WASHINGTON STATE DEPARTMENT OF
Natural Resources

DOUG SUTHERLAND
Commissioner of Public Lands

MEMORANDUM

To: Laura Vaugeois – Forest Practices
Karl Wegmann - Geology

From: Bill Lingley – Geology

Date: Nov. 21, 2003

Subject: Mashel River Watershed Analysis -- Review

Summary

The *Mashel Watershed Analysis: Mass Wasting Assessment* (Kirtland and Jackson, 1996) contains a thorough discussion of 387 landslides they mapped in the study area. The authors have defined eight broad mass wasting map units resulting in a high-level of resource protection, especially in Mass Wasting Map Units #5 and #6. During this Priority #1 - Watershed Analysis Review, 24 additional landslides were mapped, all but four of which are deep-seated or included in the eight mass wasting map units. The Kirtland and Jackson report should be sent out for final external review following addition of one minor Mass Wasting Map Unit, herein referred to as MWMU #9.

Introduction

This memorandum has been prepared as part of the Landslide Hazard Zonation project (Vaugeois and others, 2002) and follows the protocol for Priority #1 Watersheds Review developed by you (Wegmann and Vaugeois, 2003). These reviews are brief checks covering watershed analyses that are nearly complete, and primarily address State and fee lands within these drainage basins.

The draft Mashel River Watershed Analysis (Washington Department of Natural Resources; Weyerhaeuser Company; Champion International, 1996) has been completed, except for the external review. No significant federal ownership is present in the Mashel watershed, so this review covers the entire watershed.

Methods

Findings from the Landslide Hazard Assessment for the Mashel River WAU, Mass Wasting Assessment (Kirtland and Jackson, 1996) have been compared with stereoscopic interpretation of alternating flight lines from DNR Color Photo set NW-C-2001. This method resulted in six north-trending, 1000-foot wide swaths that were not reinterpreted. The eastern end of the watershed was not analyzed in detail. Note that these photo sets were acquired after completion of the Kirtland and Jackson work and after the wet winters of 1996

to 1998. Additional rule-identified unstable slopes including some inner gorges, convergent headwalls, and bedrock hollows were defined using topographic mapping (U.S. Geological Survey, 1987a-d) and a slope/convergence map (SLPSTAB) of the area produced by Laura Vaugeois. Following this work, geologic mapping of the watershed (Schasse 1987a, b) was compared with the mass wasting map units and mapped landslides. This review was spot-checked by Karl Wegmann.

Key Questions

1. *Are the majority of landslides in the basin adequately identified?*

   Yes

   Kirtland and Jackson (1996) identified 387 landslides using twelve photo sets acquired between 1942 and 1993. Sixty of these were field checked. Most of these are debris avalanches or debris flows in higher elevations of the eastern third of the watershed and most are road and harvest related. Kirtland and Jackson also identified 53 deep-seated failures.

   During this study, 24 additional "questionable" to "probable" failures were mapped using aerial photography, but only four of these pre-date the Kirtland and Jackson study. (See attached spreadsheet and maps. Note that there is no landslide "Q".) The four failures that pre-date Kirtland and Jackson are subtle deep-seated features, except for large failures straddling the Eatonville Cutoff Road in Sections 13, 23, and 24, T16N, R4E about 0.5 miles southeast of Eatonville. Creep within these landslides has resulted in repairs to the Eatonville Cutoff Road.

2. *Do the Mass Wasting Map Units reflect reasonable assumptions based upon your review of the geology and landslides in the basin?*

   Yes.

3. *Are the hazard ratings assigned to the Mass Wasting Map Units reinforced by the distribution of landslides as shown in the Landslide Inventory for the WAU?*

   Yes.

   Much of the eastern third of the watershed where most of the landslides are located is included in Mass Wasting Map Units #5 and 6. These are both rated as "high hazard". These broad designations protect sensitive areas such as the slope north of Busy Wild Creek in Sections 5, 6, and 8, T16N, R6E, where several large debris flows have built fans out into the creek. (One could argue that in some small areas, these mass wasting units are broader than necessary.) Certainly, public resources are well protected by these two mass wasting map units.)

4. *Are there landforms that seem to have a large number of landslides, but no associated Mass Wasting Map Unit?*

   Yes.

