Humboldt Redwood
COMPANY, LLC

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March 3, 2010

Ms. Catherine Kuhlman
California Regional Water Quality Control Board
North Coast Region
5550 Skylane Blvd, Suite A
Santa Rosa, CA 95403

Subject: Enrollment of THP 1-09-010 HUM (Unit 1) in the Freshwater Creek WWDR, "Tier II"

Dear Ms. Kuhlman:

HRC is requesting Tier II enrollment under Watershed-Wide Waste Discharge Requirement (WWDR) Order No. R1-2006-0041 for unit 1 of THP 1-09-101 HUM. This unit is comprised of 89.1 acres of group selection (44.6 clear-cut equivalent acres). Total acres currently enrolled or proposed for enrollment under Order No. R1-2006-0041 Tier II is shown in the Attached Pre-Harvest Planning Report. The Erosion Control Plan (ECP), Form 200 and an annual waste discharge enrollment fee have already been submitted for this THP.

Landslide risks associated with this plan were evaluated in compliance with the Freshwater Creek and Elk River WWDR Permit Acreage Enrollment and Compliance Monitoring Program Quality Assurance Project Plan (Version 2.0, September 1, 2006) approved by the Executive Officer of the North Coast Regional Water Quality Control Board. This approach uses commonly accepted standards for geologic practices in forest management (Sidle et al. 1985, Soeters and Van Western 1996, and Sidle and Ochiai 2006) to assess factors known to contribute to landslides, such as steepness of slope, slope convergence, hydrology, geologic features, and visibly unstable areas. Overlapping and complementary scientific techniques combining state-of-the-art digital elevation model (DEM) slope stability models, field investigation, and terrain analysis were used in this assessment.

The portions of Unit one to be enrolled as Tier 2 acres occupies moderate to steeply inclined and well incised slopes. The area is underlain by undifferentiated Wildcat Group sediments. Unstable areas identified during THP layout were far and few between. The one that was identified was included within a no harvest zone. The THP approved silviculture included both group and single tree selection. The yarding methods were defined appropriately with ground based occurring near ridge tops, gently inclined slopes and away from watercourses. Cable yarding was delineated for areas that are typically more inclined and remote to the existing road system. The HCP implemented watercourse and protection zones provide significant buffers to all of the watercourses. In many instances, these buffers were expanded in size for further watercourse protection. The approved harvest plan is anticipated to result in a low impact harvest that has recognized the potential impacts resulting from harvesting and mitigated for them. Based on the silviculture, yarding system, and implemented buffers, the proposed acres meet the tier 2 enrollment requirements.

The THP proposes an uneven-age silviculture retaining 75 sqft of basal area. Sub-merchantable trees and those with specific wildlife value characteristics (e.g., cavities, large limbs, broken tops, snags, etc.) will be retained within the harvest area to the extent feasible. Cable and ground based yarding is approved for the unit. Post-harvest no site preparation will occur.

Greater detail regarding this landslide hazard assessment is provided in the attached *THP Unit Review for Tier 2 Enrollment*. The licensed geologist involved with the Tier 2 landslide risk evaluation has concluded the proposed harvest operation, if implemented as planned and approved, will result in a negligible increase in potential for post-harvest landsliding; and thereby meets the applicable Zero Delivery of landslide related sediment performance standards of NCRWQCB Orders R1-2006-0041 and R1-2008-0071.

Please do not hesitate to contact me should you have any questions or comments regarding this application for enrollment into WWDR (Order No. R1-2006-0041).

Respectfully,

Jon Woessner,
Area Manager RPF #2571
Humboldt Redwood Company, LLC

Attachments:
Professional Certification of Design
THP Unit Review for Tier II enrollment
Pre-harvest Planning Report
Maps

THP: Ridge Meander THP 09-010 Unit # 1 2-25-10

Tools Used in This Assessment	Figure Number
Elevation Map with 10 ft Contours (HRC LiDAR)	1
SHALSTAB (Montgomery and Dietrich, 1994 and Palco, 2006) / Slope Class / Hillshade Maps	2
CGS Geology and Geomorphic Features (CGS, 1999)	3
Mass Wasting Potential Map (HRC, 1999)	4
Aerial Photo Map (HRC, 2007)	5
HRC Freshwater Creek WA deep-seated LS inventory (HRC, 2001)	6
Road Condition Map	7

Please see back of enrollment for references

Summary of Changes to THP Prescriptions Based on Tier II Analysis in this Unit:

Geologic Review	Forestry Silviculture/Site Prep Plan	Operational Design Plan
1-1	No change to approved selection silviculture. No site preparation will occur due to partial harvesting.	No change to approved yarding methods.

Geological Summary (information presented from existing bodies of work):

Portions of Unit 1 have been enrolled (and approved) as Tier 1 acres. The remaining portions of the unit are proposed here as Tier 2 acres. The THP includes a 'Geology Disclosure' provided by the RPF. This indicates that recent mass wasting (dating back to the initial harvest) is not prevalent within the unit. The harvest unit occupies east-facing, moderate to steeply inclined slopes underlain by Wildcat group sediments (Figure 3). Dormant rock slides are mapped within the southern portions of the unit (Figure 3). Figure 3 also maps considerable debris slide slope / source areas throughout the unit typically flanking watercourses. Watershed Analysis mapping (Figure 6) of deep seated landslides (rock slides) is consistent with Figure 3. This mapping discloses the subjective potential of reactivation as moderate.

Review of Figure 2 (Hillslope Shade) shows a typically uniform array of deeply incised watercourse channels within a homogonous underlying strata. Recognition of the Figure 3 and Figure 6 large dormant landslides is not obvious.

One area was removed from the harvest unit during plan layout due to mass wasting. The Forester did not observe any indicators within the proposed units to require inclusion of a Note 45 Report within the THP. The THP was reviewed by various agencies during PHI and was found to be compliant with the Forest Practice Rules with respect to disclosure of all known unstable areas.

For this evaluation, the harvest unit has been reviewed as one polygon.

No new road construction is proposed for this unit. Two small areas located along the ridgetop are proposed for ground based yarding. The remainder of the unit is proposed for cable yarding.

THP Unit: # 1
Polygon: 1-1

A) General Observations

The Tier 2 acres extend from ridge tops downslope to watercourses.

General slope morphology is concave to convex in response to a well incised drainage network.
The polygon occupies convergent and divergent slopes with inclinations that vary from 10% to over 60%. Steeper slope inclinations are located on flanking slopes of the well incised Class II and Class III watercourses.

A) General Observations

Areas of elevated SHALSTAB (Value 2) are located adjacent the Class III watercourses and within swales not containing watercourses. Typically areas of elevated SHALSTAB did not correlate with recent or historically active landslides. Our field review of the SHALSTAB areas revealed steeply inclined swales, evenly distributed, in situ old growth stumps and abundant 2nd growth timber.

