APPENDIX 2C – ALTERNATIVE ROUTES

2C-1. Data Sources

2C-1.1. *Cal Fire Fire Perimeters*

Distribution: Open

Location: http://frap.cdf.ca.gov/projects/fire_data/fire_perimeters/

Description: Comprehensive fire perimeter data.

Fields: Name, acres, agency, cause, year, month, day

Version: April 2007

Restrictions & Limitations: This data set includes only data through the 2006 fire season. The October 2007 fires are not included.
"include[s] timber fires 10 acres and greater in size, brush fires 50 acres and greater in size, grass fires 300 acres and greater in size, wildland fires destroying three or more structures, and wildland fires causing $300,000 or more in damage."
"The current fire perimeter layer developed by BLM, CDF, NPS and USFS is the most complete digital record of fire perimeters in California. However it is still incomplete in many respects. Fires may be missing altogether or have missing or incorrect attribute

data. Some fires may be missing because historical records were lost or damaged, fires were too small for the minimum cutoffs, documentation was inadequate, or fire perimeters have not yet been incorporated into the database. Agencies are at different stages of participation. CDF and the USFS have completed inventory for the majority of their historical perimeters back to 1950, while only 2002 - 2003 fires are currently present for BLM."
"Some duplicates may still exist. Additionally, over-generalization, particularly with large old fires may show unburned "islands" within the final perimeter as burned. Users of the fire perimeter database must exercise caution in application of the data."

Processing: Analyzed with ArcView.

2C-1.2. ***Scott & Burgan fuel models.***

Distribution: Open

Location: http://www.landfire.gov/dataproduct_natmap.php

Description: Based on the Scott and Burgan fuel models[1], which expand upon the older Anderson fuel models. Also provides a richer description of shrubland / chaparral. Included because effects of 2003 fires are reduced.

Fields: Fuel Type (NB – Non-burnable, GR – grass type, GS – Grass-shrub, SH – Shrub, TU – Timber Understory, TL – Timber Litter).

Restrictions & Limitations: Unlike the CDF Fuel Rank metric, this model does not take slope into account. Used as a hazard metric, it will tend to overpredict in level areas and underpredict in areas of greater slope.

Processing: Analyzed with ArcMap. Route analysis conducted for SPL and alternative routes and the results were put in Route_Analysis_SPLAlts.xls. The fuel models were divided into three classes on the basis of predicted flame lengths, as described in Phase 1 testimony[2].

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[1] Scott, Joe H.; Burgan, Robert E. 2005. Standard fire behavior fuel models: a comprehensive set for use with Rothermel's surface fire spread model; Gen. Tech. Rep. RMRS-GTR-153; Fort Collins, CO; U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station.

[2] MG-1; Phase 1 Direct Testimony of the Mussey Grade Road Alliance; A.06-08-010; Appendix E, pp. 17-18; Tables E-3 and E-4.

2C-1.3. *Cal Fire Fire Threat Data*

Distribution: Open

Location: http://frap.cdf.ca.gov/projects/fire_data/

Description: "Fire Threat is a combination of two factors: 1) fire frequency, or the likelihood of a given area burning, and 2) potential fire behavior (hazard). These two factors are combined to create four threat classes ranging from moderate to extreme."

Fields: Fire Rotation Class:

THREAT	DESCRIPTION
-1	LITTLE OR NO THREAT
1	MODERATE
2	HIGH
3	VERY HIGH
4	EXTREME

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               FIRE THREAT MATRIX

                  Rotation
                 0  1  2  3
                 ------------
        F   -1 | -1 -1 -1 -1
        u    1 |  1  1  2  3
        e    2*|  2  2  3  3   Threat
        l    3 |  3  3  3  4
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Restrictions & Limitations: Since it is based upon the 2001-2004 time frame of the Fuel Rank, this will also be biased by the 2003 fires, making it less suitable for long term projections.

Processing: Analyzed with ArcMap. Route analysis conducted for SPL and alternative routes and the results were put into Route_Analysis_SPLAlts.xls.

