SACRAMENTO MUNICPAL UTILITY DISTRICT
UPPER AMERICAN RIVER PROJECT
(FERC NO. 2101)

FIRE RISK AND PROTECTION
TECHNICAL REPORT

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TABLE OF CONTENTS

LIST OF TABLES

Section & Description **Page**

LIST OF FIGURES

Section & Description **Page**

LIST OF APPENDICES

Appendix & Description

LIST OF APPLICABLE STUDY PLANS

Description

- Fire Risk and Protection Study Plan

10.7 Fire Risk and Protection Study Plan

The Fire Risk and Protection Study Plan will assess fire risks and firefighting resources directly associated with the Project. The primary purpose of this study is to identify fire prevention and pre-suppression actions that could reduce fire risk directly associated with the Project, and actions that could protect the Project from fire ignition caused by other sources. A second purpose of this study is to determine the dispersed recreational facilities that are related to Project operations and maintenance that are found to need some level of assessment and treatment. The study geographical scope will include areas identified through TWG analysis of other study and research efforts.

10.7.1 Pertinent Issue Questions

15. "Is there a need for fuels management to protect Project facilities?"

20. "Does the project affect fuels management and if so, how?"

21. "What are the infrastructure needs (if any) for fighting fires associated with Project-related operations?"

25. "What are the public safety needs of induced recreation on fire (risks, issues, and mitigation)?"

27. "Does the Project increase fire risk? What are the potential mitigation or prevention measures to reduce fire risk?"

10.7.2 Background

Fire protection is a public services issue under the California Environmental Quality Act (CEQA) if new or physically altered governmental infrastructure for fire services is needed as a result of meeting service demands for a proposed project. Participants in the Alternative Licensing Process (ALP) for the UARP have identified several issues related to fire risk and fire prevention for the Project.

The Upper American River Project consists of a series of reservoirs, dams, powerhouses, switchyards, transmission lines, developed recreation facilities and associated dispersed recreation sites (refer to Initial Information Package for more descriptive information) that will be assessed in terms of fire hazard risk to and from adjacent lands. In addition to the current safety procedures associated with Project operation and maintenance, additional protection and prevention measures may be determined necessary to reduce potential fire risks directly associated with Project facilities and operations.

10.7.3 Study Objectives

1. Identify the potential need for fuels management associated with fire protection of Project facilities. This objective will address Issue Questions 15.

2. Identify existing fire fighting infrastructure and fire prevention measures associated with the Project. This objective will address Issue Questions 21 and 25.

3. Identify any potential fire risk associated with Project facilities (e.g., build up of fuels, recreation use, operations), and identify potential mitigation and/or fire prevention measures to reduce fire risk. This objective will address Issue Questions 20, 25 and 27.

4. Evaluate the adequacy of SMUD fire safety procedures for the UARP, and identify modifications to procedures associated with fire risk at different facilities. This objective will address Issue Question 27.

5. Identify through USFS records locations of dispersed recreation sites, fuel loading, historic hazard and fire risk areas in these areas; provide economic data that provides insight to funding availability; extrapolate fire risks associated with dispersed recreation for the next 30 – 50 years. This objective will also address Issue Question 25.

10.7.4 Study Area

The study area includes all structures and facilities (dams, powerhouses, switchyards, other ancillary facilities) within the FERC Project boundary. Outside the ENF, the study area is defined as the FERC Project Boundary. The USFS and SMUD agreed to consider fire risk and prevention aspects relative to Project-induced dispersed recreation as determined by the Land Use and Recreation TWG. Recreational use survey(s) may be used to provide information relative to fire risk within the study area.

10.7.5 Information Needed From Other Studies

Information needed from other relicensing studies include: 1) Vegetation Mapping and Riparian Vegetation Study plans; 2) the Recreational Use study, 3) Land Use study; and 4) the various study plans prepared for listed (and other species of concern) plants and animals.

10.7.6 Study Methods

The study methods will address the Study Objectives 1, 2, 3 and 4 and Issue Questions 15, 20, 21, 25, and 27. The first step for this task will be a review SMUD's existing fire management policies and procedures (e.g., within the Safety Management Plan) for Project facilities, including the transmission line rights-of-way or easements. Fire safety procedures at each Project facility (such as powerhouses and switchyards) will be evaluated by a fire safety expert. This will include review of fire safety equipment kept onsite and fire prevention/fighting training provided to project operators. Vegetation cutback procedures around project facilities will be reviewed by a registered/professional forester with expertise in fuels management.

Secondly, USFS, CDF fire and SMUD operations staff for the UARP will be interviewed and information collected on historical fire incidents at or near SMUD facilities (e.g., location, duration, cause) during the license period, and identify Project-related fire fighting infrastructure and capabilities, including personnel and equipment available to fight fires and provide emergency services during a fire.

Finally, USFS will gather existing historical data to prepare an analysis (in conjunction with SMUD) relative to fire risk and protection within the forest relative to developed and dispersed campsites, economic data (funding sources, ongoing costs of prevention and suppression programs), fuel loading (modeled and actual), public access, access to water for fire suppression, response time to the Crystal Basin, historic data (hazard/fuel maps, fire maps) and locations of developed, concentrated dispersed and "shotgun" dispersed recreation, as well as a treatment management pan for the next 30 – 50 years.

Following collection of the information described above, a project engineer and registered/professional forester with fuels management expertise will conduct a field assessment of fire risk at all project facilities, including the Project transmission line corridor, powerhouses, switchyards, and appurtenant

facilities and the applicable recreation sites associated with the Project. At each facility site the potential for the facility (e.g., switchyard) to start a fire will be evaluated. The evaluation will be based on the potential source(s) of fire (e.g., transformer explosion) and the proximity of fuel within the vicinity of the fire source. Areas identified in the field as having a high or moderate fire risk will be mapped on a USGS quadrangle (7.5 or 15 minute) or aerial photograph. Areas of low fire risk will not be mapped, but notes will be made as to the area of low risk and the criteria behind such a rating. From the field assessment of fire risk, the forester will develop prescriptions (in conjunction with USFS) for future management of areas within the Project vicinity that support a moderate or high fire risk. Available fire history from the CDF and USFS will also be examined.

10.7.7 Analysis

Qualitative and quantitative information for identifying potential impacts of Project operations and facilities, including dispersed recreational use, will be integrated and analyzed. If needed, protection, mitigation, and/or enhancement (PM&E) measures for significant impacts will be developed.

10.7.8 Study Output

A presentation on the study will be made to the Land Use TWG in 2003. The ultimate study output will be a written report that includes the issues addressed, study objectives, study area, including sampling locations, methods, analysis, results, discussion and conclusions. The report will be prepared in a format so that it can easily be incorporated into the Licensee's draft environmental assessment that will be submitted to FERC with the Licensee's application for a new license. The report will include maps depicting high and moderate fire risk areas in the Project vicinity. The presentation will also identify potential modifications to SMUD's fire prevention and protection procedures.

10.7.9 Preliminary Estimated Cost

[A preliminary estimated study cost will be prepared after the Socioeconomics TWG approves of the plan and prior to presenting the plan to the UARP Plenary Group for consideration.]

10.7.10 TWG Endorsement

The Land Use Technical Work Group approved this study plan on May 22, 2003. Those who said they could "live with" the study plan (as amended) were USFS, SMUD and Friends of El Dorado County. There was no one in attendance that said they could not "live with" the study plan. The Plenary Group approved the study plan at the June 4, 2003 meeting. The following participants approved the study plan: SWRCB, SMUD, USFS, NPS, Calif. DF&G, FOR, PG&E, City of Sacramento, PCWA, Camp Lotus, EDCWA, and other participants. No one present at the meeting said they could not "live with" the study plan

FIRE RISK AND PROTECTION PLAN
TECHNICAL REPORT

SUMMARY

This report analyzes wildfire hazard and risk in the vicinity of power facilities of the Upper American River Project (UARP) or Project. Data gathered in this analysis were gained through a combination of field visits, interviews, helicopter reconnaissance, vegetation mapping files, aerial photos and other electronic files. Composite fire hazard and risk values were assigned to various segments of the transmission line corridors east of White Rock Powerhouse to Loon Lake Powerhouse. A moderate rating was accorded to all segments, with the exception of the low elevation White Rock-Camino segment. Fire risk (the probability of a fire to occur), fire hazard (the amount of fuel available to burn), and exposure to fire weather conditions (elevation) were the factors to determine the fire hazard and risk values. Fire risk was determined from historical data of fire starts provided by the U. S. Forest Service (USFS) and the California Department of Forestry and Fire Protection (CDF). Fire hazard was determined by using the BehavePlus fire simulation model to estimate flame lengths for identified polygons within one-quarter mile of transmission lines and powerhouses.

Fire hazard and risk were evaluated for the Forest Service-designated dispersed recreation zones on the Pacific Ranger District, Eldorado National Forest. Fire risk, based on a 15-year history was the highest for Zone 2 (located closest to the reservoirs), intermediate for Zone 3, and the least for Zone 4 (located the furthest away from reservoirs). Within the Pacific Ranger District, there are about 28,200 acres in need of fuels reduction treatment, including 1,900 acres in Zone 2, 11,900 acres in Zone 3 and 14,400 acres in Zone 4. Projected fuel treatments to reduce fire hazard to acceptable levels includes treating areas through a combination of thinning and slash treatment on about 28,200 acres in the first decade, followed up by periodic underburning to maintain desired conditions over the next five decades.

Fire risk within one-eighth and one-quarter mile of identified dispersed recreation sites was evaluated. A positive relationship was indicated between human-caused fires within one-eighth and one-quarter mile of identified dispersed recreation sites. Available data did not provide a distinction between the types of human-caused fires, so it could not be stated with certainty which human-caused fires were actually a result of dispersed recreation.

Although line sag is a fire risk factor, there were no reports of fires starting as a result of line sag within the Eldorado National Forest. Measures are in place to reduce risk which include evaluating and removing hazard trees adjacent to and under the line. Removal of these trees on a periodic basis minimizes the risk of fire start from the transmission lines.

1.0 INTRODUCTION

This technical report is one in a series of a reports prepared by Devine Tarbell & Associates, Inc., and Continental Resource Solutions, Inc. for the Sacramento Municipal Utility District (SMUD) as an appendix to SMUD's application to the Federal Energy Regulatory Commission (FERC) for a new license for the Upper American River Project (UARP or Project). The report addresses fire risks and protection directly associated with the UARP. This report includes the following sections:

- **BACKGROUND** – Summarizes the applicable study plan approved by the UARP Relicensing Plenary Group; a brief description of the issue questions addressed, in part, by the study plan; the objectives of the study plan; the study area, and agency information

requests. In addition, requests by resource agencies for additions to this technical report are described in this section.

- **METHODS** – A description of the methods used in the study, including a listing of study sites.
- **RESULTS** – A description of the most important data results. Raw data, where copious, and detailed model results are provided by request in a separate compact disc (CD) for additional data analysis and review by interested parties.
- **ANALYSIS** – A brief analysis of the data, where applicable.
- **LITERATURE CITED** – A listing of all literature cited in the report.

This technical report does not include a detailed description of the UARP Alternative Licensing Process (ALP) or the UARP, which can be found in the following sections of SMUD's application for a new license: The UARP Relicensing Process, Exhibit A (Project Description), Exhibit B (Project Operations), and Exhibit C (Construction).

In addition, this technical report does not include a discussion of impacts analyses relative to fire risk and protection, nor does the report include a discussion of appropriate protection, mitigation, and enhancement measures (PM&E). An impacts discussion regarding the UARP is included in the applicant-prepared preliminary draft environmental assessment (PDEA) document, which is part of the SMUD's application for a new license. Development of resource measures will occur in settlement discussions, which will commence in 2004, and will be reported on in the PDEA.

2.0 BACKGROUND

2.1 Fire Risk and Protection Study Plan

The UARP Relicensing Plenary Group approved the Fire Risk and Protection Study Plan on June 4, 2003. The primary purpose of this study was to identify fire prevention and pre-suppression actions that could reduce risk directly associated with the UARP, and actions that could protect the UARP from fire ignition caused by other sources. A second purpose of the study was to determine the dispersed recreational facilities that are related to UARP operations and maintenance that are believed to need some level of assessment and treatment. The study plan was designed to address, in part, the following issues questions developed by the UARP Relicensing Plenary Group:

Issue Questions 15.	Is there a need for fuels management to protect Project facilities?
Issue Question 20.	Does the Project affect fuels management and if so, how?
Issue Question 21.	What are the infrastructure needs (if any) for fighting fires associated with Project-related operations?
Issue Question 25.	What are the public-safety needs of induced recreation on fire (risks, issues, and mitigation)?

Issue Question 27. Does the Project increase fire risk? What are the potential mitigation or prevention measures to reduce fire risk?

The study objectives include the following:

1. Identify the potential need for fuels management associated with fire protection of UARP facilities.

2. Identify existing fire fighting infrastructure and fire prevention measures associated with the UARP.

3. Identify any potential fire risk associated with UARP facilities (e.g. build up of fuels, recreation use, operations).

4. Evaluate the adequacy of SMUD fire safety procedures for the UARP, and identify modifications to procedures associated with fire risk at different facilities.

5. Identify through U.S. Forest Service (USFS) records locations of dispersed recreation site, fuel loading, historic hazard and fire risk areas in these areas; provide economic data that provides insight to funding availability; extrapolate fire risks associated with dispersed recreation for the next 30 – 50 years.

As described in Section 1, this technical report does not include a discussion of impacts analyses relative to fire risk and protection, nor does the report include a discussion of appropriate PM&Es, which will be addressed during negotiation discussions.

The study area relating to transmission line and powerhouse facilities included the following: 1) the area within 0.25 mile of the transmission line and powerhouses to determine fire hazard; and 2) an area within 2 miles of transmission line and powerhouses to determine fire risk. Facilities examined during the analysis are listed in Table 2.1-1, which includes all structures east of the White Rock Powerhouse to Loon Lake Powerhouse.

Table 2.1-1. Facilities studied.

Facility	Description
Loon Lake Switchyard	Switchyard located adjacent to the Loon Lake Powerhouse which contains a main transformer and three 69kV circuit breakers
Loon Lake-Robbs Peak Transmission Line	7.9 miles 69 kV overhead line that connects the Loon Lake Switchyard with the Robbs Peak Switchyard
Loon Lake-Union Valley Transmission Line	12.4 miles 69kV overhead line that connects the Loon Lake Switchyard to the Union Valley Switchyard
Robbs Peak Switchyard	Located adjacent to the Robbs Peak Powerhouse which contains a main transformer, high voltage circuit breakers, and manually operated disconnect switches

Table 2.1-1. Facilities studied.	
Facility	**Description**
Robbs Peak-Union Valley Transmission Line	6.8 mile 69kV overhead line that connects Robbs Peak Switchyard to the Union Valley Switchyard
Jones Fork Switchyard	Located on top of the Jones Fork Powerhouse which contains a main transformer, high voltage circuit breaker, and manually operated disconnect switches.
Jones Fork-Union Valley Transmission Line	4.0-mile 69kV overhead line that connects the Jones Fork Switchyard to the Union Valley Switchyard. "H" Frame
Union Valley Switchyard	Divided into a 69kV yard and a 230kV yard. Contains main transformers, high voltage circuit breakers, motor-operated and manual disconnect switches, lattice structures for bus system, 69kV transmission lines connecting to Loon Lake, Robbs Peak and Jones Fork powerhouses, and 230 kV lines connecting to Jaybird and Camino Powerhouses.
Union Valley—Jaybird Transmission Line	5.9-mile 230 kV overhead line connecting the Union Valley Switchyard to the Jaybird Switchyard
Union Valley-Camino Transmission Line	11.8 mile 230 kV line overhead line connecting the Union Valley Switchyard to the Camino Switchyard
Jaybird Switchyard	Switchyard interconnected with the White Rock and Union Valley switchyards via 230kV transmission lines. Yard contains main transformers, high voltage circuit breakers, motorized and manual disconnect switches, bus system and pull-off structures.
Jaybird-White Rock Transmission Line	15.9 mile 230 kV overhead line connecting the Jaybird Switchyard to the White Rock Switchyard
Camino Switchyard	Switchyard located on top of Camino Powerhouse. Includes main transformers, high voltage circuit breakers, motorized and manual disconnect switches, bus system and steel lattice pull-off structures.
Camino-White Rock Transmission Line	10.0 miles 230 kV overhead line connecting the Camino Switchyard to the White Rock Switchyard
Camino-Lake Substation Transmission Line	10.0 miles 230kV overhead line connecting the Camino switchyard to the Lake Substation
Slab Creek Switchyard	Located on top of the White Rock Tunnel Valve House and consists of a 500KVA, 12kV-480kV transformer located near the generator in the dam structure
Slab Creek Transmission Line	600 feet of 12 kV overhead circuit owned by PG&E that connects Slab Creek generator output to the PG&E system

Table 2.1-1. Facilities studied.	
Facility	**Description**
White Rock Switchyard	Located in a separate yard adjacent to White Rock Powerhouse. Includes two main transformers, circuit breakers, motorized and manual disconnect switches and steel lattice take-off structures.

Fire hazard and fire risk were analyzed for three dispersed recreation zones covering about 195,000 acres on the Pacific Ranger District, Eldorado National Forest. Prepared by the Pacific Ranger District Staff (USFS), the three zones depict three levels of UARP influence. SMUD does not necessarily agree or disagree with their designations, or with the USFS's interpretation of responsibility.

