



Understanding Maps

Lucia Patterson, Nevada Division of Minerals

A map is a simplified view of the earth's surface that shows where places and things are located and helps us communicate that information efficiently. Maps are made for many reasons, and as a result, vary in content. Some maps are made for general purposes and may show roads, towns and cities, rivers and lakes, parks, and State and local boundaries. Other maps are made for specialized purposes, such as for census, utilities, the military, etc. Geographers use the terms "large-scale" and "small scale" to describe the amount of area on the ground covered by a map. A large-scale map shows a small land area in great detail. A small-scale map shows less detail, but a larger land area. A good comparison would be a map of a city (large-scale) vs. a map of a state (small-scale).

For this activity, we will use two maps: a road map and a topographic map (Attached).

A road map shows people how they can travel from one place to another. It also shows some physical boundaries such as: mountains, valleys, and rivers; political features such as: states and counties; and populated places such as: cities, towns, and villages.

Topographic maps use contour lines to show elevation (height above sea level). Contour lines join points of equal elevation above a specified reference such as sea level. Think of a contour line as an imaginary line on the ground that takes any path necessary to maintain constant elevation. People frequently use topographic maps when hiking. Builders use topographic maps to figure out where to put buildings and roads. There's a topographic map like this for every part of the United States, including one for where you live.

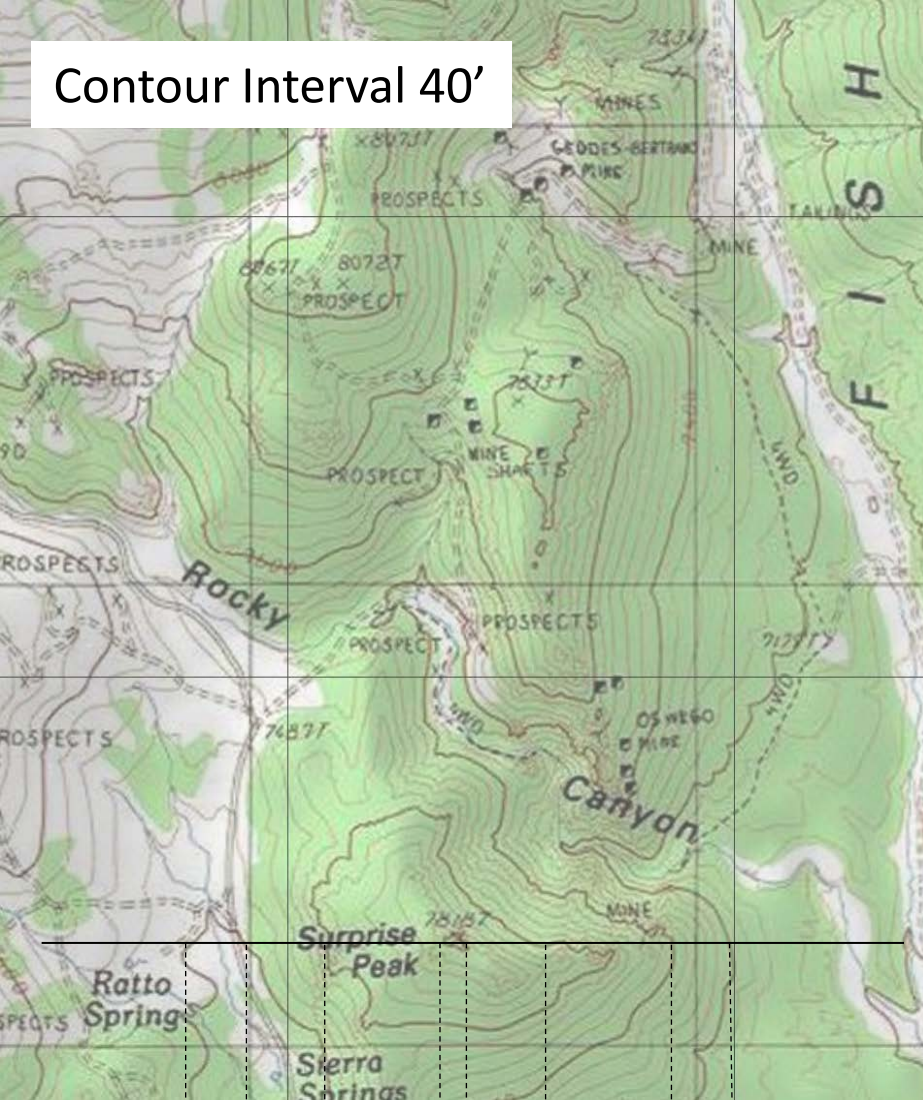
In General:

- Map makers are often referred to as cartographers. Cartography is the study and practice of making maps.
- Cartographers use north, south, east, and west to describe direction.
- Cartographers commonly orient their maps to show north at the top.
- It is possible to describe the relationship of one place to another. One place is north, south, east, or west of another place. This kind of orientation is known as relative location.
- Using longitude and latitude, a grid of imaginary lines created by geographers, it is possible to identify the absolute location of any point on earth's surface. UTM, short for Universal Transverse Mercator is another grid system used in locating a point on the Earth's Surface
- The relationship between a distance on the map and the corresponding distance on the ground is known as scale.
- Using the distance scale it is possible to determine the actual distance on the ground between two points on a map.

Materials Needed:

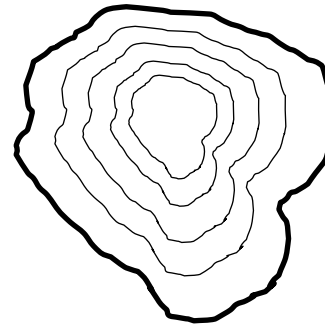
1. Nevada State Road map, map is attached and is – free from the Nevada Commission on Tourism
www.travelnevada.com,
2. 7.5' Topographic Map of the Virginia City Quadrangle (Attached)
3. Ruler, Pencil, Protractor

Contour Interval 40'

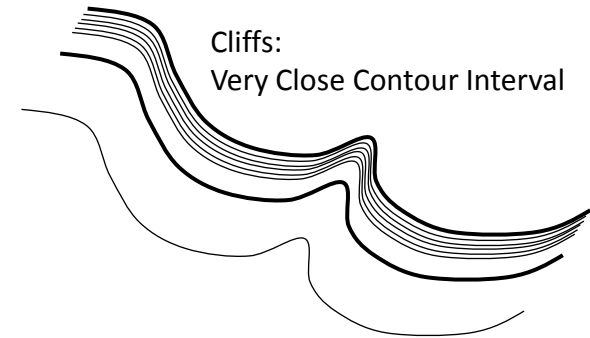


Topographic Map Features

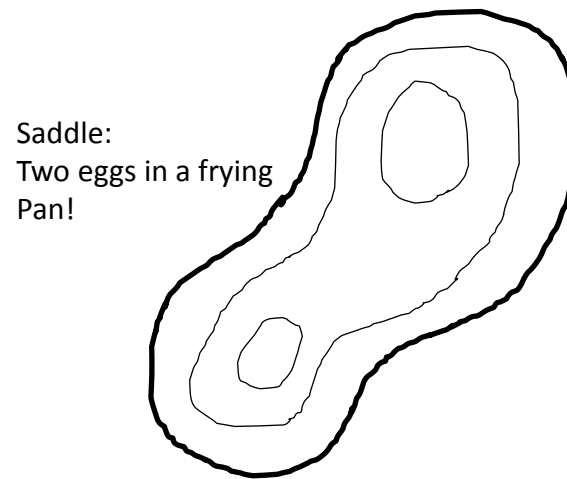
Contour maps show the shape and elevation of the land surface. A contour line is an imaginary line on Earth's surface connecting points of equal elevation.



