MENDOCINO • HUMBOLDT
Redwood Companies

September 29, 2016

Via Electronic Mail

Mr. John W. Corbett, Chair

Board Members

Mr. Matthias St. John, Executive Officer
North Coast Regional Water Quality Control Board
5550 Skylane Blvd. Ste. A
Santa Rosa, CA 95403

Re: Proposed Order No. R1-2016-0004 Waste Discharge Requirements for Nonpoint Source Discharges and Other Controllable Water Quality Factors Related to Timber Harvesting and Associated Activities Conducted by Humboldt Redwood Company, LLC in the Upper Elk River Watershed, Humboldt County

Dear Chairman Corbett, Members of the Regional Water Quality Control Board, and Mr. St. John:

Humboldt Redwood Company (HRC) appreciates the opportunity to comment on the Draft Waste Discharge Requirements (WDRs) proposed for HRC's forestry and watershed management operations in the Upper Elk River Watershed (Order No. R1-2016-0004; August 30, 2016).

We appreciative the few important revisions made in response to issues raised by HRC at the June 16, 2016 hearing. Overall however, the Order remains largely unchanged from the April 7, 2016 version in response to HRC, NCRWQCB Members, and other Resource Agency comment regarding the necessity and rationale of several specific requirements.

HRC foresters and scientists are of the professional opinion that the suite of sediment prevention and minimization measures found in the Company's submitted ROWD (August 28, 2015) fully meet the requirements of the TMDL Action Plan's conceptual zero (0) load allocation[1], including a sufficient margin of safety (MOS). The results of fifteen years of empirical monitoring from a robust hillslope and instream monitoring program, including requirements established by the NCRWQCB, suggest these measures have effectively reduced contemporary forestry inputs to a level of insignificance relative to background loading.

[1] Per the NCRWQCB adopted TMDL Action Plan: *The zero load allocation is necessarily conceptual since, using current technology and technique, no amount of land use restriction can physically result in zero loading of non-point sediment (i.e., the control of all natural and anthropogenic sediment delivery from the tributary system).*

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This finding reflects local empirical monitoring reports previously provided to the NCRWQCB (HRC 2014, HRC 2015, Sullivan and Manthorne 2012, Sullivan and Simpson 2012, Sullivan and Dhakal 2011) as well as summary of more recent trends provided as Appendix A of this letter. We also consider comments from NMFS, CDFWS, and CAL FIRE submitted to the NCRWQCB regarding the prior version of the above referenced Draft Order discussing the observed efficacy of HRC's erosion control measures and lack of evidence supporting need for additional requirements (NMFS January 15, 2016, CDFW January 20, 2016, CAL FIRE January 26, 2016), and relevant peer-reviewed literature supporting erosion control effectiveness of HRC silvicultural practices and rate of harvest as proposed in ROWD (Klein et al. 2012, Lewis et al. 2001, Reid et al. 2010 Cafferata and Reid 2013). Also there are the conclusions reached by Dr. Lee MacDonald regarding the insignificant nature of HRC's contemporary forestry-related sediment delivery compared to background loading and downstream conditions controlling nuisance flooding and water quality (*Development and implications of Sediment Budget for the Upper Elk River Watershed, Humboldt County*, 2016 Redwood Symposium Presentation), and the conclusions reached in the findings of the draft WDRs themselves by NCRWQCB staff suggesting effective erosion control, and no significant peak flow effect from proposed timber operations (Draft Order R1-2016-0004).

Recently, several focused Timber Harvest Plan (THP) Pre-Harvest Inspection (PHI) reports by trustee and lead agencies have been submitted to the public record finding that measures included in the ROWD, when applied at the project level and with due consideration of cumulative effects, are sufficient alone to prevent sediment delivery in amounts significant to nuisance flooding and water quality. These trustee and lead agency reports note that the proposed *additional* WDR measures for expanded riparian buffers in particular do not appear warranted based on site-specific field observation and review of relevant scientific literature (Appendix B). While site conditions vary from THP to THP, the September 19, 2016 CAL FIRE PHI Report authored by Drew Coe in particular, is worth reviewing when considering the value and necessity of requiring expanded riparian buffers for *all* Class II and III watercourses on HRC's ownership, beyond the riparian protection already provided in the HRC ROWD.

Balancing this weight of evidence with NCRWQCB staff's continued insistence on additional requirements beyond measures provided in the ROWD, HRC can pragmatically support additional specified canopy retention requirements of a reasonable nature *(≥60%)* within the current WDR proposed expanded riparian buffer widths for Class II and III watercourses *in properly delineated WDR 'high-risk' sub-watersheds* (see discussion below for delineation of subject sub-watersheds). HRC forestry and science staff cannot however, based on available evidence, support any additional riparian requirements – **see WDR Specific Requirement (I) (B)** - outside of accurately delineated high-risk sub-watersheds, *unless local site conditions warrant, as determined during the development and mult-agency review of individual timber harvest plans* (THPs). There is simply no field evidence or peer-reviewed published literature substantiating the need or benefit of a carte-blanch application of expanded riparian buffers across HRC's entire ownership in the Upper Elk River watershed as proposed in the Draft Order.

Similarly, HRC Forestry and Science staff can recognize some merit in designating a specified intensity rainfall amount that could warrant the establishment of a minimum number of days before hauling operations can resume - **see WDR Specific Requirement (I) (E)**, as a reasonable margin of safety, in

addition to the numerous road use requirements and prohibitions proposed in the ROWD (See Section 5.5 and Appendix B of ROWD). The triggering amount of rainfall however, should be significantly greater than the currently proposed 0.25 inches over a 72 hour period considering HRC limits its hauling operations to the use of rocked, all-season, 'stormproofed'[2] roads during the wet weather season. One-quarter inch of cumulative rainfall over a 72 hour period alone will not produce unstable, saturated soil conditions on a rocked, storm-proofed road surfaces or otherwise threaten discharge.

HRC can support the proposed additional WDR requirement *if it specifies its application is limited to hauling operations on native, non-rocked roads.*

Alternatively we can support a triggering threshold of *greater than one inch in a 24 hour period during the extended wet weather period October 15 – May 1 (14CCR 895.1, California Forest Practice Rules), specific to all road surfaces, requiring cessation of hauling for a minimum of 48 hours.* We ask the NCRWQCB to consider existing requirements for road use found in the CFPRs (14CCR 923.6) and the HRC HCP (Section 6.3.3.6), before adopting any additional requirements.

HRC recognizes there is period in a typical Humboldt County winter when soils become saturated such that ground-based yarding operations can and should be reasonably suspended as an extra caution (i.e. margin of safety) until the ensuing spring. However, a complete prohibition of ground-based yarding from October 1 to May 1 – **see WDR Specific Requirement (I) (E)**, *independent of soil conditions, provides little nexus with protecting water quality*, considering existing equipment exclusion zones protecting riparian areas and other limitations on ground based yarding operations in effect, as detailed in the ROWD (Section 5.0) and CFPRs (14CCR 914.2).

In addition to these existing ROWD measures including the California Forest Practice Rules (CFPRs) regulating ground-based yarding activities, consider that the NCRWQCB General Waste Discharge requirements identify the first ten inches of cumulative rainfall as significant, or that the County of Humboldt prohibits on-site wastewater treatment evaluation dependent upon saturated soil condition, until at least 18 inches of cumulative rainfall has occurred.

HRC can support a shut-down of ground-based yarding operations *following ten inches of cumulative rainfall, not to resume until May 1st at the earliest, provided this restriction is limited to ground-based logging operations within 200 feet of a watercourse.* Limiting this specific restriction to areas within reasonable proximity to watercourses, within the context of other existing regulations and prohibitions affecting ground-based operations, provides reasonable nexus for water quality concerns.

Specific Requirement (I) (A) (3) of the Draft Order authorizes the Executive Officer (EO) to 'decline enrollment of THP(s), or portions of the THP, or may require additional mitigations or monitoring as a

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[2] Stormproofed Roads (HRC HCP Section 6.3.3.9) are *designed, constructed and maintained to minimize sediment delivery of fine sediment from roads and road drainage facilities to Waters, as well as to minimize, to the extent feasible, sediment discharge to Waters resulting from large magnitude, infrequent storms and floods.* Specific requirements for meeting HRC stormproofed roads standards are detailed in HCP Section 6.3.3.9, and Roads and Control of Sediment from Roads including applicable measures for inspections and maintenance and wet weather road use restrictions are found in Section 5.5 and Appendix B of the ROWD.

condition of enrollment' in sub-watersheds where the average annual equivalent clearcut acres (ECA) exceeds 2% over any ten year period.

HRC has concern with this language in that it does not define conditions that must be present to execute this authority, such as increased landslide, surface, or channel erosion delivery from harvested areas elsewhere in the sub-watershed, where timber operations were conducted in the past ten years using contemporary practices consistent with approved WDRs.

We believe it helpful and appropriate in terms of consistent and certain WDR implementation, that this section *define the conditions* under which execution of this authority would be reasonably implemented.

For example: ..."Where an individual, or multiple, THP(s) would result in an average annual harvest rate in any sub-watershed above 2% equivalent clearcut acres over any 10 year period, the Executive Officer may decline to enroll the THP(s), or portions of the THP, or may require additional mitigations or monitoring as a condition of enrollment *where substantiated evidence exists that prior harvesting in the sub-watershed over the previous ten year period has led to significant sediment discharge."*

HRC requests that the proposed WDRs use existing defined wet weather periods including the 'Winter Period', November 15 – April 1 and the 'Extended Wet Weather Period', October 15 – May 1st, consistent with CFPRs (14CCR 895.1). An overall guiding principle of updating the Elk River WDRs was to accurately reflect HRC operations (e.g. selective silviculture, sustainable rate of harvest, hydrologic recovery of forested condition, etc.), as well as *to reduce complexity and confusion*. Adding a *third* wet weather season as currently proposed will increase complexity in implementation.

Another request regarding the wet weather requirements found in **WDR Specific Requirement (I) (E)** is that seasonal road construction or reconstruction restrictions limited to the *Extended Wet Weather Period (October 15 – May 1)* rather than beginning September 15th as currently proposed. Marbled Murrelet and other endangered species breeding restrictions, along with property-wide planning considerations, need to be considered. The 30 days between September 15 and October 15 are critical for completing road work otherwise restricted. Often this road work is to ensure a stormproofed road condition is maintained prior to the onset of the wet weather season. This roadwork can only be done under dry conditions with other erosion control provisions in play, as provided for in the ROWD, and therefore the threat of discharge during this period is minimal. We also ask that the seasonal prohibition on timber operations in the high risk sub-watersheds apply to the Extended Wet Weather Period as well, and exclude timber falling operations, as these pose a very low risk of sediment delivery.

HRC recommends that the delineation of the 'high risk' sub-watersheds be corrected prior to the adoption of the WDRs so as to accurately reflect the actual location of the softer bedrock terrain Hookton Formation, marine terraces, and alluvial deposits, as recently discussed with NCRWQCB Supervising Unit Timberland Chief, Jim Burke. Please refer to the attached map found as Appendix C for an accurate delineation of the lithologies of concern per Licensed Geologist, Shane Beach.

In closing we note that in addition to the very comprehensive sediment control, prevention, and minimization strategy provided in the ROWD, there is also a robust implementation, effectiveness, and

trends monitoring program that has been agreed upon by HRC and NCRWQCB staff. We appreciate past comments from this Board that the Company implements very high standards of stewardship, and that our practices should be respected for their demonstrable efficacy, as well as their adaptive nature should monitoring indicate areas of deficiency in erosion control.

Again, we thank you for this opportunity to provide comment. We know the NCRWQCB recognizes our environmental goals and objectives are in alignment with the Agency's charge and responsibility. HRC wants to see new WDRs adopted for its ownership and operations in the Elk River and can support the Draft Order with the changes requested above.

Please do not hesitate to contact us with any questions or other response to the above comments.

On behalf of HRC's forestry and science staff

Sincerely

Michael W. Miles
RPF 2704
HRC Director Forest Science

Tom Schultz
RPF 1910
HRC North Area Manager

Shane Beach
Licensed Geologist, PG 7396
HRC Senior Geologist

Nick Harrison
Forest Hydrology, M.S.
HRC Senior Hydrologist

References:

Cafferata, P.H. and L.M. Reid. 2013. Applications of long-term watershed research to forest management in California: 50 years of learning from the Caspar Creek experimental watersheds. California Forestry Report No. 5. California Department of Forestry and Fire Protection. Sacramento, CA. 110 p. http://calfire.ca.gov/resource_mgt/downloads/reports/California_Forestry_Report_5.pdf

California Department of Forestry and Fire Protection. 2015. California Forest Practice Rules. Title 14, California Code of Regulations: Chapters 4, 4.5, and 10. Prepared by California Department of Forestry and Fire Protection Resource Management, Forest Practice Program, Sacramento, California, for California Licensed Timber Operators and California Registered Professional Foresters.

HRC 2015, Report of Waste Discharge, Elk River Watershed, Humboldt County, CA; August 28, 2015. Prepared by Humboldt Redwood Company, LLC. Scotia, California

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Lewis, J., S.R. Mori, E.T. Keppeler, and R.R. Ziemer. 2001. Impacts of logging on storm peak flows, flow volumes and suspended sediment loads in Caspar Creek, California. In: Wigmosta, M.S. and S.J. Burges (eds.) Land Use and Watersheds: Human Influence on Hydrology and Geomorphology in Urban and Forest Areas. Water Science and Application Volume 2, American Geophysical Union. Washington, D.C. p. 85-125. http://www.fs.fed.us/psw/topics/water/caspar/caspubs.shtml

MacDonald et al. 2016 Redwood Symposium Presentation: Development and Implications of Sediment Budget for the Upper Elk River Watershed, Humboldt County

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Sullivan, K., N. Simpson, 2012. Effectiveness of forest road construction practices in preventing sediment delivery. Technical Report, Humboldt Redwood Company, Scotia, CA. 99 pp.