Although dispersed recreation is not a UARP feature, this study analyzed the effects of dispersed recreation on fire risk which included evaluating fire starts within 0.125 mile (660 feet) and 0.25 mile (1,320 feet) of dispersed recreation sites located adjacent to the following UARP features:

- Junction Reservoir;
- Ice House Reservoir;
- Union Valley Reservoir;
- Gerle Creek Reservoir;
- Loon Lake Reservoir;
- Crystal Basin; and
- Canyonlands.

3.0 METHODS

The study methods conformed to those approved by the UARP Relicensing Plenary Group. The study methods included:

- Interviewing agency, SMUD personnel and others for background information and data needs;
- Helicopter reconnaissance of the transmission lines;
- on-the-ground visit to each of the powerhouses and selected transmission line rights-of-way;
- Utilizing existing vegetation mapping to derive fuel models and fuel hazards; and
- Field visits to completed and planned fuel reduction projects in the vicinity of Union Valley Reservoir.

The study was prepared by a California Registered Professional Forester (RPF) and a fuels specialist consultant with experience in fire prevention, fuels, and suppression (Appendix A). Existing data analyzed included:

- Maps of the UARP supplied by SMUD;
- Fire Hazard and Risk maps supplied by the USFS;
- Map of Projects supplied by the USFS;
- Safety plans and procedures supplied by SMUD;
- Sierra Nevada Forest Plan Amendment (2004);
- Sierra Nevada Ecosystem Project (1995);
- Fire incident records supplied by the USFS and the California Department of Forestry and Fire Protection (CDF);
- Vegetation Classification and Mapping completed by Devine Tarbell & Associates (SMUD 2004a);
- Technical Report On Recreation Demand by SMUD (SMUD 2004b);
- Dispersed Recreation Sites provided by SMUD and USFS; and
- Dispersed Recreation Zone Map provided by the USFS.

Interviews of SMUD, USFS, and CDF employees were conducted (Appendix B). Employees interviewed provided histories of fire incidences, procedures involved in vegetation clearance around facilities, and a list of fire suppression resources. Interviews were conducted with USFS employees specializing in fire and special uses to obtain background on fire histories and procedures.

Site visits were conducted in June 2002 on all of the facilities and transmission line right-of-ways cited in Table 2.1-1. During these site visits, an examination was made of hazard trees, vegetation types and fuel types adjacent to the switchyards and adjacent to and under the transmission lines. An additional helicopter reconnaissance flight was done in August 2002 to evaluate hazard trees and vegetation along transmission lines. In September 2004 a field visit was made to observe the areas of completed and planned fuel reduction projects in the vicinity of Union Valley Reservoir.

3.1 Transmission Line Right of Way Segments

To develop a relative fire hazard and risk classification for each of the six right-of-way segments, fire risk, fire hazard and exposure (as determined by elevation) were determined:

- Fire risk for each of segments of the transmission line facilities was based on fire history data provided by the USFS and the CDF. For those segments above the Camino Powerhouse, USFS fire histories for about 30 years were used; CDF provided a 10-year history to determine risk for the segment between Camino Powerhouse and White Rock Powerhouse. Fire histories consulted included fire locations for small and large fires within the Eldorado National Forest (ENF) within two miles of each of the right-of-way segments and power facilities.

- Evaluation of the fire hazard adjacent to these facilities was done utilizing vegetation mapping prepared by SMUD in 2002-2003. Polygons were created depicting dominant vegetation, aspect, slope and fuel model characteristics. A crosswalk between vegetation types and fuel models was generally followed (Appendices 3 and 4). Using the

BehavePlus fire behavior model (Andrews and Bevins 2003), each polygon was assigned an average flame length to determine fire hazard as low, medium or high. Data from the Bald Mountain NFDRS weather station were used as fuel moisture inputs into the BehavePlus fire model. Flame lengths were derived based on 90th percentile weather conditions. Modifications to fuel moisture and wind conditions were made to areas that had been treated through harvesting.

- Elevation was used as a proxy for exposure to fire weather. Elevations less than 5,000 feet were considered high and the segments above 5,000 feet were considered moderate.

For reference, the fire hazard and risk maps generated by the USFS-ENF (1996) were reviewed. The hazard ranking system in the ENF analysis used a five-tiered ranking as opposed to the three-tiered system used in this analysis.[1] For example, areas rated as "Moderate" under our analysis would be rated as "High" under the ENF approach. The approach to risk is similar, but is confined to the area within two miles of the transmission corridor, as opposed to classifying risk by sub-watersheds.

A similar approach to the fire hazard and risk used by the Forest Service in their analysis of the Forest Plan Amendment (USDA Forest Service 2001) was followed in this analysis. The fire risk/hazard matrix incorporates the three major components: fire hazard, fire risk and elevation. This study analyzed both fire risk and fire hazard. Fire risk is defined as the probability of an ignition becoming a fire in a given area. (USDA Forest Service 2001). Risk factors include human-caused (including campfires, construction activities, arson, road-related, etc.) and natural-caused, such as lightning. Fire hazard measures the amount of fuel available to burn at a given time over the area. (USDA Forest Service 2001). Hazard factors include the vegetation types, the amount of surface fuels, aspect, slope, and weather factors that combine to influence the severity of a fire.

The composite rating is as follows:

Risk:	Rating:
Extreme	4
High	3
Moderate	2
Low:	1

Hazard:	
High:	3
Moderate:	2
Low:	1

[1] The three-tiered system is customarily used by the U. S. Forest Service in project analysis

Elevation:
High: 3
Moderate: 2
Low: 1

A composite ranking can range from a low score of 1 to a high score of 10. For example, an area with a high risk (3), moderate hazard (2), and low elevation ranking (1) (above 6,000 feet) would have a composite score of 6 (medium risk). The score ranking is as follows:

Low: 3-4
Moderate: 5-7
High: 8-10

The composite scores are assigned to the following transmission line segments:

- Loon Lake to Robbs Peak;
- Robbs Peak/Loon Lake to Union Valley;
- Jones Fork to Union Valley;
- Union Valley to Jaybird;
- Jaybird to Camino; and
- Camino to White Rock.

3.2 Dispersed Recreation

Two approaches to analyzing fire risk and hazard relating to potential impacts of dispersed recreation were undertake in this study. The first approach analyzed fire hazard and risk within the three dispersed recreation zones. Fire risk was determined using the most recent 15-year ignition history. For assessment of fire hazard, our analysis relied on the 1996 Landscape Analysis. The results from this analysis were modified to reflect fuel reduction treatments that have been undertaken by the USFS. From this analysis, we were able to project fuel reduction treatments that would reduce flame lengths to less than four feet over the next five decades. The second approach analyzed fire risk, utilizing a 33-year fire history within 0.125 mile and 0.25 mile of each of the dispersed recreation sites identified in the recreation demand study (SMUD 2004b), which are generally within one-quarter mile of UARP reservoirs.

4.0 RESULTS

Considering the components of fire risk, fire hazard and elevation, summary scores for each transmission line segment and dispersed recreation zone were derived as shown in Tables 4.0-1 and 4.0-2.

Table 4.0-1. Fire hazard risk matrix for UARP transmission line segments.

Right-of-way Segment	Risk	Hazard	Elevation	Composite
Loon Lake-Robbs Peak	H (3)	M(2)	M(2)	Moderate (7)
Robbs Peak-Union Valley	H (3)	M (2)	M (2)	Moderate (7)
Union Valley – Jones Fork	H (3)	L (1)	M (2)	Moderate (6)

Table 4.0-1. Fire hazard risk matrix for UARP transmission line segments.				
Right-of-way Segment	**Risk**	**Hazard**	**Elevation**	**Composite**
Union Valley – Jaybird	M (2)	M (2)	M (2)	Moderate (6)
Jaybird – Camino	L (1)	L (1)	H (3)	Moderate (5)
Camino to White Rock	E (4)	M (2)	H (3)	High (9)

Table 4.0-2. Fire hazard risk matrix for dispersed recreation zones.				
Dispersed Recreation Zones	**Risk**	**Hazard[2]**	**Elevation**	**Composite**
Zone 2[3]	E (4)	M(2)	M(2)	High (8)
Zone 3	E (4)	M (2)	M (2)	High (8)
Zone 4	M (2)	L (1)	M (2)	Moderate (5)

4.1 Fire Risk

4.1.1. Transmission Line Segments

Fire risk is defined as the probability that a fire will occur (USDA Forest Service 2001) within a given area. For the analysis of the UARP, we used past fire history to determine the relative probability of a fire occurrence. The transmission line rights-of-way were the focus of this analysis. The number of fire starts within two miles of the transmission line right-of-way was used to estimate risk in the area tributary to the major transmission line segments. USFS and CDF data regarding risk was assessed. For those areas within USFS protection, 33-year fire histories were used; for the low elevation areas within CDF protection, a 10-year history was used.

Risk values are calculated based on the number of fire starts, number years of historical information, and number of acres involved. The values in the formula are:

x = Number of fire starts recorded for the area selected area
y = period of time covered by the database
z = number of acres analyzed (displayed in thousands)

The value derived corresponds to the likelihood of a fire start per 1,000 acres per decade. The following are the risk ratings and range of values used to determine risk:

- Low Risk = 0 – 0.49: This level predicts one fire every 20 or more years per thousand acres.

[2] For consistency, the three-tiered hazard ranking was used.
[3] Zone 3 includes the area immediate adjacent to Union Valley Reservoir, Ice House Reservoir, Gerle Creek Reservoir and Loon Lake Reservoir. Because of the relatively high elevation and lower hazard fuel types the Loon Lake Reservoir area, by itself would be ranked as "Moderate"

- Moderate Risk = 0.50 – 0.99. This level predicts one fire every 11-20 years per thousand acres.
- High Risk = 1.0 to 1.4. This level predicts one fire every 1 – 10 years per 1,000 acres.
- Extreme Risk – 1.5 or greater. This level predicts greater than one fire per 1,000 acres for every 1-10 years.

For those areas that contain the transmission lines within USFS protection, risk ratings varied between 0.3 and 1.8 (Table 4.0-3). The greatest risk occurs in areas near transmission line segments close to Union Valley Reservoir and Loon Lake. The areas that contain the Loon Lake, Robbs Peak, Union Valley and Jones Fork transmission lines showed a high fire risk. The Union Valley-Jaybird segment showed a moderate risk. Low risk was accorded to the Jaybird-Camino segment. Within the ENF, the number of fire starts, both human-caused and lightning-caused increased with elevation. Human-caused fires account for 60 percent of the fires, while lightning fires account for 40 percent for those segments above the Jaybird Power House. Although increased lightning frequency can be attributed to elevation, (ranging from 2,000 feet elevation at the Camino Power house to 6,410 feet elevation at the Loon Lake Powerhouse), human-caused fires are more likely related to the proximity of recreational resources in the Union Valley-Loon Lake area.

Table 4.0-3. Fire history and risk classification by right-of-way segment.

		Number of Fires:					
Right of Way Segment	**Acres**	**Human**	**Lightning**	**Unknown**	**Total**	**Years**	**Risk Rating**
Loon Lake – Robbs Peak	27,632	88	56	3	81	33	1.8 - High
Robbs Peak – Union Valley	16,993	42	20	2	64	33	1.1 - High
Union Valley – Jones Fork	21,883	34	32	3	69	33	1.0 - High
Union Valley – Jaybird	22,544	25	19	2	46	33	0.6 – Moderate
Jaybird – Camino	22,795	9	15		24	33	0.3 - Low
Camino-White Rock	26,829				153	10	5.8- Extreme

The area in which the White Rock-Camino transmission line is located[4] has the highest risk due to the proximity to residential areas and Highway 50. The risk of a fire start within two miles of this right-of-way segment was between three and 19 times the risk associated with the other five segments. Most of the fires in this area remain small, due to rapid response times for suppression forces. CDF data for the entire Amador/Eldorado Unit indicate that man-caused fires accounted for 97% of all the fires in the period between 2001 and 2003 (CDF 2002, CDF 2003, CDF 2004). There were 63 fires with causes listed as some form of electrical power, either trees touching lines, but more often from birds or squirrels contacting conductors of utility poles. Two of the fires were associated with SMUD transmission lines; the remaining originating from distribution lines to homes outside the study area.

[4] Includes that part of the Eldorado National Forest managed by the Placerville Ranger District

In addition to the number of fire incidences, the frequency and extent of large fires is also relevant (Table 4.0-4). In areas below 5,000 feet elevation, a major fire had occurred at least once during the past 75 years. The most notable were the Cleveland Fire in 1992 and the Ice House Fire in 1959. The Cleveland Fire[5] consumed 22,499 acres (including transmission line corridors) and interrupted service over the Jones Fork-Union Valley transmission line. The Ice House Fire, was a result of construction-related activity for the Ice House Dam. Coincidentally, transmission line towers on the Union Valley-Jaybird line toppled due to high winds, which caused a fire that merged with the Ice House Fire, resulting in 19,000 acres being burned. Although the Poho Ridge-Camino Powerhouse area shows a relatively low risk of fire, Forest Service data indicates that major fires have occurred in this area since 1916, most notably within the South Fork American River Canyon. Those areas above 5,000 feet were less likely to see a major fire (between Robbs Peak and Loon Lake), with one major fire, Bottle Hill, in 1917 near Gerle Creek Reservoir. Several large fires have periodically burned in the lower elevation canyon areas near White Rock Powerhouse, the most recent being the Chili Bar Fire in 1979.

Table 4.0-4. Selected list of major fires occurring near SMUD facilities.

Fire Name	Year	Acres Burned	General Location
Unnamed	1916	2,131	White Rock - Camino
Unnamed	1916	4,306	White Rock - Camino
Bottle Hill	1917	1,326	Gerle Creek
Badger Hill	1924	638	Camino Powerhouse
Penstock	1959	331	Camino Powerhouse
Camp 7	1959	10,225	Jaybird-Camino
Ice House	1959	19,098	Ice House Reservoir
Penstock	1959	331	Camino Powerhouse
Unnamed	1960	11,212	Camino Powerhouse
Kelsey Mill	1961	11,815	White Rock
Chili Bar	1979	6,927	White Rock
Cleveland	1992	22,499	Union Valley -Jones Fork

4.1.2 Dispersed Recreation

A casual observation of fire history on the Pacific Ranger District indicates a positive relationship between human use and human-caused fires. The major fire clusters follow roads, particularly Highway 50 and surround recreational areas such as Union Valley Reservoir, Loon Lake and Ice House Reservoir. Lightning events are somewhat more random, but certain areas of the District appear to have higher concentrations of lightning fires including south of Loon Lake and northeast of Ice House Reservoir.

The Pacific Ranger District (USFS) Staff developed three dispersed recreation zones radiating from SMUD UARP reservoirs (Union Valley Reservoir, Gerle Creek Reservoir, Loon Lake Reservoir and Ice House Reservoir) (Figure 4.0-1, Table 4.0-5). Zone 2 includes those lands within the immediate influence of the UARP reservoirs and is considered the most directly

[5] The Cleveland Fire, presumably human-caused, started along the Ice House Road near Route 50 outside the UARP area.

influenced by UARP-induced recreation. Zone 3, located outside Zone 2 is considered to have some effect from the UARP, but not to the same extent as Zone 2. Zone 4 includes all the remaining land within the Pacific Ranger District and is considered to be less affected by the UARP. SMUD does not necessarily agree or disagree with their designations, or with the Forest Service's interpretation of SMUD'S responsibility.

Table 4.0-5. Acreage by dispersed recreation zones (excluding lakes)

Zone	Acres of National Forest Land - excluding lakes	Acres of Privately-Owned Lands – excluding lakes	Total Land Area – excluding lakes (Acres)	Percent by Zone
2	6,207	4,386	10,593	5.4 %
3	53,007	28,857	81,864	41.9 %
4	79,142	23,944	103,086	52.7 %
Total	138,356	57,187	195,543	100.0 %
Percent by Ownership	70.8 %	29.2 %	100.0%	

The three zones encompass all private and publicly owned within the boundary of the Pacific Ranger District for a total of about 195,543 acres (excluding lakes).[6] Of this total the National Forest and privately-owned land comprise 71 percent and 29 percent, respectively. Zones 2, 3 and 4 comprise 5, 42 and 53 percent, respectively, of the total area analyzed.

Utilizing the most recent 15-year fire-history, the extent and proportion of human-caused and lightning-caused fires was assessed (Table 4.0-6). Human-caused ignitions accounted for the largest percentage of ignitions in Zone 2 (93%), and progressively decreased for Zones 3 and 4 (66 and 44 percent, respectively). For the entire Pacific Ranger District, utilizing a 15-year ignition history, the risk rating is 1.5 or "Extreme". Zones 2 and 3 each have ratings of 5.8 and 1.8, respectively, indicating "Extreme". Zone 4, with a rating of 0.9, indicates a "moderate" risk. The major factor causing the greatest variability in risk between the two zones was the frequency of human-caused fires.

Table 4.0-6. 15-year ignitions by dispersed recreation zone.

