VAIL TRANSPORTATION MASTER PLAN

Prepared for:

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Vail, CO 81657

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EXECUTIVE SUMMARY

The purpose of this Executive Summary of the Vail Transportation Master Plan is to consolidate all of the transportation plan recommendations into a single document for easy access and reference. The Transportation Master Plan Final Report documents the entire planning process including data collection, public input, alternatives analysis, and the rationale behind each recommendation. The Transportation Master Plan Final Report should, therefore, be consulted for a full explanation and clarification of the recommendations summarized herein.

The Transportation Master Plan recommendations are summarized into five major categories and include both short-term and long-term actions as listed below. In general, short-term actions should be implemented in a 1 to 5 year time frame while long-term actions may require anywhere from 6 to 20 years to fully implement.

VAIL VILLAGE DELIVERIES

SHORT-TERM RECOMMENDATIONS

1. Modify policies at Checkpoint Charlie.

   o Eliminate 30% of the traffic (cars) accessing the Core for small deliveries and minor tasks through use of the 1-1/2 hours of free parking in the Vail Parking Structure for this type of need.

   - Designate a desirable area of the Vail Parking Structure for short term parking.

   - Enforcement of this issue would be key to its success. Educate the users that the Town is providing convenient short term spots in the Vail Parking Structure, however, abuse of these spots will result in strict enforcement.

   o Develop written policies concerning vehicles requiring access to the Village including:

   - Cars without large amounts of goods to be delivered will not be allowed in the Village or in the loading zones. Use of the parking structure would be required for these trips.

   - Trucks and cars that are making deliveries of large quantities of goods will be allowed access to the Village loading zones and will be given priority for these zones. Time will be limited to only what is needed to load or unload these goods. In addition, a permitting process could be established to access these zones.

   - The towing of vehicles for violation of loading zone restrictions will be strictly enforced.

- Construction work requiring parking will need to be planned and approved in advance by the Town of Vail's Community Development, Public Works, Fire, and Police Departments.

- Service vehicles will be allowed limited access to some loading zones for emergency work only. Non-emergency service work should be scheduled for non-peak traffic hours in the Village. All service vehicles will need to contact the Police Department for a parking permit for both the emergency and non-emergency work.

- Loading zone restrictions may be lifted after 6:00 P.M. The loading zones on Gore Creek Drive, however, will be posted as a "No Parking Area" in the non-loading hours.

o Investigate the possibility of locating "drop boxes" in designated places for overnight couriers.

2. Implement the following actions and procedures.

o Eliminate loading zones on Bridge Street and Hanson Ranch Road near Mill Creek only.

o Allow only morning use of the Gore Creek Drive loading area in the vicinity of the Lodge Promenade (winter: 9:00 A.M. to 2:00 P.M. and summer: 8:00 A.M. to 11:00 A.M.).

o Convert the 15 minute parking areas on the north side of the Christiania lot and adjacent to Riva Ridge North to delivery and service vehicles only with no large delivery trucks allowed except for over flow.

o Install "One Way/Do Not Enter" signs further north on Willow Bridge Road.

o Convert the 15 minute parking north of Willow Bridge to truck only.

3. Authorize capital improvements in an attempt to reduce the 33% "lost guest" number and those who enter the Village the wrong way.

o Relocate Checkpoint Charlie south to the vicinity of Willow Road.

o Construct landscaped medians south on Vail Road from the Frontage Road.

o Further evaluate informational and directional signing clarifications and modify as needed.

o Construct entry feature monument signs, at all entry points to pedestrian areas.

o Prior to construction of monument signs provide and install a standard sign which warns motorists with the wording "Pedestrian Zone Automobiles Restricted" at all pedestrian zone entry points.

4. Review the information signs and traffic control procedures at the Main Vail I-70 exit ramps and at the 4-way stop intersection.

   o Install portable, variable message signs at the 4-way stop intersection (Vail Road median) and the I-70 exit ramps providing clear messages to drivers. Messages can be updated based on varying demands throughout the day.

   o Develop action policies for the following groups; (1) CSO's in Village, (2) 4-way traffic controllers, (3) checkpoint personnel, (4) parking structure operations and other Town employees. These action policies should relate to enforcement, who is allowed access to the Village, and vehicle towing procedures. Evaluate disallowing certain traffic movements during peak periods based on traffic circumstances and demands.

5. Work with Vail Associates in designating allowed skier drop-off areas. This would be an attempt to recognize the problem versus banning all skier drop-offs.

LONG-TERM RECOMMENDATIONS

6. Christiania lot.

   o Resolve the land ownership issues.

   o Evaluate in greater detail:

      - Technological options of hand cart deliveries, small vehicles for deliveries and storage lockers.

      - Operational characteristics and regulations for hand carts and small vehicles along with liability issues, storage problems, and financing options.

      - Evaluate options to make the site both aesthetically compatible with the neighborhood and operational for the truck delivery functions.

7. Additional sites to be evaluated:

   o South of Lodge at Vail

      - Resolve land ownership and legal issues.
      - Evaluate compatibility with International Wing development plans.
      - Address Vail Associates concerns
      - Address United States Forest Service concerns.

   o Golden Peak

      - Resolve land ownership issues.
      - Address Vail Associates concerns.

   o Other Location Options

PARKING

SHORT-TERM RECOMMENDATIONS

1. Actively encourage private sector involvement in implementing Travel Demand Management techniques such as:

   - Price discounts for group arrivals by multi-occupant vehicles.
   - Enhanced loading facilities for group arrivals convenient to mountain access points.

2. Retain the existing formal, public parking supply of 2,750 spaces.

3. Annually review and adjust parking fees:

   - Parking structure hourly rates.
   - Premium parking program (Gold Pass) fees.
   - Discount parking program (Blue Pass and coupons) fees.
   - Ford Park hourly rates.

4. Annually review and adjust parking controls and restrictions:

   - Valid time periods for various premium and discount programs.
   - Parking locations reserved for various user groups.
   - Availability of discounts to various user groups.

LONG-TERM RECOMMENDATIONS

5. Evaluate sites and land ownership issues for potential future expansion of the formal, public parking supply including:

   - Ford Park parking lot
   - West Day lot
   - North Day lot
   - Expansion of Lionshead parking structure

6. Evaluate remote, out-lying parking potentials including site availability and transit cost impacts to link remote parking areas with the Town.

7. Evaluate replacement sites for parking over-sized vehicles if the existing parking area adjacent to the Lionshead parking structure is redeveloped. Potential sites include:

   - West Vail (Safeway area)
   - Vail Mountain School parking lot
   - Golf course parking lot
   - Ford Park parking lot
   - Athletic field parking lot
   - Red Sandstone School parking lot

IN-TOWN SHUTTLE

SHORT-TERM RECOMMENDATIONS

1. Develop performance specifications for a high-capacity bus vehicle and submit a Solicitation of Interest to potential manufacturers and bidders.

2. Implement a high-capacity bus vehicle operation along the existing In-Town Shuttle route.

3. Relocate the turnaround at Golden Peak to separate auto/bus conflicts.

4. Further evaluate relocating the west turnaround of the In-Town Shuttle to East Lionshead Circle to remove the special shuttle vehicle from mixed traffic operations on the South Frontage Road.

LONG-TERM RECOMMENDATIONS

5. Conduct a schematic design level technical study of a potential Village to Lionshead people mover to address:

   - New technologies and operating alternatives.
   - Identify alignment location options and station locations.
   - Define right-of-way and guideway envelopes for long-term preservation.

6. Evaluate the potential extension of the In-Town shuttle system into the Lionshead area in conjunction with future major redevelopment.

OUTLYING BUS SYSTEM

SHORT-TERM RECOMMENDATIONS

1. Combine the West Vail routes as opposing loop services utilizing the North and South Frontage Roads operating at 15-minute headways.

2. Continue the Sandstone route at 20 minute headways during the winter season.

3. Reroute the East Vail route along Main Gore Drive to Bighorn Road.

4. Provide separate routes for East Vail (15 minute headways) and the golf course (30 minute headways) throughout the day and combine into one route after the evening peak period operating at 30 minute headways.

5. Provide 15 minute headways between Ford Park and the Transportation Center on Fridays, Saturdays, Sundays, and holidays.

LONG-TERM RECOMMENDATIONS

6. Expand service to Chamonix Lane and Lions Ridge Loop pending future improvements to these roadways to allow safe and efficient bus operations.

7. The Town of Vail should continue to work with other public agencies and private sector beneficiaries to define and operate Down Valley transit services.

I-70 ACCESS/LOCAL CIRCULATION

SHORT-TERM RECOMMENDATIONS

1. Construct an I-70 underpass in the vicinity of Simba Run connecting the North and South Frontage Roads.

2. Upgrade the West Vail interchange and Frontage Road complex by implementing the following improvements:

   - Realign the west leg of the North Frontage Road between Wendy's and the Texaco service station to intersect Chamonix Road north of the existing intersection.

   - Realign the westbound I-70 on-ramp to connect with the east leg of the North Frontage Road.

   - Realign the eastbound I-70 on-ramp such that access to I-70 is via the South Frontage Road.

   - Add exclusive turn lanes for major left and right turning volumes at all intersections.

3. Conduct a controlled test at the Main Vail interchange to evaluate closing the east ramps and the traffic diversion to the East Vail interchange.

LONG-TERM RECOMMENDATIONS

4. Provide a connector roadway between the North Frontage Road and Chamonix Road in conjunction with future development in the vicinity of Vail Das Schone in West Vail.

5. Evaluate improvement alternatives at the Main Vail interchange including:

   - Relocating the east ramps to the Booth Falls underpass.

   - Extending the North Frontage Road east and under I-70 to connect with Vail Valley Drive immediately east of the Transportation Center.

   - Constructing new ramps to I-70 in the vicinity of the VA shops.

6. Monitor high volume intersections and provide demand responsive traffic control. The Town of Vail's preferred control method is to provide manual control with designated traffic control personnel.

7. Depress the South Frontage Road at Vail Valley Drive immediately east of the Transportation Center and provide side-street, stop-sign control on Vail Valley Drive at the South Frontage Road to allow through traffic on the Frontage Road to proceed without stopping.

8. Proceed with the long-term phased implementation of improvements to the Frontage Road system including:

   - Implementation of on-street, 6-foot wide bike lanes along the entire Frontage Road system throughout the Town.

   - Implementation of exclusive left turn lanes at 31 intersections including the provision of a continuous center turn lane along approximately 4.5 miles of the Frontage Road system.

   - Provision of landscaping at major intersections and points of interest.

   - Implementation of special safety improvements (e.g. guardrail, lighting, etc.) at major intersections, along non-residential roadway segments, high pedestrian activity areas, and at the ends of center medians.

9. Evaluate Vail Valley Drive as an eastbound one-way street between the South Frontage Road immediately east of the Transportation Center and a new connection with the South Frontage Road in the vicinity of Ford Park.

TRAIL SYSTEM INTERFACE

1. Proceed with the long-term, phased implementation of the Streetscape Master Plan including the separation of conflicting travel modes including:

   - Vail Valley Drive
   - West Meadow Drive
   - East Lionshead Circle
   - Relocation of Check Point Charlie
   - Willow Bridge Road Improvements

2. Proceed with the long-term, phased implementation of the Recreation Trails Master plan including detailed studies of eight key links throughout the Town:

   - Study Link 1: Stephens Park to 2154 South Frontage Road West
   - Study Link 2: West Gore Creek Circle to Matterhorn Circle/Donovan Park
   - Study Link 3: Lionshead/Vail Library to the Vista Bahn
   - Study Link 4: Vail Village to Kaotos Ranch Trail
   - Study Link 5: Circle K Bridge to Lupine Drive
   - Study Link 6: Nugget Lane to Meadow Drive
   - Study Link 7: Meadow Drive to Bighorn Park
   - Study Link 8: Vail Racquet Club to Main Gore Drive North

CHAPTER I. INTRODUCTION

OVERVIEW

Vail has established itself as one of Colorado's most unique and successful communities. Its geographic location, physical setting, and development history have all contributed to the Town's current character and international recognition. An important contributing factor in Vail's growth and special appeal is its planning philosophy within which multi-modal transportation planning, with a pedestrian emphasis, has been a key element. This is evidenced by:

- Vail's transit system is one of the most successful and innovative systems in Colorado consisting of a high quality core area shuttle complimented by an extensive outlying bus system.
- Vail continues to expand upon an extensive trail system which provides both transportation service and recreational opportunities for pedestrian and bicycle users.
- The Town provides large, close-in parking facilities to intercept automobile traffic and to provide immediate accessibility to exclusive busways and walkways to its base pedestrian villages.
- The Town continues to emphasize vehicular roadways separated from pedestrian facilities and shuttle bus routes which provide easy access between I-70 and major visitor parking facilities.

The Transportation Master Plan is intended to continue and expand upon this historical, multi-modal philosophy. Together with other planning activities (e.g. Comprehensive Land Use Plan, Streetscape Master Plan, Urban Design Guide Plan, Vail Village Master Plan, Recreational Trails Plan, Signage Plan, etc.), the Transportation Master Plan will focus upon all travel modes to develop a long-range implementation program to assure Vail's continued position as one of the world's premier resorts.

PURPOSE OF THE TRANSPORTATION PLAN

The Transportation Master Plan is one part of an overall strategy to develop a Comprehensive Plan for Vail. As indicated in the foregoing, many portions of the Comprehensive Plan have been completed which will be further clarified with the addition of the transportation elements.

The approved expansion of Vail Mountain by the United States Forest Service in 1986 brings with it new opportunities as well as new challenges for accommodating increased skier visits while maintaining and enhancing the Town's unique character. Vail's planned growth and the associated increases in travel demand require that the existing transportation system be evaluated for available capacity, expansion needs, and new transportation alternatives to reduce peoples' reliance on private automobiles to meet their transportation goals.

The Transportation Master Plan will provide guidance to the Town's decision-makers in developing a coordinated approach to implementing transportation improvements. It will allow the Town to resolve, monitor, and accommodate the growth the Town desires while preserving those characteristics which have made Vail a leader in transportation planning.

TRANSPORTATION PLANNING PROCESS

The Transportation Master Plan has been developed under the direction and guidance of the Parking and Transportation Advisory Committee. Several activities were conducted throughout the course of the study to obtain input, identify issues, and define potential solutions.

A series of meetings with individuals and small groups were initially held with a broad cross-section of citizens and community leaders. This input, which is documented in the Technical Appendix, was summarized into major areas of concern for subsequent analysis. Two broad areas of transportation issues were initially identified:

- Transportation problems and potential solutions which are within the Town of Vail's jurisdiction or which can be directly influenced and/or controlled by the Town of Vail.

- Transportation problems and potential solutions which are outside the Town's jurisdiction or probable funding capacity or which can only be partially influenced by Town initiatives.

Within each of these two broad areas, the transportation problems and potential solutions can be grouped into eight distinct categories as listed below.

- Transportation Issues within Vail's Jurisdiction

  - Regional access to Vail as it relates to the I-70 interchanges, new or modified access to I-70 interchanges, new or modified access to I-70, and the frontage roads.

  - Parking provisions within Vail relating to parking supply deficiencies, improved control of the operation of Vail's parking supply, and the modifications of the pricing of Vail's parking supply by user group.

  - Transit services provided by Vail including improvements and modifications to both the In-Town Shuttle and the outlying routes.

  - Delivery and service vehicle modifications desired or needed primarily within Vail Village to reduce congestion and to improve upon a wide variety of pedestrian and vehicular conflicts.

  - Pedestrian and bicycle facility enhancements needed to expand and improve the existing systems.

- Transportation Issues External to Vail's Jurisdiction

  - Regional transit services extending to Denver and the Front Range as well as to down valley communities as far as Eagle and the Eagle County Airport.

  - Remote parking facilities including Dowd Junction and Vail Pass.

  - Major modifications to I-70 such as tunneling the facility through all or portions of Vail.

Because the Transportation Master Plan is under the jurisdiction of the Town of Vail and must be largely implemented by the Town (including inter-agency coordination when necessary), the Parking and Transportation Advisory Committee determined that the planning process should focus on those issues which the Town could control or over which the Town could exert significant influence. Thus, the transportation analysis addresses the following topics:

- Vail Village Goods Delivery
- Public Parking Facilities and Operation
- Transit System Operation
- I-70 Access/Frontage Road System
- Recreation Trails Interface

To obtain additional input on these topic areas, the Town included these items in the 1990 Citizen Survey to further define citizen concerns and to identify potential alternatives and solutions. The complete results of this survey are also contained in the Technical Appendix. Some of the more frequently mentioned suggestions within each topic area included the following:

- Frequently Mentioned Ideas to Improve Traffic Conditions on Vail's Local Streets

  - Restrict or limit cars in Vail's major activity centers.
  - Improve traffic control methods utilizing more personnel or equipment.
  - Restructure truck deliveries in Town.
  - Improve overall signage.

- Frequently Mentioned Ideas to Improve Parking Conditions in Vail

  - Continue free outlying parking.
  - Build an additional parking structure.
  - Develop shoulders on frontage roads for additional parking.

- Frequently Mentioned Ideas to Improve Transit and Bus Service

  - Provide frequent summer service to East Vail, West Vail, and the golf course.
  - Increase peak period bus service and late night service.
  - Implement a monorail in the long term future.

o Frequently Mentioned Ideas to Improve I-70 Access and Frontage Road Operations

- Install traffic lights; increase traffic control personnel.
- Control speeding.
- Plant additional trees to buffer highway noise.
- Provide bike and walking path along frontage roads.
- Build interchange with I-70 in Lionshead area.
- Widen the frontage roads to provide parking.

o Frequently Mentioned Ideas to Improve Recreation Trails (Bicycle and Pedestrian)

- Provide a Valley-wide bike path (Vail Pass to Glenwood Canyon)
- Provide separate bike paths and pedestrian paths, and streamwalks.
- Provide a walking path between Vail Village and Lionshead.
- Extend existing bike paths and add new bike paths.
- Improve signing and enforce existing rules and regulations.

Based upon this broad-based input the Parking and Transportation Advisory Committee focused upon the specific analyses required to address each topic area. This included detailed quantitative evaluations, analysis of feasible alternatives, and short-range and long-range recommendations developed over a one-year planning period.

The final recommendations were then included in the 1991 Citizen Survey to obtain further input on the specific recommendations as well as their relative priority. The Transportation Master Plan was then finalized to reflect both citizen input and the Town's ability to proceed with implementation. The results of the 1991 Citizen Survey are also documented in the Technical Appendix. This plan reflects the broad public input gained from the community and is not solely a study based on engineering standards.

The recommendations contained in the Transportation Master Plan do not constitute approved projects. Each project, prior to implementation, will require full public review and must undergo a more detailed design evaluation. Steps must be taken to address quality design, with emphasis on landscaping and aesthetic considerations. The planning process recognizes that land ownership is a critical element in evaluating specific transportation solutions. The Town will need to work with private property owners and surrounding neighborhoods to examine existing covenants, zoning, and deed restrictions in finalizing specific land acquisitions to implement needed solutions. Due to the shortage of available land within Vail, land acquisition for the transportation solutions recommended in the plan will need to be addressed in the short-term.

RELATIONSHIP TO REGIONAL TRANSPORTATION NEEDS

While the Vail Transportation Master Plan documents long-range concept plans and short-range improvement projects for the Town, the planning process also recognizes the role of the Town's Plan within the greater regional context. It is recognized that transportation to and from Vail involves multi-agency cooperation throughout the Vail Valley, adjacent counties, and the Front Range.

Vail is supportive of a broad range of alternative transportation modes which address resident, employee, and visitor needs. These alternatives should be compatible with environmental constraints and should encourage reductions in travel demand as a means to reduce the need to expand the infrastructure to serve this demand.

Monitoring and updating activities are recommended which will allow future regional transportation decisions to be incorporated into the Vail Comprehensive Transportation Plan. These regional transportation decisions may include expanded mass transportation services throughout the Vail Valley as well as new technologies implemented regionally and statewide.

CHAPTER II. VAIL VILLAGE DELIVERIES

DESCRIPTION OF EXISTING CONDITIONS

While the Town of Vail was originally conceived as a pedestrian oriented village, goods delivery and various service functions have resulted in significant and undesirable truck activity in designated pedestrian areas. This problem is partially the result of inadequate service and delivery facilities, especially alleys, which requires that goods and services be provided via "front-door" access points. This condition is most evident in Vail Village in contrast to the Lionshead area which was designed with delivery access systems. This situation, combined with Vail's greater than expected growth, has magnified the problem of service and delivery vehicle conflicts with pedestrians. The result is not only an inefficient delivery system but also an adverse effect on Vail's appearance and image.

The specific area of concern for this analysis is shown in Figure 1 and generally lies south and west of Gore Creek Drive and Mill Creek. This area is accessed by Willow Bridge Road, Gore Creek Drive, Bridge Street, Vail Road, and Hanson Ranch Road. There are 31 designated loading zones for deliveries which are currently located along the west side of Willow Bridge Road south of Willow Bridge (14 parking spaces: 9 vehicle spaces plus 1 handicap space near Summers Lodge and 4 near Riva Ridge), the south side of Gore Creek Drive (10 parking spaces, 5 near Lodge at Vail and 5 near Mill Creek Court), the west side of Bridge Street adjacent to the Plaza Building (4 parking spaces), and on Hanson Ranch Road (3 parking spaces). Fifteen minute parking zones for all vehicles are also provided adjacent to the Christiania parking lot. Larger delivery vehicles are currently prohibited in the Village area from 8:30 AM to 10:30 AM and from 2:00 PM to 5:00 PM during ski season and 11:00 AM to 2:00 PM in the summer season. All delivery vehicles are required to pass through Check-Point Charlie located on the west end of Gore Creek Drive. A survey of land uses within this area was conducted by Town staff to determine floor areas of primary truck trip generators. Table 1 summarizes this data.

Because of the many different establishments represented in the area, it is not possible to define a typical delivery pattern. However, a cumulative demand level for the entire Village can be established with reasonable accuracy. The quantity of goods and associated truck volumes generated is based upon typical delivery orders and standard truck trip generation rates by land use type. These data are compared with similar information documented in a 1980 planning study in the Village [1] and were updated to reflect 1990 conditions.

The analysis of goods delivery operations indicates that peak summer activity is approximately 13% less than peak winter activity. While this is not a major difference in magnitude, winter operating conditions are much more severe indicating that the winter season is clearly the critical design period.

In addition to basic goods delivery, however, there is a considerable amount of related vehicular activity consisting of autos, vans and pick-ups, as well as large trucks. These vehicles are typically performing a variety of functions including maintenance and repair, customer service, and trash pick-up. Table 2 documents each of these functions along with their relative daily activity levels.

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1 Technical Report (undated), Town of Vail, Department of Community Development, 1980.

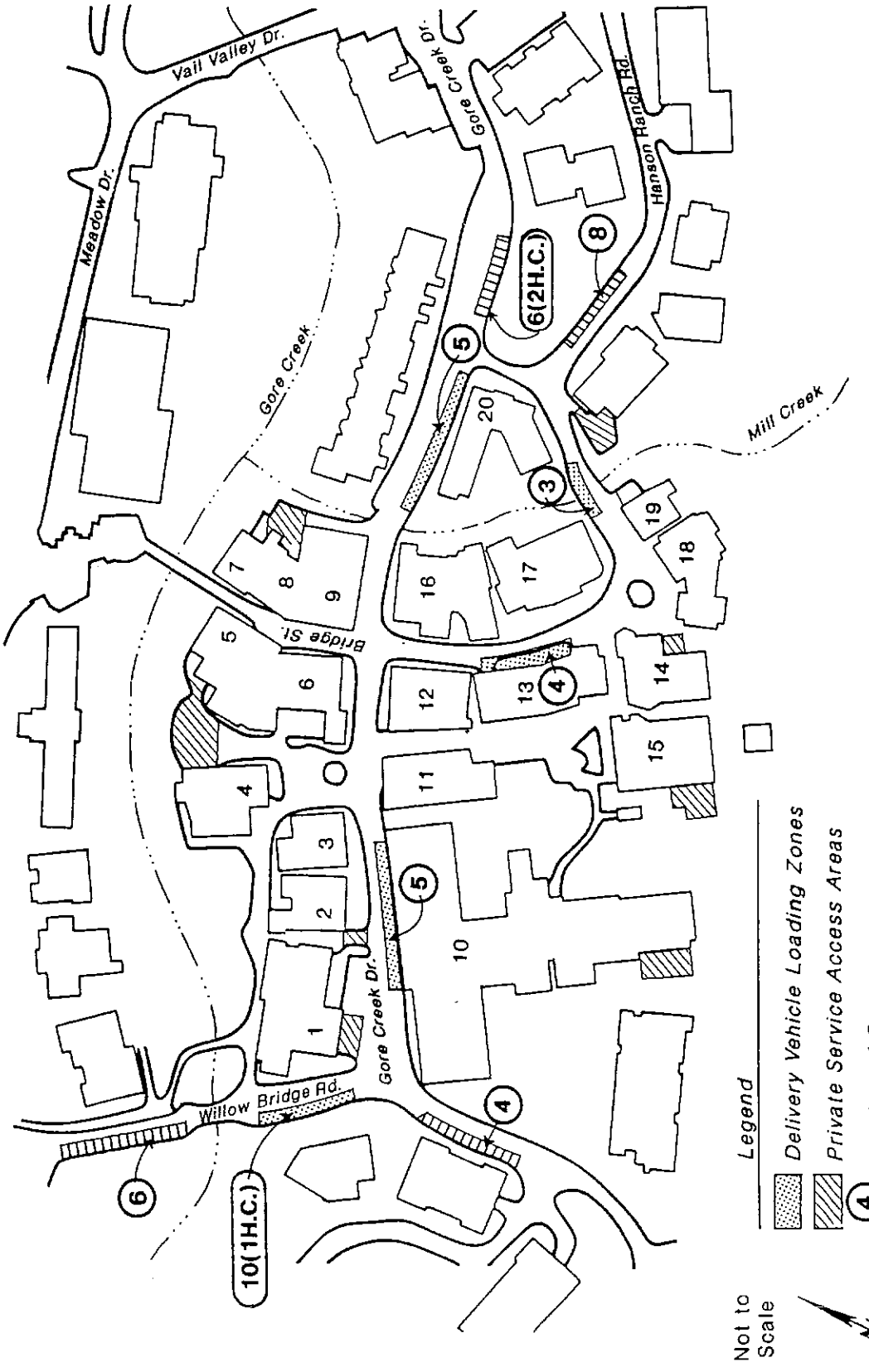

Figure 1
Existing Goods Delivery System

Table 1
Floor Areas of Primary Truck Trip Generators
(1980 Square Footages)

Building Number	Building Name/Address	Floor Area (Square Feet) General Retail	Restaurant	Office
1.	Sitzmark (83 GCD)	4,600	3,080	524
2.	Gore Creek Plaza (193 GCD)	3,004	3,800	2,102
3.	Schober (201 GCD)	3,500	2,937	2,528
4.	Creekside (223 GCD)	3,338	5,798	
5.	Covered Bridge (227 Bridge Street)	8,816		
6.	Gasthof/Gramshammer (231 Bridge St.)	7,477	6,583	
7.	Gallery (228 Bridge Street)		5,247	2,342
8.	Slifer(230 Bridge Street)	859		3,916
9.	Clock Tower (232 Bridge Street)	2,790		4,199
10.	Lodge at Vail (158-198 GCD)	9,035	8,997	
11.	Lazier Arcade (225 Wall Street)	7,371	3,000	
12.	Casino (250 GCD)	3,744	3,835	
13.	Plaza (281-293 Bridge Street)	8,000	4,800	
14.	Hill (311 Bridge Street)	8,056		
15.	One Vail Place (244 Wall Street)	2,348		9,953
16.	Liquor Store (280 Bridge Street)	5,408		1,000
17.	Red Lion (304 Bridge Street)	2,194	11,448	
18.	Gold Peak Hs. (278 HRR)	5,321	1,260	
19.	Cyranos (298 HRR)		5,434	
20.	Mill Creek Court (302 HRR)	3,553		2,746
	Totals	89,414	66,219	29,310

GCD = Gore Creek Drive
HRR = Hanson Ranch Road

Note: Numbers were increased to reflect 1990 status.

Table 2
Peak Season Delivery and Service Volumes
(Estimates of 1990 Activity)

Function	Average Delivery Trips Per Day
Emergency Operations	
Priority (Police, Fire, Ambulance)	As Required
Non-Priority (Maintenance, Repair, Service)	As Required
General Maintenance, Repairs and Service	
Major (more than 1 day)	As Required
Minor (less than 1 day)	2 - 4
Product Delivery (*)	140 - 170
General Retail Goods	
Food/Perishables	
Vending (Soft Drinks, Confections, Tobacco)	
Liquor and Alcohol	
Taxi Services	8 - 10
Package Delivery and Pick-Up	8 - 10
Customer Specialty Service	2 - 4
Trash Pick-Up	As Required
Totals	162 - 202

* Product delivery activity of 140 to 170 vehicle trips (half of the vehicle trips enter the Village area and half exit the Village area) is made by 70 to 90 trucks. This truck volume conducts approximately 230 to 250 separate deliveries and generates a total commodity volume of 1,900 to 2,100 cubic feet per day.

GOALS AND OBJECTIVES

Basic planning objectives relative to the goods and services delivery system are ordered in the following hierarchy:

- o Pedestrianization should be emphasized as a priority. Ideally, therefore, all trucks and service vehicles should be eliminated from the Village core.
- o If this is not feasible, the number and size of trucks in the Village core should be reduced.
- o Gore Creek Drive (between Check Point Charlie and Mill Creek) and Bridge Street should not carry any vehicular traffic.
- o Design solutions need to be sensitive to surrounding neighborhoods and the natural environment.

Demand estimates indicate that approximately 25 to 30 delivery and service parking spaces are required to accommodate the existing delivery demand during the peak season. In the future approximately 35 to 40 delivery and service spaces will be needed. These new loading zones should be located in response to both environmental constraints as well as pedestrian and retail space needs.

CHARACTERISTICS OF DELIVERY SYSTEMS[2]

In order to better understand the consequences of the alternatives which are available to Vail, it is important to clarify the two basic characteristics of any goods and services delivery system which fully or partially fulfill the previously stated objectives. These characteristics are:

- o Surface vs. Subsurface Operations
- o Direct Service or Decentralization vs. Non-Direct or Centralized Operations

Subsurface (or underground) delivery systems may be applicable when (as is the case in Vail) insufficient space is available on the surface level to separate incompatible delivery functions from other activities. The primary factors affecting the feasibility of subsurface delivery systems are constructability, liability, and costs. If these factors can be overcome, the primary objective can be satisfied.

Direct service delivery refers to the situation in which individual merchants order their products from multiple vendors who are responsible for bringing the product directly to the merchant. This type of delivery system emphasizes a high level of service to the merchant and can, therefore, result in excessive truck volumes in the core area due to multiple product types and varying delivery times. The entire product delivery effort, however, is the responsibility of the merchant and the vendor.

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2 Much of the material presented in this section is based upon conversations and meetings held with vendors and truck transportation providers during March, 1990.

By contrast, the application of a centralized delivery system in Vail Village would be done in order to:

- o Transfer less-than-truck-load (LTL) deliveries to smaller vehicles, and
- o Consolidate small deliveries onto fewer vehicles.

To accomplish these objectives of smaller and fewer trucks in the Village core, service to the customer is typically reduced primarily in terms of delivery times and frequency. This is due almost solely to the fact that a third party is involved in the product delivery system. Construction of a warehouse facility, purchase of down-sized delivery vehicles, personnel to operate and maintain facilities, insurance, and product replacement are all third party responsibilities. In most instances, this third party would be the Town of Vail or a private business under contract to the Town. In any case, the Town would be responsibly involved in the product distribution system.

Time restrictions on goods delivery is a means by which competing uses of limited physical space can be monitored and allocated to priority functions. As such it is a compromise which is imposed on the area in order to avoid excessive capital expenditures while retaining a certain level of convenience and efficiency for delivery operations. In addition, the Town's involvement is restricted to its typical regulatory and police powers. The Town currently has time restrictions for product delivery and intends to continue these restrictions.

