AL-Qadisiya Journal For Science Vol .17 No.2 Year 2012
Hamid Doshan Hany/Faras Ismael Ibrahim ISSN-1997-4290

Land Cover Land Use Map of Suq Al-Shuyukh City Using Remote Sensing and GIS Techniques

Hamid Doshan Hany
Technical Institute / Shatra
Department of Surveying

Faris Ismael Ibrahim
Technical Institute / Shatra
Department of Surveying

Abstract:

The land cover and land use distribution maps have been obtained. The land cover map contains seven major classes which are: Reed, Palm Forest, Barren area, Urban area, Vegetation, Water bodies, and Sabkha, while the land use map contains seventeen classes which are: Old City , Roads, Built Up-Area, Parking, Army Section, Cemetery, Apartment Exuded, Healthy Services, Educational Services, University Building, Main Public Building, Green Section, Sports Stadium, Recreation Ground, Market, Artificial Section and Palm Forest.

The urban structures were distinguished accurately from others. The types of urban uses were acceptable and distinguished. Residential uses are big in comparison with other urban uses. Industrial uses are clearly little in comparison with city size.

Nomenclature:

ETM^{+}= Enhanced Thematic Mapper Plus.
ERDAS= Earth Resources Data Analysis System.
FCC= False Color Composite.
GIS= Geographical Information System.
GPS= Global position System.
TM= Thematic Mapper.

Introduction:

Suq Al-Shuyukh city is important district in southern Iraq. It is recognized with several sides such as: natural, industrial and human resources. The number of population is about (35148). It has an area about (42.531) km². It contains a number of soil quarries and brick factories. There are several of important tourist and ancient monument sites. This area represents bed of Sumerian civilization. The human does plenty of activities specially the agriculture. There are numbers of irrigation nets which branch from Euphrates River and drainage projects in addition to the presence of biggest marsh in southern Iraq, it is Al-Hammer Marsh. This city is curlace, so it needs to increase of reconstruction populating projects. These projects need to accurate map for Land cover distribution depending on recent techniques and information.

In order to maximize advantage from different land cover classes, these classes should be managed well to meet people needs as the number of people increases. The management should take natural resources, environmental conditions and different developments probabilities into consideration. The assessment of the nature of the land offers more options for assignment the

Keywords:

Land use, Land cover, Classification, Unsupervised classification, Supervised classification.

land for specific project. The importance of remote sensing is to offer the proper solution. Remote sensing science is capable to get, treat and analyze the geographic data and dealing with them [5].

The location of study area is between latitudes (30.86º - 30.92º) north and longitudes (46.42º - 46.50º) east. The area is about (42.531) km² [2]. The climate of this area is hot in summer and cold in winter. In the beginning of summer the area is exposed to dust storm. The environment is considered relatively little noisy because of less factories. Euphrates crosses the area from northwestern sides to southeastern sides. The southwestern area is sandy. The water table is (50-80)cm deep below ground surface. The area is plain with small depression and elevation, as shown in (Figure 1).

[1] classified the land use of the Holy City of Makah by processing integrated Land sat-TM and IRS-IC-Pan data. [8] classified a land cover methodology through digital analysis of historical and new satellite data.

The aim of this study is making land cover map which describes the accurate distribution of different land cover classes.

Methodology:

Remote sensing data are used. These data represented by continuous image ETM^+ with (0.6m) resolution were produced in 2007 and topographic maps with scale (1:100000) product in 1990, in addition to specialized software such as: EARDAS 9.1 and ARC GIS 9.1. GPS instrument was used to determine the land targets in the field and on the satellite image. Several techniques have been applied to correct and enhance the space data in order to facilitate the separation of the land cover classes. The methodology of this research includes:

1-Field Work:

The field work is based on the traditional methods and Remote Sensing data. Remote Sensing techniques have been used to reduce the traditional field survey according to its facilities. Field observations have been achieved by visiting twenty different locations of the study region, according to Grid method by using Global Position System, (GPS Garmin 12).

