

Site Planning

Introduction to Topography

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WHAT IS TOPOGRAPHY?

- TOPOGRAPHY DEFINED
- NATURAL TOPOGRAPHY
- MAN MADE TOPOGRAPHY

- ▣ TOPOGRAPHY:
THE GRAPHIC REPRESENTATION OF THE BOUNDARY BETWEEN THE EARTH AND THE AIR INDICATING RELATIVE ELEVATION AND POSITION

IMAGE SOURCE:

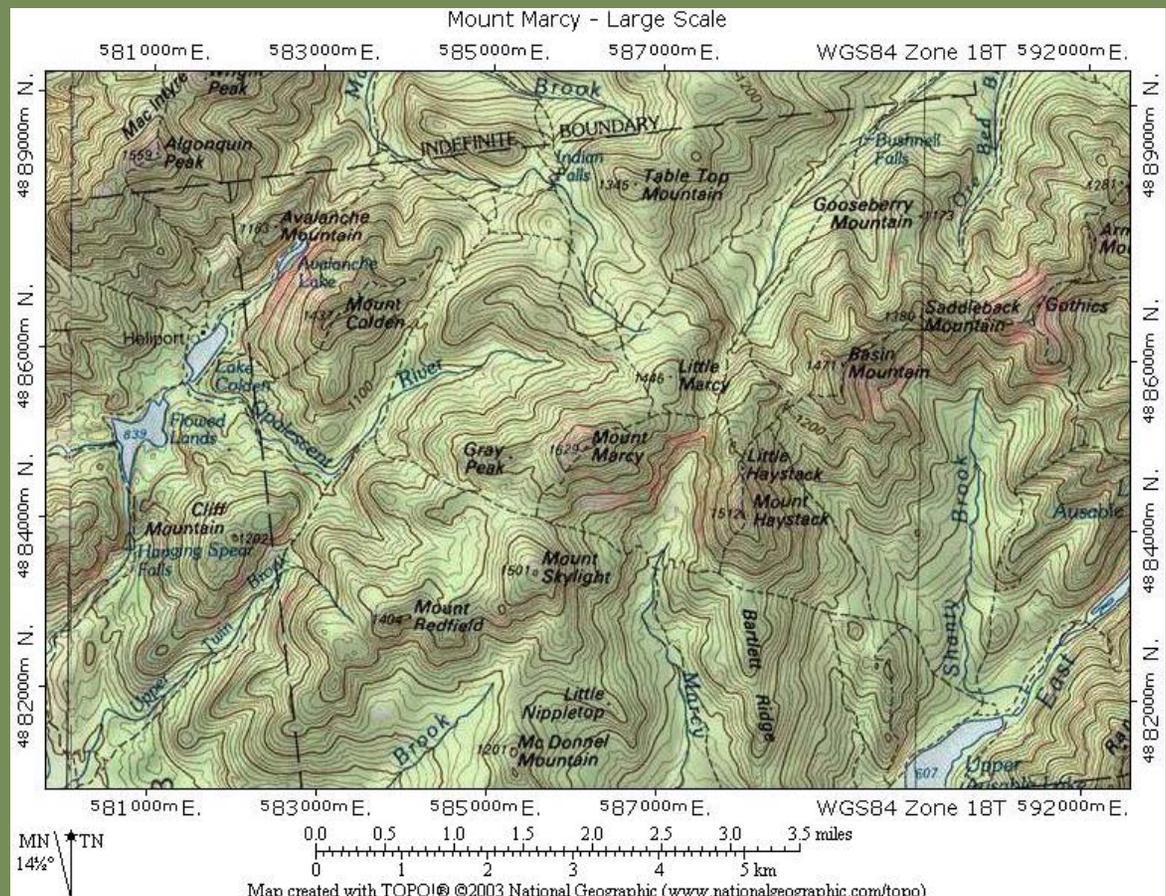
[HTTP://WWW.ADIRONDACKNORTHWAY.NET/MAPS/MTMARCYLG.JPG](http://www.adirondacknorthway.net/maps/mtmarcylg.jpg)

Topographic Map

A map showing changes in elevation and other geographic features

Mount Marcy

The tallest peak in New York States Adirondack region



- ▣ TOPOGRAPHY:
CAN DESCRIBE NATURAL FEATURES

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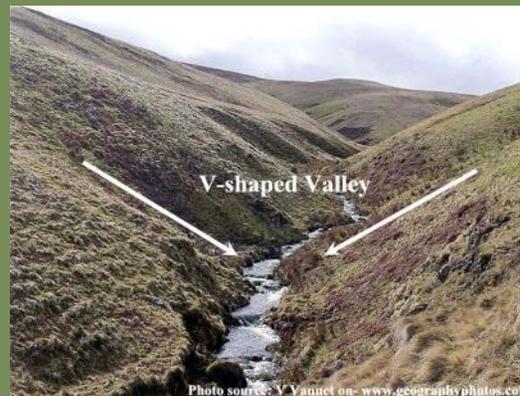
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[HTTP://WWW.BIOCRAWLER.COM/W/IMAGES/3/35/MOUNTAIN_PEAKS,_LAHAUL.JPG](http://www.biocrawler.com/w/images/3/35/mountain_peaks_lahaul.jpg)
[HTTP://WWW.STUDENTSOFTEHWORLD.INFO/SITES/COUNTRY/IMG/15830_NIAGRA%20FALLS.JPG](http://www.studentsoftheworld.info/sites/country/img/15830_niagra%20falls.jpg)
[HTTP://GGZ.E2BN.NET/E2BN/LEAS/C99/SCHOOLS/GGZ/ACCOUNTS/STAFF/RCHAMBERS/GEOBYTES%20GCSE%20BLOG%20RESOURCES/IMAGES/RIVERS/V-SHAPEDVALLEY.JPG](http://ggz.e2bn.net/e2bn/leas/c99/schools/ggz/accounts/staff/rchambers/geobytes%20gcse%20blog%20resources/images/rivers/v-shapedvalley.jpg)

Mountains Peaks

Rolling Hills

Valleys

Water Features



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IMAGE SOURCE:

[HTTP://BJDECASTRO.COM/ARTSTORE/IMAGES/SPANISH-STEPS-ROME.JPG](http://BJDECASTRO.COM/ARTSTORE/IMAGES/SPANISH-STEPS-ROME.JPG)

[HTTP://HTMLHELP.COM/~LIAM/CALIFORNIA/SANFRANCISCO/LOMBARDSTREET/LOMBARDSTREET1.JPG](http://HTMLHELP.COM/~LIAM/CALIFORNIA/SANFRANCISCO/LOMBARDSTREET/LOMBARDSTREET1.JPG)

[HTTP://WWW.MARTYBARRETT.COM/BARRETTIMAGES/NEWSPIX/WATER2.JPG](http://WWW.MARTYBARRETT.COM/BARRETTIMAGES/NEWSPIX/WATER2.JPG)

[HTTP://WWW.CSUCHICO.EDU/ALUMNI/IMG/IMG_MACHUPICCHU.JPG](http://WWW.CSUCHICO.EDU/ALUMNI/IMG/IMG_MACHUPICCHU.JPG)

Stairs

The Spanish Steps in Rome



Stepped Walls

Machu Picchu Peru



Roads

Lombard Street San Francisco



Water Aqueduct

California Aqueduct



- ▣ TOPOGRAPHY:
IS USED BY US EVERY DAY

COMMON USE OF TOPOGRAPHIC MAPS

- ROAD MAPS
- TRAIL MAPS
- TOUR DE FRANCE
- EXPLORING THE OCEANS
- SITE MODELS

IMAGE SOURCE:
GOOGLE EARTH



Road Maps

It is common for road maps to show contours which allows us to understand the slope of roads

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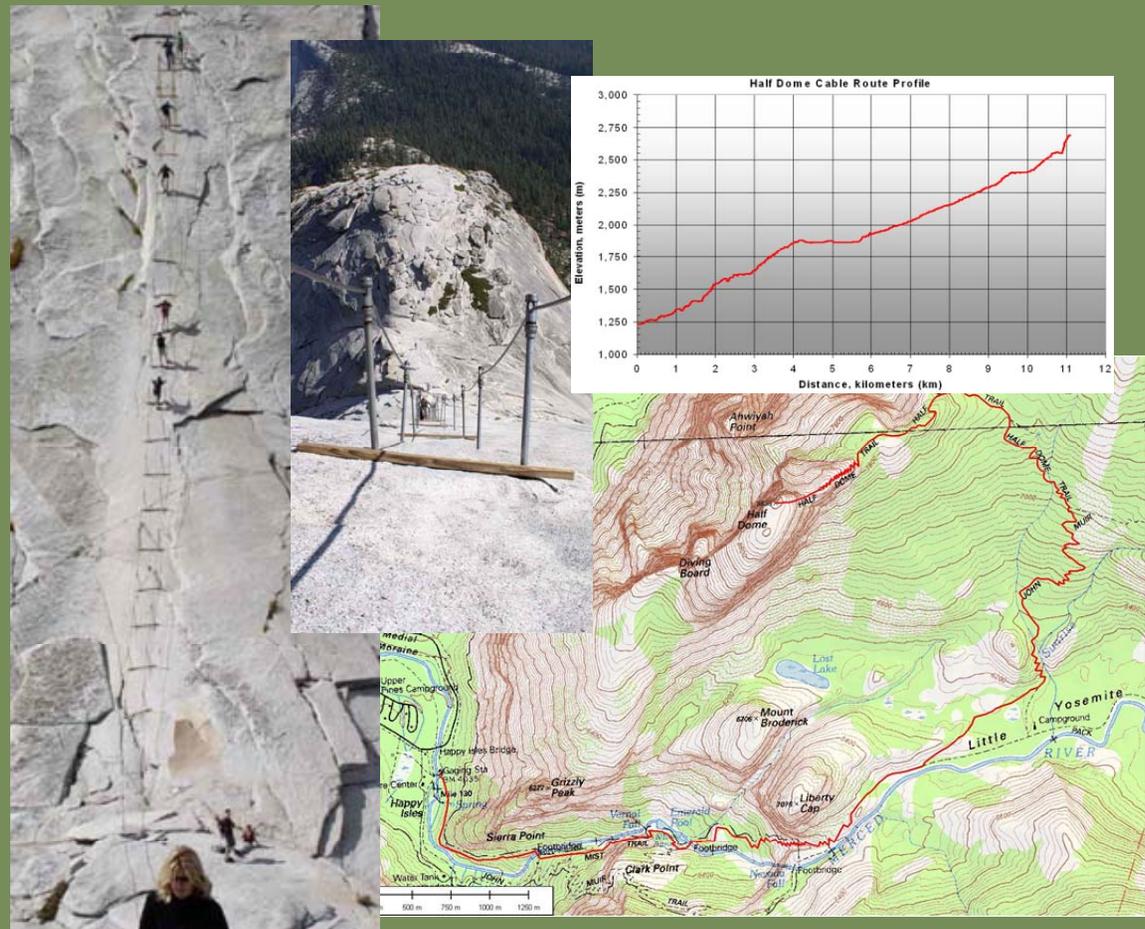
[HTTP://WWW.HELICHAIR.COM/HALF_DOME_CABLE_ROUTE_HIKE.HTML](http://www.heli-chair.com/half_dome_cable_route_hike.html)

Trail Maps

Trail maps are used by hikers.

