

Sana'a well inventory Figures

The A4 Maps

Figure 1.1 : Location of the Study Area

Sana'a Basin Well Inventory

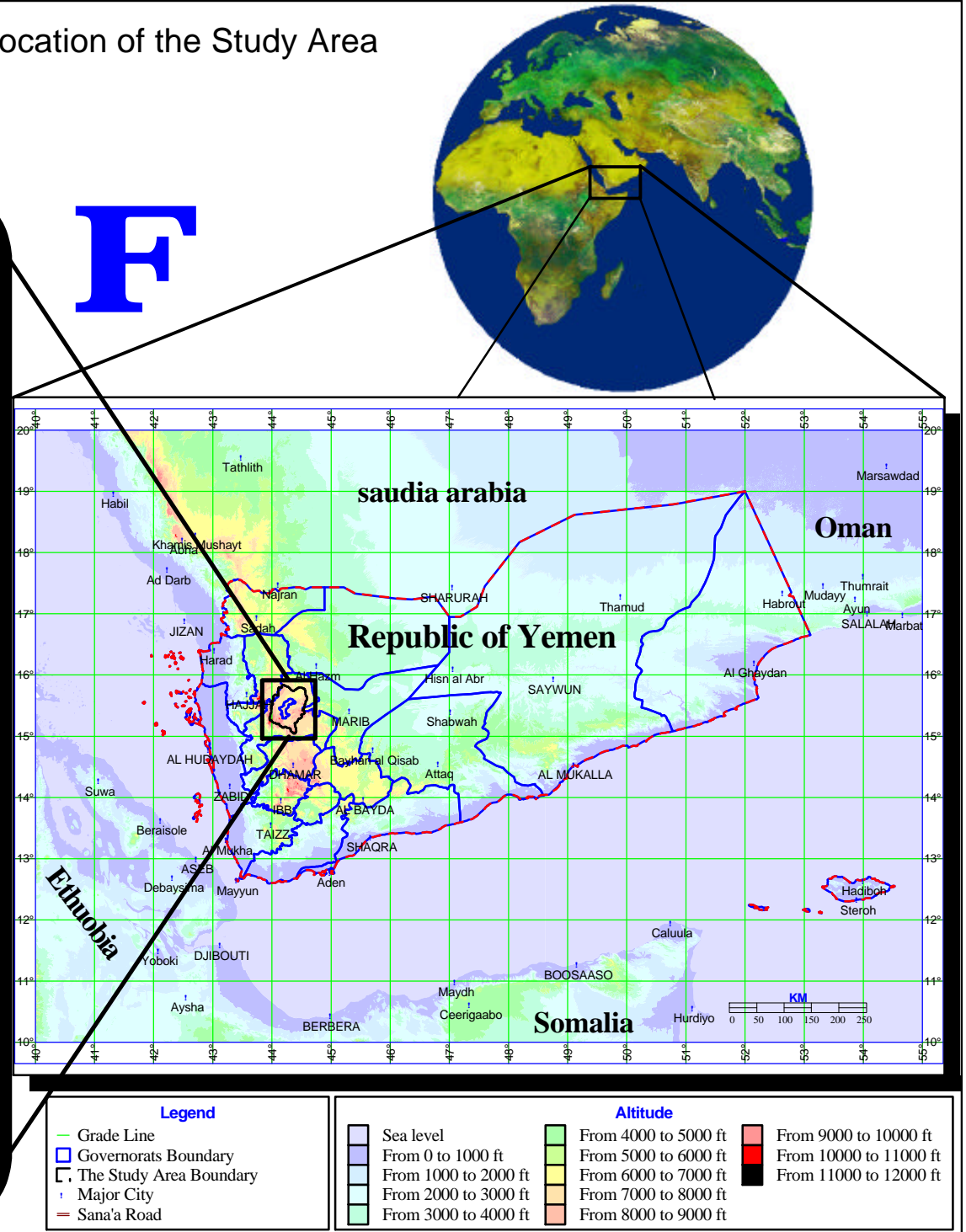
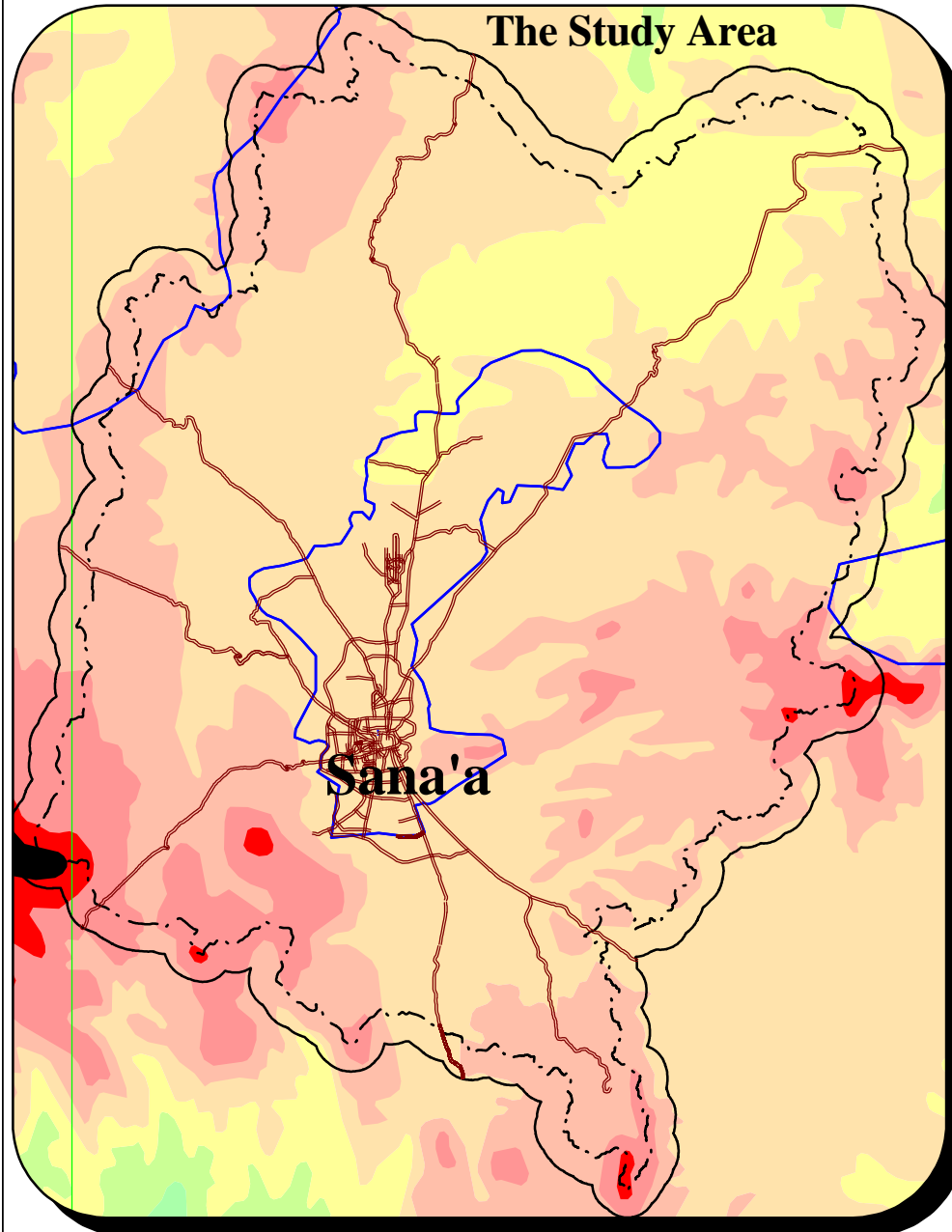
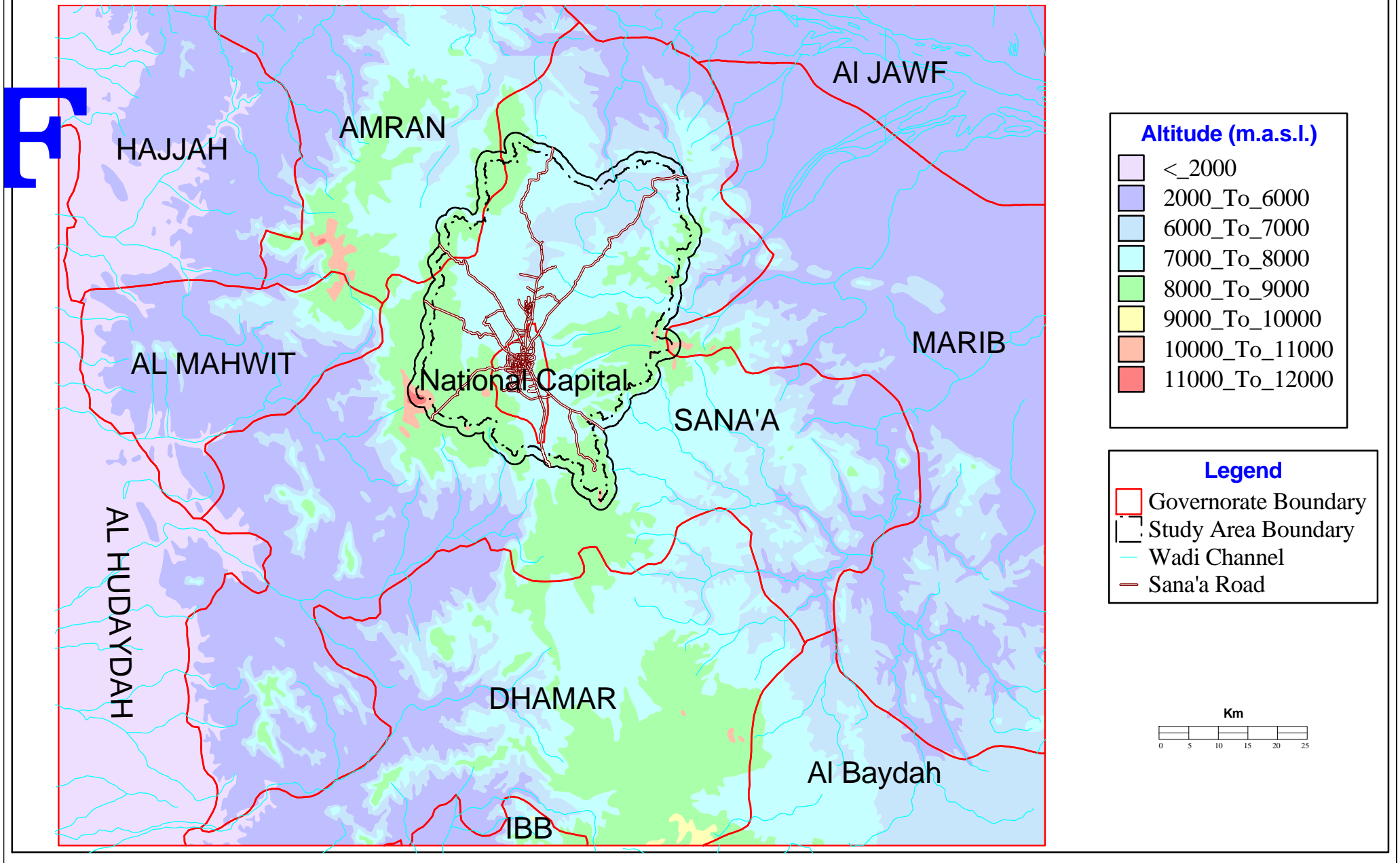


Figure 1.2 : Regional setting of the Sana'a Basin



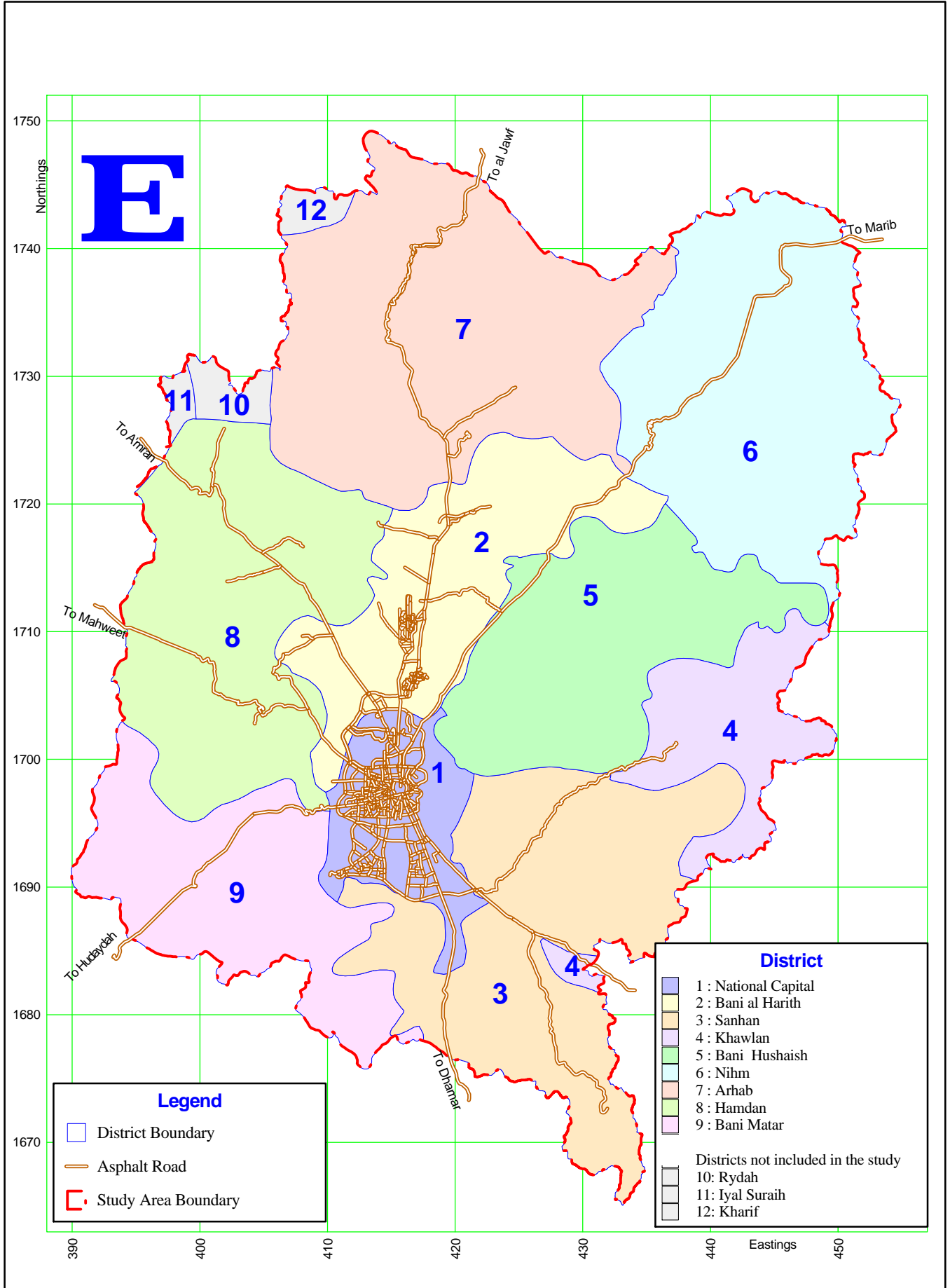
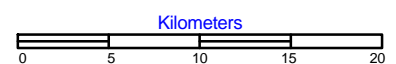


Figure 1.3 : Main Local Districts within the Basin



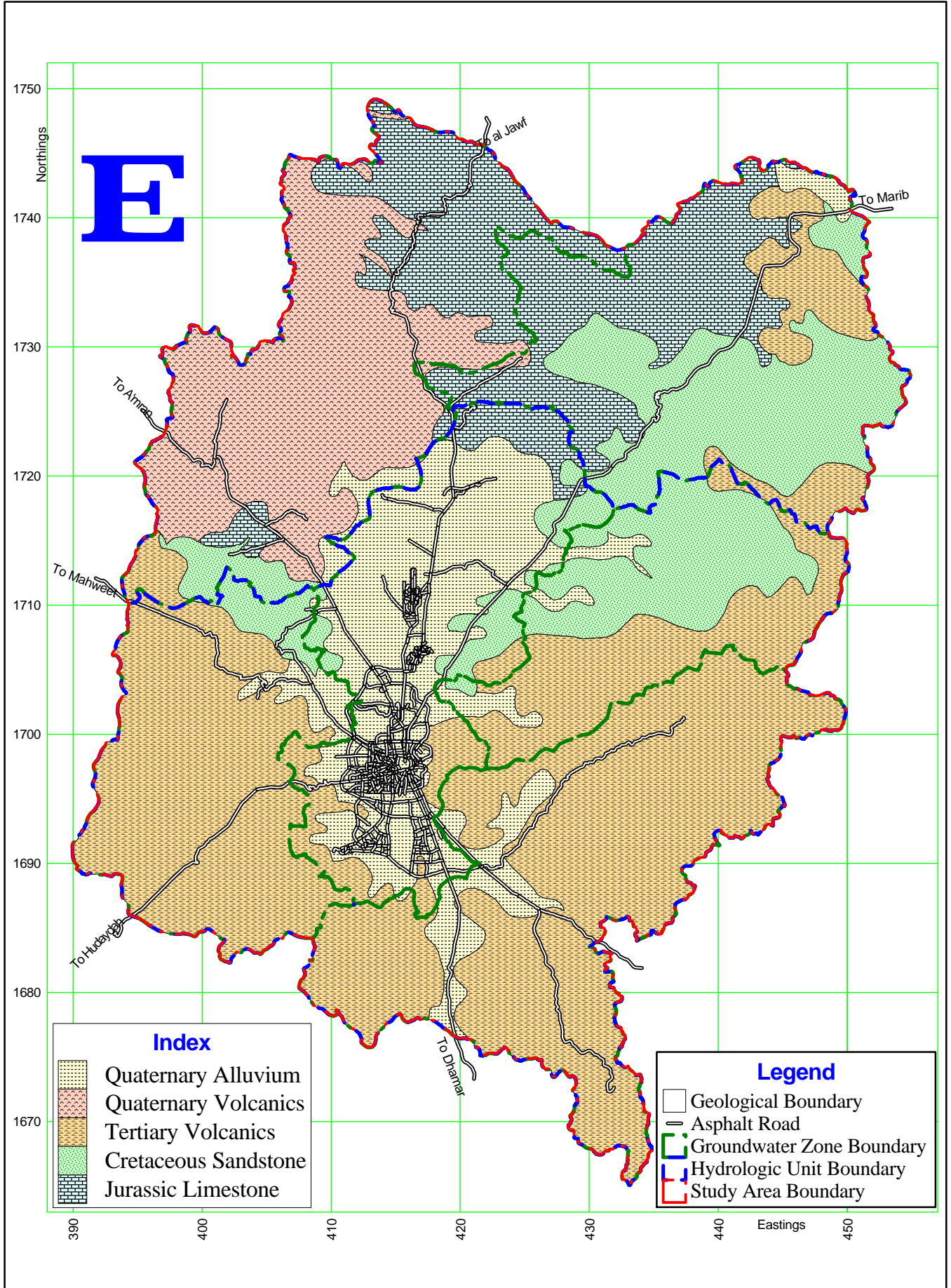
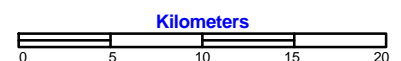


Figure 1.4b : Geological units outcropping inside the Basin and its vicinity (after SAWAS, 1996)



