GEOLOGIC SUMMARY OF CONDITIONS ALONG OCEAN BOULEVARD, MOSS BEACH

The County roads in the Seal Cove area have been affected in various ways over the years by the movement of the active coastal landslides in that area. The most recent movement has caused Ocean Boulevard, between Los Banos Avenue and Madrone Avenue, to become uneven and to tilt steeply toward the sea.

The movement under Ocean Boulevard appears to be a reactivation of a relatively small, older failure that is part of a much larger series of coalesced landslides that extend to the north and east of it.

The first of the two maps (map 1) that accompanies this report shows the most recent scarps and other landslide-related features in red. Older features, most of which still exist, are shown in black. The second map (map 2) shows the general outline of the landslides in relation to the existing roads.

The southern end of the recent activity appears to be near the intersection of Ocean Blvd and San Lucas Avenue. This view is from that intersection, looking northward.

The graben extends into the field to the right, where there are several discontinuous parallel linear depressions in the head scarp area.

The depression shown here is the graben along the top of the rotating slide mass. The picture was taken facing southward, and the white barrier is at the intersection of Ocean and San Lucas.

The small red abandoned house is in the grove of trees on the right.

The landslide mass is apparently rotating outward as it moves downward. This has caused a graben, or closed depression, to form along the head scarp.

The backscarp formed along the western edge of the graben persists for some distance along Ocean Blvd, gradually leveling out and reversing itself into a normal west-facing scarp.

Downhill of the verge, the scarp is difficult to follow due to the dense vegetation. There is no well-defined landslide toe anywhere in this area.

The road steepens abruptly as it approaches its intersection with La Grande Avenue. The house in the upper right of the previous photo is at that intersection.

There is a fresh west-facing scarp that runs through this over-steepened portion of the road, and through the vacant lot, just below the light blue house. This scarp shows fresh soil, but its precise extent is impossible to determine due to dense vegetation.

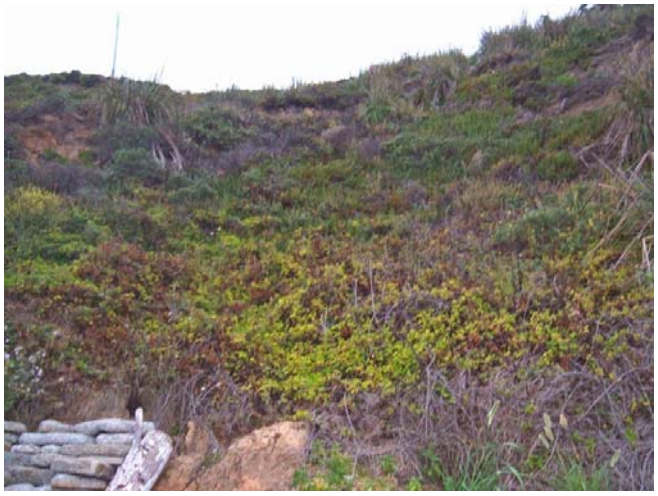
There is water flowing through this vacant lot, close to this scarp. The source of this flow was not determined.

At the top of the hill, the intersection of Ocean and Le Grande appears to be underlain by resistant material. The boundaries of both landslides, to the north and south of it, curve away to the west (toward the sea) in this area.

This picture shows Ocean Blvd. from La Grande looking south to San Lucas (see barrier in distance). The road is offset along the cracks by as much as 6” vertically. The angle of dip on the road is from 2 to 20 degrees west.

To the north of the Ocean/La Grande intersection, the road drops off sharply again along a steep scarp that crosses the road just downhill of the junction.

The scarp is visible as a dark wedge on the left of the photo, below the light blue house. The utility pole is one of about six that run along the west side of Ocean Blvd in this area. This is the pole that has been most affected by the movement of the slide. It is in the northern slide, near the scarp.



When this area is viewed from below, fresh scarps can be seen in several places, mostly directly below the road. This photo shows the swale immediately downhill of the worst of the recent movement. The leaning pole can be seen faintly in the upper left.

There is no evidence of fresh toe material anywhere in this vicinity on the beach. It appears that the active movement along Ocean Blvd. bottoms out on the natural bench that exists about half way down the slope.

Aerial photographs show that this area has moved many times in the past, mostly as small, local failures within the larger landslide mass that makes up much of the bluff area.