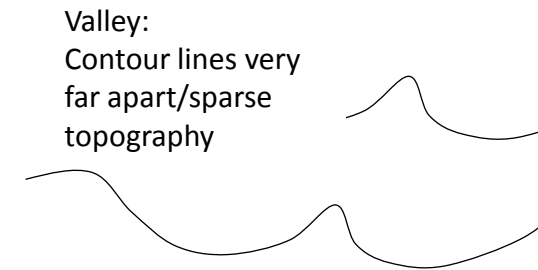
Mountains/Hills:
Bulls Eye Pattern of Closed Contours



Cliffs:
Very Close Contour Interval



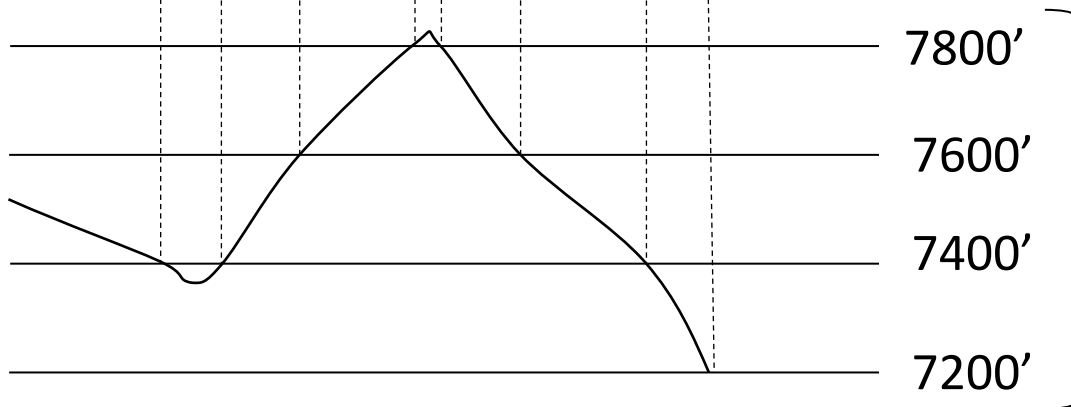
Saddle:
Two eggs in a frying
Pan!



Valley:
Contour lines very
far apart/sparse
topography

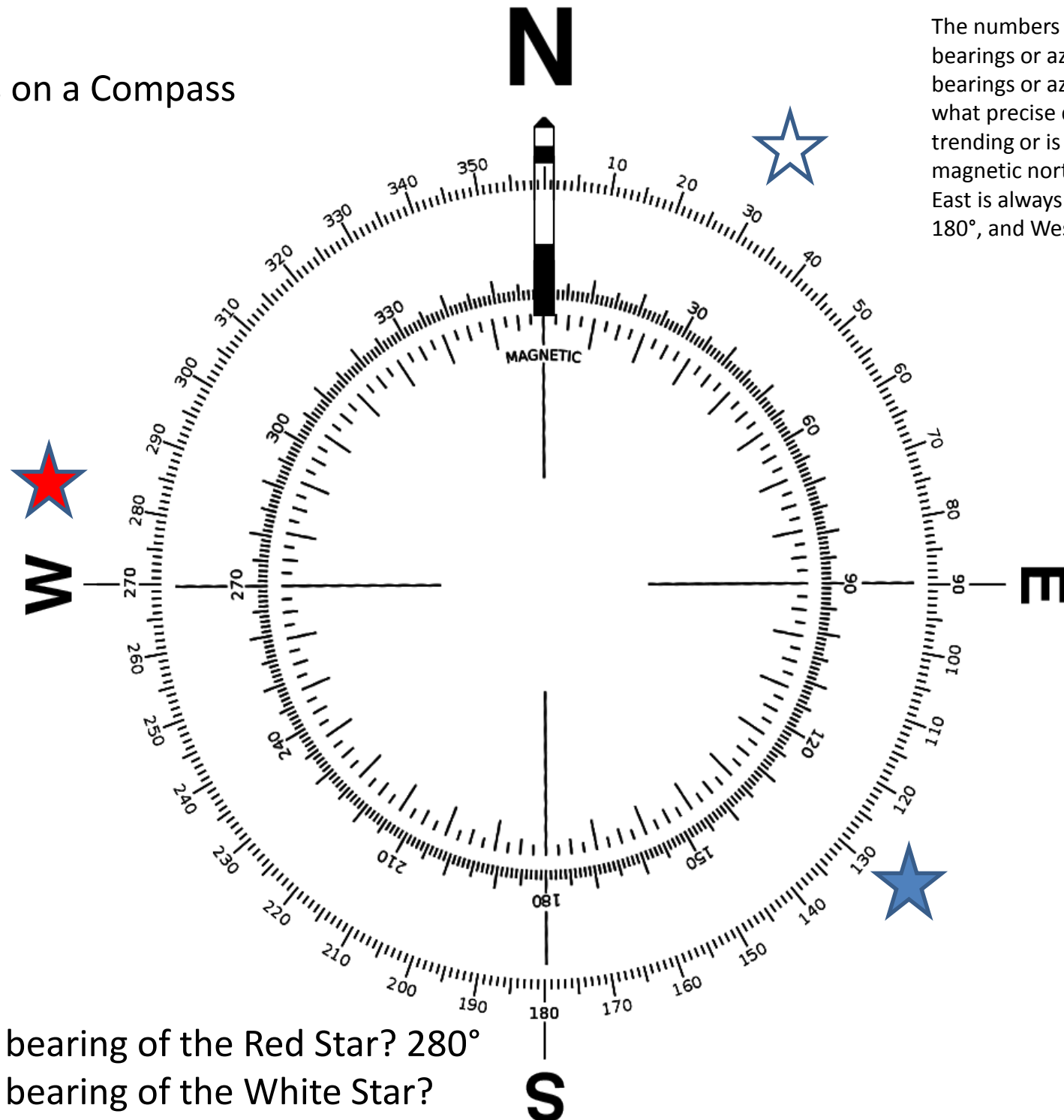


Ravine:
Contour Lines forming a
V. The V points upstream



Profile of a Mountain
using the contour
lines from a map.

