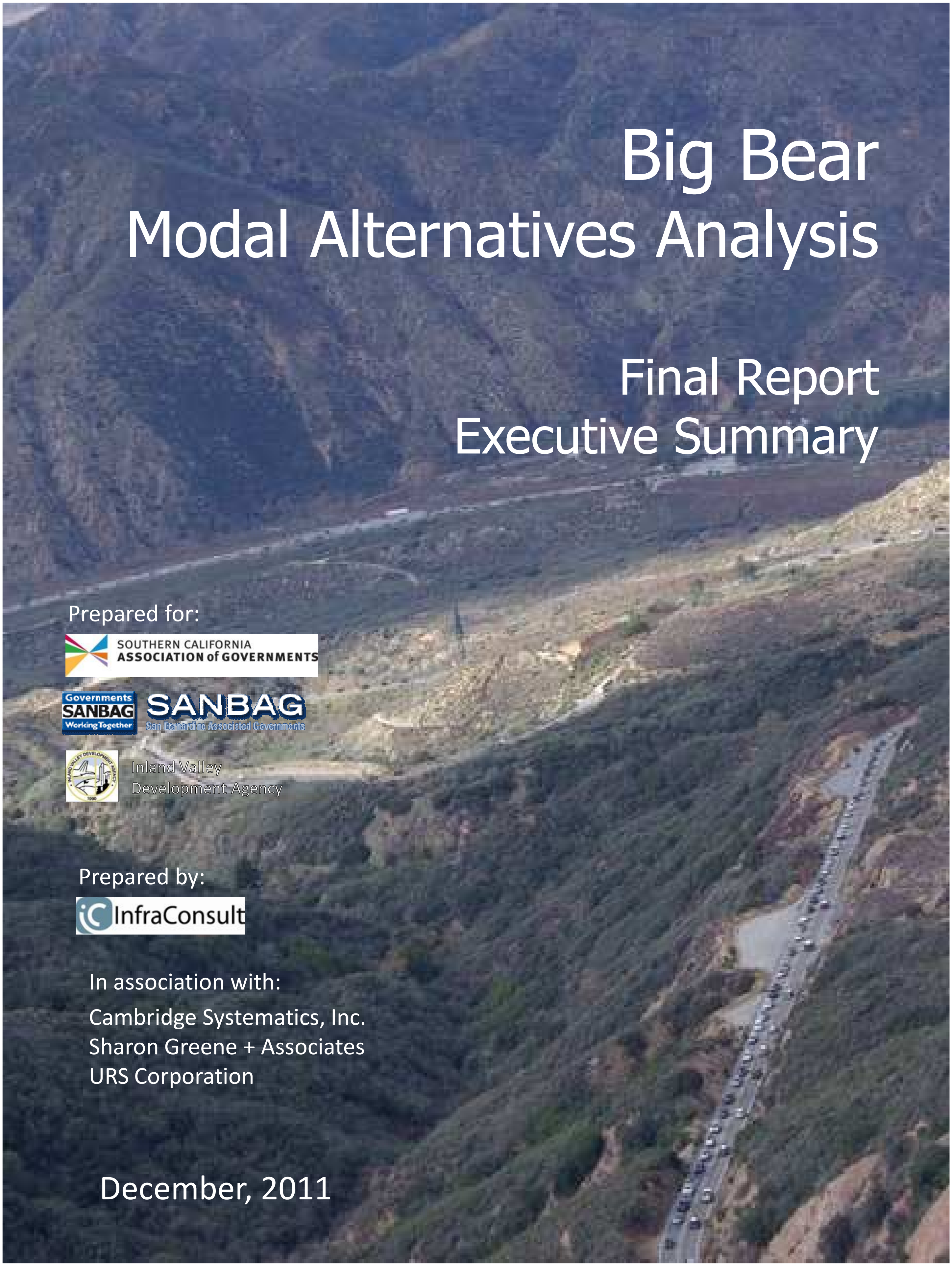

Big Bear
Modal Alternatives Analysis

Final Report
Executive Summary

Prepared for:

SOUTHERN CALIFORNIA ASSOCIATION of GOVERNMENTS

SANBAG
San Bernardino Associated Governments

Inland Valley Development Agency

Prepared by:

InfraConsult

In association with:

Cambridge Systematics, Inc.
Sharon Greene + Associates
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EXECUTIVE SUMMARY

ES.1 Background

Society is increasingly recognizing the need for man to live in balance with the environment, using the earth's natural assets in ways that will sustain a high-quality living standard over time without depleting essential resources. Planners of future transportation can contribute to a sustainable culture by developing systems that provide mobility with less reliance on fossil fuels, increased use of renewable sources, less disruption of the natural environment, and fewer emissions of pollutants and greenhouse gases. In few places around Southern California are these issues more relevant than in the mountain travel corridor between the Los Angeles Basin and the communities around Big Bear Lake.

Located high in the San Bernardino National Forest, the Big Bear Valley is both an active community and a popular recreation destination throughout the year. Primary access to Big Bear from the San Bernardino Valley and the greater Los Angeles metropolitan area is limited to three state highway routes through National Forest land, with just two lanes of capacity through most of the mountain areas. These routes have been increasingly plagued by a number of challenges that inhibit safe and convenient travel. Sections with steep grades, frequent switchback curves, limited sight distance, and slow-moving vehicles can make these roads a challenging drive under even the best of conditions. During winter snow storms, when travel demand is at its peak, travel is especially arduous due to icy conditions, chain requirements, and all-too-frequent traffic incidents. Access to the mountains has been affected by road closures for extended periods due to heavy snow, earth movement covering or undermining the road, and wildfire.

Without improvements to the system, traffic and maintenance-related problems can be expected to worsen. Weekend traffic congestion on the state highways can be expected to increase, resulting in longer periods of congestion during peak times. As traffic volumes and congestion levels increase, collision rates also typically increase. As the roadway and drainage system continues to age and deteriorate, road closures are likely to become more frequent and longer.