Zone	Human-Caused Ignitions	Lightning –Caused Ignitions	Total Ignitions	Risk Rating
2	75 (93 %)	6 (7%)	81	5.8
3	144 (66%)	75 (34%)	219	1.8
4	61 (44%)	78 (56%)	139	0.9
Total	280 (64%)	159 (36%)	439	1.5

[6] The area also includes a portion of the Placerville Ranger District south of Route 50

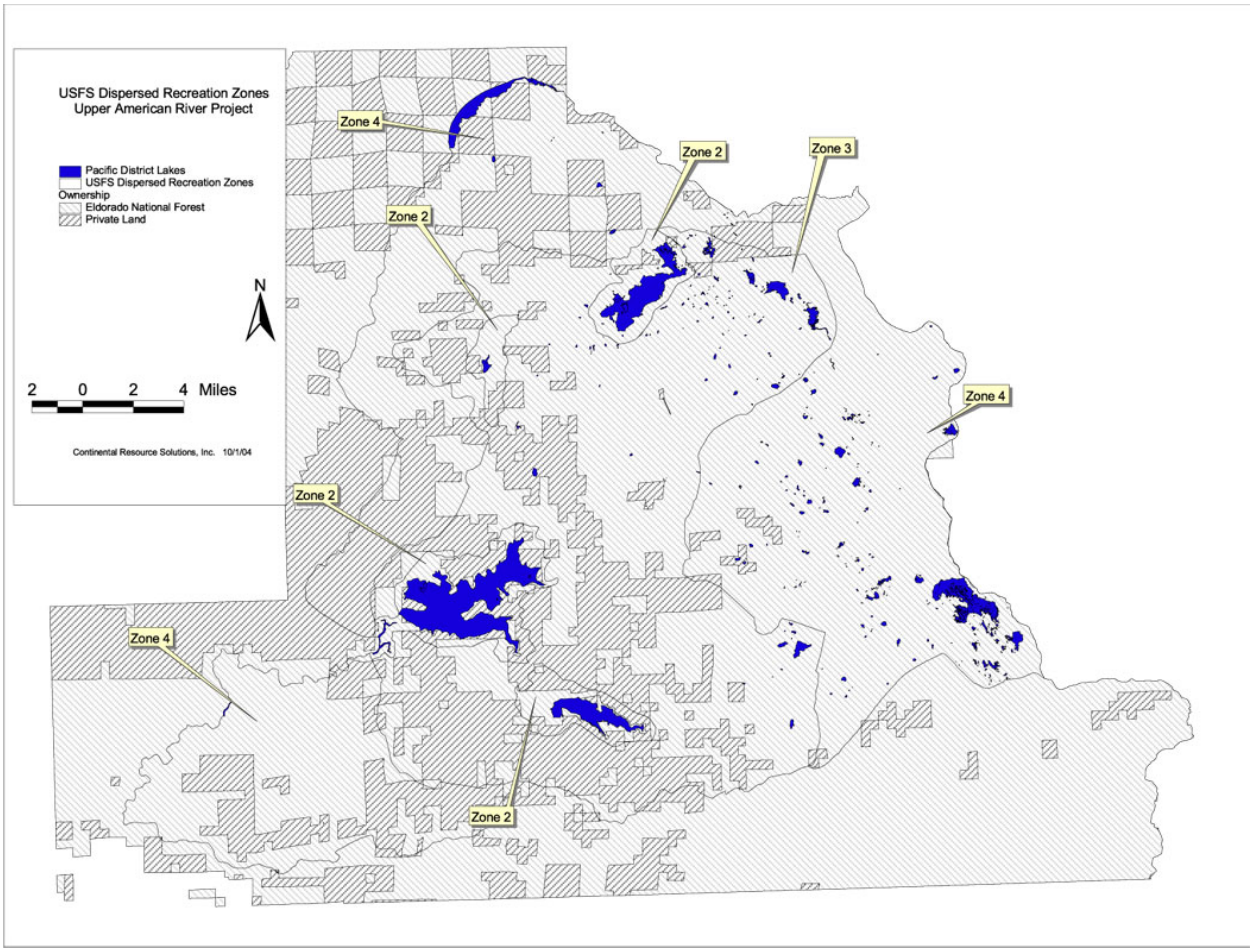

Figure 4.0-1. Dispersed recreation zones.

Dispatch calls for fire incidents on the Pacific Ranger District varied between 21 in 2001, 36 in 2002 and 30 in 2003 (Table 4.0-7). Although there is no breakdown by cause, the spatial distribution of fire incidents indicates a relationship to places where there is human use, such as roads and recreation facilities, including recreational use within transmission line corridors by motorbikes/jeeps. Total dispatch calls for all types of emergency/non-emergency response varied between 168 and 200 during the 2001-2003 time period.

Table 4.0-7. Dispatch calls for the Pacific Ranger District (March-November) 2001-2003.

Type of Call	2001	2002	2003
Fire	21	36	30
Medical Aids	33	27	30
Vehicle Accidents	16	12	18
Law Enforcement	98	107	105
Misc. /Public Assistance	Unknown	16	17
Total	168	198	200

The 33-year fire history within 0.125-mile and 0.25-mile radii of identified dispersed recreation sites was evaluated. In total there were 154 sites identified, 127 within 0.25 mile of UARP reservoirs and 27 sites located over 0.25 mile from the reservoirs.[7] Both human-caused and lightning-caused fires were identified. Available data does not provide a distinction between the types of human-caused fires, so it cannot be stated with certainty which human-caused fires were actually a result of dispersed recreation.

Tables 4.0-8 and 4.0-9 indicate a positive relationship between human-caused fires and proximity to dispersed recreation sites. Over the last 33 years of fire history, the results indicate about one fire per year within a 0.125-mile radius of a dispersed recreation site and two fires per year within a 0.25-mile radius of a dispersed recreation site. During the period analyzed, there was no case where a fire was attributed to operation or maintenance of the UARP.

Table 4.0-8. Number of fire starts within one-eighth mile of selected dispersed recreation sites.

	Fire Starts:						Risk Rating:			
	Human	Lightning	Unknown	Total	Years	Acres	Human	Lightning	Unknown	Total
Water related - Sites	24		2	26	33	2,243	3.2	0.0	2.7	3.5
Other Sites	5	1		6	33	664	2.3	0.5	0.0	2.7
Total	29	1	2	32	33	2,907	3.0	0.1	0.2	3.3

Table 4.0-9. Number of fire starts within one quarter mile of selected dispersed recreation site.

	Fire Starts:						Risk Rating:			
	Human	Lightning	Unknown	Total	Years	Acres	Human	Lightning	Unknown	Total
Water related-Sites	42	4	5	51	33	6,266	2.0	0.2	0.2	2.5
Other sites	9	5	1	15	33	1,916	1.4	0.8[8]	1.6	2.4
Total	51	9	6	66	33	8,182	1.9	0.3	0.2	2.4

Using the same procedure to determine risk for the rights-of-way segments, the risk factors for human-caused fires alone were 3.0 and 1.9, respectively for the 0.125-mile radius and 0.25-mile radius, which is equivalent to "Extreme". By comparison, the weighted average risk factor for human caused fires for the area within two miles of the rights-of-way on the Pacific Ranger District was 0.6, equivalent to "Moderate".

Dispersed recreation use[9] in 2002 within 0.25 mile of UARP reservoirs was estimated at about 51,000 recreation days (SMUD 2004). Recreation days are projected to increase to:

[7] SMUD will be conducting a recreation survey in 2004 in these areas.
[8] Most of these sites overlap an area of high lightning activity
[9] Dispersed recreation is defined as any recreation use outside developed campgrounds.

- 56,000 days in 2010
- 61,000 days by 2020
- 66,000 days by 2030 and
- 71,000 days by 2040

Projections indicate a 39 percent increase in dispersed recreation use over the next forty years. Although the data is incomplete, the strong relationship between human-caused fires and dispersed recreation sites indicate that the number of potential fire starts could increase over the next four decades.

4.2 Fire Hazard

Increased fire hazard in California's National Forests has been well documented (Weatherspoon 1996). Decades of fire suppression, coupled with removal of large trees have created dense timber stands of shade tolerant species such as white fir and incense-cedar, which are not as fire resistant as the large Ponderosa and sugar pines. The dense stands of understory trees and brush provide ladders for the surface fires to reach the crowns of overstory trees, contributing to crown fires. Consequently, fire behavior has become more intense and there has been a rise in the number of large catastrophic fires across the Western United States (McKelvey et al., 1996, Skinner and Chang 1996). Combine with this with the large number of residences being located adjacent to the National Forest (rural-urban intermix), there is increasing risk to both life and property.

4.2.1 Transmission Line Segments

To gauge relative fire hazard, potential flame lengths were determined using the BehavePlus Version 2.0 fire simulation model applied to standard fuel models in conjunction with aspect and fuel moisture. This model simulates surface fire only and does not take into account ladder fuels from intermediate trees that contribute to crown fires. High hazard ascribed to those areas that would be susceptible to stand-replacing or crown fire.

The area within 0.25 mile of the transmission lines and powerhouses was mapped to determine fuel hazard. As a proxy for fire hazard we have used fuel models identified from vegetation mapping and ortho-photos prepared for this analysis. Discrete polygons were delineated from the existing fuel vegetation layer:

- Classifying the vegetation type (accepting the existing classification or modifying the classification if we had additional information);
- identifying slope classes, (low, moderate and steep);
- identifying aspect (north, south or ridge (no discernible aspect); and
- classifying each polygon with a fuel model using a crosswalk (See Appendix D).

We used the standard fuel models (Anderson 1982). In addition, we used a custom model (FM 14) for young plantations from the Sierra Nevada Ecosystem Project (SNEP) Report (Sapsid,

Bahro, Spero, Gabriel, Jones and Greenwood, 1996). Fuel models were adjusted to account for aspect and slope percent.

The BehavePlus simulation model was used to generate estimated flame lengths for the 90th percentile weather conditions. Chief inputs into the model include:

- Wind speed;
- Fuel Depth;
- Fuel loading; and
- Fuel Moisture.

The 90th percentile weather conditions used in the model include wind speed, fuel depth, fuel loading, and fuel moisture in Table 4.0-10:

Table 4.0-10. Behave 2.0 fuel model inputs.

Input	90th Percentile
1 Hr. fuel moisture	4%
10 Hr. fuel moisture	5%
100 Hr. fuel moisture	7%
Live Woody Moisture Content	80%
20 foot wind speed	10 mph

Flame lengths generated from this model were used to determine three relative fuel hazard conditions along the transmission lines. These are as follows:

- 0 to 4 feet: Low (Fires can generally be attacked at the head or flanks by firefighters using hand tools; handline should hold the fire);
- 4 to 8 feet: Moderate (Fires are too intense for direct attack at the head of the fire by firefighters using hand tools. Handline cannot be relied on to hold the fire. Equipment such as dozers, engines, water and/or retardant dropping aircraft can be effective); and
- 8 feet plus: High (Fires may present serious control problems, such as torching crowning, and spotting. Control efforts at the head of the fire will be ineffective).

By comparison, the Forest Service hazard classes used in their 1996 landscape assessment of the Eldorado National Forest are:

- 0-2 feet: Low
- 2-4 feet: Medium
- 4-8 feet: High
- 8-11 feet: Very High
- 11+ feet: Extreme

This analysis uses the three-tiered classification, which is commonly used for project analysis on National Forests throughout California. For purposes of this analysis, all forested polygons with sawlog-sized trees were determined to be Fuel Model 10[10] (Timber litter and understory) (Appendix C). Areas that had been harvested in one of the "forest health" treatments were assigned Fuel Model 9 (Appendix C) to reflect the reduction fuel loading from the treatment. Other adjustments were made to the fuel moisture and wind factors to reflect the more open conditions (drier and windier) encountered in this thinned forest. The net result shows a reduction in fuel heights. Not modeled, but probably more significant, is the reduction of ladder fuels as a result of these treatments, which raise the base of the live crown, thereby reducing the potential of catastrophic or stand-replacing fires.

Table 4.0-11 shows the number of acres in high, moderate, and low hazard categories for each of the right-of-way segments (Appendix E). In total 12,441 acres were evaluated (excluding water acres) with 54 percent of the acres rated as low, 45 percent rated as moderate and three percent rated as high. For each of the road segments an average weighted average flame length was generated. Flame lengths generated from the BehavePlus model were applied to each of the polygons and weighted by the acreage represented by each polygon to generate a weighted average flame length.[11] Detailed mapping by polygon are contained in the electronic GIS files.

Table 4.0-11. Fire hazard classification by R/W segment.

R/W. Segment	Total Acres	Weighted Average Flame Length (feet)	Hazard Rating	Low Hazard Acres	Moderate Hazard Acres	High Hazard Acres
Loon-Lake - Robbs Peak	2,548	4.1	Moderate	1,202	1,346	0
RobbsPeak -Union Valley	1,671	5.3	Moderate	642	1,020	10
Union Valley – Jones Fork	1,161	2.6	Low	1,014	147	0
Union Valley – Jaybird	1,822	4.7	Moderate	1,064	736	21
Jaybird – Camino	1,894	3.5	Low	1,379	508	7
Camino - White Rock	3,345	5.5	Moderate	1,266	1,784	295
All	12,441	4.5	Moderate	6,567	5,542	332

The high percentage of low hazard acres can be attributed to the "Forest Health" treatments conducted by the USFS within a 0.25-mile radius of much of the transmission line rights-of-way on the ENF. The percentage of low hazard acres is probably higher within the area studied than within the remainder of the ENF, because many of the forest management activities were concentrated on ridge-tops where transmission lines are located. This analysis did not factor in recent brush control work within the right-of-way that would have probably increased the number of low hazard acres, especially in the White Rock-Camino segment. The lowest weighted average flame lengths are shown for the Union Valley – Jones Fork segment, where the area is dominated by young plantations created as a result of the Cleveland Fire. The Robbs

[10] Confirmed in conversations with Matt Johnson, Pacific Ranger District
[11] Areas covered by water were omitted from this calculation

Peak /Loon Lake Intersection to Union Valley has a relatively higher hazard due to steep slopes and untreated areas north of Union Valley Reservoir.

As noted previously, the 1996 ENF landscape analysis classification uses a five-tiered ranking system. Under the ENF ranking all polygons rated as "Moderate" in this analysis would be ranked as "High" and most of the "Low" ranked polygons would be rated as "Moderate".

4.2.2 Dispersed Recreation Zones

Relying on the 1996 USFS Landscape Analysis, we examined the extent of the area in all three zones classified by fire hazard (Table 4.0-12). The total acres by fire hazard classification are shown below. Of the total area analyzed, 73,528 acres are classified as "High" or "Very High" and would produce flame lengths in excess of four feet under 90th percentile weather conditions. About 46,289 acres within the National Forest, representing 38 percent of National forest land, are classified as "High" or "Very High".

Table 4.0-12. Fire hazard classification by zones (excluding lakes)

Zone	Ownership	Low (1)	Medium (2)	High (3)	Very High (4)	Extreme (5)	Total
	Flame Lengths:	**0-2 feet**	**2-4 feet**	**4-8 feet**	**8-11feet**	**11+feet**	
2	National Forest		2,850	1,544	1,815		6,209
2	Private		1,293	934	2,158		4,385
2	Total		4,143	2,478	3,973		10,594
3	National Forest		34,171	15,307	3,529		53,007
3	Private		17,078	9,360	2,431		28,869
3	Total		51,249	24,667	5,960		81,876
4	National Forest	3,780	51,268	5,268	18,826		78,842
4	Private		11,596	1,331	11,025		23,952
4	Total	3.780	62,864	6,599	29,851		103,094
Total	National Forest	3,780	88,289	22,119	24,170		138,358
Total	Private		29,967	11,625	15,614		57,206
Total	Total	3.780	118,256	33,744	39,784		195,564

The "High" to "Very High" hazard acres in Zone 2 surround Union Valley Reservoir, Gerle Creek Reservoir, and small areas adjacent to Ice House Reservoir and Loon Lake Reservoir. For the most part, the areas adjacent to Loon Lake Reservoir and Ice House Reservoir are rated as "Medium"[12] (or projected flame lengths less than four feet).

Field observations indicate that the implementation of timber sale projects and associated fuels treatment have reduced the number of "High" and "Very High" hazard acres. Table 4.0-13 shows the extent of acreage treated to a low to medium hazard risk within each of the Dispersed Recreation Zones[13]. Within the National Forest, 13,520 acres have been treated during the past decade. Within Zone 2, 1,066 acres have been treated accounting for 21 percent of the land area

[12] Rated as "Low" under the three-tiered hazard ranking
[13] According to the data provided by the Forest Service there are 647 acres of treated lands located on private lands.

within Zone 2. Within Zone 3, 4,941 acres have been treated accounting for nine percent of the land area within Zone 3. Within Zone 4, 7,513 acres have been treated, also accounting for about nine percent of the land area within Zone. 4.

Table 4.0-13. Forest Service treated acres by zone.

Zone	Treated	Untreated	Total[14]
2	1,066	5,141	6,207
3	4,941	48,066	53,007
4	7,513	71,630	79,143
Total	13,520	124,857	138,358

For those areas that have been treated, we assume the fire hazard classification has changed to "Medium", (flame lengths between two and four feet at the 90th percentile weather condition) (Table 4.0-14). "High" and "Very High" acres are assumed to be converted to "Medium", while "Medium" classified acres are assumed to remain unchanged.

Table 4.0-14. National Forest acres hazard classification adjusted for treatments.

Zone	**Low (1)**	**Medium (2)**	**High (3)**	**Very High (4)**	**Extreme (5)**	**Total[15]**
Flame Length	**0-2 feet**	**2-4 feet**	**4-8 feet**	**8-11feet**	**11+feet**	
2		3,809	1,185	1,212		6,207
3		38,194	12,058	2,755		53,007
4	3,780	57,355	3,938	14,069		79,143
Total	3,780	99,359	17,182	18,036		138,358

On zone basis, the weighted average predicted flame lengths indicate a current hazard ranking of "High" for Zones 2 and 3 and "Medium" for Zone 4, under the five-tiered ranking system. Under the three-tiered ranking system Zones 2 and 3 would be rated as "Medium" and Zone 4 would be rated as "Low".