2C-1.4. *Fuel Rank*

Distribution: Open

Location: http://frap.cdf.ca.gov/projects/fire_data/

Description: "The fuel ranking procedure makes an initial assessment of rank based on an assigned fuel model (see surface fuels) and slope, then raises ranks based on the amount of ladder and/or crown fuel present to arrive at a fuel rank."
"The fuel ranking methodology assigns ranks based on expected fire behavior for unique

combinations of topography and vegetative fuels under a given severe weather condition (wind speed, humidity, and temperature)."

Fields: Fuel Rank : (-1 = Non-Fuel, 1 = Moderate, 2 = High, 3 = Very High)

Restrictions & Limitations: Data is from 2001 to 2004. Biased by 2003 fires, making it less suitable for long term projections.

Processing: Analyzed with ArcMap. Route analysis conducted for SPL and results put in Route_Analysis_SPLAlts.xls

2C-1.5. *Fuel Rotation*

Distribution: Open

Location: http://frap.cdf.ca.gov/projects/fire_data/

Description: "The fire rotation interval is the expected number of years it would take, based on past fire rates, to burn an area equivalent to that of a given stratum. Fire rotation interval for a given stratum is calculated by dividing the mean annual number of acres burned into the total area of the stratum."

Fields: Fire Rotation Class:

FROTCLASS	DESCRIPTION	NUMBER OF YEARS
0	UNDETERMINED	UNDETERMINED
1	MODERATE	> 300 Years
2	HIGH	100 - 300 Years
3	VERY HIGH	< 100 Years

Processing: Analyzed with ArcMap. Route analysis conducted for SPL and alternative routes and results put in Route_Analysis_SPLAlts.xls.

2C-1.6. *SDG&E SPL and SWPL GIS data*

Distribution: Open

Data Requests: MGRA-38

File Name: MGRA Data Request #3.gis

Location: http://www.sdge.com/sunrisepowerlink/info/MGRADR3ResponseMar-2-07.doc

Description: GIS shapefiles for SWPL and SPL (including alternatives) in ESRI shapefile format.

Fields: Line type, Segment (Alternative).

Processing: Analyzed with ArcMap. Route analysis conducted for SPL and results put into Route_Analysis_SPLAlts.xls. For use in route analysis, each line was selected and then divided into 1 km segments, and then written out to a new shapefile. These 1 km segments then formed the basis of the route analysis, where hazards are evaluated on a segment-by-segment basis. This allows a more quantitative comparison of line hazards for different routes.

An example of how this was done is shown in Phase 1 testimony[3].

2C-1.7. ***Alternative Route GIS data***

Distribution: On request

Location: Available from Aspen Consulting, on request.

Description: GIS shapefiles for Environmentally Superior Northern Alternative, Environmentally Superior Southern Alternative, and LEAPS.

Fields: Line type, Segment (Alternative).

Processing: Analyzed with ArcMap. Route analysis conducted for SPL and results put into Route_Analysis_SPLAlts.xls. For use in route analysis, each line was selected and then divided into 1 km segments, and then written out to a new shapefile. These 1 km segments then formed the basis of the route analysis, where hazards are evaluated on a segment-by-segment basis. This allows a more quantitative comparison of line hazards for different routes.

An example of how this was done is shown in Phase 1 testimony[4].

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[3] MG-1; Phase 1 Direct Testimony of the Mussey Grade Road Alliance; A.06-08-010; Appendix E, p.7; Figure E-1.

[4] MG-1; Phase 1 Direct Testimony of the Mussey Grade Road Alliance; A.06-08-010; Appendix E, p.7; Figure E-1.

2C-2. Analyses

2C-2.1. *Comparison of Fire Risk for the Proposed STP Route and Alternatives*

2C-2.1.1. Goal

This section takes the methods applied to the MGRA Phase 1 testimony and applies them to the alternative routes so that the fire hazards can be directly compared between the alternatives.