In addition, the future potential of the Big Bear Valley is constrained by the access limitations imposed by the highway system. No significant improvements to the roadway system are currently programmed or planned due to public sector financial constraints and the substantial environmental impact that would be associated with any major roadway capacity project in the mountains.

Various types of roadway-based strategies have been suggested to help address the system's capacity deficiencies. Each approach would increase capacity, improve roadway operations and safety, or make better use of existing capacity, but all have significant financial, environmental, or community impact issues that make them unsatisfactory approaches to addressing the long-term access needs.

On the other hand, adding capacity by developing an alternative (non-roadway) transportation mode offers advantages that a roadway improvement could not:

- An alternative system could provide convenient mountain access with minimal or no auto driving for people throughout the greater Los Angeles metropolitan area via a connection to Metrolink in San Bernardino.
- An alternative system would enable the mountains to accommodate more users for skiing, snow play, and summer recreation without the need to expand roads or parking areas.

- An alternative system could be developed along a different alignment than the existing roadway system. Therefore it might be usable during an emergency (such as wildfire or earthquake) for evacuating people or bringing in emergency personnel and equipment even if the roadways were shut down.
- An alternative system would be operable after a major snowstorm or during other types of road closures, so people and goods could move up and down the mountain even if one or all of the key mountain access roads are closed.
- The new system itself would be a tourist attraction, providing additional ridership and revenue, and providing an economic boost to areas where stations are located.
- For some types of goods, an alternative system might provide a cheaper and more efficient means of shipment to the mountain communities.

In addition, an alternative mode would likely be a more environmentally friendly alternative than road improvements.

- It would have a smaller environmental "footprint" than roads, so it would be expected to have less impact on the lands it passes through.
- It would emit fewer vehicular and greenhouse gas emissions than carrying the same number of people in autos and other vehicles.
- It would operate using a "greener" energy source (likely electricity) than the internal combustion engine.
- It would provide opportunities for transit-oriented development near mountain stations, making it possible for people to live and work and travel without need for a car.

Because of these factors, the Cities of Big Bear Lake, San Bernardino, and Highland, and the County of San Bernardino have partnered with the region's transportation planning agencies (the San Bernardino Associated Governments, the Southern California Association of Governments, and Caltrans) and the Inland Valley Development Agency to explore the feasibility of non-roadway alternatives for future transportation of people and goods between the San Bernardino and Big Bear Valleys. This study, and a similar effort completed in 1996, explores the feasibility of developing a non-roadway mountain transportation alternative, based on the recognition that a prosperous future in the Big Bear Valley depends upon the Southern California Region's ability to take advantage of the four-season recreational assets of the San Bernardino Mountains.

ES.2 Opportunities and Constraints

Demographics

The full-time population in Big Bear is forecast to grow slowly, so visitors and part-time residents represent the demographic groups with the most future growth potential. In the City of Big Bear Lake, over 70% of the housing units are not occupied year-round and serve either as second homes or seasonal rentals; in the surrounding unincorporated areas, the percentage is approximately 50%.

Travel Conditions

Traffic congestion and road closure problems combine to indicate a clear need for additional transportation capacity to accommodate future growth in travel to and from the mountains. An alternative transportation system is an attractive alternative to adding roadway capacity because it could:

- Provide transportation of people and goods in all kinds of weather;
- Provide an alternative mode and/or route of access during an emergency;
- Have a smaller environmental “footprint” than building new roads or widening existing roads; and
- Facilitate expanded recreation opportunities in the mountains without proportional expansion of roadway and parking capacity.

Moving People with an Alternative System

The following are important factors to consider when implementing alternative methods to transport people:

Competitiveness with auto travel: To be able to attract significant numbers of riders, the new system would need to provide an overall travel time that is competitive with auto travel. This will be a determining factor in the selection of appropriate technologies.

Convenience of transporting personal belongings: To be attractive for carrying leisure travelers (weekend visitors to the mountains) or recreational trips (skiers, snow play visitors, and summer recreation visitors), the system will need to have a convenient process for loading and unloading personal belongings such as luggage and ski equipment. Since much of the corridor travel involves leisure or recreational trips, for the system to be successful it will need to conveniently serve this user group.

Distribution of people and goods: The system for distributing people (and their belongings) at the mountain end of the trip will be an important factor in attracting riders. While some destinations may be within walking distance of the stations, many destinations are dispersed throughout the mountains, so planning for an alternative system will need to include consideration of methods for moving people between the stations and their ultimate destinations. Likewise, a convenient and efficient method of moving freight from stations to its destination will be important for capturing a portion of the goods movement market.

Physical Factors

The following are important physical factors to consider:

Grades: The rapid elevation changes encountered in the mountains dictate that an alternative transportation system use a technology than can safely negotiate steep grades.

Environmental factors: When evaluating potential alignments, several environmental factors should be considered, and avoided to the extent possible, including potential landslide areas, earthquake fault zones, potential liquefaction areas, high fire hazard areas, flood plains, water courses, species habitat, and cultural resources.

Station locations: Communities to be served with stations should be selected to provide accessibility to the developed mountain communities and activity centers in the corridor; ideally, therefore, mountain stations would be located in Running Springs, Snow Valley, and Big Bear Lake (the Village area and the China Gardens/Interlaken area). Valley stations should provide park-and-ride opportunities, potential for goods movement transfers, and connections to public transportation. Stations in Highland, at San Bernardino International Airport, and at the proposed downtown Metrolink station would serve these functions.

Right of Way Issues

Coordination and consultation with the US Forest Service will be essential for the project to be successfully implemented.

Land Acquisition will likely be necessary in the developed mountain areas, where potential station sites may be located. In the San Bernardino Valley portion of the corridor, considerations for property acquisition or operating easements will also influence project viability.

ES.3 Technologies

The study identified and evaluated the range of available technological alternatives that could provide passenger and freight service from the San Bernardino Valley to Big Bear Valley. These included:

- Aerial ropeway systems with self-propelled vehicles
- Cable-propelled systems
- Suspended monorails
- Cog railways
- Funicular railways
- Air travel

Various alignments incorporating these technologies were examined in the 1996 Study to service a wide range of topographical characteristics from level grade urbanized areas to mountainous steep-grade terrain. This analysis updated the technology review performed in the 1996 Study, and sought out the latest technological advances by establishing contact with manufacturers of fixed-guideway transit systems to identify contemporary applications that would be relevant to the Big Bear corridor.