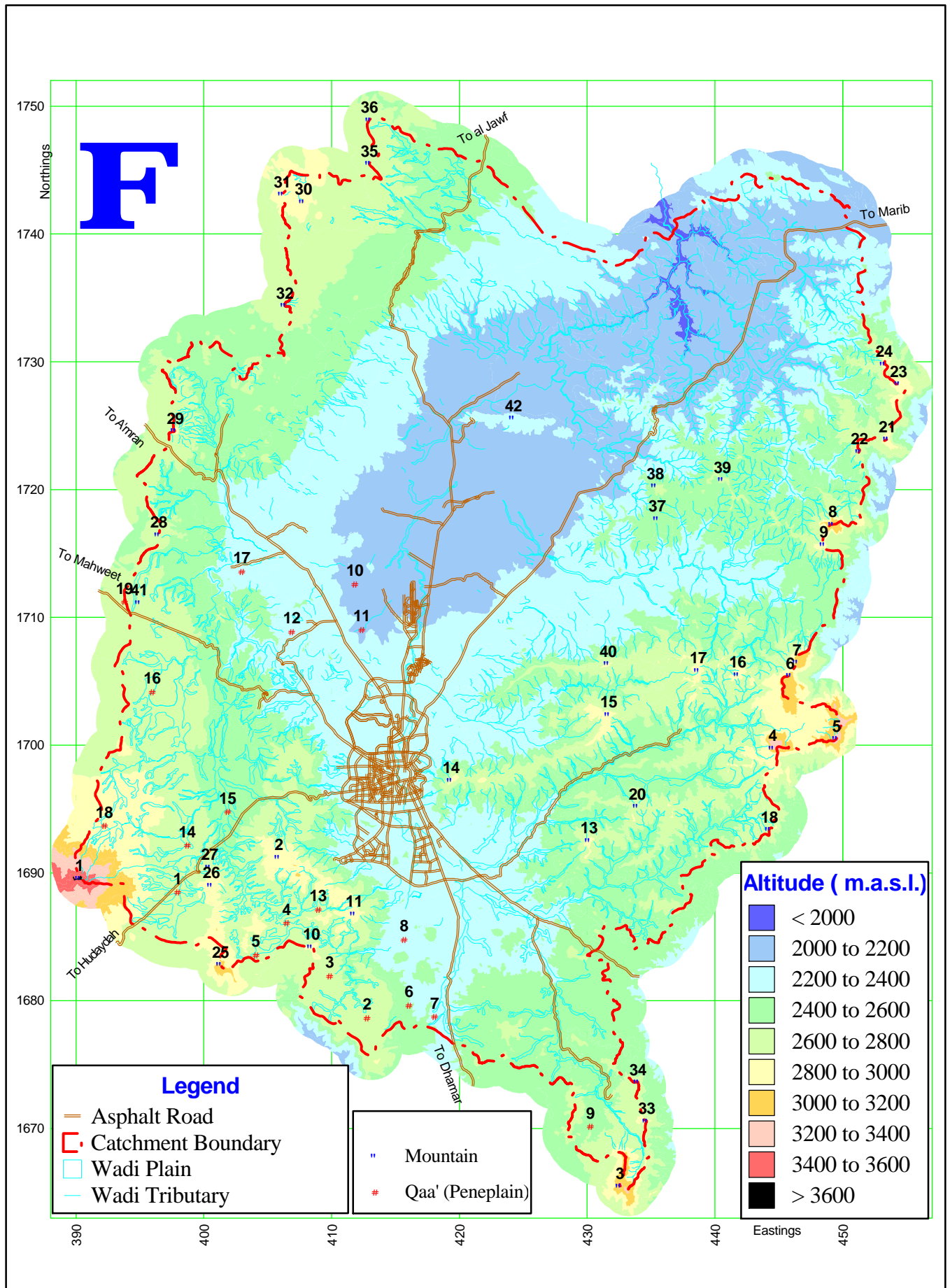
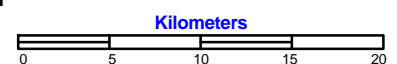


Figure 2.1 : Main physiographic features within the Basin
(see attached legend)



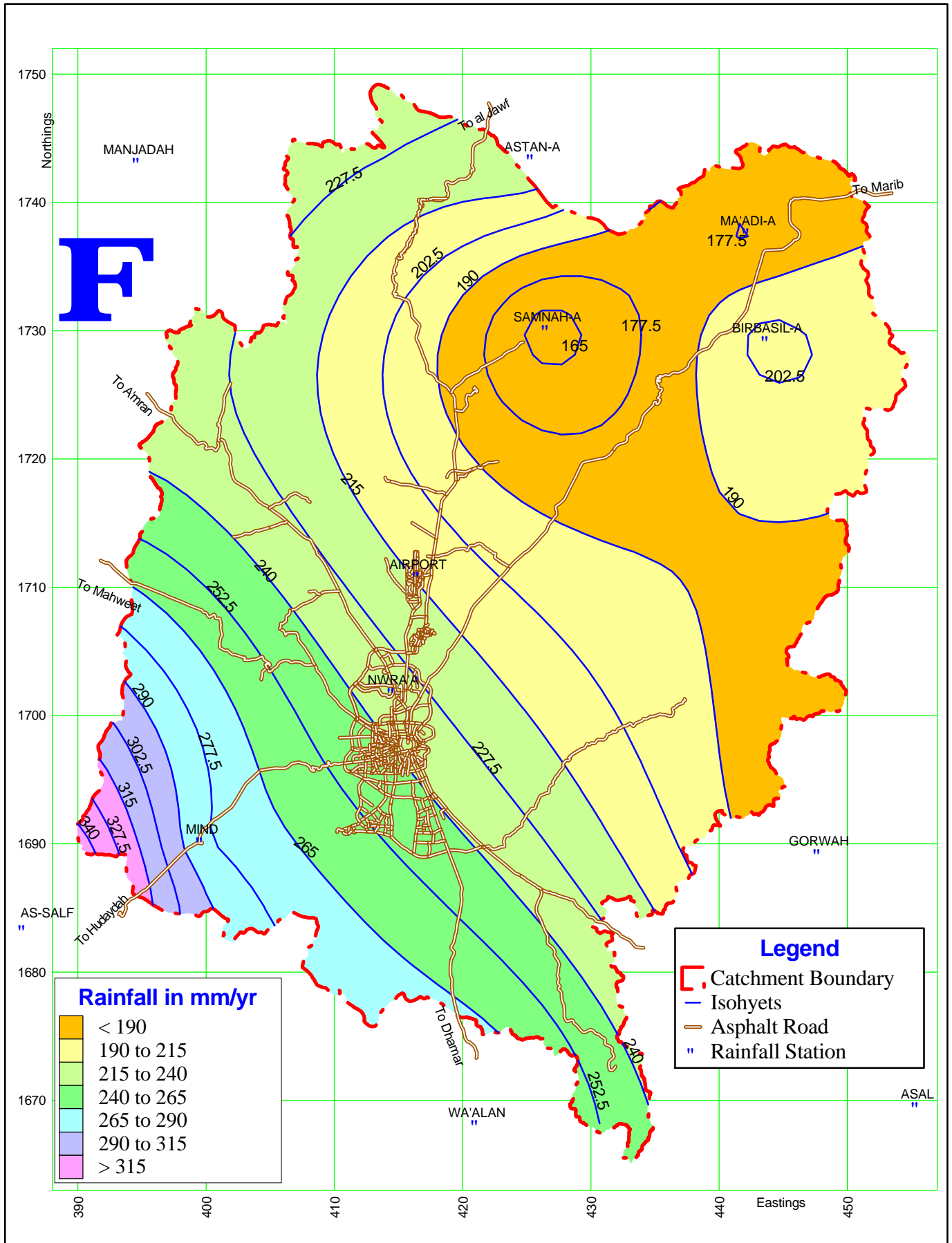
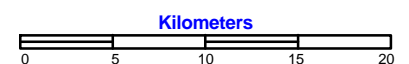
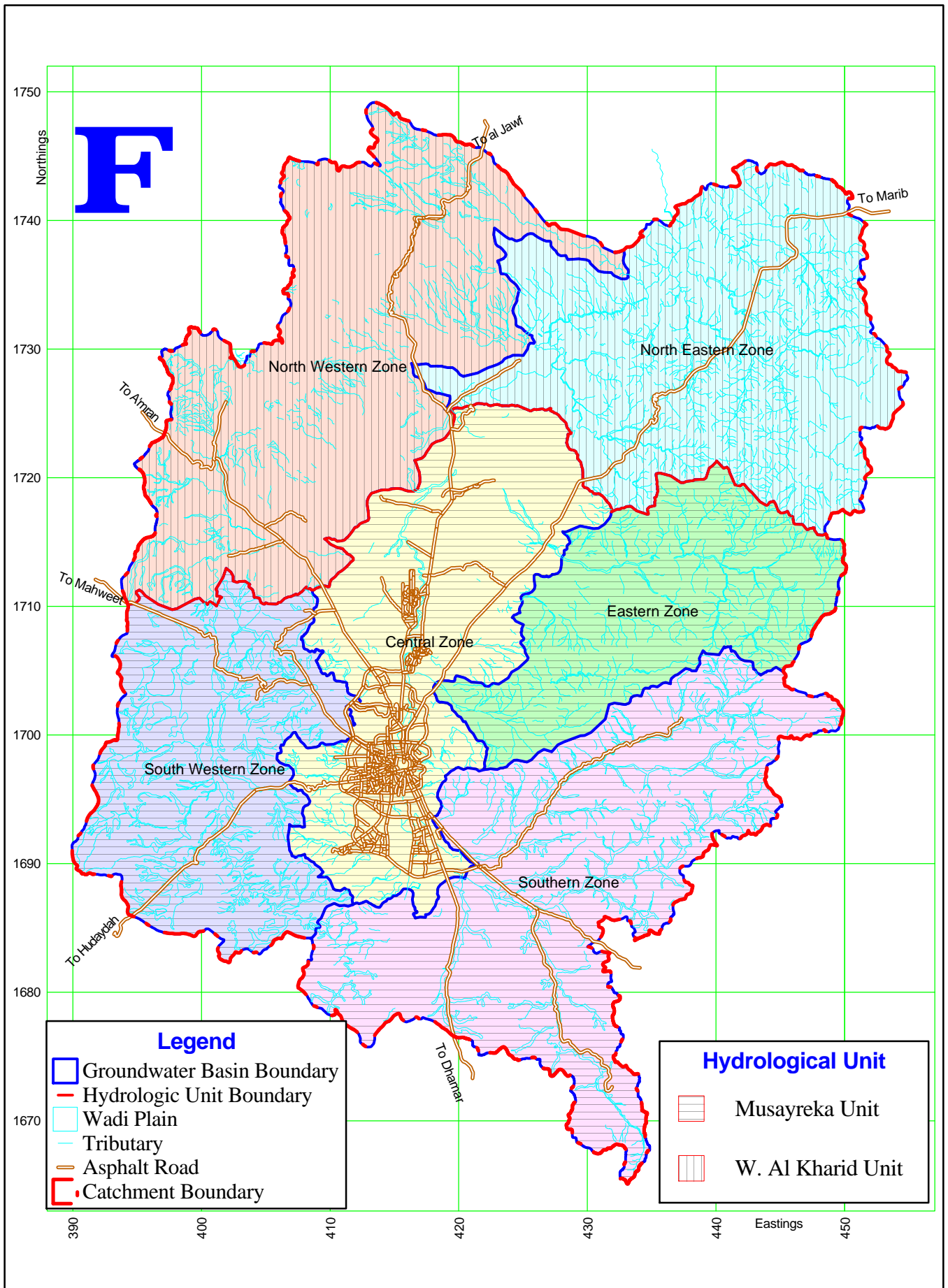


Figure 2.2 : Isohyetal map showing mean annual rainfall across the Basin (mm)





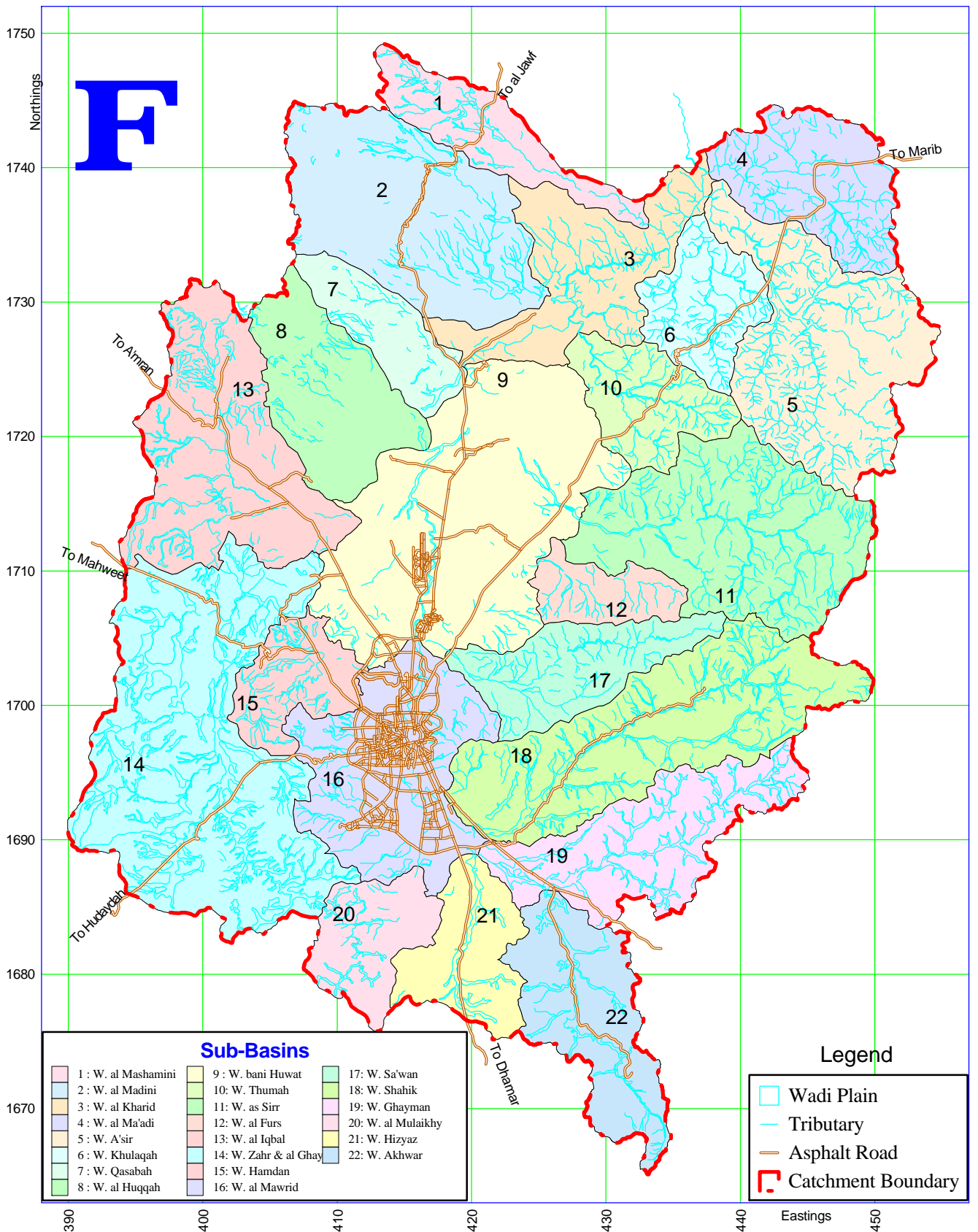


Figure 2.4 : Major Wadis Sub-Basins.



Sana'a well inventory Figures

The A3 Maps

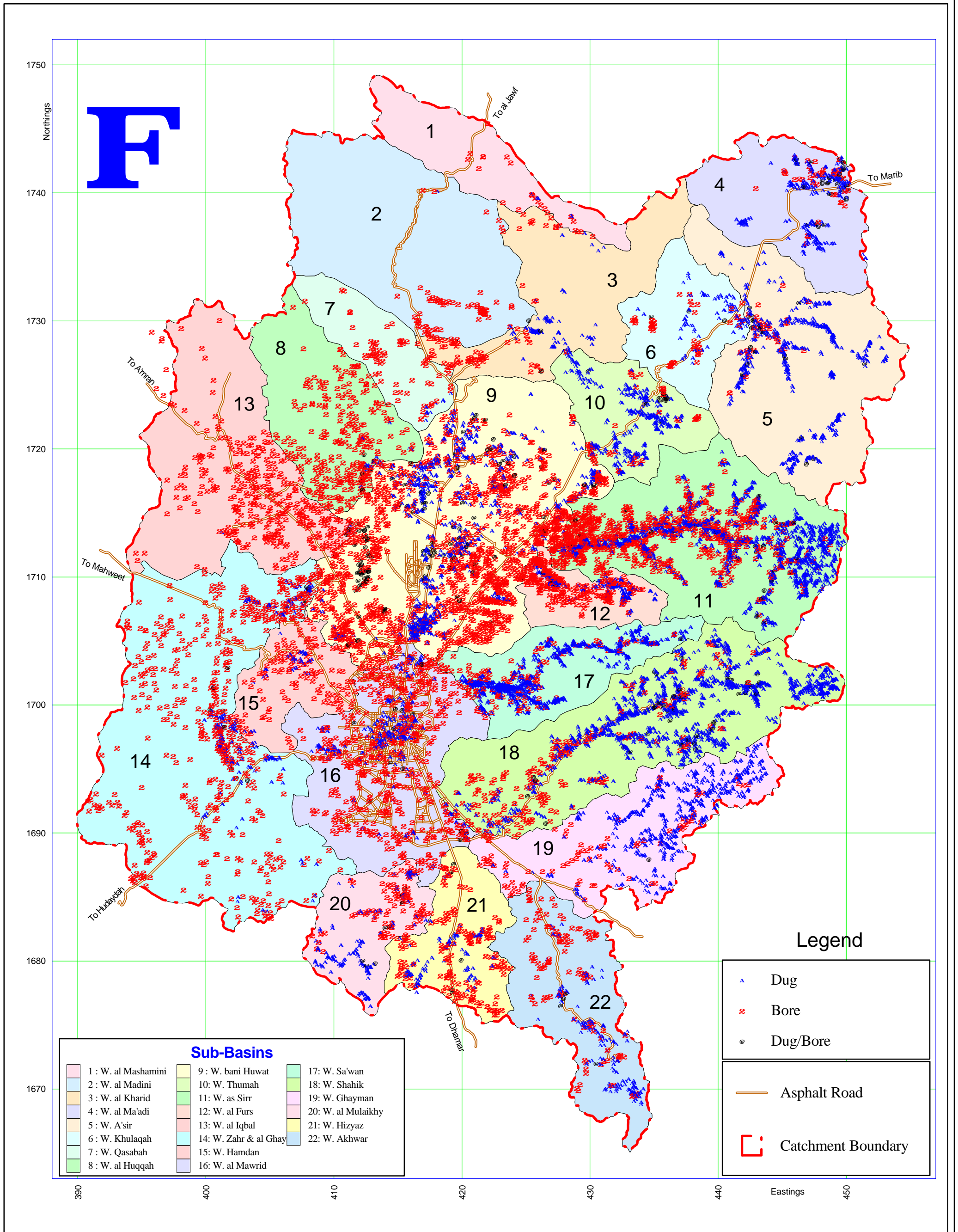


Figure 5.1a : Well types .