The number of locations has been specified according to the unsupervised classification map and spectral response of earth features that are represented in False Color Composite (FCC) image. The topographic map [6] used was considered as a basic guide in the field work.

2- Laboratory Work:

It includes treating the images digitally by using ERDAS 9.1 program [3]. It also included the analysis of data and results that were obtained by using a computer and special programs such as: Arc GIS 9.1[4], The most important step that was made was:

Classification:

There are two ways to classify pixels into different categories:

a-Unsupervised classification:

The classification is carried out by sorting each element in the image based on its spectrum reflectance. Then each element is giving a unique spectrum signature in the classification area. The result of this operation is a thematic map. This map shows the geographic locations of the classes of the land, as seen in (Figure 2).

b-Supervised classification:

According to the field visits to study area in order to verify the classification groups, and correcting the unknown image data. Land cover &Land use of study area were classified into seven classes as follows: Reed, Palm forest, Barren area, Urban area, Vegetation, Water bodies, Sabkha. Land cover land use map was resulted from this stage, as seen in (Figure 3).

The classification operation was performed by delineating the area of each use by polygons using (ERDAS software).The Maximum Likelihoods method was used in this classification. After the completion of the classification, the topology was built in order to field obtain the characteristics table which implicate the areas of each class and saving it as shape file to facilitate, calling, building database and analysis by (ARCGIS software).

Results:

(Figure 2) shows results of unsupervised classification. (Table 1) illustrate that the land cover consist of the following:

The area of Reed is (5.195) km².
The area of Water Bodies is (7.185) km².
The area of Vegetation is (6.400) km².
The area of Palm Forest is (5.345) km².
The area of Barren Area is (6.198) km².
The area of Sabkha is (7.252) km².
The area of Urban is (4.956) km².

(Figure 3) shows results of supervised classification (land use map) which were written, their results are shown in the (Table 2). This table explains the following:

The area of Old City, is about (0.341) km² which represents (16.23%) of whole study area. The area of Roads, is about (0.002) km² which represents (0.10%) of whole study area. The area of Built Up-Area, is about (0.001) km² which represents (0.05%) of whole study area. The area of Parking, is about (0.085) km² which represents (4.04%) of whole study area. The area of Army Section, is about (0.047) km² which represents (2.24%) of whole study area. The area of Cemetery, is about (0.009) km² which represents (0.43%) of whole study area. The area of Apartment Exuded, is about (0.003) km² which represents (0.14%) of whole study area. The area of Healthy Services, is about (0.018) km² which represents (0.86%) of whole study area. The area of Educational Services, is about (0.002) km² which represents (0.10%) of whole study area. The area of University Building, is about (0.807) km² which represent (38.41%) of whole study area. The area of Main Public Building, is about (0.009) km² which represents (0.43%) of whole study area. The area of Green Section, is about (0.102) km² which represents (4.85%) of whole study area. The area of Sports Stadium, is about (0.007) km² which represents (0.33%) of whole study area. The area of Recreation Ground, is about (0.159) km² which represents (7.57%) of whole study area. The area of Market, is about (0.007) km² which represents (0.33%) of whole study area. The area of Artificial Section, is about (0.274) km² which represents (13.04%) of whole study area. The area of Palm Forest, is about (0.228) km² which represents (10.85%) of whole study area.

Results analysis:

(Table 1) shows that, the Sabkha area represent maximum ratio in land cover , because it reached (17.05%) from whole study area, then Water Bodies because it represents (16.89%), then Vegetation it represents (15.05%), then Barren Area because it represents (14.57%), then Palm Forest because it represents (12.57%), then Reed because it represents (12.22%), then Urban because it represents (11.65%).