ALTERNATIVES

Five alternatives have been identified which address, in varying degrees, the objectives listed previously to reduce vehicle/pedestrian conflicts in Vail Village. These alternatives are defined as follows:

Alternative 1 - Subsurface Tunnel System

This alternative consists of tunnels directly below Gore Creek Drive, Bridge Street and Hanson Ranch Road. The tunnels would be large enough to accommodate full-size trucks such that direct service to all merchants is retained. The tunnel entrance would be located north of the current site of Check Point Charlie and exits would occur in the vicinity of Mill Creek, with underground traffic oriented one-way in the eastbound direction. Underground access to buildings would be provided via installing basement doors, staircases, and service elevators to the surface level.

Alternative 2 - Small Vehicle Subsurface Tunnel System

This alternative is similar to the subsurface tunnel system except that the underground tunnels would be sized to accommodate smaller vehicles (such as Cushmans) to reduce costs. Such an operation would require centralization of deliveries where goods would be transferred to third party vehicles.

Alternative 3 - Centralization (Close-In)

This alternative consists of a central receiving area at which delivery trucks would transfer product to smaller vehicles. The idea is to replace larger trucks currently being used in Vail Village with smaller vehicles. To make this feasible, a warehouse should be within close proximity of the Village; preferably 1/4 mile or less, and in no instance greater than 1/2 mile.

Alternative 4 - Centralization (Remote)

This alternative is identical to close-in centralization except that the warehouse receiving area would be located away from the Village area where land prices would be more feasible. The idea is to consolidate goods so that fewer delivery trucks would be needed. However, it is unlikely that small vehicles would have sufficient torque and gearing to pull the larger loads over the longer distances inherent in this alternative. Thus, while the number of trucks would be less, the size of the typical delivery vehicle would be relatively large.

Alternative 5 - Decentralization

This alternative is similar to the existing situation except trucks would not be allowed on Bridge Street. The loading zone currently located on Bridge Street would be relocated to either the Christiania parking area or to a newly constructed site in the vicinity of where Mill Creek passes under Hanson Ranch Road.

FIRST LEVEL EVALUATION

An initial screening of the five alternatives was conducted in order to identify key factors which may make an alternative unacceptable. This "fatal flaw" evaluation is summarized below.

Alternative 1 - Subsurface Tunnel System

The subsurface tunnel system would be a major undertaking involving three major issues:

- Constructability
- Liability
- Costs

The construction of such a project would require the excavation of approximately 32,000 cubic yards of material, and 58,000 square feet of new support structure for the pedestrian areas above. All utilities and other infrastructure that are currently below the surface such as storm and sanitation sewers, water, gas, telephone, and electric would need to be relocated. Construction would take a minimum of 2 years and more likely 3 to 4 years. Portions of the Village would be entirely closed off to pedestrian traffic, and businesses would be required to shut down during certain critical periods of the excavation process.

Town liability would be significantly affected. Tunneling in close proximity to existing development would have to be done utilizing special procedures to minimize potential damage or weakening a building's structural integrity. Even upon completion of the project, it is possible that structural damage to adjacent buildings may not be evident for 10 to 20 years or more after project completion. The liability consequences of this alternative would continue indefinitely.

The cost of the tunnel project can only be grossly estimated at this time. Basic excavation, structural components, and utility relocation would be approximately $30 to 40 million. Costs associated with building access modifications, insurance, material disposition, and portal treatments would increase total project costs to $50 million or more.

Although this alternative achieves the primary objective, its construction, liability, and cost implications make it impractical.

Therefore, this alternative is recommended to be eliminated from further consideration.

Alternative 2 - Small Vehicle Subsurface Tunnel System

The smaller subsurface tunnel system involves the same basic issues of constructability and liability but at a reduced project cost of approximately $10 to $15 million. In addition, this alternative would involve maintaining a central receiving area where goods would be consolidated and transferred to smaller vehicles for ultimate access to the customer. Given the fact consolidated loads would be carried by small vehicles, this kind of delivery centralization would be just as appropriate on the surface. As a consequence, tunnel excavation would not be financially necessary if delivery centralization was to occur.

Therefore, this alternative is recommended to be eliminated.

Alternative 3 - Centralization (Close-In)

The centralization alternative utilizing a close-in receiving area (within one-quarter to one-half mile of the Village) would make use of smaller vehicles in lieu of larger trucks within the Village to complete the delivery. Delivery trucks would unload their cargo onto smaller vehicles (such as Cushmans or tractor units similar to airport luggage trains) and then transport it to Village destinations. Operators of the vehicles could either be the truck driver himself or a third party employee. Delivery vehicles within the pedestrian area would be smaller in size, and the number of vehicles required to deliver the same volume of goods would decrease by approximately 15% to 20% over the existing situation.

Advantages

- Many or all of the larger delivery trucks would be removed from the core area.
- Total truck volume in the core area would be reduced.

Disadvantages

- Land acquisition costs would be extremely high for a close- in receiving area and a warehouse operation may not be considered a compatible land use with adjacent properties.

- All delivered goods would need to be "double-handled", that is, they would need to be unloaded at the receiving area and reloaded onto another vehicle before delivered to an establishment.

- The Town of Vail would likely become financially and legally involved in the goods delivery business. Maintaining the loading facility; purchase, operation, and insurance of vehicles; and product liability would all be elements of the Town's involvement.

- This alternative may not be appropriate for all types of deliveries, and therefore may only be a partial solution. For example, special arrangements would likely be required for liquor deliveries, since the law requires liquor to be delivered directly to liquor-licensed establishments.[3] This may be resolved if, in securing the liquor license, the establishment also obtains a license for an optional premises, such as a warehouse.

This alternative (or variation thereof) may be an appropriate solution, but further evaluation is necessary to determine its feasibility.

Alternative 4 - Centralization (Remote)

The idea behind a remote centralized facility is to locate the facility away from the Village where land acquisition is less expensive and construction is more feasible. Such a facility would have similar characteristics to a close-in site, and many of the advantages and disadvantages would still apply. However, a remote site would introduce additional problems which include:

- Less flexibility would exist for merchants requiring essential deliveries. If a particular establishment has placed an order that it needs as soon as possible, the delivery truck may be punctual in delivering the item(s) to the warehouse facility, but the final delivery would be subject to the loading of the third party delivery truck. That is, a delivery from the warehouse to the Village would not occur to accommodate just one merchant. The truck must be sufficiently loaded to warrant making a delivery trip to Vail Village.

- Smaller delivery vehicles would not be appropriate for a remote site. A larger truck would be required to efficiently consolidate products and to operate in mixed traffic conditions between the warehouse and the village. Therefore, large delivery trucks would still access the Village.

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[3] Conversation with the Colorado Department of Revenue, Liquor Enforcement Division, March 23, 1990.

- Delivery of perishables, food, or vending products may need individual attention and they may not lend themselves to be consolidated into a common truck. As a result many special trips to the Village would be required which is contrary to the objective of reducing truck volume in pedestrian areas.

For these reasons, Alternative 3 (close-in centralization) is a more practical solution than Alternative 4 (remote centralization).

Therefore, this alternative is recommended to be eliminated from further consideration.

Alternative 5 - Decentralization

The primary focus of a decentralized delivery system is to maintain the current delivery scheme, but to prohibit all delivery vehicles from the Village core. This concept could be implemented with continuing time restrictions so that trucks would not be allowed during heavy pedestrian traffic periods. In addition, restrictions could be imposed such that no delivery vehicles would be allowed in the Village on certain days of the week. Additional loading and unloading areas could be provided at the Christiania parking lot and/or a newly constructed loading zone which would be located on Hanson Ranch Road in the vicinity of Mill Creek. Advantages and disadvantages of this alternative are as follows:

Advantages

- Bridge Street would be free of all delivery traffic.
- Goods are not "double handled".
- Town of Vail would not be financially or legally involved in the delivery business.

Disadvantages

- Does not relieve Gore Creek Drive of delivery activity.
- Drivers would be required to handcart goods further for deliveries destined to establishments on Bridge Street north of Gore Creek Drive.
- Vehicles would be parked for a longer time period.
- Impacts on surrounding neighborhoods and the natural environment which may result.

This alternative or a variation thereof may be an appropriate solution, but further evaluation is necessary to determine its feasibility.

SECOND LEVEL EVALUATION

The preliminary technical analysis conducted to this point suggests that two basic goods and service delivery alternatives have sufficient potential to warrant more detailed investigation. These alternatives are:

- Alternative 3: Close-in Centralized Delivery
- Alternative 5: Decentralized Delivery with Bridge Street, Gore Creek Drive, and Hanson Ranch Road Loading Zones Relocated

A more indepth analysis is now required to select the preferred plan.

Alternative 3 - Centralization (Close-In)

A review of this alternative yields several issues and concerns to be addressed as follows:

- What is the best location for a decentralized warehouse?
- How big should the "small-vehicle" fleet be?
- To what degree would the Town of Vail need to be involved and be responsible?

Alternative locations for a central receiving area are limited to the tightly spaced build out of the Village area. Four alternative sites have been identified for additional evaluation which include the Christiania parking lot, the parking area east of Garden of the Gods, the Golden Peak tennis courts, and an area just off of Vail Road immediately south of the Lodge South condominium tower.

The Christiania parking lot site illustrated in Figure 2 is characterized by having the dock area below the Christiania guest parking area. The grade difference between Hanson Ranch Road and Gore Creek Drive lends itself to construct a two-level structure on this site in which the lower level would be used for unloading and the upper level would be used to replace the parking that currently exists on that site. Access to the lower level would be on Gore Creek Drive and access to the upper level would be provided via Hanson Ranch Road.

The Garden of the Gods site shown in Figure 3 is characterized by having the dock area entirely underground below the surface parking at Vail Trails. Since this is a relatively flat area, a significant amount of "ramping" is required to transfer delivery vehicles from the surface level to the lower level. The single unit delivery truck ramps would need to be a minimum of 330 feet long to traverse the elevation difference, and the small delivery vehicle ramp would need to be approximately 220 feet long. The single unit truck ramps would have to begin descending immediately south of the Gore Creek bridge along Vail Valley Drive. Consequently, Gore Creek Drive and other parking accesses would have to be closed off from Vail Valley Drive due to the access ramps. In addition, these ramps would be located very near existing buildings (Vorlaufer and Vail Trails), and the excavation required in constructing the ramps may adversely affect the structural integrity of these buildings.

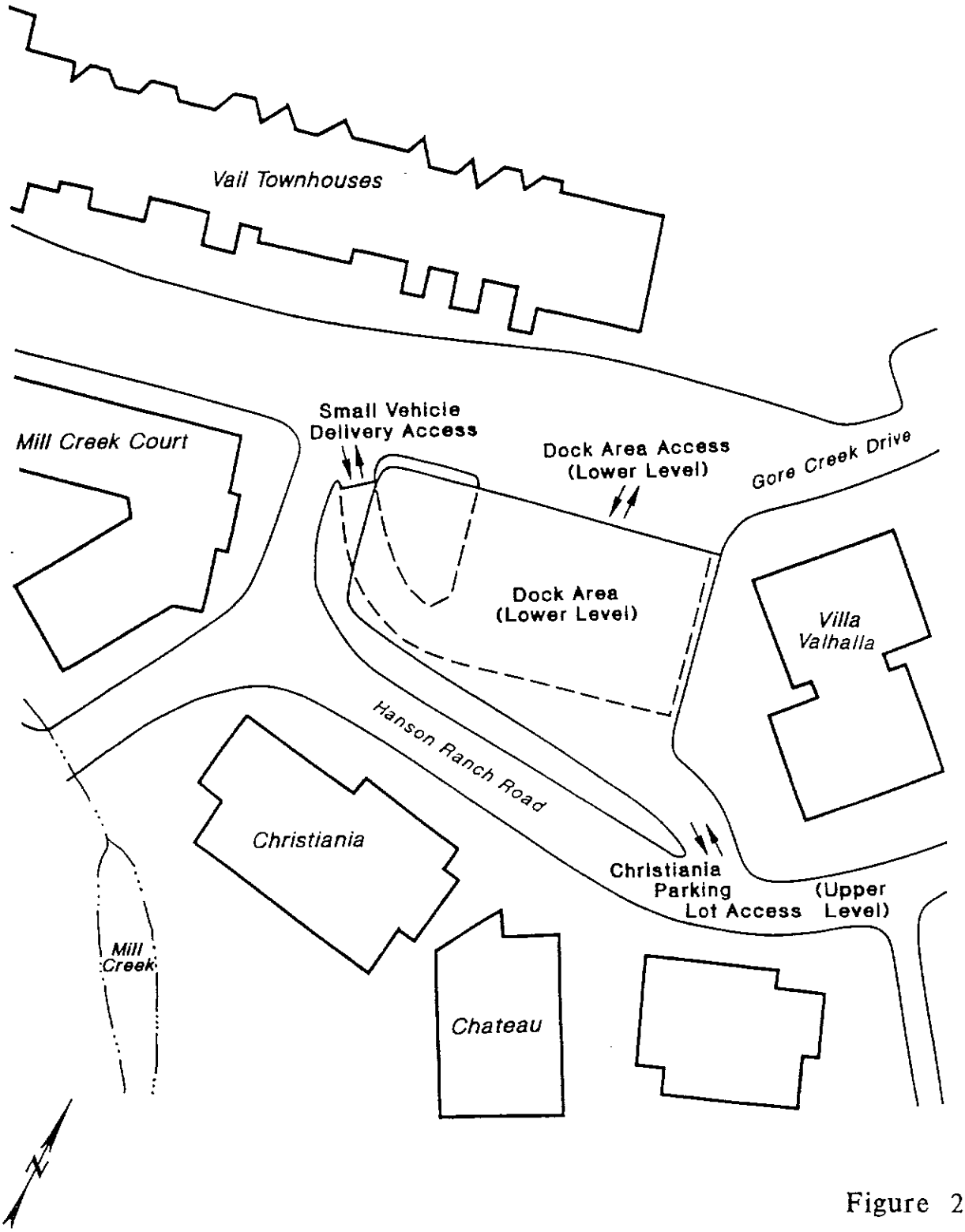


Figure 2
Christiania Lot Centralization Site

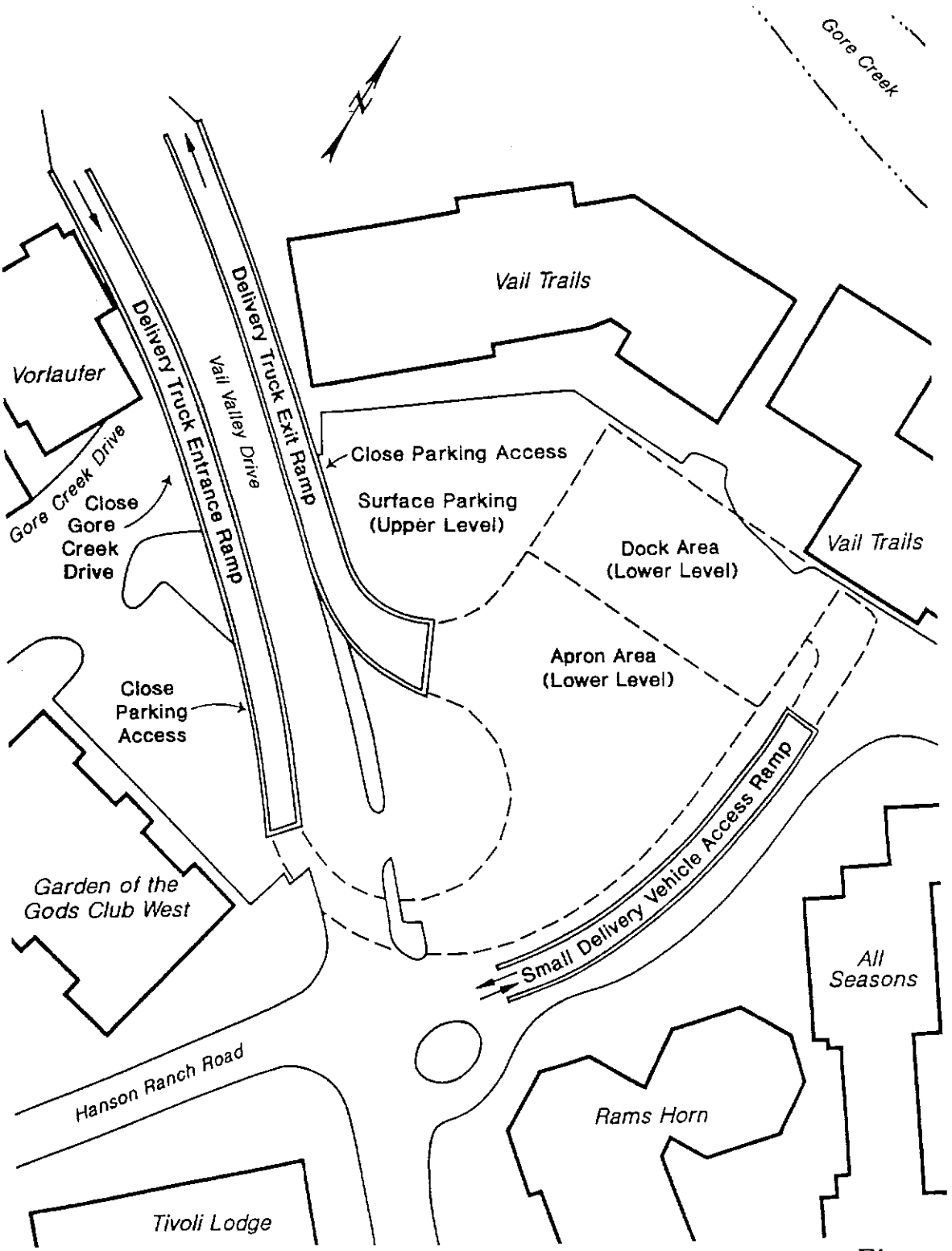


Figure 3

Garden of the Gods Centralization Site

The Golden Peak tennis courts site shown in Figure 4 is characterized by a loading area located on the current tennis court level. The embankment along the south and west sides could be used to support a roof over the loading area in which 3 tennis courts could be replaced. No tunneling would be required since the loading area and ramps would be at about the same level as Vail Valley Drive.

The Vail Road site shown in Figure 5 would essentially be located into the side of the mountain. Delivery vehicle access would be via tunnels located off of Vail Road. The southern side of the dock building would be 35 to 40 feet below the ground surface, and the northern side of the dock building would be partially exposed.

Items of concern regarding a close-in facility site include the following;

- The site should be located as close to the Village core as possible to shorten the small delivery vehicle trip length and to minimize intermixing with regular traffic.
- The site should be sufficiently large to accommodate the maneuvering of combination unit trucks off of the public street system.
- The facility should be covered and concealed to the extent possible for aesthetic reasons.
- The site should not significantly affect the surrounding neighborhoods and natural environment.
- Constructability and costs of the site should be reasonable.

Of the four sites, the Christiania site would be located closest to the Village area which is its biggest advantage over the other three sites. Planning level costs are estimated to be $1.4 to $1.7 million.

The Garden of the Gods site would be totally underground. However, installing the necessary ramping would close off key access points onto Vail Valley Drive (e.g. Gore Creek Drive) as well as impacting adjacent buildings. This alternative conflicts with many goals of the Streetscape Plan for Vail Valley Drive. Because this site requires extensive tunneling and excavation total implementation costs are estimated at $2.4 to $2.9 million.

The Golden Peak tennis courts site is located furthest from the Village core, but would be easier and less costly to implement since minimal excavation is required. The structural needs for the roofing at this site would also be less stringent since roof loading would be much less. In addition, the impacts on surrounding parking and the tennis court area are easily mitigated and additional space is available to expand the dock and apron area if future needs so dictate. Total implementation costs are estimated to be $1.4 to $1.7 million.

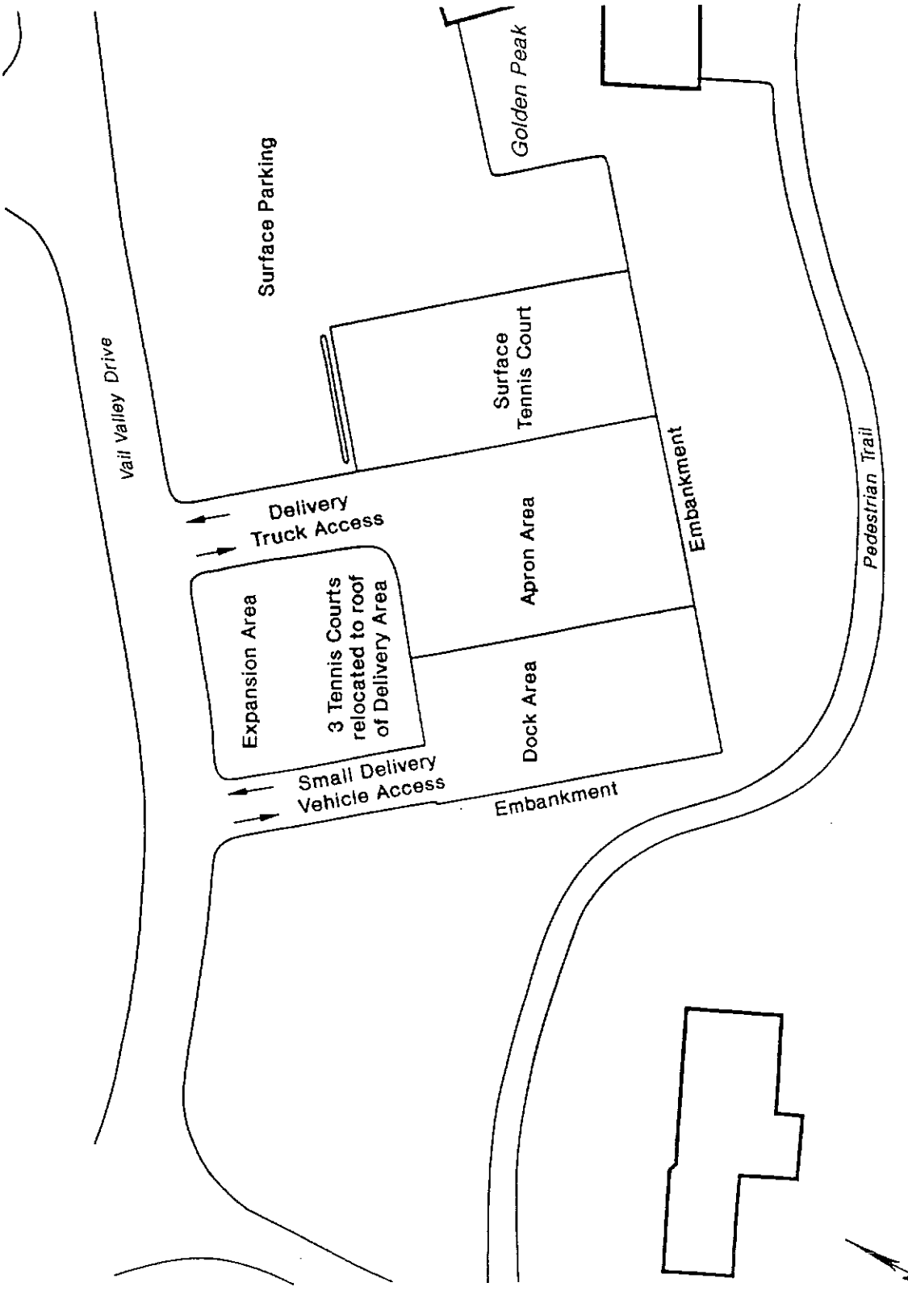


Figure 4
Golden Peak Centralization Site

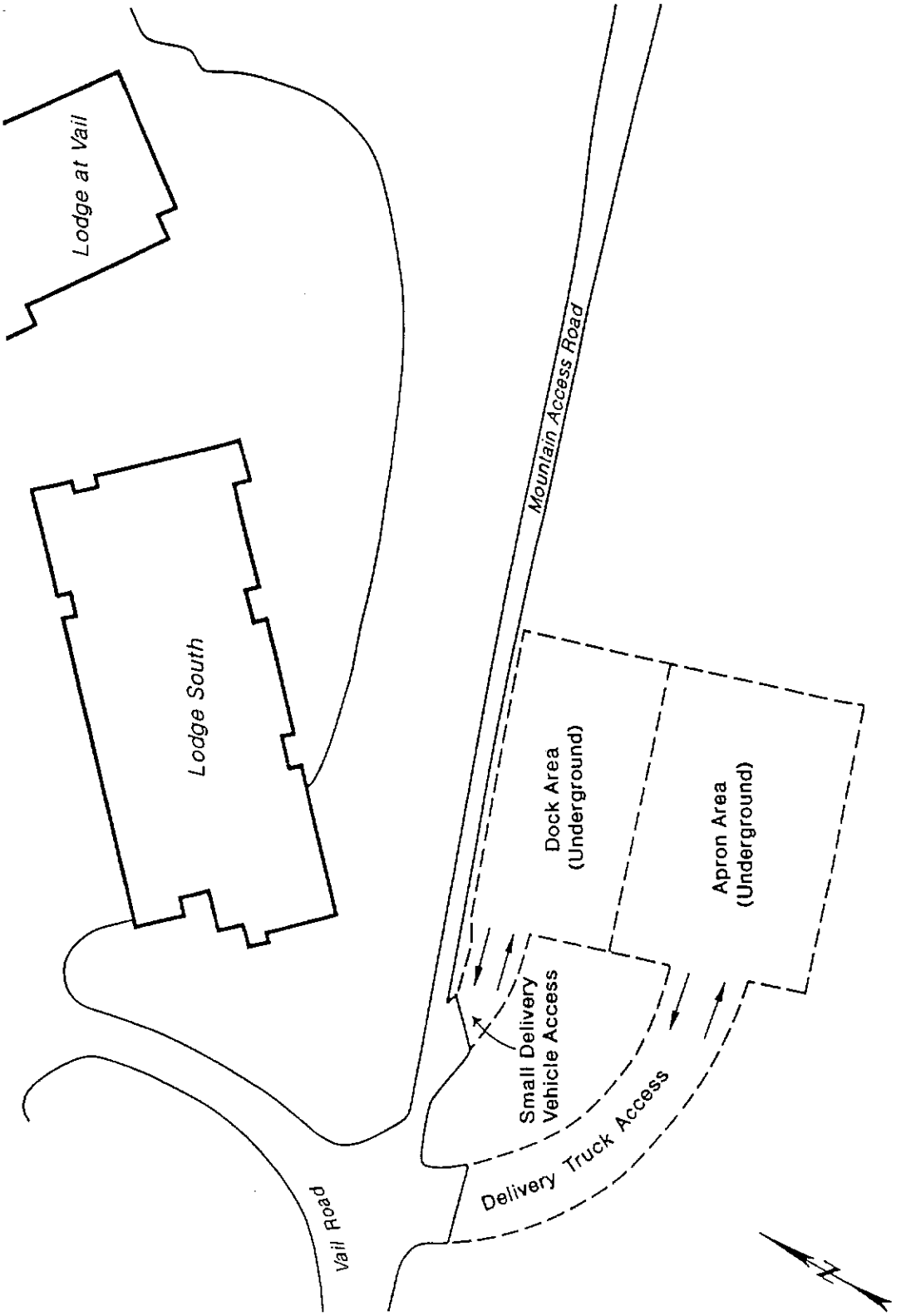


Figure 5
Vail Road Centralization Site

The Vail Road site south of the Village core also requires extensive tunneling and excavation on a difficult construction site. While nearly totally concealed, implementation costs are estimated to be $2.0 to $2.4 million.

In the event that Alternative 3 is implemented, the Christiania site would be the most desirable of the four since it is located closest to the Village area, it is not as disruptive to the surrounding area as the other alternative sites, and would be one of the more inexpensive alternatives to construct. Implementation will require extensive treatments to deal with the many aesthetic concerns of the site.

The size of the Cushman fleet is dependent upon vehicle delivery times; that is the time that each vehicle is away from the warehouse making deliveries. These times will be higher for warehouses located further from the Village core. Based on an estimated quantity of about 2,000 cubic feet of delivered goods and an effective small vehicle capacity of 40 cubic feet, a close-in site such as the Christiania lot will require a fleet of 7 vehicles whereas the other sites would require 8 to 10.

The only logical third party would be the Town of Vail which would ultimately need to construct the warehouse facility, acquire land for the facility, acquire the Cushman vehicles, and maintain the entire operation. The Town would also be directly or indirectly responsible for the condition of delivered goods. The burden of implementing and maintaining a centralized delivery system could be placed upon Village merchants or the delivery companies.

Alternative 5 - Decentralization

Three areas were discussed as potential locations for new truck loading zones under the decentralized delivery system. These areas are:

- Development of a combined alley/pedestrian corridor along Mill Creek between Gore Creek Drive and Hanson Ranch Road.
- A formalized truck loading zone between Cyranos and Christiania.
- A lower level loading zone beneath the existing Christiania parking lot.

The Mill Creek corridor is sufficiently wide to accommodate a one-way alley, provide an open water area, and retain a landscaped pedestrian corridor. Relocation of the Mill Creek channel would occur from a point north of Hanson Ranch Road to Gore Creek Drive. The ability to provide a walkway connection through the buildings along Bridge Street (North of the Red Lion) is complicated by stairways to upper level dwelling units and other building elements which would have to be re-constructed and modified. If access between these buildings cannot be provided, the alley concept still performs two important functions:

- Close-in replacement space for the loading operations which now occur on Bridge Street, and
- A connection between Hanson Ranch Road and Gore Creek Drive which enhances truck access to the south end of Bridge Street and the area north of Gore Creek Drive.

Up to six 35-foot truck spaces and nine 25-foot truck spaces can be provided along the alleyway. Basic construction costs are estimated to be approximately $100,000. The amount of landscaping and pedestrian improvements desired and the structural modifications involved in providing a pedestrian access through the buildings facing Bridge Street could increase the implementation costs to $150,000 to $250,000.

The area between Cyranos and the Christiania building can be designed to accommodate up to eight truck spaces; but more realistically five spaces in consideration of the natural environment. Cyranos would be affected with the major change occurring to the small parking area and trash container holding area next to Christiania. Exclusive of any right-of-way costs, this area could be constructed for approximately $50,000.

The area under the existing Christiania parking lot results in approximately 17 additional truck parking spaces under a simple parking deck structure to replace the Christiania parking area. Product delivery to the core area would also be via handcarts. Implementation costs for an informal truck loading zone at this sight is estimated to be $750,000 to $850,000 exclusive of land costs. Implementation will require extensive treatments to deal with the aesthetic concerns of the site.

Table 3 summarizes the advantages and disadvantages of each alternative. Details of the planning level cost estimates for all of the alternatives are presented in the Technical Appendix.

Alternatives 3 and 5 were presented to Vail Village merchants and representatives from various product vendors. Two meetings were held for discussion and a general agreement was made regarding the following items:

- Elimination of goods delivery operations from Bridge Street was agreed to be an important objective.
- The truck loading area between Cyranos and Christiania was generally considered a good replacement area for Bridge Street.
- The truck loading area on Gore Creek Drive immediately east of Check Point Charlie was desired to be retained in order to keep walk distances and truck dwell times to a minimum.
- Existing short-term parking areas were suggested to be converted to truck loading zones only and adequately enforced. This includes the areas on Gore Creek Drive next to the Mill Creek building and the Christiania parking lot and on Hanson Ranch Road next to the Christiania parking lot.

Table 3
Summary Evaluation of Product Delivery Options

Item	Alternative 3 (Centralization, Close-In)	Alternative 5 (Decentralization)
Basic Characteristics	o Retains loading zones on Village Streets while reducing the size of the delivery vehicle.	o Loading zones are eliminated on certain Village streets (i.e. Bridge Street and Gore Creek Drive).
	o Town of Vail is a participant in the goods delivery system beyond its typical regulatory and police powers.	o Town of Vail continues its basic regulatory and police powers.
Delivery Vehicle Trips on Village Streets	108 to 112 Small Vehicles Per Day Plus Exceptions (emergency, maintenance, etc.)	None on Bridge Street Plus Exceptions (emergency, maintenance, etc.)
Product Liability		None
General Retail	Yes	
Food/Perishables	Special Equipment	
Product Exceptions		None
Liquor/Alcohol	Not Currently Allowed	
Vending Products	Money Collection/Security	
Package Express	Time Guarantees	
Other Exceptions		
Emergency Operations	Yes	Yes
Maintenance/Service	Yes	Yes
Taxi Services	Yes (1)	No
Customer Specialty Service	Yes (1)	No
Trash Collection	Yes (1)	Yes (1)
Special Circumstances	Yes (1)	Yes (1)

(1) Exceptions can be controlled with existing or modified time restrictions.