2C-2.1.2. Description

Part of the goal of the EIR/EIS was to compare environmental impacts (including fire) of alternative routes. The metrics and methods used by the EIR/EIS to calculate fire hazard are extensive and include site surveys and fire modeling, among many other factors[5]. One significant shortcoming in this approach it is that the line alternatives are not analyzed in a manner that allows direct side-by-side comparison. This is important, because while all routes may have Class I impacts in terms of fire risk, in fact the risk will be expected to be proportional to the exposure of the transmission line to hazardous vegetation. This means that the relative risks of various routes can be quantified and compared. An extensive comparison of various line segment alternatives is performed in the EIR/EIS[6], however the valuations are qualitative rather than quantitative. Additionally, when comparisons are performed, they are often given in terms of percentages rather than absolute exposures[7].

Another shortcoming is that the fuel assessments have been done in the aftermath of the largest fires in recent California history (2002-2003 fires, including the Cedar Fire), and these will have significantly (though temporarily) reduced the fuel load. How this affects fire risk assessments is not specified in the EIR/EIS.

The Alliance offers an expanded version the vegetation analysis done in its Phase 1 testimony[8] that allows a direct comparison of the various routes. While it does not claim

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[5] DRAFT Environmental Impact Report/Environmental Impact Statement and Proposed Land Use Amendment (EIR/EIS); San Diego Gas & Electric Company Application for the Sunrise Powerlink Project; SCH #2006091071; DOI Control No. DES-07-58; California Public Utilities Commission and U.S. Department of Interior Bureau of Land Management; Prepared by *Aspen Environmental Group* January 2008; pp. D.15-65-D.15.69

[6] EIR/EIS; Section H, pp. H-1 – H1-160.

[7] Examples can be found in the EIR/EIS at Table E1.15-11, E7.1-37.

[8] MG-1; Phase 1 Direct Testimony of the Mussey Grade Road Alliance; A.06-08-010; Appendix E.

that these methods are superior to those used in the EIR/EIS, it presents the results in this Appendix to demonstrate direct quantitative comparisons between fire risk exposures for the various alternative routes. The metrics developed by the CPUC and Aspen for application in the EIR/EIS could be (and should be) similarly presented.

2C-2.1.3. Methods

The methods applied are identical to those in Appendix E of the MGRA Phase 1 testimony[9]. Route data was obtained from either SDG&E or the CPUC[10]. This was divided up into 1 km segments. Each of these segments was examined in combination with a wide variety of GIS data, including vegetation, fire risk, number of fires, earthquake risk, public land exposure, and jurisdiction. This data has been tabulated in the file below:

RouteAnalysis_SPLAlt_2.4.xls

File 2C-1 – Route analysis file for SPL, SWPL, the "Environmentally Superior" Northern and Southern Alternatives, and LEAPS. This shows each route divided into 1 km segments, and shows the exposure of each segment to a variety of environmental conditions.

Five routes were analyzed: The original proposed Sunrise Powerlink route (SPL), the "Environmentally Superior" Northern Alternative (ESNA) and Southern Alternative (ESSA), LEAPS, and the Southwest Powerlink (SWPL) for reference purposes. The various exposure conditions can be summed over each route to allow quantitative comparisons of the exposures between routes.

We use three metrics to determine the exposure of each route to hazardous vegetation: the Cal Fire Fuel load (ranked 0-3), Cal Fire Fire Threat (fuel load with recurrence, ranked 0-4), and the Scott-Burgan vegetation type (ranked according to potential flame lengths calculated by Scott and Burgan[11] and classified as described in Table E-3 of Appendix E of the MGRA Phase 1 Direct Testimony[12]. Figures showing the

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[9] Ibid. Description of the various methods used to apply each metric are described.

[10] See sections 2C-1.6 and 2C-1.7.

[11] Scott, Joe H. and Burgan, Robert E.; 2005; Standard fire behavior fuel models: a comprehensive set for use with Rothermel's surface fire spread model; Gen. Tech. Rep. RMRS-GTR-153; Fort Collins, CO; U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station.