Route Length: One of the most significant challenges is the scale of the proposed Big Bear project. Most of the existing aerial transportation systems are much shorter in length/distance than the 35+/- mile system being contemplated for Big Bear. In fact, the longest elevated ropeway system that the project team was able to identify is in Sweden and is approximately nine miles in length.

Topography: Another challenge of the Big Bear project is the steep mountain grades. Preliminary alignments include areas with grades exceeding 20%, and both at-grade and aerial systems have the capability of operating at this level of incline. However, for optimal passenger comfort and operations, systems are typically designed for no more than an 8% grade. After review of the Big Bear conceptual system needs, lengths and gradients, and discussions with representatives from Dopplemayr LLC, the analysis concluded that aerial ropeway systems are best suited for shorter distances, and developing and operating a 30+ mile systems using aerial ropeway technology is not recommended.

Freight Capabilities: Research has revealed that most areas rely on trucking for freight hauling to mountain destinations, with fixed-guideway systems limited to passenger travel. All of the systems evaluated have the potential to carry freight, with varying capacities. Cog rail systems offer good freight capacity and capabilities. Self-propelled aerial ropeway technology has the capability but is unproven, while the elevated monorail and aerial cable propelled systems have limited cargo hauling capacity.

Travel Speeds: Cable propelled ropeway systems have limited speed capability, and vehicles would need to transfer between rope systems several times over the length of the corridor, so this technology could not be at all competitive with automobile travel. Elevated monorail and self-propelled ropeway technology have the potential for competitive speeds, but there have been no installations of these technologies in a corridor this long to demonstrate their capability. Cog rail operates at competitive speeds over long distances through the Alps.

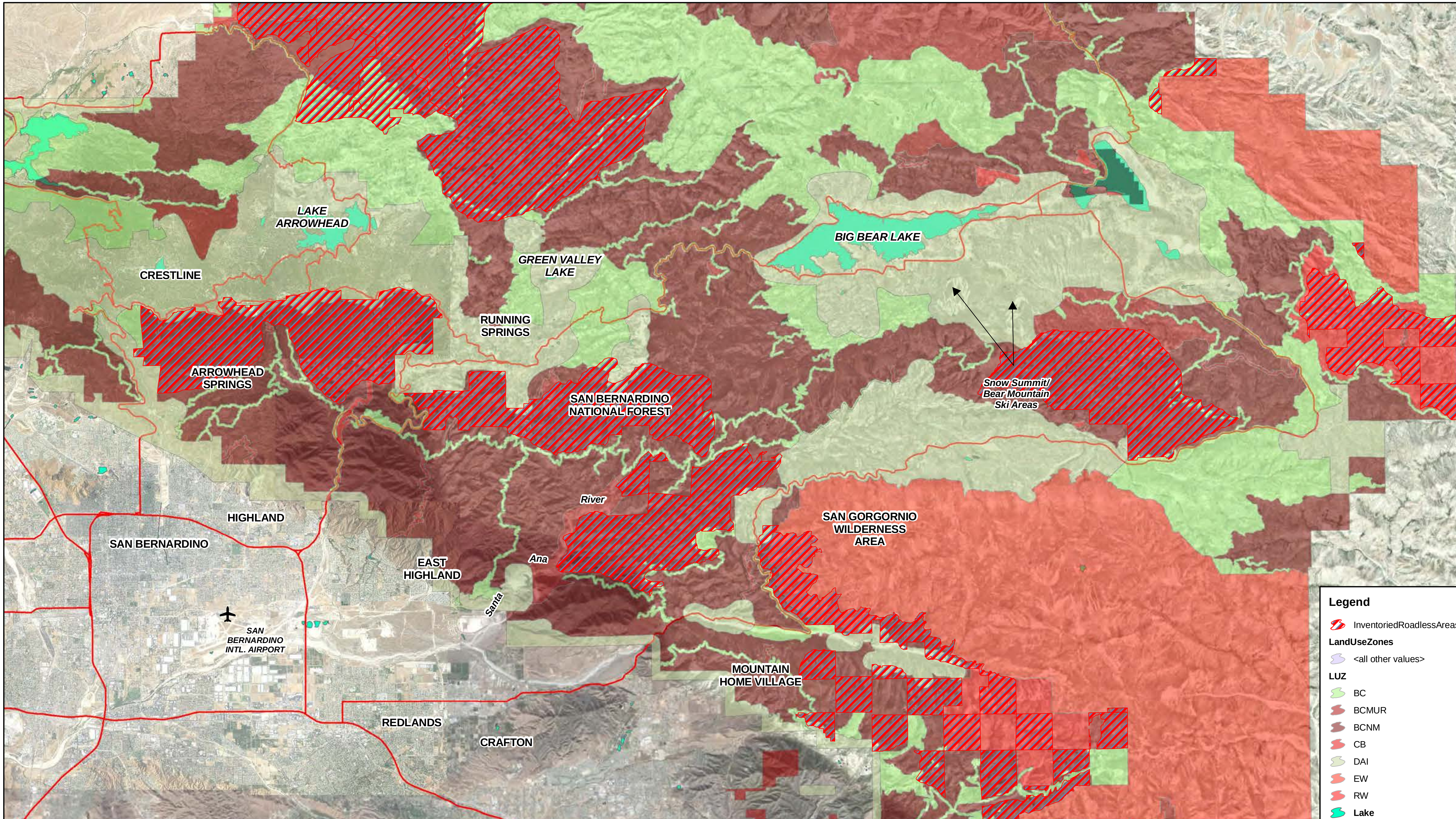
Technology Recommendation: Only the cog rail technology, which has demonstrated abilities to operate long distances through steep mountain terrain and inclement weather, is recommended to be carried forward for additional analysis and system planning.