Despite the high capabilities of this area, (Table 2) shows that the whole human activities which represented by Old City, Roads, Built Up-Area, Parking, Army Section, Cemetery, Apartment Exuded, Healthy Services, Educational Services, University Building, Main Public Building, Green Section, Sports Stadium, Recreation Ground, Market, Artificial Section, and Palm Forest do not occupy more than (4.94%) from whole study area. This ratio indicates that this area has not been utilized properly yet. May be because of long ignorance, so the authors suggest additions to land use map, as shown in (Table 3) and (Figure 4).

Conclusions:

1. The urban structures were distinguished accurately from others.
2. The types of urban uses were acceptable and distinguished.
3. Residential uses are big in comparison with other urban uses.
4. Industrial uses are clearly little in comparison with city size.

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Table 1 : Unsupervised classification statistics summary report.

Class Names	Areas(Km^2)	Percentage
Reed	5.195	12.22
Water Bodies	7.185	16.89
Vegetation	6.400	15.05
Palm Forest	5.345	12.57
Barren Area	6.198	14.57
Sabkha	7.252	17.05
Urban	4.956	11.65
Sum	42.531	100%

Table 2 : Supervised classification results.

Class Names	Areas(Km^2)	Percentage
Old City	0.341	16.23
Roads	0.002	0.10
Built Up-Area	0.001	0.05
Parking	0.085	4.04
Army Section	0.047	2.24
Cemetery	0.009	0.43
Apartment Exuded	0.003	0.14
Healthy Services	0.018	0.86
Educational Services	0.002	0.10
University Building	0.807	38.41
Main Public Building	0.009	0.43
Green Section	0.102	4.85
Sports Stadium	0.007	0.33
Recreation Ground	0.159	7.57
Market	0.007	0.33
Artificial Section	0.274	13.04
Palm Forest	0.228	10.85
Sum	2.101	100

Table 3 : Additional suggested to land use classes.

Class Names	Areas(Km^2)	Percentage
Suggested Horizontal Building	0.121	40.47
Suggested Vertical Building	0.178	59.53
Sum	0.299	100

