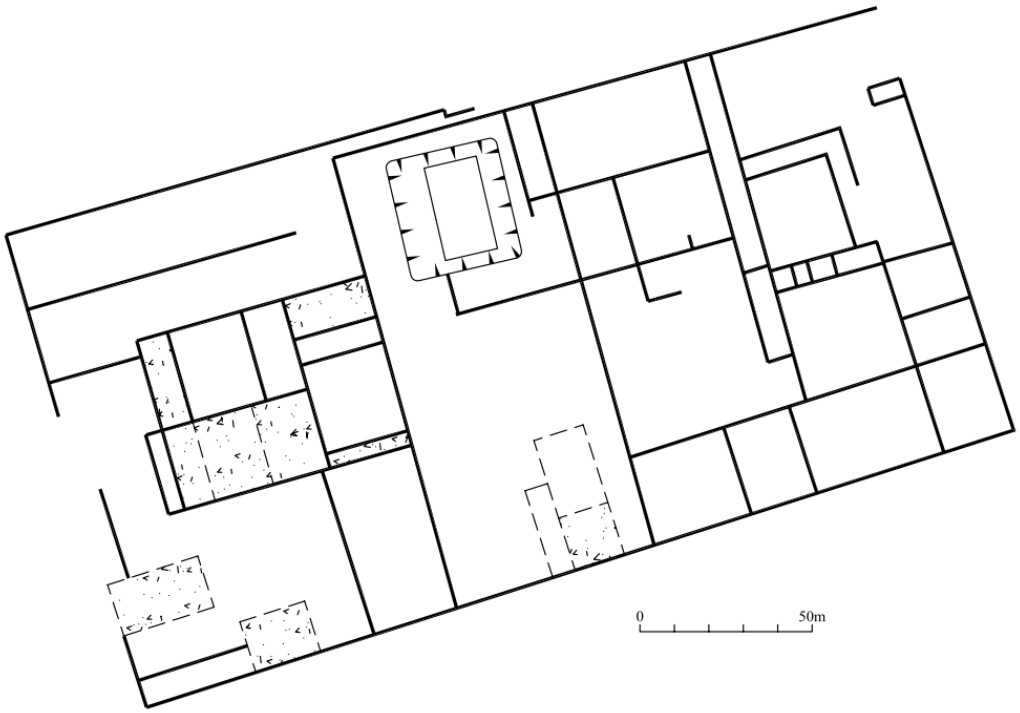


Figure 63: Markets in south Area J (Mutasim's city)



Figure 64: Markets in North Area T (Madinat al-Mutawakkiliyya).

Regarding the *shurta* or penitentiary structures, Northedge argues for J153 and J154 as these structures, based on Ya'qubi's description of the city (Fig. 65). There is no other known structures to have been involved with the protection of the city, and, as there are only two of these, I have decided not to include it. Water systems are extensively discussed in a later section of this chapter. However, the main evidence includes extensive evidence for urban canals and qanats in al-Mutawakkiliyya, while Mu'tasim's city does not have any evidence for major state-built water systems, although plenty of basins are found in buildings within this city.



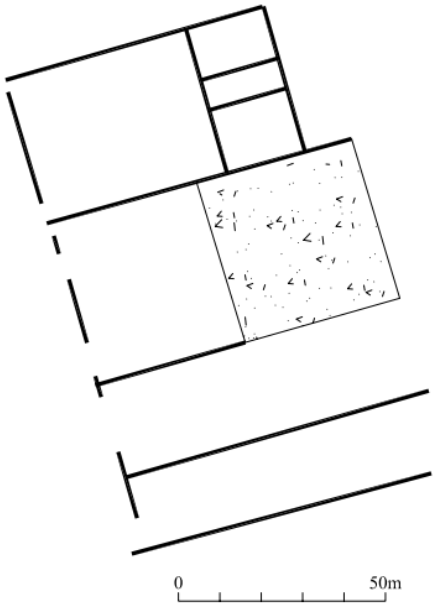


Figure 65: Buildings J153 and J154. Northedge & Kennet, 2015, Fig. 116 & 117.

Each area has specific features, with areas T and J having the most evidence for service structures, although these are not extensively distributed across Samarra. This dataset has a hierarchy if we consider more service infrastructures to symbolise wealth. This simple principle is rooted in the idea that the greater the number of facilities, the better the quality of life a resident might have had. Nevertheless, reality can be more complex. Each feature has a specific connotation, e.g. workshops are linked with crafters and, therefore, with a producing class. Markets, while attractive elements, do produce insecurity due to the big number of transits in them, as the Byzantine ambassador told al-Mansur (al-Tabari, *Tarikh al-Rusul wa al-Muluk,* Vol. 29); so the urban elite might have wanted to avoid these areas. Moreover, the elite probably had servants who could go to the markets for them, so distance in this case was not a crucial element. A higher number of public mosques can help calculate the population size, availability and distribution. Due to mosques' importance during the Abbasid period, a higher frequency in a specific area might suggest a higher-end neighbourhood or, on the other hand, a well-transited or production area. However, the bottom line is that the service infrastructure's presence, either high or low, is linked to the identity of that specific space. The combination of this analysis with the following section, house size distribution, explores and identifies any present patterns, including evidence of a more heterogeneous urban plan or a planned and homogenous city.

As discussed in Chapter 3, the nature of Samarra and its survey carry certain constraints to this analysis. The poor classification of service infrastructure is a systematic complication associated with the site and an impediment to a comprehensive understanding. The short period of usage of some of the features, especially Samarra 2 and 3, combined with the uncertainty of the continuation of production during the establishment of Madinat al-Mutawakkiliyya or the Anarchy at Samarra are other issues

to consider. The functional change of the same space during the different periods is possible, as the capital was profoundly linked with the caliphate's stability. Samarra reflects the Abbasid centralised power, and it is logical to believe that both periods of expansion and conflict should be reflected in the city's life and spaces.

This section will include an analysis of each of the neighbourhoods, including a count of residential buildings (blocks, mansions and more rarely palaces), and any mosques, markets, storehouses, workshops or any similar building (denominated service infrastructure from now on). Workshops and storehouses are special, as they are not necessarily public service. Workshops can belong to a private complex, and storehouses can be used to store private goods. Moreover, it is logical for not all units to have workshops as not all of Samarra's population had productive roles. Despite that, I decided to include within the service infrastructure category as they can throw light into the identity of Samarra, as workshops could have acted as markets and storehouses could have been used for public goods.

If the neighbourhood does not include some or all of these features, I measure the distance from an approximate centre to the closest feature within the same area. A higher presence of service infrastructures concerning the residential buildings will denote a higher quality of life. At the end of each section, a comparison between the different neighbourhoods and a general assessment will be carried out for each area.

Madinat al-Mutawakkiliyya (Area T)

For this area, I am employing the units Northedge created, with a few modifications in some examples (Fig. 66). Each of these units has a varying number of buildings and types of buildings within each area, residential and services infrastructure. This last is more concentrated on the north part of Madinat al-Mutawakkiliyya, what means that those neighbourhoods in the south will have to cover more distance to access them.

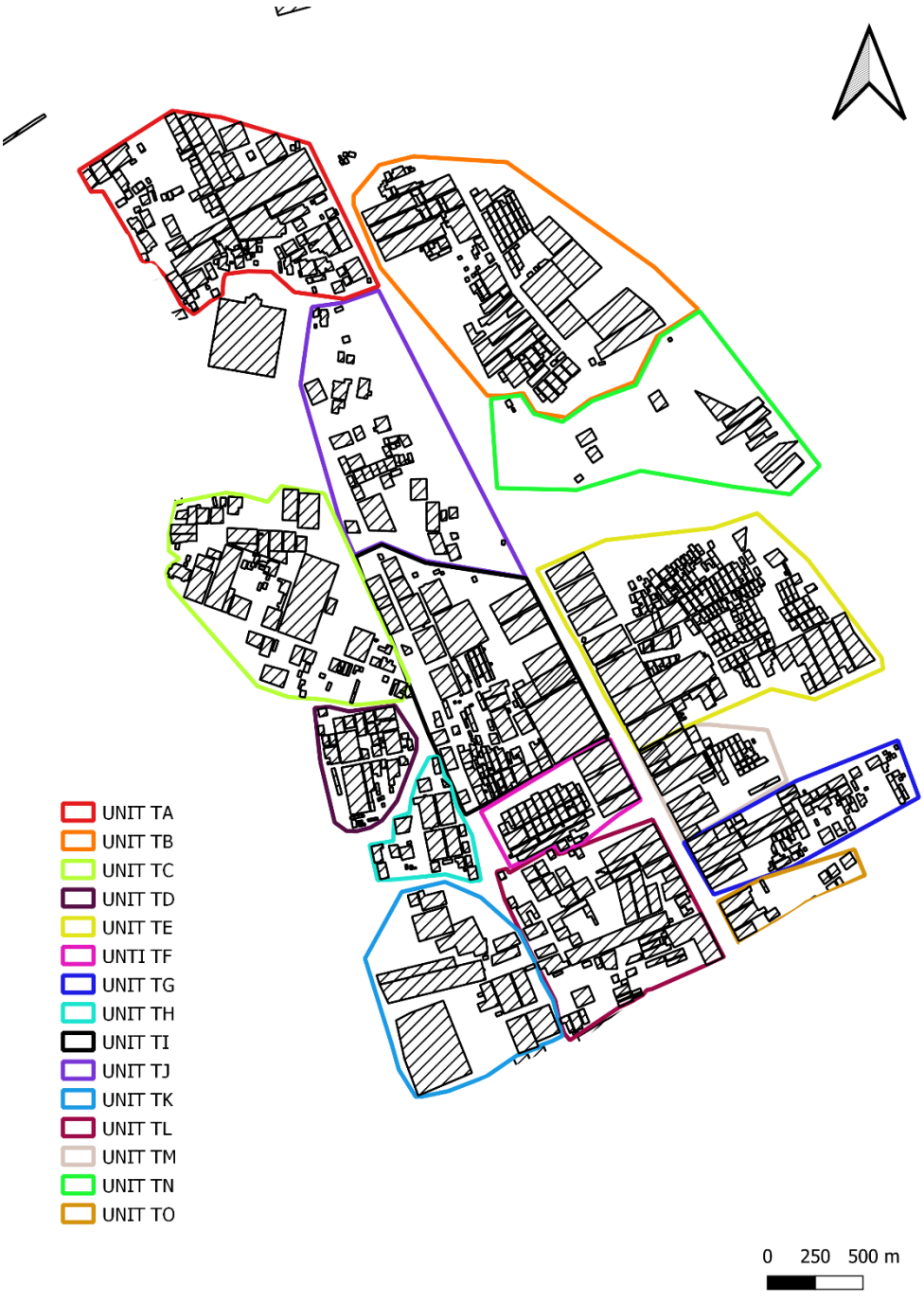


Figure 66: Map of Madinat al-Mutawakkiliyya divided by Units identified by Northedge in Northedge 2008.

Unit TA

Unit TA is located in the north-west part of Madinat al-Mutawakkiliyya next to the gate to al-Ja'fari, between the canal and the qanat line and east of al-Mahuza. It has a total of 111 buildings including blocks, markets, workshops and storehouses (Fig. 67) and an area size of 103,6 ha.

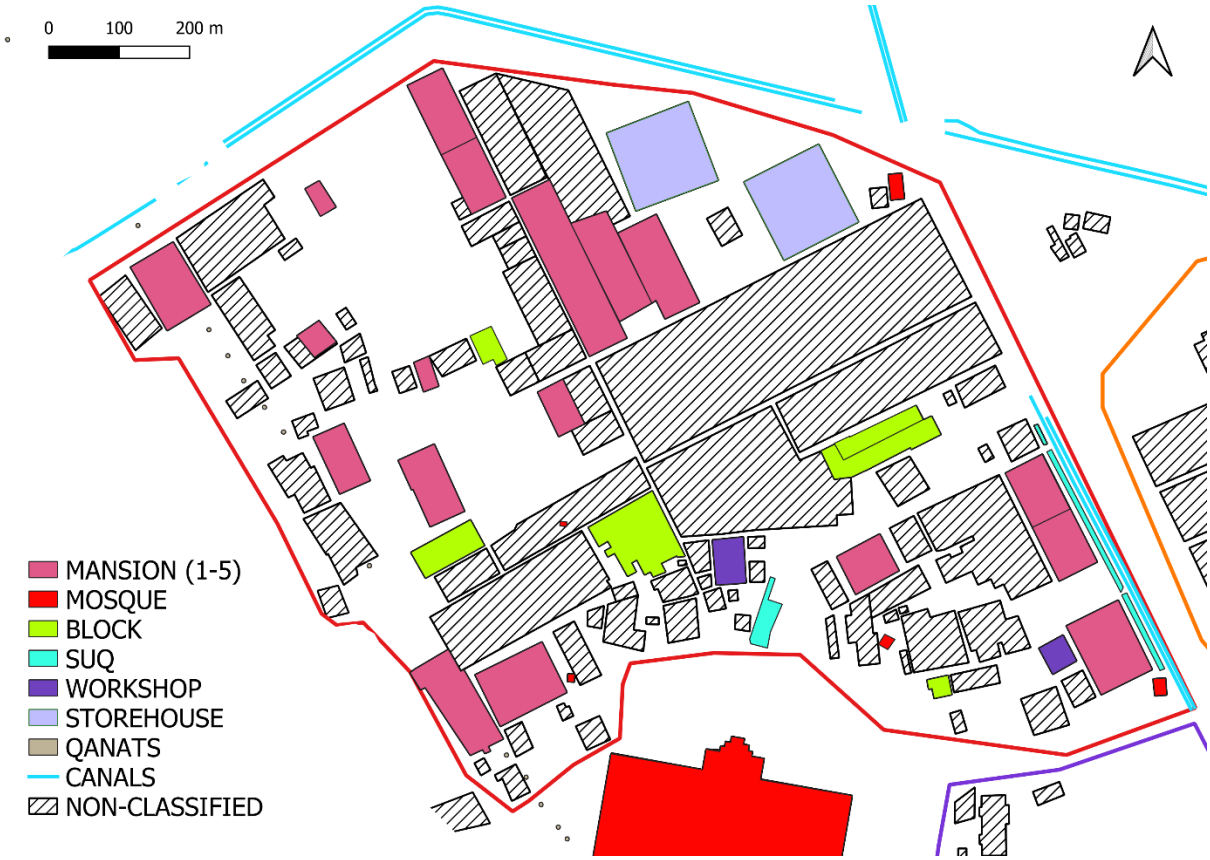


Figure 67: Plan of Unit TA.

There is a total of 22 (19.82%) residences and a total of 13 (11.71%) "service infrastructures", 1.69 houses per service infrastructure. This is an extremely high ratio, combined with the presence of 10 qanats and the canal at the northern limit of the neighbourhood, suggesting that this was a high-standing neighbourhood. Moreover, the presence of mansions (17 in total) compared to just five blocks shows a marked presence of the urban elite. In this case, markets, suqs and mosques are all within the neighbourhood borders. No specific patterns for the residential structures apart from small concentrations of mansions across the plan. The markets are concentrated to the south-east of the neighbourhood, the storehouses are in the north segment and the mosques are scattered across the plan, although there is more frequency around the south and east of the plan. The distance to the congregational mosque is 30m. The Gini coefficient for this unit is 0,3750146 (25 residences).

Building Type	Count
building	53
complex	14
mansion 3	7
block	6
mosque	5
mansion 5	5
enclosure	5
suq	4
mansion 4	4
mansion 2	3
empty enclosure	2
workshop	2
courtyard	1

Figure 68: Distribution of building types in Unit TA.

Unit TB

According to Northedge (2008, p. 216), Unit TB is a 109,2 ha cantonment located northeast of the city, east of Unit TA, similar to the Qata'i of the Maghariba (2008, p. 220) (Figs. 69 & 70)

.

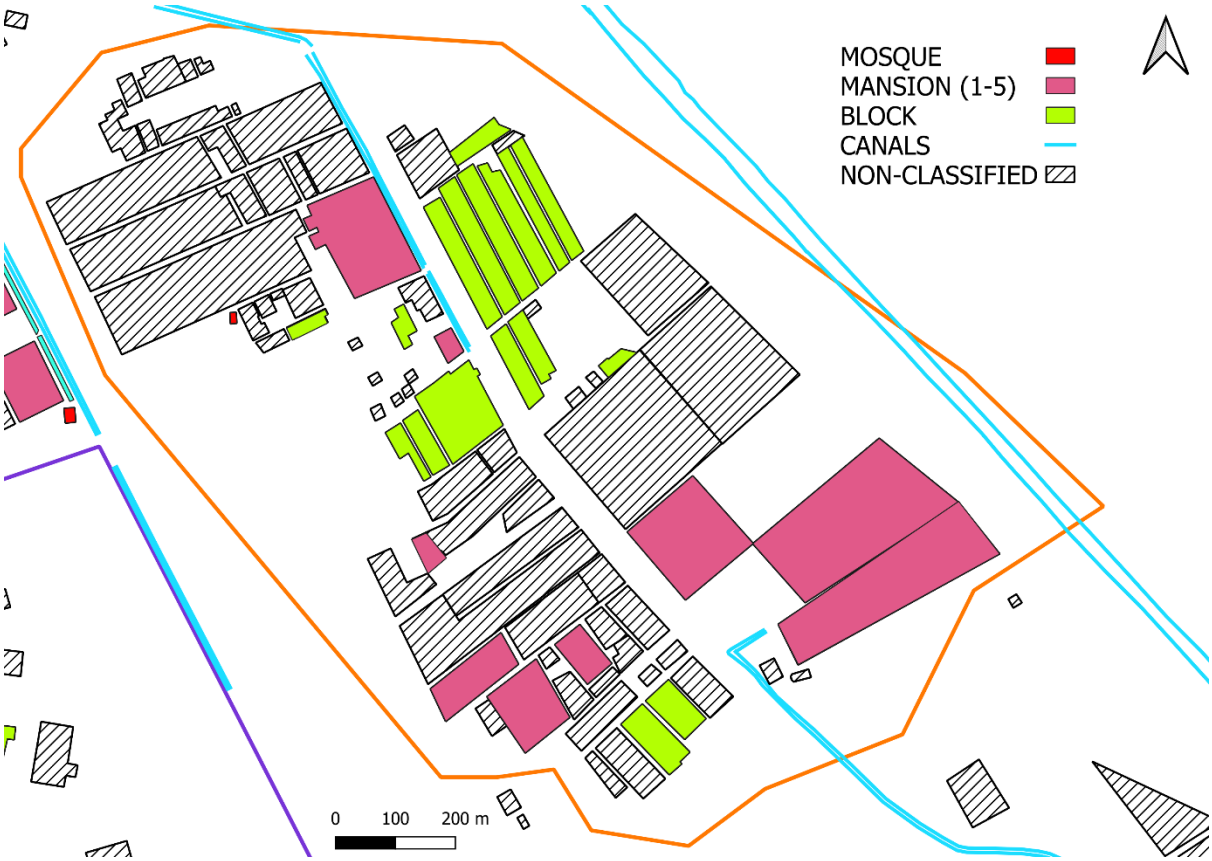


Figure 69: Plan of Unit TB.

This neighbourhood has 90 buildings in total, with 26 (28.89%) being residential buildings and just one evidence of a service structure, a mosque. Within the residential group, 17 (18.89%) were blocks and 9 were mansions (10%). The spatial organization of this specific neighbourhood shows a higher-level organisation than the previous example. In this case, the blocks are organised in rows of very similar size, implying even smaller communities within these units. The mansions are distributed across the space but also in smaller clusters, especially in the south section, with a Gini coefficient of 0,52 (26 examples). No qanats have been identified but there is evidence of one of Mutawakkil's urban canals going through it. Outside of the neighbourhood, the distance to the service infrastructure is the following

- Market (suq): 129m
- Workshop: 220m
- Storehouse: 439m
- Congregational mosque: 689m
- Maydan: 2226m

Building type	Count
building	30
block	17
complex	12
trace	10
enclosure	10
mansion 2	6
mansion 5	2
complex building	1
mosque	1
mansion 4	1
mansion 3	1

Figure 70: Distribution of building types in Unit TB.

Unit TC



Figure 71: Plan of Unit TC.

Unit TC (Figs. 71 & 72) is located in the middle west part just south of al-Mahuza, with 86 ha and has a total of 63 buildings, with 19 (30.16%) residential buildings and just one service infrastructure, a mosque and a maydan. Out of the 19 residences, there are 10 blocks (15.87%) and 9 mansions (14.29%). Regarding internal service infrastructures, there are approximately 24 qanat wells within the neighbourhood limits and a mosque next to a mansion in the south part. The presence of a maydan is especially interesting, as it was normally used as a public space for markets, ceremonies or events (Golombek, 1974). If seen in other examples, it can be evidence of places for people of the neighbourhood to gather or learn about the events taking place in the city, rather than having to walk to the Bab al'Amma, as other authors (Saba, 2022; Northedge, 2008) have suggested. It could also imply smaller-scale initiatives and public buildings, with festivities or specialised markets in the Maydans. I also believe that multiple maydans in the same neighbourhood could mean more heterogeneity than just one maydan. The Gini coefficient is 0,6986217 (19 examples). The distance to the closest service infrastructure is as follows:

- Market (suq): 1759m
- Workshop: 1742m

- Storehouse:1016m
- Congregational Mosque: 1339m

Building type	Count of type
building	23
block	10
enclosure	7
trace	7
complex	5
mansion 2	4
mansion 3	3
mansion 4	2
mosque	1
maydan	1

Figure 72: Distribution of building types in Unit TC.

Unit TD

Unit TD (Figs. 73 & 74) is located on the west side of Area T, south of Unit TC and west of the Mutawakkiliyya qanat line. It has an area of 83.6 ha.



Figure 73: Plan of Unit TD.

It has considerably fewer buildings than the rest, 39. There are a total of 13 (33.3%) residential buildings, 10 blocks (25.64%) and 3 mansions (7.69%), and no evidence of any service infrastructure. This unit has one of the two main spatial organization I want to propose in this dissertation. In this case, the biggest mansion is surrounded by a series of blocks of diverse size and shape. This spatial model is repeated around Samarra, where a mansion attracts blocks around itself. The nature of the blocks is still to be understood, but I believe they could house the service or additional structures that could be crucial for the functioning of the mansion. Another option is misclassifying the blocks, which are service infrastructure reserved only for the mansion. The Gini coefficient is 0,6276731 (13 examples).

The distance to the service infrastructures is the following:

- Market: 2585m
- Storehouse: 1690m
- Workshop: 2531m
- Mosque: 629m
- Congregational Mosque: 2064m
- Water Source: 371m (qanat line)
- Maydan: 1109m

Building type	Count
building	16
block	10
trace	4
enclosure	4
complex	3
mansion 4	2
mansion 2	1

Figure 74: Distribution of building types in Unit TD.

I disagree with Northedge regarding Unit TE. He leaves a mansion, two "houses" (which, for this dissertation, are mansions as well) and a small mosque on the north segment out of the neighbourhood, which leaves them hanging by themselves alone. I decided to modify Northedge's interpretation and add these structures to the neighbourhood, leaving 155 buildings in total and an area size of 104.6 ha.



Figure 75: Plan of Unit E.

Unit TE is characterised by a high number of residential buildings, 100 (64.52%). Out of this group, 82 (52.90%) are blocked, and only 17 are mansions (10.97%). The second theorised spatial model, the row model, organise all these blocks. Similarly to the previous spatial model, the mansions play a key role. Instead of being located in the middle and attracting the blocks, the mansions are located either west or east (normally where the avenue is), and the blocks act like a trail. Each of the blocks' rows can, therefore, be associated with a mansion. Regarding service infrastructure, there is only one mosque within the perimeter. Outside of it, the neighbourhood is between two canals at a similar distance. The calculated Gini coefficient is 0,5633817 (98 examples). The closest infrastructure services and their distance to Unit TE are the following:

- Market (suq): 2635m
- Storehouse: 1912m

- Workshop: 2356m
- Congregational Msoque: 2771m
- Water Source: 767m (Canal)
- Maydan: 1283m

Building Type	Count
block	82
building	36
empty enclosure	8
mansion 4	6
trace	5
mansion 5	4
mansion 2	3
complex	3
enclosure	3
house	3
mansion 3	1
mosque	1

Figure 76: Building types in Unit TE.

Unit TF

Unit TF is located on the southwest part of Area T, on the west side of the avenue between Units TI and TL (Fig. 77). It has an area size of 28.5 ha and a total of 35 buildings with 21 blocks (60%) within the permitter, compared to just 2 (5.71%) mansions (Fig. 78). The blocks are distributed following the row spatial model, a consecution of similar blocks placed in the trail of mansions by the avenue. In this case, two rows fall within one of the mansion's trails. The calculated Gini coefficient is 0,384 (23 examples). There are no service infrastructures within the unit, and the distance to them outside is increasing compared to previous cases:

- Market (suq): 2973m
- Workshop: 3755m
- Storehouse: 2121m
- Mosque: 908m
- Congregational Mosque: 2973m
- Water Source: 378m
- Maydan: 906m



Figure 77: Plan of Unit TF.

Building type	Count
block	21
building	8
complex	3
mansion 2	2
empty enclosure	1

Figure 78: Distribution of building types in Unit TF.

Unit TG

Unit TG is located on the southeast part of Area H, east of the avenue and south of Unit TM (Fig. 79).



Figure 79: Plan of Unit TG.

It has an area of 21.7 ha, and there are a total of 63 buildings: 37 (58.73%) of them residential buildings, 36 (57.14) of them blocks and just 1 (1.59%) mansion (Fig. 80). While this unit follows the row spatial model, the western buildings, usually mansions, have been classified as buildings by Northedge. This can be due to a poor classification, or the row model might have some degree of flexibility. The calculated Gini coefficient is 0,4496076 (37 examples). There is no service infrastructure within the unit apart from the maydan by the avenue, so the closest features are the following:

- Market (suq): 3672m
- Workshop: 3743m
- Storehouse: 2920m
- Mosque: 1488m
- Congregational Mosque: 3894m
- Water Source: 700m (Canal)

Built type	Count
block	36
building	20
complex	3
maydan	1
mansion 2	1
enclosure	1
complex building	1

Figure 80: Distribution of building types in Unit TG.

Unit TH

Unit TH is located in the southwest part of the city, south of Unit TD and west of Unit TF (Fig. 81). It is one of the clusters in the west part of Madinat al-Mutawakkiliyya (Area T). It has an area size of 21.7 ha and a total of 24 buildings, one of the few examples where there are more mansions than blocks. There are only 5 (20.83%) residential buildings, 4 (16.67%) mansions and 2 (8.33%) blocks (Fig. 82). The mansions are grouped together in a square-like model. This is the first time we have seen this model in Area T, as so far, all the mansions' groupings were in the form of lines. The calculated Gini coefficient is 0,4515629 (6 examples). The distance to the closest service infrastructure is the following:

- Market (suq): 3132m
- Workshop: 2953m
- Storehouse: 2046m
- Mosque: 1230m
- Congregational Mosque: 2572m
- Water Source: 275m (Qanat)
- Maydan: 768m



Figure 81: Plan of Unit TH.

Building type	Count
building	13
mansion 2	3
trace	2
block	2
enclosure	2
complex	1
mansion 4	1

Figure 82: Distribution of building types in Unit TH.

Unit TI

Unit I is located by the avenue, on the west side, east of Units TC, TD and TH (Fig. 83). The area is 100 ha and includes the mansions and buildings on the north-west side of the main avenue. There is a total of 86 buildings, with 41 (47.67%) residences, 27 (31.40%) blocks and 11 (12.79%) mansions (Fig. 84). The calculated Gini coefficient is 0.68 (38 examples). This follows a slight variation of the row spatial model, with blocks placed to the west of the mansions but with a vertical orientation instead of a horizontal one. Consistently with the neighbourhoods by the avenue, this space has the qanat line to the west and the avenue to the east. There is no evidence for any service infrastructure. The distance to them is the following:

- Market (suq):
- Workshop: 2249m
- Storehouse: 1318m
- Mosque: 550m
- Congregational Mosque: 1979m
- Maydan: 1478m



Figure 83: Plan of Unit TI.

Building type	Count
block	27
building	22
enclosure	10
trace	8
complex	4
empty enclosure	3
mansion 3	3
mansion 2	3
mansion 5	2
house	2
mansion 4	1
mansion 1	1

Figure 84: Distribution of building types in Unit TI.

Unit TJ

Unit TJ is located north of TI on the avenue's west side, south of TA and east of the congregational mosque (Fig. 85). There is a total of 45 buildings, with just one (2.22%) mansion and one (2.22%) block as the residential structures of the area (Fig. 86). The calculated Gini coefficient is 0,1263154 (2 examples). The neighbourhood is stretched, with the residential buildings at the ends with no apparent connection between them. The middle segment is composed mainly of unclassified buildings and a storehouse, with the avenue canal to the east and the qanat line to the west. There is a small mosque on the southeast end. The other service infrastructure is at the following distance:

- Market (suq): 894m
- Workshop: 876m
- Congregational mosque: 738m
- Maydan: 1147m

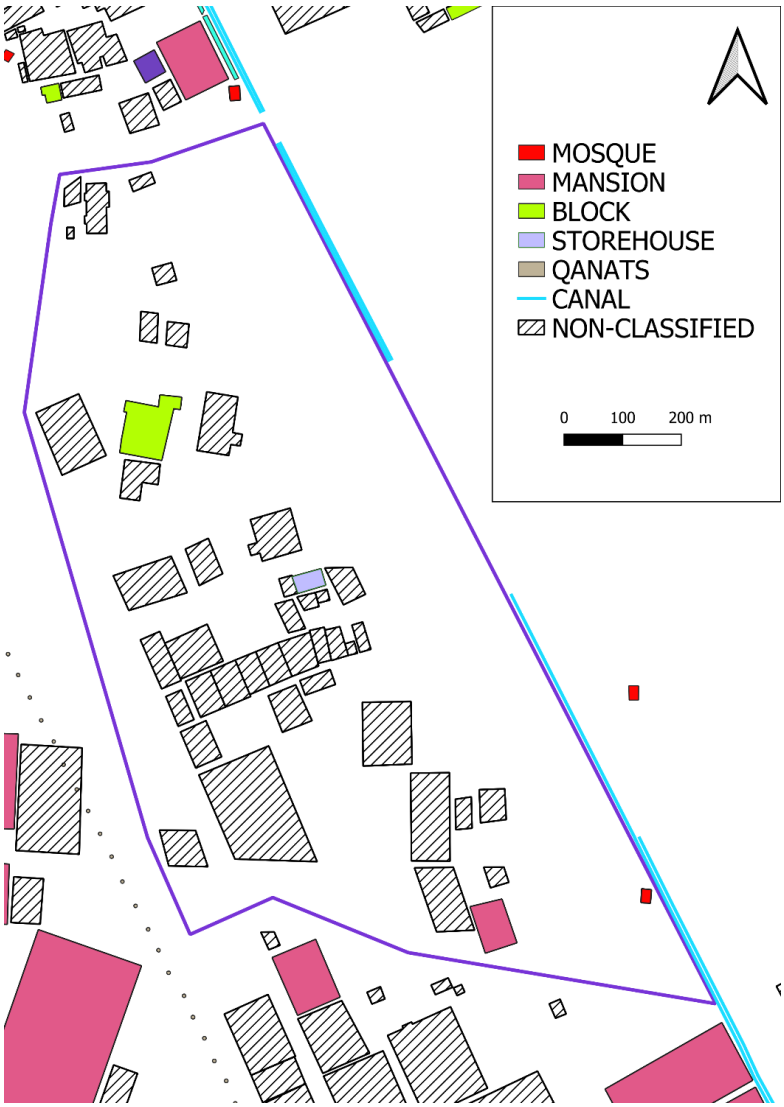


Figure 85: Plan of Unit TJ.

Building type	Count
building	22
enclosure	18
mosque	1
empty enclosure	1
storehouse	1
block	1
mansion 4	1

Figure 86: Distribution of buildings in Unit TJ.

Unit TK

Unit TK, with an area size of 69.7ha, is located on the south-west section of Area T south of Unit TH and west of TL (Fig. 87). There is a total of 18 buildings with 7 (38.89%) residential structures, 6 (33.33%) blocks and 1 (5.56%) mansion (Fig 88). These are organised with no apparent connection to each other in small groups of residences. The calculated Gini coefficient is 0,381161 (7 examples). The unit has access to the south to the horizontal canal that divides Area T and Area U and the qanat line to the east. Within its perimeter is a maydan next to the mansion, on the northwest part of the unit. The distance to service infrastructures is one of the highest due to its placement in the south of Area T. I am aware that there are closer mosques in Area U. However, due to its military nature, I assume that the civilians could not use them. The distance to the outside-unit service infrastructure is:

- Market: 3741m
- Workshop: 3883m
- Storehouse: 2905m
- Mosque: 1975m
- Congregational Mosque: 3412m



Figure 87: Plan of Unit TK.

Building type	Count
block	6
building	4
empty enclosure	3
enclosure	2
mansion 2	1
trace	1
maydan	1

Figure 88: Distribution of building types in Unit TK.

Unit TL

Unit TL, with an area size of 78.1 ha, is located in the south part of Area T, on the avenue's west side (Fig. 89). It comprises 67 residential buildings, 26 (38.81%). There are 23 (34.33%) blocks in vertical rows scattered across the space and 3 (4.48%) mansions, the two biggest by the avenue and one on the northwest corner (Fig. 90). The calculated Gini coefficient is 0,56(26 examples). There is no evidence of any service infrastructure; outside the unit, they are at the following distances:

- Market (suq): 3906m
- Workshop: 3673m
- Storehouse: 2757m
- Mosque: 1412m
- Congregational Mosque: 3398m
- Maydan: 664m



Figure 89: Plan of Unit TL.

Building type	Count
block	23
building	20
enclosure	8
trace	7
complex	4
mansion 2	2
empty enclosure	2
mansion 4	1

Figure 90: Distribution of building types in Unit TL.

Unit TM

Unit TM, with an area size of 27.1 ha, is located on the south part of Area T on the west side of the main avenue, between Units TE and TG (Fig. 91). It is composed of 67 buildings, with 23 (34.33%) blocks and 3 (4.48%) mansions, which makes a total of 26 residential buildings (Fig. 92). The majority of the blocks are in a row-like cluster on the east side, while the mansions are placed by avenue next to each other. The calculated Gini coefficient is 0,5904552 (26 examples). There is no evidence of any service infrastructure; the distance to the closest service infrastructures is the following:

- Market (suq): 3162m
- Workshop: 3206m
- Storehouse: 2407
- Mosque: 910m
- Congregational Mosque: 3266m
- Water Source: 405m (Canal)
- Maydan: 458m



Figure 91: Plan of Unit TM.

Building type	Count
block	21
mansion 2	4
building	4
enclosure	1
mansion 3	1
complex	1

Figure 92: Distribution building types in Unit TM.

Unit TN

Unit TN is located south of Unit TB, west of the eastern canal (Fig. 93). Its size, 68.5 ha, is not proportional with the number of buildings. There are only 14 buildings, with one (7.14%) mansion and one (7.14%) mosque on the west side of the unit, which is distant from the mansion, and enclosures are placed in a row on the east side (Fig. 94). The distance to the outside-unit service infrastructure is:

- Market (suq):. 1707m
- Workshop: 1795m
- Storehouse:1331m
- Congregational Mosque: 2160m
- Maydan: 2322m

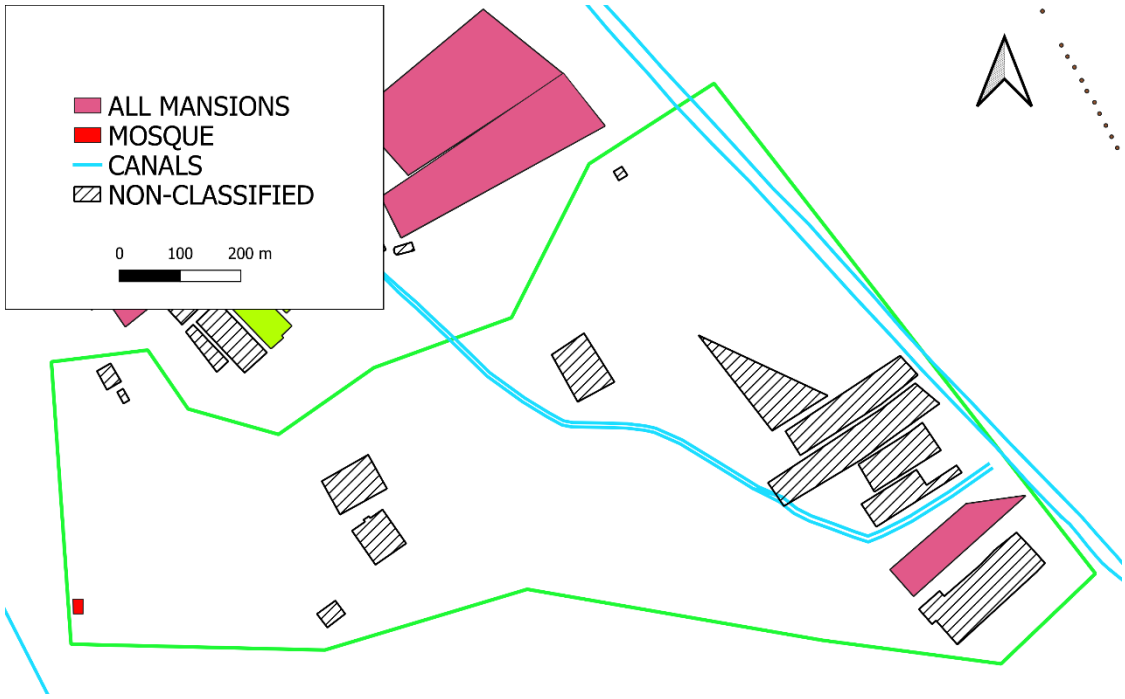


Figure 93: Plan of Unit TN.

Building type	Count
building	7
enclosure	5
trace	1
mansion 2	1

Figure 94: Distribution of building types in Unit TN.

Unit TO

Unit TO is located on the southeast segment of Area T, just north of the Al-Dur cantonment, and has an area of 12.6 ha (Fig. 95). This unit has no residential or service infrastructure buildings, and the only meaningful attribute is an east-west canal going through it. While irrelevant to this analysis, a canal suggests that the buildings were inhabited by people or used for production. Either way, it is evidence that the Samarran architecture needs to be reclassified. The distance from the unit to the service infrastructure is the following:

- Market (suq): 4295m
- Workshop: 4003m
- Storehouse: 3116m
- Mosque: 1664m
- Congregational Mosque: 4075m
- Maydan: 390m



Figure 95: Plan of Unit TO.

Discussion

Madinat al-Mutawakkiliyya is a diverse city with clusters of varying sizes and features (Table 28). Residential buildings follow different spatial distribution models across the site, with the clear influence of the avenue as a crucial keystone of both residential and functionality with the presence of canals and markets. The social dynamics and the quality of life in this area are again dependent on the part of the city, with some of the services being 3km or more away from a residence. The presence of service infrastructures is reduced, mainly in the northern part of the area, in Unit TA. This concentrates most of the services (57%), including some like markets and workshops, which are only present here. The general lack of these two across the site can be due to different reasons. A possible option is that the original city of Mu'tasim had various markets, including the central one, which could have reduced the need for more markets. Another possibility that may be more plausible is that due to its short period of existence, there was no time for the more commercial aspect of the city to develop. Moreover, as Northedge and Kennet (2015) pointed out, workshops are one of the most complicated buildings to identify with the methodology used. Defining units of Area T as productive spaces is not feasible due to the lack of evidence, with the exception of Unit TA.

UNIT	UNIT SIZE (ha)	Gini Coefficient	WATER SYSTEM (Y/N)	SPATIAL MODEL	BLOCKS	MAN-SIONS	MOS-QUE	MAR-KET	WORKSHOP	STOREHOUSE	MAYDAN
TA	103.6	0,3750146	Yes (Qanat and Canal)	Irregular	6	18	4	4	2	2	0
TB	109.2	0,5187236	Yes (Canal)	Rows	17	9	1	0	0	0	0
TC	83.6	0,6986217	Yes (Qanat)	Group	10	9	1	0	0	0	1
TD	25.1	0,6276731	No	Group	10	3	0	0	0	0	0
TE	104.6	0,5633817	No	Rows	82	17	1	0	0	0	0
TF	28.5	0,3838167	No	Rows	21	2	0	0	0	0	0
TG	41.4	0,4496076	No	Rows	36	1	0	0	0	0	1
TH	0,217	0,4515629	No	Group	2	4	0	0	0	0	0
TI	100	0,6782455	Yes (Qanat)	Rows	27	10	0	0	0	0	0
TJ	64.1	0,1263154	Yes (Canal)	Irregular	1	1	1	0	0	1	0

TK	69.7	0,381161	Yes (Canal)	Group	6	1	0	0	0	0	1
TL	78.1	0,5623051	Yes (Qanat)	Rows	23	3	0	0	0	0	0
TM	27.1	0,5904552	No	Rows	23	3	0	0	0	0	0
TN	68.5	NA	Yes (Canals)	Rows	0	1	1	0	0	0	0
TO	12.6	NA	Yes (Canal)	NA	0	0	0	0	0	0	0
TOTAL					264	82	9	4	2	3	3

Table 26: Different variables and structures presented for Mutawakkiliyya.

The table lists fifteen units (TA to TO) with sizes ranging from 0.126 km² (TO) to 1.092 km² (TB), with an average size of 0.625 km². The number of residences varies from 0 to 99, including mansions and blocks, with an average of 23 residential buildings per unit. The presence of service infrastructure varies from 0 to 12, with an average of 1.4 per unit. Finally, 60% of the units have a water system within their perimeter and an even higher number of units close to water sources. All this data provides different information regarding the correlation between different aspects and quantifies the quality of life in the area.

Most of the service infrastructure of Area T is concentrated in Unit TA, with the interesting remark that the only markets and workshops in the area are here (Table 29). Its proximity to al-Ja'fari, the avenue, canals and qanat lines, and the presence of services and mansions denotes a well-located neighbourhood, with access to water and easily accessible from different locations. The evidence of workshops and storehouses does not indicate an elite neighbourhood but a production one. Water is needed for production, and markets are conveniently next to the workshops, storehouses, and mosques for workers and visitors. The high number of mansions could argue in favour of a wealthy neighbourhood, although we see other units with a similar number of mansions without this much service infrastructure. Moreover, there is a chance that business owners or rich merchants could own the mansions. I believe Unit TA was built as the "commercial" zone of al-Mutawakkiliyya, standing between al-Ja'fari and the rest of the city.

The other areas have less evidence for service infrastructure, with only Units TC and TJ having two structures. The rest have either one or none. This could be a symptom of the premature death of Madinat al-Mutawakkiliyya and the inability of its citizens to develop more commercial areas, or it could mean that the prototype of the Samarran neighbourhood did not have these types of buildings and people would have to travel long distances to obtain it. This second idea is worth exploring, as distance to services can be perfectly used as a proxy for inequality. The southern neighbourhoods are placed further away from the service infrastructures (markets and workshops) than those in the middle or northern section of the area. Mosques, on the other hand, due to their more widespread distribution, are more accessible to all the units. The congregational mosque, supposedly

both a representation of the caliphal power and a place for people to pray on Fridays, is also placed in the northern part of Madinat al-Mutawakkiliyya, forcing the inhabitants of the southern units to travel a longer distance to pray. When compared to each other, we notice that the five first units with the least amount of distance all have infrastructure services within them.

UNIT	MAR-KET	WORK-SHOP	STORE-HOUSE	WATER SYSTEM	MAY-DAN	MOSQUE	CON. MOSQUE
TA	NA	NA	NA	NA	2096	NA	30
TB	129	220	439	NA	2226	NA	689
TC	1759	1742	1016	NA	NA	NA	1339
TD	2585	2531	1690	371	1109	629	2064
TE	2635	2356	1912	767	1238	NA	2771
TF	2973	3755	2121	378	906	908	2973
TG	3672	3743	2920	700	NA	1488	3894
TH	3132	2953	2046	275	768	1230	2572
TI	1370	2249	1318	NA	1478	550	1979
TJ	894	876	NA	NA	1147	NA	738
TK	3741	3883	2905	NA	NA	1975	3412
TL	3906	3673	2757	NA	664	1412	3398
TM	3162	3206	2407	405	458	910	3266
TN	1707	1795	1331	NA	2322	NA	2160
TO	4295	4003	3116	NA	390	1164	4075

Table 27: Distance (m) to service infrastructure not present in the units.

The distribution of various units across Area T indicates a thoughtful integration of infrastructure, with water systems playing a crucial role in shaping the development. Units with Qanat and Canal systems, like TA, demonstrate a higher diversity of buildings and services, highlighting the importance of water management in urban planning. These units tend to be closer to central reference points, facilitating better service accessibility. The spatial models observed across the different units suggest a deliberate approach to urban design, with 'Rows' being the most prevalent model, supporting larger and more densely populated areas. The presence of certain infrastructures, such as markets and workshops in northern units, shows that, in fact, these features are not part of all neighbourhoods, at least in Area T. However, the distribution of mosques and water systems across central and peripheral units indicates widespread accessibility to essential services, even in more distant neighbourhoods like TG and TL. This spatial distribution underscores the importance of these two urban features, showing the value it had for the Caliphs and the Abbasid society.

The maydans, with 3 examples in 13 units, do not seem as popular and constant as the mosques. Their distribution does not follow a certain pattern, with an average distance of 1198.2m to the other units. Further evidence of this in other areas of Samarra might argue

in favour of small and multiple shared public spaces instead of a main one like Greek agoras or Roman forums.

I think this area is heterogeneous in terms of urban organization and structure. The variation in unit sizes, presence and types of water systems, diversity in spatial models, irregular distribution of service infrastructure and the difference in distance to public spaces like congregational mosques and private spaces like markets show urban heterogeneity. More evidence is needed regarding social class, but different parameters can be used to get a broad idea. A higher number of mansions, like in Units TA, TE or TI, could indicate wealthier or higher-status residential areas. Units with multiple instances of service infrastructure can serve as central hubs for commerce, industry, and religion, mixing different social classes but with a strong production background. Those without amenities who live long distances from them can house the lower population segment.

Both classical and contemporary authors have given the avenues the utmost importance. The data shows a concentration of mansions by the middle segment of the avenue, with 18 mansions out of 81. Unlike the canal and the qanats line, the units with mansions placed by the avenues lack service infrastructure. While the mansions might have been placed in one of the city's arteries, their units did not have any evidence of quality of life, being the blocks the only other sign of planned urbanism.

UNIT	RESIDENTIAL TOTAL	S.I. TOTAL	TOTAL	RESIDENCE PER SERVICE INFRASTRUCTURE	BLOCKS PER MANSION
TA	24	12	36	2	0.33
TB	26	1	27	26	1.89
TC	19	2	21	9.5	1.11
TD	13	0	13	Not applicable	3.33
TE	99	1	100	99	4.82
TF	23	0	23	Not applicable	10.5
TG	37	1	38	37	36
TH	6	0	6	Not applicable	0.5
TI	37	0	37	Not applicable	2.7
TJ	2	2	4	1	1
TK	7	1	8	7	6
TL	26	0	26	Not applicable	7.7
TM	26	0	26	Not applicable	7.67
TN	1	1	2	1	Not applicable
TO	0	0	0	Not applicable	Not applicable

Table 28: Relationship between residences and service infrastructure in units of Area T.

Water systems are needed in both residential and production spaces. The correlation between service infrastructure, unit size, residential structures, and the presence of water systems can help explain the role the canals and qanats played in these units (Fig. 96).

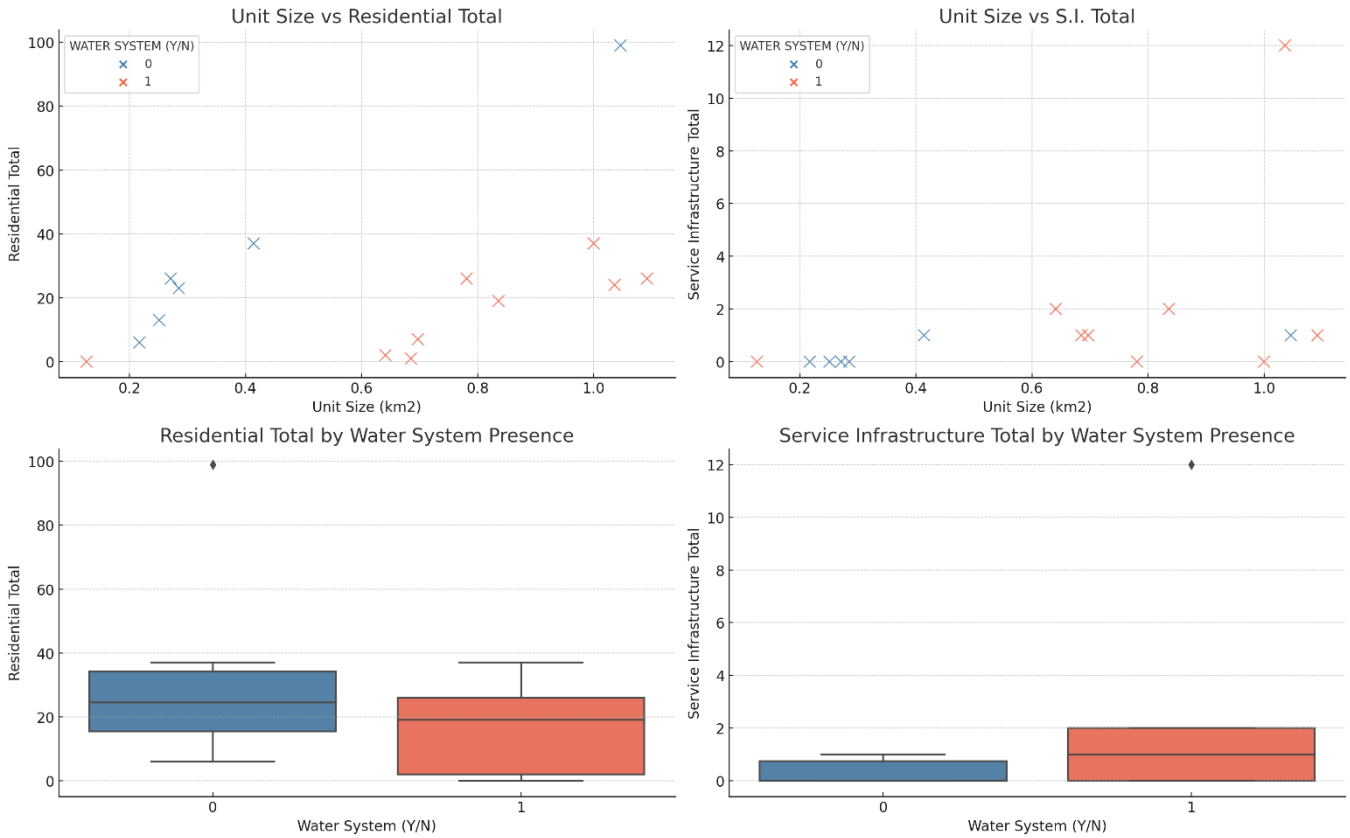


Figure 96: Relation between residences, water systems and service infrastracture.

A statistical and correlation analysis of the units reveals an intriguing relation between the presence of water systems and the other defined variables (Table 31). Larger units are more likely to have a water system, with a moderate positive correlation of 0.52. Interestingly, a negative correlation (-0.38) exists between the number of residential structures and water systems. The areas with a higher number of residences are characterised by a higher number of blocks rather than mansions, which means that the lower-class areas had less access to water. Nevertheless, there are multiple cases of canals placed 500m or less from the units, so there might be more correlation than the one presented here. The relationship between service infrastructure and the water systems is positive but not excessively pronounced. With a value of 0.30, those units with a higher number of service infrastructure tend to have water systems within their perimeter. However, the relatively low value suggests that water systems were not the definitive factor in building and forming productive complexes in Madinat al-Mutawakkiliyya.

UNITS WITH WATER SYSTEMS	SERVICE INFRASTRUCTURE
TA	12
TB	1
TC	2
TI	0
TJ	2
TK	1
TL	0
TN	1
TO	0
TOTAL	19

UNITS WITH NO WATER SYSTEMS	SERVICE INFRASTRUCTURE
TD	0
TE	1
TF	0
TG	1
TH	0
TM	0
TOTAL	2

Table 29: Relationship between units (with and without water systems) and service infrastructure.

While water systems were more common in larger units, this was not directly correlated with a higher number of residences or, in a significant way, with the service infrastructure. This reinforces the idea of a complex process of urban formation in Madinat al-Mutawakkiliyya, where water is generally accessible with certain patterns.

Cantonment of al-Dur (Area U)

The cantonment was built during the Anarchy at Samarra (Samarra 4), the last space built in the capital before its abandonment. It has three main horizontal avenues that connect the palace with the east end of the cantonment and a third avenue that divides the cantonment vertically. The area comprises west-east rows, which include between 1 and 20 blocks each. The rows normally comprise two or three sizes of similar shape and orientation. There are two mosques on the west and east of the cantonment and one big market on the northern row. Northedge (2008, fig. 78) identified four units based on the avenues as dividing features: Units UA-UD (Fig. 97).



Figure 97: All units of al-Dur.

Unit UA

This Unit is located on the south end of the Area, with an area of 56.257 ha and was built earlier than the rest of the cantonment (Fig. 98). A big mansion, U294, on the west and an approximate 20m avenue connecting it with the main cantonment avenue. The larger blocks are placed closer to the palace, while the smaller ones are further away. The Mutawakkiliyya qanat line, which extends from Area T, goes through this unit. There are 43 buildings, with 1 mansion and 12 blocks, and no service infrastructures (Fig. 99). The calculated Gini coefficient is 0.5 (92 examples). The distance to the available service infrastructure in Area U is the following:

- Market (suq): 1170m
- Mosque: 1123m
- Maydan: 456m
- Congregational Mosque: 5442m

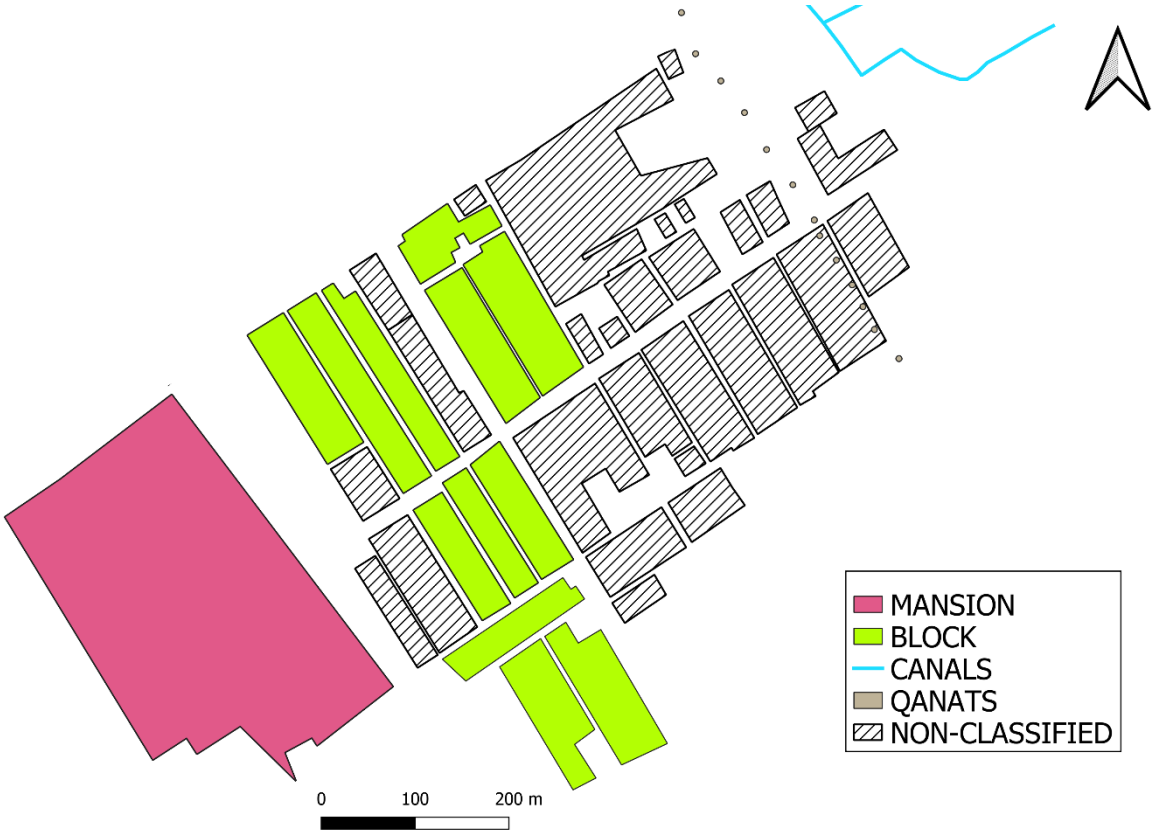


Figure 98: Plan of Unit UA.

type	Count of type
building	22
block	12
complex	8
enclosure	2
mansion 2	1
complex building	1

Figure 99: Distribution of building types in Unit UA.

Unit UB

Unit UB is located between Units UA and AC and has an area of 82.1 ha (Fig. 100). The biggest mansion of Area U, U165, is located to the west, where a 35m wide avenue reaches the main avenue *Shari'al-A'zam*. Unlike the other units, there are no residences by the avenue. The number of blocks is lower compared to the rest of the units. There is a total of 30 buildings, with just 2 blocks and 2 mansions, with a calculated Gini coefficient of 0.63 (4 examples) (Fig. 101). There are no service infrastructures, although the mansion has a polo maydan, a canal, and a qanat line. The distance to the closest service infrastructure is:

- Market (suq): 564m
- Mosque: 634m
- Congregational Mosque: 4927m

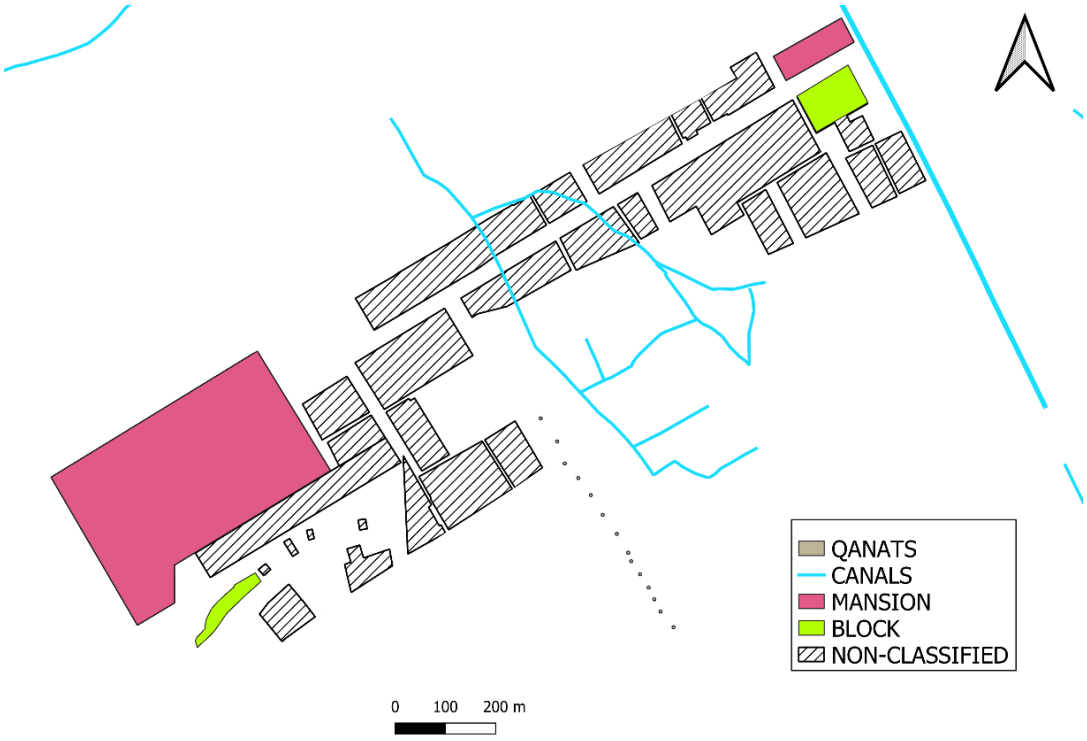


Figure 100: Plan of Unit UB.

Building type	Count
enclosure	7
empty enclosure	6
complex	5
building	4
block	2
mansion 1	1
mansion 2	1
complex building	1
maydan	1

Figure 101: Distribution of building types in Unit UB.

Unit UC

Unit UC is located on the northwest part of the cantonment and has an area of 110.7 ha (Fig. 102). A 29m wide avenue connects the mansion U62 with the main vertical avenue with the canal line. To the sides of this first avenue, there are multiple mansions with blocks attached to them. North of this, there is a narrower avenue with three clusters of block rows, a suq and a probable mosque. This Unit is surrounded by canals. There is a total of 130 buildings with 73 (56.15%) blocks, and 19 (14.62%) mansions, with a calculated Gini coefficient of 0.51 (Fig. 103). The distance to the congregational mosque is 4353m and to the maydan.



Figure 102: Plan of Unit UC.

Building type	Count
block	73
building	22
mansion 3	11
mansion 4	7
complex	5
complex building	3
empty enclosure	3
enclosure	2
suq	1
mosque	1
cantonment	1
mansion 1	1

Figure 103: Distribution of building types of Unit UC.

Unit UD

Unit UD is located east of the main avenue (Fig. 104), and, unlike the other areas, there is no big mansion. It has an area size of 73.3 ha. There is, in fact, a 12m wide avenue with a concentration of blocks. Interestingly, the spatial distribution is more similar to the examples seen in Area T, where the mansions were located by the main avenue and followed by rows of blocks. There is a total of 134 buildings, with 99 residences, 3 mansions, 96 blocks, one mosque to the south and various canals (Fig. 105). The calculated Gini coefficient is 0.37 (101 examples). The distance to the closest available service infrastructure in the area is:

- Market (suq): 1361m
- Mosque: 1578m
- Maydan: 1943m
- Congregational Mosque: 4626m.

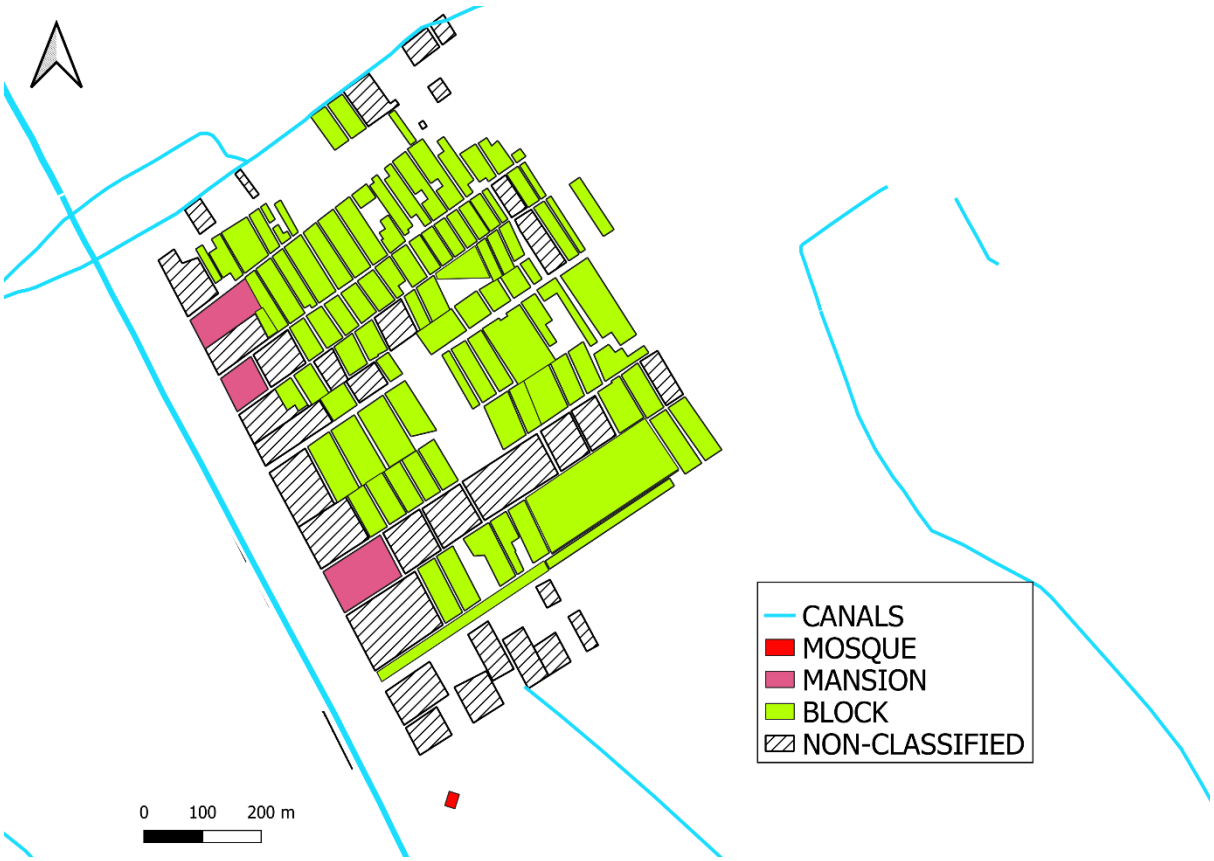


Figure 104: Plan of Unit UD.

type	Count of type
block	96
building	15
empty enclosure	7
complex	7
enclosure	3
mansion 3	2
mansion 4	1
blocks	1
trace	1
complex building	1

Figure 105: Distribution of building types in Unit UD.

Discussion

The various units within the cantonment of al-Dur exhibit distinct characteristics and spatial organization (Table 32). UC, the largest unit at 110.6 ha, contains 73 blocks, suggesting a well-organized and spacious layout. UD, while a smaller site at 73.3 ha, has the highest number of blocks (97), indicating a denser space. The distribution of service infrastructure provides a heterogeneous socio-economic dynamic of the cantonment. Unit UA, with more mansions, also includes a market and mosque and might be the central or, at least, most transited unit. In contrast, Unit UD, with a higher block density but a lack of both water systems and service infrastructure, appears to be a more purely residential area. UB, despite only having three residences, stands as an important feature of the cantonment due to the maydan. This unit further argues the presence of maydans as a point of reunion for the inhabitants of Samarra. Surprisingly, according to the Gini coefficient, Area U is an example of the Rows spatial model as unequal. Area size, presence of water systems or specific residence types do not seem to be correlated to these values.

UNIT	**UA**	**UB**	**UC**	**UD**
AREA SIZE (ha)	56.257	82.1	110.6	73.3
Gini Coefficient	0,499424	0,6282306	0,5063442	0,3662417
WATER SYSTEM	Yes (canal)	Yes (Canal)	Yes (Canal)	No
SPATIAL MODEL	Rows	Rows	Rows	Rows
BLOCKS	73	1	12	97
MANSIONS	19	2	1	3
MOSQUES	1	0	0	0
MARKETS	1	0	0	0
WORKSHOPS	0	0	0	0
STOREHOUSE	0	0	0	0
MAYDAN	0	1	0	0

Table 30: Units in area U with each presented variable.

The distance to the services is, with the exception to the congregational mosque, under 1km (Table 33). This suggests that soldiers of a cantonment would have had to move short distances within the different units to access certain services

UNIT	UA	UB	UC	UD	Avg. Distance
MARKET	1170	564	0	1361	773.75
MOSQUE	1123	634	0	1578	833.75
MAYDAN	456	0	821	1943	805
CON. MOSQUE	5442	4927	4337	4626	4833

Table 31: Distance from each unit to service infrastructure.

Cantonment of al-Karkh (Area F)

The first cantonment of al-Karkh was built for the troops under Ashinas, commander of part of the arm. It is formed by one 53-wide main avenue that starts from the main mansion, the house of Ashinas. There are two other vertical avenues; one of them connects starts from a second smaller mansion and sixteen horizontal avenues. Under Mutawakkil, the cantonment expanded to the east. This new section kept the same horizontal avenues. There is also evidence of a small segment in the north that has not been properly dated (Samarran) and Samarra 3. To facilitate the analysis, I decided to group the Samarra 1 or late, Samarran and Samarra 1 (Fig. 106). The result is two main areas, which matched those proposed by Kennet (2001) and Northedge (2008) (Fig. 107).

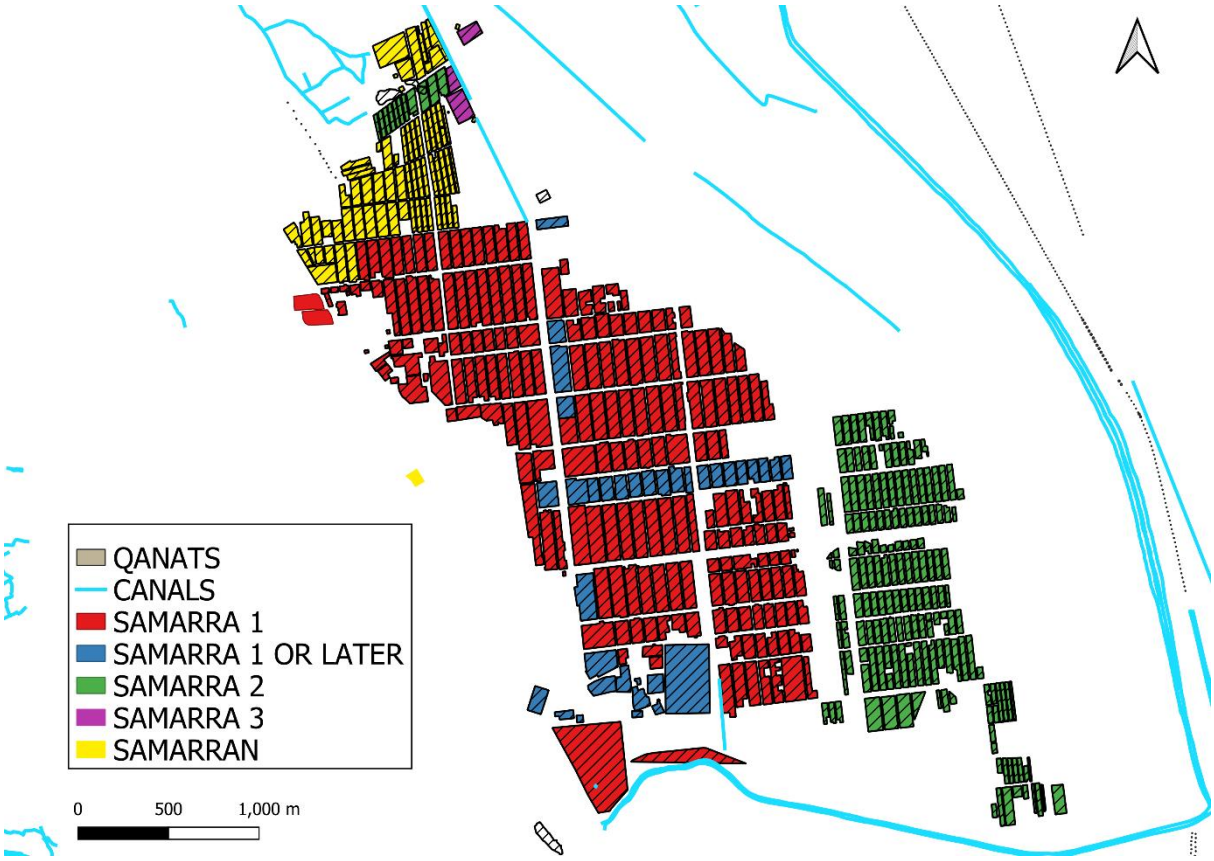


Figure 106: Different periods of construction of al-Karkh.

