Yildiz Technical University
Faculty of Civil Engineering
Department of Geomatic Engineering

TOPOGRAPHY (HRT3351)

Lecture Notes

Prof. Dr. Burak AKPINAR

Title	Code	Local Credit	ECTS	Lecture (hour/week)	Practical (hour/week)	Laboratory (hour/week)
Topography	HRT3351	3	4	3	0	0

Course Objectives	The aim of this course, gains required skills of basic of surveying techniques, mathematical definitions using for large scale map production.

Prof. Dr. Burak AKPINAR

http://www.avesis.yildiz.edu.tr/bakpinar
bakpinar@yildiz.edu.tr

WEEKLY SUBJECTS

Week	Subject
1	Introduction to Topography
2	Measurement Units and Sources of Measurement Errors
3	Types of Errors
4	Coordinate Systems and Map Projections
5	Geodetic Network Points and Distance Measurements
6	Direction Measurements
7	Traverse Computations
8	Height Measurements
9	Midterm exam 1
10	Area and Volume Computations
11	Field work
12	Field work
13	Geographic Information System, GIS
14	Midterm exam 2
15	GNSS Global Positioning Systems
16	Final exam

WEEK-1
INTRODUCTION TO TOPOGRAPHY

TOPOGRAPHY (HRT3351)

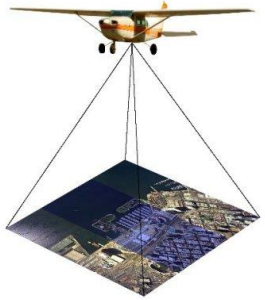
Prof. Dr. Burak AKPINAR

Geomatics Engineering

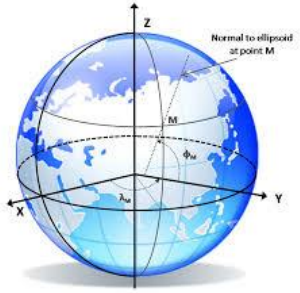
- Geomatics Engineering, is a rapidly developing discipline that focuses on spatial information (i.e. information that has a location).
- The location is the primary factor used to integrate a very wide range of data for spatial analysis and visualization.
- Geomatics engineers apply engineering principles to spatial information and implement relational data structures involving measurement sciences.
- Geomatics engineers manage local, regional, national and global spatial data infrastructures.

http://en.wikipedia.org/wiki/Geomatics_engineering

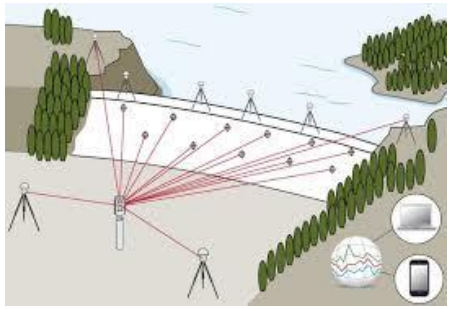
Photogrammetry



Geodesy

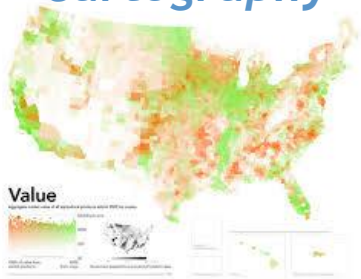


Surveying Techniques

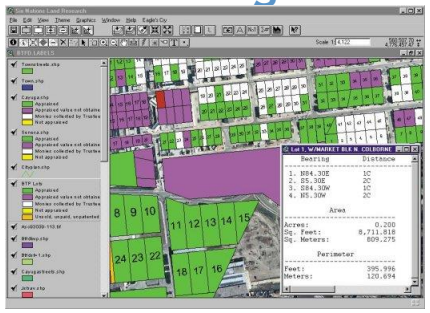


Geomatics Engineering

Cartography



Land Management



INTRODUCTION TO TOPOGRAPHY

TOPOGRAPHY (HRT3351)

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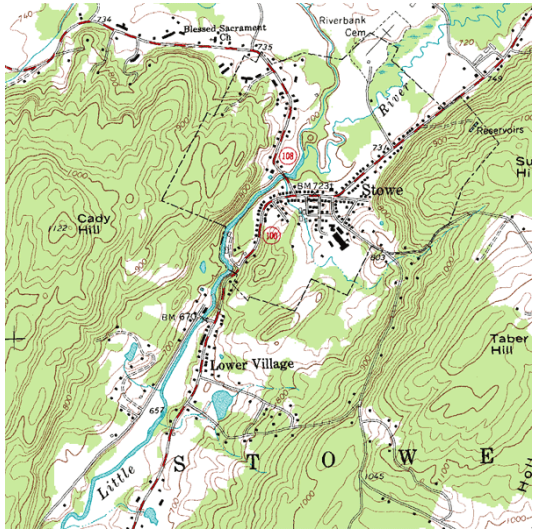
Topography

Topography is a field of geoscience and planetary science comprising the study of surface shape and features of the Earth and other observable astronomical objects including planets, moons, and asteroids.

It is also the description of such surface shapes and features (especially their depiction in maps).

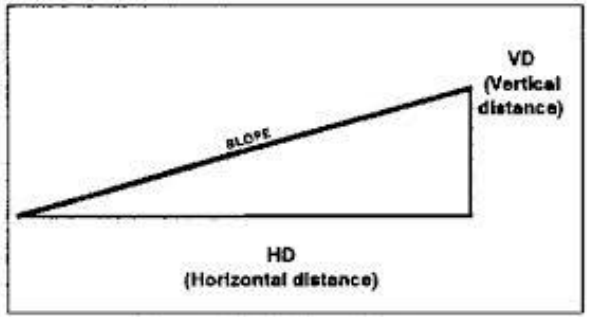
The topography of an area could also mean the surface shape and features themselves.

