



Humboldt Redwood  
COMPANY, LLC

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April 23<sup>rd</sup>, 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 1-07-189 HUM (Unit3) in the Elk River WWDR, "Tier II"

**Dear:** Ms. Kuhlman

HRC is requesting Tier II enrollment under Watershed-Wide Waste Discharge Requirement (WWDR) Order No. R1-2006-0039 for unit 3 of THP 1-07-189 HUM. This Tier II portion of the unit proposed for enrollment is comprised of 5.3 acres of group selection (2.7 clear-cut equivalent acres). Total acres currently enrolled or proposed for enrollment under Order No. R1-2006-0039 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 harvest unit occupies predominantly convex and planar slope forms adjacent a Class II watercourse in the upper reaches of Tom Gulch. The underlying geology is undifferentiated Wildcat Group sediments composed of interbedded mudstone, silts, fine sands, and infrequent pebbles and conglomerates. The bedrock is poorly indurated and predominantly held together by compaction. Yager terrane bedrock underlies the undifferentiated Wildcat Group sediments however Yager terrane is not mapped in the vicinity of the unit. CGS (1999) maps a dormant young deep-seated rotational landslide that encompasses most of the unit (Figure 3). CGS (1999) maps debris slide slopes north and east of Unit 3. No recent or historically active landslides are mapped in the unit.

The THP proposes an uneven-age silviculture retaining 90 sq.ft. 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. Tractor yarding is approved for the entire 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 R1-2006-0039 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. R1-2006-0039).

Respectfully,



Jon Woessner,  
Area Forester, RPF 2571  
Humboldt Redwood Company, LLC

Attachments:

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

Table 1. Proposed 2010 Harvest in South Fork Elk River.

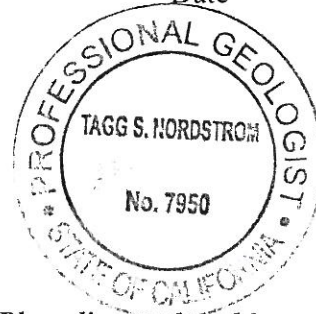
THP Name	THP Number	Unit Number	Silviculture					Hazard <sup>2</sup>		
			CC	ROW	Disp VR	SHR	SEL	CC Equivalent	Low	High
Tom Collins	07-189	5				187	0.0	140.3	185	2
Tom Collins	07-189	1					4.9	2.5	4.9	0
Tom Collins	07-189	2					24	12.0	24	0
Tom Collins	07-189	3					5.3	2.7	5.3	0
Tom Collins	07-189	4					2.3	1.2	2.3	0
South elk ridge	09-108	3					10.2	5.1	4.5	5.7
South elk ridge	09-108	2*					48.6	24.3	48.6	0
South elk ridge	09-108	1a					55.6	27.8	55.6	0
South elk ridge	09-108	1b					8.8	4.4	8.8	0
South elk ridge	09-108	1c					11.5	5.8	3.8	7.7
South elk ridge	09-108	4		1.6			45.7	24.1	37.0	10.3

Table 3. Summary of THPs by Yarding System and Site Preparation for South Fork Elk River.

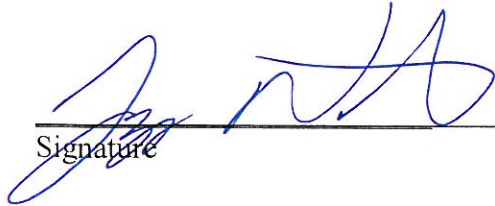
THP Name	THP Number	Unit Number	Yarding System		Site Preparation	
			Ground Based	Yarder	Mechanical	Broadcast
Tom Collins	07-189	5	145.6	40.4		
Tom Collins	07-189	1	4.9			
Tom Collins	07-189	2	24			
Tom Collins	07-189	3	5.3			
Tom Collins	07-189	4	2.3			
Sol elk ridge	09-108	3		10.3		
South elk ridge	09-108	2		48.63		
South elk ridge	09-108	1a	55.6			
South elk ridge	09-108	1b		8.8		
South elk ridge	09-108	1c		11.5		
South elk ridge	09-108	4	33.8	18.92		

## Professional Certification of Design

I, Tagg Nordstrom, P.G. 7950, 4/22/10,  
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. 1-07-189 HUM (Tom Collins) Unit # 3

- a. are in accordance with accepted practices, and recognized professional standards;
- b. comply with the requirements of the Monitoring and Reporting Program No. R1-2008-0071, 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.

**THP: Tom Collins    THP 07-189    Unit # 3    April 19, 2010**

<b>Tools Used in This Assessment</b>	<b>Figure Number</b>
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, 2005)	3
Mass Wasting Potential Map (HRC, 1999)	4
Aerial Photo Map (HRC, 2007)	5
HRC Elk River and Salmon Creek WA deep-seated LS inventory (HRC, 2004)	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:**

<b>Geologic Review</b>	<b>Forestry Silviculture/Site Prep Plan</b>	<b>Operational Design Plan</b>
3-1	THP approved silviculture within polygon 3-1 is single tree selection. No site preparation will occur due to partial harvesting.	The approved THP proposes ground based yarding within polygon 3-1. No change to approved yarding methods.

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

The harvest unit occupies predominantly convex and planar slope forms adjacent a Class II watercourse in the upper reaches of Tom Gulch. The underlying geology is undifferentiated Wildcat Group sediments composed of interbedded mudstone, silts, fine sands, and infrequent pebbles and conglomerates. The bedrock is poorly indurated and predominantly held together by compaction. Yager terrane bedrock underlies the undifferentiated Wildcat Group sediments however Yager terrane is not mapped in the vicinity of the unit. CGS (1999) maps a dormant young deep-seated rotational landslide that encompasses most of the unit (Figure 3). CGS (1999) maps debris slide slopes north and east of Unit 3. No recent or historically active landslides are mapped in the unit.