Bearings on a Compass



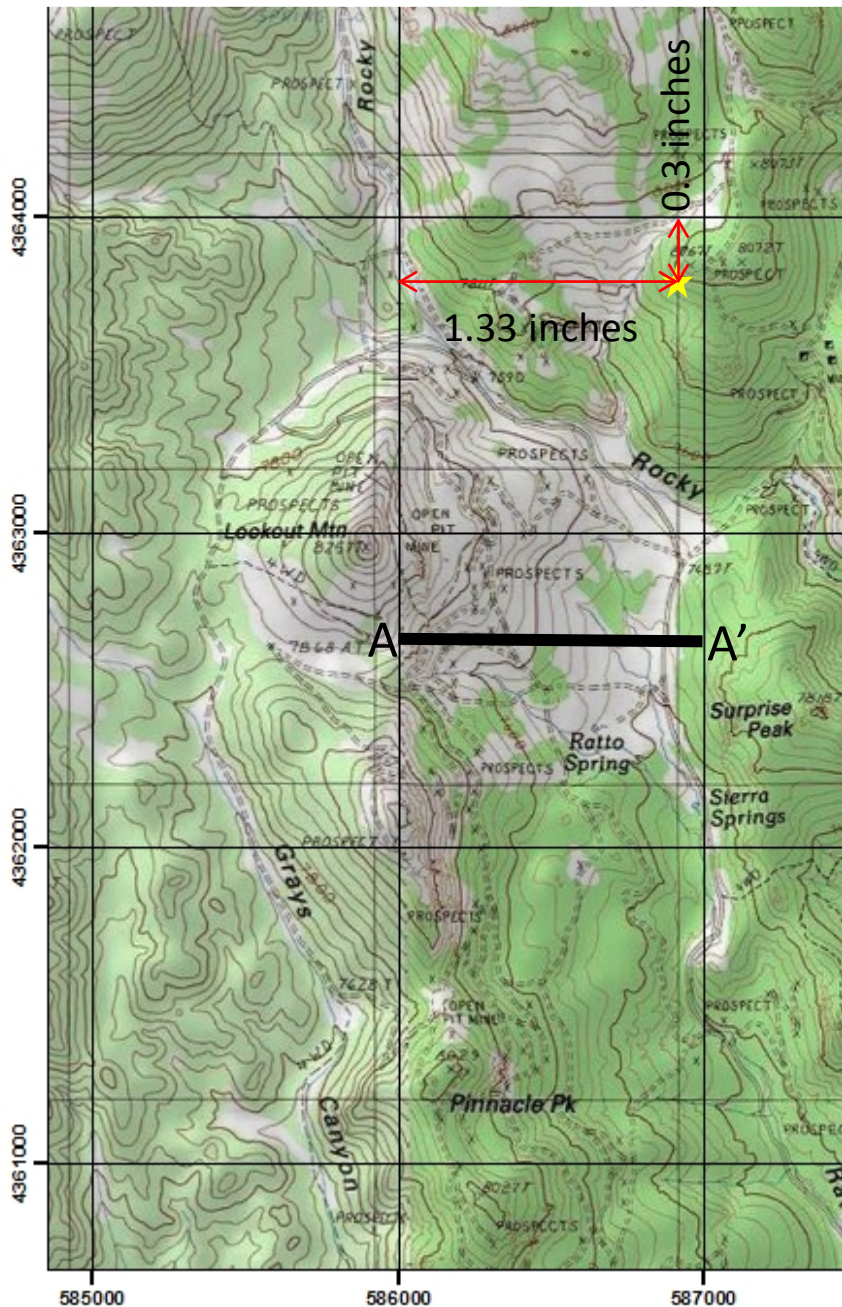
The numbers on a compass are bearings or azimuths. You use bearings or azimuths to determine what precise direction something is trending or is located relative to magnetic north. North is always 0°, East is always 90°, South is always 180°, and West is always 270°.

What is the bearing of the Red Star? 280°

What is the bearing of the White Star?

What is the opposite bearing of the blue star?

Pulling Coordinates off a Map:



From A – A' is 1.4 inches (1000 m = 1.4")

So on the map 1 inch = 694.4 meters

So if we wanted to find the coordinates for the yellow star all we need to do is some simple math.

The yellow star is 0.3 inches south of our 4,364,000N grid line so:

$$0.3 * 694.44 = 208.3 \text{ m}$$

So for our Northing:

$$4,364,000 - 208.3 = 4,363,792$$

The yellow star is 1.33 inches west of our 586,000E grid line so:

$$1.33 * 694.44 = 923.6 \text{ m}$$

So for our Easting:

$$586,000 + 923.6 = 273,924$$

Linda and Valerie's Road Trip

Linda and Valerie were best friends who liked to travel and learn about history and geology. They met up every year and went on a trip to a historical destination to see new sites and learn about history and geology. This year they have decided to visit Virginia City, Nevada. Linda lives in Reno, Nevada and Valerie lives in Caliente, Nevada. They are going to meet up at the junction of Highway 395 and Nevada State Route 341 to start their journey to Virginia City.

In order to get from Caliente to Reno Valerie has obtained a Nevada State Map. What is the scale of this map?(1)_____ How many miles does one inch equal?(2)_____ What phone number should Valerie call to find out about road conditions?(3)_____ After Valerie checks the road conditions and finds that all roads are clear, with her map in hand she starts her trip to Reno. Use the index to find Caliente on the map. How many highway miles is from Caliente to Reno Reno from Caliente (You **do not** need a ruler for this)?(4)_____ Valerie decides she is going

to make this trip in a leisurely fashion and stop to see a couple sites along the way. Her first stop will be at Lunar Crater. Lunar crater is 105 miles as the crow flies northwest of Caliente. What is Lunar Crater designated as _____ on _____ the _____ map?

(5)_____ Which routes will she take to get to Lunar Crater from Caliente? (6)_____

Is there another name for State Route 375? (7)_____ About how many highway miles is Lunar Crater from Caliente?(8)_____ Lunar crater is a large



Figure 1. Rock sample from Lunar Crater with large olivine crystals

volcanic field that covers 100 square miles. In this volcanic field one can observe specimens of volcanic rock with beautiful large olivine clusters (Figure 1) and a volcanic crater termed a maar which is a *“broad, low-relief volcanic crater that is caused by a phreatomagmatic eruption – i.e., an explosion caused by groundwater coming into contact with hot lava or magma”*. After Valerie is done seeing the sights she stops at the rest area located almost due west of Lunar Crater, what is the name of this rest stop?(9)_____ What amenities does this rest stop offer?(10)_____ It is getting towards the end of the day

Figure 2. 1913 view of Tonopah



and Valerie would like a nice dinner and a hotel to sleep in. What is the next closest town Valerie can stop at that is most likely to have what she is looking for?(11)_____ What is the population range of the town?(12)_____ What is this town designated as? (13)_____ Ore was first

discovered near Tonopah by Jim Butler in 1900 and by 1901 Tonopah was a busy boom town which had a post office, six saloons, restaurants, assay offices, lodging houses, a number of doctors, lawyers, and a newspaper (Figure 2). Tonopah was actually called Butler it was not until March 3, 1905 that the name of the town was changed to Tonopah.

Valerie wakes in the morning ready to head for Reno how far is she in kilometers from her destination? (14)_____ What is the best route for her to take to get to Reno? (15)_____ Valerie leaves Tonopah and about 30 miles west of Tonopah she sees a large mountain range on the South side of the highway. What is the name of this mountain range?(16)_____ What is the name and elevation of the highest peak in the range?(17)_____ Just before Mina, Valerie notices a very white lake bed on the east side of the highway, what is she looking at?(18)_____ As Valerie continues her travels she passes through Mina and thinks to herself "This is such a small town to have a (19)_____!" Mina was founded as a railroad town in 1905. Though the railroad is gone, at one time the town had a local shuttle called the "Slim Princess" which allowed passengers and crew to shoot wild game such as jack rabbits, ducks, and sage hens from open windows. The Slim Princess moved slow enough passengers could hop off the train grab their game and get right back on. What is the current population of Mina? (20)_____

Valerie continues up the road through Hawthorne, home of the largest U.S. Army Ammunition Depot of its kind. What county is she in?(21)_____ Valerie wonders how far is it between Hawthorne and Schurz aside from measuring with a ruler how can she figure this out?(22)_____ What is the distance between these to destinations?(23)_____ Valerie decides she would rather have a more scenic backdrop to eat

lunch so she looks for a place to visit at Walker Lake (Figure 3). She stops at the recreational facility just north of the town of Hawthorne. What is the name of this facility?
(24)_____

What services are available at this recreational facility?(25)_____

____ Valerie finishes lunch and heads up the road to Schurz. What does the peach shading on the map represent
around Schurz?(26)_____ What is running through the town of Schurz that also runs along the