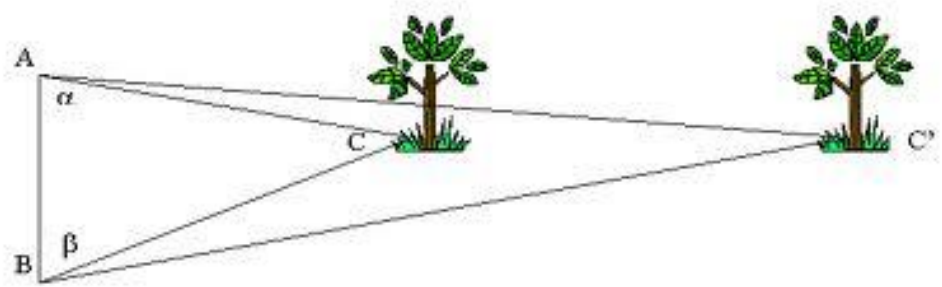


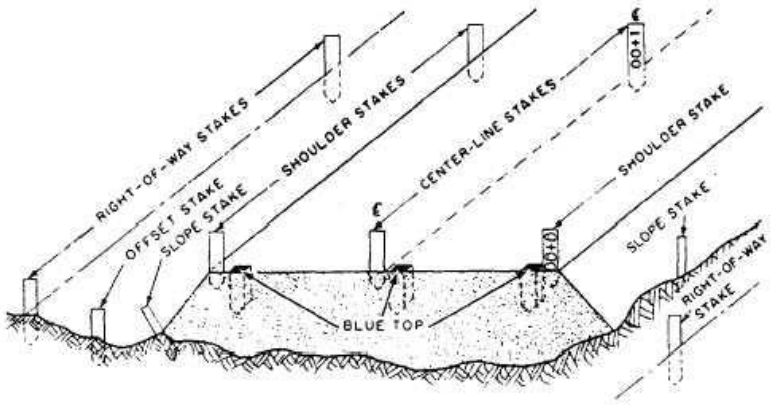
Topographic Map

Surveying

It is the art of measuring horizontal and vertical distances between objects, of measuring angles between lines, of determining the direction of lines, and of establishing points by predetermined angular and linear measurements.

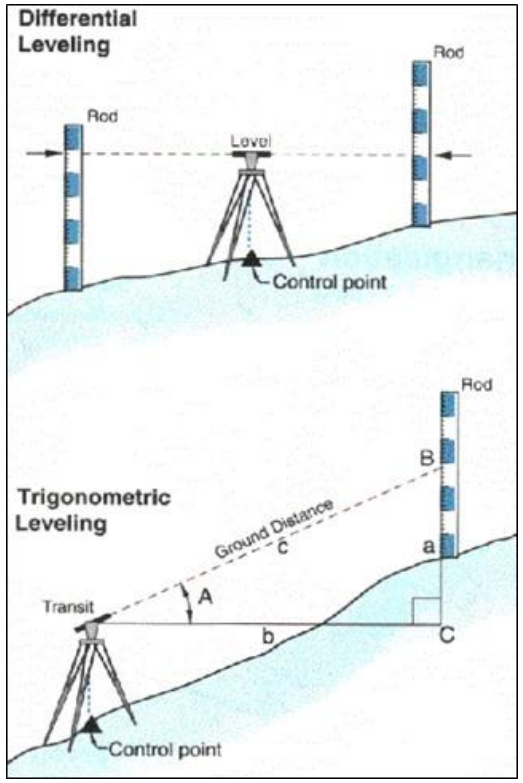


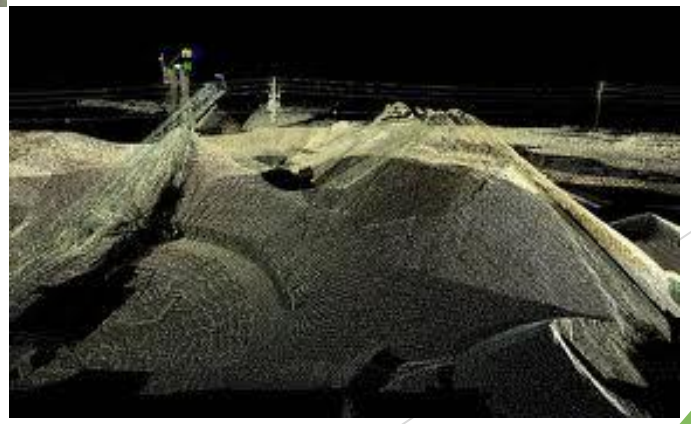




Surveying

Distances, angles, directions, locations, elevations, areas, and volumes are thus determined from the data of the survey.

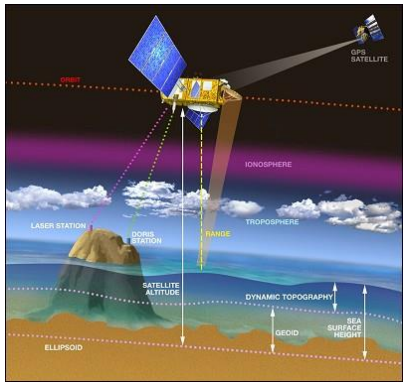




Types of Surveying

Geodetic Surveying

It is the type of surveying that takes into account the true shape of the earth. These surveys are of high precision and extend overlarge areas.



Types of Surveying

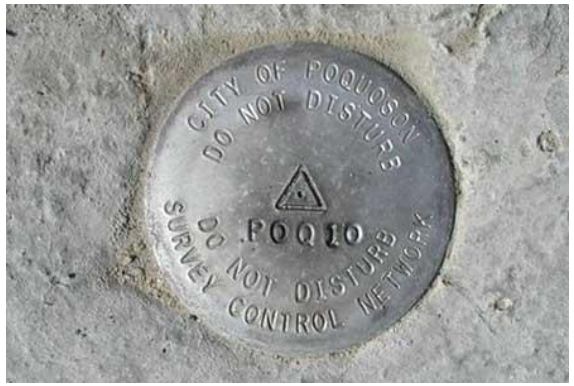
Plane Surveying

It is the type of surveying in which the mean surface of the earth is considered as a plane, or in which its spheroidal shape is neglected, with regard to horizontal distances and directions.