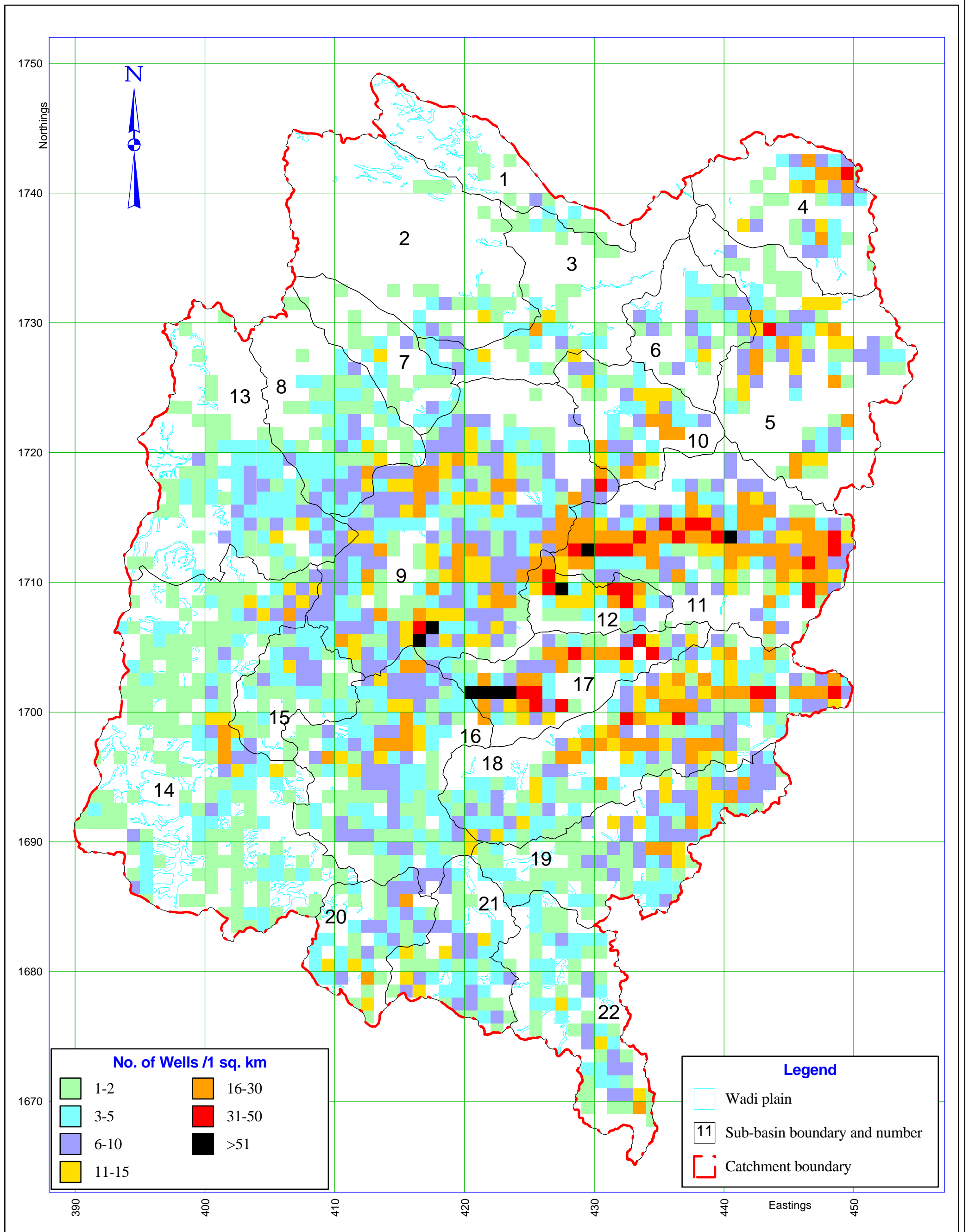


Figure 5.1b: Total number of wells per square kilometer

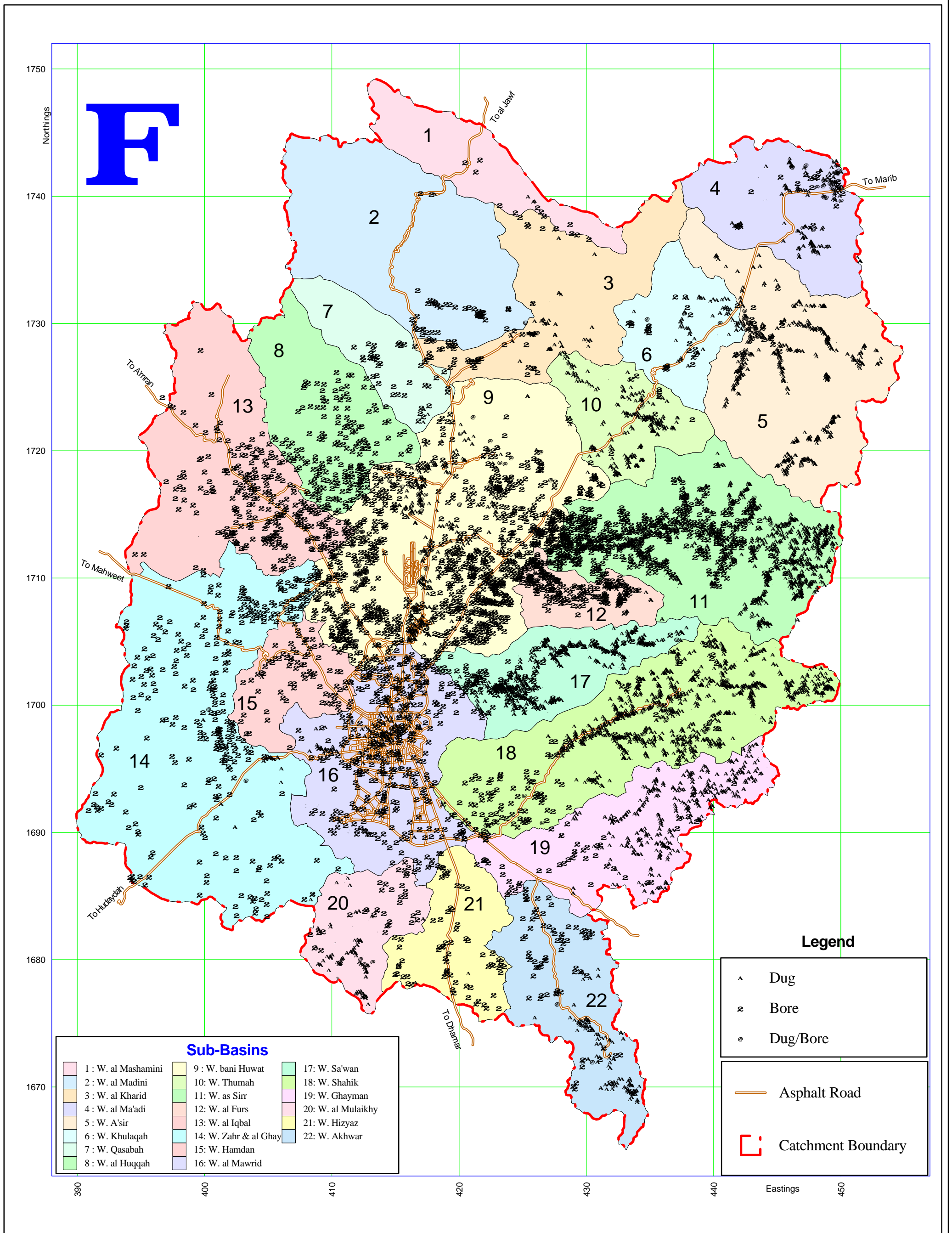
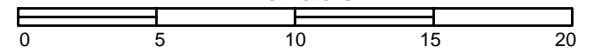


Figure 5.2a : Operating wells .

Kilometers



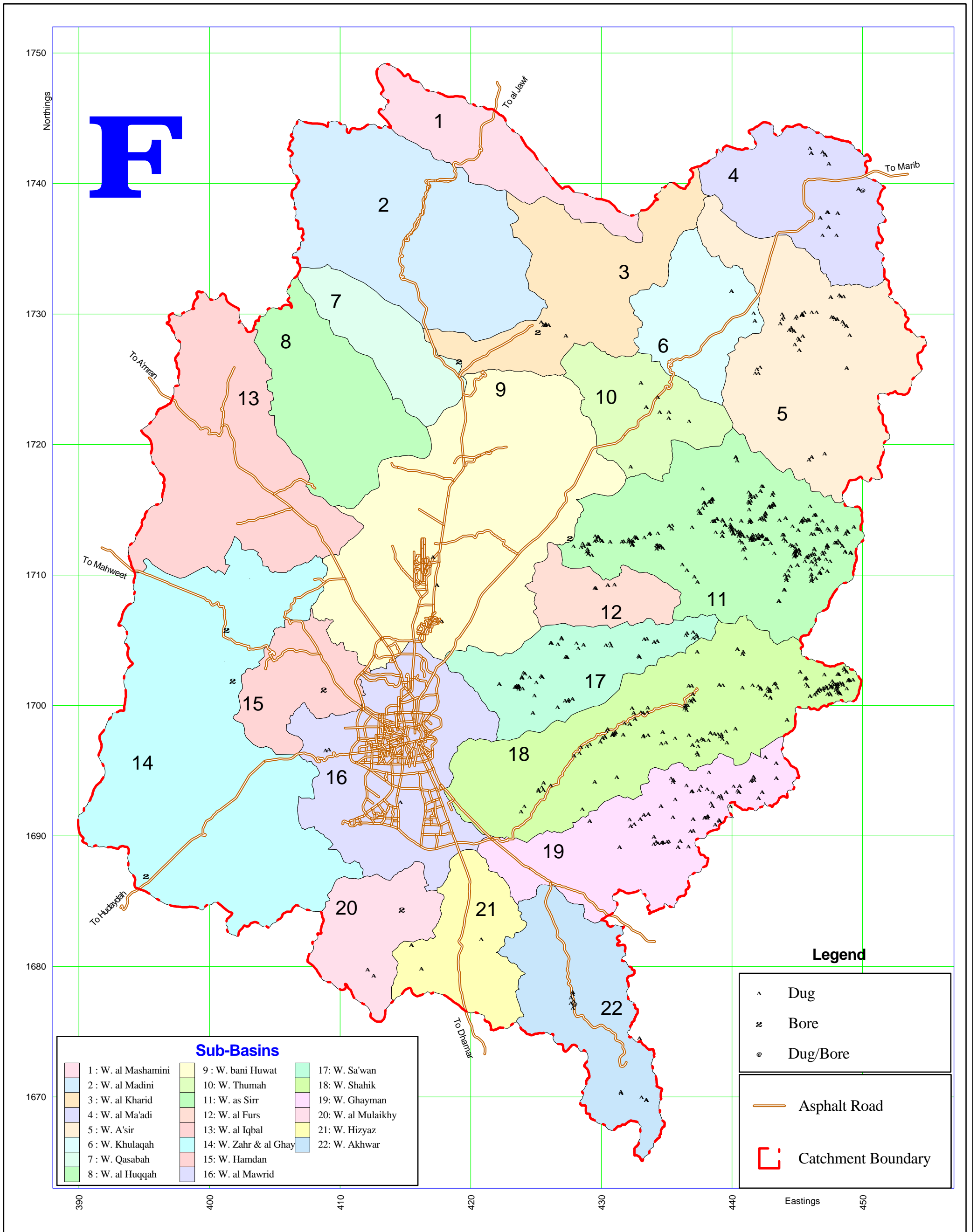
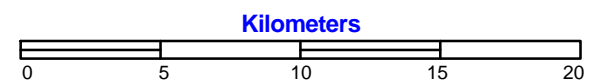


Figure 5.2b : Intermittent wells .



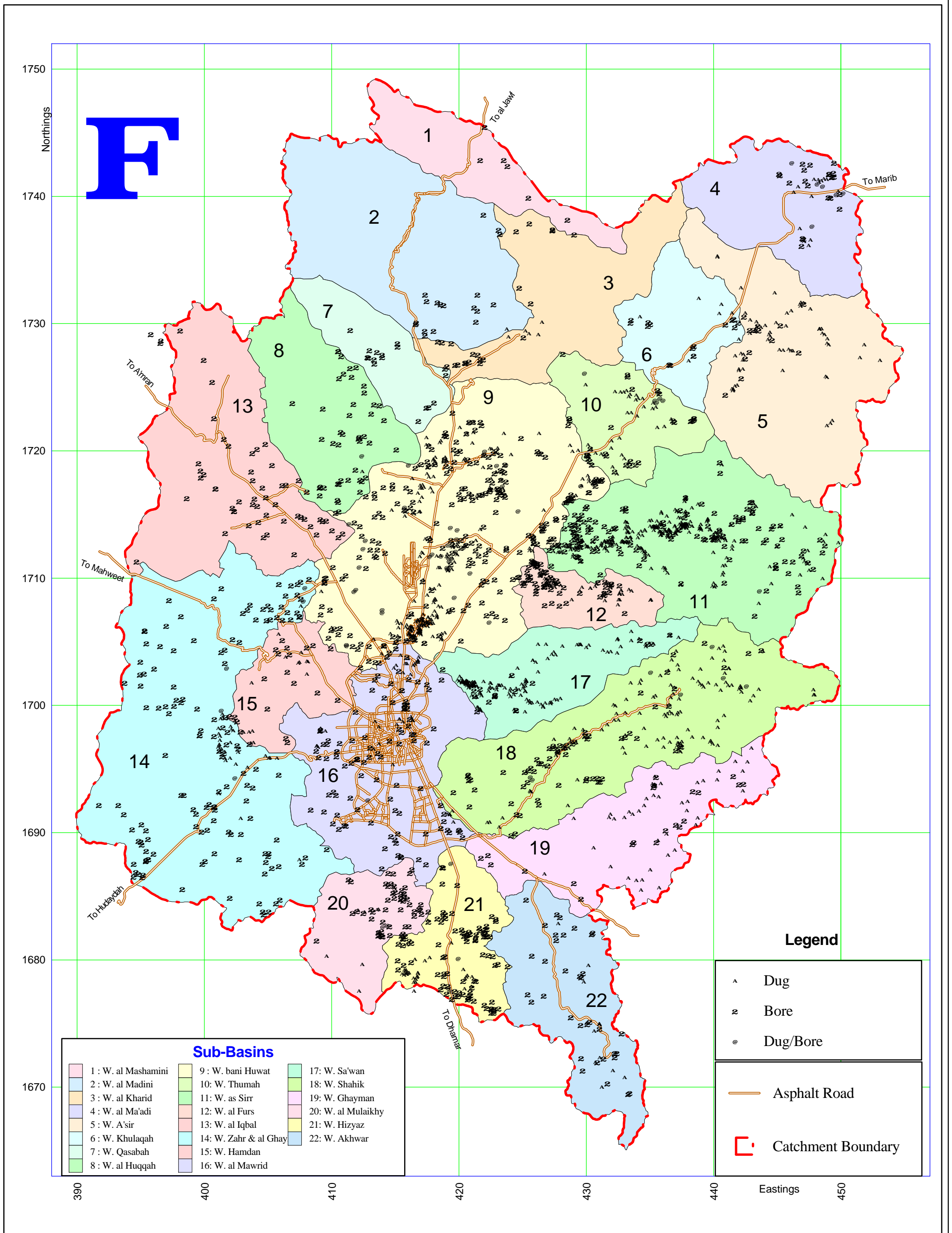


Figure 5.3a : Abandoned Wells .

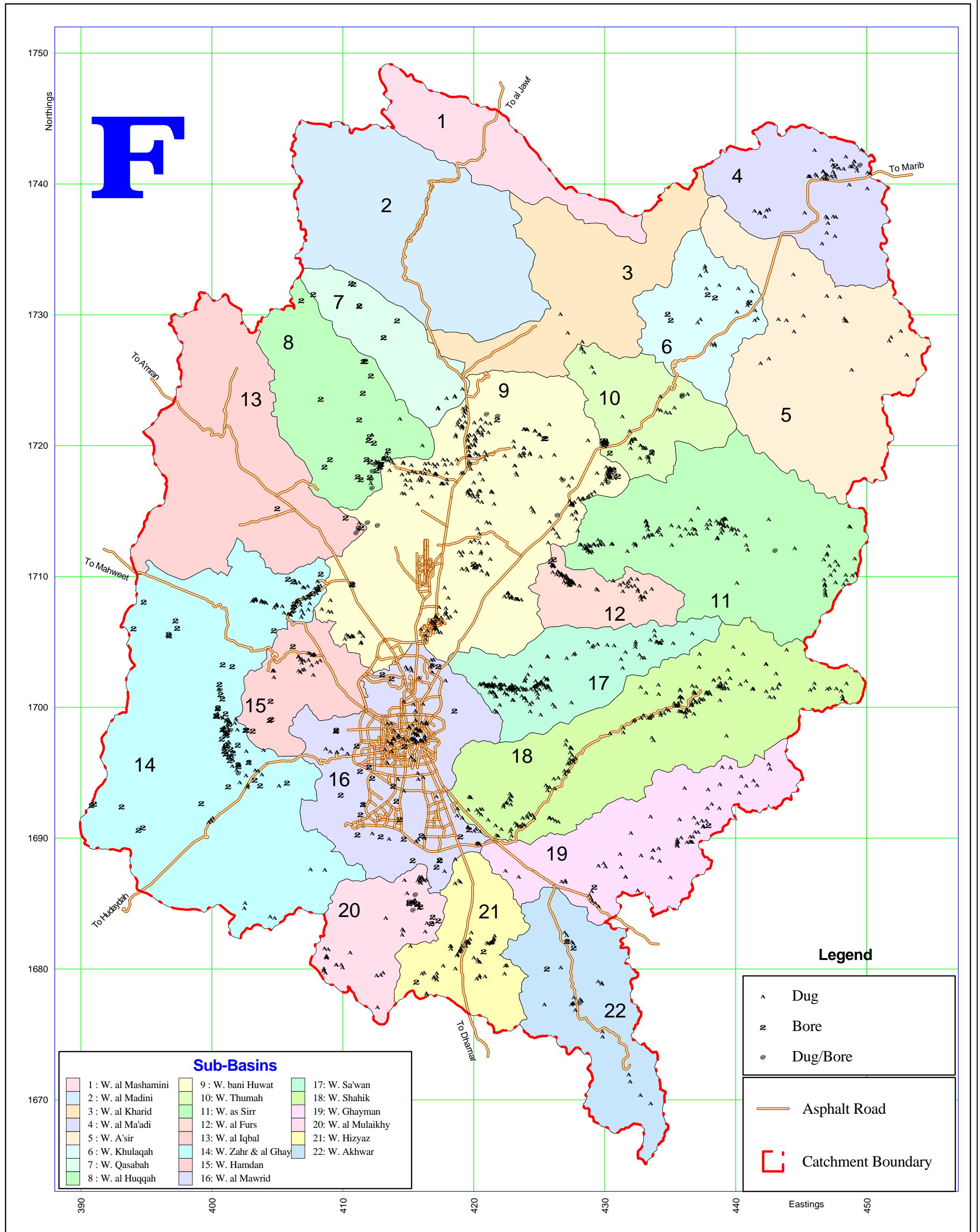
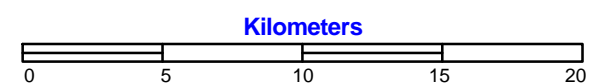


Figure 5.3b : Dry Wells.



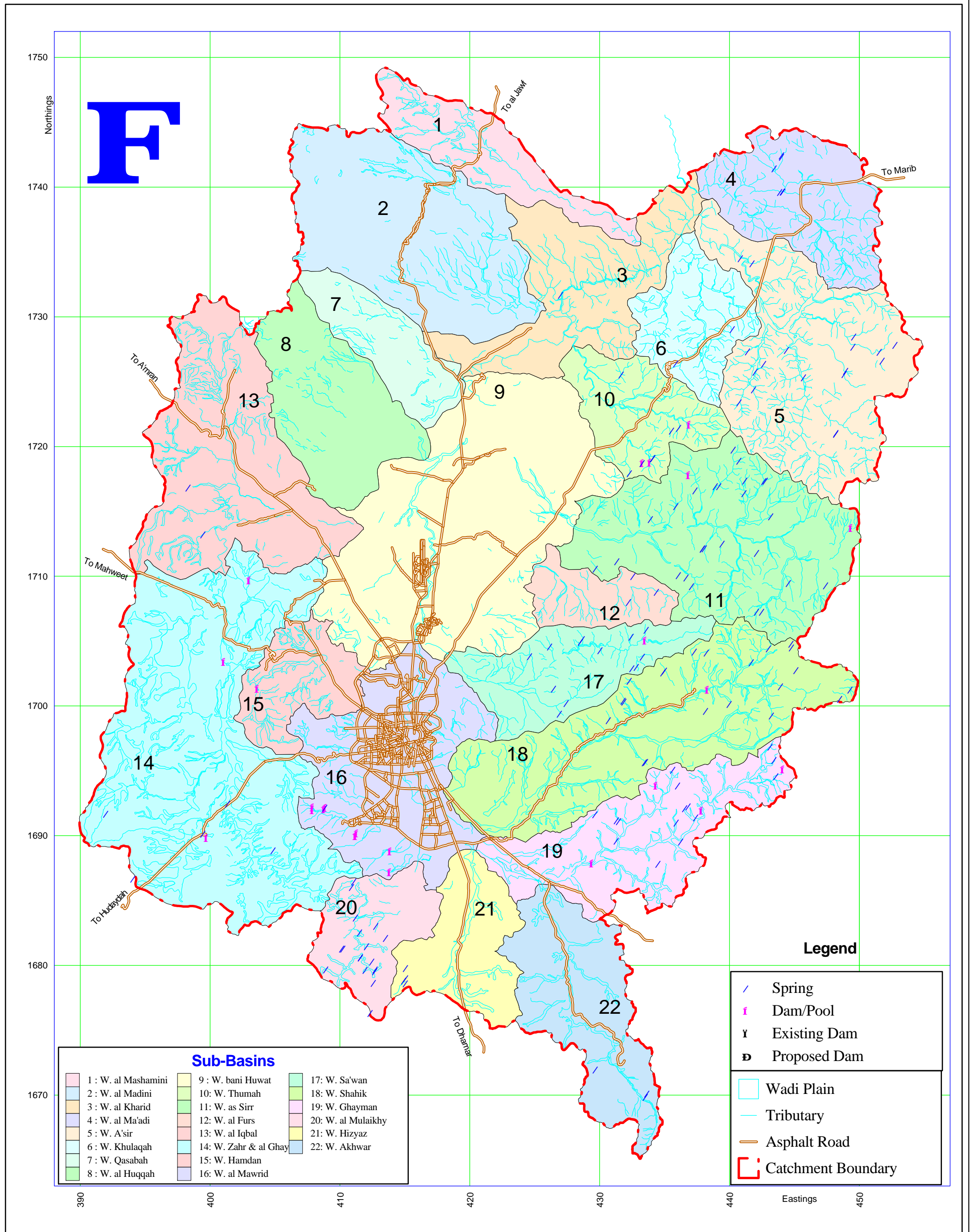
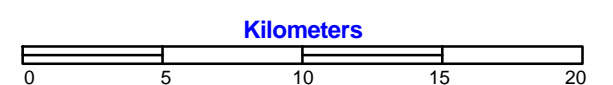


Figure 5.4 : Springs and dams .



