ADDENDUM TO GEOLOGIC REPORT

Mt. Ashland LSR Habitat Restoration and Fuels Reduction Project: Preferred Alternative

CONTENTS

Klamath National Forest: Oak Knoll Ranger District

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ADDENDUM TO GEOLOGIC REPORT OF 4-13-07 PREFERRED ALTERNATIVE

A. INTRODUCTION: This document describes the effects associated with the Preferred Alternative of the Mt. Ashland LSR Habitat Restoration and Fuels Reduction Project. Refer to the original report, "Geologic Report Mt. Ashland LSR Habitat Restoration and Fuels Reduction Project", dated April 13, 2007 for additional details. All the geologic resource protection measures and monitoring described in that report also apply to the Preferred Alternative.

Alternatives 2 and the Preferred Alternative are very similar in nature, with the main difference being that the Preferred reduces the number and length of temporary roads, and increases the amount of underburning. A list of differences between the two is provided at the end of this document (item "G") for reference.

B. PROPOSED ACTIONS- The Preferred Alternative (Table 1) would include commercial thin timber harvest on 3,601 acres (935 helicopter; 1,610 skyline; 1,056 tractor). Additionally, fuel treatment activities will occur on 1,453 acres, road maintenance on all haul roads, construction of 1.70 miles of temporary road, and opening of **8.64** miles of partially revegetated existing temporary roads. All temporary roads would be decommissioned upon completion of the project.

C. SUMMARY EFFECTS ASSESSMENT

1. Summary- The Preferred Alternative would:

a. **Not likely** have adverse effects on fish habitat;
b. **Not likely** pose a landslide risk to human life and property;
c. **Not likely** increase potential for airborne asbestos.

The Preferred Alternative has a high probability of meeting all of five geologic objectives outlined in the geologic report of 4-13-07 at a high level, with application of geological resource protection measures.

As with all projects of this type, an important consideration is the uncertainty associated with layout and implementation activities. This includes the timber mark, and final location, design, and construction of roads and landings. With good layout and execution of timber harvest, road, and landing construction, disturbance to soil and vegetation will be small. Similarly, good prescribed fire layout and execution will result in few areas inadvertently burned at high severity. This assessment assumes full application of these prectices.

2. Potential for Cumulative Watershed Effects- As described in the original geologic report of 4-13-07, the effects of past logging and road construction are a

concern in some watersheds. The landslide model indicates that implementation of the Preferred Alternative would result in a very small decrease in the potential for adverse cumulative watershed effects compared to the no action alternative. The landslide model is not very sensitive to the types of changes made in the Preferred Alternative, and consequently, the outputs for Alternatives 2 and the Preferred are almost indistinguishable (Tables 3 and 4). The only way in which the model numbers could be lowered significantly would be through a vigorous road restoration program involving stormproofing a large proportion of system roads and decommissioning un-needed roads.

3. Roads and Landings- The reduction in new temporary road miles in the Preferred Alternative will result in a lower risk of landsliding than in Alternative 2, while construction of more landings could increase landslide potential. However, in both cases, application of geologic resource protection measures will make any landsliding associated with these activities very unlikely.

4. Prescribed Burn- Increasing the area of underburn outside thinning units from 120 acres (Alternative 2) to 1,453 acres (Alternative 5A) will not increase landslide potential with application of planned low severity burn prescriptions. It is anticipated that the larger treated area will further reduce the long term risk of stand replacing fire.

D. DIRECT & INDIRECT EFFECTS FOR THE PREFERRED ALTERNATIVE- Direct and indirect effects associated with project activities are described below. It is assumed that geologic resource protection measures are implemented in all applicable situations. .

Thinning- A commercial thinning prescription would be used on 3,601 acres. These activities will result in a small short term decrease in root support, but most likely will not cause an increase landslide rates. In the longer term, stand vigor will be increased, and root support re-established.

Ground Based Yarding- Tractor yarding would be applied on 1,056 acres. By restricting tractors to gentle slopes, and controlling skid trail locations (avoiding full bench trails), ground disturbance on unstable lands would be avoided, and these activities would not likely increase landslide rates.

Skyline Yarding- Skyline yarding would be used on 1,610 acres. Ground disturbances associated with skyline yarding will be excluded from unstable areas, and as a result, would not increase landslide rates.