Operations of Surveying

Control Surveys

Establishing a network of horizontal and vertical monuments that serve as a reference framework for initiating other surveys.



Operations of Surveying

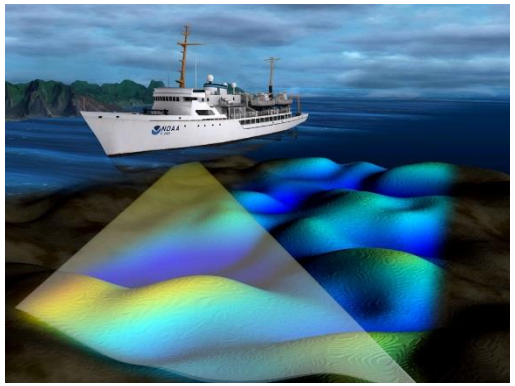
Topographic Surveys

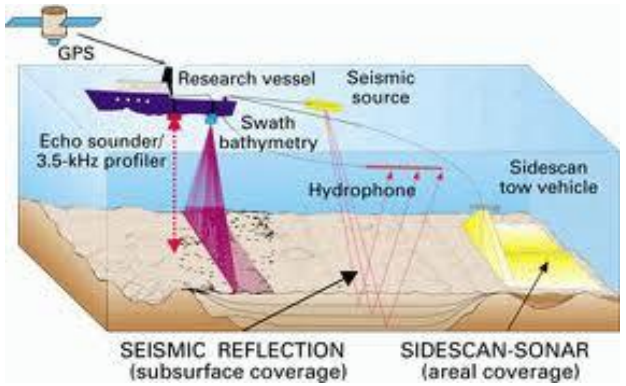
Determining the locations of natural and artificial features and elevations used in map making.

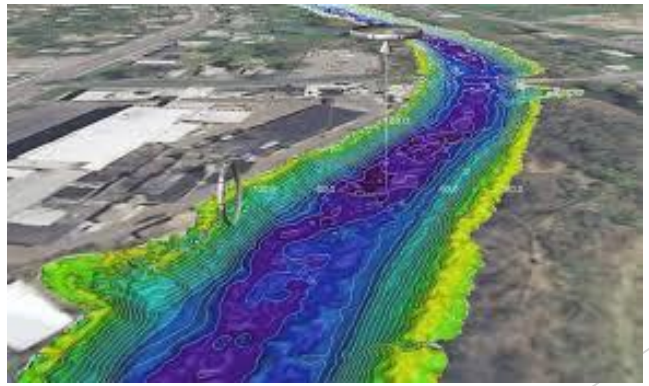
Operations of Surveying

Hydrographic Surveys

The surveys of bodies of water made for the purpose of navigation, water supply, or subaqueous construction.



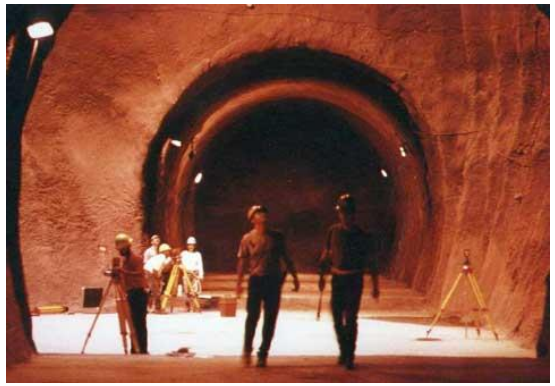




Operations of Surveying

Mining Surveys

Made to control, locate, and map underground and surface works related to mining operations.



Operations of Surveying

Construction Surveys

Made to lay out, locate and monitor public and private engineering works.

Operations of Surveying

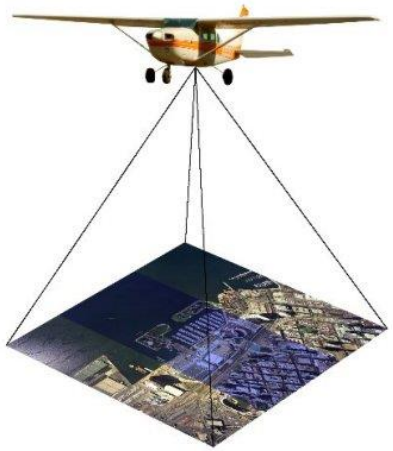
Route Surveys

Necessary for the location and construction of highways, railroads, canals, transmission lines, and pipelines.

Operations of Surveying

Photogrammetric Surveys

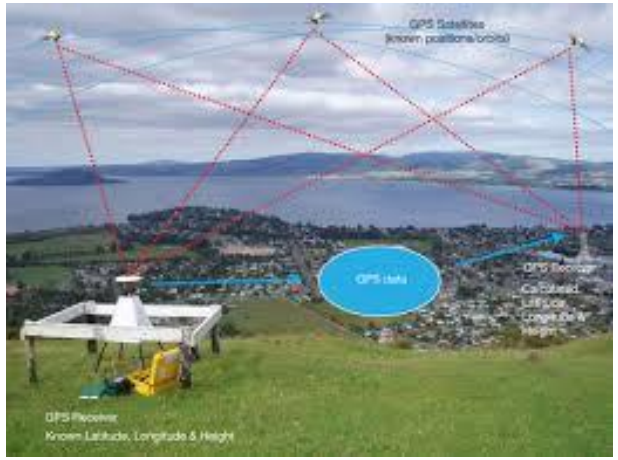
Made to utilize the principle of aerial photogrammetry, in which measurements made on photographs are used to determine the positions of photographed objects.



Operations of Surveying

Satellite Surveys

They include the determination of ground locations from measurements made to satellites using GPS receivers, or the use of satellite images for mapping and monitoring large region of the earth.