[12] MG-1; Appendix E; p. 17.

fuel load, fire threat, and Scott-Burgan vegetation type may be found in Appendix E of the Phase 1 testimony (Figures E-2, E-5, and E-7, respectively).

These exposures were tallied and summed on a per line basis. Where lines have been undergrounded, no fire exposure is assumed. Also, the results in this section do not independently treat 230 kV, 500 kV, and 69 kV (found in the LEAPS proposal) transmission lines, and therefore assume that they would all have an equal risk of igniting wildland fires.

2C-2.1.4. Analysis

All of the proposed and reference routes pass through areas of flammable vegetation with significant risk of wildland fire. This is displayed in the figure below, which shows all of the proposed and reference routes superimposed on the Cal Fire / FRAP Fire Threat map provided from the Cal Fire FRAP project.

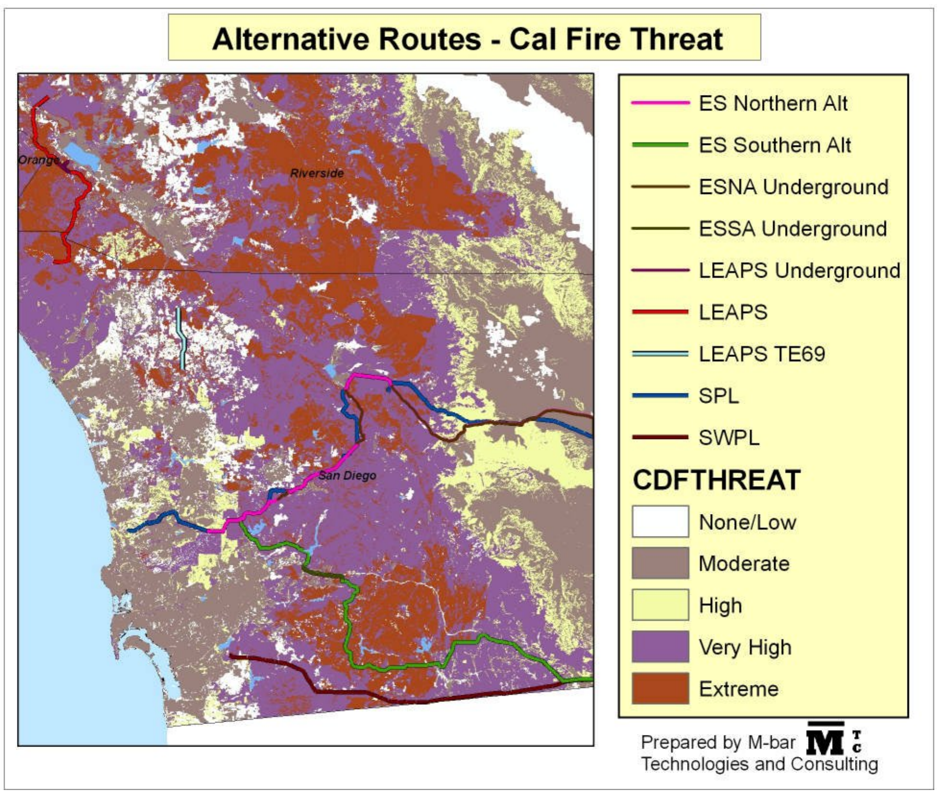

Figure 2C-1- The SPL, the Environmentally Superior Northern and Southern Routes (ESNA/ESSA), LEAPS, and SWPL (for reference) are shown superimposed on the Cal Fire / Frap Fire Threat map. Underground segments are shown in dark colors, and do not represent an ignition hazard. The end points for the ESNA and ESSA are identical and are indicated by the western endpoint of the magenta ESNA line. LEAPS would require that a segment of the Talega-Escondido line would need to be upgraded and the existing 69kV moved on to new poles. This segment is indicated by the light blue "LEAPS TE69" line.

Comparing the lengths of route that would be exposed to various Cal Fire fuel rank classifications yields the result shown in the figure below.