Debris slide slopes mapped (Figure 3) within this portion of the unit correlate with slopes inclined over 40% that lead to a watercourse. It appears that these areas were mapped as potential source areas since only one actual debris slide was identified during THP layout and approval.

Mass Wasting Potential (MWP) modeled for this portion of the unit (Figure 4) is regionally low. Moderate and high MWP is modeled in the western portion of the unit and generally correlates with slopes leading towards Class III watercourses. High MWP is modeled within the area where a debris slide did occur. This area is excluded from harvest.

The stand is predominantly redwood and fir. The original harvest was a ground based clearcut yarded either to the downslope watercourse or the ridge top. This harvest was ground based and resulted in the dragging of the large diameter felled timber across the slopes using large diameter cables (steam donkey). The unit was also partially harvest by ground based and cable yarding in the mid 1990s.

Typical RMZ for the Class II watercourses includes a 30-foot no harvest inner band and a selection buffer that extends the RMZ out to between 75 and 100 feet. The size of the outer band RMZ is slope dependent and will retain 60% canopy closure.

The implemented THP mitigation for the Class III watercourses includes the retention of all trees growing within the active channel and all trees 8 inches and less within 15 feet of the channel. The new silviculture has bolstered Class III mitigations to include a 50' RMZ where side slopes greater than 50% will maintain 75 sq. ft of basal area within the buffer. Where side slopes are less than 50% a 25' RMZ will maintain 75 sq. ft of basal area within the buffer. No group openings greater than ¼ acre will occur immediately above the terminus of the slopes leading to a Class III watercourse where slopes are greater than 40% or immediately above a headwall swale. Additionally sub-merchantable trees and those with specific wildlife value characteristics (e.g., cavities, large limbs, broken tops, snags, etc.) will be retained within the harvest area to the extent feasible.

B) Harvest Related Impacts and Hillslope Sensitivity

The slopes within the unit have experienced clearcut, burning and donkey yarding (a legacy method that dragged the large diameter, felled timber to railroads). Typically, rock strengths diminish in response to mass wasting. Portions of the unit are mapped to overlie dormant landslides suggesting a potentially reduced inherent resistance to mass wasting. Previous, more aggressive harvests have occurred on the failures and did not result in reactivation or the development of new mass wasting. This suggests that the inherent rock strength was not diminished significantly.

The potential for the development of shallow debris slides increases significantly where roads are constructed across steeply inclined slopes and incorporate fills. These activities are not proposed in this plan.

Partially harvesting the slopes within the unit is unlikely to significantly increase the potential for mass wasting.

The extensive RMZs were designed to provide sediment filtration bands adjacent the watercourses should extensive sediment be generated from the clearcut harvesting. The current level of harvest will retain both canopy closure and slash from the harvested trees potentially increasing the effectiveness of the sediment filtration band.

Overall hillslope sensitivity to harvest activities appears minimal with respect to mass wasting.

C) Forestry / Silviculture Plan

The Forester proposes a group selection silviculture where 75 square feet of basal area will be retained throughout the area being reviewed. No new road construction or reconstruction is proposed.

D) Operational Design Plan

THP approved yarding method is predominantly cable with gently inclined slopes proposed for ground based harvesting in the southeastern portion of the proposed area. The ground based yarding will be constrained to slopes inclined less than 35% with typical slope inclinations ranging from 0-20%. The volume of timber to be yarded coupled with the diameter of the trees and the anticipated

D) Operational Design Plan
moderate deflection should result in minimal ground disturbance. Where this disturbance is exceptional, the RPF will provide for waterbarring. We did not find reason to change the yarding methods as approved in the THP.

References:

CGS, 1999, Geologic and Geomorphic Features Related to Landsliding, Freshwater Creek, Humboldt County, California. DMG Open-File Report 99-10. Available via the web at http://www.conservation.ca.gov/cgs/fwgp/Pages/fresh.aspx

Montgomery, D.R. and W.E. Dietrich, 1994. A physically based model for the topographic control on shallow landsliding. Wat. Resour. Res. 30: 1153-1171. For specific details regarding the model used in this evaluation, please see Palco, 2006. Additional information from the model authors is available at the following website: http://socrates.berkeley.edu/~geomorph/shalstab

HRC, 2007, Ortho-photo rectified aerial photographs flown by 3Di West, Eugene Oregon,

HRC, 2008. Freshwater Creek and Elk River WDR Permit Acreage Enrollment and Compliant Monitoring Program, NCRWQCB R1-2006—0039 and R1-2006-0041, Quality Assurance Project Plan, Version 3.0. Policy document submitted to NCRWQCB dated June 7, 2006.

HRC, 2001, Freshwater Creek Watershed Analysis, prepared for Pacific Lumber Company (PALCO) dated January 2001, and acquired by Humboldt Redwood Company, LLC in 2008.

HRC, 2002, (Policy Acquired from The Pacific Lumber Company (PALCO)) Prescriptions Based on Watershed Analysis for Freshwater Creek, California, August 15, 2002.

HRC, 1999, The Pacific Lumber Company's Habitat Conservation Plan, Vol. 2 Part D, Landscape Assessment of Geomorphic Sensitivity, Public Review Draft.

Brief descriptions of the models used in this evaluation:

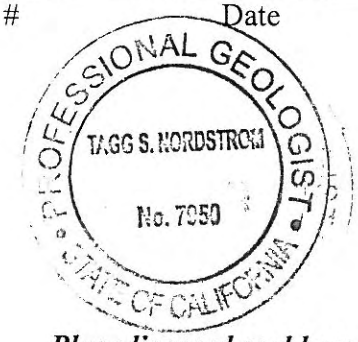
SHALSTAB was first described in Dietrich and Montgomery (1994). SHALSTAB is a simple, physically-based model based on the Mohr-Coulomb failure law that can be used to map shallow landslide potential. The model calculates the potential for failure using gridded digital elevation data. The simplicity of the model lies in the formulation of slope stability parameters that allow the model to be run parameter-free using default values suggested by the authors or determined by local measurement. Because the model uses no field measurements of critical characteristics that determine slope stability, the evaluation of potential instability is only an approximation. In applying SHALSTAB for Tier 2 enrollment, HRC has run the model on a 10-m spatial grid using LiDAR elevation

data and applied the parameters as suggested by the model authors. HRC's application of the method and parameters is described in HRC (2008).

Mass Wasting Potential (MWP) modeling is a cursory regional assessment that numerically values soil, slope inclination, geology type, and geomorphology with respect to past mass wasting (HRC, 1999). The sums of the values specific to an area are measured against a set ranking system that extends from very low to extreme. The models intent is to highlight areas of high potential for instability at the planning level. The model's use at the site specific level is limited in that pedogenic soil types are used, not textures, the geologic formations utilized provide one value for all of the incorporated facies, and the model is heavily biased if past mass wasting has occurred or has been mapped as occurring in the area.