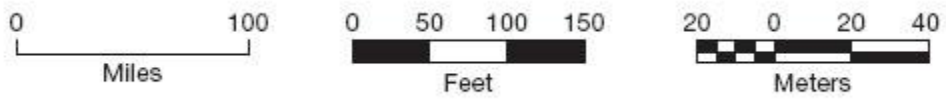
Map Scales

Map scale is the ratio of the length of an object or feature on a map to the true length of the object and feature.

Map scales can be expressed as,

1. representative fraction or ratio :
   1/2000 or 1: 2000

2. graphical scale :



Map Scales

1/1000

In giving scale by ratio or representative fraction, the same units are used for the map distance and corresponding object distance.

$$\frac{B}{N} = \frac{1}{M}$$

B = Distance on map

N = Distance on ground

M = Scale Module

Area of objects and features on the map and true area of objects and features can be calculated via the scale of map.

f = area on the map

F = true area on the ground

$$\frac{f}{F} = \frac{1}{M^2} \qquad M = \sqrt{\frac{F}{f}}$$

Map Scales

Example -1

Please determine the scale of the map on which the length of a 125 m channel is represented as 6.25 cm.

$$\frac{1}{M} = \frac{B}{N} \qquad \frac{1}{M} = \frac{0.0625}{125}$$

$$M = \frac{125}{0.0625} = 2000$$

$$Scale = \frac{1}{M} = \frac{1}{2000}$$

Map Scales

Example -2

The body of a dam is represented with an area of 345 mm^2 on a 1/5000 scaled map. Please calculate the real area of the dam body.

$$\frac{f}{F} = \frac{1}{M^2}$$

$$F = f.M^2 = 345mm^2 x 5000^2 = 345mm^2 x 25000000 = 8625000000mm^2$$

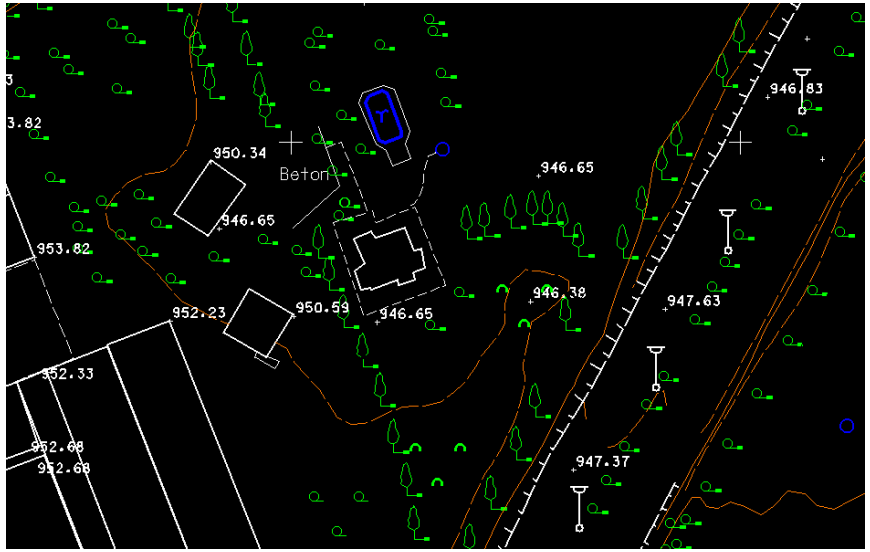
$$F = 8625m^2$$

Map Scales

Scales may be classified as large, medium and small.
Their respective scale ranges are as follows;

Large Scale : 1/200 - 1/5000
Medium Scale : 1/10000 – 1/50000
Small Scale : smaller than 1/100000

- Large Scale maps are applied where relatively high accuracy is needed over limits areas; for example, in subdivision design and the design of engineering projects like roads, dams, airport, and water sewage system.



Map Scales

- Medium scales are often used for applications such as general preliminary planning where larger areas are covered, but only moderate accuracy is needed. Applications include mapping general layout of potential construction sites, proposed transportation system, and existing facilities.