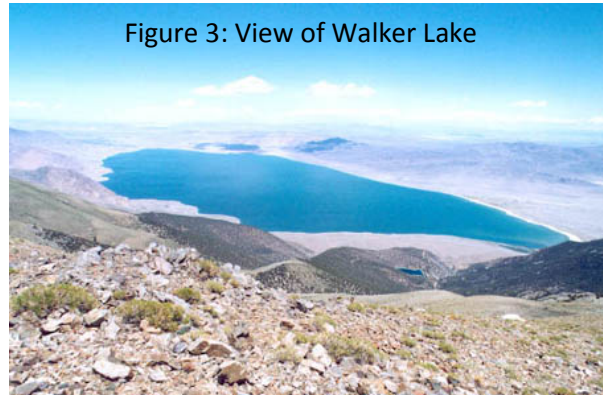


Figure 3: View of Walker Lake

east side of Walker Lake?(27)_____ Valerie drives through the County seat of Lyon County which is?(28)_____ The county seat of Lyon County was relocated from Dayton in 1911 after the Dayton Court house burned down. Yerington was initially a small trading post and whiskey store in the mid 1800's. It wasn't until after the outbreak of World War II when Anaconda mining brought some of the old copper mines into production that the town began to grow significantly. But by 1978 mining had ceased again and the 255 houses built were abandoned. In Silver Springs Valerie notices a green dashed line running roughly parallel to the Carson River. What is this green dashed line and what is it called? (29)_____ The trail

was in use by 1849 and it was used to access the American River and Placerville California gold digging region. The trail begins off of Interstate 80 near Toulon, NV and continues to Placerville, CA. Valerie then passes through Fernley, NV which was established in 1904 primarily as an agricultural and ranching community. Its first established schoolhouse is still in use today as the Fernley Chamber of Commerce (Figure 4). Ready to stop driving for the day, Valerie finally reaches Reno where she rests for the night.



Figure 4. Fernley School House/Chamber of Commerce

The next morning, Valerie and Linda arrive at their meeting place and drive to Virginia City. For the remainder of this exercise please refer to the **attached** Nevada Division of Minerals 11" x 17" Virginia City Quadrangle map.

What is the scale of this map (there are two answers)?(30)_____

What Topoquad (topographic quadrangle) is this map focused on?(31)_____ What County

are we in?(32)_____ How many feet are in 1 inch?(33)_____ What Quadrangle is directly east of the Virginia City quadrangle?(34)_____ What is the contour interval of the map?(35)_____

When Valerie and Linda get to Geiger Summit (located in the very northern most portion of your map) they notice Geiger just ahead of them to the east. What topographic feature is Geiger?(36)_____ Topographically speaking, How does one know that?(37)_____ What is the elevation of Geiger?(38)_____ 1 mile (as the crow flies) from Geiger is Long Valley. What general direction does Long Valley trend?(39)_____ How does one know it is a valley?(40)_____ What general direction is upstream?(41)_____ How does one know that?(42)_____

They arrive in Virginia City and notice a large mountain that hovers over the city to the west this is Mt Davidson it is the highest peak in the Virginia Range what is it's elevation?(43)_____ In what direction is the town of Virginia City oriented?(44)_____ The orientation of Virginia City's Main street is roughly parallel to the course of the Comstock vein system. Placer gold was originally discovered south of Virginia city towards Dayton at a location that is not on the map Valerie and Linda have. In April 1859, the Comstock Lode was discovered by persistent diggers at what was called "Old Red Ledge" at Gold Hill, which is 8,000 feet south of the Virginia City label on the map. In May of 1859 a similar discovery was also made in a ravine 10,000 feet due North of Gold Hill. What is the name of this Ravine?(45)_____

Which ravine on the west side of Virginia City looks to be the steepest?(46)_____

Why?

(47)_____ The discovery of the Comstock lode sparked a silver rush in the area with prospectors scrambling to stake their claims. Main production from the Comstock lode was

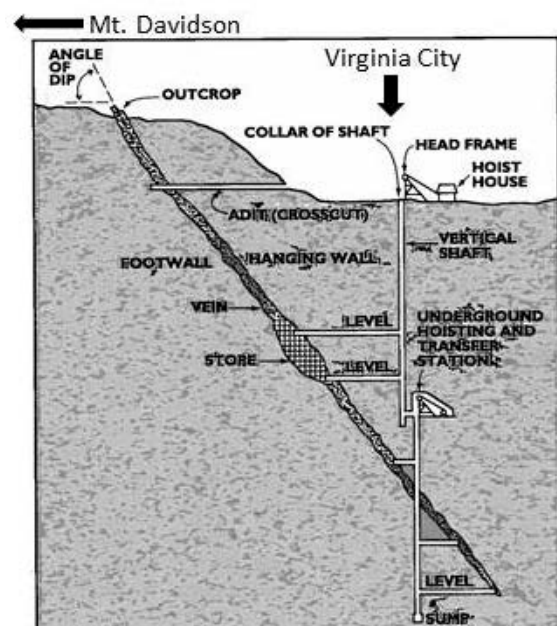


Figure 5: Tingley et al. 2005) idealized cross section of the Comstock Lode

from 1860 to 1880 during which time more gold and silver was produced from this area than all the rest of the United States. Before production came to a halt in 1984, 192 million ounces of silver, and 8.2 million ounces of gold were produced from an east dipping zone at the bottom of Mount Davidson (Figure 5). This zone of mineralization is called the Comstock Fault zone. The zone extended from the Cedar Hill mine located at coordinates 4,355,620N and 271,883E to just about the Belcher Shafts located at coordinates 4,352,139N and 270,485E how long is this zone in miles?(48)_____ In the Cedar Hill Mine area are lots of little symbols that look like Y's what are these?(49)_____ And the Cedar Hill mine is an?(50)_____ Bonanza ores that came out of these adits, declines, or open pits consisted of quartz, calcite, sphalerite, galena, chalcopryite, pyrite, acanthite, argentite, and gold.

Men mining the Comstock Deposit were in constant danger. The mines were 2,500 – 3,200 feet deep, hot, humid, and unstable. Many men suffered from pneumonia from working in cold mountain air that was constantly mixing with air temperatures that reached 100 - 125°F. Many were killed or injured in mine cave-ins caused by moisture rotting timbers and clay rich rocks that swelled with the introduction of moisture. However, most fatalities were due to poor air circulation or bad air, as well as silicosis caused by breathing high concentrations of quartz dust. Adolph Sutro, a German immigrant, saw an opportunity to make his fortune and started the construction of a tunnel which would both drain the water from the main Comstock workings (decreasing the temperature of the mines, reducing damage caused by moisture) and create ventilation through the workings via (air) shafts placed along the tunnel. The tunnel took 13 years to complete and reached the Savage Mine in July of 1878. The Savage Mine is located at 271,498E and 4,353,962N. What is the bearing or azimuth of the southeast trending Sutro Tunnel from the Savage mine?(51)_____ The tunnel extends 4 miles in this direction and it's portal is northeast of Dayton, NV. How many air shafts can you see on our map along the Sutro tunnel? (52)_____ What are the elevations of each shaft from east to