Professional Certification of Design

I, Tagg Nordstrom, P.G. 7950, 3/4/10,
Name license # Date



Place licensed seal here

Signature

hereby certify, in accordance with North Coast Regional Water Quality Control Board (NCRWQCB) Order Nos. R1-2006-0039 and R1-2006-0041, that the attached application and the description of THP modifications, and the materials submitted along with:

THP No. 1-09-010 HUM (Ridge Meander) Unit # Portions of Unit 1

a. are in accordance with accepted practices, and recognized professional standards;
b. comply with the requirements of the Monitoring and Reporting Program No. R1-2006-0103, approved by the Executive Officer of the North Coast Regional Water Quality Control Board; and
c. provided that the THP is properly implemented, operated, and maintained, are adequate for the THP to meet the applicable Zero Net Delivery performance standards of NCRWQCB Orders R1-2006-0039, R1-2006-0041, and R1-2006-0103, insofar as such performance can reasonably be predicted by accepted engineering geologic practices.

The opinions presented in the subject THP have been developed using that degree of care and skill ordinarily exercised, under similar circumstances, by reputable engineering geologists practicing in this or similar localities. No other warranty, expressed or implied, is made as to the professional advice included in this report.

Table 1. Proposed 2010 Harvest in Freshwater Creek.

THP Name	THP Number	Unit Number	Silviculture/Felled				CC Equivalent	Hazard	
			CC	ROW	shr	SEL		Low	High*
Becks 2010	10-??	1							
Ridge Meander	09-010	1 TII							
Ridge Meander	09-010	2 TI				37.7	18.9	37.7	0.0
Ridge Meander	09-010	3 TII							
Ridge Meander	09-010	1A TI				37.1	18.6	37.1	
Ridge Meander	09-010	1B TI				36.1	18.1	35.4	2.7
Ridge Meander	09-010	3A T1				16.6	8.3	16.6	
little little	10 -??	All							
City Dump	05-006	1							
City Dump	05-006	2							
City Dump	05-006	3							
City Dump	05-006	4			5.2		3.9		
City Dump	05-006	5							
City Dump	05-006	6							
City Dump	05-006	7							
						Total	67.7		

Table 3. Summary of THPs by Yarding System and Site Preparation for Freshwater Creek

THP Name	THP Number	Unit Number	Yarding System			Site Preparation	
			Ground Based	Yarder	Helicopter	Mechanical	Broadcast
Becks 2010	10-??						
Ridge Meander	09-010						
Ridge Meander	09-010	2 TI		37.7			
Ridge Meander	09-010	3 TII					
Ridge Meander	09-010	1A TI		37.1			
Ridge Meander	09-010	1B TI		24.1			
Ridge Meander	09-010	3A T1					
little little	10 -??						
City Dump	05-006	1					
City Dump	05-006	2					
City Dump	05-006	3					
City Dump	05-006	4					
City Dump	05-006	5					
City Dump	05-006	6					
City Dump	05-006	7					