Trail Profile

Understanding the slope profile and change of elevation along a hike is important to evaluating the difficulty of the trail and estimating the time it will take to complete a particular hike



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Tour de France

The Tour de France a multi-stage bike race uses topographic maps to provide information about the course

Route Map

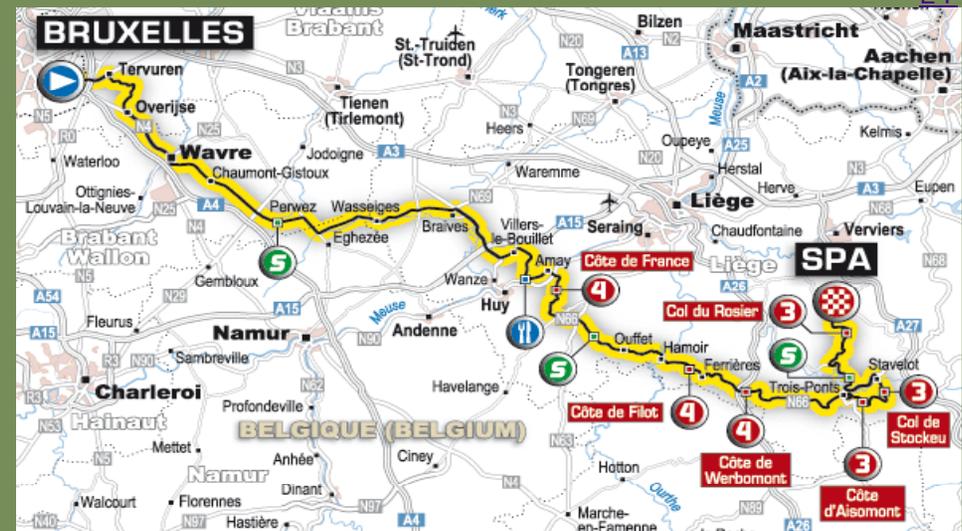
The route map provides an indication of how the course runs across the topographic map. A straighter line usually represents a shallow slope and a jagged "crisscross" line typically indicates a steep slope or switchback.

Route Profile

The route profile illustrates the number and difficulty of the climbs on each stage of the race

IMAGE SOURCE:

[HTTP://WWW.LETOUR.FR/2010/TDF/LIVE/US/200/ETAPE_PAR_ETAPE.HTML#ZON](http://www.letour.fr/2010/TDF/LIVE/US/200/ETAPE_PAR_ETAPE.HTML#ZON)



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IMAGE SOURCE:

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Topography of the Oceans

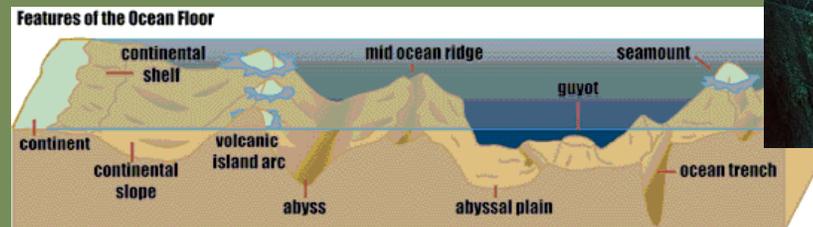
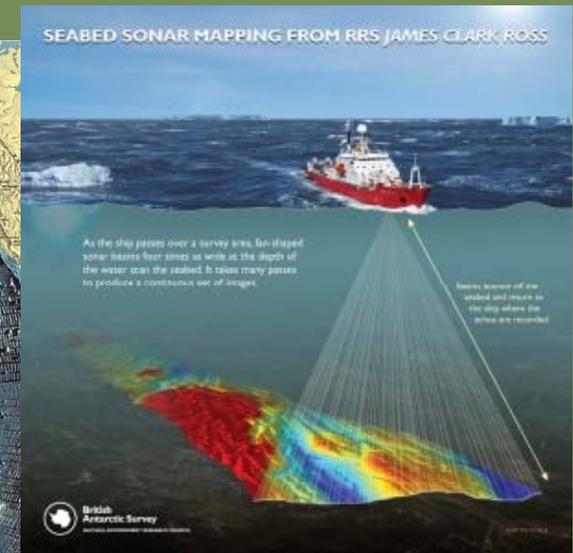
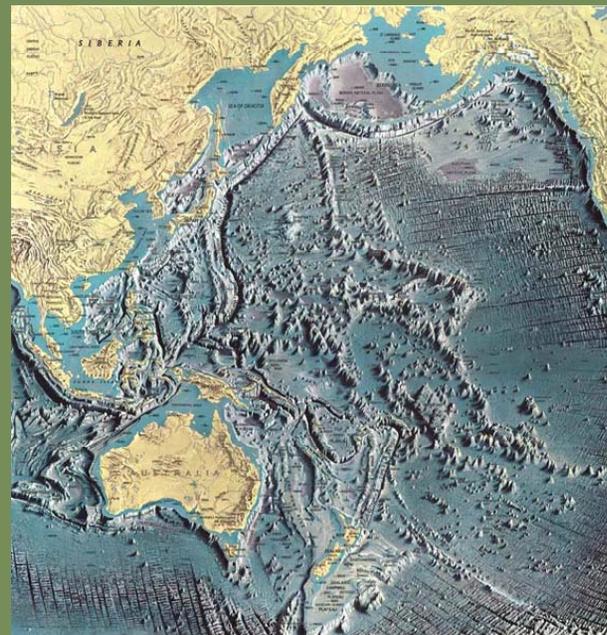
Topography does not stop when we reach the shore but continues below the sea showing the edges of tectonic plates and subduction zones

Remote Sensing

Most of the ocean below a few hundred meters it totally dark making it impossible to see. Remote sensing using sonar allows us to survey the depths to create an accurate map

Discovery of the Titanic

Tools like this helped Robert Ballard's team discover the location of the Titanic



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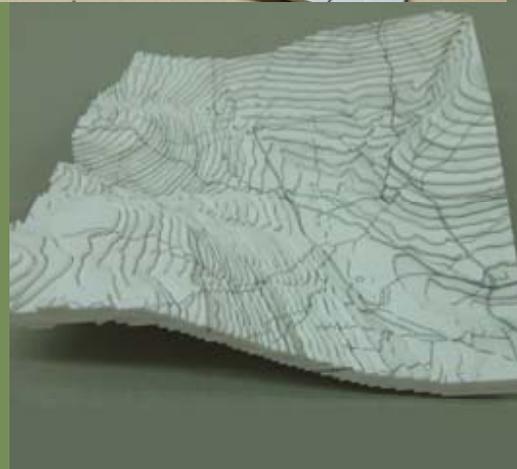
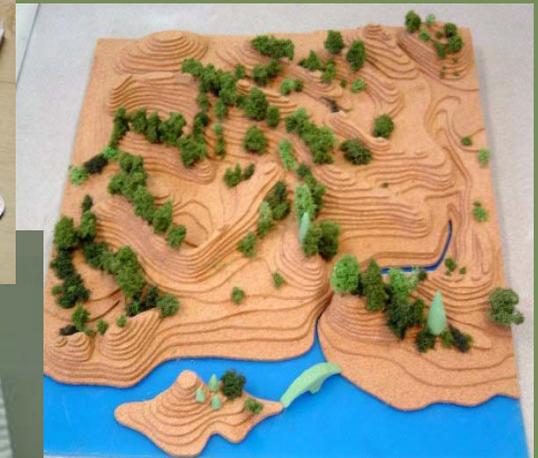
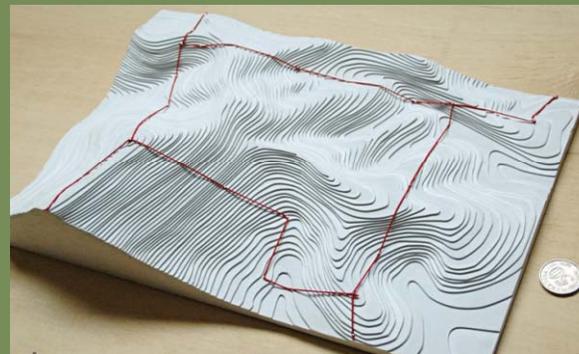
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IMAGE SOURCE:

[HTTP://WWW.DEEP.CAT.COM.MY/GALLERY/MODEL/CONTOUR%20MODEL.JPG](http://www.deepcat.com.my/gallery/model/contour%20model.jpg)

[HTTP://WWW.CAPITALMODELS.CO.UK/IMAGES/LASER/LASERPARTS1.JPG](http://www.capitalmodels.co.uk/images/laser/laserparts1.jpg)



Site Topographic Models

Architects, Landscape Architects and Civil Engineers use topographic maps to create scale models to help visualize a site

Models of this type are also very useful when explaining concepts to lay people and clients who have difficulty reading drawings

Site Planning Topography & Reading Maps

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READING A TOPOGRAPHIC MAP

- ▣ TOPOGRAPHY:
THE GRAPHIC REPRESENTATION OF THE
BOUNDARY BETWEEN THE EARTH AND THE
AIR INDICATING RELATIVE ELEVATION AND
POSITION

- EXPRESSING SCALE
- CONTOURS
- SPOT ELEVATIONS
- INTERPOLATION
- ROAD & TRAIL FEATURES

Map Scale

All maps are drawn to scale so that we can measure distances.