Mass Wasting Potential model (Figure 4) identifies low mass wasting potential. CGS (1999) mapping of the deep-seated dormant young rotational landslide correlates approximately with Watershed Analysis (Figure 6) mapping of a dormant deep-seated landslide. The extent of this landslide was not clearly observable during our field reconnaissance of the unit.

Review of Figure 2 (Hillslope Shade) shows moderate correlation between surface morphology and the head scarp of the mapped deep seated landslide in Unit 3. The Hillslope Shade map shows gently inclined divergent slopes (ridges) that are most prominent in the upslope portion of the unit. The Class II watercourses appear well entrenched with a consistent low gradient channel.

A focused geologic evaluation was conducted for the THP in accordance with Note 45 guidelines. The dormant young landslide mapped by CGS is also mapped by the project geologist. No recent or harvest related unstable areas were identified within the area proposed for Tier II acres of Unit 3. 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. Detailed characterizations and justification for the proposed harvest is provided in the geology report in Section V of the THP.

For this evaluation, the harvest unit has been reviewed as one polygon. We validate this decision based on the slope morphology, consistent slope inclination with respect elevation, and slope performance in response to the previous harvest entry.

**THP Unit: # 3**  
**Polygon: 3-1**

**A) General Observations**

The unit is bound by dirt roads on two sides and a well entrenched Class II watercourse.

The polygon occupies divergent slopes with inclinations less than 40%. Slopes exceeding 40% are infrequent and scattered in distribution.

The Class II watercourse defining the southern harvest boundary extends for approximately 250 feet along the unit before changing to a Class III watercourse. The unit drains to the Class II and Class III watercourses and unclassified swales to the north. The Class II watercourses are flanked by predominantly 10-30% inclined hill slopes. The slopes appear smooth with moderate incision of the Class III tributaries. The Class II watercourse is well developed. Slopes inclined greater than 40% are scattered in distribution, limited in acreage, and appear to correlate with the head scarp of the dormant young rotational landslide.

Areas of elevated SHALSTAB (Value 3 or higher) are not present within polygon 3-1. Our field review of the polygon revealed gently inclined slopes, evenly distributed, in situ old growth stumps and abundant straight growing 2<sup>nd</sup> growth timber.

The head scarp of the dormant young rotational landslide (Figure 3) within the unit generally correlates increased slope inclinations on otherwise gently inclined slopes. It appears that the landslide was mapped as a potential landslide based on topography since few actual landslide characteristics were observed in the field.

Mass Wasting Potential (MWP) modeled for the unit (Figure 4) is regionally low. Within the unit no high MWP has been modeled. A sliver of moderate MWP mapped within the unit correlates well with the outslope of dirt road in the down slope portion of the unit.

The stand is predominantly mature redwood with occasional fir and hardwoods. The original harvest was a ground based clearcut yarded either to the downslope watercourse or the ridge top.

**B) Harvest Related Impacts and Hillslope Sensitivity**

Response of slope to past management activities provides insight to the overall thresholds that may be exceeded from harvest activities. No landslides were noted in the unit in response to the initial clearcut, broadcast burn, and ground based harvest.

Harvest related mass wasting is typically a response to extensive vegetation removal and the rebalancing of forest soils through tractor use



**B) Harvest Related Impacts and Hillslope Sensitivity  
(cuts and fills).**

This harvest will retain a thinned forest and typically utilize existing skid road. The retained stand will comprised of redwood and fir, species that typically increase the cohesion of forest soils through deep and or wide roots.

**C) Forestry / Silviculture Plan**

We have not changed the silviculture in response to this evaluation.

**D) Operational Design Plan**

THP approved yarding method is ground based. As delineated, the proposed yarding method appears appropriate.

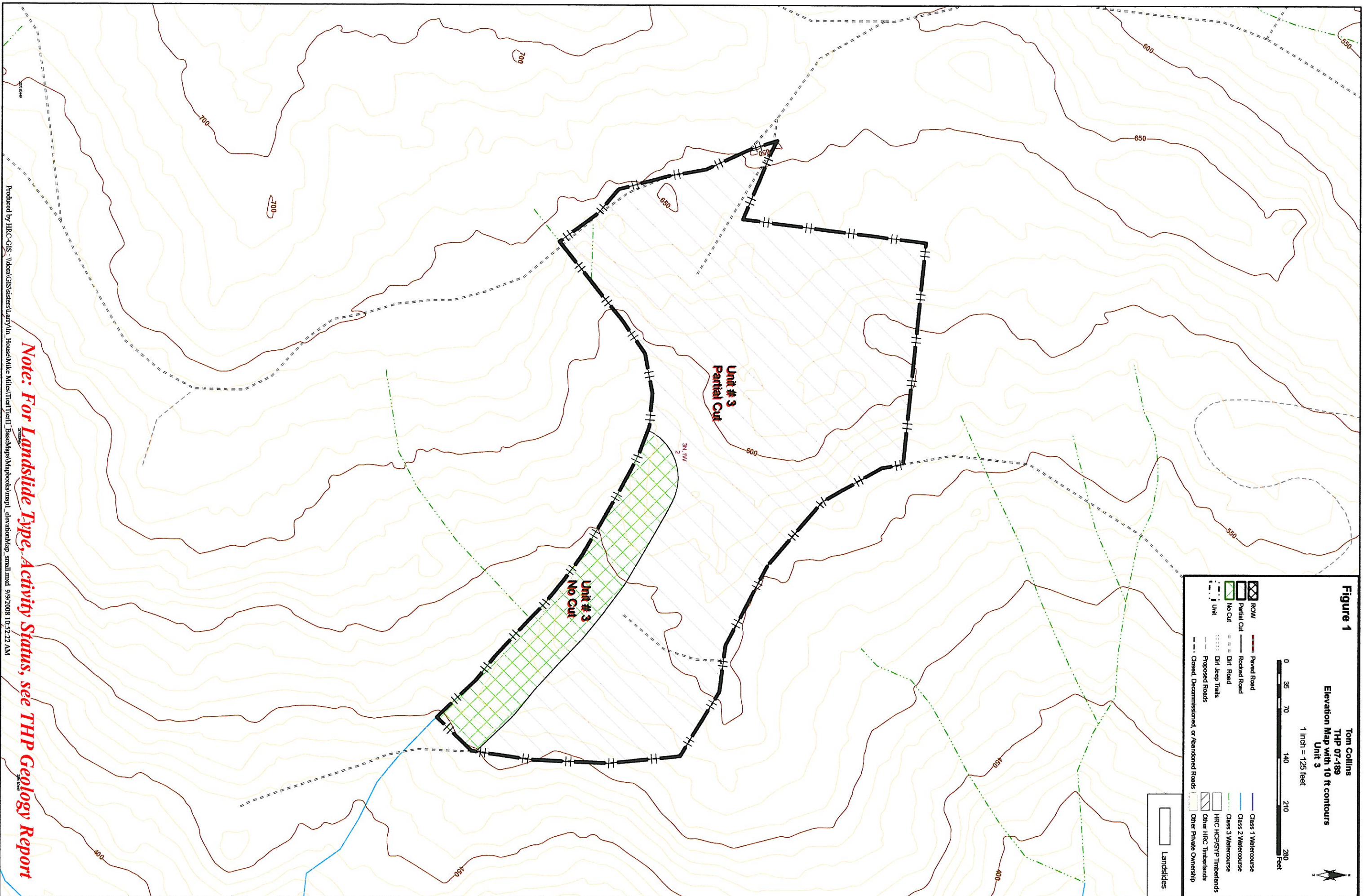
## References:

- CGS, 2005, Geologic and Geomorphic Features Related to Landsliding, Elk River Watershed, Humboldt County, California. Department of Conservation, now California Geological Survey (CGS) Watershed Mapping Series, Mapset 4, Plate 1. Available via the web at [ftp://ftp.consrv.ca.gov/pub/dmg/thp/maps/elk/elk\\_color.pdf](ftp://ftp.consrv.ca.gov/pub/dmg/thp/maps/elk/elk_color.pdf)
- 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, 2004, Elk River / Salmon Creek Watershed Analysis, Scotia, California, prepared for Pacific Lumber Company (PALCO) dated 2004?, and acquired by Humboldt Redwood Company, LLC in 2008.
- HRC, 2005, (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.
- SGD, 2008, Geologic Evaluation of the Moss Elk THP, Humboldt County, California, unpublished report to Wayne Rice RPF, Scotia Pacific Company LLC, dated April 30, 2008. Included within section V of the THP 1-08-072.

## 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.



**Figure 1**

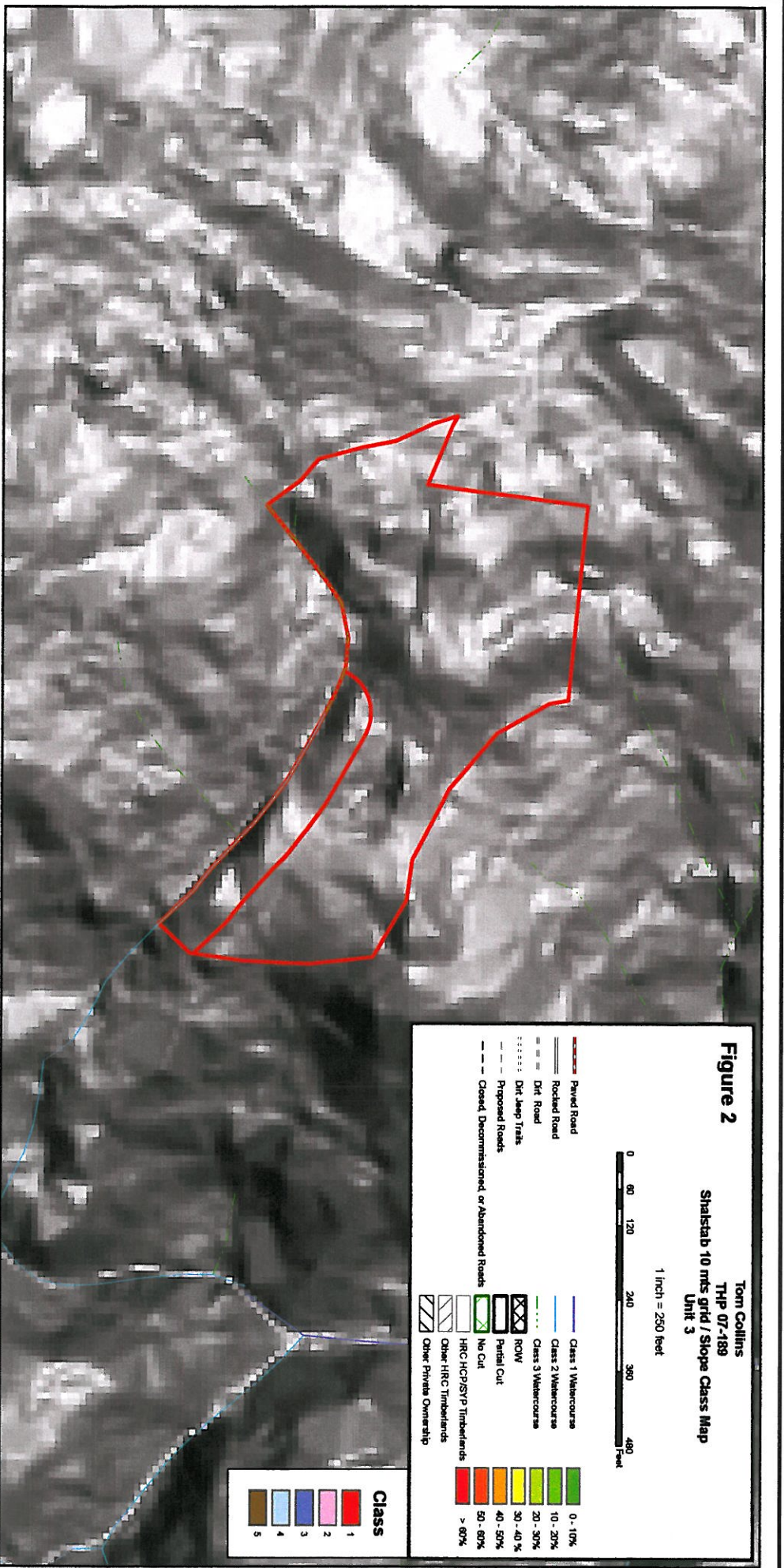
Tom Collins  
 THP 07-189  
 Elevation Map with 10 ft contours  
 Unit 3