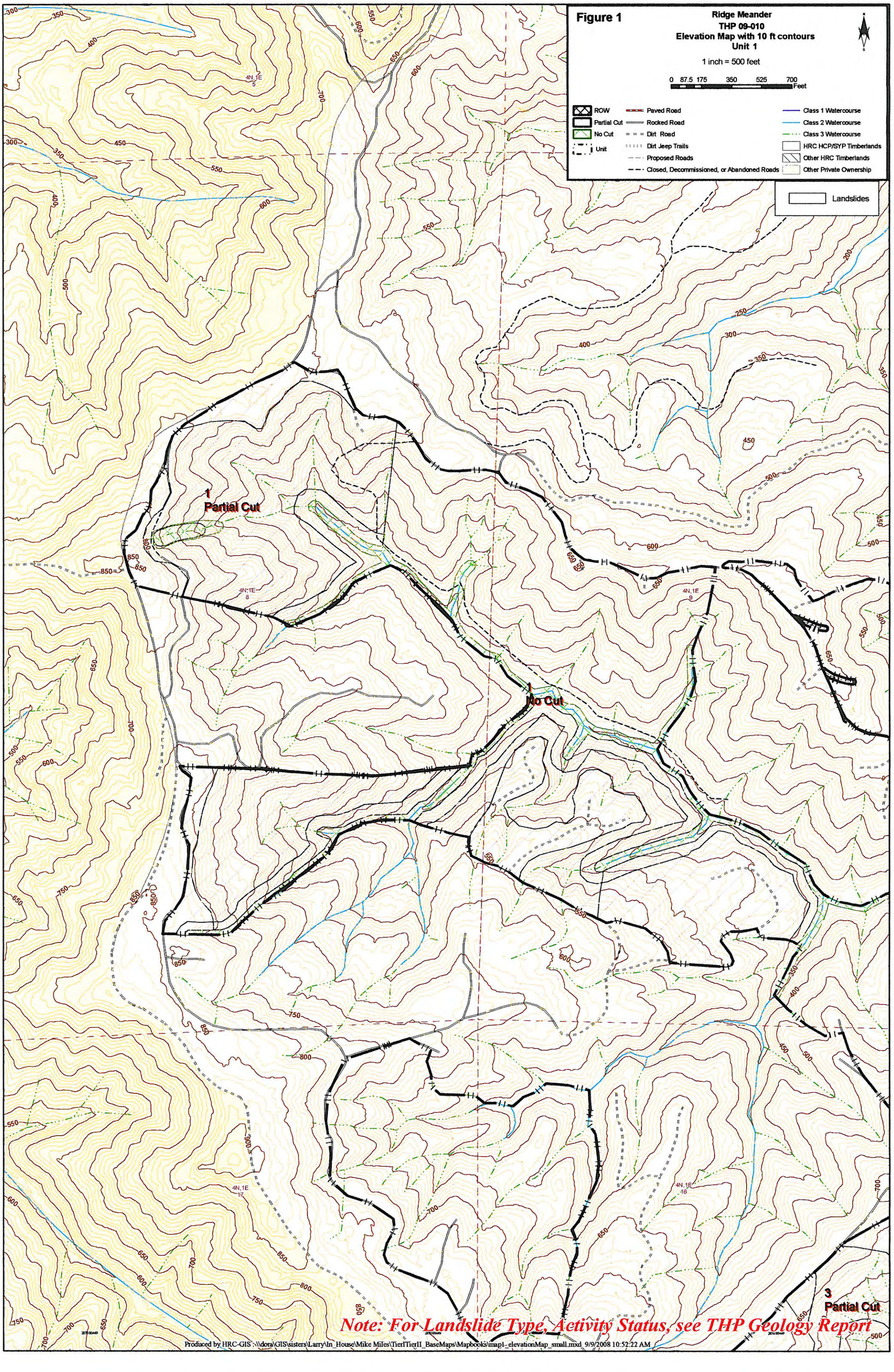


Figure 1
Ridge Meander
THP 09-010
Elevation Map with 10 ft contours
Unit 1
1 inch = 500 feet
0 87.5 175 350 525 700
Feet
ROW
Partial Cut
No Cut
Unit
Paved Road
Rocked Road
Dirt Road
Dirt Jeep Trails
Proposed Roads
Closed, Decommissioned, or Abandoned Roads
Class 1 Watercourse
Class 2 Watercourse
Class 3 Watercourse