Helicopter Yarding- Helicopter yarding (935 acres). Ground disturbances associated with helicopter yarding would be very small, and as a result is not expected to affect landslide potential.

Road Maintenance- All haul roads will be maintained. This action would decrease the potential for road related landslides, by better controlling road surface drainage.

New Road Construction/Decommissioning- A total of **1.70** miles of new temporary spurs would be built, and decommissioned upon completion of the project. There would be a reduction in root support and local evapotranspiration associated with clearing. Most alignments were inspected for landslide potential in the field, and landslide potential evaluated. Since spurs are in most cases on gentle ground (<40%) and near ridge crests, the risk of road-related landsliding is considered to be very low. Decommissioning following use would reestablish hydrologic conditions which existed prior to project implementation, and allow revegetation to commence.

Reopening/Decommissioning of Existing Roads- An additional **8.64** miles of abandoned roads which are in varying states of revegetation would be reopened. There would be a reduction in root support and local evapotranspiration, particularly where older vegetation is removed. Most of these roads were inspected for landslide potential in the field, and landslide potential evaluated. Potential for road-related landsliding is considered to be very low. Decommissioning following use would eliminate any pre-existing drainage problems, and remove fill placed in draws, thereby restoring hyrologic conditions and reducing landslide risk.

Landings: Log landings would be needed as follows:
a)New Construction (43); b) Existing Requiring Earthwork (35); Dimensions on landings will be no larger than 0.5 acres for tractor and skyline yarding, and no larger than 1.0 acre for helicopter. Size would vary considerably according to local conditions, amount of timber volume being handled, etc., but none are expected to exceed the maximum sizes listed above. By limiting landings to gentler slopes, minimizing cut heights, and constructing stable fills, applying timber sale contract clause CT 6.602 Special Erosion Prevention and Control (5/4/98), landslides associated with landings are not anticipated.

Rock Quarry Development- A small amount of rock would be needed for road maintenance in wet areas, and an existing pit on road 48N14 will be used. Ground disturbance would be limited to the existing pit, and no landsliding is anticipated associated with this use.

Hand Piling & Burning- Hand-pile and burn to reduce activity and natural fuels on 566 acres in 34 stands; hand-pile and burn followed by underburning on 55 acres in one stand. In areas currently supporting heavy fuels, this activity would greatly reduce the risk of high severity fire. This is particularly true where accumulations of down saplings and poles are present.

Treatment Type	Alternative			
Yarding Method	**Alternative 2**	**Alternative 4**	**Alternative 5**	**Preferred**
Tractor	387	220	335	579
Combination Ground Based	555	541	494	403
Tractor Endline	41	17	41	24
Mechanical Harvester	219	187	195	50
Skyline	1602	1528	1471	1610
Helicopter	1071	861	1245	935
Total Commercial Acres:	3875	3354	3781	3601
PCT:	408	408	408	408
PCT/HP/Burn:	303	303	303	303
Underburning treatment stands:	120	120	120	156
Additional Underburning outside of treatment stands:	minor	minor	minor	1,297

Landings	#	Ac.	#	Ac.	#	Ac.	#	Ac.
Existing	35	0	35	0	35	0	35	0
New Tractor	14	7	12	6	13	6.5	19	9.5
New Skyline	14	7	11	5.5	7	3.5	18	6.5
New Heli	7	7	7	7	7	7	3	3
New Heli Service	4	4	4	4	4	4	3	3
Total Acres:		**25**		**22.5**		**21**		**22**

Spur Roads	Alternative 2	Alternative 4	Alternative 5	Modified 5
T206A	0.27	0.27	0	0
T206B	0.07	0.07	0	0
T206C	0	0.19	0	0.19
T207	0.43	0	0.43	0.43
T216	0.14	0.14	0	0.14
T228A	0.19	0.19	0.19	0
T228B	0.19	0.19	0.19	0
T232	0.06	0	0.06	0.06
T235	0.29	0.29	0	0
T254	0.73	0	0	0
T264	0.11	0.11	0	0
T266	0.14	0	0.14	0.14
T277A	0.16	0.16	0.16	0
T300	0.12	0.12	0	0.12
T317B	0.82	0.82	0	0.47
T317A	0.31	0.31	0.31	0
T320A	0.39	0	0	0
T320B	0.43	0.43	0.43	0
T320C	0.36	0.36	0.36	0
T380	0.45	0.45	0	0
T383	0.2	0	0	0
T401	0.86	0.86	0	0
40S02.1 ext. (T380A)	0	0	0	0.16
Total Miles:	**6.72**	**4.96**	**2.27**	**1.7**

Table 1.