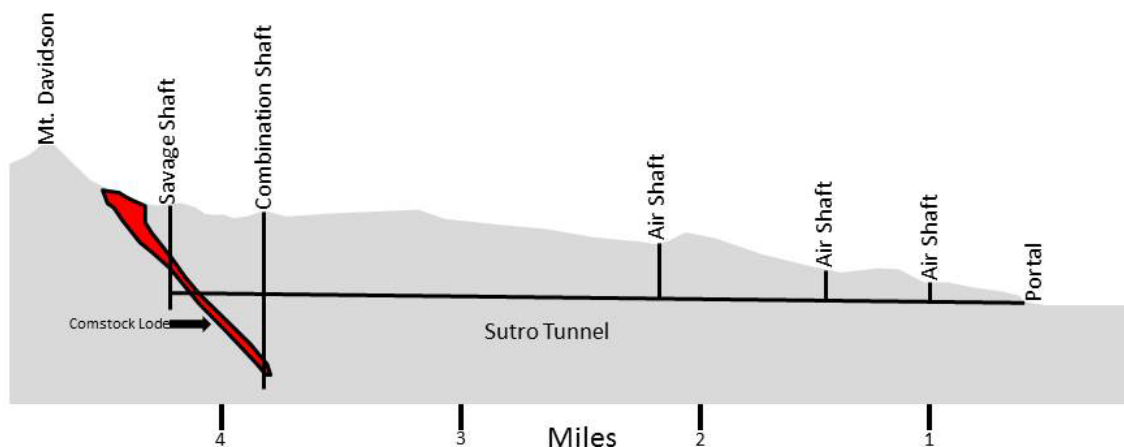
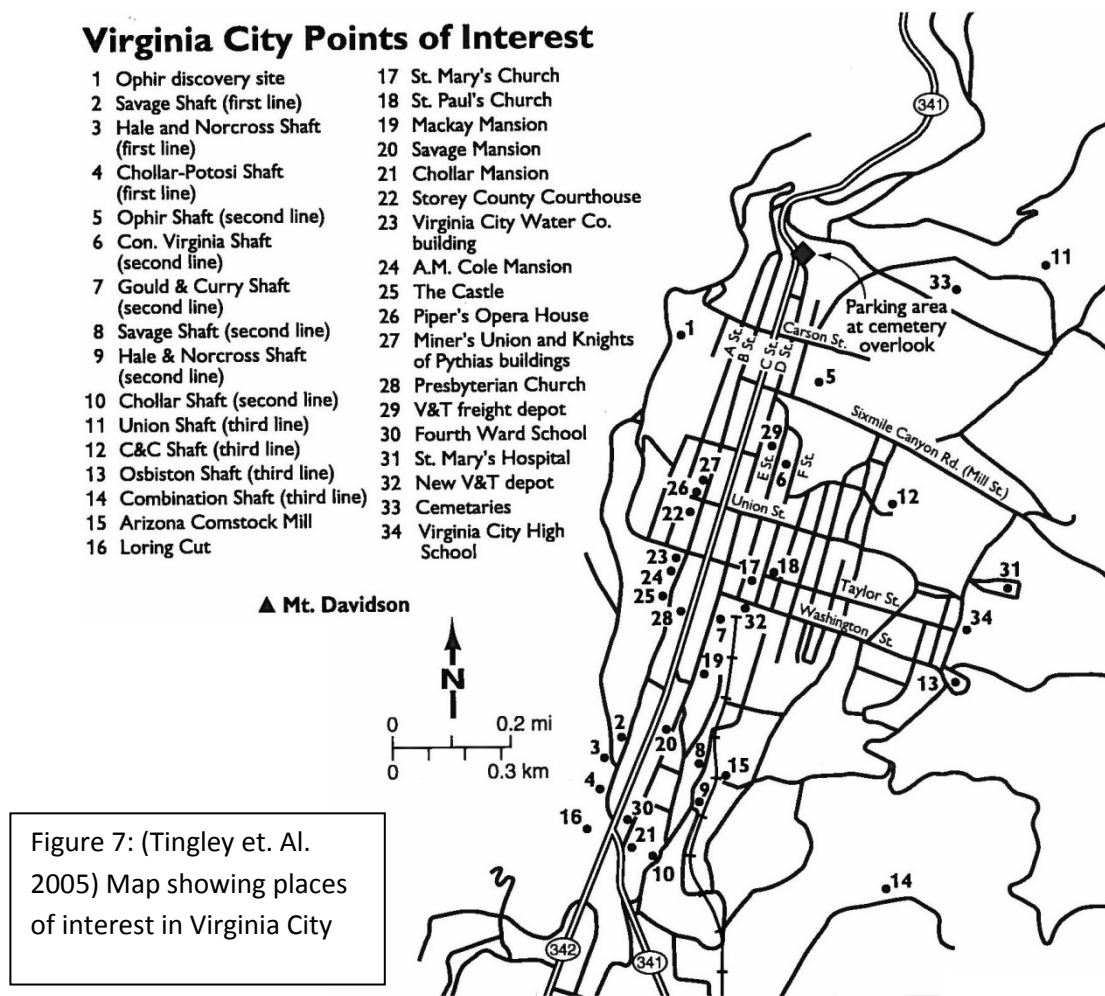


Figure 6: (Tingley et. Al. 2005) Cross section of the Sutro Tunnel

west?(53)_____ Water still drains from the mouth of the tunnel today.
Refer to figure 6 for a diagram of the Sutro Tunnel.

Virginia City at its peak had 25,000 permanent residents with another 9,000 to 10,000 people living in Gold Hill. Walking around downtown Virginia city during 1876 one would find over 100 saloons, six churches, four banks, an opera house the V & T railroad that rolled as many as 45 trains through in a single day. By 1890 only 6,000 residents remained and by 1923 only 1,500. Today the population is only 930 but mining still continues on the Comstock Load. Valerie and Linda will finish up their trip by using Figure 7 to tour Virginia City!! There is much more history to learn about Virginia City that can be obtained at every stop and walking tour brochures are available at the Visitors Center of Virginia City and the Gold hill Chamber of Commerce. What a wonderful trip!!

