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Economic Analysis of Rail Transportation System for Mineral King

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INTRODUCTION

The National Park Service of the U.S. Department of the Interior has requested Walt Disney Productions to submit data on the relative feasibility of two transportation systems to Mineral King. The alternatives are a modern all-weather highway, as proposed by the State Division of Highways, or a railroad. The original economic evaluation of Mineral King's development potentials prepared by E.R.A. and submitted to the U.S. Forest Service in support of an application for a use permit assumed a new highway. Dependence on rail transportation in lieu of an adequate highway has serious implications for both attendance and economic feasibility of the proposed development, as discovered in a preliminary investigation of access by train (or monorail) prior to the use permit application. Therefore, WDP requested E.R.A. to update its previous analysis to reflect recent economic planning. At the same time the firm of Voorheis-Trindle-Nelson, Inc. was retained to perform a preliminary engineering study on the alignment and cost of a railroad. This report summarizes the findings of the economic analysis including inputs from the engineering study.

ESTIMATED ATTENDANCE AT MINERAL KING BY DISTANCE

The estimated attendance at Mineral King in 1976 (the goal year for completion of the first phase of development) is 4,000,000 visitor days. Of these 3,100,000 would occur in summer and off-season and 900,000 in winter, assuming convenient access by a modern all-weather road. With a highway visitors could travel to Mineral King at no added cost (unless a toll is charged), but a railroad trip would impose a direct expense. To determine the effect of this additional transportation cost on the attendance level at Mineral King, visitation estimates are segregated by origin to provide comparability with a published study of the relationship between price, attendance, and revenue. The estimated origin distribution is shown in Table I.

Table I

ESTIMATED ORIGIN OF VISITORS
TO MINERAL KING

	Estimated 1976 Population	Estimated Visitor Days		
		Summer	Winter	Total
California residents - total	24,830,000	2,100,000	720,000	2,820,000
One-way distance to Mineral King				
0-100 miles	1,318,000	350,000	150,000	500,000
100-200 miles	17,690,000	1,550,000	400,000	1,950,000
200-300 miles	5,373,000	200,000	170,000	370,000
300 plus miles	449,000	negl.	negl.	negl.
Out-of-state visitors 1/	N.A.	1,000,000	180,000	1,180,000
Total	N.A.	3,100,000	900,000	4,000,000

N.A. = Not Applicable
Negl. = Negligible
1/ Based on out-of-state volume of roughly 33 percent of summer visitors and 20 percent of winter visitors.

Source: Economics Research Associates.

HYPOTHETICAL EFFECT OF VARIOUS TRANSPORTATION COSTS ON TOTAL ATTENDANCE AT MINERAL KING

To determine the effect of various transportation costs on the number of visitors and revenue at Mineral King, a hypothetical case is established representing attendance response to various ticket prices assuming the train is the only method of reaching the Mineral King valley. This effect is analyzed based on the results of a study entitled "Methods of Measuring the Demand for and Value of Outdoor Recreation,"[1/] which addresses itself to the interrelationship of travel distance, admission charges, attendance, and revenue. Its findings are derived from analysis of attendance at Yosemite, Glacier, Grand Canyon, and Shenandoah National Parks, and are shown in the form of estimated total attendance and revenue resulting from imposing admission charges of $3, $5, $10, and $20 per visitor.

The hypothetical situation in which the train provides the only access to Mineral King compares directly to the effect of an admission charge because train fare would function as an entry subcharge as far as the visitor is concerned[2/]. The data in the above cited report were therefore considered to be a valid estimating tool. After adjustment for comparability with E.R.A.'s estimates for Mineral King, analysis indicates an inverse relationship between attendance and transportation price, as shown in Table II. These calculations show a decline in total visitors of 33 percent, 45 percent, 50 percent, and 55 percent with progressive fare charge of $5, $10, $15, and $20 per capita. The largest decrease occurs with the first fare increment, which would have its greatest impact on the day visitor.