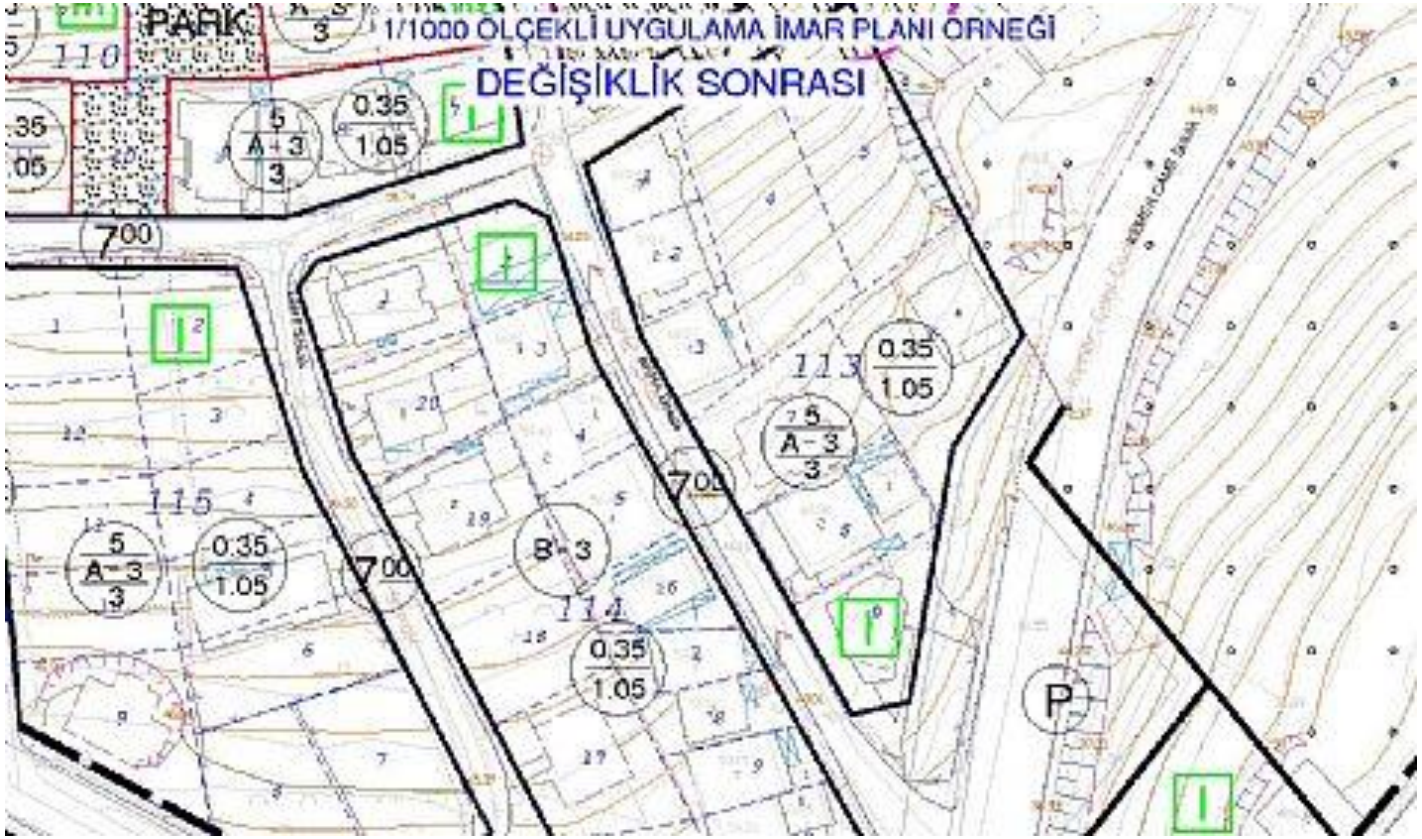
Map Scales

- Small scale maps are commonly used for mapping large areas where a lower order of accuracy will suffice. They are suitable for general topographic coverage, applications in site suitability analysis, preliminary lay out of expansive proposed construction project, and for special applications in forestry, geology, etc.

Map Scales

Large Scale Map	Small Scale Map
Shows more details	Fewer details are shown
Error rate is low	The error rate is high.
Narrow spaces are shown in reality	In reality large areas are shown.
The denominator of the scale is small.	The denominator of the scale is large.
The difference in elevation between the isohips is small.	The difference in height between isohips is large.
It takes up too much space on paper.	It takes up less space on paper.

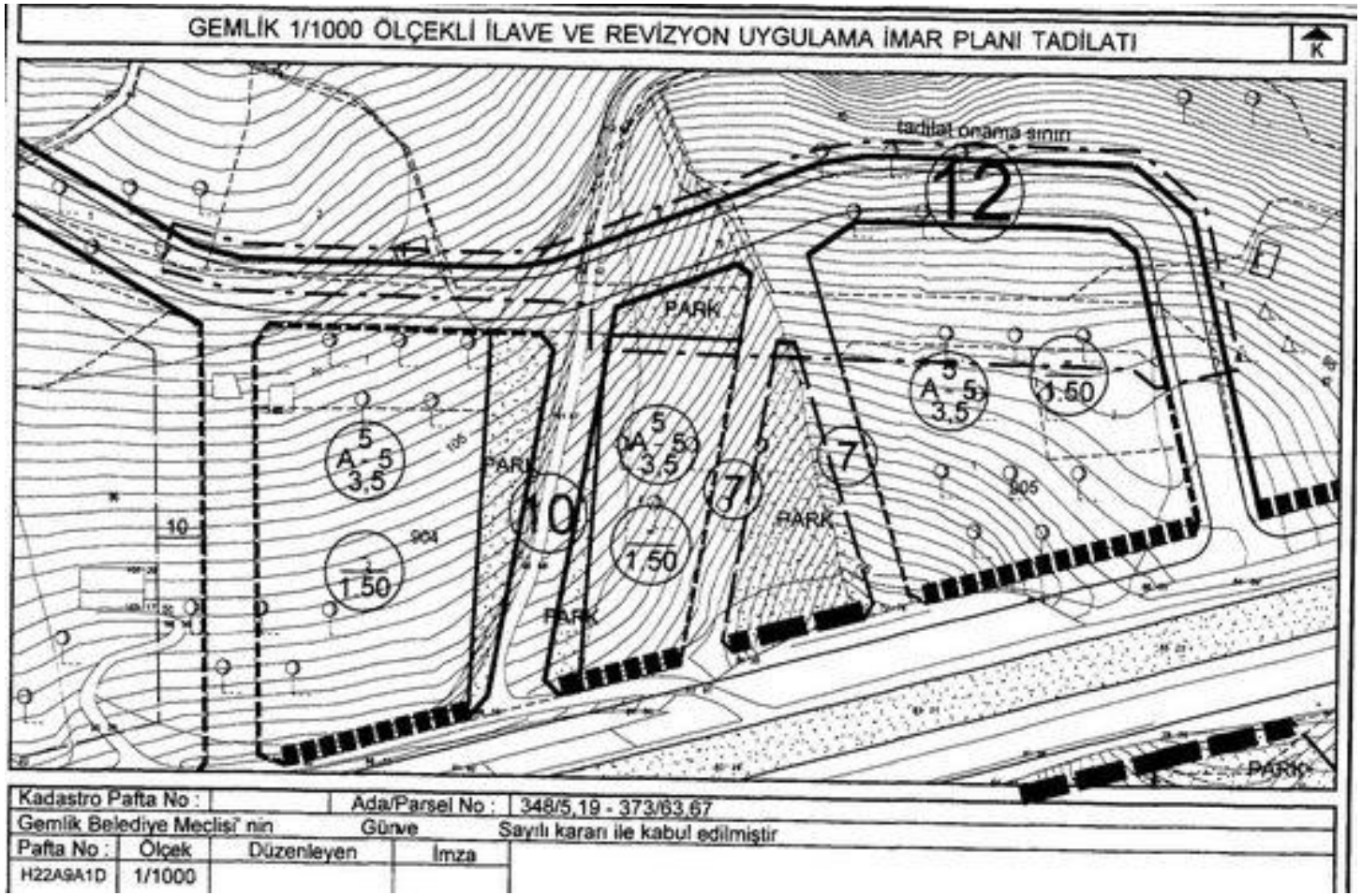
Map Scales


PARK
1/1000 ÖLÇEKLİ UYGULAMA İMAR PLANI ÖRNEĞİ
DEĞİŞİKLİK SONRASI
110
111
112
113
114
115
700
705
0.35
1.05
5
A-3
3
B-3
P

