Guide for the Earth Science Week Field Trip, October 10 or 11, 2009
Nevada Bureau of Mines and Geology Educational Series E-48

Digging Deeper into the Comstock

2009 is the 150th anniversary of the 1859 discovery of the Comstock Lode, one of the richest vein deposits of precious metals ever found, and in honor of the sesquicentennial year of that historic event, Nevada Bureau of Mines & Geology's annual Earth Science Week field trip will visit Virginia City, the "Queen of the Comstock." Along the way, we will visit several sites where we can examine and collect rocks that help earth scientists explain the geologic history of the area surrounding Virginia City and learn more about how the Comstock Lode formed.

Virginia City, with its honeycomb of underground mine workings and many surface open pit operations is located high on the east side of the Virginia Range, which consists mostly of Oligocene to Miocene volcanic rocks that overlie Mesozoic metamorphic rocks and Cretaceous granodiorite. Andesitic to dacitic (intermediate) volcanic rocks – mostly flows and breccias – and associated intrusions, began to erupt about 18 million years ago and continued until about 8 million years ago with later rhyolitic and basaltic (bimodal) volcanism continuing to only a million years ago. About the same time the earlier volcanic rocks were being erupted, the Davidson Diorite was intruded, which now forms most of Mt. Davidson just west of Virginia City. As the volcanic system waned, hot water continued to percolate through fractures, altering and mineralizing the broken rock in what is called a hydrothermal system, much like that surfacing at Steamboat Hot Springs today. We will look for evidence of hydrothermal alteration of the rocks along the route and in the Comstock district, where the original minerals of the fresh, gray volcanic rocks have been leached away and new minerals formed, often lighter and brighter in color and softer than the original unaltered rock. Hydrothermal systems also deposited the gold and silver that led to the development of the mining district. Several widespread episodes of hydrothermal activity and precious metal mineralization have been identified by the many generations of geologists who have studied the rocks of the Virginia Range. Recent work (Nevada Bureau of Mines and Geology Map 165, *Geologic map of the Virginia City quadrangle*, 2009) documents several separate volcanoes and hydrothermal systems, including the famous Comstock Lode.

Field trip participants will meet at UNR's and the Nevada Bureau of Mines and Geology's new Great Basin Science Sample and Records Library (GBSSRL) (photo 1) (*map and directions)* on the campus of the Desert Research Institute. The building houses our publication sales office, where you can park (free!) and find topographic maps for the entire state as well as many publications dealing with Nevada geology. Please feel free to return during normal business hours (Monday–Friday, 8–4) and browse our maps and publications.

Field trip road log

Leave NBMG GBSSRL parking lot at 2175 Raggio Parkway. The DRI campus is built on Miocene andesite. The area was in the midst of a volcano about 12 million years ago. This rock has locally been hydrothermally altered to quartz (forming the prominent knobs, often colored red and orange from iron oxides and oxyhydroxides, hematite and goethite) or clays (smectite and illite-smectite), which expand when wet from rain water and contract when they dry out.

Cumulative Mileage:

0.0 From the GBSSRL parking lot, turn right on Raggio Parkway.
0.1 Turn left (west) on Dandini Parkway.
0.3 Roundabout – continue straight west.
0.5 Turn left onto onramp for US 395 South.
7.3 **Take EXIT 63** – bear right at fork to South Virginia Street.
7.6 At bottom of ramp, turn left onto South Virginia Street.
7.7 Turn left on McCarran Blvd. On the skyline ahead is a "V"-shaped area of orange-colored rocks altered by the Hidden Valley hydrothermal system, which is similar to other hydrothermal systems we will discuss later today.
9.0 Pass intersection with Longley Lane.
9.1 Turn right on Alexander Lake Road immediately after intersection with Longley Lane. Pass water tank and Huffaker Hills Trailhead parking on right.

11.0 **STOP 1: Huffaker Hills composite volcano.** Carefully pull over and park on the right shoulder of the road across from the large roadcut. Please use caution crossing the road. We will look at a variety of rocks that make up the Huffaker Hills composite volcano exposed in this roadcut *(photos 2 and 3).*

Look for different rock types, how the different layers of rock are oriented, and any structures that cut through them. Beginning about 15 million years ago and until about 8 million years ago, this was a center of much volcanic activity. Over many years, a volcano or perhaps several volcanoes spewed out lava, gas, and ash that fell and flowed down slopes, out over the landscape, and hardened into rock. The rock itself is intermediate in composition between basalt, a black volcanic rock like the Hawaiian Island volcanoes, and rhyolite, a lighter-colored silica-rich volcanic rock more common in continental areas. These rocks range from andesite to dacite in composition. The textures of the rocks are determined mainly by how they were ejected from the volcano and what happened to them afterwards. Some flowed as lava and hardened into rock; some were blown up into fragments and thrown out to flow down the slopes mixed with water and gases into a viscous mudflow or ashflow full of pieces of volcanic rock. Some are sedimentary rocks, deposited by water, but containing only fragments of igneous rocks. Some layers contain more ash and fewer fragments; others are composed predominantly of rock fragments of various sizes. See how many different layers of this volcaniclastic rock you can identify, remembering that each represents a distinct explosive volcanic event. Some of the rocks here will attract a magnet because they contain an appreciable amount of the magnetic mineral magnetite. Test all rocks you find today to see which ones most strongly attract a magnet, and which ones do not. Hydrothermal alteration typically converts magnetite to pyrite, and later oxidation by rain water converts the pyrite to hematite or goethite.