This indicates a relative inelasticity of demand which would yield an increase in total revenue after the initial impact on the day visitor is felt. To calculate the total revenue at each fare level, the ratios of visitor days as originally estimated are converted to represent the number of individuals entering Mineral King (4,000,000 visitor days by 1,770,000 visitors). Visitor estimates, train fare revenues, and total revenues (or visitor expenditures) are shown on the following page.

1/ By Marion Clawson, Resources for the Future, Inc; Washington, D.C.; 1959.

2/ The effect on the operator is much different, however, in that an admission charge implies minimal increase in capital or operating cost, whereas the train would have a very high capital and operating cost.

Table II

ESTIMATED DECLINE IN ATTENDANCE
RESULTING FROM VARIOUS TRAIN FARES
TO MINERAL KING[1/]

	California Residents				
	0-100 Miles	100-200 Miles	200-250 Miles	Out-of-State Visitors[2/]	Total
Estimated attendance without train fare	500,000	1,950,000	370,000	1,180,000	4,000,000
With train fare of:					
$5 per capita					
Percent[3/]	30%	65%	88%	80%	67%
Number	150,000	1,270,000	325,000	940,000	2,685,000
$10 per capita					
Percent[3/]	20%	50%	78%	70%	55%
Number	100,000	975,000	290,000	825,000	2,190,000
$15 per capita					
Percent[3/]	18%	44%	69%	65%	50%
Number	90,000	860,000	260,000	770,000	1,980,000
$20 per capita					
Percent[3/]	15%	40%	61%	60%	45%
Number	75,000	780,000	225,000	710,000	1,790,000

1/ Hypothetical estimates assuming that the train provides the only access to Mineral King.

2/ Assumes half the out-of-state visitors travel to California primarily to visit Mineral King, while the remainder are secondary trips from other primary destinations in the state.

3/ Percent of attendance remaining after effect of train fare.

Source: Marion Clawson, Methods of Measuring the Demand for the Value of Out-door Recreation, Resources for the Future, Inc., Washington, D.C., January 1959 and Economics Research Associates.

Per Capita Train Fare	Attendance (000) Visitor Days	Visitors	Revenues Train	All Others[1/]	Total
0	4,000	1,770	--	$35,400	$35,400
$ 5	2,685	1,180	$ 5,900	23,700	29,600
10	2,190	960	9,600	19,300	28,900
15	1,980	870	13,100	17,500	30,600
20	1,790	790	15,800	15,800	31,600

1/ Based on per capita expenditures of approximately $8.84.

This relationship is shown graphically in Figure 1.

These estimates, based on the hypothetical situation of a train providing the only means of transportation to Mineral King, represent the maximum impact on attendance and revenue from railroad construction and operation. The more likely case of the train being supplemented by the existing road is discussed below.