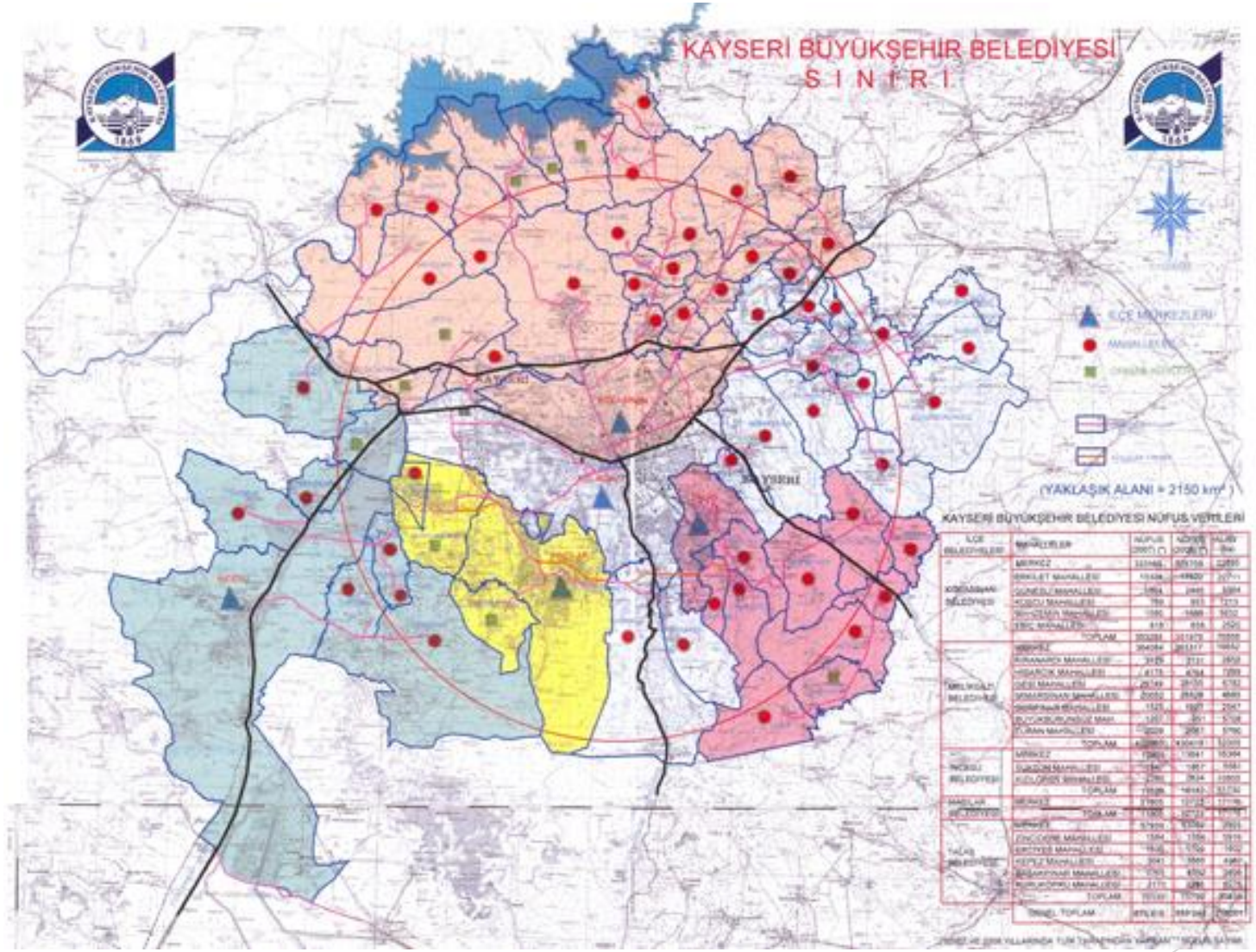
Map Scales


16/08/2011 T.T 1/1000 ÖLÇEKLİ ÜMRANİYE İLÇESİ, ELMALIKENT,
KAZIM KARABEKİR, İNKILAP VE ATATÜRK MAHALLELERİNİN
BİR KISMINI İÇEREN UYGULAMA İMAR PLANI