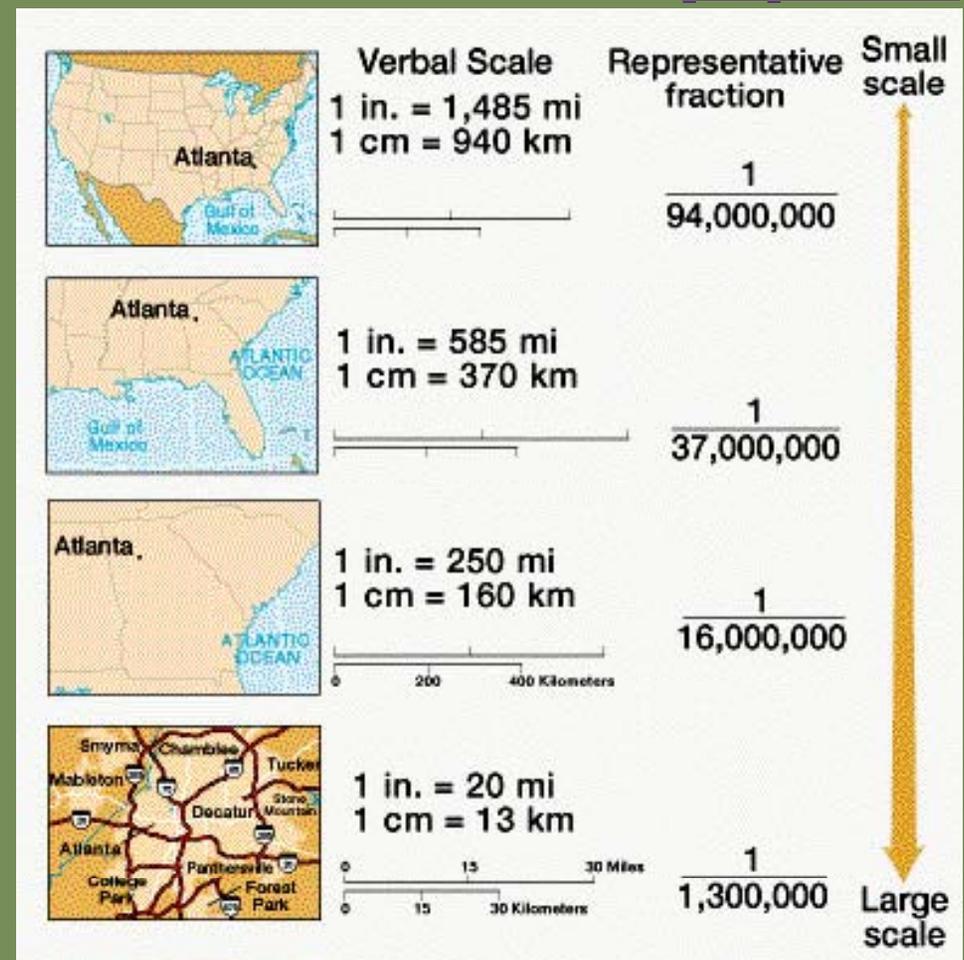
Expressing Scale

Scales are written as a fraction expressing how much distance is equal to 1 unit measured on the map. They also shown graphically as a bar scale.

A larger scale map means the map is enlarged showing greater detail.

IMAGE SOURCE:

[HTTP://GO.OWU.EDU/~JBKRYGIE/KRYGIE_HTML/GEOG_222/GEOG_222_LO/GEOG_222_LO04_GR/SCALE.JPG](http://go.owu.edu/~jbkrygie/krygie_html/geog_222/geog_222_lo/geog_222_lo04_gr/scale.jpg)



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IMAGE SOURCE:
USGS BROOKLYN QUADRANGLE

Contour Lines

A contour line is a graphic way of connecting all points of the same elevation

Contour Interval

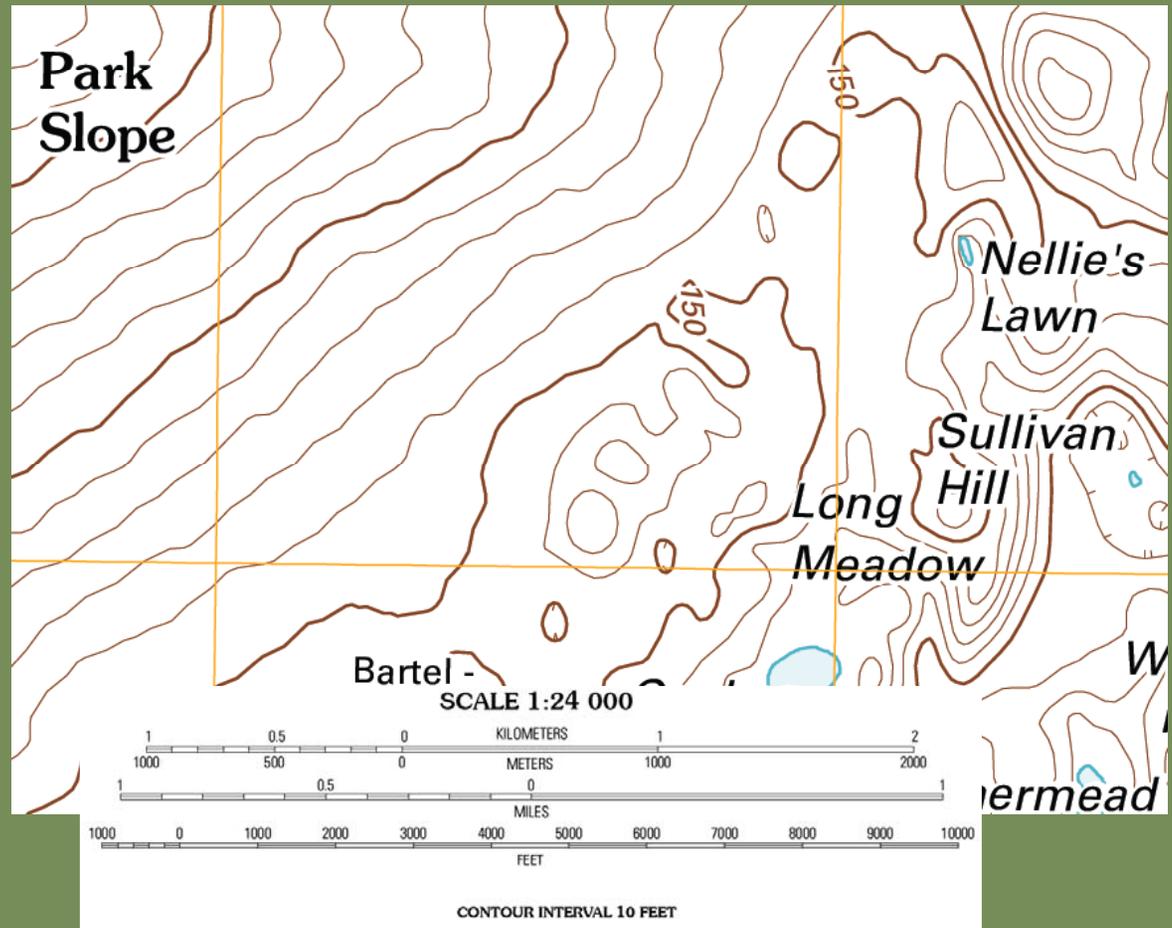
Each contour map has a contour interval which is like the vertical scale. It tells you the difference in elevation between two adjacent contours.

Contour Labels

A contour label typically breaks the contour to show the elevation of the line. Since not all contours are labeled you can count up or down from a label using the contour interval.

Every 5th Contour

To increase the readability of contour maps every 5th contour is drawn as a thicker line.



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IMAGE SOURCE:

[HTTP://WWW.CSUS.EDU/INDIV/S/SLAYMAKER/ARCHIVES/GEOL10L/DEPRESSION1.JPG](http://www.csus.edu/indiv/s/slaymaker/archives/geol10l/depression1.jpg)

Spot Elevation

Spot elevations can identify the peak of a mountain, the low point of a depression or the elevation of walls or buildings

Peaks

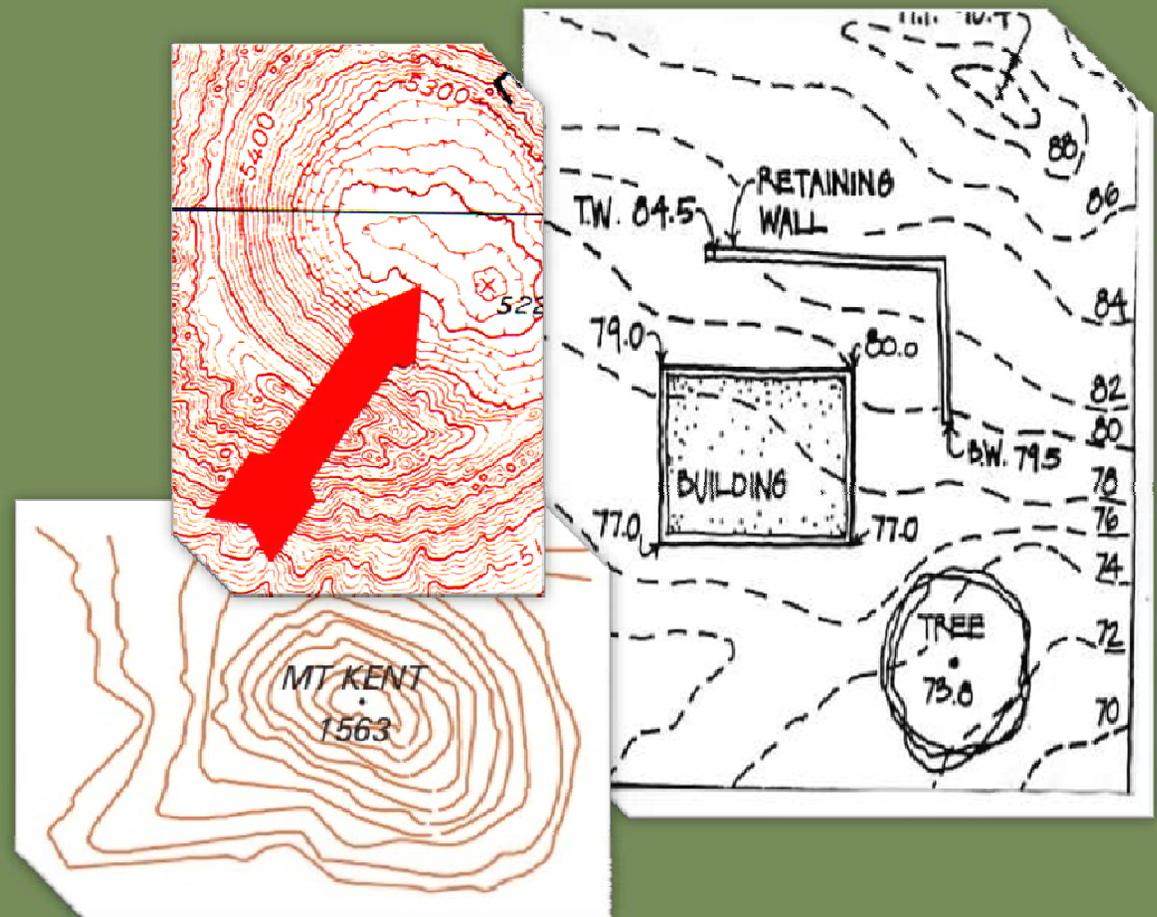
If a contour appears as a closed circular form a spot elevation can be used to clarify the peak.

Depressions

Like peaks, depressions appear on a map as closed circular contours but can be recognized by the short lines called "hachure's" along its edge pointing down towards the depression.