1 inch = 125 feet

0 35 70 140 210 280 Feet

- ROW
- Partial Cut
- No Cut
- Unit
- Paved Road
- Roaded Road
- Dirt Road
- Dirt Jeep Trails
- Proposed Roads
- Closed, Decommissioned, or Abandoned Roads
- Landslides
- Class 1 Watercourse
- Class 2 Watercourse
- Class 3 Watercourse
- HRC H/CSP/Timberlands
- Other HRC Timberlands
- Other Private Ownership

*Note: For Landslide Type, Activity Status, see THP Geology Report*



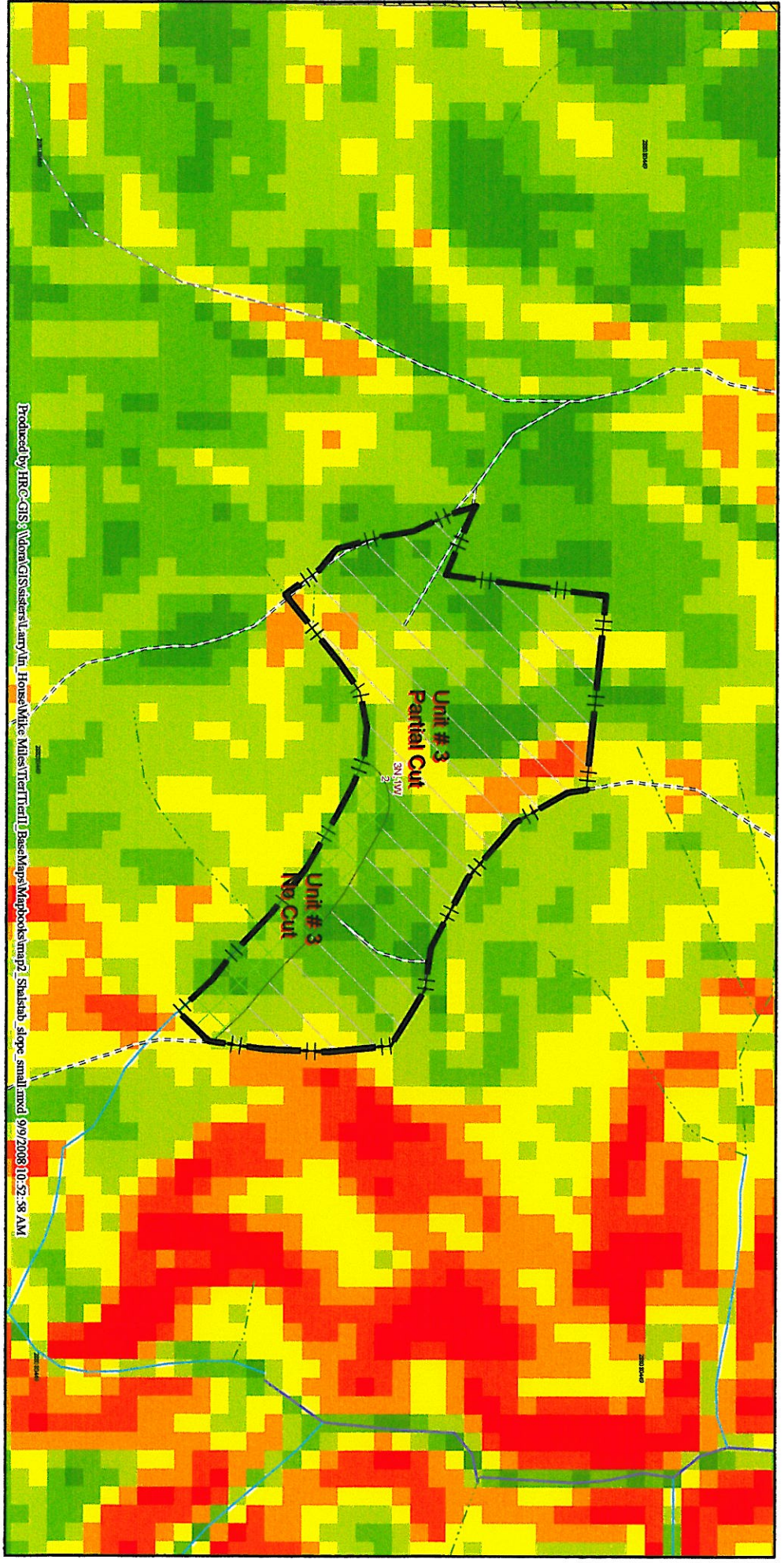
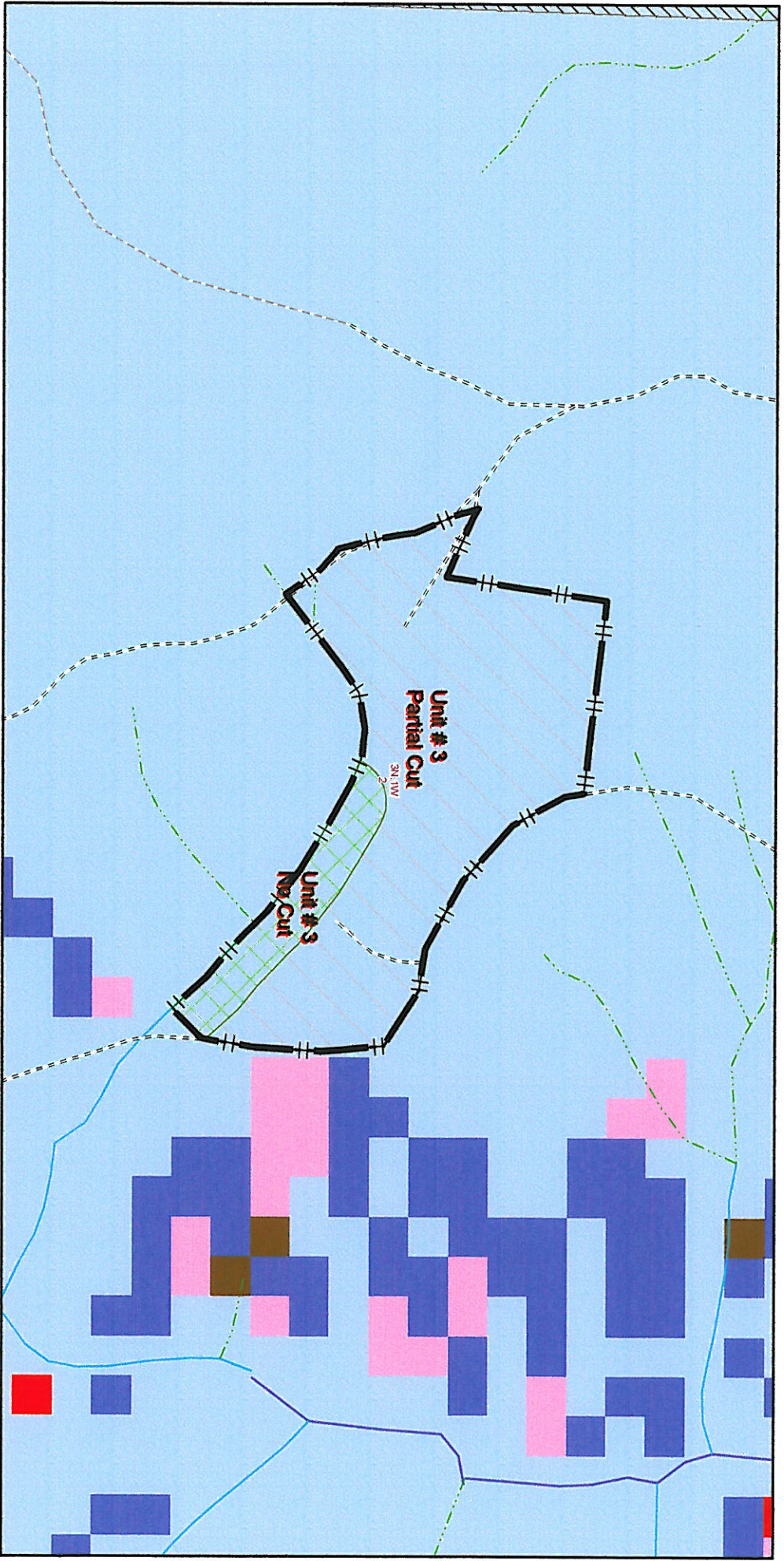
**Figure 2**