Underburning- Underburning will occur as follows:

1. Underburning within thinning stands to reduce activity and natural fuels on 1,916 acres in 95 stands.
2. Underburning combined with hand-piling within thinning stands adjacent to private land on 85 acres in one stand.
3. Underburning only to reduce natural fuel build-up in two stands on 156 acres
4. Underburning outside of treatment stands to reduce ground and ladder fuels in "batched" burn areas on 1,297 acres.
5. Thinning out small trees and burning material to reduce ladder and surface fuels within RRs on 303 acres in 31 stands

This activity would reduce the potential for high severity wildfire. However, there is always some risk of local high severity fire occurring during implementation of prescribed burns, and if this should occur on unstable areas, could increase landslide potential. Application of geologic resource protection measures are expected to minimize the risk of high severity fire in unstable areas.

Asbestos Hazard Associated With Roads & Harvest Units- There are outcrops of ultramafic rock along some roads, and this rock type often contains asbestos ("um" in Table 4). The following table lists such roads and identifies those which are closer than one mile to sensitive receptors (residences or campgrounds).

UNITS & ROADS UNDERLAIN BY ROCK WITH POTENTIAL TO CONTAIN ASBESTOS					
Road or	**Sensitive**	**Junction With**			
Unit No.	**Receptor?**	**Paved Road?**	**Location**		
Unit 207	No	NA	NW of Doe Peak		
Unit 213*	No	NA	SE of Doe Peak		
Unit 253	No	NA	West of Doe Peak		
Unit 288	No	NA	West of Doe Peak		
Unit 296	No	NA	NW of Doe Peak		
Unit 320	No	NA	NW of Doe Peak		
Unit 371	No	NA	South of Doe Peak		
Unit 394	No	NA	South of Doe Peak		
Unit 426	No	NA	West of Doe Peak		
Unit 447	Yes**	NA	South of Doe Peak		
41S10	No	No	Vicinity of Doe Peak		
40S14.3	No	No	NW of mouth Long John Cr		
41S16	No	No	NE of mouth Long John Cr		
Presence or absence of um rock based on overlay with KNF bedrock coverage, unless otherwise noted					
Sensitive Receptor- Is there a sensitive receptor within one mile of the road or unit?					
*Small exposure of um rock identified by field recon					
**Sensitive Receptor is Beaver Creek Educational Center					

Table 2.

Harvest units are similarly listed in the table. Listings are based on the Klamath National Forest bedrock coverage in the Forest GIS library.

E. CUMULATIVE WATERSHED EFFECTS- Grouse Creek and Long John Creek are classified as Areas of Watershed Concern, and have the highest potential to experience adverse cumulative watershed effects within the project area. This is due primarily to the effects of past management activities. Predicted cumulative effects for the Preferred Alternative are described below in Table 3, and those for Alternative 2 are shown in Table 4**.**

The cumulative watershed effects landslide model estimates that under fully vegetated conditions, with no roads, harvest or recent fire, the Grouse Creek watershed would produce 9,090 cubic yards of landslide derived sediment (Table 3). When existing, proposed and foreseeable future roads and harvest are accounted for, the predicted volume for the Preferred Alternative is 35,454 cubic yards, or nearly four times the undisturbed volume (35,454 / 9,090 = 3.90). By comparison, the volume predicted for Alternative 2 is 36,296 cubic yards (Table 4).