Locating Trees

A tree's elevation is shown on a contour map or survey using a spot elevation



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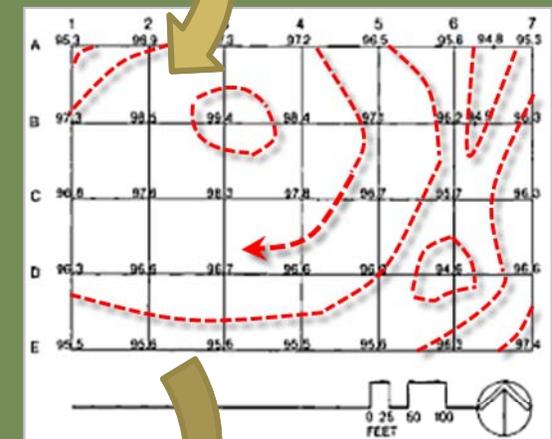
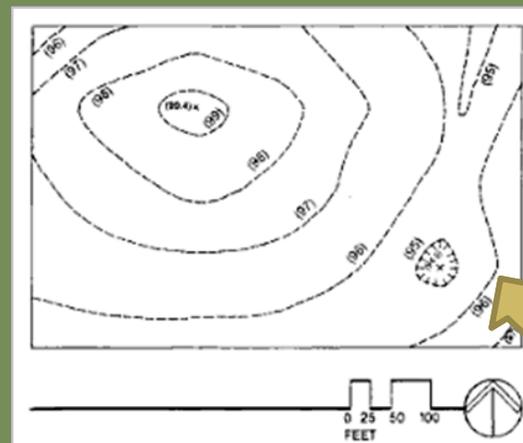
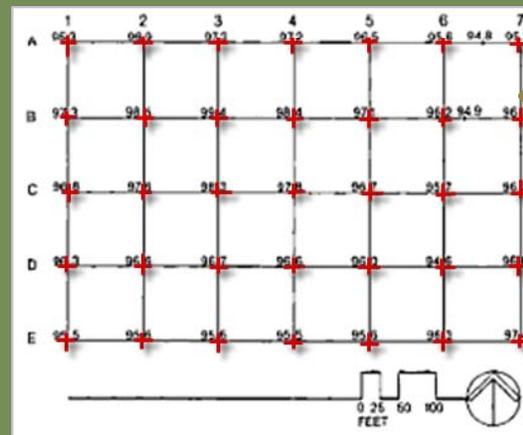
SITE ENGINEERING FOR LANDSCAPE ARCHITECTS
BY STEVEN STROM, KURT NATHAN, JAKE WOLAND

Spot Elevation Grid

A survey is sometimes performed by determining the elevation of a series of spots located on a grid.

Interpolation

From the spot elevation grid a contour map can be developed by using interpolation to estimate the position of contours.



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[HTTP://DOCS.UNH.EDU/NY/MRCY53NE.JPG](http://docs.unh.edu/ny/mrcy53ne.jpg)

Roads

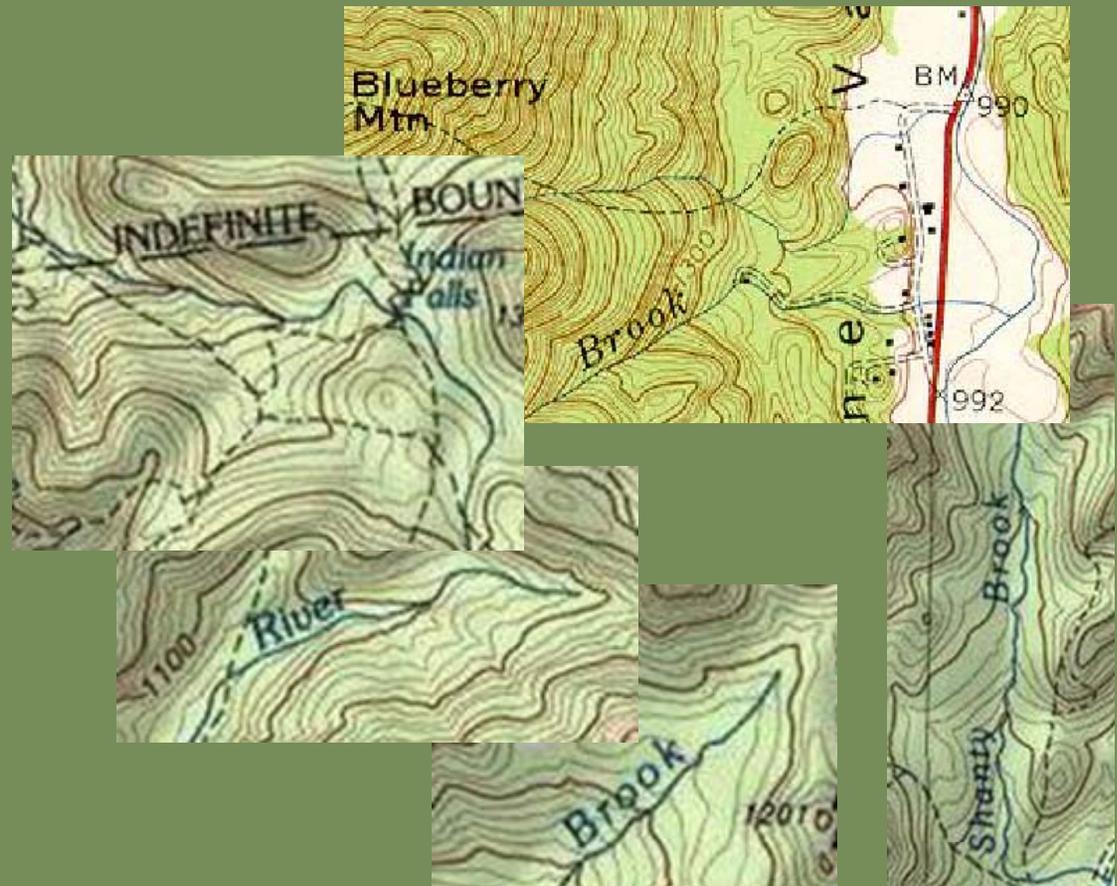
Roads are represented on contour maps as solid lines. They may either parallel or cross contours provided they do not exceed safe grades or slopes for cars.

Hiking Trails

Hiking trails show as dashed lines. Like roads they may also cross or parallel contour lines. Hiking trails can be steeper than roads.

Streams

Streams show as a solid lines and will follow the fold or "v" in the contour and the run from the point of the contour downstream. They can help you read the directions of the contours.



USGS THE UNITED STATES GEOLOGICAL SURVEY

- “AS AN UNBIASED, MULTI-DISCIPLINARY SCIENCE ORGANIZATION THAT FOCUSES ON BIOLOGY, GEOGRAPHY, GEOLOGY, GEOSPATIAL INFORMATION, AND WATER, WE ARE DEDICATED TO THE TIMELY, RELEVANT, AND IMPARTIAL STUDY OF THE LANDSCAPE, OUR NATURAL RESOURCES, AND THE NATURAL HAZARDS THAT THREATEN US”
[WWW.USGS.GOV](http://www.usgs.gov)

- USGS MAP SCALE
- USGS QUADRANGLES
- BROOKLYN QUADRANGLE

IMAGE SOURCE:

[HTTP://GO.OWU.EDU/~JBKRYGIE/KRYGIER_HTML/GEOG_222/GEOG_222_LO/GEOG_222_LO04_GR/SCALE.JPG](http://go.owu.edu/~jbkrygie/krygie_html/geog_222/geog_222_lo/geog_222_lo04_gr/scale.jpg)

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Magnetic North-Grid North

USGS Maps indicate the direction of both grid and magnetic north and the angle between the two.

Declination

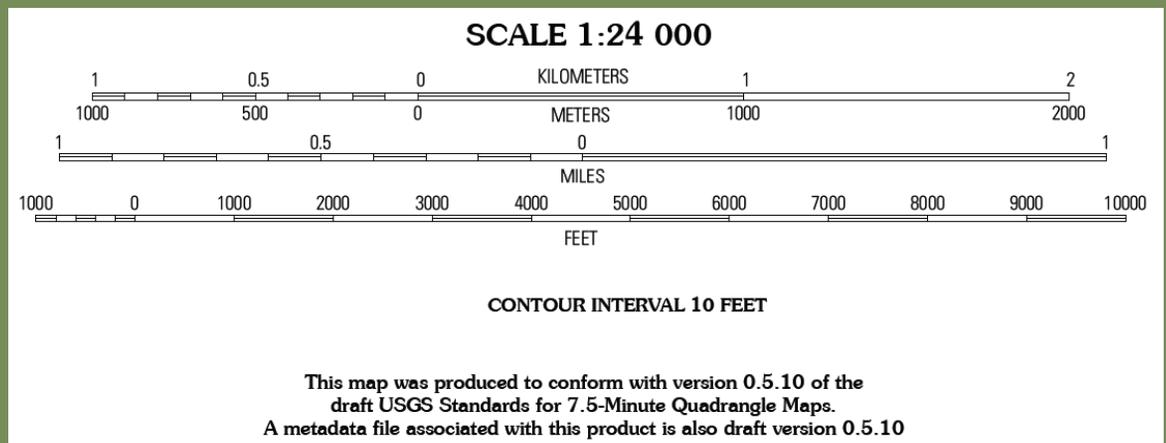
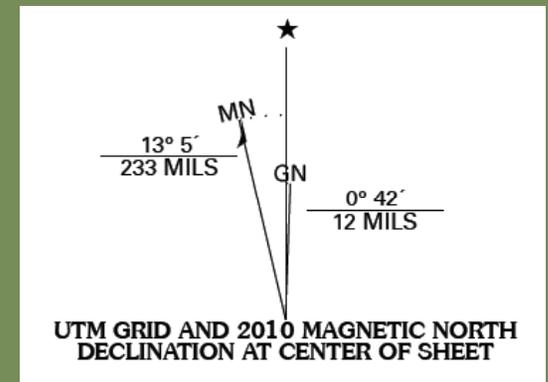
The difference between Magnetic North and Grid North. This value differs depending upon your location.