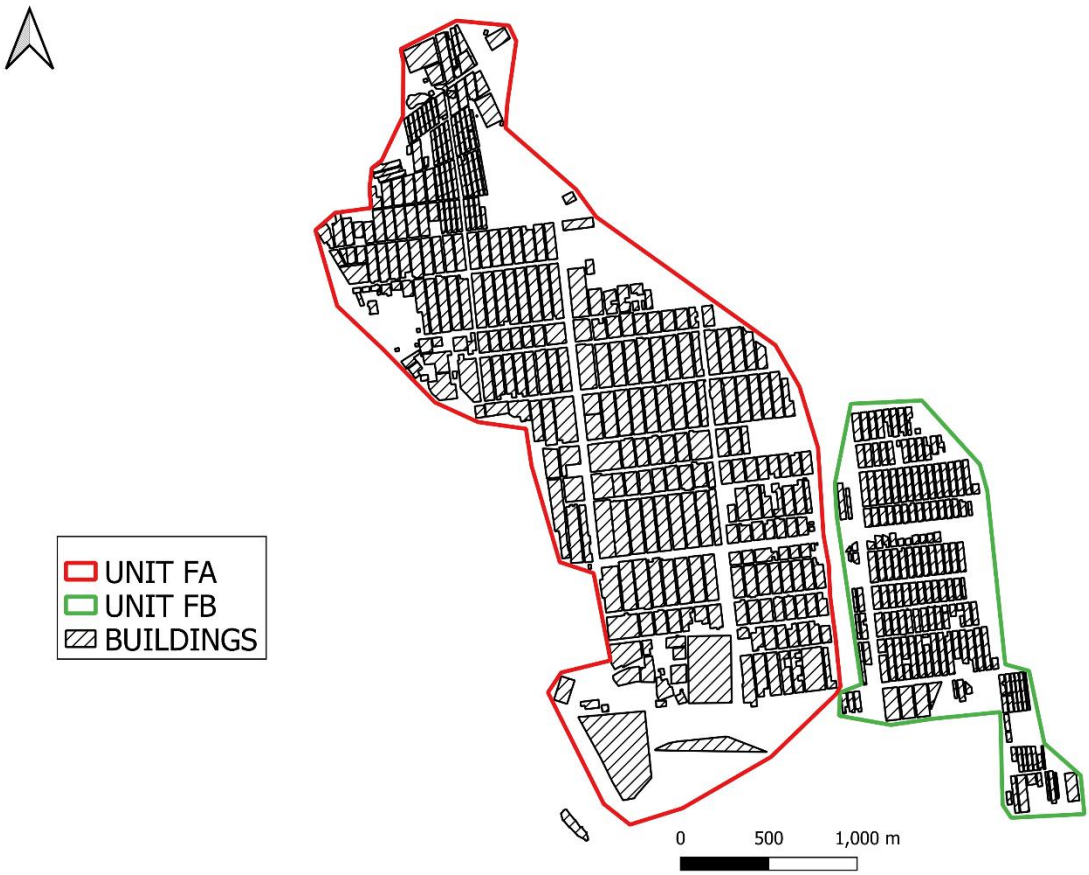


Figure 107: Units in Area F.

Unit FA

With an area of 603.8 ha, Unit FA is the bigger of the two units. It comprises 3 vertical and 16 horizontal streets with clusters of blocks in rows, with the Sur Ashnas palace to the south (Fig. 108). It has 345 buildings, including 219 blocks, 12 mansions, 2 mosques (without the one within the Sur Ashnas palace), and 1 stable (Fig. 109). The calculated Gini coefficient is 0.33 (229 examples). The two last elements, classified as service infrastructure, are located on both extremes of the cantonment. The stable, placed in the palace, was probably used to store the general's horses. Conversely, the mosques are located on the north part of the cantonment, far from the palace and most blocks.

Similarly to what we saw in some of the units in Mutawakkiliyya and al-Dur, the mansions are placed by the avenues and followed by a series of blocks of similar size and layout. The western side of Unit FA has no mansions, but the row-like organisation is preserved. A possible theory is that the mansions house lesser army commanders; the attached blocks are their battalion. The distance to the Congregational Mosque: 11358m

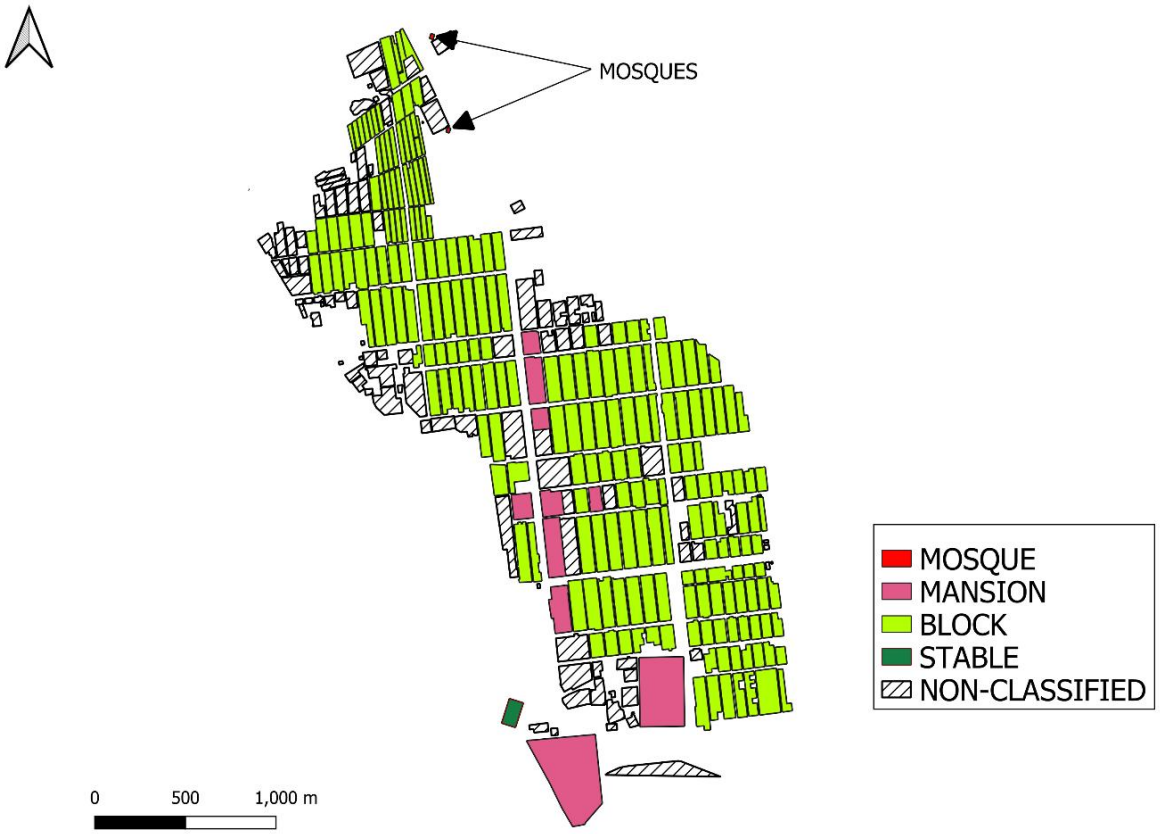


Figure 108: Plan of Unit FA.

Building type	Count
block	219
building	50
complex building	38
enclosure	11
mansion 2	8
empty enclosure	8
mosque	2
walls	2
mansion 1	2
gypkiln	2
complex	1
linwall	1
stable	1

Figure 109: Distribution of building types in Unit FA.

Unit FB

This second unit comprises 172 buildings (Fig. 110), with only blocks (138- Fig. 111) as the identified class in an area of 179.1 ha with a calculated Gini coefficient of 0.27 (138 examples). While the spatial distribution is the same as Unit FA, the blocks are smaller. The lack of service infrastructure indicates that the residents probably used the mosque in Unit FA. The distance to the service infrastructure is the following:

- Mosque: 3512m
- Congregational Mosque: 10147m
- Water Source: 1287m



Figure 110: Plan of Unit FB.

Building type	Count
block	138
trace	15
building	11
empty enclosure	5
enclosure	3

Figure 111: Distribution of building types in Unit FB.

These two units reflect the homogeneity, both in size and spatial distribution, of some of the cantonments in Samarra. However, there is a stark contrast between FA and FB in terms of infrastructure, residential density and presence of service infrastructure. The biggest and original unit seems like the key space of this area, holding the only service infrastructure and water systems. Taking this into consideration, Unit FB seems dependent on Unit FA. The quality of life in Unit FB could have been worse due to a higher number of residences and a smaller size. The service infrastructure that might be linked to a cantonment is not yet properly defined, with features like markets, stables and maydans as variables. Ya'qubi explicitly mentions the importance Mu'tasim gave to separating the troops and the rest of the city. However, the lack of markets and other service infrastructures implies a dependency on deliveries or forcing the soldiers to leave their cantonment. As expected, the low levels of inequality shown by the Gini coefficient can be linked to the relation between mansions and dwellings.

The spatial relationship between the mansions and blocks adheres closely to a spatial model that mirrors the layouts observed in examples from al-Dur and, to a lesser extent, Madinat al-Mutawakkiliyya. Until now, avenues have been seen as both a dividing and unifying element, linking the mansions and blocks to a main palace, typically at the end of the avenue., but also separating the different battalions within the army. In Area T, this same model has been observed with the mansions along the main avenue, which could suggest that these had a military connotation or that the spatial organization is more a symbol of Samarra rather than of a military nature.

UNIT	FA	FB
AREA SIZE (ha)	603.8	179.1
Gini Coefficient	0,332213	0,2667472
SPATIAL MODEL	Rows	Rows
WATER SYSTEM	Yes (canal)	No
BLOCK	219	138
MANSION	10	0
MOSQUE	2	0
MARKET	0	0
STOREHOUSE	0	0
STABLE	1	0
WORKSHOP	0	0
MAYDAN	0	0
R. per Km2	36.94	77.05

Table 32: Units in Area F and discussed variables.

Area F is separated from the rest of the city, with Madinat al-Mutwakkiliyya and the cantonment of al-Dur built in a later period. Other services not cited here are omitted as this analysis focuses on the units and areas and the features within them rather than a general distribution. The distance to the services in this area is relatively high, forcing an average soldier to walk nearly 2km to the mosque (Table 35).

UNIT	FA	FB	AVG. DISTANCE
MOSQUE	0	3512	1756
WATER SOURCE	0	1287	643.5
CON. MOSQUE	11358	10147	10752.5

Table 33: Units and their distance to external service infrastructure (in case of absence).

Cantonment of al-Jawsaq (Area X)

The cantonment of al-Jawsaq was built during Mu'tasim's reign and is directly north of his palace, Dar al-Khilafa. The site has not been divided into units by either Northedge or Kennet; however, a narrow avenue in the middle and a difference in size, shape, and spatial distribution could be taken as a division of the cantonment. As a result, I believe there are two units: XA and XB.

Unit XA

Unit XA comprises eleven rows of blocks and a few mansions divided by narrow avenues approximately 8m wide in an area of 160.6 ha (Fig. 112). In the south part, there is also a space between the buildings. There are 249 buildings, of which 146 are residential, with 4 mansions and 142 blocks (Fig. 113), and a calculated Gini coefficient of 0.25 (146 examples). The only service infrastructures are five storehouses on the south limit that were probably used by the entire cantonment. The distance to the Congregational Mosque is 4350m.



Figure 112: Plan of Unit XA.

Building type	Count
block	142
building	92
complex building	6
storehouse	5
mansion 2	2
mansion 3	2

Figure 113: Distribution of building types in Unit XA.

Unit XB

Unit XB is located to the east of the vertical avenue. There are 9 horizontal rows with an 84° inclination and a second narrow avenue that separates the rows and a series of bigger enclosures (Fig. 114). This space (148.4 ha) includes an esplanade, which could have been used for military training or, alternatively, as part of the eastern enclosures. There is a total of 86 buildings, 25 of them are residential, with 3 mansions and 22 blocks (Fig. 115), with a calculated Gini coefficient of 0.32 (25 examples). Northedge identified X1, the

mansion to the east, as the principal palace. This palace is not connected through the rest of the cantonment via an avenue like the previously discussed cantonments. There is no service infrastructure, apart from the storehouses in Unit XA, which are 1152m away from the centre of Unit XB. The congregational mosque is 3700m away.



Figure 114: Plan of Unit XB.

Building type	Count
building	44
block	22
complex building	9
enclosure	3
empty enclosure	3
mansion 2	2
courtyard	2
mansion 1	1

Figure 115: Distribution of building types in Unit XB.

Discussion

The differing infrastructure and organization of Units XA and XB reflect the presence of the varying interaction of different military ranks within a cantonment. Unit XA's highest number of blocks and service infrastructure suggest it acted as a hub for living quarters for the soldiers and supply facilities. The storehouses located on the south end of the cantonment are not a regular feature in other cantonments and, therefore, potentially unrelated to the group's military function. It possibly was related to the particular needs or preferences of this segment of the army, which denotes a more heterogeneous model of a cantonment than we previously thought. In contrast, Unit XB lacks service infrastructure and blocks, and generally, bigger buildings could have served as a space for administrative functions or officer houses. The Gini coefficients suggest a higher degree of inequality in XB, although still low.

In contrast to the avenue model, the mansion is located between the blocks instead of at one end of the group. Moreover, no avenues stem from the palace or bigger enclosures.

UNIT	**XA**	**XB**
AREA SIZE (ha)	160.6	148.4
WATER SYSTEM	No	Yes (qanats)
Gini Coefficient	0.247	0.317
SPATIAL MODEL	Rows	Rows
BLOCKS	142	22
MANSIONS	4	3
MOSQUES	0	0
MARKETS	0	0
STOREHOUSES	5	0
STABLES	0	0
WORKSHOPS	0	0
MAYDANS	0	0
RI. PER KM2	90.91	16.85

Table 34: Architectural information of Area X.

UNIT	XA	XB	AVG. DISTANCE
STOREHOUSE	0	1152	576
CON. MOSQUE	4350	4034	4192

Table 35: Distances to service infrastructure from units in Area X.

Al-Waziriyya (Area G)

This diamond-shaped area is located northwest of Area X. A main avenue with multiple blocks to both sides divides the settlement into two, with the main palace, Tell al-Wazir, to the north. This slightly resembles the plan of Madinat al-Mutawakkiliyya (Fig. 116). At the end of the mansion, on the south end, there is another large residence. This avenue probably connected al-Waziriyya with Jawsaq. There are 117 buildings, 40 residential, with 37 blocks, 2 mansions and 1 palace.

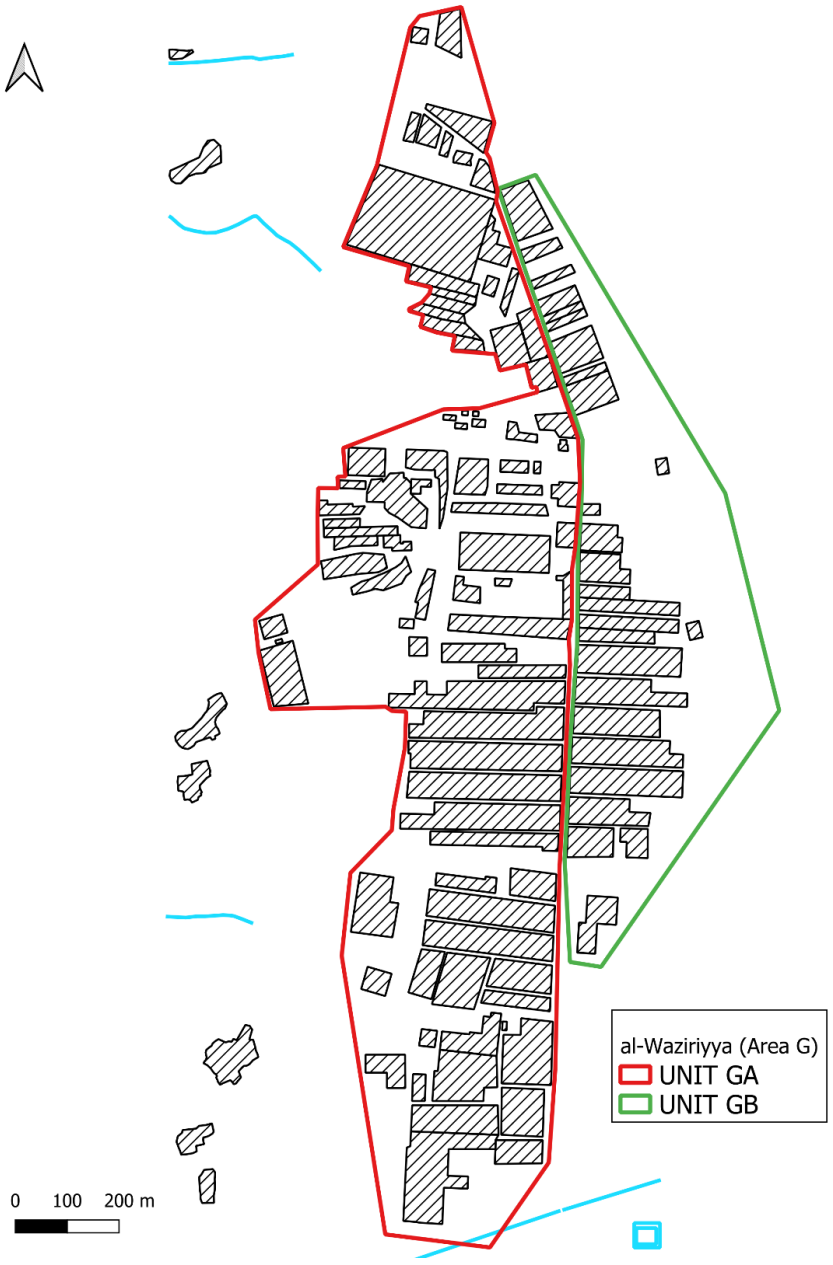


Figure 116: Two units of Area G.

Unit GA

This Unit includes all elements west of the avenue (Fig. 117), 88 buildings with 18 blocks, the 2 mansions (Fig. 118), and the palace in an area of 84.1 ha with a calculated Gini coefficient of 0.42 (21 examples). The blocks are placed by the avenue with different shapes and sizes. The spatial distribution of the unit does not follow any of the previously identified patterns, with the mansions far from the avenue and, while in clusters, located in one of the extremes. There are no infrastructure services in this unit. The closest water source is the Tigris: 700m.

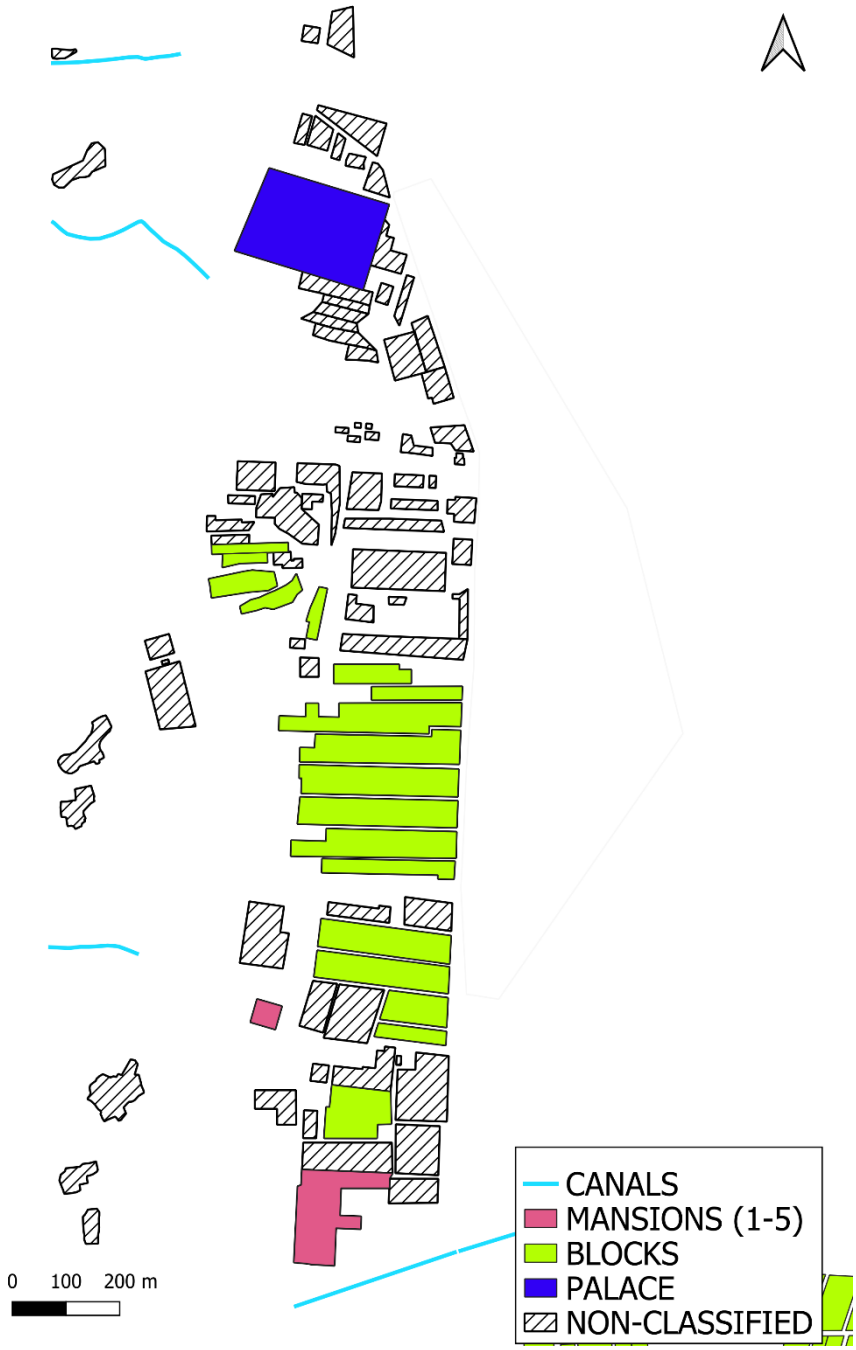


Figure 117: Plan of Unit GA.

Building type	Count
building	45
block	18
walls	16
complex	2
empty enclosure	2
palace	1
enclosure	1
complex building	1
mansion 2	1
mansion 3	1

Figure 118: Distribution of building types in Unit GA.

Unit GB

The second unit (Fig. 119) has significantly fewer buildings than Unit GA, with only 29 structures composed mainly of blocks (19) (Fig. 120) in an area of 25.9 ha with a calculated Gini coefficient of 0,3288546 (19 examples). The size and shape of buildings varied across the sample, with the southern part of the unit being more heterogeneous than the north. As Unit GA, the closest water source is the Tigris (840m).



Figure 119: Plan of Unit GB.

Building type	Count
block	19
building	8
gypkiln	1
empty enclosure	1

Figure 120: Distribution of building types in Unit GB.

Discussion

This area has an organization very similar to the cantonments of al-Dur. However, the blocks are located along the avenue instead of a row of mansions. It is possible that this was a residential extension of Area X or an intentional separation of officers from soldiers. The lack of service infrastructure and water systems gives the impression that this area was, as Northedge (2008) points out, an annexe of Area X, or at least dependent on it. The Gini coefficients depict a higher level of inequality in GA, the larger unit. This is probably due to the presence of one palace and two mansions.

UNIT	GA	GB
AREA SIZE (ha)	84.1	25.9
Gini Coefficient	0.423	0.3288
WATER SYSTEM	No	No
SPATIAL MODEL	Row	Row
BLOCKS	18	19
PALACES	1	0
MANSIONS	2	0
MOSQUES	0	0
MARKETS	0	0
STOREHOUSES	0	0
STABLES	0	0
WORKSHOPS	0	0
MAYDANS	0	0
RI. PER KM2	23,78	73.36

Table 36. Architectural information of units in Area G.

Original City North (Area H)

Area H is south of Dar al-Khilafa, west of the racecourse (al-Hayr), and north of the wadi. It housed civilian and military groups and leaders like Wasif or the Faraghina. Avenues define the site. Ya'qubi mentioned two of them, Shari Abi Ahmad and al-Shari al-A'zam. The third avenue on the east could be considered a continuation of the southern avenue Shari' Barghamish al-Turki. It was originally built during the first period and consecutively expanded during two other periods (Fig. 121). The central segment is described by the sources as built during Samarra 1. A few examples of the western and central areas are not well defined, but the construction probably started during Mu'tasim's reign and was completed during Mutwakkil's (Northedge, 2008). Regarding the western side, the immense majority was built during Samarra 2, with the exception of three buildings built during Samarra 4. This affects the availability and distance to service infrastructure.

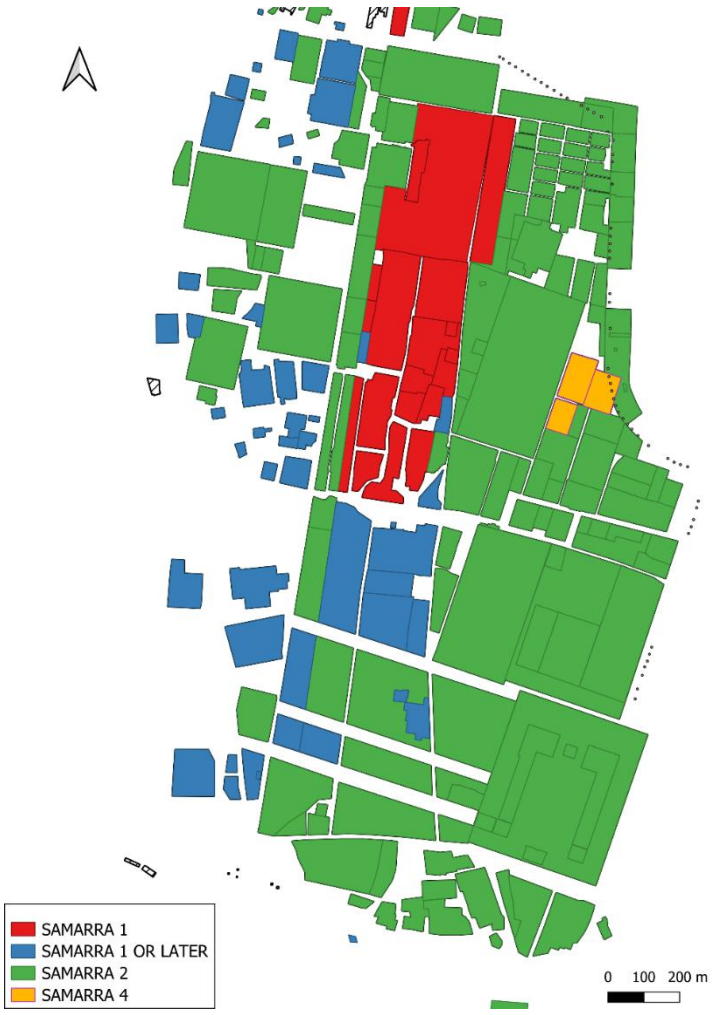


Figure 121: Time periods in Area H.

The units identified by Northedge probably used these as dividing elements, as well as the evidence presented in textual evidence (Fig. 122). Moreover, this area's lack of service infrastructure is another reason for taking streets and architectural differences as evidence of the units. The resulting product consists of six different units, four of which were identified by Northedge (2008). Two extra units entail the area of Dar al-Khilafa, which is straightforward, and the other is a cluster of (mainly) residential buildings south of the central part.

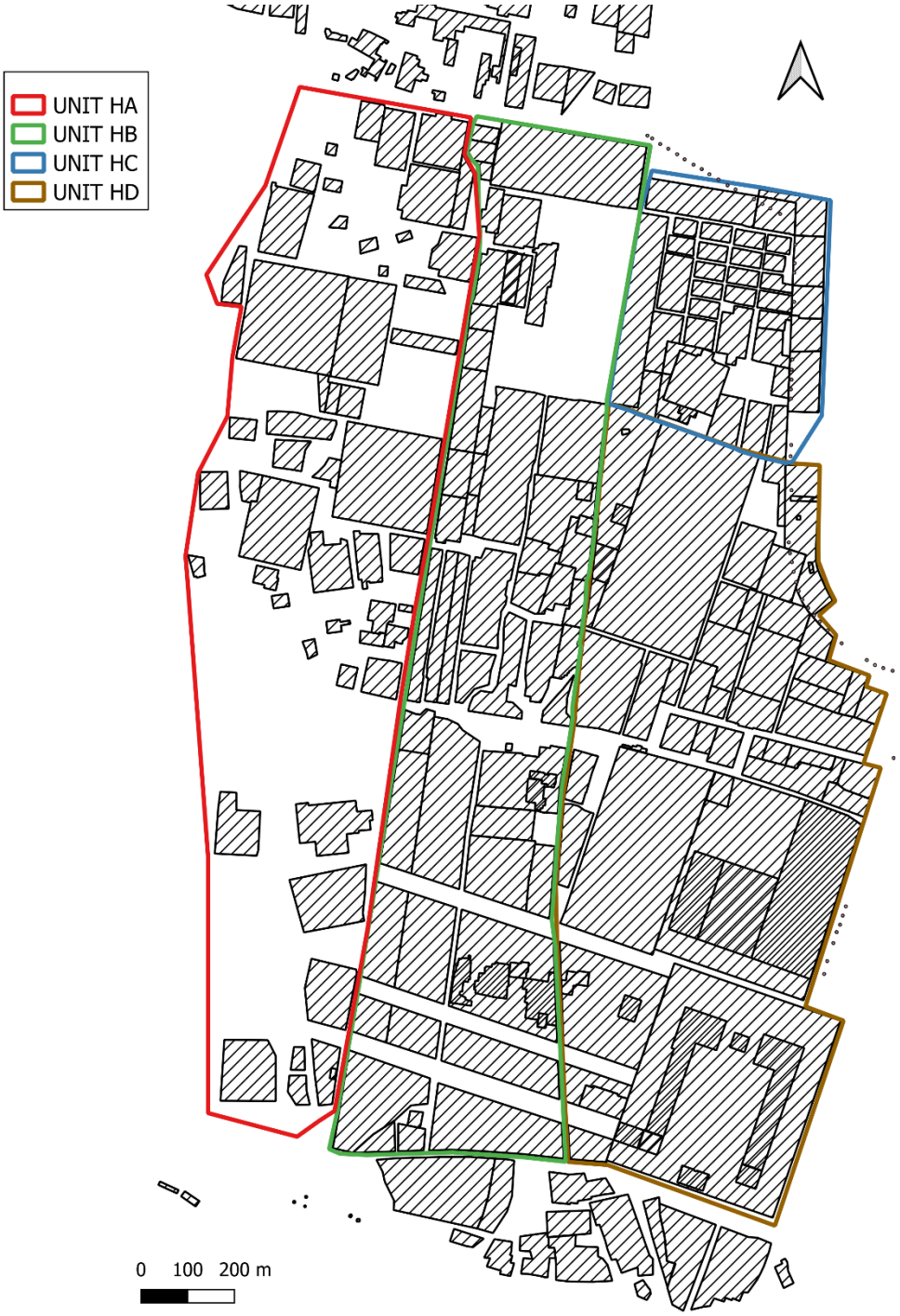


Figure 122: Units of Area H.

Unit HA

Unit HA is located on the west side of the Area with a size of 89.8 ha (Fig. 123). It has been identified by Northedge (2008, p. 170) as the cantonment of the *Faraghina,* built by Mu'tasim. This group, with both Arab and Turco-Iranian origin, was first settled west of Dar al-Khilafa and then moved between the avenues of Shari' Barghamish and Shari' al-Askar. There were 54 buildings, 19 of which were residential, with 15 mansions, 3 blocks and 1 palace, with a calculated Gini coefficient of 0.38 (19 examples) (Fig. 124). There are only a few examples of domestic basins, but no evidence exists for urban water systems. The spatial distribution of the buildings is rather irregular, with no delineated rows or groups of blocks circling the mansions. Instead, the mansions are placed across the unit without a specific organization and clustered in the southern and northern segments. The smaller number of blocks compared to other cantonments would question whether any soldiers lived here. Tabari (III, pp. 1255-56) talks about the multiple commanders who resided in this Unit but does not give any detail about any soldiers. The distance to the workshop and the congregational mosque was 927m and 1446m, respectively. Another workshop was built in Samarra 2, still farther away than the one in Unit HB. The maydan was 820m away and only available during Mutawakkil's reign. The qanat line is 986m away.

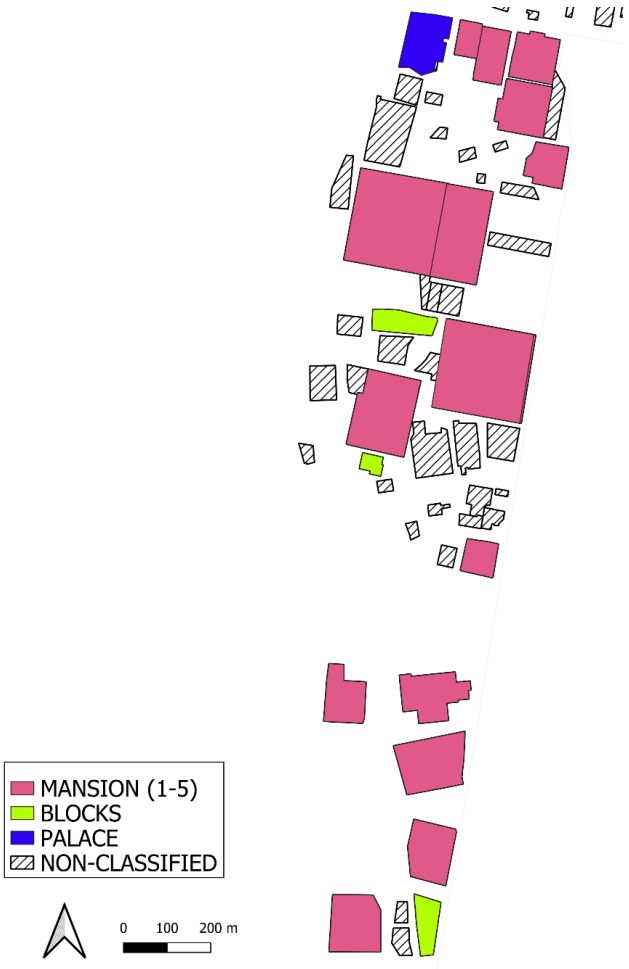


Figure 123: Unit HA.

Building type	Count
building	26
mansion 2	10
enclosure	8
block	3
mansion 1	2
mansion 3	2
mansion 4	1
tell	1
palace	1

Figure 124: Distribution of building types in Unit HA.

Unit HB

Unit HB, located in the middle part of the area, has been linked with the old cantonment of Wasif by Northedge (2008, p. 183) due to the building of H109, allegedly the first house of Wasif. Northedge identified the palaces and northern structures as a product of the initial construction of Samarra, and the southern part was built during the reign of Mutawakkil. The central segment, as not mentioned by the sources, does not have a clear classification (Samarra 1 or 2). It has an area of 83.6 ha and a calculated Gini coefficient of 0,5122651 (46 examples).

The mansions and elite residences are grouped in the north of the unit, near the caliph's palace, while the blocks occupy the southern and central parts of the unit. The central part is denser, with buildings of irregular sizes and irregular shapes, while the southern part is organized in rectangular blocks, which are more organized (Fig. 125). Four N-S-oriented and four W-E-oriented streets divide the southern segment between the blocks. The relationship between the mansions and the palaces is less clear here. The blocks do not seem to connect with the mansions, but they do seem to have a greater connection with the congregational mosque. In turn, the mansions distance themselves from the religious structure and the peasants and focus more on the other mansions in Unit HA and Dar al-Khilafa. The distance to the congregational mosque is 1015m, 625m to the Samarra 2 maydan and 617m to the qanat line.



Figure 125: Plan of Unit HB.

Building type	Count
block	24
building	13
house	7
mansion 2	6
mansion 3	3
mansion 4	3
avenue	2
mansion 1	2
bath	1
workshop	1
mansion 5	1

Figure 126: Distribution of building types in Unit HB.

Unit HC

Unit HC is located in the northeast corner, west of al-Hayr, with an area size of 23.1 ha and a Gini coefficient of 0.26 (21 examples) (Fig. 127). Northedge identified the unit, but it has not been associated with any military group; it can be understood as a civilian space. This unit's spatial organization is unique in Samarra; no other civilian or military instance has this organization. The central part has five rows of 3 to 4 four blocks with a W-E orientation. A palace in the middle of the unit is smaller than the blocks. There is also a house (considered as a mansion in this thesis) on the left side of this group of houses and two additional mansions. Interestingly, there are two maydans, one on the south side and another on the west side, which are bigger than the palace itself. The distance to the congregational mosque is 1702m, and to the workshop is 412m. A series of qanats on the east side of the unit originate from Dar al-Khilafa and end up on the congregational mosque.

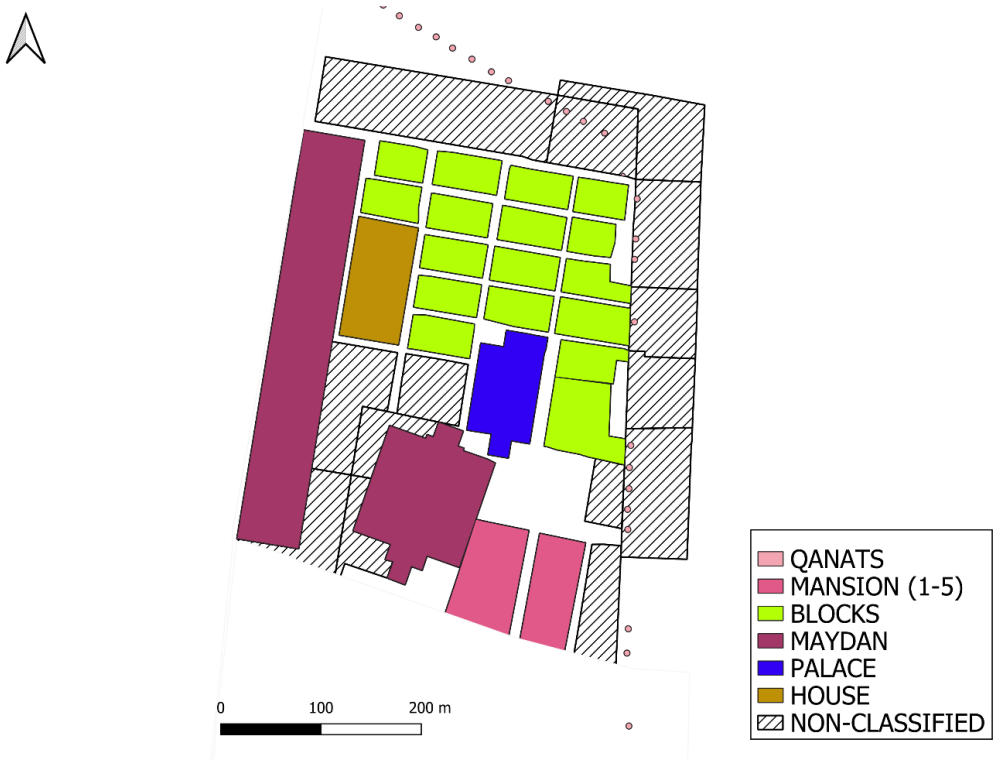


Figure 127: Plan of Unit HC.

Building type	Count
block	17
enclosure	12
maydan	2
palace	1
pavilion	1
house	1
mansion 3	1

Figure 128: Distribution of building types in Unit HC.

Unit HD

Unit HD is located in the southeast corner of area T, south of HC and west of HB, with an area of 90.7 ha (Fig. 129). Like HC and half of HB, this unit was built by Mutawakkil in the second period of Samarra's expansion. There are a total of 61 buildings, with a total of 24 residences with 12 blocks, 3 palaces (al-Badi, al-Ahmadi and al-Burj) and 9 mansions, with a calculated Gini coefficient of 0.6 (24 examples) (Fig. 130). The spatial distribution of this unit is also different from other examples in Samarra. There are three clusters separated by streets from west to east, the first two having a palace of similar sizes and the same orientation with a series of residential or still unclassified buildings following the same orientation as the palaces. Considering that there is an "avenue west of the palaces", it could be interpreted as a variation of the avenue model with mansions and blocks in its trail. It is possible that, as in the case of the mansions of military officers and soldiers, there was a correlation between the palaces and the surrounding buildings. Among these, there are mansions and blocks arranged in an irregular manner, which speaks of a heterogeneous "court". In the southernmost cluster, there is the congregational mosque with two blocks attached to it, which are mentioned by Ya'qubi as civilian residences of merchants who lived near the congregational mosque of Mutawakkil.

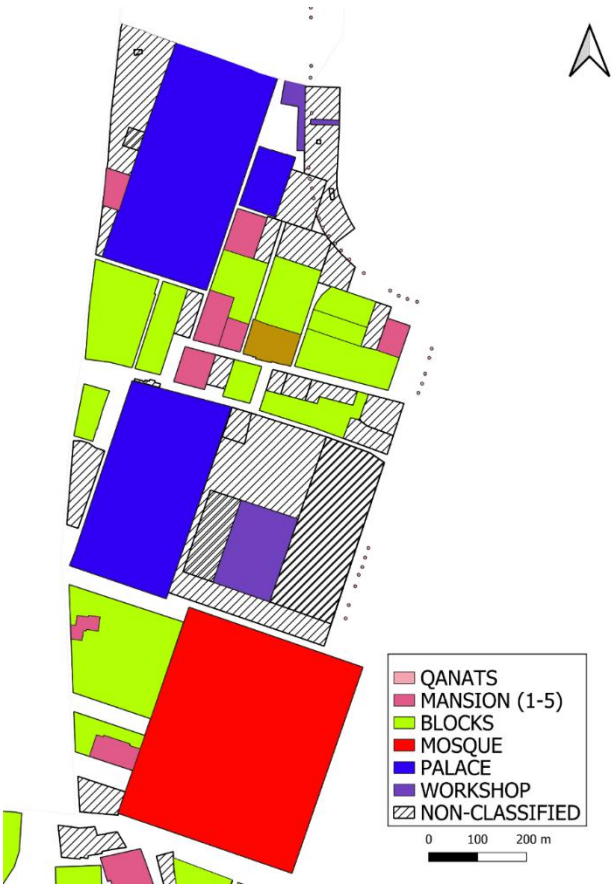


Figure 129: Plan of Unit HD.

Building type	Count
building	15
enclosure	14
block	12
mansion 4	5
workshop	3
palace	3
mansion 3	2
mosque	1
resthouse	1
complex	1
walls	1
mansion 5	1
house	1
minaret	1

Figure 130: Building type distribution in Unit HD.

Discussion

UNIT	HA	HB	HC	HD
AREA SIZE (ha)	89.8	83.6	23.1	90.7
Gini Coefficient	0.383	0.512	0.256	0.598
WATER SYSTEM	NO	NO	YES	YES
SPATIAL MODEL	IRREGULAR	ROWS	GRID	GROUP
BLOCKS	3	24	17	12
PALACES	1	0	1	3
MANSIONS	15	23	2	9
MOSQUES	0	0	0	1
MARKETS	0	0	0	0
STOREHOUSES	0	0	0	0
STABLES	0	0	0	0
WORKSHOPS	0	1	0	3
MAYDANS	0	0	1	0
RESIDENCE. PER KM2	21.16	56.23	86.58	26.46

Table 37: Architectural information of units in Area H.

Area H was first theorised as a space for the elite, based on the number of palaces and mansions compared to the southern part of the original city. As seen in the previous chapter, the size of this area indicates a high level of wealth. However, compared to other urban areas supposedly containing different social classes, the quality of life is poor regarding public infrastructure. The urban elite is distributed in different parts of the area.

Although an accumulation of examples is perceptible in the north, many other smaller examples are distributed in the south and east, and the first period of expansion left more irregular spatial patterns, with a less defined organization and buildings of little-defined sizes, such as the HA units and the north of HB. However, in the Mutawakkil period, there was a greater organization, with buildings with the same orientation, sizes, and shapes. The varying residence densities and spatial models suggest different functional, social and economic dynamics within this area. Those units with a higher density of blocks, like HC and HD, suggest a heavier presence of low-class civilian and military citizens. In contrast, HD and HA might have been more reserved for the elite due to their high number of elite residences (mansions and palaces). Moreover, in the case of Unit HD, the elevated number of service infrastructures, especially workshops, suggest a strong connection between the elite and production, an aspect more present in Caliphal palaces than the urban elite. The distance between units to the service infrastructure is, with a few exceptions, under the kilometre, in case the services were accessible for everyone (Table 55).

UNIT	HA	HB	HC	HD	AVG. DISTANCE
MAYDAN	820	625	0	845	572.5
WATER SOURCE (QANAT)	986	617	0	0	400.75
WORKSHOP	927	0	412	0	334.75
CON. MOSQUE	1446	1015	1702	0	1040.75

Table 38: Distance to service infrastructure from different units in Area.

Original City South (Area J)

Area J was built during the first two periods of Samarra and, similarly to Area H, housed both civilian and military (Figs. 131-132). The east part, built during Samarra 2, included military groups like the *Maghariba*, *Turks* and the *Faraghina*. In contrast, the west, probably initially built during the Samarra 1 and finished later, was characterised by markets (great market, vegetables, slaves), mosques and public buildings like the *diwan* and the prison. The southern side also holds mansions of important members of the court and military, like Hasan B. *'Ali al-Ma'muni, Hashim b. Banijur, Ishaq b. Yahya b. Mu'adh* and *Dar Bukhtishu,* and people from different groups like the *Khurasanis,* Arabs and people of (Northedge, 2008, p. 109). The central area, where the Turks, the Jund, the Shakiriyya and the Khazar lived, was all built during the reign of Mu'tasim. The six avenues described by Ya'qubi and other additional streets divide the area into many units.

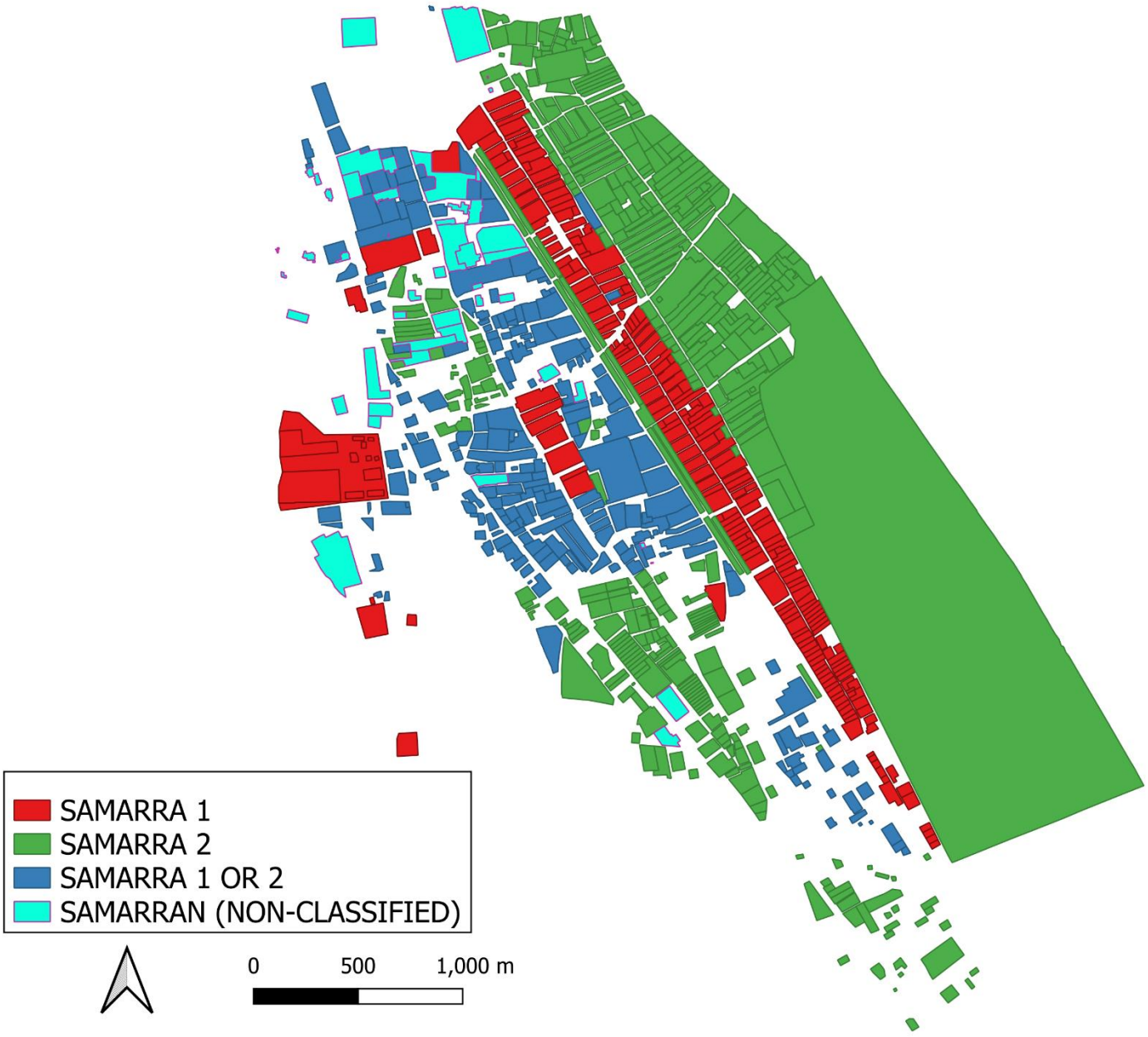


Figure 131: Different periods of construction in Area J.

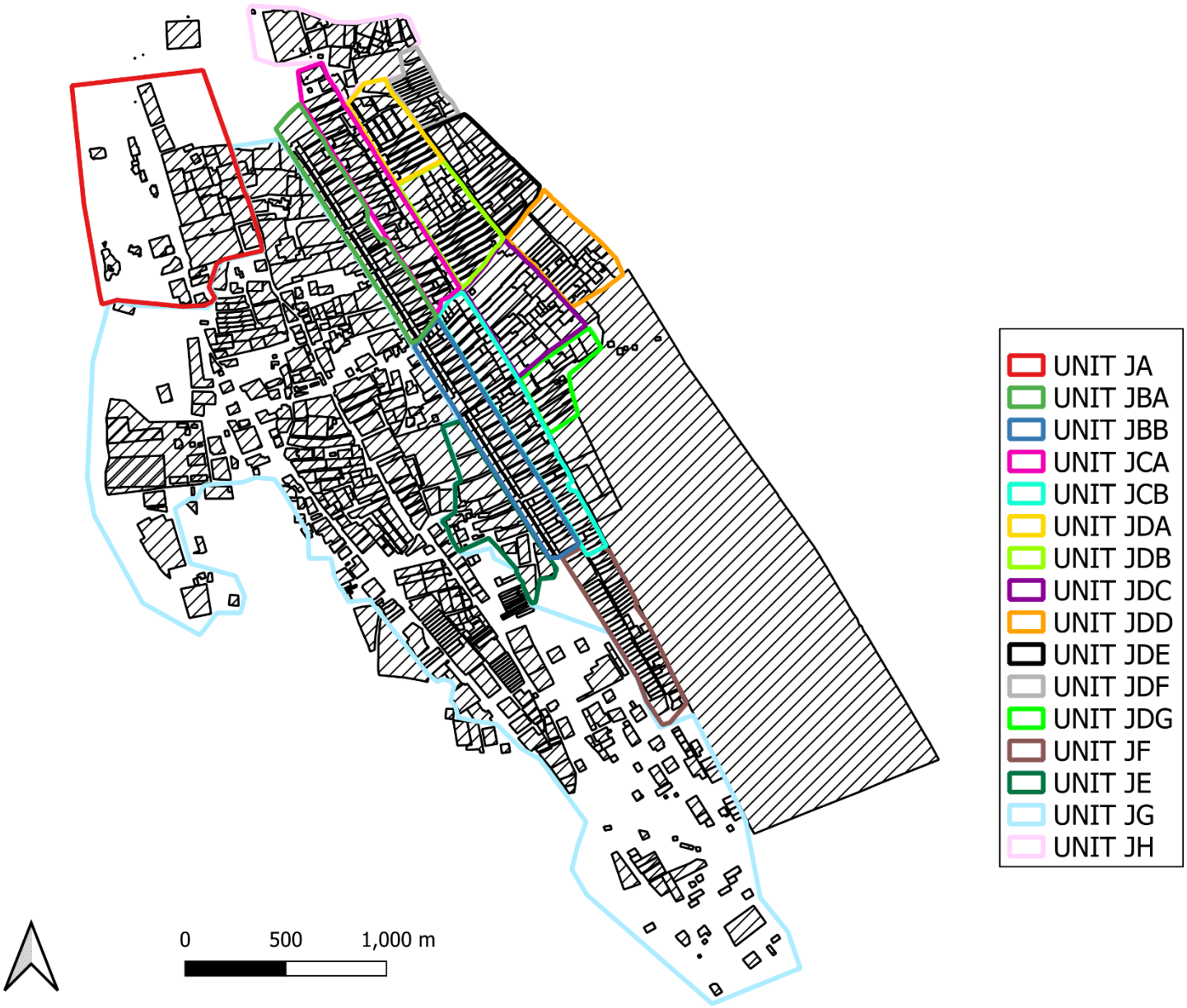


Figure 132: Units in Area J.

Unit JA

Unit JA was the cantonment of the Maghariba, which had an area of 81.6 ha and a Gini coefficient of 0.67 (13 examples) (Fig. 133). Northedge (2008) first identified this unit by the lengthy avenue (66m wide and 1240m long) and a possible bridge crossing the Tigris (p. 183). This avenue divides the cantonment into two: east and west. The east segment comprises rectangular buildings of similar sizes placed next to each other, with a group of three mansions to the north and a mansion to the south (al-Habis al-Kabir). The west included a series of irregularly scattered houses of smaller size across the plan. There are 43 buildings, 12 of which are residential (3 blocks and 9 mansions/houses) (Fig. 134). There is no service infrastructure, although, as Northedge points out (2008, p. 183), these buildings were probably just a portion of the real complex. The distance to the congregational mosque is 1656m, and the closest water source is 882m.

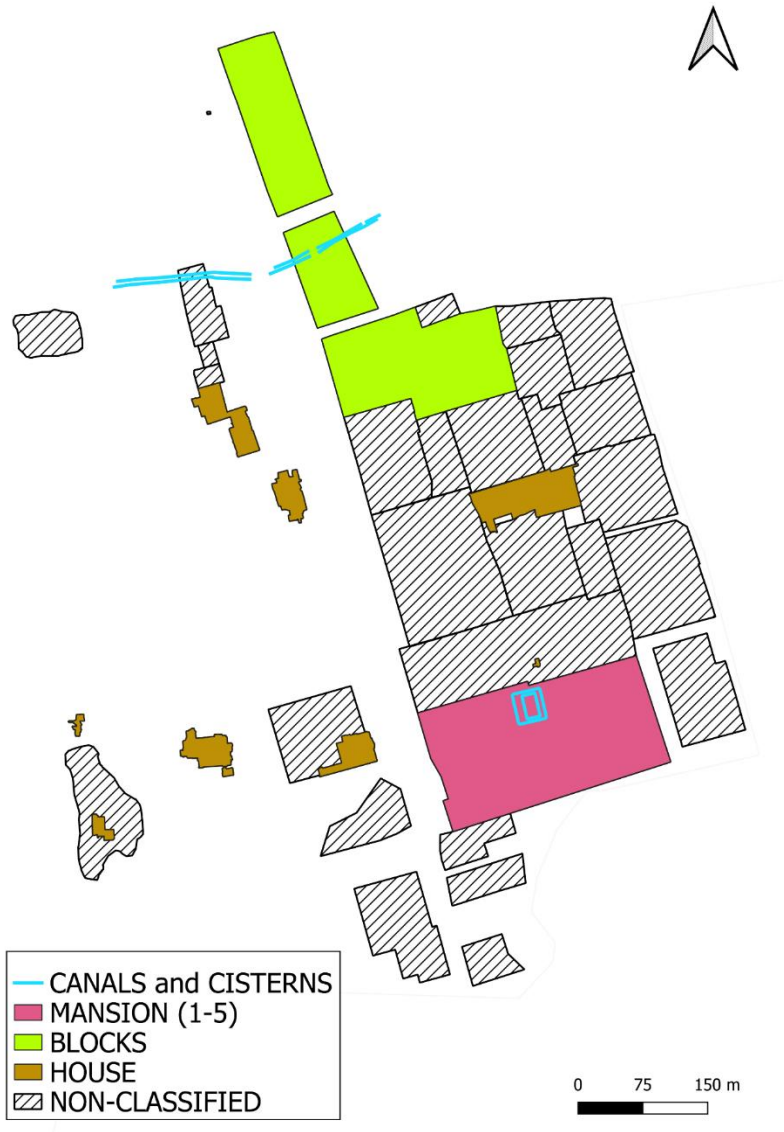


Figure 133: Plan of Unit JA.

Building type	Count
building	20
house	9
complex	4
block	3
mausoleum	2
courtyard	2
platform	1
tell	1
mansion 1	1

Figure 134: Distribution of building types in Unit JA.

Unit JB

Unit JB, with an area of 88.6 ha and built during Samarra 1, was identified by Northedge as the cantonments of the Khurasan, the Jund, and the Shakiriyya commanders. Ya'qubi described this space as located by the Shari al-Hayr al-Awwal avenue (Kitab al Buldan, pp. 259-262). It comprises a series of rows of rectangular blocks of very similar size that stretch from the north of the area until the *Khazar* cantonment. Northedge did not divide this space into two, but the W-E street/avenue marked the difference in other surrounding cantonments. Therefore, I considered it appropriate to employ that same dividing feature for this cantonment.

JBA

Unit JBA is the north part of the Jund and Shakiriyya cantonment (Fig. 135). It has an area of 21.2 ha and is separated from other cantonments through vertical streets to the east and west and an avenue to the south. There are 32 buildings, 28 of which are residential (Fig. 136), with one mansion (al-Fadl b. Marwan) on the top corner and a series of rectangular blocks of two different shapes and orientations, which were probably used for different people within the military. This spatial disposition is very similar to other cantonments, with one mansion occupied by an officer. It has a Gini coefficient of 0.34 (28 examples). There are no water features, but one of the blocks has a water basin. The distance to the congregational mosque is 1527m, and to the closest water source (Tigris) is 1710m.

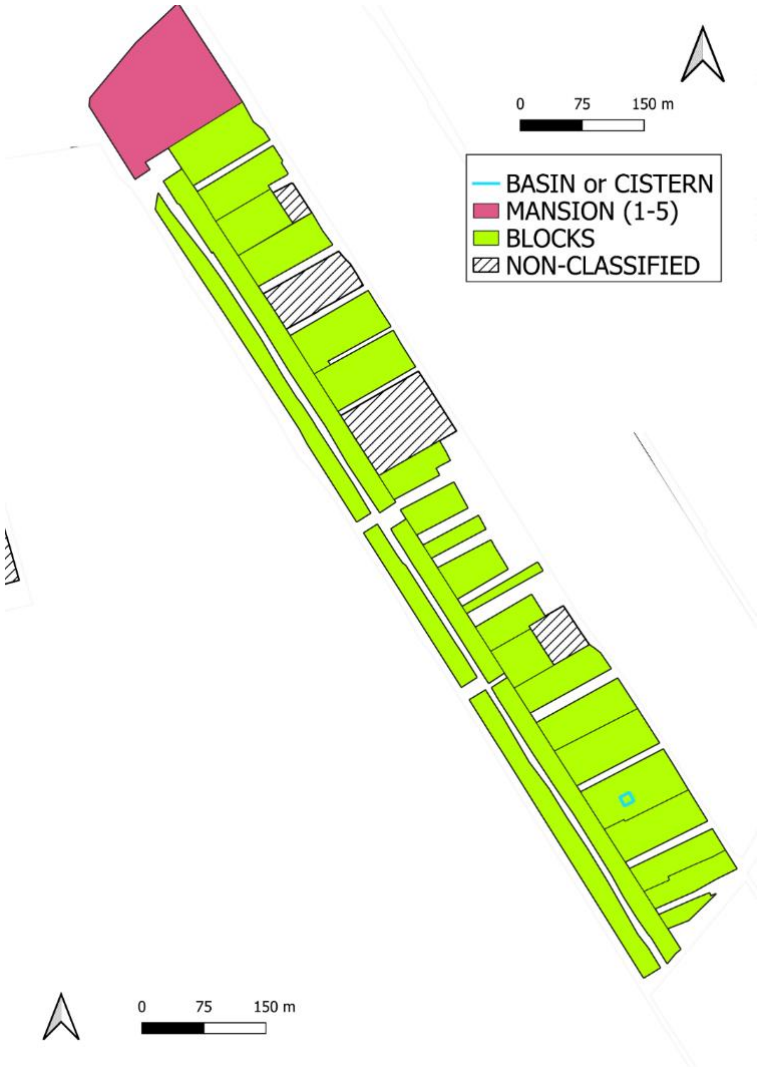


Figure 135: Plan of Unit JBA.

Building type	Count
block	27
complex	2
building	2
mansion 2	1

Figure 136: Building type distribution in Unit JBA.

JBB

Unit JBB (Fig. 137) is the south segment of the *Jund* and *Shakiriyya* cantonment, divided by an avenue from the northern unit (JBA). It has 44 buildings and 33 blocks (Figure 138), no mansions, and an area of 21.1 ha and a Gini coefficient of 0,2773377 (33 examples). This is possibly a

continuation of JBA, and the mansion there was still linked to this unit. The distance to the congregational mosque is 2629 m, and to the Tigris is 2264m.

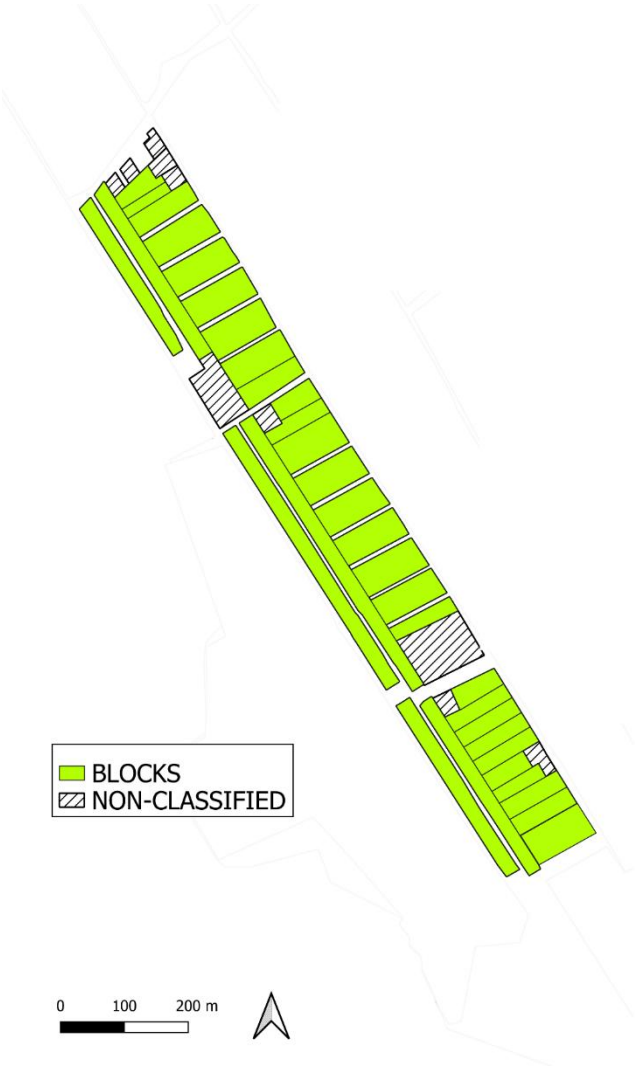


Figure 137: Plan of Unit JBB.

Building type	Count
block	33
building	10
complex	1

Figure 138: Building type distribution in Unit JBB.

Unit JC

Unit JC, located east of Unit JB, housed the Turks. It has a total area of 43.5 ha and is formed by a row of blocks very similar to JB. The row stretches 2782 m until the cantonment of the *Khazar* between the avenues of *Shari' Barghamish al-Turki* and *Shari al-Aksar*. Except for a small segment on the eastern row, the unit was built during Samarra 1.

JCA

Unit JCA (Fig. 139) is the north part of the Turk cantonment. It has 50 buildings, 26 of them residential, with 24 blocks and two houses (Fig. 140), located to the north, with an area of 22.6 ha and a Gini coefficient of 0,2662202 (26 examples). The houses are distributed in a column, with the bigger blocks on the north and the smaller gradually to the south. The non-classified buildings are mainly located to the east, possibly being service infrastructure or another type of residence. The distance to the congregational mosque is 1270m, and to the Tigris is 1985m.



Figure 139: Plan of Unit JCA.

Building type	Count
block	24
building	19
mausoleum	3
house	2
complex	2

Figure 140: Building type distribution in Unit JCA.

JCB

Unit JCB (Fig. 141) is the southern part of the Turks' cantonment. It has an area of 20.9 ha and 62 buildings, 30 of which are blocks (Fig. 142). The calculated Gini coefficient is 0,2043048 (30 examples). Unlike JCA, these are organised in columns with no specific distribution of sizes. One of the blocks in the southern part has a small water basin on the north-eastern corner. The distance to the congregational mosque is 2517m, and to the Tigris is 2367m.

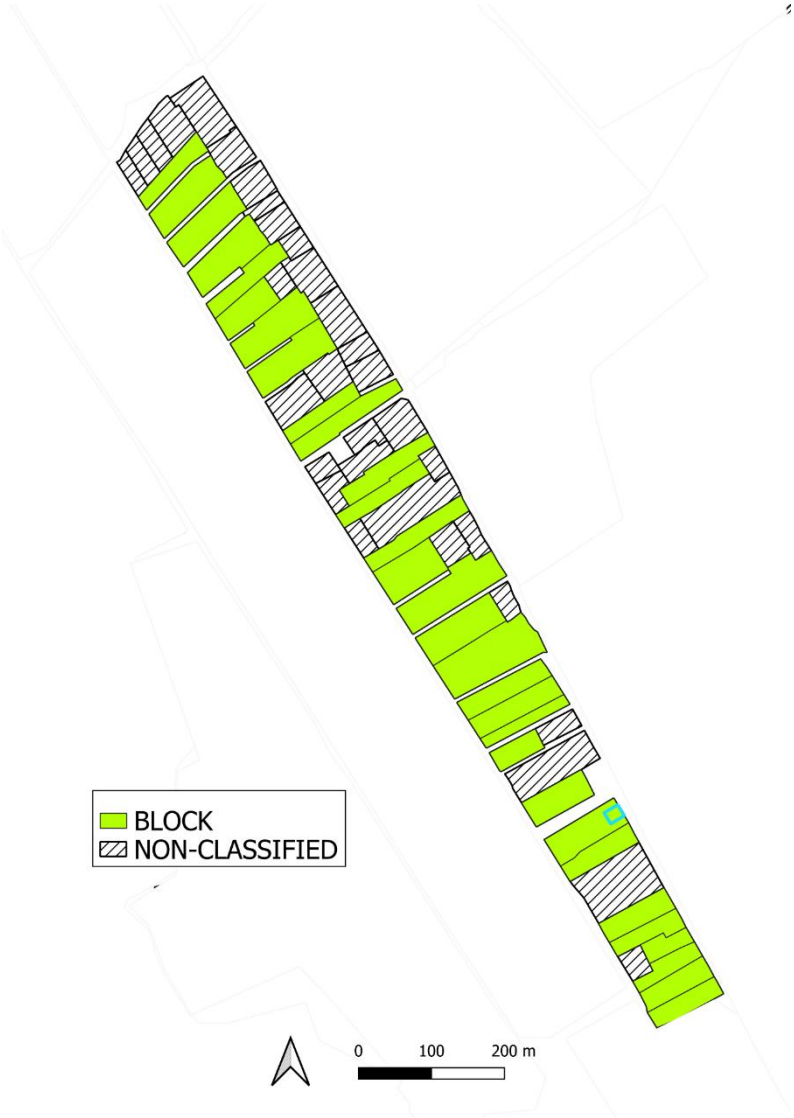


Figure 141: Plan of Unit JCB.

Building type	Count
block	30
building	24
complex	8

Figure 142: Building type distribution in Unit JCB.

Unit JD

Unit JD housed the other group of the *Farghina* (JDA, JDB, JDC and JDG) and the Central Asians (JDE, JDF and JDD), divided by the avenue of *al-Shari al-Aksar,* which leads to the palace of Salih al-Abbasi, and delimited by the avenues of *Shari 'al-Hayr al-Jadid* to the east and *Shari' Barghamish al-Turki* to the west. This whole part, with an area of 96.7ha, was part of the expansion of the original city of Mutawakkil in the second period. Northedge (2008, pp. 185-186) used W-E streets and differences in building layout and spatial organization to divide each unit. A noticeable difference from the previously described units is the width. Each unit in this part of the area is around 300m, while the units JB and JC are 187m.

JDA

This unit (Fig. 143), which has an area of 11.599 ha, is located in the northwest corner of the JD unit. It has 17 buildings, 14 of which are blocks (Fig. 144). These are organised in three different groups. Six on the south part are placed W-E with non-classified buildings to the west. Five N-S wider blocks are in the central segment of the unit, and a final cluster of four more irregular blocks to the north. The calculated Gini coefficient is 0.15 (14 examples). Despite the absence of any mansions, this difference in shape and size could suggest an internal difference within the cantonment. Further analysis of the layout will be able to contribute to this hypothesis. The distance to the congregational mosque is 1047m and to the Tigris 1938m.

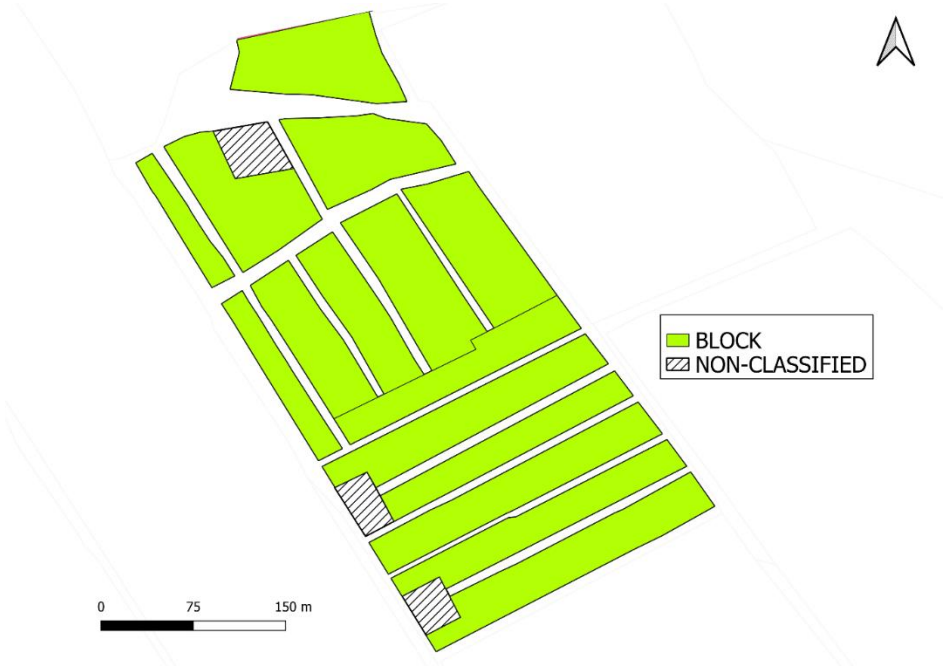


Figure 143: Plan of Unit JDA.

Building type	Count
block	14
building	3

Figure 144: Building type distribution of Unit JDA

JDB

Unti JDB (Fig. 145) is located south of Unit JDA, north of Unit JDC, and west of Unit JDE. It has an area of 15.917 ha and 29 buildings, 12 of which are residential, with 9 blocks and 3 mansions (Fig. 146). The spatial organization differs from JDA and is more similar to other cantonments. The blocks are placed in an N-S row on the south, while the mansions of different sizes are in the north, probably housing the officers. The calculated Gini coefficient is 0,1692109 (12 examples). The distance to the congregational mosque is 1542m, and to the Tigris is 2187m.



Figure 145: Plan of Unit JDB.

Building type	Count
building	16
block	9
mansion 3	2
mansion 2	1
complex	1

Figure 146: Building type distribution of unit JDB.

JDC

The unit JDC (Fig. 147), with an area of 20.076 ha, is located south of Unit JDB. It has 32 buildings in total, 8 blocks and 1 mansion (Fig. 148), with a calculated Gini coefficient of 0,4157571 (9 examples). The spatial distribution is the opposite unit JDB, with the blocks on the north and the mansion to the south. The blocks have different shapes and sizes, with the biggest example on the north end, although they all have the same orientation. The distance to the congregational mosque is 2021m and to the Tigris is 2464m.



Figure 147: Plan of Unit JDC.

Building type	Count
building	18
block	8
enclosure	4
mansion 2	1
complex	1

Figure 148: Building type distribution of unit JDC

JDD

Unit JDD (Fig. 149) is located in the southeastern corner of the area. With an area of 16.482 ha, it has 31 buildings, 12 blocks (Fig. 150) and a calculated Gini coefficient of 0,4736267 (12 examples). There are two types of blocks: one narrower on the west side and one bigger on both sides. The distance to the congregational mosque is 1873m, and to the Tigris is 2697m.