Sullivan, K., A.S. Dhakal, M.J. Kunz, M. Medlin, A. Griffith, R. Rossen, and K. Williams. 2011. Sediment production from forest roads on Humboldt Redwood Company Lands: Study of erosion rates and potential delivery to streams. Technical Report, Humboldt Redwood Company, Scotia, CA. 108 pp.

Sullivan, K., D. Manthorne, R. Rossen, and A. Griffith. 2012. Trends in sediment-related water quality after a decade of forest management implementing an aquatic Habitat Conservation Plan. Technical Report. Humboldt Redwood Company. Scotia, CA. 187 p.

Appendix A

Trends in Suspended Sediment and Cross Sectional Area at HRC Water Quality Monitoring Stations 509, 510, and 511

9/29/2016

Nick Harrison
HRC Senior Hydrologist
MS Forest Hydrology

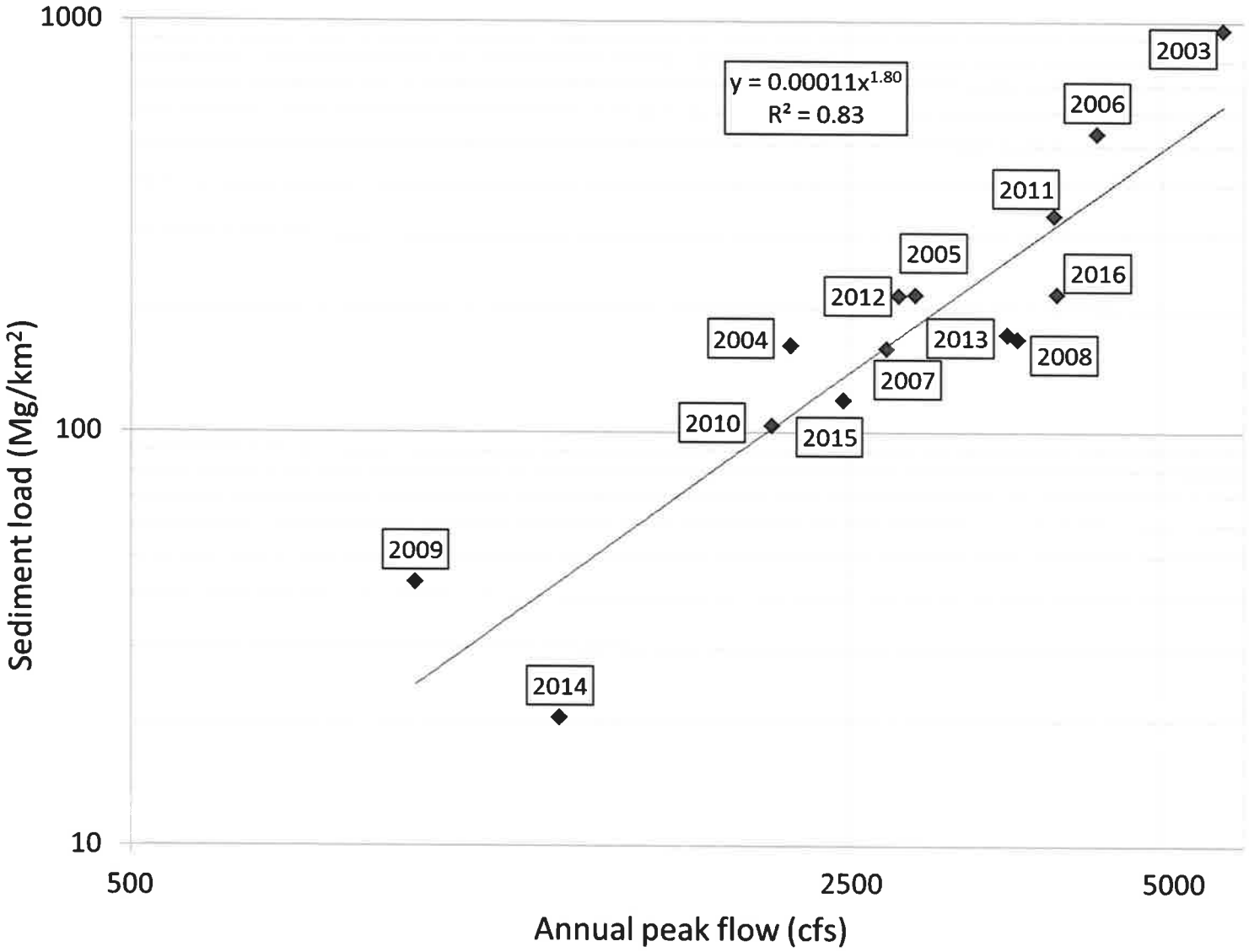

Figure 1. Annual instantaneous peak flow (cfs) vs. total annual sediment load (Mg/km^2) measured at Elk River Station 509, WY 2003-2016.

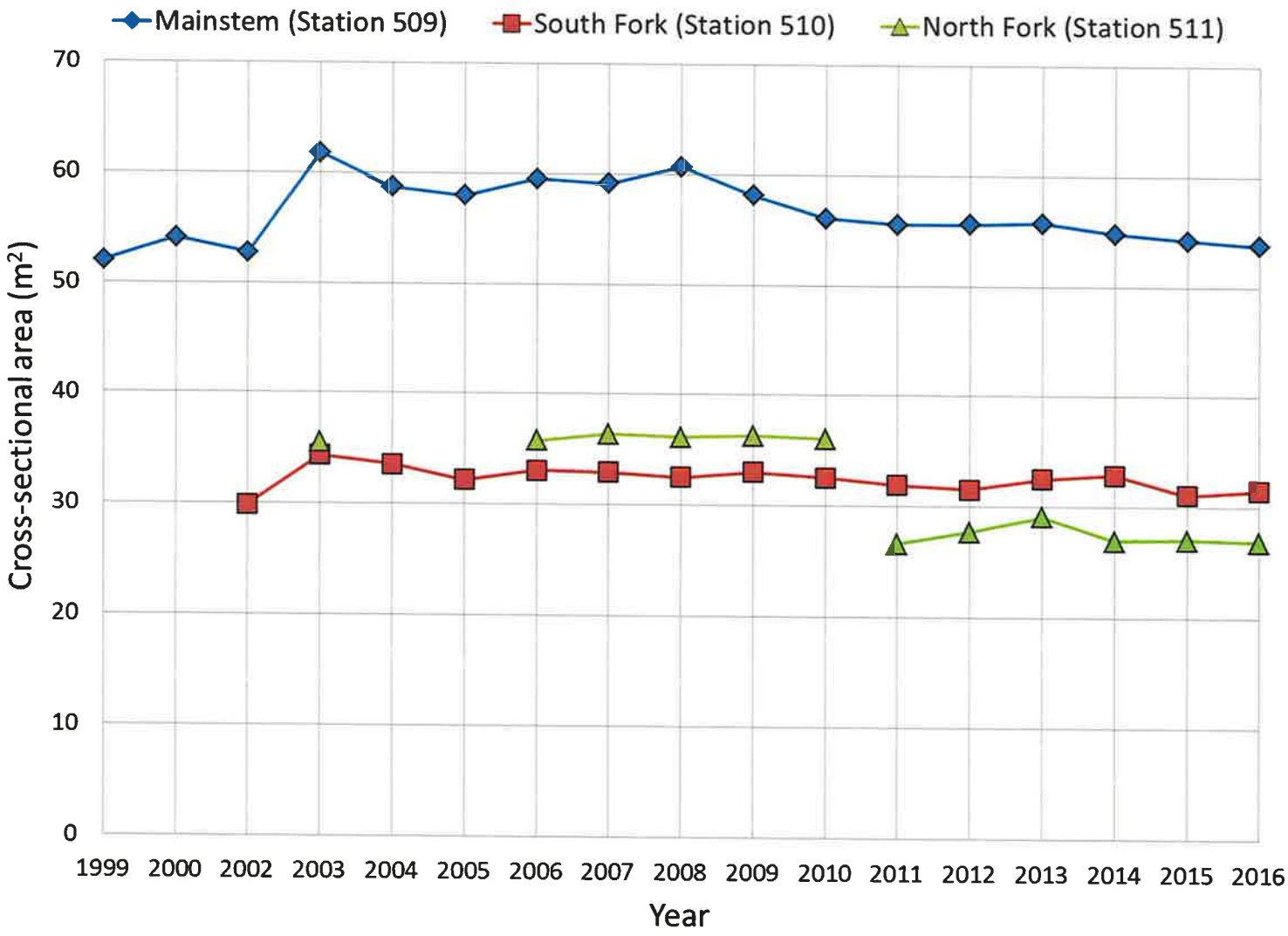

Figure 2. Cross-sectional area (m^2) at mainstem (Station 509), South Fork (Station 510) and North Fork (Station 511) Elk River monitoring stations. A new cross-section was installed near Station 511 in 2011.

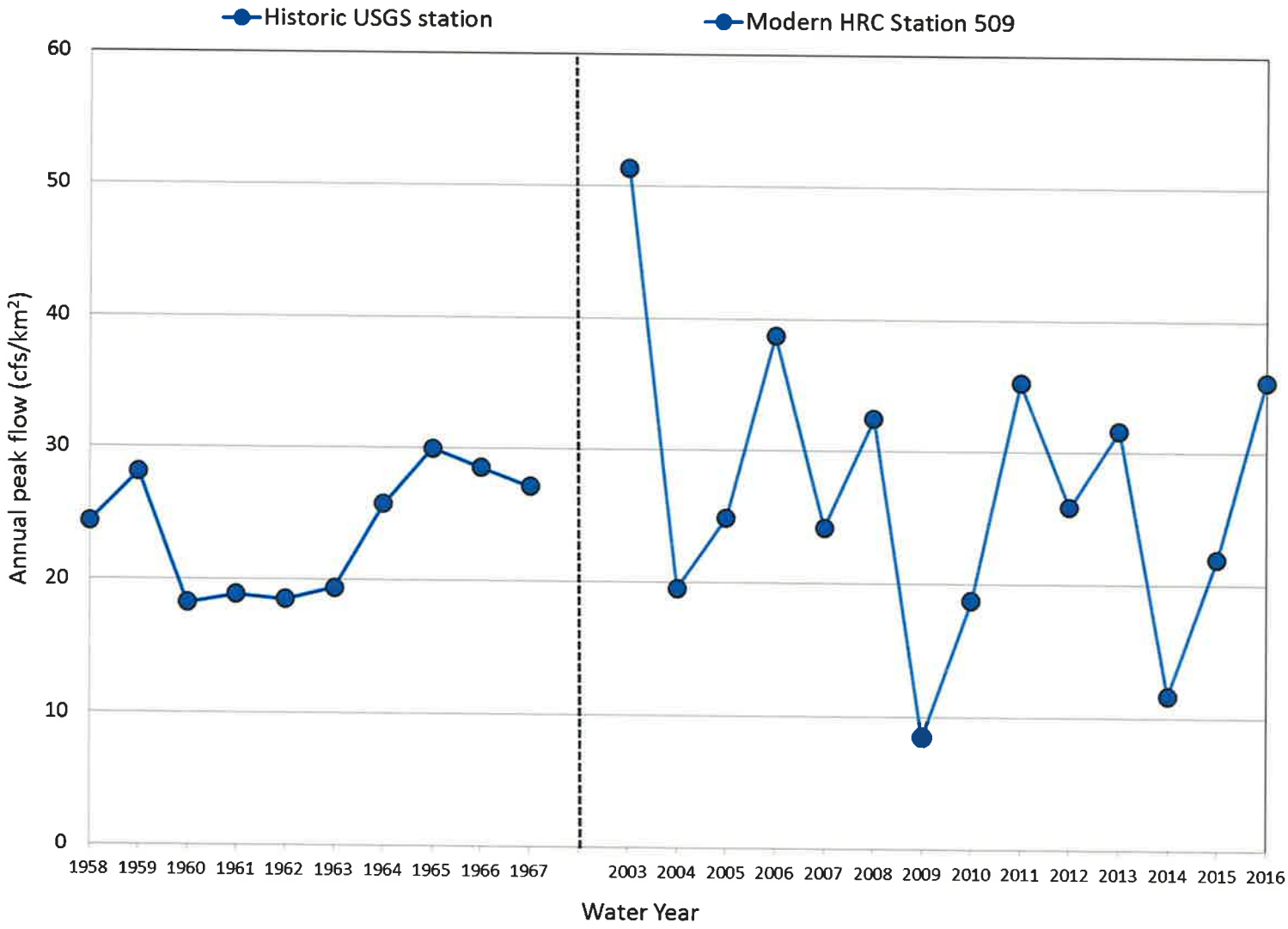

Figure 3. Annual instantaneous peak flow (cfs/km^2) measured at the historic USGS station (drainage area = 114.48 km^2) and at the modern HRC station (Station 509, drainage area = 111.84 km^2) on the mainstem Elk River. Station 509 is located approximately 140 ft. upstream of the USGS station.

Station 509 is the most downstream monitoring station on the mainstem of the Elk River. Measured sediment loads have been found to be strongly related to annual peak flows ($R^2 = 0.83$) (Figure 1). Total annual loads have been lower relative to peak flows in four out of the last five water years (WY) (2012-2016). This illustrates a change in the relative response of suspended sediment yield to peak storm rainfall within the middle portions of the watershed. For example, the total load measured in WY 2011 (~340 Mg/km^2) was nearly 55% greater than that measured in WY 2016 (~220 Mg/km^2) despite a nearly identical peak flow (~4,000 cfs). This is an encouraging development and may be one step towards watershed recovery. Continued monitoring will inform whether or not this trend continues at Station 509 and further analysis of data collected at other monitoring stations will explore whether processes in other sub-basins within the Elk River watershed are trending in a similar manner.