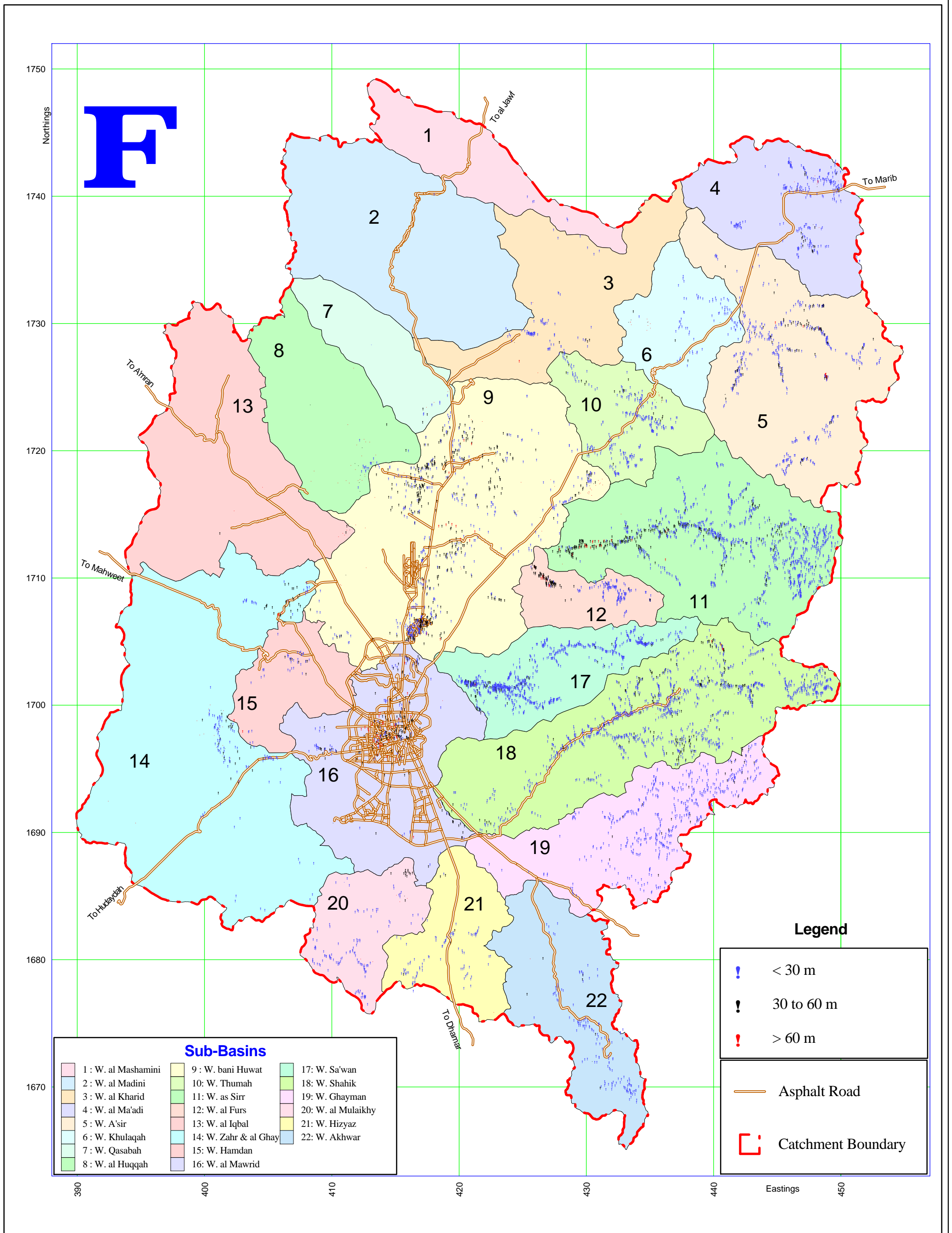


Figure 5.5a : Total depth of dug wells .

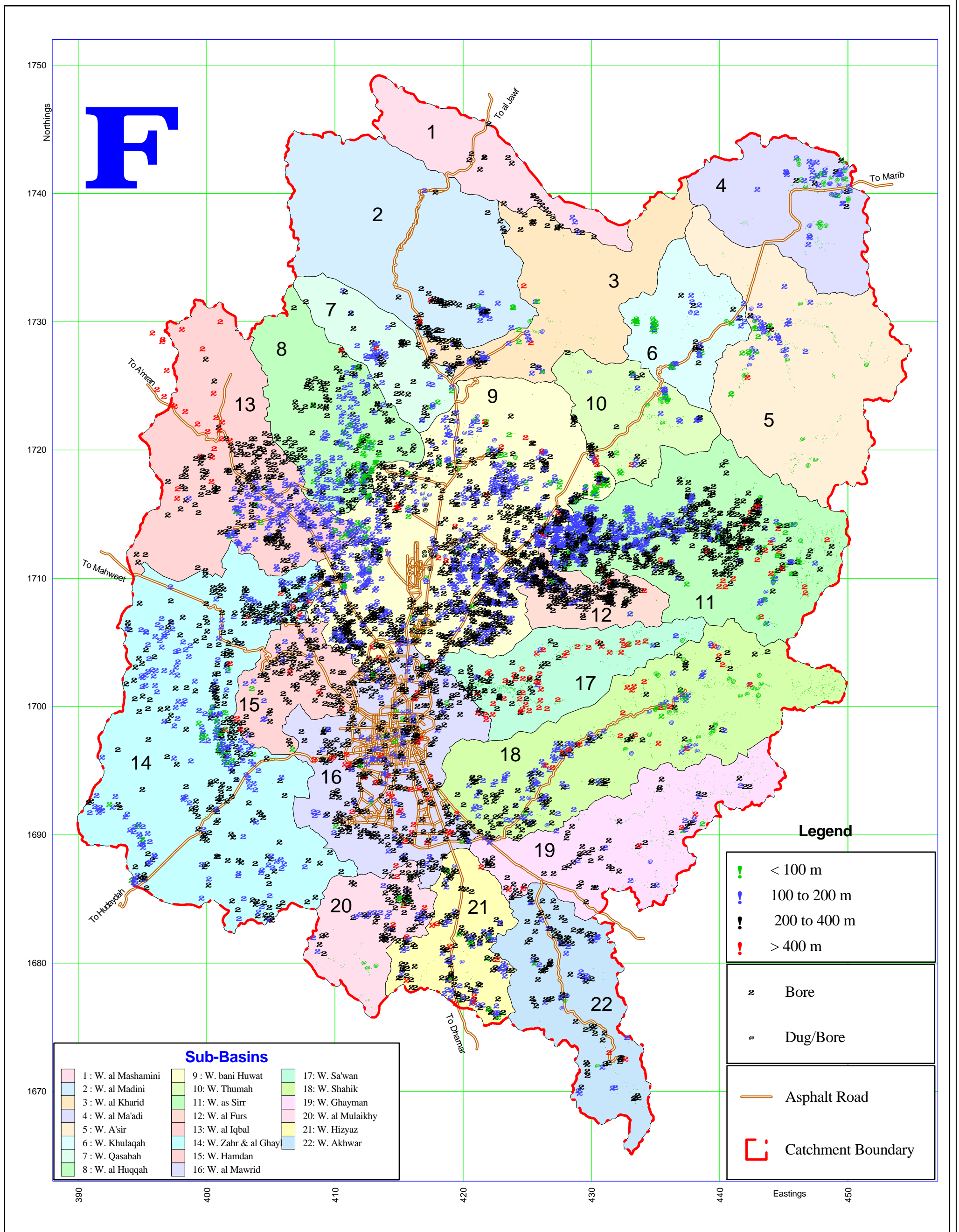
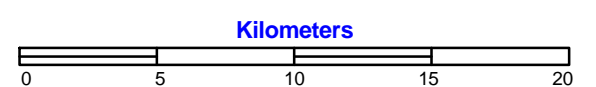


Figure 5.5b : Total depth of boreholes .



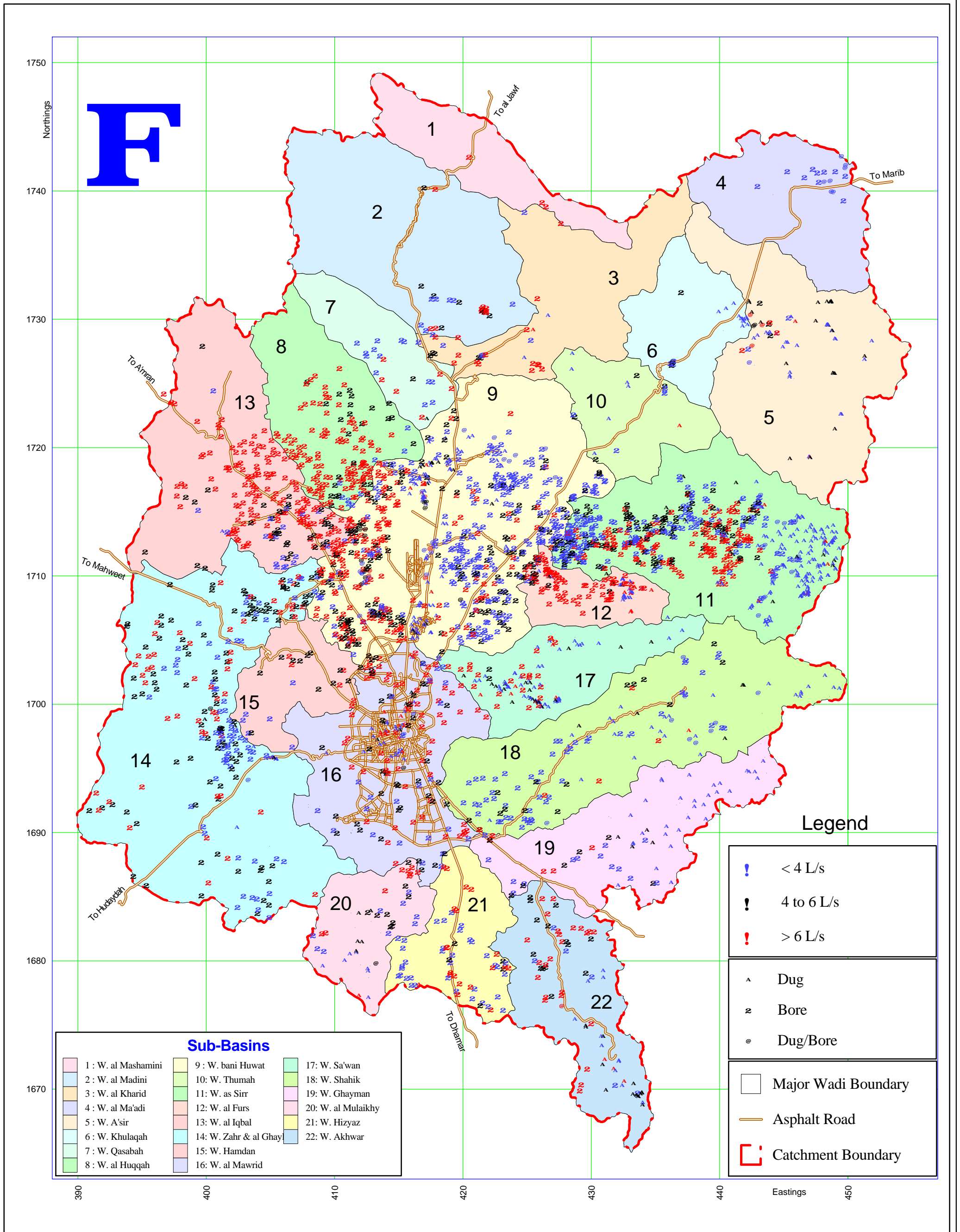
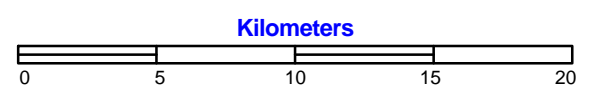


Figure 5.6a : Well yields in litres/second .



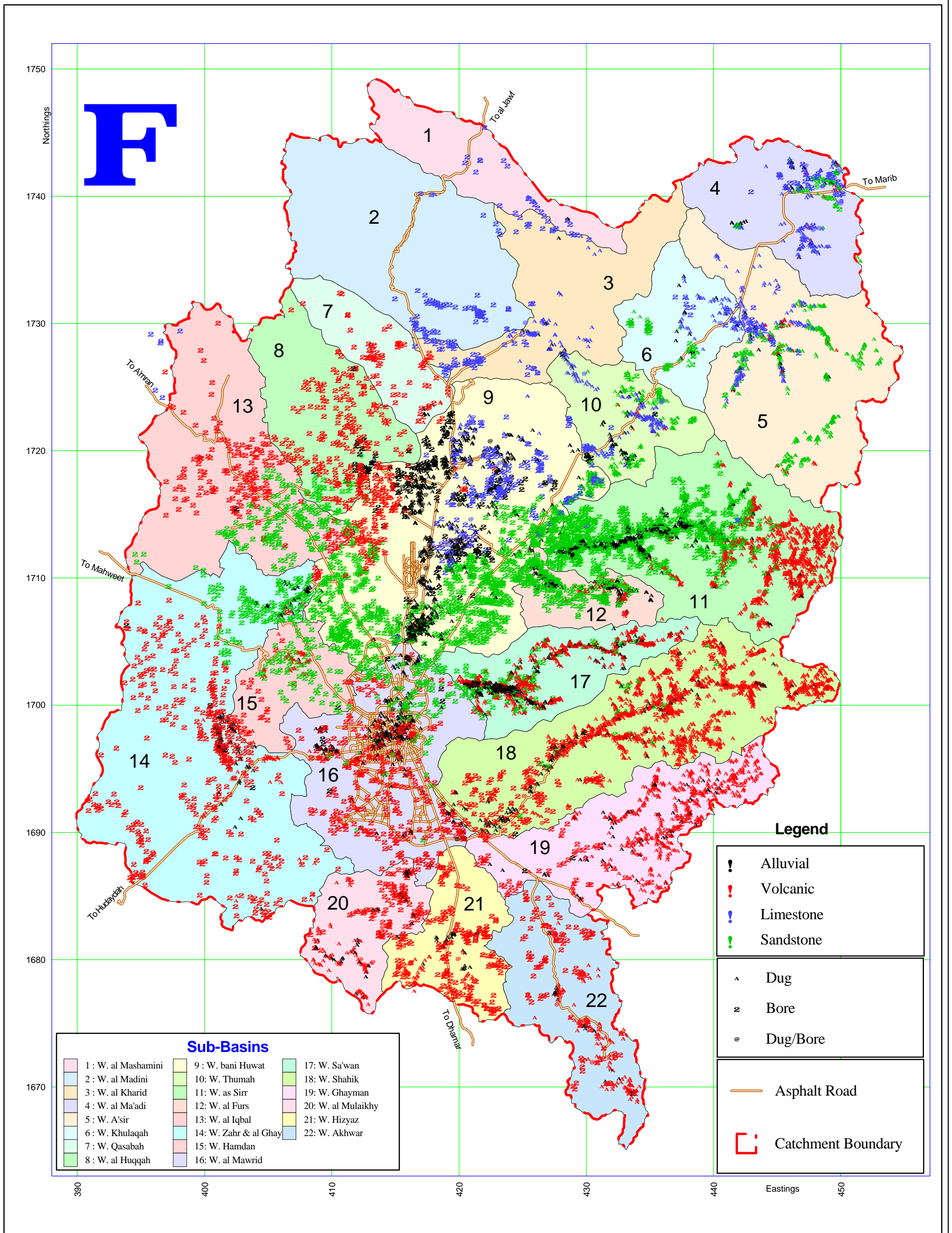
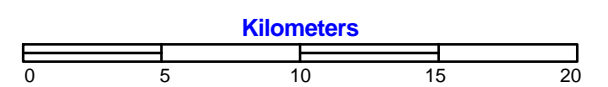


Figure 5.6b : Aquifer types supplying existing wells .



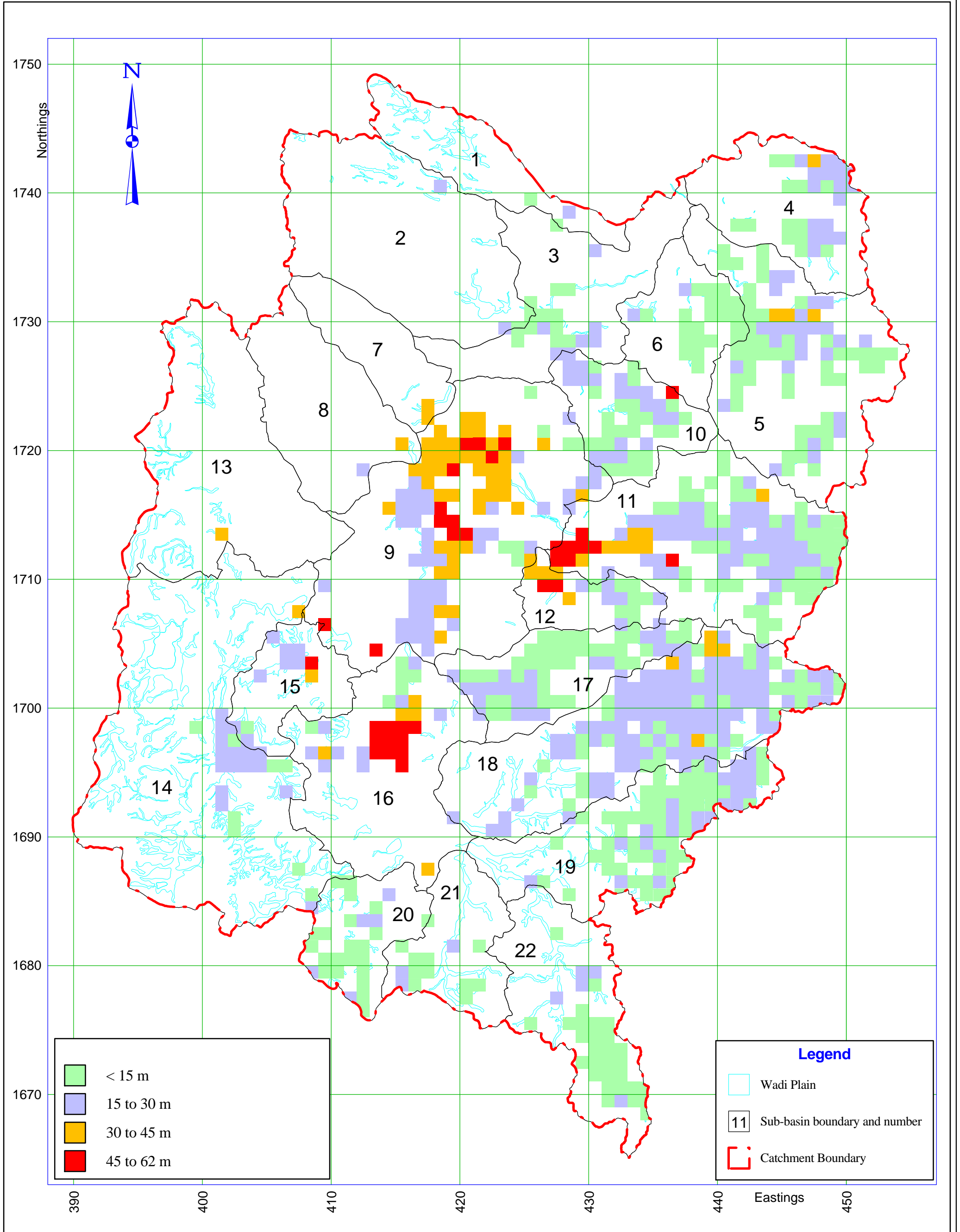


Figure 5.7a : Average water levels in meters below ground level (dug wells)



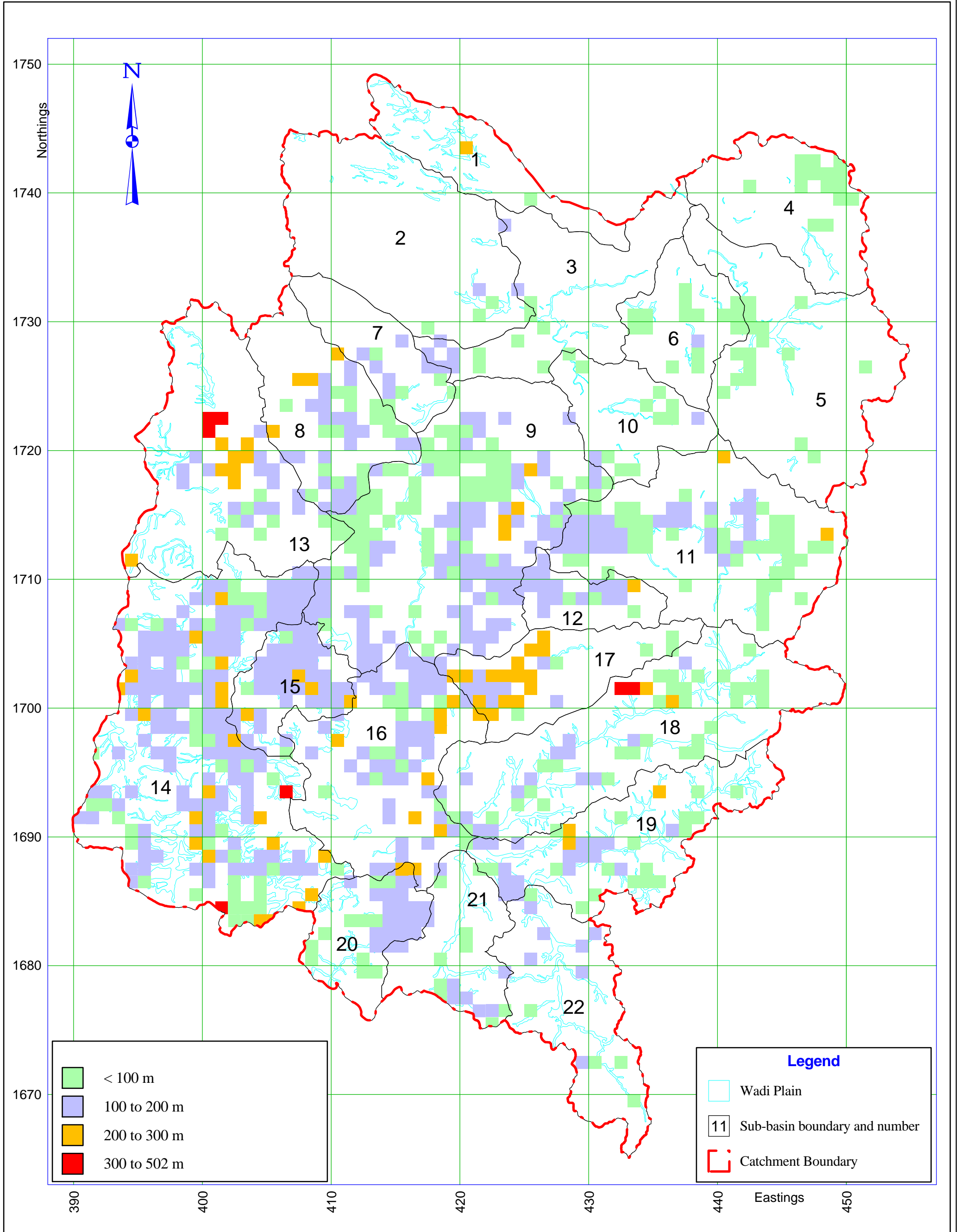


Figure 5.7b : Average water levels in meters below ground level (boreholes)