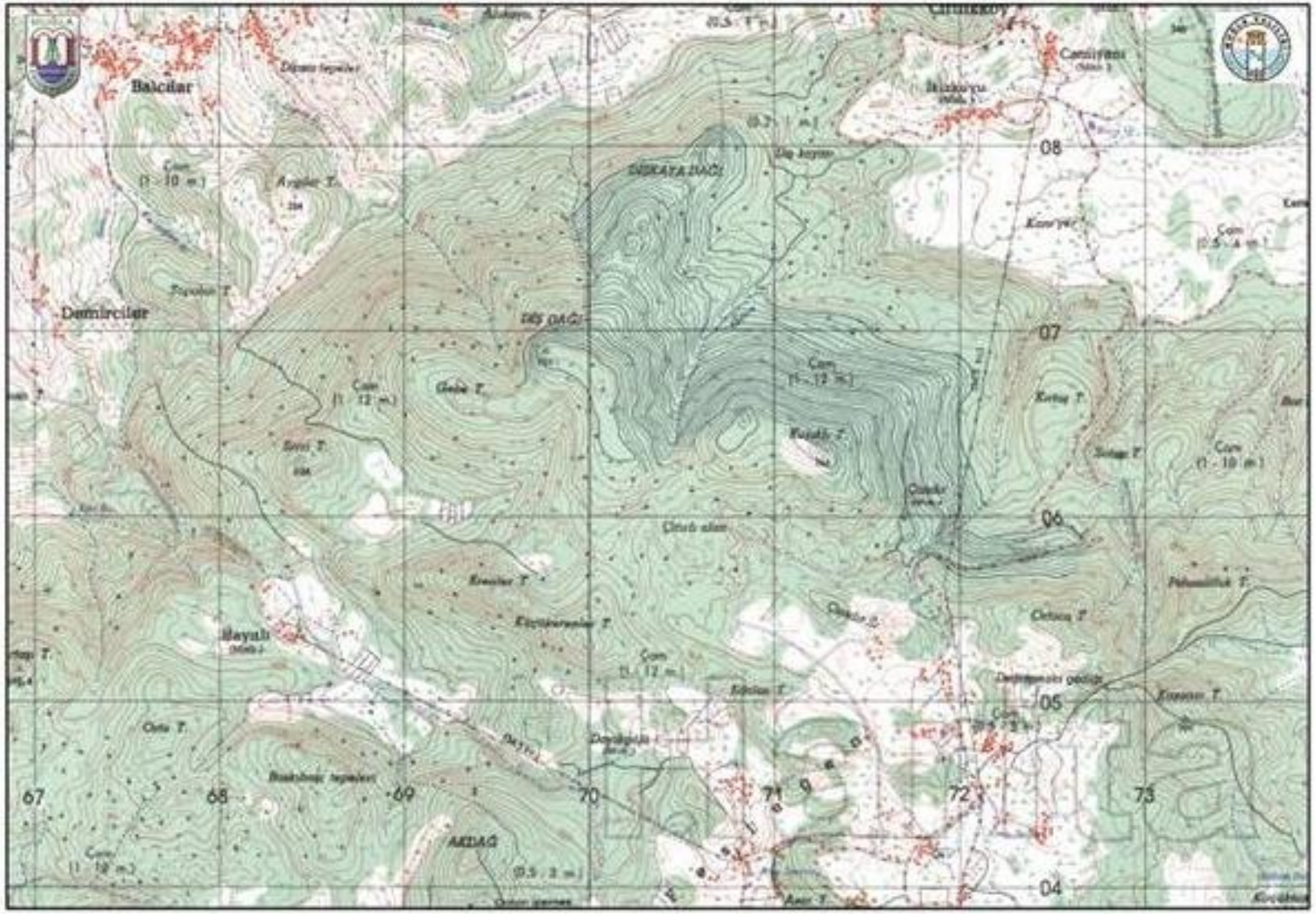
Map Scales


GEMLİK 1/1000 ÖLÇEKLİ İLAVE VE REVİZYON UYGULAMA İMAR PLANI TADİLATI
K
tadilat onama sınırı
12
PARK
5
A-5
3,5
1.50
10
7
Kadastro Pafta No :
Ada/Parsel No : 348/5,19 - 373/63,67
Gemlik Belediye Meclisi' nin Gün ve Sayılı kararı ile kabul edilmiştir
Pafta No : Ölçek Düzenleyen İmza
H22A9A1D 1/1000