Minor fluctuations in channel area have been observed since HRC surveys began at mainstem, Lower South Fork, and Lower North Fork Elk River monitoring stations (Figure 2). Channel dimensions have been relatively stable despite several large storm events that have occurred during the modern period of record. The magnitude of recent storms can be put into context by examining data collected at the Elk River USGS gaging station (11-479700) which was located about 140 feet downstream of Station 509 from WY 1958-1967. The highest peak flow (30 cfs/km^2) recorded during this ten-year monitoring period has been exceeded six times since monitoring began at HRC Station 509 in WY 2003 (Figure 3). Channel area increased on the mainstem (Stations 509) and Lower South Fork (Station 510) following a record storm event in December 2002 (maximum daily rainfall = 6.79" at the NOAA Woodley Island rain gage in Eureka) and has been slowly lessening since that time, with intermittent periods of aggradation and scour. A less complete data record exists for the Lower North Fork (Station 511) as surveys were not conducted in 2004 or 2005 and a new cross-section was installed in 2011. Available survey data from each period of measurement (2006-2010 and 2011-2016) does however suggest relatively stable channel conditions within the general reach of the Lower North Fork.

Appendix B

PHI Reports for THP 1-016-056 HUM

CAL FIRE
NCRWQCB
California Geologic Survey

State of California | The Natural Resources Agency

Memorandum

To: Dr. Helge Eng, Deputy Director
California Department of Forestry and
Fire Protection, Sacramento Headquarters

Attention: Mr. Dominik Schwab, Forester III
Forest Practice Manager; North Coast Region

Date: September 19, 2016

Telephone: (530) 224-3274

Website: www.fire.ca.gov

From: Drew Coe, Forester II
Watershed Protection Program
RPF No. 2981
Department of Forestry and Fire Protection
Northern Region

Subject: Hydrologic Review of THP 1-16-056 HUM

This memorandum reports the results of a field and office review of the potential hydrologic impacts associated with the Bridge Too Far THP (1-16-56 HUM). I did not attend the initial Pre-Harvest Inspection (PHI), held on July 12, 2016. Field inspection participants for the Focused PHI held on August 17, 2016, when I participated, included the following individuals:

Jason Wells	HRC RPF
Mike Miles	HRC RPF
Thomas Schultz	HRC RPF
Shane Beach	HRC PG
Nicholas Simpson	CDFW Environmental Scientist
James Burke	NCRWQCB, Senior Engineering Geologist, PG
John Oswald	CGS Engineering Geologist CEG
Gerald Marshall	CGS Senior Engineering Geologist CEG
Chris Curtis	CAL FIRE Humboldt-Del Norte Forester I
Drew Coe	CAL FIRE Forest Practice Monitoring Program Coordinator

A Focused PHI was deemed necessary to address a disagreement between Humboldt Redwood Company (HRC) and the North Coast Regional Water Quality Control Board (NCRWQCB) over the NCRWQCB's PHI Report Recommendation 2. This recommendation was made by the NCRWQCB to mitigate against accelerated in-channel erosion in response to peak flow increases from upslope canopy removal, and decreased slope stability from increased shallow pore water pressure and loss of rooting strength. Recommendation 2 of the NCRWQCB's PHI Report recommends the implementation of the following riparian management zone (RMZ) protections:

Class II watercourses –

a. Riparian Management Zones (RMZs) for Class II watercourses shall extend up to 200 feet on either side of the channel or to the hydrologic break in slope;
b. No harvesting within 30 feet of Class II watercourses; and
c. Between 30 feet and 200 feet of Class II watercourses, retain a minimum of 60% post-harvest conifer canopy coverage.

Class III watercourses –

a. Riparian Management Zones (RMZs) for Class III watercourses extend to 100 feet on either side of the channel or to the hydrologic break in slope;
b. No harvesting within 20 feet of Class II watercourses; and
c. Between 20 feet and 100 feet from a Class III watercourse, retain a minimum of 70% post-harvest conifer canopy coverage.

Given that the HRC RPF disagreed with the NCRWQCB's recommendation, it was necessary to have staff from the California Department of Forestry and Fire Protection's (CAL FIRE) Watershed Protection Program assess the field conditions of the plan to assist CAL FIRE's Review Team in evaluating the technical rationale of the additional watercourse protection measures. The following report combines field observations along with discussion of existing scientific information to provide CAL FIRE's Review Team with additional information to move forward with the THP review process.

THP Background and Setting

The Elk River watershed is identified on the Clean Water Act (CWA) Section 303(d) List of Impaired Waterbodies (303(d) list) as impaired for sediment.[1] Water quality impacts are primarily attributed to the cumulative effects of historic and ongoing timber harvest activities and include sedimentation, impaired domestic and agricultural water supply, impaired spawning habitat, and increased rate and depth of flooding due to sediment. On May 12, 2016 the North Coast Regional Water Quality Control Board approved the TMDL Action Plan (http://www.waterboards.ca.gov/northcoast/board_decisions/adopted_orders/pdf/2016/160512-0017_ElkRiverSedimentTMDL.pdf) for the Upper Elk River Watershed. The TMDL Action Plan will receive a hearing before the State Water Resources Control Board before receiving final approval by the United States Environmental Protection Agency.

The Bridge Too Far THP covers 263.2 acres in the Lower North Fork Elk River planning watershed, located in Humboldt County. The plan is located approximately 5.5 miles southwest of Cutten, California. Elevation within the plan area ranges from roughly 200 ft to 600 ft above sea level, within the northern part of the Coast Ranges geomorphic province. Slopes range from 0 to 80%. The plan area is underlain by sedimentary

[1] Elk River was placed on the 303(d) list in 1998.

bedrock of the Miocene-Pliocene age undifferentiated Wildcat Group, which is moderately to poorly indurated clayey siltstone, with lesser amounts of sandstone and conglomerate (see engineering geologic evaluation from Beach, 2016). Stands within the plan area predominantly contain coast redwood and Douglas-fir, and have a high growing site potential. Specified silviculture includes 225.1 acres of group selection, 21.6 acres of selection, 3 acres of road right-of-way, and 13.6 acres of no-harvest areas. Tractor yarding is proposed for 2 of the 5 units, with the remaining 3 units being cable yarded. Winter operations are being proposed for the THP area.

Section IV, Appendix B of the THP indicates that 15 THPs have been completed or approved within the past 10 years for the 9,039 acre Lower North Fork Elk River planning watershed. This accounts for approximately 32 percent of the planning watershed.

Protection of watercourses in this THP are proposed through the use of Riparian Management Zones (RMZs), as defined by the HRC Habitat Conservation Plan (HCP) and the prescriptions based on Watershed Analysis for Elk River and Salmon Creek, which provide increased protection over the standard California Forest Practice Rules. The previous landowner, PALCO, completed a Level II watershed analysis for the Elk River watershed in 2005, which provided site-specific prescriptions, as agreed to in the 1998 HCP. The Elk River/Salmon Creek watershed analysis was revisited in 2014 by HRC and the watershed analysis-generated specific recommendations for limiting sediment production are incorporated in this plan.

Office Review

A rapid review of the THP revealed that the Cumulative Impacts Assessment is generally sufficient for analysis related to sediment, peak flow, and hydrologic effects. In general, the assessment recognizes the relevant cause-and-effect relationships between timber harvest and hydrogeomorphic processes that drive hydrologic and sedimentary response. There are some instances of technically incorrect or unclear statements and several areas in the assessment that can be improved. For example:

- The Watershed Resources Assessment (Section IV, Item 6.1) incorrectly identifies the Upper North Elk River Planning Watershed as the planning watershed of interest, although this mistake is not carried throughout the rest of the analysis;

- There appears to be missing information at the bottom of page 154 (i.e., a list of future harvest areas);

- There is no mention that the Review Team agencies declared Elk River to have significant adverse cumulative impacts in 1997;

- There is no mention that the conclusions of the Cumulative Impacts Assessment is currently being tested with the Railroad Gulch BMP Evaluation study (THP 1-12-110 HUM, McCloud Shaw, Stubblefield et al. 2016);

- Channel descriptions are limited by just trying to summarize data from 3 stations, and some of the 10 factors listed in TRA #2 are not covered well in this part of the write-up;

- It appears as if more sediment and cross-section monitoring data should be included in the document (see Lewis, 2013), especially in the sediment section;

- Some of the Caspar Creek peak flow summary information is out of date and should be revised to reflect the most recent findings; and

- The document cites the Sullivan et al. (2012) report, but does not disclose that the report was criticized by Jack Lewis for having significant statistical errors (BOF 2014).

Despite these recommendations for improvement, the suggested changes will likely not change the conclusions of the assessment.

Much of the focus of the NCRWQCB's PHI Report was on in-channel erosion sources in low order channels. Prior to the Focused Pre-Harvest Inspection, I refamiliarized myself with some of the available literature on low order channel response to timber harvest. In particular, Dewey (2007) and Reid et al. (2010) were read to gain insight on how to characterize the sensitivity of watercourses to increases in flow magnitude and sediment supply. Both of these references are specific to the Caspar Creek watershed in Mendocino County. While it is recognized that there are differences in the types of hydrogeomorphic processes operating in Caspar Creek versus Elk River, Caspar Creek is one of the closest analogs to Elk River and boasts a robust collection of process-based research on forest land use and hydrogeomorphic process interactions. I also reviewed Buffleben (2009), which specifically looked at channel extension and soil creep in the Elk River watershed.

Field Observations

Specific site visits within the THP area and adjacent THPs were selected to provide a general overview of conditions for Class II and III watercourses within the planning watershed area. Particular attention was paid to the presence of the following watercourse characteristics that indicate a susceptibility to hydrologic change induced by canopy removal and ground disturbance:

- The relative proportion of watercourse banks "susceptible to erosion" (Reid et al., 2010). These are banks that are either undercut or vertical and composed of either alluvium or colluvium.

- Evidence of active incision or erosion, such as raw banks, pipe collapse, eroding headcuts, quasirectangular cross sections, and low width-depth ratios (Figures 1a and 1b) (Dewey, 2007; Reid et al., 2010).

On 17 August, 2016, sites were visited in the following order:

1-16-056 HUM - Unit 2: Unit 2 is a large selection harvest unit which is proposed to be cable logged. The field PHI Team (Team) walked down to the channel head of the first order (Strahler, 1957) Class III watercourse shown in Figure 2 (see point A). The location of the channel head appeared to be properly identified as no channelized flow was observed above where the channel head was flagged. The area where the channel head was located can be characterized as hydraulically rough due to the prevalence of live vegetation, thick layers of duff, and a relative abundance of large woody debris (Figure 4). Below the channel head, the watercourse was discontinuous, relatively entrenched, with generally subvertical and well vegetated banks. The channel exhibited a relatively steep and stepped profile with generally subvertical discontinuities (i.e., headcuts) present. Channelization was discontinuous, with subsurface channelization/piping occurring in conjunction with large woody debris (Figure 5) and thicker accumulations of colluvium and/or anthropogenically-induced valley infilling from first cycle logging.

The Team continued down to the confluence of two Class III watercourses (Figure 2; Point B), where the watercourse became a second order channel. Below the confluence the watercourse displayed slightly more consistent signs of channelization. However, valley gradient, the condition of the banks, and the roughness of the channel did not change significantly. The second order Class III watercourse combined with another second order Class III watercourse to form a third order Class III watercourse (Figure 2; Point C). This larger third order Class III watercourse was characterized by a much gentler valley gradient, a broader valley bottom (Figure 6), but largely remained a discontinuous channel. Watercourse banks were well vegetated and did not show signs of active erosion, although there was evidence of subsurface flow and/or erosion voids along the axis of the channel, particularly in areas with larger accumulations of large woody debris (Figure 7).

The third order Class III watercourse transitioned into a Class II watercourse shortly above point D on Figure 2. This transition appeared to be accurately identified by the RPF. At point D, the Team walked up a first order Class III watercourse. This watercourse displayed similar characteristics and conditions to that of the first watercourse walked between points A and B (Figure 2). The Team continued to walk the watercourse until the channel head was reached (Point E, Figure 2). The channel head at point E was very similar to the one discussed for point A (Figure 2).

1-13-005 HUM: The Team walked down and along a Class III watercourse in a unit that was previously logged approximately two years ago as part of the Three Forks THP. The Bridge Too Far THP will be logged in a manner similar to the Three Forks THP, so observations of post-logging watercourses in the 1-13-005 HUM are expected to be representative of post-logging response for 1-16-056 HUM. Much of the Class III watercourse was not visible due to dense vegetation and accumulations of large woody debris (Figure 8), but channelization was generally discontinuous in nature. No signs of active erosion in the watercourse were observed. Figure 9 shows the level of canopy retention in the Unit, and this is expected to be representative of the level of canopy retention in the proposed THP.

1-16-056 HUM - Unit 1: The Team walked up the Class II watercourse shown in Figure 3 (Point A). The portion of the Class II watercourse directly above the road displayed active erosion and incision, and this was primarily attributed to base level lowering associated with watercourse crossing replacement. Above the influence of the watercourse crossing, the watercourse displayed no signs of recent erosion. The Team continued up to the confluence of a second order Class III watercourse (Figure 3; Point B) and a first order Class II watercourse (Figure 3; Point C). No recent in-channel erosion was observed in either watercourse, although evidence of an old skid trail fill failure was observed adjacent to Point C (Figure 3). The old failure is contained within the RMZ of the proposed THP.

Discussion

NCRWQCB's Rationale for Recommendation

Recommendations should have a clear process-based linkage to the resource of concern. The NCRWQCB's first PHI Report states that in-channel sediment sources were identified as major sources during the development of the TMDL, and that in-channel sources were dominated by geomorphic processes such as streamside landsliding, bank erosion, and low order channel incision/extension. The PHI Report also states that increased peak flows due to canopy removal were of particular concern, especially as a causal mechanism for soil pipe collapse, headward channel incision, and increases in stream density.