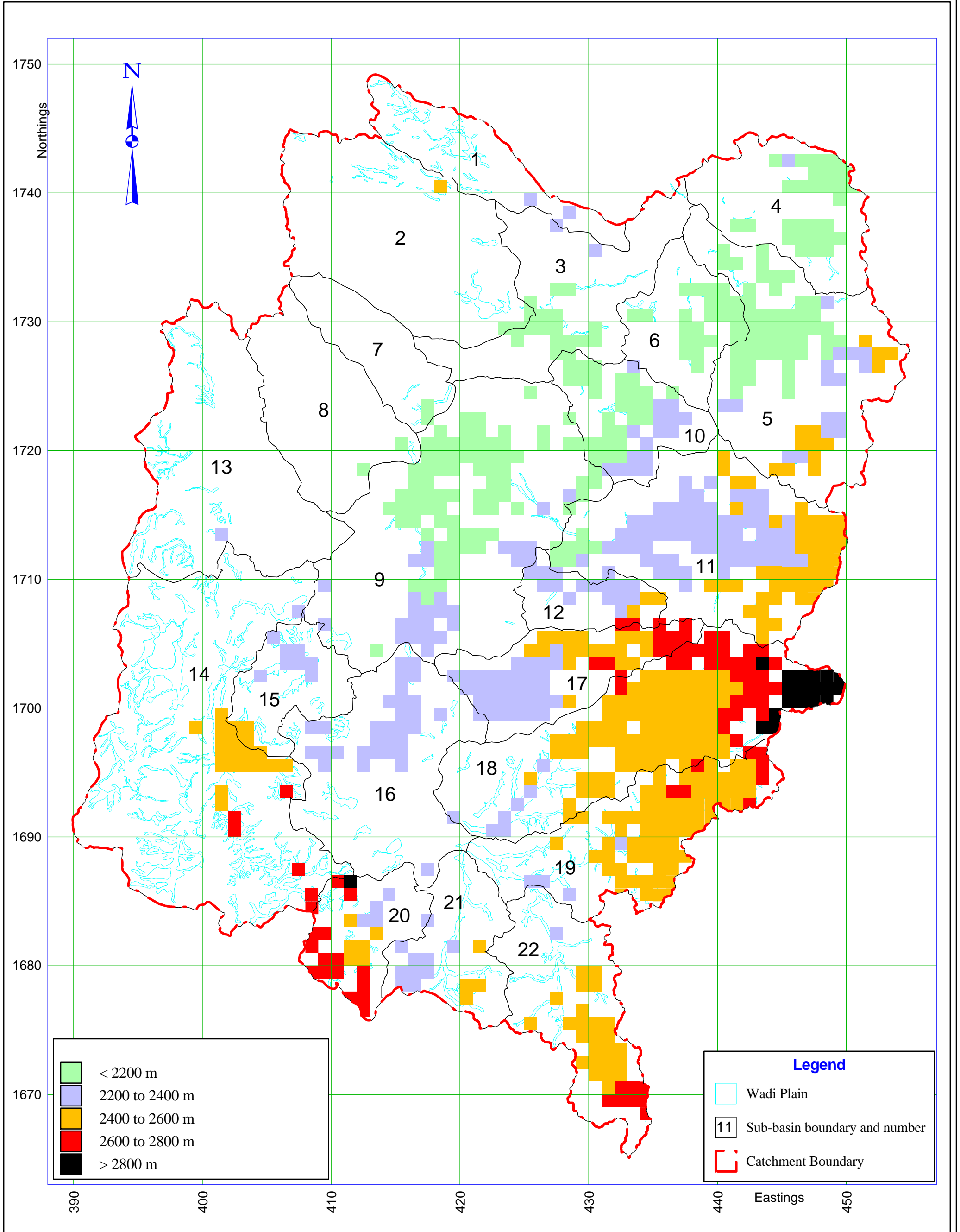


Figure 5.8a : Potentiometric surface (water level elevation above sea level per square kilometer) - dug wells

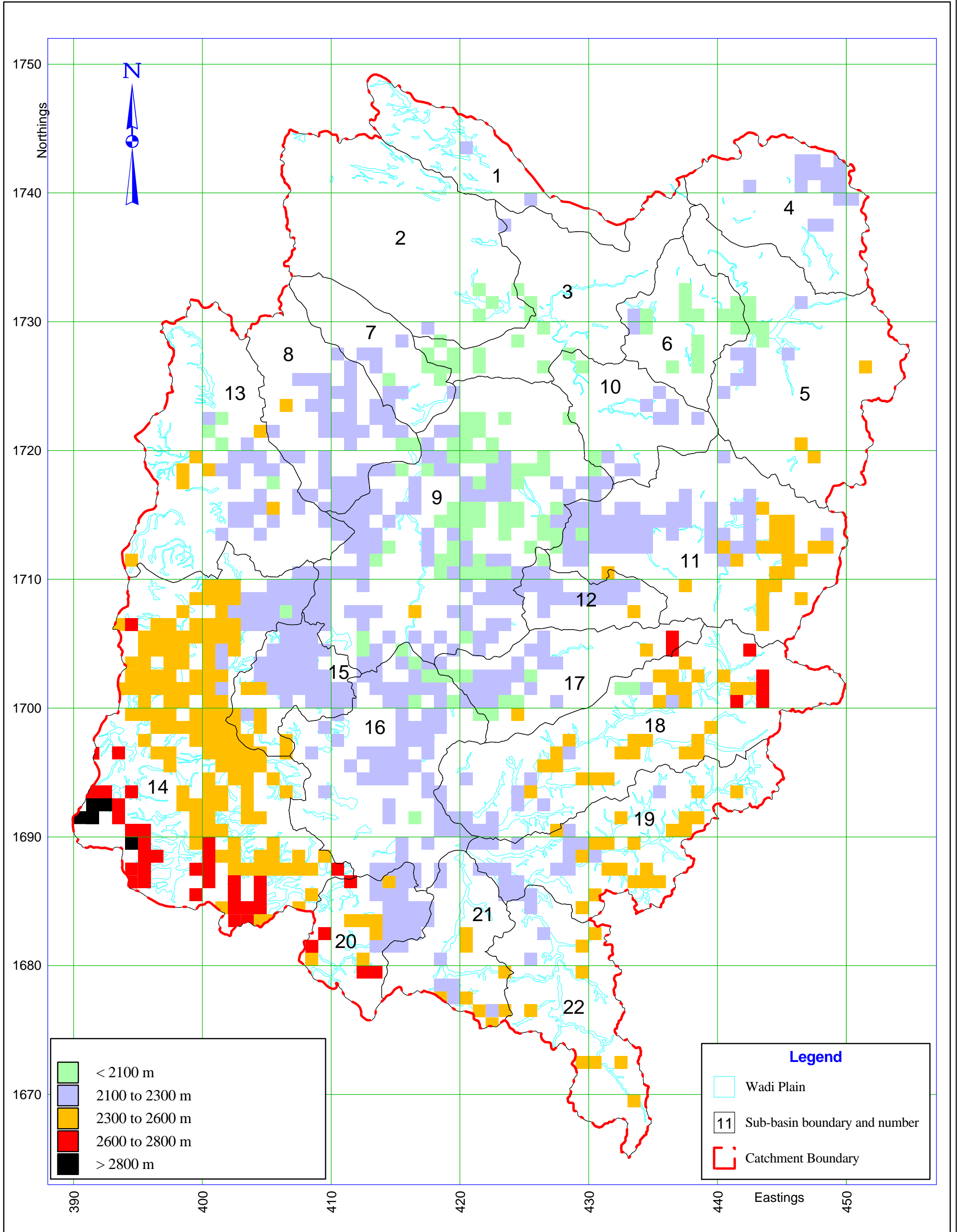


Figure 5.8b : Potentiometric surface (water level elevation above sea level per square kilometer) - boreholes .

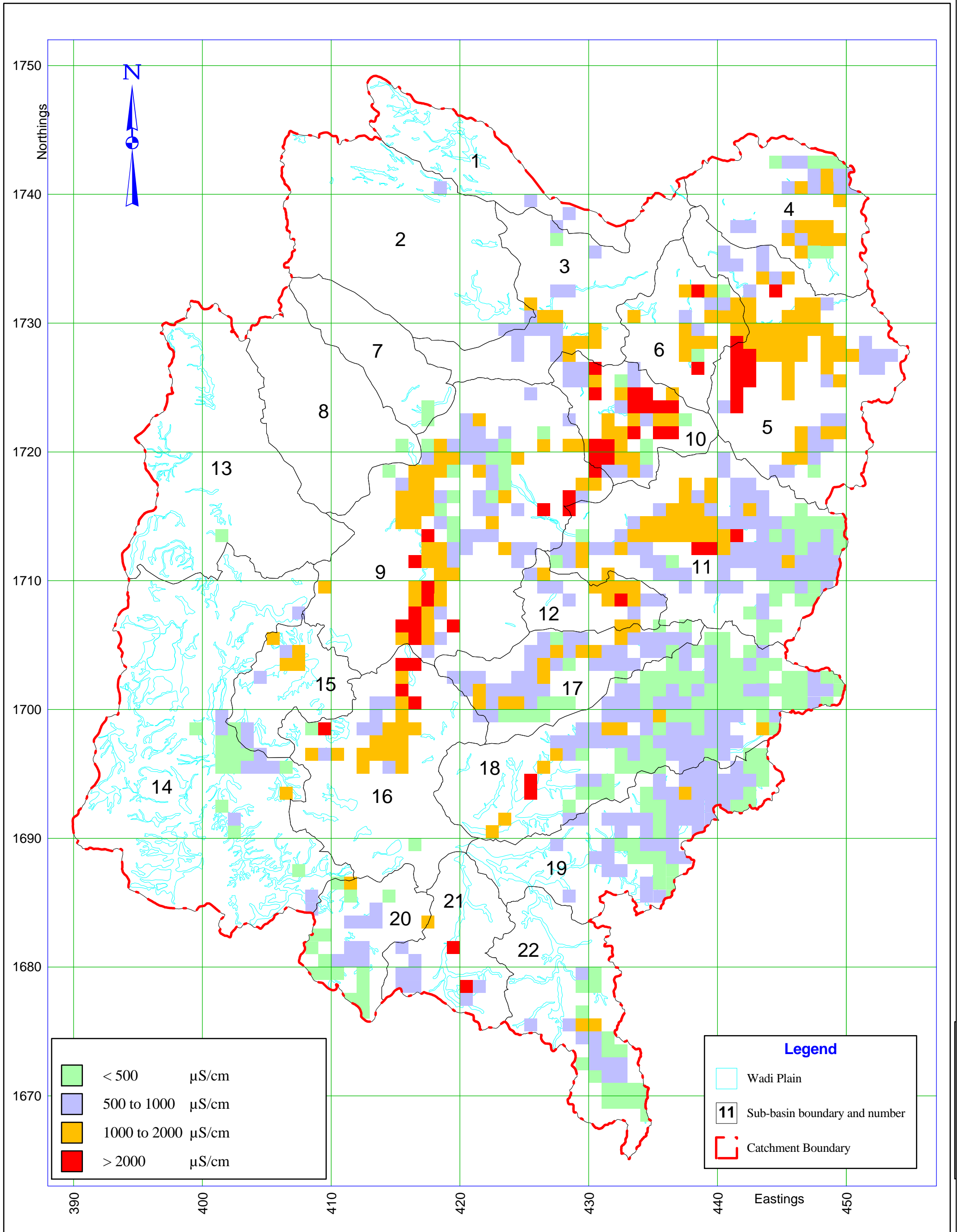


Figure 5.9a : Electrical conductivity distribution per square kilometer (Dug wells)

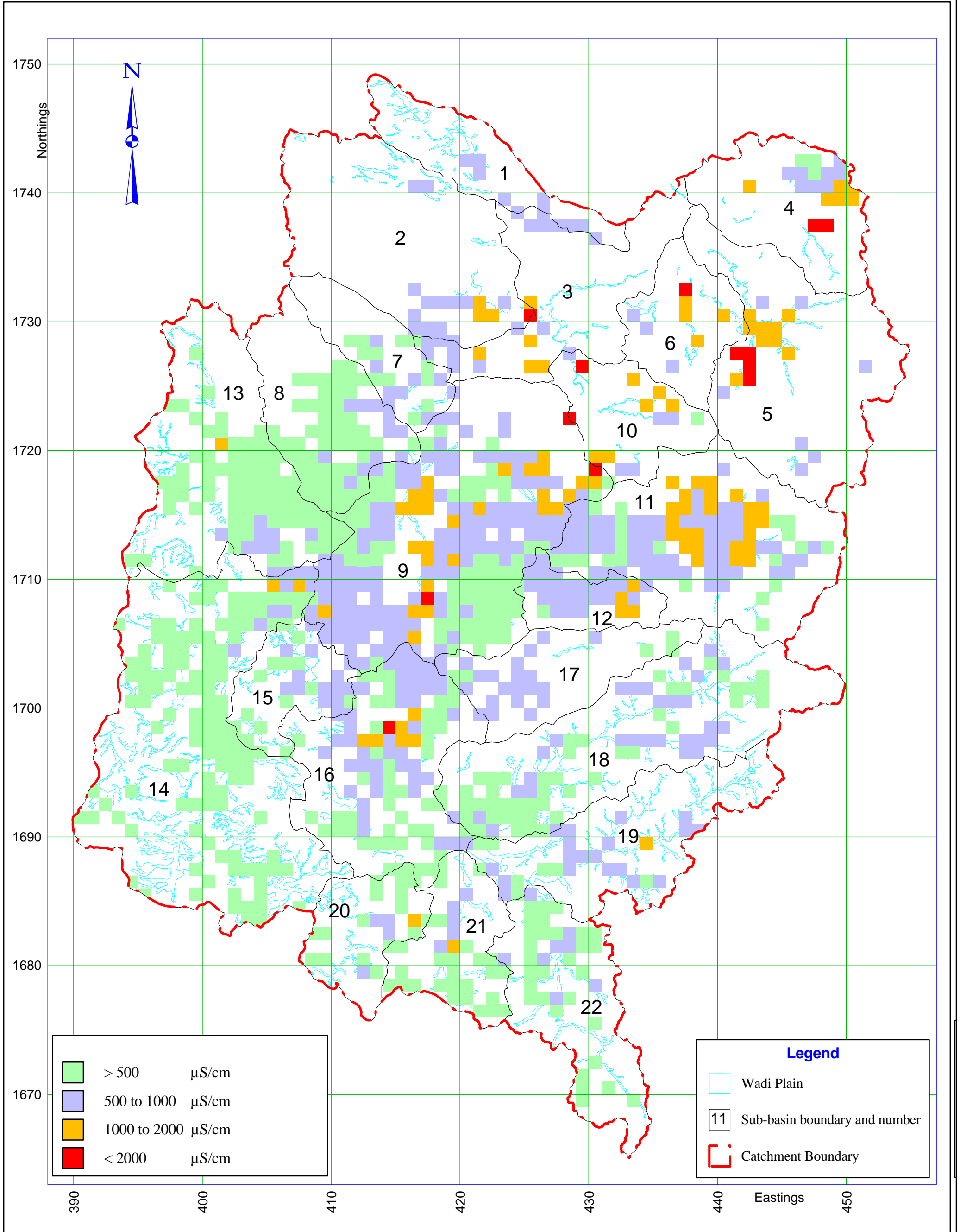


Figure 5.9b : Electrical conductivity distribution per square kilometer (Borehole)

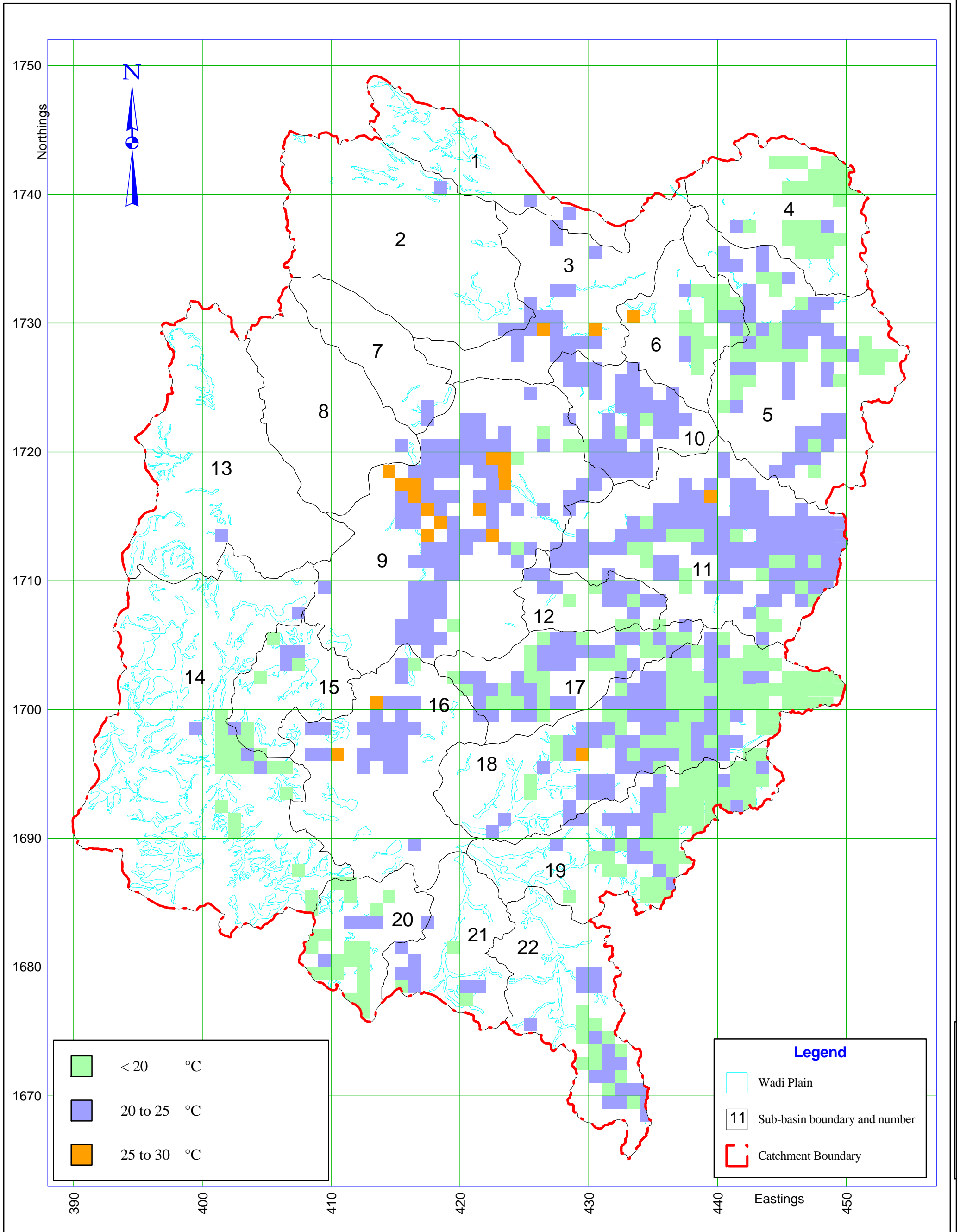


Figure 5.10a : Temperature distribution per square kilometer (Dug wells)

