This road log begins at Vale, Oregon on the west end of town where the Highway 20 split ends (junction of A Street and Washington Street at Lewin City Park) and follows Highway 20 to Burns. Odometers are approximate as odometer readings will vary between vehicles. However, landscape features described should be adequately identifiable to allow for stopping at the selected sites. Highway Mile Posts (MP) are indicated, where possible. A table of GPS coordinates for stops is at the end of the road log.

**Odometer 0:** west end of Vale, zero odometer.

**Odometer 11:** **Stop 1 Park on Right Shoulder.** Large road cut with layered sedimentary deposits. Oregon Geologic Data Compilation (OGDC) and Vale 30x60 geologic map show lacustrine sediments in this area (Tic). ? Volcanic ash layers in the gray bands.

![Image of geology](image1.png)

**Odometer 11.3:** Large road cut with more layered sedimentary deposits

**Odometer 12.6/MP 232:** **Stop 2 Park on Right Shoulder.** This is laminar flow basalt over explosive ejected basalt or scoria. The lamina actually form along flow lines while the lava is cooling.

![Image of geology](image2.png)
This is actually a rare type of basalt flow and it is lucky that it is so well seen on this tour. Some of the laminar flow basalt has actually flowed to almost vertical as it poured over the scoria. Above the laminar flow, the basalt is blocky.

Odometer 15.8: Road cut with sedimentary deposits

**Odometer 16.1: Stop 3 Park on Right pull out.** Road cut with scoria over basalt, possibly Grassy Mountain basalts. Vale quad shows upper olivine basalt (Tbou).

**Odometer 27.2: Stop 4 Park on Right.** Road cut with rhyolite; Vale quad shows Littlefield rhyolite (Trip) here.

**Odometer 32.3/ MP 212: Stop 5 Park on Left pull out - Be careful of Traffic!** Malheur River Canyon. Red band may be laterite soil or heat-modified ash sandwiched between volcanics, near Namorf. Upper layer is fine grained, hard rhyolite – an ignimbrite or welded tuff; next is the laterite or ash layer (contact); bottom is basalt scoria, very fractured and mixed up lots of vacuoules. See Roadside Geology of Oregon, page 195.
**Odometer 50.5/MP 193: Stop 6 Park on Right before guard rail.** This spectacular outcrop is vesicular Rhyolite with many crystals in the cavities, including good examples of botryoidal quartz – quartz crystals in little “pillows” (photo). There is also opalite in the outcrop.

**Odometer 52.5: Stop 7 Park on Left at Historical Marker.** Dinner Creek Welded Ash-flow Tuff. This is a rhyolitic ignimbrite dated at 15.2 Ma.

Odometer 54.4 Town of Juntura, café is good for lunch and rest stop.

**Odometer 57.5: Stop 8 Turn into highway road material lot and follow dirt road on east side about 0.1 mile to outcrop next to road.** Devine Canyon welded ash-flow tuff (OGDC). This ignimbrite material is very crystalline, weathered surfaces are shiny and smooth with glassy constituents. There are a number of large boulders that exhibit remarkable “spheroidal weathering.” The hiking cane in the photo is 36 inches long. Note in photo of the outcrop one of the spherical structures still in the outcrop. This outcrop is a basal vitrophere, forming at the base of an ignimbrite flow and cooling rapidly.

The Devine Canyon Tuff originally covered more than 18,600 square kilometers (7,180 square miles) and originated approximately 9.7 Ma.

**Odometer 66.3: Stop 9 Park in pull out on Right.** Diatomite deposits at top of Drinkwater Pass.
Diatomite (diatomaceous earth) is formed by the silica skeletons of very microscopic organisms that live in both fresh and sea water. This formation was probably deposited in a lacustrine fresh water environment. Diatomite has a number of commercial uses, including the filtering of beer. There is a diatomite mine north of Harper (Harper Junction is about 25 miles west of Vale).

**Odometer 82.8: Stop 10 Park on shoulder on Right.** Conglomerate at top of Stinking Water Pass.

This conglomerate has unusual features including very angular cobbles and a large number of very large cobbles mixed in with smaller ones (“unsorted”). Consensus of opinion is that it was formed by a turbidite flow into a lake and not by stream action. (A “turbidite” is like a turbulent landslide propelled by a large volume of water).

**Odometer 85.9: Stop 11 Park on Right shoulder between road cuts.** This outcrop probably represents three different flow events. There are several layers from bottom to top with vitrophere then compressed (welded) tuff, then less welded tuff and then the sequence repeats. The tuff layers below the succeeding vitropheres are altered in color (red) from heat from the new overlying flow.
Odometer 86.9/MP 156: Rest Area

**Odometer 87.9: Stop 12 Park in Geologic Monument on Right.** Rhyodacite at Historical Monument near Buchanan. The outcrop on the left across the road has been partly metamorphosed, probably geothermally, into crumbly greenish material.

Odometer 88.0: Buchanan
Odometer 105.1: **Stop 13** Turn into Prather Creek Road and park on Right. Tufaceous Sediments at borrow pit. These are relatively unwelded.

Odometer 108.1: Intersection with Highway 395 north to John Day. **Zero odometer here.**

Odometer 3.4: **Stop 14** Park in large turnout on Right. Rattlesnake Tuff Type Section.