There is evidence here that the volcanic events were accompanied by (or perhaps followed by) earthquakes. Look for places where the volcanic rock layers have been cut and offset from each other. In places, the fault scarps have been subsequently eroded down, covered by more volcanic rocks, and cut again by a later fault *(photos 3 & 4). Almost all the rocks we see today will be volcanic in origin, but these are some of the least changed by hydrothermal systems that we will see.*

Return to vehicles and continue east on Alexander Lake Road.

11.3 The South Truckee Meadows Water Reclamation Facility is on the right near Alexander Lake. It is permitted to treat up to 4 million gallons per day of sewage sludge.

12.4 At “T” in road, turn right on unmarked gravel road, parts of which are known as Mira Loma Road, Bella Vista Ranch Road, or Desert Way.

12.8 At the base of the hills both east and west of us, A & K Earthmovers leases privately owned land to operate the Bella Vista materials pits, where they crush and screen rock and alluvium for use in a variety of residential and industrial construction projects around the Truckee Meadows and elsewhere. Most of their products are foundation base rock, drain rock, and sand.

13.0 Cross over culvert containing A & K’s conveyer belt that is used to transfer crushed rock from the Bella Vista Pit #2 on the west to their screening plant on the east side of the road. Although Nevada’s top ranking in production of precious metals has a higher profile, production of construction aggregate from rock and gravel has often rivaled precious metals in annual total value of material mined in Nevada. Watch for mustangs that frequent the area. Some wetlands here have been rehabilitated, reclaimed, and improved as ongoing cooperative projects between the mine producers, local communities, and developers.

14.1 Sage Hill Gun Club is east of the road.

14.4 Dogleg right to continue south on paved Rio Wrangler Drive.

15.0 Stop Sign at Steamboat Parkway intersection.

15.5 Pass Damonte Ranch High School on left. The bare, light-colored rock area on the hillside to the east is Rilite Aggregate Company’s quarry (visited on our 2007 ESW field trip), where a light gray to pink flow-banded rhyolite is crushed and screened for use in construction and as decorative rock. The rock is mined from a rhyolite lava dome only 1.2 million years old, much younger than the more intermediate composition lavas we will be seeing over most of this field trip. The rhyolite is similar in age to the Mustang basalt we visited on last year’s ESW field trip.

16.8 Turn left on Veterans Parkway.

17.6 Turn left on Curti Ranch Road.

18.0 Turn right on Equestrian Road.

18.3 At traffic light, turn left on Geiger Grade Road, SR 341.

As we drive up the Geiger Grade, take note of the rocks along the road and any differences between these rocks and the volcanic rocks at STOP 1.

20.4 Pull off in the wide parking area to the right forming two or three lines of vehicles. Please be careful crossing this busy road.

STOP 2: Ferricrete deposits. Walk up and cross road to look at red-colored outcrops of ferricrete *(photo 5)*. Ferricrete is a rock composed of fragments of other rock cemented with iron oxide (hematite, Fe_2O_3) or iron oxyhydroxide (goethite, FeO(OH)). The fragments are hydrothermally altered Miocene volcanic rocks that have been cemented with goethite and perhaps hematite that precipitated from natural acid-rock drainage from a nearby pyrite-rich occurrence. The ferricrete is Quaternary in age. The wide place where our vehicles are parked is actually the remains of a mining operation called the "clay pits." In the early 1900s, clay from altered volcanic rocks was hauled from here to Reno, where it was used in brick-making. Note that in many of the areas along the highway, the acidic soils support only Jeffrey Pine, while less altered areas support a more diverse plant community that includes sage, piñon, and juniper.

Return to vehicles and continue east on Geiger Grade.

21.2 Pull over on wide shoulder of road at Geiger Overlook as far as possible and park close together to maks space for all vehicles.

STOP 3: Geiger Grade Overlook. Walk west to the overlook, which is on a knob of silicified hydrothermal breccia with fragments of altered volcanic rock cemented by alunite and quartz. From the overlook here you can get a good feel for the regional geology *(photo 6)*. The Carson Range on the western skyline is a N-S trending uplifted block of Cretaceous granodiorite (well-exposed on Slide Mountain) intruded into Triassic-Jurassic age metamorphic rocks (on Peavine Peak) or capped by volcanic rocks (as on the top of Mount Rose). The valley below has been dropped down relative to the Carson Range by Basin-and-Range faulting, which in this area has been active from about 6 million years ago to the present day. In some places the faults cut across the alluvial fans that have developed at the mouths of the canyons in the Carson Range, like the prominent Mount Rose fan below. Geologists can date the earthquake history along these faults by trenching the unconsolidated alluvium across the faults and mapping the trench walls in detail.