Table 3 (Continued)
Summary Evaluation of Product Delivery Options

Item	Alternative 3 (Centralization, Close-In)	Alternative 5 (Decentralization)
Capital Costs (Planning Level Estimates)		
Small Vehicles (7-10)	$105,000 to $150,000	None
Warehouse (10 Berths)		None
Christiania	$1.4M to $1.7M	
Garden of the Gods	$2.4M to $2.9M	
Golden Peak Tennis	$1.4M to $1.7M	
Lodge South	$2.0M to $2.4M	
Loading Zones (40-47 Spaces)		
Mill Creek (6-8 Spaces)		$150,000 to $250,000
Cyranos (7-8 Spaces)		$ 50,000 + R/W
Christiania (17 Spaces)		$750,000 to $850,000
Check Point Charlie (10-14 Spaces)		Existing
General Operations	Mandatory Warehouse Scheduling Retain Delivery Time Restrictions	Retain Merchant Control of Schedule

- The idea of connecting Hanson Ranch Road to Gore Creek Drive with a one-way roadway behind the Red Lion was suggested to be further considered, recognizing that extensive landscaping and pedestrian amenities would also be included along Mill Creek.

- The truck loading areas on Willow Bridge Road in the vicinity of Check Point Charlie were recommended to be retained with major landscaping and amenities provided to separate pedestrian movements from truck operations.

- Depending upon the final combination of official truck loading zones to be designated by the Town Council, Check Point Charlie would be relocated or additional control points defined to not only control truck operations but also to intercept lost tourists prior to reaching the Village core.

This input was combined with additional citizen input obtained from public work sessions held by the Town Council and staff. After consideration of all the technical and community factors the following recommendations and priorities were established.

RECOMMENDATIONS/PRIORITIES

The Vail Village goods delivery plan is illustrated in Figure 6 (A and B), and consists of a modified decentralized delivery strategy. Elements of the plan are as follows; prioritized by short-term (Figure 6A) and long-term (Figure 6B) actions.

Short Term

- Total delivery and service parking spaces needed in the short-term is 25 to 30 spaces.

- Modify policies at Checkpoint Charlie.

  - Eliminate 30% of the traffic (cars) accessing the Core for small deliveries and minor tasks through use of the 1-1/2 hours of free parking in the Vail Parking Structure for this type of need.

    - Designate a desirable area of the Vail Parking Structure for short term parking.

    - Enforcement of this issue would be key to its success. Educate the users that the Town is providing convenient short term spots in the Vail Parking Structure, however, abuse of these spots will result in strict enforcement.

  - Develop written policies concerning vehicles requiring access to the Village including:

    - Cars without large amounts of goods to be delivered will not be allowed in the Village or in the loading zones. Use of the parking structure would be required for these trips.

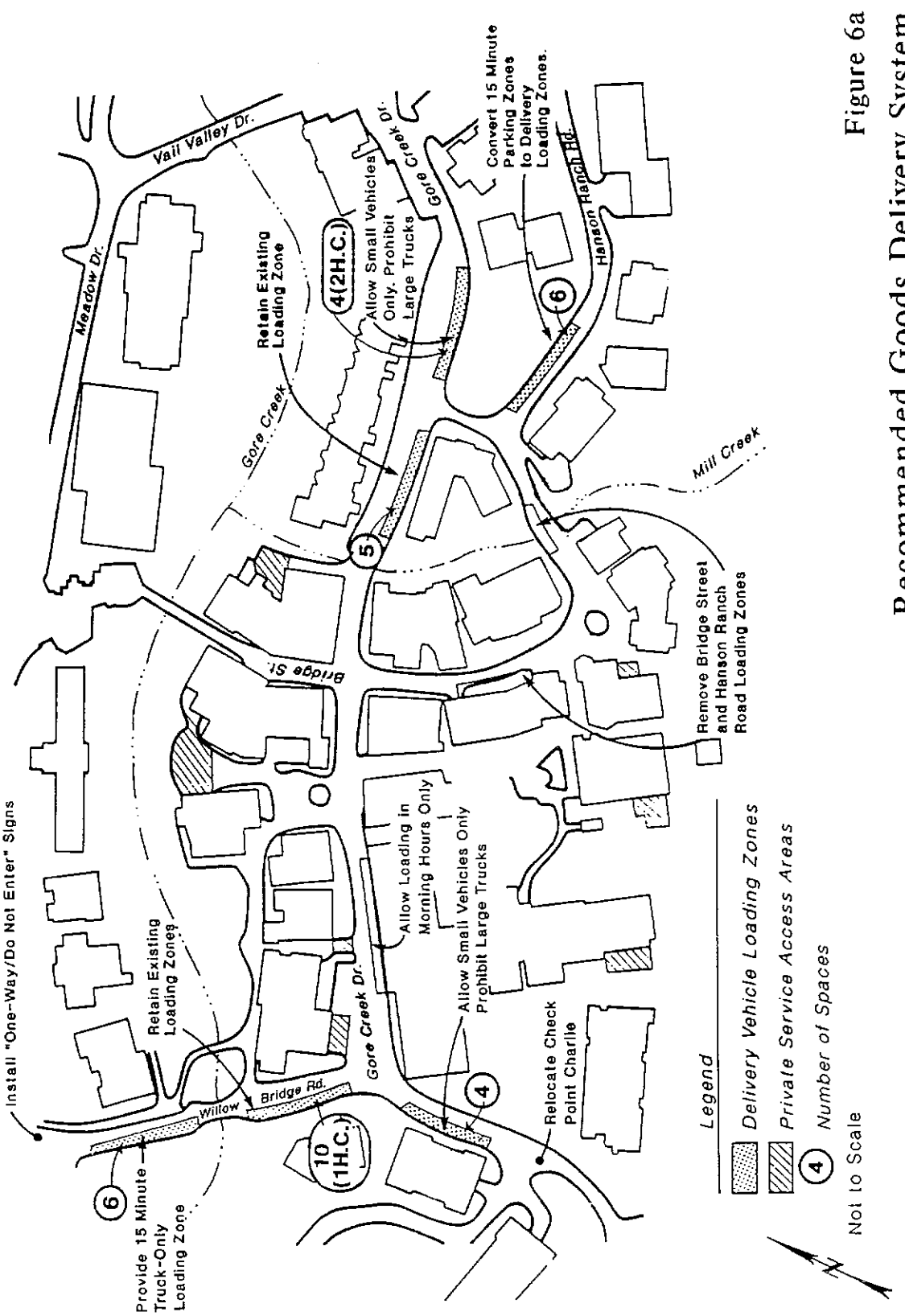


Figure 6a
Recommended Goods Delivery System
Short-Term

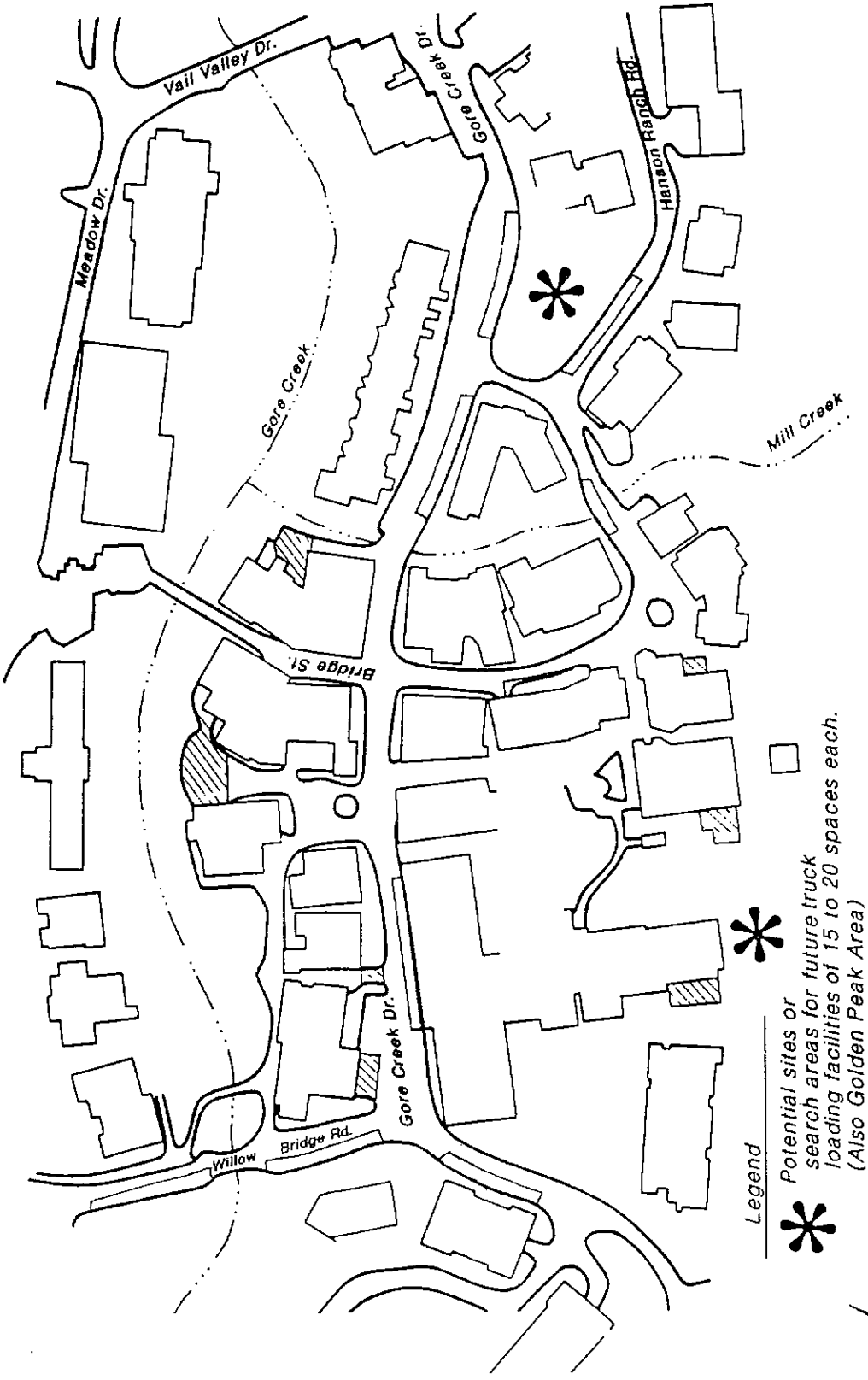


Figure 6b
Recommended Goods Delivery System
Long–Term

- Trucks and cars that are making deliveries of large quantities of goods will be allowed access to the Village loading zones and will be given priority for these zones. Time will be limited to only what is needed to load or unload these goods. In addition, a permitting process could be established to access these zones.

- The towing of vehicles for violation of loading zone restrictions will be strictly enforced.

- Construction work requiring parking will need to be planned and approved in advance by the Town of Vail's Community Development, Public Works, Fire and Police Departments.

- Service vehicles will be allowed limited access to some loading zones for emergency work only. Non-emergency service work should be scheduled for non-peak traffic hours in the Village. All service vehicles will need to contact the Police Department for a parking permit for both the emergency and non-emergency work.

- Loading zone restrictions may be lifted after 6:00 P.M. The loading zones on Gore Creek Drive, however, will be posted as a "No Parking Area" in the non-loading hours.

- Investigate the possibility of locating "drop boxes" in designated places for overnight couriers.

o Implement the following actions and procedures.

- Eliminate loading zones on Bridge Street and Hanson Ranch Road near Mill Creek only.

- Allow only morning use of the Gore Creek Drive loading area in the vicinity of the Lodge Promenade (winter: 9:00 A.M. to 2:00 P.M. and summer: 8:00 A.M. to 11:00 A.M.).

- Convert the 15 minute parking areas on the north side of the Christiania lot and adjacent to Riva Ridge North to delivery and service vehicles only with no large delivery trucks allowed except for over flow.

- Install "One Way/Do Not Enter" signs further north on Willow Bridge Road.

- Convert the 15 minute parking north of Willow Bridge to truck only.

o Authorize capital improvements in an attempt to reduce the 33% "lost guest" number and those who enter the Village the wrong way.

- Relocate Checkpoint Charlie south to the vicinity of Willow Road.

- Construct landscaped medians south on Vail Road from the Frontage Road.

- Further evaluate informational and directional signing clarifications and modify as needed.

- Construct entry feature monument signs, at all entry points to pedestrian areas.

- Prior to construction of monument signs provide and install a standard sign which warns motorists with the wording "Pedestrian Zone Automobiles Restricted" at all pedestrian zone entry points.

o Review the information signs and traffic control procedures at the I-70 Main Vail exit ramps and at the 4-way stop intersection.

- Install portable, variable message signs at the 4-way stop intersection (Vail Road median) and the I-70 exit ramps providing clear messages to drivers. Messages can be updated based on varying demands throughout the day.

- Develop action policies for the following groups; (1) CSO's in Village, (2) 4-way traffic controllers, (3) checkpoint personnel, (4) parking structure operations and other Town employees. These action policies should relate to enforcement, who is allowed access to the Village, and vehicle towing procedures. Evaluate disallowing certain traffic movements during peak periods based on traffic circumstances and demands.

o Work with Vail Associates in designating allowed skier drop-off areas. This would be an attempt to recognize the problem versus banning all skier drop-offs.

Long Term

o Total delivery and service parking spaces needed in the long-term is 35 to 40 spaces.

o Christiania lot.

- Resolve the land ownership issues.

- Evaluate in greater detail:

  • Technological options of hand cart deliveries, small vehicles for deliveries and storage lockers.

  • Operational characteristics and regulations for hand carts and small vehicles along with liability issues, storage problems, and financing options.

  • Evaluate options to make the site both aesthetically compatible with the neighborhood and operational for the truck delivery functions.

o Additional sites to be evaluated:

- South of Lodge at Vail

  - Resolve land ownership and legal issues.
  - Evaluate compatibility with International Wing development plans.
  - Address Vail Associates concerns
  - Address United States Forest Service concerns.

- Golden Peak

  - Resolve land ownership issues.
  - Address Vail Associates concerns.

- Other Location Options

CHAPTER III. PARKING

BACKGROUND

Throughout the year, the demand for parking in Vail varies considerably; ranging from very low demands between winter and summer guest seasons to very high demands especially during the peak skiing periods.

The total community parking supply is made up of many components including a wide variety of public and private parking facilities. As parking demand approaches the limits of the parking supply major public parking facilities such as the Transportation Center, Lionshead garage, and Ford Park fill to capacity. As this condition occurs excess parking demand is accommodated on the frontage road system.

In order to better define what the "parking problem" is, the existing parking supply and demand relationship is schematically depicted in Figure 7. The key points illustrated by the diagram relate to three basic levels of parking demand.

- Level 1 - As long as the total parking demand is less than the formal permanent parking supply, no parking problem exists.

- Level 2 - During peak activity periods, however, parking demands fill the formal permanent supply creating a condition where pre-planned temporary parking provisions (Ford Park) become more fully utilized. While a balance between supply and demand is maintained, the continued long-term use of Ford Park is not compatible with the park itself or with sound parking management principles, especially revenue generation.

- Level 3 - As parking demands continue to increase, all parking facilities are filled to capacity, and temporary overflow parking spaces (typically the Frontage Road) are utilized to whatever extent necessary. Not only are revenues lost, but visitor convenience and safety are also compromised.

The major components of the existing parking supply which are critical include the Transportation Center, Lionshead, Ford Park, and the Frontage Road. This existing parking supply is documented in Table 4.

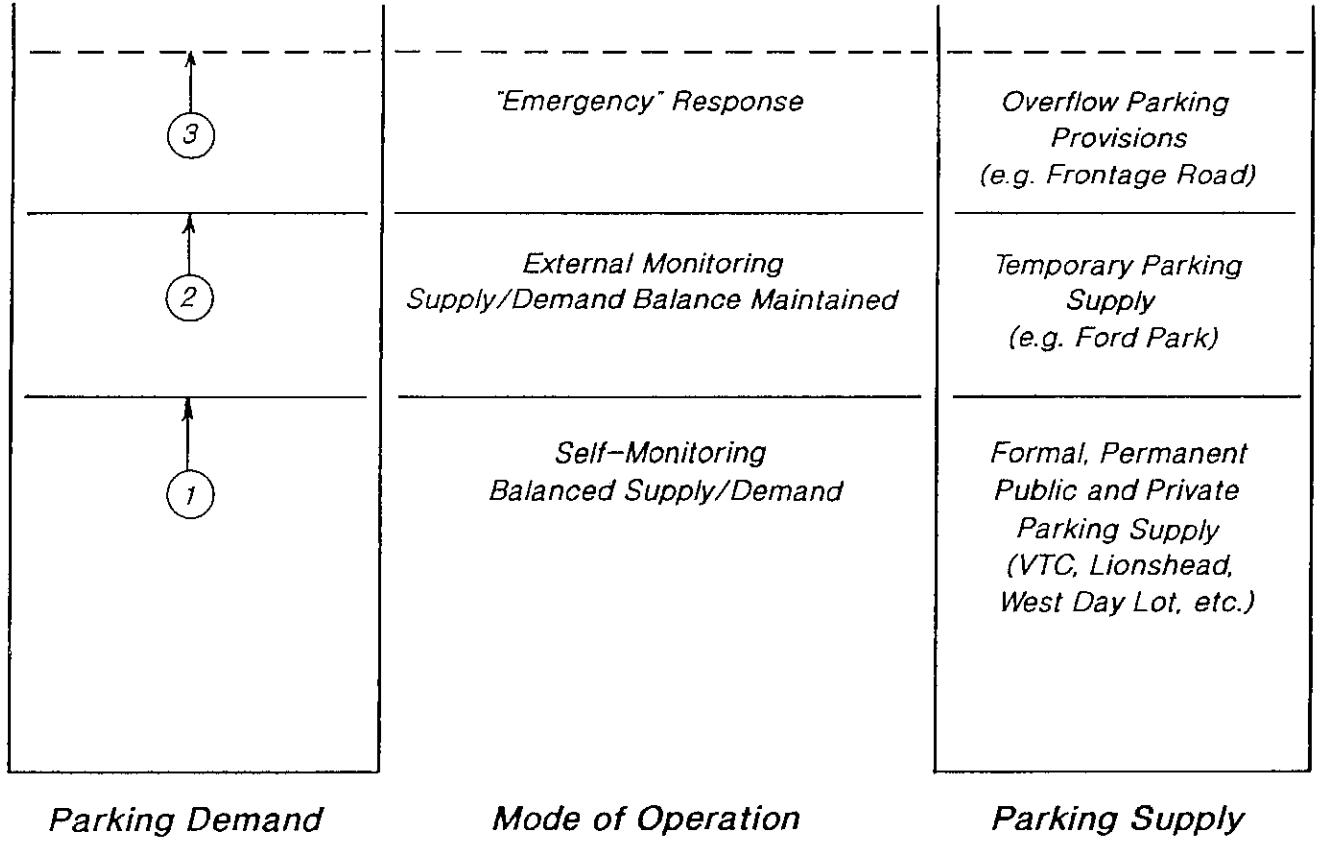


Figure 7

Existing Parking Supply/Demand Relationships

Table 4
Existing Parking Supply
Approximate Quantities

Location	Existing Supply (1/92)
Transportation Center	1,300
Lionshead	1,200
Ford Park	250
Frontage Road	As Needed
Total	2,750

Existing Parking Supply/Demand Characteristics

Figure 8 provides greater detail relative to parking supply/demand characteristics. Typical daily parking demands have been rank ordered (highest to lowest) in order to determine the number of days that a given demand for parking occurs. It will be seen from Figure 8 that when the existing parking demand is compared with the formal permanent parking supply, overflow parking on the Frontage Road is needed approximately 6 days per year. The magnitude of the overflow has varied from just a few vehicles on the 6th day to a maximum of approximately 750 vehicles.

Future parking demands are highly dependent upon anticipated future ski activity. The Environmental Assessment for the Vail Ski Area Expansion added several new areas to the special use permit and approved a portion of these new areas for site specific expansion.

The primary measure of ski area activity used in the Environmental Assessment is the "skiers-at-one-time" (SAOT) capacity. Table 5 documents the historical and potential future SAOT values for various conditions.

Table 5
SAOT by Values for Ski Area Expansion
Source: Vail Ski Area Expansion, EA, November 25, 1986.

Condition	SAOT	% Increase Over 1990
1985	15,579	-
1990 (Estimate)	19,000	-
"Manage To" Capacity	19,900	4.7%
Approved Site Specific Expansion	22,917	20.6%
Potential Future Expansion	24,702	30.0%

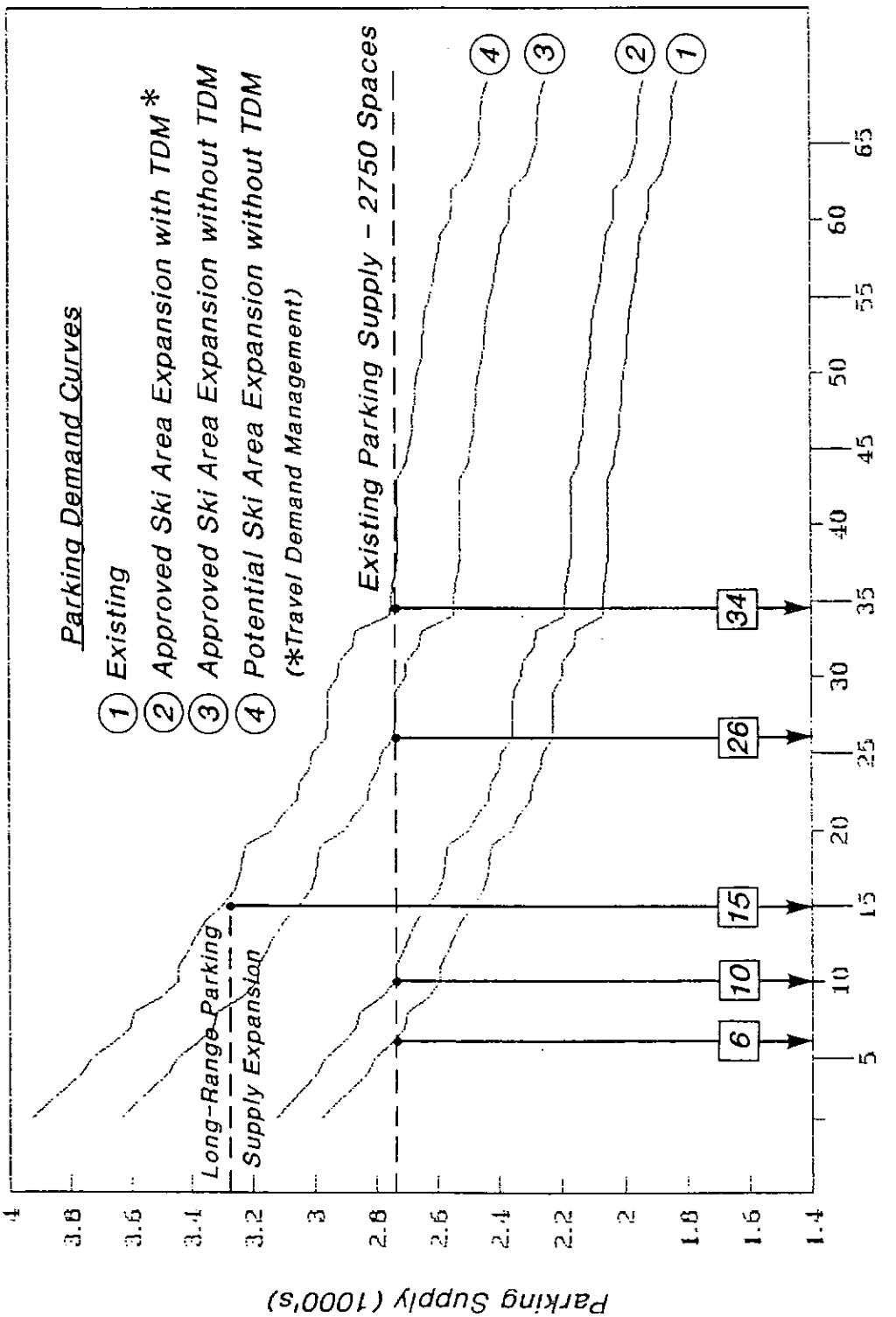


Figure 8
Parking Supply/Demand Relationships

It will be noted that the approved long term ski area expansion results in excess of a 20% increase in overall demand levels while ultimate ski area expansion has a potential for a 30% increase in demand levels.

Projected Parking Supply/Demand Characteristics

Figure 8 also documents the consequences of the increased demand level on the existing parking supply. For the approved ski area expansion, the expanded parking supply is adequate for all but 26 days. The magnitude of the overflow varies from just a few vehicles on the 26th highest day to a possible maximum of approximately 900 vehicles on the busiest day. For the potential ski area expansion the expected parking deficiency increases to 34 days with a maximum short fall of approximately 1,300 spaces.

GOALS AND OBJECTIVES

The following are the goals and objectives relative to parking needs.

- Identify travel demand management techniques to reduce current and future demands for parking including ride-share incentives, pricing controls, and transit service improvements.
- Provide an adequate public parking supply to accommodate future demands associated with the approved ski area expansion recognizing that maximum peak demands cannot be economically satisfied. The recently completed parking expansion project was initiated when parking overflows occurred 15 days per year. Thus, up to 15 days of overflow demand are considered acceptable by the Town as a reasonable balance between serving the majority of the peak parking demands with a feasible and affordable investment.
- Provide reasonably priced public parking to serve the visitor.
- Provide price discounted parking to serve Vail resident and employee needs.
- Provide limited premium service parking at a price commensurate with the value provided.
- Identify candidate expansion areas for additional public parking to accommodate long-term demands associated with the potential ski area expansion.
- Locate parking areas for charter buses, recreational vehicles, and other over-sized vehicles.
- Maintain an adequate revenue stream to fund implementation of on-going maintenance and operations.
- Provide a simple and easily understood pricing structure which is efficiently administered.
- Retain the private parking supply as an important and needed element.

DEMAND MANAGEMENT OPTIONS

The research contains a wide-variety of measures for reducing travel and parking demands collectively referred to as demand management techniques. While the vast majority of these measures are oriented toward commuter travel in large urban centers, there are techniques which are applicable to resort areas in general and Vail in particular. An analysis of the research as well as a review of the several ideas presented in the Public Input meetings has resulted in the selection of three applications having the greatest potential for reducing future parking demands in Vail.

Table 6 documents three demand management techniques which can be instituted either individually or collectively. The three options are defined as follows:

- Modified Parking Pricing - This option would include possible elimination of free parking periods, reduced rate provisions, and an overall higher rate schedule. The objective of this option is to implement cost disincentives to using the auto and to make transit or carpooling a more attractive alternative for local residents and employees. While similar effects would be expected on non-resident day skiers, for example, their average vehicle occupancy is approximately 3 persons per vehicle already. Thus, fewer mode shifts would be expected from this group.

- Vail Transit Improvements - This option would include both expanded geographic coverage and more frequent service. The purpose of this option is to make transit a more attractive alternative through service enhancements (e.g. less crowding, shorter walks, etc.). These measures will be less effective in Vail than in other areas primarily because the Vail system is already generating a significantly higher-than-average transit use. However, when implemented in conjunction with modified parking pricing, reduced parking demands could be anticipated primarily from the employee user group.

- Discount for Ride-Share Groups - This option would provide discount packages (lift tickets, local businesses, etc.) for visitors to Vail who arrive via a major ride-share mode. The primary travel mode would be charter buses but could also include vans of a minimum size. Each individual would receive specially designated coupons or other verification that he or she came to Vail with an official ride-share group. This option would target the single largest parking demand element and offer the greatest potential for significantly reducing long-term parking demands at a reasonable cost.

If the demand management options discussed in the previous section (or others) are successfully implemented, future parking demands can be significantly reduced. Although there will still be several days when overflow parking occurs and a fewer number of days when the overflow is significant.

Figure 8 also documents these reductions for the approved ski area expansion relative to the existing parking supply. For the approved ski area expansion the expanded parking supply will be adequate for all but 10 days. The magnitude of the overflow will vary from just a few vehicles on the 10th highest day to a probable maximum of approximately 400 vehicles.

Table 6
Summary Characteristics of Demand Management Options

Demand Management Option	Primary Target Group (*)	Major Cost Elements	Potential Incremental Effect	Comments
Modified Parking Pricing	Vail Residents Overnight Visitors (20% of Parkers)	None	3 - 5%	Significant opposition from locals and employees. Research indicates most people pay the increased rate and do not shift modes. Major benefit from new employee carpools.
Vail Transit Improvements	Vail Residents Overnight Visitors (20% of Parkers)	Additional Buses Increased O&M	3 - 5%	Marginal benefit limited by existing high transit use.
Ride-Share Discounts	Day Visitor (52-72% of Parkers)	Advertising Discounts	8 - 12%	Greatest potential impact on parking demand. Benefits may be partially offset by acceleration of overall increase in visitors.

(*) Primary target groups developed from "Vail Parking Field Analysis and Survey", July 27, 1989, Rosall, Remmen and Cares, Inc. which identified the following breakdown by major use groups for the parking structures:

User Group	VTC	Lionshead
Local	13%	10%
Out-of-State	23%	39%
Rental Car	33%	19%
Other Colorado	28%	30%
Truck	3%	2%
	100%	100%

Table 7 summarizes the preceding parking supply/demand analysis. Projected future overflow parking conditions are documented in terms of the number of days of overflow and the maximum and average magnitude of the overflow. These measures are also compared with existing conditions.

Table 7
Projected Overflow Parking Summary

Parking Demand Scenario	Parking Supply	Days of Overflow	Maximum Overflow	Average Overflow
Existing	Pre-1990	14	1,000	500
Existing	Post-1990	6	750	375
Approved Ski Area Expansion				
o Unmanaged Demand	Post-1990	26	900	450
o Managed Demand	Post-1990	10	400	200
Potential Ski Area Expansion				
o Unmanaged Demand	Post-1990	34	1,200	600
o Managed Demand (TDM)	Post-1990	21	800	400
Potential Ski Area Expansion				
o Unmanaged Demand	Long-Range Expansion	15	700	350
o Managed Demand (TDM)	Long-Range Expansion	7	400	200

FUTURE PARKING SUPPLY REQUIREMENTS

The Town Parking Plan consists of a short-range component (consistent with the approved ski area expansion) and a generalized long-range component. The short-range parking supply plan consists of the following elements:

- The Town of Vail should encourage private sector involvement to actively pursue travel demand management techniques to reduce the growth in parking demand.

- Up to 15 days of overflow parking demand is deemed to be acceptable by the Town in recognition of the excessive capital costs required to meet absolute peak demands. Approximately half of the days will result in very little to minor overflow conditions while the top 7 days of activity will constitute the most serious overflow conditions.

- As a consequence, the formal public parking supply of 2,750 spaces in place with completion of the expansion of the VTC is sufficient to meet the Town's immediate and short-term future parking needs. The exact time period when additional parking will be needed depends upon the success of any travel demand management techniques implemented and the rate at which the ski area expands.

In the longer range future it is recognized that the possibility of ski area expansion beyond the currently approved levels could occur along with continued general growth of the Town. Therefore, the Parking and Transportation Advisory Committee adopted the following long-term parking concept plan:

- The existing Ford Park parking area (east end of park) should be considered for a possible two-level parking facility with one level provided below existing grade.

- The existing West Day lot and the North Day lot should also be considered, in conjunction with Vail Associates, for a possible two-level parking facility with one level partially depressed below existing grade.

- The potential to expand the Lionshead parking structure should also be evaluated to provide the needed parking spaces.