USGS Quadrangle Scale

USGS topographic quadrangle maps are drawn at a scale of 1:24,000



**BROOKLYN QUADRANGLE
NEW YORK
7.5-MINUTE SERIES**



USGS THE UNITED STATES GEOLOGICAL SURVEY

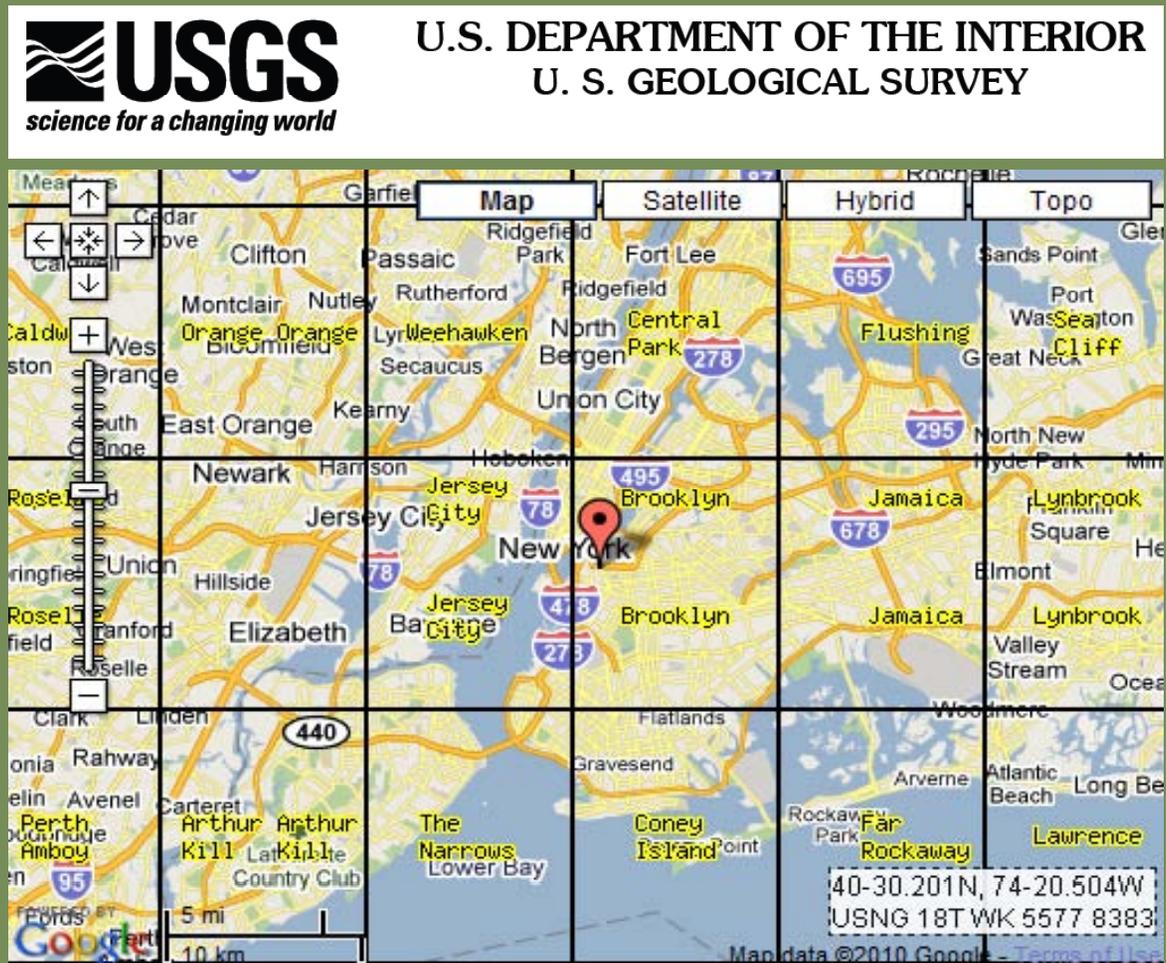
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IMAGE SOURCE:

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USGS Quadrangle Maps

Most USGS map series divide the United States into 7.5 minutes quadrangles bounded by two lines of latitude and two lines of longitude.

7.5 Minute Maps

For example, a 7.5-minute map shows an area that spans 7.5 minutes of latitude and 7.5 minutes of longitude, and it is usually named after the most prominent feature in the quadrangle

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USGS BROOKLYN QUADRANGLE



U.S. DEPARTMENT OF THE INTERIOR
U. S. GEOLOGICAL SURVEY

USGS

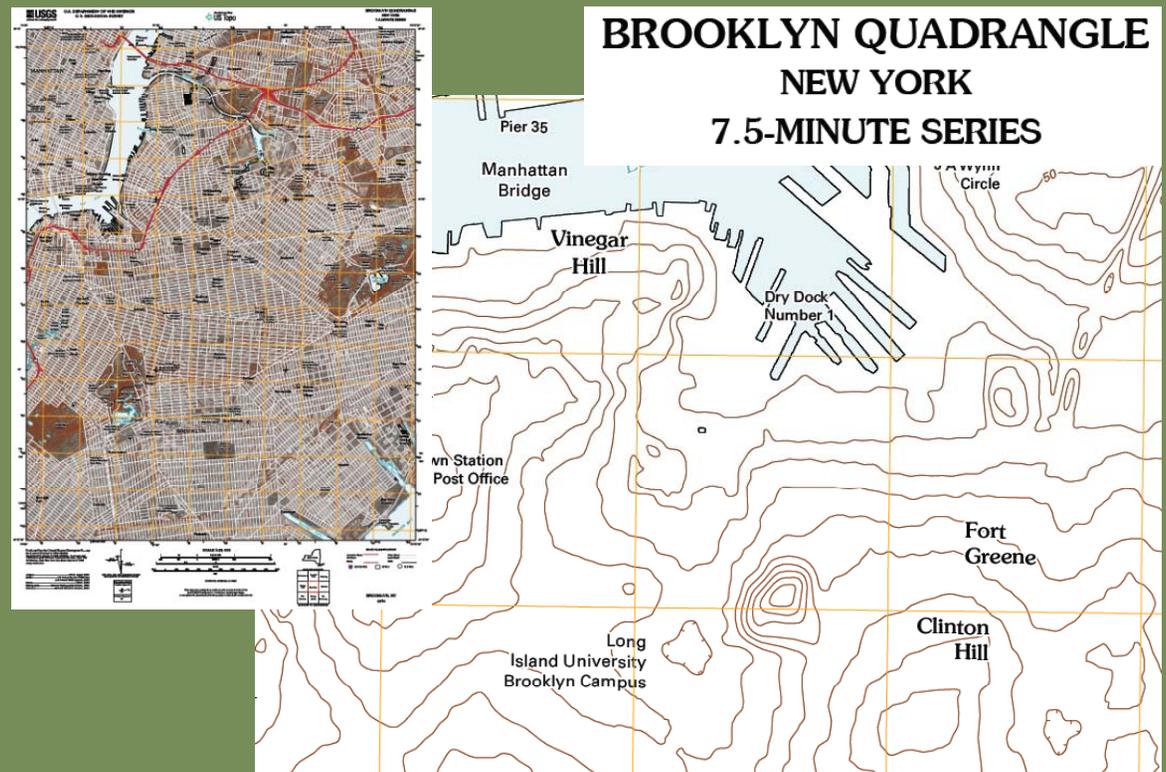
The U.S. Geological Survey maintains maps of the entire united states

USGS Quadrangles Names

Maps are named for a prominent feature within the quadrangle

Map Layers

These maps are layered allowing the control of the visibility of roads, contours and other details



Site Planning Topography & Types of Slope

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▣ **SLOPE:**

THE DEGREE TO WHICH THE GROUND TENDS UPWARD OR DOWNWARD. A HIGHER SLOPE VALUE INDICATES A STEEPER INCLINE.

TYPES OF SLOPE

➤ SECTIONS

➤ UNIFORM SLOPE

➤ CONVEX & CONCAVE SLOPES

➤ HILLS & DEPRESSIONS

➤ RIDGES & VALLEYS

➤ SAMPLE TOPOGRAPHIC MAP

IMAGE SOURCE:

[HTTP://WWW.MNGED.STATE.MN.US/CHOOSE/ELEVATION/IMAGES/USGS.GIF](http://www.mnged.state.mn.us/choose/elevation/images/usgs.gif)

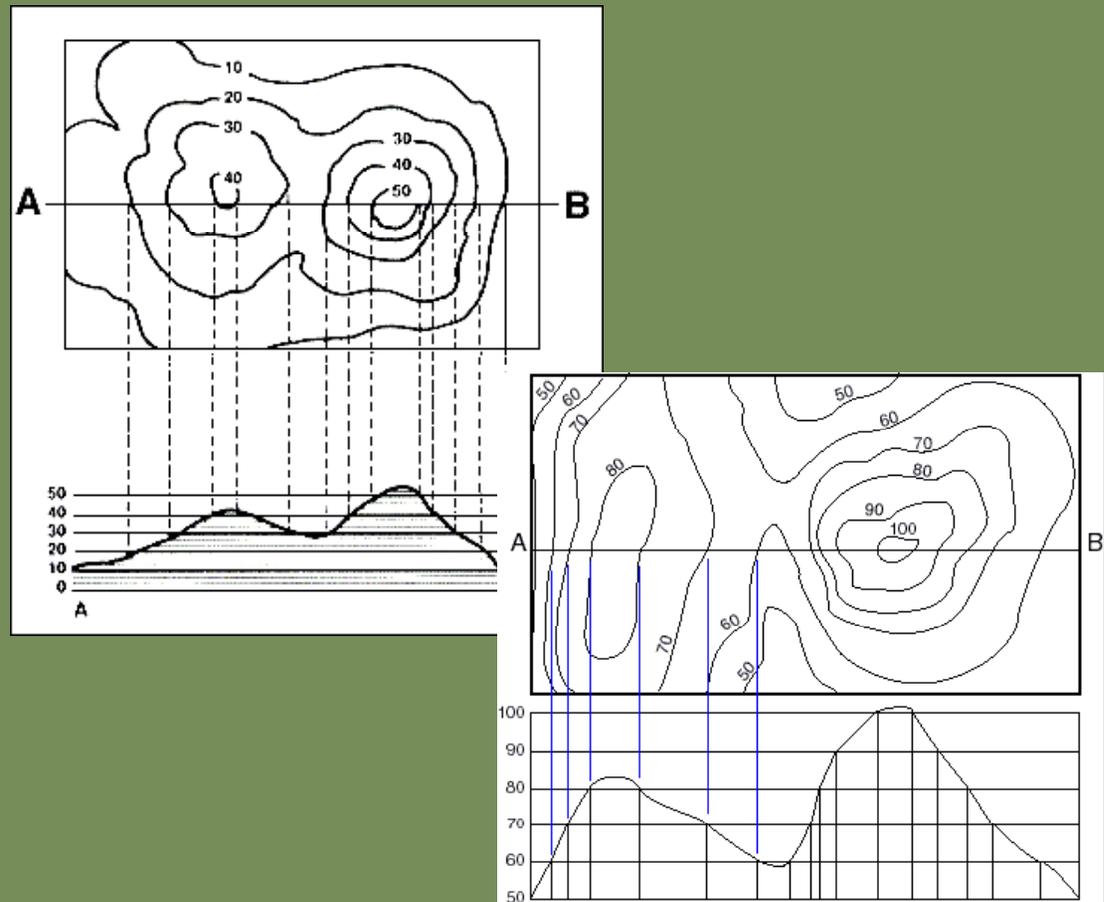
[HTTP://USER.GS.RMIT.EDU.AU/CAA/TOPO/GRAPHICS/XSECTION.GIF](http://user.gs.rmit.edu.au/caa/topo/graphics/xsection.gif)

Topographic Sections

In order to better understand contours it is helpful to draw a section

Vertical Section Scale

Sometime the vertical scale of a section is exaggerated in order to make the drawing more readable



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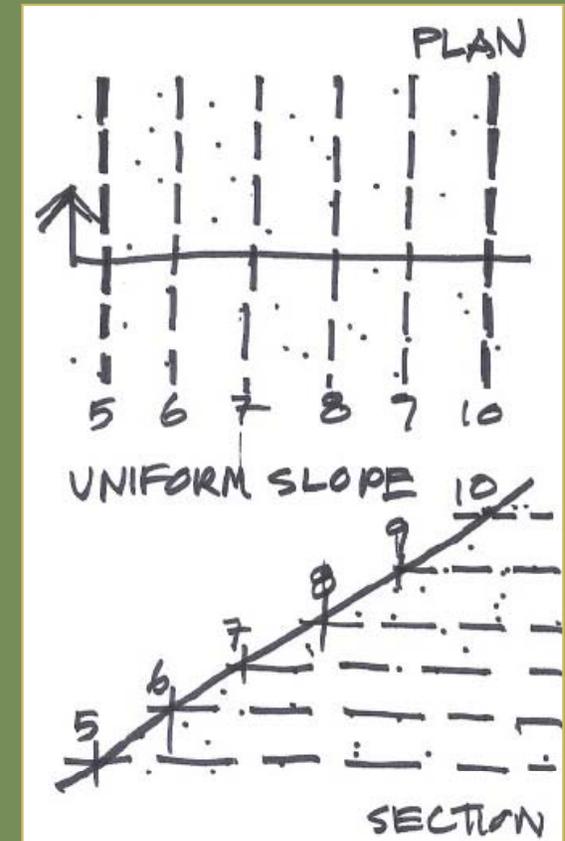
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Uniform Slope

Contour lines are evenly spaced and the slope is a uniform diagonal.