![Diagram of tuffaceous sedimentary rocks with labeled layers: Tuffaceous soily substrate, Precursor ash deposit, Non-welded glass shards, Perlite black matrix, Pervasively devitrified matrix, Spherulitic matrix, Pervasively welded vitrophyre.](image-url)
The Rattlesnake Tuff originated about 7Ma and currently covers about 9,000 square kilometers (3,473 square miles), but reconstructed original coverage was up to 40,000 square kilometers (15,400 square miles). The presumed source of the Rattlesnake Tuff was about 40 miles southwest of Burns and remnants are visible as far as John Day and Prairie City (to be seen at Stop 18). This stop demonstrates many features of a Rhyolite ignimbrite – the basal vitrophere over ash and glass with sequential differences in welding toward the top of the flow.

**Odometer 4.6: Stop 15 Park in large pull off on right.** This is another super example of Rattlesnake Tuff over a more exposed ash deposit.

![Image](image1.jpg)

**Odometer 9.4: Stop 16. Park on Right in small pull off just before Milepost 58.** Welded Tuff with lots of glassy shards. Origin of tuff is unclear.

**Odometer 20.0: Stop 17 Park on shoulder on Right before road cut.** This is Rhyolite, probably an ignimbrite; it contains nice pumice fragments. There is an excavated area on the right, possible borrow pit for road construction (see photo). There is some spheroidal weathering.

![Image](image2.jpg)
There is a rest stop in the town of Seneca, on the Left.

**Odometer 52.0: Stop 18 Park on Right Shoulder.** Shale from accreted terrane. This stop is very complex. From about Odometer 50, the road has descended through seabed shale that must have been part of an accreted terrane. At this stop, the shale is intruded by a volcanic, probably basalt, that demonstrates spheroidal weathering. There is also a piece of gray limestone at the base of the outcrop – check it out with your 10% HCl. The shale continues all the way down to the base of the grade with differing dips. There are multiple faults through this road cut.

**Odometer 63.4: Stop 19 Carefully park on the shoulder on the Right.** This is a fabulous outcrop of green Serpentinite, another piece of metamorphosed sea bed that is part of an accreted terrane.


**Odometer. 18.0 Stop 20 Turn Left on Fields Creek Road,** pull off at stone marker on Right at 0.1 miles up the hill. The stone marker describes the formation of the John Day River valley and describes water-laid tuff outcrop at this site

**Odometer 23.9: Stop 21 Park on large paved pull off on Left.** This is an interesting outcrop across the road that shows a couple of faults through an ignimbrite with scoria overlaid by a Rhyolite flow. The photo shows two faults (dotted lines) creating a “mini-graben.”

Continue to **Odometer 37.3; turn Right on Route 19** to go to the John Day Fossil Beds NM Visitor Center (2 miles) or continue straight on Hwy 26 to the Painted Hills Unit (about 4.5 miles
from the junction with Rte. 19, look for signs at Bridge Creek Road, then turn Right to signed features of the Unit).


Proceed east on Hwy. 26 to Prairie City (13 miles) and turn Right on Bridge Street. Follow Bridge Street for about 4.5 miles to an outcrop on the **Right (Odometer 17.5)** and park in the pullout next to the outcrop (**Stop 22**). This is unwelded Rattlesnake Tuff near its northernmost extent and is about 130 kilometers (78 miles) from its inferred origin. Compare this material to that seen at Stop 14 (about 57.5 linear miles distant). Clearly, distance affects welding!

Return on Bridge Street to Hwy. 26 (Rest Stop at the playground!), turn **Right**.

**Odometer 27.3: Stop 23** Pull into Historical/Geology Marker parking area at large emigrant wagon on **Left**. This stop gives information about the Strawberry Mountains and National Forest features in the area.

**Odometer 29.2: Stop 24** Park on shoulder on **Right**. This is a dacite dome with a prominent basalt dike cutting through it. There is another dike at the far right end of the outcrop. This is considered to be a flow dacite, although the texture is very rubbly.
Odometer 31.4: **Stop 25** Park on shoulder on Right just before a Forest Service Road. Across the highway is an example of columnar andesite.

Odometer 64.8: **Stop 26** Park in pull off on Right. On the right of the pull off is a Rhyolite ignimbrite with evidence of some ash. On the left of the pull off is columnar basalt that changes into a massive and somewhat confusing volcanic – probably more basalt.
Odometer 69.7: **Stop 27 Park in pullout on Right.** This is lake-deposited layers of cobbles mixed with granular material. The exact mechanism of how it was deposited is unclear, but probably multiple debris flows into a lake, or possibly as part of a braded stream bed. Mapped elevation of 4480 feet is above Lake Idaho (max 3,800 feet), unless raised by isostatic rebound (+680 feet?) after lake drained.

Odometer 93.5: **Stop 28 Park on shoulder on Right.** This is somewhat a puzzle. There are layers of gray ash of varying degrees of welding near the top of the road cut, but the rest appears to be lake bed sediments with varying sized cobbles mixed in. Again, probably a lacustrine deposition and the site is at 3,680 feet, within Lake Idaho maximum of 3,800 feet elevation.

Odometer 94.0: **Stop 29 Park in large pull out on Left.** Up the road about 50 yards is crumbled basalt. The main outcrop has an interesting sequence of broken up shale, then a partly metamorphosed fine-grained material with pebbles and clasts aligned with the foliation, then more shale; this must be part of an accreted terrane!

Vale is about 29 miles from this last stop.
# GPS Coordinates of Stops

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