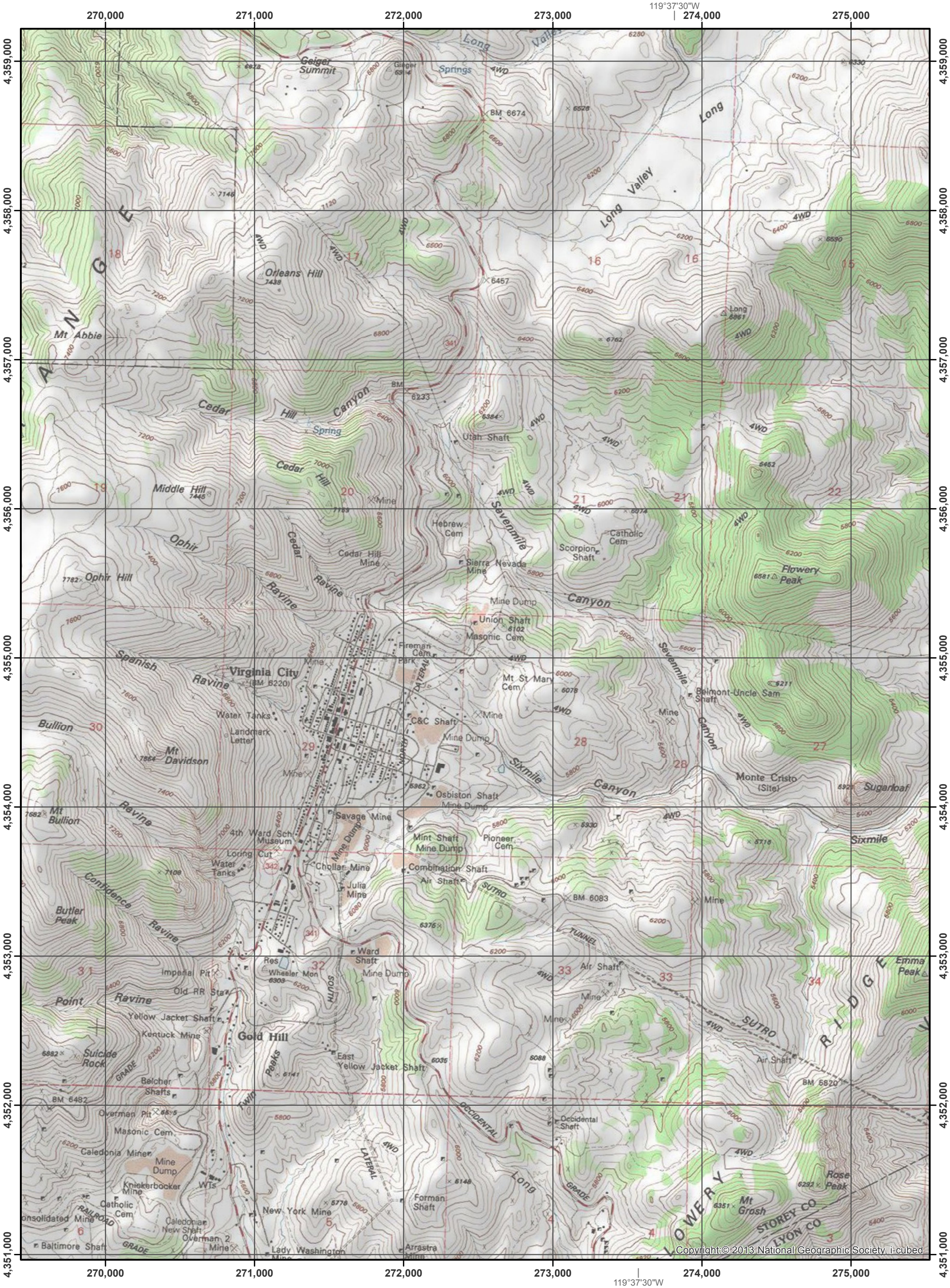


References:

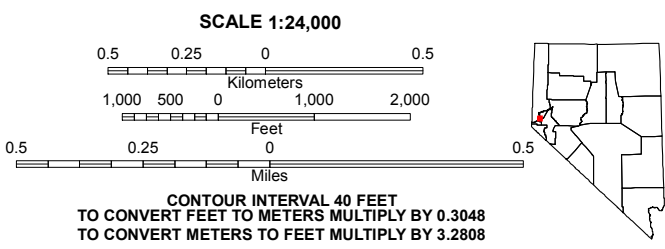
Most information on Virginia City was taken from the following references:

Smith, Grant M., 1943, The History of the Comstock Lode 1850-1920, University of Nevada Bulletin No. 37

Tingley, J. V., Pizarro, C. R., Purkey, B. W., and Garside, L. J., 2005, Geologic and Natural History Tours in the Reno Area Expanded Edition. Nevada Bureau of Mines and Geology Special Publication 19.



NEVADA DIVISION OF MINERALS
MAP CREATED BY NEVADA DIVISION OF MINERALS
Map is for NEVADA DIVISION OF MINERALS use only
NOT FOR PUBLIC USE
NAD 83 zone 11
Data provided as of 7/1/2015
Nevada Topoquad: Virginia City



QUADRANGLE LOCATION

ADJOINING 7.5' QUADRANGLE NAMES

Mount Rose NE	Steamboat	Chalk Hills
Washoe City	Virginia City	Flowery Peak
Carson City	New Empire	Dayton

ROAD CLASSIFICATION

Primary highway hard surface	Light-Duty road, hard or improved surface
Secondary highway hard surface	Unimproved road
Interstate Route	U.S. Route
Hazards	Incline
Adit	Open Pit
Decline	Shaft

Road Conditions

Phone (Toll Free) 

Outside Nevada..... **(877) NVROADS**
(877) 687-6237

Website **www.nvroads.com**

Radio Frequencies

Carson City.....	1610 AM
Lake Tahoe.....	530 AM
Las Vegas.....	1610 AM
Reno.....	530 AM
Elko.....	1610 AM