ES.4 Alignment Alternatives

The 1996 study evaluated a number of potential alignment options through the mountain portion of the corridor from Highland to Big Bear Lake. Consultations with local US Forest Service representatives brought out the fact that the nine alternative alignments studied in 1996 pass through National Forest areas designated as incompatible with transportation uses. USFS representatives have indicated that, while it would be possible to obtain approval for a new transportation system through these areas, it would involve an extensive review and approval process within the Forest Service.

Because the National Forest land use conflicts could represent a significant impediment to the original nine alignments, the study team and Technical Advisory Committee (TAC) identified additional alignments that would eliminate or minimize corridor intrusion into roadless and non-motorized areas. Using the Forest Service mapping of compatible land use areas (shown in green colors in Figure ES.1) and non-compatible areas (shown in browns and reds), the study team and TAC identified six alternative corridors for further study, with potential variations in four of the six corridors. The alternative corridors (shown in Figure ES.2) are numbered from 1 to 6 from west to east. With variations, a total of 13 alignment alternatives were carried forward into the evaluation of system alternatives.

Figure ES.1 - USFS Land Uses

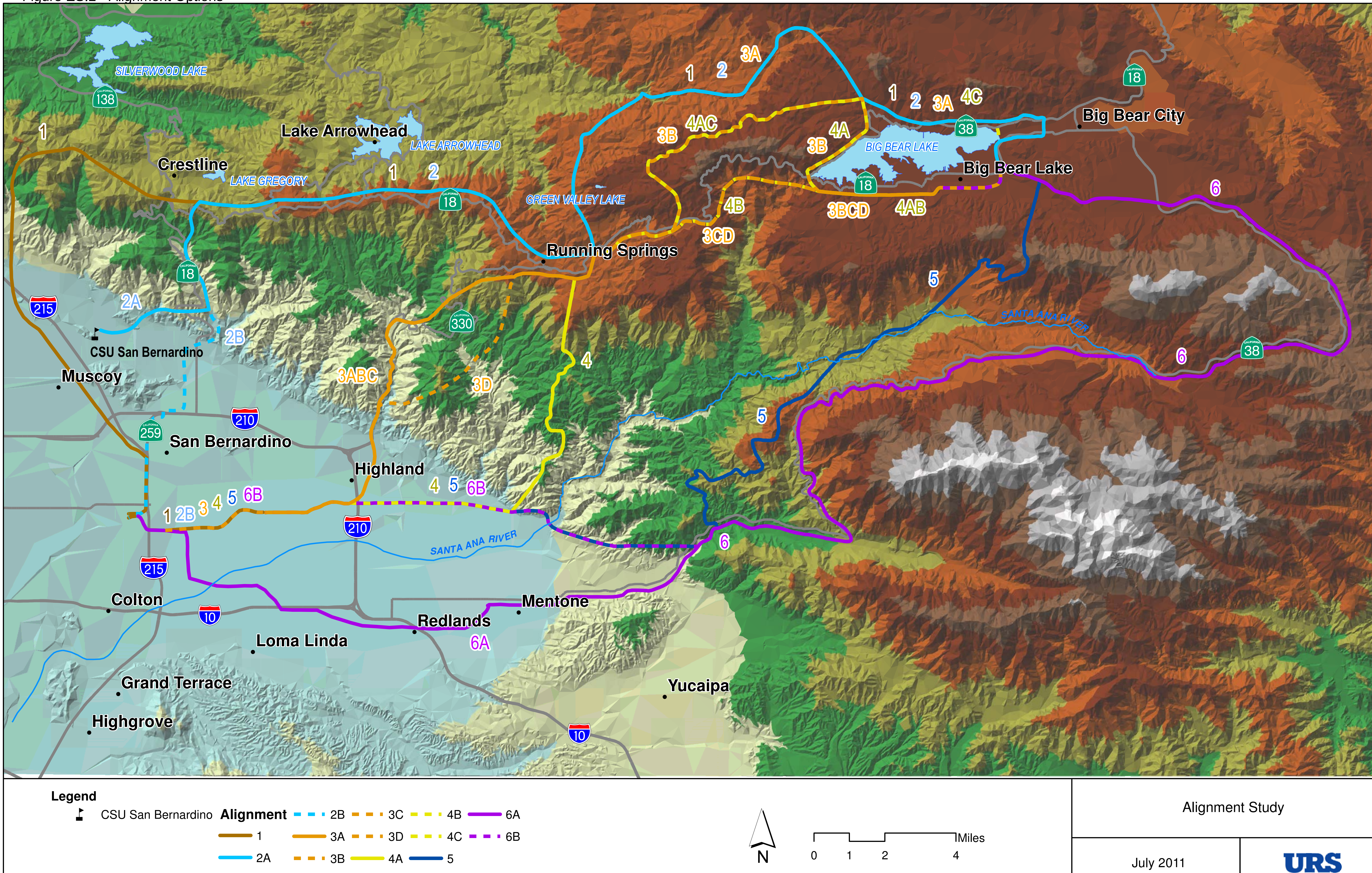


Source: USGS National Hydrography Dataset

Big Bear Modal Alternatives 2010

USFS Roadless Areas
USFS Land Use Zone (LUZ)
Green: transportation allowed
Red: transportation not allowed

Figure ES.2 - Alignment Options



ES.5 Evaluation Results

The evaluation analyzed each of the 13 system alternatives in regard to capital costs, annual operating costs, total travel time from San Bernardino to Big Bear Lake, portion of the alignment requiring cog rail operation (greater than 8% slope), estimated annual ridership and passenger revenue, estimated weekly tonnage of goods movement and annual freight revenue, the portion of the alignment crossing roadless or non-motorized areas of the National Forest, the portion crossing sensitive habitat areas, and the portion crossing geologically unstable areas. To provide a snapshot of the magnitude and range of results, Table ES.1 depicts the performance results of the alternatives with the best and worst performance for each criterion. Table ES.2 summarizes the results for each criterion and each of the 13 alternatives.