Tom Collins  
 TWP 07-189  
 Shattab 10 mts grid / Slope Class Map  
 Unit 3

1 inch = 250 feet

	Paved Road		Class 1 Watersource
	Rocked Road		Class 2 Watersource
	Dirt Road		Class 3 Watersource
	Dirt Deep Tracks		ROW
	Proposed Roads		Partial Cut
	Closed, Decommissioned, or Abandoned Roads		No Cut
			HRC HCD/SP Timberlands
			Other HRC Timberlands
			Other Private Ownership

	Class
	1
	2
	3
	4
	5



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Geologic Units

Q (Gal of McLoughlin and others, 2000) Alluvium consisting of sands, silt, clays, and gravel along major stream channels. Because of the location of this material mass wasting is typically not an issue, but in certain locations, in streams alluvium can be incorporated into debris torrents traveling the channel.

Qt (Included in Q of McLoughlin and others, 2000) Quaternary river terrace deposits. Unconsolidated generally poorly sorted pebbly sands and sandy pebbly-to boulder-conglomerates with silt interbeds. Generally flat-lying but can be susceptible to debris sliding on steep slopes and small-scale rotational landsliding where adjacent to streams.

Qm (Included in Q of McLoughlin and others, 2000) Hookton Formation. Wrapped and folded unconsolidated marine and non-marine sands, gravel and silt. Fossiliferous. Contains rare thin beds of volcanic ash. This formation is prone to erosion and debris sliding. Can be subject to shallow and deep-seated bedding plane failures resulting in translation and earthflow landslides where out of slope bedding occurs.

Qmw (Included in Qw of McLoughlin and others, 2000) Marine and non-marine sedimentary rocks of the Wildcat Group. Typically consists of poorly to moderately consolidated siltstone and fine-grained silty sandstone with some lenses of pebbly conglomerate. These deposits are moderately susceptible to deep-seated landsliding, with rotational displacements in massive units and translation along planar weaknesses such as bedding planes, joints and fractures.