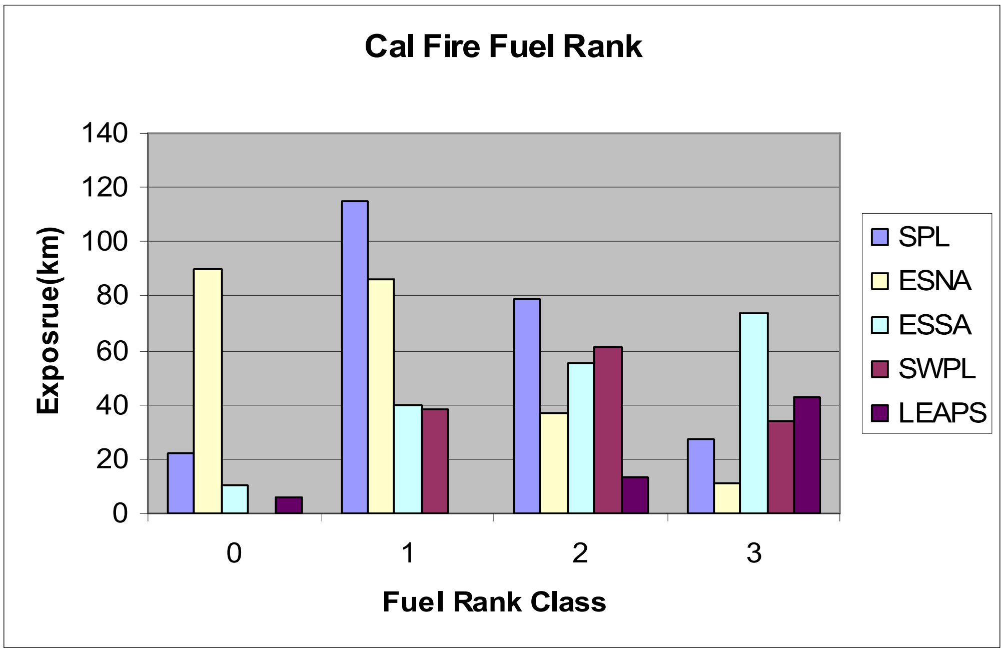

Figure 2C-2 – This figure displays the number of kilometers of route path that would pass through vegetated areas of the given Cal Fire fuel rank class. Each of five routes is displayed for each rank. From left to right they are SPL, ESNA, ESSA, SWPL (for reference only), and LEAPS.

Several conclusions can be drawn from this figure. First, that the ESNA – which is primarily the proposed SPL route, shortened, and partially undergrounded – has less exposure to hazardous vegetation conditions than does SPL due to the fact that it *is* partially undergrounded and shorter. The ESNA alternative calls for approximately 50 miles of undergrounded transmission line, as opposed to the approximately 10 miles of undergrounding planned for the original SPL route.

Another thing that can be gleaned from the above figure is that the SPL and ESSA have equivalent exposures to highly flammable vegetation. While ESSA would seem to have more exposure to the very highest fuel loads, this is (as described in the limitation section below and in previous testimony) primarily an artifact of the October 2003 fires, which affected the northern route much more than the southern. These caused a temporary reduction in fuel load, which will increase again over the next two decades.

It should be noted that all transmission routes have significant exposure to flammable vegetation and represent a fire risk. This is acknowledged in the EIR/EIS for all transmission routes studied, and given designation as a Class I impact for all routes as impact F-2: "Presence of the overhead transmission line would increase the probability of a wildfire."[13]

Similar results are obtained using the Cal Fire / FRAP Fire Threat metric, which also takes into account fire recurrence intervals as well as fuel. This is shown in the figure below:

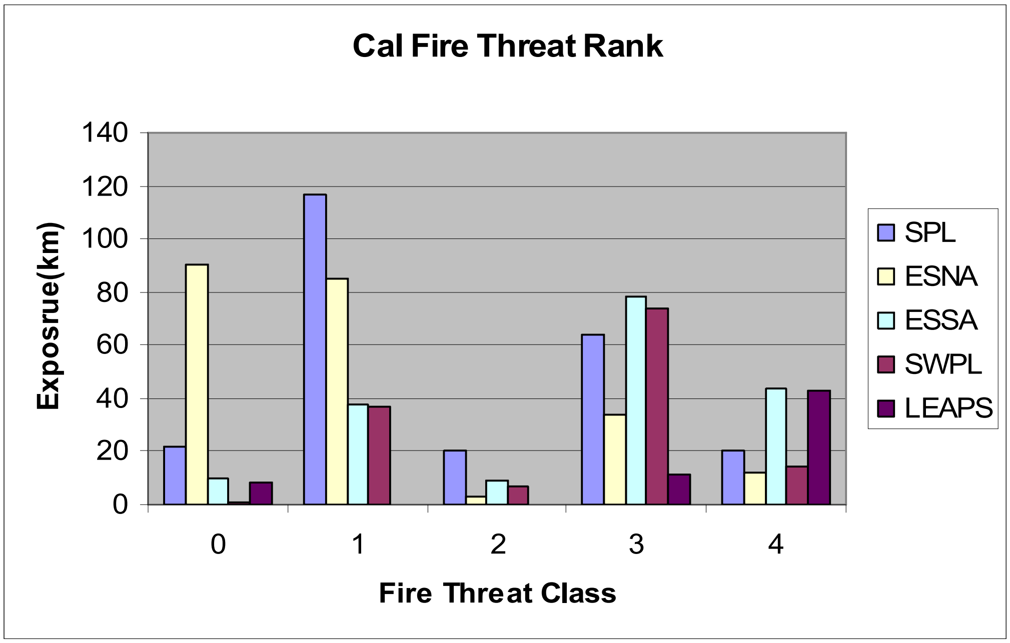

Figure 2C-3 - This figure displays the number of kilometers of route path that would pass through vegetated areas of the given Cal Fire threat rank class. Each of five routes is displayed for each rank. From left to right they are SPL, ESNA, ESSA, SWPL (for reference only), and LEAPS.

Since these two metrics are derived from the same data it is not surprising that they would have results that closely correspond to each other.

In order to obtain a alternative set of data, a metric was obtained using the Scott-Burgan vegetation types as described in section 2C-1.2, also applied in Appendix D of the MGRA Phase 1 testimony. This data was released in 2006, and is slightly less biased by the 2003 fires. It does not, however, take into account other factors such as slope, aspect, and humidity that are taken into account in the Cal Fire Fuel Rank. This Scott-Burgan metric classifies vegetation types according to potential flame heights. When this is applied to the MGRA route analysis, the following result is found:

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[13] Draft EIR/EIS; pp. D.15-70 – D.15-71 and many other places.