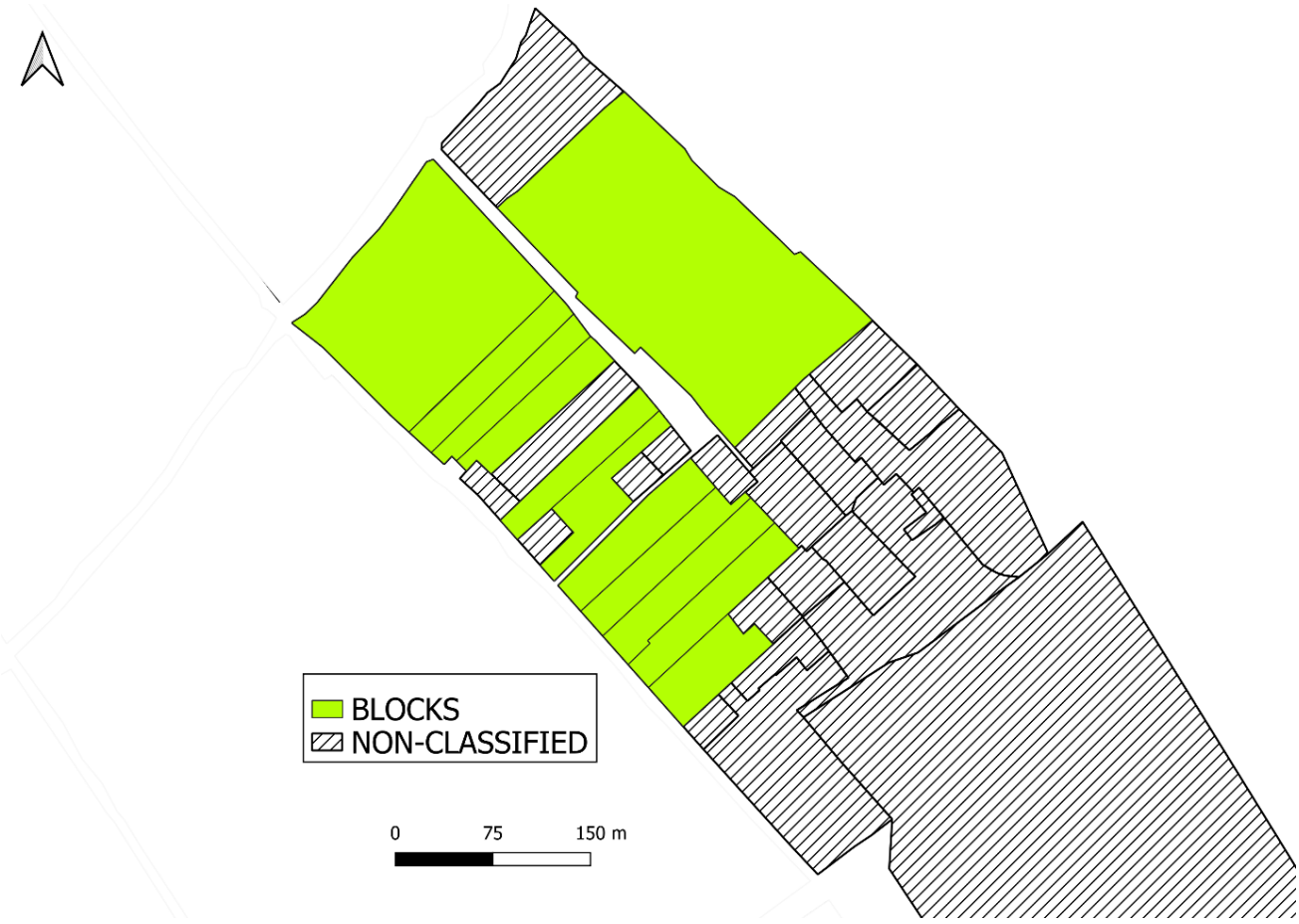


Figure 149: Plan of Unit JDD.

Building type	Count
building	15
block	12
enclosure	2
complex	2

Figure 150: Building type distribution of unit JDD.

JDE

JDE (Fig. 151) is part of the Central Asian cantonments, located on the northeastern side of the area, south of JDF and north of JDD. The calculated Gini coefficient is 0,3127979 (10 examples). With an area of 15.373 ha, there are 29 buildings with 10 blocks and no mansions (Fig. 152). The rectangular blocks are placed on the south segment of the area with sizes and the same orientation. Compared to other cantonments, this fluctuation in size is probably linked to the necessities and population size of each group. The distance to the congregational mosque is 1323m, and to the Tigris is 2397m.



Figure 151: Plan of Unit JDE.

Building type	Count of type
building	12
block	11
complex	6
enclosure	1

Figure 152: Building type distribution of unit JDE.

JDF

Unit JF (Fig. 153) is located in the north-eastern corner of the cantonment. It has an area of 6.758 ha and 17 structures, 12 blocks (Fig. 154) of very similar size and shape. The calcualted Gini coefficeint is 0,08729215 (11 examples). These are placed in an N-S row with non-classified buildings in the southeast corner and north. The distance to the congregational mosque is 874m and to the Tigris is 2204m.

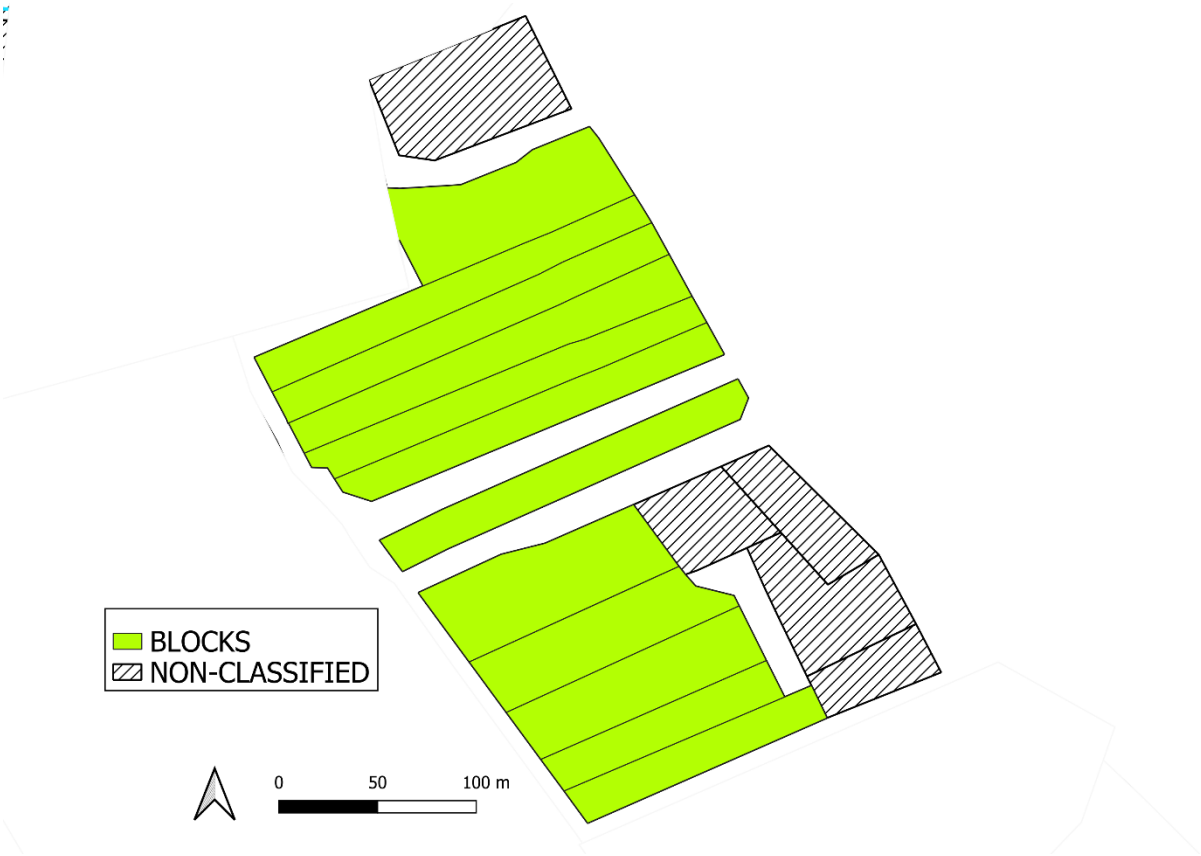


Figure 153: Plan of Unit JDF.

Building type	Count
block	12
building	5

Figure 154: Building type distribution of unit JDF

JDG

Unit JDG (Fig. 155) is located in the southern part of Unit JD. With an area of 9.128 ha, there are 16 buildings, 5 of which are residential with 4 blocks and 1 mansion (Fig. 156). The calculated Gini coefficient is 0,128267 (5 examples). The rectangular blocks are organised in the characteristic N-S rows of the cantonments, and the mansion, unlike other examples in Area J, is placed "outside" the row to the east. The non-classified structures are placed between the mansion and the rest of the blocks, one of them has a water basin. The distance to the Congregational Mosque is 2399m, and to the Tigris is 2532m.



Figure 155: Plan of Unit JDG.

Building type	Count
building	7
block	4
complex	3
mansion 3	1
enclosure	1

Figure 156: Building type distribution of unit JDG.

Unit JE

Unit JE (Fig. 157) is the cantonment of the Iranian Arabs, with an area of 18.997 ha, and is located west of Unit JDC. The period in which this was built is still uncertain. It is possible that an initial construction took place during the first period, although its placement outside the main cantonment group (Unit JD) might imply this was a later addition. It has a total of 20 buildings, 12 of which are blocks (Fig. 158). These, while placed in the usual row, are of irregular size. The calculated Gini coefficeint is 0,3345568 (10 examples). Bigger quadrangular blocks are placed in the north, while more elongated and narrow examples are in the central segment. Similar to other examples in Area J, the possible social hierarchy is based on size, shape, and layout differentiation among the blocks due to the absence of mansions or palaces. The distance to the Congregation Mosque is 2923m and to the Tigris is 2165m.



Figure 157: Plan of Unit JE.

Building type	Count
block	12
building	7
empty enclosure	1

Figure158: Building type distribution of unit JE.

Unit JF

Unit JF (Fig. 159), with an area of 17.244 ha, is the cantonment of the *Khazar*. Built during Samarra 1, the unit has 56 buildings, 42 residential buildings with 41 blocks and 1 mansion (Fig. 160). The calculated Gini coefficient is 0.245 (12 examples). The blocks are of very similar size, with some exceptions in the north and south extremes. These are arranged in the characteristic N-S rows with the exception that the mansion is placed in the centre rather than at the top of the unit. Moreover, the mansion is smaller than most units, which is unusual. The distance to the Congregational Mosque is 3705m, and to the Tigris is 2115m.



Figure 159: Plan of Unit JF.

Building type	Count
block	41
building	14
mansion 3	1

Figure 160: Building type distribution of unit JF

Unit JG

Unit JG is, by far, the most heterogeneous space in Mu'tasim's city. Ya'qubi mentions different administrative buildings, markets, residential houses, baths and other commodities that Northedge has not yet identified (Fig. 161). This analysis is based on archaeology; therefore, the data presented here will be an underestimation of the quality of life and a possible misrepresentation of the urban organization. Moreover, this unit was drawn from the portion of data not divided by Northedge, and it is plausible that further divisions could be in the posterior analysis of the urban plan. My initial interpretation is that this was Samarra's civilian and administrative side. It was separated from the military side of the area and the big urban palaces of Area H, which would not be affected by the noise and the bustle of people.



Figure 161: Plan of unit JG.

STRUCTURES MENTIONED BY YA'QUBI (not identified)
Sellers and Crafts
Imams
Great Market
Mosque of al-Mu'tasim
Slave Market
Vegetable sellers

Table 39: Structures not identified mentioned by Ya'qubi

STRUCTURES MENTIONED BY YA'QUBI (identified)
Abu Ahmad b. al-Rashid (Residence)
Harun b. Un'ay (Residence)
Hasan b. 'Ali al-Ma'umi (Residence)
Ujayf b. Banijur (Residence)
Al-Hasan b. Sahl
Diwan al-Kharaj
Hizam b. Ghalib (Residence)
Ishaq b. Yahya b. Mu'adh (Residence)
Dar bukhtishu (Residence)
Great Prision
Majlis al-Shurta

Table 40: Structures identified mentioned by Ya'qubi.

This unit, which covers an area of 486 ha, was first built during Samarra 1 and grew during Samarra 2; the chronology of many of its areas remains unclear. Multiple avenues crossed and divided the area, like Shari ‘al-Khalij, al-Shari al-A’zam and Shari ‘Abi Ahmad. There are 436 buildings, 117 of which are residential, with 98 blocks and 19 mansions/houses (Fig. 162). The calculated Gini coefficient is 0,5994667 (116 examples). A maydan and two markets are the only service infrastructure found in this area, which are insufficient and not a reflection of the textual description. Due to the size of this unit, various spatial patterns coexist. The north segment includes a series of blocks of large size and irregular shape and a small mansion (Ibn Abu Du’ad), possibly attracting these mansions to itself (“group” spatial distribution). Down the avenue, a series of mansions are placed by the avenue with a few blocks in their trails, similar to Madinat al-Mutawakkiliyya. Following the road to the west, a series of blocks are organised in a N-S pattern, with a mansion on the southern extreme. At the bottom of the unit, blocks are scattered without any specific connection apart from a small cluster of 7 similarly shaped and sized blocks. The two markets are placed here, seemingly away from the mansions or big residences. The house of al-Hasan b. Sahl stands on the west side, separated from the rest of the city, without any avenue, street, or nearby blocks.

Due to much of this unit's ambiguous dating, it is difficult to trace a proper evolution of the urban dynamics. If we assume that the "Samarra 1 or 2" is Samarra 1, the result is a group of mansions built by the avenue with nearby blocks dependent on the urban palaces. The central part (south during Samarra 1) would have constituted the residential segment with the markets, sellers, and artisans on the north segment, which reminds of Madinat al-Mutawakkiliyya. It is possible that Mutawakkil saw this unit and decided to replicate it for his city. The next period would see an expansion to the south and the addition of more residences and possibly commerce that might have been motivated by the growing popularity of Samarra during this period. On the other hand, suppose Mutawakkil builds the Samarra 1-2 structures. In that case, the result is a rather small area with a series of big residences with no additional features, something uncommon in Samarra. The distance to the Congregational Mosque is 3069m and to Tigris is 1371m.

Building type	Count
building	250
block	98
complex	30
empty enclosure	20
mansion 2	11
enclosure	10
house	4
complex building	3
mansion 1	2
mansion 3	2
modbuild	1
walls	1
Wall	1
courtyard	1
maydan	1
mansion 4	1
suq	2

Figure 162: Building type distribution of unit JG.

Unit JH

Unit JH (Fig. 163) is located on the northeast corner of the area, with an area of 21.098 ha and a Gini coefficient of 0,44 (4 examples). While it is directly above the cantonments, Northedge has not included it in any of them. Therefore, I decided to do the same and give this space its new unit. There are 31 buildings, 5 of which are residential with 1 block and 4 mansions/houses (Fig. 164). In line with the majority of Area J, it does not have any service infrastructure, although there are some domestic water systems (discussed later in this chapter). The three mansions, probably occupied by the urban elite (not clear whether military or civilian), are placed irregularly within the unit and do not attract any blocks. The distance to the congregational mosque is 616m, and to the Tigris is 1988m.

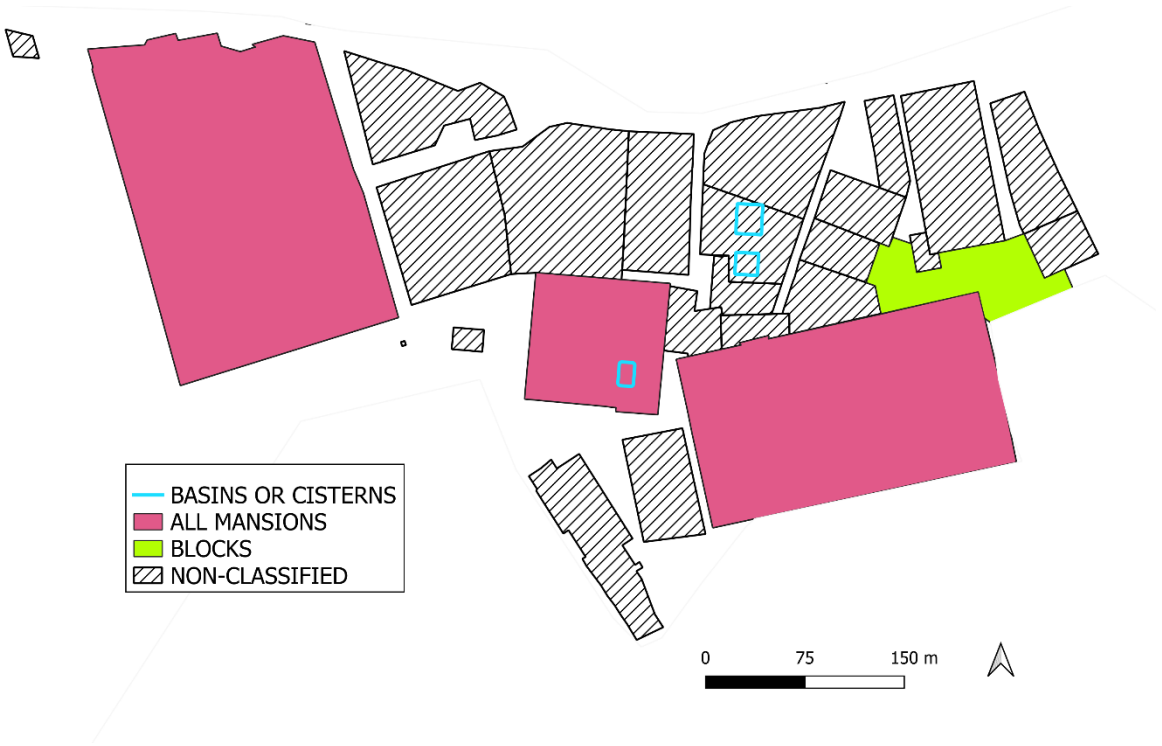


Figure 163: Plan of Unit JH.

Building type	Count
building	19
mausoleum	6
mansion 2	2
complex	1
mansion 1	1
block	1
house	1

Figure 164: Building Type of Unit JH.

Area J is composed of units with different spatial patterns, although there is a clear preference for the row model, probably due to the heavy military presence in the area. The variation in unit size is interesting in this cantonment (Tables 41 & 42); removing JG due to its enormous size, there is still an elevated coefficient of variation, 78.40%, between the other units, illustrating that military units, while incredibly similar in the layout, differ in size. The lack of mansions is also something noticeable and quite restricted to this area, with only eight areas having at least one mansion and only five having two or more. On the other hand, we have seen a difference in blocks shape and size less visible in other cantonments with a heavier presence of mansions in the rows like al-Karkh.

The almost complete lack of service infrastructure in the area, except for Unit JG, questions the relationship between military and civilian areas and, more importantly, how the military was fed. There was no water system at all during this period, which made the spaces dependent on water carriers (discussed later).

Regarding the civilian area, JG, the heterogeneous use of space and the alleged number of service infrastructure reveal a less controlled building, at least compared to the cantonments. Independently on the reason, whether poor preservation or the plan was, like that, unit JG has one of the lowest residences per square kilometre averages, meaning that there was more space for other types of buildings and between buildings for people to walk around.

UNIT	JA	JBA	JBB	JCA	JCB	JDA	JDB
AREA SIZE (ha)	81.6	21.2	21.1	22.6	20.9	11.599	15.917
Gini Coefficient	0,6751289	0,3371713	0,2773377	0,2662202	0,2043048	0,152152	0,1692109
WATER SYSTEM	NO	NO	NO	NO	NO	NO	NO
SPATIAL MODEL	GROUP	ROW	ROW	ROW	ROW	ROW	ROW
BLOCKS	3	27	33	24	30	14	9
PALACES	0	0	0	0	0	0	0
MANSIONS	10	1	0	2	0	0	3
MOSQUES	0	0	0	0	0	0	0
MARKETS	0	0	0	0	0	0	0
STOREHOUSES	0	0	0	0	0	0	0
STABLES	0	0	0	0	0	0	0
WORKSHOPS	0	0	0	0	0	0	0
MAYDANS	0	0	0	0	0	0	0
RESIDENCE. PER KM2	15.93	132.08	156.04	115.04	143.54	120.69	75.47

Table 41: Architectural information of units in Area J (Part 1).

UNIT	JDC	JDD	JDE	JDF	JDG	JE	JF	JG	JH
AREA SIZE (ha)	20.076	16.482	15.373	6.758	9.218	18.997	17.244	486	21.098
Gini Coefficient	0,4157571	0,4736267	0,3127979	0,08729215	0,128267	0,3345568	0,245182	0,5994667	0,4413561
WATER SYSTEM	NO	NO	NO	NO	NO	NO	NO	NO	NO
SPATIAL MODEL	ROW	ROW	ROW	ROW	ROW	ROW	ROW	MULTI	IRREGULAR
BLOCKS	8	12	11	12	4	12	41	98	1
PALACES	0	0	0	0	0	0	0	0	0
MANSIONS	1	0	0	0	1	0	1	20	4
MOSQUES	0	0	0	0	0	0	0	0	0
MARKETS	0	0	0	0	0	0	0	2	0
STOREHOUSES	0	0	0	0	0	0	0	0	0
STABLES	0	0	0	0	0	0	0	0	0
WORKSHOPS	0	0	0	0	0	0	0	0	0
MAYDANS	0	0	0	0	0	0	0	1	0
RESIDENCE. PER KM2	44.78	48.48	77.92	176.47	43.48	63.16	244.19	24.28	23.70

Table 42: Architectural information of units in Area J (Part 2)

There is no clear relation between the distance and the size or number of residences of the units. It is possible that the proximity to these features was not related to these variables but rather the nature of the military / civilian group that inhabited that specific space (Table 43). Nevertheless, while living in tight rows of almost identical blocks, the soldiers were far away from the Tigris and all types of service infrastructure available on the civilian side. Compared to other cantonments from the same or later period, like in Balkuwara, al-Dur, al-Ja'fari, or in Madinat al-Mutawakkiliyya, the cantonments housed more people but had less accessible services. The archaeological remains suggest that it was rather unlikely that the soldiers would cross areas where other ethnicities lived to approach. The Gini coefficients depict very different levels of inequality even in units with the same number of blocks. This is further evidence of the independence of these military groups: despite of being placed next to each other, they each had their own unique hierarchies.

UNIT	CON. MOSQUE	TIGRIS
JA	1656	882
JBA	1527	1510
JBB	2629	2264
JCA	1270	1985
JCB	2517	2367
JDA	1047	1938
JDB	1542	2187
JDC	2021	2464
JDD	1873	2697
JDE	1323	2397
JDF	874	2204
JDG	2399	2532
JE	2923	2165
JF	3705	2115
JG	3069	1371
JH	616	1988
AVG. DISTANCE	1936,9375	2066,625

Table 43: Distance to service infrastracture outside of the untis in Area J.

Cantonment of al-Matira (Area K)

The cantonment of al-Matira was allocated originally to al-Ashfin Khaydhar b. Kawus al-Ushrusani, which, according to Ya'qubi (*Kitab al-Buldan,* ET, p.p 94-95) included markets, baths and mosques. He built himself a palace, Sur Jubayriyya Dar Afshin on the northwest corner of the cantonment. There are multiple avenues and streets in the cantonment. A main 55m wide avenue crosses the cantonment East to West, a narrower north-south street connects the east gate palace with the southeastern blocks, and a third 15m wide avenue originated from the east gate to a pavilion. This cantonment was initially built during Samarra 1, with an expansion during Samarra 2 (Fig. 165). It has been divided into two units, KA and KB (Fig. 166). The unit KB, considerably smaller than the former, has been identified as the *qati'a* of Ishaq b. Ibrahim b. Mus'ab, also differentiated by a change in block size and orientation.

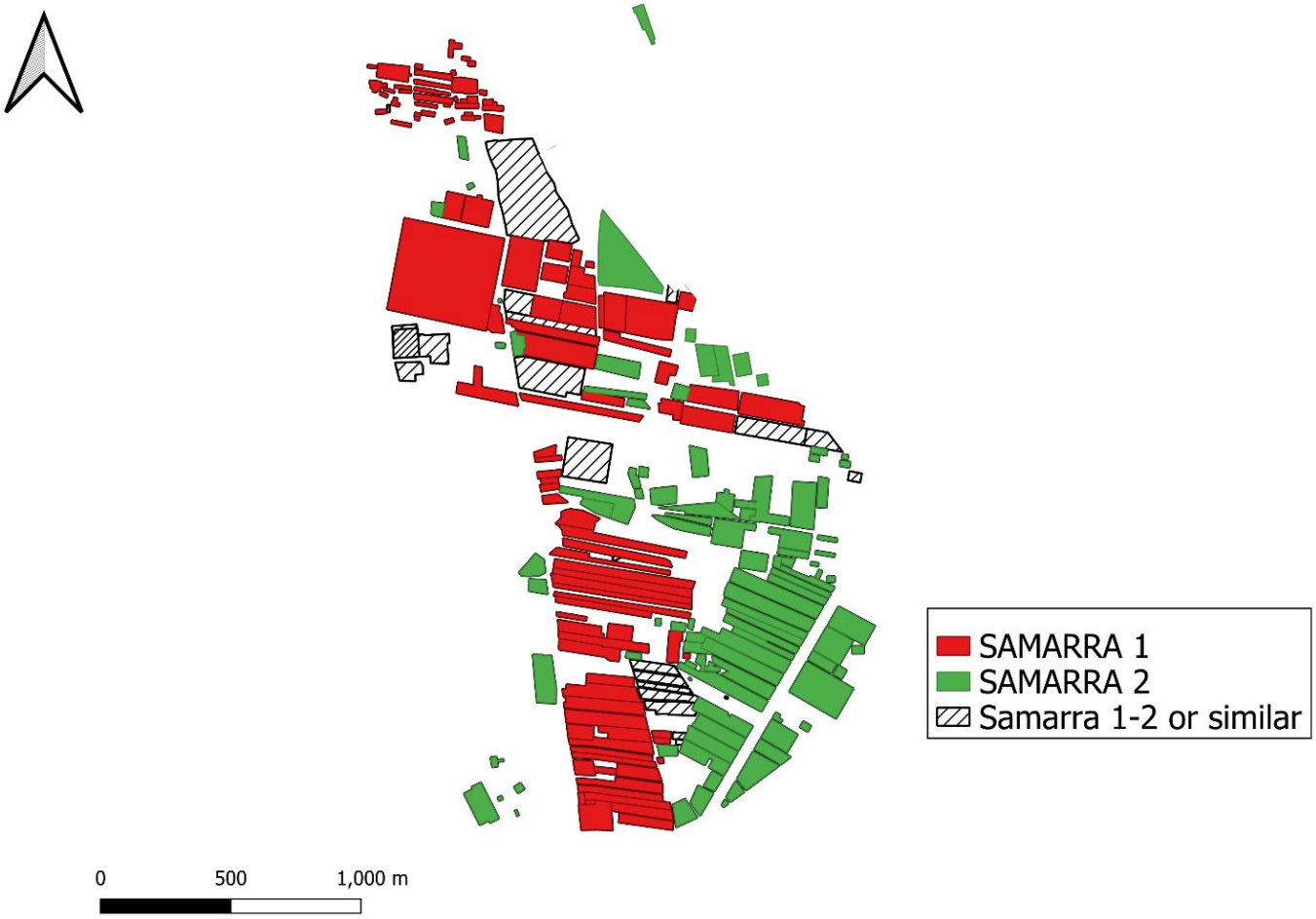


Figure 165: Different periods of construction in Area K.

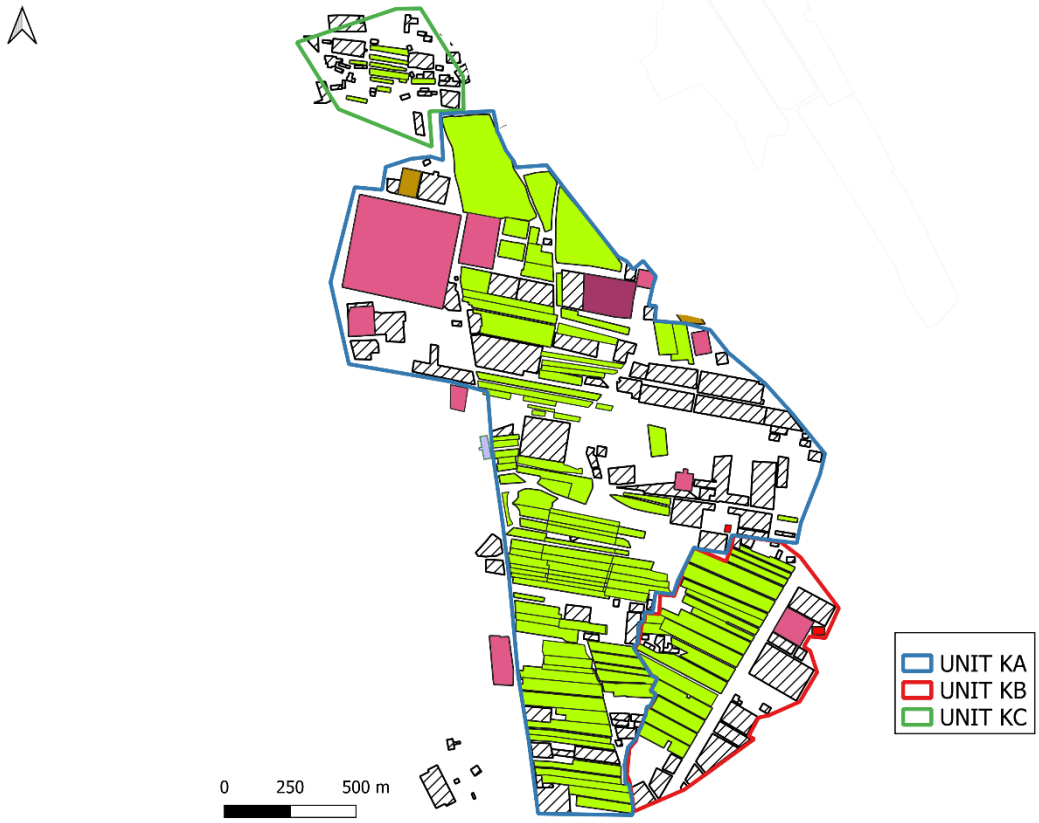


Figure 166: Units in Area K.

Unit KA

Unit KA (Fig. 167), bisected by the main west-east avenue, encompasses a variety of palaces, mansions, and public spaces. This area, with a size of 216.9 ha, features several open spaces, including a pavilion (K40) connected to the palace and a maydan on the east side. The southern segment is characterized by smaller blocks organized in uniform rows, likely serving as housing for soldiers. There are 169 buildings within the unit, including 100 residential structures, 92 blocks, and 8 mansions (Fig. 168). The calculated Gini coefficient is 0,516272 (104 examples). Despite Ya'qubi's mention of service infrastructure, only one mosque of small size has been identified in the east part. Just west of the unit lies a storehouse, likely serving the cantonment. The spatial distribution of the area depends on its location within the cantonment: the northern segment, east of Afshin's palace, features irregular clusters of larger blocks and contains all the mansions, while the southern segment consists of straight rows and a large compound (K155). Both segments are connected by narrow vertical streets that link the clusters of rows. It is possible that the northern segment was reserved for the military elite while the south was for the soldiers and lower personnel. The distance to the service infrastructure outside the unit is:

- Water Source: 1136m (Tigris)
- Congregational Mosque: 4294m



Figure 167: Plan of Unit KA.

Building Type	Count
block	89
building	46
complex building	8
complex	6
mansion 3	3
blocks	3
enclosure	3
Mansion 1	2
empty enclosure	2
mansion 2	2
maydan	1
avenue	1
pavilion	1
house	1
mansion 4	1

Figure 168: Building type distribution in Unit KA.

Unit KB

Unti KB (Fig. 169) is considerably smaller than Unit KA (50 ha) and is located on the south-east side of Area K. It is composed of a main N-S avenue, with W-E blocks to the west and clustered buildings to the east. It has a total of 46 buildings, 20 of which are residential, with 19 blocks and 1 mansion (Fig. 170), with a Gini coefficient of 0,2634751 (20 examples). The only service infrastructure found was a small mosque on the eastern side of the avenue. The distance to the other service infrastructure is:

- Maydan: 1420m
- Water Source: 1520m (Tigris)
- Congregational Mosque: 5364m



Figure 169: Plan of Unit KB.

Building type	Count
block	19
building	16
empty enclosure	6
mosque	2
ww1	1
mansion 2	1
enclosure	1

Figure 170: Building type distribution in Unit KB.

Unit KC

Unit KC (Fig. 171) is located in the northwest part of the cantonment. It is considerably smaller than the other units, with just an area of 20.0 ha. There are 39 buildings (Fig. 172), 10 of which are residential (blocks), with a Gini coefficient of 0,3287242 (10 examples). These blocks are placed in a row in the middle of the plan with some smaller exceptions. There is no evidence for any other residential structure or service infrastructure type. The distance to other services within the cantonment is:

- Mosque: 2179m
- Maydan: 1213m
- Water Source: 955m
- Congregational Mosque: 3047m



Figure 171: Plan of Unit KC.

Building type	Count
building	26
block	10
walls	1
ww1	1
trace	1

Figure 172: Building type distribution in Unit KC.

The area of each unit is the main difference among the various units. Units KB and KA follow a similar spatial model, with an avenue or diagonal space that divides the unit between the blocks and undefined buildings. In both cases, the mansions are concentrated in the north. Units KB and KC were designed as purely residential expansions of KA, which was constructed earlier than the other two. The maydan continues to be used by all, while an additional mosque has been built in KB. In all units, the distinction between each battalion or group of blocks is not clearly defined, especially due to the lack of well-defined avenues and the absence of mansions adjacent to the blocks. The difference in the Gini coefficient is probably due to the large number of mansions (8) in Unit KA.

UNIT	KA	KB	KC
AREA SIZE (ha)	216.9	50	20
Gini coefficient	0,516272	0,2634751	0,3287242
WATER SYSTEM	No	No	No
SPATIAL MODEL	Rows	Rows	Irregular
BLOCKS	92	19	10
PALACES	0	0	0
MANSIONS	8	1	0
MOSQUES	1	1	0
MARKETS	0	0	0
STOREHOUSES	0	0	0
STABLES	0	0	0
WORKSHOPS	0	0	0
MAYDANS	1	0	0
RI. PER KM2	45.56	39.84	50.76

Table 44: Architectural information of the units in Area K.

Similar to other cantonments, services that might seem necessary for daily life do not appear to be present in any of the units. The method by which these soldiers obtained food—whether they travelled to the markets to the north in area J or if there were markets that have not yet been identified in the urban plan—is still a mystery. We can ascertain that there are no indications, or at least insufficient evidence, to suggest that the cantonments in Samarra share similarities or that there is homogeneous planning. It is possible that the blocks themselves are similar or organized in a similar manner, but the services available in each cantonment are different or are located differently within the urban plan.

UNITS	KA	KB	KC	AVG. DISTANCE
MOSQUE	0	0	2179	726,3333333
MAYDAN	0	1420	1213	877,6666667
WATER SOURCE	1136	1520	955	1203,666667
CON. MOSQUE	4294	5364	3047	4235

Table 45: K Units and distance to service infrastructure.

Balkuwara cantonment (Area R)

The cantonment of Balkuwara (Fig. 173) is formed by a combination of a Caliphal palace, Balkuwara, and a series of blocks distributed across four avenues and rows. The main avenue divides the cantonment into two units, RA and RB. A separate cluster to the northwest has also been identified as an additional unit, RC. Unlike al-Waziriyya or Madinat al-Mutawakkiliyya, the palace is close to the blocks instead of separated from the main cluster of residential buildings connected by an avenue. There are only two mansions, one of which is identified as *Ubaydallah b. Yahya b. Khaqan* in the west and east corner.



Figure 173: Units in Area R.

Unit RA

Unit RA (Fig. 174), with an area of 0.864 km^2, is located in the southwest corner of the cantonment. It includes the Balkuwara palace, a maydan and some adjacent structures. There are 24 buildings (Fig. 175), with only one residence, the palace, and one service infrastructure, and the maydan is placed next to the southern part of the palace. A W-E canal is placed by the wall, and a series of qanats are located west and south of the unit. The distance to the congregational mosque is 6324m.

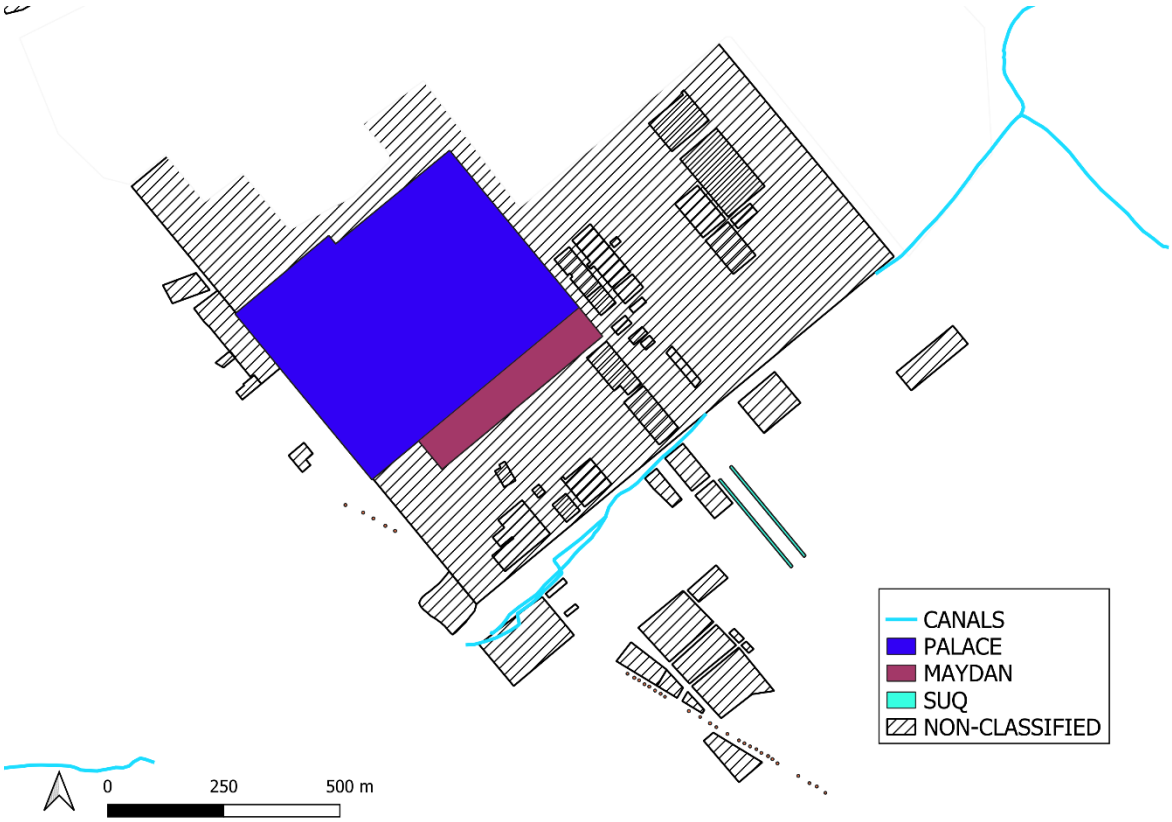


Figure 174: Plan of Unit RA.

Building type	Count
building	13
complex building	8
maydan	1
palace	1
empty enclosure	1

Figure 175: Building distribution in Unit RA.

Unit RB

Unit RB (Fig. 176), with an area of 2.666 km^2, includes most of the cantonment, formed by rows of blocks between 3 and 9 blocks divided by avenues and streets. There are 213 buildings, of which 137 are residential with 135 blocks and 2 mansions (Fig. 177). The calculated Gini coefficient is 0,332682 (137 examples). These last two are placed at the end of narrower avenues. A total of 4 elongated markets are within the avenues, available for both the west and east sides of the cantonment. An extra two markets have been identified just outside the southern part of the Unit. No other service infrastructure has been documented. The distance to the maydan and the congregational mosque is 850m and 6561m, respectively.



Figure 176: Unit RB.

Building type	Count
block	135
building	57
complex building	8
suq	5
empty enclosure	5
mansion 2	1
enclosure	1
mansion 4	1

Figure 177: Building distribution of Unit RB.

Unit RC

Unit RC (Fig. 178) is located in the northwestern corner of the cantonment and is the smallest of the three, with an area of 0.584 km2. It has 41 buildings, 8 of which are residential (8 blocks and no mansions – Fig. 179). The calculated Gini coefficient is 0,2597047 (8 examples). These are organized in irregular clusters of buildings in the centre of the space. No avenue or row can be found here. There is an N-W-orientated Maydan on the east part, the only service infrastructure in the unit. The distance to the market and the congregational mosque is 792m and 6326m, respectively. The closest water system is the qanat line, 1900m away.

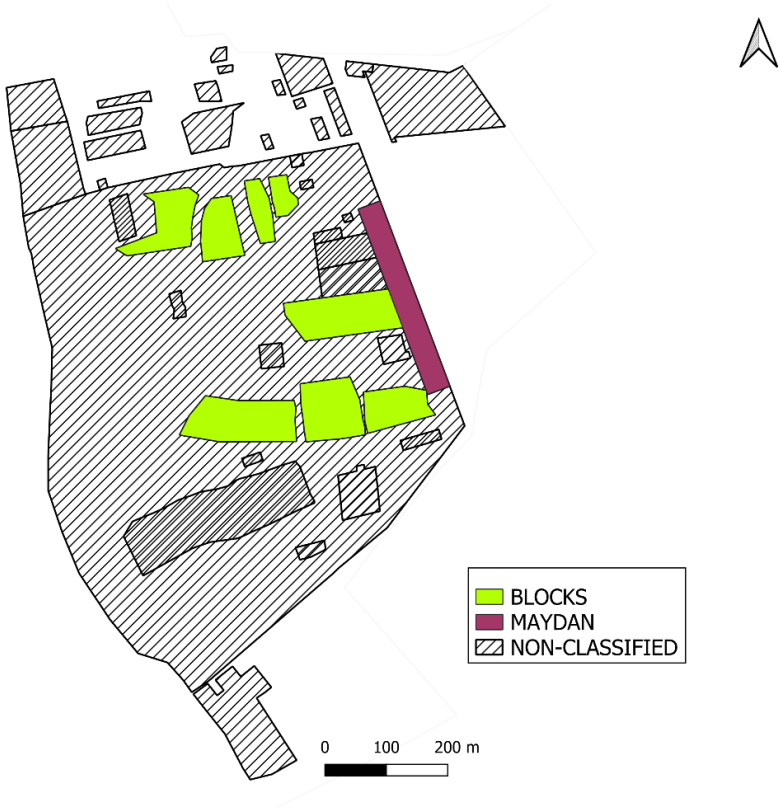


Figure 178: Unit RC.

Building type	Count
building	27
blocks	8
walls	3
ww1	1
maydan	1
complex	1

Figure 179: Distribution of buildings in Unit RC.

Discussion

Unit RA, noticeably less populated than the other two units, denotes a certain degree of separation from the cantonment that fits the description of the caliph's absolutism. The palace, built by Mutawakkil for his son, is separated from the rest of the structures by walls and private gardens. This contrasts with Unit RB, which has a significantly higher residence density that can be associated with the soldiers. Unlike other cantonments, the avenues, in this case, have a more complex function than simply connecting the palace with the mansions and blocks; in this instance, several avenues also include markets. It is possible that each market was designated for a specific type of good or service, and soldiers and officers would move along the streets and avenues to access them. The absence of mansions along the avenues is also noteworthy, as it differs from the cantonments of al-Dur and al-Karkh. The difference here is that there is a caliphal palace, which might have included space for the highest-ranking military officers, eliminating the need for them to live with their troops. In addition to the markets, there were two maydans in this cantonment: one in RA, likely reserved for the caliph, and another in RC, which might have served as a gathering place. Several canals on the eastern side and qanats in the south could supply water to the cantonment. However, the limited water infrastructure compared to other areas constructed by Mutawakkil is notable. Unit RC, with a considerably smaller density than RB, may have been added later to accommodate more troops.

UNIT	RA	RB	RC
AREA SIZE (ha)	86.4	266.6	58.4
Gini coefficient	NA	0,332682	0,2597047
WATER SYSTEM	Yes (Canal and Qanats)	No	No
SPATIAL MODEL	Row	Row	Irregular
BLOCKS	0	135	8
PALACES	1	0	0
MANSIONS	0	2	0
MOSQUES	0	0	0
MARKETS	0	5	0
STOREHOUSES	0	0	0
STABLES	0	0	0
WORKSHOPS	0	0	0
MAYDANS	1	0	1
RI. PER KM2	1.16	51.38	13.7

Table 46: Distance and presence of service infrastructure.

The distance to the services is low compared to other units, especially regarding the markets and the maydans. Nevertheless, this is the farthest unit from a congregational mosque that also does not have a mosque in any of its units. This is similar to Ja'fari's

concept, a palace away from the congregational mosque, which stands as a beacon for the Caliph's power within peasant grounds.

UNIT	RA	RB	RC	AVG. DISTANCE
MARKET	0	0	729	243
MAYDAN	0	852	0	284
CON. MOSQUE	6324	6561	6326	6403,666667
WATER SOURCE	0	0	1900	633,3333333

Table 47: Distance to services infrastructure.

Al-Istablat (Area M)

Al-Istablat was one of Mutawakkil's major projects (Fig. 180). It consists of two rectangular enclosures, the first of which is a smaller 230 x 520m rectangle with a palace; 110.248 ha. The second enclosure includes a bigger 1721 x 575m rectangle with a central avenue that divides W-E rows of four blocks each. The residents probably used a line of qanats in the middle and southern part of the central avenue. Northedge did not identify any units within the cantonment, and due to the degree of symmetry in the urban plan, I also decided to treat the enclosure as just one unit.

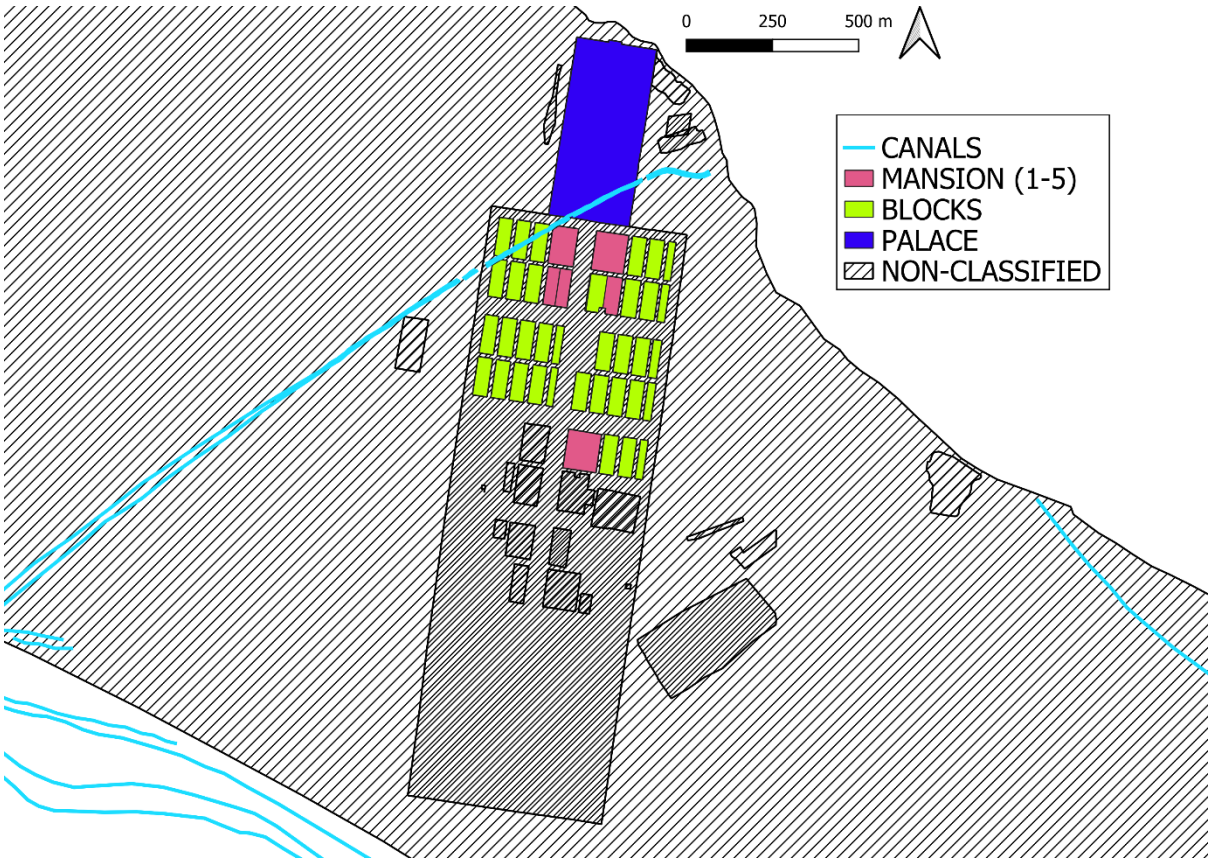


Figure 180: Plan of al-Istablat.

type	Count of type
block	34
building	12
mansion 3	4
ww1	3
mansion 2	3
tell	2
enclosure	2
cantonment	1
palace	1

Figure 181: Building distribution of al-Istablat.

The spatial organization is similar to al-Karkh's, with a defined grid and an avenue as a dividing element, like al-Dur. The main difference is the presence of a palace physically separated from the rest of the cantonment, which resembles more the cantonment of Balkuwara. The lack of service infrastructure within this area and the isolation from the rest of the city suggests that the soldiers did not necessarily depend on any specific structure to survive, and goods were probably delivered to them. The question remains whether this specific dynamic was practised across those examples with fewer service infrastructures like al-Karkh and what differences these groups had with those with markets, maydans and mosques within their perimeter.

CHAPTER 7: INEQUALITY AT SAMARRA AT A SITE LEVEL

This chapter combines the evidence and initial results presented in the fourth, fifth and sixth chapters of this dissertation to analyse the form and inequality at Samarra as a whole. Both the architectural analysis and the study of the Samarran urban layout and service infrastructure reveal a heterogeneous and complex city. Despite a short period of occupancy, Samarra housed many different groups with specific social hierarchies that suffered different levels of inequality. Nevertheless, unlike other parts of the Caliphate, like Egypt, Samarra does not have an extensive record of taxes, receipts for land distribution or any document that indicates the level of involvement the state had in the control and management of land, including water system building or laws regarding houses construction. Therefore, it is upon the material evidence of Samarra to assess these internal dynamics. Following the system employed in this dissertation so far, I will address the final results from a temporal and geographical (areas) perspective. Although there are some areas linked with time periods (Area T and Samarra 3), others include expansion periods that could benefit from this dual system.

It is not possible to either quantify or even acknowledge what Samarra meant for all its citizens, as the only non-literary evidence is Ya'qubi and he has been proven to be inaccurate. It is my intention and hope that the results presented here will convince the reader of a new conception of Samarra, a monumental city with smaller and dependent urban nuclei that conformed more to traditional definitions of a functioning city.

Temporal Analysis

Unlike other cities in the Early Islamic world, Samarra was not built from a classical or Sasanian city, despite scholars' efforts to link its spaces to both traditions. As mentioned in the very first lines of this thesis, apart from some early Abbasid and Sasanian complexes in the north and south extremes of the city, the land that would house the Abbasid royal family was mainly used for hunting grounds (probably that is what made it attractive to the Caliphs) and a Christian monastery. The context in which Samarra was first built is also relevant here, as it is a product of an escape and a new beginning, a project of a successful military leader, who while part of the Abbasid family, was able to arm himself with an army of slaves and take power. The power struggles in Iraq, a product of the civil war and the involvement of Iranian troops, saw a drastic change when Baghdad was no longer the centre of the Muslim World. The first Samarra could be considered a product of that boldness Mu'tasim had, an (overly) ambitious project characterised by a solid architectural monumentality and possible poor urban planning. Due to the fact that the city was built in a way which was not not constrained by previous occupation, we might expect its layout and architecture to be related to social organisation (and inequality) during the Abbasid period.

First, let's assess the size of both buildings and spaces during Mu'tasim's reign. The average size of non-caliphal palaces is 30,632 square meters, and blocks are 6,897 square meters, even with a higher number of dwellings. As seen in Chapter 3, blocks and palaces are the biggest in the whole 56 years of the city. It is therefore reasonable to assume that this first settlement reflected the link between monumentality and power display in both the palatial and dwelling context. The buildings were bigger, and the evidence presented in Chapter 4 shows a higher number of rooms (separation of space) and in-house water system compared to other periods. At this stage, the basins and cisterns do not have to necessarily suggest an improvement in the quality of life but rather a lack of planning and adaptation to the landscape, as later evidence for water systems indicate the need for better structured features. Regarding inequality, the Gini coefficients for this period are relatively low, with a value of 0.46. This does not mean that Mu'tasim's Samarra was an equal society, but rather, we can argue that inequality increased with the arrival of new groups. Samarra, as a whole, made monumentality and big residences a common feature of its architecture during the first period.

However, a closer look to the urban plan can shed new insights to our understanding of how Samarra worked. A city is made up of more than just its buildings. The average unit size (Table 48 & Fig. 182) is also the biggest across all periods during Mu'tasim's reign. This value continues to decrease, similar to the residences', with the exception of Samarra 4, where it increases.

TIME PERIOD	UNIT SIZE
Samarra 1	104,30
Samarra 2	60,03
Samarra 3	56,32
Samarra 4	80,56

Table 48: Average Unit size.

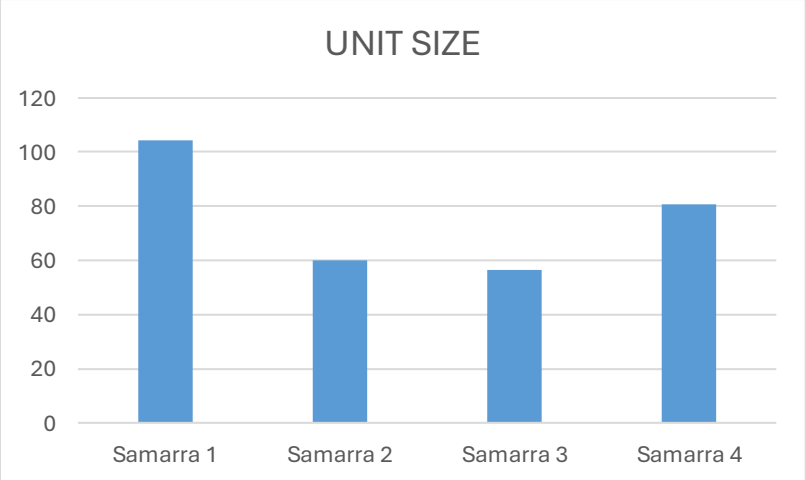


Figure 182: Unit size across time periods.

All this information helps corroborate previous discussions on Samarra's monumentality and is a good introduction for a less formal analysis focused on how the city worked during the various periods. For example, the number of service infrastructure in Units of Samarra 1 is significantly lower than in the following periods (Table 49).

TIME PERIOD	NUMBER OF SERVICE INFRASTRACTURE
Samarra 1	6
Samarra 1-2	4
Samarra 2	11
Samarra 3	21
Samarra 4	3

Table 49: Number of service infrastructure built during the different periods of Samarra.

Other markers of inequality, like distance to Service infrastructure outside of the unit, also suggest a higher quality of life than later periods, while others like the presence of water systems within the unit, depict a more similar value to other periods (Table 50).

TIME PERIOD	DISTANCE TO SERVICE INFRASTRACTURE
Samarra 1	1377.42
Samarra 2	1795.29
Samarra 3	7774.73
Samarra 4	1578.75

Table 50: Distance to service infrastructure across time periods.

The peak reached during Samarra 3 is particularly interesting and can be linked a more extensive and divided area, as well as the introduction of new service infrastructure in new areas that previously did not have any. However, the extensive jump from Samarra 2 and Samarra 3 is noteworthy.

Count of WATER SYSTEM (Y/N)	WATER SYSTEM (Y/N)					PERIOD TOTAL
TIME PERIOD	**No**	**Yes (Canal)**	**Yes (Canals)**	**Yes (Qanat and Canal)**	**Yes (Qanat)**	
Samarra 1	12	1			1	14
Samarra 1-2	2					2
Samarra 2	13	1		1	2	17
Samarra 3	6	4	1	1	3	15
Samarra 4	1	3				4
Grand Total	**34**	**9**	**1**	**2**	**6**	**52**

Table 51: Water systems across time periods.

It is also relevant to observe what type of services were more common during each period, as this is a useful depiction of the population's interests or the caliph of the period (Table 52 & Fig. 183). The first and second periods are characterised for the lack of identified storehouses, which only seem to be built during the third period. It is possible that this fulfilled a role only present in Madinat al-Mutawakkiliyya, like the arrival of a new elite, maybe merchants, that needed special and bigger spaces to store their goods. Despite a central market being built in the first period, their construction continued and maintained a rising tendency until Samarra 3. Maydans are also being built across the different periods, suggesting that this played an important role in the Muslim public life.

	MOSQUE	MARKET	STOREHOUSE	WORKSHOP	MAYDAN
SAMARRA 1	3	2	0	0	3
SAMARRA 2	2	5	0	3	1
SAMARRA 3	9	4	3	2	3
SAMARRA 4	1	1	0	0	1

Table 52: service infrastructure across time periods.

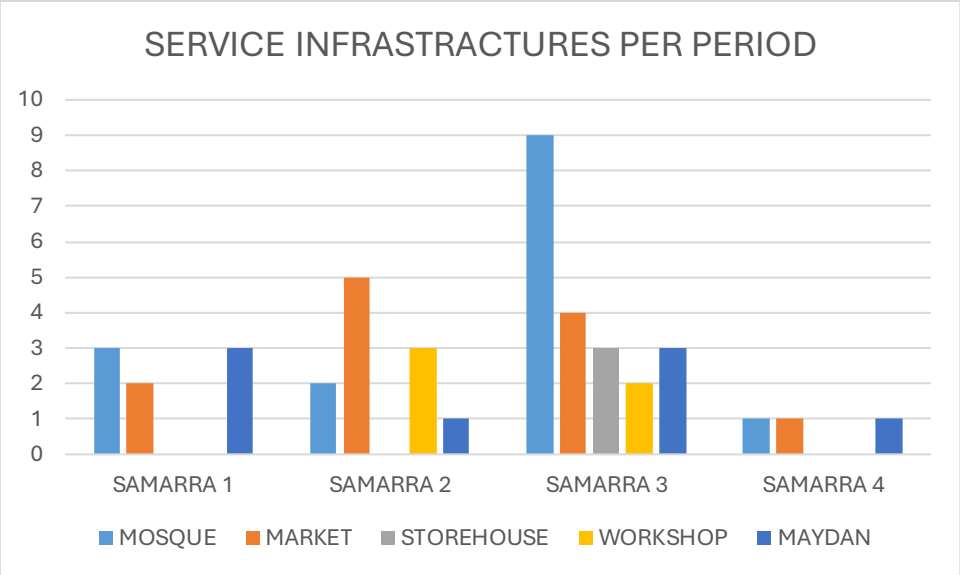


Figure 183: Each Service Infrastructure category per period.

In summary, Samarra, through the years, saw a decline in urban palaces, dwellings and unit size, accompanied with an incremental increase in distance to service infrastructure. Combined with an incremental increase in the Gini coefficient, we can say that Samarra has a more defined hierarchy through the years. Certain aspects of the data can be linked with other possible dynamics, such as the lower average in size in Mansions which can be connected with more examples of varied sizes in the periods of Samarra 3 and 4. This might indicate the emergence of a new urban elite who are not necessarily military leaders or close to the Abbasid Royal Family.

Area analysis

This discussion intends not to study temporal trends, as not all areas were built at the same time, but rather to examine whether it is possible to observe any specific feature linked with a type of building. Therefore, even if some military cantonments were built in different periods, they will be considered part of the group here.

As shown in Chapter 4, the evidence did not show a particular pattern that helped determine size, either mansions or dwellings, with the identification of trends. However, the role of units within areas can help shed light on previously unidentified features.

There is a striking unit size variability across the city (Fig. 184); the cantonments of al-Karkh and Wasif 2 present a high degree of heterogeneity in their unit's size, while other cantonments of al-Dur and al-Jawsaq have a smaller variability. Surprisingly, Area T, which is expected to have a certain degree of variability as it includes all types of structures with different purposes, is on the lower end.

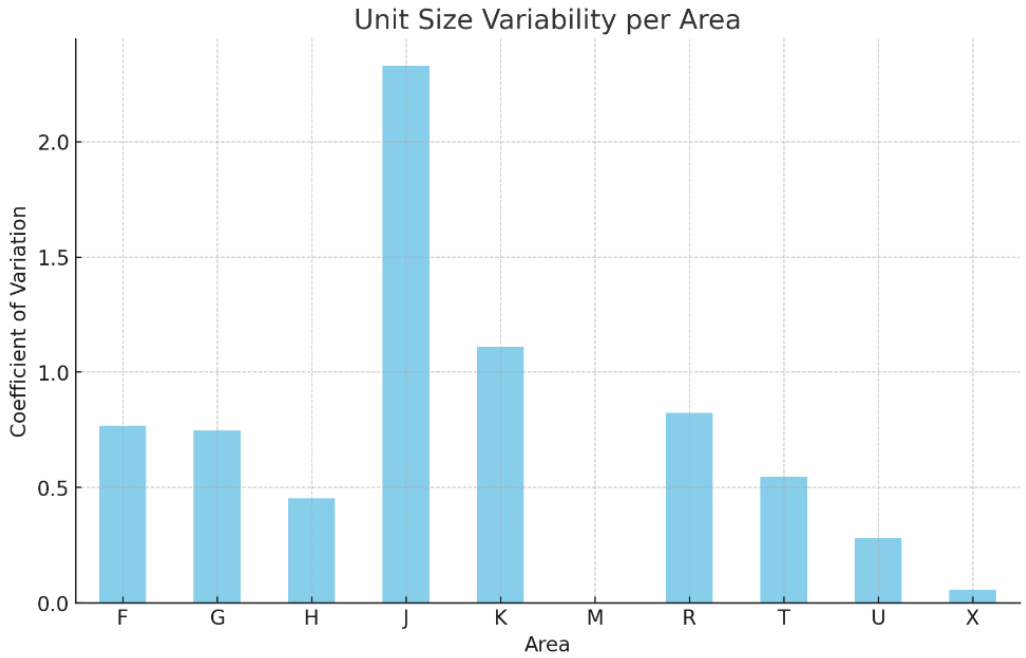


Figure 184: Unit size variability per area.

The average unit size remains similar (under 150 ha) across the city with the exception of the cantonment of al-Karkh (Fig. 185).

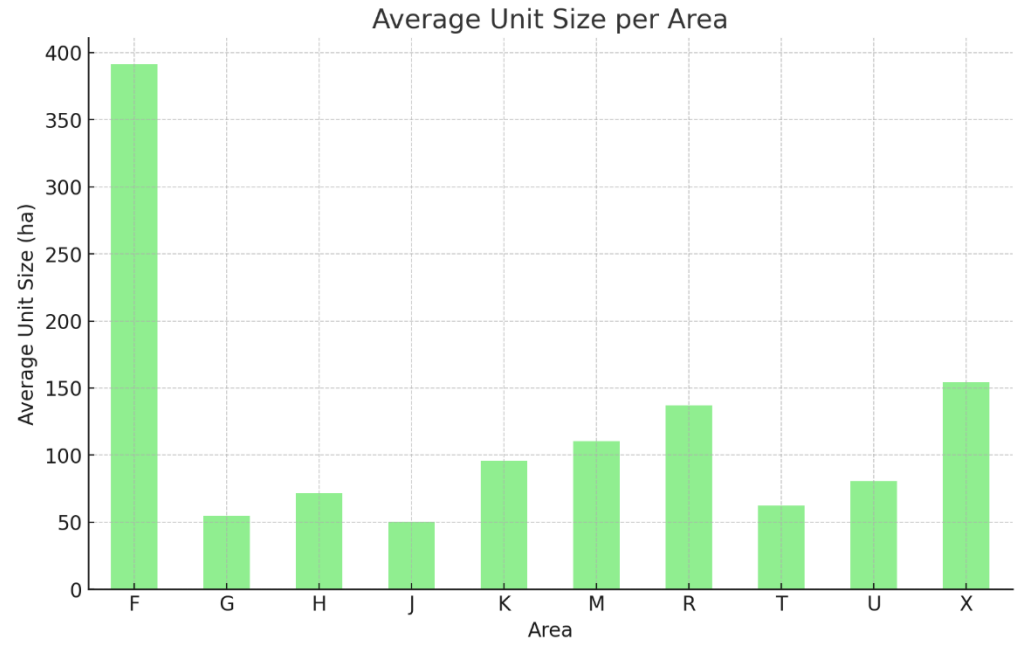


Figure 185: Average unit size per area.

The distribution of service infrastructure across the areas (Table 53 & Fig 186) is hampered by the lack of architectural remains of the markets of Area J. Nevertheless, the

data implies a higher number of these services in areas with civilian presence. Areas with more service infrastructure (J, T, H or U) tend to have more mansions, palaces, and fewer blocks. It is possible that the presence of these features attracted wealthier residents or where those who built these. On the other hand, those areas with fewer service infrastructures (F, G, K, R, M, X) have significantly more blocks inhabited by the lower-class residents. The distribution of these infrastructures is not directly related to size, as areas with more features tend to have a smaller average unit size (66.32 ha). A bigger portion of land doesn't directly correlate with wealth or quality of life, as it is associated with more blocks and a low number of service infrastructure. Moreover, the services are closer in smaller areas with a higher density than large areas with fewer infrastructures.

As happened with the rest of this section, there are no big noticeable patterns in the dissection of types of service infrastructures in the area, except for the presence of markets only present in mixed/civilian areas except for the cantonment of Balkuwara (Area X). It is also the only storehouse in another mixed/civilian area. The further identification of service infrastructure within the urban will surely change these arguments.

AREA	MOSQUE	MARKET	WORKSHOP	STOREHOUSE	MAYDAN
F	2	0	0	0	
G	0	0	0	0	
H	1	0	3	0	2
J	0	2	0	0	1
K	2	0	0	0	1
M	0	0	0	0	
R	0	5	0	0	
T	9	4	2	3	3
U	1	1	0	0	1
X	0	0	0	0	

Table 53: Distribution of service infrastructure across areas.

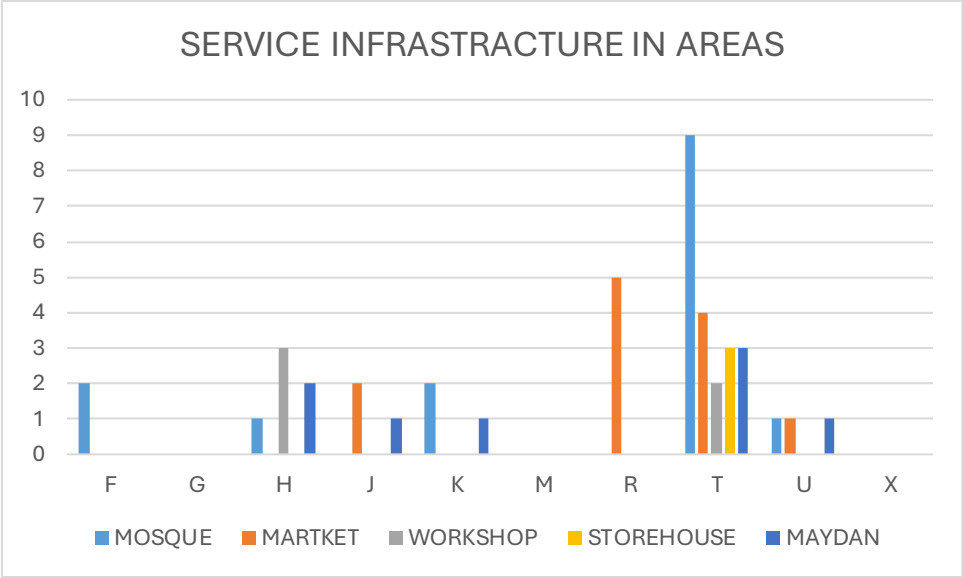


Figure 175: Service Infrastructure in the Areas

Conclusion

This chapter has shown the complex and evolving inequality present in Samarra, integrating evidence from service infrastructure, residence size and urban layout. These show a city marked by a significant social stratification combined with monumentality.

During Mu'tasim's reign, the city was characterized by monumental palace averaging 30632 square meters, blocks of 6897 square meters and an average unit size of 104.3 hectares, the largest. This indicates an initial focus on architectural grandeur, probably linked with power display. With the pass of time, both unit sizes and residential blocks became smaller. The changes correlate with a changing urban hierarchy and the presence of diverse social groups.

Service infrastructure also underwent significant changes. Mutasim's city saw limited infrastructure (6), compared to the evidence found in Madinat al-Mutawakkiliyya (21). Generally, the distribution of this structure was uneven, with areas like J, T or H having a bigger concentration compared to areas like G, F and M. The distance to service infrastructure, an important marker of inequality, shows Mutawakkil's reign as the one with the highest average distances. Additionally, the construction of specific services like markets and storehouses in civilian areas in later periods show the possible emergence of new elites.

Water systems have proved to be key in the understanding of the social dynamics of Samarra. Mutasim seemed to have prioritised in-house water systems and the mentioned water carriers, as the evidence of cisterns and basins shows. Later periods show a more structured water system, including both urban canals and qanats. This change is motivated with an urban landscape adapting to a more permanent settlement, new population and growth.

CHAPTER 8: DISCUSSION AND CONCLUSION

This final chapter synthesises the main arguments and findings proposed in this thesis, addressing the goals and objectives posed in the first chapter. There were three main research topics: the study of the Samarran dwellings and urban palaces, the exploration of early Islamic urbanism and its reflection on the city of Samarra, and finally, the assessment of inequality during the Abbasid period, combining both quantitative and qualitative analyses across both the whole site and sub-divisions based on space (areas, neighbourhoods) and building types (mansions, blocks, palaces).

It has been clear that the analysis of house sizes illustrates a socio-economic stratification. There is a significant house size variability in some areas, like H and J, while others, like the cantonments U and X, contain more uniform housing for the soldiers. The inequality was also appreciable in the layout patterns. Elite dwellings (bigger residences) commonly featured a higher number of courtyards, as, in average, each additional courtyard added approximately 455.85 square meters to the house size. Fewer rooms and irregular layouts are linked with smaller dwellings while the bigger examples had consecutive courtyards and more rooms.

The urban fabric of Samarra is composed of both less planned and state-driven planned areas. There is a coexistence of both service infrastructure clustering (Area T), which might suggest the influence of caliphal organisation and the variability in house size (elevated gini coefficients within areas) as well as Ya'qubi's account on private land ownership. The evolution towards a complex system of urban qanats and canals in Area T, built during Samarra 3, also shows the presence and need for public works while it still coexisted with a simpler system of water carriers in the Original City. Samarra remains a dynamic interplay between centralised control and localised adaptations. These architectural and urban patterns evolved differently across the four time periods. During Samarra 1 and 2, the houses tend to be larger and more uniform, possibly reflecting the intention of establishing Samarra as the new referent of Abbasid power. With the expansion of Samarra with Madinat al Mutawakkiliyya in Samarra 3, presumably more groups came to Samarra and created a greater heterogeneity (Gini coefficient: 0.76). Some architectural changes include shifts in orientation patterns and a growing dominance of single courtyard plans. This area shows nevertheless a higher level of service infrastructure than the rest. It is possible therefore that while the Caliph had no interest in the control of houses and mansions, he did pay attention to the role of Samarra as a commercial and economic hub with functional urban features. The arrival of a new commercial class during the reign of Mutawakkil could also explain the appearance of these structures. Finally, Samarra 4, has smaller dwellings, possibly linked with the instability during the Anarchy at Samarra.

Analysis of Early Islamic urbanism is still in its early stages, especially if compared with Mesopotamian or pre-Columbian cities. Most works are based on qualitative insights, using historical texts and formalist analysis to understand and contextualize the archaeology. However, this would not permit a truly comprehensive analysis,

understanding the site as both a whole complex system but also as individual areas built during specific periods. The use of Gini coefficients, Euclidean distance, correlation and regression analyses have effectively quantified inequality in both spatial organization and dwelling size. Moreover, the use of QGIS as a visual tool has created an easy-to-understand and replicable methodology.

The broader implications focus on the Abbasid urban studies but remain relevant to the debate of contemporary archaeological methodologies. Up to now, there was no definite archaeological study on the relationship between the Abbasid state and local elites. Historical evidence and previous works showed the Abbasids as absolutist rulers who strictly managed their empire. However, the evidence presented here has contested this idea and has offered new perspectives on how the Abbasids organised their cities. While the caliph remains an absolute figure, the disparity among neighbourhoods and areas shows poor control of the state over the actual building of early Islamic cities. While ya'qubi mentions the initial interference of Mu'tasim locating workers and craftsmen near the mosque, the further process of qati'a and the architectural evidence depict a more delegated model of urban governance.