The PHI Report establishes the linkage between their recommended riparian protection measures (Recommendation 2) and water quality with the following statement:

> *Riparian buffers are one of the primary management measures for achieving water quality protection from the impacts of timber harvesting. An extensive body of scientific literature exists describing the ecological functions of riparian zones, include [sic] those directly related to sediment and associated impacts to the beneficial uses of water. In August 2002, the Regional Water Board convened an Independent Scientific Review Panel. Its objective was to strengthen the scientific basis for its decision-making for protecting and restoring the sediment-impaired beneficial uses of waters in the Elk River and Freshwater, Bear, Jordan, and Stitz Creek watersheds in Humboldt County, California. The Panel issued two reports, which included several findings that were used as the basis to establish specific requirements of [sic] existing Elk River WDR (Collison et al, 2002 and 2003). Among the finding and recommendations was the recognition that most sediment enters the fluvial system from headwater streams, and therefore, within the framework of water quality protection, the largest buffers should be on Class III watercourses. The Panel also found that the 10 foot no-harvest band on Class III watercourses is likely to be of no value for the purposes of water quality protection.*
>
> *The proposed WDRs establishes protection measures for RMZs that incorporate ERSC WA prescriptions for riparian protection as minimum protection standards*

but establish additional canopy retention out to 200 feet on Class II watercourses and 100 feet on Class III.

Additional protection measures considered as necessary to protect water quality include no harvest zones on Class III watercourses, avoidance of tractor crossings and retention of trees in unchanneled swales to the extent feasible, and implementation of highest feasible level of erosion control on all RMZ road segment, landings, and skid trails

*The TMDL Action Plan contains Hillslope Water Quality Indicators and Numeric Targets regarding riparian zone protection to promote improvement in the quality/health of the riparian stand so as to promote 1) delivery of wood to channels, 2) slope stability, and 3) ground cover within 300 feet of Class I and II watercourses and 150 feet of Class III watercourses. Requirements in the proposed WDR take into account hillslope and riparian zone protection provided by the selection Silviculture beyond the RMZ, which retain significant post-harvest canopy. Therefore, the following additional RMZ protections are supportable and necessary to implement water quality requirements, including the Elk River TMDL load allocation (**Recommendation 2**).*

Additionally, the primary supporting material for the increased riparian protections was sent in an email from Senior Engineering Geologist James Burke from the North Coast Regional Water Quality Control Board on 16 August, 2016. Rationale was based on the following documents: 1) the "Independent Scientific Review Panel" report (ISRP Report) (http://www.waterboards.ca.gov/northcoast/water_issues/programs/tmdls/elk_river/pdf/report/Final-Phase-II-ISRP-Report.pdf); 2) the "Upper Elk River: Technical Analysis for Sediment" (Tetra Tech Report) (http://www.waterboards.ca.gov/northcoast/water_issues/programs/tmdls/elk_river/pdf/151222/03_20151021_Upper_Elk_River_Tech_Analysis_for_Sediment.pdf); and 3) the "Action Plan for the Upper Elk River TMDL" (TMDL Action Plan).

Strength of Rationale

Regarding Recommendation 2, the ISRP Report states that, "large amounts of sediment enter the river system via small tributaries in steep headwaters areas and hollows, which are likely to be Class II or III waters and which make up a much greater length of the stream network than Class I waters" (pg 30; first paragraph) and that sediment is primarily generated through windthrown trees and through mass wasting exacerbated by harvest-induced increases in pore-water pressures. The ISRP Report further states:

The Panel finds that stream buffer designs that address all of the beneficial uses of water at the watershed scale could be improved by retaining the existing RMZs along with increasing the width of RMZs along Class II and Class III streams (see Figure 3 below). The upstream extension of robust RMZs would provide enhanced protection against accelerated sedimentation and fish habitat degradation in downstream waters of Class II and Class III streams, as well as better protection against elevated water temperatures in Class II streams. Furthermore, the Panel finds that risk of sedimentation could also be reduced if

wetlands and areas with high risk of mass wasting in the watersheds were restricted from timber harvest and provided with modest no-harvest buffer zones.

The California Forest Practice Rules requires the identification and disclosure of unstable areas as a requirement of the THP process (14 CCR § 1034(x)(10)), and 14 CCR 916.4(a)(1) requires the plan proponent to identify unstable areas within watercourse and lake protection zones (WLPZs) that could impact water quality. Furthermore, plan proponents are encouraged to use California Geological Survey Note 45 (CGS, 2013), which explicitly addresses threats to water quality in its guidelines. In his engineering geologic evaluation of the THP (Section 5), HRC's Senior Geologist Shane Beach used the framework of Note 45 to make several recommendations to reduce the potential for mass-wasting induced water quality impacts from the proposed project (Beach 2016). He further noted that unstable areas were appropriately mitigated by the proposed RMZs and by Special Treatment Zones (STZs). California Geological Survey's John Oswald generally agreed with these recommendations and offered a more specific recommendation for site AB10. In addition, the NCRWQCB's first PHI Report states:

The engineering geologic evaluation in THP Section 5 accurately identified vulnerable slopes. Protection measures applied to these areas in the THP, including no harvest selection harvest zones and light harvest mark, appeared to be appropriate to avoid impacts to slope stability.

This line of evidence from HRC's Senior Geologist and licensed geologists on the Review Team suggest that potential water quality impacts from streamside landslides are adequately addressed in the THP.

The Tetra Tech Report identifies in-channel sediment sources as the dominant anthropogenic sediment source in the Upper Elk River watershed, and estimates that it constitutes 57 percent (174 yd^3 mi^{-2} yr^{-1}) of the total anthropogenic loading in the time period spanning from 2004 to 2011. In-channel sediment sources are further broken into two subcategories:

1. In-Channel: Low Order Channel Incision – Characterized as vertical incision and headward migration of the stream channel through gullying. This subcategory is estimated to constitute approximately 5 percent of the anthropogenic loading from 2004 to 2011.

2. In-Channel: Management-Related Bank Erosion and Streamside Landsliding – This subcategory includes erosion via lateral incision into stream banks, soil creep, and stream adjacent mass wasting processes. This subcategory is estimated to constitute approximately 52 percent of the anthropogenic loading from 2004 to 2011.

As indicated above, low order channel incision (i.e., subcategory 1) represents a relatively small proportion of the total anthropogenic sediment load (i.e., 4.5 percent), while in-channel erosion not related to headward extension (i.e., subcategory 2) represents a more significant contribution to the total sediment load. This is because in-

channel erosion from lateral bank erosion and streamside landsliding are lumped together, despite being two distinct processes.

While the Tetra Tech Report does not partition lateral erosion and streamside landsliding into different sources, the "Peer Review Draft: Staff Report to Support the Technical Sediment Total Maximum Daily Load for the Upper Elk River" (NCRWQCB, 2013) (Peer Review Draft) does attempt to quantify these sources separately. The Peer Review Draft estimates that lateral bank erosion is approximately 16 percent of the combined in-channel sediment sources related to subcategory 2, with streamside landsliding comprising the remaining 84 percent of the in-channel sediment load. If we apply this same proportionality to the Tetra Tech Report, then lateral bank erosion is estimated to be approximately 26 $yd^3\ mi^{-1}\ yr^{-1}$, or approximately 8 percent of the total anthropogenic sediment load. As mentioned earlier, the engineering geologic evaluation from HRC and the PHI Reports from CGS and the NCRWQCB both suggest that streamside landslides are adequately mitigated in the proposed THP. This indicates that Recommendation 2 is primarily focused on mitigating against headward channel incision and low order channel bank erosion.

Field observations on the focused second PHI indicate a relative lack of recent in-channel erosion in the THP area. CGS's second PHI Report states that no active in-channel erosion was observed in Unit 2 of the proposed THP, or in the previously logged unit from THP 1-13-005 HUM. CGS's second PHI Report did note a small legacy fill failure from an old skid trail above a Class II watercourse in Unit 1. The NCRWQCB's second PHI Report states that no active in-channel erosion was observed in Units 1 or 2 of the proposed THP, or in the previously logged unit of THP 1-13-005 HUM. My observations confirm observations from both CGS and the NCRWQCB.

While we did not observe active in-channel erosion in THP 1-13-005 HUM, it is recognized that in-channel erosion is a threshold phenomenon, and that storms may not have been sufficiently large to initiate in-channel erosion in the logged unit. Regardless, the effectiveness of buffers for mitigating against headward channel extension and low order channel bank erosion has been questioned. For Caspar Creek, Reid and others (2010) stated that:

> *Robust buffer strips were incorporated into the logging plan, providing extensive filter strips below upland sediment sources and preventing direct disturbance to a significant portion of the stream network. Despite these measures, suspended sediment yields increased significantly after logging, and much of the increase appears to originate from gully-related processes that are not amenable to mitigation either through road improvements or buffer strips. If increased runoff after logging generates sediment from within downstream channels, control of excess sediment from this source would be possible only through management of the level of hydrologic change induced by logging, and this would require either management of the rate of logging within a watershed or modification of the silvicultural strategy used.*

Dr. Matthew Buffleben, formerly of the NCRWQCB, made similar recommendations to Reid et al. (2010) in a presentation to the California State Board of Forestry and Fire

Protection's Monitoring Study Group (http://bofdata.fire.ca.gov/board_committees/monitoring_study_group/meeting_minutes/2010_msg_meeting_minutes/msg_meetingminutes_031710_1_.pdf). Dr. Buffleben's presentation was on his Doctor of Environmental Science and Engineering dissertation research which occurred in the Elk River watershed and focused on soil creep, bank erosion, and headward channel extension in headwater channels. Dr. Buffleben made recommendations at the end of his presentation to prevent gullies from forming in headwater swales. These recommendations included (1) reducing the amount and rate of clearcutting, or changing silviculture to selection harvesting; (2) using equipment limitation zones for headwater streams and swales; and (3) using aerial yarding systems rather than ground-based yarding. These recommendations are consistent with many of the practices proposed in the THP.

In the case of the Upper Elk River, the amount of the anthropogenic sediment load attributed to channel extension and low order channel bank erosion is just under 13 percent of the load attributed to management (i.e., approximately 40 $yd^3\ mi^{-2}\ yr^{-1}$). Applying a more protective riparian prescription seems questionable given 1) the relative lack of observed active erosion or erosion prone banks in the THP area; 2) the lack of observable erosion in the recently harvested units from THP 1-13-005 HUM; 3) the relatively low magnitude of erosion from these processes when compared to streamside landsliding; and 4) the evidence suggesting a lack of effectiveness for riparian buffers as a means for controlling headward channel extension and bank erosion in low order channels. Furthermore, consistent with management recommendations made by Reid and others (2010) and Dr. Matthew Buffleben, HRC proposes to implement selection silviculture rather than clearcutting in the catchment areas draining to these watercourses. This management practice is perhaps a better means to reduce the potential for increased flows, and presumably less channel incision and bank erosion, than the more stringent buffer requirements.

An additional rationale for this conclusion relies on the peak flow analysis conducted by HRC for this THP (HRC 2016). Peak flows in the Bridge Creek sub-basin, which comprises 149.3 acres or 57% of the THP area, were analyzed using the Caspar Creek peak flow prediction equation (Lewis et al. 2000, Cafferata and Reid 2013). The Bridge Creek watershed has a drainage area of 1,420 acres. The estimated peak flow increase for a 2-year recurrence interval storm resulting from the proposed canopy removal, along with that from past plans in this watershed, is only 2.7% under average winter soil moisture conditions (0.9% under wet conditions and 7.8% under dry conditions). Due to this small estimated increase in peak flows in the Bridge Creek watershed, the change in sediment due to in-channel erosion is expected to be very small.

The TMDL Action Plan is the third line of evidence offered by NCRWQCB staff for Recommendation 2, as the TMDL Action Plan supports the implementation of the revised RMZ prescriptions contained in the unapproved Draft "Waste Discharge Requirements for Nonpoint Source Discharges and Other Controllable Water Quality Factors Related to Timber Harvesting and Associated Activities Conducted by Humboldt Redwood Company, LLC in the Upper Elk River Watershed, Humboldt County" (Draft WDR). A TMDL Action Plan must incorporate the statutory requirements of the Porter-

Cologne Water Quality Control Act and the Federal Clean Water Act to be approved by the State Water Resources Control Board (SWRCB) and United States Environmental Protection Agency (USEPA). To date, the TMDL Action Plan has not been approved by the SWRCB or by the USEPA. Under California Water Code (CWC) Section 13245:

> *A water quality control plan, or a revision thereof adopted by a regional board, shall not become effective unless and until it is approved by the state board. The state board may approve such plan, or return it to the regional board for further consideration and resubmission to the state board. Upon resubmission the state board may either approve or, after a public hearing in the affected region, revise and approve such plan.*

CAL FIRE has made previous comments about the uncertainty of the proposed RMZ prescriptions (i.e., the same prescriptions used in Recommendation 2) in the Draft WDR for achieving desired water quality conditions (http://www.waterboards.ca.gov/northcoast/water_issues/programs/tmdls/elk_river/pdf/160223/160211_KenPimlott_CalFire_TMDL_comment.pdf). Since the unapproved TMDL Action Plan relies on the implementation of an unapproved Draft WDR to achieve water quality objectives, and CAL FIRE questions the efficacy of these prescriptions in achieving water quality objectives, the Department considers the TMDL Action Plan as insufficient evidence for supporting Recommendation 2. We recommend that the NCRWQCB wait until results from the Railroad Gulch BMP Effectiveness Monitoring Project (Stubblefield et al. 2016) are available before determining if significant revisions of RMZ prescriptions are necessary and appropriate.