Ty (Q1 of McLoughlin and others, 2000) Yager terrace of the Franciscan Complex Coastal Belt in the Elk River Watershed it typically consists of well-indurated and highly foliated arkosic sandstone and argillite. The sandstone is typically very strong and often forms cliffs. The argillite is prone to slaking, and deep weathering and is often very sheared. Slopes underlain by this material are often irregular and lack well developed sidehill drainages. The slaking, shearing and deep weathering results in deep-seated flow type failures on moderate slopes.

Kfs (gen'd of McLoughlin and others, 2000) Melange of the Franciscan Complex Central Belt. Deeply sheared meta-sandstone and meta-argillite with chert and carbonates. Includes large rock block with diverse lithologies. Where the unit deeply sheared particularly within the argillite, the rock of the argillite may fail as earthflows. Because this unit may contain large deep-seated earthflow failures with large inclusions of well indurated sandstone, areas underlain by this unit may appear hammocky and may lack well-defined drainages. Because of the pervasive shearing that limits internal cohesion of the sliding mass, relatively deep-seated translational sliding occurring on steep slopes underlain by this material can develop into debris flows and occasionally torrents. Soils developed from this sheared rock are typically plastic sandy clays and clayey sands. Large block of massive sandstone present in the central belt are typically well indurated and support steep slopes. The soils and colluvium developed from the sandstone are sandy silts to siltly to sand that have relatively low cohesion and are susceptible to debris flows.

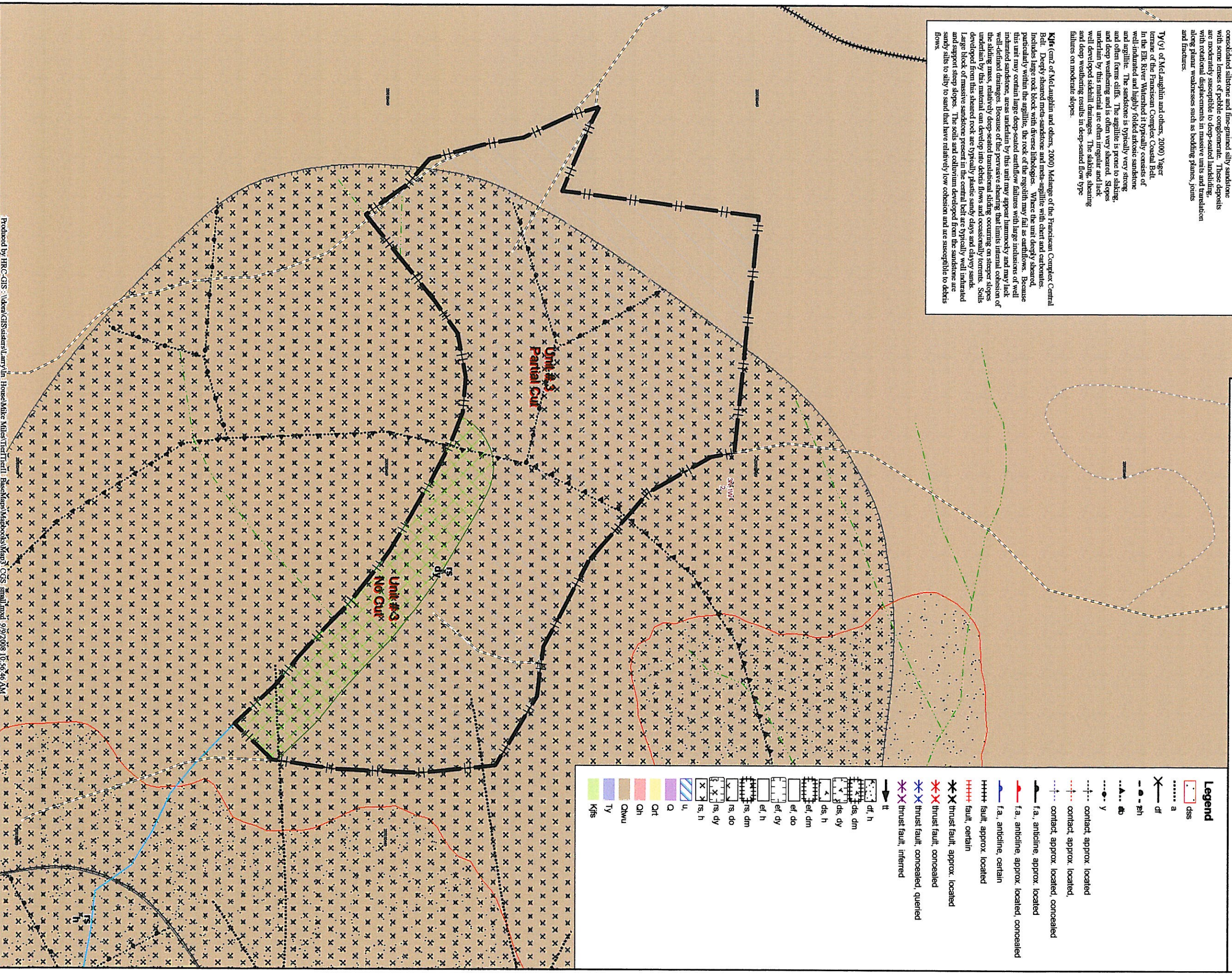
Figure 3

Tom Collins  
THP 07-189  
CGS Map Unit 3  
1 inch = 125 feet



- HRC HCP/SYP Timberlands
- Other HRC Timberlands
- Other Private Ownership
- ROW
- Partial Cut
- No Cut
- Unit
- Dirt Deep Trails
- Proposed Roads
- Closed, Decommissioned, or Abandoned Roads
- Paved Road
- Rocked Road
- Dirt Road
- Class 1 Watercourse
- Class 2 Watercourse
- Class 3 Watercourse