Moreover, in a place that has significantly fewer available historical sources (compared to, for example, the Geniza Archive of Egypt), this thesis offers a way in which archaeology can fill some of these gaps, by identifying details such as access to resources or the presence of service infrastructure. Equally important, this thesis demonstrates that using quantitative and data-driven methods in studying the human past can lead to interpretable results. Using statistical analyses, spatial data, and historical sources will only benefit the study of urban archaeology.

This dissertation has revealed some of Samarra's intricate socio-economic patterns, including stratification, urban planning, and architectural diversity. However, there is plenty of work left to do. Multiple techniques could be applied to the existing data, among them, spatial equilibrium or spatial syntax analysis. This could be applied to the houses and mansions, delving into concepts like privacy, Islamic law and adaptation to climate and their applicability in the distribution of Samarran residential architecture. With the quality of data available here, Samarra should take place as one of the best understood cities in the human past. Engaging with questions similar to the ones presented here would not only stimulate a crucial debate within Islamic Archaeology but in the study of ancient urbanism. his thesis is only the start, and I am committed to continue to enrich our understanding of Samarra and its people.

BIBLIOGRAPHY

Primary Sources

Abu Muhammad al-Muzaffar b. Nasr b. Sayyar al-Warraq. *Kitab al-Tabikh wa Islah al-aghdiyat al-ma'lukat*. Translation used: Nasrallah, N. (2010) *Annals of the Caliphs' Kitchens: Ibn Sayyār Al-Warrāq's Tenth-Century Baghdadi Cookbook*. Brill.

Abu Uthman Amr ibn Bahr al-Kinani al-Basri (al-Jahiz). *Kitab al-Bukhala'*. Used version: Jahiz Kitab Al Bukhala (2014). Internet Archive: https://www.scribd.com/document/417572162/Jahiz-Kitab-Al-Bukhala

Abu Uthman Amr ibn Bahr al-Kinani al-Basri (al-Jahiz). *Kitab al-Bayan wa'l-Tabyin*. Used version: Mahboob (1916) *Al Bayan Wal Tabain*. Digitised by Internet Archive: https://archive.org/details/in.ernet.dli.2015.322902/mode/2up

Abu Uthman Amr ibn Bahr al-Kinani al-Basri (al-Jahiz). *Kitab al-Hayawan*. Used version: (1905) *Hādhā kitāb al-ḥayawān*. [Cairo] : al-Matbaʿah al-Ḥamīdīyyah al-Miṣrīyyah.

Abu Uthman Amr ibn Bahr al-Kinani al-Basri (al-Jahiz). *Rasa'il*. Used version: 'Abd al Salam Muhammad Harun (1965). *Rasa'il al Jahiz*. Maktabat al Janyi (Cairo).

Al-Azdī. *Hikayat Abi al-Qasim*. Translation used: Selove, E. (2017). *Ḥikāyat Abī al-Qāsim: A Literary Banquet*. Edinburgh University Press.

Al-Mas'ūdī. *Murūj al-dhahab wa-maʿādin al-jawhar,* I, VII & VIII. Used version: al-Tārīkh al-yāniʿ al-azāhir wa-al-thamar al-mawsūm bi-Murūj al-dhahab wa-maʿādin al-jawhar : muḥallá al-hawāmish bi-al-tārīkh al-musammá bi-Rawḍat al-manāẓir fī akhbār al-awā'il wa-al-awākhir li-Abī al-Walīd ibn al-Shiḥnah. Harvard University Library.

Al-Raghib al-Asfahani. *Muhadarat al-'Udaba'*. Used version: (2004). Muhadarat al-'Udaba' (5 Volumes) محاضرات الادباء ومحاورات الشعر اء والبلغاء Der Sader Publisher (Beirut).

Al-Tanukhi al-Muhassin ibn Ali. *Nishwar*. Translation used : (1922) *The Table-Talk of a Mesopotamian Judge: Being the First Part of the Nishwar Al-Muhadarah, or Jami Al-Tawarikh of Abu 'Ali Al-Muhassin Al-Tanukhi*. Cornell University Library.

Hayyan at-Tawhidi. *Al-Imtāʿ wa al-Mu'ānasa*. Used version: (2001) Imta' wa-al-Mu'anasah الإمتاع والمؤانسة Dar Ihya Turath (Beirut).

Hayyan at-Tawhidi. *Mathalib al-Wazirain*. Abu Hayyan 'Ali Bin Muhammad (1992) *Akhlaq Al Wazirain, Mathalib Al Wazirain Al Sahib Bin Abbad Wa Ibn Al 'Amid*. Dar Sader (Beirut).

Ibn al-Jawzi. *Talbis*. Translation used: The Devil's Deception [Talbis Iblis]. Groups and Sects, Kalamullah. https://www.kalamullah.com/the-devils-deception.html

Ibn Hawqal. *Kitab Surat al-ard*. Used version: Kramers, J.H. (ed.) (1938). Kitāb surat al-ard. Brill.

Ibn Qutaybah. *Kitab al-Ashriba*. *Used version:* ʻUmar ibn ʻAbd al-ʻAzīz (1945). *Kitāb al-ashribah wa-dhikr ikhtilāf al-nās fīhā*. Mahum al-Mansuri collection. Library of Congress.

Ibn Qutaybah. *Kitab al-Maysir wa'l-Qidah*. Used version: (1965) al-Maysir wa-al-qidāḥ. [al-Qāhirah] : al. Maṭbaʻah al-Salafīyah wa-Maktabatihā. UCLA Library, Preservation Department. Digitised by Internet Archive: https://archive.org/details/almaysirwaalqida00musl/mode/1up

Ibn Qutaybah. *Kitāb ʿuyūn al-akhbār*. Used version: (1908) ʻUyun al-Akhbar (عيون الاخبار). Dar Sader.

Ibn Wadih al-Ya'qubi. *Kitab al-Buldan*. Translation used: Gordon, M. S., Robinson, C. F., Rowson, E. T. & Fishbein, M. (2018) *The Works of Ibn Wadih al-Ya'qubi (Volume 1)*. Brill.

Ibraim Ibn Muhammad Bayhaqi. *Mahasin*. Used version: (1906) *Al-Mahasin Wa-al-Masawi*. Pranava Books.

Khawarizmi. *Mafatih al-'Ulum*. Used version: Muhammad ibn Ahmad (1923) *Mafatih al 'Ulum*. Ash Sharq (Cairo).

Maqqari. *Nafkh al-Tib*. Used version: (1921) Nafh al-tib. 'Aligarh Matba'ah-i Muslim University Institute. University of Toronto. Digitised by Internet Archive: https://archive.org/details/nafhaltib00maqq

Muhammad ibn Jarir al-Tabari. *Tarikh*. Translation used: The History al-Tabari. Current Affairs & History, Kalamullah. https://www.kalamullah.com/tabari.html

Muqassasi. *Ahsan al-Taqasim*. Used version: Azoo, R. F. (1897). Ahsan al-taqasim fi maʻrifat al-aqalim. Bengal Asiatic Society.

Sabi. *Kitab al Wuzara'*. Translation used: Amedroz, H.F. (1904) The historical remains of Hilāl al-Sābi : first part of his Kitab al-Wuzara. Catholic Press of Beyrut, Leyden.

Yāqūt ibn ʻAbd Allāh al-Ḥamawī. *Mu'tam al-Buldan*. Used version: Muʻjam al-buldān [v.1-v.2]. Bayrūt : Dār Sādar. Internet archive: https://archive.org/details/32882018661143-mujamalbuldanvv/mode/1up

Secondary Sources

Abass, F., Ismail, L. H., & Solla, M. (2016). A Review of Courtyard House: History Evolution Forms, and Functions. *ARPN Journal of Engineering and Applied Sciences*, 11(4), 2557-2563.

Adamo, N., & Al-Ansari, N. (2020). Sammara and its Canals. *Journal of Earth Sciences and Geotechnical Engineering*, 10(3), 223-251.

Ahsan, M. M. (1973). *Social Life under the Abbasids, 170-289/786-902*. University of London, School of Oriental and African Studies, United Kingdom.

Akulov, A. (2018). Comparing Çatalhöyük with the palace of Knossos by matrix-vector method. *Cultural Anthropology and Ethnosemiotics*, *4*(4), 2-16.

Almagro, A. (1987). *Origins and Repercussions of the Architecture of the Umayyad Palace in Amman*. Centro Superior de Investigación Científica (CSIC).

Almamoori, H. S. (2015, October). courtyard is basic pattern in tradition Islamic architecture: as prototype'. In *12th International conference "Standardization, Porotypes and quality a means of Balkan countries' collaboration (Turkey)* (Vol. 12).

Bakare, A. S. (2012). Measuring the income inequality in Nigeria: the Lorenz Curve and Gini co-efficient approach. *American journal of Economics*, *2*(1), 47-52.

Basri, P., & Lawrence, D. (2020). Wealth inequality in the ancient Near East: a preliminary assessment using Gini coefficients and household size. *Cambridge archaeological journal*, *30*(4), 689-704.

Beck, J., & Quinn, C. P. (2022*)*. Balancing the Scales: Archaeological Approaches to Social Inequality. *World Archaeology*, 54(4), 572-583.

Bell, G. (1914). *Palace and Mosque at Ukhaidir*. Oxford.

Bennison, A. K. (2018). The Trajectory of the High Caliphate: Expansion and Contraction. *The Wiley Blackwell History of Islam*, 115-135.

Bentley, R. A., & Maschner, H. D. (2003). *Complex Systems and Archaeology*. Salt Lake City: University of Utah Press.

Bier, L. (1993). The Sasanian Palaces and Their Influence in Early Islam. *Ars Orientalis*, 23, 57-66.

Binici, H., Aksogan, O., Bodur, M. N., Akca, E., & Kapur, S. (2007). Thermal Isolation and Mechanical Properties of Fibre Reinforced Mud Bricks as Wall Materials. *Construction and Building Materials*, 21(4), 901-906.

Bosworth, C. E. (1986) *ARDAŠĪR-ḴORRA*. Encyclopædia Iranica. https://www.iranicaonline.org/articles/ardasir-korra

Bosworth, C. E. (1994). Abū Ḥafṣ ʿUmar al-Kirmānī and the Rise of the Barmakids. *Bulletin of the School of Oriental and African Studies*, 57(2), 268-282.

Bowles, S. (2012). *The New Economics of Inequality and Redistribution*. Cambridge University Press.

Bowles, S. (2012). *The new economics of inequality and redistribution*. Cambridge University Press.

Bowles, S., Smith, E. A., & Borgerhoff Mulder, M. (2010). The Emergence and Persistence of Inequality in Premodern Societies: Introduction to the Special Section. *Current Anthropology*, 51(1), 7-17.

Brady, D., Blome, A., & Kleider, H. (2016*)*. How Politics and Institutions Shape Poverty and Inequality. *The Oxford Handbook of the Social Science of Poverty*, 1. Oxford University Press.

Brown, P. J., & van Berkel, M. (2024). Water Provision in Early Islamic Cities: A Multidisciplinary Approach to Urban Water Governance. In *City, Citizen, Citizenship, 400–1500: A Comparative Approach*, 75-103. Cham: Springer International Publishing.

Burgio, L., Clark, R. J., & Rosser-Owen, M. (2007). Raman Analysis of Ninth-century Iraqi Stuccoes from Samarra. *Journal of Archaeological Science*, 34(5), 756-762.

Campanini, M. (2012). The Mu ‘tazila in Islamic History and Thought. *Religion Compass*, 6(1), 41-50.

Canepa, M. P., & Hardy, J. W. (2021). *Persian Palace Architecture, Garden Design and Digital Archaeology*. Sasanian Iran in the Context of Late Antiquity: The Bahari Lecture Series at the University of Oxford, 6, 39.

Canuto, M. A., Auld-Thomas, L., Yagi, H., & Barrientos, T. (2023). Gini coefficient at La Corona: The impacts of variation in analytical unit and aggregation scale. *Ancient Mesoamerica*, *34*(3), e7.

Cartwright, M. (2018). *Byzantine Art*. World History Encyclopedia.

Cegielski, W. H., & Rogers, J. D. (2016). Rethinking the Role of Agent-based Modelling in Archaeology. *Journal of Anthropological Archaeology*, 41, 283-298.

Chase, A. S., Chase, A. F., & Chase, D. Z. (Eds.) (2024). *Ancient Mesoamerican Population History: Urbanism, Social Complexity, and Change*. University of Arizona Press.

Chase, D. Z., & Chase, A. F. (2014). 10 Path Dependency in the Rise and Denouement of a Classic Maya City: The Case of Caracol, Belize. *Archeological Papers of the American Anthropological Association*, 24(1), 142-154.

Chávez-Gómez, S., & Spence, M. (2012). Interaction Among the Complex Societies of Classic-Period Mesoamerica', in Deborah L. Nichols (ed.) (2012). *The Oxford Handbook of Mesoamerican Archaeology*, Oxford Handbooks.

Childe, V. G. (1950). The Urban Revolution. *Town planning review*, 21(1), 3.

Coleman, C. B. (1968). *Constantine the Great and Christianity: Three Phases: the Historical, the Legendary, and the Spurious*. Columbia University Press.

Coleman, J. S. (1974). Inequality, Sociology, and Moral Philosophy. *American Journal of Sociology*, 80(3), 739-764.

Cowgill, G. L. (2004). Origins and Development of Urbanism: Archaeological Perspectives. *Annu. Rev. Anthropol.*, 33(1), 525-549.

Creswell, K. A. C. (1958). *A Short Account of Early Muslim Architecture*. London: Penguin Books.

Curtis, J., Raheed, Q. H., Clarke, H., Al Hamdani, A. M., Stone, E., Van Ess, M.,... & Ali, M. (2008). *An Assessment of Archaeological Sites in June 2008: An Iraqi-British Project*. Iraq, 70, 215-237.

Dagum, C. (1998). *A new approach to the decomposition of the Gini income inequality ratio* (pp. 47-63). Physica-Verlag HD.

Dahmani, F. (2020*).* A Reassessment of the Location of the Mural Paintings in the Caliphal Palace of Samarra. *Der Islam*, 97(2), 367-404.

Debevoise, N. C. (1941). The Origin of Decorative Stucco. *American Journal of Archaeology*, 45(1), 45-61.

Dennehy, T. J., Stanley, B. W., & Smith, M. E. (2016). 9 Social Inequality and Access to Services in Premodern Cities. *Archaeological Papers of the American Anthropological Association*, 27(1), 143-160.

Dougherty, K. J. (2018). *Higher Education Choice-making in the United States: Freedom, Inequality, Legitimation*. Centre for Global Higher Education.

Edwards, B. (2006). *Courtyard Housing: Past, Present and Future*. Taylor & Francis.

Egberts, E., Jotheri, J., Di Michele, A., Baxter, A., & Rey, S. (2023). Dating Ancient Canal Systems Using Radiocarbon Dating and Archaeological Evidence at Tello/Girsu, Southern Mesopotamia, Iraq. *Radiocarbon*, 65(4), 979-1002.

El-Hibri, T. (2021). *The Abbasid Caliphate: A History*. Cambridge University Press.

Erarslan, A. (2020). Typological Variations of the Courtyard House with Iwan Tradition. A Comparative Analysis of Examples in Syria, Egypt, Iraq and Iran. *Advances in Scientific Research: Engineering and Architecture*, 429-467.

Ettinghausen, R. (1972). *From Byzantium to Sasanian Iran and the Islamic World: Three Modes of Artistic Influences* (Vol. 3). Brill Archive.

Ettinghausen, R., Grabar, O., & Jenkins, M. (2003). *Islamic Art and Architecture 650-1250*. Yale University Press.

Fatemeh, H. M. (2022). *History of the Development of the Religions of the Ancient Iranians in Pahlavi Inscriptions and Historical Monuments of the Late Sassanid Period*. Religion, (1), 1.

Fenwick, C. (2013). From Africa to Ifrīqiya: Settlement and Society in Early Medieval North Africa (650–800). *Al-Masaq*, 25(1), 9-33.

Fochesato, M., Bogaard, A., & Bowles, S. (2019). Comparing ancient inequalities: the challenges of comparability, bias and precision. *Antiquity*, *93*(370), 853-869.

Garosi, E. (2022). *Projecting a New Empire: Formats, Social Meaning, and Mediality of Imperial Arabic in the Umayyad and Early Abbasid Periods* (Vol. 42). Walter de Gruyter GmbH & Co KG.

Genito, B. (2016). A Modern Archaeology of the Sasanian Period: Former Limitations and New Perspective. *Newsletter di Archeologia CISA*, 7, 35-90.

Giatsis, S. G. (2000). The Organization of Chariot-racing in the Great Hippodrome of Byzantine Constantinople. *The International Journal of the History of Sport*, 17(1), 36-68.

Gillani, A. H., & Tahir, M. (2014). *The Administration of Abbasids Caliphate: A Fateful Change in the Muslim History*. Pakistan Journal of Commerce and Social Sciences (PJCSS), 8(2), 565-571.

Gordon, M. S. (2001). *The Breaking of a Thousand Swords: A History of the Turkish Military of Samarra (AH 200-275/815-889 CE)*. SUNY Press.

Grabar, O. (1955). *Ceremonial and Art at the Umayyad Court*. Princeton University.

Grabar, O. (2023). *Umayyad Palaces Reconsidered*. In *Early Islamic Art, 650–1100*, 187-212. Routledge.

Grof, S. (1996). Consciousness Evolution and Planetary Survival: Psychological Roots of Human Violence and Greed. *World Futures: Journal of General Evolution*, 47(4), 243-262.

Hales, S. (2003). *The Roman house and social identity* (p. 125207). Cambridge: Cambridge University Press.

Hassan, I. (1947). *Nazam-ul-Islam*. Browse Publisher, Delhi, India.

Hayden, B., & Cannon, A. (1984). Interaction inferences in archaeology and learning frameworks of the Maya. *Journal of Anthropological Archaeology*, *3*(4), 325-367.

Heidemann, S. (2006). The History of the Industrial and Commercial Area of 'Abbāsid Al-Raqqa, called Al-Raqqa Al-Muhtariqa. *Bulletin of the School of Oriental and African Studies*, 69(1), 33-52.

Heinrich, A. J., & Million, A. (2021). Educational Inequality and Urban Development: Education as a Field for Urban Planning, Architecture and Urban Design. In *Space, Place and Educational Settings*. Springer International Publishing, 33-62.

Hillenbrand, R. (1986). The Classical Heritage in Islamic Art: the Case of Medieval Architecture. *The Scottish Journal of Religious Studies*, 7(1986), 123-140.

Hillenbrand, R. (1994). *Islamic Architecture: Form, Function, and Meaning*. Columbia University Press.

Hitti, P. K. (1970). *Political Administration and Social Conditions Under the Umayyads*. History of the Arabs: From the Earliest Times to the Present, 224-239.

Hölscher, U. (1941). *The Excavation of Medinet Habu/3 The Mortuary Temple of Ramses III, part 1*. The Excavation of Medinet Habu. University of Chicago Press.

Hoseini, S. M. R. M., & Branch, S. (2012). Azar Barzin Mehr Firetemple, Shining Over the Peaks of Sassanids' Era Architecture. *Life Science Journal*, 9(3).

Hritz, C. (2010). Tracing Settlement Patterns and Channel Systems in Southern Mesopotamia Using Remote Sensing. *Journal of Field Archaeology*, 35(2), 184-203.

Huff, D. (1972). *Der Takht-i Nishin in Firuzabad.* Archäologischer Anz, 517-540

Huff, D. (1998). *Palace Architecture*. Encyclopædia Iranica. https://www.iranicaonline.org/articles/palace-architecture

Huff, D., O'Kane, B. (2012). ČAHĀRṬĀQ. Encyclopædia Iranica, IV/6, 634-642, available online at http://www.iranicaonline.org/articles/cahartaq

Ismail, O. (2007). *Mu'taṣim and the Turks.* In: Bosworth, C.E. (Ed.). (2007). T*he Turks in the Early Islamic World (1st ed.)*. Routledge. https://doi.org/10.4324/9781315236711

Jamal, N. (2019). *Islamic Interior and Exterior.* Lecture. University of Tishk, College of Engineering, Department of Interior Design.

Jamsari, E. A., Razak, A. Q. A., Sidik, R., & Hassan, M. Z. A. (2013). The History of the Muslim Naval Army During the 'Abbasid Era. *Advances in Natural and Applied Sciences*, 7(1), 79-83.

Jansen, M. R. (1993*)*. Mohenjo-daro: Type Site of the Earliest Urbanization Process in South Asia. *Studies in the History of Art*, 31, 35-51.

Jenkins, S. (2017). The measurement of income inequality. In *Economic inequality and poverty* (pp. 3-38). Routledge.

Kaas, L., Kocharkov, G., & Preugschat, E. (2019). Wealth Inequality and Homeownership in Europe. *Annals of Economics and Statistics*, 136, 27-54.

Kay, K., Haddow, S., Knüsel, C., Mazzucato, C., Milella, M., Veropoulidou, R., & Twiss, K. C. (2022). No Gentry but Grave-makers: Inequality Beyond Property Accumulation at Neolithic Çatalhöyük. *World Archaeology*, 54(4), 584-601.

Kennedy, H. (2013). *The Armies of the Caliphs: Military and Society in the Early Islamic State*. Routledge.

Kennedy, H. (2015). *The Middle East in Islamic Late Antiquity*. Fiscal Regimes and the Political Economy of Premodern States, 390-403.

Kennedy, H. (2022). *The Prophet and the Age of the Caliphates: The Islamic Near East from the 6th to the 11th Century*. Routledge.

Kennedy, P. (2016). The Fall of the Barmakids in Historiography and Fiction: Recognition and Disclosure. *Journal of Abbasid Studies*, 3(2), 167-238.

Kennet, D. (2001). *The Form of the Military Cantonments at Samarra, the Organisation of the Abbasid army*. Oxford University Press.

King, G. R. D. (1989). *Building Methods and Materials in Western Saudi Arabia*. In Proceedings of the Seminar for Arabian Studies. Seminar for Arabian Studies, 71-78.

King, G. R. D. (1991). Creswell's Appreciation of Arabian Architecture. *Muqarnas*, 94-102.

Klein, H. A. (2006). Sacred Relics and Imperial Ceremonies at the Great Palace of Constantinople. *Byzas*, 5, 79-99.

Kohler, T. A., & Smith, M. E. (Eds.). (2018). *Ten Thousand Years of Inequality: The Archaeology of Wealth Differences*. University of Arizona Press.

Kohler, T. A., Smith, M. E., Bogaard, A., Feinman, G. M., Peterson, C. E., Betzenhauser, A., ... & Bowles, S. (2017). Greater post-Neolithic wealth disparities in Eurasia than in North America and Mesoamerica. *Nature*, *551*(7682), 619-622.

Kolluru, M., & Semenenko, T. (2021). Income inequalities in EU countries: GINI indicator analysis. *Economics*, *9*(1), 125-142.

Lam, J. C., Han, Y., Bai, R., Li, V. O., Leong, J., & Maji, K. J. (2020). *Household Wealth Proxies for Socio-economic Inequality Policy Studies in China*. Data & Policy, 2, e1.

Legrain, L. (1927). The Expedition at Ur of the Chaldees. *The Museum Journal*, Penn Museum (18 -2) 121-158.

Leisten, T. (2005). *Mshatta, Samarra, and al-Hira: Ernst Herzfeld's Theories Concerning the Development of the Hira-style Revisited*. In *Ernst Herzfeld and the Development of Near Eastern Studies 1900-1950*, 371-384. Brill.

Leone, A. (2007). *Changing Townscapes in North Africa from Late Antiquity to the Arab Conquest* (Vol. 28). Edipuglia srl.

Leone, A. (2013). *The End of the Pagan City: Religion, Economy, and Urbanism in Late Antique North Africa*. OUP Oxford.

Lopez, M., & Dubrow, J. K. (2020). Politics and Inequality in Comparative Perspective: A Research Agenda. *American Behavioral Scientist*, 64(9), 1199-1210.

Love, S. (2013). *The Performance of Building and Technological Choice Made Visible in Mudbrick Architecture*. Cambridge Archaeological Journal, 23(2), 263-282.

Martin, R. (2021). *Path Dependence and the Spatial Economy: Putting History in its Place*. Handbook of Regional Science, 1265-1287.

Mehran, F. (1976). Linear measures of income inequality. *Econometrica: Journal of the Econometric Society*, 805-809.

Meirison, M., & Saharuddin, D. (2021). The Distinction of Government Administration and Judicial Institutions in The Umayyad Dynasty. *Buletin Al-Turas*, 27(1), 123-138.

Micheau, F. (2015). *Baghdad, an Imperial Foundation (762–836 CE)*. Early Cities in Comparative Perspective, 397-415.

Milanovic, B., Lindert. P. H. & Williamson, J.G. (2007). Measuring Ancient Inequality. *Nber Working Paper Series*. National Bureau of Economic Research.

Miller, D. (1985). Ideology and the Harappan Civilization. *Journal of Anthropological Archaeology*, 4(1), 34-71.

Milwright, M. (2017). *Samarra and Abbasid Ornament*. A Companion to Islamic Art and Architecture, 177-196.

Mirsalami, M., Omranipour, A., & Khoshbakht Bahramani, S. (2021). *Study of Spatial-Social Relations in the Pattern of Four-Iwan Mosques in Iran (Case study: Isfahan, Ardestan, Qazvin and Zavareh Grand Mosques)*. Journal of Architectural Thought, 5(9), 19-39.

Moeller, N. (2016). *The Archaeology of Urbanism in Ancient Egypt: From the Predynastic Period to the End of the Middle Kingdom*. Cambridge University Press.

Morton, S. G., Peuramaki-Brown, M. M., Dawson, P. C., & Seibert, J. D. (2012). Civic and Household Community Relationships at Teotihuacan, Mexico: A Space Syntax Approach. *Cambridge Archaeological Journal*, 22(3), 387-400.

Moulaert, F., & Mehmood, A. (2015). *Analysing Regional Development: From Territorial Innovation to Path-dependent Geography*. In *The Elgar Companion to Social Economics, Second Edition*, 676-700. Edward Elgar Publishing.

Mulder, M. B., Bowles, S., Hertz, T., Bell, A., Beise, J., Clark, G.,... & Wiessner, P. (2009). Intergenerational wealth transmission and the dynamics of inequality in small-scale societies. *science*, *326*(5953), 682-688.

Munson, J., & Scholnick, J. (2022). Wealth and Well-being in an Ancient Maya Community: A Framework for Studying the Quality of Life in Past Societies. *Journal of Archaeological Method and Theory*, 29(1), 1-30.

Nevett, L. (2007*). Greek Houses as a Source of Evidence for Social Relations*. British School at Athens Studies, 5-10.

Northedge, A. (1993). An Interpretation of the Palace of the Caliph at Samarra (Dar al-Khilafa or Jawsaq al-Khaqani). *Ars Orientalis*, 23, 143-170.

Northedge, A. (2001). *The Palaces of the Abbasids at Samarra*. A Medieval Islamic City Reconsidered: An Interdisciplinary Approach to Samarra, 29-67.

Northedge, A. (2008). *The Historical Topography of Samarra (Samarra Studies 1)*. British School of Archaeology in Iraq. Foundation Max van Berchem.

Northedge, A. (2011). *Sasanian and Abbasid Royal Settlement at Samarra: Aspects of Continuity and Change*. na.

Northedge, A., & Kennet, D. (2015). *Archaeological Atlas of Samarra: Samarra Studies II*. Foundation Max van Berchem.

Norwood, A. L., & Smith, M. E. (2022). Urban Open Space and Governance in Ancient Mesoamerica. *Journal of Archaeological Method and Theory*, 29(3), 939-961.

Novák, M. (2012). *The Change of Caliphate Ideology in the Light of Early Islamic City Planning*. In. Baker, H. D., Kaniuth, K., Otto, A. (2012) *Stories of Long Ago. Festschrift für Muchael D. Roaf*. 385-404. Alter Orient und Altes Testament.

Nuhair, L. D. A. K. I. (2017). Decentralization in Islamic law and Islamic History. *Journal of Al-Qalam University College*, (Special Issue).

Nussbaum, M., & Sen, A. (Eds.). (1993). *The Quality of Life*. Clarendon Press.

Pailes, M. C. (2014). Social network analysis of Early Classic Hohokam corporate group inequality. *American Antiquity*, *79*(3), 465-486.

Pfälzner, P. (2012). Household Dynamics in Late Third Millennium Northern Mesopotamia. *Studia Chaburensia* (3) 145-162.

Phillips, D. (2006). *Quality of Life: Concept, Policy and Practice*. Routledge.

Pinder-Wilson, R. (1976). *The Persian Garden: Bāgh and Chahār Bāgh*. in E. B. Macdougall and R. Ettinghausen, (eds.) (1976). *The Islamic Garden*, Washington, D.C., 69-85.

Pugachenkova, G. (1958). *Puti Razvitiya Arkhitektury Yuzhnogo Turkmenistana (The Course of the Development of Architecture in Southern Turkmenistan)*.

Ramzy, N. S. (2016). Morphological Logic in Historical Settlements: Space Syntax Analyses of Residential Districts at Mohenjo-Daro, Kahun and Ur. *Urban Design International*, 21, 41-54.

Rice, D. T. (1958). *The Great Palace of the Byzantine Emperors*. Edinburgh University Press.

Riyadi, A. S. I. M., & Putra, M. H. A. (2022). Dearabization of Islamic Government during the Abbasid Dynasty. *Journal of Islamic History and Manuscript*, 1(1), 53-68.

Rogerson, P. A. (2013). The Gini coefficient of inequality: a new interpretation. *Letters in Spatial and Resource Sciences*, *6*(3), 109-120.

Roland, G. (2021). Review of Ten Thousand Years of Inequality: The Archaeology of Wealth Differences. *Journal of Economic Literature*, *59*(3), 1023-1029.

Rollin, S., & Streetly, J. (1998). *Jordan*. A & C Black.

Rusydi, I., Saepudin, D., & Murodi, M. (2023). The Golden Age of Islamic Intellectuals and the Development of Science During the Abbasid Dynasty. *Tafkir: Interdisciplinary Journal of Islamic Education*, 4(4), 599-609.

Saba, M. (2022). *Impermanent Monuments, Lasting Legacies: The Dār Al-Khilāfa of Samarra and Palace Building in Early Abbasid Iraq*. Reichert Verlag.

Saba, M. D. (2015). A Restricted Gaze: The Ornament of the Main Caliphal Palace of Samarra. *Muqarnas Online*, 32(1), 155-195.

Saeed, N. A. M. (2023). *Political Variables and their Impact on the fall of the Umayyad Caliphate (41-132 AH/661-749 AD)*. Journal of Education for Humanities, 3(خاص القسم الثاني).

Sahin, O. E. (2019). *Space, Identity and Belonging in the Context of Hagia Sophia*. In: Kolukirik, S. & Gün, E. (eds.) (2019) *Global Transformation and Differentiation 1: Congress Book*. Innovation and Global Issues Congress.

Schippmann, K. (1972). *The Development of the Fire Temple*. In 5th International Congress on Iranian Art & Archaeology, Teheran.

Schmidt, E. (1937). *Excavations at Tepe Hissar, Damghan*. Philadelphia.

Schmidt, J. & Finster, B. (1976). Tulul al-Ukhaidir. Sumer. *A Journal of Archaeology and History in Iraq*, Vol. 32, no 1-2, p. 203-216.

Schmitt, R. & Stronach, D. (2011). *Apadana*. Encyclopædia Iranica. https://www.iranicaonline.org/articles/apadana

Schoon, M., Baggio, J. A., Salau, K. R., & Janssen, M. (2014). Insights for Managers from Modeling Species Interactions Across Multiple Scales in an Idealized Landscape. *Environmental Modelling & Software*, 54, 53-59.

Schwarb, G. (2011). *Mu ʻtazilism in the Age of Averroes*. In the *Age of Averroes: Arabic Philosophy in the Sixth/Twelfth Century*, 251-282.

Shareef, S. S., & Sani, R. M. (2021). The Symbolic Usage of Stone Beyond its Function as a Construction Material: Example of Residential Architecture in Iraqi Kurdistan. *Semiotica*, 2021(238), 37-59.

Siegel, U. (2017). *Die Residenz des Kalifen Hārūn ar-Rašīd in ar-Raqqa/ar-Rāfiqa (Syrien)*. In *Die Residenz des Kalifen Hārūn ar-Rašīd in ar-Raqqa/ar-Rāfiqa (Syrien)*. De Gruyter.

Sirry, M. I. (2011). The Public Role of Dhimmīs during ʿAbbāsid Times. *Bulletin of the School of Oriental and African Studies*, 187-204.

Smith, M. D., & Wesselbaum, D. (2023). Well-being and income across space and time: Evidence from one million households. *Journal of Happiness Studies*, *24*(5), 1813-1840.

Smith, M. E. (2010). The Archaeological Study of Neighborhoods and Districts in Ancient Cities. *Journal of Anthropological Archaeology*, 29(2), 137-154.

Smith, M. E., Dennehy, T., Kamp-Whittaker, A., Colon, E., & Harkness, R. (2014). Quantitative Measures of Wealth Inequality in Ancient Central Mexican Communities. *Advances in Archaeological Practice*, 2(4), 311-323.

Sparks, R. T., Finlayson, B., Wagemakers, B., & Briffa, J. M. (2019). *Digging Up Jericho. Past, Present and Future*. Archeopress Archaeology.

Squitieri, A., & Altaweel, M. (2022). Empires and the Acceleration of Wealth Inequality in the Pre-Islamic Near East: an Archaeological Approach. *Archaeological and Anthropological Sciences*, 14(10), 190.

Squitieri, A., & Altaweel, M. (2022). Empires and the acceleration of wealth inequality in the pre-Islamic Near East: an archaeological approach. *Archaeological and Anthropological Sciences*, *14*(10), 190.

Stiglitz, J. E. (2016). *Inequality and Economic Growth*. In Jacobs, M., & Mazzucato, M. (eds). *Rethinking Capitalism: Economics and Policy for Sustainable and Inclusive Growth*. Wiley Blackwell.

Storey, R., Márquez Morfín, L., Nuñez, F., Arnauld, M. C., Manzanilla, L. R., & Smith, M. E. (2012). *Teotihuacan Neighborhoods and the Health of Residents*. The Neighborhood as a Social and Spatial Unit in Mesoamerican Cities, 86.

Taleghani, M., Tenpierik, M., & van den Dobbelsteen, A. (2012). Environmental Impact of Courtyards—A Review and Comparison of Residential Courtyard Buildings in Different Climates. *Journal of Green Building*, 7(2), 113-136.

Thompson, A. E., Chase, A. S., & Feinman, G. M. (2023). Measuring inequality: The effect of units of analysis on the Gini coefficient. *Ancient Mesoamerica*, *34*(3), e2.

Thompson, A. E., Feinman, G. M., & Prufer, K. M. (2021). Assessing Classic Maya Multi-scalar Household Inequality in Southern Belize. *Plos One*, 16(3), e0248169.

Tsoulouvis, L. (1996). Urban Planning, Social Policy and New Forms of Urban Inequality and Social Exclusion in Greek Cities. *International Journal of Urban and Regional Research*, 20, 718-732.

Van Tubergen, F., & Volker, B. (2015). Inequality in Access to Social Capital in the Netherlands. *Sociology*, 49(3), 521-538.

Verhagen, P., Nuninger, L., & Groenhuijzen, M. R. (2019). *Modelling of Pathways and Movement Networks in Archaeology: an Overview of Current Approaches*. In Verhagen, P., Joyce, J., & Groenhuijzen, M. R. (2019). *Finding the Limits of the Limes: Modelling Demography, Economy and Transport on the Edge of the Roman Empire*, 217-249. Springer.

Vidale, M. (2010). Aspects of Palace Life at Mohenjo-*Daro*. *South Asian Studies*, 26(1), 59-76.

Walmsley, A. G. (2011). *Trends in the Urban History of Eastern Palaestina Secunda during the Late Antique - Early Islamic Transition*. Le Proche-Orient de Justinien aux Abassides: Peuplement et Dynamiques Spatiales. Actes du Colloque "Continuités de l'Occupation entre Les Périodes Byzantine et Abbasside au Proche-Orient, VIIe-IXe Siècles," Paris, 18-20 Octobre 2007, 271-284.

Walmsley, A. G. (2016). *Some Reflections on Rural Islamic Landscapes*. Landscapes of the Islamic World: Archaeology, History, and Ethnography, 237.

Wengrow, D., & Graeber, D. (2015). Farewell to the 'Childhood of Man': Ritual, Seasonality, and the Origins of Inequality. *Journal of the Royal Anthropological Institute*, 21(3), 597-619.

Westbrook, N. (2006). Architecture of Traces and Ascriptions: Interpreting the Vanished Great Palace of the Byzantine Emperors in Constantinople. *Fabrications*, 16(1), 43-61.

Westbrook, N. (2017). *Exchange of Palatine Architectural Motifs between Byzantium, Persia and the Caliphate*. In (2017) *Byzantium, Its Neighbours and Its Cultures* (pp. 129-153). Brill.

Westbrook, N. (2019). *The Great Palace in Constantinople: An Architectural Interpretation*. Brepols Publishers.

Wi'am Baz, S. (2023). *Early Islamic Homes: Uncovering Jordan-Palestine's Early Islamic Architecture*. Ali Shah Publisher.

Winter, I. J. (1993). " Seat of Kingship"/" A Wonder to Behold": The Palace as Construct in the Ancient Near East. *Ars Orientalis*, 23, 27-55.

Yunbo, Z. H. O. U. (2009). The factors that impact income inequality of rural residents in China: Decomposing the Gini coefficient from income components. *Frontiers of Economics in China*, *4*(4), 617-632.

Zamani, Z., Heidari, S., & Hanachi, P. (2018). Reviewing the Thermal and Microclimatic Function of Courtyards. *Renewable and Sustainable Energy Reviews*, 93, 580-595.

Zhang, D. (2020). Courtyard houses around the world: A cross-cultural analysis and contemporary relevance. *New approaches in contemporary architecture and urbanism*, 23-44.

Zhou, Q., & Shi, W. (2022). How Does Town Planning Affect Urban-rural Income Inequality: Evidence from China with Simultaneous Equation Analysis. *Landscape and Urban Planning*, 221, 104380.

APPENDIX 1

AREA	ID	TYPE	SIZE (square meters)	DATE
F	F1	Mansion 1	128961	Samarra 1
F	F463	Mansion 1	92521	Samarra 1 or later
H	H28	Mansion 1	42355	Samarra 2
H	H31	Mansion 1	43376	Samarra 2
H	H109	Mansion 1	95183	Samarra 1
H	H188	Mansion 1	44203	Samarra 2
J	J13	Mansion 1	41174	Samarran
J	J14	Mansion 1	57819	Samarra 1 or 2
J	J15	Mansion 1	180151	Samarra 1
J	J153	Mansion 1	35575	Samarra 1
J	J1102	Mansion 1	21541	Samarran
K	K1	mansion 1	138488	Samarra 1
T	T579	Mansion 1	100887	Samarra 3
U	U62	Mansion 1	87300	Samarra 4
U	U165	Mansion 1	140733	Samarra 4
X	X1	mansion 1	25084	Samarra 1
A	A188	Mansion 2	29640	Samarra 3
E	E45	Mansion 2	8552	Samarran
E	E103	Mansion 2	10120	Samarran
F	F168	Mansion 2	11228	Samarra 1 or later
F	F195	Mansion 2	23260	Samarra 1 or later
F	F255	Mansion 2	14625	Samarra 1 or later
F	F256	Mansion 2	15764	Samarra 1 or later
F	F259	Mansion 2	8772	Samarra 1 or later
F	F288	Mansion 2	29868	Samarra 1
F	F352	Mansion 2	24932	Samarra 1 or later
F	F571	Mansion 2	10624	Samarra 1 or later
G	G13	Mansion 2	17201	Samarra 1
H	H11	Mansion 2	9570	Samarra 1
H	H105	Mansion 2	9198	Samarra 2
H	H120	Mansion 2	12474	Samarra 2
H	H122	Mansion 2	8730	Samarra 2
H	H127	Mansion 2	9558	Samarra 2
H	H164	Mansion 2	21762	Samarra 1 or 2
H	H166	Mansion 2	8424	Samarra 1 or 2
H	H176	Mansion 2	10717	Samarra 1 or 2
H	H177	Mansion 2	13208	Samarra 1 or 2
H	H179	Mansion 2	8263	Samarra 2
H	H189	Mansion 2	23512	Samarra 2

H	H196	Mansion 2	23661	Samarra 2
H	H198	Mansion 2	10077	Samarra 1 or 2
H	H219	Mansion 2	14630	Samarra 1 or 2
H	H231	Mansion 2	17403	Samarra 1 or 2
H	H232	Mansion 2	13271	Samarra 1 or 2
H	H264	Mansion 2	13353	Samarra 2
H	H283	mansion 2	39297	Samarra 2
H	H376	Mansion 2	12707	Samarra 2
J	J36	Mansion 2	19815	Samarra 1 (?)
J	J40	Mansion 2	15499	Samarra 1 (?)
J	J268	Mansion 2	13840	Samarra 1
J	J269	Mansion 2	8944	Samarra 1
J	J270	Mansion 2	9258	Samarra 1
J	J271	Mansion 2	9784	Samarra 1
J	J272	Mansion 2	16453	Samarra 1
J	J282	Mansion 2	9842	Samarra 1 or 2
J	J291	Mansion 2	11729	Samarra 1
J	J524	Mansion 2	9818	Samarra 2 or later
J	J527	Mansion 2	30602	Samarra 2
J	J557	Mansion 2	14446	Samarra 2
J	J646	Mansion 2	11147	Samarra 1 or 2
J	J662	Mansion 2	9515	Samarra 2
J	J840	Mansion 2	12024	Samarra 2
J	J878	Mansion 2	15396	Samarra 2
J	J1131	Mansion 2	19441	Samarra 1
K	K3	Mansion 2	24878	Samarra 1
K	K14	Mansion 2	23518	Samarra 1 ?
K	K186	Mansion 2	12028	Samarra 2
K	K207	Mansion 2	13660	Samarra 2
M	M18	Mansion 2	8022	Samarra 2
M	M19	Mansion 2	10524	Samarra 2
M	M54	Mansion 2	10779	Samarra 2
P	P16	mansion 2	24537	Samarra 1
R	R211	Mansion 2	25208	Samarra 2
T	T7	Mansion 2	80145	Samarra 3
T	T58	Mansion 2	11267	Samarra 3
T	T61	Mansion 2	8269	Samarra 3
T	T77	Mansion 2	8478	Samarra 3
T	T82	Mansion 2	8556	Samarra 3
T	T269	Mansion 2	21754	Samarra 3
T	T337	Mansion 2	11067	Samarra 3
T	T346	Mansion 2	43018	Samarra 3
T	T357	Mansion 2	42886	Samarra 3
T	T363	Mansion 2	33928	Samarra 3
T	T378	Mansion 2	13232	Samarra 1-2

T	T403	Mansion 2	12473	Samarra 3
T	T407	Mansion 2	11931	Samarra 3
T	T435	Mansion 2	8422	Samarra 3
T	T491	Mansion 2	25321	Samarra 3
T	T492	Mansion 2	24339	Samarra 3
T	T532	Mansion 2	25937	Samarra 3
T	T574	mansion 2	21690	Samarra 3
T	T611	Mansion 2	13666	Samarra 3
T	T612	Mansion 2	13385	Samarra 3
T	T624	Mansion 2	10840	Samarra 3
T	T657	Mansion 2	27833	Samarra 3
T	T658	Mansion 2	14158	Samarra 3
T	T677	Mansion 2	56508	Samarra 3
T	T700	Mansion 2	13753	Samarra 3
T	T715	Mansion 2	8776	Samarra 3
T	T776	Mansion 2	26678	Samarra 3
T	T817	Mansion 2	26651	Samarra 3
T	T836	Mansion 2	39164	Samarra 3
T	T968	Mansion 2	10875	Samarra 3
T	T969	Mansion 2	12452	Samarra 3
T	T970	Mansion 2	12002	Samarra 3
T	T972	Mansion 2	10670	Samarra 3
T	T1063	Mansion 2	10775	Samarra 3
U	U200	Mansion 2	8275	Samarra 4
U	U294	Mansion 2	87571	Samarra 1 or 2
V	V9	Mansion 2	14616	Samarra 1
X	X7	Mansion 2	19945	Samarra 1
X	X151	Mansion 2	18529	Samarra 1
X	X270	Mansion 2	17537	Samarra 1
X	X320	Mansion 2	11869	Samarra 1 or 2
Y	Y3	mansion 2	16234	Samarra 1
C	C3	Mansion 3	7129	Early Abbasid ?
C	C33	Mansion 3	5190	Abbasid
C	C99	Mansion 3	6873	Abbasid
C	C171	Mansion 3	6637	Abbasid
D	D105	Mansion 3	5923	Abbasid
E	E80	Mansion 3	7247	Samarran
G	G2	Mansion 3	2160	Early Abbasid or Samarra 1
H	H22	Mansion 3	6232	Samarra 1 or 2
H	H42	Mansion 3	5187	Samarra 2
H	H43	Mansion 3	6245	Samarra 2
H	H69	Mansion 3	5586	Samarra 4
H	H72	Mansion 3	5578	Samarra 2
H	H111	Mansion 3	7977	Samarra 2

H	H141	Mansion 3	5385	Samarra 2
H	H148	Mansion 3	5288	Samarra 2
H	H159	Mansion 3	5757	Samarra 1 or 2
J	J558	Mansion 3	7811	Samarra 2
J	J569	Mansion 3	6400	Samarra 2
J	J680	Mansion 3	6246	Samarra 2
J	J847	Mansion 3	5110	Samarra 2
J	J862	Mansion 3	5565	Samarra 2
J	J953	Mansion 3	5298	Samarra 2
J	J1072	Mansion 3	5764	Samarra 1
K	K64	Mansion 3	7154	Samarra 1
L	L9	Mansion 3	5455	Samarran
M	M26	Mansion 3	3866	Samarra 2
M	M27	Mansion 3	3848	Samarra 2
M	M28	Mansion 3	5003	Samarra 2
M	M29	Mansion 3	4922	Samarra 2
P	P2	Mansion 3	11707	Samarra 1
T	T2	Mansion 3	7406	Samarra 3
T	T43	Mansion 3	6100	Samarra 3
T	T44	Mansion 3	5194	Samarra 3
T	T60	Mansion 3	7937	Samarra 3
T	T70	Mansion 3	5734	Samarra 3
T	T155	Mansion 3	8939	Samarra 3
T	T333	Mansion 3	8950	Samarra 3
T	T409	Mansion 3	6975	Samarra 3
T	T410	Mansion 3	3613	Samarra 3
T	T412	Mansion 3	6337	Samarra 3
T	T477	Mansion 3	8494	Samarra 3
T	T580	Mansion 3	6978	Samarra 3
T	T597	Mansion 3	5877	Samarra 3
T	T909	Mansion 3	6679	Samarra 3
T	T1058	Mansion 3	5075	Samarra 3
T	T1064	Mansion 3	5494	Samarra 3
U	U100	Mansion 3	6622	Samarra 4
U	U171	Mansion 3	7699	Samarra 4
U	U182	Mansion 3	5248	Samarra 4
U	U184	Mansion 3	7441	Samarra 4
U	U185	Mansion 3	5348	Samarra 4
U	U266	Mansion 3	9018	Samarra 4 or perhaps 3
U	U339	mansion 3	5463	Samarra 4
U	U340	mansion 3	5330	Samarra 4
U	U341	mansion 3	5260	Samarra 4

U	U342	mansion 3	5433	Samarra 4
U	U343	mansion 3	5039	Samarra 4
U	U344	mansion 3	5415	Samarra 4
U	U348	Mansion 3	6225	Samarra 4
U	U349	mansion 3	6206	Samarra 4
X	X18	mansion 3	9013	Samarra 1
C	C97	Mansion 4	4520	Abbasid
D	D150	Mansion 4	4774	Samarran
H	H73	Mansion 4	2746	Samarra 2
H	H74	Mansion 4	4815	Samarra 2
H	H83	Mansion 4	3347	Samarra 2
H	H103	Mansion 4	4576	Samarra 2
H	H129	Mansion 4	2793	Samarra 1
H	H175	Mansion 4	3314	Samarra 2
H	H180	Mansion 4	4223	Samarra 1 or 2
H	H277	Mansion 4	3230	Samarra 2
H	H495	Mansion 4	2121	Samarra 1 or later
J	J961	Mansion 4	3737	Samarra 1 or 2
K	K162	mansion 4	4443	Samarra 2
R	R286	Mansion 4	2917	Samarra 2
T	T35	Mansion 4	4247	Samarra 3
T	T75	Mansion 4	4030	Samarra 3
T	T119	Mansion 4	4150	Samarra 3
T	T122	Mansion 4	5143	Samarra 3
T	T239	Mansion 4	4507	Samarra 3
T	T340	Mansion 4	4508	Samarra 3
T	T386	Mansion 4	3877	Samarra 3
T	T438	Mansion 4	4664	Samarra 3
T	T450	Mansion 4	3777	Samarra 3
T	T508	Mansion 4	3772	Samarra 3
T	T511	Mansion 4	2666	Samarra 3
T	T606	Mansion 4	3729	Samarra 3
T	T608	Mansion 4	4033	Samarra 3
T	T688	Mansion 4	4604	Samarra 3
T	T767	Mansion 4	3692	Samarra 3
T	T833	Mansion 4	2379	Samarra 3
T	T837	Mansion 4	2511	Samarra 3
T	T840	Mansion 4	7764	Samarra 3
T	T915	Mansion 4	4982	Samarra 3
U	U92	Mansion 4	2996	Samarra 4
U	U93	Mansion 4	4368	Samarra 4

U	U119	Mansion 4	3955	Samarra 4
U	U191	mansion 4	2697	Samarra 4
U	U345	Mansion 4	2546	Samarra 4
U	U346	Mansion 4	3094	Samarra 4
U	U347	Mansion 4	3277	Samarra 4
U	U352	Mansion 4	2760	Samarra 4
U	U353	Mansion 4	2140	Samarra 4
U	U354	Mansion 4	2089	Samarra 4
U	U355	Mansion 4	3108	Samarra 4
U	U380	Mansion 4	2819	Samarra 4
U	U382	Mansion 4	2077	Samarra 4
U	U384	Mansion 4	2730	Samarra 4
U	U392	Mansion 4	3039	Samarra 4
H	H23	Mansion 5	1219	Samarra 1 or 2
H	H24	Mansion 5	1958	Samarra 2
T	T13	Mansion 5	907	Samarra 3
T	T38	Mansion 5	1511	Samarra 3
T	T39	Mansion 5	1326	Samarra 3
T	T285	Mansion 5	1914	Samarra 3
T	T306	Mansion 5	1475	Samarra 3
T	T566	Mansion 5	1921	Samarra 3
T	T839	Mansion 5	1068	Samarra 3
T	T843	Mansion 5	1874	Samarra 3
T	T849	Mansion 5	1481	Samarra 3
T	T860	Mansion 5	1475	Samarra 3
J	J1142	blocks	41110	Samarra 2
K	K245	blocks	3089	Samarra 2
K	K253	blocks	5356	Samarra 2
K	K255	blocks	3640	Samarra 2
K	K256	blocks	6029	Samarra 2
K	K257	blocks	4725	Samarra 2
K	K258	blocks	1969	Samarra 2
K	K259	blocks	5618	Samarra 2
K	K260	blocks	2616	Samarra 2
K	K261	blocks	2117	Samarra 2
K	K262	blocks	1864	Samarra 2
K	K263	blocks	6617	Samarra 2
K	K265	blocks	3631	Samarra 2
K	K266	blocks	9644	Samarra 2
K	K267	blocks	3868	Samarra 2
K	K268	blocks	3957	Samarra 2
K	K271	blocks	3416	Samarra 2
K	K272	blocks	12798	Samarra 2
K	K274	blocks	15773	Samarra 2
K	K275	blocks	6997	Samarra 2
K	K276	blocks	3895	Samarra 2

K	K282	blocks	13992	Samarra 1
K	K286	blocks	12762	Samarra 2
K	K293	blocks	3854	Samarra 2
K	K294	blocks	745	Samarra 2
K	K317	blocks	86503	Samarran
R	R79	Blocks	7331	Samarra 2
R	R80	Blocks	3165	Samarra 2
R	R81	Blocks	2125	Samarra 2
R	R85	Blocks	6152	Samarra 2
R	R221	blocks	11527	Samarra 2
R	R227	blocks	5729	Samarran, of uncertain date
R	R237	blocks	11137	Samarran, of uncertain date
R	R253	blocks	8994	Samarran, of uncertain date
T	T19	BLOCKS	5138	Samarra 3
T	T36	BLOCKS	5085	Samarra 3
T	T40	BLOCKS	5911	Samarra 3
T	T73	BLOCKS	14441	Samarra 3
T	T93	BLOCKS	9006	Samarra 3
T	T149	blocks	3585	Samarra 3
T	T855	BLOCKS	12236	Samarra 3
T	T1068	BLOCKS	8076	Samarra 3
T	T1070	BLOCKS	6355	Samarra 3
U	U89	blocks	8862	Samarra 4
U	U281	BLOCKS	25812	Samarra 4
U	U365	blocks	1952	Samarra 4
A	A1	palace	60127	Sasanian/Samarra 3
A	A2	palace	1861602	Samarra 3
B	B2	palace	9745	Samarra 3
B	B11	palace	6348	Samarra 3
B	B12	palace	74541	Samarra 3
G	G1	Palace	40178	Samarra 1
H	H1	Palace	1306657	Samarra 1 and later
H	H5	palace	84894	Samarra 2
H	H30	palace	119480	Samarra 2
H	H50	palace	6819	Samarra 2
H	H68	Palace	9853	Samarra 4
H	H140	palace	102482	Samarra 2
H	H181	palace	12085	Samarra 1 ?
H	H293	palace	209909	Samarra 1
H	H294	palace	14764	Samarra 4
H	H311	Palace	6057	Samarra 1
H	H343	palace	40407	Samarra 1

M	M9	palace	122179	Samarra 2
Q	Q46	palace	23807	Samarra 2
R	R3	Palace	260397	Samarra 2, between 232/847 and 240/854.
V	V1	palace	12347	Samarra 1
V	V2	palace	12104	Samarra 1
V	V7	palace	16226	Samarra 4
A	A17	block	9798	Samarra 3
A	A37	block	1701	Samarra 3
A	A39	block	1764	Samarra 3
A	A52	block	5642	Samarra 3
A	A53	block	8845	Samarra 3
A	A54	block	3340	Samarra 3
A	A57	block	5021	Samarra 3
A	A58	block	2863	Samarra 3
A	A59	block	1740	Samarra 3
A	A73	block	7834	Samarra 3
A	A74	block	3401	Samarra 3
A	A75	block	8958	Samarra 3
A	A76	block	7037	Samarra 3
A	A78	block	10184	Samarra 3
A	A79	block	13703	Samarra 3
A	A81	block	4915	Samarra 3
A	A85	block	8070	Samarra 3
A	A100	block	6915	Samarra 3
A	A107	block	2956	Samarra 3
A	A108	block	2889	Samarra 3
A	A109	block	3338	Samarra 3
A	A134	block	2513	Samarra 3
A	A136	block	7518	Samarra 3
A	A137	block	5581	Samarra 3
A	A138	block	11247	Samarra 3
A	A139	block	5634	Samarra 3
A	A142	block	3509	Samarra 3
A	A143	block	3545	Samarra 3
A	A161	block	1544	Samarra 3
A	A162	block	3362	Samarra 3
A	A165	block	5482	Samarra 3
B	B4	block	4615	Samarra 3
B	B5	block	5739	Samarra 3
C	C29	Block	12003	Abbasid
C	C38	Block	6040	Abbasid
C	C43	Block	21583	Abbasid
C	C46	Block	1741	Abbasid
C	C47	Block	2457	Abbasid
C	C51	Block	5289	Abbasid

C	C52	Block	4217	Abbasid
C	C53	Block	723	Abbasid
C	C54	Block	1887	Abbasid
C	C55	Block	6168	Abbasid
C	C56	Block	4513	Abbasid
C	C57	Block	1717	Abbasid
C	C60	Block	4764	Abbasid
C	C61	Block	1101	Abbasid
C	C64	Block	2420	Abbasid
C	C73	Block	5232	Abbasid
C	C74	Block	3963	Abbasid
C	C75	Block	1867	Abbasid
C	C80	Block	6112	Abbasid
C	C81	Block	4909	Abbasid
C	C82	Block	5001	Abbasid
C	C83	Block	2255	Abbasid
C	C84	Block	1739	Abbasid
C	C93	block	2633	Abbasid
C	C94	Block	4700	Abbasid
C	C95	Block	19206	Abbasid
C	C96	Block	16581	Abbasid
C	C119	Block	5929	Abbasid
C	C120	Block	8411	Abbasid
C	C121	Block	10948	Abbasid
C	C131	Block	8618	Abbasid
C	C132	Block	7053	Abbasid
C	C134	Block	925	Abbasid
C	C135	Block	4045	Abbasid
C	C144	Block	5842	Abbasid
C	C152	block	7046	Abbasid
C	C180	Block	3234	Abbasid
D	D16	BLOCK	5223	Sasanian-Abbasid
D	D17	BLOCK	7116	Sasanian-Abbasid
D	D19	BLOCK	8199	Sasanian-Abbasid
D	D158	Block	15890	Sasanian-Abbasid
D	D160	Block	3868	Sasanian-Abbasid
D	D161	Block	8427	Sasanian-Abbasid
D	D162	Block	6007	Sasanian-Abbasid
E	E2	BLOCK	6841	Samarra 1-2
E	E3	BLOCK	15228	Samarra 1-2
E	E4	BLOCK	8212	Samarra 1-2
E	E8	BLOCK	3153	Samarra 1-2
E	E10	BLOCK	2673	Samarra 1-2
E	E12	BLOCK	1232	Samarra 1-2
E	E14	BLOCK	1420	Samarra 1-2
E	E15	block	2677	Samarra 1-2

E	E26	BLOCK	497	Samarran
E	E29	BLOCK	6768	Samarran
E	E30	BLOCK	6724	Samarran
E	E31	BLOCK	3147	Samarran
E	E32	BLOCK	2954	Samarran
E	E34	BLOCK	960	Samarran
E	E36	BLOCK	2621	Samarran
E	E37	BLOCK	3170	Samarran
E	E39	BLOCK	1213	Samarran
E	E40	BLOCK	613	Samarran
E	E42	BLOCK	2187	Samarran
E	E43	BLOCK	5058	Samarran
E	E44	BLOCK	17904	Samarran
E	E52	BLOCK	1490	Samarran
E	E53	BLOCK	4168	Samarran
E	E54	BLOCK	2160	Samarran
E	E56	BLOCK	5374	Samarran
E	E57	BLOCK	4895	Samarran
E	E63	BLOCK	3381	Samarran
E	E75	Block	2054	Samarran
E	E78	Block	5300	Samarran
E	E82	Block	9886	Samarran
E	E93	BLOCK	3222	Samarran
E	E95	BLOCK	6023	Samarran
E	E100	BLOCK	1492	Samarran
E	E101	BLOCK	1363	Samarran
E	E102	BLOCK	1628	Samarran
E	E104	BLOCK	10764	Samarran
E	E105	BLOCK	7184	Samarran
E	E106	BLOCK	8674	Samarran
E	E107	BLOCK	9571	Samarran
E	E108	BLOCK	10446	Samarran
E	E109	BLOCK	13146	Samarran
E	E110	BLOCK	11641	Samarran
E	E111	BLOCK	6005	Samarran
E	E112	BLOCK	8482	Samarran
E	E113	BLOCK	9783	Samarran
E	E115	BLOCK	17776	Samarran
E	E116	BLOCK	2486	Samarran
E	E117	BLOCK	2615	Samarran
E	E119	BLOCK	1768	Samarran
E	E120	BLOCK	1017	Samarran
E	E121	BLOCK	3154	Samarran
E	E122	BLOCK	1884	Samarran
E	E123	BLOCK	3220	Samarran
E	E124	BLOCK	2613	Samarran

E	E125	BLOCK	3094	Samarran
E	E126	BLOCK	3240	Samarran
E	E128	BLOCK	5661	Samarran
E	E129	BLOCK	2639	Samarran
E	E130	BLOCK	2858	Samarran
E	E131	BLOCK	5391	Samarran
E	E132	BLOCK	5849	Samarran
E	E133	BLOCK	6142	Samarran
E	E134	BLOCK	6252	Samarran
E	E142	BLOCK	3894	Samarran
E	E143	BLOCK	1359	Samarran
E	E144	BLOCK	2642	Samarran
E	E146	BLOCK	10117	Samarran
E	E148	BLOCK	2408	Samarran
E	E150	BLOCK	1166	Samarran
E	E151	BLOCK	823	Samarran
E	E152	BLOCK	3979	Samarran
E	E153	BLOCK	4294	Samarran
E	E154	BLOCK	4006	Samarran
E	E155	BLOCK	3905	Samarran
E	E156	BLOCK	3815	Samarran
E	E157	BLOCK	3407	Samarran
E	E158	BLOCK	5007	0
E	E159	BLOCK	4271	0
E	E160	BLOCK	4217	0
E	E162	BLOCK	768	0
E	E163	BLOCK	1732	0
F	F4	BLOCK	14810	Samarran
F	F8	BLOCK	3891	Samarran
F	F9	BLOCK	7004	Samarran
F	F10	BLOCK	7024	Samarran
F	F14	BLOCK	2551	Samarra 2
F	F15	BLOCK	3490	Samarra 2
F	F16	BLOCK	3430	Samarra 2
F	F17	BLOCK	3464	Samarra 2
F	F18	BLOCK	3077	Samarra 2
F	F19	BLOCK	3329	Samarra 2
F	F20	BLOCK	3223	Samarra 2
F	F23	BLOCK	7727	Samarra 2
F	F24	BLOCK	7690	Samarra 2
F	F25	BLOCK	7222	Samarra 2
F	F34	BLOCK	4214	Samarran
F	F35	BLOCK	4665	Samarran
F	F36	BLOCK	4742	Samarran
F	F37	BLOCK	4843	Samarran
F	F38	BLOCK	4946	Samarran

F	F39	BLOCK	5236	Samarran
F	F40	BLOCK	5835	Samarran
F	F41	BLOCK	3245	Samarran
F	F42	BLOCK	2432	Samarran
F	F43	BLOCK	2916	Samarran
F	F54	BLOCK	8959	Samarran
F	F55	BLOCK	4427	Samarran
F	F56	BLOCK	4809	Samarran
F	F57	BLOCK	5308	Samarran
F	F58	BLOCK	5141	Samarran
F	F59	BLOCK	5255	Samarran
F	F60	BLOCK	5517	Samarran
F	F61	BLOCK	6228	Samarran
F	F62	BLOCK	5748	Samarran
F	F63	BLOCK	3421	Samarran
F	F68	BLOCK	6158	Samarran
F	F69	BLOCK	10057	Samarran
F	F70	BLOCK	9809	Samarran
F	F71	BLOCK	10496	Samarran
F	F72	BLOCK	11338	Samarran
F	F73	BLOCK	9675	Samarran
F	F75	BLOCK	4213	Samarran
F	F76	BLOCK	4502	Samarran
F	F77	BLOCK	4466	Samarran
F	F78	BLOCK	4248	Samarran
F	F79	BLOCK	4315	Samarran
F	F80	BLOCK	4255	Samarran
F	F81	BLOCK	4556	Samarran
F	F82	BLOCK	3041	Samarran
F	F90	BLOCK	11009	Samarran
F	F91	BLOCK	11245	Samarran
F	F92	BLOCK	11103	Samarra 1
F	F93	BLOCK	11228	Samarra 1
F	F94	BLOCK	13311	Samarra 1
F	F95	BLOCK	10904	Samarra 1
F	F96	BLOCK	10047	Samarra 1
F	F97	BLOCK	10819	Samarra 1
F	F98	BLOCK	10574	Samarra 1
F	F99	BLOCK	10908	Samarra 1
F	F100	BLOCK	10926	Samarra 1
F	F101	BLOCK	11293	Samarra 1
F	F102	BLOCK	10897	Samarra 1
F	F103	BLOCK	10689	Samarra 1
F	F104	BLOCK	11873	Samarra 1
F	F105	BLOCK	10411	Samarra 1
F	F106	BLOCK	10928	Samarra 1

F	F125	BLOCK	14613	Samarra 1
F	F126	BLOCK	15676	Samarra 1
F	F127	BLOCK	16809	Samarra 1
F	F128	BLOCK	16008	Samarra 1
F	F129	BLOCK	15607	Samarra 1
F	F130	BLOCK	16913	Samarra 1
F	F131	BLOCK	15720	Samarra 1
F	F132	BLOCK	15882	Samarra 1
F	F133	BLOCK	15895	Samarra 1
F	F134	BLOCK	16534	Samarra 1
F	F135	BLOCK	18232	Samarra 1
F	F136	BLOCK	15526	Samarra 1
F	F137	BLOCK	16144	Samarra 1
F	F160	BLOCK	4048	Samarra 1
F	F161	BLOCK	6744	Samarra 1
F	F162	BLOCK	6115	Samarra 1
F	F163	BLOCK	6341	Samarra 1
F	F164	BLOCK	6171	Samarra 1
F	F165	BLOCK	5999	Samarra 1
F	F166	BLOCK	6924	Samarra 1
F	F172	BLOCK	7873	Samarra 1
F	F174	BLOCK	7879	Samarra 1
F	F176	BLOCK	7772	Samarra 1
F	F177	BLOCK	4609	Samarra 1
F	F178	BLOCK	6906	Samarra 1
F	F187	BLOCK	13927	Samarra 1
F	F188	BLOCK	11722	Samarra 1
F	F189	BLOCK	12191	Samarra 1
F	F190	BLOCK	12397	Samarra 1
F	F191	BLOCK	12680	Samarra 1
F	F192	BLOCK	14515	Samarra 1
F	F193	BLOCK	12499	Samarra 1
F	F194	BLOCK	13323	Samarra 1
F	F196	BLOCK	18236	Samarra 1
F	F197	BLOCK	17254	Samarra 1
F	F198	BLOCK	15736	Samarra 1
F	F199	BLOCK	17138	Samarra 1
F	F200	BLOCK	17101	Samarra 1
F	F201	BLOCK	17178	Samarra 1
F	F202	BLOCK	17227	Samarra 1
F	F203	BLOCK	9445	Samarra 1
F	F204	BLOCK	15997	Samarra 1
F	F205	BLOCK	15967	Samarra 1
F	F206	BLOCK	15831	Samarra 1
F	F207	BLOCK	11354	Samarra 1
F	F208	BLOCK	7098	Samarra 1

F	F212	BLOCK	12337	Samarra 1
F	F213	BLOCK	16461	Samarra 1
F	F216	BLOCK	19283	Samarra 1
F	F217	BLOCK	18664	Samarra 1
F	F218	BLOCK	17052	Samarra 1
F	F219	BLOCK	17115	Samarra 1
F	F220	BLOCK	17341	Samarra 1
F	F221	BLOCK	17722	Samarra 1
F	F222	BLOCK	17401	Samarra 1
F	F223	BLOCK	10024	Samarra 1
F	F224	BLOCK	16486	Samarra 1
F	F225	BLOCK	16452	Samarra 1
F	F226	Block	16187	Samarra 1
F	F227	BLOCK	13411	Samarra 1
F	F228	BLOCK	13280	Samarra 1
F	F229	BLOCK	13654	Samarra 1
F	F230	BLOCK	8962	Samarra 1
F	F232	BLOCK	13215	Samarra 1
F	F233	block	13222	Samarra 1
F	F235	BLOCK	11669	Samarra 1
F	F236	BLOCK	10260	Samarra 1
F	F237	BLOCK	10464	Samarra 1
F	F238	BLOCK	10674	Samarra 1
F	F239	BLOCK	10704	Samarra 1
F	F241	BLOCK	9540	Samarra 1
F	F242	BLOCK	10010	Samarra 1
F	F243	BLOCK	5571	Samarra 1
F	F244	BLOCK	6714	Samarra 2
F	F245	BLOCK	5760	Samarra 2
F	F246	BLOCK	5066	Samarra 2
F	F247	BLOCK	5357	Samarra 2
F	F248	BLOCK	3715	Samarra 2
F	F249	BLOCK	5045	Samarra 2
F	F250	BLOCK	4703	Samarra 2
F	F252	BLOCK	1370	Samarra 2
F	F258	BLOCK	8997	Samarra 1 or later
F	F261	BLOCK	9137	Samarra 1 or later
F	F262	BLOCK	9341	Samarra 1 or later
F	F263	BLOCK	9370	Samarra 1 or later
F	F264	BLOCK	5004	Samarra 1 or later
F	F266	BLOCK	8024	Samarra 1 or later
F	F267	BLOCK	8266	Samarra 1 or later
F	F268	BLOCK	6967	Samarra 1 or later
F	F269	BLOCK	6511	Samarra 1 or later
F	F270	BLOCK	6869	Samarra 1 or later
F	F271	BLOCK	6426	Samarra 1 or later

F	F272	BLOCK	6909	Samarra 1 or later
F	F273	BLOCK	5126	Samarra 2
F	F275	BLOCK	3934	Samarra 2
F	F276	BLOCK	4203	Samarra 2
F	F277	BLOCK	3911	Samarra 2
F	F280	BLOCK	4257	Samarra 2
F	F281	BLOCK	4275	Samarra 2
F	F282	BLOCK	4033	Samarra 2
F	F283	BLOCK	3392	Samarra 2
F	F284	BLOCK	3392	Samarra 2
F	F286	BLOCK	21069	Samarra 1
F	F287	BLOCK	12146	Samarra 1
F	F290	BLOCK	22430	Samarra 1
F	F291	BLOCK	19996	Samarra 1
F	F292	BLOCK	20685	Samarra 1
F	F293	BLOCK	21610	Samarra 1
F	F294	BLOCK	21744	Samarra 1
F	F295	BLOCK	20832	Samarra 1
F	F296	BLOCK	12059	Samarra 1
F	F299	BLOCK	11831	Samarra 1
F	F301	BLOCK	12201	Samarra 1
F	F302	BLOCK	6378	Samarra 1
F	F303	BLOCK	7391	Samarra 1
F	F304	BLOCK	5005	Samarra 1
F	F307	BLOCK	5644	Samarra 1
F	F308	BLOCK	9011	Samarra 1
F	F309	BLOCK	5467	Samarra 1
F	F310	BLOCK	9497	Samarra 1
F	F311	BLOCK	5365	Samarra 1
F	F313	BLOCK	4851	Samarra 1
F	F322	BLOCK	5931	Samarra 2
F	F323	BLOCK	6050	Samarra 2
F	F324	BLOCK	6143	Samarra 2
F	F325	BLOCK	5941	Samarra 2
F	F326	BLOCK	6257	Samarra 2
F	F327	BLOCK	6095	Samarra 2
F	F328	BLOCK	5836	Samarra 2
F	F329	BLOCK	5866	Samarra 2
F	F330	BLOCK	6061	Samarra 2
F	F331	BLOCK	6138	Samarra 2
F	F332	BLOCK	6299	Samarra 2
F	F333	BLOCK	5937	Samarra 2
F	F339	BLOCK	3273	Samarra 2
F	F340	BLOCK	3212	Samarra 2
F	F341	BLOCK	3376	Samarra 2
F	F342	BLOCK	3267	Samarra 2