Finally, it should also be noted that the load allocation in the proposed TMDL Action Plan for the Upper Elk River is established as zero. The proposed TMDL Action Plan states that the zero load allocation is not an effluent limitation or waste load allocation, and therefore shouldn't be interpreted as a requirement to discharge zero sediment. However, the threshold of concern for the TMDL Action Plan is not held to a conventional CEQA standard for significant adverse impacts. Rather, the proposed TMDL Action Plan gives the NCRWQCB the discretion to decide what constitutes a controllable discharge and craft requirements to reduce or eliminate these discharges to the maximum extent practicable. This indicates that if the TMDL Action Plan is approved by the SWRCB and USEPA, then any discharge, no matter how big or small, can be viewed as controllable by the NCRWQCB. Under an approved TMDL Action Plan and WDR, Recommendation 2 would theoretically reduce sediment discharge from the THP even though the reduction would likely be small and non-significant in magnitude.

Conclusions

Based on office and field review, as well as knowledge of the pertinent literature summarized above, water quality impacts associated with this plan are anticipated to be minor and not produce significant adverse impacts. The practices prescribed in this plan should not significantly degrade water quality in the Lower North Fork Elk River or Upper Elk River watersheds, given that the California Forest Practice Act and Rules are properly implemented by the Licensed Timber Operator. For completeness, the

additional modifications and revisions specified in this report for the Cumulative Impacts Section of the THP should be provided.

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Figure 1a. Evidence of active erosion and incision in the YOC watershed, Caspar Creek, CA. Photo taken from Dewey (2007).

Figure 1b. Evidence of active erosion and incision in the MUN watershed, Caspar Creek, CA. Photo taken from Dewey (2007).

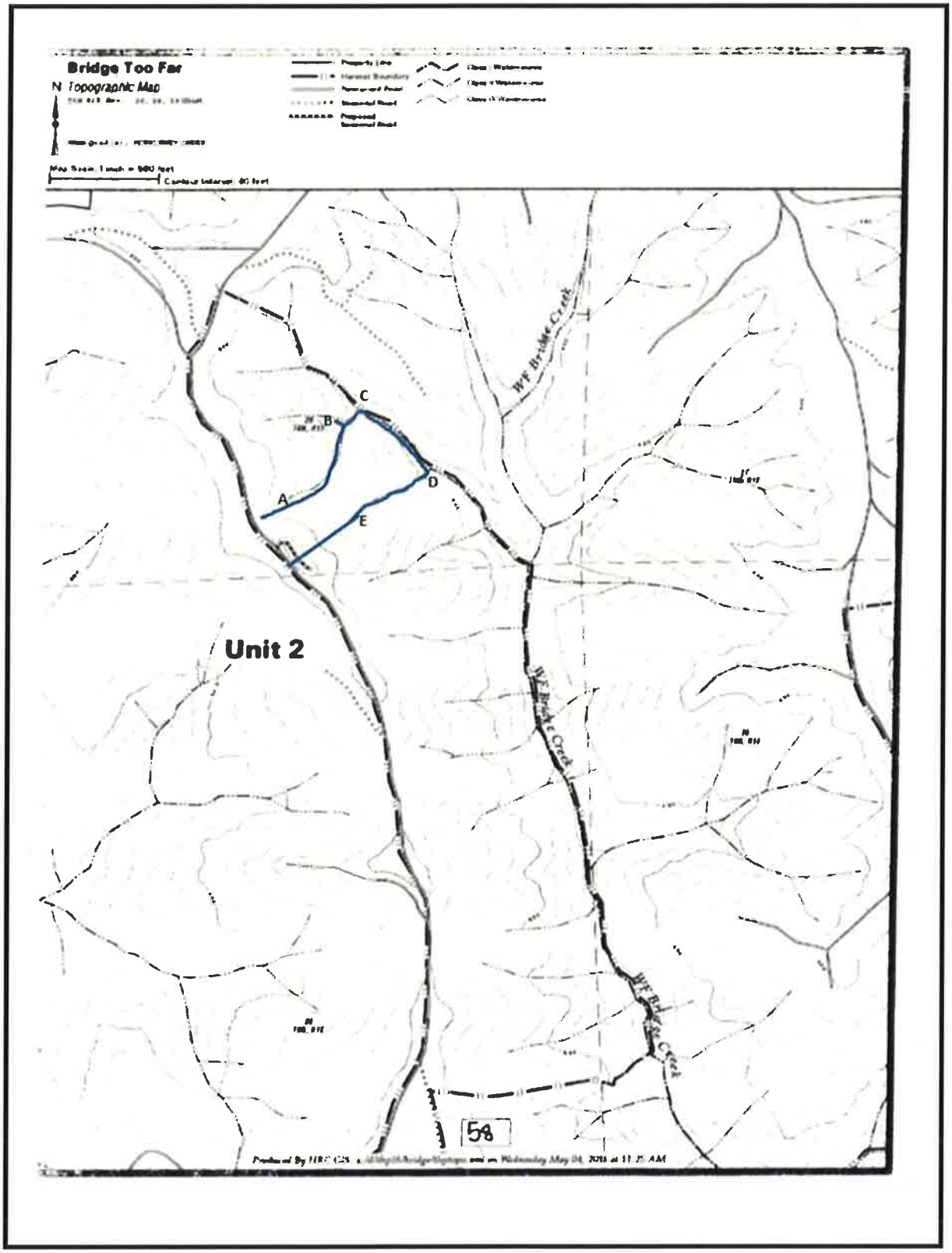

Figure 2. The route taken by the Review Team in Unit 2.

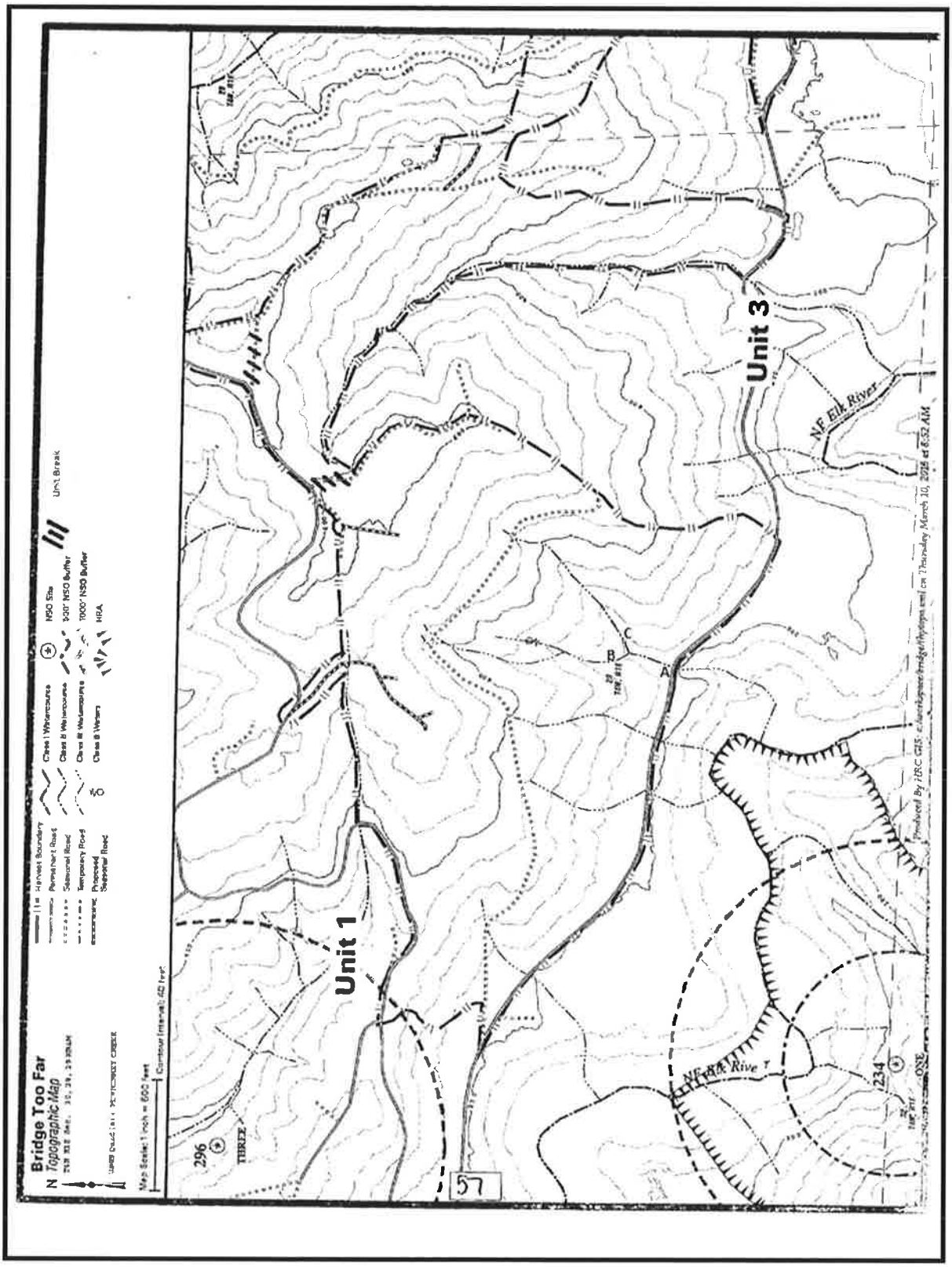

Figure 3. Points indicating the locations inspected in Unit 1.

Figure 4. The channel head of the Class III watercourse. Note the dense vegetative cover and relative abundance of large woody debris.

Figure 5. The Class III watercourse several hundred feet below the channel head. The watercourse went subsurface in response to large woody debris. Binder used for scale.

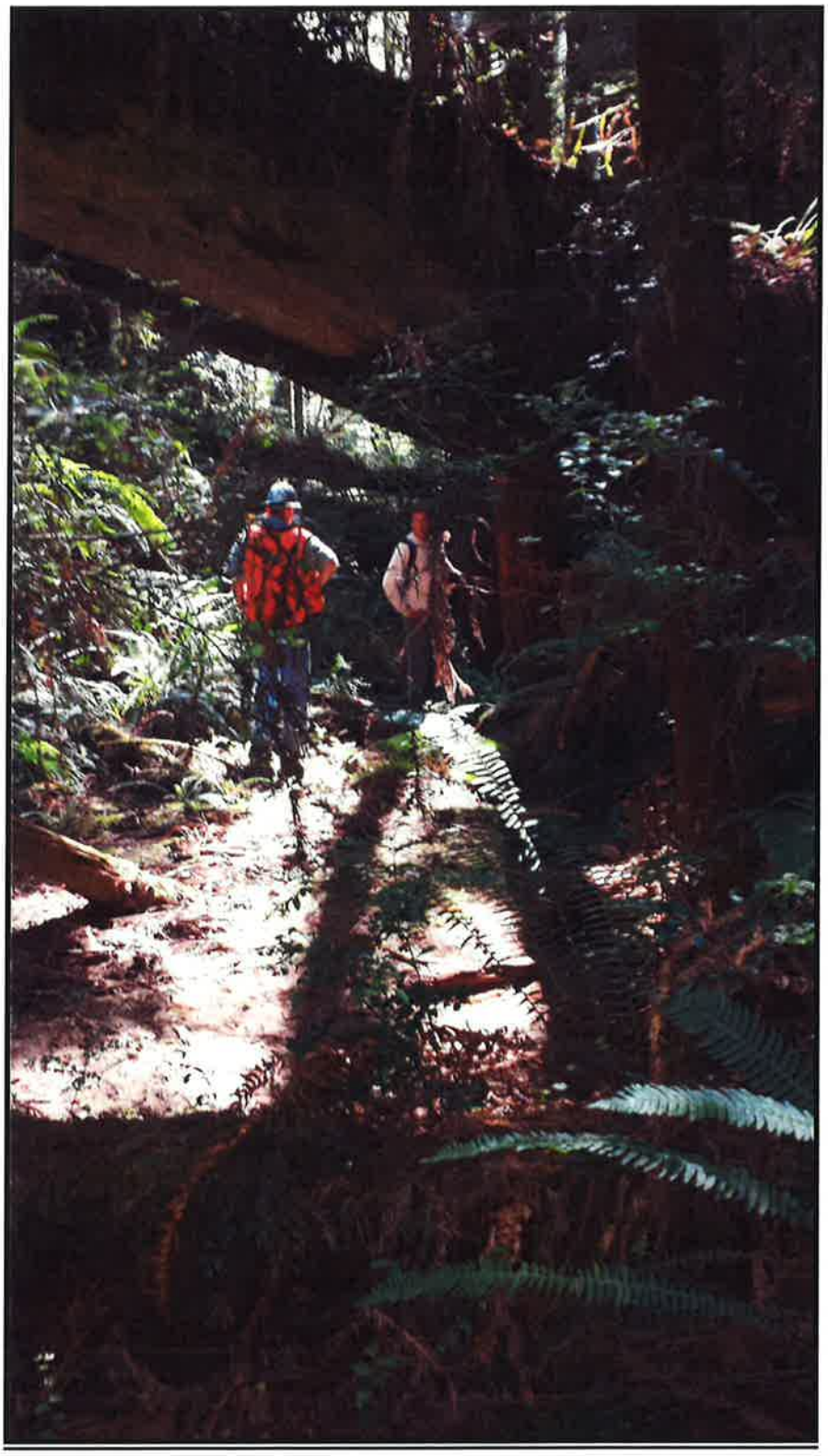

Figure 6. The third order Class III watercourse. Note the lack of channelization and relatively unconfined valley bottom.