4.3 Elevation (exposure time)

Under certain conditions, almost all of the California vegetation types are susceptible to a major fire (i.e., high wind, low humidity, low fuel moisture, etc.). In addition to fire risk and fire hazard, the likelihood of theses events occurring within a given area is basically a function of how much of the season are these areas exposed to high or extreme conditions. Fire researchers have concluded that elevation is a good proxy for the exposure time (USDA Forest Service 2001). Larger and most severe fires typically occur during extreme conditions. These conditions vary within the study area, with increasing likelihood of severe fires at the lower elevations. The elevation zone classifications used by the Forest Service in the Forest Plan Amendment EIS (2001) are used in this analysis:

[14] Due to rounding totals will not add up exactly.
[15] Due to rounding totals will not add up exactly.

- high – less than 5,000 feet elevation
- moderate – 5,000 to 6,000 feet elevation
- low – greater than 6,000 feet elevation

4.3.1 Transmission Line Segments

The areas containing the six right-of-way segments are classified as being either moderate or high (Table 4.0-15). Those segments above Union Valley Powerhouse rate as moderate, while those below Union Valley Powerhouse rate as high.

Table 4.0-15. Elevation classification by right-of-way segment.

Right-of-way Segment	Elevation Range (feet msl)	Hazard Rating
Loon-Lake-Robbs Peak	5,000 – 6,500	Moderate
Robbs Int-Union Valley	4,800 – 6,000	Moderate
Union Valley – Jones Fork	4,800 – 5,600	Moderate
Union Valley – Jaybird	3,200 – 4,800	High
Jaybird – Camino	2,000 – 4,500	High
Camino – White Rock	1,200 – 3,200	High

4.3.2 Dispersed Recreation Zones

The three zones are given a classification as either being moderate or low based on elevation (Table 4.0-16). Portions of Zones 2, 3, and 4 are over 6,000 feet elevation which would indicate a "Low" rating for exposure to fire weather. For example, the high elevation area around Loon Lake would be rated as "Low".

Table 4.0-16. Elevation classification by dispersed recreation zone.

Dispersed Recreation Zone	Elevation Range (Feet msl)	Hazard Rating
2	5,000 – 6,400	Moderate[16]
3	5,000 –7,900	Moderate
4	5,000 – 7,600	Low

4.4 Evaluation of SMUD's Current Vegetation Management Practices

SMUD's vegetation management program includes the following activities:

- Flying the lines twice a year to identify hazard trees that may fall into the lines;
- Using a combination of masticating machines and chemicals to control growth of small trees and brush;
- Cutting hazard trees; and
- Coordinating with the USFS through special use permits or timber settlement sales to remove vegetation or cut trees on the Eldorado National Forest. SMUD and the

[16] "Low" rating at Loon Lake

USFS have worked cooperatively to remove potential hazard trees during the implementation of USFS timber sales.

SMUD implements a vegetation management program to maintain clearance along the transmission lines. As with other utilities, SMUD is governed by rules and regulations regarding powerline clearances[17]. This management program has been recently adopted and memorialized as SMUD policy (Davis 2003). The purpose of this program is to maintain a safe and reliable transmission corridor while establishing and maintaining a vegetative cover that provides biological diversity (e.g., ecotones) and wildlife habitat. SMUD uses a "wire zone"/border zone right-of-way management concept. Initially, the right-of-way is restored by removing undesirable vegetation. Thinning of desirable vegetation is also done if densities should present a fuels or access issue. Once restoration is complete, the right-of-way is monitored for vegetative cover and inhabiting wildlife. The right-of-way is then enhanced via various management techniques to provide a desired outcome.

The following is from SMUD's transmission line vegetation management summary:

As shown in Figure 4.0-2, the right-of-way is managed from two perspectives, the wire zone and the border zone. The wire zone is that portion immediately below the conductors. This area is managed for a low-growing shrub-forb-grass cover. The border zone is the transition zone at the edge of the right-of-way. This area is managed for taller shrubs, certain trees and brush cover. Several factors including conductor height, voltage, extant wildlife, and fuels potential determine what types of vegetation will be selected for management in each zone.

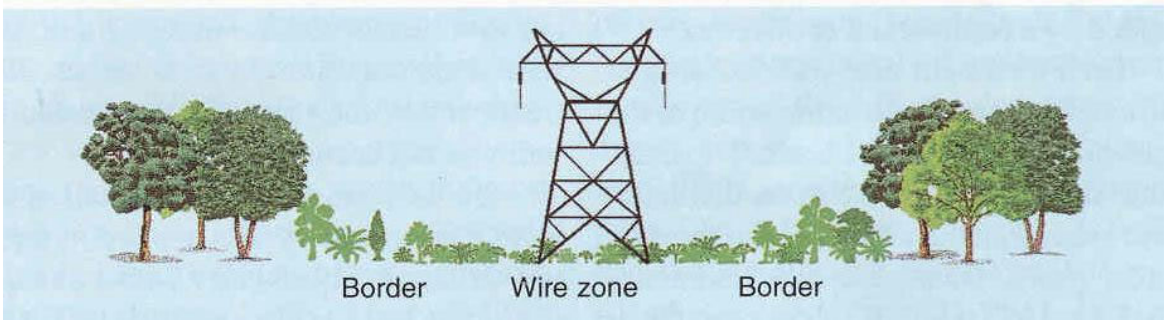

Figure 4.0-2. Border and wire zone concept.

The restoration phase of the program includes the removal of brush and trees growing under the lines as well as the removal or pruning of trees adjacent to the lines, which interfere with or may be a hazard to the operation of SMUD facilities. After notifying the parcel owner, which

[17] Under the California Public Resource Code, 30 feet of clearance adjacent to buildings or structures are required (CPRC 4291). Under CRPRC 4292, Vegetation clearance adjacent to power lines any pole that supports a switch, fuse, transformer, lightning arrester, line junction, or dead end or corner pole, must have a clearance of 10 feet (CPRC 4292). For transmission lines, clearance requirements vary between six feet for lines operating at 72kV to 110kV to 10 feet for lines operating at greater than 100kV. All dead, decadent or trees weakened by decay or disease that lean toward the line are to be removed.

includes an offer for their participation during the on-site inspection, SMUD patrols the lines twice a year and identifies the work to be done. Trees that pose a safety hazard are designated as well as those that need only pruning. Vegetation growing under the lines is evaluated to determine the best method to reduce the amount of these flash fuels. The parcel owner is also advised of the schedule for the actual vegetation management activities. Disposal of residue from removal and pruning includes a variety of measures including chipping and lop and scatter[18].

The management of certain undesirable species is accomplished with selective herbicide applications and hand clearing crews. The objective is to convert the right-of-way to grass and low growing herbaceous plants (desirable species) by controlling re-sprouting hardwoods, seedling conifers, and thinning certain brush species (undesirable species). Herbicide application is prescribed by a licensed pest control advisor, implemented by a licensed applicator and limited to the area previously cleared.

The above program is a positive step to maintain a low shrub-forbs-grass cover within the wire zone and relatively taller shrub-forbs-grass cover within the border zone. While some treatment has been accomplished on the rights-of-way prior to 2002, this current plan presents a more comprehensive strategy to maintain a relatively low-flammable and less hazardous area adjacent to the transmission lines, while maintaining important wildlife habitat values. Although this treatment plan seems well suited for the wide transmission rights-of-way with 230 kV lines, the border and wire concept has less applicability to the narrower rights-of-way with 69kV lines.

The Jaybird and White Rock Powerhouses are located at the end of dead-end roads, which could cause concern for SMUD personnel or others caught in the middle of a major wildfire. In the event of a wildfire, the safest locations would be areas free of flammable material, which characterizes the conditions at the powerhouses and switchyards that were observed.

4.5 Fire Risk of UARP-caused Fires

The study plan objectives included identifying the potential risk created as a result of the operation and maintenance of the UARP. This risk category includes those operations and activities associated with the UARP that could elevate the probability of an ignition. These could include the following:

- Transmission lines contacting trees or other vegetation that could cause an ignition, especially when excessive electrical load demands cause line sag;
- Maintenance activities such as welding or vegetation clearing along the lines that could cause an ignition;
- Vehicles used for UARP operations that could cause an ignition (catalytic converter, faulty brakes, etc.); and
- Malfunctioning transformers at a switchyard that could create an ignition.

[18] Lop and scatter is the cutting of limbs and tops to a depth not normally greater than 18 inches.

Within the last three years there have been two fires created as a result of transmission line sag including one near Placerville and one near Rescue, both outside the area analyzed in this study (Scott 2003, CDF 2001). The CDF indicated that SMUD was precluded from obtaining landowner cooperation during vegetation management operations for the section of the right-of-way between Cameron Park and Camino, apparently due to landowner reluctance to cutting trees or vegetation near the lines (Scott 2004). Presently, SMUD's vegetation management program appears to be addressing this problem. By contrast, the portion of the right-of-way within the Eldorado National Forest is relatively clear.

Investigation of UARP facilities indicate that even if fires occur in the area, the potential damage to facilities is likely minor, given the clearance around switchyards and along most transmission lines. There is more risk of fire within a switchyard to do internal damage, than for a fire to do damage to the facility. Transmission lines are more at risk for damage from wildfire. A fire approaching a power line would likely cause interruption of service, as power to the lines would need to be shut off, to prevent arcing and to allow for safe access for suppression action.

4.6 Vegetation Management Activities on the Eldorado National Forest

The most effective treatments on the landscape include modifying stand structures by a combination of thinning from below (removing the small trees that contribute to ladder fuels) and prescribed burning (cool underburns). Removing the small trees eliminates the ladder fuels that contribute to crown fires. Opening the timber stand through timber harvesting can also contribute to the drying of fuels and increase the effective wind in a timber stand, which, in turn, can contribute to more intense surface fire behavior. However, the elimination of the smaller trees effectively raises the crown base of the remaining trees, and minimizes the possibility of these trees being killed in a crown fire (Weatherspoon 1996, Graham, Jain, and Toin 1999). Harvesting treatments are generally not effective unless all residual slash (fuels) are removed, chipped or burned. Recent experience indicates that a combination of thinning and under-burning were effective in slowing fire spread on the Blacks Mountain Experimental Forest (September 2002). Areas that were under-burned after thinning were the most effective in slowing fire spread.

About two-thirds of the area analyzed in this report is within the Eldorado National Forest. The USFS has conducted "forest health" treatments, which have included understory thinning on ridges which have often coincided or crossed transmission line rights-of-way or adjacent to roads in high-use areas such as Union Valley Reservoir (Pacific Ranger District). Other areas treated have included Iowa Hill (Placerville RD), Poho Ridge (Georgetown RD), Jaybird Road (Pacific Ranger District), and Robbs Peak (Pacific Ranger District). The Iowa Hill area has been under-burned and the Jaybird and Poho Ridge areas have recently been completed and will require under-burning to maintain these areas as effective fuelbreaks. Within the Pacific Ranger District about 13,520 acres have been treated with a combination of thinning, slash piling and burning, and under-burning. Continued maintenance of forest health treatments completed within the last five years will require maintenance to keep them in a relatively low hazard condition. Funding for these treatments and any subsequent treatments comes chiefly from congressional appropriations and in some cases from funds made available from "brush disposal" (BD)

deposits and Knudsen-Vandenberg (KV) funds.[19] Recently, the Forest Service has been given the authority to enter into stewardship contracts, which allow the sale of products from a contract area to subsidize treatments such as fuel reduction or watershed enhancement.

4.6.1 Forest Plan Amendment

Activities, conducted on the Eldorado National Forest, are governed by federal laws and regulations associated with the management of the Forest Service. In January 2004, the Regional Forester adopted The Sierra Nevada Forest Plan Amendment, which details the management direction to be implemented on the National Forests, specifically in regards to treatments that are designed to reduce fire hazard conditions. This was a revision of a more restrictive decision adopted in January 2001. The forest health treatments would not likely have been permissible under the 2001 Forest Plan Amendment, due to the restriction on the size of trees that could be harvested and the level of canopy cover that could be maintained. In many of the areas that have been treated, the only treatments permissible under the Forest Plan Amendment would have been under-burning. This treatment will likely be effective for reducing fire hazard, at least through the next 10-year period. The newer plan offers more flexibility in the harvesting of larger trees, which enable the Forest Service to offset the costs of removing the smaller trees.

The Forest Plan Amendment (USDA Forest Service 2000) fire and fuels strategies include:

1. Placing highest priority on treating fuels in the urban wildland intermix zone;

2. Implementing the Federal Wildland Fire Policy; and

3. Strategically placing fuel treatments to support fire suppression, change fire behavior in treated landscapes, and move toward restoring fire regimes in pine, mixed conifer, and oak woodland vegetation types.

Fire and fuels management relies on a combination of four primary strategies for modifying wildland fire behavior and re-introducing fire across broad landscapes:

1. Strategically placed area treatments – strategically placed areas between 50 and 1,000 acres where vegetation has been treated to reduce fuel loading. The treatments are designed to burn at lower intensities and slower rates of spread during wildfires;

2. Wildland fire use – using lightning fires to reduce fuel loads;

3. Defensible fuels profile zones adjacent to communities and areas of high value-strategically located strips of land where the vegetation has been modified to a less dense fuel type, generally located on a ridgetop or along a road, where firefighters can make a stand to contain a fire; and

[19] BD deposits are collected from Timber Sale Purchasers to treat fuels created as a result of logging operations. KV funds are collected from the timber sale revenues and in some cases can be used to fund prescribed burning.

4. Priority-setting mechanisms established in the national Cohesive Fire Strategy – strategy directs fuel treatments at high-risk areas, specifically urban wildland intermix areas, accessible municipal (community) watersheds, and threatened and endangered species habitats.

An important component of this strategy is the implementation of fuels treatment in the Urban Wildland Intermix. The Urban Wildland Intermix is an area where human habitation is mixed with areas of flammable wildland vegetation (Record of Decision, Appendix A-10) including those areas where there are high-density residences (approximately one structure per five acres), commercial buildings, and administrative sites with facilities. These areas have been generally depicted in the Region-wide map, however, each National Forest is responsible for locally delineating the actual boundaries of the defense zone. The Eldorado National Forest threat and defense zones are located proximate to private property and SMUD's UARP facilities, although SMUD facilities are not considered to be commercial buildings or administrative sites with facilities.

The Threat and Defense zone designations were presumably formed to protect human life and property. Priority for fuel treatment includes the Defense zone, extending 0.25 mile from structures and the Threat zone, extending approximately 1.25 miles beyond that for a total of 1.5 miles (page 5, Record of Decision Forest Plan Amendment, January 2001). The most intensive treatments are planned for the Defense zones and are designed to prevent the loss of life and property by creating defensible space. Proposed treatments basically include thinning small trees and leaving larger trees with the objective of reducing the average flame length of four feet or less if the stand was to burn under 90th percentile fire weather conditions. Within the threat zone, treatments are designed to modify fire behavior, thereby, allowing firefighters to take advantage of reduced spotting, lower rates of spread and intensity to more effectively contain the fire approaching the Defense zone.

The Defense Zones discussion in the Record of Decision, does not address power lines or power facilities. However, the FEIS (page 385 Volume 2, Chapter 3, part 3.5) includes transmission lines as contiguous to the defense zone (the only reference in the FEIS). As cited above, the ENF designations only include those areas proximate to SMUD's powerhouses and switchyards.

4.6.2 Projected Fuel Reduction Needs in the Area of the UARP

This study considered what vegetation or fuels reduction treatments would be desirable in the vicinity of the UARP, particularly on the Pacific Ranger District, where recreation use is concentrated. To do this we looked at what projects had been completed and projected additional treatments (including maintenance) over the next five decades.

To estimate the number of remaining acres that require treatment to reduce fuel hazard (flame lengths less than four feet), we overlaid the hazard classification over the fuel reduction treatments that have been completed. The number of acres untreated in the "High" and "Very High" classifications were used as indicators to determine the number of acres remaining to be

treated. This amount was reduced by 20 percent to account for stream buffers, archaeological sites, and wildlife territories that may overlap potential treatment areas.

After adjustments, we estimate 28,200 acres would need to be treated to reduce fire hazard to acceptable levels. The estimated acres shown below (rounded to the nearest 100 acres) are programmatic estimates and have not been verified on an acre-by-acre basis (Table 4.0-17). Any proposed fuel reduction treatments will require further planning and analysis. However, these estimates appear to be reasonable at a program level based on the data analyzed and field visits.

Table 4.0-17. Currently estimated acreage requiring fuel reduction treatments.

Zones	Fuel Reduction Acres	Maintenance Acres
2	1,900	1,300
3	11,900	5,600
4	14.400	8.600
Total	28,200	15,500

The two principal fuel reduction methods projected over the next five decades are thinning (including small tree thinning, mastication[20], or combinations) to reduce ladder fuels and crown densities and under-burning to reduce surface fuels. Past treatments have included removal of sawlogs to subsidize the cutting and disposing of small trees. Field observations indicate that much of these acres have been treated over the past decade and the more costly acres to treat are remaining, particularly in those areas surrounding Union Valley Reservoir. Costs of fuel treatment can vary widely depending on whether the treatments are done manually, mechanically, or whether there are sawlogs present to subsidize the removal of small trees. For this analysis we have assumed an average cost per acre of $500. Actual net costs could vary between $0 per acre to $1,000 per acre.

Thinned areas will require periodic under-burning to maintain the effectiveness of fuel reduction treatments over time. We have assumed a return interval of nine years.[21] Under-burning costs are assumed at an average of $200 per acre during the first treatment. Subsequent treatments are assumed to be $100 per acre for successive year treatments as these areas become easier to maintain over time.[22] We assume that the acreage thinned would be under-burned, plus an additional 15 percent to account for areas such as stream buffers that were not treated by mechanical means.