Map Scales


KAYSERİ BÜYÜKŞEHİR BELEDİYESİ
SINIRI
(YAKLAŞIK ALANI = 2150 km²)
KAYSERİ BÜYÜKŞEHİR BELEDİYESİ NÜFUS VERİLERİ

Map Scales



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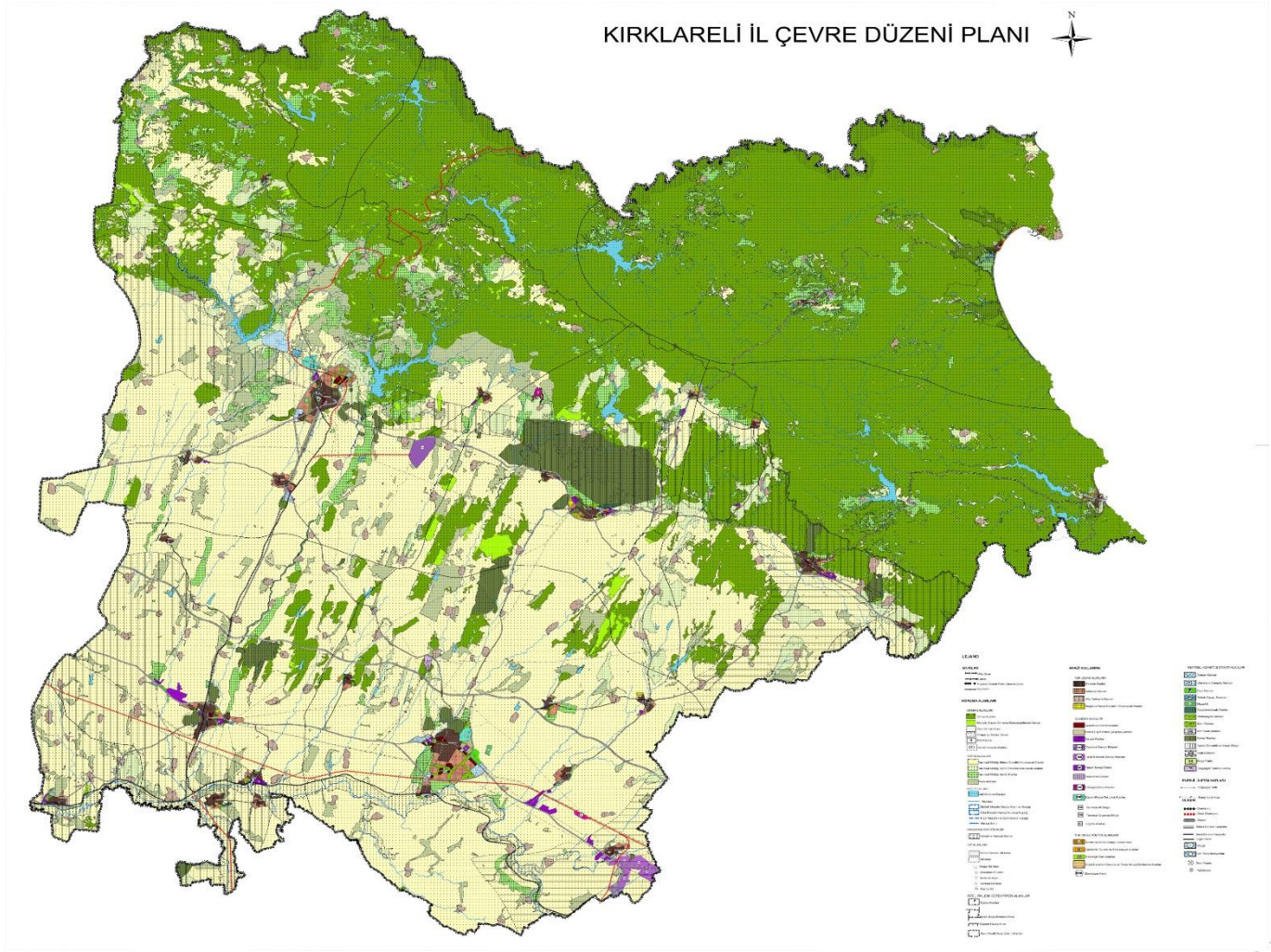
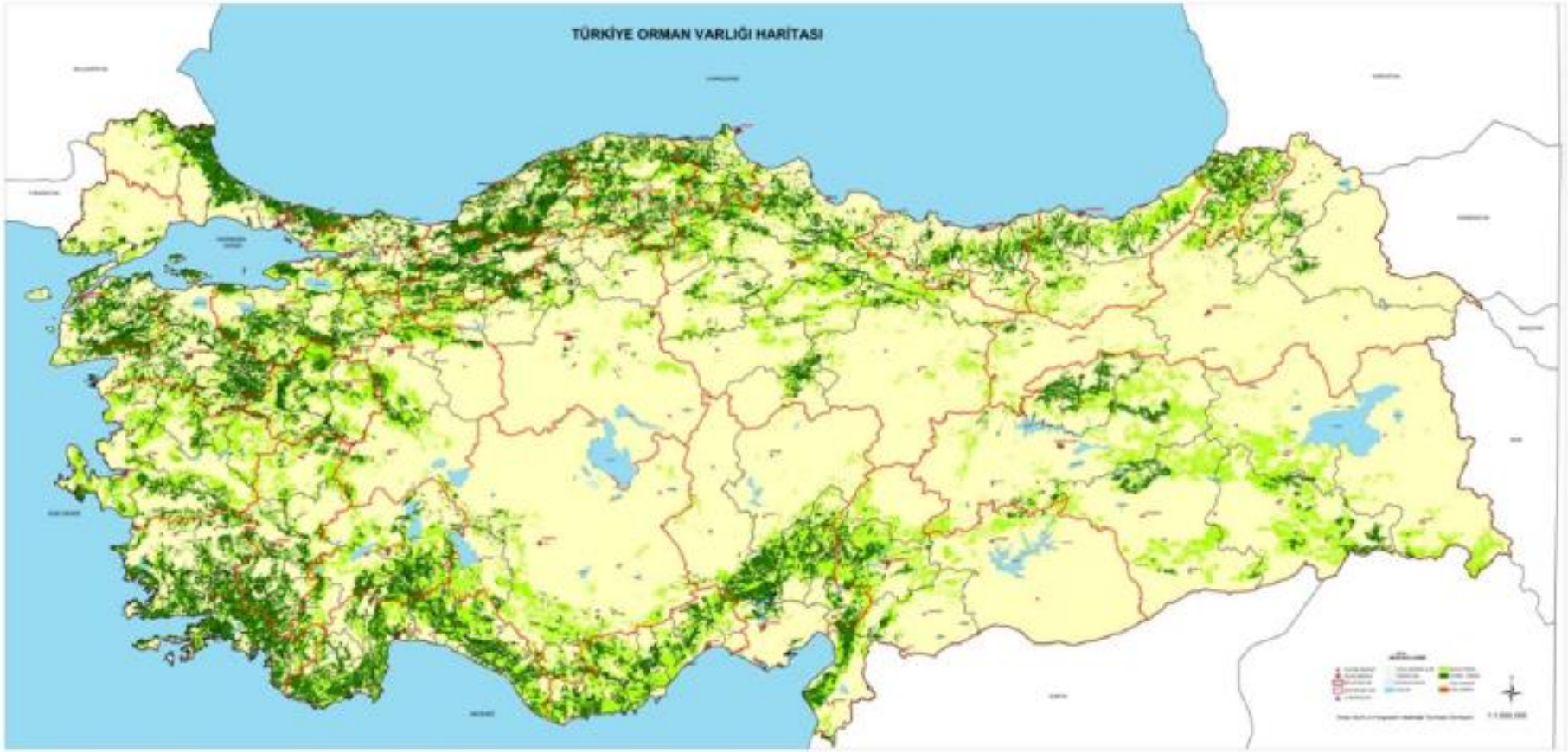
Map Scales



Map Scales



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Map Scales


TÜRKİYE JEOTERMAL KAYNAKLAR DAĞILIMI VE UYGULAMA HARİTASI
K A R A D E N İ Z
A K D E N İ Z
E G E D E N İ Z
ANKARA
SURİYE
IRAK
AÇIKLAMALAR

Map Scales


TÜRKİYE MADEN YATAKLARI
K A R A D E N İ Z
MARMARA DENİZİ
EGE DENİZİ
A K D E N İ Z
ANKARA
MTA
MADEN TETKİK VE ARAMA GENEL MÜDÜRLÜĞÜ

Week-2
Measurement Units and Sources of Measurement Errors

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