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THE SEA CLIFF LANDSLIDE AT NEWPORT
Lincoln County, Oregon

by
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INTRODUCTION

A crescent-shaped section, about 1000 ft. long by 200 ft. wide, of the 70-ft. sea cliff at the north city limits of Newport recently slumped, causing considerable property damage. In this area, known as "Jump-Off-Joe", a north-trending fissure, some 20-30 feet wide and from 10-25 feet deep was opened, along with tributary cracks and openings. Legal description of the area is sec. 5, T. 11 S., R. 11 W.

Disturbing, though hardly measurable movements began late in December, 1942, when residents of the locality noticed that the doors and windows of their houses were sticking and the walls cracking. These movements culminated in the gradual slumping and cracking of this block during the latter part of March following heavy rains. They were climaxed by greatest subsidence about March 30, 1943. When it became apparent that the landslide was imminent, some residents removed or partially salvaged their houses; some houses were completely abandoned. Some of the houses were left hanging over the main crack; a few resting in it. Water pipes were left dangling in the crevasse. Coast Street was narrowed at one place by the landslip, though traffic proceeded much as usual following minor repair work.

The Oregon Department of Geology and Mineral Industries was asked by the State Highway Department to investigate the cause of the landslide as well as the possibility of a recurrence; and to advise if any protective measures might be taken. The investigation was made on April 3, 1943, and the results herein reported.

HISTORY OF THE JUMP-OFF-JOE SECTION

A similar landslide is said to have occurred at this locality in 1911 when the sea wall was some 70 feet farther seaward. The nature of that slide is not known, although undercutting by the waves was the probable cause. Twenty-two years ago (1921) a similar cave-in, some 500 feet long occurred, forming a fissure which is now a gully.

The recent slumping is a recurrence of movement along the older break and an extension of it northward for a distance of another 500 feet. A sketch map of the area concerned is shown in Figure 1.

GEOLOGY AT JUMP-OFF-JOE

The upper $\pm^{25}$ feet of the 70-foot high sea wall is made up of nearly flat-lying dune sands of Pleistocene age. They are underlain nonconformably by somewhat massive brown and gray jointed argillaceous sandstones and sandy shales which have been referred to as the "Astoria Miocene beds of the Newport region"* (see figure 1, cross-section A-A) These beds strike nearly north and dip 21° to the west (seaward). They make up almost all the lower portion of the sea wall which is quite steep here. However, near the north end of the slumped block (locality I of sketch map) where the cliff is cut in farthest, the lowermost beds exposed are dark gray, nearly black, crumbly shales which probably are part of the "Nye shales"* of Oligocene age. According to Packard, "The character of the Nye shales is such that the true structure is frequently obscured by slumping.

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* Packard, E. L., and Kellogg R., "A New Cetothere from the Miocene Astoria Formation of Newport, Oregon". Contributions to Paleontology, Reprinted from Carnegie Institution of Washington, Publication No 447, January 10, 1934, page 6.

They occur as slightly embayed slump areas protected somewhat by more resistant Miocene sandstones that form the boulder cliffs of the nearly straight shoreline." Packard states that "near Newport on Yaquina Bay, the formation dips westward at an angle of about 20° or strikes from N. 3° W., to N. 16° W. It consists of at least 2000 feet of a black, massive shale or claystone that, upon exposure, readily slacks to a black mud, and normally occurs as slumps, especially where undercut by the sea." An unconformity is said to separate the Oligocene Nye shales from the overlying Miocene Astoria beds. The capping Pleistocene sands which stratigraphically overlie the Oligocene-Miocene shales and sandstone beds rest on a wave-cut bench.

CAUSE OF SLUMPING AND FUTURE RECURRENCE

Although the Astoria Miocene beds, which are exposed along the basal portion of the sea cliff in this vicinity, are fairly competent to support an overlying load, the lowermost shaly beds (whether they are or are not part of the thick Nye shales) are incompetent. As the protecting, more competent, Miocene sandy beds had been cut back to expose the shale near the north end of the slumped block and had been nearly cut through along much of the cliff's front, the block depended for most of its support on the shaly beds. When the shaly beds became saturated with water from the heavy rains which soaked through the overlying Pleistocene sands, the clay particles in the shales became well lubricated and the shale lost its competency to support the weight of the overlying block whose weight had been increased by the soaking rains. Thus the bed gradually broke apart and subsidence occurred along its bedding planes (and/or at the point of contact with the overlying Miocene sandstones). This type of slide is known as a bedding slip.

Evidence that the slipping occurred in the shale is found in the buc'led and cracked nature of the Miocene beds which directly overlie the shale near the base of the sea wall and particularly in the crumpled character of the dark gray shale itself. The Pleistocene sands and upper portion of Miocene beds which form the upper part of the sea cliff are essentially undisturbed. Further and conclusive support is shown by the wave-cut bench of the slumped block, whose elevation is some 6 ft. lower than that of the undisturbed point immediately to the north. This is illustrated in figure 2.

Figure 2.

As the shoreline is being gradually eaten away and more particularly as this locality is probably underlain by the incompetent Nye shales, conditions favor further slipping when similar circumstances again arise. However, the slumped block, until destroyed, will serve as a partial protection against further large-scale slumping. The sandstones which have protected this point are now nearly removed and the incompetent Nye shales are being increasingly exposed to the erosive action of the waves. The Nye shales are notorious along the Oregon coast for their tendency to give way and slump when there is an excess of water and no lateral support - a condition that is common along the steep sea walls.

The shoreline of the area around Jump-Off-Joe under continuing normal conditions and particularly under those of winter storms will gradually be eaten away and will probably subside further until finally consumed. Although this action may require a number of years, the area east of Coast Street will then be menaced.

CONCLUSIONS

The evidence points toward further damage to this vicinity in the future - though not necessarily near future. Though the supporting shales may contain, in places, more competent beds, they never will be resistant to the action of the waves, and as long as the shoreline is subjected to wave action, destructive effects are to be expected. There is no cause for alarm, but people should be discouraged from building in the immediate vicinity. It is probably wisest to say, "Watch developments and take appropriate measures". Any drainage improvement will be helpful and the constant soaking of this neighborhood from cesspools of course does not help the situation, though probably it cannot be economically corrected; also even if the cesspool condition is corrected, there would be no

guarantee of much preventive value.

The seaward dip of the beds underlying the Pleistocene sands in this section is a discouraging condition from the standpoint of the home-owner. A knowledge of the geology along the sea cliffs is enlightening and might form the basis of some measures which would retard local movement, but it is believed that in no sense could these measures be considered curative.