The slope is neither convex or concave.



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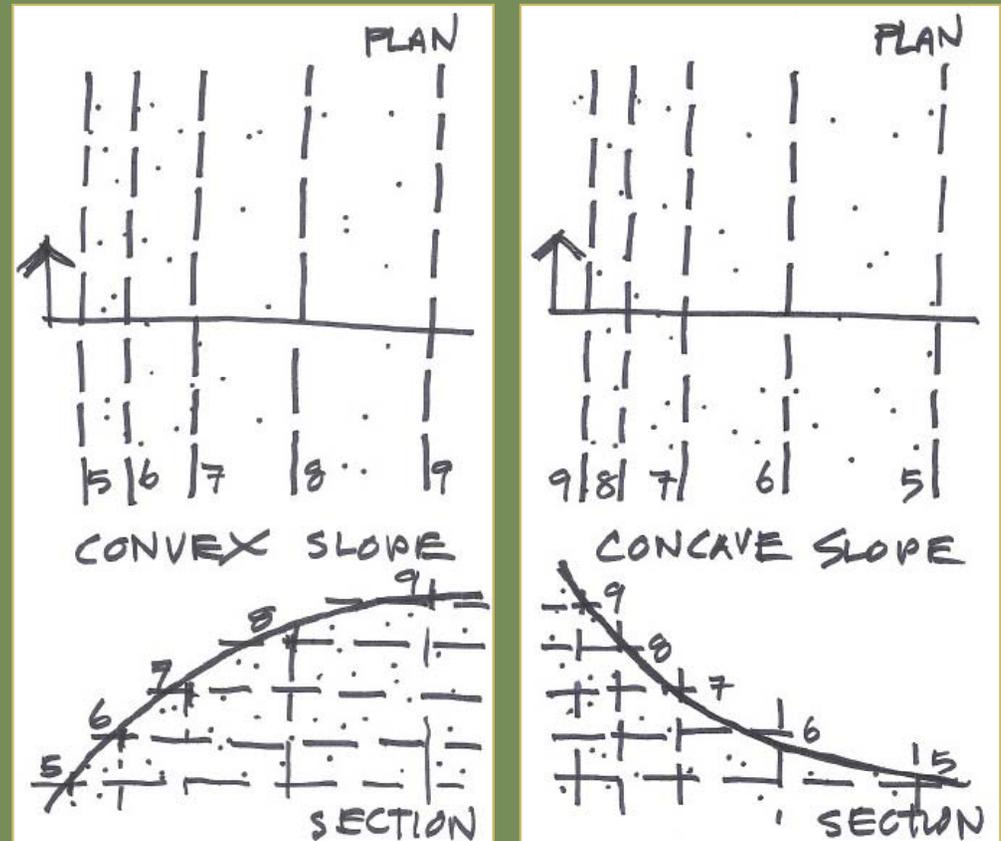
IMAGE SOURCE:

Convex Slope

Contours get closer at lower elevations and the slope is curved outward

Concave Slope

Contour lines get closer at higher elevations and the slope is curved inward like a "cave"



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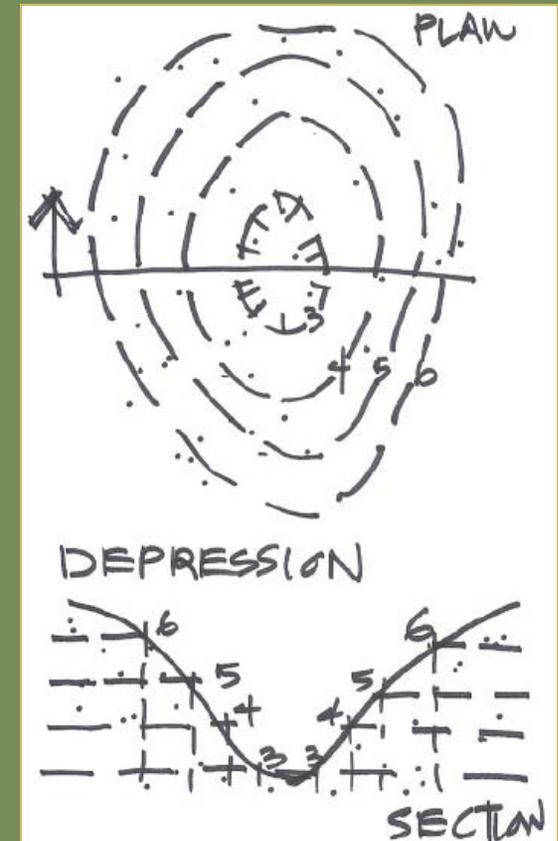
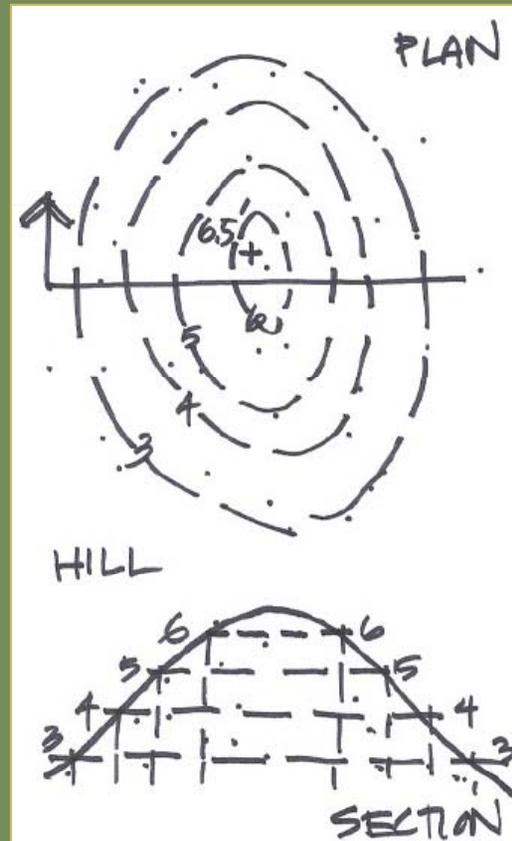
[HTTP://WWW.ADIRONDACKNORTHWAY.NET/MAPS/MTMARCYLG.JPG](http://www.adirondacknorthway.net/maps/mtmarcylg.jpg)

Hill

Shows as a series of concentric contours where the highpoint is in the middle. The peak is often noted with a spot elevation.

Depression

The depression is lower than the surrounding area. Looks similar to the hill but has hachure's indicating the direction of the depression



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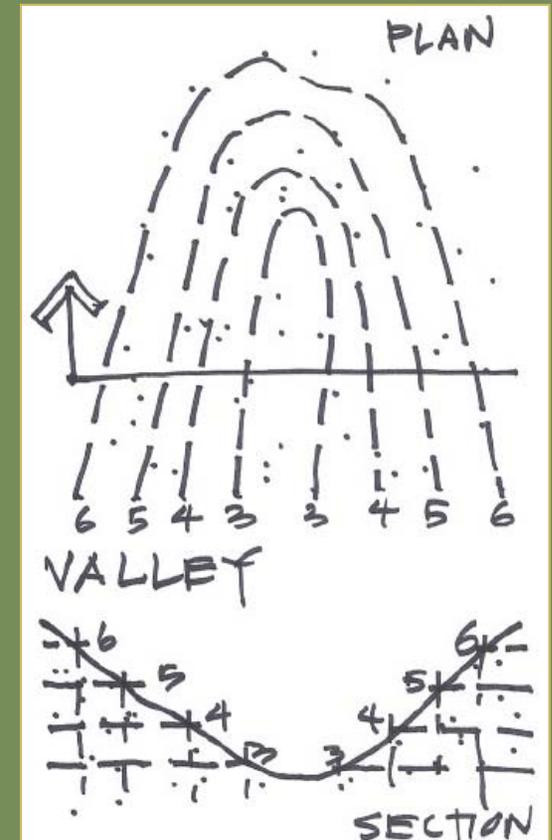
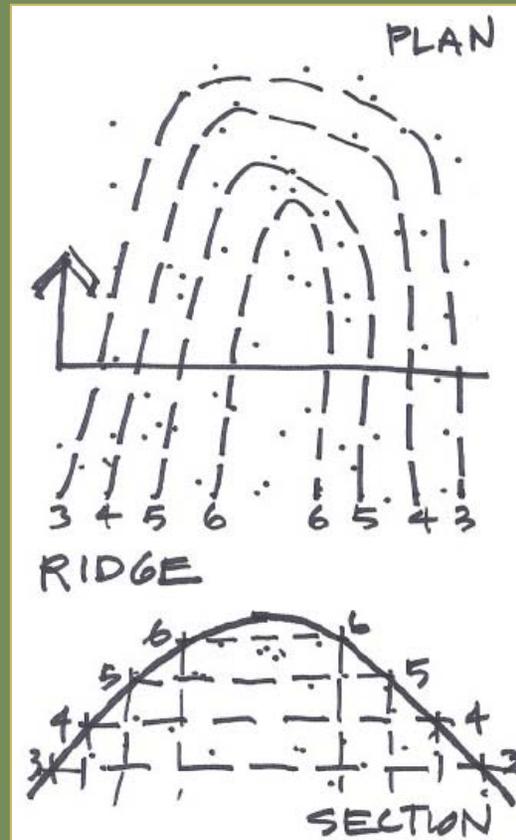
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Ridge