HRC HCP/SYP Timberlands
Other HRC Timberlands
Other Private Ownership
Landslides
1
Partial Cut
1
No Cut
3
Partial Cut
Note: For Landslide Type, Activity Status, see THP Geology Report
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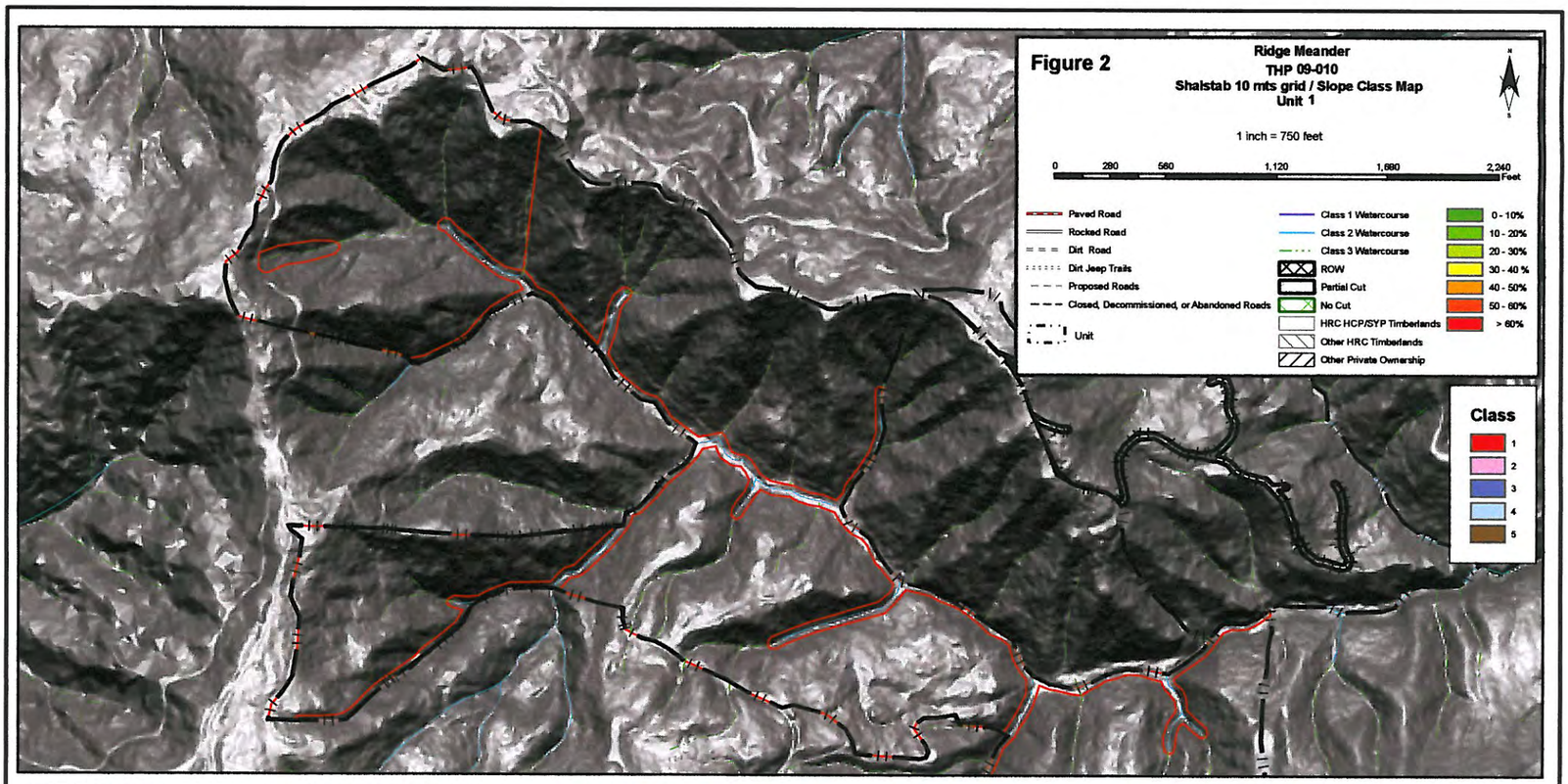
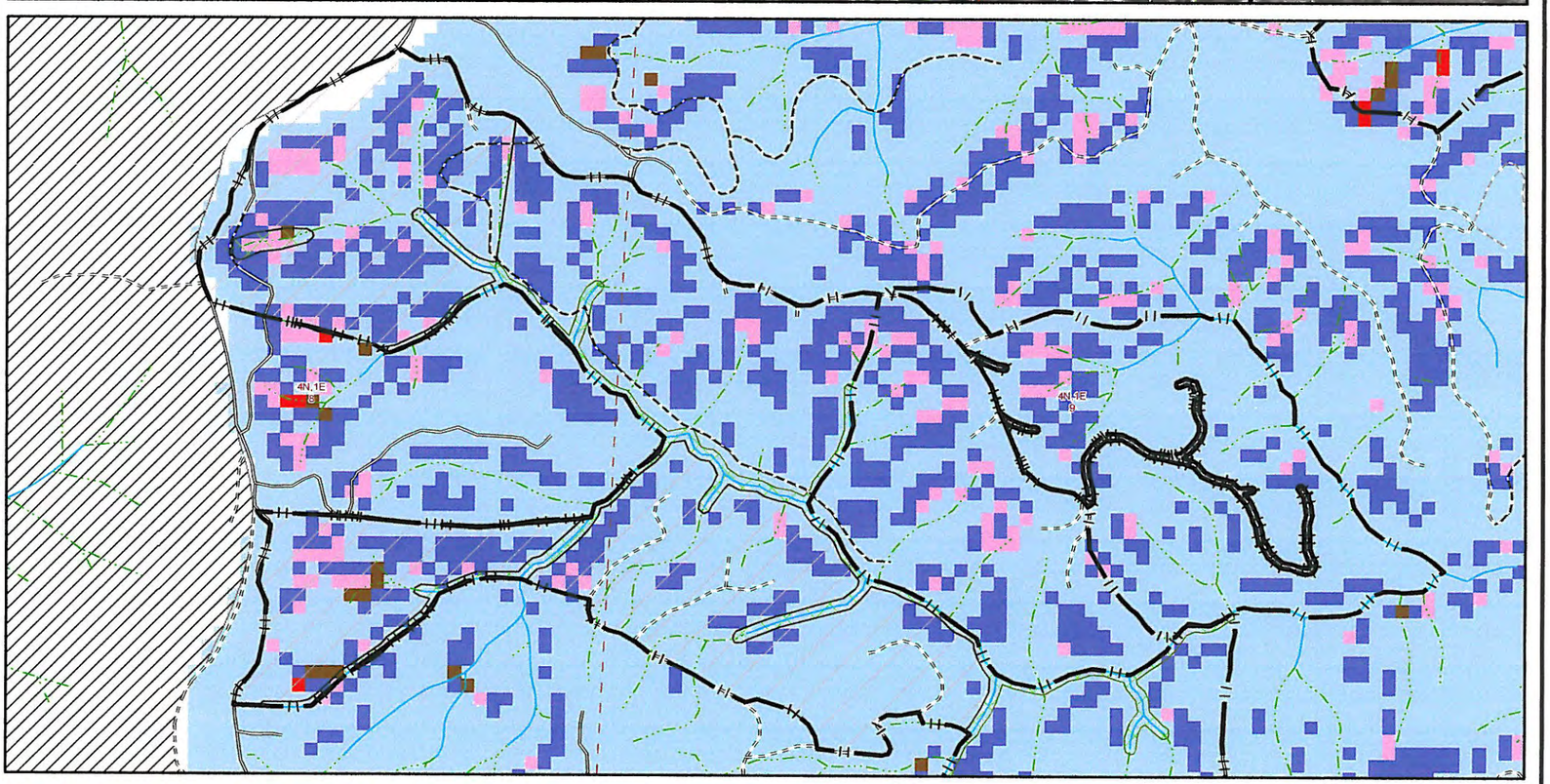
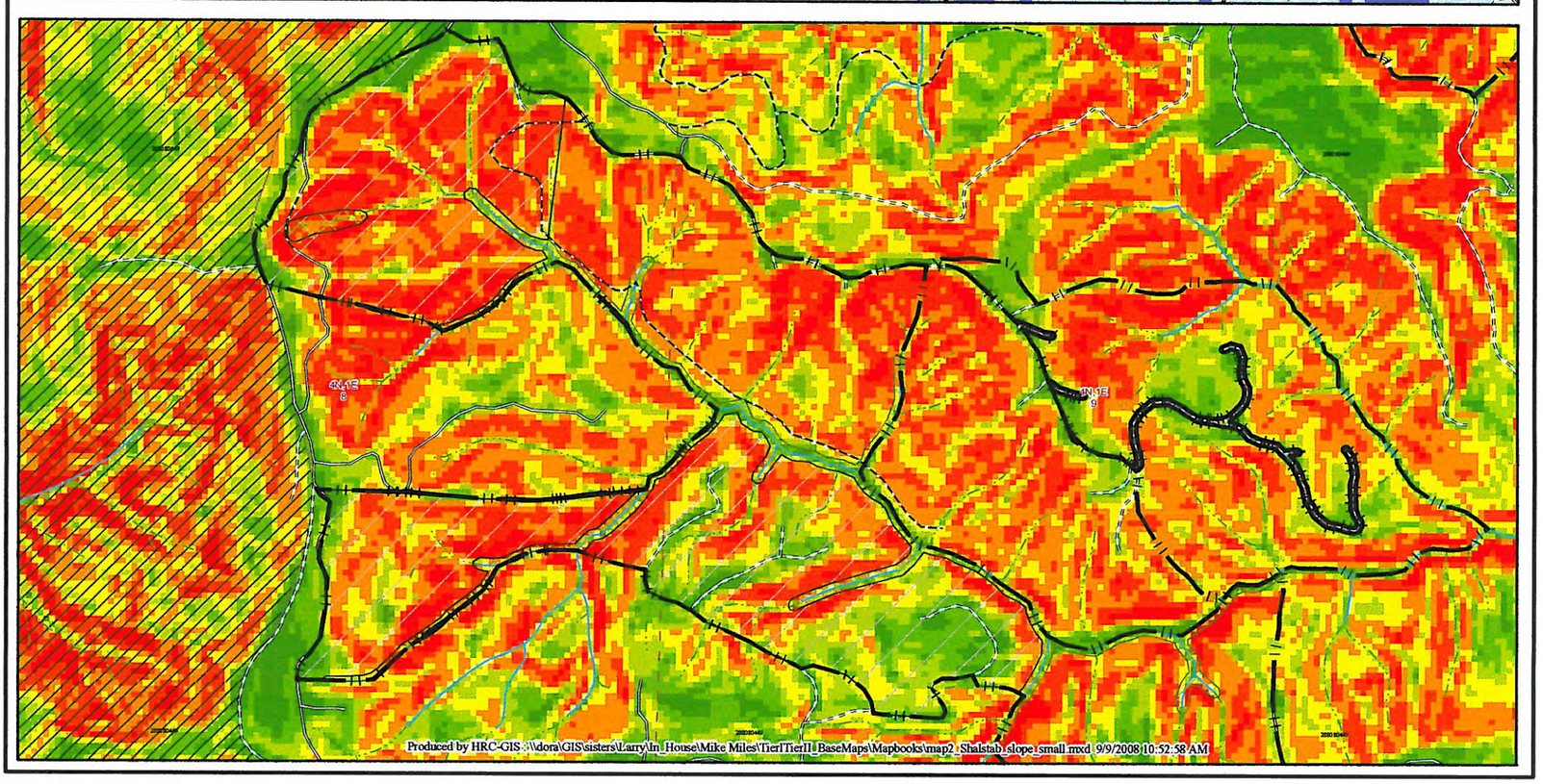


