

bedrock. The first part of the project up to about Station 79+00 is in very rough mountain terrain with large rock outcrops, natural slopes locally exceeding 45 degrees, and dense forest cover. Raven Rock, an overhanging cliff of 70 feet, lies above the road on the right hidden from view by dense forest understory. Silvervale Falls plunges 100 feet below the road on the left. The maximum relief on slopes adjacent to the highway is about 400 feet.

The highway beyond Silvervale Falls, from about Station 79+00, as far as Richland Road (SR-1372) at Station 140+00, lies in gentler terrain. This segment traverses a mix of open residential lots, woodland, and small stream valleys with narrow floodplains. Maximum slope relief is about 200 feet, and rock outcrops are infrequent.

The highway climbs almost continuously beyond Richland Road as it follows the broad crest of a major spur ridge off the Blue Ridge escarpment as far as Carolina Circle, at about Station 297+00. It gains over 650 feet in elevation in this three-mile segment. Slopes are about 35 degrees or less and are covered extensively by forest. Hard rock becomes gradually more and more in evidence as the road rises. Residential and commercial lots are few and widely spaced except at Falcon Ridge Development.

The terrain steepens abruptly at Carolina Circle, and the highway enters a set of large, looping curves as it traverses the west side of the ridge to the end of this project at Blackberry Road. Plans call for relocation of the highway on a straighter alignment. Slopes adjacent to the highway have over 600 feet of relief, and bedrock outcrops are everywhere abundant beneath dense, mature forest. A few commercial establishments selling produce and souvenirs lie beside the highway, while residential sites, some only seasonal, occupy the mountaintop above.

Geology and Rock Characteristics

This project is located within the Grandfather Mountain Window, a geologic area bounded by faults and composed of very old metamorphic rocks. The rocks include granite gneiss of the Brown Mountain Formation, augen gneiss and mylonite of the Blowing Rock Formation, and a variety of more or less mylonitic gneisses of the Wilson Creek Formation. Those rocks correspond to units of Zg, Ybrg, and Ybgr, respectively, on the Geologic Map of North Carolina (1985).

The granite gneiss is coarse-grained, homogeneous, non-layered rock that may be highly fractured in some outcrops and massive in others. It does not have a strong set of cleavage or foliation breaks, although there is a rather strong metamorphic mineral alignment. Where fractured, it breaks into blocks of moderate to large size bounded by persistent smooth to moderately rough intersecting joint faces. Joint spacing varies from about a foot to more than 10 feet. Large outcrops may be seen at Silvervale Falls, in roadcuts above the falls, and in roadcuts between Stations 26+00 and 50+00.

The Wilson Creek Formation comprises a suite of metamorphosed igneous rocks including granite gneiss, quartz monzonite gneiss, meta-diorite and chlorite schist that are medium to fine grained and more or less mylonitic in structure. The mylonitic structure is characterized by fine grain-size and banding that is about .01 to .25 inches thick. The thicker banding is the result of pervasive shearing over great thicknesses of rock. The thinner banding is the product of more

intense shearing concentrated in belts not more than a few hundred feet thick. The Wilson Creek Formation, therefore, consists of a large body of banded mylonite gneiss that is cut by belts of platy or slaty mylonite a few hundred feet or less in thickness. The platy or slaty mylonite has persistent smooth cleavage planes and tends to break into flat tabular or flaggy pieces a few inches thick. The thicker banded gneiss tends to form blocks of moderate to large size bounded by intersecting, smooth joint faces.

A very large outcrop of thicker banded mylonite gneiss forms the roadcut between Stations 47+00 and 55+00, and Raven Rock cliff above there. The Wilson Creek Formation in that area overlies granite gneiss with a sharp contact that crosses the highway twice, near Stations 50+00 and 62+00. Thicker banded gneiss with intersecting, smooth joints is seen in a through cut at Station 112+00. Belts of platy mylonite increase in frequency in the up-station direction, and rocks of this type are common in roadcuts between Stations 240+00 and 290+00.

Augen gneiss of the Blowing Rock Formation is composed of white feldspar crystals up to an inch long in a gray or greenish gray, fine, micaceous groundmass. The rock is fairly uniform and massive. It is weakly to strongly foliated. As in the Wilson Creek Formation, there are belts of platy mylonite, and there are zones of transition between massive augen gneiss and mylonite. The augen gneiss is found in large roadcuts and bold natural outcrops beyond Station 290+00. It is cut by very widely spaced, rough, intersecting joints to form large blocks. Partial weathering of this lithology in some areas, such as in the existing cut at Station 330+00, has produced a thick layer in which the rock has broken up into lensoid gravelly material.

Other rocks found in this project area include pods and dikes of pegmatite and sills of greenstone. The pegmatite is a white, very coarse-grained rock composed of quartz and feldspar. It is a massive, tough lithology in bodies seldom more than 10 feet thick. It occurs randomly throughout the project area and weathers to a white, coarse sand saprolite. The greenstone occurs as slate or phyllite layers a few feet to tens of feet thick within the Wilson Creek and Blowing Rock Formations. It may be highly conducive of plane failure in unfavorably oriented rock slopes.

Foliation or rock cleavage throughout the project is oriented to dip eastward at angles of about 50 to 75 degrees. That orientation is favorable for the stability of right side cuts and unfavorable for cuts on the left side at slope steeper than 1:1.

Soil Properties

The typical soil profile on this project consists of saprolite overlying weathered rock and hard rock. A thin cap of clayey residual soil overlies saprolite where slopes are gentle, but is missing from steeper slopes.

The great majority of saprolite soils are red-brown or yellow-brown to brown, gray, or white, moist, medium stiff to hard, micaceous sandy silt (A-4). Much less abundant within the saprolite profile are A-5, A-2-4, A-7-5, and A-1-b soils. Many borings encountered weathered rock interlayered with saprolite.