F	F343	BLOCK	3361	Samarra 2
F	F344	BLOCK	3571	Samarra 2
F	F345	BLOCK	3187	Samarra 2
F	F346	BLOCK	3029	Samarra 2
F	F347	BLOCK	3081	Samarra 2
F	F348	BLOCK	2783	Samarra 2
F	F349	BLOCK	1497	Samarra 2
F	F353	BLOCK	20720	Samarra 1
F	F354	BLOCK	21181	Samarra 1
F	F355	BLOCK	17268	Samarra 1
F	F356	BLOCK	17201	Samarra 1
F	F357	BLOCK	18075	Samarra 1
F	F358	BLOCK	17718	Samarra 1
F	F359	BLOCK	16666	Samarra 1
F	F360	BLOCK	4461	Samarra 1
F	F361	BLOCK	10868	Samarra 1
F	F362	BLOCK	4512	Samarra 1
F	F363	BLOCK	11244	Samarra 1
F	F364	BLOCK	7999	Samarra 1
F	F365	BLOCK	10972	Samarra 1
F	F366	BLOCK	9221	Samarra 1
F	F367	BLOCK	3636	Samarra 1
F	F368	BLOCK	9263	Samarra 1
F	F369	BLOCK	3616	Samarra 1
F	F370	BLOCK	9028	Samarra 1
F	F371	BLOCK	3769	Samarra 1
F	F372	BLOCK	8878	Samarra 1
F	F375	BLOCK	7856	Samarra 1
F	F378	BLOCK	1283	Samarra 2
F	F379	BLOCK	650	Samarra 2
F	F380	BLOCK	1785	Samarra 2
F	F381	BLOCK	1729	Samarra 2
F	F382	BLOCK	2530	Samarra 2
F	F383	BLOCK	1760	Samarra 2
F	F384	BLOCK	2475	Samarra 2
F	F385	BLOCK	1263	Samarra 2
F	F386	BLOCK	1129	Samarra 2
F	F387	BLOCK	1705	Samarra 2
F	F388	BLOCK	1490	Samarra 2
F	F389	BLOCK	1648	Samarra 2
F	F390	BLOCK	1903	Samarra 2
F	F391	BLOCK	7248	Samarra 2
F	F392	BLOCK	5731	Samarra 2
F	F393	BLOCK	5844	Samarra 2
F	F394	BLOCK	5560	Samarra 2
F	F395	BLOCK	5340	Samarra 2

F	F396	BLOCK	5126	Samarra 2
F	F397	BLOCK	5375	Samarra 2
F	F398	BLOCK	5315	Samarra 2
F	F399	BLOCK	5534	Samarra 2
F	F400	BLOCK	6088	Samarra 2
F	F401	BLOCK	4886	Samarra 2
F	F402	BLOCK	5430	Samarra 2
F	F403	BLOCK	5445	Samarra 2
F	F406	BLOCK	9502	Samarra 1
F	F407	BLOCK	8740	Samarra 1
F	F408	BLOCK	8780	Samarra 1
F	F409	BLOCK	6822	Samarra 1
F	F410	BLOCK	6449	Samarra 1
F	F411	BLOCK	9644	Samarra 1
F	F412	BLOCK	8416	Samarra 1
F	F413	BLOCK	8032	Samarra 1
F	F414	BLOCK	8212	Samarra 1
F	F415	BLOCK	6657	Samarra 1
F	F416	BLOCK	6772	Samarra 1
F	F417	BLOCK	6749	Samarra 1
F	F418	BLOCK	6810	Samarra 1
F	F419	BLOCK	5960	Samarra 1
F	F420	BLOCK	2189	Samarra 2
F	F421	BLOCK	4088	Samarra 2
F	F423	BLOCK	4476	Samarra 2
F	F424	BLOCK	4246	Samarra 2
F	F425	BLOCK	4142	Samarra 2
F	F426	BLOCK	4716	Samarra 2
F	F427	BLOCK	4191	Samarra 2
F	F428	BLOCK	3932	Samarra 2
F	F429	BLOCK	3873	Samarra 2
F	F430	BLOCK	3807	Samarra 2
F	F431	BLOCK	4261	Samarra 2
F	F432	BLOCK	3518	Samarra 2
F	F433	BLOCK	3749	Samarra 2
F	F434	BLOCK	2159	Samarra 2
F	F465	BLOCK	6819	Samarra 1
F	F466	BLOCK	8396	Samarra 1
F	F467	BLOCK	6759	Samarra 1
F	F468	BLOCK	6226	Samarra 1
F	F469	BLOCK	7049	Samarra 1
F	F470	BLOCK	6604	Samarra 1
F	F471	BLOCK	4902	Samarra 1
F	F472	BLOCK	2475	Samarra 2
F	F473	BLOCK	4370	Samarra 2
F	F474	BLOCK	5351	Samarra 2

F	F475	BLOCK	4044	Samarra 2
F	F476	BLOCK	4273	Samarra 2
F	F477	BLOCK	4721	Samarra 2
F	F478	BLOCK	4089	Samarra 2
F	F481	BLOCK	4165	Samarra 2
F	F482	BLOCK	4033	Samarra 2
F	F483	BLOCK	1199	Samarra 2
F	F484	BLOCK	2667	Samarra 2
F	F485	BLOCK	2089	Samarra 2
F	F486	BLOCK	1220	Samarra 2
F	F490	BLOCK	18524	Samarra 1
F	F491	BLOCK	14334	Samarra 1
F	F492	BLOCK	15154	Samarra 1
F	F493	BLOCK	11234	Samarra 1
F	F494	BLOCK	10648	Samarra 1
F	F495	BLOCK	27938	Samarra 1
F	F496	BLOCK	7292	Samarra 1
F	F497	BLOCK	4238	Samarra 2
F	F498	BLOCK	4444	Samarra 2
F	F499	BLOCK	2961	Samarra 2
F	F501	BLOCK	8001	Samarra 2
F	F502	BLOCK	8353	Samarra 2
F	F503	BLOCK	4048	Samarra 2
F	F505	BLOCK	7530	Samarra 2
F	F506	BLOCK	7801	Samarra 2
F	F508	BLOCK	5648	Samarra 2
F	F509	BLOCK	7677	Samarra 2
F	F510	BLOCK	7450	Samarra 2
F	F511	BLOCK	7339	Samarra 2
F	F512	BLOCK	5021	Samarra 2
F	F513	BLOCK	6128	Samarra 2
F	F514	BLOCK	7130	Samarra 2
F	F515	BLOCK	7553	Samarra 2
F	F516	BLOCK	7633	Samarra 2
F	F517	BLOCK	2002	Samarra 2
F	F518	BLOCK	3136	Samarra 2
F	F519	BLOCK	3317	Samarra 2
F	F520	BLOCK	3482	Samarra 2
F	F522	BLOCK	13461	Samarra 2
F	F523	BLOCK	13721	Samarra 2
F	F525	BLOCK	1541	Samarra 2
F	F526	BLOCK	3984	Samarra 2
F	F528	BLOCK	2938	Samarra 2
F	F529	BLOCK	2649	Samarra 2
F	F530	BLOCK	2673	Samarra 2
F	F531	BLOCK	2475	Samarra 2

F	F532	BLOCK	4357	Samarra 2
F	F533	BLOCK	4587	Samarra 2
F	F534	BLOCK	4327	Samarra 2
F	F535	BLOCK	2463	Samarra 2
F	F536	BLOCK	2573	Samarra 2
F	F537	BLOCK	1591	Samarra 2
F	F538	BLOCK	3050	Samarra 2
F	F539	BLOCK	1446	Samarra 2
F	F540	BLOCK	2108	Samarra 2
F	F541	BLOCK	3161	Samarra 2
F	F542	BLOCK	2815	Samarra 2
F	F543	BLOCK	3217	Samarra 2
F	F544	BLOCK	3122	Samarra 2
F	F546	BLOCK	2057	Samarra 2
F	F547	BLOCK	1415	Samarra 2
F	F554	BLOCK	1999	Samarra 2
F	F555	BLOCK	4609	Samarra 2
F	F556	BLOCK	1435	Samarra 2
G	G3	Block	12818	Samarra 1
G	G32	Block	5292	Samarra 1
G	G33	Block	1499	Samarra 1
G	G34	Block	5624	Samarra 1
G	G35	Block	1696	Samarra 1
G	G36	Block	1217	Samarra 1
G	G37	Block	2636	Samarra 1
G	G38	Block	1440	Samarra 1
G	G55	Block	4910	Samarra 1
G	G56	Block	4153	Samarra 1
G	G60	Block	15366	Samarra 1
G	G61	Block	2486	Samarra 1
G	G62	Block	15141	Samarra 1
G	G63	Block	15345	Samarra 1
G	G64	Block	14803	Samarra 1
G	G65	Block	14139	Samarra 1
G	G66	Block	6613	Samarra 1
G	G69	Block	3956	Samarra 1
G	G70	Block	1646	Samarra 1
G	G71	Block	4902	Samarra 1
G	G73	Block	4823	Samarra 1
G	G74	Block	3578	Samarra 1
G	G76	Block	10951	Samarra 1
G	G77	Block	9185	Samarra 1
G	G78	Block	8669	Samarra 1
G	G79	Block	10217	Samarra 1
G	G80	Block	11002	Samarra 1
G	G81	Block	7030	Samarra 1

G	G82	Block	5074	Samarra 1
G	G83	Block	4523	Samarra 1
G	G85	Block	3133	Samarra 1
G	G86	Block	2033	Samarra 1
G	G88	Block	12376	Samarra 1
G	G89	Block	6474	Samarra 1
G	G90	Block	3348	Samarra 1
G	G105	Block	10368	Samarra 1
G	G198	Block	4888	Samarra 1
H	H21	block	16592	Samarra 2
H	H36	block	1774	Samarra 2
H	H37	block	1522	Samarra 2
H	H38	block	2678	Samarra 2
H	H39	block	2253	Samarra 2
H	H51	block	2301	Samarra 2
H	H52	block	2232	Samarra 2
H	H53	block	2185	Samarra 2
H	H54	block	2130	Samarra 2
H	H55	block	2234	Samarra 2
H	H56	block	2133	Samarra 2
H	H57	block	2116	Samarra 2
H	H58	block	2084	Samarra 2
H	H59	block	2174	Samarra 2
H	H60	block	1663	Samarra 2
H	H71	block	10390	Samarra 2
H	H80	block	13622	Samarra 2
H	H81	block	6062	Samarra 2
H	H82	block	4731	Samarra 2
H	H84	block	14799	Samarra 2
H	H85	block	4483	Samarra 2
H	H86	block	10913	Samarra 2
H	H101	block	1989	Samarra 2
H	H113	block	4845	Samarra 2
H	H118	block	1951	Samarra 2
H	H137	block	2012	Samarra 2
H	H143	block	9788	Samarra 2
H	H144	block	23013	Samarra 2
H	H149	block	16330	Samarra 1
H	H153	block	5960	Samarra 2
H	H154	block	20205	Samarra 2
H	H156	block	42966	Samarra 2
H	H157	block	46435	Samarra 2
H	H160	block	18504	Samarra 1 or 2
H	H161	block	7269	Samarra 1 or 2
H	H163	block	4986	Samarra 2
H	H167	block	34687	Samarra 1 or 2

H	H169	block	8847	Samarra 1 or 2
H	H170	block	6097	Samarra 1 or 2
H	H171	block	14777	Samarra 1 or 2
H	H184	block	3337	Samarra 1 or 2
H	H194	block	6852	Samarra 2
H	H222	block	6053	Samarra 1 or 2
H	H238	block	28814	Samarra 2
H	H239	block	29724	Samarra 2
H	H243	block	7075	Samarra 2
H	H253	block	4805	Samarra 2
H	H267	block	14864	Samarra 2
H	H270	block	22632	Samarra 2
H	H271	block	22431	Samarra 2
H	H278	block	8135	Samarra 1
H	H286	block	16261	Samarra 1
H	H288	block	10140	Samarra 1
H	H291	block	1634	Samarra 1
H	H316	block	4643	Samarra 2 or 4
H	H317	block	3809	Samarra 2 or 4
H	H354	block	5070	Samarra 2
H	H358	block	9573	Samarra 2 or 4
H	H494	block	8825	Samarra 2 or later
H	H496	block	33429	Samarra 1
H	H497	block	5196	Samarra 1
H	H498	block	5129	Samarra 1
H	H499	block	4833	Samarra 1
H	H500	block	5613	Samarra 1
H	H501	block	15023	Samarra 1
H	H502	block	21692	Samarra 1
H	H504	block	11045	Samarra 1
H	H505	block	6128	Samarra 1
J	J19	block	31129	Samarran
J	J20	block	20760	Samarran
J	J37	block	8699	Samarra 2
J	J38	block	11416	Samarra 2
J	J42	block	23962	Samarran
J	J44	block	8504	Samarran
J	J49	block	21313	Samarran
J	J69	block	2184	Samarran
J	J117	block	18194	Samarra 1 or later
J	J128	block	4305	Samarra 1 or later
J	J142	block	7842	Samarra 1 or later
J	J148	block	8205	Samarra 1 or later
J	J149	block	9111	Samarra 2 or later
J	J159	block	7654	Samarra 2 or later
J	J199	block	5472	Samarra 1 or later

J	J207	block	13514	Samarra 1 or later
J	J208	block	3588	Samarra 1 or later
J	J218	block	7794	Samarran
J	J224	block	7588	Samarra 1 or later
J	J235	block	4016	Samarra 1 or later
J	J237	block	10164	Samarra 1 or 2
J	J243	block	2265	Samarra 1 or 2
J	J244	block	2872	Samarra 1 or 2
J	J262	block	11570	Samarra 1 or 2
J	J263	block	7150	Samarra 1 or 2
J	J266	block	8874	Samarra 1 or 2
J	J274	block	3980	Samarra 1 or 2
J	J275	block	6669	Samarra 1 or 2
J	J285	block	8591	Samarra 1 or 2
J	J286	block	4124	Samarra 1 or 2
J	J287	block	6115	Samarra 1 or 2
J	J290	block	20023	Samarra 1 or 2
J	J292	block	3921	Samarra 1 or 2
J	J293	block	3350	Samarra 1 or 2
J	J294	block	3407	Samarra 1 or 2
J	J298	block	16491	Samarra 1 or 2
J	J299	block	15841	Samarra 1 or 2
J	J300	block	4165	Samarra 1 or 2
J	J301	block	13656	Samarra 1 or 2
J	J307	block	2770	Samarra 1 or 2
J	J310	block	6551	Samarra 1 or 2
J	J311	block	5575	Samarra 2
J	J313	block	5900	Samarra 1
J	J314	block	4388	Samarra 1
J	J316	block	3820	Samarra 1
J	J317	block	4628	Samarra 1
J	J319	block	5592	Samarra 1
J	J320	block	5691	Samarra 1
J	J322	block	2766	Samarra 1
J	J323	block	2557	Samarra 1
J	J324	block	13806	Samarra 1 or 2
J	J330	block	1404	Samarra 1
J	J331	block	3076	Samarra 1
J	J332	block	1149	Samarra 1
J	J333	block	2659	Samarra 1
J	J334	block	2922	Samarra 1
J	J336	block	4063	Samarra 1
J	J337	block	4749	Samarra 1
J	J338	block	5587	Samarra 1
J	J339	block	6341	Samarra 1
J	J340	block	4982	Samarra 1

J	J341	block	3412	Samarra 1
J	J342	block	2977	Samarra 1
J	J343	block	1105	Samarra 1
J	J349	block	3759	Samarra 1
J	J350	block	1400	Samarra 1
J	J351	block	2154	Samarra 1
J	J352	block	5425	Samarra 1
J	J353	block	5205	Samarra 1
J	J354	block	5325	Samarra 1
J	J355	block	5504	Samarra 1
J	J356	block	5076	Samarra 1
J	J357	block	3507	Samarra 1
J	J359	block	2459	Samarra 1
J	J360	block	2605	Samarra 1
J	J361	block	5775	Samarra 1
J	J362	block	5301	Samarra 1
J	J363	block	5233	Samarra 1
J	J364	block	5051	Samarra 1
J	J365	block	5445	Samarra 1
J	J366	block	4867	Samarra 1
J	J367	block	2556	Samarra 1
J	J370	block	2462	Samarra 1
J	J371	block	2688	Samarra 1
J	J372	block	2927	Samarra 1
J	J373	block	2755	Samarra 1
J	J374	block	2759	Samarra 1
J	J375	block	2208	Samarra 1
J	J376	block	1917	Samarra 1
J	J378	block	3112	Samarra 1
J	J379	block	3066	Samarra 1
J	J380	block	5512	Samarra 1
J	J389	block	3923	Samarra 2
J	J390	block	3085	Samarra 2
J	J391	block	4419	Samarra 2
J	J393	block	8313	Samarra 1
J	J394	block	7337	Samarra 1
J	J395	block	3777	Samarra 1
J	J396	block	6459	Samarra 1
J	J397	block	2650	Samarra 1
J	J399	block	1716	Samarra 1
J	J400	block	3679	Samarra 1
J	J401	block	3835	Samarra 1
J	J402	block	5691	Samarra 1
J	J404	block	6071	Samarra 1
J	J405	block	6196	Samarra 1
J	J406	block	2501	Samarra 1

J	J407	block	4651	Samarra 1
J	J408	block	4860	Samarra 1
J	J409	block	4088	Samarra 1
J	J410	block	3875	Samarra 1
J	J413	block	4158	Samarra 1
J	J417	block	2454	Samarra 2
J	J431	block	5480	Samarra 1
J	J432	block	5364	Samarra 1
J	J435	block	2827	Samarra 1
J	J436	block	2755	Samarra 1
J	J438	block	5083	Samarra 2
J	J444	block	2723	Samarra 1
J	J445	block	4723	Samarra 1
J	J446	block	4795	Samarra 1
J	J447	block	5256	Samarra 1
J	J448	block	3277	Samarra 1
J	J453	block	3365	Samarra 1
J	J455	block	5571	Samarra 1
J	J456	block	5380	Samarra 1
J	J459	block	2514	Samarra 1
J	J460	block	4189	Samarra 1
J	J472	block	7744	Samarra 2
J	J473	block	7114	Samarra 2
J	J474	block	11344	Samarra 2
J	J475	block	11770	Samarra 2
J	J477	block	6247	Samarra 2
J	J478	block	7387	Samarra 2
J	J479	block	9306	Samarra 2
J	J480	block	8964	Samarra 2
J	J481	block	4991	Samarra 2
J	J483	block	4791	Samarra 2
J	J484	block	4474	Samarra 2
J	J485	block	4169	Samarra 2
J	J486	block	4484	Samarra 2
J	J494	block	3664	Samarra 1
J	J495	block	3119	Samarra 1
J	J499	block	3752	Samarra 1
J	J500	block	4629	Samarra 1
J	J503	block	6712	Samarra 1
J	J504	block	5327	Samarra 1
J	J506	block	8335	Samarra 1
J	J507	block	3646	Samarra 1
J	J508	block	3899	Samarra 1
J	J509	block	2000	Samarra 1
J	J510	block	2067	Samarra 1
J	J513	block	3569	Samarra 1

J	J514	block	4447	Samarra 1
J	J515	block	3071	Samarra 1
J	J517	block	3183	Samarra 1
J	J518	block	2489	Samarra 1
J	J520	block	2288	Samarra 1
J	J521	block	3089	Samarra 1
J	J522	block	2732	Samarra 1
J	J523	block	7127	Samarra 2
J	J532	block	3763	Samarra 2
J	J533	block	3841	Samarra 2
J	J534	block	4197	Samarra 2
J	J535	block	3549	Samarra 2
J	J536	block	3596	Samarra 2
J	J537	block	3766	Samarra 2
J	J540	block	2134	Samarra 2
J	J541	block	6744	Samarra 2
J	J542	block	5088	Samarra 2
J	J544	block	6478	Samarra 2
J	J545	block	7201	Samarra 2
J	J546	block	7084	Samarra 2
J	J547	block	3039	Samarra 2
J	J548	block	7432	Samarra 2
J	J550	block	5249	Samarra 2
J	J551	block	7595	Samarra 2
J	J552	block	6443	Samarra 2
J	J554	block	7941	Samarra 2
J	J562	block	5648	Samarra 2
J	J580	block	3917	Samarra 2
J	J581	block	5831	Samarra 2
J	J582	block	8332	Samarra 2
J	J583	block	7637	Samarra 2
J	J584	block	7954	Samarra 2
J	J585	block	8462	Samarra 2
J	J586	block	7046	Samarra 2
J	J587	block	6739	Samarra 2
J	J588	block	4470	Samarra 2
J	J592	block	3191	Samarra 2
J	J594	block	3405	Samarra 2
J	J597	block	4088	Samarra 2
J	J602	block	4503	Samarra 2
J	J603	block	4492	Samarra 2
J	J604	block	3593	Samarra 2
J	J605	block	4192	Samarra 2
J	J606	block	4152	Samarra 2
J	J607	block	38420	Samarra 2
J	J609	block	10960	Samarra 2

J	J611	block	7995	Samarra 2
J	J612	block	13848	Samarra 2
J	J615	block	4288	Samarra 2
J	J616	block	4155	Samarra 2
J	J640	block	4743	Samarra 2
J	J652	block	11949	Samarra 1 or 2
J	J660	block	1715	Samarra 1
J	J687	block	2965	Samarra 2
J	J688	block	7085	Samarra 2
J	J689	block	5667	Samarra 2
J	J690	block	6559	Samarra 2
J	J691	block	20426	Samarra 2
J	J692	block	3560	Samarra 2
J	J693	block	2915	Samarra 2
J	J694	block	3463	Samarra 2
J	J722	block	4728	Samarra 2
J	J723	block	3799	Samarra 2
J	J724	block	3802	Samarra 2
J	J725	block	2470	Samarra 2
J	J726	block	2540	Samarra 2
J	J743	block	4902	Samarra 2
J	J746	block	9877	Samarra 2
J	J747	block	8765	Samarra 2
J	J748	block	7833	Samarra 2
J	J750	block	2908	Samarra 2
J	J751	block	1344	Samarra 2
J	J753	block	3722	Samarra 2
J	J755	block	2505	Samarra 2
J	J756	block	2573	Samarra 2
J	J757	block	6357	Samarra 2
J	J761	block	4793	Samarra 2
J	J762	block	7168	Samarra 2
J	J764	block	4839	Samarra 2
J	J766	block	3558	Samarra 2
J	J767	block	35290	Samarra 2
J	J788	block	5789	Samarra 2
J	J789	block	5532	Samarra 1 or 2
J	J791	Block	7565	Samarra 1 or 2
J	J817	block	16190	Samarra 1 or 2
J	J829	block	11578	Samarra 2
J	J830	block	2874	Samarra 2
J	J831	block	2174	Samarra 2
J	J845	Block	8363	Samarra 2
J	J846	Block	8080	Samarra 2
J	J866	block	2028	Samarra 2
J	J867	block	2058	Samarra 2

J	J868	block	2034	Samarra 2
J	J869	block	2104	Samarra 2
J	J870	block	2056	Samarra 2
J	J871	block	2203	Samarra 2
J	J872	block	2124	Samarra 2
J	J873	block	2140	Samarra 2
J	J874	block	2161	Samarra 2
J	J875	block	2251	Samarra 2
J	J882	block	1571	Samarra 2
J	J893	Block	902	Samarra 2
J	J896	Block	1718	Samarra 2
J	J897	Block	1500	Samarra 2
J	J898	Block	1500	Samarra 2
J	J899	Block	3238	Samarra 2
J	J901	Block	1687	Samarra 2
J	J902	Block	1730	Samarra 2
J	J903	Block	1676	Samarra 2
J	J904	Block	1646	Samarra 2
J	J905	Block	1610	Samarra 2
J	J906	Block	1565	Samarra 2
J	J907	Block	1571	Samarra 2
J	J908	Block	1488	Samarra 2
J	J909	Block	1483	Samarra 2
J	J910	Block	1303	Samarra 2
J	J911	Block	1298	Samarra 2
J	J914	Block	2996	Samarra 2
J	J915	Block	2039	Samarra 2
J	J916	Block	1005	Samarra 2
J	J920	Block	1374	Samarra 2
J	J922	Block	1151	Samarra 2
J	J931	Block	1585	Samarra 2
J	J932	Block	1573	Samarra 2
J	J934	Block	2777	Samarra 2
J	J935	Block	4518	Samarra 2
J	J936	Block	1623	Samarra 2
J	J937	Block	2010	Samarra 2
J	J938	Block	1973	Samarra 2
J	J939	Block	1742	Samarra 2
J	J940	Block	1355	Samarra 2
J	J941	Block	1288	Samarra 2
J	J942	Block	1709	Samarra 2
J	J943	Block	1793	Samarra 2
J	J944	Block	1880	Samarra 2
J	J945	Block	7626	Samarra 2
J	J946	Block	1531	Samarra 2
J	J955	block	11212	Samarra 1

J	J956	block	20151	Samarra 1 or 2
J	J962	Block	707	Samarra 1 or 2
J	J965	Block	4653	Samarra 1 or 2
J	J967	Block	3990	Samarra 1 or 2
J	J982	Block	2213	Samarra 2
J	J983	block	3628	Samarra 2
J	J986	block	4615	Samarra 2
J	J987	block	4132	Samarra 2
J	J988	block	3979	Samarra 2
J	J989	block	3982	Samarra 2
J	J991	block	2989	Samarra 2
J	J994	block	7497	Samarra 2
J	J1012	Block	3193	Samarra 2
J	J1014	Block	4090	Samarra 2
J	J1015	Block	5220	Samarra 2
J	J1022	Block	3813	Samarra 2
J	J1023	Block	1838	Samarra 1
J	J1024	Block	2023	Samarra 1
J	J1025	Block	1896	Samarra 1
J	J1026	Block	1513	Samarra 1
J	J1027	Block	1906	Samarra 1
J	J1028	Block	1909	Samarra 1
J	J1029	Block	2108	Samarra 2
J	J1030	Block	2229	Samarra 1
J	J1031	Block	1515	Samarra 1
J	J1032	Block	2086	Samarra 1
J	J1033	Block	1561	Samarra 1
J	J1034	Block	1902	Samarra 1
J	J1035	Block	1408	Samarra 1
J	J1036	Block	4350	Samarra 1
J	J1037	block	2165	Samarra 1
J	J1045	Block	4920	Samarra 1 or 2
J	J1049	Block	2340	Samarra 2
J	J1055	Block	3568	Samarra 1
J	J1057	Block	2790	Samarra 1
J	J1065	Block	1900	Samarra 1
J	J1066	Block	2056	Samarra 1
J	J1067	Block	2145	Samarra 1
J	J1068	Block	1994	Samarra 1
J	J1069	Block	2097	Samarra 1
J	J1070	Block	2047	Samarra 1
J	J1071	Block	1991	Samarra 1
J	J1073	Block	1494	Samarra 1
J	J1076	Block	1763	Samarra 1
J	J1077	Block	2200	Samarra 1
J	J1078	Block	1863	Samarra 1

J	J1079	Block	2352	Samarra 1
J	J1106	Block	977	Samarra 2
J	J1107	Block	1573	Samarra 2
J	J1114	Block	3120	Samarra 1
J	J1115	Block	3999	Samarra 1
J	J1120	Block	2700	Samarra 1
J	J1121	Block	13416	Samarra 1
J	J1122	Block	2434	Samarra 1
J	J1123	Block	2055	Samarra 1
J	J1124	Block	2783	Samarra 1
J	J1125	Block	1780	Samarra 1
J	J1126	Block	5026	Samarra 1
J	J1127	Block	1983	Samarra 1
J	J1128	Block	2450	Samarra 1
J	J1129	Block	1998	Samarra 1
J	J1130	Block	2013	Samarra 1
J	J1137	Block	3624	Samarra 2
J	J1138	Block	4972	Samarra 2
J	J1143	Block	1788	Samarra 1
J	J1144	Block	1701	Samarra 1
J	J1145	Block	1582	Samarra 1
J	J1146	Block	1588	Samarra 1
K	K4	Block	8847	Samarra 1 or 2
K	K5	Block	8805	Samarra 1
K	K8	Block	9848	Samarra 1 or 2
K	K16	Block	11419	Samarra 1
K	K17	Block	23375	Samarra 1
K	K21	Block	11215	Samarra 1
K	K23	Block	5391	Samarra 1
K	K24	Block	4752	Samarra 2
K	K28	Block	6331	Samarra 1
K	K33	Block	6184	Samarra 1
K	K34	Block	6174	Samarra 1
K	K35	Block	1973	Samarra 1
K	K37	block	5877	Samarra 1
K	K38	block	5874	Samarra 1
K	K39	Block	2490	Samarra 1
K	K58	Block	421	Samarra 1
K	K59	Block	2310	Samarra 1
K	K60	Block	2358	Samarra 1
K	K61	Block	1572	Samarra 1
K	K62	Block	1784	Samarra 1
K	K63	Block	3081	Samarra 1
K	K65	Block	7519	Samarra 1
K	K68	Block	12798	Samarra 2
K	K69	Block	5244	Samarra 2

K	K71	block	8281	Samarra 1
K	K72	Block	4699	Samarra 1
K	K73	Block	3126	Samarra 1
K	K74	Block	3424	Samarra 1
K	K78	Block	3396	Samarra 1
K	K79	Block	2313	Samarra 1
K	K80	Block	4751	Samarra 1
K	K81	Block	2269	Samarra 1
K	K82	Block	1998	Samarra 1
K	K83	Block	8681	Samarra 1
K	K84	Block	1743	Samarra 1
K	K85	block	10881	Samarra 1
K	K87	block	4531	Samarra 1
K	K88	block	4773	Samarra 1
K	K89	block	8917	Samarra 1
K	K91	block	5997	Samarra 1
K	K92	Block	11190	Samarra 1
K	K93	Block	14098	Samarra 1
K	K94	block	3880	Samarra 1
K	K95	Block	15412	Samarra 1
K	K97	Block	8722	Samarra 1
K	K98	block	10891	Samarra 1
K	K99	Block	6880	Samarra 1
K	K102	Block	6336	Samarra 1
K	K103	Block	10194	Samarra 1
K	K105	Block	8208	Samarra 1
K	K106	Block	9205	Samarra 1
K	K108	Block	8450	Samarra 1
K	K109	Block	7229	Samarra 1
K	K119	Block	8781	Samarra 1 or 2
K	K120	Block	7482	Samarra 1 or 2
K	K121	Block	4098	Samarra 1 or 2
K	K122	Block	6740	Samarra 1 or 2
K	K123	Block	6305	Samarra 1 or 2
K	K127	Block	9450	Samarra 2
K	K128	Block	5005	Samarra 2
K	K129	Block	10673	Samarra 2
K	K130	Block	10687	Samarra 2
K	K131	Block	8781	Samarra 2
K	K132	Block	15363	Samarra 2
K	K134	Block	3345	Samarra 2
K	K136	Block	15089	Samarra 2
K	K137	Block	11647	Samarra 2
K	K139	Block	15706	Samarra 2
K	K140	Block	17002	Samarra 2
K	K141	Block	5793	Samarra 2

K	K142	Block	8348	Samarra 2
K	K143	Block	7394	Samarra 2
K	K144	Block	9830	Samarra 2
K	K145	Block	18535	Samarra 2
K	K146	Block	4828	Samarra 2
K	K147	Block	19668	Samarra 2
K	K148	Block	6340	Samarra 2
K	K149	Block	4204	Samarra 2
K	K158	Block	6818	Samarra 2
K	K159	Block	2895	Samarra 2
K	K179	Block	1771	Samarra 2
K	K180	Block	4509	Samarra 2
K	K182	Block	1153	Samarra 2
K	K196	Block	1809	Samarra 2
K	K226	block	5896	Samarra 1
K	K236	Block	2274	Samarra 1
K	K239	Block	1770	Samarra 1
K	K241	Block	7715	Samarra 2
K	K242	Block	1353	Samarra 2
K	K246	Block	1572	Samarra 2
K	K249	Block	4498	Samarra 2
K	K250	Block	3254	Samarra 2
K	K252	Block	10469	Samarra 2
K	K254	Block	1096	Samarra 2
K	K273	Block	4681	Samarra 2
K	K277	Block	6684	Samarra 2
K	K278	Block	5190	Samarra 2
K	K288	Block	6504	Samarra 2
K	K289	Block	5796	Samarra 2
K	K290	Block	6730	Samarra 2
K	K296	Block	5893	Samarra 2
K	K304	Block	4672	Samarran
K	K305	Block	3974	Samarran
K	K337	Block	822	Samarra 1
K	K338	Block	756	Samarra 1
K	K342	Block	1683	Samarra 1
K	K343	Block	2787	Samarra 1
K	K344	Block	2112	Samarra 1
K	K345	Block	3344	Samarra 1
K	K346	Block	1698	Samarra 1
K	K372	Block	286	Samarra 1
K	K373	Block	1017	Samarra 1
K	K374	Block	999	Samarra 1
K	K379	Block	6739	Samarra 1 or 2
K	K380	Block	7329	Samarra 1
K	K381	Block	3916	Samarra 1

K	K382	Block	8156	Samarra 1
K	K383	Block	7086	Samarra 1
K	K384	Block	6989	Samarra 1
K	K385	Block	3902	Samarra 1
K	K386	Block	3578	Samarra 1
K	K387	Block	3147	Samarra 1
M	M15	block	4430	Samarra 2
M	M16	block	4440	Samarra 2
M	M17	block	4600	Samarra 2
M	M20	block	4714	Samarra 2
M	M21	block	4732	Samarra 2
M	M22	block	2322	Samarra 2
M	M23	block	4185	Samarra 2
M	M24	block	4595	Samarra 2
M	M25	block	4571	Samarra 2
M	M30	block	4797	Samarra 2
M	M31	block	4753	Samarra 2
M	M32	block	2382	Samarra 2
M	M33	block	4520	Samarra 2
M	M34	block	4705	Samarra 2
M	M35	block	4772	Samarra 2
M	M36	block	4423	Samarra 2
M	M37	block	2403	Samarra 2
M	M38	block	4671	Samarra 2
M	M39	block	4784	Samarra 2
M	M40	block	4636	Samarra 2
M	M41	block	4582	Samarra 2
M	M42	block	2641	Samarra 2
M	M43	block	4646	Samarra 2
M	M44	block	4483	Samarra 2
M	M45	block	4518	Samarra 2
M	M46	block	4497	Samarra 2
M	M47	block	2134	Samarra 2
M	M48	block	4640	Samarra 2
M	M49	block	4641	Samarra 2
M	M50	block	4615	Samarra 2
M	M51	block	4507	Samarra 2
M	M52	block	2473	Samarra 2
M	M55	block	4733	Samarra 2
M	M56	block	4495	Samarra 2
M	M57	block	2434	Samarra 2
O	O12	block	6736	Early Abbasid – Samarran
O	O13	block	7552	Early Abbasid – Samarran
Q	Q19	block	5339	Samarra 2
Q	Q20	block	5445	Samarra 2

Q	Q21	block	6123	Samarra 2
Q	Q22	block	5304	Samarra 2
Q	Q23	block	5377	Samarra 2
Q	Q24	block	4251	Samarra 2
Q	Q25	block	2813	Samarra 2
Q	Q31	block	2855	Samarra 2
Q	Q32	block	4945	Samarra 2
Q	Q33	block	4711	Samarra 2
Q	Q34	block	5091	Samarra 2
Q	Q35	block	4895	Samarra 2
Q	Q36	block	5134	Samarra 2
Q	Q37	block	4632	Samarra 2
Q	Q38	block	4974	Samarra 2
R	R21	Block	17011	Samarra 2, after 232/847.
R	R23	Block	17067	Samarra 2, after 232/847.
R	R26	Block	8197	Samarra 2, after 232/847.
R	R27	Block	5336	Samarra 2, after 232/847.
R	R30	Block	4096	Samarra 2, after 232/847.
R	R31	Block	10212	Samarra 2, after 232/847.
R	R32	Block	7610	Samarra 2, after 232/847.
R	R33	Block	4797	Samarra 2, after 232/847.
R	R34	Block	6878	Samarra 2, after 232/847.
R	R35	Block	9503	Samarra 2, after 232/847.
R	R36	Block	6709	Samarra 2, after 232/847.
R	R37	Block	5560	Samarra 2, after 232/847.
R	R38	Block	3834	Samarra 2, after 232/847.
R	R39	Block	7136	Samarra 2, after 232/847.
R	R40	Block	7894	Samarra 2, after 232/847.
R	R42	Block	4720	Samarra 2, after 232/847.
R	R43	Block	6778	Samarra 2, after 232/847.
R	R44	Block	13958	Samarra 2, after 232/847.

R	R45	Block	12909	Samarra 2, after 232/847.
R	R46	Block	14274	Samarra 2, after 232/847.
R	R47	Block	7835	Samarra 2, after 232/847.
R	R49	Block	3091	Samarra 2, after 232/847.
R	R50	Block	4502	Samarra 2, after 232/847.
R	R51	Block	4382	Samarra 2, after 232/847.
R	R52	Block	6221	Samarra 2, after 232/847.
R	R53	Block	10308	Samarra 2, after 232/847.
R	R54	Block	6654	Samarra 2, after 232/847.
R	R55	Block	3198	Samarra 2, after 232/847.
R	R56	Block	2727	Samarra 2, after 232/847.
R	R82	Block	4114	Samarra 2
R	R95	Block	12492	Samarra 2
R	R96	Block	10749	Samarra 2
R	R98	Block	14089	Samarra 2
R	R99	Block	6403	Samarra 2
R	R101	Block	5939	Samarra 2
R	R102	Block	12377	Samarra 2
R	R106	Block	19635	Samarra 2
R	R107	Block	4139	Samarra 2
R	R110	Block	1499	Samarra 2
R	R117	Block	22307	Samarra 2
R	R119	Block	10192	Samarra 2
R	R121	Block	15354	Samarra 2
R	R122	Block	21232	Samarra 2
R	R123	Block	18669	Samarra 2
R	R124	Block	19043	Samarra 2
R	R125	Block	21017	Samarra 2
R	R129	Block	16649	Samarra 2
R	R134	Block	19775	Samarra 2
R	R135	Block	21702	Samarra 2
R	R136	Block	21008	Samarra 2
R	R137	Block	16041	Samarra 2
R	R138	Block	13737	Samarra 2
R	R139	Block	13862	Samarra 2
R	R140	Block	2255	Samarra 2
R	R141	Block	4046	Samarra 2

R	R142	Block	13935	Samarra 2
R	R143	Block	4564	Samarra 2
R	R144	Block	2049	Samarra 2
R	R146	Block	6663	Samarra 2
R	R148	Block	8308	Samarra 2
R	R149	Block	7345	Samarra 2
R	R150	Block	9116	Samarra 2
R	R151	Block	14478	Samarra 2
R	R152	Block	15452	Samarra 2
R	R153	Block	15199	Samarra 2
R	R154	Block	15098	Samarra 2
R	R155	Block	14643	Samarra 2
R	R156	Block	6385	Samarra 2
R	R158	Block	2829	Samarra 2
R	R159	Block	2811	Samarra 2
R	R160	Block	2203	Samarra 2
R	R161	Block	2704	Samarra 2
R	R162	Block	2730	Samarra 2
R	R166	Block	8219	Samarra 2
R	R167	Block	9436	Samarra 2
R	R169	Block	17891	Samarra 2
R	R171	Block	6276	Samarra 2
R	R172	Block	8391	Samarra 2
R	R173	Block	17253	Samarra 2
R	R174	Block	17895	Samarra 2
R	R177	Block	4593	Samarra 2
R	R178	Block	7679	Samarra 2
R	R179	Block	9560	Samarra 2
R	R180	Block	8776	Samarra 2
R	R181	Block	8227	Samarra 2
R	R182	Block	8024	Samarra 2
R	R184	Block	11880	Samarra 2
R	R185	Block	13383	Samarra 2
R	R186	Block	13707	Samarra 2
R	R187	Block	14144	Samarra 2
R	R188	Block	13582	Samarra 2
R	R189	Block	14249	Samarra 2
R	R190	Block	7112	Samarra 2
R	R191	Block	6921	Samarra 2
R	R193	Block	7503	Samarra 2
R	R194	Block	10838	Samarra 2
R	R196	Block	24905	Samarra 2
R	R198	Block	13100	Samarra 2
R	R199	Block	7254	Samarra 2
R	R200	Block	13130	Samarra 2
R	R201	Block	13454	Samarra 2

R	R202	Block	13509	Samarra 2
R	R203	Block	3305	Samarra 2
R	R207	Block	13841	Samarra 2
R	R208	Block	13124	Samarra 2
R	R209	Block	6431	Samarra 2
R	R210	Block	7919	Samarra 2
R	R215	Block	20585	Samarra 2
R	R216	Block	15399	Samarra 2
R	R217	Block	16481	Samarra 2
R	R219	Block	1321	Samarra 2
R	R240	Block	9176	Samarra 2
R	R255	Block	4147	Samarra 2
R	R256	Block	10535	Samarra 2
R	R257	Block	2149	Samarra 2
R	R259	Block	1015	Samarra 2
R	R262	Block	5366	Samarra 2
R	R264	Block	18652	Samarra 2
R	R265	Block	8209	Samarra 2
R	R266	Block	9626	Samarra 2
R	R267	Block	3463	Samarra 2
R	R269	Block	10093	Samarra 2
R	R272	Block	8517	Samarra 2
R	R273	Block	8379	Samarra 2
R	R274	Block	3901	Samarra 2
R	R275	Block	9605	Samarra 2
R	R282	Block	777	Samarra 2
R	R283	Block	2041	Samarra 2
R	R284	Block	3961	Samarra 2
R	R310	Block	9099	Samarra 2
R	R312	Block	2839	Samarra 2
R	R313	Block	4329	Samarra 2
R	R317	Block	8917	Samarra 2
R	R323	Block	6708	Samarra 2
R	R324	Block	6431	Samarra 2
R	R334	Block	6846	Samarra 2
T	T53	BLOCK	1622	Samarra 3
T	T71	Block	4025	Samarra 3
T	T109	Block	3093	Samarra 3
T	T138	Block	791	Samarra 3
T	T194	BlOCK	1698	Samarra 3
T	T276	block	1526	Samarra 3
T	T279	block	2851	Samarra 3
T	T295	BLOCK	2366	Samarra 3
T	T296	BLOCK	4096	Samarra 3
T	T299	BLOCK	1584	Samarra 3
T	T307	BLOCK	7168	Samarra 3

T	T308	BLOCK	7632	Samarra 3
T	T309	BLOCK	7708	Samarra 3
T	T310	BLOCK	6581	Samarra 3
T	T311	BLOCK	4707	Samarra 3
T	T312	BLOCK	5156	Samarra 3
T	T313	BLOCK	2153	Samarra 3
T	T314	BLOCK	3244	Samarra 3
T	T315	BLOCK	13434	Samarra 3
T	T319	BLOCK	4332	Samarra 3
T	T320	BLOCK	3630	Samarra 3
T	T324	BLOCK	1201	Samarra 3
T	T354	BLOCK	5851	Samarra 3
T	T355	BLOCK	4023	Samarra 3
T	T441	BLOCK	778	Samarra 3
T	T457	BLOCK	1092	Samarra 3
T	T458	BLOCK	1263	Samarra 3
T	T459	BLOCK	805	Samarra 3
T	T460	BLOCK	812	Samarra 3
T	T461	BLOCK	363	Samarra 3
T	T464	BLOCK	713	Samarra 3
T	T466	BLOCK	1044	Samarra 3
T	T467	BLOCK	1158	Samarra 3
T	T474	BLOCK	3318	Samarra 3
T	T498	BLOCK	2561	Samarra 3
T	T499	BLOCK	4000	Samarra 3
T	T500	BLOCK	4981	Samarra 3
T	T501	BLOCK	2760	Samarra 3
T	T530	BLOCK	2631	Samarra 3
T	T533	BLOCK	8119	Samarra 3
T	T534	BLOCK	3211	Samarra 3
T	T535	BLOCK	1110	Samarra 3
T	T539	BLOCK	1002	Samarra 3
T	T543	BLOCK	1273	Samarra 3
T	T545	BLOCK	899	Samarra 3
T	T546	BLOCK	948	Samarra 3
T	T547	BLOCK	1249	Samarra 3
T	T548	BLOCK	591	Samarra 3
T	T549	BLOCK	351	Samarra 3
T	T553	BLOCK	2138	Samarra 3
T	T559	BLOCK	1469	Samarra 3
T	T560	BLOCK	3162	Samarra 3
T	T562	BLOCK	374	Samarra 3
T	T564	BLOCK	1055	Samarra 3
T	T565	BLOCK	2215	Samarra 3
T	T567	BLOCK	1172	Samarra 3
T	T568	BLOCK	2192	Samarra 3

T	T569	BLOCK	6473	Samarra 3
T	T583	BLOCK	1928	Samarra 3
T	T585	BLOCK	725	Samarra 3
T	T586	BLOCK	536	Samarra 3
T	T587	BLOCK	2758	Samarra 3
T	T589	BLOCK	1388	Samarra 3
T	T590	BLOCK	538	Samarra 3
T	T591	BLOCK	4336	Samarra 3
T	T592	BLOCK	4479	Samarra 3
T	T593	BLOCK	873	Samarra 3
T	T594	BLOCK	2899	Samarra 3
T	T600	BLOCK	845	Samarra 3
T	T601	BLOCK	927	Samarra 3
T	T602	BLOCK	2399	Samarra 3
T	T603	BLOCK	2460	Samarra 3
T	T619	BLOCK	242	Samarra 3
T	T620	BLOCK	265	Samarra 3
T	T635	BLOCK	2924	Samarra 3
T	T636	BLOCK	4520	Samarra 3
T	T637	BLOCK	4296	Samarra 3
T	T638	BLOCK	4489	Samarra 3
T	T639	BLOCK	4761	Samarra 3
T	T640	BLOCK	4321	Samarra 3
T	T641	BLOCK	4375	Samarra 3
T	T645	BLOCK	1932	Samarra 3
T	T646	BLOCK	3236	Samarra 3
T	T647	BLOCK	3193	Samarra 3
T	T648	BLOCK	3466	Samarra 3
T	T649	BLOCK	3310	Samarra 3
T	T650	BLOCK	3420	Samarra 3
T	T651	Block	3049	Samarra 3
T	T652	Block	3308	Samarra 3
T	T653	Block	1490	Samarra 3
T	T656	BLOCK	5337	Samarra 3
T	T661	BLOCK	8309	Samarra 3
T	T664	BLOCK	12949	Samarra 3
T	T682	BLOCK	8121	Samarra 3
T	T683	BLOCK	7408	Samarra 3
T	T684	BLOCK	5720	Samarra 3
T	T695	BLOCK	7960	Samarra 3
T	T696	BLOCK	8128	Samarra 3
T	T698	BLOCK	1068	Samarra 3
T	T699	BLOCK	5731	Samarra 3
T	T702	BLOCK	6788	Samarra 3
T	T723	BLOCK	9820	Samarra 3
T	T724	BLOCK	19154	Samarra 3

T	T725	BLOCK	13857	Samarra 3
T	T731	BLOCK	43685	Samarra 3
T	T738	BLOCK	4093	Samarra 3
T	T739	BLOCK	3024	Samarra 3
T	T742	BLOCK	2749	Samarra 3
T	T743	BLOCK	1055	Samarra 3
T	T744	BLOCK	3113	Samarra 3
T	T745	BLOCK	2644	Samarra 3
T	T746	BLOCK	0	Samarra 3
T	T753	BLOCK	1400	Samarra 3
T	T755	BLOCK	2891	Samarra 3
T	T756	BLOCK	19293	Samarra 3
T	T759	BLOCK	4432	Samarra 3
T	T760	BLOCK	2265	Samarra 3
T	T761	BLOCK	1537	Samarra 3
T	T766	BLOCK	749	Samarra 3
T	T768	BLOCK	330	Samarra 3
T	T769	BLOCK	3454	Samarra 3
T	T770	BLOCK	1466	Samarra 3
T	T771	BLOCK	1782	Samarra 3
T	T772	BLOCK	1901	Samarra 3
T	T773	BLOCK	870	Samarra 3
T	T774	BLOCK	569	Samarra 3
T	T786	BLOCK	3887	Samarra 3
T	T787	BLOCK	1339	Samarra 3
T	T788	BLOCK	3011	Samarra 3
T	T793	BLOCK	1356	Samarra 3
T	T797	BLOCK	1734	Samarra 3
T	T799	BLOCK	2140	Samarra 3
T	T800	BLOCK	939	Samarra 3
T	T801	BLOCK	1308	Samarra 3
T	T802	BLOCK	988	Samarra 3
T	T803	BLOCK	1179	Samarra 3
T	T804	BLOCK	1180	Samarra 3
T	T805	BLOCK	1709	Samarra 3
T	T806	BLOCK	1252	Samarra 3
T	T807	BLOCK	880	Samarra 3
T	T808	BLOCK	2417	Samarra 3
T	T809	BLOCK	3010	Samarra 3
T	T810	BLOCK	577	Samarra 3
T	T811	BLOCK	762	Samarra 3
T	T812	BLOCK	602	Samarra 3
T	T813	BLOCK	799	Samarra 3
T	T814	BLOCK	1180	Samarra 3
T	T815	BLOCK	3000	Samarra 3
T	T820	BlOCK	3180	Samarra 3

T	T821	BLOCK	3722	Samarra 3
T	T822	BLOCK	3280	Samarra 3
T	T823	BLOCK	6668	Samarra 3
T	T824	BLOCK	3345	Samarra 3
T	T825	BLOCK	2451	Samarra 3
T	T826	BLOCK	3928	Samarra 3
T	T827	BLOCK	3971	Samarra 3
T	T828	BLOCK	4243	Samarra 3
T	T829	BLOCK	3808	Samarra 3
T	T830	BLOCK	2410	Samarra 3
T	T831	BLOCK	650	Samarra 3
T	T835	BLOCK	3038	Samarra 3
T	T838	BLOCK	1565	Samarra 3
T	T842	BLOCK	1920	Samarra 3
T	T844	BLOCK	1578	Samarra 3
T	T850	BLOCK	1189	Samarra 3
T	T851	BLOCK	1338	Samarra 3
T	T852	BLOCK	1332	Samarra 3
T	T853	BLOCK	1079	Samarra 3
T	T864	BLOCK	824	Samarra 3
T	T866	BLOCK	1207	Samarra 3
T	T867	BLOCK	1602	Samarra 3
T	T868	BLOCK	1638	Samarra 3
T	T869	BLOCK	1503	Samarra 3
T	T870	BLOCK	1007	Samarra 3
T	T878	BLOCK	1900	Samarra 3
T	T879	BLOCK	1566	Samarra 3
T	T880	BLOCK	2436	Samarra 3
T	T881	BLOCK	3844	Samarra 3
T	T882	BLOCK	2452	Samarra 3
T	T883	BLOCK	2852	Samarra 3
T	T884	BLOCK	3110	Samarra 3
T	T885	BLOCK	3034	Samarra 3
T	T890	BLOCK	3020	Samarra 3
T	T891	BLOCK	2424	Samarra 3
T	T892	BLOCK	2366	Samarra 3
T	T893	BLOCK	2247	Samarra 3
T	T894	BLOCK	2450	Samarra 3
T	T895	BLOCK	2436	Samarra 3
T	T896	BLOCK	4037	Samarra 3
T	T898	BLOCK	2373	Samarra 3
T	T899	BLOCK	2387	Samarra 3
T	T902	BLOCK	2578	Samarra 3
T	T903	BLOCK	2483	Samarra 3
T	T905	BLOCK	2290	Samarra 3
T	T906	BLOCK	2667	Samarra 3

T	T907	BLOCK	3942	Samarra 3
T	T911	BLOCK	1722	Samarra 3
T	T912	BLOCK	2294	Samarra 3
T	T913	BLOCK	2294	Samarra 3
T	T917	Block	39073	Samarra 3
T	T931	BLOCK	2696	Samarra 3
T	T932	BLOCK	5182	Samarra 3
T	T933	BLOCK	6454	Samarra 3
T	T935	BLOCK	20749	Samarra 3
T	T937	BLOCK	25520	Samarra 3
T	T938	BLOCK	18980	Samarra 3
T	T939	BLOCK	24870	Samarra 3
T	T941	BLOCK	1051	Samarra 3
T	T942	BLOCK	2096	Samarra 3
T	T943	BLOCK	1785	Samarra 3
T	T945	BLOCK	6377	Samarra 3
T	T946	BLOCK	2305	Samarra 3
T	T947	BLOCK	881	Samarra 3
T	T950	BLOCK	3976	Samarra 3
T	T951	BLOCK	751	Samarra 3
T	T952	BLOCK	794	Samarra 3
T	T953	BLOCK	4163	Samarra 3
T	T954	BLOCK	820	Samarra 3
T	T955	BLOCK	887	Samarra 3
T	T956	BLOCK	2907	Samarra 3
T	T958	BLOCK	746	Samarra 3
T	T959	BLOCK	775	Samarra 3
T	T960	BLOCK	1251	Samarra 3
T	T961	BLOCK	1108	Samarra 3
T	T962	BLOCK	1966	Samarra 3
T	T966	BLOCK	4822	Samarra 3
T	T967	BLOCK	3814	Samarra 3
T	T975	BLOCK	1403	Samarra 3
T	T976	BLOCK	2010	Samarra 3
T	T977	BLOCK	3394	Samarra 3
T	T978	BLOCK	3239	Samarra 3
T	T980	BLOCK	11730	Samarra 3
T	T983	BLOCK	12487	Samarra 3
T	T984	BLOCK	14019	Samarra 3
T	T987	BLOCK	2935	Samarra 3
T	T988	BLOCK	2241	Samarra 3
T	T989	BLOCK	1655	Samarra 3
T	T991	BLOCK	2805	Samarra 3
T	T994	BLOCK	4668	Samarra 3
T	T995	BLOCK	3490	Samarra 3
T	T998	BLOCK	2377	Samarra 3

T	T999	BLOCK	957	Samarra 3
T	T1001	BLOCK	3499	Samarra 3
T	T1003	BLOCK	1254	Samarra 3
T	T1004	BLOCK	336	Samarra 3
T	T1008	BLOCK	796	Samarra 3
T	T1009	BLOCK	2207	Samarra 3
T	T1010	BLOCK	1692	Samarra 3
T	T1011	BLOCK	2730	Samarra 3
T	T1012	BLOCK	947	Samarra 3
T	T1015	BLOCK	1707	Samarra 3
T	T1016	BLOCK	1428	Samarra 3
T	T1019	BLOCK	829	Samarra 3
T	T1020	BLOCK	1868	Samarra 3
T	T1021	BLOCK	1616	Samarra 3
T	T1022	BLOCK	1132	Samarra 3
T	T1029	BLOCK	2056	Samarra 3
T	T1030	BLOCK	2111	Samarra 3
T	T1031	BLOCK	2121	Samarra 3
T	T1034	BLOCK	2663	Samarra 3
T	T1035	BLOCK	2191	Samarra 3
T	T1037	BLOCK	4740	Samarra 3
T	T1040	BLOCK	1559	Samarra 3
T	T1072	Block	3328	Samarra 3
U	U14	BLOCK	3621	Samarra 4
U	U15	BLOCK	4191	Samarra 4
U	U16	BLOCK	4345	Samarra 4
U	U17	BLOCK	5770	Samarra 4
U	U18	BLOCK	5479	Samarra 4
U	U19	BLOCK	5504	Samarra 4
U	U20	BLOCK	2158	Samarra 4
U	U21	BLOCK	3106	Samarra 4
U	U22	BLOCK	5148	Samarra 4
U	U23	BLOCK	5785	Samarra 4
U	U25	BLOCK	5280	Samarra 4
U	U26	BLOCK	2182	Samarra 4
U	U27	BLOCK	1413	Samarra 4
U	U28	BLOCK	1704	Samarra 4
U	U29	BLOCK	3349	Samarra 4
U	U30	BLOCK	3429	Samarra 4
U	U31	BLOCK	3224	Samarra 4
U	U32	BLOCK	4686	Samarra 4
U	U33	BLOCK	5052	Samarra 4
U	U34	BLOCK	3213	Samarra 4
U	U35	BLOCK	3275	Samarra 4
U	U36	BLOCK	3055	Samarra 4
U	U37	BLOCK	4026	Samarra 4

U	U38	BLOCK	6092	Samarra 4
U	U42	BLOCK	2049	Samarra 4
U	U43	BLOCK	2160	Samarra 4
U	U48	BLOCK	859	Samarra 4
U	U49	BLOCK	2081	Samarra 4
U	U50	BLOCK	3889	Samarra 4
U	U51	BLOCK	1459	Samarra 4
U	U52	BLOCK	325	Samarra 4
U	U53	BLOCK	427	Samarra 4
U	U54	BLOCK	723	Samarra 4
U	U56	BLOCK	762	Samarra 4
U	U64	BLOCK	4463	Samarra 4
U	U65	BLOCK	3692	Samarra 4
U	U66	BLOCK	3734	Samarra 4
U	U67	BLOCK	2428	Samarra 4
U	U68	BLOCK	2351	Samarra 4
U	U69	BLOCK	2379	Samarra 4
U	U70	BLOCK	2402	Samarra 4
U	U71	BLOCK	2346	Samarra 4
U	U72	BLOCK	1169	Samarra 4
U	U90	BLOCK	2745	Samarra 4
U	U91	BLOCK	1357	Samarra 4
U	U94	BLOCK	10353	Samarra 4
U	U96	BLOCK	6480	Samarra 4
U	U97	BLOCK	7382	Samarra 4
U	U102	BLOCK	2218	Samarra 4
U	U103	BLOCK	3411	Samarra 4
U	U104	BLOCK	2306	Samarra 4
U	U105	BLOCK	3924	Samarra 4
U	U106	BLOCK	3248	Samarra 4
U	U107	BLOCK	3812	Samarra 4
U	U108	BLOCK	3530	Samarra 4
U	U109	BLOCK	844	Samarra 4
U	U110	BLOCK	1446	Samarra 4
U	U111	BLOCK	2155	Samarra 4
U	U112	BLOCK	2451	Samarra 4
U	U113	BLOCK	3187	Samarra 4
U	U114	BLOCK	3598	Samarra 4
U	U115	BLOCK	2329	Samarra 4
U	U116	BLOCK	1849	Samarra 4
U	U117	BLOCK	1707	Samarra 4
U	U118	BLOCK	286	Samarra 4
U	U121	BLOCK	1929	Samarra 4
U	U122	BLOCK	2039	Samarra 4
U	U123	BLOCK	1776	Samarra 4
U	U124	BLOCK	1907	Samarra 4

U	U125	BLOCK	2064	Samarra 4
U	U126	BLOCK	1684	Samarra 4
U	U127	BLOCK	1990	Samarra 4
U	U128	BLOCK	1446	Samarra 4
U	U129	BLOCK	1468	Samarra 4
U	U130	BLOCK	1388	Samarra 4
U	U131	BLOCK	1321	Samarra 4
U	U132	BLOCK	1333	Samarra 4
U	U133	BLOCK	1300	Samarra 4
U	U134	BLOCK	670	Samarra 4
U	U136	BLOCK	1528	Samarra 4
U	U137	BLOCK	687	Samarra 4
U	U139	BLOCK	937	Samarra 4
U	U141	BLOCK	2018	Samarra 4
U	U142	BLOCK	2116	Samarra 4
U	U145	BLOCK	2074	Samarra 4
U	U146	BLOCK	1978	Samarra 4
U	U147	BLOCK	1063	Samarra 4
U	U150	BLOCK	1288	Samarra 4
U	U151	BLOCK	2566	Samarra 4
U	U152	BLOCK	2257	Samarra 4
U	U153	BLOCK	5274	Samarra 4
U	U154	BLOCK	2048	Samarra 4
U	U155	BLOCK	1522	Samarra 4
U	U156	BLOCK	1243	Samarra 4
U	U157	BLOCK	1446	Samarra 4
U	U158	BLOCK	1483	Samarra 4
U	U159	BLOCK	1273	Samarra 4
U	U160	BLOCK	688	Samarra 4
U	U162	BLOCK	2202	Samarra 4
U	U163	BLOCK	1046	Samarra 4
U	U164	BLOCK	2225	Samarra 4
U	U173	BLOCK	6237	Samarra 4
U	U174	BLOCK	1099	Samarra 4
U	U175	BLOCK	1332	Samarra 4
U	U188	BLOCK	3133	Samarra 4
U	U192	BLOCK	1707	Samarra 4
U	U202	BLOCK	4748	Samarra 4
U	U203	BLOCK	5262	Samarra 4
U	U204	BLOCK	5695	Samarra 4
U	U205	BLOCK	3814	Samarra 4
U	U207	BLOCK	2656	Samarra 4
U	U208	BLOCK	2709	Samarra 4
U	U209	BLOCK	2539	Samarra 4
U	U210	BLOCK	2360	Samarra 4
U	U211	BLOCK	2519	Samarra 4

U	U212	BLOCK	1448	Samarra 4
U	U213	BLOCK	2914	Samarra 4
U	U214	BLOCK	2869	Samarra 4
U	U215	BLOCK	8457	Samarra 4
U	U216	BLOCK	1954	Samarra 4
U	U217	BLOCK	2197	Samarra 4
U	U218	BLOCK	7703	Samarra 4
U	U219	BLOCK	3695	Samarra 4
U	U220	BLOCK	2247	Samarra 4
U	U221	BLOCK	4087	Samarra 4
U	U222	BLOCK	2339	Samarra 4
U	U223	BLOCK	2368	Samarra 4
U	U224	BLOCK	2651	Samarra 4
U	U226	BLOCK	4457	Samarra 4
U	U272	BLOCK	3769	Samarra 4
U	U273	BLOCK	2928	Samarra 4
U	U276	BLOCK	3498	Samarra 4
U	U277	BLOCK	3346	Samarra 4
U	U278	BLOCK	3845	Samarra 4
U	U279	BLOCK	2268	Samarra 4
U	U280	BLOCK	3207	Samarra 4
U	U282	BLOCK	3601	Samarra 4
U	U283	BLOCK	3664	Samarra 4
U	U284	BLOCK	3919	Samarra 4
U	U285	BLOCK	3787	Samarra 4
U	U296	BLOCK	7301	Samarra 1 or 2
U	U298	BLOCK	8182	Samarra 1 or 2
U	U299	BLOCK	6478	Samarra 1 or 2
U	U302	BLOCK	4335	Samarra 1 or 2
U	U303	BLOCK	7495	Samarra 1 or 2
U	U305	BLOCK	9023	Samarra 1 or 2
U	U320	BLOCK	4929	Samarra 1 or 2
U	U321	BLOCK	4271	Samarra 1 or 2
U	U322	BLOCK	5781	Samarra 1 or 2
U	U356	BLOCK	4657	Samarra 4
U	U357	BLOCK	4888	Samarra 4
U	U358	BLOCK	1011	Samarra 4
U	U360	BLOCK	3480	Samarra 4
U	U361	BLOCK	938	Samarra 4
U	U362	BLOCK	1633	Samarra 4
U	U363	BLOCK	1389	Samarra 4
U	U364	BLOCK	1598	Samarra 4
U	U367	BLOCK	1363	Samarra 4
U	U368	BLOCK	1163	Samarra 4
U	U370	BLOCK	1362	Samarra 4
U	U371	BLOCK	1298	Samarra 4

U	U372	BLOCK	1462	Samarra 4
U	U373	BLOCK	1613	Samarra 4
U	U374	BLOCK	713	Samarra 4
U	U375	BLOCK	1272	Samarra 4
U	U376	BLOCK	2248	Samarra 4
U	U377	BLOCK	2180	Samarra 4
U	U378	BLOCK	2281	Samarra 4
U	U379	BLOCK	2239	Samarra 4
U	U381	BLOCK	2390	Samarra 4
U	U381	BLOCK	514	Samarra 4
U	U381	BLOCK	2230	Samarra 4
U	U381	BLOCK	4874	Samarra 4
U	U381	BLOCK	4758	Samarra 4
U	U381	BLOCK	2276	Samarra 4
U	U386	BLOCK	2367	Samarra 4
U	U387	BLOCK	4555	Samarra 4
U	U388	BLOCK	674	Samarra 4
U	U389	BLOCK	1460	Samarra 4
U	U393	block	6842	Samarra 4
U	U394	block	5554	Samarra 4
U	U397	BLOCK	2229	Samarra 4
X	X9	Block	3043	Samarra 1
X	X10	Block	3556	Samarra 1
X	X11	Block	5685	Samarra 1
X	X13	Block	6081	Samarra 1
X	X14	Block	6803	Samarra 1
X	X15	Block	5759	Samarra 1
X	X16	Block	2021	Samarra 1
X	X17	Block	2507	Samarra 1
X	X19	Block	4113	Samarra 1
X	X20	Block	4848	Samarra 1
X	X22	Block	4063	Samarra 1
X	X24	Block	4861	Samarra 1
X	X29	Block	6964	Samarra 1
X	X30	Block	4279	Samarra 1
X	X31	Block	8302	Samarra 1
X	X32	Block	4265	Samarra 1
X	X37	Block	6761	Samarra 1
X	X38	Block	4156	Samarra 1
X	X39	Block	4419	Samarra 1
X	X40	Block	3265	Samarra 1
X	X41	Block	7797	Samarra 1
X	X42	Block	4435	Samarra 1
X	X43	Block	7344	Samarra 1
X	X44	Block	4031	Samarra 1
X	X45	Block	7832	Samarra 1

X	X46	Block	7817	Samarra 1
X	X47	Block	8429	Samarra 1
X	X48	Block	6924	Samarra 1
X	X49	Block	5505	Samarra 1
X	X50	Block	2526	Samarra 1
X	X51	Block	3120	Samarra 1
X	X52	Block	7497	Samarra 1
X	X53	Block	7907	Samarra 1
X	X56	Block	10417	Samarra 1
X	X57	Block	4626	Samarra 1
X	X58	Block	5100	Samarra 1
X	X59	Block	7031	Samarra 1
X	X60	Block	6867	Samarra 1
X	X61	Block	6167	Samarra 1
X	X62	Block	7250	Samarra 1
X	X63	Block	6316	Samarra 1
X	X64	Block	5669	Samarra 1
X	X65	Block	4828	Samarra 1
X	X68	Block	5119	Samarra 1
X	X69	Block	7846	Samarra 1
X	X70	Block	5047	Samarra 1
X	X71	Block	5585	Samarra 1
X	X72	Block	9872	Samarra 1
X	X74	Block	3614	Samarra 1
X	X75	Block	5066	Samarra 1
X	X77	Block	1535	Samarra 1
X	X78	Block	2654	Samarra 1
X	X79	Block	2536	Samarra 1
X	X80	Block	2652	Samarra 1
X	X81	Block	3947	Samarra 1
X	X83	Block	3653	Samarra 1
X	X87	Block	7854	Samarra 1
X	X100	Block	6001	Samarra 1
X	X101	Block	5398	Samarra 1
X	X102	Block	4883	Samarra 1
X	X103	Block	3080	Samarra 1
X	X104	Block	6305	Samarra 1
X	X105	Block	4941	Samarra 1
X	X106	Block	5385	Samarra 1
X	X107	Block	4400	Samarra 1
X	X111	Block	4232	Samarra 1
X	X112	Block	5788	Samarra 1
X	X113	Block	5820	Samarra 1
X	X114	Block	5315	Samarra 1
X	X115	Block	3595	Samarra 1
X	X116	Block	3026	Samarra 1

X	X117	Block	5547	Samarra 1
X	X118	Block	5939	Samarra 1
X	X119	Block	2361	Samarra 1
X	X120	Block	3477	Samarra 1
X	X121	Block	4505	Samarra 1
X	X123	Block	5132	Samarra 1
X	X124	Block	1435	Samarra 1
X	X125	Block	3245	Samarra 1
X	X128	Block	3569	Samarra 1
X	X131	Block	3552	Samarra 1
X	X132	Block	7276	Samarra 1
X	X133	Block	7319	Samarra 1
X	X134	Block	7093	Samarra 1
X	X135	Block	4681	Samarra 1
X	X136	Block	6487	Samarra 1
X	X137	Block	6720	Samarra 1
X	X138	Block	7279	Samarra 1
X	X139	Block	7134	Samarra 1
X	X140	Block	7792	Samarra 1
X	X141	Block	7268	Samarra 1
X	X142	Block	5295	Samarra 1
X	X143	Block	9171	Samarra 1
X	X144	Block	8088	Samarra 1
X	X145	Block	7557	Samarra 1
X	X146	Block	7107	Samarra 1
X	X147	Block	3954	Samarra 1
X	X148	Block	8398	Samarra 1
X	X149	Block	2774	Samarra 1
X	X150	Block	5145	Samarra 1
X	X152	Block	5874	Samarra 1
X	X155	Block	3575	Samarra 1
X	X156	Block	3368	Samarra 1
X	X175	Block	3283	Samarra 1
X	X182	Block	2740	Samarra 1
X	X199	Block	3382	Samarra 1
X	X200	Block	6483	Samarra 1
X	X201	Block	3036	Samarra 1
X	X208	Block	3578	Samarra 1
X	X209	Block	5491	Samarra 1
X	X210	Block	3909	Samarra 1
X	X211	Block	1090	Samarra 1
X	X215	Block	6124	Samarra 1
X	X216	Block	1171	Samarra 1
X	X217	Block	2727	Samarra 1
X	X231	Block	7387	Samarra 1
X	X235	Block	3500	Samarra 1

X	X236	Block	7659	Samarra 1
X	X237	Block	2512	Samarra 1
X	X238	Block	9196	Samarra 1
X	X257	Block	8389	Samarra 1
X	X260	Block	13593	Samarra 1
X	X261	Block	6368	Samarra 1
X	X262	Block	6061	Samarra 1
X	X263	Block	2160	Samarra 1
X	X264	Block	6964	Samarra 1
X	X266	Block	3297	Samarra 1
X	X267	Block	6449	Samarra 1
X	X268	Block	6548	Samarra 1
X	X269	Block	6441	Samarra 1
X	X273	Block	11971	Samarra 1
X	X277	Block	8086	Samarra 1
X	X278	Block	7836	Samarra 1
X	X284	Block	6235	Samarra 1
X	X285	Block	4669	Samarra 1
X	X309	Block	5298	Samarra 1
X	X316	Block	19461	Samarra 1
X	X317	Block	12555	Samarra 1
X	X331	Block	3161	Samarra 1
X	X332	Block	2460	Samarra 1
X	X333	Block	2323	Samarra 1
X	X334	Block	2862	Samarra 1
X	X335	Block	3937	Samarra 1
X	X336	Block	3251	Samarra 1
X	X337	Block	4329	Samarra 1
X	X338	Block	3942	Samarra 1
X	X339	Block	4246	Samarra 1
X	X340	Block	3458	Samarra 1
X	X341	Block	4227	Samarra 1
X	X342	Block	5856	Samarra 1
X	X343	Block	3805	Samarra 1
X	X344	Block	6340	Samarra 1
X	X345	Block	5255	Samarra 1
X	X346	Block	5281	Samarra 1
X	X347	Block	5351	Samarra 1
X	X349	Block	1526	Samarra 1
X	X350	Block	2869	Samarra 1
X	X351	Block	2313	Samarra 1
X	X352	Block	2325	Samarra 1
X	X371	Block	3142	Samarra 1
X	X375	Block	2811	Samarra 1
X	X376	Block	4157	Samarra 1
X	X377	Block	3418	Samarra 1

X	X378	Block	3603	Samarra 1
X	X380	Block	3253	Samarra 1

APPENDIX 2

PALACE	SIZE (m2)	C.A	DESCRIPTION (INTERNAL LAYOUT)
.Qati'at 'Umar (J282)	9842	Yes	Rectangular building. Main reception block with T-Iwan and courtyards north and south
A188	2964	Yes	Rectangular mansion. Reception halls and apartments
al-Muntarad (J13)	41174	Yes	Rectangular residence. The plan is divided into three stripes. Central reception hall with courtyards to the north and south. Polo maydan €
al-Qasr al-Ahmar (H283)	39297	Yes	Irregular residence. Central reception court with courtyards north and south and apartments east and west. Three extra courtyards (N) and a courtyard building (NE)
C171	6637	No	Trapezoidal building. Central courtyard with evidence of rooms northwest corner
C3	7129	No	Irregular building. Three rooms on the east side. The rest of the remains are unexcavated.
C33	5190	Yes ?	Irregular building. Reception with attached courtyard in the middle. Four rooms to the sides.
C99	6873	No	Irregular building. Three courtyards with ten rooms attached to the them divided by a N-S central wall. Evidence of more rooms n the SW corner.
D105	5923	Yes	Rectangular building. Two courtyards separated by a possible reception block and rooms on the southern side.
D150	4774	No	Irregular building. Just evidence of a room on the SW corner.
Dar al-Itakh (H31)	43305	Yes	Rectangular mansion. Basin and three areas of the reception hall. Extension to the west: two courtyards
E103	1012	Yes	Rectangular building. Central courtyard and reception rooms, a secondary courtyard and four courtyard apartments
E45	8552	Yes ?	Rectangular mansion. Evidence of a reception block and a courtyard on the NE corner. While not very preserved, it is very possible that more courtyards would be found SW of the reception block
E80	7247	No	Irregular building. No surviving remains, basin on the west part.
F168	11228	No	Rectangular building. Unexcavated remains (possibly belonged to a Turkish officer)
F195	2326	Yes	Rectangular building. Unexcavated remains (possibly belonged to a Turkish officer)
F255	14625	Yes	Rectangular building. Unexcavated remains (possibly belonged to a Turkish officer)
F256	15764	No	Rectangular building. Unexcavated remains (possibly belonged to a Turkish officer)
F288	29868	Yes	Rectangular building. Unexcavated remains (possibly belonged to a Turkish officer)

F352	24932	No	Rectangular building. Unexcavated remains (possibly belonged to a Turkish officer)
F463	95521	Yes	Rectangular plan with buttressed walls. Three courtyards on the south side lead to the reception rooms. Polo maydan (East)
F571	10624	No	Unexcavated remains (possibly belonged to a Turkish officer)
G13	17201	No	Square building. The courtyard faces to the east. The reception hall is a rectangle projecting into the Yard. Polo maydan (West - 173 x 32m)
H103	4576	Yes	Rectangular building. Consequetion of courtyards in a W-E axis with rooms to the sides.
H105	9198	No	Irregular building. Series of rooms on the north part.
H11	9570	Yes	Rectangular mansion. Series of courtyards separated by a central reception block and evidence of rooms (and smaller courtyards) on the NW corner. Entrance located in the very south
H111	7977	Yes	Irregular building. Three courtyards in the central N-S axis. Three more courtyard separated by rooms on the East segment of the building.
H120	12474	No	Rectangular building. There is a central N-S wall dividing the mansion in two, with W-E courtyards on the east end with rooms attached and central courtyard with ten rooms on the south, east and north part.
H122	8730	Yes	Rectangular building. Central reception block with apartments around the courtyard to the north
H127	9558	Yes	Rectangular residence. Central reception block flanked with courtyards and apartments north and south
H129	2793	Yes	Recentagular residence. Central reception block with two courtyards to the north and south. Separated entrance area on the south part.
H141	5385	Yes	Rectangular mansion. Three consecutive courtyards separated by a possible reception block. A space, possibly occupied with rooms on the west side, separated by a wall
H148	5288	Yes	Rectangular mansion. Four consecutive coutyards with a reception block between the second and third. Rooms and unidentified spaces to the sides.
H159	5757	No	Quadrangular building. Four rooms on the NW corner.
H164	21762	No?	Rectangular building. Central reception block with a minimum of six apartments
H166	8424	No	Rectangular building. Series of unorganised courtyards and palaces in a N-S orientation.
H175	3314	No	Irregular building. Five rooms situated on the center of the residence.
H176	10717	Yes	Square building. The reception hall is flanked by courtyards to the north and south.
H179	8263	Yes	Rectangular building. Three consecutive courtyard with a reception block between the first and second with rooms to the sides.