A convex landform where the fold of the contours points downhill

Valley

A concave landform where the fold of the contours points uphill



▣ SAMPLE TOPOGRAPHIC MAP EXERCISE

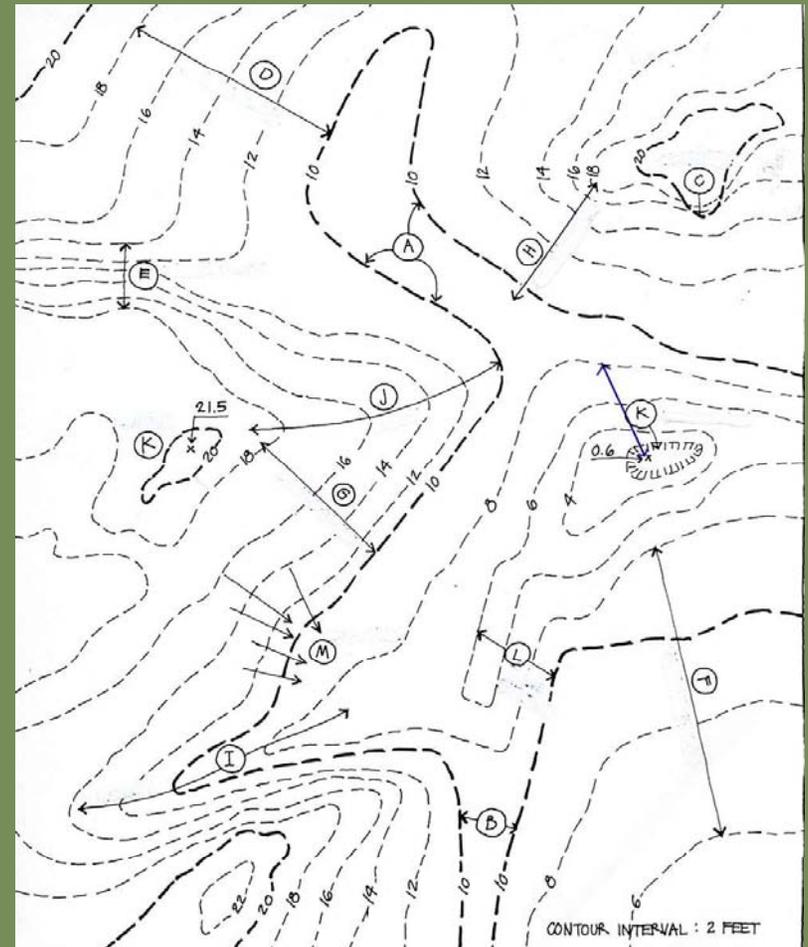
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- **SAMPLE TOPOGRAPHIC MAP**

IMAGE SOURCE:

Match each of the following the labels on the map. Words can be used more than once or not at all:

- Contour Line
- Overhang
- Uniform Slope
- Valley
- Ridge
- Convex Slope
- Concave Slope
- Valley Swale
- Ridge
- Hill or Depression



Site Planning

Topography

Grading and Drainage

Copyright © 2009 Paul C. King

GRADING & DRAINAGE PRINCIPLES

- ▣ GRADING IS DONE TO MODIFY A SITE TO ACCOMMODATE A GIVEN USE AND TO CONTROL THE FLOW OR DRAINAGE OF WATER
- ▣ THE TOOLS OF GRADING ARE CUT AND FILL

➤ GRADING

➤ DRAINAGE

➤ CUT

➤ FILL

➤ CUT & FILL

Purpose of Grading

To adapt a site for human use

While maintaining:

- maintaining water drainage away from structures
- keeping water on the site
- preventing erosion

Artistic Expression

May Lin's Wave Field at the Storm King Art Center in New York is an example of grading used as a means of artistic expression

IMAGE SOURCE:

[HTTP://WWW.THREELILPIGS.COM/PROJECTS/EXLINE/TRACTOR.JPG](http://www.threelilpigs.com/projects/exline/tractor.jpg)

[HTTP://HANKBLOG.FILES.WORDPRESS.COM/2008/11/05KIND2_650.JPG](http://hankblog.files.wordpress.com/2008/11/05kind2_650.jpg)

[HTTP://WWW.SRWCONTRACTING.COM/COMMPROJECTS/IMAGES/CONTENT-HEADER.JPG](http://www.srwcontracting.com/commprojects/images/content-header.jpg)



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➤ CUT

➤ FILL

➤ CUT & FILL

Control of Water

Controlling water on a site is critical to maintaining its stability & usability

Drainage

Proper drainage prevents flooding. Water from the site is often directed to an underground drainage system

Runoff

Runoff occurs when the amount of rain exceeds the ability of the ground to absorb it.

Retention

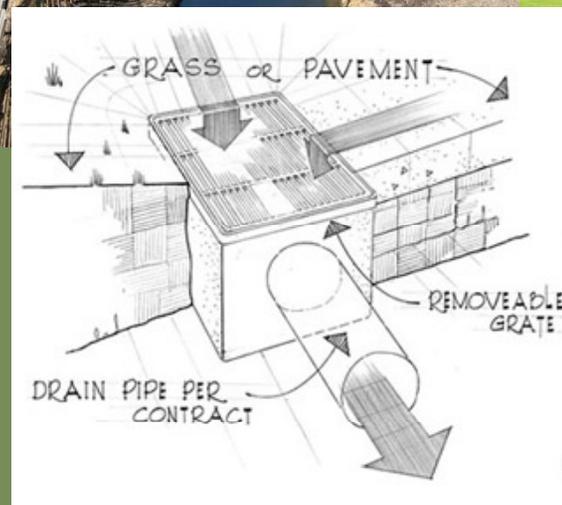
In dry climates water should be collected for reuse and in climates susceptible to sudden storm surges water is stored in retention basins to minimize runoff

IMAGE SOURCE:

[HTTP://WWW.TROTTERCOMPANY.COM/IMG/SKETCH-CATCH-BASINS.JPG](http://www.trottercompany.com/img/sketch-catch-basins.jpg)

[HTTP://EHPNET1.NIEHS.NIH.GOV/DOCS/2001/109-12/RUNOFF.JPG](http://ehpnet1.niehs.nih.gov/docs/2001/109-12/runoff.jpg)

PHOTO RETENTION POND BROOKLYN BRIDGE PARK – PROF. PAUL KING



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- GRADING
- DRAINAGE
- **CUT**
- FILL
- CUT & FILL

Cut

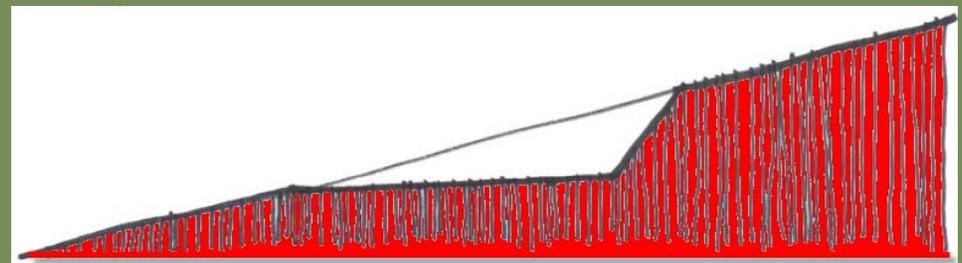
Carving out from the existing grade.

A cut slope can typically be steeper than a filled slope of the same materials as it has been undisturbed and is better bound together.

When grading a road it is common for the uphill side to be cut. Excess cut needs to be carted away.

IMAGE SOURCE:

[HTTP://WWW.HYD.GOV.HK/CONTRACTWEBSITES/CPR/PROGRESS%20PHOTOS/HY9919_PHOTOS/PHOTO_FILES/M051224.JPG](http://www.hyd.gov.hk/contractwebsites/cpr/progress%20photos/hy9919_photos/photo_files/M051224.jpg)



GRADING & DRAINAGE PRINCIPLES

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- GRADING
- DRAINAGE
- CUT
- **FILL**
- CUT & FILL

Fill

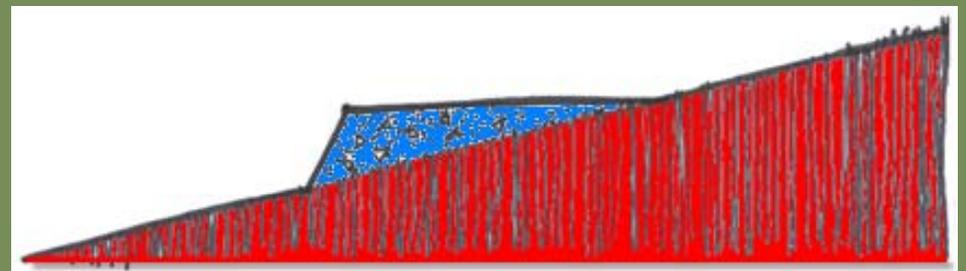
Adding to the existing grade

When you add to the existing grade you need to respect the angle of repose of the soil

Fill must be purchased

IMAGE SOURCE:

[HTTP://YOSEMITE.EPA.GOV/R10/CLEANUP.NSF/0/24BFD539E4497BD088256E54007F4534/\\$FILE/T4P1RA-WB-090208-CAF-EE.JPG](http://Yosemite.EPA.GOV/R10/CLEANUP.NSF/0/24BFD539E4497BD088256E54007F4534/$FILE/T4P1RA-WB-090208-CAF-EE.JPG)



GRADING & DRAINAGE PRINCIPLES

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- GRADING
- DRAINAGE
- CUT
- FILL
- CUT & FILL

Cut & Fill

A solution which uses both cut and fill has advantages over a “cut only” or a “fill only” solution.

A Balanced Solution

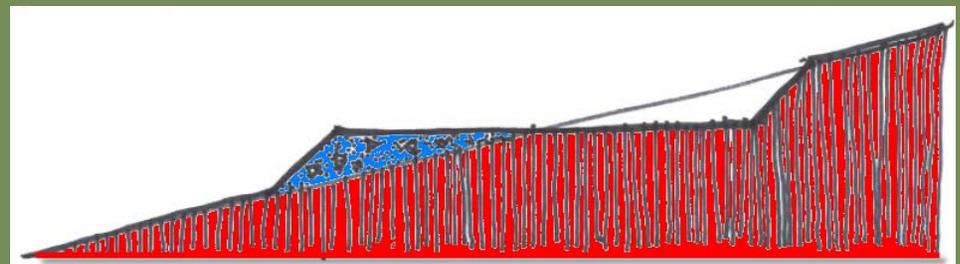
In a cut and fill combined solution the soil cut away can be used to fill other areas on site.

Excess cut is better

It is cheaper to cart away extra soil that is cut away than it is to pay for delivery of clean fill

IMAGE SOURCE:

<HTTP://COMMONDATASTORE.GOOGLEAPIS.COM/STATIC.PANORAMIO.COM/PHOTOS/ORIGINAL/11597371.JPG>



WORKING WITH SLOPES

- ▣ THE SLOPE OF THE GROUND EFFECTS HOW WE CAN USE THE LAND, HOW WATER WILL FLOW AND EROSION

➤ MEASURING SLOPE

IMAGE SOURCE:

➤ ANGLE OF REPOSE

➤ EROSION

Slope Formula

$$G = H / L$$

Grade

A calculation of the slope expressed as a percentage

Height

The vertical change in elevation

Length

The horizontal distance

Percentage

A fraction or ratio with 100 as the denominator

- ▣ $G = H/L$

- ▣ $GRADE = \frac{HEIGHT}{LENGTH} \times 100$

- ▣ TO EXPRESS THE ANSWER AS A PERCENTAGE WE NEED TO MULTIPLY BY 100

- ▣ EXAMPLE:

IF WE MEASURE A DISTANCE ON A MAP OF 30 FEET FROM ONE CONTOUR TO ANOTHER WHEN THE CONTOUR INTERVAL IS 5 FEET, WHAT IS THE SLOPE?