The Steamboat geothermal area is visible from the viewpoint, which we visited on our 2007 ESW field trip. Ormat owns and operates the Steamboat Geothermal Complex of power plants in the Steamboat Hills, including the Steamboat 1A, Steamboat 2 and 3, Burdette, Steamboat Hills, Galena 2, and Galena 3 power plants. In aggregate, these plants produce a total of about 103 megawatts of power (one megawatt is capable of providing electricity for about 1,000 residences). Electricity produced at the plants is sold to NV Energy. The original Steamboat Hot Springs in the lowest part of the valley have been commercially developed since the 1860s by private owners.

Return to vehicles and continue up Geiger Grade.

23.8 Storey County line.
24.9 Pass Geiger Grade historical marker on right.
27.3 Pass Lousetown historic marker on left.
28.0 Pull over to left of highway and park in large pull-out making two lines of vehicles.

STOP 4. Cross road to look at road cut. We are standing approximately on the trace of the roughly N-S-trending Comstock fault, which is the "plumbing system" for the hydrothermal activity that formed the Comstock Lode. The rocks in the roadcut are in the footwall of the fault (the upthrown or mountain side) and consist of volcanic flows and lahars of mostly Silver City andesite in which the original minerals have been altered to epidote, chlorite, and calcite, typical of what is called propylitic alteration. These minerals give the maroon-colored volcanic rock some splotches of green that are characteristic of propylitic alteration. You may be able to distinguish individual areas of pea-green epidote and darker bluish-green chlorite in the outcrop. The fresher-looking, gray rock on the left end of the roadcut is a dike of biotite hornblende andesite porphryry that cuts across the altered volcanic rocks. Use your magnet to test for the presence or absence of magnetite, which occurs in unaltered andesite.

Return to vehicles and continue on south on SR 341.

29.8 Entering Virginia City.
30.5 Turn left on Carson Street, the first cross-street in town, at the green "Cemetery" sign.

30.6 Turn right at the white “Cemetery” sign and park in gravel area above Miners Park.

31.6 **LUNCH STOP:** *Miners Park has a shaded pavilion, picnic tables, grass, trees and flush toilets.*

Overview of Comstock geology and history.

Virginia City’s mines produced a huge amount of silver as well as gold from the Comstock Lode mainly between 1859 and 1900, and mining along the trend continues to this day. The Comstock Lode is a set of roughly parallel quartz veins that extends for more than 13,000 feet along the east flank of the Virginia Range The vein was exposed at the surface in the area of the Kendall Cut above “A” Street, which we will visit next, and dipped or tilted down to the east at an angle steeper than the hillside, so the mines farther downhill from “A” street had to go progressively deeper and deeper to intersect the veins.You may notice that the size of the mine dumps increases downhill, indicative of the greater amount of material that had to be dug out to reach the orebodies. Refer to the “Comstock Facts” page at end of log for more detailed information.

The prominent brick building visible below C Street labeled “Mackay Mansion” is the Gould and Curry Mining Company Office, which was built in 1860 and provided accommodations for the mine superintendent. The three-story house was first occupied by a young mine superintendent named George Hearst, who successfully invested $400 of borrowed funds in Comstock mines. In just a few years, he grew his borrowed money to several million dollars that he later used to build the legendary Hearst fortune. After the building survived the Great Fire of 1875, it served as the business headquarters and short-time residence of John Mackay, an Irish immigrant mining engineer who in 1872, along with engineer James G. Fair and 2 saloon-keeper partners, James C. Flood and William O’Brien, discovered the Consolidated Virginia’s “Big Bonanza” in 1873. It was a 7-foot-wide segment of the Comstock Lode located 1,200 feet below the surface that was mined to produce $400 million dollars worth of silver and gold over the next five years. The Mackay School of Mines at the University of Nevada, Reno, now part of the College of Science, was later built by John Mackay’s family. In 1876, the Mackays sent a half ton of Comstock silver from the mine to Tiffany’s in New York for the creation of an elaborate silver service, many pieces of which are still on display in the lower level of the Mackay School of Mines Building on the UNR campus.

Return to vehicles and drive west back up Carson Street, passing C, B, and A Streets.