Table ES.1 - Range of Performance Results

Criterion	Best Alternative Result	Worst Alternative Result
Length of Alignment	30 miles	58 miles
Capital Cost (2011 $)	$2.8 – 5.0 billion	$5.2 – 9.6 billion
Annual Operating Cost	$11.8 million	$13.8 million
Total travel time	72 minutes	114 minutes
Cog rail operation	0 miles (of 54 total miles)	7.5 miles (of 37 total miles)
Estimated 2035 annual passengers Annual passenger revenue	981,000 $16.5 million	575,000 $9.6 million
Weekly goods movement Annual freight revenue (high rate freight strategy)	870 tons $6.7 million	525 tons $5.5 million
Roadless & non-motorized areas: Distance across Distance adjacent to	 0 miles (of 57 miles total) 0.6 miles (of 32 miles total)	 9.2 miles (of 32 miles total) 17.9 miles (of 54 miles total)
Distance across sensitive habitat areas	0.5 miles (of 40 total miles)	5.2 miles (of 41 total miles)
Distance across Very High Landslide Risk areas	2.0 miles (of 51 total miles)	22.6 miles (of 54 total miles)

Table ES.2
Big Bear Modal Alternatives Analysis
Evaluation Results Summary Matrix

Alternative	**1**	**2A**	**2B**	**3A**	**3B**	**3C (original Alt. 3)**	**3D (original Alt. 4)**	**4A**	**4B (original Alt. 5)**	**4C**	**5**	**6A**	**6B**
Description													
Corridor	Devore	Waterman	Waterman	Highland/ SR-330	Highland/ SR-330	Highland/ SR-330	Highland/ SR-330	East Highland	East Highland	East Highland	Radford Camp Rd.	SR-38	SR-38
Route		To CSUSB	To SR-210	Via City Creek, 2W03, Division	Via City Creek, 2N13, BB Dam	Via City Creek, Arctic Circle	Via Plunge Creek, Arctic Circle	Via 2N13, BB Dam	Via Arctic Circle	Via 2N13, Division		Via Redlands	Via East Highland
Alignment Length (miles)	57	42	51	41	39	31	30	40	32	39	37	58	54
# of Stations	7	5	8	6	7	7	7	7	7	7	5	5	6
Stations/Communities Served	SB Intl. Airport Downtown SB SB Metrolink Crestline Running Springs Big Bear China Garden Big Bear Village	CSU San Bernardino Crestline Running Springs Big Bear China Garden Big Bear Village	SB Intl. Airport Downtown SB SB Metrolink SB E St./SR-210 Crestline Running Springs Big Bear China Garden Big Bear Village	Downtown SB SB Intl. Airport Highland SR-330 Running Springs Big Bear China Garden Big Bear Village	Downtown SB SB Intl. Airport Highland SR-330 Running Springs Snow Valley Big Bear Village Big Bear China Garden	Downtown SB SB Intl. Airport Highland SR-330 Running Springs Snow Valley Big Bear Village Big Bear China Garden	Downtown SB SB Intl. Airport Highland SR-330 Running Springs Snow Valley Big Bear Village Big Bear China Garden	Downtown SB SB Intl. Airport Highland Greenspot Running Springs Snow Valley Big Bear Village Big Bear China Garden	Downtown SB SB Intl. Airport Highland Greenspot Running Springs Snow Valley Big Bear Village Big Bear China Garden	Downtown SB SB Intl. Airport Highland Greenspot Running Springs Snow Valley Big Bear Village Big Bear China Garden	Downtown SB SB Intl. Airport Highland Greenspot Big Bear Village Big Bear China Garden	Downtown SB [intermediate stops] Redlands Angelus Oaks Big Bear China Garden Big Bear Village	Downtown SB SB Intl. Airport Highland Greenspot Angelus Oaks Big Bear China Garden Big Bear Village
Total One-Way Travel Time end to end (min)	114	90	106	92	94	73	72	93	78	91	85	114	114
Average speed (mph)	30	28	29	27	25	25	25	26	25	26	26	31	28
Steep Slopes Requiring Cog Rail (miles, slope > 8%)													
8-14%	0.0	0.0	0.0	0.0	2.5	0.0	6.0	2.5	0.0	2.5	7.5	0.0	0.0
14-25%	3.5	2.0	2.0	2.5	2.5	2.5	0.0	2.5	2.5	2.5	0.0	0.0	0.0
Capital Costs ($ millions)													
Low estimate	$5,225	$4,140	$4,685	$3,860	$3,610	$2,810	$2,760	$3,685	$2,885	$3,535	$3,170	$5,345	$5,120
High estimate	$9,600	$8,100	$8,600	$7,200	$6,700	$5,100	$5,000	$6,600	$5,000	$6,300	$5,200	$9,400	$9,100
Annual Operating Costs ($ millions)													
Rail system	$13.8	$12.0	$13.8	$13.6	$13.6	$11.8	$11.8	$13.6	$11.8	$13.6	$12.0	$13.8	$13.8
Feeder bus system	$4.7	$4.7	$4.7	$4.2	$4.9	$4.9	$4.9	$4.9	$4.9	$4.9	$2.7	$3.3	$3.3
TOTAL ANNUAL O&M	$18.5	$16.7	$18.5	$17.8	$18.5	$16.7	$16.7	$18.5	$16.7	$18.5	$14.6	$17.1	$17.1
Estimated Annual Ridership, 2035 (valley-mountain riders)	756,000	704,000	818,000	769,000	855,000	981,000	981,000	855,000	981,000	855,000	641,000	575,000	575,000
Estimated Annual Revenue, 2035 (in millions of 2010 $)	$11.5	$10.7	$12.5	$12.9	$14.3	$16.5	$16.5	$14.3	$16.5	$14.3	$10.8	$9.6	$9.6
Estimated Weekly Tonnage of Goods Movement, 2035													
Low-Rate Strategy	2,230	1,487	2,230	1,515	1,515	1,515	1,515	1,515	1,515	1,515	1,335	1,415	1,415
High-Rate Strategy	870	580	870	595	595	595	595	595	595	595	525	555	555
Estimated Annual Value of Goods Movement, 2035 (in millions of 2010 $)													
Low-Rate Strategy	$3.4	$2.3	$3.4	$2.9	$2.9	$2.9	$2.9	$2.9	$2.9	$2.9	$2.8	$2.8	$2.8
High-Rate Strategy	$6.7	$4.5	$6.7	$5.8	$5.8	$5.8	$5.8	$5.8	$5.8	$5.8	$5.5	$5.6	$5.6
Portion of Alignment Crossing or Between Roadless or Non-Motorized Areas (miles)													
Crosses Roadless or Non-Motorized Areas	0.0	0.0	0.0	0.6	0.6	3.9	8.3	5.9	9.2	5.9	1.1	0.9	0.9
Alignment Between Roadless or Non-Motorized Areas	5.0	5.0	5.0	8.0	7.4	3.6	0.9	4.4	0.6	4.4	9.8	17.9	17.9
Portion of Alignment Crossing Critical Habitat Areas (miles)	1.4	1.6	1.7	5.2	3.9	4.0	1.7	0.5	0.6	0.5	1.3	1.7	2.1
Portion of Alignment Crossing Geologically Unstable Areas (miles)													
Very High Landslide Risk	4.1	2.1	2.0	5.5	6.8	7.4	8.8	8.0	8.5	6.3	14.2	21.8	22.6
High Landslide Risk	31.1	31.1	30.3	19.1	20.1	11.7	7.1	19.2	10.8	18.0	8.8	11.6	11.1