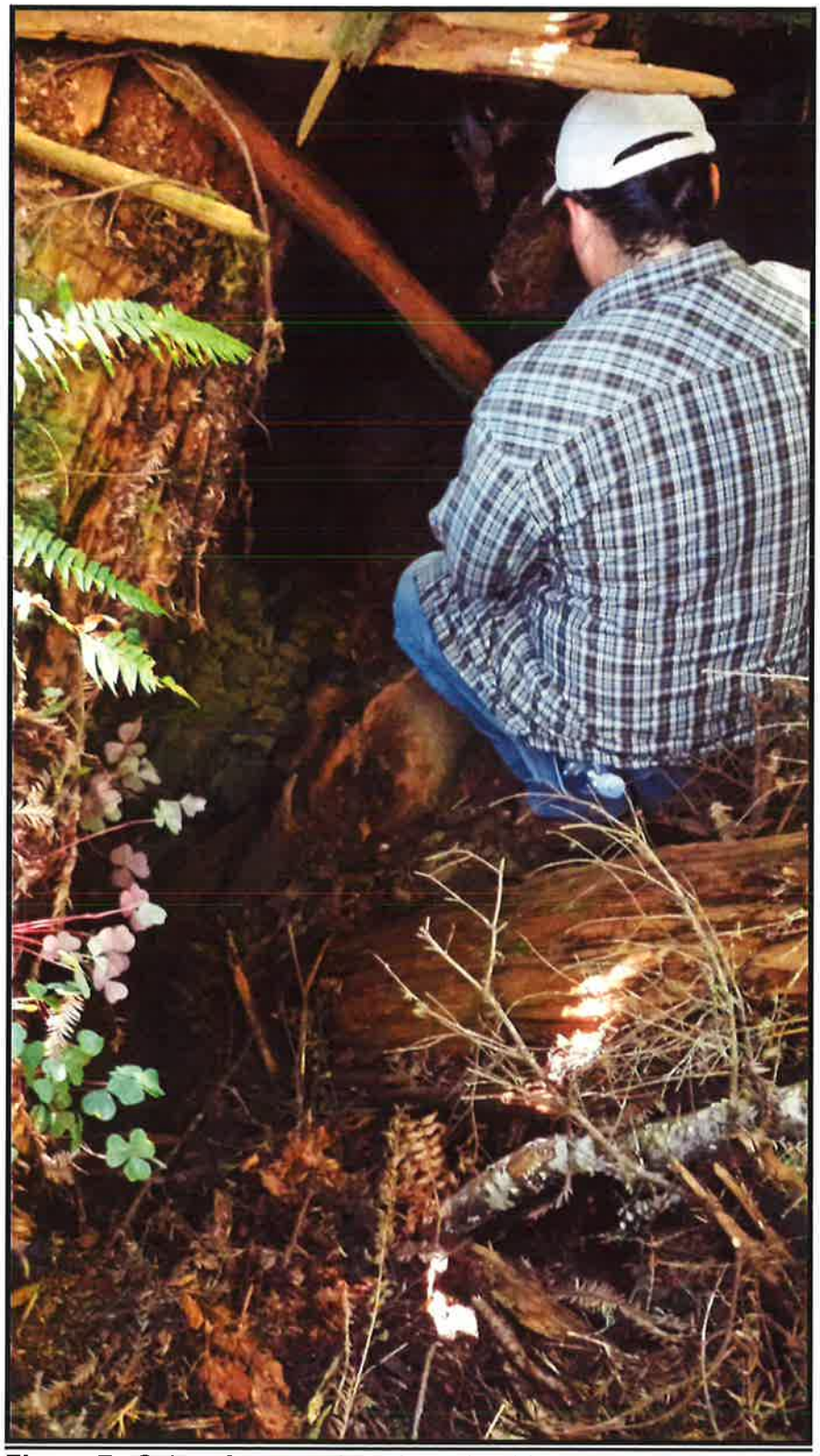

Figure 7. Subsurface erosion along the third order Class III watercourse.

Figure 8. Looking up at the Class III watercourse in the Three Forks THP (1-13-005 HUM).

Figure 9. Canopy retention above the Class III watercourse in a unit of the Three Forks THP (1-13-005 HUM).

DEPARTMENT OF FORESTRY AND FIRE PROTECTION
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MEMORANDUM

TO: Helge Eng,
Deputy Director Resource Management

DATE: August 29, 2016

ATTENTION: Dominik Schwab
Forest Practice North Region I Headquarters
135 Ridgway Ave, Santa Rosa, CA. 95401

Telephone:(707)576-2959

Website: www.fire.ca.gov

FROM: Department of Forestry and Fire Protection
(CAL FIRE) Humboldt / Del Norte Unit

SUBJECT: 5000 RESOURCE MANAGEMENT
5400 Forest Practice Regulation and Timber Taxation
5410 Forest Practice Act
Preharvest Inspection Report #2 (Focused)
THP 1-16-056 HUM Bridge Too Far THP
Inspection No: 1
Inspection Dates: July 12, 2016 and August 17, 2016
Final Public Comment Date: September 16, 2016
Inspection Hours: 20
Forest District: Coast
Present: Jason Wells – HRC RPF 6/12 and 8/17
Shane Beach – HRC Staff Geologist 6/12 and 8/17
Tom Schultz HRC Area Forester
Mike Miles – HRC Staff Scientist 6/12 and 8/17
Jim Burke – RWB 6/12 and 8/17
Chuck Striplen – RWB 8/17
John Oswald – CGS 6/12 and 8/17
Gerald Marshal CGS – 8/17
Nick Simpson – CDFW 6/12 and 8/17
Steve Baumgartner – CDFW 6/12
Chris Curtis – CAL FIRE 6/12 and 8/17
Drew Coe CAL FIRE Staff Hydrologist 8/17

On July 12, 2016, a Preharvest Inspection was conducted on the site of the proposed harvest area. Second review for this plan was conducted on August 4, 2016. The landowner and North Coast Regional Water Board Staff (RWB) are in disagreement regarding RWB PHI Recommendations 2 and 3. Second Review for this plan was postponed on August 4, 2016 and rescheduled for August 11, 2016. Second review was again postponed and CAL FIRE staff determined the need for an

additional field inspection where subject matter expert Staff Hydrologist Drew Coe could conduct an inspection. This inspection was determined to be the second day of the PHI. Staff Hydrologist Drew Coe will produce a report that provides significant additional information to the public record for this plan. The following is a summary of the observations, and evaluations made during the field inspection conducted August 17, 2016.

The PHI Team inspected Class III watercourses both within the boundary of 1-16-056 HUM Unit 2 and within HRC THP 1-13-005 HUM (Three Forks THP). The PHI Team also inspected a Class II watercourse in the lower slopes of 1-16-056 HUM in the lower portions of proposed harvest Unit 1. In Unit 1, the team inspected to where the Class II watercourse reach transitions to a Class III.

The Class III watercourses inspected in Unit 2 of 1-16-056 HUM are in the upper headwater reaches of Bridge Creek. Upper headwater Class III watercourses are cited in the RWB PHI Report as being sensitive to surface and subsurface erosion processes.

Three Forks THP, harvested in 2014 and 2015, is similar in scope to the proposed 1-16-056 HUM. Three Forks THP is also within Bridge Creek sub-basin, and was harvested utilizing Selection Silviculture, with Cable and Ground Based Yarding. The Class III watercourse inspected in 1-13-005 HUM is approximately mid Bridge Creek watershed. The watercourse reach inspected is in the upper slope near the ridgetop.

The following excerpts are quoted from the *CGS ENGINEERING GEOLOGIC REVIEW OF 2ND FIELD INSPECTION FOR TIMBER HARVESTING PLAN 1-16-056 HUM ("Bridge Too Far THP")*. These report statements of observations accurately describe the topography and stream conditions:

> *The PHI team visited several Class III watercourses within the northern portion of proposed harvest Unit 2. We traversed the heads of the watercourses and along the channels looking for evidence of erosion and collapsing soil macro pipes and voids. The Class III channels were well incised into the surrounding hillslope with steep side slopes and moderately steeply inclined channels. The channels contained evidence of filling and erosion. Large diameter, saw cut redwood logs were observed lying in and adjacent to the stream channels. The logs were commonly partially buried or had sediment blanketing the tops of the logs suggesting some burial and exhumation by erosion. Based on the lack of bare ground and the maturity of the vegetation along the stream channels there had not been any significant erosion within the channels for some time. It is likely the erosion occurred shortly following the last clearcut harvest cycle in the 1940's to 1960's. Much of the stream flow was contained in soil pipes and voids visible beneath the logs. We did not observe any significant plumes of sediment emerging from soil pipes.*
>
> *We also visited a recently harvested Class III watercourse and lake protection zone (WLPZ) in portions of THP 1-13-005 HUM. The harvest unit used selection silviculture and there were scattered conifer and hardwood remaining on the slopes. The Class III watercourse was less incised than the Class III channels observed in Unit 2 and had more gently inclined sideslopes. We did not see any evidence of erosion within the Class III watercourse and surrounding WLPZ that had occurred following the recent harvest. We walked a cable corridor up the hillslope after reviewing the channel. The cable corridor was about 25-30 feet wide, contained no large timber and was littered with limbs and small diameter logs. There was a significant*

vegetative cover of grasses, brush, and small timber growing in the corridor. We did not observe any evidence of erosion within the cable yarding corridor.

We traversed a Class II to Class III watercourse in the lower portions of proposed harvest Unit 1. Within the Class II WLPZ and located on steep streamside slopes we observed a soil pipe located in a head-cut immediately upslope of an area of bare exposed soil. The area of exposed soil was about 10 feet wide and 15 feet long, and is about 20- to 25-feet upslope of the watercourse. Further investigation showed the soil pipe was emerging from the left lateral margin of a dormant-historic fill failure that initiated from a legacy skid trail. The legacy skid trail was located about 50-feet upslope of the Class II channel and is within the Class II watercourse WLPZ. As per the HRC Habitat Conservation Plan (HCP) watershed analysis prescriptions for Elk River, Class II WLPZ are no harvest from the watercourse to 30-feet. Selection harvest that retains 60% canopy cover is permitted from 30-feet to 75- or 100-feet depending on the inclination of the stream side slopes. The area of erosion was within the no harvest band and the skid trail and dormant fill failure are within the area of selection harvest.

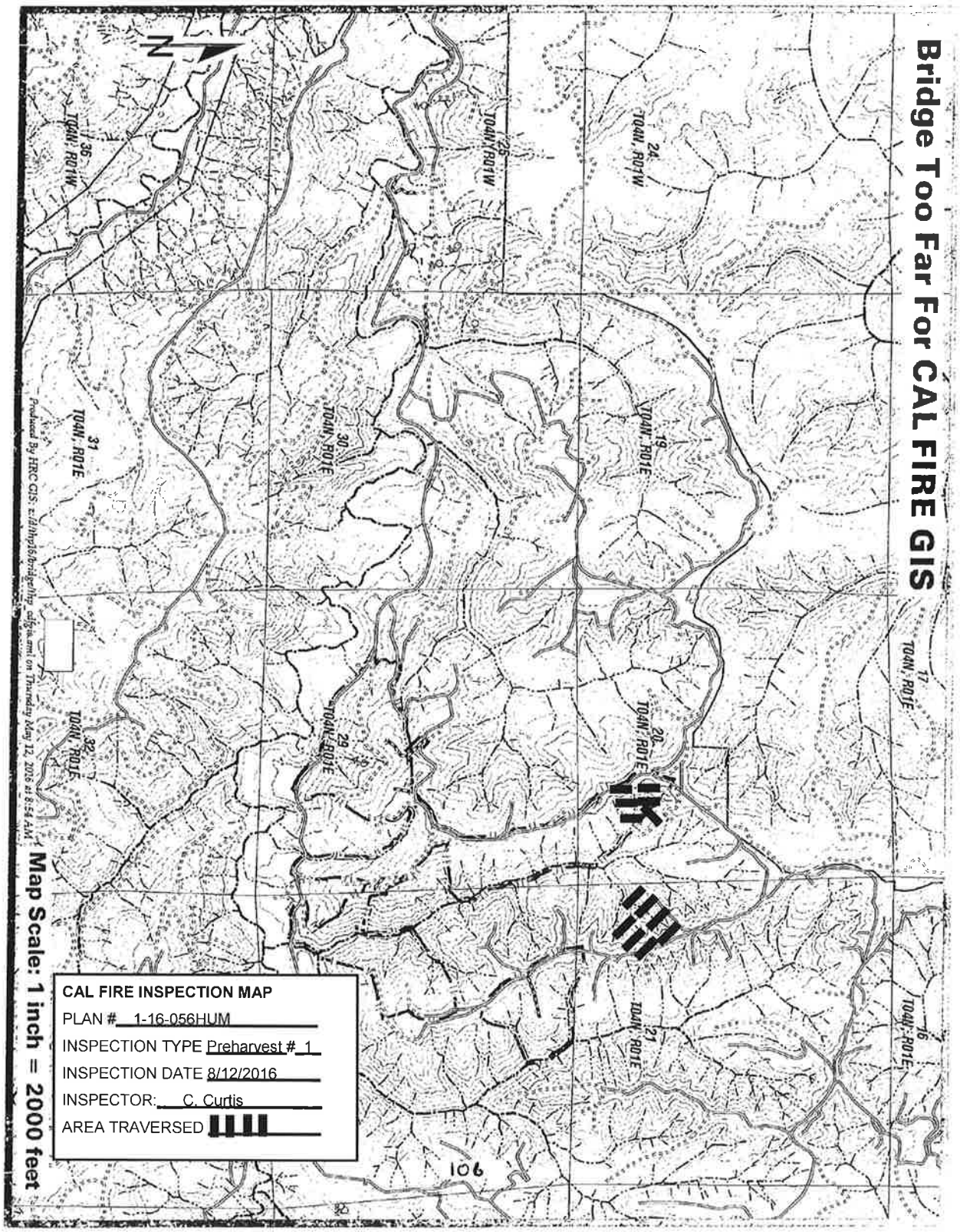
In summary the PHI Team did not observe any localized stream side conditions that require an increase in WLPZ width pursuant to 14 CCR 916.4(b)(5). Potential impacts from proposed THP 1-16-056 HUM appear to be well mitigated. For further information, please see the CAL FIRE PHI Report from Staff Hydrologist and Forest Practice Monitoring Coordinator Drew Coe.