- The Golden Peak area, in particular the soccer practice fields; the ski school/practice area; and the tennis courts and parking lot should be considered as potential parking expansion areas if the traffic impacts can be mitigated.

Approximately 400 to 500 total parking spaces could be provided in one location or combination of locations at a cost of approximately $2.5 to $3.0 million. An increase of 500 parking spaces would retain approximately 15 days of overflow with the full potential expansion of the ski area with no travel demand management techniques implemented (see Figure 8). In any scenario, the maximum below grade parking potential of a site should be considered.

In the future long-term an evaluation of remote, outlying parking and its impact on transit service costs to link these outlying parking areas with the Town should be completed if the need arises for additional parking due to lost opportunities at the sites mentioned above or ski area expansion occurs beyond what is now known.

PARKING RATE STRUCTURE*

The Town of Vail currently charges patrons to park at the Lionshead and Transportation Center garages during ski season (parking is free in the summer). Charging is primarily oriented towards visitors, as local residents and employees purchase parking passes for the duration of the ski season. The pricing structure varies depending on the duration of the parked vehicle and it ranges from free if parked for less than an hour-and-a-half to $7.00 for a 24-hour period. The Town also sells parking passes and coupons for the two structures which include the premium Gold Pass, the discount Blue Pass and other discount coupon options. The use of the Blue Pass and coupons is restricted during peak demand periods.

To meet the Town's objectives, a major revision of the basic rate structure, premium service program, and discount parking program are recommended. The following parking rate structure is recommended for the Town of Vail.

Time Interval	1990/91 Price	1991/92 Price
0 -1-1/2 Hours	$ 0.00	$ 0.00
1-1/2 to 2 Hours	$ 2.00	$ 3.00
2 to 3 Hours	$ 3.00	$ 4.00
3 to 4 Hours	$ 4.00	$ 5.00
4 to 5 Hours	$ 5.00	$ 6.00
5 to 7 Hours	$ 6.00	$ 7.00
7 to 9 Hours	$ 7.00	$ 8.00
9 to 11 Hours	$ 8.00	$ 9.00
11 to 13 Hours	$ 9.00	$10.00
13 to 15 Hours	$10.00	$11.00
15 to 24 Hours	$12.00	$13.00

The Gold Pass should be continued as the premium service program, but price levels should be increased and reviewed annually to better reflect the costs incurred to provide guaranteed parking. The following is recommended for the premium service Gold Pass program in 1990/1991.

- Price set at $750.00 plus a $25.00 deposit.
- Limited to a maximum of 150 Gold Passes.
- Guaranteed space availability and unlimited entry/exit.
- No restrictions on use.
- Gold Passes valid to the following November 1.

* Many of the recommendations presented in this section have been implemented by the Town of Vail for the 1990/1991 season and modified for the 1991/1992 season.

The following are recommendations for the Discount Parking program and Ford Park in 1990/1991. Price levels are recommended to be reviewed annually.

Coupons:

- Coupons will be sold for $3.00 each up to a maximum of 100 coupons per individual and may be purchased in any quantity.
- Coupons are valid to the following November 1.
- Coupons are valid at both VTC and Lionshead any day and at any time.
- At the VTC, Level 4 and Level 5 will be reserved exclusively for coupon holders (226 spaces).
- If Levels 4 and 5 fill, then coupon holders will use Lionshead.
- If Levels 4 and 5 do not fill, then general parkers will be allowed to use Levels 4 and 5 provided that the rest of the VTC is full.
- Coupons may be purchased by those individuals who have a valid drivers license with a Vail address or verification of employment by a Vail business.

Blue Passes:

- Blue Passes will be sold for $400.00 plus a $25.00 deposit to anyone wishing to purchase them.
- Blue passes are valid to the following November 1.
- Blue Passes may be used at the VTC at any time on Monday, Tuesday, Wednesday, and Thursday (except between Christmas and New Years Day) and after 3:00 P.M. on Friday, Saturday and Sunday.
- Blue Passes may be used at Lionshead any day and at any time.
- Blue Passes allow unlimited entry/exit during the valid time periods defined above.

Ford Park:

- Ford Park will be free and available on a first come, first serve basis on Monday, Tuesday, Wednesday and Thursday.
- Ford Park will be available to Coupon and Blue Pass holders or to general parkers for a $5.00 flat fee (payable upon entry) on Friday, Saturday and Sunday.

SPECIAL PARKING PROVISIONS

The area adjacent to the Lionshead structure has been used to park over-sized vehicles. In addition, the recent expansion at the Vail Transportation Center limits vehicle heights to 7'-4". Demand levels have typically been approximately 30 to 35 vehicles with peak demands of approximately 50 vehicles. It is recommended that this area continue to be used for over-sized vehicles. The potential exists for the Performing Arts Group to erect a building on this site at which time a replacement site will need to be identified. Some possible sites include the following which would require negotiations with the entities involved.

- Safeway Area in West Vail
- Vail Mountain School Parking Lot
- Golf Course Parking Lot
- Ford Park Parking Lot
- Athletic Field Parking Area
- Red Sandstone School - Lower Parking Lot

Overflow parking demands of oversized vehicles can be accommodated in the same fashion as overflow demands for general parking or arrangements can be made to park oversized vehicles at one of the above mentioned sites.

In addition, as a part of an overall travel demand management strategy, enhanced loading facilities convenient to mountain access points should be evaluated for charter buses and possible outlying shuttles; most specifically, Golden Peak and the west side of the Lionshead Gondola building. During the day these vehicles should be parked in one of the areas designated for oversized vehicles.

CHAPTER IV. TOWN BUS SYSTEM

The Town of Vail currently operates six free bus routes throughout the Town during ski season. Five of the six routes serve outlying areas of Vail while one, the In-Town shuttle, serves the Vail Village and Lionshead Village areas. The In-Town shuttle provides service to a relatively small area, but yet it comprises about three-fourths of the ridership for the entire bus system. As such, its operating characteristics differ from the outlying routes. The following sections of the report address operations of the In-Town shuttle and outlying routes.

IN-TOWN SHUTTLE

This free bus service operates year-round and carries over 2.2 million riders annually along a 1.75 mile route between Golden Peak and West Lionshead Circle (see Figure 9). A portion of the route is restricted to bus traffic only. The route serves the high-density, commercial lodging and retail core of Vail. On peak winter days up to 30,000 riders use the In-Town shuttle on a single day. Visitors, mainly destination and day skiers, make up the bulk of the winter day ridership. Destination visitors also use the shuttle to travel between the slopes, their lodging, and dining and shopping attractions within Vail and Lionshead villages. Day visitors, local residents and employees use the shuttle as an internal circulator after having parked in either the Vail or Lionshead parking structures.

The In-Town shuttle is the backbone of the Vail transportation system. Because of the rather unique linear nature of Vail's mountain-town-highway orientation, the shuttle performs singularly what is typically parceled out to separate transit services in most other North American resort communities. In the typical resort community bed base, skier-mountain, nightlife/retail, and day skier parking are separate and distinct, sometimes several miles apart- Snowmass Village, Steamboat, Jackson Hole, Sun Valley, and Crested Butte for example. In these cases separate routes and services provided for day-skier parking shuttles, destination visitor shuttles and in-village circulation. In Vail the In-Town shuttle bears the brunt of each of these functions. Clearly, the quality of experience for Vail visitors is tied closely to the operation of the In-Town shuttle.

CURRENT OPERATION

The village shuttle operates 19-1/2 hours a day between the hours of 6:30 AM and 2:00 AM. Frequency of service is eight minutes or less with the most intense service provided during the 3:30 to 5:30 afternoon hours when skiers departing from the slopes create the greatest demand for transportation. Ten vehicles are regularly scheduled for shuttle service during the afternoon rush. Occasionally four additional vehicles are pressed into service to respond to heavy demand. With 14 vehicles in service on the shuttle route the frequency between vehicles is often less than the dwell time at the major boarding points. This results in "bunching", i.e. buses running in tandem rather than uniformly spaced along the route. Operation efficiency breaks down under these conditions as passenger loads on the lead bus are usually greater than the trailing bus (or buses) and system speed is governed by the slower vehicle. As system speed slows more passengers accumulate at stops between bus arrivals, dwell time increases accordingly thereby further reducing system speed and ensuring that incrementally more passengers will be waiting upon arrival at the next stop. Although, not documented, it is believed the usual daytime average system speed of 7 to 8 MPH degrades to 3 or 4 MPH, or even less, during peak season afternoon hours. At these speeds and crowding conditions many prospective riders will opt to walk.

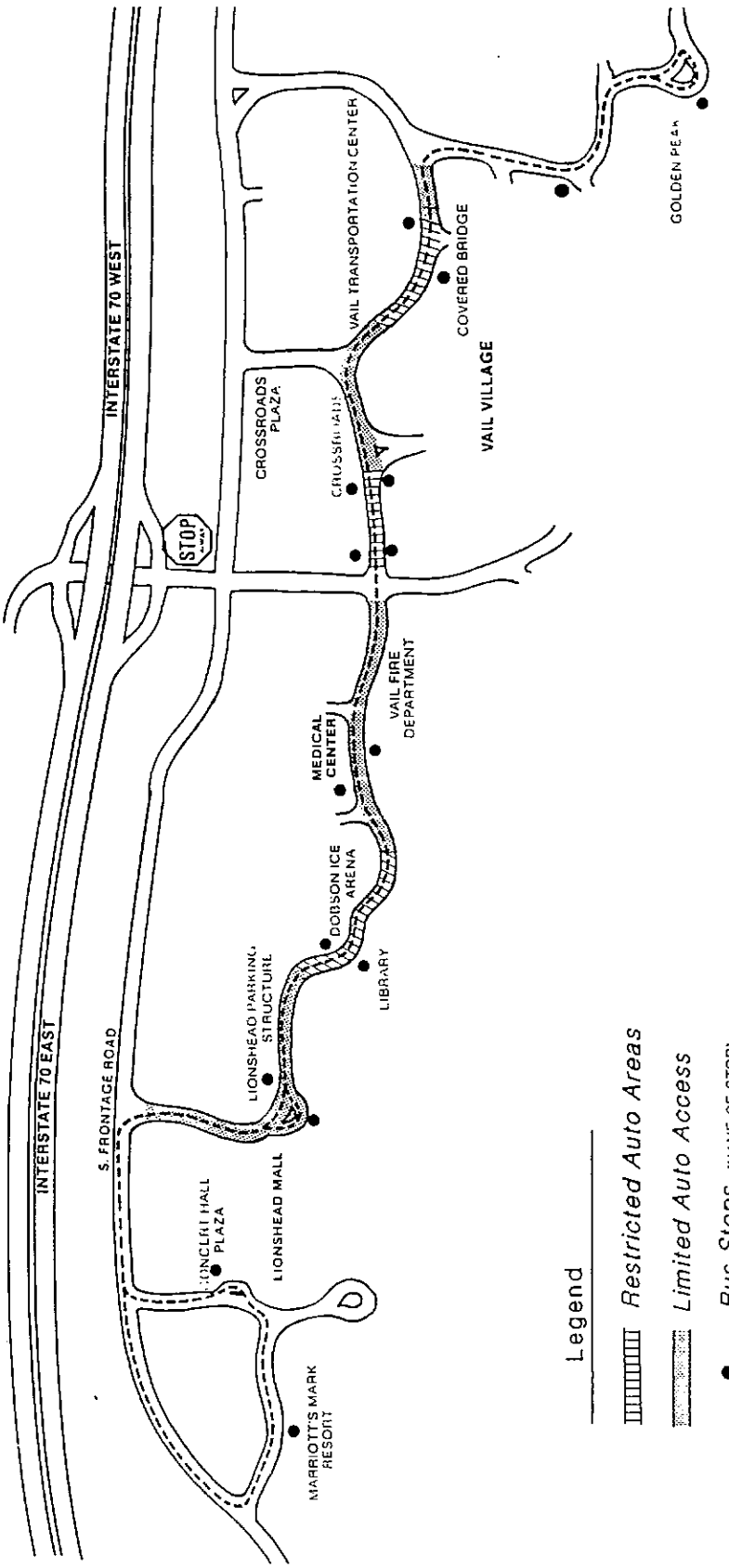


Figure 9
In-Town Shuttle Bus Route

While not documented precisely, it is estimated from daily boarding counts that the current shuttle system was seriously overloaded between 27 to 30 days during the 1989-90 150-day winter season or about one day out of five (see Figure 10, line #4). What is important to note by the slope of the curve depicted in Figure 10 is that relatively small increases in annual skier days spread out uniformly over the entire ski season, trigger a major increase in the number of days the current system will be overloaded during the afternoon peak. This means destination skiers in the future will experience more occasions of overcrowding on the current shuttle system. Whereas peak week, high season visitors probably anticipate and will tolerate some overcrowding throughout Vail or any other major destination resort, this condition will prevail more frequently on the shuttle system during isolated days, probably weekends when higher day-skier volumes are added to moderate-occupancy destination visitor volumes. These destination visitors may be unpleasantly surprised to experience overcrowding on the shuttle system during "non-peak" weeks.

As a matter of policy it should be clear that if the "status quo" condition for shuttle riders is deemed appropriate and cost effective, to maintain this condition will require an 18% increase in system capacity if the "Approved Expansion" growth scenario evolves. Alternatives for achieving this, or several other system capacity expansions, are discussed in a subsequent section.

GOALS AND OBJECTIVES

The following represent the Town's goals and objectives relative to the In-Town shuttle.

- Provide increased passenger capacity.
- Improve operations at physical bottlenecks.
- Identify a long-term concept plan for passenger demands beyond 2010.
- Maintain high quality transit service while being sensitive to the quality and character of pedestrian areas.

CAPACITY IMPROVEMENT ALTERNATIVES

Several alternatives have been developed for addressing shuttle system capacity improvements to alleviate current overload conditions and/or provide improved conditions in the future. For ease of comparison these have been grouped as "fixed guideway" or "at-grade" alternatives.

Fixed Guideway Shuttle System (Above Grade)

Recognizing the need to address eventually the inherent limitations of the conventional transit coach shuttle service, the Town of Vail in 1987 commissioned a nationally recognized transit systems technology firm, Lea Elliott, McGean and Company, to conduct a feasibility study of replacing the existing shuttle service with an elevated people mover system. The study recommended a short-range, medium-duty, automated monorail-type people mover system as the most appropriate replacement solution. Some of the key operating parameters of the "generic monorail" replacement as described in the Lea Elliott report are as follows:

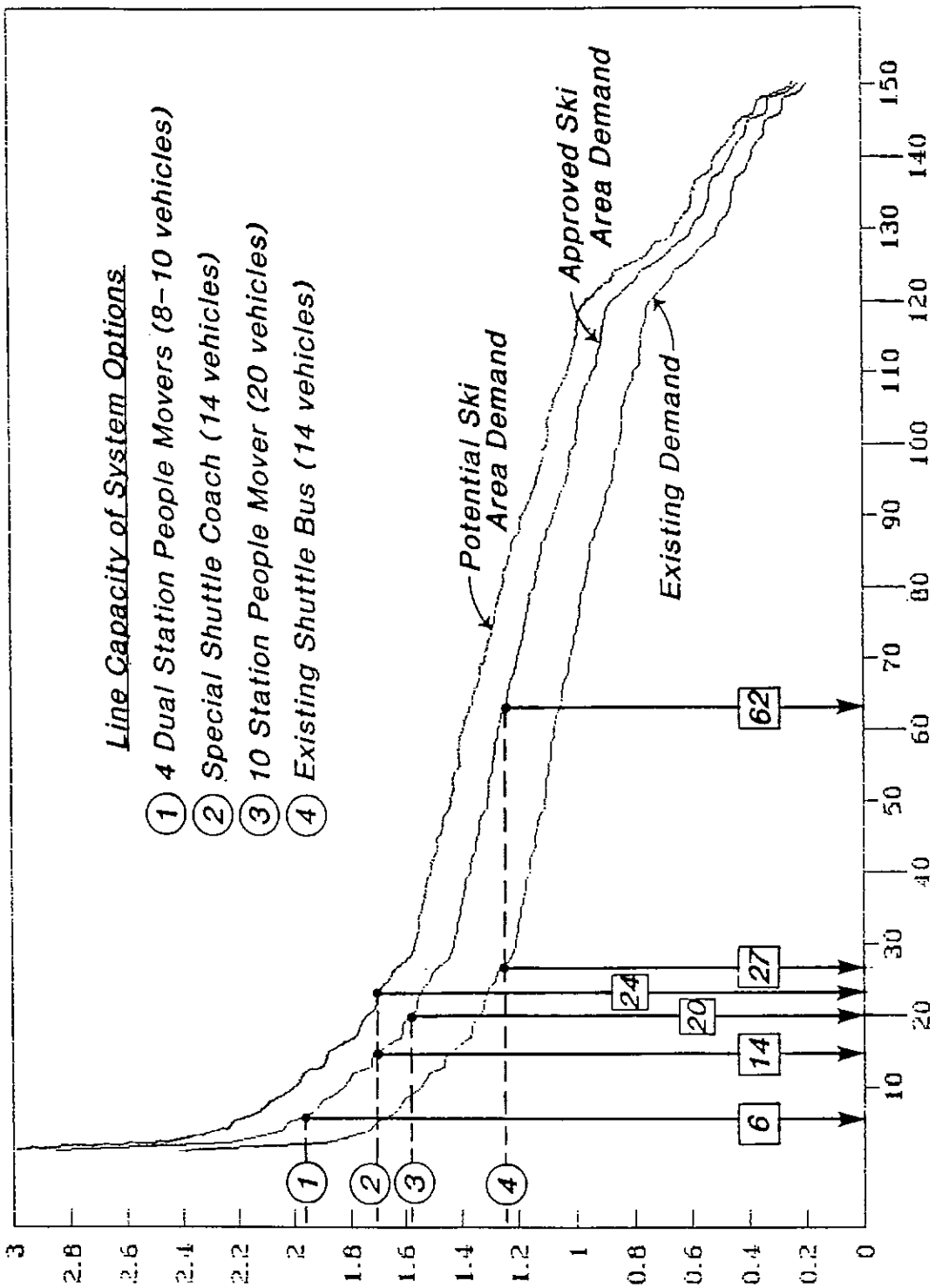


Figure 10
In-Town Shuttle Directional Peak Hour Demand

- o 10 elevated stations
- o 32 foot, 2-car train
- o Winter Crush unit capacity of 51 passengers
- o Outboard ski placement
- o 6 mph average speed during crush conditions
- o 1580 passengers per hour per direction line capacity at winter crush conditions (20 vehicles)
- o Capital costs estimated to be $30.3 million
- o Annual operating costs estimated to be $950,000.

When comparing the "crush" capacity of the replacement monorail system with that of a fleet of fourteen 35-seat conventional transit coaches, the representative replacement monorail system, using 20 2-car trains, would provide about 30% more line capacity than the conventional bus system. In either case it is assumed skis are carried in racks mounted outside the vehicle.

The cost to construct, equip and test the 20-train automated people mover system is estimated to be $33.8 million (1990 $). This includes 10 single platform stations and a special maintenance facility. The annual operating cost (manpower, energy, supplies, etc.) is estimated to be comparable to the annual cost of operating the shuttle bus service.

As shown in Figure 10 (line #3), the 30% benefit in line capacity over conventional transit coaches would reduce the number days currently operating over capacity from 27 to 8. If increases in demand attributed to "approved expansion" is factored in, the number of over capacity days would be 20 instead of a projected 62 days.

While a 30% increase in line capacity is significant, it would seem disproportionate considering the relatively high capital costs of the elevated, automated system. Visual and pedestrian impacts aside, the elevated people mover system is hampered in achieving its full potential by several external constraints. These are:

1. **The number of stations.** Any automated system follows a rigid standard of deceleration, docking, door opening and closure, and subsequent controlled rate of acceleration. In trying to duplicate the existing bus service by providing 10 stations along a 3.5 mile pinched loop, the time spent stopping is too high to take advantage of grade separated operation.

2. **Stowing skis outside the vehicle.** The assumption that skis need to be carried in racks outside the vehicle adds to the dwell time and precludes the ability to use doors on either side of the vehicle separately for boarding and deboarding passengers. Single-sided boarding also adds to dwell time.

A variation on a more effective use of an in-village automated people mover system is discussed later in this report.

AT-GRADE HIGH CAPACITY BUS SYSTEM

As an alternative to a capital intensive replacement for the existing shuttle service, the use of special high-capacity buses designed specifically for short-haul shuttle service of this type was investigated. Designed with low floors, multiple wide doors and high interior compartments for standee comfort, these vehicle types have been used for a number of years in Europe as airport apron service, shuttling passengers between airplanes and terminals. The vehicles used in Denver for shuttle service along the 1.1 mile long 16th Street Mall are an adaption of these buses. Figure 11 illustrates the 16th Street Mall vehicle along side the existing Town of Vail transit coach and a generic elevated monorail vehicle. Either bus is about two feet wider than this class of monorail vehicle. The special shuttle bus has a limited number of perimeter seats, thus catering more to standees. A newer generation of low-floor shuttle bus has wheel base dimensions similar to the Town's existing buses and thereby should be able to operate over the same route with minimal adjustment needed.

The main attribute of the special low-floor, high-ceiling bus is reduced dwell time at stops and ability to accommodate more passengers on board than either the conventional 35-seat bus or the 2-car generic monorail. Dwell time is minimized by the multiple doors, one-step entry/exit and ability to carry skis on board. The net effect of these features is an estimated 25% improvement in system speed as compared to the existing bus operation and about a 35% increase in line capacity of a comparable size transit bus fleet (14 vehicles) due to the combination of higher average system speed and more passenger capacity per vehicle.

The cost of adding a new fleet of 16 special low-floor buses (2 spares) including vehicle design development costs, maintenance facility modifications, and allowance for bus stop, streetscape and utility improvements along the existing route is about $7.5 million (1990 $). The line capacity achieved by using these special shuttle buses would reduce the number of days currently experiencing overloads from 27 to 6. With increases in demand induced by "Approved Ski Area Expansion" the special bus fleet would be overloaded 14 days per year, or about half the current experience. Even under the full "potential" ski area expansion, overloading would occur approximately 24 days per year.

OPTIMAL MONORAIL VS. SPECIAL SHUTTLE BUS

Analysis of the special shuttle bus shows a line capacity benefit over the existing bus service to be somewhat higher than the "replacement monorail" alternative. However, stipulating that the monorail serve the same route as the existing at-grade bus system, puts monorail technology at a competitive disadvantage. A more practical application of an elevated people mover for in-village shuttle service would be the route described as the "Starter System" in the Lea Elliott report. This truncated route would connect the Covered Bridge area of Vail Village with the Gondola area of Lionshead Village via an elevated people mover. The loop would be 2.2 miles, or 63% of the existing bus route, but would encompass about 78% of the existing boardings. Presumably a "background" bus route would continue to operate between Golden Peak and Marriott Mark (or even Cascade Village) on the west to maintain central shuttle service to these areas beyond the Village Core.

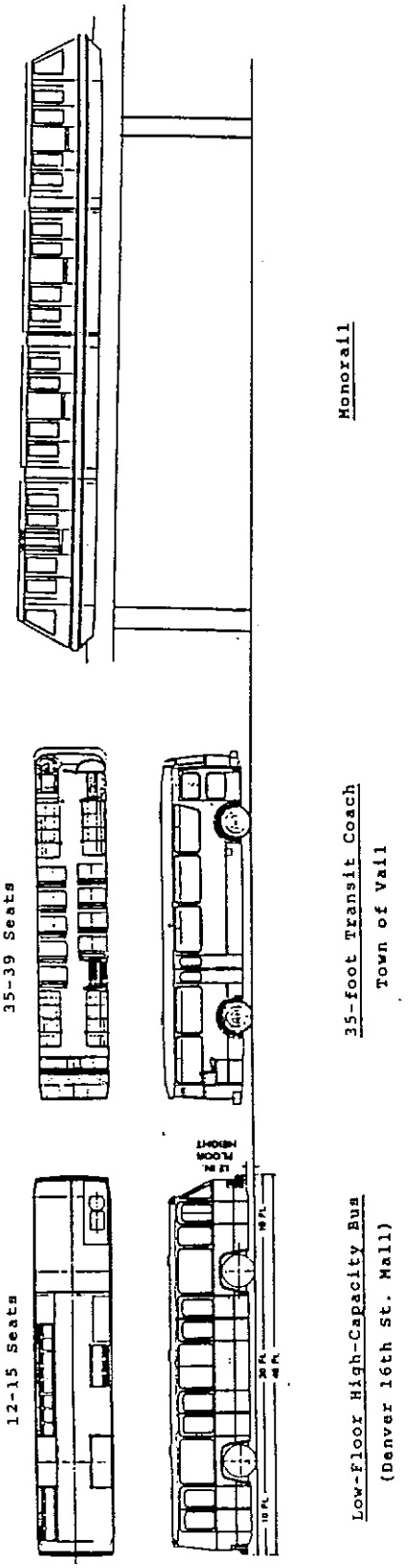


Figure 11
Alternative In-Town Shuttle Systems

Within the "pinched-loop" route there would be a maximum of four stations. Each station would have a center as well as side platform to permit separate boarding and deboarding operations.

Vehicle interiors would be adapted to facilitate carrying and stowing skis on board. This concept has been used successfully on a 4-station, 0.8 mile (each way) underground people mover system in the resort community of Serfaus, Austria.

The net effort of station consolidation, dual-platform stations, and onboard skis will increase line capacity about 44% as compared to the "starter line" capacity referenced in the Lea Elliott report. This would equate to a line capacity of 1,950 passengers per hour per direction (pphpd). With a shortened route and a higher average speed this line capacity is achieved with fewer vehicles. Ten, or possibly 8, 2-car trains would be needed for this "optimal" people mover configuration.

The line capacity of the optimal monorail of 1,950 pphpd would be about 13% higher than the maximum capacity of the high-capacity, at-grade shuttle bus system. As shown in Table 8 the cost to develop the 2.2 mile "optimal" monorail system would about $24 million.

IN-TOWN SHUTTLE RECOMMENDATIONS/PRIORITIES

A reliable, convenient, and safe in-town shuttle is essential for mobility in Vail Village. Transit coach delivery of this service has sufficed, for the most part, for the past decade. However, if the increases in visitation experienced the past few years continue into the 1990's, overcrowding and dissatisfaction with the current system capabilities will become commonplace during afternoon peak travel times for destination and day skiers. Two avenues have been explored in this study for expanding the capacity of the in-town shuttle system to match growing demand.

As previously analyzed monorail system, when adapted to its most effective application, could achieve faster, quieter and more reliable service than the existing bus system. The Lionshead to Covered Bridge monorail as described would offer about 55% more capacity than is possible with the existing service, however, fewer stops would be provided under this option. This would allow the shuttle system to operate without overloads on all but about six days per year well into the future. Not withstanding the visual, environmental, and pedestrian impacts of introducing the elevated monorail system, the development costs would be substantial -- about $24 million.

Although not as dramatic in capacity improvement and still subject to at-grade interference, the high-capacity fleet alternative does achieve a substantial, 38%, increase in capacity at a considerably lower, $7.5 million, development cost than the monorail, see Table 8. Part of this cost is new vehicle acquisition -- a cost which will be experienced to some degree in a few years to replace existing vehicles, regardless of what shuttle system decision is reached.

It is recommended that the high-capacity bus alternative is the appropriate shuttle system solution for the 1992-2002 service period. The 16 vehicles needed for the shuttle fleet can be acquired over a two-season period as replacements for vehicles scheduled for retirement. In the interim period, a technical committee should develop the performance specifications for these special use vehicles and a solicitation of interest should be sent to all potential bus manufacturing bidders.

Table 8
In-Town Shuttle Comparison

Operation Parameters		Special Low-Floor Bus	Elevated People Mover
1.	Route Length (miles)	3.5	2.2
2.	Service Area	Mariott Mark to Golden Peak	Lionshead to Covered Bridge
3.	Ski Placement	on board	on board
4.	Avg. System Speed (mph)	7.5	10.7
5.	Line Capacity (passengers per hour per direction)	1,720	1,950 (1)
6.	Max # Vehicles in service @ Peak	14	8
7.	Vehicle Unit	40' bus	32' 2-car train
8.	Estimated Development Cost		
	Vehicles	@ 16 = $4,000,000	@ 10 = $ 3,550,000
	Other	$3,450,000 (2)	$20,450,000 (3)
	Total	**$7,450,000**	**$24,000,000**

Source: TDA using Lea Elliot reports for Town of Vail dated 2/16/87 & 3/22/90. Detailed calculations are presented in the Technical Appendix.

(1) Optimal capacity, assumes 4-station, dual platform system. (Stations would be established based upon a more detailed operations and feasibility study.)

(2) Includes an allowance for expanded maintenance facilities for special buses, minor roadway improvements, enhanced bus loading facilities as outlined in the Streetscape Plan, engineering, and contingencies.

(3) Includes fixed facilities, engineering and contingencies.

In addition, a new turnaround area should be provided at the Golden Peak area as shown in Figure 12. Consideration should also be given to relocating the Lionshead turnaround such that the special shuttle bus would not travel in mixed traffic along the frontage road. In addition, a low impact extension of the shuttle system into Lionshead should be considered in conjunction with any potential major redevelopment of the Lionshead area.

Looking beyond 2005, toward the end of the useful life of the special shuttle fleet, there may be a real need to advance to a grade separated people mover system because of growth in visitation and pedestrian activity at street level. To preserve this option, we suggest commissioning a follow-up technical study, at the schematic design level, of the Core Village People Mover alignment. The product of this work would be an alignment and station envelope that could accommodate a variety of future, undetermined people mover technologies which are environmentally sensitive. A wide range of service and alignment options should be retained for future evaluation including service between the major core areas and alignments along the Frontage Road on I-70. Not unlike future roadway widening projects, adjacent redevelopment proposals would honor the formally adopted people mover envelope in terms of set backs, subterranean construction, and architectural treatments.

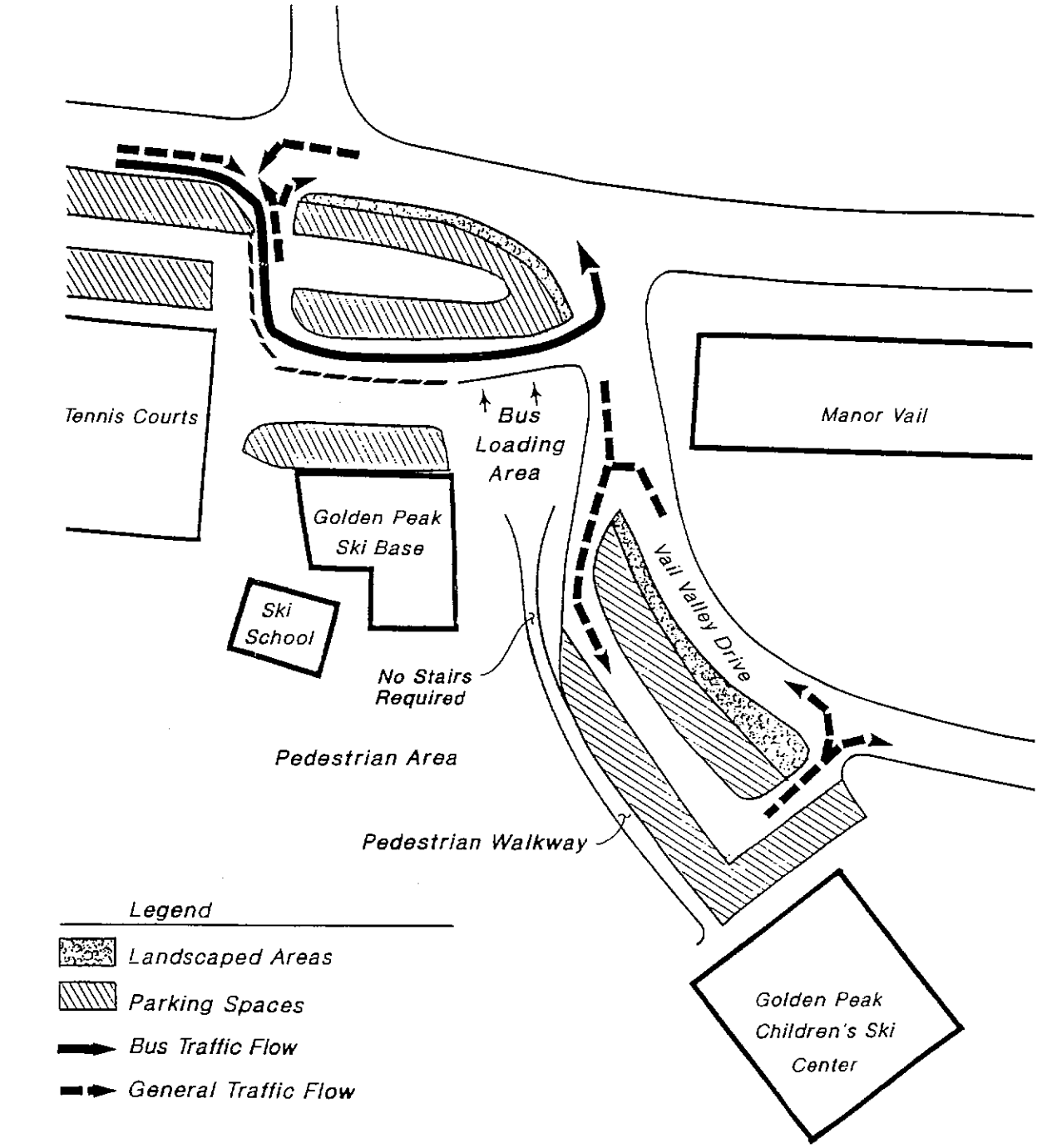


Figure 12
Golden Peak Area
Short Term Concept

CHAPTER V. OUTLYING BUS SYSTEM

Vail currently operates five bus routes serving outlying areas including the East Vail area, Golf Course, West Vail north of I-70, West Vail south of I-70, and the Sandstone area. All routes originate at the Village Transportation Center which serves as a transfer point between Town routes as well as to Down Valley routes.