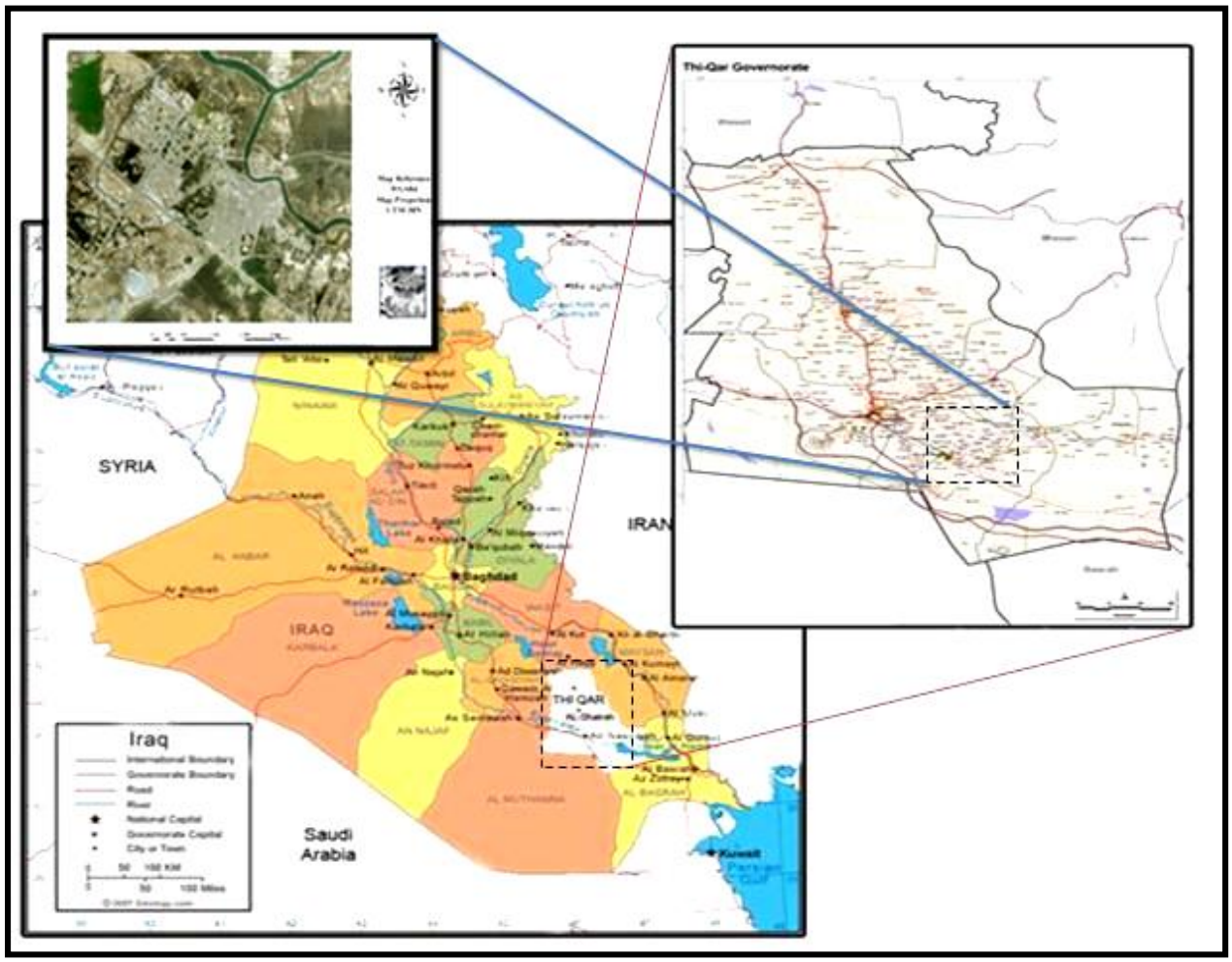

Figure 1 : A map illustrating the locations of the