The following fuel reduction costs are projected over the next five decades (Table 4.0-18). Over time, there will likely be additional entries to remove commercial-sized trees, although these cost

[20] Mastication: A Mechanical Type Treatment. Chopping, grinding, and/or mowing treatments, usually by mechanical means, to reduce fuel bed depth or crowning potential. The primary target is usually live fuels, such as brush and small trees, but can be used in light loadings of dead fuels. Vegetation is usually left in place.
[21] Assume 75% of stands are fir with a return interval of 10 years and 25% percent are pine stands with a return interval of 7 years. [0.75 X 10 years + 25% X 7 years =9.2 years (rounded to 9 years)
[22] According to Matt Johnson (USFS) costs per acre can drop to $50 per acre after initial treatments have reduced most of the surface and ladder fuels and larger areas are treated.

offsets are not included in the costs shown below. Treatment acreages and associated costs are shown on an annual basis. We have assumed that the remaining untreated acres in "High" and "Very High" classifications would be treated over the first decade. After the initial treatments in Decade 1, costs are projected to decline as under-burning becomes the primary fuel reduction treatment.

Table 4.0-18. Projected fuel reduction treatments and costs (current costs)

Zone 2	Decade 1	Decade 2	Decade 3	Decade 4	Decade 5
Initial Treatment (Acres)	190				
Per Acre Cost	$ 500				
Annual Cost	$ 95,000				
Maintenance (Acres)	144[23]	166	166	166	166
Per Acre Cost	$ 200	150	100	100	100
Annual Cost	$ 28,889	$24,833	$16,556	$16,556	$16,556
Total Cost (Annual)	$123,889	$24,833	$16,556	$16,556	$16,556
Zone 3	Decade 1	Decade 2	Decade 3	Decade 4	Decade 5
Initial Treatment (Acres)	1,190				
Per Acre Cost	$ 500				
Annual Cost	$595,000				
Maintenance (Acres)	622	754	754	754	754
Per Acre Cost	$ 200	$ 150	$ 100	$ 100	$ 100
Annual Cost (Annual)	$124,444	$113,167	$ 75,444	$ 75,444	$ 75,444
Total Cost	$719,444	$113,167	$ 75,444	$ 75,444	$ 75,444
Zone 4	Decade 1	Decade 2	Decade 3	Decade 4	Decade 5
Initial Treatment (Acres)	1,440				
Per Acre Cost	$ 500				
Annual Cost	$720,000				
Maintenance (Acres)	956	1,116	1,116	1,116	1,116
Per Acre Cost	$ 200	$ 150	$ 100	$ 100	$ 100
Annual Cost	$191,111	$167,333	$111,566	$ 111,566	$ 111,566
Total Cost (Annual)	$911,111	$167,333	$111,566	$ 111,566	$ 111,566

4.7 Fire Suppression Resources in the UARP Area

The study area is covered by a variety of fire suppression forces, including the USFS, the CDF, and several local fire departments. The existing fire-fighting infrastructure that could respond during an initial attack includes resources from the USFS, the CDF and local fire departments

[23] Maintenance Acres are calculated as follows: From **Table 4.0-12** the estimated number of acres in Zone 2 in need of maintenance was 1,097 acres. Increased by 15 percent and rounded to the nearest 100 acres equals 1,300 acres. Assuming a 9-year return interval results in the following computation. 1,300 acres/10 years/decade/ 9-year return interval/10 years per decade = 144 acres per year

within the El Dorado County Fire Protection District. Forest Service resources would logically respond to any incident in the Loon Lake, Union Valley Reservoir, Poho Ridge, and Jaybird Powerhouse areas. The CDF engines would likely respond to incidents at the lower elevations, along with the local fire departments.

The Forest Service resources are listed below:

- Engines, Type 3, 5 person a day effective, 7 days a week;
- Engine 54, Crystal Station;
- Engine 53, Pacific Station;
- Engine 64, Kyburz Station;
- Engine 34, Quintette Station;
- Engine 65, Sierra Springs Station;
- Engine 66, Sly Park Station;
- Water Tender 5, Crystal Station;
- Helicopter 516, Type 2 helicopter, 10 person flight crew/day;
- Dozer 3, Type 2 (D-6), Sly Park Station;
- Hand crews, Type 2, 10 person crews;
    - Crew 516, Helishots, Pacific RD;
    - Crew 33, Georgetown Station;
    - Crew 36, Sly Park Station; and
- Eldorado Hotshots, Type 1 Interagency Hotshot Crew, 20 people effective.

Forest Service resources also include one prevention patrolman on the Pacific Ranger District and two patrolmen on the Georgetown District. Overhead includes one Division Chief and one Battalion Chief.

Funding for fire suppression and prevention modules are from appropriated funds and funding is appropriated year to year. Typically each National Forest determines their fire preparedness need using the National Fire Management Analysis System (NFMAS), which is a tool to determine the most efficient level (MEL) for the fire management program (USDA Forest Service 2001). The MEL displays the tradeoffs between the dollars spent on fire preparedness versus the fire suppression costs, plus the change in value of the natural resources burned. During the 1990s, funding for preparedness was at the 75 percent of MEL. Due to the National Fire Plan emphasis, MEL is currently at or close to 90 percent of MEL.[24]

Total annual cost to fund an engine module and fire prevention technician is about $190,000 (Johnson 2004), including:

- $131,000 for Engine Crew during the fire season;
- $ 22,620 for a Fire Prevention Technician during the fire season; and
- $ 23,040 for Engine, prevention truck and prevention pump.

[24] Cited by Matt Johnson at the Land Use Technical Working Group Meeting on June 11, 2004.

The CDF resources in El Dorado County available during the fire season originate from the following stations:

- Danaher Station #20, Camino;
- Garden Valley Station #50, Garden Valley;
- El Dorado Station #43, Placerville; and
- Pilot Hill Station #70, Pilot Hill.

Specific resources include the following:

- 9 Engines; and
- 4 15-person crews.

Funding of CDF resources comes from funds appropriated by the State Legislature.

The El Dorado Fire Protection District has three stations situated close to the Camino Powerhouse, White Rock Powerhouse and Slab Creek Powerhouse. The stations are located in Placerville, Pollock Pines and Camino. Each station maintains an engine and a four-person crew. Although these units primarily respond to vehicle or structure fires, they are likely to be the initial responders on a wildland fire at the lower elevations in the Camino area. Funding for these resources comes from local property taxes or special assessments. Grant funding is sometimes available for training or other needs.

Response times to Crystal Lake Basin and Loon Lake for various Forest Service, CDF and County resources are displayed in Table 4.0-19. Currently there is a Type 3 engine stationed at Crystal Basin Work Center between May and November. The additional resources listed are the next available resources to respond to incidents into Crystal Basin and Loon Lake. Crystal Engine 54 is 30 minutes from Loon Lake. In the absence of Engine 54, the closest resource to Loon Lake is Engine 34 from Quintette.

Table 4.0-19. Response times to Crystal Basin and Loon Lake.

Resources	Response time Crystal Basin (minutes)	Response time Loon Lake (minutes)
USFS E-54 (Crystal)	0	30
USFS E-53 (Pacific)	35	65
County E-17, Medic 17	40	70
CDF Danaher	50	80
USFS E-34 (Quintette)	40	35
USFS E-64 (Kyburz)	40	70
USFS E-33 (Georgetown)	50	45
USFS E-66 (Sly Park)	50	80
ENF Hotshots (Sly Park)	50	80
County Medic 61 (Georgetown)	50	45

SMUD's resources for prevention and suppression include the following:

- Crews working in the woods carry fire tools and follow the California Public Resource Code requirements, and Forest Service prescribed activity levels;
- SMUD has installed taps and fire hydrants along penstocks for water access for fire suppression (Jones Fork, Robbs Powerhouse and Camino Adit). Water is also available from Robbs Peak Reservoir;
- SMUD trucks within the UARP area carry fire tools, such as axes and shovels;
- Activities within the UARP conform to USFS activity level requirements;
- SMUD has a current Emergency Response/Contingency Plan for each of the powerhouses; and
- SMUD's equipment that could be used for fire suppression includes a D5 dozer, graders, 500-gallon water trucks, and submersible high volume water pump.

As a goodwill effort following the Cleveland Fire in 1992, SMUD contributed to the rebuilding of the Big Hill Lookout after the Cleveland Fire. SMUD also contributed to the employment of a crewmember of the Big Hill helitack crew during the construction of the Ice House Project.

4.8 Facility Summary Assessment

The following are summary observations are specific to the facilities analyzed:

Transmission Lines from White Rock Switchyard to Camino Switchyard (Western Portion)
Adjacent Landowners: Various private
Fire Hazard/Risk: High. Vegetation includes low elevation foothill mix of Ponderosa pine, gray pine and low elevation brush species, interspersed with Christmas tree farms, vineyards and apple orchards. Right-of-way shows evidence of being treated for vegetation hazards.
Major Risk Factors: Human-caused, debris fire escapes, arson, etc.
Risk for Damage from Fire: Low
Other Comments: Segments of transmission lines in Sections 31 and 32 above White Rock Powerhouse are in steep canyons with highly flammable fuels.

Transmission Lines from White Rock Switchyard to Camino Switchyard (Eastern Portion)
Adjacent Landowners: Various private and Eldorado National Forest
Fire Hazard/Risk: Moderate. Vegetation includes low Ponderosa Pine and Mixed conifer forest. Vegetation under transmission lines includes manzanita, oak, and ceanothus; areas show evidence of being treated within the past two years. Iowa Hill Ridge (Eldorado National Forest) has been thinned and under-burned, reducing hazard adjacent to transmission lines in Sections 28 and 29, T11N, R12E, MDM. Fuel hazard conditions vary widely in the Camino area between the low hazard cultivated vineyards and orchards and high hazardous brush fields near White Rock Powerhouse.
Major Risk Factors: Human-caused, debris fire escapes, arson, other, etc.
Risk for Damage from Fire: Low

Other Comments: Segment of transmission lines in Sections 22 above Camino Powerhouse. Powerhouse is in a steep canyon with highly flammable fuels.

Transmission Lines from Camino Switchyard to Jaybird Switchyard
Adjacent Landowners: Eldorado National Forest and Sierra Pacific Industries
Fire Hazard/Risk: Moderate. Vegetation includes Ponderosa Pine and Mixed conifer forest. Vegetation under transmission lines includes manzanita, oak, tanoak and ceanothus; areas show evidence of being treated within the past two years. Knobcone pine and manzanita fields, indicators of past fire history were observed in Section 14, T. 12N, R13E, MDM. Poho Ridge (Eldorado National Forest) has been recently thinned and logging slash has been piled for burning, which will ultimately reduce hazard adjacent to transmission lines in Sections 1, 11, 12, T. 11N, R11E, MDM and Sections 5 and 6, T. 11N, R13E, MDM. Potential hazard trees under and adjacent to the lines have been harvested and brush within the right-of-way have been cleared in many areas.
Major Risk Factors: Human-caused, lightning, other, etc.
Risk for Damage from Fire: Low
Other Comments: Segments of transmission line rights-of-way in Sections 15 above (north of) Camino Powerhouse and Sections 4 and 5 above Jaybird Powerhouse (Camino Diversion Reservoir) are in steep canyons with highly flammable fuels.

Transmission Lines from Jaybird Switchyard to Union Valley Switchyard
Adjacent Landowners: Eldorado National Forest, Sierra Pacific Industries
Fire Hazard/Risk: Moderate. Vegetation includes Ponderosa Pine and Mixed conifer forest. Vegetation under transmission lines includes manzanita, and ceanothus; areas show evidence of being treated within the past two years. Recent harvesting and slash piling was observed along the Jaybird Access Road (Eldorado National Forest) which will ultimately reduce hazard adjacent to transmission lines in Sections 2 and 3, T. 11N, R14E, MDM. Potential hazard trees under and adjacent to the lines have been harvested and brush within the right-of-way have been cleared in many areas. Transmission line right-of-way passes through recently clearcut land owned by Sierra Pacific Industries.
Major Risk Factors: Human-caused, lightning
Risk for Damage from Fire: Low
Other Comments: Segment of transmission line right-of-way in Sections 4 (east of) Jaybird Powerhouse (Camino Diversion Reservoir) is in a steep canyon with highly flammable fuels. No mitigation to reduce this hazard is recommended or feasible.

Transmission Lines from Union Valley Switchyard to Jones Fork Switchyard
Adjacent Landowners: Eldorado National Forest, Sierra Pacific Industries
Fire Hazard/Risk: Low. The principal vegetation type surrounding this transmission line are the 11-year old plantations created as a result of the Cleveland Burn. Fuel loading is low at this time. Brush competition is largely controlled and has a relatively low dead to live ratio. Potential hazard trees were noted along the transmission line right-of-way west of the Powerhouse.
Major Risk Factors: Human-caused, lightning, campfires, other, etc.
Risk for Damage from Fire: Low

Transmission Lines from Union Valley Switchyard to Robbs Peak Switchyard and Loon Lake Switchyard (Section 2, T. 12N, R14E, MDM)
Adjacent Landowners: Eldorado National Forest, Sierra Pacific Industries
Fire Hazard/Risk: Moderate. The principal vegetation types are mixed conifer forests and 15-year old Ponderosa pine plantations. Harvest treatments, including slash treatments have been conducted adjacent to the transmission line right-of-way in Section 3, T12N, R14E and Section 17, T12N, R14E, MDM. Vegetation treatment is needed where the line crosses the plantation in Section 17, where the plantation is closing in.
Major Risk Factors: Human-caused, lightning, escaped campfires, other, etc.
Risk for Damage from Fire: Low to Moderate
Other Comments: The Forest Service has done thinning from below, effectively fire-proofing stands on National Forest land in the Union Valley Reservoir area.

Transmission Lines from Loon Lake Switchyard to Union Valley Switchyard (from Section 2 T12N, R14E, MDM. To Loon Lake)
Adjacent Landowners: Eldorado National Forest, Sierra Pacific Industries, other landowners
Fire Hazard/Risk: Moderate. The principal vegetation types are true fir and mixed conifer interspersed with brush fields and rock. The transmission right-of-way contains relatively young brush species and open areas. There was evidence of cut fir trees along the right-of-way adjacent to the Loon Powerhouse.
Major Risk Factors: Human-caused, lightning, escaped campfires
Risk for Damage from Fire: Low
Other Comments: This portion of the National Forest has the lowest likelihood of large fires.

5.0 ANALYSIS

5.1 Need for Fuels Management to Protect Facilities

The transmission line facilities are the major facilities at risk from a wildfire. Given adequate facilities space buffers and construction material of the structures (steel concrete), the risk of a fire damaging the powerhouses, switchyards or penstocks is remote. Treating fuels through a combination of forest thinning, underburning and brush treatment, will tend to reduce the potential of damage to the power lines. Pursuing opportunities to cooperate with Fire Safe Councils to coordinate transmission line maintenance and fuel reduction on adjacent lands could also contribute to this objective. During negotiation discussions, risk factors and management objectives will be addressed.

5.2 UARP's Effect on Fire Risk

As explained earlier in this report, risk is defined as the probability that a fire will occur. Risk factors identified include:

- Trees falling into transmission lines;
- Line sag due to high power load, causing the transmission lines to contact trees; and
- Use of off-road vehicles along transmission line right of ways.

Within the last three years two fires have been started as a result of line sag from SMUD transmission lines. Both fires occurred on portions of the transmission line right-of-way not analyzed in this study. There were no reports of a fire starting as a result of line sag within the Eldorado National Forest.
Measures are in place to reduce the risk including evaluating hazard trees adjacent to and under the line. Removal of these trees on a periodic basis minimizes the risk of fire start from the transmission lines. Other measures that were observed include masticating or grinding brush species. Various treatments are implemented along the transmission line right-of-way throughout the system (Loon Lake to White Rock). Although potential hazard trees were noted adjacent to the right-of-way, none appeared to be dead or diseased, which would then pose an immediate risk. As a general observation, those portions of the right-of-way within the National Forest appeared to have wider clearance than some portions of the right-of-way observed outside the National Forest.

There is an apparent positive relationship between human-use and the number of fire starts. The proportion of human-caused fire starts is higher for those areas closest to UARP reservoirs and lower away from the reservoirs.

This analysis indicates that there is a need to treat fuels in the landscape adjacent to UARP facilities. Within the 195,000-acre area analyzed across the Pacific Ranger District, there are about 74,000 acres at unacceptable levels of fuel loading. A multi-year program to treat fuels through a combination of thinning and underburning will reduce fire hazard to acceptable levels.

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APPENDIX A

CURRICULUM VITAE FOR REPORT PREPARERES

Report Preparers

Bradford R. Seaberg
Registered Professional Forester

Expertise
- Timberland Valuation
- Biomass Energy Development
- Environmental Analysis (Interdisciplinary teams)
- Timber Harvesting and Best Management Practices
- Forest Health and Fuels Management

Experience
2003-Present –Continental Resource Solutions, Inc.

Consulting Forester. One of two principals for Continental Resource Solutions, Inc. Work includes land acquisition, timberland valuation, biomass energy development, fuels management and timber harvest planning. Work has included evaluating fuel supplies for potential and existing biomass to energy facilities, evaluation of forest fire risk and fuels hazard, timber sale layout and preparation.

1992-2003 - Mason, Bruce & Girard, Inc.