The Vail bus system as it currently exists provides a high degree of mobility to the Town in both geographic coverage and service frequency. However, there are certain problems and concerns, in the way the system functions which require improvements.

- The East Vail route, which has the highest ridership (other than the In-Town Shuttle), runs every 15 minutes during the peak hours of the day. During the busiest times, this bus fills completely by the time it reaches the Vail Racquet Club. Many riders must wait for another bus or try to enter an already overloaded vehicle.

- The two West Vail routes are segregated by Interstate 70. While service provided to each side of the freeway is good, service between the north side and the south side of the freeway is not. To cross I-70, riders must take the bus back to the Village Transportation Center and transfer to the other West Vail route resulting in unacceptable travel times.

- There is a general desire to expand service throughout the Town in terms of frequency as well as geographic coverage.

- Improved and expanded service is required for Ford Park.

GOALS AND OBJECTIVES

The following describe the Town's objectives concerning the outlying bus routes:

- Revise the basic route structure to more efficiently serve West Vail and East Vail.
- Identify additional service areas for future transit coverage.
- Improve frequency of service where ridership demands warrant.

ROUTE STRUCTURE MODIFICATIONS

West Vail requires improved service between the north side and the south side of I-70. The most appropriate service concept is an "opposing loop" configuration in which one bus route would circulate clockwise along the frontage roads between West Vail and the VTC, and another route would circulate in the counter-clockwise direction. Riders in West Vail would be able to cross the freeway by simply boarding the appropriate bus. In addition, these routes could also serve the existing Sandstone route.

Service to East Vail should be structured such that combining it with the golf course route should occur only in the evening after the peak period. Currently, these routes are separate during the A.M. and P.M. peak periods, but are combined during the midday and evening periods. Ridership from the East Vail area and the golf course area is substantial enough to warrant a separate route to each area for all except the late evening hours.

ROUTE COVERAGE EXPANSION OPTIONS

Several areas within the Town have been considered for formal bus service expansion. These areas and their expansion potential are described below:

- Lions Ridge Loop - There is a general desire to route a bus along this roadway. However, there are grade and geometric deficiencies which require upgrading before a bus can operate safely along this road. Therefore, it is recommended that when the necessary roadway improvements are accomplished, service along Lions Ridge loop be examined in detail.

- Chamonix Lane - There is also a desire to route a bus along this road west of Chamonix Road. There are also grade and geometric deficiencies along this road which require upgrading before a bus can be operated safely. As was the case on Lions Ridge loop, bus service on this road should be re-evaluated upon completion of the necessary physical improvements.

- Ford Park - A separate route will need to be provided specifically to Ford Park on Fridays, Saturdays, and Sundays during the ski season to accommodate visitors as well as residents and employees. During non-peak times, Ford Park will be served by the East Vail route.

- Lupine Road/Columbine Drive in East Vail - The possibility of rerouting the East Vail route along these roadways was evaluated. However, it was determined that this change would add travel time to the route with no increase in ridership. Potential passengers along this segment are served via Big Horn Road.

- Main Gore Circle North - Rerouting the East Vail bus once it reaches Main Gore Drive is necessary to reduce travel time back to the Transportation Center. This bus generally fills completely during the A.M. peak hour by the time it reaches the Vail Racquet Club, and it is best at that point to route it directly back to the Transportation Center.

SERVICE FREQUENCY IMPROVEMENT NEEDS

The entire outlying bus system requires increased service frequencies to accommodate projected ridership levels. Pending implementation of the various recommended route modifications a revised frequency plan should be implemented.

RECOMMENDATIONS/PRIORITIES

The following define the recommended improvements to the outlying bus routes prioritized by short-term and long-term actions.

Short-term

- Combine the West Vail routes as opposing clockwise and counter-clockwise routes utilizing the North and South Frontage Roads, as shown in Figure 13. During the peak winter season, ridership demands on the existing Sandstone route will require that service on this route be provided separately from the opposing loop service.

- Reroute the East Vail route such that it extends along Main Gore Drive to Bighorn Road, as shown in Figure 14.

- Maintain separate East Vail and golf course routes throughout the day and combine these into one route after the evening peak period.

- Provide continuous service between Ford Park and the Transportation Center on Fridays, Saturdays, Sundays and holidays.

- Frequency of service for the revised transit system structure is recommended to be:

  - West Vail Opposing Loops - 15 Minutes
    Sandstone Route Winter Service - 20 Minutes.

  - East Vail Route - 15 Minutes

  - Golf Course Route - 30 Minutes

  - Combined East Vail/Golf Course Route (late evening) - 30 Minutes

  - Ford Park Weekend Service - 15 Minutes

Recommended frequencies will need to be adjusted as ridership demands change relative to peak and non-peak hours, late night, and seasonal variations.

Long-term

- Expand service to Chamonix Lane and Lions Ridge Loop pending future horizontal and vertical geometric improvements to these roadways.

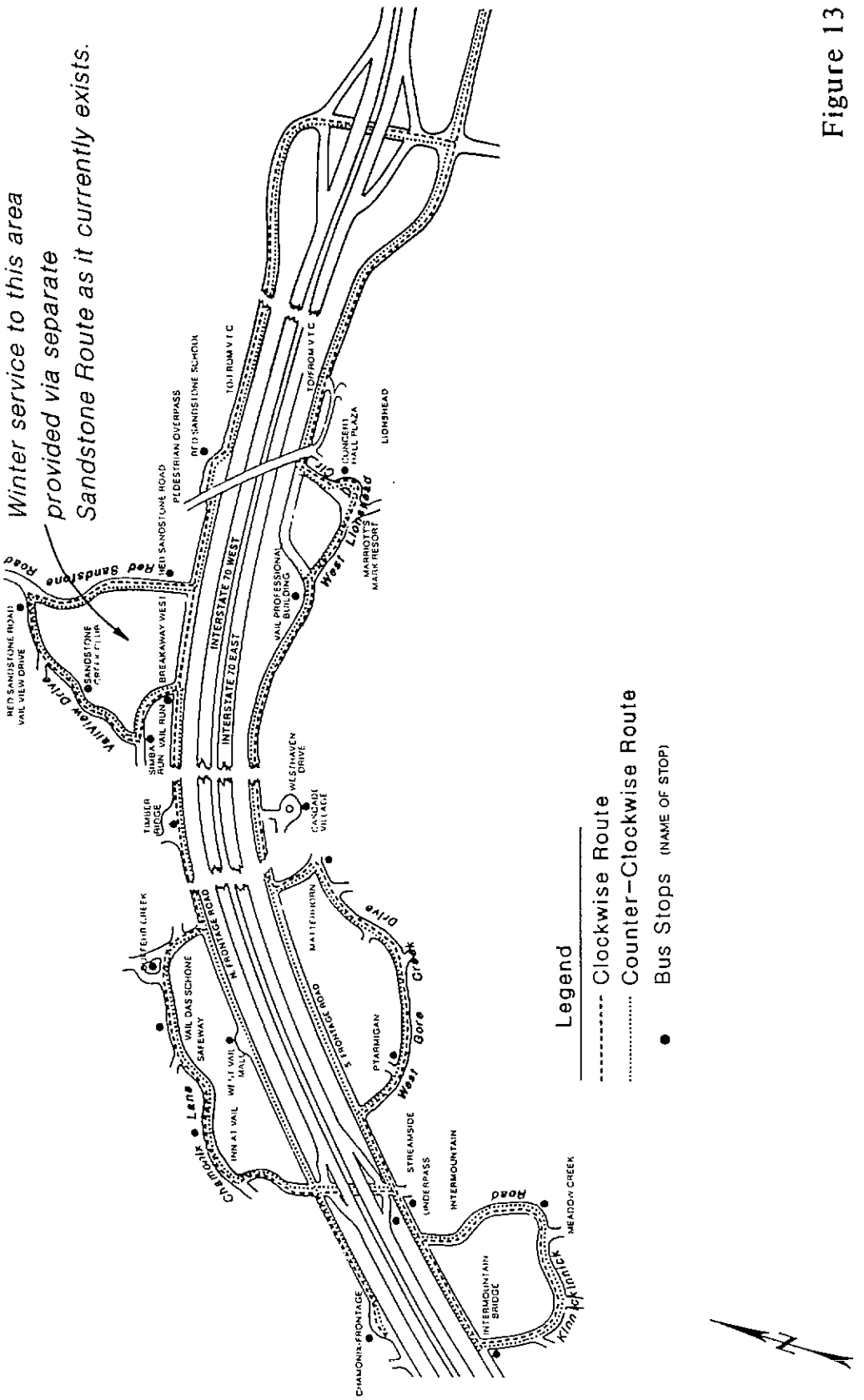


Figure 13

Recommended West Vail Bus Routes

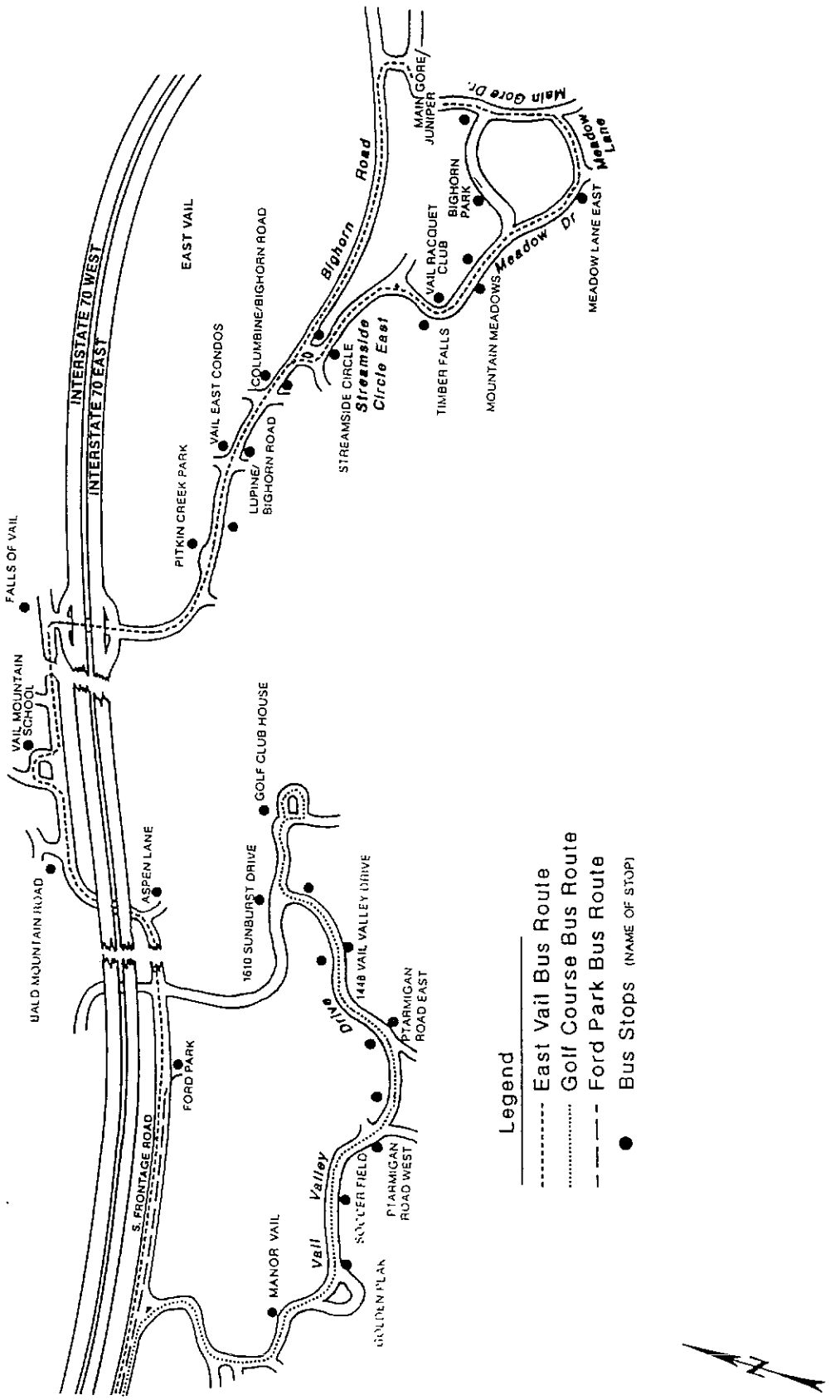


Figure 14
Recommended East Vail Bus Routes

DOWN VALLEY BUS SERVICE

The need does exist to provide transit service to/from Down Valley communities. Many Vail day skiers residing Down Valley utilize the transit system. In addition, a significant number of employees working in Vail also reside Down Valley who rely on the transit service.

Eagle County has been providing Down Valley transit service until 1990 at which time it discontinued service. The Town of Avon then initiated continuing this service during the 1990-91 ski season with Town funds and other contributions. The Town of Vail has contributed $90,000 to maintain this service during the 1990-91 ski season. A more permanent solution for Down Valley service will need to be established in the future in cooperation with both public agencies and private sector beneficiaries.

CHAPTER VI. I-70 ACCESS

BACKGROUND

Three freeway interchanges along Interstate-70 currently provide access to the Town. Two of the three, the West Vail interchange and the Main Vail interchange, are heavily utilized as they are located near activity centers. The East Vail interchange, though used some by day skiers, is not utilized to the extent that the other two are and has not historically been known to be congested.

Physical and operational characteristics of the West Vail interchange are as follows:

- Extremely close spacing of ramp intersections and frontage road intersections.
- All approaches into the interchange area are single lane, including the roadway through the overpass. No exclusive turn lanes are provided at any of the intersections.
- The interchange area processes about 2,200 vehicles during the evening peak hour of which 55 percent are oriented to/from I-70 and 45 percent are vehicles crossing I-70. Of the I-70 traffic, about two-thirds are oriented towards Down Valley. Existing peak hour traffic volumes are shown in the Technical Appendix.
- During peak conditions, excessive delay can be experienced on the westbound North Frontage Road approach.

The Main Vail interchange experiences even heavier vehicular use and is characterized by the following:

- Extremely close spacing of ramp intersections and the South Frontage Road intersection.
- 4-way stop intersection south of the interchange with multi-lane approaches serving nearly all I-70 oriented traffic as well as serving as the merging point for the north and south frontage roads. During peak periods, this intersection "bottlenecks" the interchange area and frequently requires manual officer control.
- The interchange processes about 3,250 vehicles during the evening peak hour of which 75 percent are oriented to/from I-70 and 25 percent are vehicles crossing I-70. Existing peak hour traffic volumes are shown in the Technical Appendix.
- During peak conditions (particularly P.M. peak conditions), excessive delay can be experienced for "I-70 bound" vehicles at the four-way stop (i.e., eastbound lefts, northbound throughs and westbound rights).

As mentioned, existing peak hour traffic volumes indicative of peak season conditions are presented in the Technical Appendix. In addition, projected future peak hour volumes are also presented which reflect ski expansion that has been approved. Future projected traffic volumes are 15 to 20 percent higher than existing traffic.

GOALS AND OBJECTIVES

The following reflects the Town goals regarding access to I-70.

- Provide additional capacity for crossing I-70 between West Vail and Main Vail.
- Relieve existing congestion and accommodate future demand at the West Vail and Main Vail interchanges, especially at the ramp terminals and at nearby adjacent intersections on the frontage roads.
- When possible, increase intersection spacing and reduce traffic conflict points at interchange areas.
- Document the implications of alternative demand responsive traffic control options (traffic signals and/or manual officer control).
- Enhance safety characteristics along the frontage road system by providing exclusive turn lanes at major intersections.
- Provide improvements which emphasize pedestrian priorities in key local circulation areas and which separate conflicting travel modes.
- Provide significant areas in the frontage road cross-section to develop meaningful aesthetic and landscape improvements.

I-70 CROSSING LOCATION

Providing additional capacity for crossing I-70 between West Vail and Main Vail is a major goal. The travel demand analysis indicated that approximately 45% of the traffic volume at the West Vail interchange and approximately 25% of the traffic volume at the main Vail interchange is crossing I-70 as opposed to entering or exiting the freeway. In addition, I-70 is currently crossed at-grade by a significant number of pedestrians resulting in major safety hazards.

An analysis of interchange turning movement patterns was conducted using actual peak hour traffic counts at both the West Vail and Main Vail interchanges in order to determine how much utilization a new crossing of I-70 would receive. Clearly many trips which currently cross I-70 would not divert to a new I-70 crossing if it would require longer travel distances and greater travel time. On the other hand if a new I-70 crossing provided either a shorter travel distance or a reduced travel time for a significant number of trips, then another crossing of I-70 would provide significant benefits.

The results of the analysis of actual traffic counts resulted in the identification of two major travel patterns and several minor travel patterns which would benefit from a new crossing of I-70. The two major travel patterns are:

- Trips between the South Frontage Road/Vail Road (passing through the 4-way stop) and the North Frontage Road amount to nearly 600 vehicles in the peak hour alone. While not all of these trips would divert to a new crossing of I-70 it was calculated that approximately 240 of these trips would experience both a shorter travel distance and a reduced travel time and that approximately another 120 vehicles would experience a reduced travel time during peak congestion periods by utilizing a new I-70 crossing. This results in a diversion in excess of 50% (360 trips out of 600) which is an extremely high diversion potential.

- The second major travel pattern benefitted by a new crossing of I-70 includes trips between the North Frontage Road (east of the West Vail interchange) and the South Frontage Road (also east of the West Vail interchange). This volume amounts to nearly 300 trips in the peak hour of which 100 trips would experience a reduced travel distance or a reduced travel time by utilizing a new I-70 crossing.

Together, these two major travel patterns provide an expected volume demand of 460 trips which would use a new I-70 crossing if it were in place immediately. When these trips are combined with other minor travel patterns and when future growth in travel demand levels is included, it is conservatively estimated that 600 to 650 vehicles would utilize a new I-70 crossing during the peak hour of travel.

Therefore, an intermediate crossing of I-70 is anticipated to result in the following benefits:

- Volume demands at the Main Vail interchange will be reduced.
- Traffic using the 4-way stop will be reduced.
- Volume demands at the West Vail interchange will be reduced.
- Pedestrian and bicycle safety will be enhanced.
- Shorter trip lengths and reduced vehicle miles of travel will occur for travel across I-70.

The preferred location for an underpass has been identified near the Simba Run condominiums, though both frontage roads would need to be lowered. Since the I-70 interchanges currently serve as the only I-70 crossings between West Vail and Main Vail, providing this additional crossing will relieve the interchange areas and is an important consideration when evaluating interchange alternatives. The planning level cost estimate for constructing a new underpass in this location is approximately $2.0 million exclusive of any right-of-way, major drainage requirements, and frontage road revisions.

WEST VAIL INTERCHANGE ALTERNATIVES

Interchange alternatives for the West Vail interchange are as follows:

0. No Action

1. Single Point Diamond (Urban)

2. Relocated EB and WB Entry Ramps

3. Relocate West Leg of North Frontage Road

4. Relocate West Leg of North Frontage Road and Relocate WB Entry Ramp

5. Relocate West and East Legs of North Frontage Road

6. Relocate West Leg of North Frontage Road and Provide New Connection Between Frontage Road and Chamonix Road; Restrict East Leg of North Frontage Road to Right Turns Only

These alternatives are shown diagrammatically in Table 9.

An initial screening of the West Vail interchange alternatives and input from the Parking and Transportation Advisory Committee indicated that certain options are not financially or operationally feasible. The following alternatives were eliminated from consideration.

- *Alternative 1 - Single Point Diamond (Urban)*

  This alternative would alleviate some of the intersection spacing concerns, but it would have little affect on operations at the adjacent 4-way stop intersections. Though an urban interchange would be more beneficial at West Vail than Main Vail since intersection spacing is a concern on both sides of the interchange, the benefits would not be justified by its excessive cost.

- *Alternative 2 - Relocate Eastbound and Westbound Entry Ramps*

  This alternative would somewhat be beneficial in alleviating intersection spacing concerns, but it would force additional traffic through the adjacent 4-way stop intersections, particularly the North Frontage Road intersection which is the primary bottleneck of the interchange area. Therefore, this alternative may actually worsen traffic operations on the North Frontage Road. Relocating the eastbound on-ramp does benefit the South Frontage Road and remains a viable option.

Table 9
West Vail Interchange Design Alternatives

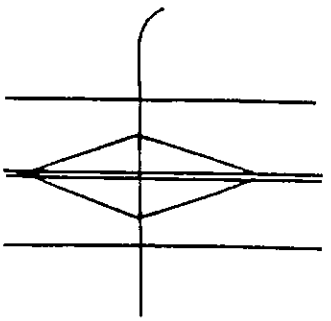
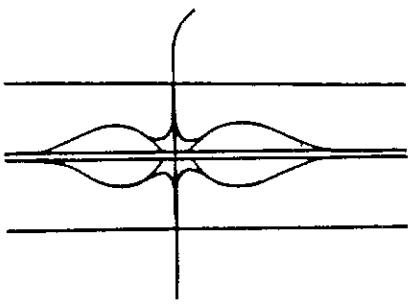
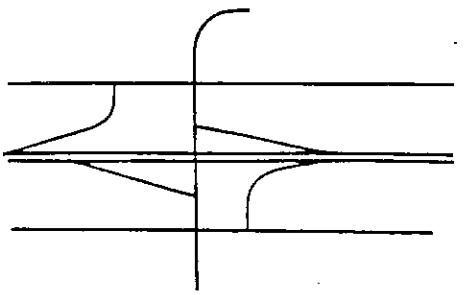
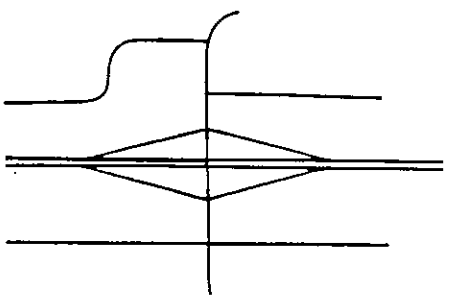
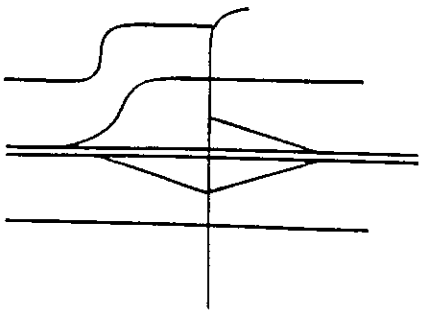
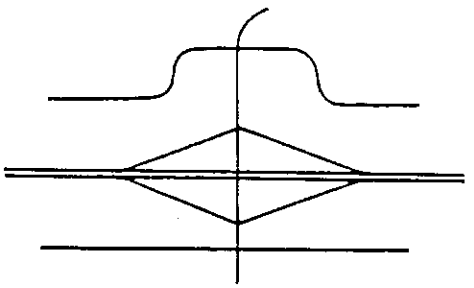
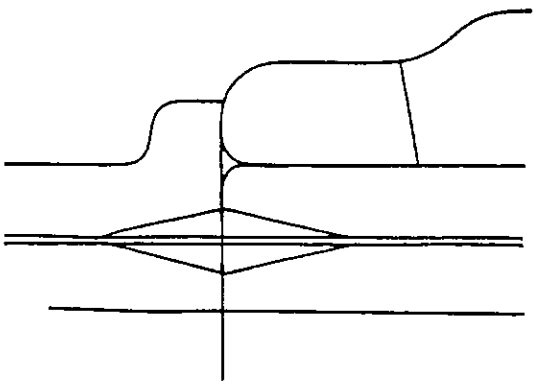
Alternative		Characteristics
0.		Existing Situation for comparison.
1.		Combines ramp terminals into one intersection. Reduces turning movement conflicts. Increases intersection spacing.
2.		Relocates EB and WB entries to Frontage Road. Simplifies individual intersection operations. Complicates directional signing to I-70.
3.		Provides additional spacing to I-70 for west leg of North Frontage Road. Simplifies operations at east leg of North Frontage Road.

Table 9 (con't)
West Vail Interchange Design Alternatives

Alternative	Characteristics
4. 	Provides additional spacing to I-70 for west leg of North Frontage Road. Simplifies operations on North Frontage Road. Simplifies operations at north ramp terminal.
5. 	Increases intersection spacing on north side.
6. 	Provides additional spacing to I-70 for west leg of North Frontage Road. Simplifies operations on North Frontage Road. Requires access to Chanonix Road from commercial area.

- *Alternative 5 - Relocate West and East Legs of North Frontage Road*

  This alternative would be beneficial to alleviate intersection spacing concerns along the north side, but it would be very difficult to relocate the east leg of this road. Grade differences would be very difficult to negotiate and the roadway would need to be located extremely close to existing buildings. Relocating the west leg of the intersection remains a viable option.

- *Alternative 6 - Relocate West Leg of North Frontage Road and Provide New Connection Between the North Frontage Road and Chamonix Road; Restrict East Leg of North Frontage Road to Right Turns Only*

  This alternative would be very beneficial in alleviating congestion along the north side of the interchange. It was also determined that a new "connector" roadway between Chamonix Road and the North Frontage Road in the vacant lot adjacent to Safeway would alleviate congestion at the interchange. However, the additional traffic that this alternative would introduce to Chamonix Road was deemed undesirable.

The remaining Alternatives 3 and 4 are essentially identical with the only difference being where the westbound on-ramp would be located. This is not a significant difference since Chamonix Road, North Frontage Road, and the north ramps operate as a single multi-legged intersection. The important element in these two alternatives is the realignment of the North Frontage Road between Wendy's and the Texaco service station. A revised traffic control scheme is inherent in this configuration where both legs of the North Frontage Road would be stop-sign controlled at their respective "T" intersections, and traffic along Chamonix Road would have the right-of-way. Demand responsive control may be necessary during peak hours, however at the Chamonix/North Frontage Road/north ramps intersection.

The remaining option to potentially improve the south intersection is the relocation of the eastbound on-ramp as was shown as part of Alternative 2. Intersection capacity analyses were conducted to determine the impact of relocating this on-ramp as well as the proposed improvements along the north side of the interchange. Results are illustrated as a volume-to-capacity (V/C) ratio which documents the percent of available capacity used and are shown in Table 10. V/C ratios greater than 0.9 indicate that roadway segments are experiencing undesirable levels of delay and congestion. These analyses for the proposed modifications reflect turning lane additions as is shown in Figure 15.

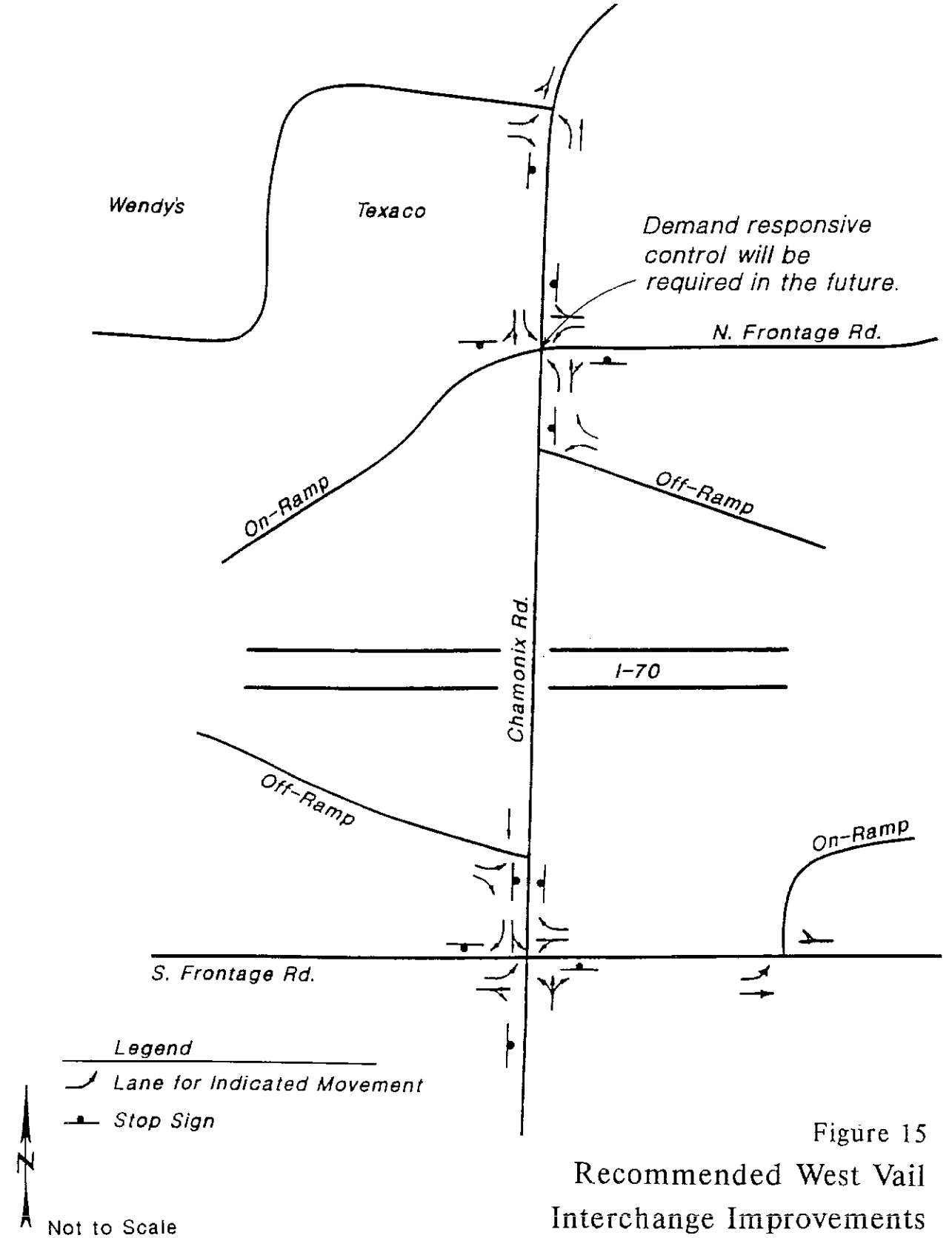


Figure 15
Recommended West Vail Interchange Improvements

Table 10
West Vail Traffic Volume-to-Capacity Summary

Intersection	Existing Demand/ Existing Network	Future (1) Demand/ Existing Network	Future Demand/ Existing Network w/ New I-70 Crossing (Simba Run) Only	Future Demand/ Future Network (Figure 15)
Chamonix/N. Frontage Road	1.41	1.67	1.41 (2)	1.03 (2)
Chamonix/S. Frontage Road	1.20	1.42	1.18	0.87

(1) Future demand is based upon approved ski area expansion levels.
(2) Demand responsive traffic control (traffic signal or manual control). Manual traffic control is the preferred option and method used by the Town of Vail.