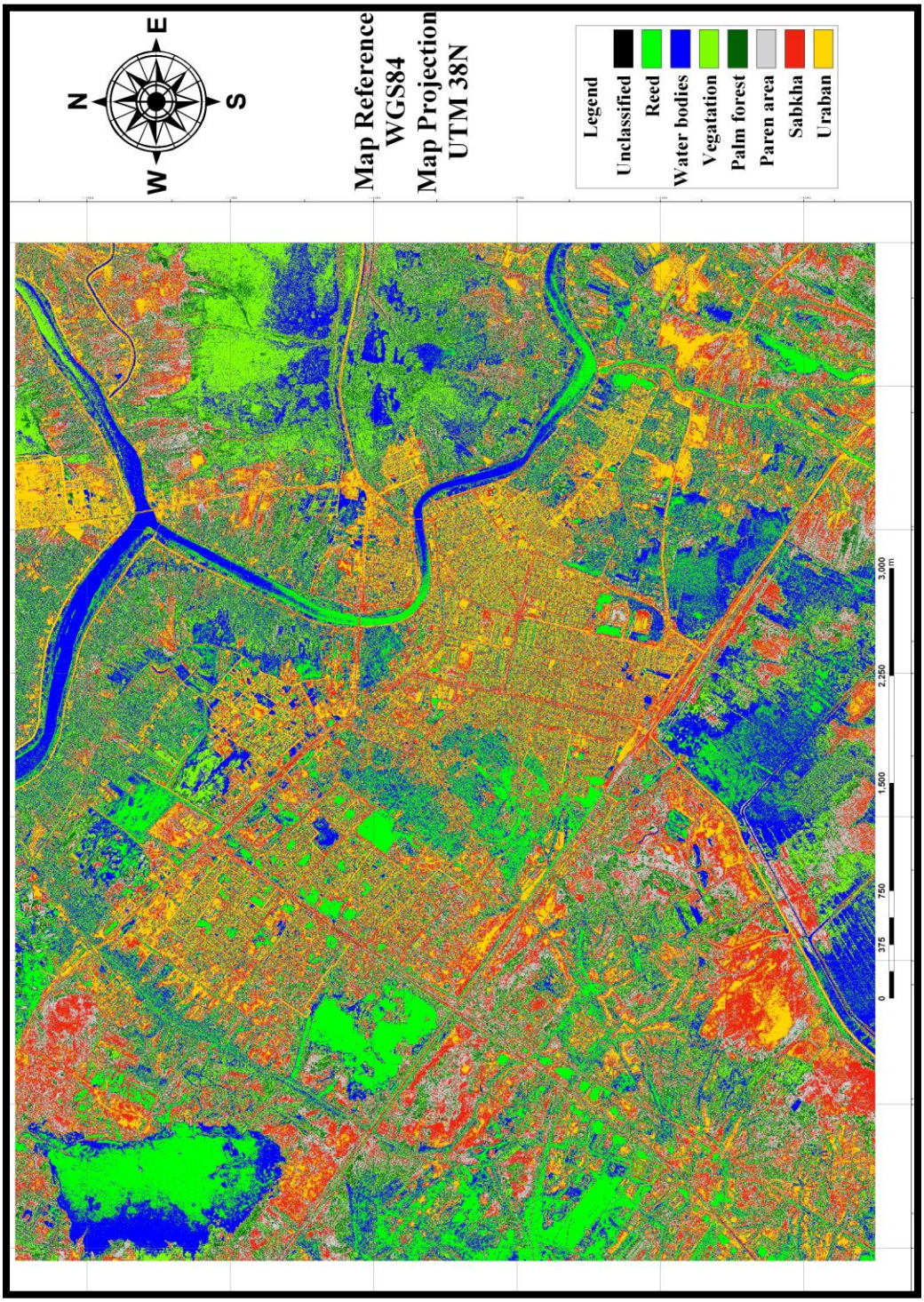

Figure 2 : Unsupervised classification