Consulting Forester. One of eight principals for Mason, Bruce & Girard, Inc. Work included: following:

Environmental Analysis for National Forest timber sales in Alaska and California (Tongass and Lassen National Forests) and PG&E hydro-divestiture. Coordinated alternative development, prepared silvicultural prescriptions, and planned logging systems for National Forest timber sales. Managed the implementation of project including layout, marking and cruising on Lassen NF of a defensible fuel profile zone. Developed timber harvest scenarios and provided fire and fuels background for the hydro-divestiture project. Provided fire and fuels analysis for re-licensing of a hydro-electric project in the Central Sierra.

Biomass Energy Fuel Supply Analysis for biomass energy plants in California, North Carolina, Michigan and the Northeastern United States, including evaluating feasibility to site facilities that can utilize small diameter trees and logs to reduce fire hazard in the urban-rural interface.

Project feasibility and forest products analysis for a forest stewardship project on the Winema National Forest to improve ecosystem health and reduce fuel hazards.

Timber Inventory of private and public properties in California, Oregon, and New York. Manager of several projects.

Appraisal and Valuation of Land and Timber in California, Oregon, and New York for estate planning, litigation, damages, and acquisition. Consulted and testified in cases involving damages as a result of wildfire.

Business Planning, Public Affairs and Development for companies and industry associations in the timber harvest and wood products industries in California, Washington, Wyoming, South

Dakota, and Colorado. Worked with bidders and purchasers of Forest Service timber sales regarding Timber Sale Contracts and volume measurement.

Timber Harvest Practices Audit (including Best Management Practices) for industrial timberland in Oregon and California.

1977-1992 - US Forest Service, Plumas National Forest
Responsibilities included

- T
  imber sale planning, preparation, appraisal and contract administration
- Managing the district small sales program
- Leading environmental analysis and writing environmental assessment reports
- Administering timber sale contracts and appraising timber for contract adjustments

Special assignments included

- Coordinating the Region 5 Multi-Sale Extension Program
- Coordinating fire salvage programs for large fires on the Plumas National Forest
- Determining damages from defaulted contracts and various assignments as district timber staff officer on three ranger districts

1973-1976 - US Forest Service, Uinta and Bighorn NF

Seasonal summer positions during the academic year break in engineering survey and timber sale preparation. While at the University of New Hampshire worked in forest genetics and forest economics.

Academic Background

Master of Forest Science Degree, Yale University School of Forestry and Environmental Studies, New Haven Connecticut, 1976
Bachelor of Science Degree in Forest Management, University of New Hampshire, Durham, New Hampshire, 1974

Professional Licenses and Affiliations

Society of American Foresters – Member, Certified Forester, Past Chairman for the Northern California Society, Past Chairman of Wyntoon Chapter
Association of Consulting Foresters – ACF
California Licensed Foresters Association
Registered Professional Forester, Sate of CA, RPF #2449
CDF Archaeological Training Certificate

David A. Moody
Fuels and Fire Specialist

Expertise

Over 26 years experience in wildland fire suppression and fuels management on California National Forests. Served in various fire/fuels positions on the Los Padres and Plumas National Forests. His major areas of expertise are fuels management and fire suppression.

Fuels Management - Served as a fuels management officer on the La Porte Ranger District which included being member of the inter-disciplinary team in the planning of timber sales. Experienced in preparation of burn prescriptions, fuels inventory, instruction in fire effects and fire ecology and providing fire/fuels expertise to an interdisciplinary team.

Fire Suppression - Served in various positions on the National Forests leading fire prevention and suppression efforts. Experienced in fire suppression, including management of fire control resources.

Experience

1996 - Mason, Bruce & Girard, Inc.
Work included serving on an interdisciplinary team for developing and analyzing a defensible fuel profile zone on the Lassen National Forest.

1989 to 1994 – USFS - La Porte Ranger District / Feather River Ranger District, Plumas National Forest
Assistant Fire Management Officer for fuels management on the La Porte Ranger District and management of fire control resources for the Feather River Ranger District. Duties included managing fire suppression workforce and providing fuels input and analysis for timber sale interdisciplinary team. Managed prescribed burning program.

1976 to 1989 – USFS – La Porte Ranger District
Fire Prevention Officer on the La Porte Ranger District. Duties included coordinating fire prevention efforts and managing fire control resources. Worked in fuels management in preparation of prescribed burning and hazard reduction.

1968 to 1976 – USFS – Los Padres National Forest
Served in various fire suppression and prevention positions on the Los Padres National Forest

Wayne D. Hawk
Registered Professional Forester (GIS)

Expertise

- Forest Industry Analysis
- Timberland Appraisals
- Biomass Energy
- Forest Practice Rule Application and Administration
- NEPA/CEQA Application and Administration
- Project Management
- Timber Cruising and Inventory/USFS Stand Exams

Experience

2003 – Present – Continental Resource Solutions, Inc. Forester and analyst. Work includes timber valuation, fuel supply studies for biomass fueled power plants, timber inventory, performing USFS stand exams, and FIA quality control and assurance.

1989-2003 - Mason, Bruce & Girard, Inc.
Forester: Responsibilities included:
Timber and Land Assessments and Appraisals for large acreage properties including all phases of appraisal work , plus sales, partitioning, and taxes
Project feasibility and fuel supply studies for biomass energy plants in California, Hawaii, Michigan, Massachusetts, and New York
Analysis and application of regulatory law as it pertains to timberland and ranch properties
Complex database structure development and implementation
Detailed data analysis of land use and business activities
GPS and GIS application and implementation
Quality Control for FIA plot measurements on the Klamath, Lassen, Modoc, Plumas, Sequoia, Shasta-Trinity, Six Rivers and Tahoe National Forests
Project management on various stand exam projects on the Lassen National Forest
Timber sale layout and cruising quality control on the Wheel Fuelbreak Project (Lassen National Forest)

1976-1986 – Diamond Lands Corporation
Forest Technician (1976-1979): Tasks included marking timber, cruising timber for volume and grade, surveying property lines, identifying proposed road locations, planting, log scaling, and control burning of slash from site preparation.

Associate Forester (1979-1983): Supervised timber marking and planting crews, trained newly hired foresters, and involved in the implementation of a Superior Tree Program. Other activities included logging administration and the reconnaissance of several Timber Harvest Plans under the direction of a Registered Professional Forester.

Forester (1983-1986): Responsible for writing and submitting Timber Harvest Plans. Duties included reconnaissance, road location, and the selection of proper logging methods and silvicultural systems. Supervised timber marking crews and logging contractors for personally written Harvest Plans.

1975 – US Forest Service, Foresthill Ranger District, Tahoe NF
Forest Technician: Duties included timber sale preparation, marking timber, performing skyline profiles, and fire fighting.

Academic Background

Bachelor or Arts Degree in Business Administration with a concentration in Management Information Systems, California State University Fullerton, 1989
Associate of Science Degree and Forest Technician Certificate, Sierra College, Rocklin, CA 1976

Professional Licenses & Affiliations

Registered Professional Forester, State of California, RPF #2165
CDF Archaeological Training Certificate

APPENDIX B

PERSONS CONTACTED

List of Contacts

Contact	Organization	Subject
Ben Scott	CDF	Fire/fuels issues-CDF protection
Cindy Oswald	USFS – Placerville RD	Right-of-way clearance issues
Jack Noble	SMUD	History/general procedures
John Haak	SMUD	Vegetation Management
Lonn Maier	SMUD	General SMUD contact
Mark Johnson	ECFPD	Fire suppression issues
Martha Goodavish	MG	General background of project
Matt Johnson	USFS – Pacific RD	Fire/fuels issues –National Forest
Rich Platt	USFS-Pacific RD	Right-of-way clearance issues
Robert Brenton	VMS	SMUD R/W vegetation management

APPENDIX C

FUEL MODEL CLASSIFICATIONS

		Fuel Loading (Tons/acre)					
Fuel Model	**Typical Fuel complex**	**1 hour**	**10 hours**	**100 hours**	**Live**	**Fuel bed depth (feet)**	**Moisture of extinction of dead fuels**
	Grass and grass dominated						
1	Short grass (1 foot)	0.74	0.00	0.00	0.00	1.0	12
2	Timber (grass and understory)	2.00	1.00	0.50	0.50	1.0	15
3	Tall grass (2.5 feet)	3.01	0.00	0.00	0.00	2.5	25
	Chaparral and shrub fuels						
4	Chaparral (6 feet)	5.01	4.01	2.00	5.01	6.0	20
5	Brush (2 feet)	1.00	0.50	0.00	2.00	2.0	20
6	Dormant Brush, hardwood slash	1.50	2.50	2.00	0.00	2.5	25
7	Southern Rough	1.13	1.87	1.50	0.37	2.5	40
	Timber Litter						
8	Closed Timber litter	1.50	1.00	2.50	0.00	0.2	30
9	Hardwood Litter	2.02	0.41	0.15	0.00	0.2	25
10	Timber (litter and understory)	3.01	2.00	5.01	2.00	1.0	25
	Slash						
11	Light Logging Slash	1.50	4.51	5.51	0.00	1.0	15
12	Medium Logging Slash	4.01	14.03	16.63	0.00	2.3	20
13	Heavy Logging Slash	7.01	23.04	28.05	0.00	3.0	25
	Plantation						
14	Young Plantation	1.02	0.50	0.00	0.00	0.20	25

APPENDIX D

VEGETATION TYPE FUEL MODEL CROSSWALK

Vegetation Class - Fuel Model Crosswalk

Veg Class	Description	FM	Aspect	Slope Class R 15%	1 20%	2 50%	3 75%	Base Inputs to BehavePlus 2.02 1 hr FM	10 hr FM	100 hr FM	LWFM	LHFM	Wind
AG	Agriculture	0											
BA_	Barren	0											
CG	Greenleaf Manzanita	6		6.3	6.4	7.4	8.7	4	5	7	80	30	10
CH_	Huckleberry Oak	8		1	1	1.2	1.5	4	5	7	80	30	10
CQ	Lower Montane Mixed Chaparal	4		20.5	20.8	24.3	28.6	4	5	7	80	30	10
CX	Upper Montane Mixed Chaparral	5		6.5	6.6	7.7	9.0	4	5	7	80	30	10
DPS	Douglas-fir Pine Sawtimber	10	Ridgetop	3.8				4	5	7	80	30	10
DPS	Douglas-fir Pine Sawtimber	10	North		4	5.3	6.7	4	5	7	80	30	10
DPS	Douglas-fir Pine Sawtimber	10	South		4	5.3	6.7	3	4	6	80	30	10
DPSH	Douglas-fir Pine Sawtimber	9	Ridgetop	2.5	2.5	3.2	3.9	4	5	7	80	30	10
DPSH	Douglas-fir Pine Sawtimber	9	North	2.5	2.5	3.2	3.9	4	5	7	80	30	10
DPSH	Douglas-fir Pine Sawtimber	9	South	3	3.1	3.7	4.4	3	4	6	70	30	12
HG	Annual Grassland	1						4	5	7	80	30	10
HJ_	Wet Meadows	1											
MFS	Mixed Conifer - Fir Sawtimber	10	Ridgetop	3.8				4	5	7	80	30	10
MFS	Mixed Conifer - Fir Sawtimber	10	North		4	5.3	6.7	4	5	7	80	30	10
MFS	Mixed Conifer - Fir Sawtimber	10	South		4	5.3	6.7	4	5	7	80	30	10
MFSH	MCF - Harvested	9	Ridgetop	2.5	2.5	3.2	3.9	4	5	7	80	30	10
MFSH	MCF - Harvested	9	North	2.5	2.5	3.2	3.9	4	5	7	80	30	10
MFSH	MCF - Harvested	9	South	2.8	2.8	3.4	4.1	4	5	7	80	30	12
MPS	Mixed Conifer - Pine Sawtimber	10	Ridgetop	3.8				4	5	7	80	30	10
MPS	Mixed Conifer - Pine Sawtimber	10	North		4.0	5.3	6.7	4	5	7	80	30	10
MPS	Mixed Conifer - Pine Sawtimber	10	South		4.0	5.3	6.7	4	5	6	80	30	10
MPSH	MPS - Harvested	9	Ridgetop	2.5	2.5	3.2	3.9	4	5	7	80	30	10
MPSH	MPS - Harvested	9	North	2.5	2.5	3.2	3.9	4	5	7	80	30	10
MPSH	MPS - Harvested	9	South	3.0	3.1	3.7	4.4	4	5	7	80	30	12
NX	Mixed Hardwood (non-productive)	8		1.0	1.0	1.2	1.5	4	5	7	80	30	10

Vegetation Class - Fuel Model Crosswalk

Veg Class	Description	FM	Aspect	Slope Class R 15%	1 20%	2 50%	3 75%	Base Inputs to BehavePlus 2.02 1 hr FM	10 hr FM	100 hr FM	LWFM	LHFM	Wind
PPP	Pine Plantation	14		2.2	2.3	2.7	3.2	4	5	7	80	30	10
PPP/PPX	Pine Plantation (>15 years)	5		6.5	6.6	7.7	9.0	4	5	7	80	30	10
QC_	Canyon Live Oak	8		1.0	1.0	1.2	1.5	4	5	7	70	30	10
QK	Black Oak	8		1.0	1.0	1.2	1.5	4	5	7	80	30	10
QO_	Willow Series	8		1.0	1.0	1.2	1.5	4	5	7	80	30	10
QW	Interior Live Oak	8		1.0	1.0	1.2	1.5	4	5	7	70	30	10
UB	Urban	0											
WA_	Water	0											

FM- Fuel Model No.
Slope Class: 1=0 to 35% (used 20%), 2=35-70% (used 50%), 3= 70%+ (used 75%)
Base Inputs: fm-fuel moisture, LWFM=live woody fuel moisture, LHFM=live herbaceious fuel moisture, Wind=20-ft windspeed

APPENDIX E

ESTIMATED FLAME LENGTHS AND ACRES BY HAZARD CLASSES

ESTIMATED FLAME LENGTHS FROM BEHAVE PLUS FIRE BEHAVIOR MODEL

White Rock - Camino Segment

Acres	Veg/Fuel Type	Flame Length (ft)	Hazard	Hazard Acres: Low	Moderate	High
377.3	**AG Total**	0.0	L	377.3	0.0	0.0
4.2	**BA/0 Total**	0.0	L	4.2	0.0	0.0
12.7	**CG/N/1/4 Total**	20.8	H	0.0	0.0	12.7
35.9	**CG/N/1/5 Total**	6.6	M	0.0	35.9	0.0
8.1	**CG/N/1/6 Total**	6.4	M	0.0	8.1	0.0
6.9	**CG/S/1/4 Total**	6.6	M	0.0	6.9	0.0
18.8	**CG/S/1/5 Total**	6.6	M	0.0	18.8	0.0
6.4	**CG/S/2/4 Total**	24.3	M	0.0	6.4	0.0
7.8	**CG/S/2/6 Total**	7.4	M	0.0	7.8	0.0
16.1	**CQ/N/1/4 Total**	28.6	H	0.0	0.0	16.1
5.2	**CQ/N/1/5 Total**	6.6	M	0.0	5.2	0.0
99.3	**CQ/N/1/6 Total**	7.0	M	0.0	99.3	0.0
34.0	**CQ/N/2/4 Total**	24.3	H	0.0	0.0	34.0
43.0	**CQ/N/2/5 Total**	7.7	M	0.0	43.0	0.0
10.8	**CQ/N/2/8 Total**	1.2	L	10.8	0.0	0.0
90.7	**CQ/N/3/4 Total**	28.6	H	0.0	0.0	90.7
105.5	**CQ/S/1/6 Total**	6.4	M	0.0	105.5	0.0
16.0	**CQ/S/2/6 Total**	7.4	M	0.0	16.0	0.0
561.2	**DPS/N/1/10 Total**	4.0	M	0.0	561.2	0.0
140.4	**DPS/N/2/10 Total**	5.3	M	0.0	140.4	0.0
165.9	**DPS/N/3/10 Total**	6.7	M	0.0	165.9	0.0
50.2	**DPS/N/3/5 Total**	9.0	H	0.0	0.0	50.2
386.0	**DPS/S/1/10 Total**	4.0	M	0.0	386.0	0.0
58.8	**DPS/S/2/10 Total**	5.3	M	0.0	58.8	0.0
65.9	**DPS/S/3/10 Total**	6.7	M	0.0	65.9	0.0
151.1	**DPSH/N/1/9 Total**	2.5	L	151.1	0.0	0.0
48.7	**DPSH/S/1/9 Total**	3.1	L	48.7	0.0	0.0
37.2	**DPX/N/1/5 Total**	6.6	L	37.2	0.0	0.0
61.9	**DPX/N/3/5 Total**	9.0	H	0.0	0.0	61.9
11.3	**DPX/S/1/5 Total**	6.6	H	0.0	0.0	11.3
18.3	**DPX/S/2/5 Total**	7.7	H	0.0	0.0	18.3
8.8	**HG/N/1/1 Total**	4.3	M	0.0	8.8	0.0
5.0	**HG/S/1/1 Total**	4.3	M	0.0	5.0	0.0
1.5	**HJ/N/1/1 Total**	0.0	L	1.5	0.0	0.0
128.4	**NX/N/2/8 Total**	1.2	L	128.4	0.0	0.0
15.7	**NX/S/1/8 Total**	1.0	L	15.7	0.0	0.0
29.1	**NX/S/2/8 Total**	1.2	L	29.1	0.0	0.0
16.6	**NX/S/3/8 Total**	1.5	L	16.6	0.0	0.0
9.5	**PPPL/N/1/5 Total**	6.6	M	0.0	9.5	0.0