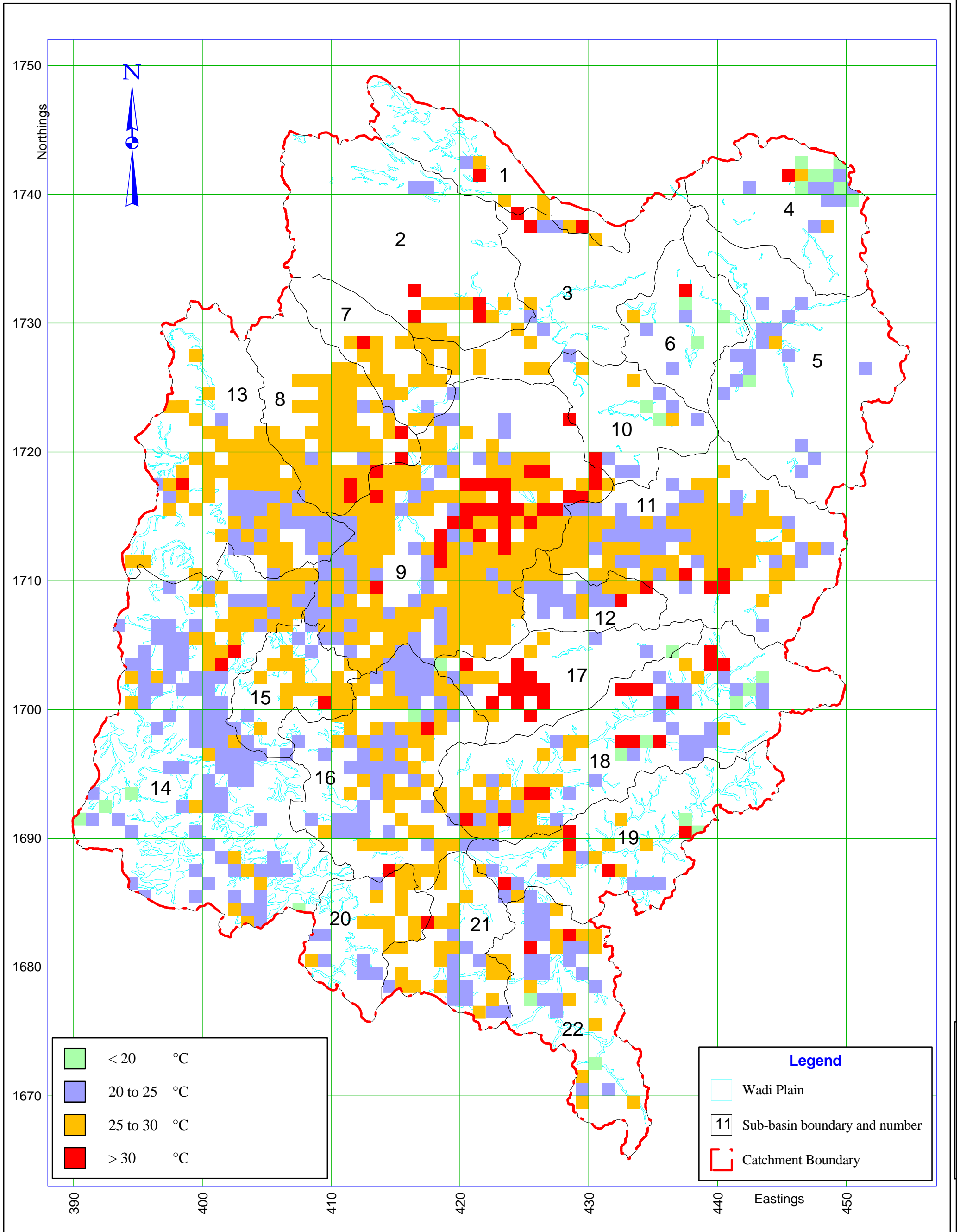


Figure 5.10b : Temperature distribution per square kilometer (boreholes)

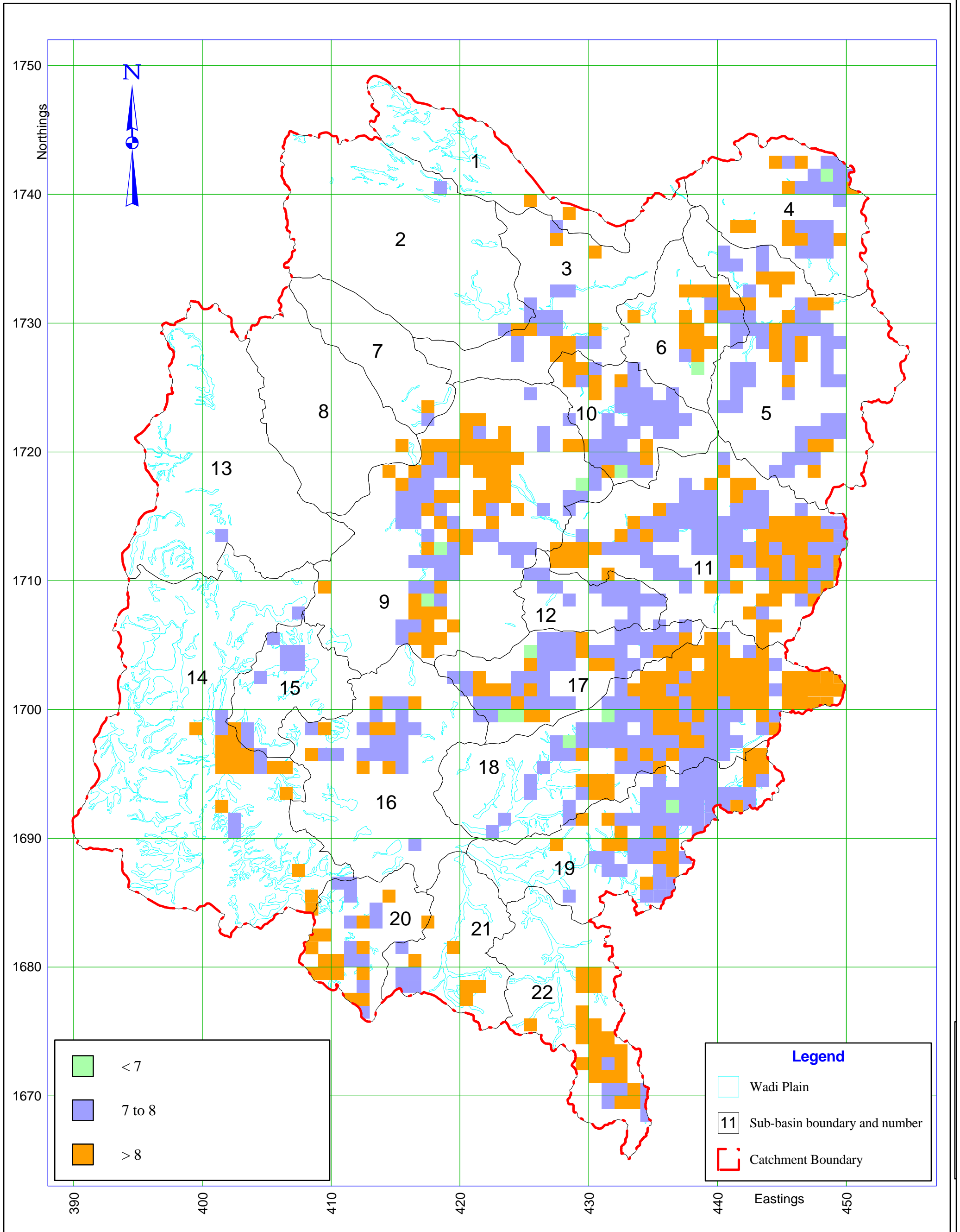


Figure 5.11a : pH distribution per square kilometer (Dug wells)



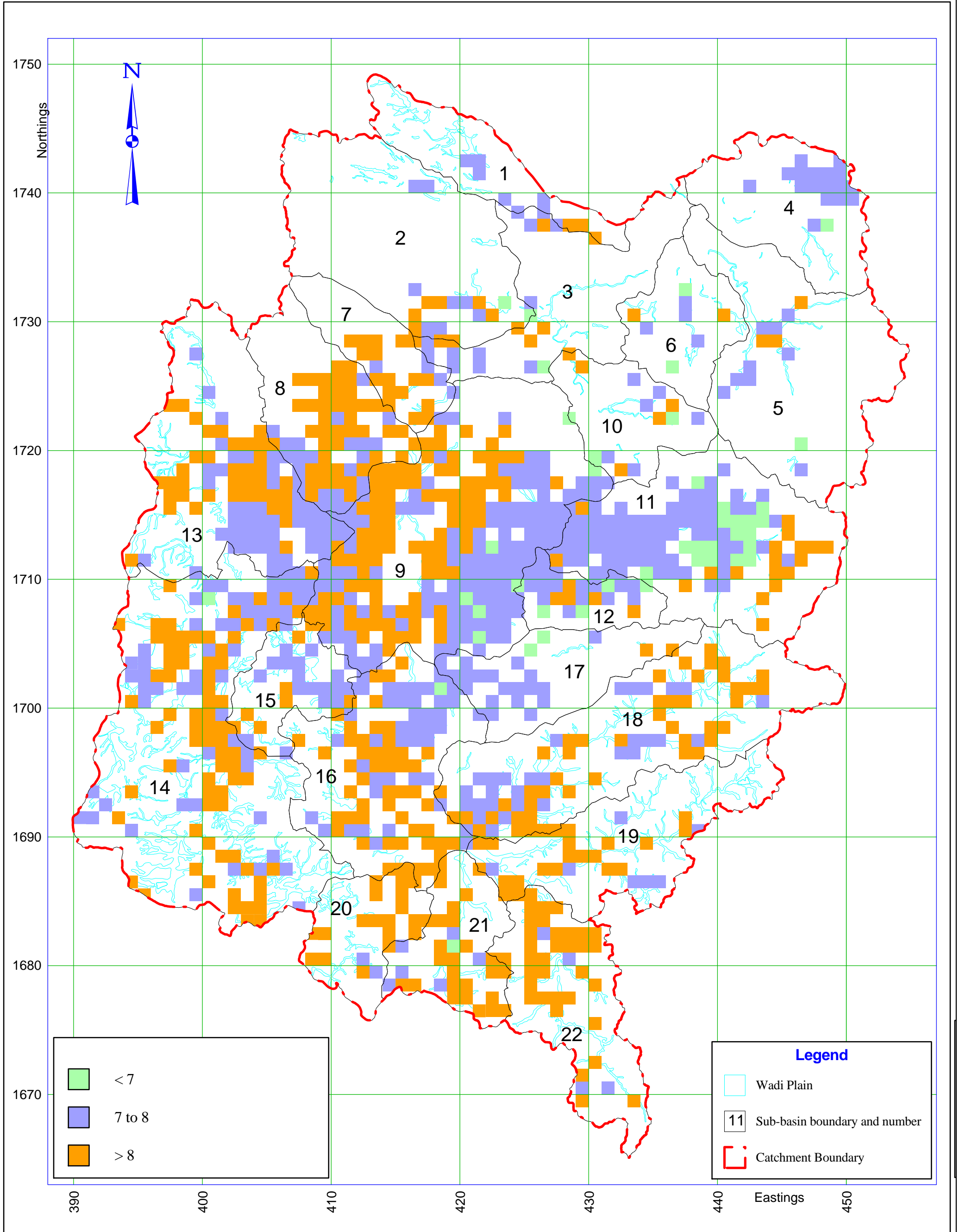


Figure 5.11b : pH distribution per square kilometer (Boreholes)

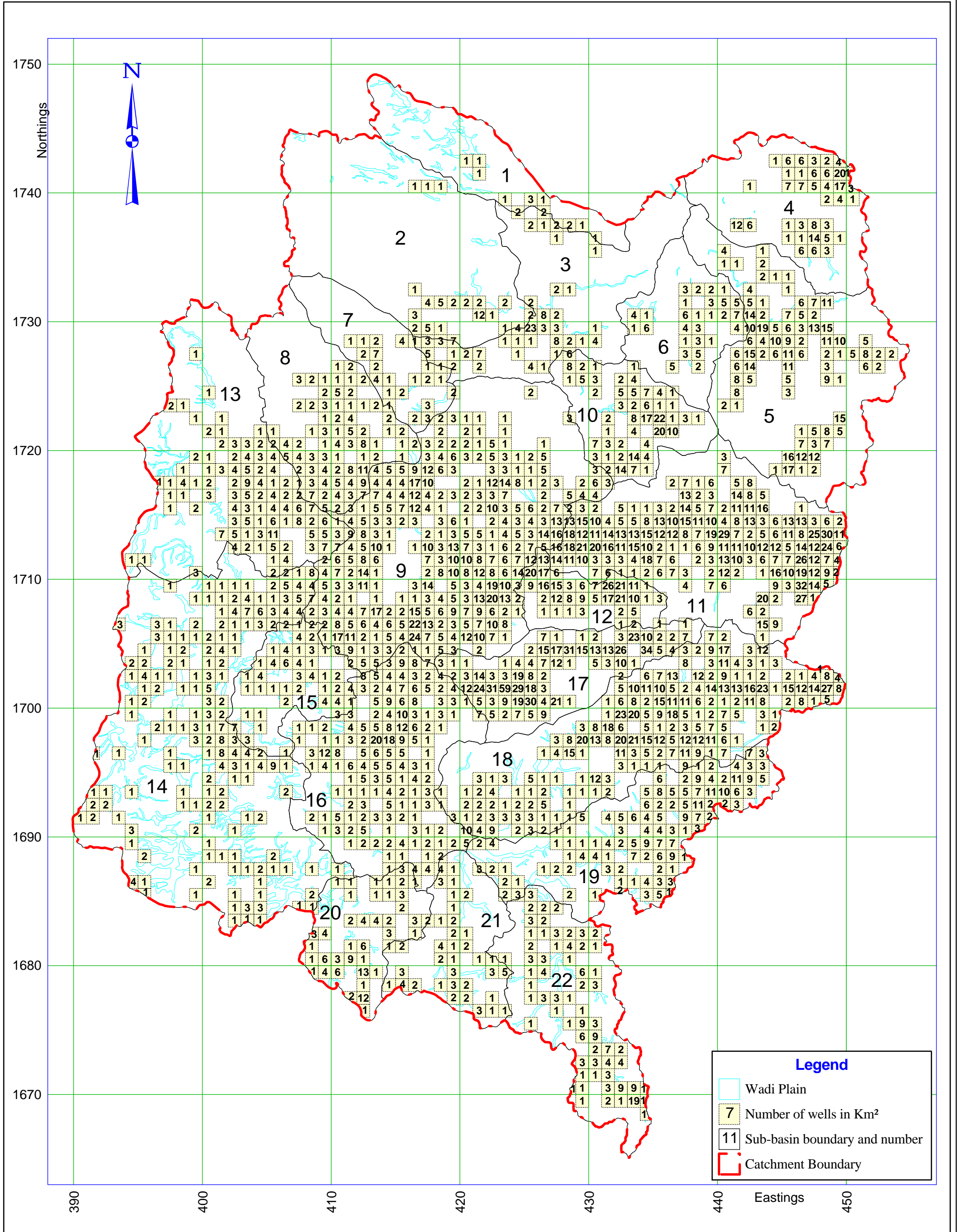


Figure 5.12a : Number of abstracting wells per square kilometer .

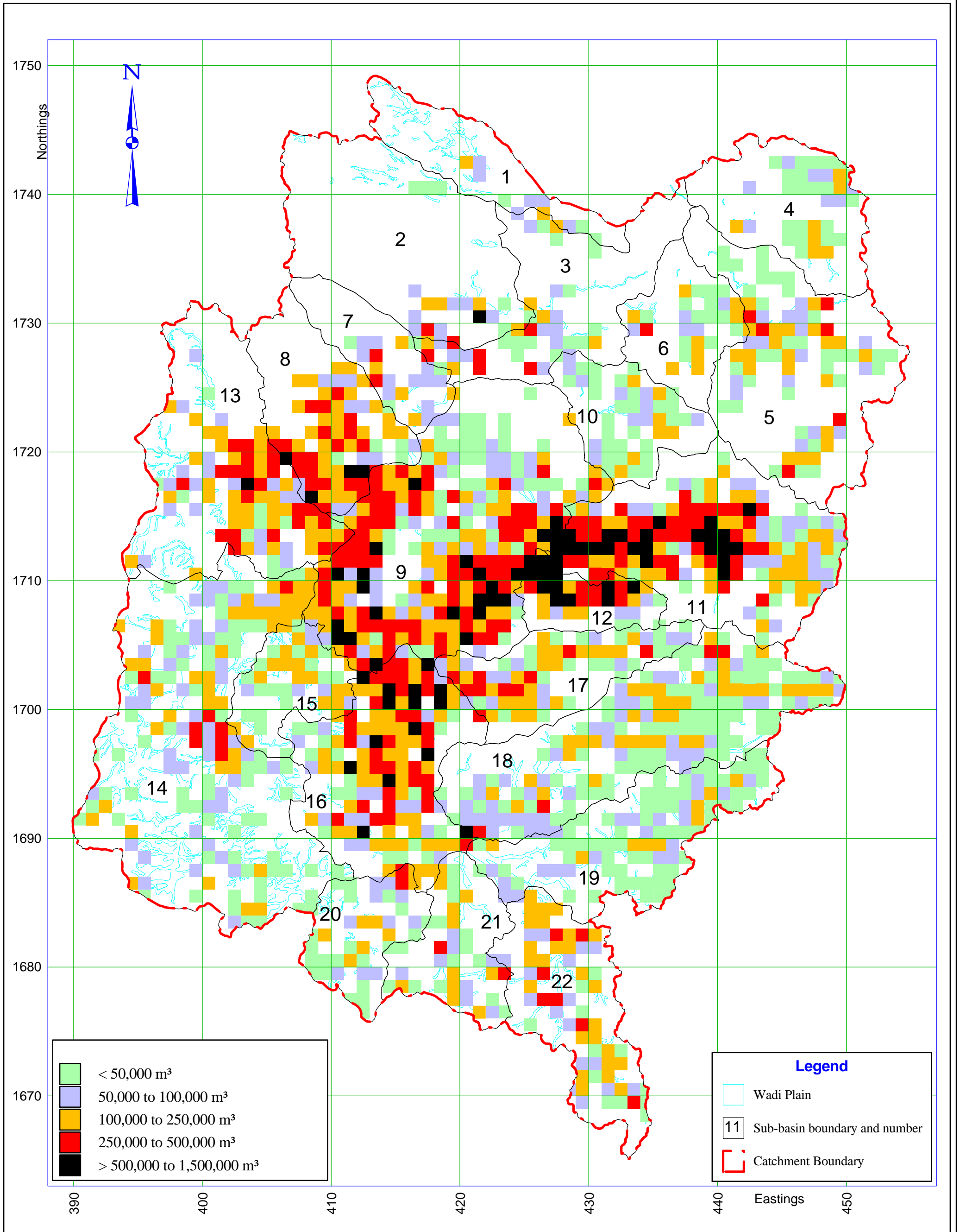
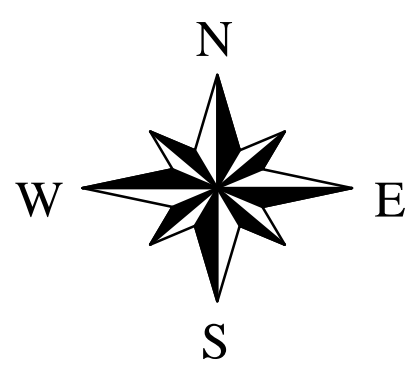


Figure 5.12b : Total Annual Groundwater Abstraction (m³) per Square Kilometer
(see figure 5.12a for number of wells)

The Maps Scale

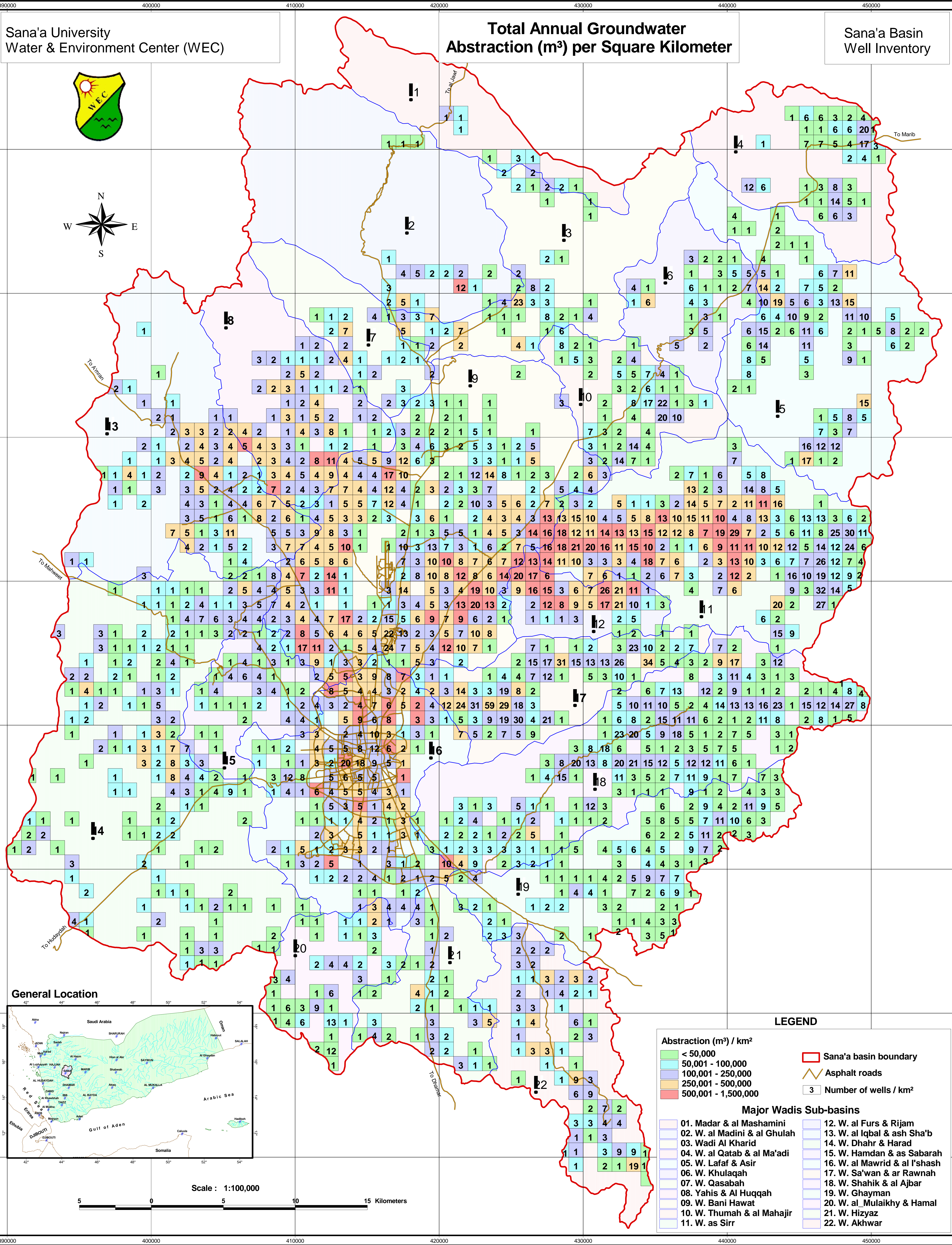
1: 100,000

Sana'a University
Water & Environment Center (WEC)