Figure 2
Ridge Meander
THP 09-010
Shalstab 10 mts grid / Slope Class Map
Unit 1
1 inch = 750 feet
0
280
560
1,120
1,680
2,240
Feet
Paved Road
Rocked Road
Dirt Road
Dirt Jeep Trails
Proposed Roads
Closed, Decommissioned, or Abandoned Roads
Unit
Class 1 Watercourse
Class 2 Watercourse
Class 3 Watercourse
ROW
Partial Cut
No Cut
HRC HCP/SYP Timberlands
Other HRC Timberlands
Other Private Ownership
0 - 10%
10 - 20%
20 - 30%
30 - 40 %
40 - 50%
50 - 60%
> 60%
Class
1
2
3
4
5


4N,1E
8
4N,1E
8


4N,1E
8
4N,1E
8
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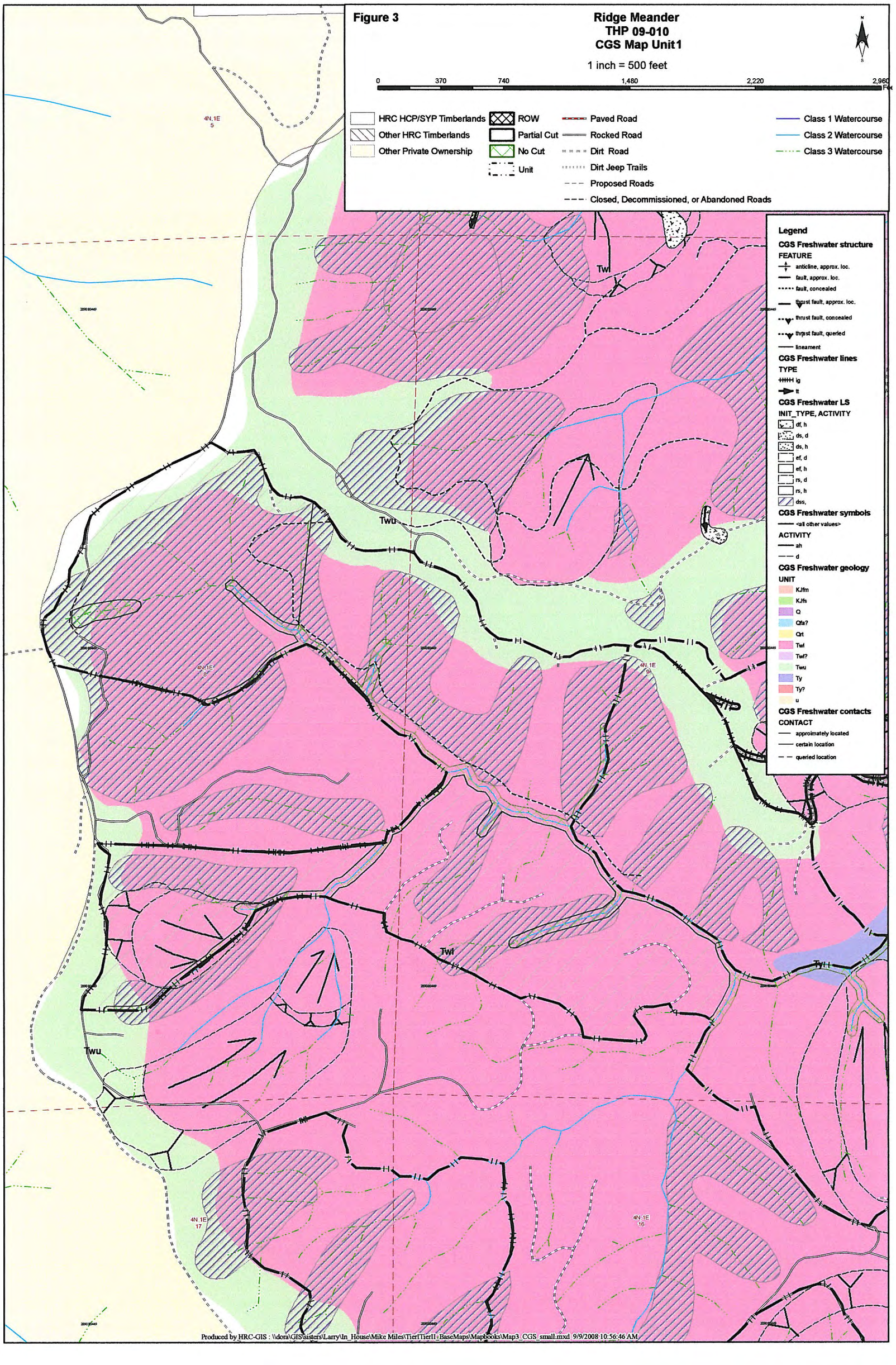
Figure 3
Ridge Meander
THP 09-010
CGS Map Unit1
1 inch = 500 feet
0
370
740
1,480
2,220
2,960
HRC HCP/SYP Timberlands
Other HRC Timberlands
Other Private Ownership
ROW
Partial Cut
No Cut
Unit
Paved Road
Rocked Road
Dirt Road
Dirt Jeep Trails
Proposed Roads
Closed, Decommissioned, or Abandoned Roads
Class 1 Watercourse
Class 2 Watercourse
Class 3 Watercourse
Legend
CGS Freshwater structure
FEATURE
anticline, approx. loc.
fault, approx. loc.
fault, concealed
thrust fault, approx. loc.
thrust fault, concealed
thrust fault, queried
lineament
CGS Freshwater lines
TYPE
ig
lt
CGS Freshwater LS
INIT_TYPE, ACTIVITY
df, h
ds, d
ds, h
ef, d
ef, h
rs, d
rs, h
dss,
CGS Freshwater symbols
<all other values>
ACTIVITY
ah
d
CGS Freshwater geology