WEST VAIL INTERCHANGE RECOMMENDATIONS/PRIORITIES

Given the results in Table 10, the following is recommended for the West Vail interchange.

- As a first priority, construct an I-70 underpass in the vicinity of Simba Run connecting the North and South Frontage Roads.
- Realign the west leg of the North Frontage Road between Wendy's and the Texaco service station forming two "T" intersections with Chamonix Road.
- Realign the westbound on-ramp to line up with the east leg of the North Frontage Road.
- Realign the eastbound ramp such that access to it is via the South Frontage Road.
- Demand responsive control will be required at the Southern "T" intersection during peak periods.
- Add exclusive turn lanes at all intersections as shown in Figure 15.
- When the vacant lot adjacent to Vail Das Schone develops, provide a connector roadway between the North Frontage Road and Chamonix Lane.

Construction costs for the West Vail improvements as shown in Figure 15 are estimated to be approximately $225,000 plus landscaping, engineering, contingencies, and land acquisition.
Figure 15.

MAIN VAIL INTERCHANGE ALTERNATIVES

The range of alternatives for the Main Vail interchange is summarized in Table 11. Shown are alternatives that have been previously considered for Vail as well as new and modified alternatives and supplemental improvements. Table 12 shows the Main Vail interchange alternatives diagrammatically.

An initial screening of the Main Vail interchange alternatives yield several that should be omitted from detail analysis. The following illustrates which alternatives are no longer considered and the reasoning for omitting it.

- *Alternative 1 - Close Vail Road at 4-Way Stop*

  This alternative would force Vail Road traffic to reroute along East Meadow Drive to Village Center Road in order to reach the Frontage Road. Traffic would be detoured through a pedestrian area. "De-pedestrianizing" East Meadow Drive has been considered unacceptable and is sufficient reason to drop this alternative from detailed analysis.

- *Alternative 2 - Single Point Diamond (Urban)*

  This alternative would alleviate some of the intersection spacing concerns, but it would have little affect on operations at the 4-way stop intersection. Therefore, any benefits that would be gained by this alternative would not be justified by its excessive cost.

- *Alternative 4 - Relocate Eastbound Entry Ramp*

  This alternative will simplify some of the traffic operations that are occurring under the interchange, but basic travel patterns will not differ significantly and the 4-way stop intersection will remain congested.

- *Alternative 5 - High Capacity Diamond*

  This alternative provides minimal operational benefits but it will not improve turning movements off the ramps nor will it have any affect on operations at the 4-way stop intersection since its travel patterns would not change. Therefore, this alternative is dropped from further evaluation.

- *Alternative 6 - Relocate Eastbound and Westbound Entry Ramps*

  This alternative has the same impact as Alternative 4 along the south side of the interchange and would further enhance north ramp intersection operations. However, basic travel patterns will not be altered significantly and the 4-way stop intersection will still be congested during peak periods.

The remaining alternatives (3, 7 and 8) have been evaluated as to their impact on interchange operations. Table 13 shows the volume-to-capacity ratios at key intersections for each alternative. In addition to the 4-way stop and ramp intersections, other intersections are presented whose operations are an important consideration in evaluating each alternative.

Table 11
Main Vail Interchange Design Alternatives

Alternative		Comments
	Previously Considered Alternatives (*)	
0.	No Action	Used as base case for comparative analysis.
1.	Close Vail Road at 4-Way Stop	To be re-evaluated in terms of the entire I-70 access system for the long-range transportation plan
2.	Single Point Diamond (Urban)	
3.	Remove/Modify EB Exit Ramp; Provide New Ramp(s) at VA Shops	
4.	Relocate EB Entry Ramp	
5.	High Capacity Diamond	
(*)	Traffic signals were proposed to be included in all of the alternatives previously considered.	
	New or Modified Alternatives	
6.	Relocate EB and WB Entry Ramps	
7.	Extend North Frontage Road East	
8.	Relocate East Ramps to Existing Underpass East of Golf Course (Modified Split Diamond)	
	Supplemental Actions Previously Considered	
9.	Frontage Road Modifications (One-Way, Widen, Relocate)	While not recommended as isolated alternatives, these actions are an integral part (in varying degrees) of any future improvement option.
10.	Additional I-70 Crossings	
11.	Signing Modifications	
12.	Expanded Peripheral Parking	
13.	Expanded Bus Services	
14.	Manual Traffic Control	

Table 12
Main Vail Interchange Design Alternatives

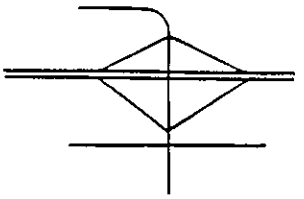
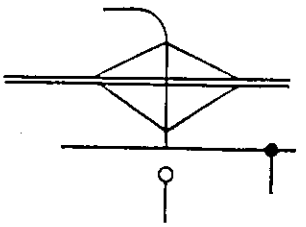
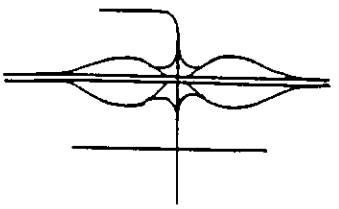
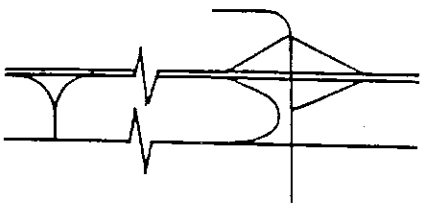
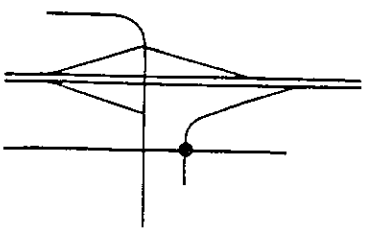
Alternative		Characteristics
0.		Existing situation for comparison.
1.		Converts 4-way stop to 3-way stop. Diverts traffic to Village Center Road. Impacts Meadow Drive pedestrian zone.
2.		Combines ramp terminals into one intersection. Reduces turning movement conflicts. Increases intersection spacing.
3.		New exit/entry ramps at VA shops. Right turns only at EB exit to Vail Road. Operational analysis to be done without signals. Federal access approval to I-70 exists.
4.		Relocates EB entry to South Frontage Road. Simplifies operations at EB exit ramp. Complicates directional signing to I-70 east.

Table 12 (con't)
Main Vail Interchange Design Alternatives

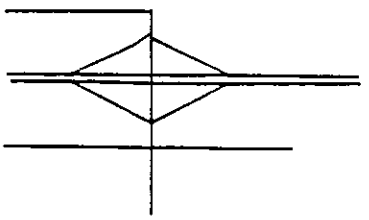
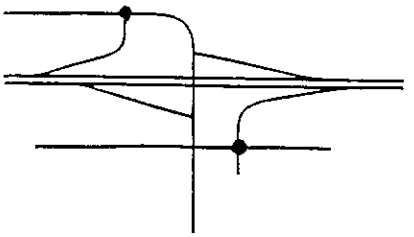
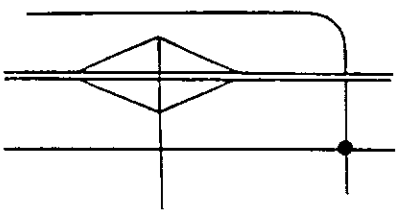
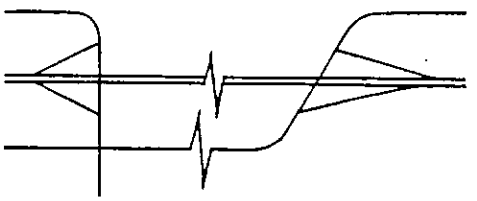
Alternative		Characteristics
5.		Increases laneage at existing interchange. Retains all existing traffic patterns.
6.		Relocates EB and WB entries to Frontage Roads. Simplifies individual intersection operations. Complicates directional signing to I-70.
7.		Provides new I-70 crossing east of Main Vail interchange. Reduces traffic through interchange area.
8.		Relocates east ramps to existing underpass east of golf course. Reduces traffic through interchange and 4-way stop.

Table 13
Main Vail Volume-to-Capacity Ratio Summary

Intersection	Existing Demand/ Existing Network	Future Demand/ Existing Network	Future Demand on Existing Network w/ New I-70 Crossing (Simba Run) Only	Future Demand/ VA Shops Ramps (Alt. 3)	Future Demand Vail Valley Connection/ Underpass (Alt. 7)	Future Demand/ Booth Falls Split Diamond (Alt. 8)
Vail Road/North Ramps (Left Turns)	1.16	1.33	1.21	1.21	0.96	0.77 (1)
Vail Road/South Frontage Road/ South Ramps	0.94 (2)	1.11 (2)	1.09 (2)	0.90 (2)	1.02 (2)	0.92 (2)
South Frontage Road/VA Shops Area	-	-	-	0.89 (2)	-	-
South Frontage Road/Vail Valley Drive	1.14	1.26	1.26	0.74 (2) (3)	0.76 (2) (3)	0.85 (2) (3)

(1) All way stop control along East Frontage Road/westbound off-ramp intersection near Booth Falls.

(2) Demand responsive traffic control required (manual control or traffic signal).

(3) Intersection modification required (lower South Frontage Road).

It can be seen from Table 13 that Alternative 8, relocating the east ramps to the Booth Falls underpass, would yield the best intersection operations given the appropriate traffic control and intersection improvements. Alternative 3 is significantly over capacity at Vail Road/north ramps intersection without demand responsive control. In addition demand response control is required at a total of three other intersections while Alternative 7 and 8 require demand responsive control at only two intersections. While Alternative 7 results in significant overall improvements to traffic operations, it is the least effective in eliminating congestion at the 4-way stop even under demand responsive control.

In addition to traffic operations, right-of-way considerations, approvals required, physical and visual impacts, and construction costs are also important. These aspects are summarized for each alternative in Table 14. In addition, each aspect has been subjectively rank ordered by alternative, and rankings have been summed for an overall ranking of each alternative for comparative planning purposes. Table 15 illustrates the results.

MAIN VAIL INTERCHANGE RECOMMENDATIONS/PRIORITIES

The following are recommendations regarding the Main Vail interchange to relieve traffic congestion prioritized by short-term and long term actions.

Short-Term

- As a first priority, construct an I-70 underpass in the vicinity of Simba Run connecting the North and South Frontage Roads.
- Conduct a controlled test in which the east Main Vail ramps would be closed and sign easterly oriented traffic to use the East Vail interchange. Results of this will indicate how well the Long-range solution will work.
- Continue to manually control (Vail's preferred traffic control method) the 4-way stop intersection during peak periods.

Long-Term

- Relocate the east ramps to the Booth Falls underpass as shown in Figure 16. The westbound off-ramp/East Frontage Road intersection will require stop sign traffic control in all directions. Keeping the east ramps at the Main Vail interchange open during non-peak months may also be a possibility.
- Improve the frontage road between Main Vail and Booth Falls as necessary to accommodate increase volumes and improve safety.
- Depress and modify the South Frontage Road in the vicinity of Vail Valley Drive and manually control the intersection during peak hours. This is required because the existing grades on Vail Valley Drive necessitate that the minor roadway have the right-of-way. This greatly impacts the capacity of the major roadway and will only worsen in the future.

Table 14
Implications and Consequences of Main Vail Interchange Alternatives

Alternative/Phase	R/W Implications	Approvals Required	Physical Implications	Planning Level Cost (1)
Booth Falls Split Diamond	Minimal or no R/W required at Booth Falls.	I-70 access approval required for Booth Falls. Currently FHWA policy prohibits half diamonds.	Minor relocations of EFR north of I-70 and local street access may be needed at Booth Falls. A facility of the Upper Eagle Valley Water and Sanitation District will have to be maintained on the south side of the interchange. Visual and noise impacts on adjacent neighborhoods. Lowering of Vail Valley Drive/SFR intersection.	$0.5M
Vail Valley Connection/ Underpass	R/W required along with slope easements north of I-70.	No I-70 access approval required for NFR extension. Standard review of I-70 bridge construction is required.	Retaining walls required for cut area on portions of NFR extension of I-70. Walls would be approximately 40-feet in height with approximately 20-feet above the grade of I-70. Lowering of Vail Valley Drive/ SFR intersection.	$2.0M
Holy Cross/ VA Shops Ramps	R/W required in the VA shops area (Holly Cross site).	I-70 access approval is required, has been previously granted, and is still valid. Approval may be conditioned on the installation of traffic signal equipment.	New intersection on SFR at VA shops with restricted movements at Vail Road and EB exit ramp. Modifications at Main Vail interchange. Removal of large evergreen trees.	$1.2M

(1) Costs are in 1990 dollars and do not include land acquistion nor improvements to the frontage roads beyond the interchange area.

Table 15
Main Vail Interchange Alternative Ranking

Interchange Alternative	Traffic Operations	Right-of-Way Impact	Institutional Considerations	Physical Impact	Visual Impact	Cost	Rank Sum
Alternative 3 VA Shops Ramps	3	3	1	1.5	2	2	12.5
Alternative 7 NFR Vail Valley Connection	2	1.5	1.5	3	3	3	14.0
Alternative 8 Booth Falls Split Diamond	1	1.5	3	1.5	2	1	10.0

Note: 1 = Good, 2 = Moderate, 3 = Poor

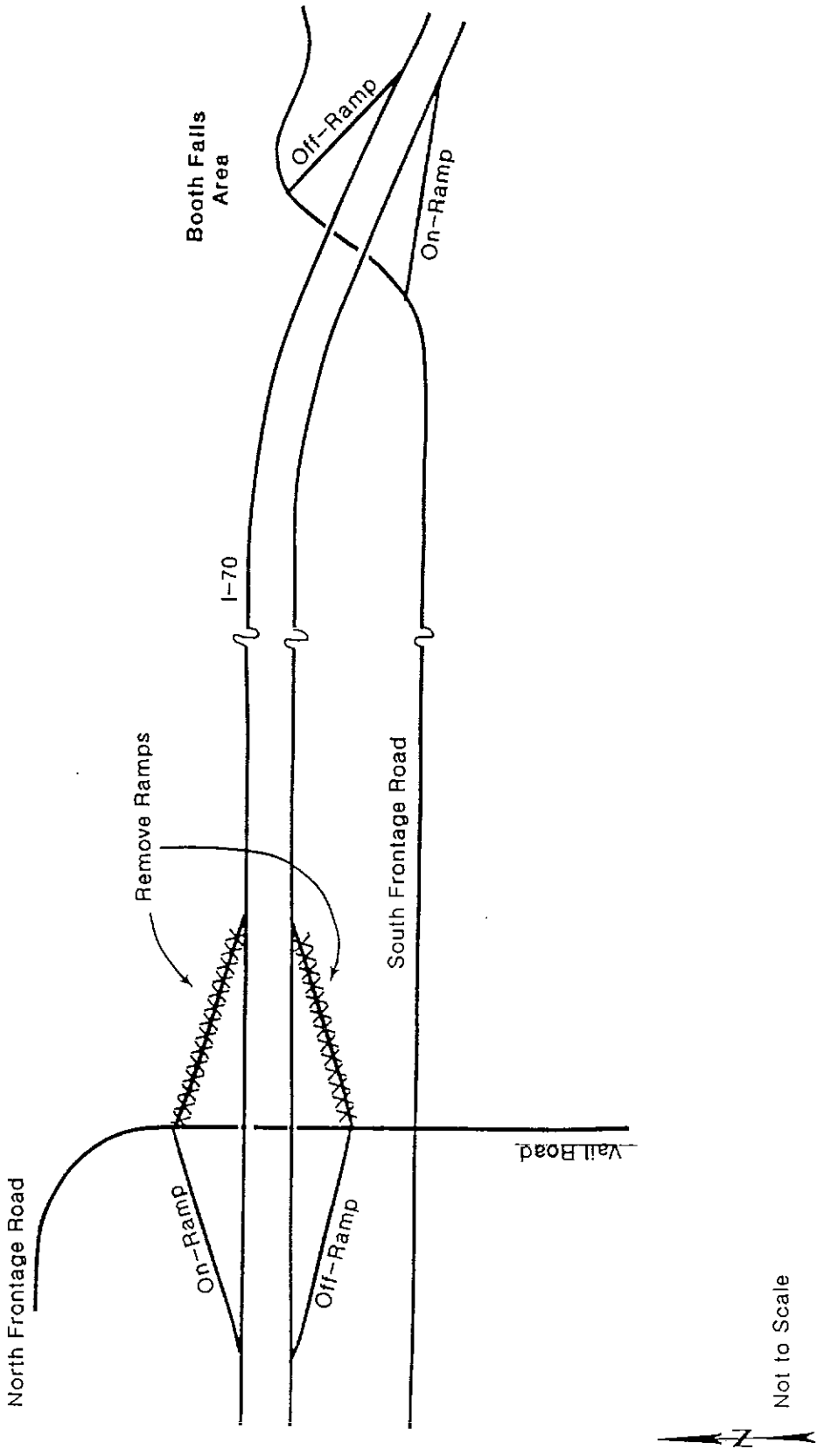


Figure 16
Recommended Main Vail Interchange Improvements

- Retain as possible future options, the extension of the North Frontage Road under I-70 to connect with Vail Valley Drive, and the addition of new ramps to I-70 in the VA shops area.

- Traffic signal control versus manual control at high volume intersections remains an issue. In the future some form of demand responsive control will be required on the South Frontage Road at Vail Road and at Vail Valley Drive even if the east ramps of the Main Vail interchange are relocated. The Town's preferred control method is to provide manual control with designated traffic control personnel.

FRONTAGE ROAD SYSTEM

The modifications recommended for the West Vail and Main Vail interchanges will require that certain modifications be made to the I-70 frontage roads serving these interchanges. In addition, existing traffic counts and anticipated future travel demand levels will require that several improvements be implemented in order to maximize the efficiency of the existing street system.

The major objectives of the frontage road improvement recommendations include:

- Provision of exclusive and separated areas for bicycle and pedestrian use to enhance the users experience and to improve safety.

- Provision of significant landscape areas and user amenities along the entire length of the frontage road system.

- Provision of additional crossing capacity of I-70 (as discussed previously) in order to relieve traffic congestion at the West Vail and Main Vail interchange areas.

- Provision of turn lanes (primarily left turn lanes) to reduce congestion and to improve safety at critical intersections serving the West Vail and Main Vail interchanges as well as at major access points between them.

Figure 17 documents the conceptual improvement plan for the I-70 frontage roads. Major elements of the concept plan include:

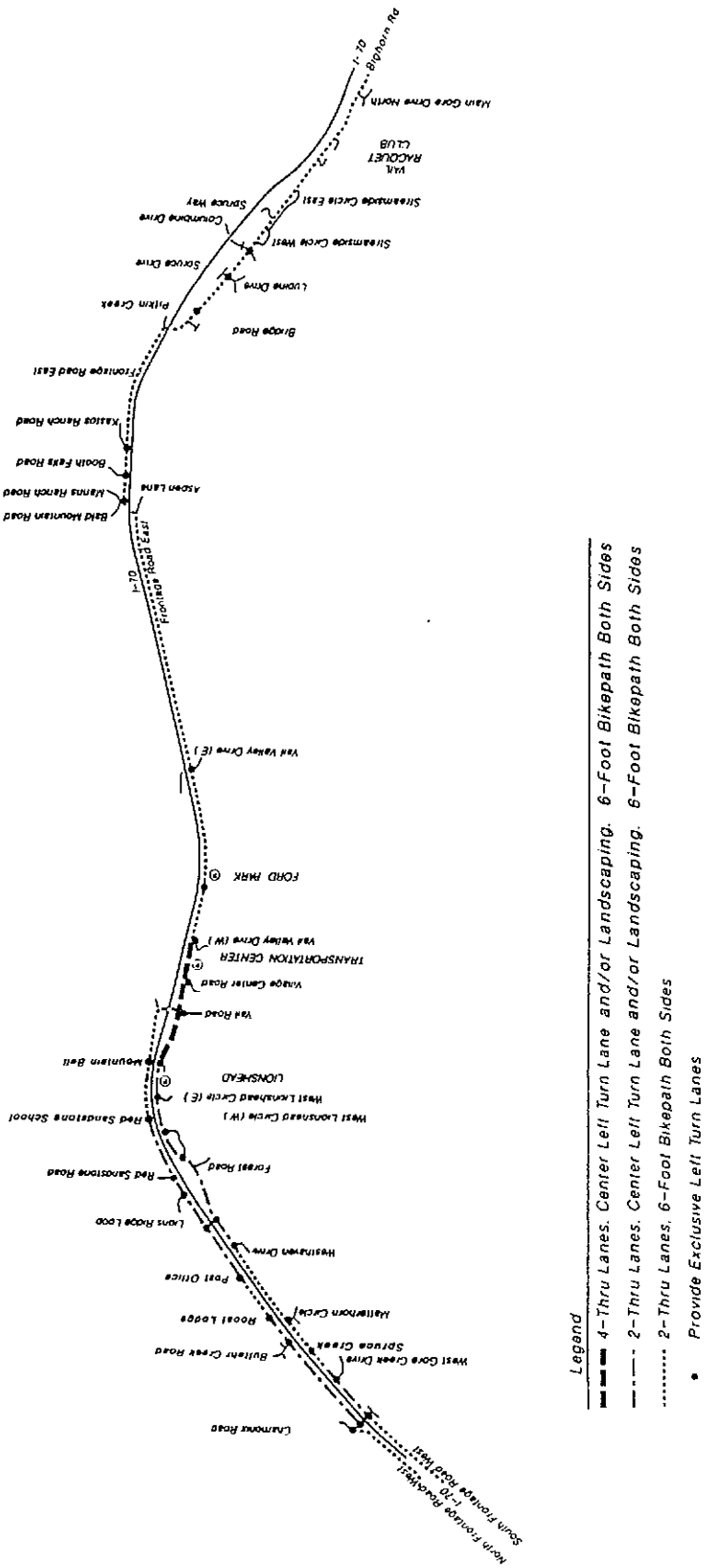
- On-street, 6-foot bike paths are provided along the entire frontage road system throughout the Town of Vail.

- New center turn lanes are recommended to occur along approximately 4.5 miles of the frontage roads and landscaping is recommended at major intersections and interest points.

- Special safety improvements including guardrail and street lighting at intersections (and on several roadway segments in high activity areas where pedestrians are present), non-residential segments, and at the end of center medians are recommended.

- Exclusive left turn lanes are recommended for 31 intersections; 19 of these intersections currently have no such provisions. Further analysis and design detail will be required prior to implementation to insure expansion is necessary.

Figure 17
Frontage Road Concept Plan



Included with the adoption of the Vail Transportation Plan, 50-scale functional drawings will document specific locations and dimensions for implementing the Frontage Road Concept Plan. The planning level cost estimate for implementing the frontage road improvements is approximately $4.5 to $5.0 million.

SEPARATION OF CONFLICTING TRAVEL MODES

The Town of Vail is characterized by an extensive system of multi-modal transportation facilities including pedestrian-only areas, bicycle paths, shuttle transit system, and numerous recreational trails of all types. Full implementation of a total system of separated facilities for each of these various user groups requires that:

- Sufficient width and right-of-way be made available to adequately serve each travel mode.
- Control points be defined which maintain, and where necessary, enforce the desired degree of separation among modes.
- Where joint use of a right-of-way by more than one travel mode is unavoidable, proper delineation, adequate signing, and physical control elements must be provided.

These principles are especially applicable in the core area of Vail which generally extends from Lionshead to Golden Peak. This area is served by the In-Town Shuttle and is the area where pedestrian activity is highest, auto access to private properties occurs, and goods delivery by truck is significant.

To provide basis for future improvements geared toward enhancing the desired pedestrian environment, a conceptual framework plan has been prepared for the core area as shown in Figure 18. Key elements of the core area concept are described below.

Pedestrian improvements are proposed to occur along significant portions of East Lionshead Circle, East Meadow Drive and West Meadow Drive from Lionshead to the VTC. Separation of pedestrian areas from the In-Town Shuttle consist of delineated walkways and busways with improved geometrics and widening in constricted locations. The area lying easterly of Vail Road along East Meadow Drive will require approximately 30 feet of width to properly implement. The Master Streetscape Plan identifies pedestrian improvements on 20-scale drawings. In addition to the improvements to Meadow Drive, implementation of the streamwalk as mentioned in the Master Recreation Trails Plan also improves the pedestrian connection between Lionshead and Vail Village.

Control points will remain necessary to insure that the core area system functions properly. It is proposed that the existing Check Point Charlie be relocated southerly to Willow Road to reduce the volume of traffic on Willow Bridge Road exiting Vail Village and to insure that delivery vehicles are adequately controlled.

A pedestrian overpass of I-70 in the vicinity of the Post Office would provide an important pedestrian safety improvement in an area where pedestrian crossings of I-70 are currently prevalent.

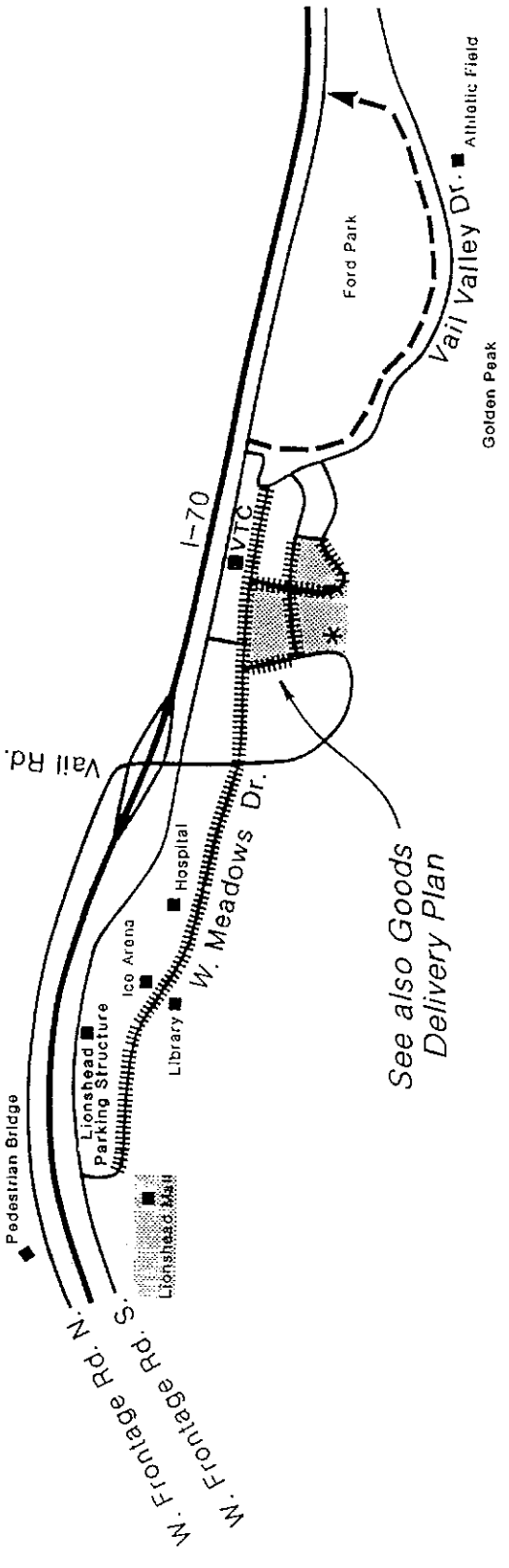


Figure 18
Core Area Concept Plan

Another element of the core area concept plan consists of a potential long-range revision of traffic flow on Vail Valley Drive from the frontage road past Golden Peak and to the Ford Park area. To implement the concept, a new connection is required between Vail Valley Drive and the frontage road including a bridge across Gore Creek at Ford Park and modification of the Athletic Club bridge. Further analysis is required to determine the physical and financial implications of constructing this connection. However, if such a connection should prove to be feasible and politically acceptable, Vail Valley Drive could be converted to one-way traffic flow to the east. The potential advantages of this revised circulation pattern include:

- Roadway widths to accommodate auto traffic could be reduced if traffic flow was in one direction only.

- The width gained from the conversion to one-way traffic flow could be used for an exclusive separated pedestrian/transitway to Golden Peak by eliminating or minimizing the need for acquiring additional right-of-way and improving the efficiency of the In-Town Shuttle along this segment of roadway.

- Beyond Golden Peak, the width gained could be used for a separated bicycle/pedestrian path without the need to acquire additional right-of-way or roadway widening.

- Auto traffic would be directed away from the core area, away from the 4-way stop intersection on Vail Road, and toward the East Vail interchange; all of which are historic Town objectives.

- The existing grade up Vail Valley Drive to the frontage road would no longer be an issue and the non-standard traffic control at this intersection could be corrected.

- Preliminary estimates of volume to capacity ratios indicate that the intersection of Vail Valley Drive and the frontage road would be less than 0.35 and the new intersection created at Ford Park and the frontage road would be less than 0.60; both of which result in excellent traffic operations.

- The Golden Peak turnaround area for the In-Town Shuttle would function more efficiently because buses would have an exclusive drive lane and traffic would not require a turnaround due to its one-way flow.

This concept would require extensive environmental analysis, preliminary engineering analysis, and extensive public review prior to being implemented. However, the concept has sufficient merit to warrant further investigation.

VII. TRAIL SYSTEM INTERFACE

The Town of Vail has adopted a Recreation Trail Master Plan [4] which specifies a broad range of trail types. In addition, the trails plan locates certain trail types along the frontage roads and several Town streets. The trails inventory also identifies problem areas which includes areas that are congested, areas where pedestrian and non-pedestrian uses should be separated, and areas where geometric deficiencies exist. As such, several additional off-street, separated recreation trails were recommended along the Valley and are included in the Implementation Plan as illustrated in Figures 19A, 19B and 19C. These figures are followed by narrative descriptions of eight study links requiring more detailed analysis.

In addition to the 6-foot bike paths along all Frontage Roads, there was strong community support evidenced in the public input process and community surveys for a separated trail from Vail Pass to Dowd Junction. The following areas have been identified as important additions to the Recreation Trail Master Plan in order to ultimately provide a fully separated system.

- Dowd Junction to Intermountain
- Stephen's Park to Donovan Park
- Library to Vail Village
- Golden Peak to Katsos Ranch Trail
- East Vail Interchange to Gore Creek Campground

Meadow Drive and Vail Valley Drive currently exhibit safety problems and are two priority areas requiring improvement. These issues are being addressed in the Streetscape Master Plan currently underway in the Village area.

The planning level construction costs of these additional trails is estimated to be in the range of $2,000,000. The feasibility of implementing these improvements will be evaluated in detail as a part of the Parks and Open Space Master Plan and the Main Vail Trails Feasibility Study.