Table ES.3 presents a graphic comparison of the results, using a color scale to show the relative performance of each alternative for each criterion. Alternatives receiving a blue dot have the best performance for that criterion, those receiving a red dot have the poorest performance for that criterion, and the intermediate color scale (from green to yellow to orange) indicates decreasing level of performance relative to the other alternatives.

Table ES.3 – Qualitative Summary Evaluation of Alternatives

	ALTERNATIVE												
CRITERIA	1	2A	2B	3A	3B	3C	3D	4A	4B	4C	5A	6A	6B
Capital Costs	worst	poor	poor	average	good	best	best	good	best	good	best	worst	worst
O&M Costs	worst	average	worst	poor	worst	average	average	worst	average	worst	best	average	average
Steep Slopes	average	good	good	good	poor	good	poor	poor	good	poor	worst	best	best
Communities Served	good	poor	good	good	best	best	best	best	best	best	worst	average	average
Travel Time	worst	average	poor	average	average	best	best	average	best	average	good	worst	worst
Ridership & Revenue	average	poor	average	average	good	best	best	good	best	good	poor	worst	worst
Goods & Revenue	best	worst	best	good	good	good	good	good	good	good	average	average	average
Land Use Compatibility	best	best	best	average	good	good	poor	average	average	average	worst	worst	worst
Critical Habitat	good	good	good	worst	poor	poor	good	best	best	best	good	good	average
Landslide Risk	best	best	best	best	good	average	good	average	average	best	poor	worst	worst

● (blue) = best ● (green) = good ● (yellow) = average ● (orange) = poor ● (red) = worst

ES.6 Financial Analysis

The financial analysis considers the financial requirements of the project (capital and operating costs) and evaluates possible funding and financing scenarios to determine how much of project costs can be covered by project revenues (passenger fares and freight fees), how much revenue could be generated from new sources of funding (excluding government grants), how project financing terms will affect the overall financial picture, and how much would still be required in government grants if the other funding sources are insufficient to cover the entire cost.

The financial analysis starts with definition of a baseline scenario. The baseline scenario assumes that a medium-length (approximately 37 miles) system alternative is to be built, with capital and operating unit costs at the higher end of the cost range ($6 billion in capital costs and $18.5 million in annual operating costs). Operating revenues are $20.1 million annually in 2035, a surplus of $1.6 million over the annual operating costs. (This assumed system for the financial analysis is generally comparable to Alternative 4C in the evaluation of alternatives.) No new non-grant revenue sources are adopted, and traditional tax-exempt bonds are used for project capital financing. In this Baseline scenario, the annual revenue stream needed to cover debt service is $478 million, so with an operating surplus of just $1.6 million the annual revenue gap is $476 million. To fill this gap, almost $6 billion of public sector grants would be needed.

To test the financial implications of different revenue and financing scenarios, three alternative scenarios were analyzed with varying cost, revenue, and financing assumptions applied to the same assumed 37-mile system. Table ES.4 summarizes the assumptions in the four scenarios.

Table ES.4 - Cost and Revenue Estimates Applied to Each Financial Scenario

Financial Scenario	Baseline	#1	#2	#3
Scenario Description	**Base Case**	**Least Optimistic Case**	**Mid-Range Case**	**Most Optimistic Case**
Capital Cost	$6.0 billion	$6.2 billion	$4.7 billion	$3.1 billion
Net Annual Operating Income	$1.6 million	$14.0 million	$29.8 million	$62.6 million
Potential New Revenue Sources	None	$24.5 million	$44.0 million	$63.5 million

In Scenario #1 ("Least Optimistic Case") the capital and operating costs were held at the higher end of the cost range; passenger and freight revenues were assumed to be higher than the baseline scenario due to higher system usage attributable to increased energy costs; total capital costs were increased to pay for additional vehicles to provide reduced headways; a low level estimate of new revenue sources was included; and financing with traditional tax-exempt bonds was assumed. (New revenue sources could include things like a portion of mountain road tolls, a benefit assessment district, a fee on lodging or recreation area use, or a portion of a countywide vehicle license fee.)

In Scenario #3 ("Most Optimistic Case") a set of optimal assumptions was applied: capital costs were assumed to be at the low end of the unit cost range, hourly operating costs are the average for light rail in the US rather than the high end, passenger ridership was assumed to be 17.5% of corridor travelers, freight revenues were based on carrying all the corridor's package freight as a result of air quality and energy factors, a high level of new revenue sources was included, and financing was assumed with zero-interest bond financing based on the "America Fast Forward" transit financing proposal being proposed to Congress by the Los Angeles County MTA.

Scenario #2 ("Mid-Range Case") represents a mid-range capital cost and revenue scenario between #1 and #3, financed with traditional tax-exempt bonds.