GEO [mass-wasting] [Values represent model-estimated sediment delivery in cubic yards / **DECADE**]

MT ASHLAND LSR ALT 5M

Drainages [7th-field]	Acres	Back-ground	Current [past & present] Harvest & Fire 1/ [cumulative]	Roads 1/ [cumulative]	Road treat-ments 2/ [direct/ indirect]	Current 1/ [cumulative]	Risk ratio 3/	Proposed Action Units & landings [Table C] [direct/ indirect]	Roads 2A/ [direct/ indirect]	Current + proposed 4/ [cumulative]	Risk ratio 3/	Future [reasonably foreseeable] Units [harvest & fire] [Table A] [direct/ indirect]	Roads 2/ [direct/ indirect]	Current + proposed + future 5/ [cumulative]	Risk ratio 3/
Headwaters Cottonwood Creek	4,814	7,050	3,495	8,568		19,113	0.86		0.8	19,113	0.86			19,113	0.86
Beaver/Dutch Creek	3,819	11,841	1,142	14,924		27,907	0.68			27,907	0.68			27,907	0.68
Beaver/Grouse Creek	6,497	9,090	7,579	19,125		35,794	1.47	66.6	-406.6	35,454	1.45			35,454	1.45
Buckhorn-Beaver Creek	8,265	19,227	2,125	20,832		42,184	0.60			42,184	0.60			42,184	0.60
Deer-Beaver Creek	2,708	7,283	1,363	11,262		19,908	0.87	80.3	-72.6	19,916	0.87	273.0		20,189	0.89
Hungry Creek	7,105	7,420	4,089	22,685		34,194	1.80		-15.1	34,179	1.80			34,179	1.80
Jaynes Canyon	7,007	21,727	3,789	29,094		54,611	0.76			54,611	0.76			54,611	0.76
Long John Creek	5,679	8,419	3,850	20,132		32,401	1.42	95.4	-1083.3	31,413	1.37			31,413	1.37
Lower West Fork Beaver Creek	4,058	11,514	393	18,806		30,713	0.83			30,713	0.83			30,713	0.83
Soda-Bumblebee	7,372	15,944	3,807	37,567		57,318	1.30			57,318	1.30	1,653.5		58,971	1.35
Upper Cow Creek	8,127	16,436	2,294	13,897		32,628	0.49	17.3	-125.8	32,519	0.49			32,519	0.49
Upper West Fork Beaver Creek	4,818	13,352	1,979	20,348	-673	35,006	0.81			35,006	0.81			35,006	0.81
WF Beaver/Bear Creek	4,208	10,002	772	13,188		23,961	0.70			23,961	0.70	534.1		24,495	0.72
Beaver Creek [5th-field]	69,664	152,257	33,181	241,859	-673	426,624	0.90	259.6	-1703.4	425,180	0.90	2,460.6	0.0	427,640	0.90
Entire analysis area	74,478	159,306	36,676	250,427	-673	445,736	0.90	259.6	-1702.6	444,293	0.89	2,460.6	0.0	446,754	0.90

Table 3: Preferred Alternative CWE run of 12-12-07

Grouse and Long John Creeks

The Model also indicates that the Preferred Alternative would reduce the risk for adverse cumulative watershed effects by a small amount, relative to the No Action Alternative. It would drop the risk ratio from 1.42 to 1.37 in Long John

Creek, and from 1.47 to 1.45 in Grouse Creek. There would be no change (.90) when the entire Beaver Creek watershed is evaluated (Table 3). The reason that the model predicts a drop in risk, despite the fact that the project involves considerable timber thinning and road activity, is as follows: a) It assumes that there will be no measurable increase in landslide potential associated with thinning; b) It assumes that opening and then decommissioning currently abandoned roads will reduce landslide risk. This reduction in risk offsets the adverse effects of new temporary road construction. As a result, the mix of road activities results in a net reduction in cumulative watershed effect risk.

Summary of Cumulative Effects

In summary, the potential for adverse cumulative watershed effects exists in some watersheds, due primarily to pre-project road densities. New temporary road construction and opening of overgrown existing roads, followed by decommissioning of all temporary roads results in a complex set of offsetting effects. The CWE model predicts a small reduction in risk of adverse effects in some watersheds for the Preferred Alternative. However, there will be some small adverse effects associated with the reopening of existing roads which are in various states of revegetation. These adverse effects are not reflected by the model, and would gradually recover as the decommissioned roads revegetate.