This is another photo showing the swale below the road, but looking slightly more northward than the previous one. The cement "steps" are in the middle at the base of the slope here, for reference. The benched form of the slope is evident, as is the lack of recent movement at the beach level.

There is a stream coming out at the base of the slope below the distressed portion of Ocean Blvd. On the east side of the road above, there is evidence of uncontrolled drainage coming through the vacant lot. This water may be a contributing factor in the recent movement.

There are several generations of riprap and cement cover in the two coves that lie below the area between Madrone Avenue and Cypress St to the north. There are the remains of cement "blankets" on the slope below both of the two remaining houses on the west side of Ocean Blvd. These are the little red house between San Lucas and Madrone (#3 on map 1), and the only occupied home, which is adjacent to the Distillery parking lot (#2 on map 1). The riprap is sparse in places and does not appear to provide much protection for the toe of the slope, particularly below the Distillery. The approximate extent of riprap is shown on map 1.

The left photo shows the small cove below the Distillery, which can be seen on the top of the bluff to the left. The picture on the right shows riprap on the beach near one of the houses that sits almost right on the beach. The exposed cliff on the right of the Distillery picture is visible in the distance on the right photo.

The picture on the left shows part of an old cement "blanket" that sits below the occupied house near the Distillery. It is broken, and the ocean has eroded the rock from behind it. The photo on the right shows the edge (just below the dark green bluff) of another partial blanket of cement that exists downhill of the Ocean Blvd. area that is failing.

There are other signs of continued and, in some places, accelerated landslide movement in the Seal Cove area. The slide that includes the Distillery restaurant, its parking lots, and several nearby homes, is very active and movement continues to cause cracking and deformation in pavement and structures. The head scarp for this slide crosses Beach Way at its intersection with Park Avenue, crosses diagonally through a house, a vacant lot, and across Los Banos Ave. It forms a steep scarp through the vacant lot and immediately downhill of the house on the northeast corner of La Grande and Ocean. This is the same scarp shown in a previous photo (with the leaning utility pole).

CONCLUSIONS

Ocean Boulevard and an adjacent portion of Los Banos Avenue are currently impassable. These roads could be repaired by regrading and repaving. However, movement of the underlying landslides will probably continue, and will eventually destroy the roads again.

The current distress along the bluff road, from the Distillery south to Madrone Avenue, is caused by local movement within two separate landslides. The northern one is moving roughly northwest, with its head scarp curving out toward the sea at the intersection of Ocean Blvd. and La Grande Avenue. There appears to be a resistant mass of material beneath that intersection, which has deflected both of these slides. The southern failure, which is moving almost due west, extends from that intersection southward, with most of its movement concentrated in the area closest to its northern boundary, between La Grande and San Lucas Avenue. The southern limit of this landslide is not well-defined, although there are cracks and small bulges visible in the roads and other structures at least as far south as Madrone Avenue.

The most significant contributing factor to the current landslide movement is probably water, from surface drainage and rain during the very wet winter of 2005-2006. The uncontrolled drainage that exists through some properties along Ocean Boulevard, and landscape watering in this area will continue to be a problem, even if future rainy seasons are not as severe.

Landslide repair would probably involve the placement of buttress materials on the bench below the road and/or at the base of the coastal bluff slope. Even if this were accomplished below the two landslides identified here, further movement may occur in the surrounding, older landslide deposits. Because of the complex nature of the landslides in the Seal Cove area, any mitigation of small landslides in this area may later be affected by future movement within adjacent or inclusive failures. This is evidenced by the continued movement of the Distillery and its neighborhood, even though the base of the adjacent slope is protected by riprap.

RECOMMENDATIONS

The following recommendations are based on field reconnaissance, aerial photograph interpretation, and review of the pertinent published and unpublished literature.

1. Abandon those sections of Ocean Boulevard and Los Banos Avenue that are currently impassable. Make the barriers permanent, and discourage any traffic through this area, including by bicycle or foot.

2. Remove paving and other structures, and regrade the slope into a natural form, with a positive grade toward the sea.

3. Revegetate the area with plants that are native to the area and that can survive with no care or additional water.

4. Require the utility companies responsible for the line of poles that are currently along the west side of Ocean Boulevard to relocate them to the east, outside the active landslide zone.

5. Provide control of drainage from the paved and developed portions of the Seal Cove area away from the two landslides. Failure to do this will probably result in continued movement in these areas, and possible headward migration of the scarps.

Respectfully submitted,
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Jean F. DeMouthe
Acting County Geologist