Table ES.5 summarizes the results of the financial analysis. Of the four scenarios, only the Most Optimistic Case Scenario could be fully funded without public sector grants, assuming a low-end cost scenario, the highest passenger and freight revenue scenarios, the highest rates for supplementary revenue sources, and the lowest interest rates on bonding. For all other scenarios, the annual shortfall needed to finance additional bond proceeds is projected to range from $301 million per year to $459 million per year, which indicates that a substantial public sector grant ($3.8 – 6 billion) would be needed in all scenarios except the Most Optimistic Case.

Table ES.5 - Calculation of Annual Funding Gap/Surplus

Scenario	Base	#1	#2	#3
Scenario Description	**Base Case**	**Least Optimistic Case**	**Mid-Range Case**	**Most Optimistic Case**
Assumed Alignment Length	37 miles	37 miles	37 miles	37 miles
Capital Cost ($2011, millions)	$6,000.0	$6,250.0	$4,710.0	$3,070.0
Financing Method	traditional tax-exempt	traditional tax-exempt	traditional tax-exempt	QTIBs 0% interest
Annual revenue stream needed to cover debt svc	($477.7)	($497.6)	($375.0)	($107.4)
Passenger and Freight Revenues	$1.6	$14.0	$29.8	$62.6
New revenue sources	$0.0	$24.5	$44.0	$63.5
Total available annual revenue sources available for debt svc	$1.6	$38.5	$73.8	$126.1
Annual revenue (gap)/surplus	**($476.1)**	**($459.1)**	**($301.2)**	**$18.8**
Bonding Capacity of Total Available Revenue Sources	$20.1	$483.9	$926.8	$3,606.7
Additional Public Funding/Capital Cost Reductions Needed or (Bonding Capacity Surplus)	$5,980.0	$5,766.1	$3,783.2	($536.7)

The key findings of the financial analysis are as follows:

- The high capital cost and the project financing cost (assuming traditional tax-exempt debt) are the most significant financial impediments to financing a feasible project.
- The project could generate an operating surplus under the following conditions:
    - the corridor alignment follows one of the shorter or medium length routes;

  - the system includes stations that provide: a direct connection to Metrolink, convenient transloading for goods movement, a convenient park and ride lot at the base of the mountains, and intermediate stations in the mountain area (such as Running Springs and Snow Valley);
  - the system's hourly operating costs are toward the middle or lower end of the cost range for light rail systems in the United States; and
  - the system operation includes a package shipping operation that can successfully attract an adequate share of the market.
- Other additional sources of revenue (besides passenger fares and freight revenue) will be needed in order to have a sufficient revenue stream to pay for capital costs through bond financing. Various types of new revenue sources are possible, though relatively few could generate sufficient ongoing revenue to meaningfully contribute to debt payments for a project of this magnitude. For those sources that are capable of generating a significant revenue stream, support from the public and elected officials will be required to achieve their adoption.
- Even with very optimistic assumptions regarding operating revenues and additional revenue sources, the project's financial viability depends on getting either low interest bond financing or a multi-billion dollar government grant to help defray the capital costs.

For the project to be financially feasible without requiring significant government grants:

- The estimated capital cost will need to be toward the lower end of the range estimated in this study. More detailed study will be needed to identify an alignment that: follows a reasonably direct routing between San Bernardino and Big Bear Lake, has relatively limited need for elevated segments or structures, avoids environmentally sensitive areas, and minimizes right-of-way costs.
- Operating revenues will need to be maximized. A significantly higher-than-typical passenger mode share will need to be captured because of factors like substantial increases in fuel prices or extended road closures in the mountains. A very high level of freight movement activity will need to be captured because of factors like substantial increases in fuel prices, extended road closures in the mountains, or vehicle technology requirements that limit trucks' ability to climb mountain grades.
- Substantial new sources of funds will be needed to help defray capital costs.
- Very low interest bond financing will need to be secured for most of the project's capital cost.

ES.7 Key Findings

This section highlights the study's key findings that will significantly affect/determine the desirability and feasibility of implementing an alternative mode in this corridor and the conditions under which it would be feasible.

Transportation System Constraints

1. The mountain highway routes that provide access to the Big Bear Valley experience traffic congestion on weekends throughout the year, and experience high levels of congestion for extended periods of time on holiday weekends and winter weekends with good snow conditions.
2. The mountain access roads are increasingly vulnerable to closure or restriction because of adverse weather, traffic accidents, rockfall, landslides, or wildfire.
3. These impediments to mountain access act as constraints to growth and development in the Big Bear Valley, and to the Southern California Region's ability to take advantage of the mountain area's four-season recreational assets.
4. The feasibility of adding significant capacity to existing highways or constructing a new road facility is doubtful because of both environmental and financial constraints.
5. A non-roadway transportation alternative could increase transportation system capacity, reduce traffic congestion, operate in adverse weather or when roads are closed, and help accommodate long-term growth in mountain area population and visitation, and would likely have less environmental impact than road improvements that would provide comparable system capacity.

Technology Issues

6. Only one non-roadway transportation technology currently exists and has demonstrated in commercial operation its capability to safely transport large numbers of people across the kinds of distances and the steep terrain encountered in this corridor at speeds and costs that are competitive with automobile travel (and could therefore attract significant numbers of riders). For these reasons, the current preferred feasible technology for this corridor is light rail technology with a rack (cog) system that can engage on steep slopes.
7. Self-propelled aerial ropeway technology has shown the potential to have competitive operating characteristics with a lower initial capital cost, but has only been built and operated on a limited basis and is not currently in commercial operation.