Recommendations:
No additional recommendations were developed.

Hugh Scanlon
Unit Chief, Humboldt/Del Norte Unit
Original signature is
On file with CAL FIRE
By Chris C. Curtis RPF# 2541
Forest Practice Inspector

Attachment: CAL FIRE PHI Inspection Map
CC: North Region I Headquarters
HUU RM File
CAL FIRE Inspector-- C Curtis
RPF Wells
CDFW Simpson
RWB Burke
CGS Oswald
CAL FIRE Drew Coe
CGS Gerald Marshal

PHI Map Not To Scale



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Department of Conservation
California Geological Survey
2120 Campton Road • Suite E
Eureka, CA 95503

Edmund G. Brown Jr., *Governor*
John G. Parrish, Ph.D., *State Geologist*

MEMORANDUM

DATE: August 22, 2016

TO: Duane Shintaku
Deputy Director for Resource Management
California Department of Forestry and Fire Protection
135 Ridgway Avenue
Santa Rosa, California 95401

FROM: John Oswald
Engineering Geologist

SUBJECT: ENGINEERING GEOLOGIC REVIEW OF 2ND FIELD INSPECTION FOR TIMBER HARVESTING PLAN 1-16-056 HUM ("Bridge Too Far THP")

Date of Inspection: August 17, 2016

Timber and Timberland Owner:
Humboldt Redwood Company (HRC)

County: Humboldt

USGS Quadrangle: Fields Landing and McWhinney Creek 7.5 minute

Calwater v 2.2: 1110.000201 Lower North Fork Elk River

Legal Description: Sect. 20, 28, 29, 30 T4N R1E and Sect. 25 T4N R1W HB&M

Participants-Affiliation:
Jason Wells – HRC, RPF
Tom Schultz – HRC, RPF
Mike Miles – HRC, RPF
Shane Beach – HRC PG
Chris Curtis – CAL FIRE Inspector, RPF
Drew Coe – CAL FIRE, RPF/Hydrologist subject expert
Nicholas Simpson – CDFW, Env. Sci.
James Burke – NCRWQCB, Senior Eng. Geol., PG
Chuck Striplen, PhD – NCRWQCB, Env. Sci.
Gerald Marshall – CGS, Senior Eng. Geol., CEG
John Oswald – CGS, CEG

Introduction:

The California Geological Survey (CGS) attended a second day of pre-harvest inspection (PHI) for timber harvesting plan (THP) 1-16-056 HUM. CGS participation in the initial day of PHI is documented in a previous memorandum (CGS, 2016). The additional day was requested by CALFIRE Second Review Team (SRT) to allow review team subject matter experts conduct additional analysis and provide the SRT with guidance on the scientific issues at hand. The additional analysis is needed to allow CALFIRE evaluate disagreement between the landowner over Recommendations 2 and 3 from the North Coast Regional Water Quality Control Board (NCRWQCB) PHI report (NCRWQCB, 2016). CGS (2016) asked for additional information and a report from a California licensed geologist to evaluate and justify new road construction within the Class I WLPZ. The CALFIRE subject expert and NCRWQCB licensed geologist requested to inspect the upper

extents of Class III watercourses in the proposed plan area and on a Class III watercourse in a nearby recently harvested THP 1-13-005 HUM.

Observations:

Within the plan area, we observed light brown to gray, poorly consolidated, fine sandy siltstone exposed in road cuts and natural exposures throughout the plan area. The bedrock composition is consistent with descriptions of the undifferentiated Wildcat Group (Ogle, 1953). Within the Class III channel visited in proposed Unit 1, we observed terrace deposits cut into the on top of fine sandy siltstone. The terrace deposits contained a coarse cobble to boulder sized lag deposit on top of the strath terrace cut into the undifferentiated Wildcat Group bedrock. The coarse lag deposit was capped with fine grained silt and sand with few gravels.

The PHI team visited several Class III watercourses within the northern portion of proposed harvest Unit 2. We traversed the heads of the watercourses and along the channels looking for evidence of erosion and collapsing soil macro pipes and voids. The Class III channels were well incised into the surrounding hillslope with steep side slopes and moderately steeply inclined channels. The channels contained evidence of filling and erosion. Large diameter, saw cut redwood logs were observed lying in and adjacent to the stream channels. The logs were commonly partially buried or had sediment blanketing the tops of the logs suggesting some burial and exhumation by erosion. Based on the lack of bare ground and the maturity of the vegetation along the stream channels there had not been any significant erosion within the channels for some time. It is likely the erosion occurred shortly following the last clearcut harvest cycle in the 1940's to 1960's. Much of the stream flow was contained in soil pipes and voids visible beneath the logs. We did not observe any significant plumes of sediment emerging from soil pipes.

We also visited a recently harvested Class III watercourse and lake protection zone (WLPZ) in portions of THP 1-13-005 HUM. The harvest unit used selection silviculture and there were scattered conifer and hardwood remaining on the slopes. The Class III watercourse was less incised than the Class III channels observed in Unit 2 and had more gently inclined sideslopes. We did not see any evidence of erosion within the Class III watercourse and surrounding WLPZ that had occurred following the recent harvest. We walked a cable corridor up the hillslope after reviewing the channel. The cable corridor was about 25-30 feet wide, contained no large timber and was littered with limbs and small diameter logs. There was a significant vegetative cover of grasses, brush, and small timber growing in the corridor. We did not observe any evidence of erosion within the cable yarding corridor.

We traversed a Class II to Class III watercourse in the lower portions of proposed harvest Unit 1. Within the Class II WLPZ and located on steep streamside slopes we observed a soil pipe located in a head-cut immediately upslope of an area of bare exposed soil. The area of exposed soil was about 10 feet wide and 15 feet long, and is about 20- to 25-feet upslope of the watercourse. Further investigation showed the soil pipe was emerging from the left lateral margin of a dormant-historic fill failure that initiated from a legacy skid trail. The legacy skid trail was located about 50-feet upslope of the Class II channel and is within the Class II watercourse WLPZ. As per the HRC Habitiat Conservation Plan (HCP) watershed analysis prescriptions for Elk River, Class II WLPZ are no harvest from the watercourse to 30-feet. Selection harvest that retains 60% canopy cover is permitted from 30-feet to 75- or 100-feet depending on the inclination of the stream side slopes. The area of erosion was within the no harvest band and the skid trail and dormant fill failure are within the area of selection harvest.

Summary:

CGS participated on the second day of PHI for the above referenced THP. As noted in our July 25, 2016 memorandum, the RPF, working with the geologist, appears to have been aware of the geologic framework of the region and appears to have reasonably used the unstable area definitions put forth in the HRC HCP, Forest Practice Rules, and California Licensed Forester Association Guidelines (PALCO, 1999; HRC, 2005; CALFIRE, 2015; CLFA, 1999). Potential problem sites have been mitigated by avoidance, silvicultural prescription, and use of appropriate set-backs. The RPF's mitigation measures appear to be reasonable based on our field reconnaissance conducted as a part of the PHI. Nothing was observed during the August 17 site visit that would cause us to modify the conclusions of the earlier memorandum. We have no recommendations from the second day of the PHI.

General Recommendations: NONE

Site-Specific Recommendations: NONE

Original signed by:

John A. Oswald CEG 2291
Engineering Geologist
john.oswald@conservations.ca.gov
(707) 441-5745

Concur:

Original signed by:

Gerald J. Marshall CEG 1909
Senior Engineering Geologist

References:

CALFIRE, 2016, California Forest Practice Rules 2016, Title 14 CCR, Chpt 4, 4.5, and 10 Department of Forestry and Fire Protection.

California Licensed Foresters Association (CLFA), 1999, Guide To Determining The Need for Input From A Licensed Geologist In THP Preparation.

CGS, 1999, North Coast Watersheds Mapping, DMG CD-ROM 99-002.

CGS, 2005, Geologic and Geomorphic Features Related to Landsliding Elk River Watershed, Map Set 4 CD 2005-01.

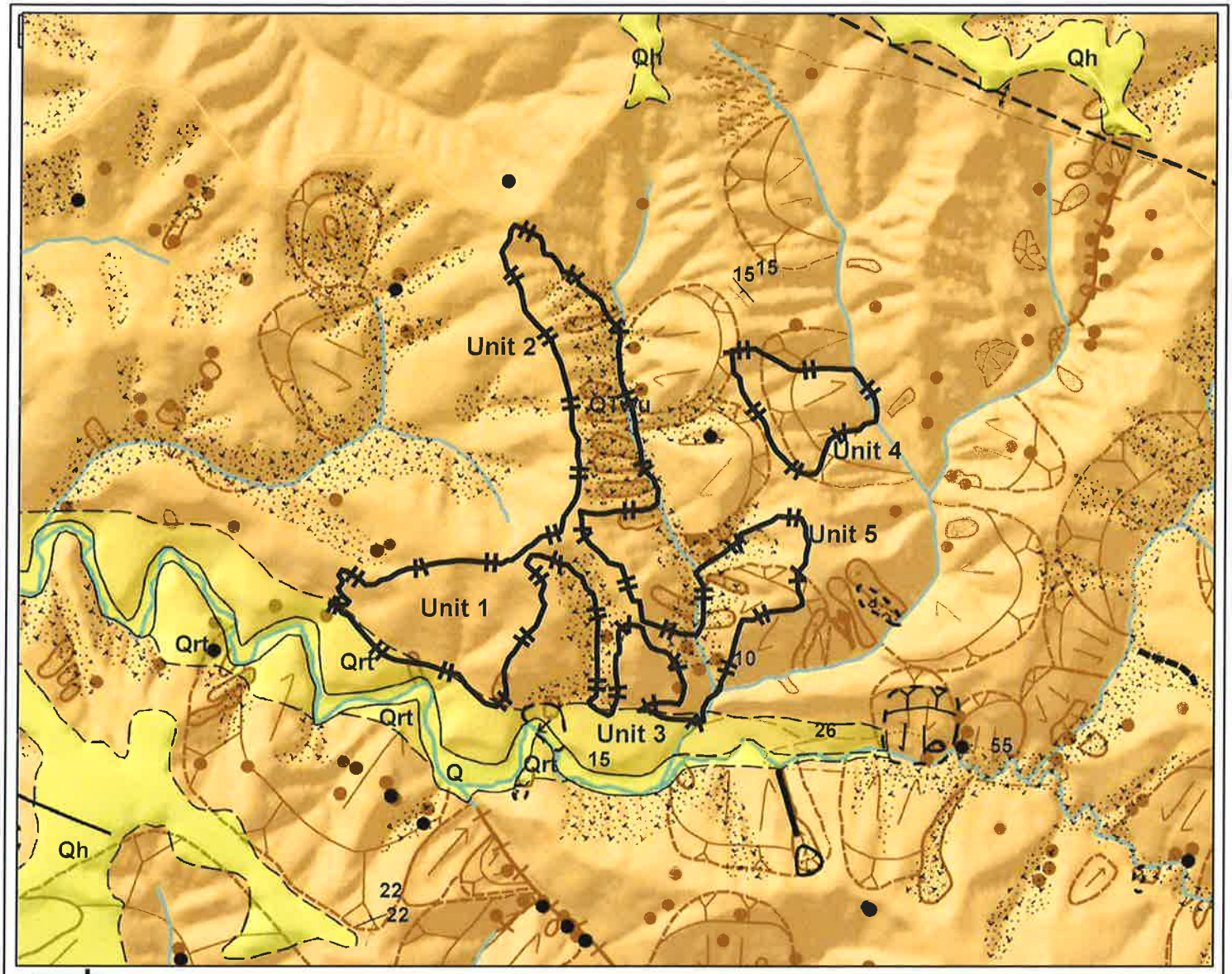
CGS, 2016; Engineering Geologic Review of Timber Harvesting Plan 1-16-056 HUM ("Bridge Too Far THP"), unpublished memorandum from John Oswald, Certified Engineering Geologist and Gerald Marshal, Certified Engineering Geologist, California Geological Survey, to Dr. Helge Eng, Deputy Director for Resource Management, California Department of Forestry and Fire Protection, dated August 22, 2016, 4pp, 1 fig.

HRC, 2005, Elk River and Salmon Creek Watershed Analysis, Humboldt Redwood Company LLC 2005.

NCRWQCB, 2016; Pre-harvest Inspection (PHI) Report Timber Harvest Plan (THP) 1-16-056 HUM, unpublished memorandum from Jim Burke, Professional Geologist, North Coast Regional Water Quality Control Board, to Jason Wells, Registered Professional Forester, Humboldt Redwood Company LLC, and Santa Rosa Second Review, California Department of Forestry and Fire Protection, dated July 21, 2016, 10pp, 1 fig.

Ogle, B.A., 1953, Geology of the Eel River Valley Area, Humboldt County, California: California Division of Mines Bulletin 164, 128 p., 6 plates, scale 1:62,500.

PALCO, 1999, Habitat Conservation Plan for the Properties of the Pacific Lumber Company, Scotia Pacific Holding Company, and Salmon Creek Corporation, 1999.