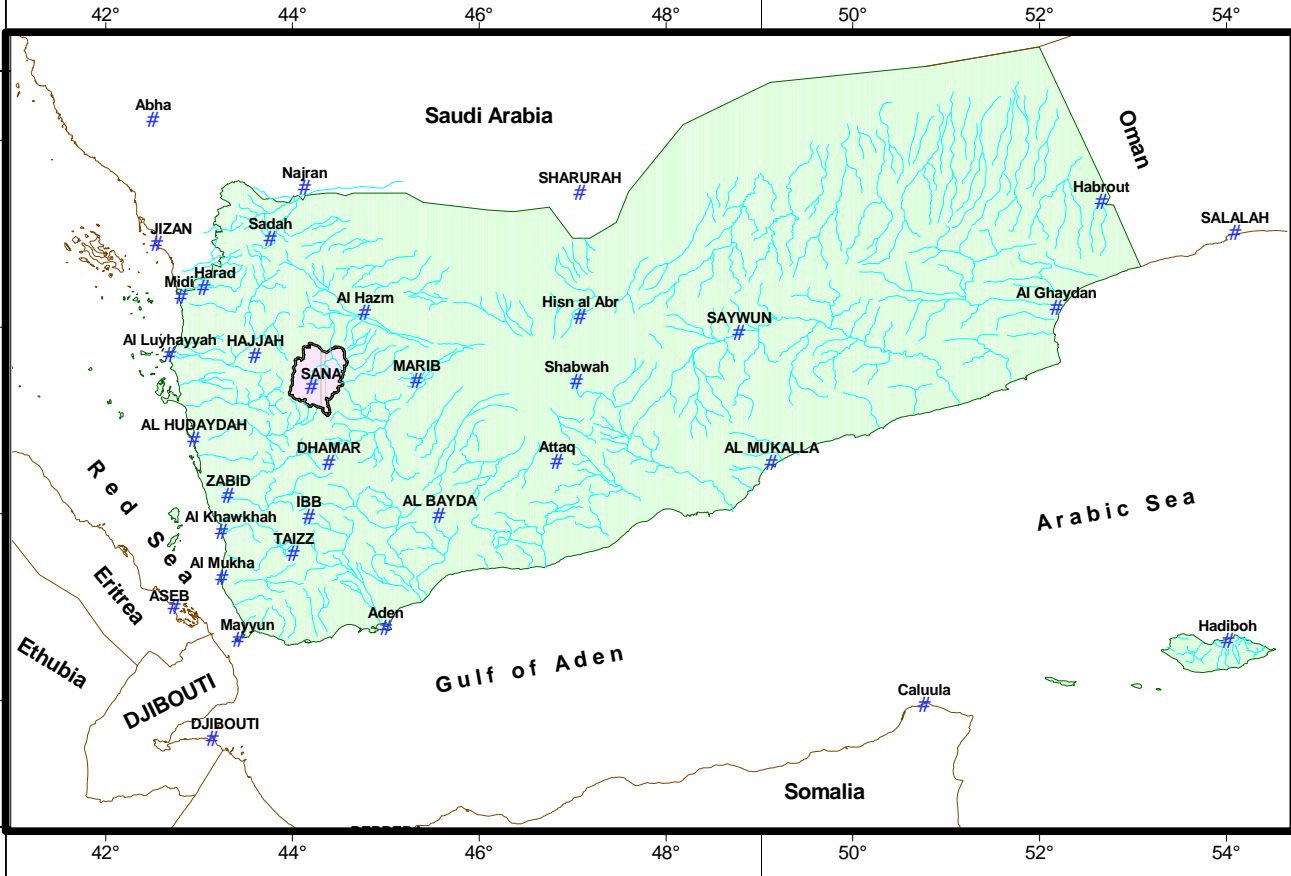


Total Annual Groundwater Abstraction (m³) per Square Kilometer

Sana'a Basin
Well Inventory



General Location



Scale : 1:100,000

LEGEND

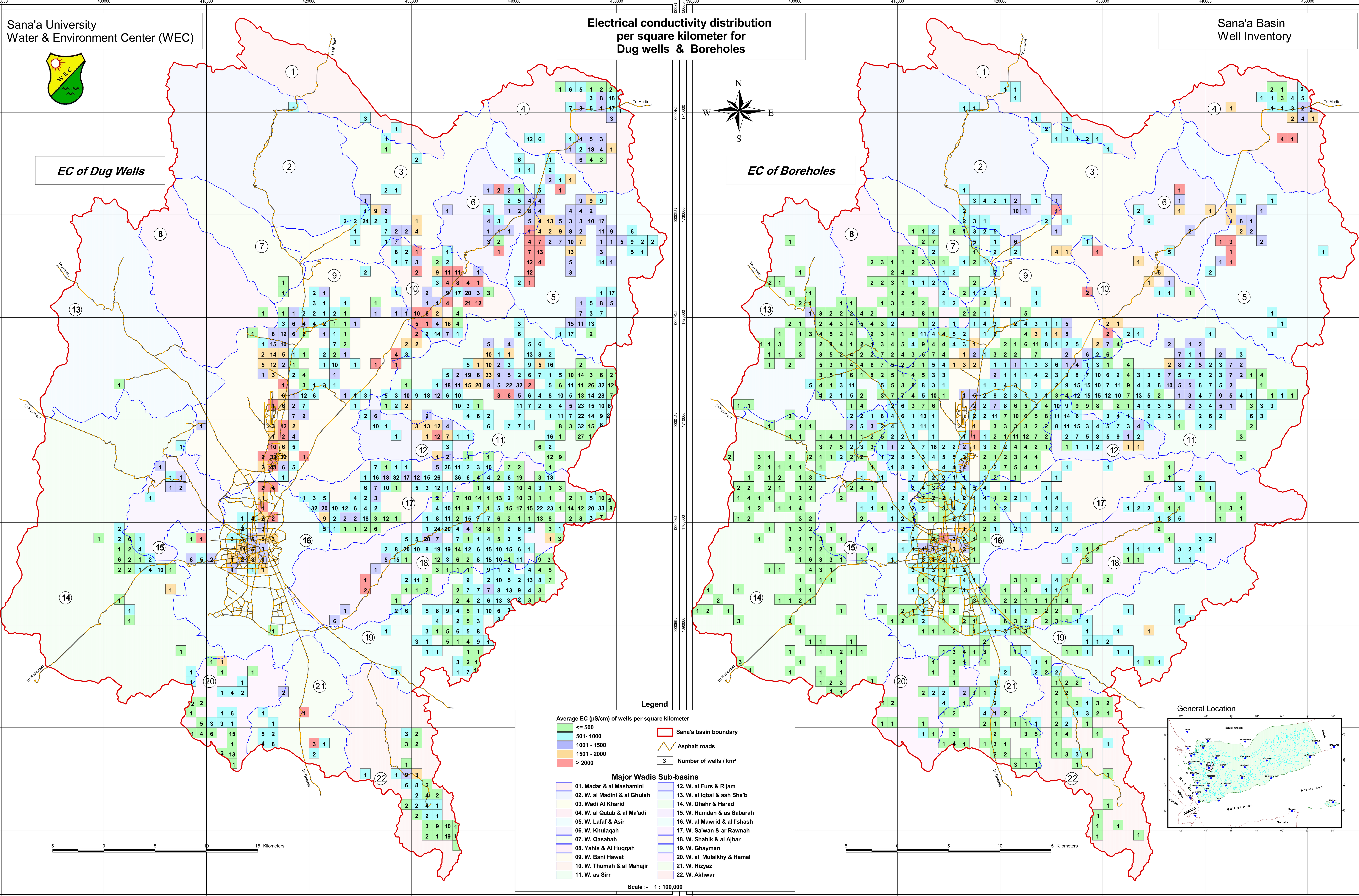
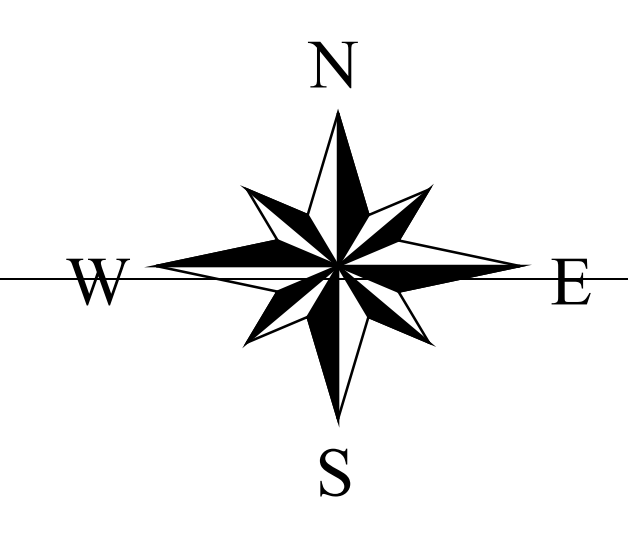
- Abstraction (m³) / km²**
- < 50,000
 - 50,001 - 100,000
 - 100,001 - 250,000
 - 250,001 - 500,000
 - 500,001 - 1,500,000
- Sana'a basin boundary
- Asphalt roads
- 3 Number of wells / km²
- Major Wadis Sub-basins**
- 01. Madar & al Mashamini
 - 02. W. al Madini & al Ghulah
 - 03. Wadi Al Kharid
 - 04. W. al Qatab & al Ma'adi
 - 05. W. Lafaf & Asir
 - 06. W. Khulaqah
 - 07. W. Qasabah
 - 08. Yahis & Al Huqqah
 - 09. W. Bani Hawat
 - 10. W. Thumah & al Mahajir
 - 11. W. as Sirr
 - 12. W. al Furs & Rijam
 - 13. W. al Iqbal & ash Sha'b
 - 14. W. Dhahr & Harad
 - 15. W. Hamdan & as Sabarah
 - 16. W. al Mawrid & al l'shah
 - 17. W. Sa'wan & ar Rawnah
 - 18. W. Shahik & al Ajbir
 - 19. W. Ghayman
 - 20. W. al Mulaikhy & Hamal
 - 21. W. Hizyaz
 - 22. W. Akhwar



**Electrical conductivity distribution
per square kilometer for
Dug wells & Boreholes**

EC of Dug Wells

EC of Boreholes



Legend

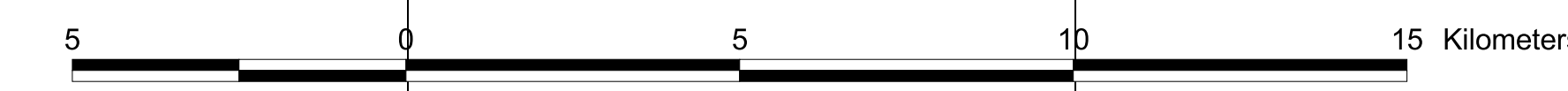
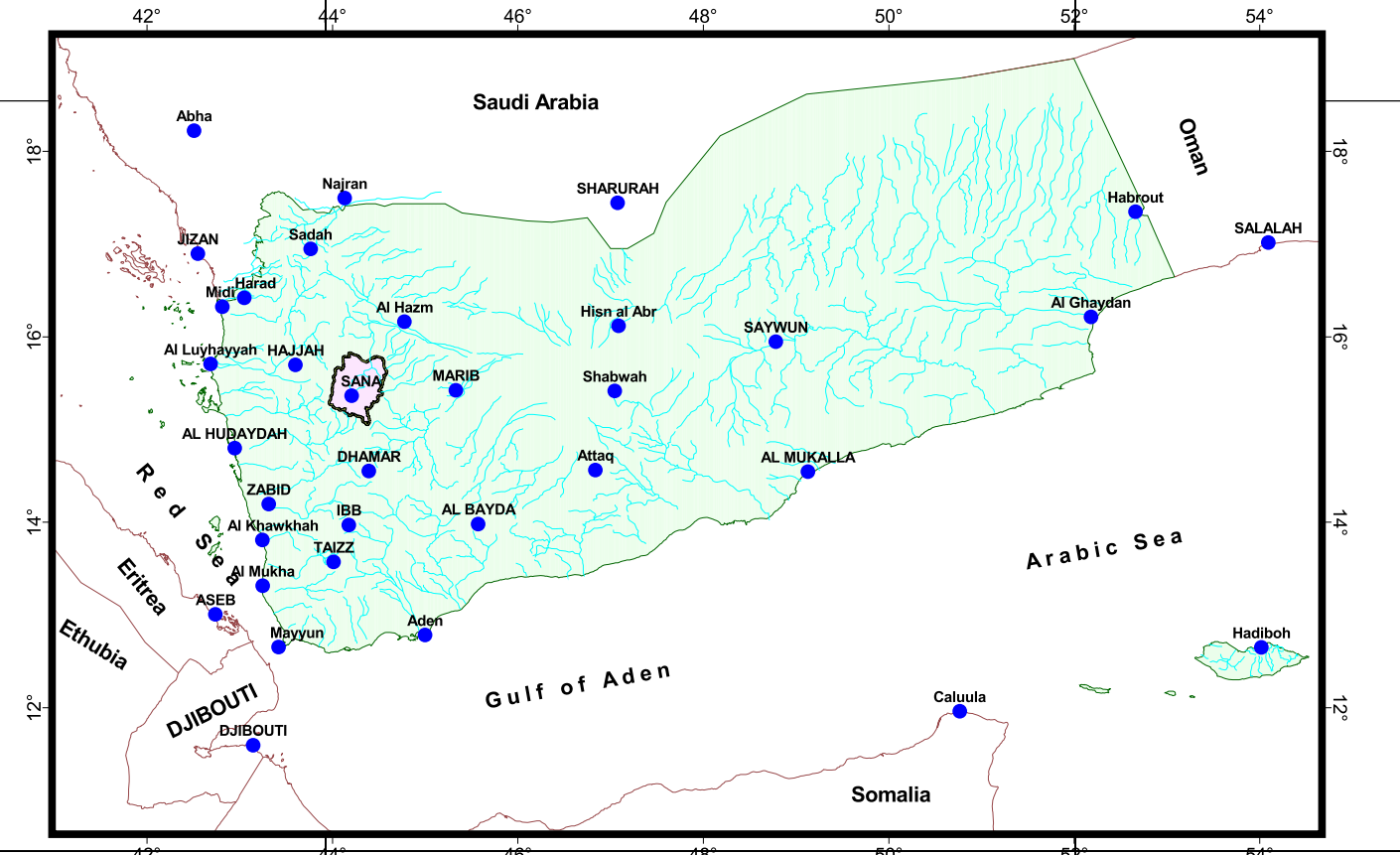
- Average EC ($\mu\text{S/cm}$) of wells per square kilometer
- ≤ 500
 - 501 - 1000
 - 1001 - 1500
 - 1501 - 2000
 - > 2000
- Sana'a basin boundary
 Asphalt roads
 Number of wells / km²

Major Wadis Sub-basins

- | | |
|---|--|
| <ul style="list-style-type: none"> 01. Madar & al Mashamini 02. W. al Madini & al Ghulah 03. Wadi Al Kharid 04. W. al Qatab & al Ma'adi 05. W. Lafaf & Asir 06. W. Khulaqah 07. W. Qasabah 08. Yahis & Al Huqqah 09. W. Bani Hawat 10. W. Thumah & al Mahajir 11. W. as Sirr | <ul style="list-style-type: none"> 12. W. al Furs & Rijam 13. W. al Iqbal & ash Sha'b 14. W. Dhahr & Harad 15. W. Hamdan & as Sabarah 16. W. al Mawrid & al I'shah 17. W. Sa'wan & ar Rawnah 18. W. Shahik & al Ajbar 19. W. Ghayman 20. W. al_Mulalkhy & Hamal 21. W. Hizyaz 22. W. Akhwar |
|---|--|

Scale :- 1 : 100,000

General Location

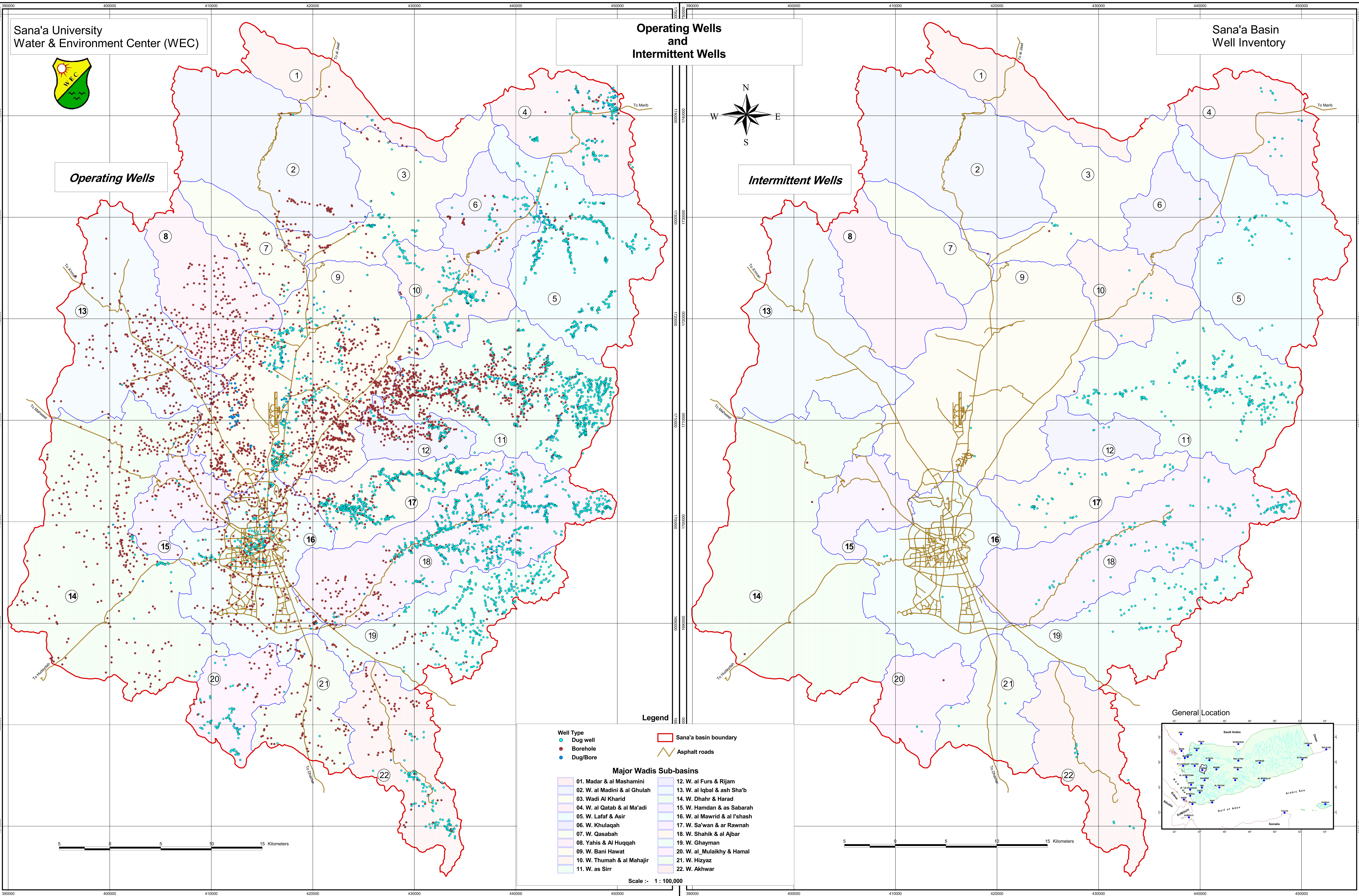
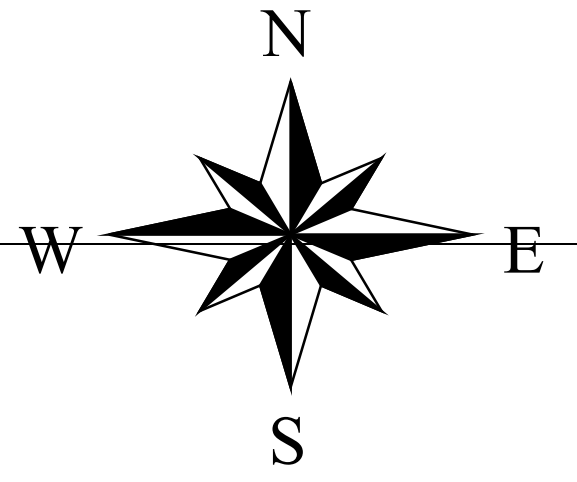