ESTIMATED FLAME LENGTHS FROM BEHAVE PLUS FIRE BEHAVIOR MODEL

White Rock - Camino Segment

Acres	Veg/Fuel Type	Flame Length (ft)	Hazard	Hazard Acres: Low	Moderate	High
14.0	**PPPL/N/2/5 Total**	7.7	M	0.0	14.0	0.0
15.1	**PPPL/S/1/14 Total**	2.3	M	0.0	15.1	0.0
11.5	**QC/N/1/8 Total**	1.0	L	11.5	0.0	0.0
1.3	**QC/N/3/8 Total**	1.5	L	1.3	0.0	0.0
4.6	**QC/S/1/8 Total**	1.0	L	4.6	0.0	0.0
10.6	**QO/N/1/8 Total**	1.0	L	10.6	0.0	0.0
59.6	**QW/N/1/8 Total**	1.0	L	59.6	0.0	0.0
86.2	**QW/S/1/8 Total**	1.0	L	86.2	0.0	0.0
271.1	**URB/0 Total**	0.0	L	271.1	0.0	0.0
15.7	**Water Total**	0.0	L			
3,344.6	**Grand Total**					
		5.5	M	**1,265.8**	**1,783.6**	**295.2**
				38%	53%	9%

Jaybird - Camino

Acres	Veg Type/Fuel Model	Flame Length (ft)	Hazard	Hazard Acres: Low	Moderate	High
16.5	**BA/0 Total**	0.0	L	16.5	0.0	0.0
2.4	**CQ/S/1/5 Total**	6.6	M	0.0	2.4	0.0
2.1	**CQ/S/2/5 Total**	6.6	M	0.0	2.1	0.0
11.9	**CW/N/1/5 Total**	6.6	M	0.0	11.9	0.0
10.9	**CW/R/1/5 Total**	6.5	M	0.0	10.9	0.0
23.7	**CW/S/1/5 Total**	6.5	M	0.0	23.7	0.0
4.9	**CW/S/1/6 Total**	6.4	M	0.0	4.9	0.0
18.6	**CW/S/2/5 Total**	7.7	M	0.0	18.6	0.0
48.6	**CW/S/2/6 Total**	7.4	M	0.0	48.6	0.0
6.6	**CW/S/3/6 Total**	8.7	H	0.0	0.0	6.6
38.1	**DPS/N/1/10 Total**	4.0	M	0.0	38.1	0.0
140.9	**MPS/N/1/10 Total**	4.0	M	0.0	140.9	0.0
29.7	**MPS/N/2/10 Total**	5.3	M	0.0	29.7	0.0
2.2	**MPS/N/3/10 Total**	6.7	M	0.0	2.2	0.0
11.4	**MPS/R/1/10 Total**	3.8	L	11.4	0.0	0.0
100.2	**MPS/S/1/10 Total**	5.0	M	0.0	100.2	0.0
28.0	**MPS/S/2/10 Total**	5.3	M	0.0	28.0	0.0
147.6	**MPSH/N/1/9 Total**	2.5	L	147.6	0.0	0.0
434.9	**MPSH/S/1/9 Total**	3.0	L	434.9	0.0	0.0
7.0	**MPSH/S/2/9 Total**	3.7	L	7.0	0.0	0.0
38.8	**PPPL/R/1/14 Total**	2.2	L	38.8	0.0	0.0
9.2	**PPPL/S/1/14 Total**	2.3	L	9.2	0.0	0.0

ESTIMATED FLAME LENGTHS FROM BEHAVE PLUS FIRE BEHAVIOR MODEL

Jaybird - Camino

Acres	Veg Type/Fuel Model	Flame Length (ft)	Hazard	Hazard Acres: Low	Moderate	High
46.4	**PPPL/S/1/5 Total**	6.6	M	0.0	46.4	0.0
70.2	**QC/N/1/8 Total**	1.0	L	70.2	0.0	0.0
48.8	**QC/N/3/8 Total**	1.5	L	48.8	0.0	0.0
589.5	**QC/S/3/8 Total**	1.5	L	589.5	0.0	0.0
5.1	**URB/0 Total**	0.0	L	5.1	0.0	0.0
1,894.2	**Grand Total**	3.5	L	**1,379.0**	**508.5**	**6.6**
				73%	27%	0%

Loon Lake - Robbs Peak

Acres	Veg Type/Fuel Model	Flame Length (ft)	Hazard	Hazard Acres: Low	Moderate	High
21.6	**BA/0 Total**	0.0	L	21.6	0.0	0.0
5.8	**CG/S/1/5 Total**	6.6	M	0.0	5.8	0.0
2.9	**CG/S/2/5 Total**	7.4	M	0.0	2.9	0.0
49.2	**CH/N/1/8 Total**	1.0	L	49.2	0.0	0.0
20.7	**CH/N/2/8 Total**	1.2	L	20.7	0.0	0.0
78.9	**CH/R/1/8 Total**	1.0	L	78.9	0.0	0.0
14.4	**CX/N/1/5 Total**	6.6	M	0.0	14.4	0.0
14.4	**CX/N/2/5 Total**	7.4	M	0.0	14.4	0.0
130.1	**CX/R/1/5 Total**	6.3	M	0.0	130.1	0.0
8.9	**CX/S/1/5 Total**	6.4	M	0.0	8.9	0.0
5.8	**CX/S/2/5 Total**	7.4	M	0.0	5.8	0.0
22.3	**HJ/R/1/1 Total**	0.0	L	22.3	0.0	0.0
6.0	**HJ/S/1/1 Total**	0.0	L	6.0	0.0	0.0
17.8	**LP/R/1/8 Total**	1.0	L	17.8	0.0	0.0
543.4	**MFS/N/1/10 Total**	4.0	M	0.0	543.4	0.0
76.5	**MFS/N/2/10 Total**	5.3	M	0.0	76.5	0.0
417.1	**MFS/R/1/10 Total**	3.8	L	417.1	0.0	0.0
494.8	**MFS/S/1/10 Total**	4.0	M	0.0	494.8	0.0
49.2	**MFS/S/2/10 Total**	5.3	M	0.0	49.2	0.0
230.5	**MFSH/N/1/9 Total**	2.5	L	230.5	0.0	0.0
139.0	**MFSH/R/1/9 Total**	2.5	L	139.0	0.0	0.0
42.1	**MFSH/S/1/9 Total**	2.8	L	42.1	0.0	0.0
50.0	**PPPL/N/1/14 Total**	2.3	L	50.0	0.0	0.0
62.4	**PPPL/R/1/14 Total**	2.2	L	62.4	0.0	0.0
31.7	**PPPL/S/1/14 Total**	2.3	L	31.7	0.0	0.0
2.7	**QK/R/1/8 Total**	1.0	L	2.7	0.0	0.0
0.5	**QY/N/1/8 Total**	1.0	L	0.5	0.0	0.0
1.1	**QY/R/1/8 Total**	1.0	L	1.1	0.0	0.0
9.3	**URB/0 Total**	0.0	L	9.3	0.0	0.0

ESTIMATED FLAME LENGTHS FROM BEHAVE PLUS FIRE BEHAVIOR MODEL

Loon Lake - Robbs Peak

Acres	Veg Type/Fuel Model	Flame Length (ft)	Hazard	Hazard Acres: Low	Moderate	High
54.8	**Water Total**					
2,604.1	**Grand Total**	4.1	M	**1,203.0**	**1,346.3**	**0.0**
				47%	53%	0%

Union Valley - Robbs Peak

Acres	Type2	Flame Height (ft)	Hazard	Hazard Acres: Low	Moderate	High
25.1	**BA/0 Total**	0.0	L	25.1	0.0	0.0
8.4	**CX/N/1/5 Total**	6.4	M	0.0	8.4	0.0
67.2	**CX/S/1/5 Total**	6.4	M	0.0	67.2	0.0
7.3	**CX/S/2/5 Total**	7.4	M	0.0	7.3	0.0
9.6	**CX/S/3/5 Total**	8.7	H	0.0	0.0	9.6
3.4	**HJ/N/1/1 Total**	0.0	L	3.4	0.0	0.0
11.8	**HJ/S/1/1 Total**	0.0	L	11.8	0.0	0.0
1.0	**LP/S/1/10 Total**	4.0	M	0.0	1.0	0.0
255.9	**MFS/N/1/10 Total**	4.0	M	0.0	255.9	0.0
21.1	**MFS/N/1/5 Total**	6.4	M	0.0	21.1	0.0
40.9	**MFS/N/2/10 Total**	7.4	M	0.0	40.9	0.0
361.1	**MFS/S/1/10 Total**	6.4	M	0.0	361.1	0.0
239.2	**MFS/S/2/10 Total**	7.4	M	0.0	239.2	0.0
44.1	**MFSH/N/1/9 Total**	2.5	L	44.1	0.0	0.0
16.8	**MFSH/R/1/9 Total**	2.5	L	16.8	0.0	0.0
336.2	**MFSH/S/1/9 Total**	2.8	L	336.2	0.0	0.0
9.6	**PPPL/N/1/14 Total**	2.3	L	9.6	0.0	0.0
24.0	**PPPL/S/1/14 Total**	2.3	L	24.0	0.0	0.0
76.9	**PPPL/S/1/5 Total**	2.3	L	76.9	0.0	0.0
17.6	**PPPL/S/2/5 Total**	7.4	M	0.0	17.6	0.0
64.8	**PPSH/S/1/9 Total**	3.0	L	64.8	0.0	0.0
0.4	**TA/N/1/1 Total**	0.0	L	0.4	0.0	0.0
29.0	**URB/0 Total**	3.1	L	29.0	0.0	0.0
32.6	**Water Total**					
1,704.0	**Grand Total**	5.3	M	642.0	1,019.8	9.6
				38%	61%	1%

Union Valley - Jaybird

Acres	Type2	Flame Height (ft)	Hazard	Hazard Acres: Low	Moderate	High
2.6	**BA/0 Total**	0.0	L	2.6	0.0	0.0
6.5	**CQ/R/1/5 Total**	6.6	M	0.0	6.5	0.0
9.1	**CQ/S/1/5 Total**	6.6	M	0.0	9.1	0.0

ESTIMATED FLAME LENGTHS FROM BEHAVE PLUS FIRE BEHAVIOR MODEL

Union Valley - Jaybird

Acres	Type2	Flame Height (ft)	Hazard	Hazard Acres: Low	Moderate	High
7.4	**CQ/S/2/5 Total**	7.7	M	0.0	7.4	0.0
2.6	**CX/N/1/5 Total**	6.6	M	0.0	2.6	0.0
11.9	**CX/N/3/5 Total**	8.7	H	0.0	0.0	11.9
68.4	**CX/R/1/5 Total**	6.3	M	0.0	68.4	0.0
29.1	**CX/S/1/5 Total**	6.6	M	0.0	29.1	0.0
33.2	**CX/S/2/5 Total**	7.7	M	0.0	33.2	0.0
9.0	**CX/S/3/5 Total**	8.7	H	0.0	0.0	9.0
0.4	**HJ/N/1/1 Total**	0.0	M	0.0	0.4	0.0
131.6	**MPS/N/1/10 Total**	4.0	M	0.0	131.6	0.0
106.2	**MPS/N/2/10 Total**	5.3	M	0.0	106.2	0.0
162.4	**MPS/N/3/10 Total**	6.7	M	0.0	162.4	0.0
118.8	**MPS/R/1/10 Total**	3.8	L	118.8	0.0	0.0
128.0	**MPS/S/1/10 Total**	4.0	M	0.0	128.0	0.0
32.1	**MPS/S/2/10 Total**	5.3	M	0.0	32.1	0.0
19.4	**MPS/S/3/10 Total**	6.7	M	0.0	19.4	0.0
78.3	**MPSH/N/1/9 Total**	2.5	L	78.3	0.0	0.0
360.7	**MPSH/R/1/9 Total**	2.5	L	360.7	0.0	0.0
80.4	**MPSH/S/1/9 Total**	3.1	L	80.4	0.0	0.0
209.1	**PPPL/N/1/14 Total**	2.3	L	209.1	0.0	0.0
5.6	**PPPL/N/2/14 Total**	2.7	L	5.6	0.0	0.0
45.4	**PPPL/R/1/14 Total**	2.2	L	45.4	0.0	0.0
39.9	**PPPL/S/1/14 Total**	2.3	L	39.9	0.0	0.0
37.8	**QC/N/3/8 Total**	1.5	L	37.8	0.0	0.0
32.9	**QC/S/1/8 Total**	1.0	L	32.9	0.0	0.0
46.4	**QC/S/3/8 Total**	1.5	L	46.4	0.0	0.0
6.4	**URB/0 Total**	0.0	L	6.4	0.0	0.0
63.4	**Water Total**					
1,885.0	**Grand Total**	4.7	M	**1,064.2**	**736.4**	**20.9**
				58%	40%	1%

Acres	Type2	Flame Height (ft)	Hazard	Hazard Acres: Low	Moderate	High
4.9	**BA/0 Total**	0.0	L	4.9	0.0	0.0
4.5	**HJ/N/1/1 Total**	0.0	L	4.5	0.0	0.0
6.6	**HJ/S/1/1 Total**	0.0	L	6.6	0.0	0.0
0.5	**LP/S/1/10 Total**	4.0	M	0.0	0.5	0.0
14.1	**MPS/N/1/10 Total**	3.8	L	14.1	0.0	0.0
141.0	**MPS/R/1/10 Total**	4.0	M	0.0	141.0	0.0
5.7	**MPS/S/1/10 Total**	4.0	M	0.0	5.7	0.0

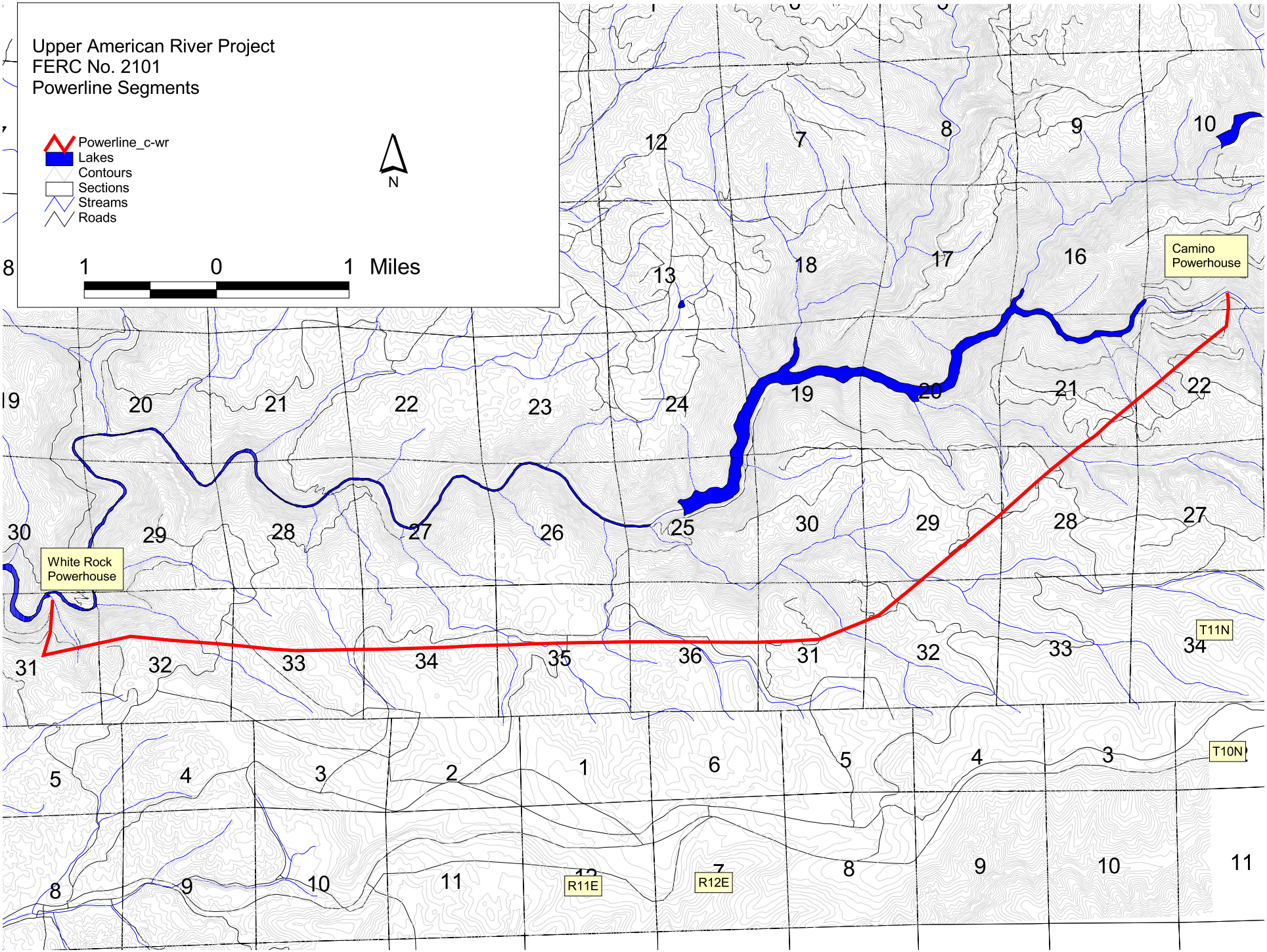
ESTIMATED FLAME LENGTHS FROM BEHAVE PLUS FIRE BEHAVIOR MODEL

Acres	Type2	Flame Height (ft)	Hazard	Hazard Acres: Low	Moderate	High
27.2	**MPS/S/1/14 Total**	2.3	L	27.2	0.0	0.0
422.6	**PPPL/N/1/14 Total**	2.3	L	422.6	0.0	0.0
84.6	**PPPL/N/2/14 Total**	2.7	L	84.6	0.0	0.0
104.7	**PPPL/R/1/14 Total**	2.2	L	104.7	0.0	0.0
235.0	**PPPL/S/1/14 Total**	2.3	L	235.0	0.0	0.0
105.1	**PPPL/S/2/14 Total**	2.7	L	105.1	0.0	0.0
4.7	**URB/0 Total**	0	L	4.7	0.0	0.0
3.7	**Water Total**					
1,164.9	**Grand Total**	2.6	L	1,014.0	147.3	0.0
				87%	13%	0%
12,597	TOTAL - GRAND	4.5	M	6,568.0	5,541.9	332.4