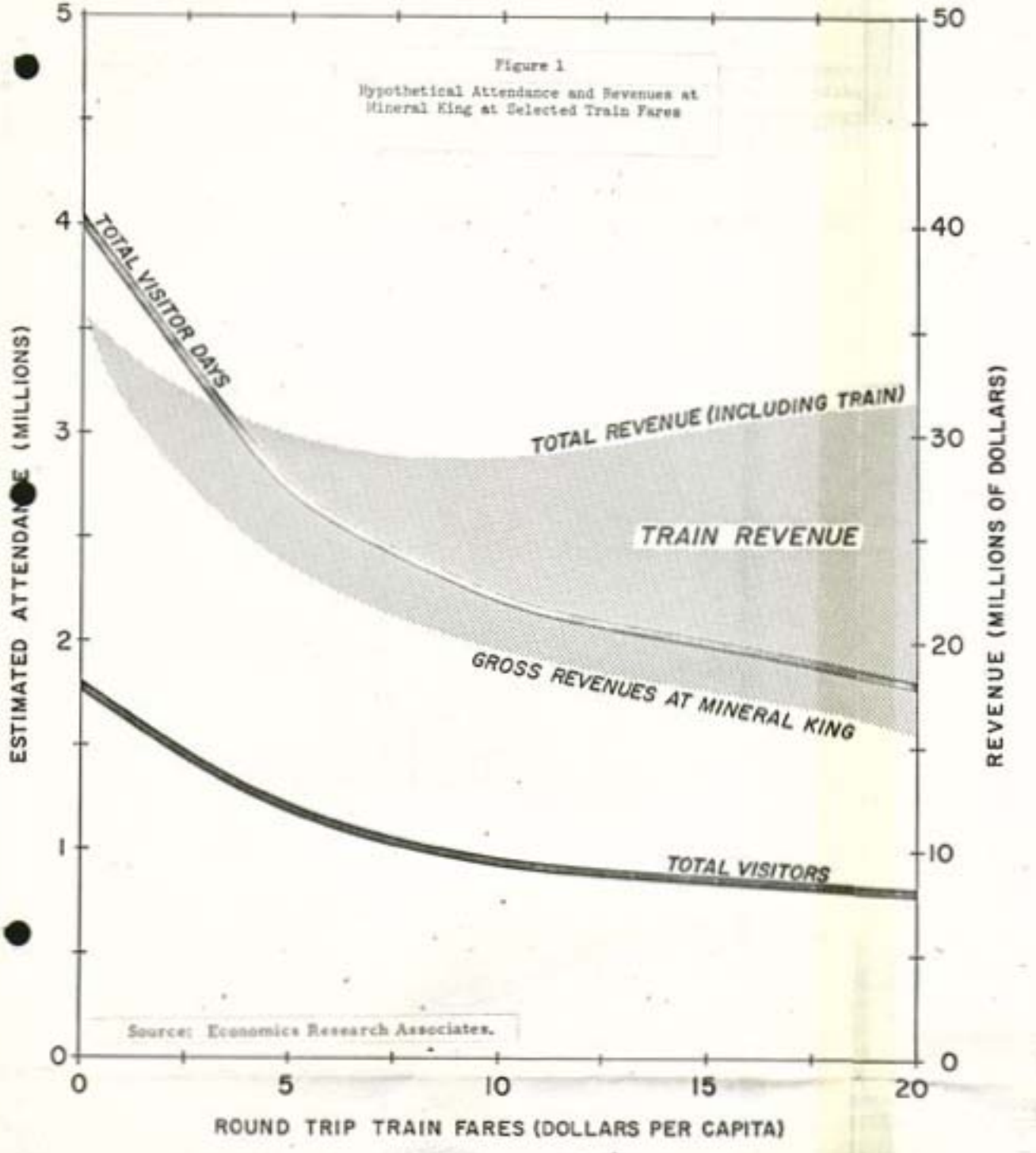
OPERATION OF A TRAIN IN CONJUNCTION WITH THE EXISTING ROAD

More realistically, access to Mineral King (as an alternative to construction of a new all-weather road) would include the train plus improvement of the existing road. It must be assumed that even were a railroad built, this road would remain open for public use. A significant volume of private land, residences, and resort cabins require continued service by the present road, regardless of what other means of access are available. The existence of this route provides Mineral King visitors an alternative method of travel, one highly desirable from the standpoint of the modern day attachment to the private automobile. Therefore, the train must be evaluated as a pleasure ride and as a transportation alternative rather than as the sole means of access.

To make this evaluation, the experience of existing sightseeing rides including both trains and tramways are used. The pricing schedule and market penetration of selected facilities of this type are summarized in Tables III and IV. As can be seen for those installations where market data are available, a sightseeing ride will normally attract between 5 and 20 percent of its available market. Based on this analysis, the train to

Figure 1

Hypothetical Attendance and Revenues at Mineral King at Selected Train Fares



Source: Economics Research Associates.