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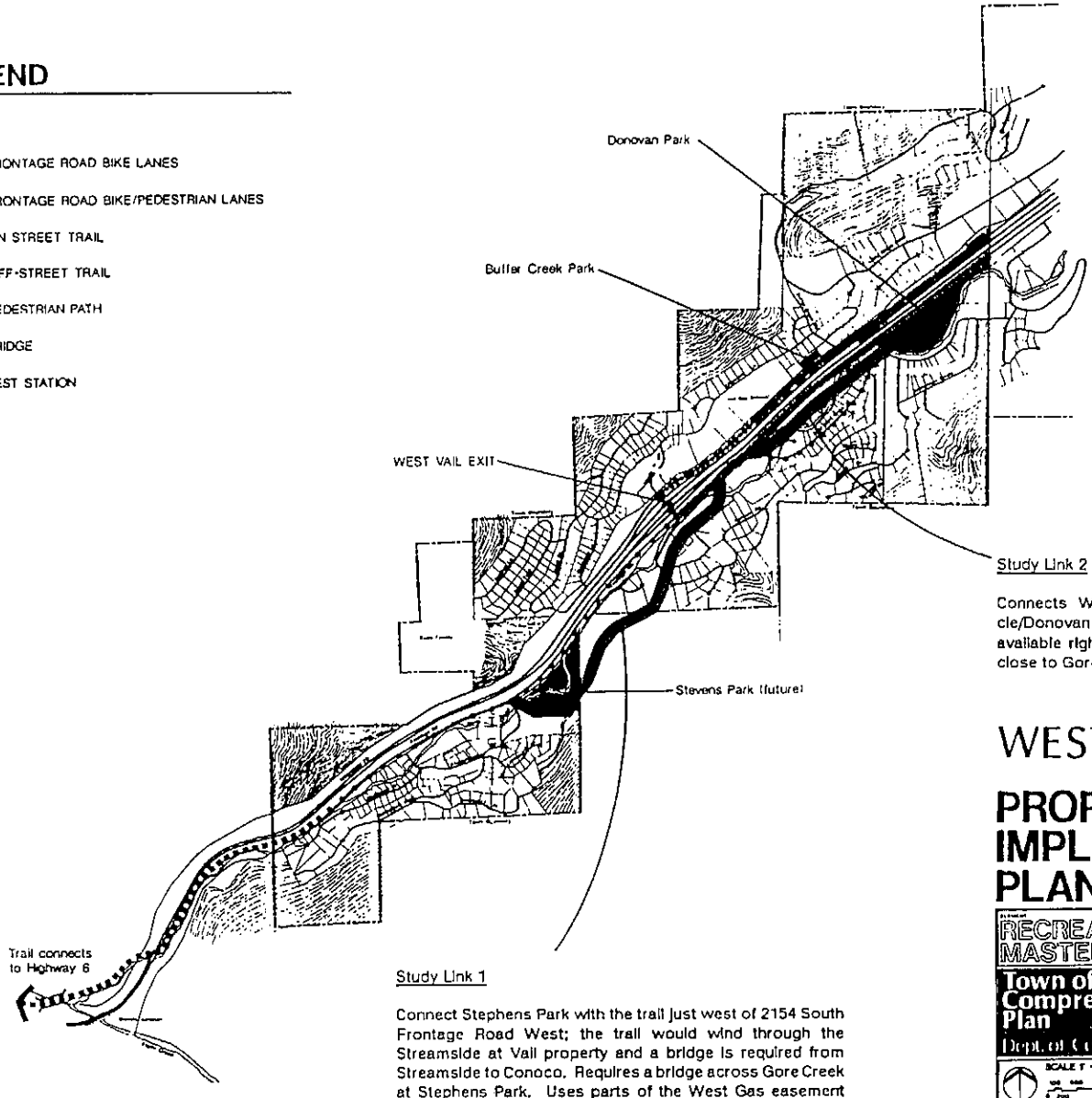
[4] Recreation Trail Master Plan, 1988, Winston Associates.

LEGEND

- FRONTAGE ROAD BIKE LANES
- FRONTAGE ROAD BIKE/PEDESTRIAN LANES
- ON STREET TRAIL
- OFF-STREET TRAIL
- PEDESTRIAN PATH
- BRIDGE
- Ⓡ REST STATION



Study Link 1

Connect Stephens Park with the trail just west of 2154 South Frontage Road West; the trail would wind through the Streamside at Vail property and a bridge is required from Streamside to Conoco. Requires a bridge across Gore Creek at Stephens Park. Uses parts of the West Gas easement over the hill. Easements required from private properties on the east side and permission from the Forest Service. Sensitivity required for surrounding neighborhood and natural environment.

Study Link 2

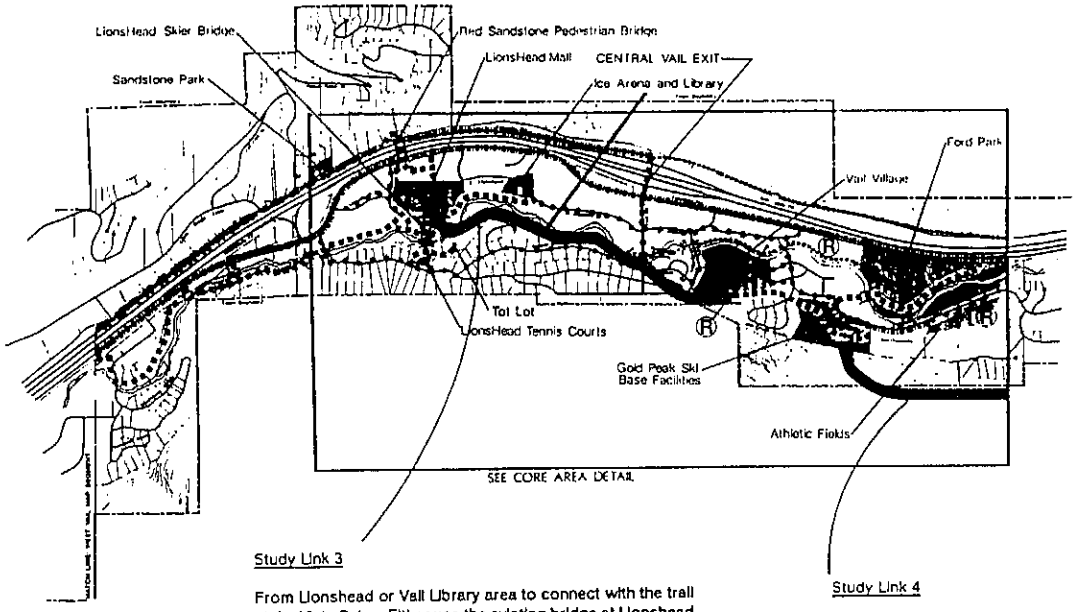
Connects West Gore Creek Circle with Matterhorn Circle/Donovan Park. This trail would be established within available right-of-way and easements. Trail should be as close to Gore Creek as practical.

WEST VAIL

PROPOSED IMPLEMENTATION PLAN

RECREATION TRAILS MASTER PLAN
Town of Vail Comprehensive Plan
Dept. of Community Development
SCALE 1" = 400' DATE: APRIL 1988

Figure 19a



Study Link 3

From Lionshead or Vail Library area to connect with the trail at the Vista Bahn. Either use the existing bridge at Lionshead or provide a new bridge at the Library. Use the stream tract where possible and acquire easements where necessary to proceed from Lionshead to west of the chapel on the south side of the creek. Sensitivity required for the surrounding neighborhoods and natural environment. Trail either connects with Beaver Dam Road or crosses the creek and proceeds to Vail Road. Use Vail Road and the forest access with minor widening to provide the trail connection to the Vista Bahn.

Study Link 4

Major connection between Vail Village and the Katsos Ranch Trail which may need phasing. Trail generally follows the current Vail trail alignment. If phases are needed, it is best to start at the golf course maintenance facility and tie into Katsos. If further phases are determined practical, these would be from the golf course maintenance facility to West Ptarmigan Circle and from West Ptarmigan Circle to Golden Peak. Extensive easements and use of U.S.F.S. lands is required. Sensitivity to the surrounding neighborhood and natural environment is necessary.

LEGEND

- FRONTAGE ROAD BIKE LANES
- FRONTAGE ROAD BIKE/PEDESTRIAN LANES
- ON STREET TRAIL
- OFF STREET TRAIL
- PEDESTRIAN PATH
- BRIDGE
- (R) REST STATION

CENTRAL VAIL

PROPOSED IMPLEMENTATION PLAN

RECREATION TRAILS MASTER PLAN
Town of Vail Comprehensive Plan
Dept. of Community Development
SCALE 1" = 400'
DATE APRIL 1980

Figure 19b

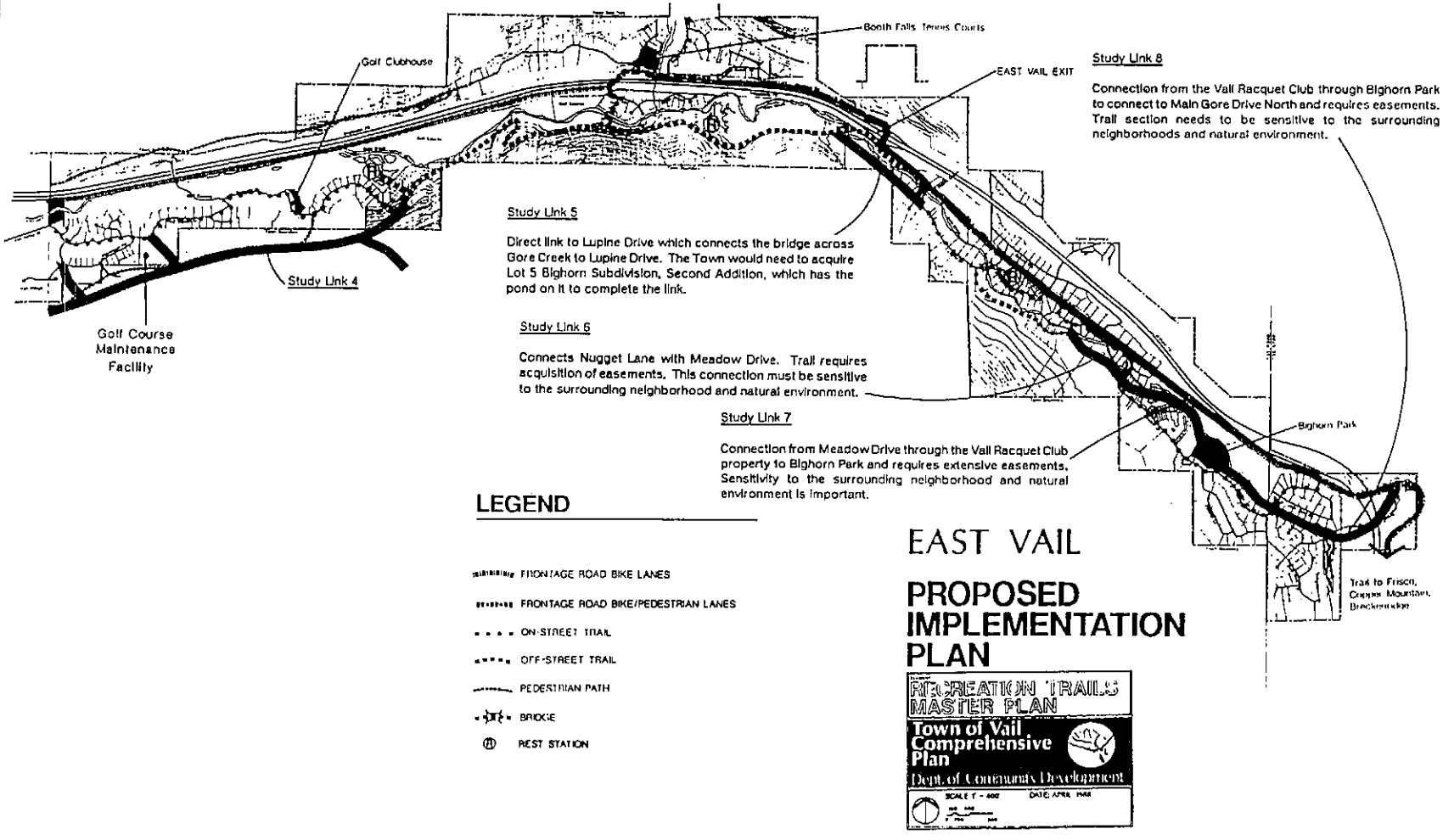

Booth Falls Tennis Courts
Golf Clubhouse
EAST VAIL EXIT
Study Link 8
Connection from the Vail Racquet Club through Bighorn Park to connect to Main Gore Drive North and requires easements. Trail section needs to be sensitive to the surrounding neighborhoods and natural environment.
Study Link 5
Direct link to Lupine Drive which connects the bridge across Gore Creek to Lupine Drive. The Town would need to acquire Lot 5 Bighorn Subdivision, Second Addition, which has the pond on it to complete the link.
Study Link 4
Golf Course Maintenance Facility
Study Link 6
Connects Nugget Lane with Meadow Drive. Trail requires acquisition of easements. This connection must be sensitive to the surrounding neighborhood and natural environment.
Study Link 7
Connection from Meadow Drive through the Vail Racquet Club property to Bighorn Park and requires extensive easements. Sensitivity to the surrounding neighborhood and natural environment is important.
Bighorn Park
Trail to Frisco, Copper Mountain, Breckenridge
LEGEND
FRONTAGE ROAD BIKE LANES
FRONTAGE ROAD BIKE/PEDESTRIAN LANES
ON-STREET TRAIL
OFF-STREET TRAIL
PEDESTRIAN PATH
BRIDGE
REST STATION
EAST VAIL
PROPOSED IMPLEMENTATION PLAN
RECREATION TRAILS MASTER PLAN
Town of Vail Comprehensive Plan
Dept. of Community Development

Figure 19c

CHAPTER VIII. IMPLEMENTATION PROCESS

A long-range plan, by its very nature, is implemented over an extended time-frame sometimes as long as 20 years. During this period it is often found that priorities change, funding capabilities vary, and new ideas are developed. Therefore, the implementation process for the Vail Transportation Plan must, like the plan itself, be flexible and be able to respond to changing conditions and new funding opportunities.

The implementation process typically consists of three elements:

- Prioritization
- Funding Identification
- Actual Project Implementation

PRIORITIZATION

The Vail Transportation Plan documents action/project priorities within each travel mode or topic area including short-term and long-term recommendations. On the other hand, priorities among travel modes (for example, implementing transit improvements before or after pedestrian improvements) is a more subjective process ultimately defined by local elected officials with input from the community. During the course of the study, however, the projects that generated a substantial level of interest and general support for implementation include:

- Removal of truck loading zones on Bridge Street and control of trucks throughout the Village area.

- Implementation of an underpass of I-70 in the Simba Run area.

- Implementation of a consolidated truck loading facility near the Village.

- Continued implementation of the trails and streetscape plans.

- Improvement to the I-70 interchanges including landscaping, safety and capacity improvements, and pedestrian and bicycle considerations.

These recommendations are based upon the planning process outlined in this report. Prior to any actual implementation, a full public input process and detailed design would need to be undertaken for each project.

General plan priorities are listed in Table 16 by travel mode or topic area as detailed in the body of this report.

Table 16
Generalized Plan Priorities

Action/Project	Time Frame in Years 1-5	6-10	11-20	20+
Vail Village Deliveries				
Remove Truck Loading Zones	*			
o Bridge Street				
o Mill Creek/Hanson Ranch Road				
o Gore Creek Drive/Lodge at Vail				
Add Truck Loading Zones	*			
o Gore Creek Drive/Christiania				
o Hanson Ranch Road/Christiania				
o Willow Bridge Road				
Identify and Evaluate Truck Loading Facility/ East Side of Village	*			
Provide Covered Truck Loading Facility/ East Side of Village	*			
Design Centralized Goods/Delivery/Small Vehicle		*		
Identify Truck Loading Facility Location on West Side of Village	*			
Parking				
Modify Rate Structure/Administration (On-Going)	*			
Expand Public Parking Supply/Ford Park and West Day Lot			*	
Select Area for Over-Sized Vehicles	*			
Transit				
Modify Outlying Bus Routes	*	*		
Expand Outlying Bus Service	*	*		
Revise East Shuttle Turnaround	*			
Implement High-Capacity Shuttle Bus System	*			
Evaluate New Transit Technologies for Shuttle Route		*		

Table 16 (Continued)
Generalized Plan Priorities

Action/Project	Time Frame in Years 1-5	6-10	11-20	20+
I-70 Access/Frontage Roads				
Implement I-70 Underpass/Simba Run	*			
Implement West Vail Interchange Improvements	*			
Conduct Ramp Closure Test at Main Vail Interchange	*			
Select Main Vail Interchange Concept		*		
Implement Main Vail Interchange Improvement Plan			*	
Phase and Implement Frontage Road Improvements Per 50-Scale Functional Plans	*	*	*	*
Local Circulation				
Implement Pedestrianization Improvements, LionsHead to Transportation Center	*			
Relocate Check Point Charlie	*			
Evaluate 1-Way Traffic on Vail Village Drive and Implement as Appropriate		*		
Trail System				
Implement Recreation Trails per Recreation Trails Master Plan	*	*	*	*
Implement Streetscape Plan	*	*	*	*

FUNDING

Because most of the plan elements do not have a committed funding source at this point in time, project funding opportunities need to be continuously monitored. Existing funding sources exist for several project areas, however, including the Colorado Department of Transportation and the Federal Highway Administration (I-70 and frontage roads), the Federal Transit Administration (transit) and local revenue sources (local improvement projects).

The total, planning level, capital cost estimates to achieve full implementation of the long-range transportation plan consists of:

o	Vail Village Delivery System	$ 1,700,000
o	Public Parking Facilities	$ 3,000,000
o	Transit In-Town Shuttle	$ 7,500,000
o	I-70 Underpass	$ 2,000,000
o	West Vail Interchange	$ 250,000
o	Main Vail/Booth Falls Interchange	$ 500,000
o	Frontage Road System	$ 5,000,000
o	Recreation Trails	$ 2,000,000
		$21,950,000

These costs represent 1990 dollars and are necessarily approximations of actual future costs. Any land acquisition costs and costs for buffering, landscaping, and aesthetic enhancement are in addition to these basic implementation cost estimates. In addition, the preliminary design process for each project may identify special or unique problems (such as unsuitable soils, unusual drainage requirements, special underground constraints, etc.) which could significantly alter these planning level cost estimates.

This level of capital expenditure over a 20 year time frame, is not an unreasonable long-term investment in Vail's total transportation system. Possible sources of funding will need to be identified and worked out by the Town Council and Town staff to ensure the implementation of the above projects.

CHAPTER IX. PLAN MONITORING AND UPDATING

The Vail Transportation Plan will guide the implementation of the transportation system over the next 20 years. In order to keep the plan a viable document over this time period, continuous monitoring of the transportation system and periodic updating of the plan are needed.

Vail currently maintains extensive data relative to transit system performance and operations at the public parking facilities. These data have proved invaluable in the preparation of the Vail Transportation Master Plan and should continue to be maintained for on-going plan evaluation and modification.

In addition, it is recommended that Vail institute a traffic counting program including the following activities:

- Coverage Counts - Daily traffic volumes should be obtained every two years on the frontage roads and important local streets at the same or similar locations conducted in March 1990. Hourly recording counts should be taken for 48-hours to obtain a daily average and peak hour volumes. To be consistent with historical data, counts should be obtained in December or March.

- Turning Movement Counts - Intersection turning movement counts should also be obtained every two years at the ramp terminals at the three I-70 interchanges and at intersections immediately adjacent to the ramp terminals in West Vail and Main Vail. Other turning movement counts should be obtained periodically with the interval between counts dependent upon volume increases determined from the coverage counts.

- An evaluation of the transportation plan should be conducted annually to document major changes in project priorities or implementation. A formal plan update should be conducted every five years.

In accordance with Section 2.24.060 of the Municipal Code of the Town of Vail, this plan shall be adopted by the Planning and Environmental Commission of the Town of Vail and approved by the Town Council. The Planning and Environmental Commission may adopt additions or amendments to the Plan for approval by the Town Council. Before the adoption of the Plan, or any such amendment or addition, the Planning and Environmental Commission shall hold at least one public hearing, thereon, notice of the time and place of which shall be given by one publication in a newspaper of general circulation in the Town of Vail no later than seven days prior to the date set for the public hearing. The adoption of the Plan shall be by motion of the Planning and Environmental Commission recommending approval of the Plan by the Town Council. Approval of the Plan or any amendment or adoption thereto shall be by a resolution of the Town Council at a regular or special public meeting.

APPENDIX A

CITIZEN SURVEYS 1990 AND 1991

1990 CITIZEN SURVEY

Question 1: What specific actions would you suggest to improve cycling and bicycle facilities in Vail?

		TOTAL RESPONSES
1.	Valley-wide bike path. Vail Pass-Dowd Junction-Avon-Edwards	123
2.	Separate path for bicycles from the roads and pedestrians.	60
3.	Additional bike paths, extend present ones.	58
4.	Clear, separate signs and markings for bicycles only, i.e. "caution" signs at new Post office, at intersections, etc.	45
5.	Widen bike paths.	42
6.	Enforce bicycle riders to use provided paths and obey rule and regulations, i.e. warning bells for pedestrians.	40
7.	Improve bike path maintenance, sweep bike paths more frequently; keep clean! (Maintain Vail Pass bike path.)	38
8.	Additional bike racks, with locks, in designated areas.	29
9.	Increase awareness of the rules and regulations of bicycle riding in the Valley, possibly by posting these rules/maps on paths.	24
10.	Complete all existing bike paths.	23
11.	Restrict/eliminate biking in high people concentrated areas, i.e. the Village.	14
12.	Bike Path to Minturn.	12
13.	Create a bicycle guide for guests and locals.	10
14.	Don't discourage veteran riders from riding on highways and frontage road/restrict speed in certain areas/separate novice riders from expert riders.	10
15.	Keep bikes off frontage roads.	9
16.	Bike path through Vail Village - Lionshead.	9
17.	Vail Village to golf course bike path.	9
18.	Intermountain to Town bike path.	8
19.	Need a protected bike lane, in general and along frontage roads - parking structure to East Vail.	7
20.	Additional trash cans, additional rest rooms, water fountains.	5
21.	Keep bicycles off I-70.	4

		TOTAL RESPONSES
22.	Create Town bypass from Golden Peak to south side of Lodge Tower.	3
23.	Repair potholes	2
24.	Provide emergency phones on bike paths.	2
25.	Town bike paths are vital; but don't overdo wilderness paths.	1
26.	Straighten curves at golf course.	1
27.	Require all bikes to be licensed; this may help finance bike paths.	1
28.	Require all bikes to be licensed; this may help finance bike paths.	1

Question 2: **What specific actions would you suggest to improve walking and pedestrian facilities in Vail?**

		TOTAL RESPONSES
1.	Walking paths along: a. Vail Village to Lionshead (i.e. VV Medical to Village) b. Gore Creek Drive c. Streamwalk d. Meadow Drive e. Vail Village to Golf Course f. To East Vail and Along East Vail g. Frontage Roads h. Ford Park to Lionshead i. Throughout West Vail	121
2.	Separate pedestrians from bike path.	62
3.	Restrict traffic from all pedestrian areas.	20
4.	Additional pedestrian paths, in wilderness areas as well.	17
5.	Additional lighting along pedestrian paths for safety purposes (i.e. Gore Creek Path).	17
6.	Another pedestrian/bike overpass across I-70 (i.e. near Post Office).	16
7.	Additional landscaping along pedestrian paths, including art works as well as flowers.	14
8.	Limit cars (i.e. Vail Village).	13
9.	Vail Village "Pedestrians Only".	12
10.	Keep delivery trucks out, limit time they are in the congested areas.	12
11.	Leave pedestrian paths as they are, excellent!	10
12.	Additional benches throughout Town.	9
13.	Reduce biking speed on pedestrian paths.	9
14.	Additional accurate pedestrian/bike signage.	8
15.	Reduce/limit auto speed where there is heavy pedestrian traffic.	8
16.	Eliminate bikers/skateboarders from Vail Village.	8
17.	Provide biking/pedestrian maps of the Vail Valley.	4
18.	Heat walking paths or improve snow removal.	4
19.	Fix potholes/widen streets.	4
20.	Enlarge the covered bridge.	3
21.	Improve access to Ford Park form Golden Peak	3

		TOTAL RESPONSES
22.	No creek walkway.	3
23.	Eliminate horses in the Village area.	2
24.	Enforce pedestrian right-of-way.	2
25.	Additional rest rooms along pedestrian paths.	1
26.	Pick-up trash several times a day.	1
27.	Label that West Meadow Drive is a dead-end street.	1
28.	Enforced animal leash laws.	1
29.	Pedestrian path bridge next to skier's bridge in Lionshead.	1
30.	Path from Buffer Creek Road to the Valley.	1
31.	Patrolling of secluded areas.	1

Question 3: **What specific actions would you suggest to improve bus service and transit facilities in Vail?**

		TOTAL RESPONSES
1.	Summer schedule should include a frequent East and West Vail bus service.	112
2.	Additional buses during peak hours.	57
3.	Need a long-term monorail with buses providing a fill-in service.	32
4.	Increase service during the off-season compared to the present hours of service.	30
5.	Shuttle buses should be on time.	29
6.	Late night bus service.	23
7.	Expand bus service down Valley.	22
8.	Need a U-turn for the buses on the West Vail route.	20
9.	Improve bus service to and from golf course in summer.	20
10.	Use vans for off-season and remote areas.	13
11.	Better training of drivers (some are rude).	10
12.	Increase bus service to the Sandstone areas.	8
13.	Increase stops at the following locations: a. Closer to the Slopes b. Soccer Field c. Closer to the Hospital d. ABC School	7
14.	Pay bus drivers more money.	6
15.	Purchase a non-pollutant bus/natural gas.	5
16.	Need additional shelters for bus stops.	5
17.	Charge a fee for the late night and overlying bus service.	4
18.	Improve service to Ford Park parking lot.	4
19.	Improve bus spacing so they do not get bunched up.	3
20.	Increase publicity on the scheduled bus service.	3
21.	No people mover system.	2
22.	Better signage on the front of buses informing guests of destinations.	2
23.	Eliminate music on buses.	2
24.	Increase charges for parking, so hopefully more people will take the bus.	2

		TOTAL RESPONSES
25.	Need to slow down the buses/drive too fast.	2
26.	Continue West Vail South route to the end of Bellflower Road.	1
27.	Encourage people to walk.	1
28.	Additional direct service to and from Core areas.	1
29.	Frequently announce bus stops.	1
30.	Need larger buses.	1
31.	Bus stops which do not interfere with private residences.	1
32.	Work closer with van shuttle companies.	1
33.	Increase attention to the elderly and disabled.	1
34.	East Vail buses should stop at Lionshead.	1
35.	Need outlying service which runs once per hour.	1

Question 4: What specific actions would you suggest to improve parking conditions in Vail?

		TOTAL RESPONSES
1.	Continue the free outlying parking.	153
2.	Build an additional parking structure.	95
3.	Increase bus service.	78
4.	Develop frontage road shoulders to accommodate additional parking.	37
5.	Additional underground parking.	26
6.	Provide discounts for locals parking in the structure.	15
7.	Eliminate in-town parking.	13
8.	Increase parking structure rates.	12
9.	Improve ground transportation from Vail to Denver.	11
10.	Reserve space in the structure for cars which are there for minimum of 2 hours.	11
11.	Limit ski ticket sales.	7
12.	Suggest to Vail Associates to build an underground parking structure to Golden Peak.	7
13.	Discounts for car pooling.	5
14.	Utilize the RV lot for cars.	4
15.	Buses which run closer to the lifts.	2
16.	Monthly/seasonal parking passes.	2
17.	Restrict parking, encourage people to walk or ride bikes.	2

Question 5: What specific actions would you suggest to improve traffic conditions along I-70 and north and south frontage roads?

		TOTAL RESPONSES
1.	Install some traffic lights.	64
2.	Control speeding.	45
3.	Increase the number of traffic control persons.	32
4.	Plant additional trees to buffer the highway noise.	30
5.	Include a bike path or walk path on frontage roads.	24
6.	Build I-70 interchange at Lionshead.	23
7.	Widen the frontage roads to allow for additional parking.	23
8.	Clearly marked turning lanes.	16
9.	Need an interchange at the following locations; a. Post Office b. Golf Course c. Ford Park	13
10.	Raise the speed limit.	10
11.	No parking.	10
12.	Place additional road reflectors around Town.	9
13.	Increase signage throughout Town.	9
14.	Decrease the speed limit throughout Town.	8
15.	Same speed on the frontage roads.	5
16.	Need to restripe lines throughout Town.	5
17.	Lower speed limit on I-70 to 55 MPH.	5
18.	Utilize more one-way streets.	3
19.	Need crosswalks connecting the frontage roads.	3
20.	Increase the sanding in the winter months.	3
21.	Remove stop sign at Blue Cow Chute.	3
22.	Need guard rails along the river.	2
23.	Put I-70 underground?	2
24.	Remove the four-way stop.	1
25.	Increase bus service.	1
26.	Fill potholes	1

		TOTAL RESPONSES
27.	Need signs which say "Icy Road".	1
28.	Maps at all I-70 exits.	1
29.	Widen underpasses.	1

Question 6: What specific actions would you suggest to improve traffic, circulation, and access on Vail's local streets?