30.8 **STOP 5. Kendall Cut.** Park carefully along roadsides near A street, with some parking in the cut area for jeeps with high clearance. Walk to the disturbed ground to the south *(photos 7 & 8).* This area is the heart of the original discovery of the earliest and richest of the Comstock mines. The Comstock fault surfaces here, along which the hydrothermal alteration and mineralization occurred that formed the Comstock Lode. It dips steeply down to the east. The Kendall Cut is located on the Ophir orebody. The rock in and around the outcrop shows the pervasive quartz stockwork veining typical of the Comstock Lode. Scattered ore stockpiles here contain a variety of minerals – look for pyrite, chalcopyrite, galena, sphalerite, and dark gray-black silver minerals such as stephanite (silver antimony sulfide) or acanthite (silver sulfide) in stockwork-veined quartz, which may be light purple-colored amethyst in places.

After the Kendall Cut stop, please take an hour to visit sites in Virginia City and reconvene the field trip at 2:30 PM in the gravel “parking area” opposite the Fourth Ward School at the south end of the Virginia City business district. Directions below will take you to the Loring Cut and Fourth Ward School.

31.0 Turn right (south) on B Street.

31.9 **Stop where B Street rejoins C Street/SR 341.** Park in gravel area on right side (west), opposite the Fourth Ward School, near the wooden “Chollar Raise/New Savage Mine” sign.

STOP 6: Loring Cut. Walk to the gravel area to the west called the Loring Cut, which was mined until recently by United Mining Company *(photos 9 & 10).*

PLEASE BE EXTREMELY CAREFUL IN THESE AREAS AND AVOID ANY HOLES, FENCED AREAS, OR UNSTABLE GROUND. THERE HAVE BEEN RECENT CAVE-INS OF OLD UNDERGROUND BURIED STOPES REPORTED IN THIS AREA. The scarp above the water tanks is the west splay of the Comstock fault zone, and we are parked about on the trace of the east branch of the fault. This is the southern end of the mile-long heart of the Comstock Lode. Older andesites and Davidson Diorite are exposed in the pit area, cut by many small faults. The rocks here have been extensively altered and mineralized. According to one expert on local mining geology, some of the rock in the cut face by the road still “runs” as much as 10 grams of gold and 90

grams of silver per ton of ore. Some of the exposed timbers in back-filled workings here date from the earliest mining in the 1860s. Just to the west of the lode is barren quartz that is not even anomalously high in gold and silver, thus it was called “bastard quartz” by the early miners. Examine the ore stockpiles and rocks in the Loring Cut.

Return to vehicles and REZERO ODOMETERS at the Loring Cut.

0.0 Turn right out of the lot, continue driving south, following the right fork onto SR 342.
0.7 Cross V&T Railroad tracks.
1.3 Turn right on American Flat Road (not marked), prominent dirt road marked by red safety cone and blue flagging. (Shortly after a tumbled-down wooden shack on right)
1.5 Turn sharply right (double back) on gravel fork.
1.6 Turn sharply left at corner of black fence. Follow the cemetery fence to the south and then west to gravel parking area.
1.8 Circle vehicles by large boulders and park.

STOP 7: Gold Hill Masonic Cemetery

Look at the landscaping boulders surrounding the parking area. What rock that we have seen today do they most resemble? Can you identify any minerals in them? The Gold Hill Masonic Cemetery is one of the oldest cemeteries in the area. Please be appropriately respectful of the graves. Examine the gravestones to see what materials were used. You should be able to find excellent examples of Prison Hill sandstone, the material that was used to construct the U.S. Mint and Nevada State Capitol buildings in Carson City. Look for Davidson Diorite and other rock types in float around cemetery.

Return to vehicles and retrace route back to the Loring Cut and the Fourth Ward School Museum.

3.6 **Fourth Ward School Museum** *(photo 11)*. Although this ends the guided geological portion of field trip, we have arranged for a reduced admission price of $3.00 per person (full price is $5) to the Fourth Ward School museum for all Earth Science Week field trip participants (show field trip name badge for reduced fee). There are many excellent educational exhibits on history and mining in Virginia City at the Fourth Ward School, and we hope you will include it as the final stop of your field trip today. The museum is open until 5 PM.

The guided Earth Science Week field trip ends here. Retrace the route back to the Reno-Sparks area or continue south to return via U.S. 50 and U.S. 395 through Carson City. Thank you for helping us celebrate Earth Science Week, which has been officially designated as the second full week of October by Nevada Governor Jim Gibbons, the U.S. Congress, the Association of American State Geologists, and the American Geological Institute to recognize the importance of geology and other Earth sciences to society. This field trip is sponsored by the Nevada Bureau of Mines and Geology, Mackay School of Earth Sciences and Engineering, College of Science, University of Nevada, Reno. If you have any questions about the geology, natural hazards, minerals, energy, or other natural resources of Nevada, please contact the Nevada Bureau of Mines and Geology by telephone (682-8767), e-mail (nbmginfo@unr.edu), or the Web (www.nbmg.unr.edu), or visit NBMG’s Great Basin Science Sample and Records Library between 8:00 a.m. and 4:00 p.m., Monday through Friday.

References

Hudson, Donald M., 2003, Epithermal alteration and mineralization in the Comstock district, Nevada: Economic Geology, vol. 98, p. 367–385.