Table III

COMPARABLE DATA ON
SELECTED RAILROADS AND COG RAILWAYS

Location	Skunk Railroad Willits, California	Roaring Camp Railroad Felton, California	Cog Railroad Mt. Washington, New Hampshire	Incline Chattanooga, Tennessee
Type	Common Carrier Steam locomotive and old train 3 self propelled diesel train cars	Narrow gauge track Steam locomotive	Cog - narrow gauge track Steam locomotive	Cog - narrow gauge track
Capacity (persons)	Steam: 320/train Diesel: 56/train	400/hour	80/hour	40/train
Elevation Gain	--	8%	25%	72%
Length	40 miles	5 miles	3.5 miles	4,800 feet
Construction Cost	$3 million (replacement cost)	--	--	--
Cost per Foot	$100,000/mile	--	--	--
Admission Price	Adult: $4.50 Child (5-11):$2.25	Adult: $2.50 Child (5-11):$1.25	Adult: $5.90 Child (6-12):$3.00	Adult: $0.75
Attendance	126,000 (1966)	100,000 (9 months)	50,000 (1966)	300,000 (1965)
Attractions	Steam locomotive and old train, scenic ride, fishing and beaches.	Steam locomotive historic ride, redwoods, and shops.	Oldest cog railroad in world, highest mountain in New England, recreation area, shops and cabins.	View of City and tour of recreation areas near top.
Available Market	2,695,000	6,737,000	1,549,500	3,187,400
Market Penetration	4.7%	1.5%	3.2%	9.4%

Source: Economics Research Associates.

Table IV

COMPARABLE DATA ON
SELECTED TRAMWAYS

Location	Banff Alberta, Canada	Teton Village Jackson, Wyoming	Jasper Alberta, Canada	Estes Park Colorado	Sandia Peak Albuquerque, New Mexico	Palm Springs Aerial Tramway Palm Springs	Cannon Mountain Franconia, New Hampshire
Elevation Gain (feet)	2,300	--	--	--	3,770	5,873	2,000
Capacity (persons per hour)	450	400	360	240	240	320	200
Length	4,980	13,200	6,500	2,800	14,256	13,200	5,700
Construction Cost	$600,000	$2,000,000	$1,075,000	$225,000	$1,500,000	$8,100,000	$1,500,000
Cost per Foot	$120	$150	$175	$80	$105	$615	$260
Admission Price	Adult: $2.00 Child: 1.25	Adult: $2.75 Child: 1.25	Adult: $3.00 Child: 1.50	Adult: $1.50 Child: 0.75	Adult: $3.00 Child: 2.00	Adult: $2.95 Junior: 1.95 Child: 1.00	Adult: $2.00 Child: 1.00
Attendance	182,000 (1965)	110,000 (projected)		95,000(1965)	60,000 (estimated)	298,000 (1966)	150,000
Attractions	Teahouse, snack stand, picnic areas, trails	Restaurant, warming hut, observation points	Restaurant, shops, picnicking, trails	Restaurant, snack bar, souvenir shop, viewing points	Summit house, restaurant, chair lift for skiing	Restaurant, gifts and souvenirs, skiing	Cafeteria, observation tower, trails, souvenir shop
Available Market	1,700,000	2,062,500 (1965)	n.a.	1,600,000	435,000	1,900,000	860,000 1/
Market Penetration	10.7%	5.3%	n.a.	5.9%	13.8%	15.7%	17.4%

n.a. = not available.
1/ 1959 Figure.

Source: Economics Research Associates.

Mineral King could reasonably expect to obtain a rider volume of 90,000 to 350,000 from a total attendance of 1,770,000 persons and 4,000,000 visitor days at Mineral King. This expectation assumes reasonable fares and pertains to persons riding for recreation. An appropriate round trip price to obtain these volumes is estimated at $5 for adults, $4 for juniors (12-17 years), and $2.50 for children under 12. A visitor distribution of 50 percent adult, 20 percent juniors, and 30 percent children would yield a revenue of roughly $4 per capita. Applying this figure to the number of riders yields an annual revenue of $360,000 to $1,400,000.

This estimate represents the revenue to be derived from the ride value of the facility alone. In addition, a portion of the remaining visitors to Mineral King would probably take the train as an alternative form of transportation, thus avoiding the difficult driving and potential hazards of the existing road even with substantial improvement over present conditions. It is estimated that a maximum of 10 percent of the total visitors, or some 175,000 persons, would use the train for transportation purposes, considering the effect of the fare as illustrated previously[1/].

Using a penetration of 20 percent of total visitors on the basis of ride value plus the 175,000 transportation-oriented users yields an estimated 525,000 riders and $2,100,000 in revenue.