1-16-056 HUM
Landslide
disrupted ground
tt, d
tt, h
contact, approx. located
contact, certain
shear zone
debris slide slopes

debris slide, dormant
debris slide, active
earthflow, dormant
earthflow, active
rockslide, dormant
rockslide, active
inner gorge
Scarp
anticline, approx. located
anticline, certain
syncline, approx. located

syncline, certain
fault, approx. located
fault, certain
grad. contact
photo lineament
s.s. fault, approx. located
s.s. fault, certain
thrust fault, approx. located
thrust fault, certain

Dipbed
Dipbed-approx
Dipfault
Dipfrac
Dipover
Dipvert
Dipvrtfrac
Horiz-bed

N

2,000 1,000 0 2,000 Feet

Geology modified from CGS, CD 2005-01 and CGS, 1999
CA State LiDAR generated hillshade product, 1m resolution

QTwu: Wildcat Group, undifferentiated

Date: 7/20/16 Scale: 1:24,000 Approved by: jao	**Regional Geologic and Geomorphic Map** **To Accompany** **2nd Field Evaluation** **THP 1-16-056-HUM**	**Figure:** **1**

UNIT, RPF, PLANSUB, ftp/NEW

CALIFORNIA Water Boards

EDMUND G. BROWN JR. GOVERNOR

MATTHEW RODRIQUEZ SECRETARY FOR ENVIRONMENTAL PROTECTION

North Coast Regional Water Quality Control Board

Pre-harvest Inspection (PHI) Report
Timber Harvest Plan (THP) 1-16-056 HUM

Date: August 24, 2016

To: CAL FIRE santarosareviewteam@fire.ca.gov
Jason Wells, Registered Professional Forester (RPF)

Subject: Pre-harvest Inspection of THP 1-16-056 HUM

From: Jim Burke, Senior Engineering Geologist

PHI Attendance on August 18, 2016
Chris Curtis – California Department of Forestry and Fire Protection (CAL FIRE)
Drew Coe – CAL FIRE
Jim Burke- North Coast Regional Water Quality Control Board (RWB)
Chuck Striplin - RWB
Jason Wells – Registered Professional Forester (RPF) Humboldt Redwood Company (HRC)
John Oswald – California Geologic Survey (CGS)
Nicholas Simpson – California Department of Fish and Wildlife (DFW)
Shane Beach – Certified Engineering Geologist, HRC Geology Department
Tom Schultz – HRC
Mike Miles - HRC

Introduction
On August 18, 2016, I participated in the second day of the Pre-harvest Inspection (PHI) for Timber Harvest Plan (THP) 1-16-056 HUM. The second day was scheduled to allow review team members including CAL FIRE hydrologist Drew Coe to evaluate watercourses and streamside slopes within the context of recommendation #2 from my July 21, 2016 PHI report, copied below:

"The THP shall be revised to include the following additional RMZ protection

measures intended to implement water quality requirements, including the Elk River TMDL load allocation:

Class II watercourses -

a. Riparian Management Zones (RMZs) for Class II watercourses shall extend up to 200 feet on either side of the channel or to the hydrologic break in slope;
b. No harvesting within 30 feet of Class II watercourses; and
c. Between 30 feet and 200 feet of Class II watercourses, retain a minimum of 60% post-harvest conifer canopy coverage.

Class III watercourses -

a. Riparian Management Zones (RMZs) for Class III watercourses extend to 100 feet on either side of the channel or to the hydrologic break in slope;
b. No harvesting within 20 feet of Class III watercourses; and
c. Between 20 feet and 100 feet from a Class III watercourse, retain a minimum of 70% post-harvest conifer canopy coverage."

During the August 18, 2016, the review team focused on observing conditions of Class II and III watercourses in the proposed harvest area and in an adjacent unit of THP 1-13-005 HUM that was harvested under similar prescriptions proposed in this THP approximately 2 years ago. The review team evaluated the stability of watercourse channels, banks, and adjacent hillslopes and their potential susceptibility to further destabilization from proposed timber harvest activities. Such impacts could result from increased peak flows from upslope canopy removal and decreased slope stability from increased shallow pore water pressure and loss of root strength.

On-site observations

Channels observed during the inspection were representative of low order tributary streams throughout those portions of the Elk River watershed underlain by bedrock of the undifferentiated Wildcat Group. Stream side slope gradients were generally between 30% and 50% and covered with a thick layer of duff, low lying vegetation, and scattered conifers and hardwoods. Stream channels were rough and discontinuous with large numbers of fallen trees, both cut logs from past logging operations as well as naturally recruited, entrained within the channel. In-stream woody material is so prevalent as to be nearly continuous along the entire length of channels and is likely a significant channel forming feature, functioning to route and store sediment, bridge large voids, and deflect streamflow. Large logs were dragged down many of the low order channels during early logging operations and tractors were driven in and adjacent to watercourse channels; however, we did not observe conclusive evidence that this occurred. As is typical of low order tributary watercourses in Elk River, channels were a chaotic jumble of wood and earthen debris, often covering and obscuring the channel bed, large in-channel voids, exposed bedrock in places, and bank failures in varying stages of healing. We did not observe significant evidence of recent channel instability, such as bare vertical banks, headward channel

incision or gullies, fresh sediment deposits in either proposed harvest units 1 and 2, or in the adjacent recently harvested unit.

TMDL Hillslope Indicators

The table below shows hillslope indicators associated with riparian zone protection from the Elk River TMDL Action Plan, which the Regional Water Board adopted on May 12, 2016. The hillslope indicators are based on information from the *Upper Elk River: Technical Analysis for Sediment* (Tetra Tech, 2015). Regional Water Board's recommendation that the THP incorporate enhanced Class II and III RMZs is intended to implement hillslope indicators listed below and contribute towards achieving the TMDL load allocation.

Specific Upper Elk River Watershed Indicators		
Headward incision in low order channels	Zero increase in the existing drainage network	Class II/III catchments
Peak flows	Less than 10% increase in peak flows in 10 years related to timber harvest	Class II/III catchments
Channels with actively eroding banks	Decreasing length of channel with actively eroding banks	Class I, II, and III watercourses
Characteristics of riparian zones (i.e., 300 feet on either side of the channel) associated with Class I and II watercourses	Improvement in the quality/health of the riparian stand so as to promote 1) delivery of wood to channels, 2) slope stability, and 3) ground cover	Class I and II watercourses
Characteristics of riparian zones (i.e., 150 feet on either side of the channel) associated with Class III watercourses	Improvement in the quality/health of the riparian stand so as to promote 1) delivery of wood to channels, 2) slope stability, and 3) ground cover	Class III watercourses

Revised Recommendation #3

Recommendation #3 from my July 21, 2016 PHI report addressed wet weather operations. Upon further consideration, RWB staff have reevaluated wet weather requirements deemed necessary to protect water quality and therefore revise recommendation so that "dry weather" conditions are defined as, "less than a cumulative total of 0.25 inches of precipitation during any consecutive 72 hour period." The original recommendation #3 cited 0.15 inches during any consecutive 96 hour period. My revised recommendation #3 is presented below:

> Road construction or reconstruction shall not take place between September 15 and May 1 except in response to failure of a road segment or watercourse crossing that is resulting in ongoing or imminent sediment discharge.
>
> Between October 1 and May 1, timber falling and cable yarding are permitted. Ground-based yarding and site preparation shall not occur during that period. Hauling (including logs, heavy equipment and/or rock) shall be prohibited once there is 4 inches of accumulated precipitation in any water year (October 1 – September 30) as measured at the National Weather Service Woodley Island Station in Eureka (NWS Woodley Island). Hauling may resume during dry weather conditions, but is prohibited when dry weather conditions do not exist. Dry weather

conditions are defined as less than a cumulative total of 0.25 inches of precipitation during any consecutive 72 hour period as measured at NWS Woodley Island. Hauling may resume May 1 pursuant to HCP requirements.

Reference

Tetra Tech, Inc., 2015. Upper Elk River: Technical Analysis for Sediment. Prepared for Environmental Protection Agency, Region 9 and North Coast Regional Water Quality Control Board. Fairfax, VA.

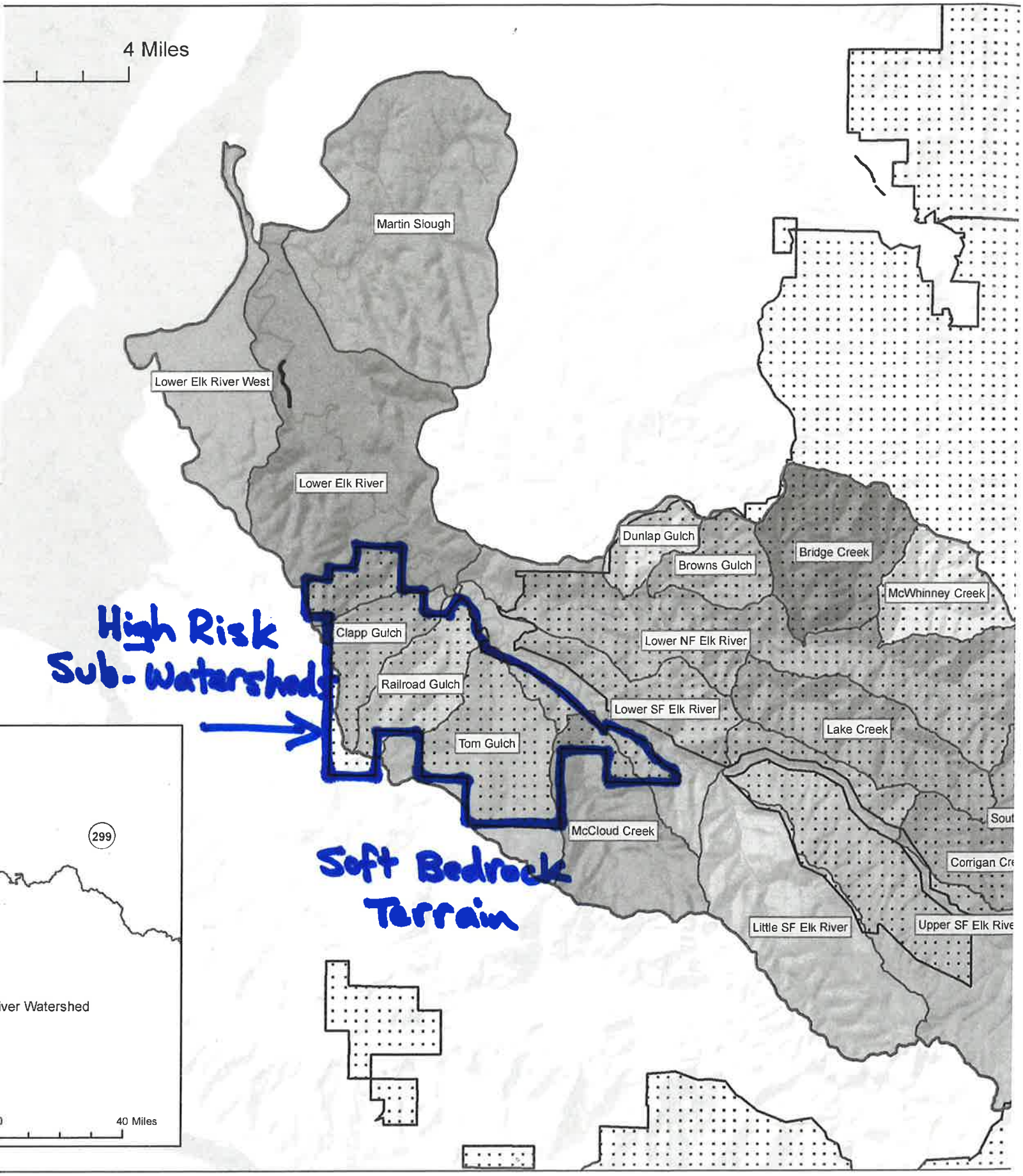
Appendix C

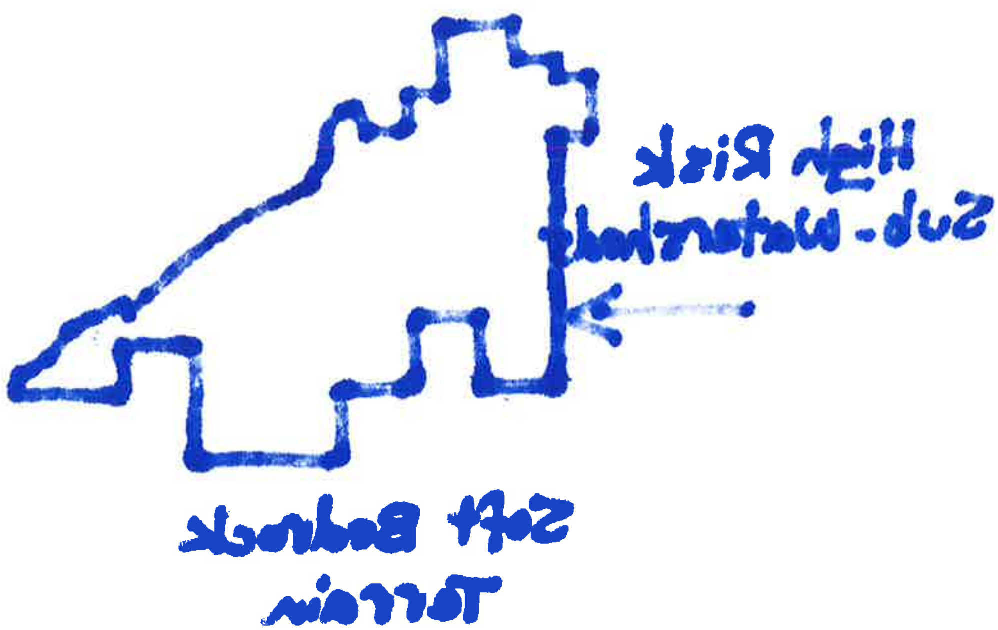
Recommended 'High Risk' Sub-Watershed Delineation reflecting Actual Location of Hookton Formation and related Alluvium and Marine Terraces

September 29, 2016

Shane Beach, PG 7936

Attachment A - Elk River Location Ma




High Risk Sub-Watersheds
Soft Bedrock Terrain