Hudson, Donald M., Castor, Stephen B., Garside, Larry J. and Henry, Christopher D., 2009, Geologic map of the Virginia City Quadrangle, Washoe, Storey, and Lyon Counties and Carson City, Nevada: Nevada Bureau of Mines and Geology Map 165.

Tingley, Joseph V. and Tingley, Susan L., 2000, Exploring east of the summit, a field trip guide to Steamboat Springs, Lake Tahoe, and the Comstock area: Nevada Bureau of Mines and Geology Educational Series E-38.

Field trip guide prepared by D.D. La Pointe and J.G. Price, Nevada Bureau of Mines and Geology, October 2009.

Comstock Facts

Production:

- About 192 million ounces of silver and 8.3 million ounces of gold 1859–1986 (80% prior to 1880).
- Value at time of production, about $412 million.
- Value at today's prices, about $11 billion ($3 billion in silver plus $8 billion in gold).
- The Crown Point Bonanza, found in 1871, produced $35 million.
- The "Big Bonanza," found in John Mackay's Consolidated Virginia Mine, produced $105 million between 1873 and 1880.

Geology:

- Three distinct Miocene volcanic suites, one at 18.3–17.4 Ma, one at 15.8–15.2 Ma, and one at 14.9–14.2 Ma.
- Host rock, early to middle Miocene (15.8–15.2 Ma) Alta Formation andesite.
- Mount Davidson (above town, 15.3 Ma) is composed of Davidson Diorite (actually a granodiorite) which is correlative with age of Alta Formation; Davidson Diorite is in the footwall of the Lode for most of its length.
- Two types of mineralization are present:
  1. Regionally most extensive is advanced argillic, high-sulfidation mineralization (15.5–15.3 and 13.5–13.3 Ma). Lots of pyrite, silica ledges, and associated alunite, but very little gold or silver. Red rocks along Geiger Grade are evidence of this type mineralization.
  2. More restricted Comstock quartz-adularia, low-sulfidation mineralization (14.2–14.1 Ma). Quartz, calcite, adularia ores with associated silver and gold. This is the Comstock ore-stage mineralization.
- Most of the known orebodies occur within the Comstock fault zone (at Virginia City and Gold Hill), or the Silver City fault zone (at Silver City). A few orebodies occur in hanging wall fractures of the Comstock fault zone, such as the famous Con Virginia bonanza.
- The Comstock fault zone can be traced on the surface by pits that can be seen on the slope to the west above town and by silicified zones and veins (narrow, light-colored ribs) that can be seen cropping out on the steep slope above the pits.
- The Comstock Lode is a stockwork zone of quartz veins. Individual veins commonly are 0.1 to one inch wide, and rarely exceed one foot. Near surface, the veins are composed of calcite, quartz, and adularia. Deeper veins are entirely quartz with adularia. The veins are usually banded. Ore minerals consist of argentite and electrum with some galena, chalcopyrite, and minor pyrite.
- The vertical extent of the orebodies within the Lode rarely exceeded 500 feet, and strike lengths rarely exceeded 1000 feet. Mining widths were up to 150 feet.

Mine Areas and Names:

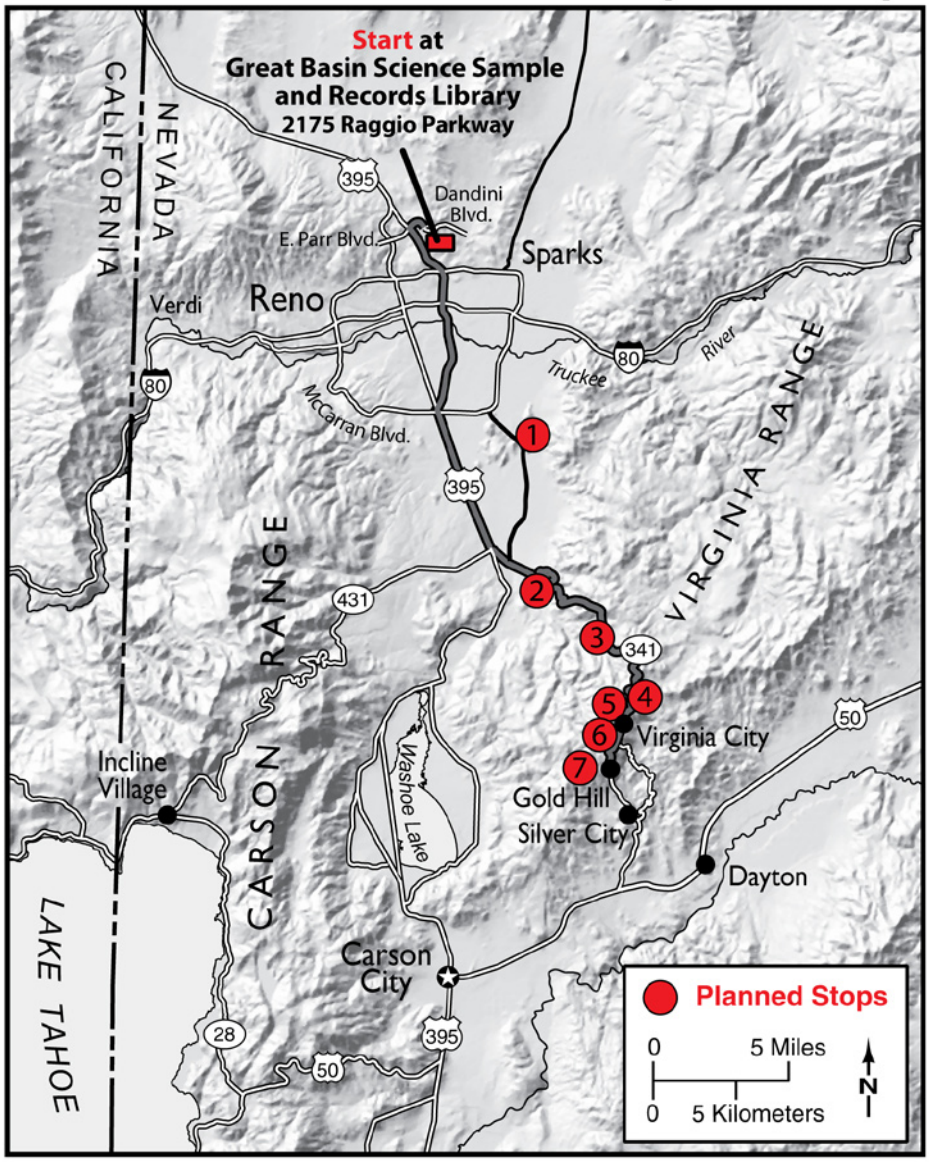
- Most Comstock descriptions speak of three groups of mines (*see map on page 8*):
  1. The South End Mines. These are the Gold Hill Mines including the Overman, Belcher, Crown Point, Yellow Jacket, and Imperial. The Gold Hill discovery was made on the Imperial.
  2. The Middle Mines. These are in the general area of the "Divide" between Gold Hill and Virginia City, and include the Best & Belcher, Gould & Curry, Chollar, Potosi, Savage, and Hale & Norcross.
  3. The North End Mines. These were the major producers under the north part of Virginia City, and included the Consolidated Virginia, Mexican, and Ophir, as well as the less productive Union and Sierra Nevada Mines in the cemetery area.
- Comstock descriptions also speak of three "lines" of shafts:
  1. The first line of shafts referred to in Comstock literature was along a line now marked by the several small open pits, above A Street. These shafts were collared on outcrops of mineralized Lode.
  2. The second line of shafts was generally along D and E Streets, and intersected the Lode around 1,500 to 1,700 feet below surface.
  3. The third line of shafts were sunk from locations below town to the east, and on the hills south of town. These intersected the Lode at depths of 2,500 to 3,200 feet. Many of these shafts reached the Lode late in the life of the Comstock, and few were economic ventures.