	Background	Current	Cur + Fut	Current	Post Proj.	Fut.Actions
Alternative 2	Sediment	Sediment	Sediment	Risk Ratio	Risk Ratio	Risk Ratio
Headwaters Cottonwood Creek	7,050	19,359	19370	0.87	0.87	0.87
Beaver/Dutch Creek	11,841	28,073	28073	0.69	0.69	0.69
Beaver/Grouse Creek	9,090	36,296	36027	1.50	1.48	1.48
Buckhorn-Beaver Creek	19,227	42,383	42383	0.60	0.60	0.60
Deer-Beaver Creek	7,283	19,980	19954	0.87	0.87	0.87
Hungry Creek	7,420	34,369	34354	1.82	1.81	1.81
Jaynes Canyon	21,727	54,796	54796	0.76	0.76	0.76
Long John Creek	8,419	32,753	31838	1.45	1.39	1.39
Lower West Fork Beaver Creek	11,514	30,766	30766	0.84	0.84	0.84
Soda-Bumblebee	15,944	57,612	57612	1.31	1.31	1.31
Upper Cow Creek	16,436	32,825	32759	0.50	0.50	0.50
Upper West Fork Beaver Creek	13,352	35,100	35100	0.81	0.81	0.81
WF Beaver/Bear Creek	10,002	23,971	23971	0.70	0.70	0.70
Beaver Creek [5th-field]	152,257	428,922	427631	0.91	0.90	0.90
Entire analysis area	159,306	448,281	447002	0.91	0.90	0.90

Table 4: From Geologic Report of April 13, 2007 (data from CWE model run of July 17, 2006).

F. DIFFERENCES BETWEEN ALTERNATIVES PREFERRED AND 2

The main differences between the Preferred Alternative and Alternative 2 are listed below. This list was taken verbatim from the narrative description of the Preferred Alternative (5A) dated 12-12-07.

- Stands 250, 312, 313, and 314 along the PCT have been dropped.
- Stand 703 has been dropped to avoid road re-construction on roads 40S20.1 and 1A.
- Stands 235 and 339 have been dropped due to the dropping of spur road T235.
- Stand 440 has been dropped due to infeasibility of underburning that stand.
- There are 13 fewer spur roads than Alternative 2; remaining spurs are only located on ridges tops or upper slopes in this alternative.
- Spur road mileage has been reduced from 6.72 to 1.70 miles; spur roads T206A, T206B, T228A, T228B, T235, T254, T264, T277A, T317A, T320A, T320B, T320C, T380, T383, and T401 have been dropped and ridgetop road 40S02.1 has been extended approximately 1/10th of a mile.
- There is reduced helicopter yarding (from 1071 to 935 acres).
- There is reduced ground based equipment yarding (tractor, tractor end-line, mechanical harvester) (from 1202 to 1056 acres).
- There is increased cable yarding (from 1602 to 1610).
- There are more new landings proposed to facilitate yarding but less acreage affected due to smaller skyline landings on system roads (43 new landings, 22 acres).
- There are fewer acres treated with timber harvest (from 3875 to 3601).
- There is more underburning to reduce fine fuels and ladder fuels outside of thinning stands (from 120 to 1,453 acres); the additional underburning consists of six “batched” underburn areas as displayed on Map X.
- There will be 208 less acres of mastication and mastication will occur only on slopes $\leq$ 35%.
- In true fir stands, as part of the prescription, red fir will be favored in stands that are dominated by white fir to increase diversity.

G. ALTERNATIVE NO ACTION PLUS WILDFIRE

The cumulative watershed effects model was run in order to evaluate the effects of a future wildfire in the project area (No Action + Wildfire Alternative). This was done by taking the out put of the fire model, and using it estimate where areas of high and moderate severity fire would likely occur. The fire model assumes

existing fuel conditions, and estimates how fire would behave on the landscape, but only within proposed treatment units (see results in Table 5 below).