Corridor Alignment Considerations

8. Certain alignment and station options are important to the success of the system and to best achieve the purpose and need:
   a) a reasonably direct alignment between San Bernardino and Big Bear Lake, because a long alignment would substantially increase the project's capital cost and the overall travel time, which would make the system less attractive to potential riders and reduce operating revenues;
   b) an alignment that serves intermediate mountain communities such as Running Springs and Snow Valley, because it would increase ridership and revenue and would substantially increase the number of travelers for whom an alternative system could be a viable travel option;
   c) a station with direct connection to Metrolink, to provide convenient transit access to Big Bear Lake from much of the greater Los Angeles metropolitan area;
   d) valley and mountain stations that provide convenient transloading for goods movement, so the system can compete effectively in the freight shipping market; and
   e) a convenient station/park-and-ride lot at the base of the mountains, to attract auto users that prefer not to navigate the mountain roads.
9. More detailed engineering studies will need to be undertaken in order to confirm feasible alignments. In particular, detailed study will be needed to find alignments that avoid sensitive

habitat areas, minimize needs for environmental mitigation, and are not unreasonably subject to landslide risk.

10. Much of the corridor will pass through the San Bernardino National Forest. Regardless of the specific alignment selected, it will traverse areas currently designated as incompatible with a new transportation system, since extensive areas of the National Forest have been designated to remain roadless or as appropriate only for non-motorized transportation. US Forest Service representatives have indicated that an extensive review and approval process within the Forest Service would be required to obtain approval for a change to accommodate a new transportation system through these areas.

Financial Considerations

11. For the project to be financially feasible:
    a) The estimated capital cost will need to be toward the lower end of the range estimated in this study. More detailed study will be needed to identify an alignment that: follows a reasonably direct routing between San Bernardino and Big Bear Lake, has relatively limited need for elevated segments or structures, avoids environmentally sensitive areas, and minimizes right-of-way costs.
    b) Operating revenues will need to be maximized. Changing conditions in the coming years are expected to lead to increasing interest in, and demand for, and alternative transportation mode to the mountains; these include increasing fuel prices, environmental regulations that affect vehicle technology (limiting the ability of trucks to ascend steep grades), and more frequent mountain road closures. These factors could enable a new transportation system to capture a significantly higher-than-typical passenger mode share and a high level of freight movement activity in the corridor, and generate a substantial positive stream of net operating revenue.
    c) Substantial new revenue sources will be needed at the local or regional level to provide a reliable funding stream so the project sponsor can issue long-term bonds to satisfy the upfront capital needs.
    d) Very low interest bond financing will need to be secured for most of the project's capital cost.
    e) If all of the above factors do not materialize, substantial supplemental sources of traditional grant funding will likely be necessary to help defray capital costs in addition to any new revenue sources implemented at the local and/or regional level to support the project.

ES.8 Recommendations

In short, the analysis has found that an alternative transportation system would be a good solution to help address future transportation needs between the San Bernardino Valley and Big Bear Lake; however, the system's technical and financial feasibility depends on the convergence of a number of political, financial, and operational conditions. Changing circumstances associated with energy costs, fuel sources, vehicle technology, air quality regulation, and transportation project funding and financing could create a situation in which an alternative transportation mode would be financially feasible. The following recommendations for further action are designed to increase understanding about the evolving status of circumstances that would be necessary for the project's success, while developing more specific information about system alignments, technologies, and operations that could help define a specific project proposal that is consistent with the requirements for success.

Next Steps

A. Outreach

1. Conduct a dialogue with the corridor's key elected officials and opinion leaders to determine the current level of interest in, and support for, the project.
2. Conduct an ongoing dialogue with the US Forest Service to develop a better mutual understanding of future transportation needs through the San Bernardino National Forest and how to serve them.
3. Work with USFS staff to develop a description of the requirements and process that would be involved in order for the Forest Service to be able to approve an alternative transportation system through the San Bernardino National Forest.
4. Monitor the progress of legislation in Congress that could present opportunities for grant funding.
5. Monitor the progress of the Fast Forward America legislation in Congress, and identify the potential and conditions for zero- or very-low interest financing for this project.
6. Monitor technological progress toward commercial operation of high-speed, high-capacity transportation technologies that can travel long distances and traverse steep grades through the mountains at overall speeds competitive with automobile travel.
7. Explore the potential to enter into a project development agreement with a light rail vehicle or other equipment manufacturer who may be interested in bringing its technology to market and may be willing to co-fund a Major Investment Study.
8. Conduct a dialogue with other resort access corridors that face similar transportation access challenges (Sacramento - Lake Tahoe, CA; Salt Lake City - Cottonwood Canyons UT; and Denver - Rocky Mountain Resorts, CO). Identify common issues and explore possibilities for benefits from cooperation.

B. Project Phasing/Early Action Opportunities

1. Evaluate potential project phasing to ascertain the viability of developing a first phase of the project before the entire system.
2. Identify potential early action projects that could serve as initial steps toward a new mountain access system.

C. Cost and Revenue Refinement

1. Undertake a conceptual engineering study or Major Investment Study to determine the location and cost of alignment alternatives that serve intermediate mountain communities, avoid sensitive habitat and minimize environmental mitigation, and avoid unnecessary risk of landslides.
2. Develop a better understanding of the geotechnical issues, constraints, and risks involved with developing a cog rail system through the corridors identified as alternatives for Alignments 3 and 4, for the purpose of helping to identify a lower-risk alignment that follows a relatively direct route from San Bernardino to Big Bear Lake.
3. Develop refined estimates of potential ridership and farebox revenues, as well as potential freight shipments and revenue.
4. Develop a more refined concept for passenger access to and from the mountain stations in the system. Identify an operational concept that is well suited to the access and distribution needs of potential passengers, as well as estimates of capital costs, operations and maintenance costs, and potential revenues.
5. Develop a more specific understanding of current goods movement activity through the corridor, including the types and volumes of commodities being carried and how the goods are distributed to mountain destinations.

6. Develop a more refined concept of how a cog rail system could serve the mountain corridor's goods movement needs effectively and efficiently. Include determination of types of goods to be carried, feasible and effective operational strategies, and a concept for distributing goods from mountain stations to their destinations.
7. Evaluate the potential ridership and farebox revenue within catchment areas of the corridor (i.e., trips between valley stations and between mountain stations), including potential increases if more stations are added to the alignment.
8. Investigate the reasons for differences in hourly operating costs for light rail systems in the United States, and develop a refined operating cost scenario for a light rail/cog rail system in the San Bernardino – Big Bear Lake corridor.