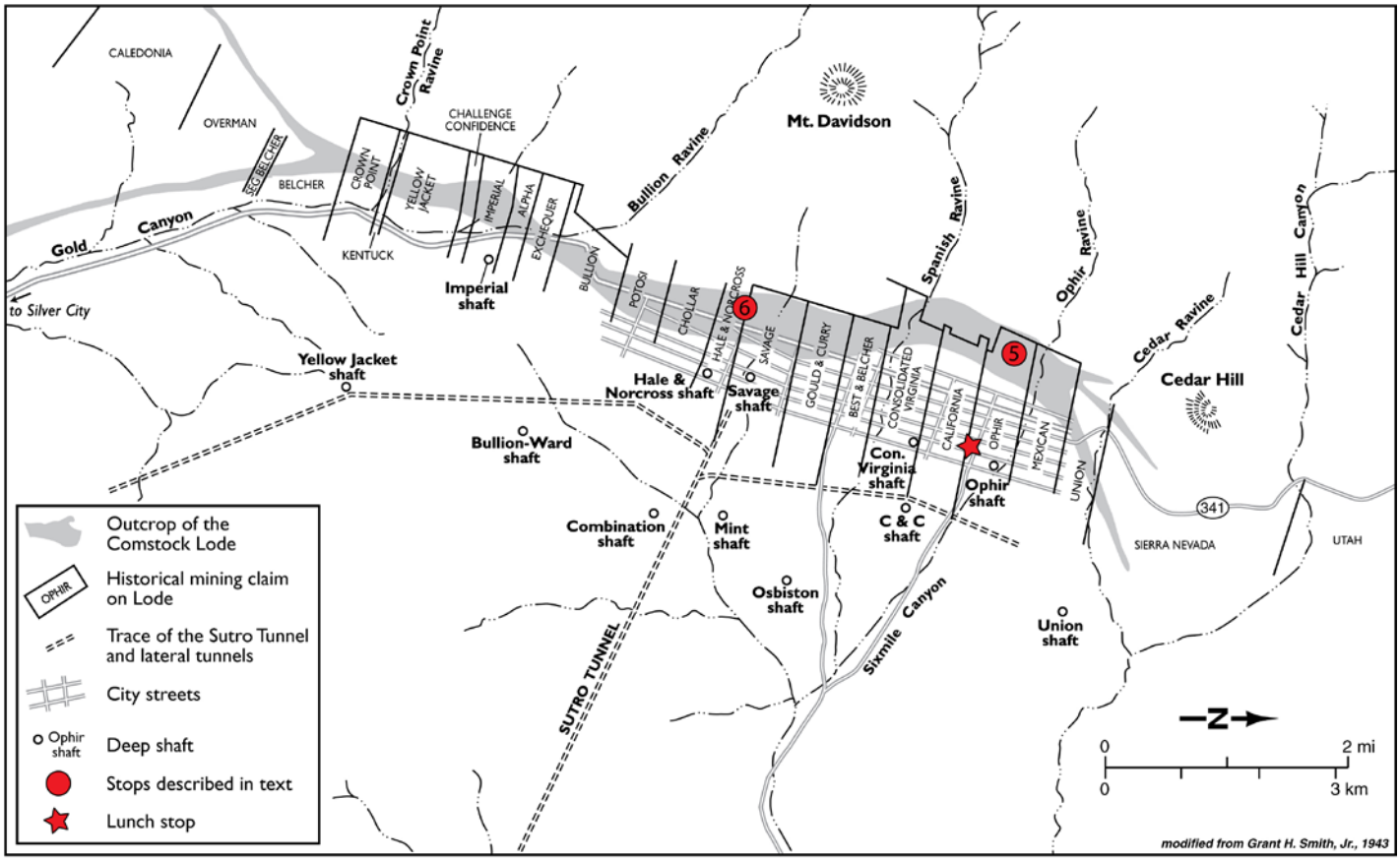
Sutro Tunnel:

- Driven under the mines near the level of the Carson River from a point on the range front about 4 miles to the southeast of Virginia City.
- Purpose was to drain the water from the mines, provide ventilation, and provide haulage route for ore through the tunnel to mills located on the Carson River near the tunnel mouth.
- Intersected the Lode at the 1,650 foot level of the Savage Mine in July 1878.
- By the time it intersected the Lode, the mines were as much as 1,500 feet below tunnel level.

Ma = million years ago

Earth Science Week 2009 Field Trip Route Map





Historical map of Virginia City showing generalized outline of the Comstock Lode, mining claims, and major shafts, and field trip stops.