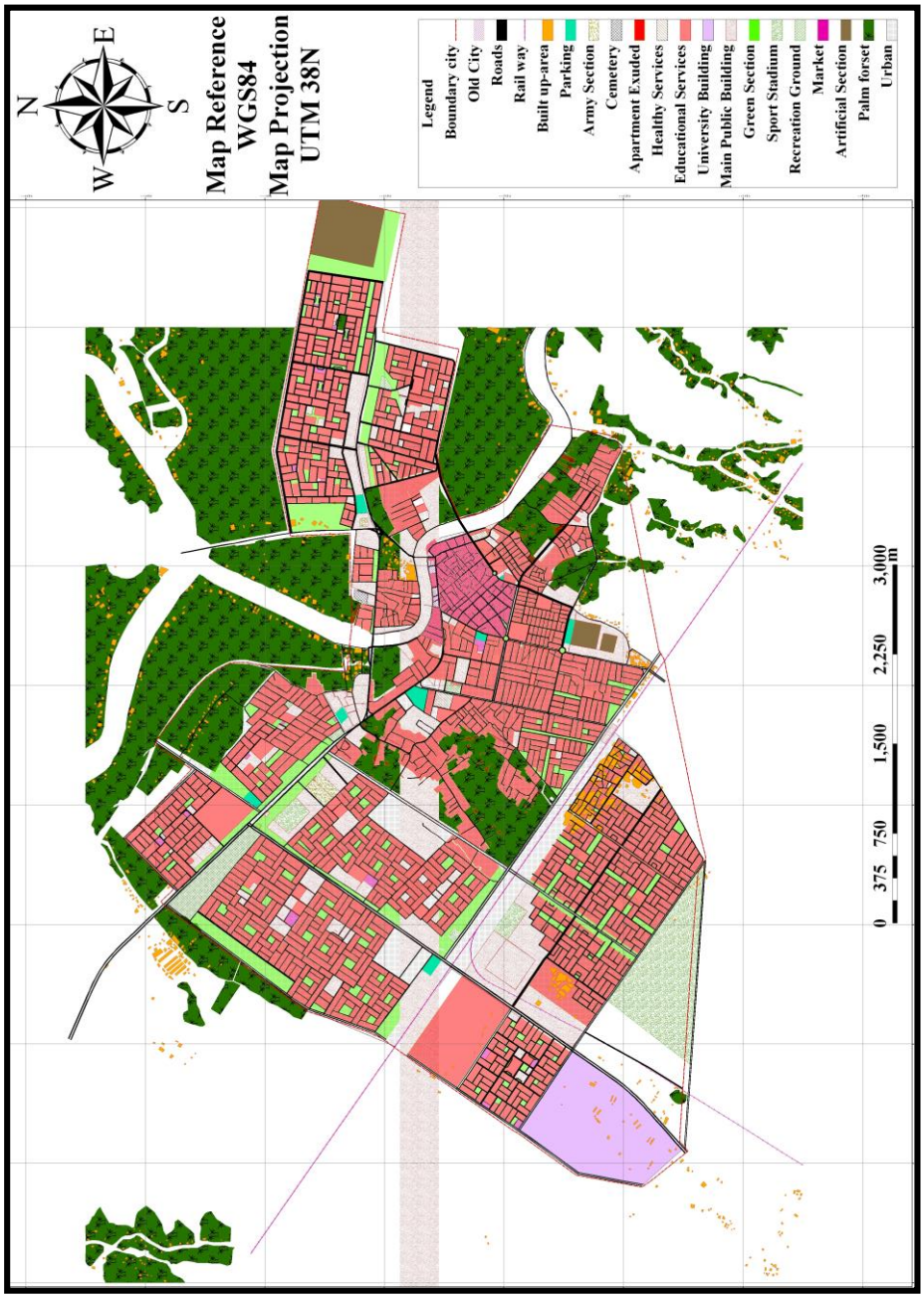

Figure 3 : Supervised classification. Modified after [7]