- Legend**
- dss
  - a
  - df
  - df-h
  - df
  - ab
  - y
  - contact, approx. located
  - contact, approx. located
  - contact, approx. located
  - f.a. anticline, approx. located
  - f.a. anticline, certain
  - faul, approx. located
  - faul, certain
  - thrust fault, approx. located
  - thrust fault, queried
  - thrust fault, concealed, located
  - thrust fault, inferred
  - ti
  - df, h
  - df, dm
  - df, dy
  - df, do
  - df, dm
  - df, h
  - rs, h
  - rs, dy
  - rs, do
  - rs, dm
  - ef, h
  - ef, dy
  - ef, do
  - ef, dm
  - ds, h
  - ds, dy
  - ds, do
  - u1
  - Q
  - Crt
  - Ch
  - Qmw
  - Ty
  - Kfs

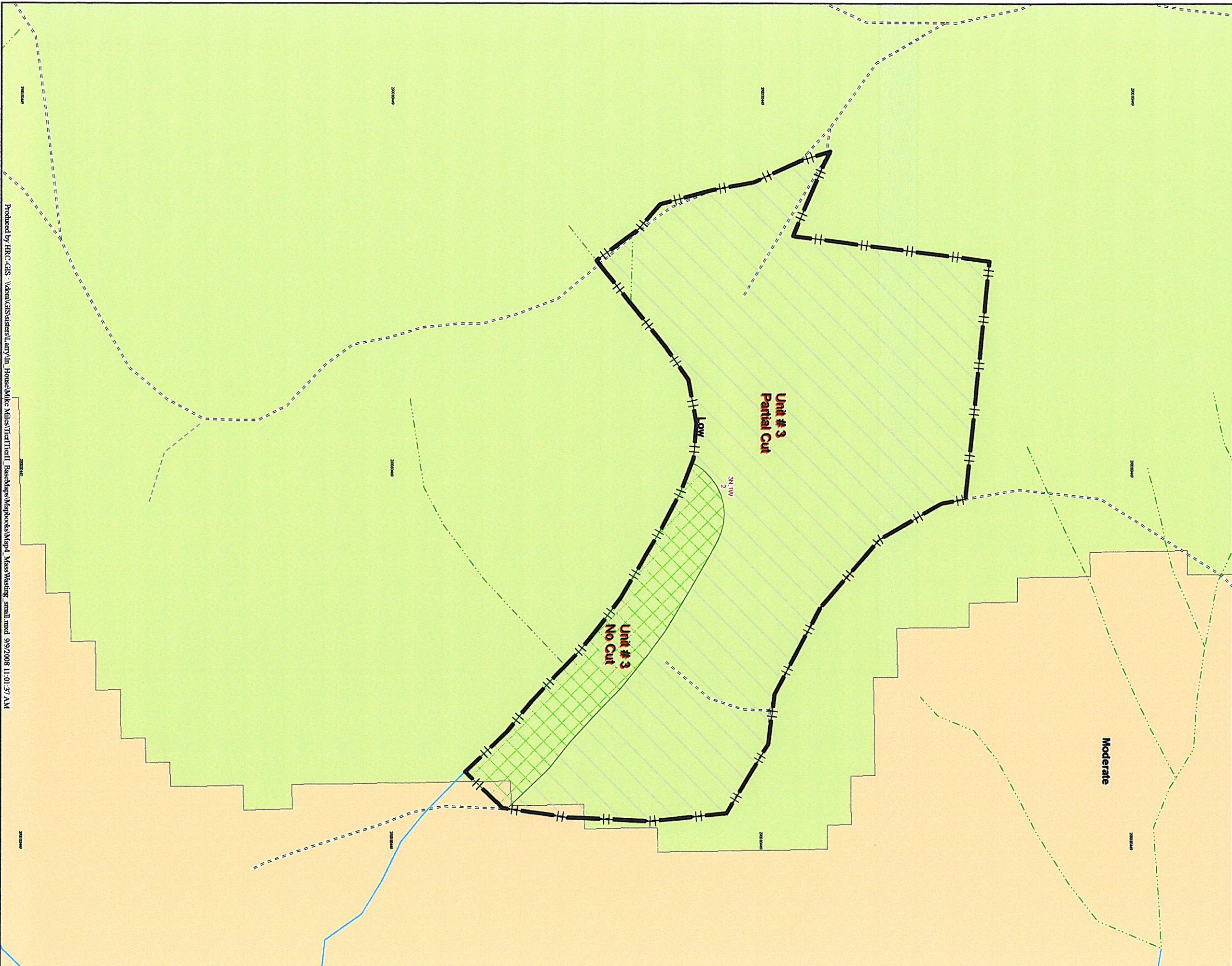
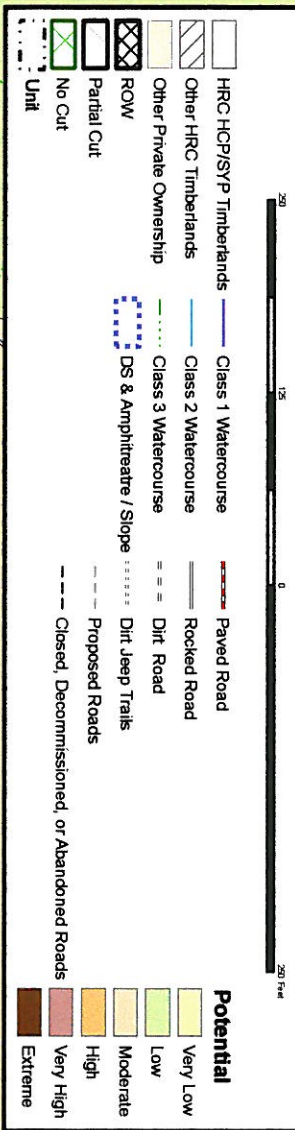