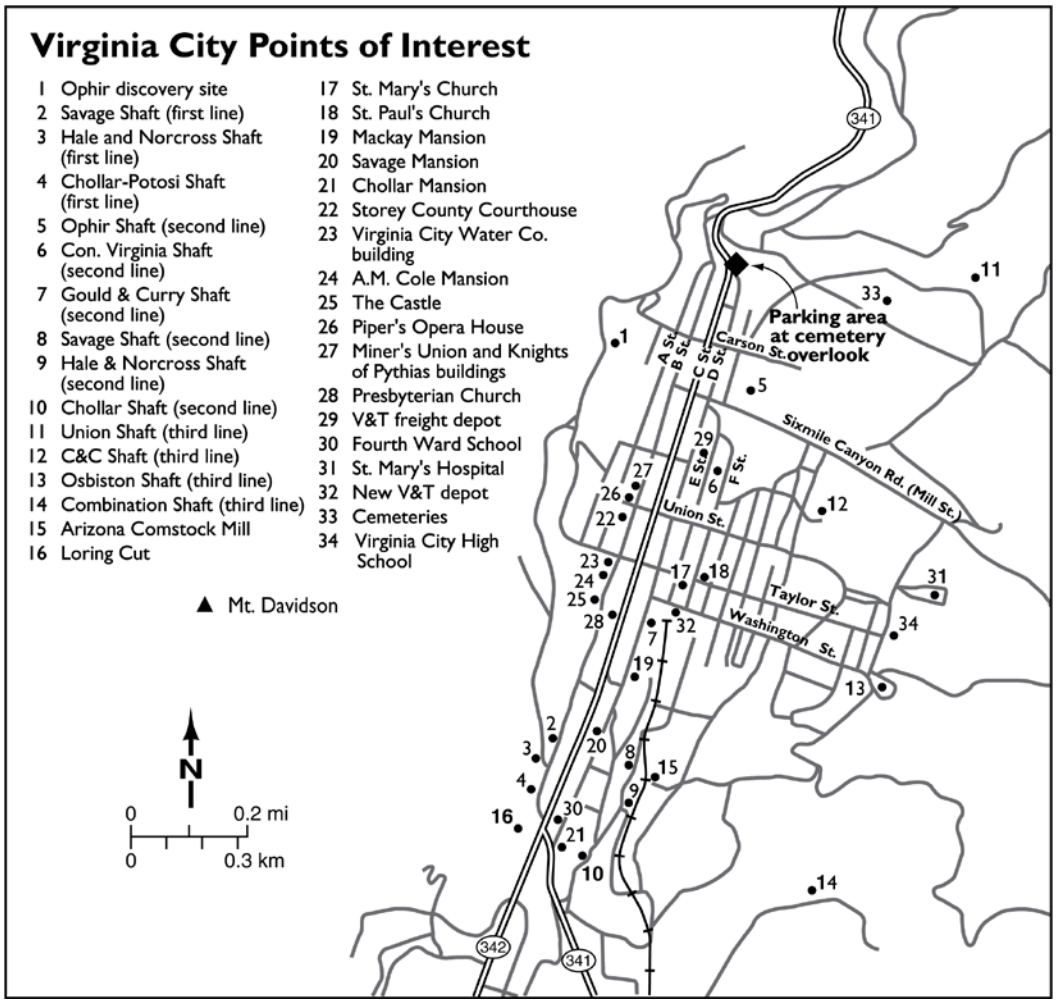


Photo 1. Nevada Bureau of Mines & Geology's new Great Basin Science Sample and Records Library on the campus of the Desert Research Institute.

Photo 2. Part of the road cut on Alexander Lake Road showing tilted layers of volcanic and volcaniclastic rocks.

Photo 3. Part of the road cut on Alexander Lake Road showing tilted layers of volcanic and volcaniclastic rocks cut by faults.

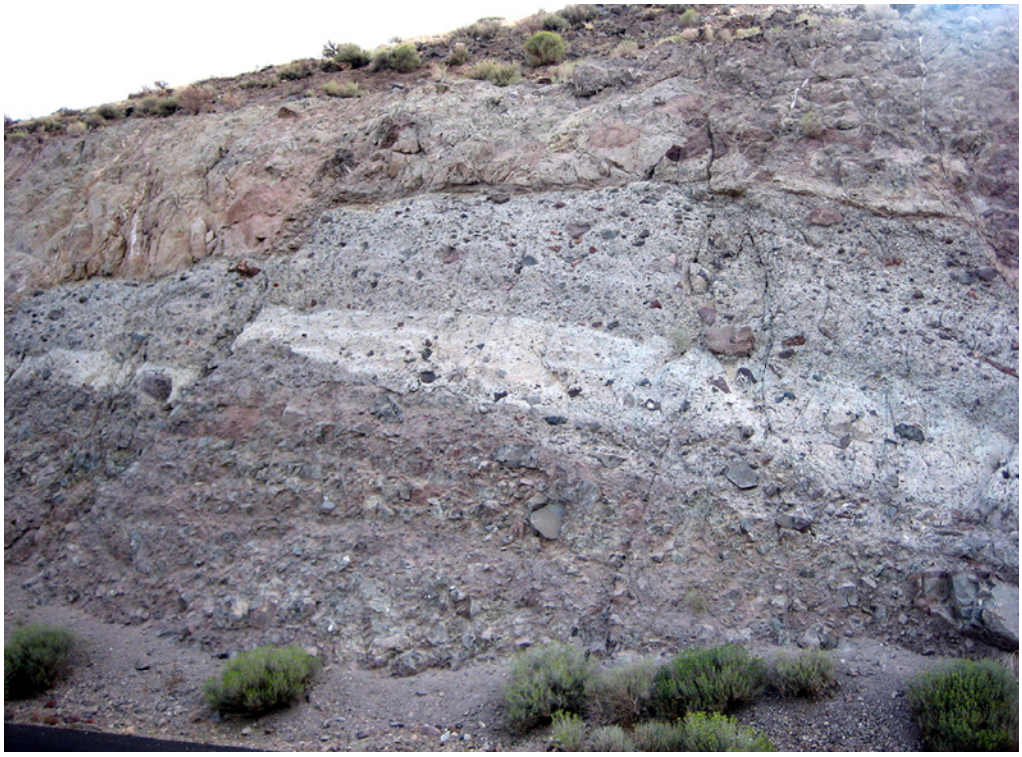


Photo 4. Tilted layers of volcaniclastic rocks cut and offset by faulting. Road cut on Alexander Lake Road.

Photo 5. Ferricrete outcrop on Geiger Grade Road.

Photo 6. View from Geiger Overlook showing Steamboat Hills and geothermal area, Carson Range and Mount Rose fan.

Photo 7. Ore stockpiles at the Kendall Cut, Virginia City.

Photo 8. Closed mine adit at the Kendall Cut, Virginia City. "Stay Out and Stay Alive."

Photo 9. Loring Cut, south end of Virginia City.

Photo 10. Loring Cut, Virginia City.

Photo 11. Fourth Ward School Museum, Virginia City.