Road Emergency

Nevada Highway Patrol*647
or dial operator and ask for Zenith 1-2000

Medical Emergency

Phone 911

NDOT Traveler Information

Phone(775) 888-7000
Twitter@nevadadot
Website.....www.nevadadot.com

Oversize/Overweight Vehicles

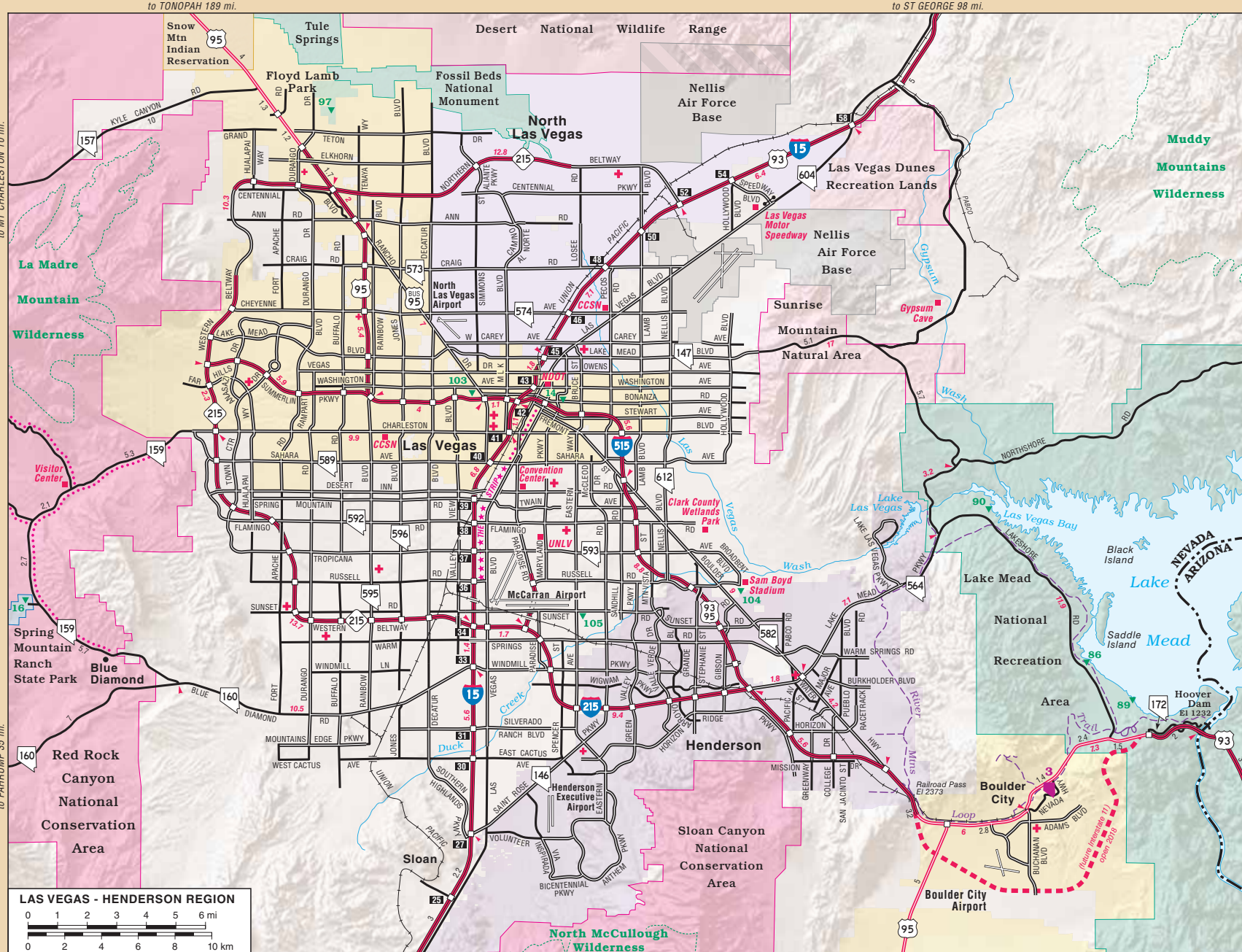
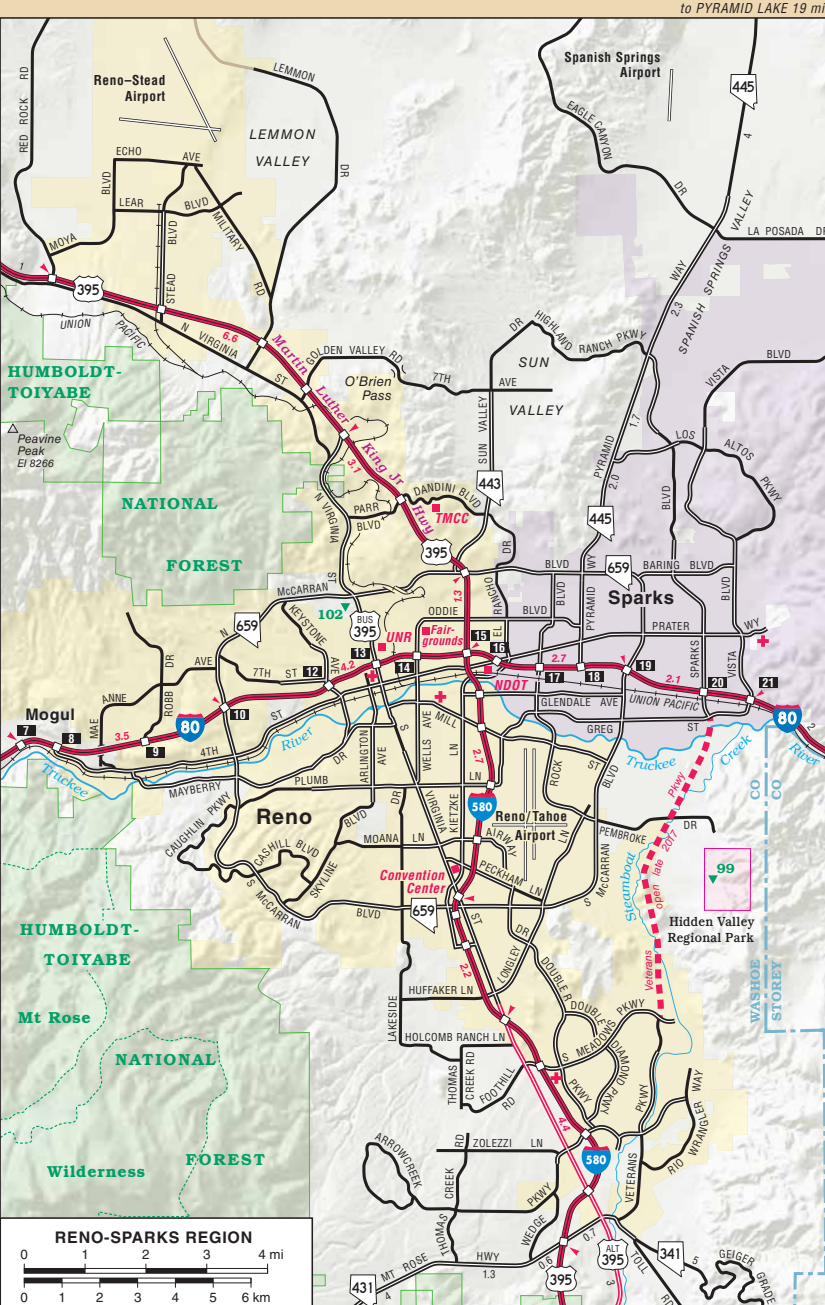
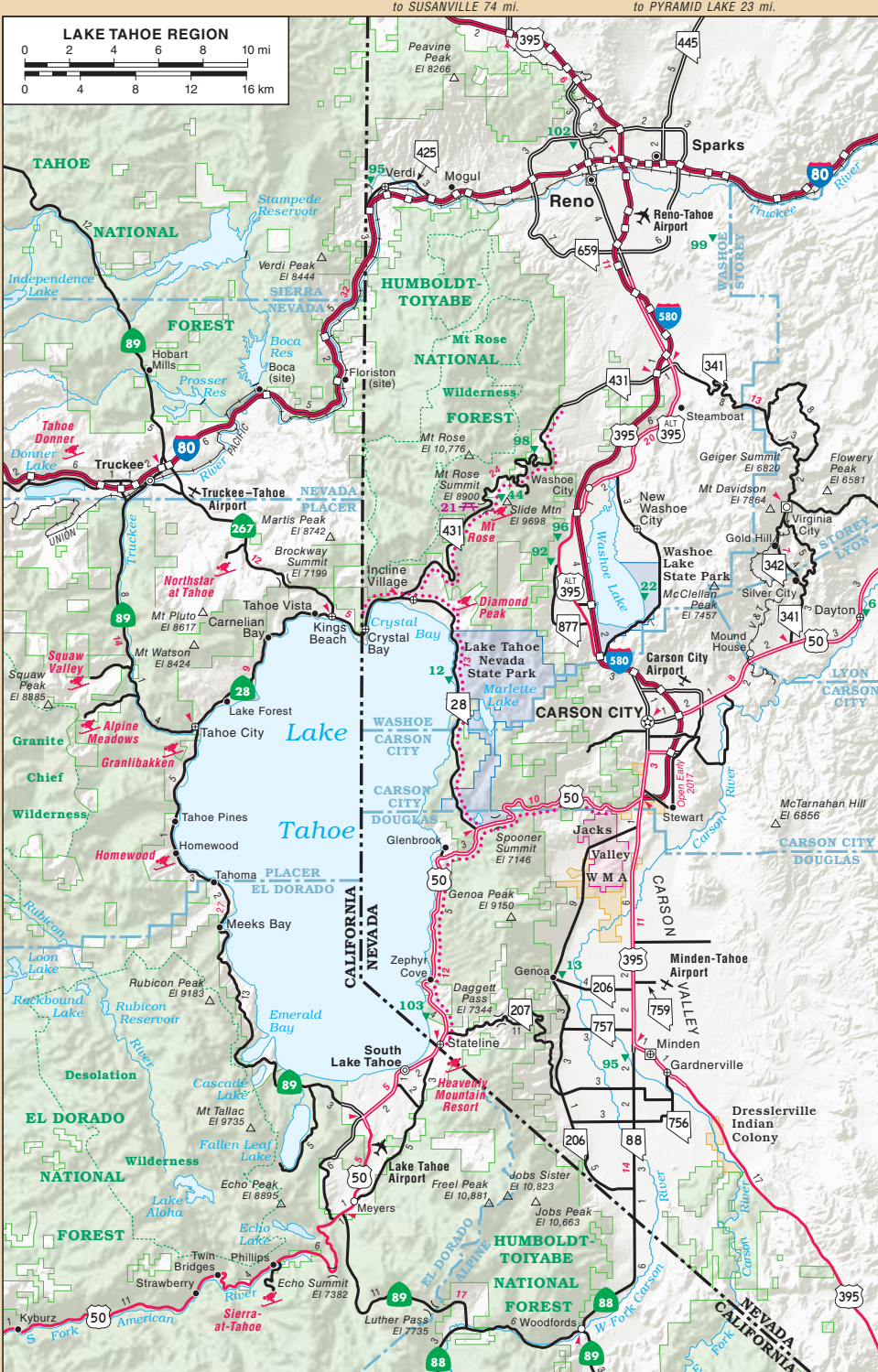
Phone (800) 552-2127
Website
www.nevadadot.com,
select commercial vehicles