Alternative	7th-field Drainage	Current	With Alternative	With Alternative + Future Actions
No Action + Wildfire	Headwaters Cottonwood Creek	0.86	0.86	0.86
No Action + Wildfire	Beaver/Grouse Creek	**1.47**	**2.06**	**2.06**
No Action + Wildfire	Deer-Beaver Creek	0.87	0.87	0.89
No Action + Wildfire	Hungry Creek	**1.80**	**1.80**	**1.80**
No Action + Wildfire	Long John Creek	**1.42**	**1.74**	**1.74**
No Action + Wildfire	Upper Cow Creek	0.49	0.50	0.50
2	Headwaters Cottonwood Creek	0.86	0.87	0.87
2	Beaver/Grouse Creek	**1.47**	**1.48**	**1.48**
2	Deer-Beaver Creek	0.87	0.87	0.87
2	Hungry Creek	**1.80**	**1.81**	**1.81**
2	Long John Creek	**1.42**	**1.39**	**1.39**
2	Upper Cow Creek	0.49	0.50	0.50
3	Headwaters Cottonwood Creek	0.86	0.87	0.87
3	Beaver/Grouse Creek	**1.47**	**1.48**	**1.48**
3	Deer-Beaver Creek	0.87	0.87	0.87
3	Hungry Creek	**1.80**	**1.81**	**1.81**
3	Long John Creek	**1.42**	**1.39**	**1.39**
3	Upper Cow Creek	0.49	0.50	0.50
4	Headwaters Cottonwood Creek	0.86	0.87	0.87
4	Beaver/Grouse Creek	**1.47**	**1.49**	**1.49**
4	Deer-Beaver Creek	0.87	0.87	0.87
4	Hungry Creek	**1.80**	**1.82**	**1.82**
4	Long John Creek	**1.42**	**1.41**	**1.41**
4	Upper Cow Creek	0.49	0.50	0.50
5	Headwaters Cottonwood Creek	0.86	0.87	0.87
5	Beaver/Grouse Creek	**1.47**	**1.49**	**1.49**
5	Deer-Beaver Creek	0.87	0.87	0.87
5	Hungry Creek	**1.80**	**1.81**	**1.81**
5	Long John Creek	**1.42**	**1.39**	**1.39**
5	Upper Cow Creek	0.49	0.50	0.50
Preferred Alt.	Headwaters Cottonwood Creek	0.86	0.86	0.86
Preferred Alt.	Beaver/Grouse Creek	**1.47**	**1.45**	**1.45**
Preferred Alt.	Deer-Beaver Creek	0.87	0.89	0.89
Preferred Alt.	Hungry Creek	**1.80**	**1.80**	**1.80**
Preferred Alt.	Long John Creek	**1.42**	**1.37**	**1.37**
Preferred Alt.	Upper Cow Creek	0.49	0.49	0.49

Table 5: Geo Model Risk Ratios For Preferred Alternative: From CWE Model Run of 1-10-08

For details on the assumptions used in the fire and cumulative effects model, refer to: Addendum #1 to Mt. Ashland Late-Successional Reserve Habitat Restoration and Fuels Reduction Project Cumulative Watershed Effects Analysis Specialist Report for the FEIS Preferred Alternative and No Action + Wildfire by Gregg Bousfield, Don Elder, and Tom Laurent, dated 1-10-08.

Should a wildfire with characteristics assumed by the model occur in the project area, there would be a considerable increase in landslide potential in **Beaver/Grouse** and **Long John** watersheds. The Geo model predicts an increase in the risk ratio of + 0.61, and + 0.37 respectively for these two watersheds (Table 5). This is because such a fire would burn much of the area within units at high or moderate severity, reducing root support and evapotranspiration.

The most recent, wildfire of moderate size in the vicinity of the project area was the Colestine Fire, which occurred in August of 1981. This fire burned about 900 acres immediately NW of the community of Colestine, Oregon. Review of color infrared air photos taken after the fire in 1982 revealed that the majority burned at moderate severity, with lesser amounts at high and low. This behavior is consistent with predictions of the fire model. Larger streams with riparian vegetation and adjoining lands burned at low severity, while timber and brush/hardwood hillslopes burned at moderate to high severity. It is noteworthy that the majority of terrain had a south aspect, and much of it was granitic, similar to the Mt. Ashland project area.

H. FOLLOW UP FIELD REVIEW AND MONITORING

The original geologic report for this project (4-13-07) identifies the need for four field days of monitoring, two reviewing the timber mark, and two after logging and fuel treatment are completed. As a result of changes in unit and road boundaries associated with the Preferred Alternative, an additional two days of field time will be needed to review these changes in 2008 field season, so that any needed field adjustments can be applied.