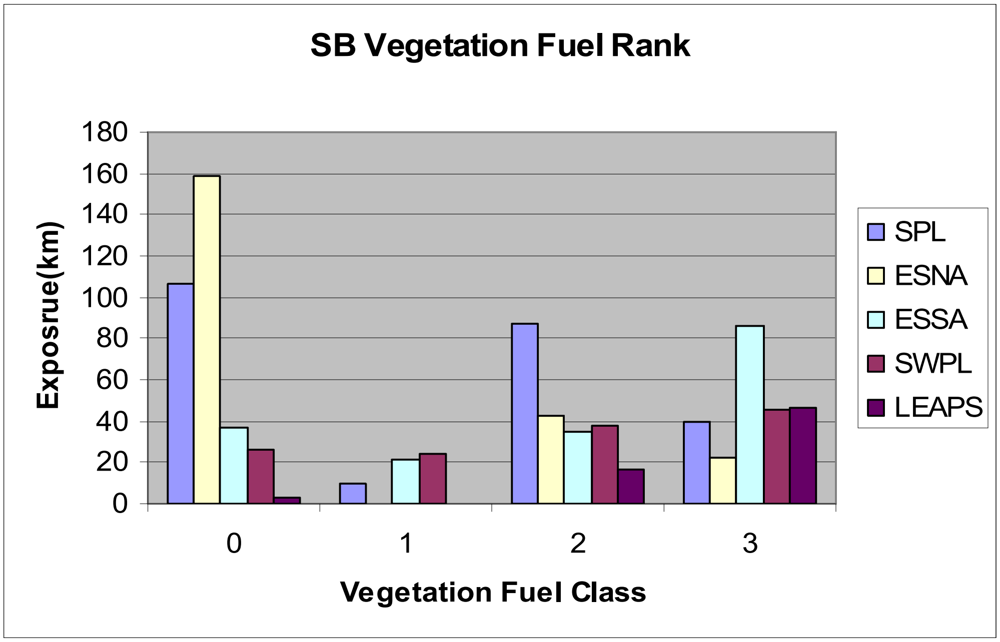

Figure 2C-4 – This figure displays the number of kilometers of route path that would pass through vegetated areas having a certain flame-length range derived from their Scott-Burgan vegetation classification. Each of five routes is displayed for each rank. From left to right they are SPL, ESNA, ESSA, SWPL (for reference only), and LEAPS.

There are a couple of differences between this result and those derived from the Cal Fire data. First, the Cal Fire results tend to indicate that the Environmentally Superior Southern Alternative (ESSA) has the longest travel through hazardous fire zones, somewhat longer than the proposed project. The Scott-Burgan vegetation fuel rank, though, indicates that the proposed SPL route and the ESSA are roughly equivalent in hazardous vegetation traversed. The Environmentally Superior Northern Alternative (ESNA) is roughly equivalent to LEAPS in all metrics measured.

These results are summarized in the table below.

Route	**CF Fuel > 1**	**CF Threat >1**	**SB Vegetation >1**
SPL	106	104	127
ESSA	129	131	121
SWPL	95	95	83
ESNA	48	49	65
LEAPS	56	54	62

Table 2C-1 – This table compares the number of kilometers of exposure to hazardous vegetation for alternative transmission line routes (and also SWPL, for comparison), using three different exposure metrics. Two of these are from Cal Fire's FRAP data (fuel rank and fire threat), while one is derived from the Scott-Burgan fire model maps supplied by Landfire.

2C-2.1.5. Limitations

The data used for both the Cal Fire fuel load and fire threat metrics was based upon a 2004 survey that occurred in the aftermath of the Cedar fire. This temporarily reduced the fuel hazard ranking of a wide area, much of which is traversed by the proposed route for SPL. This was confirmed by SDG&E's witness Hal Mortier during cross-examination[14].

Alternatives vary as to the relative proportion of new 500 kV, 230 kV and 69 kV (for LEAPS) transmission line to be constructed. These may have systematic differences

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[14] Cross Examination of witness Mortier; Public Utilities Commission, State of California; A0608010; July 17, 2007; p.1007.
Exhibit MG – 10; CDF Fire Threat - Pre-Cedar (2003)/Pines(2002) Fires;
Exhibit MG – 11; CDF Fire Threat - Post Cedar (2003)/Pines (2002) Fires;
Exhibit MG – 12; CDF Fire 2003 - Pre-Cedar/Pines Enlarged "Sunrise" Northern Loop

in their relative risk. This will be discussed in Appendix 2D. Also, this analysis does not take into account wind conditions, which are a major determinant of power line wildland fires.

Other limitations to this approach are discussed in the Limitations sections of Appendix D of the Phase 1 testimony.

2C-2.1.6. Conclusions

While these analyses are not as accurate as site surveys such as those done for the EIR/EIS, we argue that the metrics presented in the Draft EIR / EIS should be similarly quantified for ready comparison of fire hazards between various routes.

The "Environmentally Superior" Southern Alternative and the original SPL route seem to be roughly equivalent in their exposure to hazardous vegetation, with the ESSA being slightly higher using the Cal Fire metrics. LEAPS and the ESNA (which is simply a shortened original route with significant undergrounding of the line) are roughly equivalent in their exposure using all three of the above metrics.

All routes have significant exposure to power hazardous vegetation, and all are correctly rated as Class I impacts due to fire hazard in the Draft EIR/EIS.