H180	4223	Yes ?	Rectangular building. Not enough evidence, although traces might suggest multiple consaecutive and narrow courtyards.
H188	44203	Yes ?	Square compound. Square reception hall at the centre (29 x 33m). Other unknown buildings to the east and northwest
H189	23511	Yes	Rectangular compound. Square reception hall at the centre (45 x 45m). Two courtyards on the north side and two others on the south side.
H196	23661	Yes	Rectangular compound. The reception hall at the centre (38 x 53m) has a courtyard to the north. Extra building in the SW corner and apartments in NE
H198	10077	No	Quadrangular compound. Series of walls with N-S axis, but no further evidence.
H219	14630	No	Rectangular compound. Small room in the middle of the compound, no further evidence.
H22	62632	No	Irregular building. Five main courtyards separated by walls. Two of those with rooms attached on the north part.
H23	1219	No	Rectangular building. One main courtyard on the west side, separated by a N-S wall from four rooms.
H231	17403	No	Irregular compound. Series of walls that suggest an unorganised distributiopn of rooms across the plan.
H232	13271	Yes	Irregular building. NW-E orientation with three consecutive courtyard with a possible reception block between the second and the third and a group of rooms on the south side.
H24	1958	No	Irregular building. Courtyard in the NE structure with a series of rooms attached to each corner.
H264	13353	No?	Rectangular building. Rooms located to both ends, possible courtyard(s) in the centre of the structure
H277	3230	Yes	Irregular building. Two consecutive courtyards separated by a reception hall with rooms to the sides.
H28	42355	No	Square building. Buttressed walls (204 x 206m), multiple reception halls and apartments
H376	12707	No?	Irregular building. Traces are inconclusive, bnut strongly suggest a very irregular plan with courtyards of different sizes and orientations surrounded by rooms.
H42	5187	Yes	Rectangular building. Two long N-S consecutive courtyards separated by a reception block. Rooms would have been located on the west side, although no traces remain.
H43	6245	Yes	Trapezoidal building. Three consecutive courtyards on the east side with a reception hall between the second and the third with rooms to the north and smaller courtyards and rooms to the west.
H495	2121	Yes ?	Rectangular building with two courtyards and a residential space in the middle-upper part of the building.
H69	5586	Yes	Rectangular building. Two central consecutive courtyards separated by a reception hall and rooms to the sides.

H72	5578	Yes	Rectangular building. Two central consecutive courtyards with basins separated by a reception hall and rooms to the sides.
H73	2746	No	Trapezoidal building. Eight rooms in the central and east part and three in the east side of a N-S wall.
H83	3347	Yes	Rectangular building with two central couryards and rooms with smaller courtyards to the side.
House of 'Ubaydallah b. Yahya b. Khaqan (R211)	25208	Yes	Rectangular mansion. Two main centrar courtyards divided by a reception hall. To the sides there courtyards with attached rooms. A possible stable or service space on the SE corner
J1072	5764	Yes	Rectangular residence. Reception hall block with courtyards east and west and seven courtyard apartments north and south
J1102	21541	No	Quadrangular compound. Main central courtyard with a basin.
J1131	19,441	No	square reception hall block
J15	180151	No	Central courtyard with a reception and a reception block
J153	35575	Yes	Irregular complex. The main residential building has a central reception hall block with a courtyard behind it and a garden on the Tigris front (just like Balkuwara and Dar al-Khilafa). It also has a basin and ten apartments.
J268	13840	Yes?	Rectangular complex. The main reception block looks at the street with a gatehouse—A courtyard with a basin and pavilion to the east.
J269	8944	No	Rectangular building. Courtyard (75 x 203m) as main element. Reception hall to the far end
J271	9874	No	Trapezoidal building. Four courtyards in the center with a series of rooms attached to varioues sides. Empty space on the west and south segments of the building.
J272	16453	No	Rectangular building. Two courtyards with Iwans
J291	11729	Yes?	Rectangular residence. The central reception hall is an Iwan (E) with another three groups of courtyard buildings.
J36	19815	No	Irregular quadrilateral compound. Five courtyard buildings and other spaces
J40	15499	No	Irregular building. Reception hall block
J524	9818	No	Square building. Oriented to the Qibla rectangular reception hall block (35 x 46 m) and inner courtyard.
J527	30602	No	Square mansion. Two courtyards, a basin and an Iwan
J557	14446	No	Rectangular compound. The location of the reception block is not precise. Two unequal parts divided by a road
J558	7811	Yes	It's a slightly irregular compound. The entrance is from the north. The east side contains the reception block with courtyards north and south—extra building (SE). The west side is an amalgamation of courtyards.
J569	6400	Yes	Two main central courtyards separated by a reception hall with rooms to the NE side.

J662	9515	Yes ?	Rectangular building. Two main courtyards with a basin separated by a reception hall. On the east side there is a series of rooms organised across the N-S axis with a basin.
J680	6246	No	Rectangular residence. T-Iwan faces a basin.
J840	12024	Yes	Rectangular building. Central reception hall block (T-Iwan) surrounded by two courtyards north and south
J847	5110	Yes	Irregular house. Square reception hall block between two courtyards. Five extra courtyards (W)
J862	5565	Yes	Rectangular house. T-Iwan between two courtyards
J878	15396	No	Rectangular house. Unexcavated remains
J953	5298	Yes	Irregular building. Triple reception hall block between two courtyards
J961	3737	Yes	Rectangular building. Reception hall with two courtyards north and south
K14	23518	Yes	Irregular building with three consecutive divided by two residential areas. On the west side, there is N-S courtyard with a series of rooms to the west and north.
K162	4443	Yes ?	It is an irregular building. The very poor preservation limits the interpretation. To the south is a reception block with an attached courtyard and apartments.
K186	12346	Yes	Rectangular building with two consecutive courtyards divided by a reception hall and rooms to the sides.
K207	13660	Yes	Rectangular building. Small reception block with a dome chamber surrounded by apartments and other courtyards
K3	24878	Yes	Rectangular building. Three consecutive courtyards separated by a reception block between the first and the second. Series of rooms and courtyards with W-E orientation to the east
K64	7154	Yes	Rectangular building. The reception hall block has courtyards north and south. Rooms to the east and west could be residential.
L9	5455	Yes	Trapezoidal building. Two coyrtyards separated by a reception hall with rooms to the sides.
M18	8022	Yes	Rectangular building with two central courtyards divided by a reception hall and a series of rooms organised by smaller W-E courtyards.
M19	10524	Yes	Rectangular building with two central courtyards divided by a reception hall and a series of rooms organised by smaller W-E courtyards.
M26	3866	No	Rectangular building with a main courrtyard in the south with a series of N-S rooms and smaller spaces on the north part
M27	3848	No	Rectangular building with a main courrtyard in the south with a series of N-S rooms and smaller spaces on the north part
M28	5003	Yes	Rectangular building with two central courtyards divided by a reception hall and a series of rooms organised by smaller W-E courtyards.
M29	4922	Yes	Rectangular building with two central courtyards divided by a reception hall and a series of rooms organised by smaller W-E courtyards.

M54	10779	Yes	Rectangular building with two central courtyards divided by a reception hall and a series of rooms organised by smaller W-E courtyards.
P2	11707	No	Irregular building. Main courtyard surrounded by rooms a NW-SE courtyard on the south sides with extra rooms. There is an extra courtyard outside of the main building.
Qat'at Abi Ahmad b. al-Rashid (J646)	11147	No	Square building. Central courtyard with surrounding rooms and reception room (S). Extra single room (SW)
Sur al-Wastani (J14)	57819	No	Irregular residence. Reception hall of uncertain plan (47 x 76m)
Sur Ashnas (F1)	128961	Yes	Irregular complex. The main residential building has a central reception hall flanked by courtyards to the north and south and apartments to the east and west. Extra square courtyards (NE and W). Polo Maydan (E)
Sur Jubayriyya (Dar al-Ashfin / K1)	138488	No	Irregular building. Quadrilateral courtyard (N) and a group of reception halls (S)
T1058	5075	Yes	Square building. Polo maydan (50 x 342) on the west side, followed by a courtyard (112 x 123m) and a block of reception halls (cruciform plan with four basilica halls). Apartments occupy the rest of the space.
T1063	10,775	No	After the gate, a rectangular complex with an iwan courtyard is placed. It is the same on the west side but more substantial.
T1064	5494	No	Rectangular residence with a stable by the door, five courtyard apartments in the SE corner and the principal T-shaped courtyard with an Iwan on the S side.
T119	4150	No	Rectangular enclosure with a central Iwan courtyard with adjacent rooms
T122	5143	No?	Rectangular enclosre with two small courtyards to the side separated by rooms. Additional W-E courtyards with rooms in the west side.
T13	907	Yes?	Rectangular mansion. Two courtyards separated by an Iwan with apartments to the west.
T155	8939	No	Rectnagular compound. Four courtyards surrounded by rooms.
T2	7406	No	Rectangular building. Three courtyard houses and an Iwan courtyard (W)
T239	4507	Yes	Recetangular building with two courtyards divided by a reception block and an entrance on the south side.
T269	21754	Yes?	Rectangular mansion. Two big courtyards on the west side with a basin in the second one. A series of courtyards with attached rooms to the west side.
T285	1914	No?	Rectangular residence. Central courtyard with a reception block to the south and apartments to the west. Extra polo maydan (S)

T3 (House no. 4 (1940))	26558	Yes	Recntagular residence. Various consecutive courtyards with rooms of various nature (including residence and service) to the sides and a bason on the West end.
T306	1475	Yes	Rectangular mansion. Two courtyards before the reception block. This is extended north and south with four small courtyards. 12 courtyard units north and seven south
T333	8950	No	Rectangular building. Rooms to The SE side of the compound
T337	11067	Yes ?	Trapezoidal building with two main courtyards with attached rooms. These are not necessarily consecutive. Some additional courtyards with rooms are found on the NE corner
T346	65033	Yes	Rectangular compound with four monumental and consecutive courtyards. The last one has a big basin, and there is a reception hall between the third and fourth. A series of rooms, probably associated to service are located in the corners.
T357	42886	Yes	Rectangular residence. Consecution of a courtyard, reception hall, central courtyard and principal reception block. Basin to the far side and a stable on the left side
T363	33927	Yes ?	Quadrilateral residence. The reception hall block is on a mound with a courtyard in front, and additional buildings are by the entrance. The state is too poor to assign the Yes category fully.
T378	13232	No	Quadrilateral residence. Single pavilion with a basin and two halls
T38	1511	No	Quadrilateral enclosure. The square pavilion (centre) and two extra apartments are on the west. There is also an incomplete courtyard.
T386	3877	No	Rectangular building wiht firve courtyards of different sizes dsitributed across the plan with attached sets of three rooms.
T39	1326	No	Rectangular building with three unidentified spaces.
T4 (House no. 6 (1940) (Serdab al-Harami))	7010	No?	Rectangular building with four main courtyards distributed in each of the corners of the space. These include basins and a series of rooms set next to smaller courtyards.
T403	12473	Yes	Quadrilateral mansion. The Interior, divided by an N-S wall, probably represents the separation between the private and public. In the reception area (public), there are two buildings and a series of courtyards with a reception block.
T407	11931	Yes	Rectangular residence. Central triple-room reception block flanked north and south by two courtyards and east and west by two apartments.
T409	6975	Yes	Rectangular residence. The reception block has a central dome and is preceded by three consecutive courtyards. Courtyards apartments east of the reception hall
T410	3616	Yes	Rectangular residence. Two reception halls with two courtyards, residences to the east and west

T412	6337	Yes	Rectangular residence. Two courtyards separated by a reception hall with rooms east and west.
T43	6100	Yes	Rectangular residence. Two courtyards with a reception hall (Iwan), apartments to the east and west
T435	8422	Yes	Rectangular building. The central courtyard is followed by a reception block (Iwan) to the south. Extra courtyards (N)
T438	4664	No	Rectangular building part of a wider complex. Four main courtyards located in each corner surrounded by rooms.
T44	5194	No	Rectangular building with one central courtyard and a series of rooms attached to its southern side.
T450	3777	No	Rectangular building with four courtyrds distributed on the west and northern side of the building. These have set of three rooms attached.
T477	8494	Yes	Rectanguilar enclosre with two consecutive courtyards with an entrance and additional rooms to the sides.
T491	25321	Yes	Rectangular mansion. Two consecutive courtyards with a reception complex (Iwan). Possibly an extra reception hall/block between the two courtyards. Rooms to the east and west
T492	24339	Yes	Rectangular mansion. Three consecutive courtyards, the first two separated by a hall and the last two a reception block. 10 apartment courtyards to the sides
T5 (House no. 11 (1940))	37388	Yes	Rectangular mansion. Two courtyards lead to a reception block and a basin (29 x 47m). To the sides, there are other four (2 each)
T511	2666	Yes	Rectangular mansion. Central square reception block, possibly with a central dome chamber and courtyards to both sides. Residential quarters to the sides
T532	25937	Yes	Rectangular mansions with three consecutive corutyards with a reception block between the second and the thirtd. There are eleven additional courtyards to which the rooms are attached to.
T538	478	Yes	Rectangular mansion. Two courtyards which lead to the main reception block and a further courtyard. A double line of apartments (W) and a single line (E)
T566	1921	No	Rectangular enclosure with five courtyards of various sizes with rooms attached in sets of three.
T574	21690	Yes	Rectangular mansion with three consecutive courtyards with a reception hall and block. Rooms are located next to smaller courtyards by both sides.
T579	100887	Yes	Rectangular mansion. The reception block has a double entrance on the east and a single one on the west, flanked by two courtyards.
T58	11627	No	The reception hall block has two courtyards (NW and NE). Maydan (48 x 159m) on the south part. Enclosure and rectangular building in the southwest corner
T580	6978	Yes	Rectangular enclosure. Central reception hall with transversals to the east and west and flanked north and south with courtyards with additional rooms to their sides
T597	5877	No	Rectangular compound. Two Iwan courtyards and three wells

T60	7937	Yes	Rectangular mansion with four consecutive courtyards with a reception hall and rooms to the sides.
T606	3729	No	Two small N-S courtyards on the East and West of the structures with various rooms attached. There is also eight rooms with a W-E axis on the west part.
T608	4033	No	Quadrangular structure with a small central courtyard and rooms attached to the north and south walls.
T61	8269	No?	Rectangular structure with a series of courtyards distributed in an almost consecutive way. The most dense area of the building is located in the south with twelve rooms on the east side and eleven to the west
T611	13666	Yes	Rectangular structure with four consecutive courtyards and a reception block that extends W-E with a series of rooms. In the NE corner there is what seems to be a stable.
T612	13385	Yes	Rectangular residence. A square reception block with a dome chamber and a four-Iwan plan is flanked by two courtyards north and south. Courtyard apartments in the NE quadrant. Might be incomplete
T624	10840	Yes	Rectangular residence. The reception block has three parallel halls with porticoes flanked by two courtyards. Four courtyard apartments in the NE and W sides
T657	27833	Yes	Rectangular residence. The reception block has three parallel halls and two courtyards. Further courtyards on the west and east sides
T658	14158	Yes ?	Rectangular compound. Largely unbuilt. A possible reception block followed by courtyards and placed next to lateral courtyards
T677	56508	Yes	Rectangular residence. The reception block is flanked by two courtyards to the east and west. Possible stable by the entrance
T688	4604	Yes	Trapezoidal residence with two central courtyards separated by a reception block and rooms to the sides organised around smaller courtyards.
T7	80145	Yes	Rectnagular structure with four conseccutive structure and a basin in the second one. Evidencec for side rooms are found in the NE corner organised aroudn a series of smaller courtyards.ç
T70	5734	Yes	Rectangular mansion. Unfinished. Central inner enclosure with a reception block (not complete), five courtyard buildings to the NE. Storerooms SW corner
T700	13753	Yes	Rectnagular mansion with two consecutive courtyards separated by a reception hal with a desiganted entrance. Rooms are attached to the north side.
T715	8776	Yes	Rectangular residence. Two courtyards separated by a reception block. Fort courtyard apartments (N)
T75	4030	Yes	Rectangular residence. Dome reception block flanked by two courtyards NE and SW
T767	3692	No	Rectnagular building with five small courtyards distributted across the building with a series of rooms attached.

T77	8014	Yes	Irregular building with two conseccutive courtyards separated by a possible reception block. A series of rooms are attached to both the sides and north of the courtyards,
T776	26678	Yes	Irregular building. Reception hall, which opens onto two courtyards
T8 (House no. 1 Shari' al-A'zam (1981))	23143	Yes ?	Rectangular residence. All construction is at the far end of the structure. The reception hall block has a dome chamber and two opening courtyards—further, seven courtyard apartments.
T817	26651	Yes	Rectangular mansion. The main reception block comprises a T-Iwan with a transverse hall in front surrounded by the central courtyard to the west) and a series of rooms, including a bath, to the north. The entrance (W) has a courtyard with rooms, including a kitchen.
T82	8556	Yes ?	Rectangular residence. Same disposition as T776. An extra polo maydan (T1062) and a mosque (T777)
T833	2379	No	Rectangular buttressed building. Central courtyard surrounded by rooms
T836	39164	Yes	Recntagular building with a living complex within. This has three consecutive courtyards on the west side, while the east is composed by a long N-S corridor with attached courtyards with rooms to both sides.
T837	2511	No	Rectangular compound. Internal structures have a different orientation from the outer wall. The poorly preserved reception block is flanked by two courtyards, one north and one south, and two separate courtyard buildings to the west. Outside, but still within the compound, there is the service space on the NW corner.
T839	1068	No	Trapezoidal building with three identified rooms.
T840	7764	No	Irregular building with a series of unevenly disrtibuted courtyards and rooms.
T843	1874	No	Irregular building with eighteen unidentified spaces.
T849	1481	No?	Three unidentified spaces and an apparent reception hall dividing two of them.
T860	1475	No	Rectangular building with seven rooms and a central courtyard.
T888	36082	Yes	Rectangular encolosre with two central and consecutive courtyards with a series of rooms on both sides. There is evidence of two basins at the east end.
T9 (House no. 3 Shari' al-A'zam (1981))	22607	No	Rectangular complex. Long rectangular maydan (40 x 136m) in the middle of the complex. Series of rooms to the north.
T909	6679	Yes	Rectangular mansion. The main central reception hall is surrounded by east and west courtyards and additional rooms north and south. By the entrance (E), there is a courtyard flanked by rooms (N) and a mosque (S). Iwan in the rooms next to the mosque

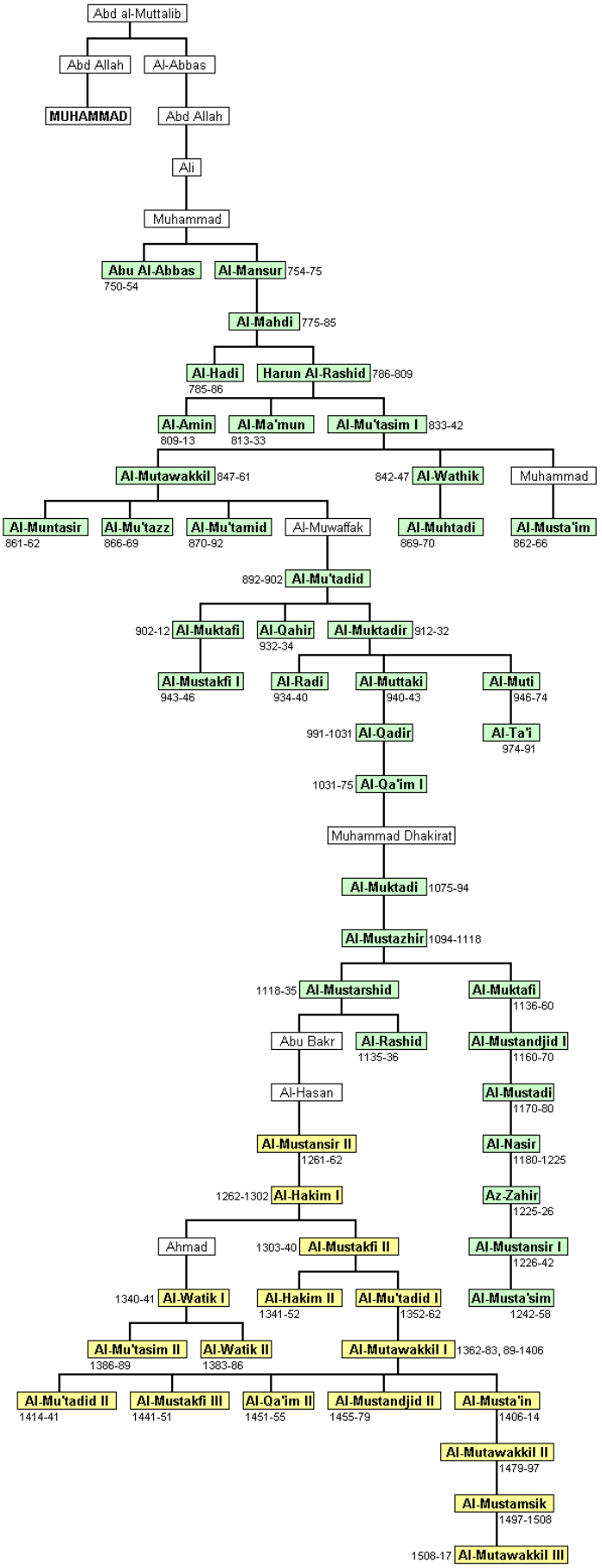
T915	4982	No	Rectangular enclosure divided into two by a central N-S wall. Thwe west side contains one courtyards and four rooms in the south. The east part contains an undefined space on the SW corner.
T968	10874	No	Rectangular structurer with four smaller courtyards on the SW end of the building with a series of rooms attached.
T969	12452	No	Rectangular residence with one courtyard building and a reception block. Probably unfinished
T970	12002	Yes ?	Two courtyards with a basin and a series of rooms and courtyards as dididvidng features.
T972	10670	No	Rectangular compound with two yards and four courtyard buildings by the entrance and a large basin near the end
Tell al-Usaybi'in (Qasr al Ashnas - P16)	24537	No	Rectangular complex with a series of courtyards in different orientations. The northeast corner might contain a workshop.
Tell Tuqan (G2)	2160	No	Rectangular building. Rectangular yard with a possible dome chamber in the centre (poor condition)
The old qati'a of Wasif (H109)	95183	No	The Square building has corner buttresses and a possible dome chamber in the centre.
U100	6622	Yes	Rectangular building. The main entrance on the north side leads to a courtyard (192 x 78m). Central reception hall block with Iwan, courtyard and a series of unexcavated rooms to the east and south
U119	3955	No	Trapezoidal structure with a small courtyard on the SW corner with four rooms attached.
U165	140773	Yes	Rectangular mansion. Three consecutive courtyards that lead to a dome chamber. Various structures are located to the sides, such as courtyards, stables, ssservice spaces and residential rooms. Behind the domed chamber there is a space by the Tigris, possibly a garden.
U171	7699	Yes	Rectangular major residence. The central axis continues the avenue, leading to three consecutive courtyards and a reception block with a transverse hall, Iwan and dome. There is a garden on the far side.
U182	5248	Yes ?	Rectnagular enclosrue with two consecutive courtyards (more or less complete) with a reception block as dividing elements. There a series of rooms and courtyards on the west side.
U184	7441	Yes ?	Courtyard with reception block and series of rooms to the west. They might not have had space to build more courtyards.
U185	5348	Yes	Rectangular residence with two consecutive courtyards and a reception block. Eight courtyard apartments to the sides.
U191	2697	Yes	Rectangular residence. The entrance leads to the Iwan reception block with two courtyards (north and south). Additional four courtyards

U200	8275	No?	Rectangular structure with two spaces on each side (one with a basin) and rooms in the middle. Unclear whether these two spaces were conceived as corutyards or other architectural features.
U266	9018	No	Rectangular enclosure with a central set of rooms and courtyards.
U294	87571	No	Rectangular residence with a stable by the entrance, two courtyard buildings to the right side, and one courtyard with a T-Iwan with three adjacent smaller courtyards in the centre
U345	2546	No	Irregular compound. The central complex lies on the west side and includes a reception hall, three enclosures and other undefined structures. The north side has a reception hall, an L-shaped yard and a polo maidan (32 x 176m). South is not clear
U346	3094	Yes ?	Rectangular enclosure with two small courtyards separated by a possible rception block and a space probably used for rooms on the west side.
U347	3277	No	Rectnagular enclosure with one big courtyard on the SW corner with a series of small rooms attached
U348	6225	Yes	Rectangular enclosure with two courtyards of different sizes with a basin located in the central segment of the buildings with rooms attached to the sides.
U352	2760	No	Rectangular enclosure with scarce evidence of rooms on the south end
U353	2140	No	Rectangular enclosure with scarce evidence of rooms on the south end
U354	2089	No	Rectangular enclosure with scarce evidence of rooms on the south end
U355	3108	No	Rectangular enclosure with scarce evidence of rooms on the south end
U380	2819	Yes	Rectangular encolosure with two consecutive courtyards separated by a W-E line of rooms.
U382	2077	No	Rectangular building with archtiectural remains on the north and south walls of the space.
U384	2730	No	Rectangular building with archtiectural remains on the middle and south wall of the space.
U392	3039	No	Rectangular building with a series of NW-SE rooms and a small courtyards on the SW corner.
U62	87300	Yes	Rectangular mansion with three consecutive courtyards leading to an apparent dome chamber. On the sides there are a series of rooms organised around courtyards of different sizes. It is possible that there was a garden on the SW side by the Tigris.
U92	2966	Yes	Rectangular major residence. The central axis goes through two courtyards to reach a reception block (square) with a garden to the west. There are seven courtyard buildings and a polo maidan north to the central axis. On the south, ten courtyard apartments
U93	4368	No	Rectangular building with one central courtyard and a series of rooms attached to its southern and northern side.

V9	14616	No	Quadrangular compound with scarce architectural evidence; mainly concentrated on the west part.
X1	25084	No	Quadrangular compound with an alleged dome chamber in the centre.
X151	18529	No	Large square residence. Iwan faces outwards and a central dome chamber. More excavations might give more information.
X18	9013	No	Quadrilateral residence. Square reception block and courtyard with a yard to the east. More excavations might give more information.
X270	17537	Yes	Trapezoidal structure with two consecutive courtyards leading to a reception hall (probably with a dome). Series of rooms of various sizes and orientations attached to this central axis around courtyards.
X7	19945	Yes	Quadrilateral complex. Fired monumental entrance in the centre. The central axis leads through two courtyards with three courtyard apartments and a yard to a reception block. Two entrances with parallel halls in the central axis
X76	6507	No	Rectangular residence. Basin (46 x 48m) on the north side with a T-Iwan.
Y3	16234	No	Recntagular basin with no significant architectural remains.

APPENDIX 3

List of Abbasid caliphs. (2025, January 4). In *Wikipedia*. https://en.wikipedia.org/wiki/List_of_Abbasid_caliphs



APPENDIX 4

ID	AREA	DATE	SIZE	N. of ROOMS	N. of COURTYARDS	SPACES	SHAPE	ORIENTATION	N. of ENTRANCES	WATER FEATURE	BUILDING MATERIALS	EXTRA STRUCTURES
A17	A	Samarra 3	97988	156	12	168	Rectangular	N-S	Unkwown	NO	NA	
A37	A	Samarra 3	17001	32	3	35	Rectangular	N-S	1	NO	NA	
A39	A	Samarra 3	1764	29	4	33	Rectangular	N-S	1	NO	NA	
A52	A	Samarra 3	56422	59	4	63	Rectangular	W-E	2	NO	NA	
A53	A	Samarra 3	88455	152	10	162	Rectangular	W-E	Unkwown	YES (1)	NA	
A54	A	Samarra 3	33400	36	2	38	Rectangular	W-E	1	NO	NA	
A57	A	Samarra 3	50021	54	3	57	Rectangular	W-E	2	NO	NA	
A58	A	Samarra 3	28863	61	3	64	Rectangular	W-E	1	NO	NA	
A59	A	Samarra 3	17400	33	3	36	Rectangular	W-E	1	NO	NA	
A73	A	Samarra 3	78334	123	8	131	Rectangular	W-E	Unkwown	YES (1)	NA	

A74	A	Samarra 3	34001	83	5	88	Rectangular	W-E	1	NO	NA	
A75	A	Samarra 3	89582	192	10	202	Rectangular	W-E	2	NO	NA	
A76	A	Samarra 3	70377	128	8	136	Rectangular	W-E	1	NO	NA	
A78	A	Samarra 3	101844	165	8	173	Rectangular	W-E	1	NO	NA	Reception Hall
A79	A	Samarra 3	137703	188	12	200	Rectangular	W-E	1	NO	NA	Monumental entrance (?)
A81	A	Samarra 3	49115	71	6	77	Rectangular	W-E	2	NO	NA	
A85	A	Samarra 3	80770	155	8	163	Rectangular	W-E	1	NO	NA	
A100	A	Samarra 3	69115	66	5	71	Square (Irregular)	W-E	1	YES (5)	NA	Reception Block
A107	A	Samarra 3	29556	48	4	52	Rectangular	W-E	1	YES (1)	NA	
A108	A	Samarra 3	28889	79	5	84	Rectangular	W-E	1	NO	NA	
A109	A	Samarra 3	33338	54	5	59	Rectangular	W-E	1	YES (1)	NA	
A1	A	Samarra 3	25	11	2	13	Trapezoidal	N-S	2	NO	NA	

34			13									
A136	A	Samarra 3	75118	57	7	64	Rectangular	W-E	Unkwown	NO	NA	
A137	A	Samarra 3	55581	81	9	90	Rectangular	W-E	2	NO	NA	
A138	A	Samarra 3	11247	188	20	208	Rectangular	W-E	2	NO	NA	
A139	A	Samarra 3	56334	94	10	104	Rectangular	W-E	2	NO	NA	
A142	A	Samarra 3	35099	28	6	34	Rectangular	N-S	1	NO	NA	
A143	A	Samarra 3	35455	27	5	32	Rectangular	N-S	1	NO	NA	
A161	A	Samarra 3	15444	27	2	29	Rectangular	N-S	1	NO	NA	
A162	A	Samarra 3	33662	27	3	30	Rectangular	N-S	1	NO	NA	
A165	A	Samarra 3	54822	27	7	34	Rectangular	N-S	1	NO	NA	
B4	B	Samarra 3	46155	81	7	88	Rectangular	W-E	1	NO	NA	
B5	B	Samarra 3	57399	39	5	44	Rectangular	W-E	1	NO	NA	
C29	C	Abbasid	120	7	6	13	Rectangular	N-S	Unkwown	NO	NA	

			03									
C38	C	Abbasid	60400	21	5	26	Irregular	W-E	Unkwown	NO	NA	
C43	C	Abbasid	21583	4	21	25	Irregular	N-S	Unkwown	NO	NA	
C46	C	Abbasid	17411	3	0	3	Irregular	W-E	Unkwown	NO	NA	
C47	C	Abbasid	24457	3	0	3	Irregular	W-E	Unkwown	NO	NA	
C51	C	Abbasid	52889	12	3	15	Irregular	N-S	1	NO	NA	
C52	C	Abbasid	42117	10	10	20	Trapezoidal	W-E	Unkwown	NO	NA	
C53	C	Abbasid	723	8	1	9	Rectangular	W-E	1	NO	NA	
C54	C	Abbasid	18887	4	0	4	Irregular	W-E	Unkwown	NO	NA	
C55	C	Abbasid	61668	16	9	25	Irregular	W-E	Unkwown	NO	NA	
C56	C	Abbasid	45113	24	7	31	Irregular	W-E	Unkwown	NO	NA	
C57	C	Abbasid	17117	14	4	18	Irregular	N-S	Unkwown	NO	NA	
C60	C	Abbasid	47644	3	6	9	Rectangular	N-S	1	NO	NA	

C61	C	Abbasid	11011	0	5	5	Trapezoidal	W-E	Unkwown	NO	NA	
C64	C	Abbasid	24220	4	2	6	Rectangular	W-E	1	NO	NA	
C73	C	Abbasid	52332	27	3	30	Irregular	W-E	1	NO	NA	
C74	C	Abbasid	39663	23	7	30	Irregular	W-E	1	NO	NA	
C75	C	Abbasid	18667	3	6	9	Irregular	W-E	1	NO	NA	
C80	C	Abbasid	61112	25	8	33	Rectangular	W-E	1	NO	NA	
C81	C	Abbasid	49099	10	10	20	Rectangular	W-E	Unkwown	NO	NA	
C82	C	Abbasid	50001	10	10	20	Trapezoidal	W-E	Unkwown	NO	NA	
C83	C	Abbasid	22555	4	4	8	Square (Irregular)	N-S	Unkwown	NO	NA	
C84	C	Abbasid	17399	6	3	9	Rectangular	W-E	Unkwown	NO	NA	
C93	C	Abbasid	26333	16	3	19	Rectangular	N-S	1	NO	NA	
C94	C	Abbasid	47000	12	6	18	Irregular	W-E	1	NO	NA	
C95	C	Abbasid	192	20	9	29	Irregular	W-E	Unkwown	NO	NA	

			06									
C96	C	Abbasid	165811	96	27	123	Irregular	W-E	Unkwown	NO	NA	
C119	C	Abbasid	59299	10	8	18	Rectangular	W-E	Unkwown	NO	NA	
C120	C	Abbasid	84111	11	5	16	Rectangular	W-E	2	NO	NA	
C121	C	Abbasid	109448	39	18	57	Irregular	W-E	Unkwown	NO	NA	
C131	C	Abbasid	86118	22	11	33	Square (Irregular)	W-E	Unkwown	NO	NA	
C132	C	Abbasid	70053	12	9	21	Trapezoidal	N-S	2	NO	NA	
C134	C	Abbasid	925	7	2	9	Trapezoidal	W-E	1	NO	NA	
C135	C	Abbasid	40045	3	1	4	Rectangular	W-E	1	NO	NA	
C144	C	Abbasid	58442	14	5	19	Square (Irregular)	N-S	1	NO	NA	
C152	C	Abbasid	70046	3	4	7	Irregular	W-E	Unkwown	NO	NA	
C180	C	Abbasid	32334	6	4	10	Irregular	N-S	1	NO	NA	
D16	D	Sasanian-	52	2	3	5	Rectangular	W-E	1	NO	NA	

		Abbasid	23									
D17	D	Sasanian-Abbasid	7116	7	1	8	Irregular	N-S	1	NO	NA	
D19	D	Sasanian-Abbasid	81999	13	4	17	Rectangular	N-S	1	NO	NA	
D158	D	Sasanian-Abbasid	15890	2	0	2	Trapezoidal	N-S	2	NO	NA	
D160	D	Sasanian-Abbasid	3868	0	0	0	Rectangular	W-E	1	NO	NA	
D161	D	Sasanian-Abbasid	8427	2	0	2	Trapezoidal	W-E	2	NO	NA	
D162	D	Sasanian-Abbasid	6007	0	0	0	Trapezoidal	W-E	1	NO	NA	
E2	E	Samarra 1-2	6841	10	5	15	Rectangular	N-S	2	NO	NA	
E3	E	Samarra 1-2	15228	44	6	50	Rectangular	N-S	2	NO	NA	
E4	E	Samarra 1-2	8212	8	3	11	Rectangular	N-S	1	NO	NA	
E8	E	Samarra 1-2	3153	7	1	8	Rectangular	N-S	1	NO	NA	
E10	E	Samarra 1-2	2673	4	1	5	Rectangular	N-S	1	NO	NA	
E12	E	Samarra 1-2	12	5	0	5	Rectangular	N-S	1	NO	NA	

			32									
E14	E	Samarra 1-2	14200	3	1	4	Rectangular	N-S	1	NO	NA	
E15	E	Samarra 1-2	26777	3	1	4	Rectangular	N-S	1	NO	NA	
E26	E	Samarran	497	5	0	5	Rectangular	W-E	1	NO	NA	
E29	E	Samarran	67768	8	2	10	Irregular	W-E	Unkwown	NO	NA	
E30	E	Samarran	67224	10	2	12	Irregular	W-E	Unkwown	NO	NA	
E31	E	Samarran	3147	4	2	6	Irregular	W-E	Unkwown	NO	NA	
E32	E	Samarran	29544	10	0	10	Rectangular	W-E	Unkwown	NO	NA	
E34	E	Samarran	960	4	0	4	Rectangular	W-E	Unkwown	NO	NA	
E36	E	Samarran	26221	0	0	0	Rectangular	N-S	Unkwown	NO	NA	
E37	E	Samarran	31700	0	0	0	Irregular	N-S	Unkwown	NO	NA	
E39	E	Samarran	12133	5	0	0	Irregular	N-S	Unkwown	NO	NA	
E40	E	Samarran	6133	2	0	0	Rectangular	N-S	1	NO	NA	
E42	E	Samarran	21887	4	1	5	Rectangular	W-E	2	NO	NA	

E43	E	Samarran	5058	10	4	14	Rectangular	W-E	2	NO	NA	
E44	E	Samarran	17904	16	3	19	Irregular	W-E	Unkwown	NO	NA	
E52	E	Samarran	14900	4	0	4	Trapezoidal	N-S	Unkwown	NO	NA	
E53	E	Samarran	41688	9	1	10	Irregular	N-S	Unkwown	NO	NA	
E54	E	Samarran	21600	2	0	2	Rectangular	N-S	Unkwown	NO	NA	
E56	E	Samarran	53744	13	8	21	Rectangular	W-E	Unkwown	NO	NA	
E57	E	Samarran	48955	8	0	8	Rectangular	W-E	Unkwown	NO	NA	
E63	E	Samarran	33881	14	8	22	Rectangular	N-S	Unkwown	NO	NA	
E75	E	Samarran	20554	8	0	8	Rectangular	N-S	Unkwown	NO	NA	
E78	E	Samarran	53000	10	4	14	Irregular	N-S	Unkwown	NO	NA	Reception Block
E82	E	Samarran	98866	0	0	0	Irregular	N-S	Unkwown	NO	NA	
E93	E	Samarran	32222	12	0	12	Rectangular	N-S	Unkwown	NO	NA	

E95	E	Samarran	6023	2	0	2	Rectangular	N-S	Unkwown	NO	NA	
E1000	E	Samarran	1492	0	0	0	Irregular	W-E	Unkwown	NO	NA	
E1001	E	Samarran	13663	0	0	0	Irregular	W-E	Unkwown	NO	NA	
E1002	E	Samarran	16288	0	0	0	Irregular	W-E	Unkwown	NO	NA	
E1004	E	Samarran	10764	7	2	9	Irregular	W-E	Unkwown	NO	NA	
E1005	E	Samarran	7184	5	1	6	Rectangular	W-E	1	NO	NA	
E1006	E	Samarran	8674	0	0	0	Rectangular	W-E	Unkwown	NO	NA	
E1007	E	Samarran	95771	6	3	9	Irregular	W-E	1	NO	NA	
E1008	E	Samarran	10446	0	0	0	Irregular	W-E	2	NO	NA	
E1009	E	Samarran	13146	6	4	10	Rectangular	W-E	2	NO	NA	Reception Block
E1110	E	Samarran	11641	0	0	0	Rectangular	W-E	2	NO	NA	
E1	E	Samarran	60	0	0	0	Rectangular	W-E	2	NO	NA	

111			05									
E112	E	Samarran	8482	6	2	8	Rectangular	W-E	1	NO	NA	
E113	E	Samarran	9783	0	0	0	Rectangular	W-E	2	NO	NA	
E115	E	Samarran	17776	0	0	0	Irregular	W-E	2	NO	NA	
E116	E	Samarran	2486	10	0	10	Rectangular	N-S	Unkwown	NO	NA	
E117	E	Samarran	2615	10	0	10	Rectangular	N-S	Unkwown	NO	NA	
E119	E	Samarran	1768	4	0	4	Rectangular	N-S	Unkwown	NO	NA	
E120	E	Samarran	1017	2	0	0	Rectangular	N-S	Unkwown	NO	NA	
E121	E	Samarran	3154	11	0	11	Rectangular	N-S	Unkwown	NO	NA	
E122	E	Samarran	1884	12	0	12	Rectangular	N-S	Unkwown	NO	NA	
E123	E	Samarran	3220	12	0	12	Rectangular	N-S	Unkwown	NO	NA	
E124	E	Samarran	2613	12	0	12	Rectangular	N-S	Unkwown	NO	NA	
E125	E	Samarran	3094	12	0	12	Rectangular	N-S	Unkwown	NO	NA	

E126	E	Samarran	3240	12	0	12	Rectangular	N-S	Unkwown	NO	NA	
E128	E	Samarran	5661	13	1	14	Rectangular	N-S	Unkwown	NO	NA	
E129	E	Samarran	2639	10	0	10	Rectangular	N-S	Unkwown	NO	NA	
E130	E	Samarran	2858	10	0	10	Rectangular	N-S	Unkwown	NO	NA	
E131	E	Samarran	5391	0	0	0	Rectangular	N-S	Unkwown	NO	NA	
E132	E	Samarran	5849	2	0	2	Rectangular	N-S	Unkwown	NO	NA	
E133	E	Samarran	6142	2	0	2	Rectangular	N-S	Unkwown	NO	NA	
E134	E	Samarran	6252	2	0	2	Rectangular	N-S	Unkwown	NO	NA	
E142	E	Samarran	3894	2	1	3	Rectangular	W-E	1	NO	NA	
E143	E	Samarran	1359	0	0	0	Rectangular	W-E	Unkwown	NO	NA	
E144	E	Samarran	2642	4	1	5	Rectangular	W-E	1	NO	NA	
E146	E	Samarran	10117	12	5	17	Irregular	W-E	Unkwown	NO	NA	

E148	E	Samarran	2408	3	1	4	Rectangular	W-E	1	NO	NA	
E150	E	Samarran	1166	0	0	0	Rectangular	W-E	Unkwown	NO	NA	
E151	E	Samarran	823	0	0	0	Rectangular	W-E	Unkwown	NO	NA	
E152	E	Samarran	3979	3	1	4	Rectangular	W-E	1	NO	NA	
E153	E	Samarran	4294	2	2	4	Rectangular	N-S	1	NO	NA	
E154	E	Samarran	40006	6	1	7	Rectangular	N-S	1	NO	NA	
E155	E	Samarran	3905	12	2	14	Rectangular	N-S	1	NO	NA	
E156	E	Samarran	3815	16	5	21	Rectangular	N-S	1	NO	NA	
E157	E	Samarran	3407	10	2	12	Rectangular	N-S	1	NO	NA	
E158	E	0	50007	3	2	5	Rectangular	W-E	Unkwown	NO	NA	
E159	E	0	4271	0	0	0	Rectangular	N-S	Unkwown	NO	NA	
E160	E	0	4217	0	0	0	Rectangular	N-S	Unkwown	NO	NA	
E1	E	0	768	3	0	3	Rectangular	N-S	Unkwown	NO	NA	

62												
E163	E	0	1732	6	0	6	Rectangular	N-S	Unkwown	NO	NA	
F4	F	Samarran	148110	18	7	25	Rectangular	N-S	1	NO	NA	
F8	F	Samarran	3891	8	5	13	Rectangular	N-S	1	NO	NA	
F9	F	Samarran	7004	34	11	45	Irregular	N-S	1	NO	NA	
F10	F	Samarran	7024	15	9	24	Rectangular	N-S	1	NO	NA	
F14	F	Samarra 2	2551	0	0	0	Rectangular	N-S	Unkwown	NO	NA	
F15	F	Samarra 2	3490	0	0	0	Rectangular	N-S	Unkwown	NO	NA	
F16	F	Samarra 2	3430	0	0	0	Rectangular	N-S	Unkwown	NO	NA	
F17	F	Samarra 2	3464	0	0	0	Rectangular	N-S	Unkwown	NO	NA	
F18	F	Samarra 2	3077	0	0	0	Rectangular	N-S	Unkwown	NO	NA	
F19	F	Samarra 2	3329	0	0	0	Rectangular	N-S	Unkwown	NO	NA	
F20	F	Samarra 2	3223	0	0	0	Rectangular	N-S	Unkwown	NO	NA	

F23	F	Samarra 2	7727	3	3	6	Rectangular	N-S	1	NO	NA	
F24	F	Samarra 2	7690	9	5	14	Rectangular	N-S	1	NO	NA	
F25	F	Samarra 2	7222	10	3	13	Irregular	N-S	1	NO	NA	
F34	F	Samarran	4214	36	9	45	Rectangular	N-S	1	NO	NA	
F35	F	Samarran	4665	19	18	37	Rectangular	N-S	1	NO	NA	
F36	F	Samarran	4742	32	18	50	Rectangular	N-S	1	NO	NA	
F37	F	Samarran	4843	36	19	55	Rectangular	N-S	1	NO	NA	
F38	F	Samarran	4946	34	18	52	Rectangular	N-S	1	NO	NA	
F39	F	Samarran	5236	15	15	30	Rectangular	N-S	1	NO	NA	
F40	F	Samarran	5835	18	15	33	Rectangular	N-S	1	NO	NA	
F41	F	Samarran	3245	24	12	36	Rectangular	N-S	1	NO	NA	
F42	F	Samarran	2432	12	9	21	Rectangular	N-S	1	NO	NA	
F43	F	Samarran	29	3	5	8	Rectangular	N-S	1	NO	NA	

			16									
F54	F	Samarran	89599	1	2	3	Rectangular	N-S	1	NO	NA	
F55	F	Samarran	44427	4	5	9	Rectangular	N-S	1	NO	NA	
F56	F	Samarran	48099	23	16	39	Rectangular	N-S	1	NO	NA	
F57	F	Samarran	53088	12	12	24	Rectangular	N-S	1	NO	NA	
F58	F	Samarran	51411	17	11	28	Rectangular	N-S	1	NO	NA	
F59	F	Samarran	52555	12	10	22	Rectangular	N-S	1	NO	NA	
F60	F	Samarran	55517	10	10	20	Rectangular	N-S	1	NO	NA	
F61	F	Samarran	62288	19	14	33	Rectangular	N-S	1	NO	NA	
F62	F	Samarran	57488	16	13	29	Rectangular	N-S	1	NO	NA	
F63	F	Samarran	34211	4	1	5	Rectangular	N-S	1	NO	NA	
F68	F	Samarran	61588	4	1	5	Rectangular	N-S	1	NO	NA	
F69	F	Samarran	10057	11	3	14	Rectangular	N-S	1	NO	NA	

F70	F	Samarran	98099	16	7	23	Rectangular	N-S	1	NO	NA	
F71	F	Samarran	10496	13	8	21	Rectangular	N-S	1	NO	NA	
F72	F	Samarran	11338	11	4	15	Rectangular	N-S	1	NO	NA	
F73	F	Samarran	9675	10	7	17	Rectangular	N-S	1	NO	NA	
F75	F	Samarran	4213	9	12	21	Rectangular	N-S	1	NO	NA	
F76	F	Samarran	4502	7	14	21	Rectangular	N-S	1	NO	NA	
F77	F	Samarran	4466	2	9	11	Rectangular	N-S	1	NO	NA	
F78	F	Samarran	4248	5	14	19	Rectangular	N-S	1	NO	NA	
F79	F	Samarran	4315	5	9	14	Rectangular	N-S	1	NO	NA	
F80	F	Samarran	4255	0	6	6	Rectangular	N-S	1	NO	NA	
F81	F	Samarran	4556	14	7	21	Rectangular	N-S	1	NO	NA	
F82	F	Samarran	3041	14	3	17	Rectangular	N-S		NO	NA	

F90	F	Samarran	110009	24	17	41	Rectangular	N-S	1	NO	NA	
F91	F	Samarran	112245	29	24	53	Rectangular	N-S	1	NO	NA	
F92	F	Samarra 1	111103	16	17	33	Rectangular	N-S	1	NO	NA	
F93	F	Samarra 1	112228	12	14	26	Rectangular	N-S	1	NO	NA	
F94	F	Samarra 1	133111	16	19	35	Rectangular	N-S	1	NO	NA	
F95	F	Samarra 1	109004	13	12	25	Rectangular	N-S	1	NO	NA	
F96	F	Samarra 1	100047	5	5	10	Rectangular	N-S	1	NO	NA	
F97	F	Samarra 1	108119	9	9	18	Rectangular	N-S	1	NO	NA	
F98	F	Samarra 1	105574	15	11	26	Rectangular	N-S	1	NO	NA	
F99	F	Samarra 1	109008	5	6	11	Rectangular	N-S	1	NO	NA	

F1000	F	Samarra 1	10926	6	7	13	Rectangular	N-S	1	NO	NA	
F1001	F	Samarra 1	11293	7	4	11	Rectangular	N-S	1	NO	NA	
F1002	F	Samarra 1	10897	8	10	18	Rectangular	N-S	1	NO	NA	
F1003	F	Samarra 1	10689	15	18	33	Rectangular	N-S	1	NO	NA	
F1004	F	Samarra 1	11873	9	6	15	Rectangular	N-S	1	NO	NA	
F1005	F	Samarra 1	10411	20	14	34	Rectangular	N-S	1	NO	NA	
F1006	F	Samarra 1	10928	28	13	41	Rectangular	N-S	1	NO	NA	
F1255	F	Samarra 1	14613	9	9	18	Irregular	N-S	1	NO	NA	
F1266	F	Samarra 1	15676	5	5	10	Rectangular	N-S	1	NO	NA	
F1277	F	Samarra 1	16809	9	6	15	Rectangular	N-S	1	NO	NA	

F128	F	Samarra 1	160008	29	17	46	Rectangular	N-S	1	NO	NA	
F129	F	Samarra 1	156007	54	20	74	Rectangular	N-S	1	NO	NA	
F130	F	Samarra 1	169113	30	15	45	Rectangular	N-S	1	NO	NA	
F131	F	Samarra 1	157200	10	12	22	Rectangular	N-S	1	NO	NA	
F132	F	Samarra 1	158882	8	7	15	Rectangular	N-S	1	NO	NA	
F133	F	Samarra 1	158895	23	13	36	Rectangular	N-S	1	NO	NA	
F134	F	Samarra 1	165334	34	14	48	Rectangular	N-S	1	NO	NA	
F135	F	Samarra 1	182322	28	22	50	Rectangular	N-S	1	NO	NA	
F136	F	Samarra 1	155526	42	23	65	Rectangular	N-S	1	NO	NA	
F137	F	Samarra 1	161444	41	21	62	Rectangular	N-S	1	NO	NA	

F160	F	Samarra 1	4048	4	2	6	Irregular	N-S	1	NO	NA	
F161	F	Samarra 1	67444	50	4	54	Rectangular	N-S	1	NO	NA	Reception Block
F162	F	Samarra 1	61115	13	6	19	Rectangular	N-S	1	NO	NA	Rception Block
F163	F	Samarra 1	63411	7	8	15	Rectangular	N-S	1	NO	NA	
F164	F	Samarra 1	61711	6	6	12	Rectangular	N-S	1	NO	NA	
F165	F	Samarra 1	59999	11	6	17	Rectangular	N-S	1	NO	NA	
F166	F	Samarra 1	69244	11	5	16	Rectangular	N-S	1	NO	NA	
F172	F	Samarra 1	78733	10	8	18	Rectangular	N-S	1	NO	NA	
F174	F	Samarra 1	78879	22	8	30	Rectangular	N-S	1	NO	NA	
F176	F	Samarra 1	77772	23	8	31	Rectangular	N-S	1	NO	NA	
F177	F	Samarra 1	46099	22	6	28	Rectangular	N-S	1	NO	NA	
F178	F	Samarra 1	69066	8	3	11	Rectangular	N-S	1	NO	NA	

F196	F	Samarra 1	182336	44	22	66	Rectangular	N-S	1	NO	NA	
F197	F	Samarra 1	172254	55	15	70	Rectangular	N-S	1	NO	NA	
F198	F	Samarra 1	157336	30	14	44	Rectangular	N-S	1	NO	NA	
F199	F	Samarra 1	171138	16	13	29	Rectangular	N-S	1	NO	NA	
F200	F	Samarra 1	171101	32	14	46	Rectangular	N-S	1	NO	NA	
F201	F	Samarra 1	171178	12	10	22	Rectangular	N-S	1	NO	NA	
F202	F	Samarra 1	172227	26	10	36	Rectangular	N-S	1	NO	NA	
F203	F	Samarra 1	94445	24	15	39	Rectangular	N-S	1	NO	NA	
F204	F	Samarra 1	159997	50	19	69	Rectangular	N-S	1	NO	NA	
F205	F	Samarra 1	159667	27	20	47	Rectangular	N-S	1	NO	NA	

F206	F	Samarra 1	158311	24	4	28	Rectangular	N-S	1	NO	NA	
F207	F	Samarra 1	113544	12	7	19	Rectangular	N-S	1	NO	NA	
F208	F	Samarra 1	70988	15	5	20	Irregular	N-S	1	NO	NA	
F212	F	Samarra 1	123377	6	5	11	Rectangular	N-S	1	NO	NA	
F213	F	Samarra 1	164611	10	10	20	Rectangular	N-S	1	NO	NA	
F216	F	Samarra 1	192833	39	14	53	Rectangular	N-S	1	NO	NA	
F217	F	Samarra 1	186644	36	24	60	Rectangular	N-S	1	NO	NA	
F218	F	Samarra 1	170522	15	19	34	Rectangular	N-S	1	NO	NA	
F219	F	Samarra 1	171115	18	19	37	Rectangular	N-S	1	NO	NA	
F220	F	Samarra 1	173411	35	21	56	Rectangular	N-S	1	NO	NA	

F221	F	Samarra 1	17722	15	7	22	Rectangular	N-S	1	NO	NA	
F222	F	Samarra 1	17401	45	17	62	Rectangular	N-S	1	NO	NA	reception block
F223	F	Samarra 1	10024	47	14	61	Rectangular	N-S	1	NO	NA	Reception Block
F224	F	Samarra 1	16486	58	15	73	Rectangular	N-S	1	NO	NA	
F225	F	Samarra 1	16452	34	11	45	Rectangular	N-S	1	NO	NA	Reception Block
F226	F	Samarra 1	16187	49	16	65	Rectangular	N-S	1	NO	NA	
F227	F	Samarra 1	13411	54	15	69	Rectangular	N-S	1	NO	NA	Reception Block
F229	F	Samarra 1	13654	23	8	31	Rectangular	N-S	1	NO	NA	
F230	F	Samarra 1	89622	31	8	39	Rectangular	N-S	1	NO	NA	
F232	F	Samarra 1	13215	16	4	20	Rectangular	N-S	1	NO	NA	

F233	F	Samarra 1	132222	11	14	25	Rectangular	N-S	1	NO	NA	
F235	F	Samarra 1	116699	7	3	10	Rectangular	N-S	1	NO	NA	
F236	F	Samarra 1	102600	4	5	9	Rectangular	N-S	1	NO	NA	
F237	F	Samarra 1	104644	11	4	15	Rectangular	N-S	1	NO	NA	
F238	F	Samarra 1	106744	14	7	21	Rectangular	N-S	1	NO	NA	
F239	F	Samarra 1	107044	12	5	17	Rectangular	N-S	1	NO	NA	
F241	F	Samarra 1	95400	6	11	17	Rectangular	N-S	1	NO	NA	
F242	F	Samarra 1	100010	13	8	21	Rectangular	N-S	1	NO	NA	
F243	F	Samarra 1	55771	8	4	12	Rectangular	N-S	1	NO	NA	
F244	F	Samarra 2	67144	0	0	0	Rectangular	N-S	1	NO	NA	
F245	F	Samarra 2	57600	6	6	12	Rectangular	N-S	1	NO	NA	

F246	F	Samarra 2	5066	69	17	86	Rectangular	N-S	1	NO	NA	
F247	F	Samarra 2	5357	31	18	49	Rectangular	N-S	1	NO	NA	
F248	F	Samarra 2	3715	22	5	27	Rectangular	N-S	1	NO	NA	
F249	F	Samarra 2	5045	21	11	32	Rectangular	N-S	1	NO	NA	
F250	F	Samarra 2	4703	16	11	27	Rectangular	N-S	1	NO	NA	
F252	F	Samarra 2	1370	6	0	6	Rectangular	N-S	1	NO	NA	
F258	F	Samarra 1 or later	8997	6	4	10	Rectangular	N-S	1	NO	NA	
F261	F	Samarra 1 or later	9137	17	8	25	Rectangular	N-S	1	NO	NA	reception block
F262	F	Samarra 1 or later	9341	14	7	21	Rectangular	N-S	1	NO	NA	
F263	F	Samarra 1 or later	9370	9	7	16	Rectangular	N-S	1	NO	NA	
F264	F	Samarra 1 or later	5004	3	3	6	Rectangular	N-S	1	NO	NA	
F266	F	Samarra 1 or later	8024	6	1	7	Rectangular	N-S	1	NO	NA	

F267	F	Samarra 1 or later	82666	15	8	23	Rectangular	N-S	1	NO	NA	
F268	F	Samarra 1 or later	69667	7	5	12	Rectangular	N-S	1	NO	NA	
F269	F	Samarra 1 or later	65111	8	2	10	Rectangular	N-S	1	NO	NA	
F270	F	Samarra 1 or later	68669	9	5	14	Rectangular	N-S	1	NO	NA	
F271	F	Samarra 1 or later	64266	7	8	15	Rectangular	N-S	1	NO	NA	
F272	F	Samarra 1 or later	69099	7	8	15	Rectangular	N-S	1	NO	NA	
F273	F	Samarra 2	51266	2	0	2	Rectangular	N-S	1	NO	NA	
F275	F	Samarra 2	39334	9	1	10	Rectangular	N-S	1	NO	NA	
F276	F	Samarra 2	42033	12	0	12	Rectangular	N-S	1	NO	NA	
F277	F	Samarra 2	39111	7	3	10	Rectangular	N-S	1	NO	NA	
F280	F	Samarra 2	42257	22	4	26	Rectangular	N-S	1	NO	NA	
F281	F	Samarra 2	42275	23	3	26	Rectangular	N-S	1	NO	NA	
F2	F	Samarra 2	40	8	4	12	Rectangular	N-S	1	NO	NA	

82			33									
F283	F	Samarra 2	33922	17	2	19	Rectangular	N-S	1	NO	NA	
F284	F	Samarra 2	33922	14	2	16	Rectangular	N-S	1	NO	NA	
F286	F	Samarra 1	210669	26	10	36	Rectangular	N-S	1	NO	NA	
F287	F	Samarra 1	121466	23	3	26	Rectangular	N-S	1	NO	NA	
F290	F	Samarra 1	224330	14	8	22	Rectangular	N-S	1	NO	NA	
F291	F	Samarra 1	199996	5	4	9	Rectangular	N-S	1	NO	NA	
F292	F	Samarra 1	206685	0	0	0	Rectangular	N-S	1	NO	NA	
F293	F	Samarra 1	216110	5	4	9	Rectangular	N-S	1	NO	NA	
F294	F	Samarra 1	217444	12	12	24	Rectangular	N-S	1	NO	NA	
F295	F	Samarra 1	208332	19	14	33	Rectangular	N-S	1	NO	NA	

F296	F	Samarra 1	12059	16	4	20	Rectangular	N-S	1	NO	NA	
F299	F	Samarra 1	11831	3	1	4	Rectangular	N-S	1	NO	NA	
F301	F	Samarra 1	12201	14	8	22	Rectangular	N-S	1	NO	NA	
F302	F	Samarra 1	6378	9	3	12	Rectangular	N-S	1	NO	NA	
F303	F	Samarra 1	73911	15	6	21	Rectangular	N-S	1	NO	NA	
F307	F	Samarra 1	5644	14	6	20	Rectangular	N-S	1	NO	NA	
F308	F	Samarra 1	90111	15	11	26	Rectangular	N-S	1	NO	NA	
F309	F	Samarra 1	5467	11	7	18	Rectangular	N-S	1	NO	NA	
F310	F	Samarra 1	9497	10	12	22	Rectangular	N-S	1	NO	NA	
F311	F	Samarra 1	5365	7	9	16	Rectangular	N-S	1	NO	NA	
F313	F	Samarra 1	48511	7	1	8	Rectangular	N-S	1	NO	NA	
F322	F	Samarra 2	59311	7	2	9	Rectangular	N-S	1	NO	NA	

F323	F	Samarra 2	6050	21	4	25	Rectangular	N-S	1	NO	NA	
F324	F	Samarra 2	6143	22	1	23	Rectangular	N-S	1	NO	NA	
F325	F	Samarra 2	5941	16	10	26	Rectangular	N-S	1	NO	NA	
F326	F	Samarra 2	6257	19	4	23	Rectangular	N-S	1	NO	NA	
F327	F	Samarra 2	6095	33	2	35	Rectangular	N-S	1	NO	NA	
F328	F	Samarra 2	58366	15	4	19	Rectangular	N-S	1	NO	NA	
F329	F	Samarra 2	58666	14	6	20	Rectangular	N-S	1	NO	NA	
F330	F	Samarra 2	6061	22	3	25	Rectangular	N-S	1	NO	NA	
F331	F	Samarra 2	6138	1	4	5	Rectangular	N-S	1	NO	NA	
F332	F	Samarra 2	6299	3	1	4	Rectangular	N-S	1	NO	NA	
F333	F	Samarra 2	59337	21	3	24	Rectangular	N-S	1	NO	NA	
F339	F	Samarra 2	32733	2	0	2	Rectangular	N-S	1	NO	NA	
F3	F	Samarra 2	32	1	2	3	Rectangular	N-S	1	NO	NA	

40			12									
F341	F	Samarra 2	33776	18	1	19	Rectangular	N-S	1	NO	NA	
F342	F	Samarra 2	32667	9	5	14	Rectangular	N-S	1	NO	NA	
F343	F	Samarra 2	33661	16	16	32	Rectangular	N-S	1	NO	NA	
F344	F	Samarra 2	35571	5	4	9	Rectangular	N-S	1	NO	NA	
F345	F	Samarra 2	31887	0	0	0	Rectangular	N-S	1	NO	NA	
F346	F	Samarra 2	30299	6	2	8	Rectangular	N-S	1	NO	NA	
F347	F	Samarra 2	30881	20	0	20	Rectangular	N-S	1	NO	NA	
F348	F	Samarra 2	27883	15	0	15	Rectangular	N-S	1	NO	NA	
F349	F	Samarra 2	14997	6	1	7	Rectangular	N-S	1	NO	NA	
F353	F	Samarra 1	207220	23	20	43	Rectangular	N-S	1	NO	NA	
F354	F	Samarra 1	211181	50	10	60	Rectangular	N-S	1	NO	NA	
F3	F	Samarra 1	172	18	13	31	Rectangular	N-S	1	NO	NA	

55			68									
F356	F	Samarra 1	172001	45	15	60	Rectangular	N-S	1	NO	NA	
F357	F	Samarra 1	180075	41	10	51	Rectangular	N-S	1	NO	NA	
F358	F	Samarra 1	177718	12	10	22	Rectangular	N-S	1	NO	NA	
F359	F	Samarra 1	166666	4	3	7	Rectangular	N-S	1	NO	NA	
F360	F	Samarra 1	44461	4	2	6	Rectangular	N-S	1	NO	NA	
F361	F	Samarra 1	108668	17	4	21	Rectangular	N-S	1	NO	NA	
F362	F	Samarra 1	45112	5	4	9	Rectangular	N-S	1	NO	NA	
F363	F	Samarra 1	112444	22	12	34	Rectangular	N-S	1	NO	NA	
F364	F	Samarra 1	79999	2	1	3	Rectangular	W-E	1	NO	NA	
F365	F	Samarra 1	109772	12	9	21	Rectangular	N-S	1	NO	NA	

F366	F	Samarra 1	9221	17	7	24	Rectangular	N-S	1	NO	NA	
F367	F	Samarra 1	3636	29	5	34	Rectangular	N-S	1	NO	NA	
F368	F	Samarra 1	9263	21	7	28	Rectangular	N-S	1	NO	NA	
F369	F	Samarra 1	3616	5	3	8	Rectangular	N-S	1	NO	NA	
F370	F	Samarra 1	9028	20	6	26	Rectangular	N-S	1	NO	NA	
F371	F	Samarra 1	3769	23	4	27	Rectangular	N-S	1	NO	NA	
F372	F	Samarra 1	8878	6	5	11	Rectangular	N-S	1	NO	NA	
F375	F	Samarra 1	7856	5	1	6	Rectangular	N-S	1	NO	NA	
F378	F	Samarra 2	1283	8	0	8	Rectangular	N-S	1	NO	NA	
F379	F	Samarra 2	650	3	0	3	Rectangular	N-S	1	NO	NA	
F380	F	Samarra 2	1785	12	0	12	Rectangular	N-S	1	NO	NA	
F381	F	Samarra 2	1729	0	0	0	Rectangular	N-S	1	NO	NA	
F3	F	Samarra 2	25	8	1	9	Rectangular	N-S	1	NO	NA	

82			30									
F383	F	Samarra 2	17600	5	1	6	Rectangular	N-S	1	NO	NA	
F384	F	Samarra 2	24755	1	1	2	Rectangular	N-S	1	NO	NA	
F385	F	Samarra 2	12663	0	0	0	Rectangular	N-S	1	NO	NA	
F386	F	Samarra 2	11129	0	0	0	Rectangular	N-S	1	NO	NA	
F387	F	Samarra 2	17005	0	0	0	Rectangular	N-S	1	NO	NA	
F388	F	Samarra 2	14900	0	0	0	Rectangular	N-S	1	NO	NA	
F389	F	Samarra 2	16488	0	0	0	Rectangular	N-S	1	NO	NA	
F390	F	Samarra 2	19033	0	0	0	Rectangular	N-S	1	NO	NA	
F391	F	Samarra 2	72488	5	5	10	Rectangular	N-S	1	NO	NA	
F392	F	Samarra 2	57331	16	2	18	Rectangular	N-S	1	NO	NA	
F393	F	Samarra 2	58444	15	2	17	Rectangular	N-S	1	NO	NA	
F394	F	Samarra 2	55600	0	2	2	Rectangular	N-S	1	NO	NA	

F395	F	Samarra 2	5340	6	4	10	Rectangular	N-S	1	NO	NA	
F396	F	Samarra 2	5126	16	1	17	Rectangular	N-S	1	NO	NA	
F397	F	Samarra 2	5375	5	1	6	Rectangular	N-S	1	NO	NA	
F398	F	Samarra 2	5315	0	0	0	Rectangular	N-S	1	NO	NA	
F399	F	Samarra 2	5534	0	0	0	Rectangular	N-S	1	NO	NA	
F400	F	Samarra 2	6088	0	0	0	Rectangular	N-S	1	NO	NA	
F401	F	Samarra 2	4886	0	0	0	Rectangular	N-S	1	NO	NA	
F402	F	Samarra 2	5430	5	0	5	Rectangular	N-S	1	NO	NA	
F403	F	Samarra 2	5445	2	2	4	Rectangular	N-S	1	NO	NA	
F406	F	Samarra 1	9502	18	16	34	Rectangular	N-S	1	NO	NA	reception block
F407	F	Samarra 1	8740	13	5	18	Rectangular	N-S	1	NO	NA	reception block
F408	F	Samarra 1	8780	16	6	22	Rectangular	N-S	1	NO	NA	

F409	F	Samarra 1	6822	8	10	18	Rectangular	N-S	1	NO	NA	
F410	F	Samarra 1	6449	15	4	19	Rectangular	N-S	1	NO	NA	
F411	F	Samarra 1	9644	9	6	15	Rectangular	N-S	1	NO	NA	
F412	F	Samarra 1	8416	39	7	46	Rectangular	N-S	1	NO	NA	reception block
F413	F	Samarra 1	8032	32	10	42	Rectangular	N-S	1	NO	NA	
F415	F	Samarra 1	6657	14	9	23	Rectangular	N-S	1	NO	NA	
F416	F	Samarra 1	6772	14	4	18	Rectangular	N-S	1	NO	NA	
F417	F	Samarra 1	6749	14	6	20	Rectangular	N-S	1	NO	NA	
F418	F	Samarra 1	6810	22	5	27	Rectangular	N-S	1	NO	NA	
F419	F	Samarra 1	5960	9	3	12	Rectangular	N-S	1	NO	NA	
F420	F	Samarra 2	2189	2	1	3	Rectangular	N-S	1	NO	NA	
F421	F	Samarra 2	4088	8	2	10	Rectangular	N-S	1	NO	NA	

F423	F	Samarra 2	4476	11	2	13	Rectangular	N-S	1	NO	NA	
F424	F	Samarra 2	4246	12	1	13	Rectangular	N-S	1	NO	NA	
F425	F	Samarra 2	4142	10	2	12	Rectangular	N-S	1	NO	NA	
F426	F	Samarra 2	4716	12	2	14	Rectangular	N-S	1	NO	NA	
F427	F	Samarra 2	4191	6	1	7	Rectangular	N-S	1	NO	NA	
F428	F	Samarra 2	3932	2	1	3	Rectangular	N-S	1	NO	NA	
F429	F	Samarra 2	3873	7	1	8	Rectangular	N-S	1	NO	NA	
F430	F	Samarra 2	3807	2	1	3	Rectangular	N-S	1	NO	NA	
F431	F	Samarra 2	4261	0	0	0	Rectangular	N-S	1	NO	NA	
F432	F	Samarra 2	3518	1	0	1	Rectangular	N-S	1	NO	NA	
F433	F	Samarra 2	3749	1	0	1	Rectangular	N-S	1	NO	NA	
F434	F	Samarra 2	2159	2	1	3	Rectangular	N-S	1	NO	NA	
F4	F	Samarra 1	68	23	1	24	Rectangular	N-S	1	NO	NA	

65			19									
F467	F	Samarra 1	67559	14	5	19	Rectangular	N-S	1	NO	NA	
F468	F	Samarra 1	62266	9	5	14	Rectangular	N-S	1	NO	NA	
F469	F	Samarra 1	70049	10	4	14	Rectangular	N-S	1	NO	NA	
F470	F	Samarra 1	66044	17	7	24	Rectangular	N-S	1	NO	NA	
F471	F	Samarra 1	49022	12	2	14	Rectangular	N-S	1	NO	NA	
F472	F	Samarra 2	24755	11	0	11	Rectangular	N-S	1	NO	NA	
F473	F	Samarra 2	43700	23	2	25	Rectangular	N-S	1	NO	NA	
F474	F	Samarra 2	53551	9	2	11	Rectangular	N-S	1	NO	NA	
F475	F	Samarra 2	40444	9	2	11	Rectangular	N-S	1	NO	NA	
F476	F	Samarra 2	42733	17	1	18	Rectangular	N-S	1	NO	NA	
F477	F	Samarra 2	47211	16	2	18	Rectangular	N-S	1	NO	NA	
F478	F	Samarra 2	40889	14	2	16	Rectangular	N-S	1	NO	NA	