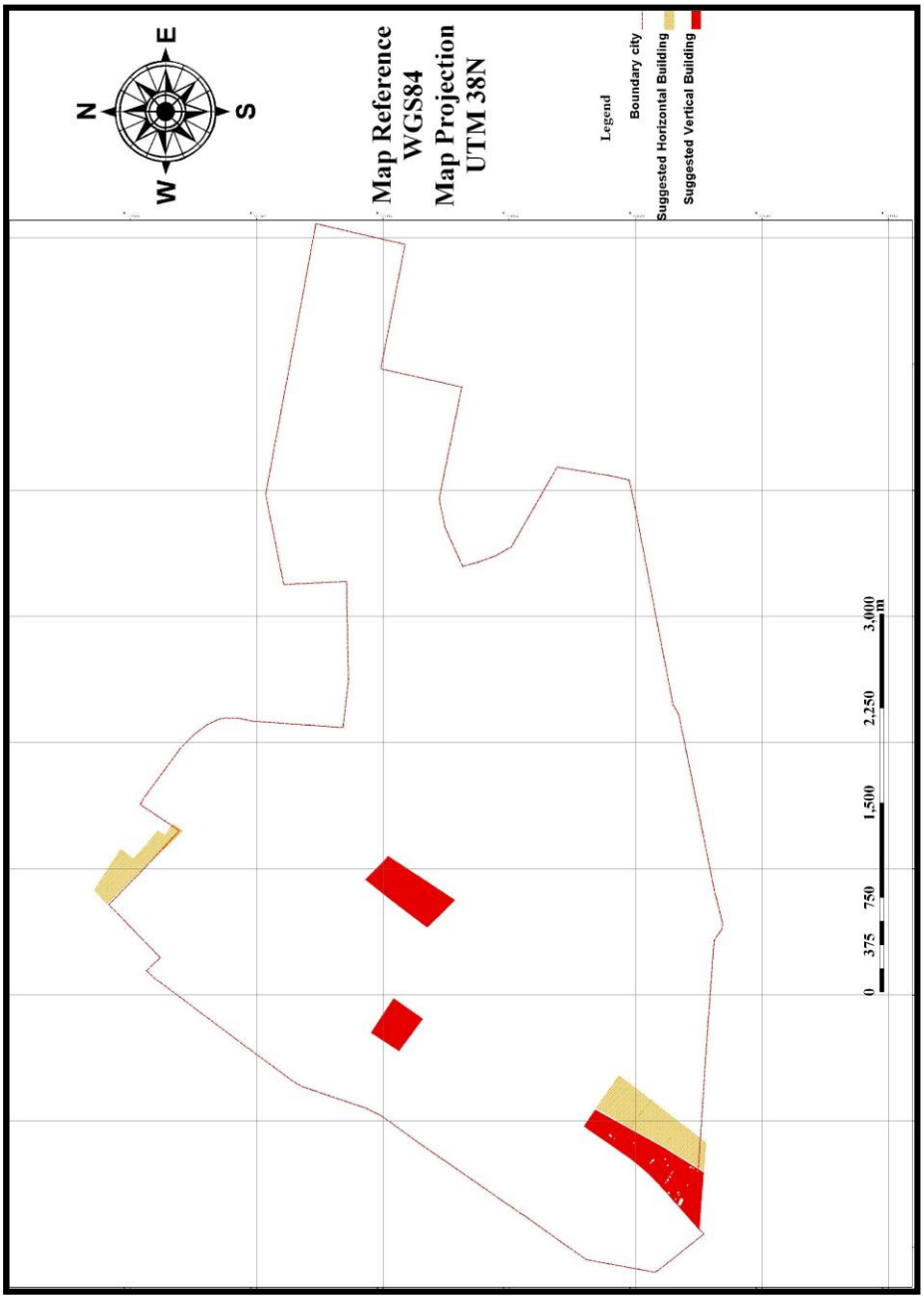

Figure 4 : Suggested additions to land use map.

خارطة غطاء واستخدامات الأرض لمدينة سوق الشيوخ باستخدام تقنيات التحسس النائي ونظم المعلومات الجغرافية

فارس إسماعيل إبراهيم
المعهد التقني/الشطرة
قسم المساحة

حامد دوشان هاني
المعهد التقني/الشطرة
قسم المساحة

الخلاصة :-

تم الحصول على خارطة توزيع الغطاء الأرضي وأخرى لتوزيع استخدامات الأرض.أن خارطة الغطاء الأرضي تحتوي على سبعة أصناف رئيسية هي(قصب، أجسام مائية، محاصيل زراعية، غابات نخيل، مناطق قاحلة، صبخات، مناطق حضريه)، بينما تحتوي خارطة استخدامات الأرض على سبعة عشر صنف وهي (المدينة القديمة،شبكة الطرق،تجمعات سكانية عشوائية،ساحة لوقوف السيارات،مناطق عسكرية، مقابر، سكن مفرز، خدمات صحية، خدمات تعليمية، مباني جامعية، مباني حكومية، مناطق خضراء، ملاعب رياضية،متنزهات،أسواق،مناطق صناعية،غابات النخيل)،هذا وقد أمكن تمييز المنشآت المدنية على اختلاف استخداماتها عن سواها وبدرجة عالية من الصحة وان التمييز بين أنواع الاستخدامات المدنية تم بدرجة مرضية من الصحة.تشكل الاستخدامات السكنية النسبة الأكبر مقارنة ببقية الاستخدامات المدنية بينما تمثل الاستخدامات الصناعية نسبة قليلة قياساً مع حجم المدينة.