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Figure 4

Tom Collins  
THP 07-189  
Mass Wasting Potential  
Unit 3

1 inch = 125 feet





**Figure 5**  
Tom Collins  
THP 07-189  
Aerial Photo Map - Unit 3

0 65 130 260 520 Feet  
1 inch = 125 feet

	HRC HCP/SYP Timberlands		ROW		Class 1 Watercourse		Paved Road
	Other HRC Timberlands		Partial Cut		Class 2 Watercourse		Roaded Road
	Other Private Ownership		No Out		Class 3 Watercourse		Dirt Road
	Unit				Dirt Jeep Trails		Proposed Roads
					Closed, Decommissioned, or Abandoned Roads		

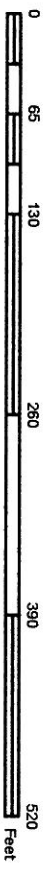
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Figure 6

Tom Collins  
THP 07-189  
Watershed Analysis Deep-Seated Landslide Inventory  
Unit 3

1 inch = 125 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

- Legend**
- Scarp
  - Earthflow
  - Rotational/Translational/Earthflow
  - Rotational/Translational

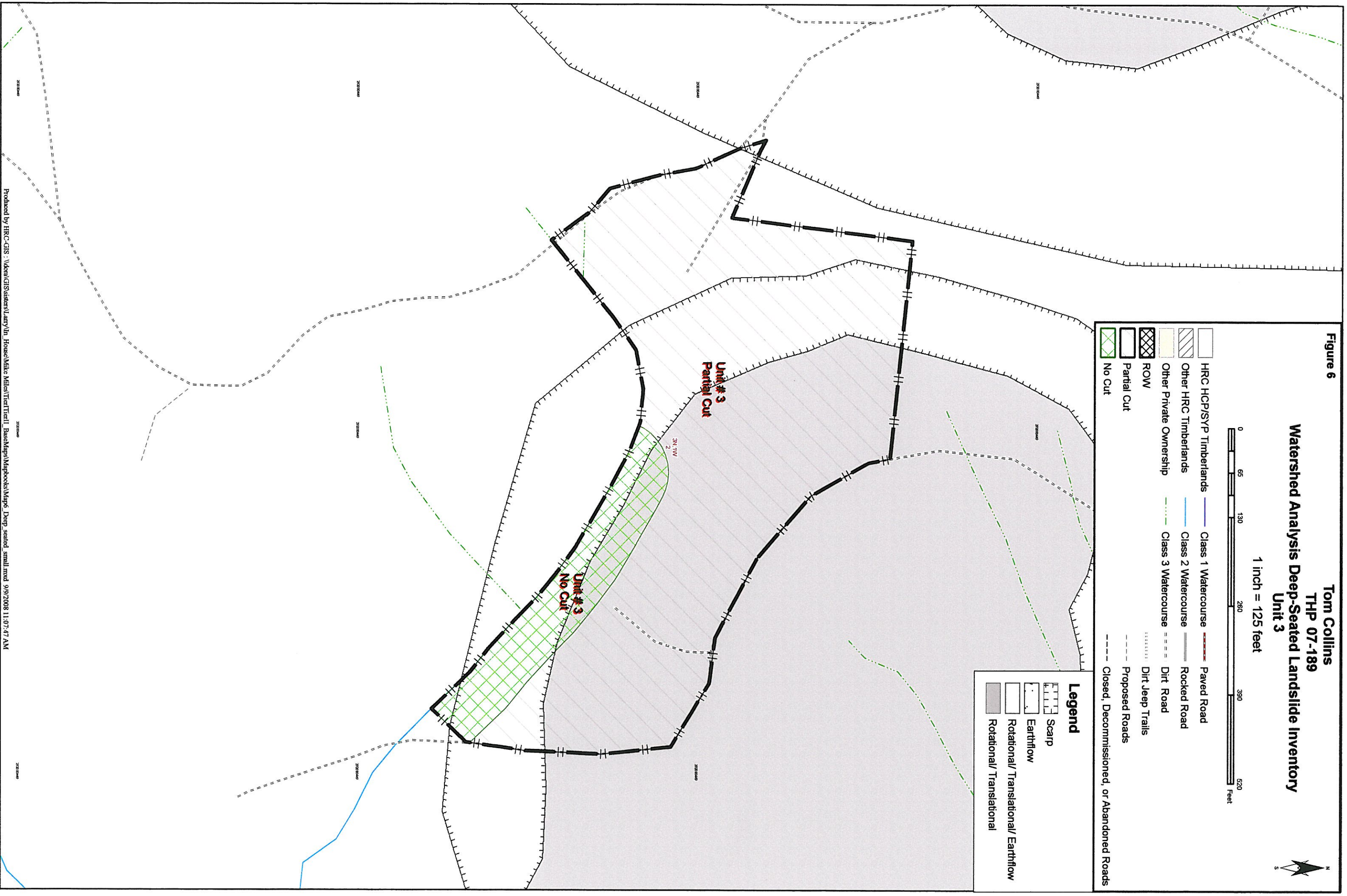


Figure 7

**Tom Collins  
THP 07-189  
Road Map**  
1 inch = 1,000 feet



- HRC HCP/STP Timberlands
- Other HRC Timberlands
- Other Private Ownership
- ROW
- Partial Cut
- No Cut
- Paved Road
- Rocked Road
- Dirt Road
- Dirt Jeep Trails
- Proposed Roads
- Closed, Decommissioned, or Abandoned Roads
- Stormproofed
- Upgraded
- Decommissioned
- Class 1 Watercourse
- Class 2 Watercourse
- Class 3 Watercourse