   See question #6 below.

5. *Does the text describing the Mass Wasting Map Units do an adequate job in presenting the landform / geology information that a forester using this map would need to identify the features on the ground?*

Yes.

The text and data analysis for this watershed are easy to read, thorough, and informative. The histograms showing the distribution of landslides by variables such as elevation, lithology, etc. are particularly useful.

6. *Are there additions to the mass wasting assessment products?*

Yes.

The steep inner gorge of the Nisqually River between the La Grande town site and Alder Lake is the site of three recent, shallow-rapid landslides. These landslides appear to be partially related to the dams, either by direct erosion from the outfall pipe or by water-level fluctuations. Because of steep slopes, numerous areas of convergence, and undercutting by the Nisqually River, this large inner gorge should be included as new Mass Wasting Map Unit #9, unless this area was excluded for specific reasons not explained in the text (e.g., this land is already part of a federal dam management area). Proposed Mass Wasting Map Unit #9 is shown on the attached map. It is recommended that this new Mass Wasting Map Unit be assigned a high risk. A Form A-2 is attached.

7. *Is this mass wasting assessment: (1) acceptable as is, (2) acceptable with revisions, or (3) not acceptable?*

This mass wasting module is acceptable with the minor modifications noted above.

<u>References</u>

Schasse, Henry W., compiler, 1987a, Geologic map of the Centralia quadrangle, Washington: Washington Division of Geology and Earth Resources Open File Report 87-11, 28 p., 1 plate, scale 1:100,000.

Schasse, Henry W., compiler, 1987b, Geologic map of the Mount Rainier quadrangle, Washington: Washington Division of Geology and Earth Resources Open File Report 87-16, 43 p., 1 plate, scale 1:100,000.

U.S. Geological Survey, 1987a, Washington Ashford quadrangle; U.S. Geological Survey Map, 1 sheet, scale 1:24,000.

U.S. Geological Survey, 1987b, Washington Elbe quadrangle; U.S. Geological Survey Map, 1 sheet, scale 1:24,000.

U.S. Geological Survey, 1987c, Washington Lake Kapowsin quadrangle; U.S. Geological Survey Map, 1 sheet, scale 1:24,000.

U.S. Geological Survey, 1987d, Washington Le Dout Creek quadrangle; U.S. Geological Survey Map, 1 sheet, scale 1:24,000.

Kirtland and Jackson, 1996, Mashel watershed analysis, mass wasting assessment, 25 p., 7 tables, 2 appendices, 7 figs. *IN* Washington Department of Natural Resources; Weyerhaeuser Company; Champion International, draft Mashel River watershed analysis, Federal Way, 1 v.

Vaugeois, Laura, Dieu, Julie, Raines, Mary, 2002, Landslide Hazard Zonation – Project status report and proposal. Draft report submitted to the Cooperative Evaluation, Monitoring, and Research Committee, Washington Department of Natural Resources, 38 p.

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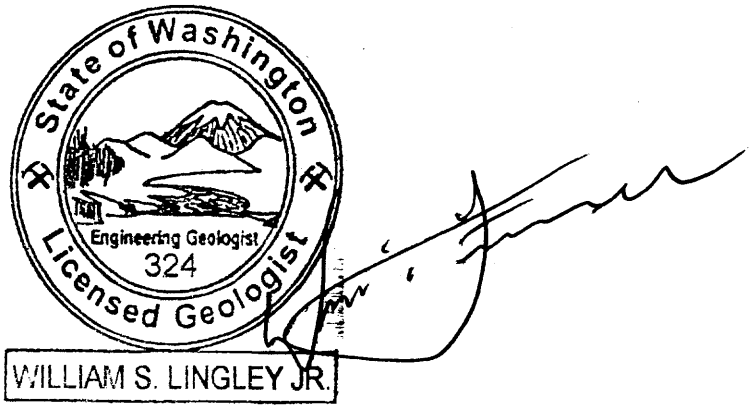
Wegmann, Karl, Vaugeois, Laura, 2003, written communication, July 15, 2003 -- Landslide Hazard Zonation project, protocol for priority # 1 watersheds; Department of Natural Resources, Division of Geology and Earth Resources.

Respectfully submitted,



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