UNIT
KJfm
KJfs
Q
Qfa?
Qrt
Twl
Twl?
Twu
Ty
Ty?
u
CGS Freshwater contacts
CONTACT
approximately located
certain location
queried location
Twl
Twu
Twl
Twu
Ty
4N,1E 5
4N,1E 8
4N,1E 9
4N,1E 17
4N,1E 16
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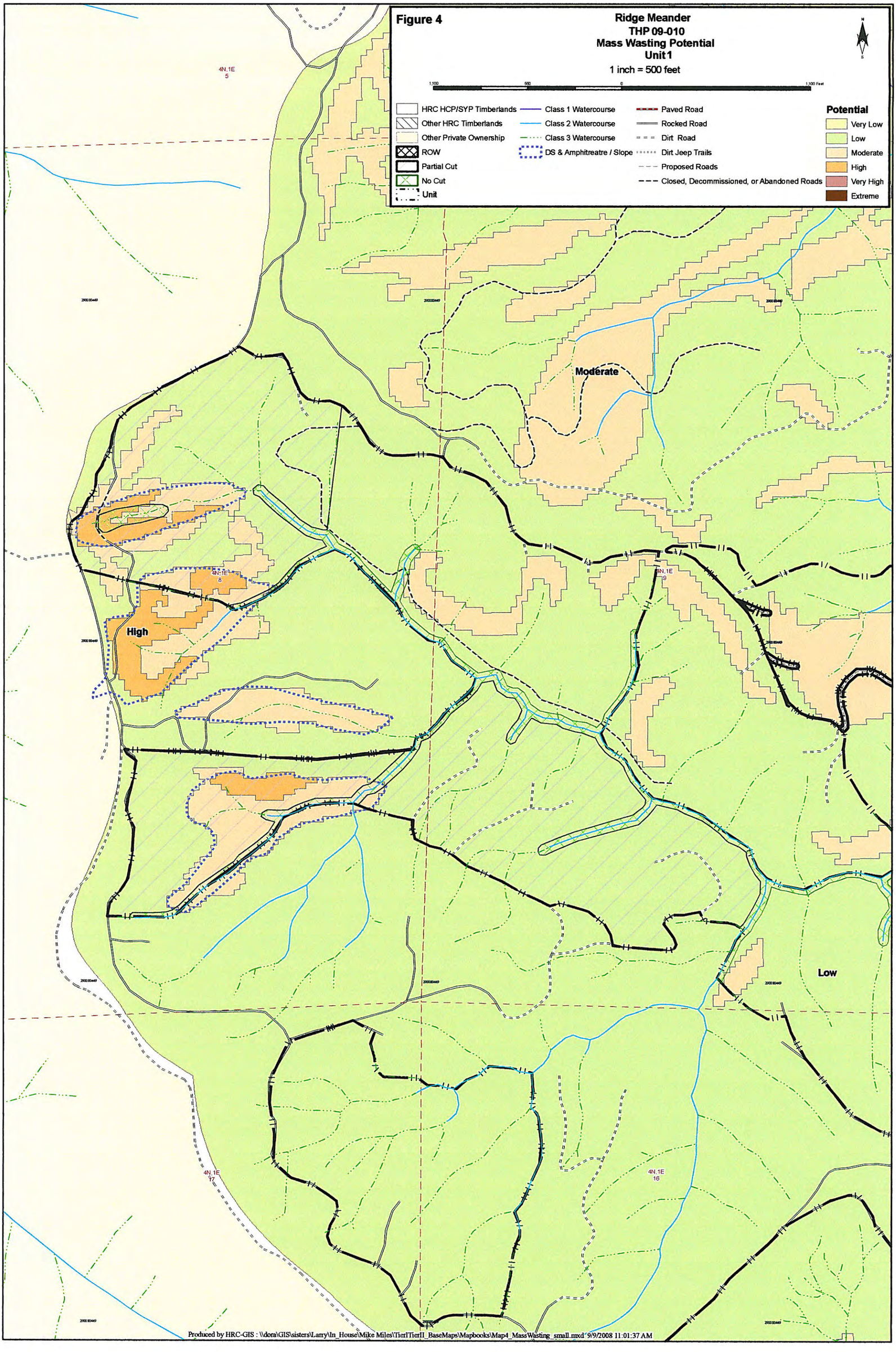
Figure 4
Ridge Meander
THP 09-010
Mass Wasting Potential
Unit 1
1 inch = 500 feet
1,000
500
0
1,000 Feet
HRC HCP/SYP Timberlands
Other HRC Timberlands
Other Private Ownership
ROW
Partial Cut
No Cut
Unit
Class 1 Watercourse
Class 2 Watercourse
Class 3 Watercourse
DS & Amphitreatre / Slope
Paved Road
Rocked Road
Dirt Road
Dirt Jeep Trails
Proposed Roads
Closed, Decommissioned, or Abandoned Roads
Potential
Very Low
Low
Moderate
High
Very High
Extreme
Moderate
High
Low
4N,1E
5
4N,1E
8
4N,1E
9
4N,1E
17
4N,1E
16
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Figure 5
Ridge Meander
THP 09-010
Aerial Photo Map - Unit 1
1 inch = 500 feet
0
237.5
475
950
1,425
1,900
Feet
HRC HCP/SYP Timberlands
Other HRC Timberlands
Other Private Ownership
Unit
ROW
Partial Cut
No Cut
Class 1 Watercourse
Class 2 Watercourse
Class 3 Watercourse
Paved Road
Rocked Road
Dirt Road
Dirt Jeep Trails
Proposed Roads
Closed, Decommissioned, or Abandoned Roads
4N,1E
5
4N,1E
8
4N,1E
9
4N,1E
17
4N,1E
16
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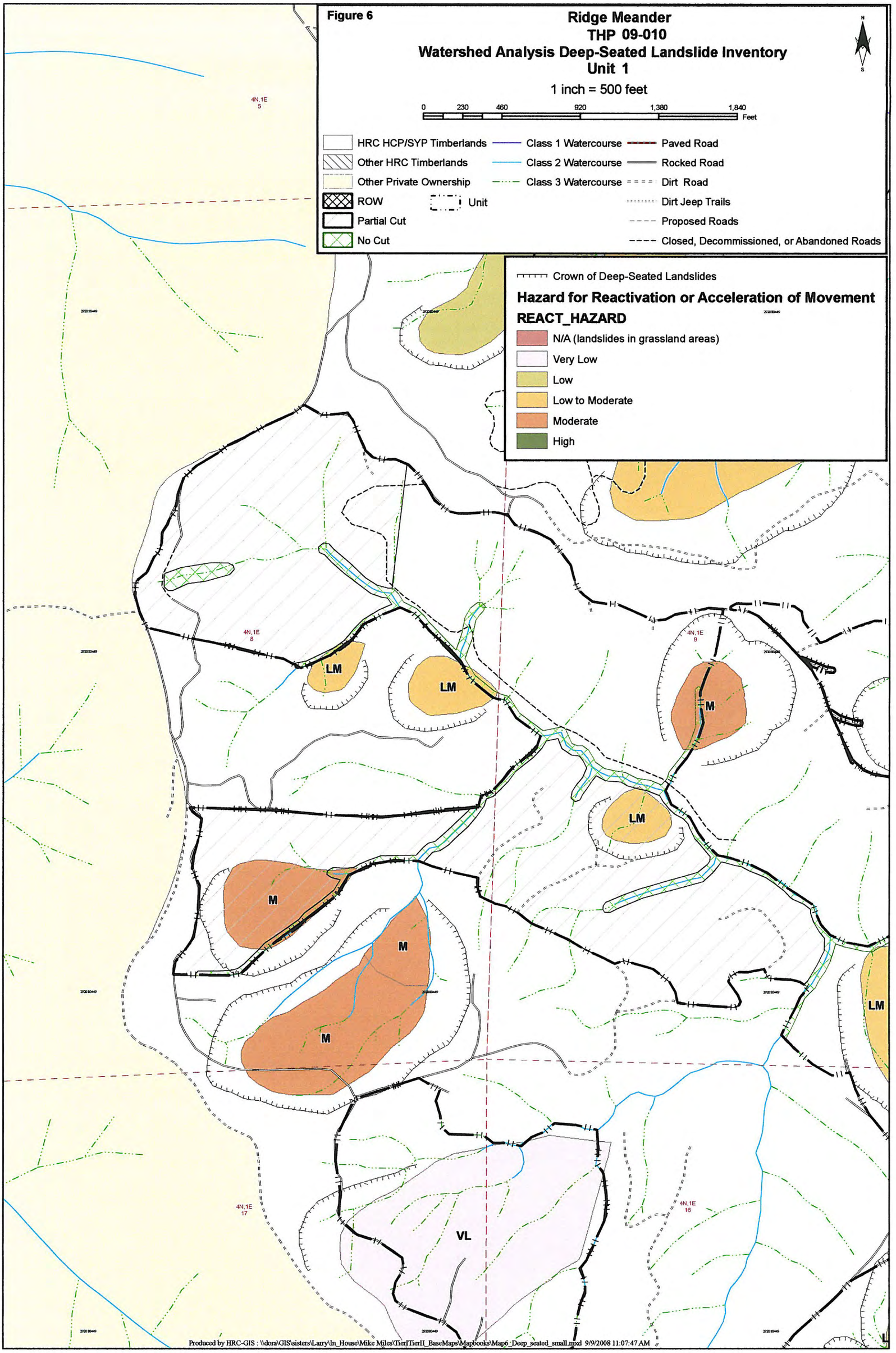