Hazard Ranking: 0-4 feet-Low; 4-8 feet; High-8 feet+

APPENDIX F

UARP MAPS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FERC No. 2101
Powerline Segments
Powerline_c-wr
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Contours
Sections
Streams
Roads
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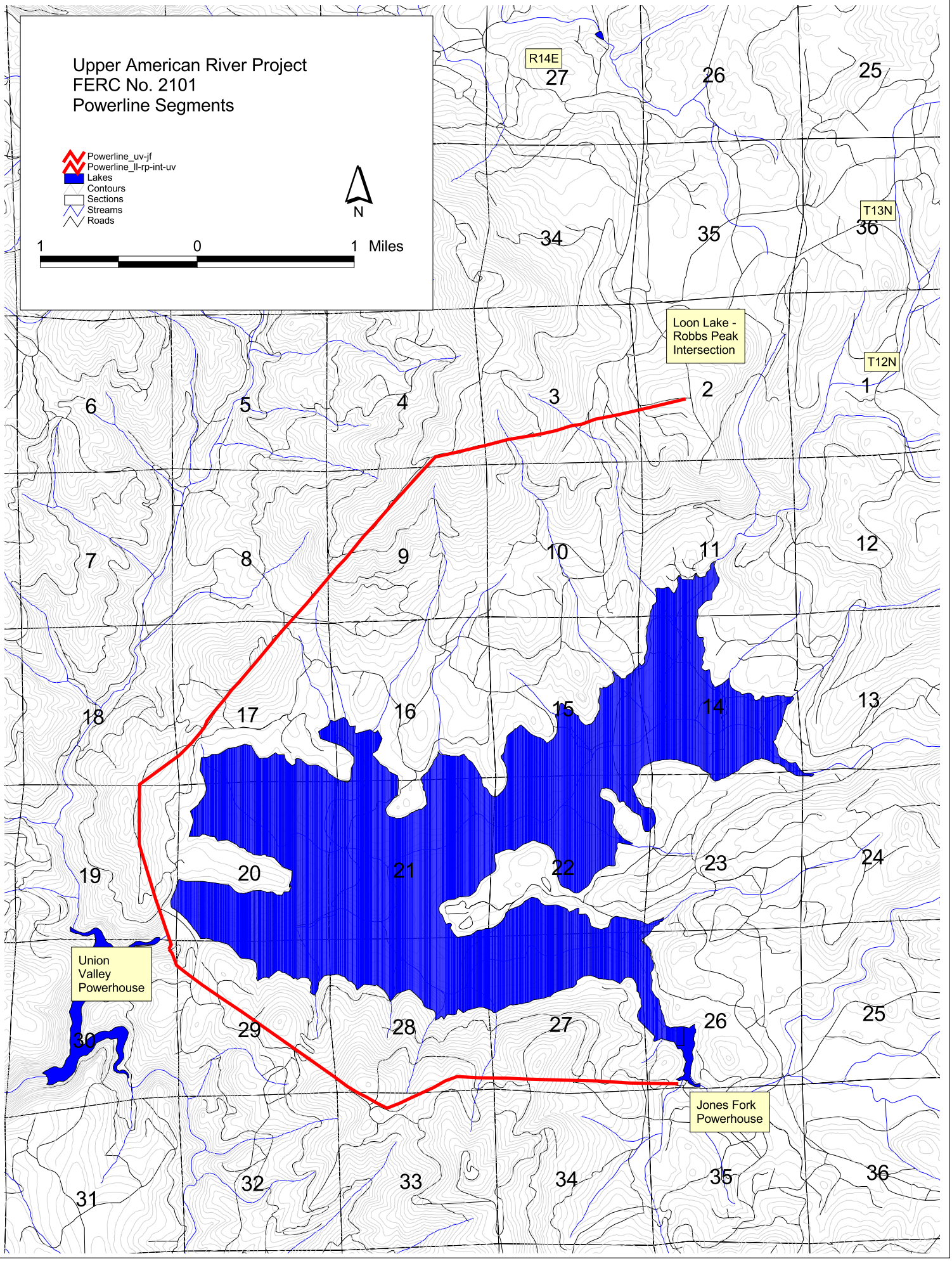
1 0 1 Miles
White Rock Powerhouse
Camino Powerhouse
T11N
T10N
R11E
R12E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FERC No. 2101
Powerline Segments
Powerline_uv-jf
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Lakes
Contours
Sections
Streams
Roads
N
1 0 1 Miles
R14E
T13N
T12N
Loon Lake - Robbs Peak Intersection
Union Valley Powerhouse
Jones Fork Powerhouse
25
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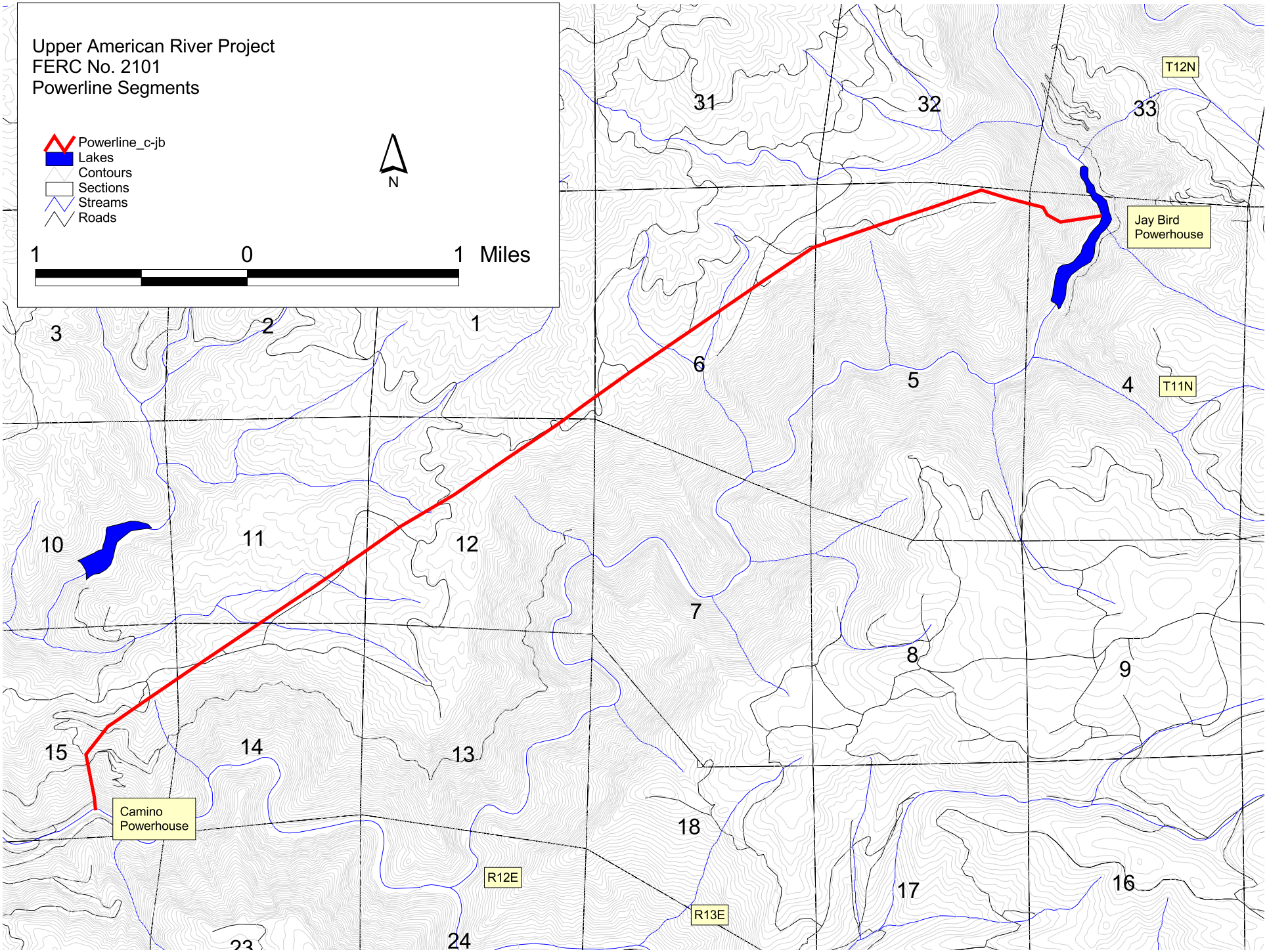
Upper American River Project
FERC No. 2101
Powerline Segments
Powerline_c-jb
Lakes
Contours
Sections
Streams
Roads
N
1 0 1 Miles
Jay Bird Powerhouse
Camino Powerhouse
T12N
T11N
R12E
R13E
31
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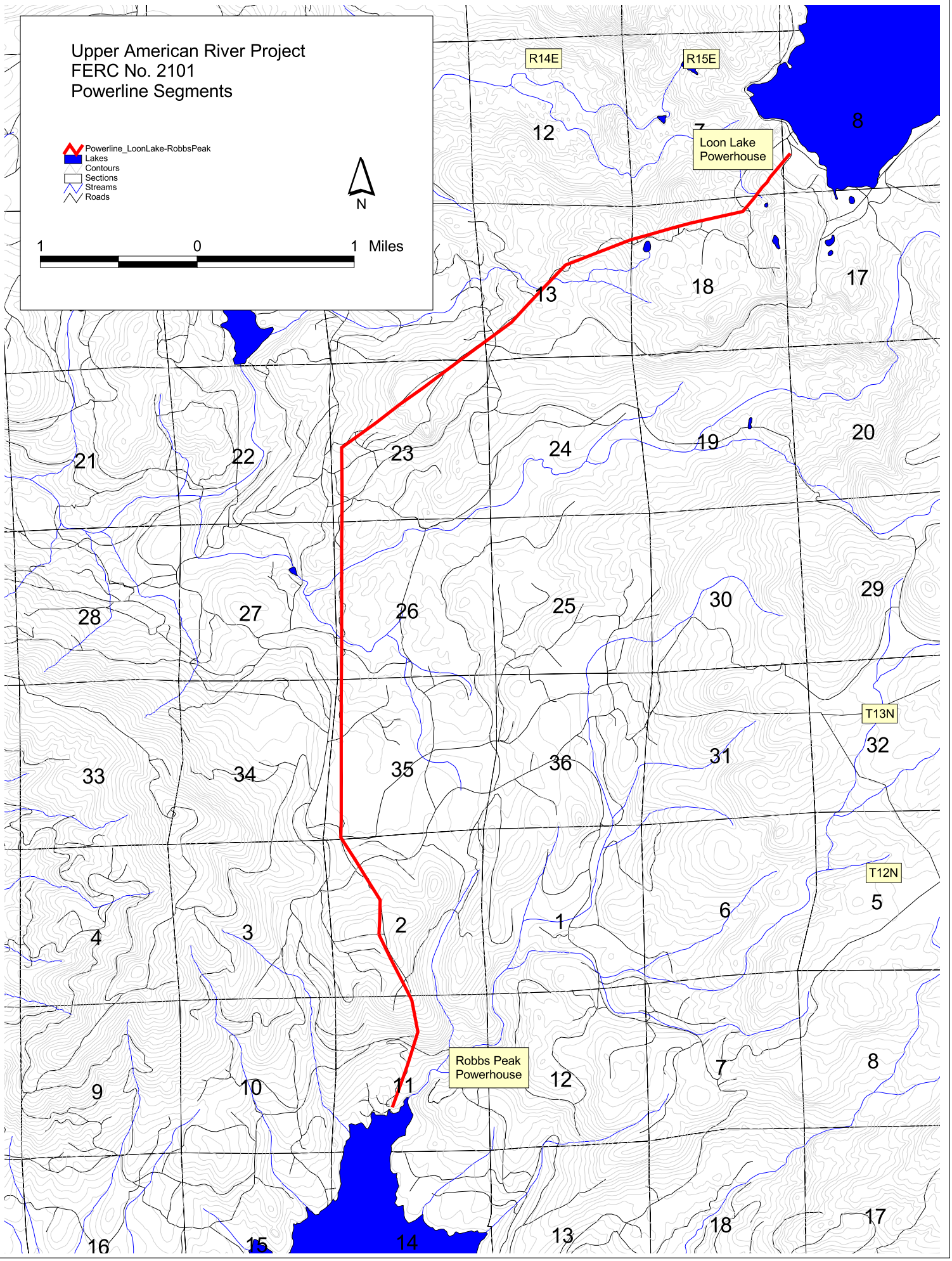
Upper American River Project
FERC No. 2101
Powerline Segments
Powerline_LoonLake-RobbsPeak
Lakes
Contours
Sections
Streams
Roads
N
1 0 1 Miles
R14E
R15E
Loon Lake Powerhouse
Robbs Peak Powerhouse
T13N
T12N
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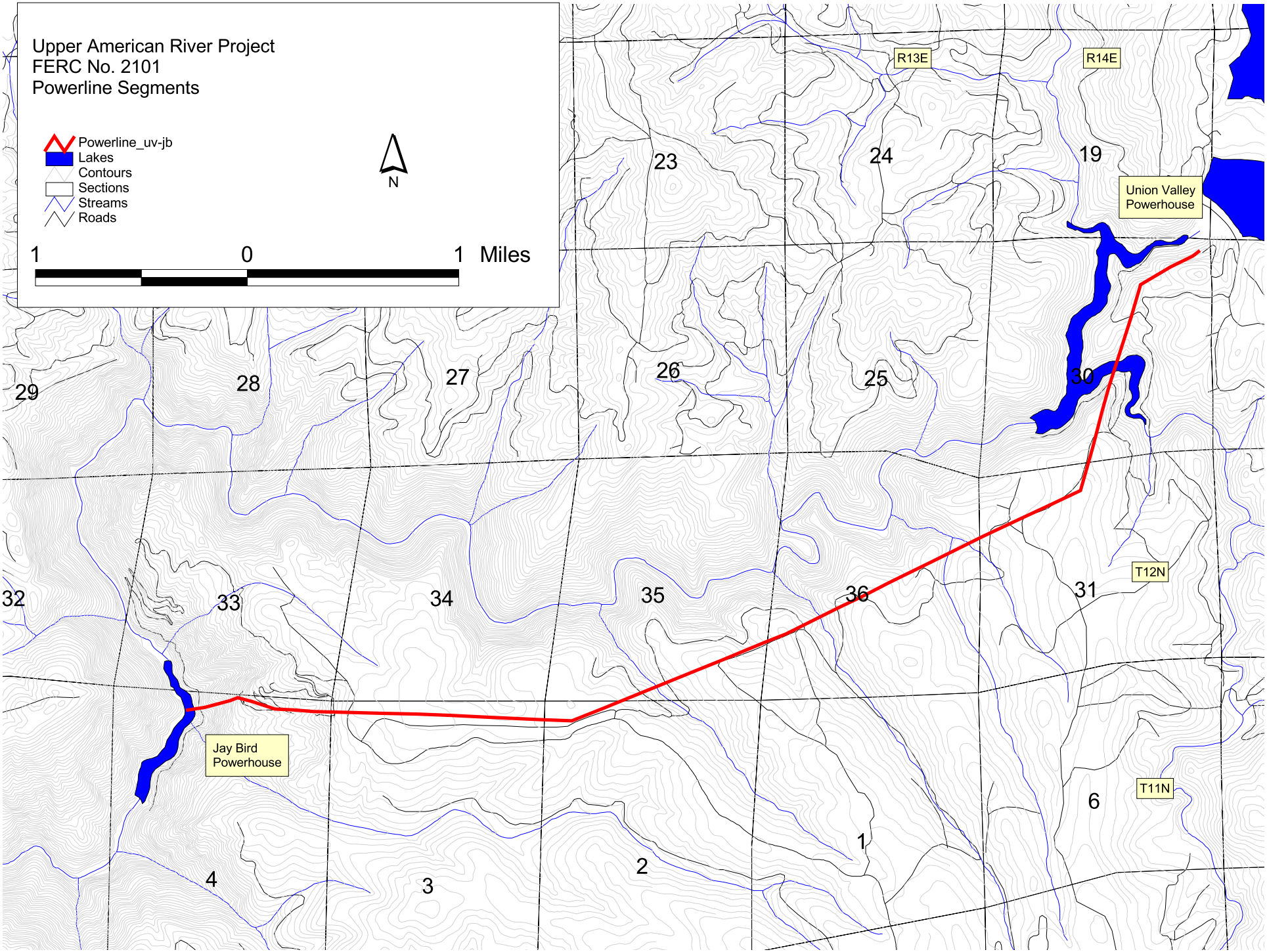
Upper American River Project
FERC No. 2101
Powerline Segments
Powerline_uv-jb
Lakes
Contours
Sections
Streams
Roads
N
1 0 1 Miles
R13E
R14E
Union Valley Powerhouse
Jay Bird Powerhouse
T12N
T11N
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