Bicycle Information

Phone (775) 888-7433
Website.....www.bicyclenevada.com

Tourist Information

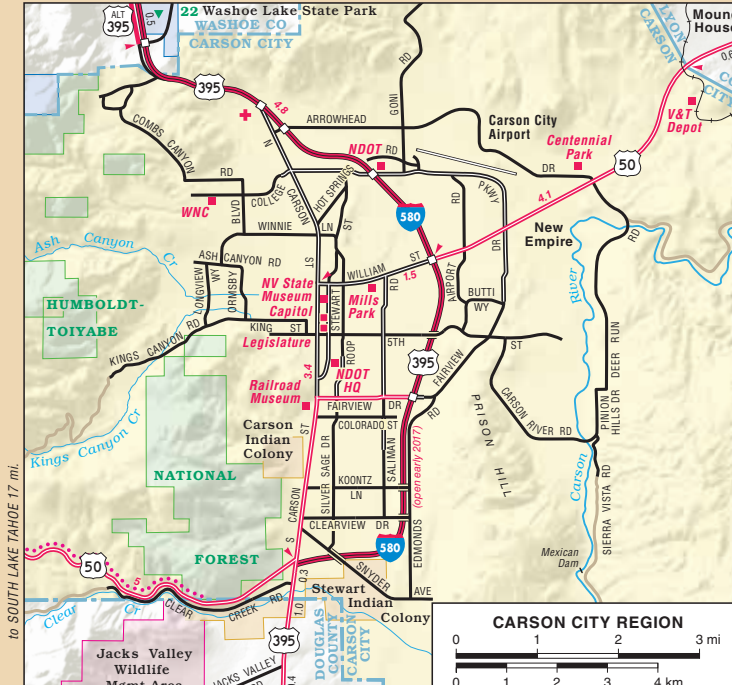
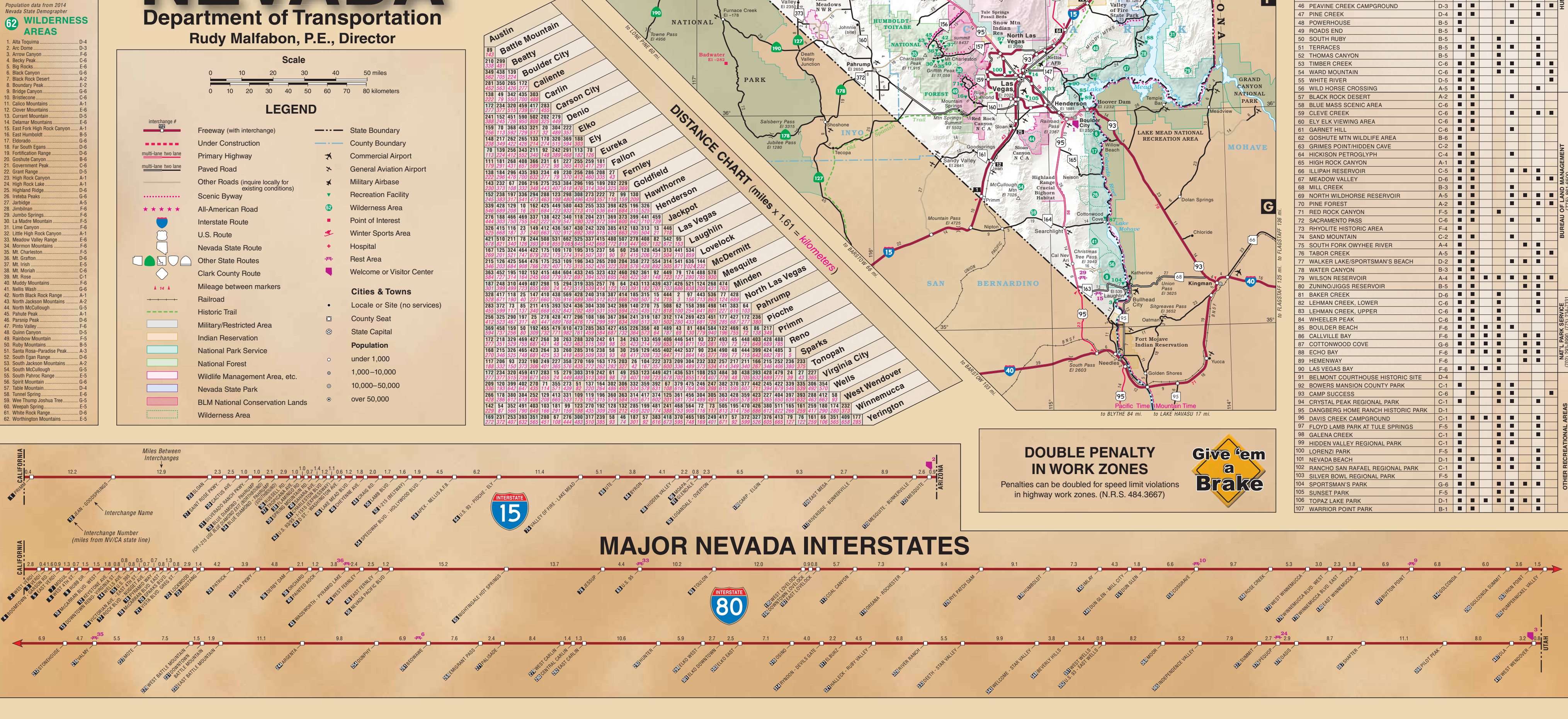
Phone (800) NEVADA8
(800) 638-2328
Website..... www.travelnevada.com



**MOTORISTS ARE CAUTIONED TO INQUIRE
LOCALLY ABOUT ROAD CONDITIONS
BEFORE TRAVELING ON UNPAVED ROADS**

A red-bordered sign with a black background. It features a white telephone handset icon with a diagonal slash through it, indicating that phone use is prohibited. The text "NO PHONE ZONE" is written in white capital letters on the left side of the sign.

All handheld cell phone use is illegal while driving in Nevada, excluding emergency calls.
Up to \$250.00 fine.

[illegible][illegible][illegible]

Key to Understanding Maps Activity

1. Small Scale
2. ~25 miles
3. 511
4. 427 miles
5. Point of Interest
6. US Route 93, Nevada State Route 375, then Interstate Route 6
7. Extraterrestrial Highway
8. ~160 miles
9. Blue Jay
10. Picnic Tables, Litter Barrels, and Running water
11. Tonopah
12. 1,000-10,000
13. County Seat
14. 380 km
15. U.S. Route 95 to Interstate Route 80
16. Silver Peak Range
17. Piper Peak, El 9450
18. Rhodes Salt Marsh
19. General Aviation Airport
20. 163
21. Mineral
22. Mileage between markers
23. 33 miles
24. Walker Lake
25. Picnicking, Boat Launching, and Fishing
26. Indian Reservation
27. Railroad
28. Yerington
29. A historic trail called the Carson Trail
30. Large Scale or 1:24,000
31. Virginia City
32. Storey County
33. 2,000 feet
34. Flowery Peak
35. 40'
36. A Mountain
37. Bulls-eye pattern of closed contours
38. 6934 feet
39. Northeast-Southwest
40. Widely spaced contour lines/no topography
41. Southwest
42. The V-shaped pattern made by contour lines point upstream
43. 7864 feet
44. Northeast-Southwest
45. Ophir Ravine
46. Bullion Ravine
47. Because the contour lines are really close together
48. ~2.5 miles
49. Adits or declines
50. Open Pit
51. 105°
52. 3
53. 5520 ft, 5840 ft, & 6020 ft