**Operating Wells
and
Intermittent Wells**

Operating Wells

Intermittent Wells



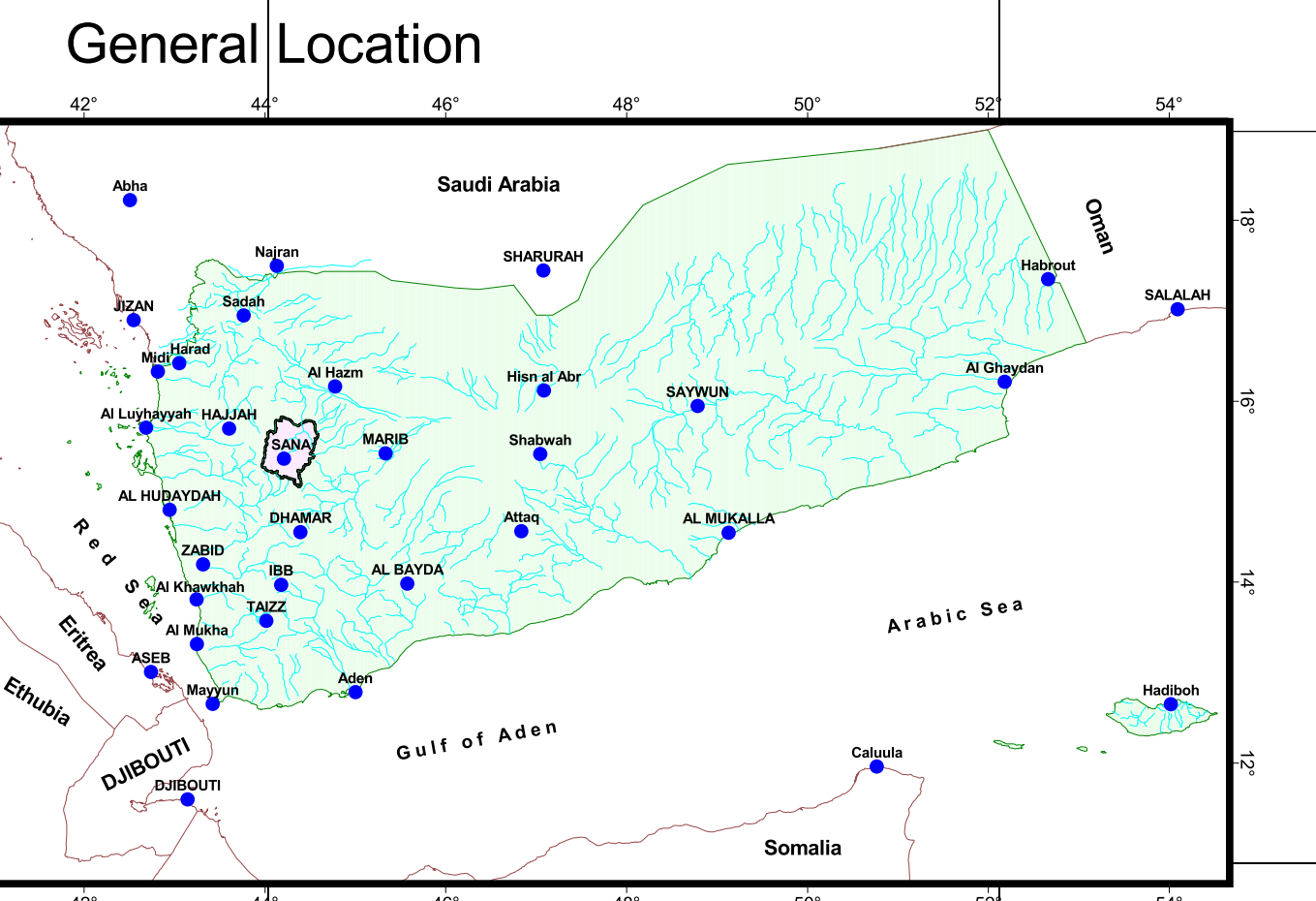
Legend

- Dug well
 - Borehole
 - Dug/Bore
 - Sana'a basin boundary
 - Asphalt roads
- Major Wadis Sub-basins**
- | | |
|------------------------------|-------------------------------|
| 01. Madar & al Mashamini | 12. W. al Furs & Rijam |
| 02. W. al Madini & al Ghulah | 13. W. al Iqbal & ash Sha'b |
| 03. Wadi Al Kharid | 14. W. Dhahr & Harad |
| 04. W. al Qatab & al Ma'adi | 15. W. Hamdan & as Sabarah |
| 05. W. Lafaf & Asir | 16. W. al Mawrid & al I'shash |
| 06. W. Khulaqah | 17. W. Sa'wan & ar Rawnah |
| 07. W. Qasabah | 18. W. Shahik & al Ajbah |
| 08. Yahis & Al Huqqah | 19. W. Ghayman |
| 09. W. Bani Hawat | 20. W. al_Mulaikhy & Hamal |
| 10. W. Thumah & al Mahajir | 21. W. Hizyaz |
| 11. W. as Sirr | 22. W. Akhwar |

Scale :- 1 : 100,000

5 0 5 10 15 Kilometers

5 0 5 10 15 Kilometers



General Location

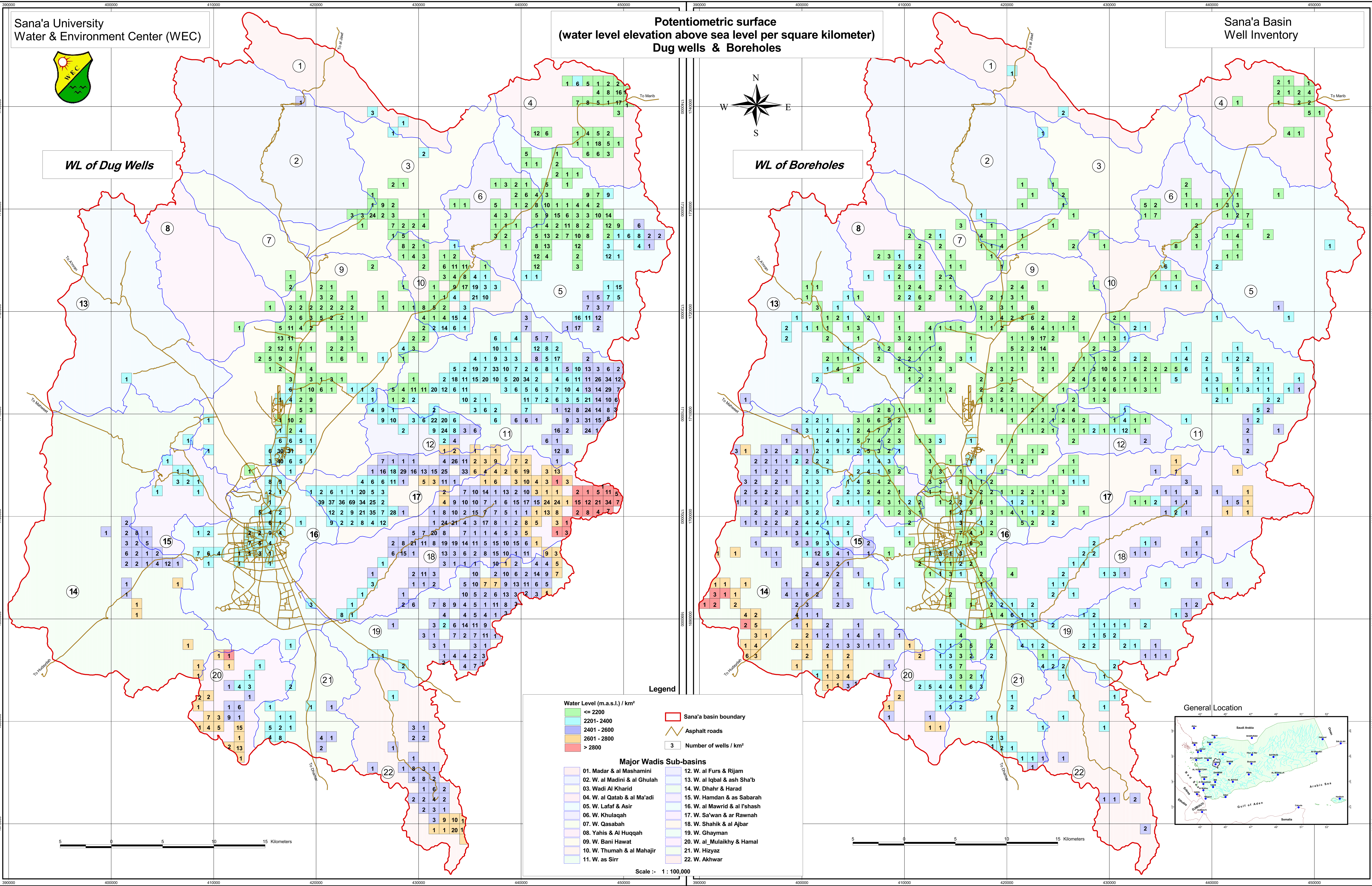
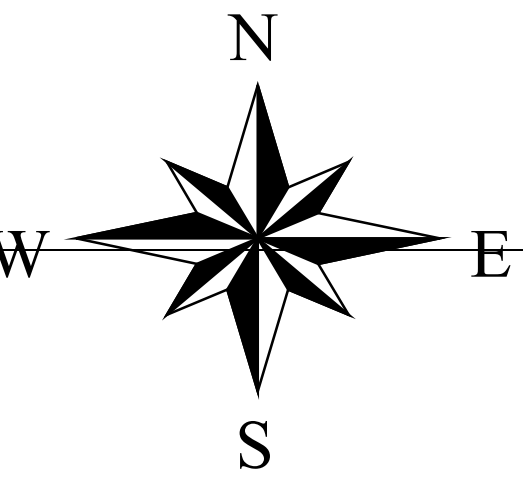


**Potentiometric surface
(water level elevation above sea level per square kilometer)
Dug wells & Boreholes**

**Sana'a Basin
Well Inventory**

WL of Dug Wells

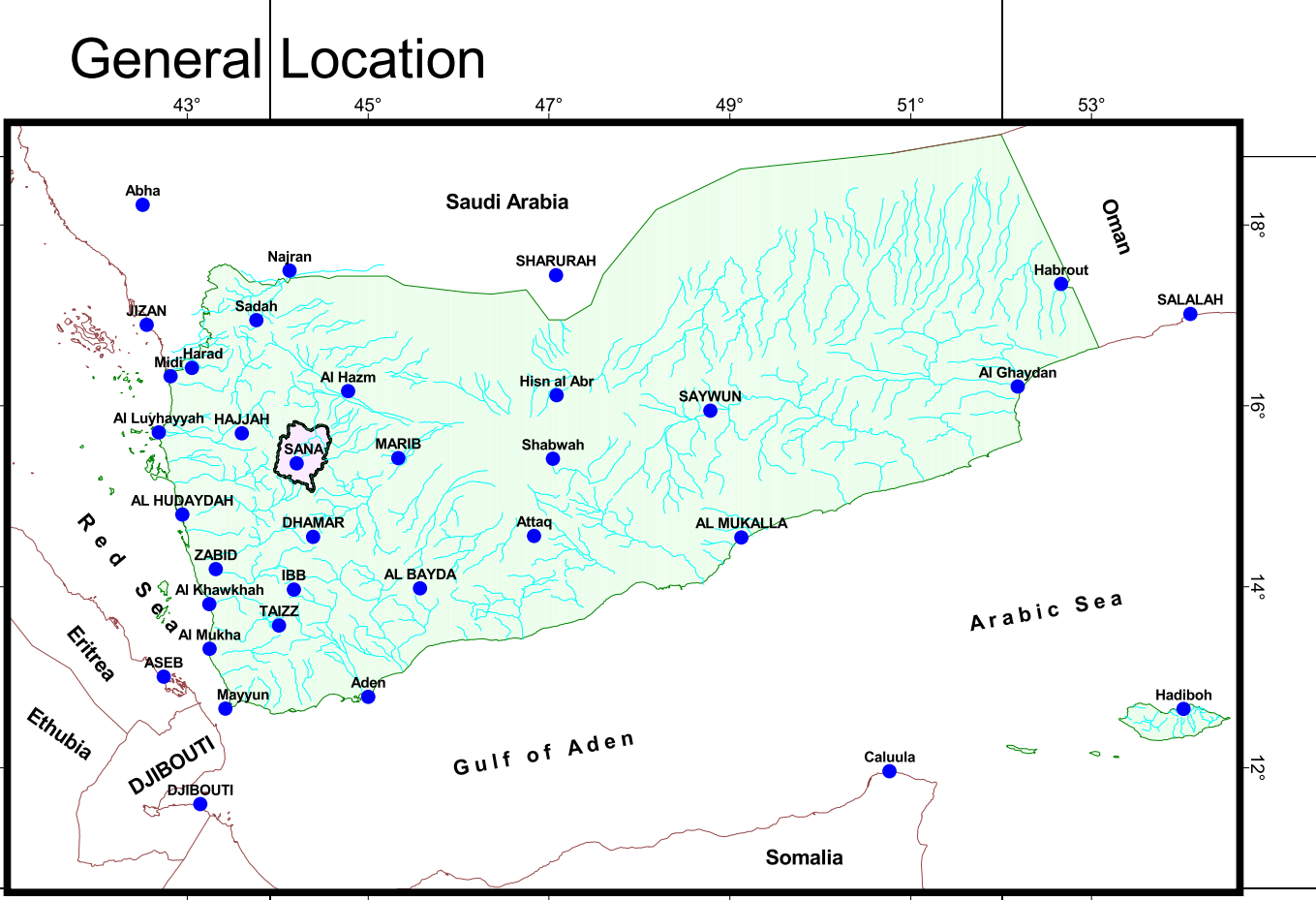
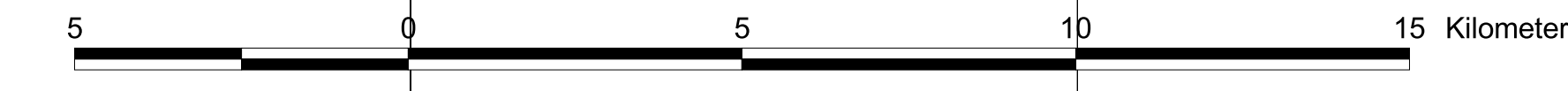
WL of Boreholes



Legend

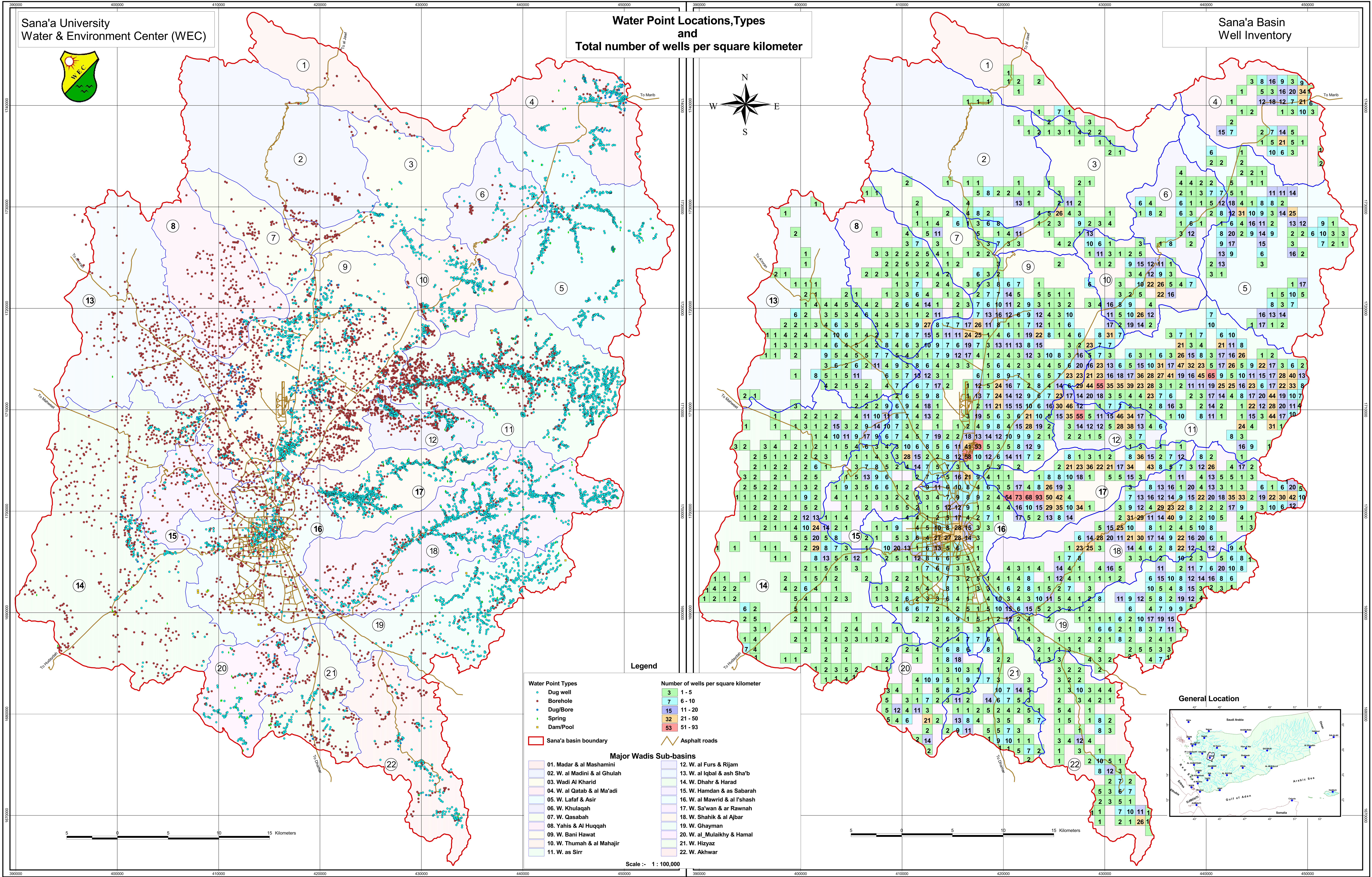
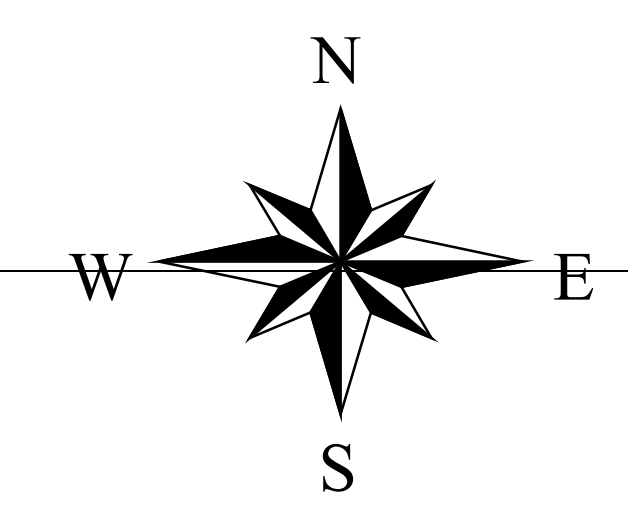
- | | | |
|---|---|--|
| Water Level (m.a.s.l.) / km ² | <ul style="list-style-type: none"> <= 2200 2201 - 2400 2401 - 2600 2601 - 2800 > 2800 | <ul style="list-style-type: none"> Sana'a basin boundary Asphalt roads 3 Number of wells / km² |
| Major Wadis Sub-basins | | |
| <ul style="list-style-type: none"> 01. Madar & al Mashamini 02. W. al Madini & al Ghulah 03. Wadi Al Kharid 04. W. al Qatab & al Ma'adi 05. W. Lafaf & Asir 06. W. Khulaqah 07. W. Qasabah 08. Yahis & Al Huqqah 09. W. Bani Hawat 10. W. Thumah & al Mahajir 11. W. as Sirr | <ul style="list-style-type: none"> 12. W. al Furs & Rijam 13. W. al Iqbal & ash Sha'b 14. W. Dhahr & Harad 15. W. Hamdan & as Sabarah 16. W. al Mawrid & al I'shah 17. W. Sa'wan & ar Rawnah 18. W. Shahik & al Ajbar 19. W. Ghayman 20. W. al_Mulaikhy & Hamal 21. W. Hizyaz 22. W. Akhwar | |

Scale :- 1 : 100,000





**Water Point Locations, Types
and
Total number of wells per square kilometer**



Legend

- | | | |
|--|--|--|
| <p>Water Point Types</p> <ul style="list-style-type: none"> ● Dug well ● Borehole ● Dug/Bore ● Spring ■ Dam/Pool <p> Sana'a basin boundary</p> | <p>Number of wells per square kilometer</p> <ul style="list-style-type: none"> 3 - 5 6 - 10 11 - 20 21 - 30 31 - 40 41 - 50 51 - 60 61 - 70 71 - 80 81 - 90 91 - 93 | <p>Major Wadis Sub-basins</p> <ul style="list-style-type: none"> 01. Madar & al Mashamini 02. W. al Madini & al Ghulah 03. Wadi Al Kharid 04. W. al Qatab & al Ma'adi 05. W. Lafaf & Asir 06. W. Khulaqah 07. W. Qasabah 08. Yahis & Al Huqqah 09. W. Bani Hawat 10. W. Thumah & al Mahajir 11. W. as Sirr 12. W. al Furs & Rijam 13. W. al Iqbal & ash Sha'b 14. W. Dhahr & Harad 15. W. Hamdan & as Sabarah 16. W. al Mawrid & al I'shah 17. W. Sa'wan & ar Rawnah 18. W. Shahik & al Ajbar 19. W. Ghayman 20. W. al Mulaikhy & Hamal 21. W. Hizyaz 22. W. Akhwar |
|--|--|--|

Scale :- 1 : 100,000

General Location