FINANCIAL IMPLICATIONS OF CONSTRUCTION AND OPERATION OF A TRAIN TO MINERAL KING

Estimates of the construction cost and annual operating expenses for the train are $27.5 million in capital investment ($3.0 million for rolling stock; $23.5 million in electrical system; track, roadbeds, and right-of-way; and $1.0 million stations, workshops, and parking areas) and $646,000 in annual operating expenses. Thus, the annual revenue required to cover these costs and yield a reasonable return on investment can be calculated as follows:

1/ Roughly 20 percent of total attendees are expected to arrive in truck-mounted campers or pulling trailers and therefore could not use the train as transportation except as a ride after reaching the valley.

Estimated annual operating costs		$ 646,000
Depreciation		
30-year schedule		
Roadbed	$332,000	
Track	183,000	
Stations, workshops, etc.	25,000	
Parking area	10,000	550,000
15-year schedule		
Trains	200,000	
Electrical system	476,000	676,000
Subtotal		$1,872,000
Opportunity cost of capital based on 6 percent return on investment		1,650,000
Total		$3,522,000

Comparing this revenue requirement with the total revenue estimate of $2,100,000 indicates an $1,422,000 operating loss after considering opportunity cost of capital. The loss will occur even with a relatively high market penetration.

Furthermore, the attendance at Mineral King would be restricted because the existing road, even if improved to a 24-foot roadway and oiled surface[1/], would probably have a maximum one-way capacity of 200 vehicles per hour on the present alignment. The approximate effect of this limited road capacity on attendance was derived by calculating the number of hours in which the estimated volume would exceed the 200-vehicle level and excluding the excess vehicles. This calculation represents the minimum decline since it implies the road would function at capacity through as much as 5-6 hours on peak attendance days during the peak summer and winter months. It is estimated on this basis that the minimum decrease in attendance, would be 700,000 visitor days[2/]. Thus, the revised attendance estimate would be 3,300,000 visitor days in 1976. Revenues would be $29,100,000 exclusive of train revenues. It is questionable whether or not the amounts spent on the

1/ Considered feasible by the Tulare County Road Department and also indicated in the State Highway Engineers Report to Senator Hugh M. Burns, May 14, 1964.

2/ Number of vehicles times persons per vehicle times visitor days per person.

train would be in addition to the normal expenditures estimated previously, or would replace expenditures for other activities. Assuming an even split between new and substituted expenditures, the total gross revenue would be some $30.0 million compared to $35.0 million.

As can be seen from the above, the effect of building a train and continuing use of the existing road with minimal improvement to the Mineral King Valley would be:

1. A net loss from train operation of $1,422,000 after consideration of the opportunity cost of capital.

2. A loss of 700,000 visitor days and a minimum of 300,000 visitors and some $5 million in annual gross revenue.

3. The existing road even if improved to 24-feet all-weather road standards would be subject to extreme congestion and present hazardous driving conditions.

4. Further, the very existence of the present road would be detrimental to successful operation of the train and would not significantly relieve the potential congestion on the highway.

TRAIN FARE REQUIRED TO YIELD A REASONABLE RETURN ON INVESTMENT

It is possible that the train could be made a profitable venture by increasing the fare -- or the revenue per passenger. This, however, would reduce the number of riders. Using the price -- attendance relationship derived previously under the assumption that the train would provide the only access to Mineral King results in estimated riders and revenues as follows:

Average Train Fare	Estimated Number of Riders	Estimated Revenue
$ 4	525,000	$2,100,000
9	350,000	3,150,000
14	290,000	4,050,000
19	260,000	4,950,000
24	235,000	5,650,000

Based on the calculation on the previous page, the railroad could cover all costs of operation, depreciation, and yield a 6 percent return on investment at a price averaging $11 per person (round trip) and carrying 325,000 passengers. However, it should be noted that this is a most optimistic passenger level considering the $11 price and may not be attainable. The attendance decline curve originally derived assumed the rider had no alternative but to ride the train or not visit Mineral King. It is questionable that the same relationship of demand inelasticity could be maintained since the option of using the existing highway will be available. Thus, this pricing alternative would involve an extremely high risk. Moreover, it would aggravate the congestion on the existing highway as visitors would tend to select road access to Mineral King over relatively expensive rail transportation.