Figure 6
Ridge Meander
THP 09-010
Watershed Analysis Deep-Seated Landslide Inventory
Unit 1
1 inch = 500 feet
0 230 460 920 1,380 1,840
Feet
HRC HCP/SYP Timberlands
Other HRC Timberlands
Other Private Ownership
ROW
Partial Cut
No Cut
Unit
Class 1 Watercourse
Class 2 Watercourse
Class 3 Watercourse
Paved Road
Rocked Road
Dirt Road
Dirt Jeep Trails
Proposed Roads
Closed, Decommissioned, or Abandoned Roads
Crown of Deep-Seated Landslides
Hazard for Reactivation or Acceleration of Movement
REACT_HAZARD
N/A (landslides in grassland areas)
Very Low
Low
Low to Moderate
Moderate
High
LM
M
VL
4N,1E 5
4N,1E 8
4N,1E 9
4N,1E 17
4N,1E 16
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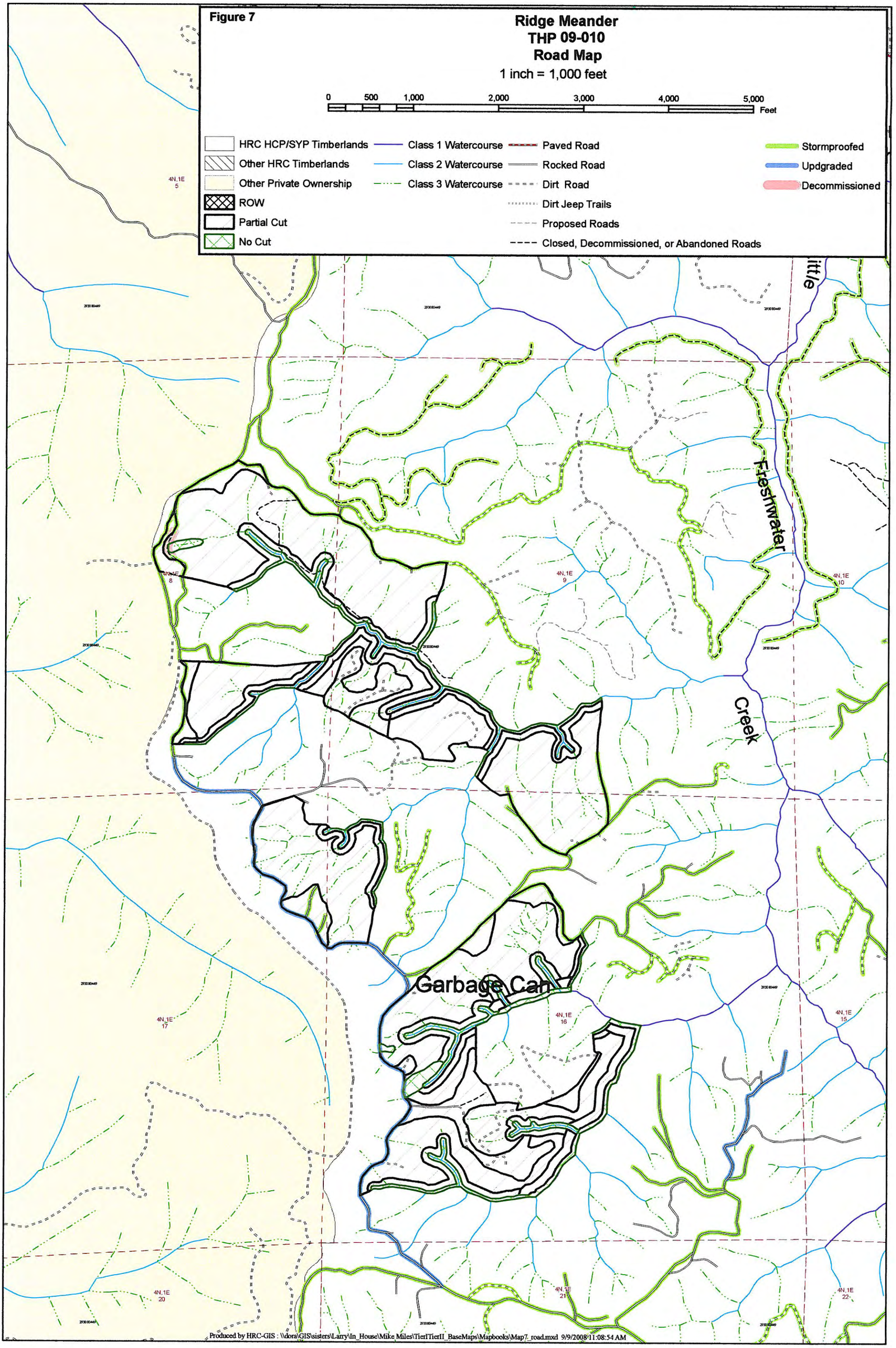
Figure 7
Ridge Meander
THP 09-010
Road Map
1 inch = 1,000 feet
0
500
1,000
2,000
3,000
4,000
5,000
Feet
HRC HCP/SYP Timberlands
Other HRC Timberlands
Other Private Ownership
ROW
Partial Cut
No Cut
Class 1 Watercourse
Class 2 Watercourse
Class 3 Watercourse
Paved Road
Rocked Road
Dirt Road
Dirt Jeep Trails
Proposed Roads
Closed, Decommissioned, or Abandoned Roads
Stormproofed
Updgraded
Decommissioned
Freshwater
Creek
Garbage Can
4N,1E
5
4N,1E
8
4N,1E
9
4N,1E
10
4N,1E
17
4N,1E
16
4N,1E
15
4N,1E
20
4N,1E
21
4N,1E
22
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