F481	F	Samarra 2	41665	15	1	16	Rectangular	N-S	1	NO	NA	
F482	F	Samarra 2	40333	25	0	25	Rectangular	N-S	1	NO	NA	
F483	F	Samarra 2	11999	10	0	10	Rectangular	N-S	1	NO	NA	
F484	F	Samarra 2	26667	7	1	8	Rectangular	N-S	1	NO	NA	
F485	F	Samarra 2	20889	5	6	11	Rectangular	N-S	1	NO	NA	
F486	F	Samarra 2	12220	1	1	2	Rectangular	N-S	1	NO	NA	
F490	F	Samarra 1	185224	20	11	31	Rectangular	N-S	1	YES	NA	
F491	F	Samarra 1	143334	24	7	31	Rectangular	N-S	1	NO	NA	
F492	F	Samarra 1	151154	16	13	29	Rectangular	N-S	1	NO	NA	
F493	F	Samarra 1	112234	23	6	29	Rectangular	N-S	1	NO	NA	
F494	F	Samarra 1	106448	19	5	24	Rectangular	N-S	1	NO	NA	

F495	F	Samarra 1	279338	52	14	66	Rectangular	N-S	1	NO	NA	reception block
F496	F	Samarra 1	72922	15	5	20	Rectangular	N-S	1	NO	NA	
F497	F	Samarra 2	42388	6	7	13	Rectangular	N-S	1	NO	NA	
F498	F	Samarra 2	44444	9	6	15	Rectangular	N-S	1	NO	NA	
F499	F	Samarra 2	29611	13	0	13	Rectangular	N-S	1	NO	NA	
F501	F	Samarra 2	80001	33	4	37	Rectangular	N-S	1	NO	NA	
F502	F	Samarra 2	83533	19	4	23	Rectangular	N-S	1	NO	NA	
F503	F	Samarra 2	40448	13	2	15	Rectangular	N-S	1	NO	NA	
F505	F	Samarra 2	75330	22	5	27	Rectangular	N-S	1	NO	NA	
F506	F	Samarra 2	78001	28	3	31	Rectangular	N-S	1	NO	NA	
F508	F	Samarra 2	56448	0	0	0	Rectangular	N-S	1	NO	NA	
F509	F	Samarra 2	76777	1	2	3	Rectangular	N-S	1	NO	NA	

F510	F	Samarra 2	7450	5	4	9	Rectangular	N-S	1	NO	NA	
F511	F	Samarra 2	7339	11	5	16	Rectangular	N-S	1	NO	NA	
F512	F	Samarra 2	5021	11	1	12	Rectangular	N-S	1	NO	NA	
F513	F	Samarra 2	6128	15	4	19	Rectangular	N-S	1	NO	NA	
F514	F	Samarra 2	7130	15	6	21	Rectangular	N-S	1	NO	NA	
F515	F	Samarra 2	7553	24	3	27	Rectangular	N-S	1	NO	NA	
F516	F	Samarra 2	7633	30	3	33	Rectangular	N-S	1	NO	NA	
F517	F	Samarra 2	2002	8	0	8	Rectangular	N-S	1	NO	NA	
F518	F	Samarra 2	3136	13	0	13	Rectangular	N-S	1	NO	NA	
F519	F	Samarra 2	3317	15	1	16	Rectangular	N-S	1	NO	NA	
F520	F	Samarra 2	3482	12	3	15	Rectangular	N-S	1	NO	NA	
F522	F	Samarra 2	13461	6	1	7	Rectangular	N-S	1	NO	NA	

F523	F	Samarra 2	137211	11	5	16	Rectangular	N-S	1	NO	NA	
F525	F	Samarra 2	15411	3	1	4	Rectangular	N-S	1	NO	NA	
F526	F	Samarra 2	39844	5	0	5	Rectangular	N-S	1	NO	NA	
F528	F	Samarra 2	29388	7	1	8	Rectangular	N-S	1	NO	NA	
F529	F	Samarra 2	26449	12	0	12	Rectangular	N-S	1	NO	NA	
F530	F	Samarra 2	26733	10	0	10	Rectangular	N-S	1	NO	NA	
F531	F	Samarra 2	24745	10	0	10	Rectangular	N-S	1	NO	NA	
F532	F	Samarra 2	43557	30	1	31	Rectangular	N-S	1	NO	NA	
F533	F	Samarra 2	45887	42	0	42	Rectangular	N-S	1	NO	NA	
F534	F	Samarra 2	43227	42	0	42	Rectangular	N-S	1	NO	NA	
F535	F	Samarra 2	24633	21	0	21	Rectangular	N-S	1	NO	NA	
F536	F	Samarra 2	25733	10	0	10	Rectangular	N-S	1	NO	NA	

F537	F	Samarra 2	1591	6	0	6	Rectangular	N-S	1	NO	NA	
F538	F	Samarra 2	3050	6	2	8	Irregular	N-S	1	NO	NA	
F539	F	Samarra 2	1446	0	0	0	Rectangular	N-S	1	NO	NA	
F540	F	Samarra 2	2108	9	1	10	Rectangular	N-S	1	NO	NA	
F541	F	Samarra 2	3161	16	2	18	Rectangular	N-S	1	NO	NA	
F542	F	Samarra 2	2815	9	1	10	Rectangular	N-S	1	NO	NA	
F543	F	Samarra 2	3217	6	1	7	Rectangular	N-S	1	NO	NA	
F544	F	Samarra 2	3122	10	1	11	Rectangular	N-S	1	NO	NA	
F546	F	Samarra 2	2057	10	0	10	Rectangular	N-S	1	NO	NA	
F547	F	Samarra 2	1415	7	0	7	Rectangular	N-S	1	NO	NA	
F554	F	Samarra 2	1999	15	0	15	Rectangular	N-S	1	NO	NA	
F555	F	Samarra 2	4609	22	1	23	Rectangular	N-S	1	NO	NA	
F5	F	Samarra 2	14	7	1	8	Rectangular	N-S	1	NO	NA	

56			35									
G3	G	Samarra 1	128118	12	3	15	Rectangular	W-E	1	NO	NA	
G32	G	Samarra 1	52992	24	0	24	Rectangular	W-E	1	NO	NA	
G33	G	Samarra 1	14999	8	0	8	Rectangular	W-E	1	NO	NA	
G34	G	Samarra 1	56244	15	1	16	Rectangular	W-E	1	NO	NA	
G35	G	Samarra 1	16966	6	0	6	Rectangular	W-E	1	NO	NA	
G36	G	Samarra 1	12117	6	0	6	Rectangular	W-E	1	NO	NA	
G37	G	Samarra 1	26366	18	0	18	Rectangular	W-E	1	NO	NA	
G38	G	Samarra 1	14440	5	1	6	Rectangular	W-E	1	NO	NA	
G55	G	Samarra 1	49100	8	0	8	Rectangular	W-E	Unkwown	NO	NA	
G56	G	Samarra 1	41153	9	0	9	Rectangular	W-E	1	NO	NA	
G60	G	Samarra 1	153666	15	6	21	Rectangular	W-E	1	NO	NA	
G61	G	Samarra 1	24	8	1	9	Rectangular	W-E	1	NO	NA	

			86									
G62	G	Samarra 1	151141	25	6	31	Rectangular	W-E	1	NO	NA	
G63	G	Samarra 1	153455	20	0	20	Rectangular	W-E	1	NO	NA	
G64	G	Samarra 1	148003	18	3	21	Rectangular	W-E	1	NO	NA	
G65	G	Samarra 1	141139	14	1	15	Rectangular	W-E	1	NO	NA	
G66	G	Samarra 1	66133	10	3	13	Rectangular	W-E	1	NO	NA	
G69	G	Samarra 1	39556	6	0	6	Rectangular	W-E	1	NO	NA	
G70	G	Samarra 1	16466	2	1	3	Rectangular	W-E	1	NO	NA	
G71	G	Samarra 1	49022	2	2	4	Rectangular	W-E	1	NO	NA	
G73	G	Samarra 1	48233	5	1	6	Rectangular	W-E	1	NO	NA	
G74	G	Samarra 1	35788	2	0	2	Rectangular	W-E	1	NO	NA	
G76	G	Samarra 1	109511	6	2	8	Rectangular	W-E	1	NO	NA	

G77	G	Samarra 1	9185	6	1	7	Rectangular	W-E	1	NO	NA	
G78	G	Samarra 1	8669	15	0	15	Rectangular	W-E	1	NO	NA	
G79	G	Samarra 1	102117	9	2	11	Rectangular	W-E	1	NO	NA	
G80	G	Samarra 1	110002	6	2	8	Rectangular	W-E	1	YES	NA	
G81	G	Samarra 1	70300	6	0	6	Rectangular	W-E	1	NO	NA	
G82	G	Samarra 1	50074	2	0	2	Rectangular	W-E	1	NO	NA	
G83	G	Samarra 1	45223	6	1	7	Irregular	W-E	1	NO	NA	
G85	G	Samarra 1	31333	11	0	11	Irregular	W-E	1	NO	NA	
G86	G	Samarra 1	20333	3	1	4	Irregular	N-S	1	NO	NA	
G88	G	Samarra 1	123776	14	5	19	Rectangular	W-E	1	NO	NA	
G89	G	Samarra 1	64744	6	0	6	Rectangular	W-E	1	NO	NA	
G90	G	Samarra 1	33348	4	1	5	Rectangular	W-E	1	NO	NA	

G105	G	Samarra 1	10368	8	3	11	Rectangular	W-E	1	NO	NA	
G198	G	Samarra 1	48888	5	1	6	Rectangular	W-E	1	NO	NA	
H21	H	Samarra 2	16592	0	0	0	Irregular	N-S	1	YES	NA	
H36	H	Samarra 2	17774	14	6	20	Rectangular	W-E	1	NO	NA	
H37	H	Samarra 2	15222	0	0	0	Rectangular	W-E	1	NO	NA	
H38	H	Samarra 2	26778	16	0	16	Rectangular	W-E	1	NO	NA	
H39	H	Samarra 2	22253	7	0	7	Rectangular	W-E	1	YES	NA	
H51	H	Samarra 2	23011	5	2	7	Rectangular	W-E	1	NO	NA	
H52	H	Samarra 2	22232	3	1	4	Rectangular	W-E	1	NO	NA	
H53	H	Samarra 2	21885	2	0	2	Rectangular	W-E	1	NO	NA	
H54	H	Samarra 2	21330	4	1	5	Rectangular	W-E	1	NO	NA	
H55	H	Samarra 2	22334	7	1	8	Rectangular	W-E	1	NO	NA	

H56	H	Samarra 2	2133	12	0	12	Rectangular	W-E	1	NO	NA	
H57	H	Samarra 2	2116	6	1	7	Rectangular	W-E	1	NO	NA	
H58	H	Samarra 2	2084	6	0	6	Rectangular	W-E	1	YES	NA	
H59	H	Samarra 2	2174	7	1	8	Rectangular	W-E	1	YES	NA	
H60	H	Samarra 2	1663	4	2	6	Rectangular	W-E	1	NO	NA	
H71	H	Samarra 2	103900	4	3	7	Irregular	N-S	Unkwown	NO	NA	
H80	H	Samarra 2	136222	17	3	20	Rectangular	N-S	Unkwown	NO	NA	
H81	H	Samarra 2	60662	6	1	7	Rectangular	W-E	1	NO	NA	
H82	H	Samarra 2	47331	3	0	3	Rectangular	W-E	1	NO	NA	
H84	H	Samarra 2	147999	9	5	14	Rectangular	W-E	1	YES	NA	
H85	H	Samarra 2	44833	4	1	5	Rectangular	N-S	1	NO	NA	
H86	H	Samarra 2	109	8	5	13	Irregular	W-E	1	NO	NA	

			13									
H101	H	Samarra 2	19889	2	1	3	Rectangular	W-E	1	NO	NA	
H113	H	Samarra 2	48445	0	0	0	Irregular	N-S	1	YES	NA	
H118	H	Samarra 2	19511	4	1	5	Irregular	W-E	1	NO	NA	
H143	H	Samarra 2	97888	7	3	10	Rectangular	N-S	1	YES	NA	
H144	H	Samarra 2	230013	10	3	13	Trapezoidal	N-S	1	YES	NA	
H149	H	Samarra 1	163330	11	3	14	Rectangular	N-S	1	NO	NA	
H153	H	Samarra 2	59600	0	0	0	Irregular	W-E	1	NO	NA	
H154	H	Samarra 2	202005	0	0	0	Irregular	W-E	Unkwown	NO	NA	
H156	H	Samarra 2	429666	0	0	0	Trapezoidal	W-E	Unkwown	NO	NA	
H157	H	Samarra 2	464435	0	0	0	Trapezoidal	W-E	Unkwown	NO	NA	
H160	H	Samarra 1 or 2	185	7	4	11	Irregular	N-S	1	YES	NA	

			04									
H161	H	Samarra 1 or 2	72669	5	5	10	Rectangular	N-S	1	YES	NA	
H163	H	Samarra 2	49866	15	2	17	Trapezoidal	N-S	1	NO	NA	
H167	H	Samarra 1 or 2	34687	9	3	12	Rectangular	N-S	2	YES	NA	
H169	H	Samarra 1 or 2	8847	0	0	0	Rectangular	W-E	Unkwown	NO	NA	
H170	H	Samarra 1 or 2	60997	0	0	0	Rectangular	W-E	Unkwown	NO	NA	
H171	H	Samarra 1 or 2	14777	0	0	0	Rectangular	N-S	Unkwown	NO	NA	
H184	H	Samarra 1 or 2	3337	5	0	5	Irregular	N-S	Unkwown	NO	NA	
H194	H	Samarra 2	68522	5	1	6	Rectangular	W-E	Unkwown	NO	NA	
H222	H	Samarra 1 or 2	60533	0	0	0	Trapezoidal	N-S	2	NO	NA	
H238	H	Samarra 2	28814	4	0	4	Irregular	W-E	1	NO	NA	
H239	H	Samarra 2	29724	0	0	0	Rectangular	W-E	Unkwown	NO	NA	

H243	H	Samarra 2	7075	5	1	6	Rectangular	N-S	1	NO	NA	
H253	H	Samarra 2	4805	8	2	10	Rectangular	W-E	1	NO	NA	reception block
H267	H	Samarra 2	148664	8	6	14	Irregular	N-S	1	NO	NA	
H270	H	Samarra 2	226632	0	0	0	Rectangular	N-S	1	YES	NA	
H271	H	Samarra 2	224431	5	5	10	Rectangular	N-S	Unkwown	NO	NA	
H278	H	Samarra 1	81355	5	1	6	Rectangular	N-S	1	YES	NA	
H286	H	Samarra 1	162661	340	60	400	Rectangular	W-E	Unkwown	NO	NA	
H288	H	Samarra 1	101440	162	35	197	Irregular	N-S	Unkwown	NO	NA	
H291	H	Samarra 1	16344	48	8	56	Rectangular	N-S	Unkwown	NO	NA	
H316	H	Samarra 2 or 4	46443	61	13	74	Irregular	N-S	Unkwown	NO	NA	
H317	H	Samarra 2 or 4	38009	43	3	46	Irregular	N-S	Unkwown	YES	NA	

H354	H	Samarra 2	5070	0	0	0	Irregular	N-S	1	NO	NA	
H358	H	Samarra 2 or 4	9573	90	12	102	Irregular	N-S	Unkwown	NO	NA	
H494	H	Samarra 2 or later	88225	10	5	15	Rectangular	N-S	1	YES	NA	
H496	H	Samarra 1	334229	17	5	22	Rectangular	N-S	1	NO	NA	
H497	H	Samarra 1	5196	2	1	3	Irregular	N-S	1	NO	NA	
H498	H	Samarra 1	5129	0	0	0	Irregular	N-S	1	NO	NA	
H499	H	Samarra 1	4833	4	2	6	Irregular	N-S	1	NO	NA	
H500	H	Samarra 1	5613	9	4	13	Irregular	N-S	1	NO	NA	
H501	H	Samarra 1	150023	7	6	13	Irregular	N-S	Unkwown	NO	NA	
H502	H	Samarra 1	216922	30	10	40	Rectangular	N-S	1	NO	NA	
H504	H	Samarra 1	110445	7	5	12	Irregular	N-S	Unkwown	NO	NA	
H5	H	Samarra 1	61	7	0	7	Irregular	N-S	1	NO	NA	

05			28									
J37	J	Samarra 2	8699	8	11	19	Rectangular	NW-SE	1	NO	NA	
J38	J	Samarra 2	11416	12	11	23	Rectangular	NW-SE	1	NO	NA	
J69	J	Samarran	2184	3	1	4	Irregular	NW-SE	1	NO	NA	
J117	J	Samarra 1 or later	18194	15	1	16	Irregular	NE-SW	Unkwown	NO	NA	
J128	J	Samarra 1 or later	43005	6	1	7	Irregular	N-S	1	NO	NA	
J142	J	Samarra 1 or later	7842	10	2	12	Rectangular	NE-SW	1	NO	NA	
J148	J	Samarra 1 or later	8205	0	0	0	Trapezoidal	NW-SE	Unkwown	NO	NA	
J149	J	Samarra 2 or later	9111	1	2	3	Irregular	N-S	1	NO	NA	
J159	J	Samarra 2 or later	7654	6	4	10	Irregular	N-S	Unkwown	NO	NA	
J199	J	Samarra 1 or later	54722	10	0	10	Trapezoidal	N-S	1	NO	NA	
J207	J	Samarra 1 or later	13514	20	5	25	Rectangular	W-E	2	YES	NA	

J208	J	Samarra 1 or later	3588	4	1	5	Rectangular	W-E	1	NO	NA	
J218	J	Samarran	7794	11	1	12	Rectangular	W-E	1	NO	NA	
J224	J	Samarra 1 or later	7588	17	1	18	Rectangular	W-E	1	NO	NA	
J235	J	Samarra 1 or later	4016	5	0	5	Rectangular	N-S	1	NO	NA	
J237	J	Samarra 1 or 2	101664	3	0	3	Rectangular	NE-SW	1	NO	NA	
J243	J	Samarra 1 or 2	2265	6	3	9	Rectangular	NW-SE	1	NO	NA	
J244	J	Samarra 1 or 2	2872	4	0	4	Rectangular	N-S	1	NO	NA	
J263	J	Samarra 1 or 2	7150	7	1	8	Irregular	N-S	1	NO	NA	
J266	J	Samarra 1 or 2	88774	19	14	33	Rectangular	NW-SE	1	NO	NA	
J274	J	Samarra 1 or 2	3980	12	1	13	Rectangular	W-E	1	NO	NA	
J275	J	Samarra 1 or 2	6669	13	2	15	Rectangular	W-E	1	NO	NA	
J285	J	Samarra 1 or 2	8591	4	1	5	Rectangular	NE-SW	1	NO	NA	

J286	J	Samarra 1 or 2	41244	11	3	14	Irregular	NE-SW	1	NO	NA	
J287	J	Samarra 1 or 2	61155	3	0	3	Rectangular	NE-SW	1	NO	NA	
J290	J	Samarra 1 or 2	200023	20	2	22	Rectangular	NE-SW	1	NO	NA	
J292	J	Samarra 1 or 2	39221	12	1	13	Rectangular	NE-SW	1	NO	NA	
J293	J	Samarra 1 or 2	33500	11	0	11	Rectangular	NE-SW	1	NO	NA	
J294	J	Samarra 1 or 2	34007	6	4	10	Rectangular	NE-SW	1	NO	NA	
J298	J	Samarra 1 or 2	164991	17	2	19	Trapezoidal	NW-SE	1	NO	NA	
J299	J	Samarra 1 or 2	158441	23	1	24	Trapezoidal	NW-SE	1	NO	NA	
J301	J	Samarra 1 or 2	136566	0	0	0	Rectangular	W-E	1	NO	NA	
J307	J	Samarra 1 or 2	27700	0	0	0	Rectangular	W-E	1	NO	NA	
J310	J	Samarra 1 or 2	65551	0	0	0	Rectangular	W-E	1	NO	NA	
J3	J	Samarra 1	59	0	0	0	Rectangular	NE-SW	1	NO	NA	

13			00									
J314	J	Samarra 1	43888	3	1	4	Rectangular	NE-SW	1	NO	NA	
J316	J	Samarra 1	38200	6	2	8	Rectangular	NE-SW	1	NO	NA	
J317	J	Samarra 1	46288	14	0	14	Rectangular	NE-SW	1	NO	NA	
J319	J	Samarra 1	55592	9	1	10	Rectangular	NE-SW	1	NO	NA	
J320	J	Samarra 1	56911	2	3	5	Rectangular	NE-SW	1	NO	NA	
J322	J	Samarra 1	27666	2	2	4	Rectangular	NE-SW	1	NO	NA	
J323	J	Samarra 1	25557	2	1	3	Rectangular	NE-SW	1	NO	NA	
J324	J	Samarra 1 or 2	138006	1	0	1	Rectangular	N-S	1	NO	NA	
J330	J	Samarra 1	14044	2	0	2	Rectangular	NE-SW	1	NO	NA	
J331	J	Samarra 1	30776	5	2	7	Rectangular	NE-SW	1	NO	NA	
J332	J	Samarra 1	11449	5	0	5	Rectangular	NE-SW	1	NO	NA	
J333	J	Samarra 1	26599	3	0	3	Rectangular	NE-SW	1	NO	NA	

J334	J	Samarra 1	2922	13	2	15	Rectangular	NE-SW	1	NO	NA	
J336	J	Samarra 1	4063	2	1	3	Rectangular	NE-SW	1	YES	NA	
J337	J	Samarra 1	4749	2	1	3	Rectangular	NE-SW	1	YES	NA	
J338	J	Samarra 1	5587	10	0	10	Rectangular	NE-SW	1	YES	NA	
J339	J	Samarra 1	6341	10	2	12	Rectangular	NE-SW	1	YES	NA	
J340	J	Samarra 1	4982	11	6	17	Rectangular	NE-SW	1	YES	NA	
J341	J	Samarra 1	3412	7	3	10	Rectangular	NE-SW	1	YES	NA	
J342	J	Samarra 1	2977	3	0	3	Rectangular	NE-SW	1	YES	NA	
J343	J	Samarra 1	1105	7	0	7	Rectangular	NE-SW	1	NO	NA	
J349	J	Samarra 1	3759	6	1	7	Rectangular	NE-SW	1	NO	NA	
J350	J	Samarra 1	1400	4	0	4	Rectangular	NE-SW	1	NO	NA	
J351	J	Samarra 1	2154	5	0	5	Rectangular	NE-SW	1	NO	NA	
J3	J	Samarra 1	54	17	1	18	Rectangular	NE-SW	1	NO	NA	

52			25									
J353	J	Samarra 1	5205	10	0	10	Rectangular	NE-SW	1	NO	NA	
J354	J	Samarra 1	53255	13	2	15	Rectangular	NE-SW	1	NO	NA	
J355	J	Samarra 1	5504	22	0	22	Rectangular	NE-SW	1	NO	NA	
J356	J	Samarra 1	5076	16	2	18	Rectangular	NE-SW	1	NO	NA	
J357	J	Samarra 1	3507	11	2	13	Rectangular	NE-SW	1	NO	NA	
J359	J	Samarra 1	2459	10	2	12	Rectangular	NE-SW	1	NO	NA	
J360	J	Samarra 1	2605	6	1	7	Rectangular	NE-SW	1	NO	NA	
J361	J	Samarra 1	5775	11	5	16	Rectangular	NE-SW	1	NO	NA	
J362	J	Samarra 1	5301	12	1	13	Rectangular	NE-SW	1	NO	NA	
J363	J	Samarra 1	5233	20	3	23	Rectangular	NE-SW	1	NO	NA	
J364	J	Samarra 1	5051	18	3	21	Rectangular	NE-SW	1	NO	NA	
J365	J	Samarra 1	5445	9	3	12	Rectangular	NE-SW	1	NO	NA	

J366	J	Samarra 1	4867	30	5	35	Rectangular	NE-SW	1	NO	NA	
J367	J	Samarra 1	2556	5	3	8	Rectangular	NE-SW	1	NO	NA	
J370	J	Samarra 1	2462	0	0	0	Rectangular	NE-SW	1	NO	NA	
J371	J	Samarra 1	2688	0	0	0	Rectangular	NE-SW	1	NO	NA	
J372	J	Samarra 1	2927	3	1	4	Rectangular	NE-SW	1	NO	NA	
J373	J	Samarra 1	2755	4	0	4	Rectangular	NE-SW	1	NO	NA	
J374	J	Samarra 1	2759	4	0	4	Rectangular	NE-SW	1	NO	NA	
J375	J	Samarra 1	2208	4	0	4	Rectangular	NE-SW	1	NO	NA	
J376	J	Samarra 1	1917	11	3	14	Rectangular	NE-SW	1	NO	NA	
J378	J	Samarra 1	3112	6	3	9	Rectangular	NE-SW	1	NO	NA	
J379	J	Samarra 1	3066	3	0	3	Rectangular	NE-SW	1	NO	NA	
J380	J	Samarra 1	5512	4	1	5	Rectangular	NE-SW	1	NO	NA	
J3	J	Samarra 2	39	2	0	2	Rectangular	W-E	1	NO	NA	

89			23									
J3900	J	Samarra 2	30885	3	0	3	Rectangular	W-E	1	NO	NA	
J3901	J	Samarra 2	44199	2	0	2	Rectangular	W-E	1	NO	NA	
J3903	J	Samarra 1	83133	9	5	14	Rectangular	W-E	1	NO	NA	
J3904	J	Samarra 1	73337	10	6	16	Rectangular	W-E	1	NO	NA	
J3905	J	Samarra 1	37777	5	0	5	Rectangular	W-E	1	NO	NA	
J3906	J	Samarra 1	64599	7	3	10	Rectangular	W-E	1	NO	NA	reception block
J3907	J	Samarra 1	26500	0	0	0	Rectangular	W-E	1	NO	NA	
J3909	J	Samarra 1	17116	1	1	2	Rectangular	W-E	1	NO	NA	
J4000	J	Samarra 1	36799	7	2	9	Rectangular	W-E	1	NO	NA	
J4001	J	Samarra 1	38355	12	0	12	Rectangular	W-E	1	NO	NA	
J4002	J	Samarra 1	56911	6	2	8	Rectangular	W-E	1	NO	NA	
J4004	J	Samarra 1	60711	10	2	12	Irregular	W-E	1	NO	NA	

J408	J	Samarra 1	4860	8	3	11	Rectangular	W-E	1	NO	NA	
J409	J	Samarra 1	4088	10	3	13	Rectangular	W-E	1	NO	NA	
J410	J	Samarra 1	3875	8	1	9	Rectangular	W-E	1	NO	NA	
J413	J	Samarra 1	4158	12	1	13	Trapezoidal	W-E	1	NO	NA	
J417	J	Samarra 2	2454	3	1	4	Rectangular	NW-SE	1	NO	NA	
J431	J	Samarra 1	5480	14	4	18	Rectangular	NE-SW	1	NO	NA	
J432	J	Samarra 1	5364	7	1	8	Rectangular	NE-SW	1	NO	NA	
J435	J	Samarra 1	2827	8	0	8	Rectangular	NE-SW	1	NO	NA	
J436	J	Samarra 1	2755	4	1	5	Rectangular	NE-SW	1	NO	NA	
J438	J	Samarra 2	5083	13	1	14	Rectangular	NE-SW	1	NO	NA	
J444	J	Samarra 1	2723	5	2	7	Rectangular	NW-SE	1	YES	NA	
J445	J	Samarra 1	4723	24	1	25	Trapezoidal	NE-SW	1	NO	NA	
J4	J	Samarra 1	47	14	4	18	Rectangular	NE-SW	1	NO	NA	

46			95									
J447	J	Samarra 1	52556	19	1	20	Rectangular	NE-SW	1	NO	NA	
J448	J	Samarra 1	32777	7	3	10	Rectangular	NE-SW	1	NO	NA	
J453	J	Samarra 1	33665	6	2	8	Rectangular	NE-SW	1	NO	NA	
J455	J	Samarra 1	55571	13	3	16	Rectangular	NE-SW	1	NO	NA	
J456	J	Samarra 1	53800	8	1	9	Rectangular	NE-SW	1	NO	NA	
J459	J	Samarra 1	25144	11	3	14	Rectangular	NE-SW	1	NO	NA	
J460	J	Samarra 1	41889	9	4	13	Rectangular	NE-SW	1	NO	NA	
J472	J	Samarra 2	77444	10	5	15	Rectangular	NW-SE	1	NO	NA	
J473	J	Samarra 2	71144	6	8	14	Rectangular	NW-SE	1	NO	NA	
J474	J	Samarra 2	113444	11	13	24	Rectangular	NW-SE	1	NO	NA	
J475	J	Samarra 2	117770	11	15	26	Rectangular	NW-SE	1	NO	NA	
J4	J	Samarra 2	62	8	4	12	Rectangular	NW-SE	1	NO	NA	

77			47									
J478	J	Samarra 2	73887	10	6	16	Rectangular	NW-SE	1	NO	NA	
J479	J	Samarra 2	93006	8	9	17	Rectangular	NW-SE	1	NO	NA	
J480	J	Samarra 2	89664	19	10	29	Rectangular	NW-SE	1	NO	NA	
J481	J	Samarra 2	49911	6	5	11	Rectangular	NW-SE	1	NO	NA	
J483	J	Samarra 2	47911	9	3	12	Rectangular	NW-SE	1	NO	NA	
J484	J	Samarra 2	44744	2	0	2	Rectangular	NW-SE	1	NO	NA	
J485	J	Samarra 2	41669	2	0	2	Rectangular	NW-SE	1	NO	NA	
J486	J	Samarra 2	44844	2	0	2	Rectangular	NW-SE	1	NO	NA	
J494	J	Samarra 1	36644	7	1	8	Rectangular	NE-SW	1	NO	NA	
J495	J	Samarra 1	31119	14	5	19	Rectangular	NE-SW	1	NO	NA	
J499	J	Samarra 1	37522	10	3	13	Rectangular	NE-SW	1	NO	NA	
J500	J	Samarra 1	46229	13	8	21	Rectangular	NE-SW	1	NO	NA	

J503	J	Samarra 1	6712	11	10	21	Rectangular	NE-SW	1	NO	NA	
J504	J	Samarra 1	5327	22	8	30	Rectangular	NE-SW	1	NO	NA	
J506	J	Samarra 1	8335	10	6	16	Rectangular	NE-SW	1	NO	NA	
J507	J	Samarra 1	3646	6	0	6	Rectangular	NE-SW	1	NO	NA	
J508	J	Samarra 1	3899	4	0	4	Rectangular	NE-SW	1	NO	NA	
J509	J	Samarra 1	20000	4	0	4	Rectangular	NE-SW	1	NO	NA	
J510	J	Samarra 1	2067	3	0	3	Rectangular	NE-SW	1	NO	NA	
J513	J	Samarra 1	3569	8	0	8	Rectangular	NE-SW	1	NO	NA	
J514	J	Samarra 1	4447	3	2	5	Rectangular	NE-SW	1	NO	NA	
J515	J	Samarra 1	3071	3	3	6	Rectangular	NE-SW	1	NO	NA	
J517	J	Samarra 1	3183	3	1	4	Rectangular	NE-SW	1	NO	NA	
J518	J	Samarra 1	2489	3	1	4	Rectangular	NE-SW	1	NO	NA	
J5	J	Samarra 1	22	2	1	3	Rectangular	NE-SW	1	NO	NA	

20			88									
J521	J	Samarra 1	3089	3	0	3	Rectangular	NE-SW	1	NO	NA	
J522	J	Samarra 1	2732	0	0	0	Rectangular	NE-SW	1	NO	NA	
J523	J	Samarra 2	7127	5	2	7	Rectangular	NE-SW	1	NO	NA	
J532	J	Samarra 2	3763	9	1	10	Rectangular	NE-SW	1	NO	NA	
J533	J	Samarra 2	3841	10	1	11	Rectangular	NE-SW	1	NO	NA	
J534	J	Samarra 2	4197	6	1	7	Rectangular	NE-SW	1	NO	NA	
J535	J	Samarra 2	3549	2	0	2	Rectangular	NE-SW	1	NO	NA	
J536	J	Samarra 2	3596	7	1	8	Rectangular	NE-SW	1	NO	NA	
J537	J	Samarra 2	3766	3	0	3	Rectangular	NE-SW	1	NO	NA	
J540	J	Samarra 2	2134	5	0	5	Rectangular	NW-SE	1	NO	NA	
J541	J	Samarra 2	6744	9	4	13	Rectangular	NW-SE	1	NO	NA	
J542	J	Samarra 2	5088	8	2	10	Rectangular	NW-SE	1	NO	NA	

J545	J	Samarra 2	7201	15	1	16	Rectangular	NW-SE	1	NO	NA	
J546	J	Samarra 2	7084	5	4	9	Rectangular	NW-SE	1	NO	NA	
J547	J	Samarra 2	3039	6	5	11	Rectangular	NW-SE	1	NO	NA	
J548	J	Samarra 2	7432	16	1	17	Rectangular	NE-SW	1	NO	NA	
J550	J	Samarra 2	5249	14	2	16	Rectangular	NE-SW	1	NO	NA	
J551	J	Samarra 2	7595	19	1	20	Rectangular	NE-SW	1	NO	NA	
J552	J	Samarra 2	6443	5	0	5	Rectangular	NE-SW	1	NO	NA	
J554	J	Samarra 2	7941	23	0	23	Rectangular	NE-SW	1	NO	NA	
J562	J	Samarra 2	5648	10	2	12	Rectangular	NE-SW	1	NO	NA	
J580	J	Samarra 2	3917	4	1	5	Rectangular	NE-SW	1	NO	NA	
J581	J	Samarra 2	5831	9	2	11	Rectangular	NE-SW	1	NO	NA	
J582	J	Samarra 2	8332	11	2	13	Rectangular	NE-SW	1	NO	NA	
J5	J	Samarra 2	76	15	2	17	Rectangular	NE-SW	1	NO	NA	

83			37									
J584	J	Samarra 2	7954	12	6	18	Rectangular	NE-SW	2	YES	NA	
J585	J	Samarra 2	8462	21	2	23	Rectangular	NE-SW	2	YES	NA	
J586	J	Samarra 2	7046	18	5	23	Rectangular	NE-SW	2	YES	NA	
J587	J	Samarra 2	6739	14	3	17	Rectangular	NE-SW	2	NO	NA	
J588	J	Samarra 2	4470	6	3	9	Rectangular	NE-SW	2	YES	NA	
J592	J	Samarra 2	3191	10	1	11	Rectangular	NE-SW	1	NO	NA	
J594	J	Samarra 2	3405	15	1	16	Irregular	NE-SW	1	NO	NA	
J597	J	Samarra 2	4088	13	1	14	Rectangular	NE-SW	1	NO	NA	
J602	J	Samarra 2	4503	10	2	12	Rectangular	NE-SW	1	NO	NA	
J603	J	Samarra 2	4492	7	2	9	Rectangular	NE-SW	1	NO	NA	
J604	J	Samarra 2	3593	9	1	10	Rectangular	NE-SW	1	NO	NA	
J605	J	Samarra 2	4192	8	2	10	Rectangular	NE-SW	1	NO	NA	

J606	J	Samarra 2	41552	12	1	13	Rectangular	NE-SW	1	NO	NA	
J609	J	Samarra 2	109600	18	3	21	Rectangular	NE-SW	1	NO	NA	
J611	J	Samarra 2	79955	18	2	20	Rectangular	NE-SW	1	NO	NA	
J615	J	Samarra 2	42888	9	3	12	Irregular	NE-SW	1	NO	NA	
J616	J	Samarra 2	41555	5	2	7	Irregular	NE-SW	1	NO	NA	
J640	J	Samarra 2	47443	4	3	7	Rectangular	NW-SE	Unkwown	NO	NA	
J652	J	Samarra 1 or 2	119449	8	1	9	Trapezoidal	W-E	1	NO	NA	
J660	J	Samarra 1	17115	4	0	4	Irregular	NE-SW	1	NO	NA	
J687	J	Samarra 2	29665	4	2	6	Rectangular	NE-SW	1	NO	NA	
J688	J	Samarra 2	70885	14	2	16	Rectangular	NE-SW	1	NO	NA	
J689	J	Samarra 2	56667	5	3	8	Rectangular	NE-SW	1	NO	NA	
J690	J	Samarra 2	65559	18	7	25	Rectangular	NE-SW	1	NO	NA	

J692	J	Samarra 2	35600	10	3	13	Rectangular	NE-SW	1	NO	NA	
J693	J	Samarra 2	29155	7	1	8	Rectangular	NE-SW	2	NO	NA	
J694	J	Samarra 2	34633	13	1	14	Rectangular	NE-SW	2	NO	NA	
J722	J	Samarra 2	47288	5	1	6	Rectangular	NE-SW	1	NO	NA	
J723	J	Samarra 2	37999	4	1	5	Rectangular	NE-SW	1	NO	NA	
J724	J	Samarra 2	38002	9	1	10	Rectangular	NE-SW	1	NO	NA	
J725	J	Samarra 2	24700	6	0	6	Rectangular	NE-SW	1	NO	NA	
J726	J	Samarra 2	25400	9	0	9	Rectangular	NE-SW	1	NO	NA	
J743	J	Samarra 2	49002	7	2	9	Rectangular	NE-SW	1	NO	NA	
J746	J	Samarra 2	98777	14	4	18	Rectangular	NE-SW	1	NO	NA	
J747	J	Samarra 2	87765	10	2	12	Rectangular	NE-SW	1	NO	NA	
J748	J	Samarra 2	78333	10	2	12	Rectangular	NE-SW	1	NO	NA	
J7	J	Samarra 2	29	10	1	11	Rectangular	NE-SW	Unkwown	NO	NA	

50			08									
J751	J	Samarra 2	1344	4	0	4	Rectangular	NE-SW	Unkwown	NO	NA	
J753	J	Samarra 2	3722	6	3	9	Rectangular	NE-SW	1	NO	NA	
J755	J	Samarra 2	2505	0	0	0	Rectangular	NE-SW	1	NO	NA	
J756	J	Samarra 2	2573	3	1	4	Rectangular	NE-SW	Unkwown	NO	NA	
J757	J	Samarra 2	6357	6	3	9	Rectangular	NE-SW	1	NO	NA	
J761	J	Samarra 2	4793	14	2	16	Rectangular	NE-SW	Unkwown	NO	NA	
J762	J	Samarra 2	7168	8	2	10	Irregular	W-E	Unkwown	YES	NA	
J764	J	Samarra 2	4839	5	1	6	Irregular	NE-SW	Unkwown	NO	NA	
J766	J	Samarra 2	3558	14	0	14	Rectangular	NE-SW	1	NO	NA	
J788	J	Samarra 2	5789	0	0	0	Irregular	W-E	Unkwown	NO	NA	
J789	J	Samarra 1 or 2	5532	6	1	7	Irregular	W-E	Unkwown	NO	NA	
J791	J	Samarra 1 or 2	7565	10	0	10	Irregular	N-S	Unkwown	NO	NA	

J817	J	Samarra 1 or 2	161900	9	2	11	Irregular	N-S	Unkwown	NO	NA	
J829	J	Samarra 2	115778	8	2	10	Irregular	NW-SE	Unkwown	NO	NA	
J830	J	Samarra 2	28744	2	1	3	Rectangular	NE-SW	1	NO	NA	
J831	J	Samarra 2	21744	2	1	3	Rectangular	NE-SW	1	NO	NA	
J845	J	Samarra 2	83633	5	0	5	Rectangular	N-S	Unkwown	NO	NA	
J846	J	Samarra 2	80800	14	2	16	Rectangular	N-S	Unkwown	NO	NA	
J866	J	Samarra 2	20228	2	0	2	Rectangular	NE-SW	1	NO	NA	
J867	J	Samarra 2	20558	3	0	3	Rectangular	NE-SW	1	NO	NA	
J868	J	Samarra 2	20334	0	0	0	Rectangular	NE-SW	1	NO	NA	
J869	J	Samarra 2	21044	2	0	2	Rectangular	NE-SW	1	NO	NA	
J870	J	Samarra 2	20556	3	0	3	Rectangular	NE-SW	1	NO	NA	
J871	J	Samarra 2	22033	4	0	4	Rectangular	NE-SW	1	NO	NA	

J872	J	Samarra 2	2124	2	0	2	Rectangular	NE-SW	1	NO	NA	
J873	J	Samarra 2	2140	2	0	2	Rectangular	NE-SW	1	NO	NA	
J874	J	Samarra 2	2161	2	0	2	Rectangular	NE-SW	1	NO	NA	
J875	J	Samarra 2	2251	2	1	3	Rectangular	NE-SW	1	NO	NA	
J882	J	Samarra 2	1571	5	0	5	Trapezoidal	NE-SW	1	NO	NA	
J893	J	Samarra 2	902	3	0	3	Trapezoidal	N-W	1	NO	NA	
J896	J	Samarra 2	1718	0	0	0	Rectangular	NE-SW	1	NO	NA	
J897	J	Samarra 2	1500	2	1	3	Rectangular	NE-SW	1	NO	NA	
J898	J	Samarra 2	1500	2	1	3	Rectangular	NE-SW	1	NO	NA	
J899	J	Samarra 2	3238	6	0	6	Rectangular	NE-SW	1	NO	NA	
J901	J	Samarra 2	1687	0	0	0	Rectangular	NE-SW	1	NO	NA	
J902	J	Samarra 2	1730	0	0	0	Rectangular	NE-SW	1	NO	NA	
J9	J	Samarra 2	16	0	0	0	Rectangular	NE-SW	1	NO	NA	

03			76									
J904	J	Samarra 2	1646	0	0	0	Rectangular	NE-SW	1	NO	NA	
J905	J	Samarra 2	1610	0	0	0	Rectangular	NE-SW	1	NO	NA	
J906	J	Samarra 2	1565	0	0	0	Rectangular	NE-SW	1	NO	NA	
J907	J	Samarra 2	1571	0	0	0	Rectangular	NE-SW	1	NO	NA	
J908	J	Samarra 2	1488	0	0	0	Rectangular	NE-SW	1	NO	NA	
J909	J	Samarra 2	1483	0	0	0	Rectangular	NE-SW	1	NO	NA	
J910	J	Samarra 2	1303	0	0	0	Rectangular	NE-SW	1	NO	NA	
J911	J	Samarra 2	1298	0	0	0	Rectangular	NE-SW	1	NO	NA	
J914	J	Samarra 2	2996	4	0	4	Trapezoidal	NE-SW	1	NO	NA	
J915	J	Samarra 2	2039	4	0	4	Trapezoidal	NE-SW	1	NO	NA	
J916	J	Samarra 2	1005	2	0	2	Trapezoidal	NE-SW	1	NO	NA	
J920	J	Samarra 2	1374	2	0	2	Irregular	N-S	Unkwown	NO	NA	

J922	J	Samarra 2	1151	4	0	4	Rectangular	W-E	1	NO	NA	
J931	J	Samarra 2	1585	0	0	0	Rectangular	NE-SW	Unkwown	NO	NA	
J932	J	Samarra 2	1573	0	0	0	Rectangular	NE-SW	Unkwown	NO	NA	
J934	J	Samarra 2	2777	0	0	0	Rectangular	NE-SW	Unkwown	NO	NA	
J935	J	Samarra 2	4518	0	0	0	Rectangular	NE-SW	Unkwown	NO	NA	
J936	J	Samarra 2	1623	3	0	3	Rectangular	NE-SW	Unkwown	NO	NA	
J937	J	Samarra 2	2010	4	0	4	Rectangular	NE-SW	Unkwown	NO	NA	
J938	J	Samarra 2	1973	2	0	2	Rectangular	NE-SW	Unkwown	NO	NA	
J939	J	Samarra 2	1742	4	0	4	Rectangular	NE-SW	Unkwown	NO	NA	
J940	J	Samarra 2	1355	4	0	4	Rectangular	NE-SW	Unkwown	NO	NA	
J941	J	Samarra 2	1288	4	0	4	Rectangular	NE-SW	Unkwown	NO	NA	
J942	J	Samarra 2	1709	0	0	0	Rectangular	NE-SW	Unkwown	NO	NA	
J9	J	Samarra 2	17	0	0	0	Rectangular	NE-SW	Unkwown	NO	NA	

43			93									
J944	J	Samarra 2	18800	0	0	0	Rectangular	NE-SW	Unkwown	NO	NA	
J945	J	Samarra 2	76226	7	4	11	Rectangular	NW-SE	Unkwown	NO	NA	
J946	J	Samarra 2	15331	0	0	0	Rectangular	NE-SW	Unkwown	NO	NA	
J955	J	Samarra 1	11212	17	0	17	Irregular	N-S	Unkwown	NO	NA	
J956	J	Samarra 1 or 2	20151	39	6	45	Irregular	NE-SW	Unkwown	NO	NA	
J962	J	Samarra 1 or 2	707	0	0	0	Rectangular	NE-SW	1	NO	NA	
J965	J	Samarra 1 or 2	4653	12	2	14	Rectangular	NW-SE	Unkwown	NO	NA	
J967	J	Samarra 1 or 2	39900	19	4	23	Irregular	NE-SW	Unkwown	NO	NA	
J982	J	Samarra 2	22113	0	0	0	Rectangular	NW-SE	Unkwown	NO	NA	
J983	J	Samarra 2	36228	1	1	2	Irregular	NW-SE	Unkwown	NO	NA	
J986	J	Samarra 2	46115	2	0	2	Irregular	NE-SW	1	NO	NA	
J9	J	Samarra 2	41	3	1	4	Rectangular	NE-SW	1	NO	NA	

87			32									
J9888	J	Samarra 2	39779	2	0	2	Irregular	NE-SW	Unkwown	NO	NA	
J9889	J	Samarra 2	39882	3	0	3	Irregular	NW-SE	Unkwown	NO	NA	
J9891	J	Samarra 2	29889	2	0	2	Rectangular	NE-SW	1	NO	NA	
J9894	J	Samarra 2	74977	11	6	17	Rectangular	NW-SE	1	NO	NA	
J10012	J	Samarra 2	31933	5	0	5	Rectangular	NE-SW	Unkwown	NO	NA	
J10014	J	Samarra 2	40900	14	0	14	Rectangular	NE-SW	Unkwown	NO	NA	
J10015	J	Samarra 2	52220	9	1	10	Rectangular	NE-SW	1	NO	NA	
J10022	J	Samarra 2	38133	6	0	6	Rectangular	NW-SE	Unkwown	NO	NA	
J10023	J	Samarra 1	18388	4	0	4	Rectangular	NE-SW	Unkwown	NO	NA	
J10024	J	Samarra 1	20223	3	0	3	Rectangular	NE-SW	Unkwown	NO	NA	
J10	J	Samarra 1	18	2	0	2	Rectangular	NE-SW	Unkwown	NO	NA	

25			96									
J1026	J	Samarra 1	1513	4	0	4	Rectangular	NE-SW	Unkwown	NO	NA	
J1027	J	Samarra 1	1906	5	0	5	Rectangular	NE-SW	Unkwown	NO	NA	
J1028	J	Samarra 1	1909	0	0	0	Rectangular	NE-SW	Unkwown	NO	NA	
J1029	J	Samarra 2	2108	4	0	4	Rectangular	NE-SW	Unkwown	NO	NA	
J1030	J	Samarra 1	2229	6	0	6	Trapezoidal	NE-SW	1	NO	NA	
J1031	J	Samarra 1	1515	1	0	1	Rectangular	NE-SW	1	NO	NA	
J1032	J	Samarra 1	2086	0	0	0	Rectangular	NE-SW	1	NO	NA	
J1033	J	Samarra 1	1561	3	0	3	Trapezoidal	NE-SW	1	NO	NA	
J1034	J	Samarra 1	1902	2	0	2	Rectangular	NE-SW	1	NO	NA	
J10	J	Samarra 1	1408	3	0	3	Trapezoidal	NE-SW	1	NO	NA	

35												
J1036	J	Samarra 1	4350	3	0	3	Trapezoidal	NW-SE	1	NO	NA	
J1037	J	Samarra 1	2165	0	0	0	Square	NW-SE	1	NO	NA	
J1045	J	Samarra 1 or 2	4920	18	0	18	Rectangular	NW-SE	1	NO	NA	
J1049	J	Samarra 2	2340	4	1	5	Rectangular	NW-SE	Unkwown	NO	NA	
J1055	J	Samarra 1	3568	6	0	6	Rectangular	NW-SE	Unkwown	NO	NA	
J1057	J	Samarra 1	2790	2	0	2	Rectangular	NW-SE	Unkwown	NO	NA	
J1065	J	Samarra 1	19000	0	0	0	Trapezoidal	NE-SW	1	NO	NA	
J1066	J	Samarra 1	2056	2	0	2	Rectangular	NE-SW	1	NO	NA	
J1067	J	Samarra 1	2145	2	0	2	Rectangular	NE-SW	1	NO	NA	
J10	J	Samarra 1	1994	2	0	2	Rectangular	NE-SW	1	NO	NA	

68												
J1069	J	Samarra 1	2097	2	0	2	Rectangular	NE-SW	1	NO	NA	
J1070	J	Samarra 1	2047	2	0	2	Rectangular	NE-SW	1	NO	NA	
J1071	J	Samarra 1	1991	2	0	2	Rectangular	NE-SW	1	NO	NA	
J1073	J	Samarra 1	1494	2	0	2	Rectangular	NE-SW	1	NO	NA	
J1076	J	Samarra 1	1763	2	0	2	Rectangular	NE-SW	1	NO	NA	
J1077	J	Samarra 1	2200	2	0	2	Rectangular	NE-SW	1	NO	NA	
J1078	J	Samarra 1	1863	2	0	2	Rectangular	NE-SW	1	NO	NA	
J1079	J	Samarra 1	2352	2	0	2	Rectangular	NE-SW	1	NO	NA	
J1106	J	Samarra 2	977	4	0	4	Rectangular	NE-SW	1	NO	NA	
J111	J	Samarra 2	1573	2	0	2	Rectangular	NE-SW	1	NO	NA	

07												
J1114	J	Samarra 1	3120	2	2	4	Trapezoidal	NE-SW	1	NO	NA	
J1115	J	Samarra 1	3999	0	0	0	Trapezoidal	NE-SW	1	NO	NA	
J1120	J	Samarra 1	2700	2	0	2	Rectangular	NE-SW	1	NO	NA	
J1121	J	Samarra 1	13416	4	1	5	Irregular	NW-SE	Unkwown	NO	NA	
J1122	J	Samarra 1	2434	3	1	4	Rectangular	NE-SW	1	NO	NA	
J1123	J	Samarra 1	2055	0	0	0	Rectangular	NE-SW	1	NO	NA	
J1124	J	Samarra 1	2783	0	0	0	Rectangular	NE-SW	1	NO	NA	
J1125	J	Samarra 1	1780	0	0	0	Rectangular	NE-SW	1	NO	NA	
J1126	J	Samarra 1	5026	2	0	2	Rectangular	NE-SW	1	NO	NA	
J111	J	Samarra 1	1983	0	0	0	Rectangular	NE-SW	1	NO	NA	

27												
J1128	J	Samarra 1	2450	0	0	0	Rectangular	NE-SW	1	NO	NA	
J1129	J	Samarra 1	1998	0	0	0	Rectangular	NE-SW	1	NO	NA	
J1130	J	Samarra 1	2013	0	0	0	Rectangular	NE-SW	1	NO	NA	
J1137	J	Samarra 2	3624	2	2	4	Rectangular	NW-SE	Unkwown	NO	NA	
J1138	J	Samarra 2	4972	3	0	3	Trapezoidal	NW-SE	Unkwown	NO	NA	
J1143	J	Samarra 1	1788	2	0	2	Trapezoidal	NE-SW	1	NO	NA	
J1144	J	Samarra 1	1701	2	0	2	Trapezoidal	NE-SW	1	NO	NA	
J1145	J	Samarra 1	1582	2	0	2	Trapezoidal	NE-SW	1	NO	NA	
J1146	J	Samarra 1	1588	3	0	3	Trapezoidal	NE-SW	1	NO	NA	
K4	K	Samarra 1 or 2	8847	11	0	11	Irregular	W-E	Unkwown	NO	NA	

K21	K	Samarra 1	11215	4	4	8	Rectangular	W-E	2	NO	NA	
K23	K	Samarra 1	53911	4	1	5	Rectangular	W-E	1	NO	NA	
K24	K	Samarra 2	47552	5	3	8	Rectangular	W-E	1	NO	NA	
K28	K	Samarra 1	63331	8	1	9	Rectangular	W-E	1	NO	NA	
K33	K	Samarra 1	61884	5	2	7	Rectangular	W-E	1	NO	NA	
K34	K	Samarra 1	61774	4	0	4	Irregular	W-E	1	NO	NA	
K35	K	Samarra 1	19733	2	0	2	Rectangular	N-S	1	NO	NA	
K37	K	Samarra 1	58777	0	0	0	Rectangular	W-E	1	NO	NA	
K38	K	Samarra 1	58774	4	0	4	Rectangular	W-E	1	NO	NA	
K39	K	Samarra 1	24900	10	0	10	Trapezoidal	N-S	1	NO	NA	
K58	K	Samarra 1	421	0	0	0	Rectangular	W-E	1	NO	NA	
K59	K	Samarra 1	23100	2	0	2	Trapezoidal	W-E	1	NO	NA	
K60	K	Samarra 1	23	2	0	2	Trapezoidal	W-E	1	NO	NA	

			58									
K61	K	Samarra 1	15722	2	0	2	Trapezoidal	W-E	1	NO	NA	
K62	K	Samarra 1	17844	2	0	2	Trapezoidal	W-E	1	NO	NA	
K63	K	Samarra 1	30881	2	0	2	Trapezoidal	W-E	1	NO	NA	
K65	K	Samarra 1	75199	4	0	4	Rectangular	W-E	1	NO	NA	
K69	K	Samarra 2	52444	4	1	5	Irregular	W-E	Unkwown	NO	NA	
K71	K	Samarra 1	82881	10	0	10	Irregular	W-E	Unkwown	NO	NA	
K72	K	Samarra 1	46999	3	0	3	Rectangular	W-E	1	NO	NA	
K73	K	Samarra 1	31266	2	0	2	Rectangular	W-E	1	NO	NA	
K74	K	Samarra 1	34244	3	0	3	Rectangular	W-E	1	NO	NA	
K78	K	Samarra 1	33996	2	0	2	Rectangular	W-E	1	NO	NA	
K79	K	Samarra 1	23133	0	0	0	Rectangular	W-E	1	NO	NA	
K80	K	Samarra 1	47551	2	0	2	Rectangular	W-E	1	NO	NA	

K81	K	Samarra 1	22669	1	0	1	Rectangular	W-E	1	NO	NA	
K82	K	Samarra 1	19988	2	0	2	Rectangular	W-E	1	NO	NA	
K83	K	Samarra 1	86881	2	0	2	Rectangular	W-E	1	NO	NA	
K84	K	Samarra 1	17443	1	0	1	Rectangular	W-E	1	NO	NA	
K85	K	Samarra 1	10881	5	3	8	Rectangular	W-E	1	YES	NA	
K87	K	Samarra 1	45331	2	0	2	Rectangular	W-E	1	NO	NA	
K88	K	Samarra 1	47733	2	0	2	Rectangular	W-E	1	NO	NA	
K89	K	Samarra 1	89117	11	3	14	Rectangular	W-E	1	NO	NA	
K91	K	Samarra 1	59997	5	0	5	Rectangular	W-E	1	NO	NA	
K92	K	Samarra 1	11190	8	1	9	Rectangular	W-E	1	NO	NA	
K93	K	Samarra 1	14098	11	2	13	Rectangular	W-E	1	NO	NA	
K94	K	Samarra 1	38800	3	0	3	Rectangular	W-E	1	NO	NA	

K95	K	Samarra 1	15412	12	2	14	Rectangular	W-E	1	NO	NA	
K97	K	Samarra 1	87222	16	0	16	Rectangular	W-E	1	NO	NA	
K98	K	Samarra 1	10891	5	2	7	Irregular	W-E	1	NO	NA	
K99	K	Samarra 1	68880	8	0	8	Rectangular	W-E	1	NO	NA	
K102	K	Samarra 1	6336	7	0	7	Rectangular	W-E	1	NO	NA	
K103	K	Samarra 1	10194	8	0	8	Rectangular	W-E	1	NO	NA	
K105	K	Samarra 1	82088	5	1	6	Rectangular	W-E	1	NO	NA	
K106	K	Samarra 1	92005	10	1	11	Rectangular	W-E	1	NO	NA	
K108	K	Samarra 1	84500	4	1	5	Trapezoidal	W-E	1	NO	NA	
K109	K	Samarra 1	72229	6	1	7	Rectangular	W-E	1	NO	NA	
K119	K	Samarra 1 or 2	87811	11	3	14	Rectangular	W-E	1	NO	NA	
K120	K	Samarra 1 or 2	74822	6	4	10	Trapezoidal	W-E	1	NO	NA	

K121	K	Samarra 1 or 2	4098	4	2	6	Rectangular	W-E	1	NO	NA	
K122	K	Samarra 1 or 2	67400	12	1	13	Rectangular	W-E	1	NO	NA	
K123	K	Samarra 1 or 2	63005	8	2	10	Rectangular	W-E	Unkwown	NO	NA	
K127	K	Samarra 2	94500	21	11	32	Rectangular	NW-SE	1	NO	NA	
K128	K	Samarra 2	50005	8	0	8	Rectangular	W-E	1	NO	NA	
K129	K	Samarra 2	106733	13	7	20	Rectangular	NW-SE	1	NO	NA	
K130	K	Samarra 2	106887	5	6	11	Rectangular	NW-SE	1	NO	NA	
K131	K	Samarra 2	87881	6	5	11	Rectangular	NW-SE	1	NO	NA	
K132	K	Samarra 2	153663	22	6	28	Rectangular	NW-SE	1	NO	NA	
K134	K	Samarra 2	33445	3	1	4	Rectangular	W-E	1	NO	NA	
K136	K	Samarra 2	150889	12	3	15	Rectangular	NW-SE	1	NO	NA	
K1	K	Samarra 2	116	12	0	12	Rectangular	NW-SE	1	NO	NA	

37			47									
K139	K	Samarra 2	157706	14	2	16	Rectangular	NW-SE	Unkwown	NO	NA	
K140	K	Samarra 2	170002	15	2	17	Rectangular	NW-SE	1	NO	NA	
K141	K	Samarra 2	57933	5	0	5	Rectangular	NW-SE	2	NO	NA	
K142	K	Samarra 2	83488	8	1	9	Rectangular	NW-SE	Unkwown	NO	NA	
K143	K	Samarra 2	73944	11	1	12	Rectangular	NW-SE	1	NO	NA	
K144	K	Samarra 2	98300	4	0	4	Rectangular	NW-SE	1	NO	NA	
K145	K	Samarra 2	185335	11	1	12	Rectangular	NW-SE	1	NO	NA	
K146	K	Samarra 2	48288	4	0	4	Rectangular	NW-SE	1	NO	NA	
K147	K	Samarra 2	196688	13	0	13	Rectangular	NW-SE	1	NO	NA	
K148	K	Samarra 2	63400	6	1	7	Rectangular	NW-SE	1	NO	NA	
K149	K	Samarra 2	42044	4	1	5	Rectangular	NW-SE	1	NO	NA	

K158	K	Samarra 2	6818	5	1	6	Rectangular	W-E	1	NO	NA	
K159	K	Samarra 2	2895	5	0	5	Rectangular	W-E	1	NO	NA	
K179	K	Samarra 2	1771	3	0	3	Rectangular	N-S	Unkwown	NO	NA	
K180	K	Samarra 2	4509	3	3	6	Rectangular	N-S	1	NO	NA	
K182	K	Samarra 2	1153	0	0	0	Rectangular	W-E	1	NO	NA	
K196	K	Samarra 2	1809	0	0	0	Rectangular	W-E	1	NO	NA	
K226	K	Samarra 1	5896	2	0	2	Rectangular	W-E	1	NO	NA	
K236	K	Samarra 1	2274	0	0	0	Rectangular	W-E	1	NO	NA	
K239	K	Samarra 1	1770	10	0	10	Rectangular	N-S	1	NO	NA	
K241	K	Samarra 2	7715	4	3	7	Rectangular	W-E	1	NO	NA	
K242	K	Samarra 2	1353	0	0	0	Rectangular	W-E	Unkwown	NO	NA	
K246	K	Samarra 2	1572	0	0	0	Rectangular	W-E	Unkwown	NO	NA	
K2	K	Samarra 2	44	0	0	0	Rectangular	W-E	Unkwown	NO	NA	

49			98									
K2500	K	Samarra 2	32544	4	1	5	Rectangular	W-E	Unkwown	NO	NA	
K2522	K	Samarra 2	104699	0	0	0	Rectangular	W-E	Unkwown	NO	NA	
K2544	K	Samarra 2	10966	0	0	0	Rectangular	W-E	Unkwown	NO	NA	
K2733	K	Samarra 2	46811	2	0	2	Rectangular	W-E	1	NO	NA	
K2777	K	Samarra 2	66844	6	1	7	Rectangular	W-E	1	NO	NA	
K2788	K	Samarra 2	51900	2	0	2	Rectangular	W-E	1	NO	NA	
K2888	K	Samarra 2	65044	2	0	2	Rectangular	W-E	1	NO	NA	
K2889	K	Samarra 2	57966	12	0	12	Rectangular	W-E	1	NO	NA	
K2900	K	Samarra 2	67300	6	1	7	Rectangular	W-E	1	NO	NA	
K2966	K	Samarra 2	58933	4	8	12	Rectangular	W-E	1	NO	NA	
K3044	K	Samarran	46722	7	6	13	Rectangular	W-E	1	NO	NA	
K3055	K	Samarran	39744	3	0	3	Rectangular	W-E	1	NO	NA	

K337	K	Samarra 1	822	3	0	3	Rectangular	W-E	Unkwown	NO	NA	
K338	K	Samarra 1	756	3	3	6	Rectangular	W-E	Unkwown	NO	NA	
K342	K	Samarra 1	1683	4	1	5	Rectangular	W-E	2	NO	NA	
K343	K	Samarra 1	2787	2	1	3	Rectangular	W-E	2	NO	NA	
K344	K	Samarra 1	2112	10	0	10	Rectangular	W-E	2	NO	NA	
K345	K	Samarra 1	3344	7	6	13	Rectangular	W-E	2	NO	NA	
K346	K	Samarra 1	1698	4	0	4	Rectangular	W-E	2	NO	NA	
K372	K	Samarra 1	286	2	0	2	Rectangular	W-E	1	NO	NA	
K373	K	Samarra 1	1017	9	0	9	Rectangular	W-E	1	NO	NA	
K374	K	Samarra 1	999	3	0	3	Rectangular	W-E	Unkwown	NO	NA	
K379	K	Samarra 1 or 2	6739	2	1	3	Rectangular	W-E	1	NO	NA	
K380	K	Samarra 1	7329	7	2	9	Rectangular	W-E	1	NO	NA	
K3	K	Samarra 1	39	0	0	0	Rectangular	W-E	1	NO	NA	

81			16									
K382	K	Samarra 1	8156	7	4	11	Rectangular	W-E	1	NO	NA	
K383	K	Samarra 1	70866	6	4	10	Rectangular	W-E	1	NO	NA	
K384	K	Samarra 1	69889	4	0	4	Rectangular	W-E	1	NO	NA	
K385	K	Samarra 1	39002	0	0	0	Rectangular	W-E	1	NO	NA	
K386	K	Samarra 1	3578	0	0	0	Rectangular	W-E	1	NO	NA	
K387	K	Samarra 1	3147	0	0	0	Rectangular	W-E	1	NO	NA	
M15	M	Samarra 2	44330	80	10	90	Rectangular	N-S	1	NO	NA	
M16	M	Samarra 2	44440	80	10	90	Rectangular	N-S	1	NO	NA	
M17	M	Samarra 2	46000	80	10	90	Rectangular	N-S	1	NO	NA	
M20	M	Samarra 2	4714	80	10	90	Rectangular	N-S	1	NO	NA	
M21	M	Samarra 2	4732	80	10	90	Rectangular	N-S	1	NO	NA	
M22	M	Samarra 2	2322	40	5	45	Rectangular	N-S	1	NO	NA	

M23	M	Samarra 2	4185	80	10	90	Rectangular	N-S	1	NO	NA	
M24	M	Samarra 2	4595	80	10	90	Rectangular	N-S	1	NO	NA	
M25	M	Samarra 2	4571	80	10	90	Rectangular	N-S	1	NO	NA	
M30	M	Samarra 2	4797	80	10	90	Rectangular	N-S	1	NO	NA	
M31	M	Samarra 2	4753	80	10	90	Rectangular	N-S	1	NO	NA	
M32	M	Samarra 2	2382	40	5	45	Rectangular	N-S	1	NO	NA	
M33	M	Samarra 2	4520	80	10	90	Rectangular	N-S	1	NO	NA	
M34	M	Samarra 2	4705	80	10	90	Rectangular	N-S	1	NO	NA	
M35	M	Samarra 2	4772	80	10	90	Rectangular	N-S	1	NO	NA	
M36	M	Samarra 2	4423	80	10	90	Rectangular	N-S	1	NO	NA	
M37	M	Samarra 2	2403	40	5	45	Rectangular	N-S	1	NO	NA	
M38	M	Samarra 2	4671	80	10	90	Rectangular	N-S	1	NO	NA	
M39	M	Samarra 2	47	80	10	90	Rectangular	N-S	1	NO	NA	

			84									
M40	M	Samarra 2	4636	80	10	90	Rectangular	N-S	1	NO	NA	
M41	M	Samarra 2	4582	80	10	90	Rectangular	N-S	1	NO	NA	
M42	M	Samarra 2	2641	40	5	45	Rectangular	N-S	1	NO	NA	
M43	M	Samarra 2	4646	80	10	90	Rectangular	N-S	1	NO	NA	
M44	M	Samarra 2	4483	80	10	90	Rectangular	N-S	1	NO	NA	
M45	M	Samarra 2	4518	80	10	90	Rectangular	N-S	1	NO	NA	
M46	M	Samarra 2	4497	80	10	90	Rectangular	N-S	1	NO	NA	
M47	M	Samarra 2	2134	40	5	45	Rectangular	N-S	1	NO	NA	
M48	M	Samarra 2	4640	80	10	90	Rectangular	N-S	1	NO	NA	
M49	M	Samarra 2	4641	80	10	90	Rectangular	N-S	1	NO	NA	
M50	M	Samarra 2	4615	80	10	90	Rectangular	N-S	1	NO	NA	
M51	M	Samarra 2	4507	80	10	90	Rectangular	N-S	1	NO	NA	

M52	M	Samarra 2	24733	40	5	45	Rectangular	N-S	1	NO	NA	
M55	M	Samarra 2	47333	20	10	30	Rectangular	N-S	1	NO	NA	
M56	M	Samarra 2	44995	11	5	16	Rectangular	N-S	1	NO	NA	
M57	M	Samarra 2	24344	5	4	9	Rectangular	N-S	1	NO	NA	
O12	O	Early Abbasid – Samarran	67336	7	1	8	Rectangular	NE-SW	Unkwown	NO	NA	
O13	O	Early Abbasid – Samarran	75552	4	3	7	Irregular	NE-SW	Unkwown	NO	NA	
Q19	Q	Samarra 2	53399	35	3	38	Rectangular	NW-SE	Unkwown	NO	NA	
Q20	Q	Samarra 2	54455	10	5	15	Rectangular	NW-SE	Unkwown	NO	NA	
Q21	Q	Samarra 2	61233	11	5	16	Rectangular	NW-SE	Unkwown	NO	NA	
Q22	Q	Samarra 2	53044	13	2	15	Rectangular	NW-SE	Unkwown	NO	NA	
Q23	Q	Samarra 2	53777	24	1	25	Rectangular	NW-SE	Unkwown	YES	NA	
Q24	Q	Samarra 2	42511	40	0	40	Rectangular	NW-SE	Unkwown	YES	NA	

Q25	Q	Samarra 2	28133	40	1	41	Rectangular	NW-SE	Unkwown	NO	NA	
Q31	Q	Samarra 2	28555	20	1	21	Rectangular	NW-SE	Unkwown	NO	NA	
Q32	Q	Samarra 2	49445	40	1	41	Rectangular	NW-SE	Unkwown	NO	NA	
Q33	Q	Samarra 2	47111	40	1	41	Rectangular	NW-SE	Unkwown	NO	NA	
Q34	Q	Samarra 2	50091	40	1	41	Rectangular	NW-SE	Unkwown	NO	NA	
Q35	Q	Samarra 2	48895	69	1	70	Rectangular	NW-SE	Unkwown	NO	NA	
Q36	Q	Samarra 2	51334	38	4	42	Rectangular	NW-SE	Unkwown	NO	NA	
Q37	Q	Samarra 2	46332	2	1	3	Rectangular	NW-SE	Unkwown	NO	NA	
Q38	Q	Samarra 2	49974	6	3	9	Rectangular	NW-SE	Unkwown	NO	NA	
R21	R	Samarra 2, after 232/847.	17011	24	5	29	Rectangular	NW-SE	Unkwown	NO	NA	
R23	R	Samarra 2, after 232/847.	17067	22	5	27	Rectangular	NW-SE	Unkwown	NO	NA	
R26	R	Samarra 2, after 232/847.	81977	1	2	3	Rectangular	NW-SE	Unkwown	NO	NA	

R27	R	Samarra 2, after 232/847.	5336	2	1	3	Rectangular	NW-SE	Unkwown	NO	NA	
R30	R	Samarra 2, after 232/847.	4096	15	5	20	Rectangular	NW-SE	1	NO	NA	
R31	R	Samarra 2, after 232/847.	10212	7	2	9	Irregular	NW-SE	1	NO	NA	
R32	R	Samarra 2, after 232/847.	7610	13	5	18	Rectangular	NW-SE	1	NO	NA	
R33	R	Samarra 2, after 232/847.	4797	3	1	4	Rectangular	NW-SE	1	NO	NA	
R34	R	Samarra 2, after 232/847.	6878	3	2	5	Rectangular	NW-SE	1	NO	NA	
R35	R	Samarra 2, after 232/847.	9503	18	5	23	Rectangular	NW-SE	1	NO	NA	
R36	R	Samarra 2, after 232/847.	6709	9	0	9	Rectangular	NW-SE	1	NO	NA	
R37	R	Samarra 2, after 232/847.	5560	4	0	4	Rectangular	NW-SE	1	NO	NA	
R38	R	Samarra 2, after 232/847.	3834	7	0	7	Rectangular	NW-SE	1	NO	NA	

R39	R	Samarra 2, after 232/847.	71366	18	3	21	Rectangular	NW-SE	1	NO	NA	
R40	R	Samarra 2, after 232/847.	78944	10	1	11	Rectangular	NW-SE	1	NO	NA	
R42	R	Samarra 2, after 232/847.	47200	2	0	2	Rectangular	NW-SE	1	NO	NA	
R43	R	Samarra 2, after 232/847.	67778	5	1	6	Rectangular	NW-SE	1	NO	NA	
R44	R	Samarra 2, after 232/847.	139558	14	2	16	Rectangular	NW-SE	1	NO	NA	
R45	R	Samarra 2, after 232/847.	129009	22	3	25	Rectangular	NW-SE	1	NO	NA	
R46	R	Samarra 2, after 232/847.	142274	16	12	28	Rectangular	NW-SE	1	NO	NA	
R47	R	Samarra 2, after 232/847.	78355	16	2	18	Rectangular	NW-SE	1	NO	NA	
R49	R	Samarra 2, after 232/847.	30911	3	2	5	Irregular	NW-SE	1	NO	NA	
R50	R	Samarra 2, after 232/847.	45022	9	3	12	Rectangular	NW-SE	1	NO	NA	

R51	R	Samarra 2, after 232/847.	43822	3	0	3	Rectangular	NW-SE	1	NO	NA	
R52	R	Samarra 2, after 232/847.	62221	8	5	13	Rectangular	NW-SE	1	NO	NA	
R53	R	Samarra 2, after 232/847.	103088	12	6	18	Rectangular	NW-SE	1	NO	NA	
R54	R	Samarra 2, after 232/847.	66544	12	0	12	Rectangular	NW-SE	1	NO	NA	
R55	R	Samarra 2, after 232/847.	31988	4	1	5	Rectangular	NW-SE	1	NO	NA	
R56	R	Samarra 2, after 232/847.	27277	3	0	3	Rectangular	NW-SE	1	NO	NA	
R82	R	Samarra 2	41144	0	0	0	Rectangular	NW-SE	1	NO	NA	
R95	R	Samarra 2	124992	2	0	2	Rectangular	NW-SE	1	NO	NA	
R96	R	Samarra 2	107499	0	0	0	Rectangular	NW-SE	1	NO	NA	
R98	R	Samarra 2	140889	9	2	11	Rectangular	NW-SE	1	NO	NA	