- ▣ $GRADE = \frac{5 \text{ FEET}}{30 \text{ FEET}} \times 100$

$$GRADE = .166 \times 100 = 16.6 \%$$

- THE SLOPE OF THE GROUND EFFECTS HOW WE CAN USE THE LAND, HOW WATER WILL FLOW AND EROSION

WORKING WITH SLOPES

- MEASURING SLOPE
- ANGLE OF REPOSE
- EROSION

IMAGE SOURCE:

[HTTP://WWW.GS.UMD.EDU/CLASS/SPRING2001/CMSSC838B/PROJECT/PARIJA_SPACCO/OLD_IMAGES/AVALANCHE.JPG](http://www.gs.umd.edu/class/spring2001/cmssc838b/project/PARIJA_SPACCO/OLD_IMAGES/AVALANCHE.JPG)

[HTTP://BELMONT.SD62.BC.CA/TEACHER/GEOLOGY12/PHOTOS/EROSION/ANGLE_OF_REPOSE1.JPG](http://belmont.sd62.bc.ca/teacher/geology12/photos/erosion/angle_of_repose1.jpg)

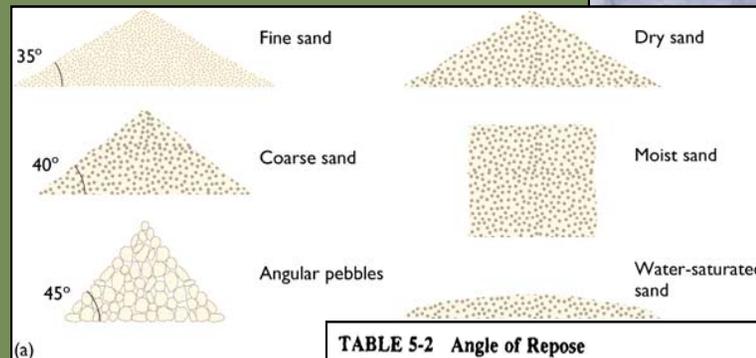
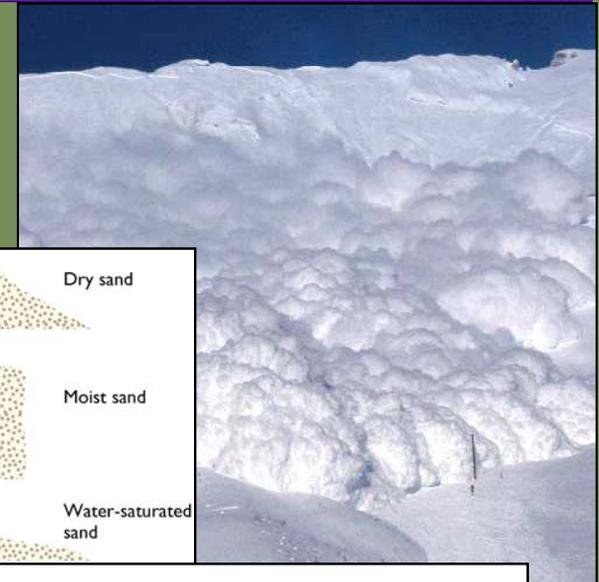


TABLE 5-2 Angle of Repose

MATERIAL	ANGLE OF REPOSE	SLOPE RATIO
Sand, clean	33°41'	1.5:1
Sand and clay	36°53'	1.33:1
Clay, dry	29°44'	1.75:1
Clay, damp, plastic	18°24'	3.0:1
Gravel, clean	36°53'	1.33:1
Gravel, sand, and clay	36°53'	1.33:1
Soil (average)	33°41'	9.5:1
Soft rotten rock	36°53'	1.33:1
Hard rotten rock	45°	1:1
Cinders	45°	1:1

Angle of Slope

The angle of any surface relative to the horizontal

Angle of Repose

The steepest angle at which loose earth will stand without sliding.

Avalanche

An avalanche is an example of exceeding the angle of repose of a snow bank

Design for Safety

Different materials have different angles of repose. When we design we need to add a safety factor and design a slope well under the angle of repose of a material.

WORKING WITH SLOPES

- ▣ THE SLOPE OF THE GROUND EFFECTS HOW WE CAN USE THE LAND, HOW WATER WILL FLOW AND EROSION

➤ MEASURING SLOPE

➤ ANGLE OF REPOSE

➤ EROSION

IMAGE SOURCE:

[HTTP://MELISSAKEMPF.FILES.WORDPRESS.COM/2010/03/USA_09847_GRAND_CANYON_LUCA_GALUZZI_20071.JPG](http://melissakempff.files.wordpress.com/2010/03/usa_09847_grand_canyon_luca_galuzzi_20071.jpg)

[HTTP://IMBS.SFGATE.COM/C/PICTURES/2006/05/02/BA_SLIDE050PG.JPG](http://imbs.sfgate.com/c/pictures/2006/05/02/ba_slide050pg.jpg)

Erosion

The mechanical process of wearing away the earth's surface through natural means like wind, rain and ice

The Grand Canyon

One of the best known examples of erosion the Grand Canyon was formed by the actions of the Colorado river

Exceeding the angle of repose can lead to collapse of the slope and erosion. Often the addition of water can cause such an event to occur



Chronicle / Penni Gladstone

Site Planning

Topography Surveying

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PROFESSIONALS USE OF TOPOGRAPHIC MAPS?

- THE GRAPHIC REPRESENTATION OF THE BOUNDARY BETWEEN THE EARTH AND THE AIR INDICATING RELATIVE ELEVATION AND POSITION

- BENCHMARK
- SURVEY
- SURVEYORS TOOLS
- METES & BOUNDS

IMAGE SOURCE:

[HTTP://DIVIDINGLINE.BIZ/ATTACHMENTS/IMAGE/ALTA-ACSMWEB.JPG](http://dividingline.biz/attachments/image/alta-acsmweb.jpg)

[HTTP://WWW.RUXTONDESIGN.COM/SURVEYS/IMG/LOCATION-900.JPG](http://www.ruxtondesign.com/surveys/img/location-900.jpg)

[HTTP://WWW.ACIMT.COM/TRANSIT2.GIF](http://www.acimt.com/transit2.gif)

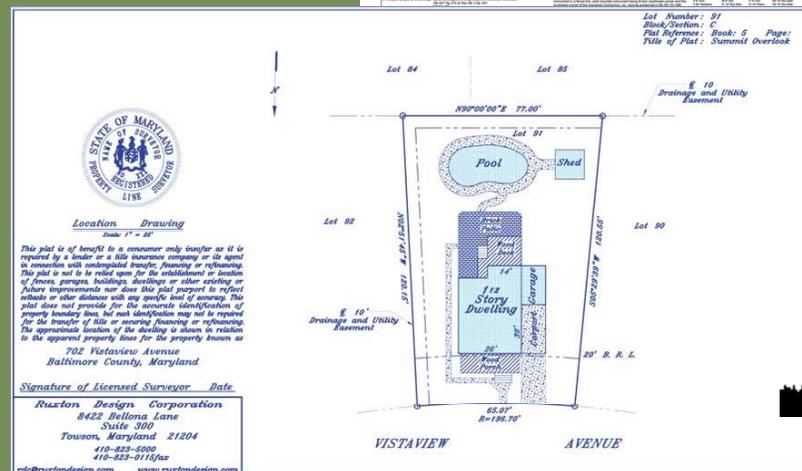
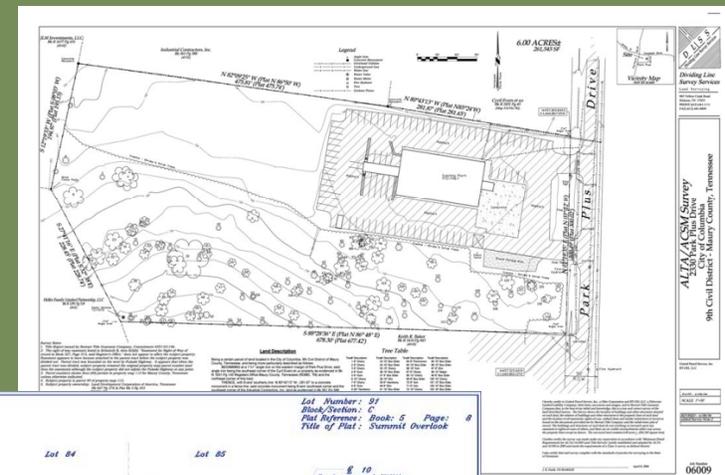
Land Survey (the map)

A map showing the accurate locations of three-dimensional positions and the distances and angles between them

Surveyor (the creator)

A person who measures land to identify topographic features and boundaries

Surveyors are registered and licensed



PROFESSIONALS USE OF TOPOGRAPHIC MAPS?

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IMAGE SOURCE:

[HTTP://WWW.SURVEYHISTORY.ORG/THE_SURVEYOR'S_BASIC_TOOLS.HTM](http://www.surveyhistory.org/the_surveyor's_basic_tools.htm)

[HTTP://ARCHIVE.LIVEAUCTIONEERS.COM/ARCHIVE4/KIMBALLSAUCTION/13840/929564_1_LG.JPG](http://archive.liveauctioneers.com/archive4/kimballsauction/13840/929564_1_LG.JPG)

[HTTP://ECX.IMAGES-AMAZON.COM/IMAGES/I/518RAPK112L.JPG](http://ecx.images-amazon.com/images/I/518RAPK112L.JPG)

[HTTP://WWW.NEWENGLANDLASER.COM/IMAGE-FILES/DAVID-WHITE-LT8-300LP-TRANS.JPG](http://www.newenglandlaser.com/image-files/DAVID-WHITE-LT8-300LP-TRANS.JPG)

The Chain

Used to measure distance it is 66 feet long and consists of 100 links



The Compass

Used to determine direction of a lines relative to magnetic north



The Transit

Used to measure horizontal and vertical angles



The Level

Used to measure elevation

The Laser Transit & Level

A modern instruments that use a pulsing beam of light to measure the three dimensional position of a point



PROFESSIONALS USE OF TOPOGRAPHIC MAPS?

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Metes and Bounds Description

A legal description of the boundary of a piece of property in words. From a benchmark or starting point is describes the direction and length of each edge of the property.

They are commonly a part of legal deeds

Sample Description

Beginning at the maple tree on the property line of the old Jones Farm and its intersection with the Summer Creek road; thence S 67 degrees W 593'; thence N 24 degrees W 642'; then N 15 degrees E 265'; thence S 35 degrees E 490'; thence S 66 degrees E 500' to the point of beginning, containing 5.46 acres, more or less.

Creating a Drawing

Using the distances and bearings in the written description a property boundary can be drawn

IMAGE SOURCE:

[HTTP://AGECON2.TAMU.EDU/PEOPLE/FACULTY/LARD-CURTIS/432/PDFs/METESANDBOUNDS.PDF](http://agecon2.tamu.edu/people/faculty/lard-curtis/432/PDFs/MetesAndBounds.pdf)

[HTTP://C.ANCESTRY.COM/L/LEARN/CHAIN/SAMPLEMAP.JPG](http://c.ancestry.com/l/learn/chain/samplemap.jpg)