R99	R	Samarra 2	64003	4	15	19	Rectangular	NW-SE	1	NO	NA	
R101	R	Samarra 2	59399	2	0	2	Rectangular	NW-SE	1	NO	NA	
R102	R	Samarra 2	123777	6	1	7	Rectangular	NW-SE	1	NO	NA	
R106	R	Samarra 2	196365	53	1	54	Rectangular	NW-SE	1	NO	NA	
R107	R	Samarra 2	41399	18	4	22	Rectangular	NW-SE	1	NO	NA	
R110	R	Samarra 2	14999	0	0	0	Trapezoidal	NE-SW	1	NO	NA	
R117	R	Samarra 2	223007	30	22	52	Rectangular	NW-SE	1	NO	NA	
R119	R	Samarra 2	101992	21	6	27	Rectangular	NW-SE	1	NO	NA	reception block
R121	R	Samarra 2	153354	36	11	47	Rectangular	NE-SW	1	NO	NA	
R122	R	Samarra 2	212232	82	20	102	Rectangular	NE-SW	1	NO	NA	
R123	R	Samarra 2	186669	30	9	39	Rectangular	NE-SW	1	NO	NA	

R124	R	Samarra 2	190443	103	25	128	Rectangular	NE-SW	1	NO	NA	
R125	R	Samarra 2	210117	87	22	109	Rectangular	NE-SW	1	NO	NA	
R129	R	Samarra 2	166449	51	13	64	Trapezoidal	NE-SW	1	NO	NA	
R134	R	Samarra 2	197775	7	2	9	Rectangular	NE-SW	1	NO	NA	
R135	R	Samarra 2	217702	21	11	32	Rectangular	NE-SW	1	NO	NA	
R136	R	Samarra 2	210008	28	7	35	Rectangular	NE-SW	1	NO	NA	
R137	R	Samarra 2	160441	9	6	15	Rectangular	NE-SW	1	NO	NA	
R138	R	Samarra 2	137737	7	3	10	Rectangular	NW-SE	1	NO	NA	
R139	R	Samarra 2	138662	16	2	18	Rectangular	NW-SE	1	NO	NA	
R140	R	Samarra 2	22555	10	0	10	Rectangular	NE-SW	Unkwown	NO	NA	

R141	R	Samarra 2	4046	5	1	6	Rectangular	NE-SW	Unkwown	NO	NA	
R142	R	Samarra 2	13935	0	0	0	Rectangular	NW-SE	Unkwown	NO	NA	
R143	R	Samarra 2	45644	12	3	15	Rectangular	NW-SE	Unkwown	NO	NA	
R144	R	Samarra 2	20449	3	0	3	Rectangular	NW-SE	Unkwown	NO	NA	
R146	R	Samarra 2	66633	3	1	4	Rectangular	NW-SE	Unkwown	NO	NA	
R148	R	Samarra 2	83008	5	1	6	Rectangular	NW-SE	1	NO	NA	
R149	R	Samarra 2	73455	6	0	6	Rectangular	NW-SE	1	NO	NA	
R150	R	Samarra 2	91116	10	1	11	Rectangular	NW-SE	1	NO	NA	
R151	R	Samarra 2	144478	11	2	13	Rectangular	NW-SE	1	NO	NA	
R152	R	Samarra 2	154452	14	2	16	Rectangular	NW-SE	1	NO	NA	
R153	R	Samarra 2	151999	15	7	22	Rectangular	NW-SE	1	NO	NA	
R1	R	Samarra 2	150	13	4	17	Rectangular	NW-SE	1	NO	NA	

54			98									
R155	R	Samarra 2	14643	12	2	14	Rectangular	NW-SE	1	NO	NA	
R156	R	Samarra 2	63885	0	0	0	Rectangular	NW-SE	1	YES	NA	
R158	R	Samarra 2	28299	5	1	6	Rectangular	NE-SW	1	NO	NA	
R159	R	Samarra 2	28111	3	3	6	Rectangular	NE-SW	1	NO	NA	
R160	R	Samarra 2	22003	3	3	6	Rectangular	NE-SW	1	NO	NA	
R161	R	Samarra 2	27004	5	2	7	Rectangular	NE-SW	1	NO	NA	
R162	R	Samarra 2	27330	5	2	7	Rectangular	NE-SW	1	NO	NA	
R166	R	Samarra 2	82199	29	9	38	Rectangular	NW-SE	1	NO	NA	
R167	R	Samarra 2	94366	0	0	0	Rectangular	NW-SE	1	NO	NA	
R171	R	Samarra 2	62766	2	0	2	Rectangular	NW-SE	1	NO	NA	
R172	R	Samarra 2	83911	3	2	5	Rectangular	NW-SE	1	NO	NA	
R173	R	Samarra 2	172	23	2	25	Rectangular	NW-SE	1	NO	NA	

			53									
R174	R	Samarra 2	178955	5	3	8	Rectangular	NW-SE	1	NO	NA	
R177	R	Samarra 2	45933	0	0	0	Rectangular	N-S	1	NO	NA	
R178	R	Samarra 2	76779	12	0	12	Rectangular	N-S	Unkwown	NO	NA	
R179	R	Samarra 2	95600	15	0	15	Rectangular	N-S	Unkwown	NO	NA	
R180	R	Samarra 2	87776	14	0	14	Rectangular	N-S	Unkwown	NO	NA	
R181	R	Samarra 2	82227	11	0	11	Rectangular	N-S	Unkwown	NO	NA	
R182	R	Samarra 2	80224	3	0	3	Rectangular	N-S	Unkwown	NO	NA	
R184	R	Samarra 2	118800	13	2	15	Rectangular	NW-SE	1	NO	NA	
R185	R	Samarra 2	133833	11	5	16	Rectangular	NW-SE	1	NO	NA	
R186	R	Samarra 2	137007	16	2	18	Rectangular	NW-SE	1	NO	NA	
R187	R	Samarra 2	141444	14	1	15	Rectangular	NW-SE	1	NO	NA	

R188	R	Samarra 2	13582	21	3	24	Rectangular	NW-SE	1	NO	NA	
R189	R	Samarra 2	142249	18	0	18	Rectangular	NW-SE	1	NO	NA	
R190	R	Samarra 2	71112	3	1	4	Rectangular	NW-SE	1	NO	NA	
R191	R	Samarra 2	69211	0	0	0	Rectangular	NW-SE	1	NO	NA	
R193	R	Samarra 2	75033	3	1	4	Irregular	NW-SE	1	NO	NA	
R194	R	Samarra 2	108388	7	2	9	Rectangular	NW-SE	1	NO	NA	
R196	R	Samarra 2	249005	4	1	5	Rectangular	NW-SE	1	NO	NA	
R198	R	Samarra 2	131100	0	0	0	Rectangular	NW-SE	1	NO	NA	
R199	R	Samarra 2	72254	5	1	6	Rectangular	NW-SE	1	NO	NA	
R200	R	Samarra 2	131130	12	2	14	Rectangular	NW-SE	1	NO	NA	
R201	R	Samarra 2	134554	11	2	13	Rectangular	NW-SE	1	NO	NA	

R202	R	Samarra 2	13509	14	2	16	Rectangular	NW-SE	1	NO	NA	
R203	R	Samarra 2	33005	4	0	4	Rectangular	NW-SE	1	NO	NA	
R207	R	Samarra 2	138441	17	2	19	Rectangular	NW-SE	1	NO	NA	
R208	R	Samarra 2	131124	17	3	20	Rectangular	NW-SE	1	NO	NA	
R209	R	Samarra 2	64311	11	0	11	Rectangular	NW-SE	1	NO	NA	
R210	R	Samarra 2	79119	17	3	20	Rectangular	NW-SE	1	NO	NA	
R215	R	Samarra 2	205885	14	3	17	Rectangular	NW-SE	1	NO	NA	
R216	R	Samarra 2	153999	10	1	11	Rectangular	NW-SE	1	NO	NA	reception block
R217	R	Samarra 2	16481	22	0	22	Rectangular	NW-SE	1	NO	NA	
R219	R	Samarra 2	13211	2	0	2	Rectangular	NW-SE	1	NO	NA	
R240	R	Samarra 2	91776	7	2	9	Rectangular	NW-SE	1	NO	NA	

R255	R	Samarra 2	41447	16	0	16	Rectangular	NW-SE	1	NO	NA	
R256	R	Samarra 2	105355	0	0	0	Rectangular	NW-SE	1	NO	NA	
R257	R	Samarra 2	21449	10	0	10	Rectangular	NW-SE	Unkwown	NO	NA	
R259	R	Samarra 2	10155	10	0	10	Rectangular	NW-SE	Unkwown	NO	NA	
R262	R	Samarra 2	53666	3	1	4	Rectangular	NW-SE	Unkwown	NO	NA	
R264	R	Samarra 2	186652	8	3	11	Rectangular	NW-SE	1	NO	NA	
R265	R	Samarra 2	82099	8	2	10	Rectangular	NW-SE	1	NO	NA	
R266	R	Samarra 2	96266	13	3	16	Rectangular	NW-SE	1	NO	NA	
R267	R	Samarra 2	34663	5	0	5	Rectangular	NW-SE	Unkwown	NO	NA	
R269	R	Samarra 2	100093	16	9	25	Rectangular	NE-SW	Unkwown	NO	NA	
R273	R	Samarra 2	83779	25	6	31	Rectangular	NW-SE	1	NO	NA	
R274	R	Samarra 2	39011	12	2	14	Rectangular	NW-SE	1	NO	NA	

R275	R	Samarra 2	9605	6	1	7	Rectangular	NE-SW	Unkwown	NO	NA	
R282	R	Samarra 2	777	3	0	3	Irregular	NW-SE	Unkwown	NO	NA	
R283	R	Samarra 2	2041	3	1	4	Rectangular	NE-SW	Unkwown	NO	NA	
R284	R	Samarra 2	39611	8	0	8	Rectangular	NW-SE	Unkwown	NO	NA	
R310	R	Samarra 2	9099	4	2	6	Rectangular	NW-SE	1	NO	NA	
R312	R	Samarra 2	28399	9	1	10	Rectangular	NE-SW	1	NO	NA	
R313	R	Samarra 2	43299	1	1	2	Rectangular	NW-SE	1	NO	NA	
R317	R	Samarra 2	89177	31	4	35	Rectangular	NE-SW	1	NO	NA	
R323	R	Samarra 2	67088	12	3	15	Rectangular	NW-SE	Unkwown	NO	NA	
R324	R	Samarra 2	64311	2	1	3	Rectangular	NW-SE	Unkwown	NO	NA	
R334	R	Samarra 2	68466	9	4	13	Rectangular	NW-SE	1	NO	NA	
T53	T	Samarra 3	16222	3	0	3	Rectangular	NW-SE	Unkwown	NO	NA	
T71	T	Samarra 3	40	2	0	2	Rectangular	NE-SW	Unkwown	NO	NA	

			25									
T109	T	Samarra 3	3093	16	3	19	Rectangular	NW-SE	Unkwown	NO	NA	
T138	T	Samarra 3	7911	4	4	8	Squared	N-S	Unkwown	NO	NA	
T194	T	Samarra 3	16988	12	9	21	Rectangular	W-E	Unkwown	NO	NA	
T276	T	Samarra 3	15266	8	1	9	Rectangular	NE-SW	1	NO	NA	
T279	T	Samarra 3	28551	12	1	13	Rectangular	NE-SW	1	NO	NA	
T295	T	Samarra 3	23666	4	2	6	Rectangular	NW-SE	1	NO	NA	
T296	T	Samarra 3	40966	25	4	29	Rectangular	NW-SE	1	NO	NA	
T299	T	Samarra 3	15844	6	0	6	Rectangular	NW-SE	Unkwown	NO	NA	
T307	T	Samarra 3	71668	52	9	61	Rectangular	NW-SE	1	NO	NA	
T308	T	Samarra 3	76632	63	28	91	Rectangular	NW-SE	1	NO	NA	
T309	T	Samarra 3	77088	53	12	65	Rectangular	NW-SE	1	NO	NA	
T310	T	Samarra 3	65881	60	24	84	Rectangular	NW-SE	1	NO	NA	

T311	T	Samarra 3	4707	42	25	67	Rectangular	NW-SE	1	NO	NA	
T312	T	Samarra 3	5156	30	16	46	Rectangular	NW-SE	1	NO	NA	
T313	T	Samarra 3	2153	11	0	11	Irregular	NW-SE	Unkwown	NO	NA	
T314	T	Samarra 3	3244	6	1	7	Rectangular	NW-SE	Unkwown	NO	NA	
T315	T	Samarra 3	134334	25	4	29	Squared	NW-SE	Unkwown	NO	NA	
T319	T	Samarra 3	4332	49	15	64	Rectangular	NW-SE	1	NO	NA	
T320	T	Samarra 3	3630	42	14	56	Rectangular	NW-SE	1	NO	NA	
T324	T	Samarra 3	1201	16	3	19	Rectangular	NE-SW	Unkwown	NO	NA	
T354	T	Samarra 3	58551	8	1	9	Rectangular	NW-SE	Unkwown	NO	NA	
T355	T	Samarra 3	4023	11	4	15	Rectangular	NW-SE	Unkwown	YES	NA	
T441	T	Samarra 3	778	5	0	5	Irregular	NW-SE	Unkwown	NO	NA	
T457	T	Samarra 3	1092	7	1	8	Rectangular	NE-SW	Unkwown	NO	NA	

T458	T	Samarra 3	1263	7	1	8	Rectangular	NE-SW	Unkwown	NO	NA	
T459	T	Samarra 3	805	2	2	4	Rectangular	NE-SW	Unkwown	NO	NA	
T460	T	Samarra 3	812	2	0	2	Irregular	NE-SW	Unkwown	NO	NA	
T461	T	Samarra 3	363	2	0	2	Rectangular	NE-SW	Unkwown	NO	NA	
T464	T	Samarra 3	713	0	0	0	Rectangular	NE-SW	Unkwown	NO	NA	
T466	T	Samarra 3	1044	3	0	3	Rectangular	NE-SW	Unkwown	NO	NA	
T467	T	Samarra 3	1158	4	1	5	Rectangular	NE-SW	Unkwown	NO	NA	
T474	T	Samarra 3	3318	10	3	13	Rectangular	NE-SW	Unkwown	NO	NA	
T498	T	Samarra 3	25611	16	2	18	Rectangular	NW-SE	Unkwown	NO	NA	
T499	T	Samarra 3	40000	20	9	29	Rectangular	NW-SE	1	NO	NA	
T500	T	Samarra 3	49811	29	1	30	Rectangular	NW-SE	1	NO	NA	
T501	T	Samarra 3	27600	15	7	22	Rectangular	NW-SE	1	NO	NA	
T5	T	Samarra 3	26	12	1	13	Rectangular	NW-SE	1	NO	NA	

30			31									
T5333	T	Samarra 3	81119	49	6	55	Irregular	NW-SE	1	NO	NA	
T5334	T	Samarra 3	32111	15	1	16	Irregular	N-S	1	NO	NA	
T5335	T	Samarra 3	11110	10	3	13	Rectangular	N-S	Unkwown	NO	NA	
T5339	T	Samarra 3	10002	3	0	3	Rectangular	N-S	Unkwown	NO	NA	
T5433	T	Samarra 3	12733	3	4	7	Rectangular	NW-SE	1	NO	NA	
T5445	T	Samarra 3	899	2	0	2	Rectangular	W-E	Unkwown	NO	NA	
T5446	T	Samarra 3	948	4	0	4	Rectangular	W-E	Unkwown	NO	NA	
T5447	T	Samarra 3	12499	11	0	11	Irregular	W-E	Unkwown	NO	NA	
T5448	T	Samarra 3	591	4	0	4	Rectangular	W-E	Unkwown	NO	NA	
T5449	T	Samarra 3	351	3	0	3	Rectangular	W-E	Unkwown	NO	NA	
T5533	T	Samarra 3	21338	5	0	5	Rectangular	NW-SE	Unkwown	NO	NA	
T5559	T	Samarra 3	14699	12	0	12	Rectangular	NW-SE	Unkwown	NO	NA	

T560	T	Samarra 3	3162	24	0	24	Rectangular	NW-SE	Unkwown	NO	NA	
T562	T	Samarra 3	374	3	0	3	Rectangular	NW-SE	Unkwown	NO	NA	
T564	T	Samarra 3	1055	7	1	8	Rectangular	NW-SE	Unkwown	NO	NA	
T565	T	Samarra 3	2215	3	0	3	Rectangular	NW-SE	Unkwown	NO	NA	
T567	T	Samarra 3	1172	3	0	3	Rectangular	NW-SE	Unkwown	NO	NA	
T568	T	Samarra 3	2192	6	0	6	Rectangular	NW-SE	Unkwown	NO	NA	
T569	T	Samarra 3	6473	36	12	48	Irregular	NE-SW	Unkwown	NO	NA	
T583	T	Samarra 3	1928	8	0	8	Rectangular	N-S	Unkwown	NO	NA	
T585	T	Samarra 3	725	3	0	3	Irregular	NW-SE	Unkwown	NO	NA	
T586	T	Samarra 3	536	4	0	4	Rectangular	NW-SE	Unkwown	NO	NA	
T587	T	Samarra 3	2758	19	0	19	Rectangular	NW-SE	Unkwown	NO	NA	
T589	T	Samarra 3	1388	10	3	13	Rectangular	NW-SE	Unkwown	NO	NA	
T5	T	Samarra 3	538	6	0	6	Rectangular	W-E	Unkwown	NO	NA	

90												
T591	T	Samarra 3	4336	26	15	41	Rectangular	NW-SE	1	YES	NA	
T592	T	Samarra 3	4479	44	7	51	Rectangular	NW-SE	1	NO	NA	
T593	T	Samarra 3	873	3	3	6	Rectangular	N-S	Unkwown	NO	NA	
T594	T	Samarra 3	2899	23	7	30	Irregular	NW-SE	Unkwown	NO	NA	
T600	T	Samarra 3	845	4	2	6	Rectangular	NW-SE	Unkwown	NO	NA	
T601	T	Samarra 3	927	6	0	6	Rectangular	NW-SE	1	NO	NA	
T602	T	Samarra 3	2399	8	4	12	Rectangular	NW-SE	1	NO	NA	
T603	T	Samarra 3	2460	15	2	17	Irregular	NW-SE	1	NO	NA	
T619	T	Samarra 3	242	2	0	2	Rectangular	N-S	Unkwown	NO	NA	
T620	T	Samarra 3	265	2	0	2	Rectangular	N-S	Unkwown	NO	NA	
T635	T	Samarra 3	2924	18	1	19	Rectangular	NW-SE	1	NO	NA	
T636	T	Samarra 3	4520	18	0	18	Rectangular	NW-SE	1	NO	NA	

T637	T	Samarra 3	4296	21	0	21	Rectangular	NW-SE	1	NO	NA	
T638	T	Samarra 3	4489	20	0	20	Rectangular	NW-SE	1	NO	NA	
T639	T	Samarra 3	4761	21	0	21	Rectangular	NW-SE	1	NO	NA	
T640	T	Samarra 3	4321	21	1	22	Rectangular	NW-SE	1	NO	NA	
T641	T	Samarra 3	4375	13	1	14	Rectangular	NW-SE	1	NO	NA	
T645	T	Samarra 3	1932	6	1	7	Rectangular	NW-SE	1	NO	NA	
T646	T	Samarra 3	3236	13	1	14	Rectangular	NW-SE	1	NO	NA	
T647	T	Samarra 3	3193	14	2	16	Rectangular	NW-SE	1	NO	NA	
T648	T	Samarra 3	3466	16	8	24	Rectangular	NW-SE	1	NO	NA	
T649	T	Samarra 3	3310	15	8	23	Rectangular	NW-SE	1	NO	NA	
T650	T	Samarra 3	3420	19	4	23	Rectangular	NW-SE	1	NO	NA	
T651	T	Samarra 3	3049	12	0	12	Irregular	NW-SE	1	NO	NA	
T6	T	Samarra 3	33	57	7	64	Rectangular	NW-SE	1	NO	NA	

52			08									
T653	T	Samarra 3	14900	21	3	24	Rectangular	NW-SE	1	NO	NA	
T656	T	Samarra 3	53337	17	1	18	Rectangular	NE-SW	1	NO	NA	
T661	T	Samarra 3	83009	15	0	15	Rectangular	NE-SW	Unkwown	NO	NA	
T664	T	Samarra 3	12949	38	2	40	Rectangular	NE-SW	Unkwown	NO	NA	
T682	T	Samarra 3	81211	8	1	9	Rectangular	NW-SE	Unkwown	NO	NA	
T683	T	Samarra 3	74008	12	0	12	Rectangular	NW-SE	Unkwown	NO	NA	
T695	T	Samarra 3	79600	48	0	48	Squared	NW-SE	Unkwown	NO	NA	
T696	T	Samarra 3	81288	32	2	34	Squared	NW-SE	Unkwown	NO	NA	
T698	T	Samarra 3	10068	10	0	10	Irregular	NE-SW	Unkwown	NO	NA	
T699	T	Samarra 3	57311	44	1	45	Rectangular	NE-SW	Unkwown	NO	NA	
T702	T	Samarra 3	67888	48	0	48	Rectangular	NE-SW	Unkwown	NO	NA	
T723	T	Samarra 3	98200	40	0	40	Irregular	NW-SE	Unkwown	NO	NA	

T724	T	Samarra 3	191154	91	10	101	Rectangular	NW-SE	1	NO	NA	
T725	T	Samarra 3	138557	87	1	88	Rectangular	NW-SE	1	NO	NA	
T738	T	Samarra 3	40933	4	1	5	Rectangular	NE-SW	1	NO	NA	
T739	T	Samarra 3	30224	2	3	5	Rectangular	NE-SW	1	NO	NA	
T742	T	Samarra 3	27449	6	1	7	Rectangular	NE-SW	1	NO	NA	
T743	T	Samarra 3	10555	0	0	0	Irregular	NE-SW	Unkwown	NO	NA	
T744	T	Samarra 3	31113	4	2	6	Rectangular	NE-SW	1	NO	NA	
T745	T	Samarra 3	26444	2	0	2	Rectangular	NE-SW	Unkwown	NO	NA	
T753	T	Samarra 3	14000	0	0	0	Rectangular	N-S	1	NO	NA	
T755	T	Samarra 3	28911	0	0	0	Rectangular	N-S	1	NO	NA	
T756	T	Samarra 3	192933	54	3	57	Rectangular	NW-SE	1	NO	NA	
T759	T	Samarra 3	44332	5	1	6	Rectangular	NW-SE	1	NO	NA	

T760	T	Samarra 3	22665	6	2	8	Rectangular	NW-SE	1	NO	NA	
T761	T	Samarra 3	15337	3	0	3	Rectangular	NW-SE	1	NO	NA	
T766	T	Samarra 3	749	3	1	4	Trapezoidal	NE-SW	Unkwown	NO	NA	
T768	T	Samarra 3	330	1	2	3	Irregular	N-S	Unkwown	NO	NA	
T769	T	Samarra 3	3454	23	0	23	Trapezoidal	NE-SW	Unkwown	NO	NA	
T770	T	Samarra 3	14666	16	0	16	Rectangular	NE-SW	Unkwown	NO	NA	
T771	T	Samarra 3	17822	16	0	16	Rectangular	NE-SW	Unkwown	NO	NA	
T772	T	Samarra 3	19011	17	0	17	Rectangular	NE-SW	Unkwown	NO	NA	
T773	T	Samarra 3	870	10	0	10	Rectangular	NE-SW	Unkwown	NO	NA	
T774	T	Samarra 3	569	5	0	5	Rectangular	NE-SW	Unkwown	NO	NA	
T786	T	Samarra 3	38887	25	4	29	Rectangular	N-S	1	NO	NA	
T787	T	Samarra 3	13399	3	1	4	Rectangular	N-S	Unkwown	NO	NA	
T7	T	Samarra 3	30	13	3	16	Irregular	NW-SE	1	NO	NA	

88			11									
T793	T	Samarra 3	1356	6	3	9	Rectangular	NW-SE	1	NO	NA	
T797	T	Samarra 3	1734	6	0	6	Irregular	NW-SE	1	NO	NA	
T799	T	Samarra 3	2140	7	0	7	Irregular	NW-SE	1	NO	NA	
T8000	T	Samarra 3	939	8	0	8	Irregular	NW-SE	1	NO	NA	
T8001	T	Samarra 3	1308	10	0	10	Rectangular	NW-SE	1	NO	NA	
T8002	T	Samarra 3	988	8	0	8	Rectangular	NW-SE	1	NO	NA	
T8003	T	Samarra 3	1179	7	1	8	Rectangular	NW-SE	1	NO	NA	
T8004	T	Samarra 3	1180	5	0	5	Rectangular	NW-SE	1	NO	NA	
T8005	T	Samarra 3	1709	10	1	11	Rectangular	NW-SE	1	NO	NA	
T8006	T	Samarra 3	1252	10	0	10	Rectangular	NW-SE	1	NO	NA	
T8007	T	Samarra 3	880	6	0	6	Rectangular	NW-SE	1	NO	NA	
T8008	T	Samarra 3	2417	15	6	21	Rectangular	NW-SE	1	NO	NA	

T809	T	Samarra 3	3010	6	2	8	Rectangular	NW-SE	1	NO	NA	
T810	T	Samarra 3	577	2	0	2	Rectangular	NE-SW	Unkwown	NO	NA	
T811	T	Samarra 3	762	3	0	3	Irregular	NE-SW	Unkwown	NO	NA	
T812	T	Samarra 3	602	2	0	2	Rectangular	NE-SW	Unkwown	NO	NA	
T813	T	Samarra 3	799	2	0	2	Rectangular	NW-SE	Unkwown	NO	NA	
T814	T	Samarra 3	11180	4	0	4	Irregular	NW-SE	Unkwown	NO	NA	
T815	T	Samarra 3	30000	8	1	9	Rectangular	NW-SE	1	NO	NA	
T820	T	Samarra 3	31800	2	2	4	Rectangular	N-S	1	NO	NA	
T821	T	Samarra 3	3722	2	0	2	Rectangular	NW-SE	1	NO	NA	
T822	T	Samarra 3	32800	8	1	9	Rectangular	NW-SE	1	NO	NA	
T823	T	Samarra 3	6668	12	1	13	Irregular	NW-SE	1	NO	NA	
T824	T	Samarra 3	3345	12	0	12	Rectangular	NW-SE	1	NO	NA	
T8	T	Samarra 3	24	18	2	20	Rectangular	NW-SE	1	NO	NA	

25			51									
T8266	T	Samarra 3	39288	10	2	12	Rectangular	NW-SE	1	NO	NA	
T8277	T	Samarra 3	39771	7	0	7	Rectangular	NW-SE	1	NO	NA	
T8288	T	Samarra 3	42433	18	1	19	Rectangular	NW-SE	1	NO	NA	
T8299	T	Samarra 3	38088	27	0	27	Rectangular	NW-SE	1	NO	NA	
T8300	T	Samarra 3	24100	14	1	15	Rectangular	NW-SE	1	NO	NA	
T8311	T	Samarra 3	650	2	0	2	Rectangular	NW-SE	Unkwown	NO	NA	
T8355	T	Samarra 3	30388	10	3	13	Rectangular	NE-SW	Unkwown	NO	NA	
T8388	T	Samarra 3	15655	5	4	9	Rectangular	NW-SE	1	NO	NA	
T8422	T	Samarra 3	19200	10	3	13	Rectangular	NW-SE	1	NO	NA	
T8444	T	Samarra 3	15778	6	2	8	Rectangular	N-S	Unkwown	NO	NA	
T8500	T	Samarra 3	11889	10	0	10	Rectangular	NW-SE	1	NO	NA	
T8511	T	Samarra 3	13388	15	0	15	Rectangular	NW-SE	1	NO	NA	

T852	T	Samarra 3	1332	8	1	9	Rectangular	NW-SE	1	NO	NA	
T853	T	Samarra 3	1079	9	1	10	Rectangular	NW-SE	1	NO	NA	
T864	T	Samarra 3	824	6	0	6	Rectangular	NW-SE	1	NO	NA	
T866	T	Samarra 3	1207	7	0	7	Rectangular	NW-SE	1	NO	NA	
T867	T	Samarra 3	1602	14	0	14	Rectangular	NW-SE	1	NO	NA	
T868	T	Samarra 3	1638	14	10	24	Rectangular	NW-SE	1	NO	NA	
T869	T	Samarra 3	1503	12	8	20	Rectangular	NW-SE	1	NO	NA	
T870	T	Samarra 3	1007	5	0	5	Irregular	NW-SE	Unkwown	NO	NA	
T878	T	Samarra 3	19000	5	1	6	Irregular	NW-SE	1	NO	NA	
T879	T	Samarra 3	1566	7	0	7	Rectangular	NW-SE	Unkwown	NO	NA	
T8800	T	Samarra 3	2436	7	2	9	Rectangular	NW-SE	1	NO	NA	
T8811	T	Samarra 3	3844	13	4	17	Rectangular	NW-SE	1	NO	NA	
T8	T	Samarra 3	24	10	3	13	Rectangular	NW-SE	1	NO	NA	

82			52									
T883	T	Samarra 3	28522	10	9	19	Rectangular	NW-SE	1	NO	NA	
T884	T	Samarra 3	31110	21	19	40	Rectangular	NW-SE	1	NO	NA	
T885	T	Samarra 3	30334	22	16	38	Rectangular	NW-SE	1	NO	NA	
T890	T	Samarra 3	30200	13	4	17	Rectangular	NW-SE	1	NO	NA	
T891	T	Samarra 3	24244	7	2	9	Rectangular	NW-SE	1	NO	NA	
T892	T	Samarra 3	23666	8	3	11	Rectangular	NW-SE	1	NO	NA	
T893	T	Samarra 3	22447	20	1	21	Rectangular	NW-SE	1	NO	NA	
T894	T	Samarra 3	24500	11	5	16	Rectangular	NW-SE	1	NO	NA	
T895	T	Samarra 3	24366	9	4	13	Rectangular	NW-SE	1	NO	NA	
T896	T	Samarra 3	40377	14	5	19	Trapezoidal	NW-SE	1	NO	NA	
T898	T	Samarra 3	23733	21	8	29	Rectangular	NW-SE	1	NO	NA	reception block
T899	T	Samarra 3	23887	20	4	24	Rectangular	NW-SE	1	NO	NA	

T902	T	Samarra 3	25778	20	1	21	Rectangular	NW-SE	1	NO	NA	
T903	T	Samarra 3	24833	11	1	12	Rectangular	NW-SE	1	NO	NA	
T905	T	Samarra 3	22900	5	2	7	Rectangular	NW-SE	1	NO	NA	
T906	T	Samarra 3	26667	15	9	24	Rectangular	NW-SE	1	NO	NA	
T907	T	Samarra 3	39422	29	0	29	Rectangular	NW-SE	1	NO	NA	
T911	T	Samarra 3	17222	6	3	9	Trapezoidal	NW-SE	1	NO	NA	
T912	T	Samarra 3	22944	14	0	14	Rectangular	NW-SE	1	NO	NA	
T913	T	Samarra 3	22944	13	0	13	Rectangular	NW-SE	1	NO	NA	
T931	T	Samarra 3	26966	12	0	12	Rectangular	NW-SE	1	NO	NA	
T932	T	Samarra 3	51822	20	10	30	Rectangular	NW-SE	1	NO	NA	
T933	T	Samarra 3	64544	14	7	21	Irregular	NW-SE	1	NO	NA	
T935	T	Samarra 3	20749	31	3	34	Irregular	NW-SE	1	NO	NA	

T937	T	Samarra 3	25520	122	19	141	Rectangular	NW-SE	1	NO	NA	
T938	T	Samarra 3	18980	70	14	84	Rectangular	NW-SE	1	NO	NA	
T939	T	Samarra 3	24870	71	12	83	Rectangular	NW-SE	1	NO	NA	
T941	T	Samarra 3	10051	7	0	7	Rectangular	NW-SE	1	NO	NA	
T942	T	Samarra 3	20096	2	2	4	Rectangular	NE-SW	Unkwown	NO	NA	
T943	T	Samarra 3	17785	7	0	7	Rectangular	NE-SW	Unkwown	NO	NA	
T945	T	Samarra 3	63777	40	16	56	Rectangular	NW-SE	1	NO	NA	
T946	T	Samarra 3	23005	5	2	7	Rectangular	NW-SE	1	NO	NA	
T947	T	Samarra 3	881	0	0	0	Rectangular	NW-SE	1	NO	NA	
T950	T	Samarra 3	39776	2	4	6	Rectangular	NW-SE	1	NO	NA	
T951	T	Samarra 3	751	6	0	6	Rectangular	NE-SW	Unkwown	NO	NA	
T952	T	Samarra 3	794	6	0	6	Rectangular	NE-SW	Unkwown	NO	NA	

T953	T	Samarra 3	4163	6	5	11	Rectangular	NW-SE	1	NO	NA	
T954	T	Samarra 3	820	6	0	6	Rectangular	NE-SW	Unkwown	NO	NA	
T955	T	Samarra 3	887	6	0	6	Rectangular	NE-SW	Unkwown	NO	NA	
T956	T	Samarra 3	2907	2	2	4	Rectangular	NW-SE	1	NO	NA	
T958	T	Samarra 3	746	6	0	6	Rectangular	NE-SW	Unkwown	NO	NA	
T959	T	Samarra 3	775	9	0	9	Rectangular	NE-SW	Unkwown	NO	NA	
T960	T	Samarra 3	1251	3	3	6	Irregular	NW-SE	Unkwown	NO	NA	
T961	T	Samarra 3	1108	7	0	7	Rectangular	NE-SW	Unkwown	NO	NA	
T962	T	Samarra 3	1966	8	6	14	Rectangular	NE-SW	Unkwown	NO	NA	
T966	T	Samarra 3	4822	10	5	15	Rectangular	NE-SW	Unkwown	NO	NA	
T967	T	Samarra 3	3814	15	9	24	Rectangular	NE-SW	Unkwown	NO	NA	
T975	T	Samarra 3	1403	3	1	4	Rectangular	NE-SW	Unkwown	NO	NA	
T9	T	Samarra 3	20	6	3	9	Rectangular	NE-SW	Unkwown	NO	NA	

76			10									
T977	T	Samarra 3	33934	15	4	19	Rectangular	NE-SW	Unkwown	NO	NA	
T978	T	Samarra 3	32339	9	2	11	Rectangular	NE-SW	Unkwown	NO	NA	
T983	T	Samarra 3	12487	24	1	25	Rectangular	NE-SW	1	NO	NA	
T984	T	Samarra 3	14019	55	10	65	Rectangular	NE-SW	1	NO	NA	
T987	T	Samarra 3	29335	15	2	17	Rectangular	NE-SW	1	NO	NA	
T988	T	Samarra 3	22441	7	1	8	Rectangular	NW-SE	1	NO	NA	
T989	T	Samarra 3	16555	2	1	3	Rectangular	NW-SE	Unkwown	NO	NA	
T991	T	Samarra 3	28005	25	0	25	Rectangular	NE-SW	Unkwown	NO	NA	
T994	T	Samarra 3	46668	33	0	33	Rectangular	NE-SW	Unkwown	NO	NA	
T995	T	Samarra 3	34900	25	0	25	Rectangular	NE-SW	1	NO	NA	
T998	T	Samarra 3	23777	9	0	9	Squared	NE-SW	Unkwown	NO	NA	
T9	T	Samarra 3	957	4	0	4	Rectangular	NW-SE	Unkwown	NO	NA	

99												
T1001	T	Samarra 3	3499	6	1	7	Rectangular	NE-SW	Unkwown	NO	NA	
T1003	T	Samarra 3	1254	4	0	4	Irregular	NE-SW	Unkwown	NO	NA	
T1004	T	Samarra 3	336	1	0	1	Rectangular	NW-SE	1	NO	NA	
T1008	T	Samarra 3	796	4	0	4	Irregular	NW-SE	Unkwown	NO	NA	
T1009	T	Samarra 3	2207	3	2	5	Rectangular	NW-SE	Unkwown	NO	NA	
T1010	T	Samarra 3	1692	16	0	16	Irregular	NE-SW	Unkwown	NO	NA	
T1011	T	Samarra 3	2730	13	2	15	Rectangular	NE-SW	Unkwown	NO	NA	
T1012	T	Samarra 3	947	8	0	8	Rectangular	NW-SE	Unkwown	NO	NA	
T1015	T	Samarra 3	1707	6	1	7	Rectangular	NW-SE	Unkwown	NO	NA	
T10	T	Samarra 3	1428	14	0	14	Rectangular	NW-SE	1	NO	NA	

16												
T10019	T	Samarra 3	829	3	0	3	Rectangular	NW-SE	Unkwown	NO	NA	
T10020	T	Samarra 3	1868	12	1	13	Irregular	NE-SW	Unkwown	NO	NA	
T10021	T	Samarra 3	1616	7	0	7	Irregular	NE-SW	Unkwown	NO	NA	
T10022	T	Samarra 3	1132	4	1	5	Squared	NE-SW	Unkwown	NO	NA	
T10029	T	Samarra 3	2056	3	1	4	Rectangular	NW-SE	1	NO	NA	
T10030	T	Samarra 3	2111	10	0	10	Irregular	NW-SE	1	NO	NA	
T10031	T	Samarra 3	2121	5	1	6	Irregular	NW-SE	1	NO	NA	
T10034	T	Samarra 3	2663	9	0	9	Rectangular	NW-SE	Unkwown	NO	NA	
T10035	T	Samarra 3	2191	8	0	8	Rectangular	NW-SE	Unkwown	NO	NA	
T10	T	Samarra 3	4740	7	1	8	Rectangular	NW-SE	1	NO	NA	

37												
T1040	T	Samarra 3	1559	4	0	4	Rectangular	NW-SE	Unkwown	NO	NA	
T1072	T	Samarra 3	3328	14	0	14	Rectangular	NE-SW	Unkwown	NO	NA	
U14	U	Samarra 4	3621	9	1	10	Rectangular	NW-SE	1	NO	NA	
U15	U	Samarra 4	4191	0	0	0	Rectangular	NW-SE	1	NO	NA	
U16	U	Samarra 4	4345	1	0	1	Rectangular	NW-SE	1	NO	NA	
U17	U	Samarra 4	5770	10	2	12	Rectangular	NW-SE	1	NO	NA	
U18	U	Samarra 4	5479	17	4	21	Rectangular	NW-SE	1	NO	NA	
U19	U	Samarra 4	5504	16	3	19	Rectangular	NW-SE	1	NO	NA	
U20	U	Samarra 4	2158	4	2	6	Rectangular	NW-SE	1	NO	NA	
U21	U	Samarra 4	3106	7	7	14	Rectangular	NW-SE	1	NO	NA	
U22	U	Samarra 4	5148	16	4	20	Rectangular	NW-SE	1	NO	NA	
U23	U	Samarra 4	57	6	2	8	Rectangular	NW-SE	1	NO	NA	

			85									
U25	U	Samarra 4	52800	13	2	15	Rectangular	NW-SE	1	NO	NA	
U26	U	Samarra 4	21882	9	0	9	Irregular	NW-SE	1	NO	NA	
U27	U	Samarra 4	14113	2	0	2	Rectangular	NW-SE	1	NO	NA	
U28	U	Samarra 4	17004	16	0	16	Rectangular	NW-SE	1	NO	NA	
U29	U	Samarra 4	33499	12	1	13	Rectangular	NW-SE	1	NO	NA	
U30	U	Samarra 4	34299	20	3	23	Rectangular	NW-SE	1	NO	NA	
U31	U	Samarra 4	32224	0	2	2	Rectangular	NW-SE	1	NO	NA	
U32	U	Samarra 4	46866	12	3	15	Rectangular	NW-SE	1	NO	NA	
U33	U	Samarra 4	50552	20	0	20	Rectangular	NW-SE	1	NO	NA	
U34	U	Samarra 4	32213	20	1	21	Rectangular	NW-SE	1	NO	NA	
U35	U	Samarra 4	32755	20	1	21	Rectangular	NW-SE	1	NO	NA	
U36	U	Samarra 4	30555	4	1	5	Rectangular	NW-SE	1	NO	NA	

U37	U	Samarra 4	40266	2	0	2	Rectangular	NW-SE	1	NO	NA	
U38	U	Samarra 4	60922	8	8	16	Rectangular	NW-SE	1	NO	NA	
U42	U	Samarra 4	20499	4	1	5	Rectangular	NW-SE	Unkwown	NO	NA	
U43	U	Samarra 4	21600	4	2	6	Rectangular	NW-SE	Unkwown	NO	NA	
U48	U	Samarra 4	8599	12	1	13	Rectangular	NW-SE	Unkwown	NO	NA	
U49	U	Samarra 4	20881	10	0	10	Irregular	NW-SE	1	NO	NA	
U50	U	Samarra 4	38889	24	0	24	Rectangular	NW-SE	1	NO	NA	
U51	U	Samarra 4	14599	12	1	13	Rectangular	NW-SE	1	NO	NA	
U52	U	Samarra 4	3255	3	0	3	Rectangular	NW-SE	Unkwown	NO	NA	
U53	U	Samarra 4	4277	4	0	4	Irregular	NW-SE	1	NO	NA	
U54	U	Samarra 4	7233	4	0	4	Rectangular	NW-SE	1	NO	NA	
U56	U	Samarra 4	7622	5	0	5	Rectangular	NW-SE	Unkwown	NO	NA	
U64	U	Samarra 4	44633	5	3	8	Rectangular	NE-SW	2	NO	NA	
U65	U	Samarra 4	36992	12	1	13	Rectangular	NE-SW	1	NO	NA	

U66	U	Samarra 4	37334	12	1	13	Rectangular	NE-SW	1	NO	NA	
U67	U	Samarra 4	24228	20	0	20	Rectangular	NE-SW	1	NO	NA	
U68	U	Samarra 4	23351	20	0	20	Rectangular	NE-SW	1	NO	NA	
U69	U	Samarra 4	23779	20	0	20	Rectangular	NE-SW	1	NO	NA	
U70	U	Samarra 4	24022	20	0	20	Rectangular	NE-SW	1	NO	NA	
U71	U	Samarra 4	23446	20	0	20	Rectangular	NE-SW	1	NO	NA	
U72	U	Samarra 4	11669	6	1	7	Rectangular	NE-SW	1	NO	NA	
U91	U	Samarra 4	13557	6	0	6	Squared	NW-SE	Unkwown	NO	NA	
U94	U	Samarra 4	103533	32	15	47	Rectangular	NW-SE	1	NO	NA	
U96	U	Samarra 4	64800	29	9	38	Rectangular	NW-SE	1	NO	NA	
U97	U	Samarra 4	73822	12	10	22	Rectangular	NW-SE	1	NO	NA	reception block
U103	U	Samarra 4	34111	18	4	22	Rectangular	NW-SE	1	NO	NA	

U104	U	Samarra 4	2306	17	0	17	Rectangular	NW-SE	1	NO	NA	
U105	U	Samarra 4	3924	7	6	13	Rectangular	NW-SE	1	NO	NA	
U106	U	Samarra 4	3248	2	0	2	Rectangular	NW-SE	1	NO	NA	
U107	U	Samarra 4	3812	0	0	0	Rectangular	NW-SE	1	NO	NA	
U108	U	Samarra 4	3530	0	0	0	Rectangular	NW-SE	1	NO	NA	
U109	U	Samarra 4	844	4	0	4	Rectangular	NW-SE	1	NO	NA	
U110	U	Samarra 4	1446	6	0	6	Irregular	NW-SE	1	NO	NA	
U111	U	Samarra 4	2155	8	2	10	Rectangular	NW-SE	1	NO	NA	
U112	U	Samarra 4	2451	7	1	8	Irregular	NW-SE	1	NO	NA	
U113	U	Samarra 4	3187	13	0	13	Rectangular	NW-SE	1	NO	NA	
U114	U	Samarra 4	3598	20	1	21	Rectangular	NW-SE	1	NO	NA	
U115	U	Samarra 4	2329	10	0	10	Rectangular	NW-SE	1	NO	NA	
U1	U	Samarra 4	18	14	3	17	Rectangular	NW-SE	1	NO	NA	

16			49									
U117	U	Samarra 4	17077	15	2	17	Rectangular	NW-SE	1	NO	NA	
U118	U	Samarra 4	286	4	1	5	Rectangular	NE-SW	1	NO	NA	
U121	U	Samarra 4	19229	14	2	16	Rectangular	NW-SE	1	NO	NA	
U122	U	Samarra 4	20399	8	0	8	Rectangular	NW-SE	1	NO	NA	
U123	U	Samarra 4	17776	8	0	8	Rectangular	NW-SE	1	NO	NA	
U124	U	Samarra 4	19077	3	0	3	Rectangular	NW-SE	1	NO	NA	
U125	U	Samarra 4	20644	0	0	0	Rectangular	NW-SE	1	NO	NA	
U126	U	Samarra 4	16844	0	0	0	Rectangular	NW-SE	1	NO	NA	
U127	U	Samarra 4	19900	4	1	5	Rectangular	NW-SE	1	NO	NA	
U128	U	Samarra 4	14446	4	3	7	Rectangular	NW-SE	1	NO	NA	
U129	U	Samarra 4	14668	15	9	24	Rectangular	NW-SE	1	NO	NA	
U130	U	Samarra 4	13888	9	3	12	Rectangular	NW-SE	1	NO	NA	

U131	U	Samarra 4	1321	14	0	14	Rectangular	NW-SE	1	NO	NA	
U132	U	Samarra 4	1333	20	6	26	Rectangular	NW-SE	1	NO	NA	
U133	U	Samarra 4	1300	17	0	17	Rectangular	NW-SE	1	NO	NA	
U134	U	Samarra 4	670	6	0	6	Rectangular	NW-SE	1	NO	NA	
U136	U	Samarra 4	1528	30	12	42	Rectangular	NW-SE	1	NO	NA	
U137	U	Samarra 4	687	6	3	9	Rectangular	NW-SE	1	NO	NA	
U139	U	Samarra 4	937	4	0	4	Rectangular	NW-SE	1	NO	NA	
U141	U	Samarra 4	2018	15	1	16	Rectangular	NW-SE	1	NO	NA	
U142	U	Samarra 4	2116	13	3	16	Rectangular	NE-SW	1	NO	NA	
U145	U	Samarra 4	2074	11	3	14	Rectangular	NW-SE	1	NO	NA	
U146	U	Samarra 4	1978	6	3	9	Rectangular	NW-SE	1	NO	NA	
U147	U	Samarra 4	1063	3	0	3	Rectangular	NW-SE	1	NO	NA	
U1	U	Samarra 4	25	10	0	10	Rectangular	NE-SW	1	NO	NA	

51			66									
U152	U	Samarra 4	2257	4	3	7	Rectangular	NW-SE	1	NO	NA	
U153	U	Samarra 4	5274	1	0	1	Rectangular	NE-SW	Unkwown	NO	NA	
U155	U	Samarra 4	1522	2	0	2	Rectangular	NW-SE	1	NO	NA	
U156	U	Samarra 4	1243	14	0	14	Rectangular	NW-SE	1	NO	NA	
U157	U	Samarra 4	1446	4	0	4	Rectangular	NW-SE	1	NO	NA	
U158	U	Samarra 4	1483	14	0	14	Rectangular	NW-SE	1	NO	NA	
U159	U	Samarra 4	1273	12	0	12	Rectangular	NW-SE	1	NO	NA	
U160	U	Samarra 4	688	0	0	0	Rectangular	NW-SE	1	NO	NA	
U162	U	Samarra 4	2202	20	0	20	Rectangular	NW-SE	1	NO	NA	
U163	U	Samarra 4	1046	10	0	10	Rectangular	NW-SE	1	NO	NA	
U164	U	Samarra 4	2225	19	0	19	Rectangular	NW-SE	1	NO	NA	
U173	U	Samarra 4	6237	14	3	17	Rectangular	NE-SW	1	NO	NA	

U174	U	Samarra 4	1099	3	0	3	Rectangular	NE-SW	Unkwown	NO	NA	
U175	U	Samarra 4	1332	4	1	5	Irregular	NE-SW	Unkwown	NO	NA	
U188	U	Samarra 4	3133	8	2	10	Rectangular	NW-SE	1	NO	NA	
U192	U	Samarra 4	1707	19	0	19	Rectangular	NE-SW	Unkwown	NO	NA	
U202	U	Samarra 4	4748	19	8	27	Rectangular	NW-SE	1	NO	NA	
U203	U	Samarra 4	5262	19	5	24	Rectangular	NW-SE	1	NO	NA	
U204	U	Samarra 4	5695	21	7	28	Rectangular	NW-SE	1	NO	NA	
U205	U	Samarra 4	3814	6	3	9	Rectangular	NW-SE	1	NO	NA	
U207	U	Samarra 4	2656	10	5	15	Rectangular	NW-SE	1	NO	NA	
U208	U	Samarra 4	2709	10	5	15	Rectangular	NW-SE	1	NO	NA	
U209	U	Samarra 4	2539	6	2	8	Rectangular	NW-SE	1	NO	NA	
U210	U	Samarra 4	2360	5	0	5	Rectangular	NW-SE	1	NO	NA	
U2	U	Samarra 4	25	0	0	0	Rectangular	NW-SE	1	NO	NA	

11			19									
U212	U	Samarra 4	1448	6	0	6	Rectangular	NW-SE	1	NO	NA	
U213	U	Samarra 4	2914	12	0	12	Rectangular	NW-SE	1	NO	NA	
U214	U	Samarra 4	2869	25	0	25	Rectangular	NW-SE	1	NO	NA	
U215	U	Samarra 4	8457	43	0	43	Rectangular	NW-SE	1	NO	NA	
U216	U	Samarra 4	1954	8	0	8	Rectangular	NW-SE	1	NO	NA	
U217	U	Samarra 4	2197	7	0	7	Rectangular	NW-SE	1	NO	NA	
U218	U	Samarra 4	7703	3	2	5	Rectangular	NW-SE	1	NO	NA	
U219	U	Samarra 4	3695	5	2	7	Rectangular	NW-SE	1	NO	NA	
U220	U	Samarra 4	2247	5	2	7	Rectangular	NW-SE	1	NO	NA	
U221	U	Samarra 4	4087	12	0	12	Rectangular	NW-SE	1	NO	NA	
U222	U	Samarra 4	2339	11	0	11	Rectangular	NW-SE	1	NO	NA	
U223	U	Samarra 4	2368	10	0	10	Rectangular	NW-SE	1	NO	NA	

U224	U	Samarra 4	2651	12	0	12	Irregular	NE-SW	Unkwown	NO	NA	
U226	U	Samarra 4	44457	16	1	17	Irregular	NE-SW	Unkwown	NO	NA	
U272	U	Samarra 4	37769	6	2	8	Rectangular	NW-SE	1	NO	NA	
U273	U	Samarra 4	29288	3	2	5	Rectangular	NW-SE	1	NO	NA	
U276	U	Samarra 4	34988	14	0	14	Rectangular	NW-SE	1	NO	NA	
U277	U	Samarra 4	33346	10	0	10	Rectangular	NW-SE	Unkwown	NO	NA	
U278	U	Samarra 4	38445	8	2	10	Rectangular	NW-SE	Unkwown	NO	NA	
U279	U	Samarra 4	22268	6	0	6	Irregular	NW-SE	Unkwown	NO	NA	
U280	U	Samarra 4	32007	8	2	10	Rectangular	NW-SE	Unkwown	NO	NA	
U282	U	Samarra 4	36001	6	1	7	Rectangular	NW-SE	Unkwown	NO	NA	
U283	U	Samarra 4	36664	0	0	0	Rectangular	NW-SE	Unkwown	NO	NA	
U284	U	Samarra 4	39119	3	1	4	Rectangular	NE-SW	Unkwown	NO	NA	
U2	U	Samarra 4	37	2	1	3	Rectangular	NE-SW	Unkwown	NO	NA	

85			87									
U296	U	Samarra 1 or 2	7301	4	1	5	Rectangular	NW-SE	1	NO	NA	
U298	U	Samarra 1 or 2	81822	15	1	16	Rectangular	NW-SE	1	NO	NA	
U299	U	Samarra 1 or 2	64778	17	3	20	Rectangular	NW-SE	1	NO	NA	
U302	U	Samarra 1 or 2	43335	7	1	8	Irregular	NE-SW	Unkwown	NO	NA	
U303	U	Samarra 1 or 2	74955	13	2	15	Rectangular	NW-SE	1	NO	NA	
U305	U	Samarra 1 or 2	90233	10	2	12	Rectangular	NW-SE	1	NO	NA	
U320	U	Samarra 1 or 2	49229	4	2	6	Rectangular	NW-SE	1	NO	NA	
U321	U	Samarra 1 or 2	42771	9	5	14	Rectangular	NW-SE	1	NO	NA	
U322	U	Samarra 1 or 2	57781	7	1	8	Rectangular	NW-SE	1	NO	NA	
U356	U	Samarra 4	46557	4	2	6	Rectangular	NE-SW	1	NO	NA	
U357	U	Samarra 4	48888	8	2	10	Rectangular	NE-SW	1	NO	NA	
U358	U	Samarra 4	10111	3	1	4	Rectangular	NE-SW	1	NO	NA	

U360	U	Samarra 4	3480	0	0	0	Rectangular	NW-SE	1	NO	NA	
U361	U	Samarra 4	938	2	0	2	Rectangular	NE-SW	Unkwown	NO	NA	
U362	U	Samarra 4	1633	7	0	7	Rectangular	NE-SW	Unkwown	NO	NA	
U363	U	Samarra 4	1389	4	1	5	Rectangular	NE-SW	Unkwown	NO	NA	
U364	U	Samarra 4	1598	4	1	5	Rectangular	NE-SW	Unkwown	NO	NA	
U367	U	Samarra 4	1363	9	0	9	Rectangular	NW-SE	Unkwown	NO	NA	
U368	U	Samarra 4	1163	3	1	4	Rectangular	NW-SE	Unkwown	NO	NA	
U370	U	Samarra 4	1362	6	0	6	Squared	NW-SE	Unkwown	NO	NA	
U371	U	Samarra 4	1298	5	0	5	Squared	NW-SE	Unkwown	NO	NA	
U372	U	Samarra 4	1462	6	0	6	Squared	NW-SE	Unkwown	NO	NA	
U373	U	Samarra 4	1613	7	0	7	Squared	NW-SE	Unkwown	NO	NA	
U374	U	Samarra 4	713	4	0	4	Rectangular	NE-SW	Unkwown	NO	NA	
U3	U	Samarra 4	12	4	1	5	Rectangular	NW-SE	Unkwown	NO	NA	

75			72									
U376	U	Samarra 4	2248	8	3	11	Rectangular	NE-SW	1	NO	NA	
U377	U	Samarra 4	21800	7	1	8	Rectangular	NE-SW	1	NO	NA	
U378	U	Samarra 4	2281	12	1	13	Rectangular	NE-SW	1	NO	NA	
U379	U	Samarra 4	2239	5	0	5	Rectangular	NE-SW	1	NO	NA	
U381	U	Samarra 4	2390	0	0	0	Rectangular	NW-SE	1	NO	NA	
U381	U	Samarra 4	514	8	1	9	Rectangular	NW-SE	1	NO	NA	
U381	U	Samarra 4	2230	2	0	2	Rectangular	NW-SE	1	NO	NA	
U381	U	Samarra 4	4874	10	0	10	Rectangular	NW-SE	1	NO	NA	
U381	U	Samarra 4	4758	13	0	13	Rectangular	NW-SE	1	NO	NA	
U381	U	Samarra 4	2276	5	0	5	Rectangular	NW-SE	1	NO	NA	
U386	U	Samarra 4	2367	3	1	4	Rectangular	NE-SW	Unkwown	NO	NA	
U387	U	Samarra 4	4555	22	11	33	Irregular	NE-SW	Unkwown	NO	NA	

U388	U	Samarra 4	674	4	4	8	Rectangular	NW-SE	1	NO	NA	
U389	U	Samarra 4	14600	11	0	11	Rectangular	NW-SE	2	NO	NA	
U393	U	Samarra 4	68422	11	3	14	Rectangular	NE-SW	Unkwown	NO	NA	
U394	U	Samarra 4	55554	8	5	13	Rectangular	NE-SW	Unkwown	NO	NA	
U397	U	Samarra 4	22229	4	0	4	Rectangular	NE-SW	Unkwown	NO	NA	
X9	X	Samarra 1	30043	8	2	10	Rectangular	N-S	1	NO	NA	
X10	X	Samarra 1	35556	9	1	10	Rectangular	N-S	1	NO	NA	
X11	X	Samarra 1	56885	10	2	12	Rectangular	N-S	1	NO	NA	
X13	X	Samarra 1	60881	13	2	15	Rectangular	NE-SW	1	NO	NA	
X14	X	Samarra 1	68003	7	1	8	Rectangular	NE-SW	1	NO	NA	
X15	X	Samarra 1	57559	5	1	6	Rectangular	NE-SW	1	NO	NA	
X16	X	Samarra 1	20221	4	4	8	Rectangular	NE-SW	1	NO	NA	
X17	X	Samarra 1	25	3	2	5	Rectangular	NE-SW	1	NO	NA	

			07									
X19	X	Samarra 1	4113	12	1	13	Trapezoidal	N-S	1	NO	NA	
X20	X	Samarra 1	4848	5	2	7	Rectangular	N-S	1	NO	NA	
X22	X	Samarra 1	4063	12	1	13	Trapezoidal	N-S	1	NO	NA	
X24	X	Samarra 1	4861	7	1	8	Rectangular	NE-SW	1	NO	NA	
X29	X	Samarra 1	6964	7	1	8	Rectangular	N-S	1	NO	NA	
X30	X	Samarra 1	4279	7	1	8	Rectangular	N-S	1	NO	NA	
X31	X	Samarra 1	8302	9	5	14	Rectangular	N-S	1	NO	NA	
X32	X	Samarra 1	4265	3	4	7	Rectangular	N-S	1	NO	NA	
X37	X	Samarra 1	6761	7	4	11	Rectangular	NE-SW	1	NO	NA	
X38	X	Samarra 1	4156	5	0	5	Rectangular	NE-SW	1	NO	NA	
X39	X	Samarra 1	4419	6	0	6	Rectangular	NE-SW	1	NO	NA	
X40	X	Samarra 1	3265	5	0	5	Rectangular	NE-SW	1	NO	NA	

X41	X	Samarra 1	7797	7	3	10	Rectangular	NE-SW	1	NO	NA	
X42	X	Samarra 1	4435	7	0	7	Rectangular	NE-SW	1	NO	NA	
X43	X	Samarra 1	7344	13	0	13	Rectangular	NE-SW	1	NO	NA	
X44	X	Samarra 1	4031	13	1	14	Rectangular	NE-SW	1	NO	NA	
X45	X	Samarra 1	7832	9	2	11	Rectangular	NE-SW	1	NO	NA	
X46	X	Samarra 1	7817	9	3	12	Rectangular	NE-SW	1	NO	NA	
X47	X	Samarra 1	8429	22	8	30	Rectangular	NE-SW	1	NO	NA	
X48	X	Samarra 1	6924	10	1	11	Rectangular	NE-SW	1	NO	NA	
X49	X	Samarra 1	5505	8	0	8	Rectangular	NE-SW	1	NO	NA	
X50	X	Samarra 1	2526	6	0	6	Rectangular	W-E	Unkwown	NO	NA	
X51	X	Samarra 1	3120	6	1	7	Rectangular	W-E	Unkwown	NO	NA	
X52	X	Samarra 1	7497	5	2	7	Rectangular	N-S	1	NO	NA	
X53	X	Samarra 1	79	20	2	22	Rectangular	N-S	1	NO	NA	

			07									
X56	X	Samarra 1	10417	18	0	18	Rectangular	N-S	1	NO	NA	
X57	X	Samarra 1	4626	8	0	8	Rectangular	N-S	1	NO	NA	
X58	X	Samarra 1	51000	5	2	7	Rectangular	N-S	1	NO	NA	
X59	X	Samarra 1	7031	13	0	13	Rectangular	N-S	1	NO	NA	
X60	X	Samarra 1	68667	11	0	11	Rectangular	N-S	1	NO	NA	
X61	X	Samarra 1	6167	12	0	12	Rectangular	N-S	1	NO	NA	
X62	X	Samarra 1	72500	17	1	18	Rectangular	N-S	1	NO	NA	
X63	X	Samarra 1	6316	9	0	9	Rectangular	N-S	1	NO	NA	
X64	X	Samarra 1	56669	4	1	5	Rectangular	N-S	1	NO	NA	
X65	X	Samarra 1	4828	6	0	6	Rectangular	N-S	1	NO	NA	
X68	X	Samarra 1	51119	4	0	4	Rectangular	N-S	1	NO	NA	
X69	X	Samarra 1	78466	13	2	15	Rectangular	N-S	1	NO	NA	

X70	X	Samarra 1	5047	7	0	7	Rectangular	N-S	1	NO	NA	
X71	X	Samarra 1	5585	6	0	6	Rectangular	N-S	1	NO	NA	
X72	X	Samarra 1	9872	10	1	11	Rectangular	N-S	1	NO	NA	
X74	X	Samarra 1	3614	3	1	4	Rectangular	N-S	1	NO	NA	
X75	X	Samarra 1	5066	6	2	8	Rectangular	N-S	1	NO	NA	
X77	X	Samarra 1	1535	4	0	4	Rectangular	NE-SW	1	NO	NA	
X78	X	Samarra 1	2654	6	0	6	Rectangular	W-E	Unkwown	NO	NA	
X79	X	Samarra 1	2536	5	0	5	Rectangular	W-E	Unkwown	NO	NA	
X80	X	Samarra 1	2652	5	0	5	Rectangular	W-E	Unkwown	NO	NA	
X81	X	Samarra 1	3947	0	0	0	Rectangular	N-S	1	NO	NA	
X83	X	Samarra 1	3653	7	2	9	Rectangular	NE-SW	1	NO	NA	
X87	X	Samarra 1	7854	5	1	6	Trapezoidal	W-E	1	NO	NA	
X1	X	Samarra 1	60	4	5	9	Rectangular	N-S	1	NO	NA	

00			01									
X101	X	Samarra 1	5398	7	1	8	Rectangular	N-S	1	NO	NA	
X102	X	Samarra 1	4883	10	1	11	Rectangular	N-S	1	NO	NA	
X103	X	Samarra 1	30800	6	0	6	Rectangular	N-S	1	NO	NA	
X104	X	Samarra 1	63005	8	2	10	Rectangular	N-S	1	NO	NA	
X105	X	Samarra 1	4941	5	2	7	Rectangular	N-S	1	YES	NA	
X106	X	Samarra 1	5385	3	3	6	Rectangular	N-S	1	NO	NA	
X107	X	Samarra 1	44000	0	0	0	Rectangular	N-S	1	NO	NA	
X111	X	Samarra 1	4232	5	2	7	Rectangular	N-S	1	NO	NA	
X112	X	Samarra 1	5788	9	0	9	Rectangular	N-S	1	NO	NA	
X113	X	Samarra 1	58200	10	0	10	Rectangular	N-S	1	YES	NA	
X114	X	Samarra 1	5315	8	0	8	Rectangular	N-S	1	NO	NA	
X115	X	Samarra 1	3595	3	1	4	Rectangular	N-S	1	NO	NA	

X116	X	Samarra 1	3026	3	1	4	Rectangular	N-S	1	NO	NA	
X117	X	Samarra 1	5547	10	0	10	Rectangular	N-S	1	NO	NA	
X118	X	Samarra 1	5939	11	0	11	Rectangular	N-S	1	NO	NA	
X119	X	Samarra 1	2361	7	0	7	Rectangular	N-S	1	NO	NA	
X120	X	Samarra 1	3477	8	0	8	Rectangular	N-S	1	NO	NA	
X121	X	Samarra 1	4505	5	1	6	Rectangular	N-S	1	NO	NA	
X123	X	Samarra 1	5132	6	3	9	Rectangular	N-S	1	NO	NA	
X124	X	Samarra 1	1435	1	2	3	Rectangular	N-S	1	NO	NA	
X125	X	Samarra 1	3245	3	5	8	Rectangular	N-S	1	NO	NA	
X128	X	Samarra 1	3569	5	1	6	Irregular	W-E	Unkwown	NO	NA	
X131	X	Samarra 1	3552	6	0	6	Rectangular	N-S	1	NO	NA	
X132	X	Samarra 1	7276	10	0	10	Rectangular	N-S	1	NO	NA	
X1	X	Samarra 1	73	3	2	5	Rectangular	N-S	1	NO	NA	

33			19									
X134	X	Samarra 1	7093	1	1	2	Rectangular	N-S	1	NO	NA	
X135	X	Samarra 1	46811	2	2	4	Rectangular	N-S	1	NO	NA	
X136	X	Samarra 1	6487	11	2	13	Rectangular	N-S	1	NO	NA	
X137	X	Samarra 1	67220	12	5	17	Rectangular	N-S	1	NO	NA	
X138	X	Samarra 1	7279	14	3	17	Rectangular	N-S	1	NO	NA	
X139	X	Samarra 1	7134	8	3	11	Rectangular	N-S	1	NO	NA	
X140	X	Samarra 1	7792	6	2	8	Rectangular	N-S	1	NO	NA	
X141	X	Samarra 1	7268	9	0	9	Rectangular	N-S	1	NO	NA	
X142	X	Samarra 1	5295	6	1	7	Rectangular	N-S	1	NO	NA	
X143	X	Samarra 1	9171	8	1	9	Rectangular	N-S	1	NO	NA	
X144	X	Samarra 1	8088	13	0	13	Rectangular	N-S	1	NO	NA	
X145	X	Samarra 1	7557	6	10	16	Rectangular	N-S	1	NO	NA	

X146	X	Samarra 1	7107	7	8	15	Rectangular	N-S	1	NO	NA	
X147	X	Samarra 1	3954	3	0	3	Rectangular	N-S	1	NO	NA	
X148	X	Samarra 1	8398	9	0	9	Rectangular	N-S	1	NO	NA	
X149	X	Samarra 1	2774	7	0	7	Rectangular	N-S	1	NO	NA	
X150	X	Samarra 1	5145	8	0	8	Irregular	N-S	1	NO	NA	
X152	X	Samarra 1	5874	11	0	11	Irregular	NE-SW	1	NO	NA	
X155	X	Samarra 1	3575	4	0	4	Rectangular	NE-SW	1	NO	NA	
X156	X	Samarra 1	3368	1	0	1	Rectangular	NE-SW	1	NO	NA	
X175	X	Samarra 1	3283	6	0	6	Rectangular	N-S	Unkwown	NO	NA	
X182	X	Samarra 1	2740	4	0	4	Rectangular	W-E	Unkwown	NO	NA	
X199	X	Samarra 1	3382	4	0	4	Rectangular	N-S	1	NO	NA	
X200	X	Samarra 1	6483	6	1	7	Rectangular	N-S	1	NO	NA	
X2	X	Samarra 1	30	5	0	5	Rectangular	N-S	1	NO	NA	

01			36									
X2008	X	Samarra 1	35788	4	0	4	Rectangular	W-E	1	NO	NA	
X2009	X	Samarra 1	54891	3	1	4	Rectangular	N-S	1	NO	NA	
X2110	X	Samarra 1	39099	4	2	6	Rectangular	N-S	1	NO	NA	
X2111	X	Samarra 1	10900	2	0	2	Irregular	W-E	1	NO	NA	
X2115	X	Samarra 1	61124	6	1	7	Irregular	N-S	1	NO	NA	
X2116	X	Samarra 1	11771	2	0	2	Rectangular	N-S	1	NO	NA	
X2117	X	Samarra 1	27277	4	0	4	Trapezoidal	N-S	1	NO	NA	
X2311	X	Samarra 1	73887	7	1	8	Rectangular	N-S	1	NO	NA	
X2350	X	Samarra 1	35000	7	0	7	Irregular	N-S	Unkwown	NO	NA	
X2366	X	Samarra 1	76599	5	1	6	Rectangular	NE-SW	1	NO	NA	
X2377	X	Samarra 1	25122	3	0	3	Rectangular	NE-SW	1	NO	NA	
X2388	X	Samarra 1	91996	14	1	15	Rectangular	NE-SW	1	NO	NA	

X257	X	Samarra 1	83889	11	2	13	Rectangular	NE-SW	1	NO	NA	
X260	X	Samarra 1	135933	9	2	11	Rectangular	NW-SE	Unkwown	NO	NA	
X261	X	Samarra 1	63688	8	0	8	Rectangular	NE-SW	1	NO	NA	
X262	X	Samarra 1	60061	12	2	14	Irregular	NE-SW	1	NO	NA	
X263	X	Samarra 1	21600	0	0	0	Rectangular	N-S	1	NO	NA	
X264	X	Samarra 1	69664	18	5	23	Rectangular	N-S	1	NO	NA	
X266	X	Samarra 1	32977	4	1	5	Rectangular	NE-SW	1	YES	NA	
X267	X	Samarra 1	64449	12	0	12	Rectangular	NE-SW	1	NO	NA	
X268	X	Samarra 1	65488	13	0	13	Rectangular	NE-SW	1	NO	NA	
X269	X	Samarra 1	64441	7	0	7	Rectangular	NE-SW	1	NO	NA	
X273	X	Samarra 1	11971	20	0	20	Irregular	NW-SE	Unkwown	NO	NA	
X277	X	Samarra 1	80866	18	6	24	Rectangular	NE-SW	1	NO	NA	

X278	X	Samarra 1	7836	7	0	7	Rectangular	NE-SW	1	NO	NA	
X284	X	Samarra 1	6235	6	2	8	Rectangular	NE-SW	1	NO	NA	
X285	X	Samarra 1	4669	5	1	6	Rectangular	NE-SW	1	NO	NA	
X309	X	Samarra 1	52988	16	0	16	Rectangular	NE-SW	Unkwown	NO	NA	
X316	X	Samarra 1	194611	24	11	35	Rectangular	NE-SW	Unkwown	NO	NA	
X317	X	Samarra 1	125555	40	4	44	Rectangular	NE-SW	1	NO	NA	
X331	X	Samarra 1	31611	9	1	10	Rectangular	N-S	1	NO	NA	
X332	X	Samarra 1	24600	4	2	6	Rectangular	N-S	1	NO	NA	
X333	X	Samarra 1	23233	5	2	7	Rectangular	NE-SW	1	NO	NA	
X334	X	Samarra 1	28622	3	1	4	Rectangular	NE-SW	1	NO	NA	
X335	X	Samarra 1	39377	8	1	9	Rectangular	NE-SW	1	NO	NA	
X336	X	Samarra 1	32511	5	0	5	Rectangular	NE-SW	1	NO	NA	

X337	X	Samarra 1	4329	11	0	11	Rectangular	NE-SW	1	NO	NA	
X338	X	Samarra 1	3942	6	0	6	Rectangular	NE-SW	1	NO	NA	
X339	X	Samarra 1	4246	4	0	4	Rectangular	NE-SW	1	NO	NA	
X340	X	Samarra 1	3458	7	0	7	Rectangular	NE-SW	1	NO	NA	
X341	X	Samarra 1	4227	11	1	12	Rectangular	NE-SW	1	NO	NA	
X342	X	Samarra 1	5856	8	0	8	Rectangular	N-S	1	NO	NA	
X343	X	Samarra 1	3805	4	1	5	Rectangular	N-S	1	NO	NA	
X344	X	Samarra 1	6340	8	0	8	Rectangular	N-S	1	NO	NA	
X345	X	Samarra 1	5255	7	2	9	Rectangular	N-S	1	NO	NA	
X346	X	Samarra 1	5281	4	0	4	Rectangular	N-S	1	NO	NA	
X347	X	Samarra 1	5351	6	1	7	Rectangular	N-S	1	NO	NA	
X349	X	Samarra 1	1526	6	2	8	Rectangular	N-S	1	NO	NA	
X3	X	Samarra 1	28	4	1	5	Rectangular	N-S	1	NO	NA	

50			69									
X351	X	Samarra 1	2313	4	1	5	Rectangular	N-S	1	NO	NA	
X352	X	Samarra 1	2325	4	0	4	Rectangular	N-S	1	NO	NA	
X371	X	Samarra 1	3142	2	1	3	Rectangular	NW-SE	1	NO	NA	
X375	X	Samarra 1	2811	3	1	4	Rectangular	N-S	1	NO	NA	
X376	X	Samarra 1	4157	3	1	4	Rectangular	NE-SW	1	NO	NA	
X377	X	Samarra 1	3418	5	1	6	Rectangular	N-S	1	NO	NA	
X378	X	Samarra 1	3603	2	1	3	Rectangular	N-S	1	NO	NA	
X380	X	Samarra 1	3253	6	0	6	Rectangular	N-S	1	NO	NA	