		TOTAL RESPONSES
1.	Restrict cars from Vail.	48
2.	Utilize traffic lights.	44
3.	Limit cars in Vail.	30
4.	Increase signage.	25
5.	Restructure the truck deliveries in Town.	24
6.	Increase traffic control persons.	23
7.	Continue the TOV bus system.	19
8.	Enforce speed limits	17
9.	Increase the sidewalks throughout Town.	14
10.	Additional exits off I-70.	12
11.	Increase 15 minute parking spaces.	6
12.	No street lights.	6
13.	Monorail	6
14.	Widen streets.	5
15.	Increase lighting throughout Town.	5
16.	Restripe lanes throughout Town.	4
17.	Additional parking.	4
18.	Interchange closer to hospital.	4
19.	Free parking during summer months.	3
20.	Buffer noise.	3
21.	Restrict parking along frontage roads.	3
22.	Improve street conditions.	3
23.	Additional host/hostess to direct guests.	3
24.	Down Valley bus service.	2
25.	Tunnel interstate.	2
26.	Build 3-lane frontage road.	2
27.	Limit parking.	2
28.	One-way streets.	2

		TOTAL RESPONSES
29.	Additional through-streets.	2
30.	Skier drop-offs should be located closer to Vista Bahn.	2
31.	Allow van drivers to enter Vail Village from all points.	1
32.	Need another East Vail exit.	1
33.	Raise speed limits.	1
34.	Restrict roller skates/skateboards from Core area.	1
35.	Restrict large housing projects.	1
36.	Improve the drop-off facilities.	1
37.	Satellite parking	1
38.	Need "Dead End" sign at Potato Patch.	1
39.	Hotel owners should notify guests of traffic problems.	1
40.	Add speed bumps.	1
41.	Permit stickers.	1

1991 CITIZENS SURVEY

Relative Importance of Transportation Plan Recommendations

Rank	Recommendation	Relative Score on a Scale of 1 to 5
1	Completion of an off-street recreation path from East Vail to Dowd Junction. a. Intermountain to Dowd Junction recreation path. b. Stephen's Park to Donovan Park recreation path. c. East Vail interchange to Gore Creek Campground recreation path. d. Golden Peak to Katsos Ranch recreation path.	4.03
2	Improve the West Vail interchange to provide for better traffic maneuverability.	3.81
3	Provide six foot paved shoulders along both sides of each frontage road for bicycles.	3.72
4	Eliminate truck parking on Bridge Street.	3.39
5	Restructure the West Vail routes to provide cross circulation between the north and south sides of I-70.	3.34
6	Provide a vehicular/pedestrian underpass connecting the north and south frontage roads just west of Simba Run.	3.25
7	Eliminate truck parking on Gore Creek Drive from Checkpoint Charlie to Mill Creek.	3.17
8	Provide turn lanes on the frontage roads for left and right turning vehicles along key roadway stretches and intersections. Where left turn lanes are not required, the center area would be landscaped.	2.89
9	In the long term acquire Vail Associates' West Day Lot for a small two-story parking structure.	2.87
10	Preserve the east end of Ford Park for a small two-story parking structure, not higher than the existing lot.	2.86
11	Develop another underground central loading lot, located south of the Lodge at Vail, to eliminate all on-street parking in the West Vail Village area.	2.72
12	Develop a centralized loading area beneath the Christiania parking lot to eliminate all on-street parking in the East Vail Village area. The centralized loading area may or may not provide storage units for individual businesses.	2.71
13	Provide parking spaces for delivery trucks over Mill Creek between Cyranos and the Christiania to eliminate parking on Hanson Ranch Road.	2.64

Rank	Recommendation	Relative Score on a Scale of 1 to 5
14	Convert all 15 minute parking areas in Vail to truck loading zones.	2.57
15	Provide new on and off ramps for eastbound I-70 near the Vail Associates shops.	2.56
16	Acquire a new bus fleet for the In-Town Shuttle to increase efficiency. New buses would have lower floors, wider doors, and the possibility of allowing the passenger to carry skis on board if it can be done safely.	2.39
17	Provide new on and off ramps for eastbound traffic at the Booth Falls underpass near Aspen Lane.	2.33
18	Modify I-70 access by closing the westbound off-ramp and eastbound on-ramp during peak periods at the Main Vail interchange (December-March), allowing vehicles from Denver to use the East Vail exit exclusively.	1.83

APPENDIX B

EXISTING AND FUTURE PEAK HOUR LINK TRAFFIC VOLUMES

FELSBURG
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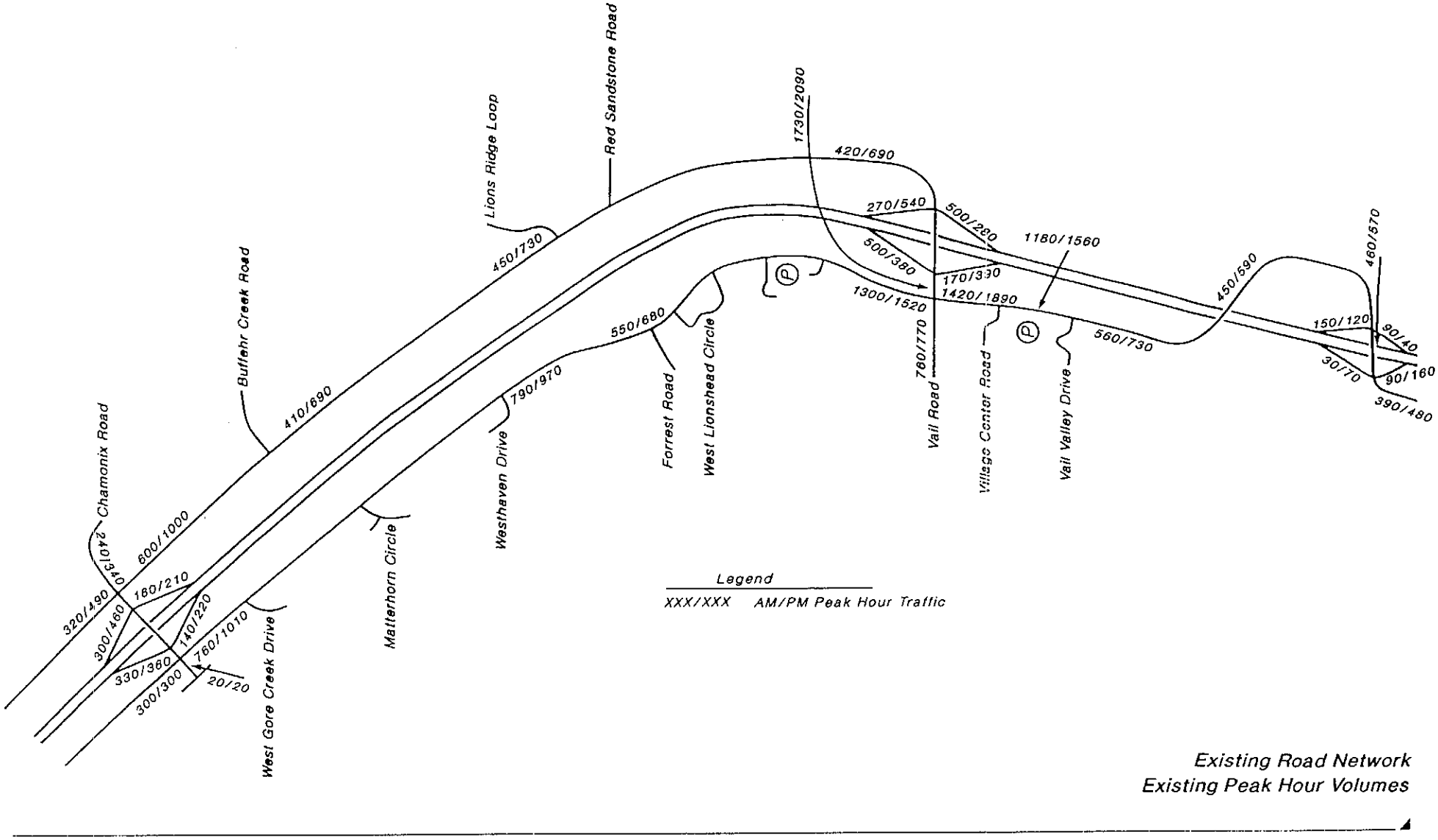
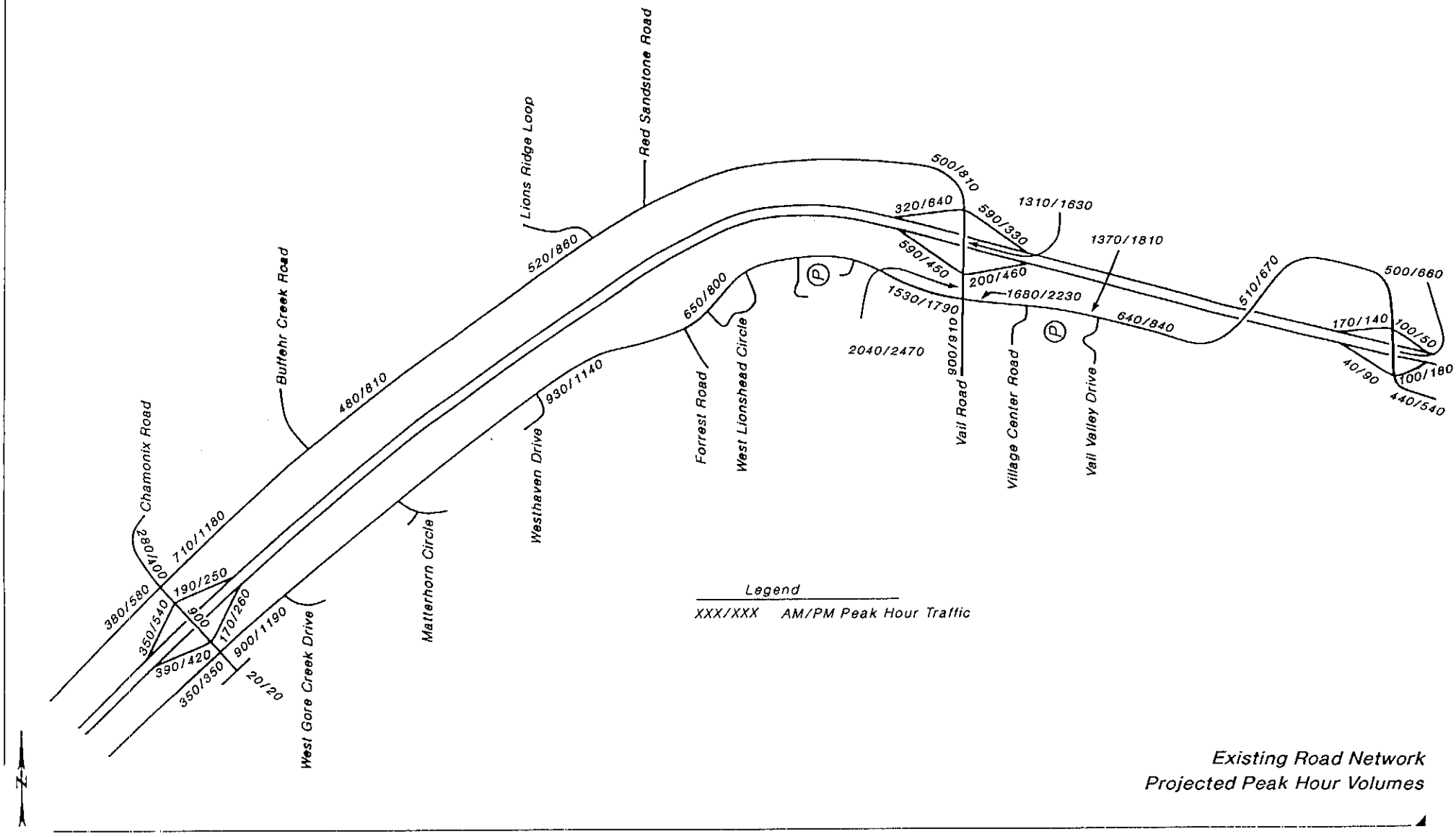
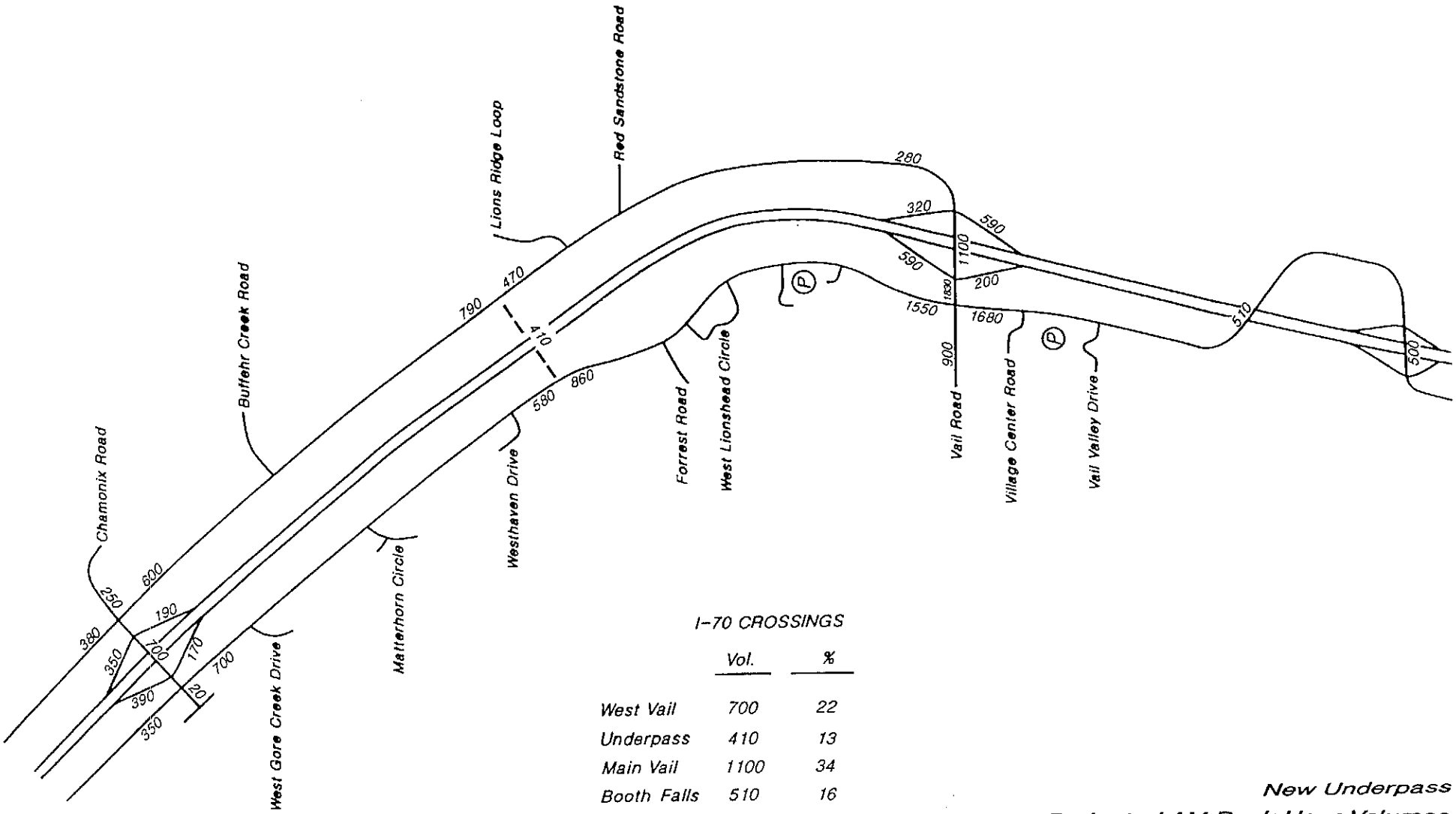


Existing Road Network
Existing Peak Hour Volumes

FELSBURG
HOLT &
ULLEVIG



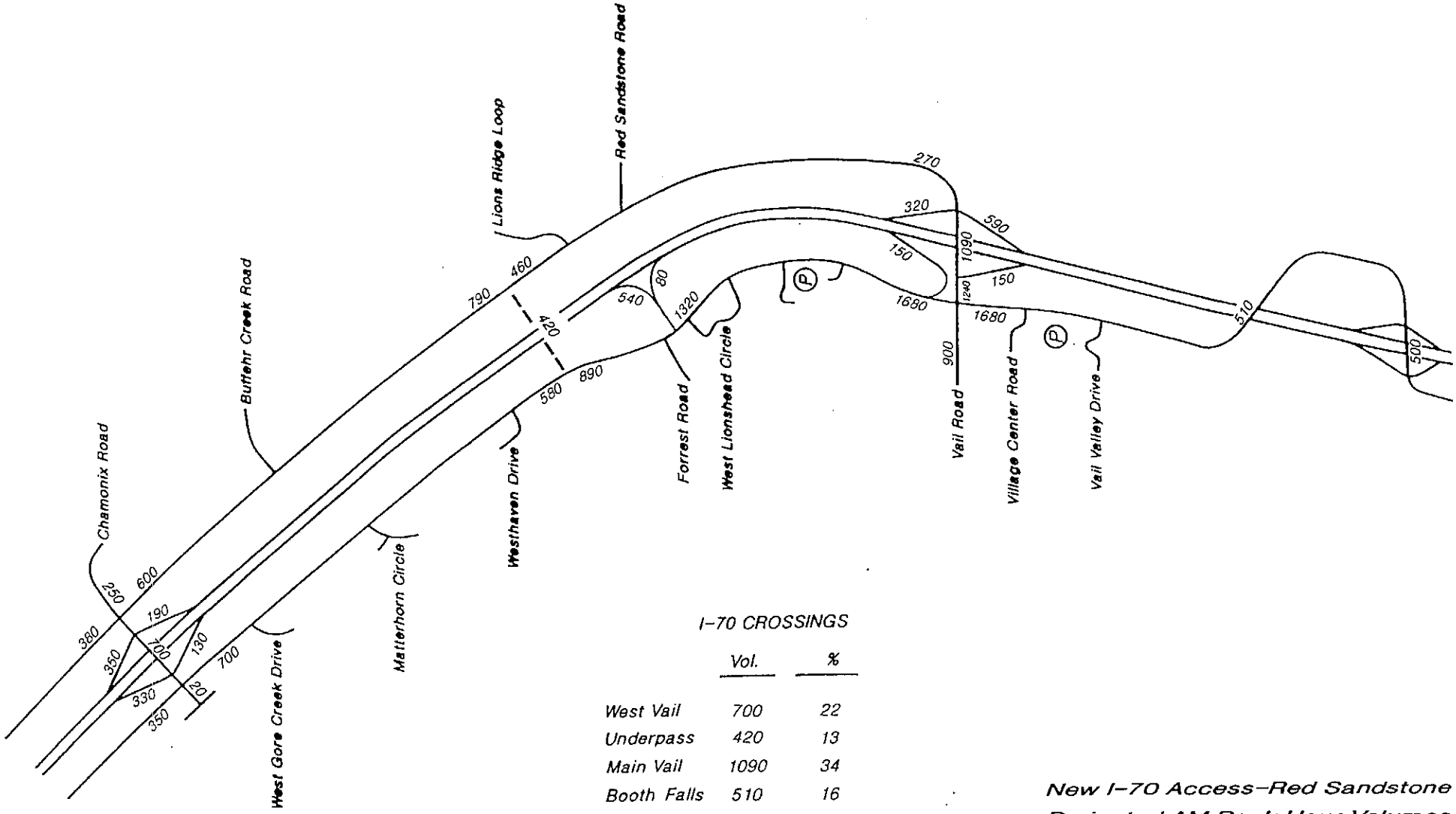
Existing Road Network
Projected Peak Hour Volumes



I-70 CROSSINGS

	Vol.	%
West Vail	700	22
Underpass	410	13
Main Vail	1100	34
Booth Falls	510	16
East Vail	500	15
	3220	100

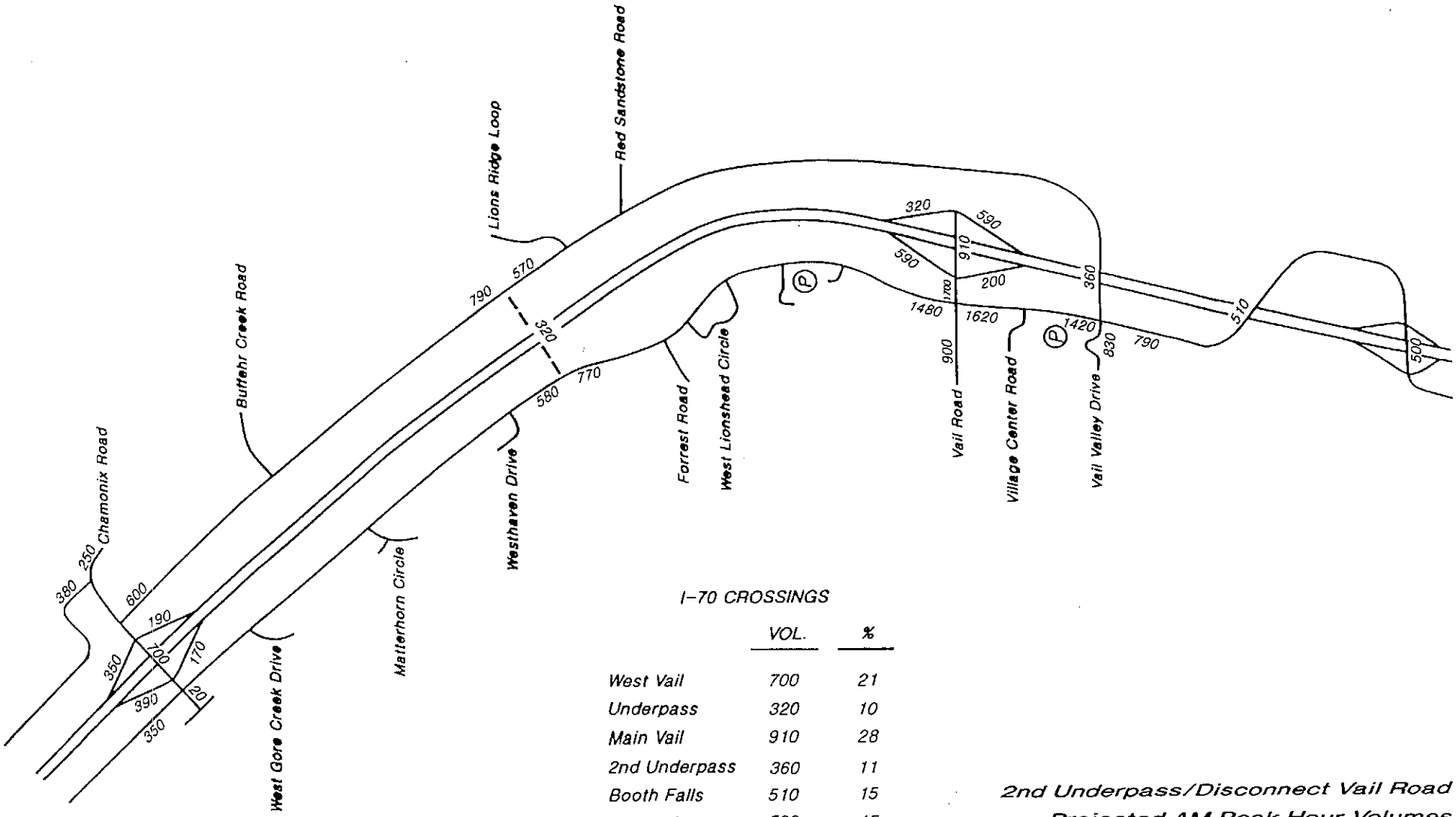
New Underpass
Projected AM Peak Hour Volumes



I–70 CROSSINGS

	Vol.	%
West Vail	700	22
Underpass	420	13
Main Vail	1090	34
Booth Falls	510	16
East Vail	500	15
	3220	100

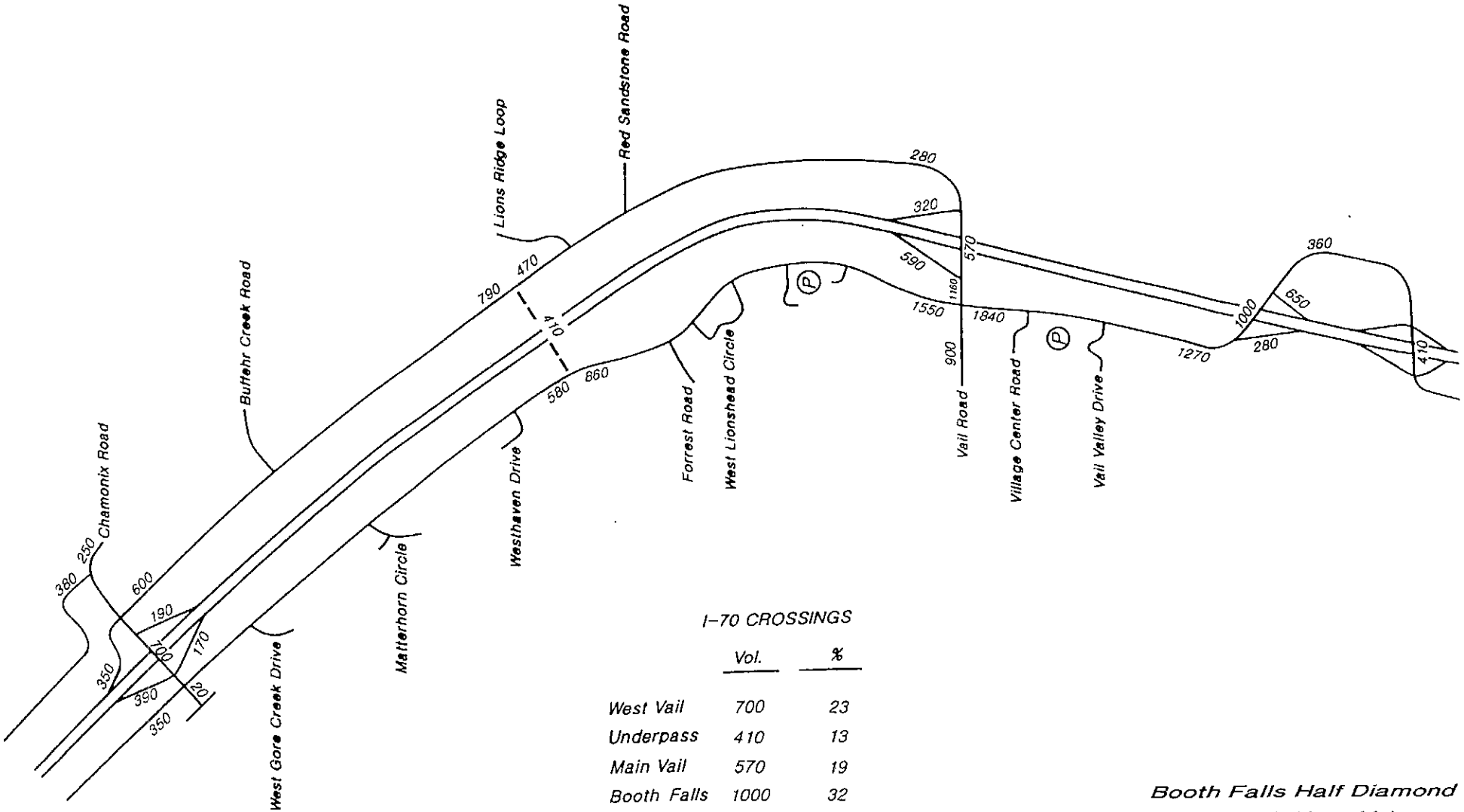
New I–70 Access–Red Sandstone
Projected AM Peak Hour Volumes



I–70 CROSSINGS

	VOL.	%
West Vail	700	21
Underpass	320	10
Main Vail	910	28
2nd Underpass	360	11
Booth Falls	510	15
East Vail	500	15
	3300	100

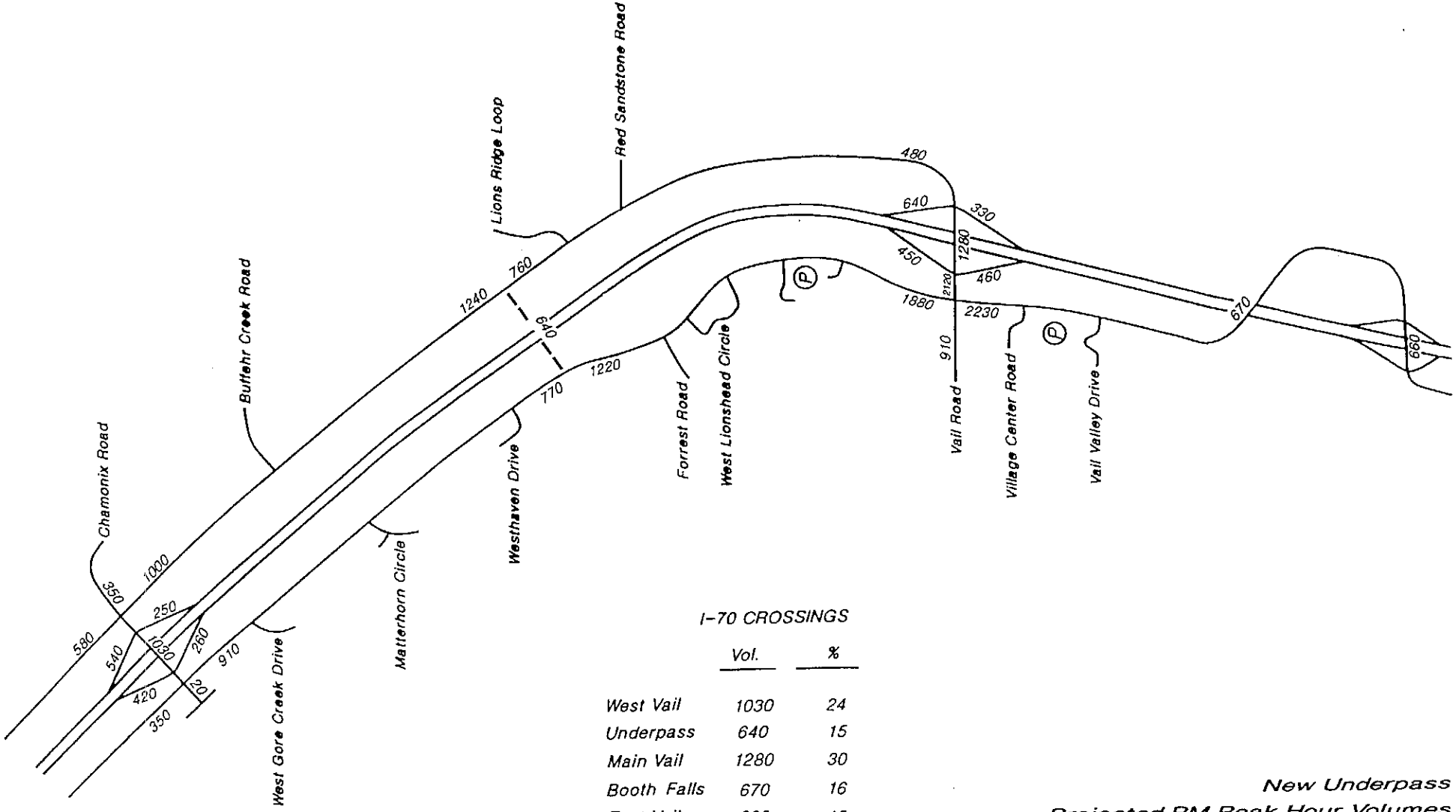
2nd Underpass/Disconnect Vail Road
Projected AM Peak Hour Volumes



I–70 CROSSINGS

	Vol.	%
West Vail	700	23
Underpass	410	13
Main Vail	570	19
Booth Falls	1000	32
East Vail	410	13
	3090	100

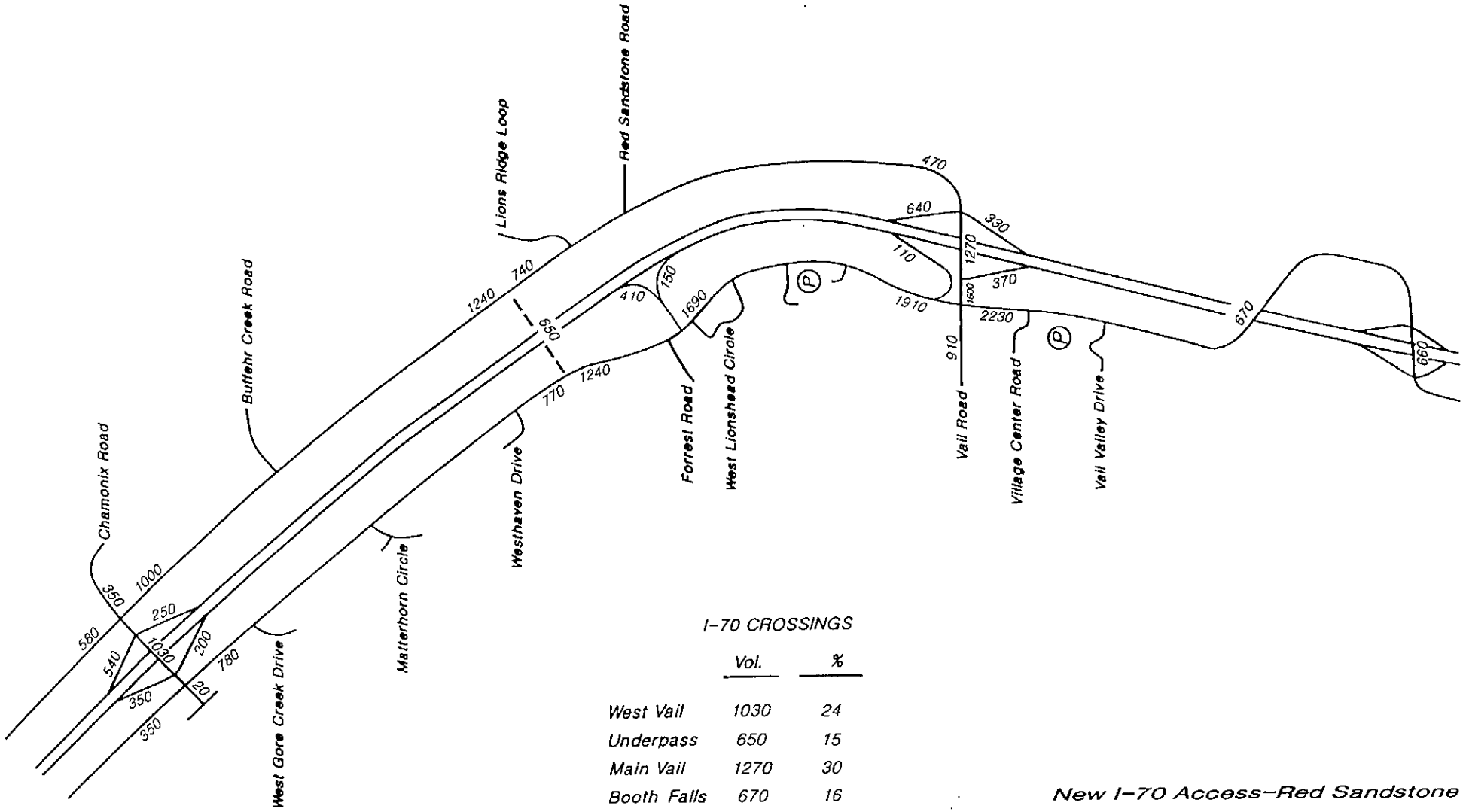
Booth Falls Half Diamond
Projected AM Peak Hour Volumes



I-70 CROSSINGS

	Vol.	%
West Vail	1030	24
Underpass	640	15
Main Vail	1280	30
Booth Falls	670	16
East Vail	660	15
	4280	100

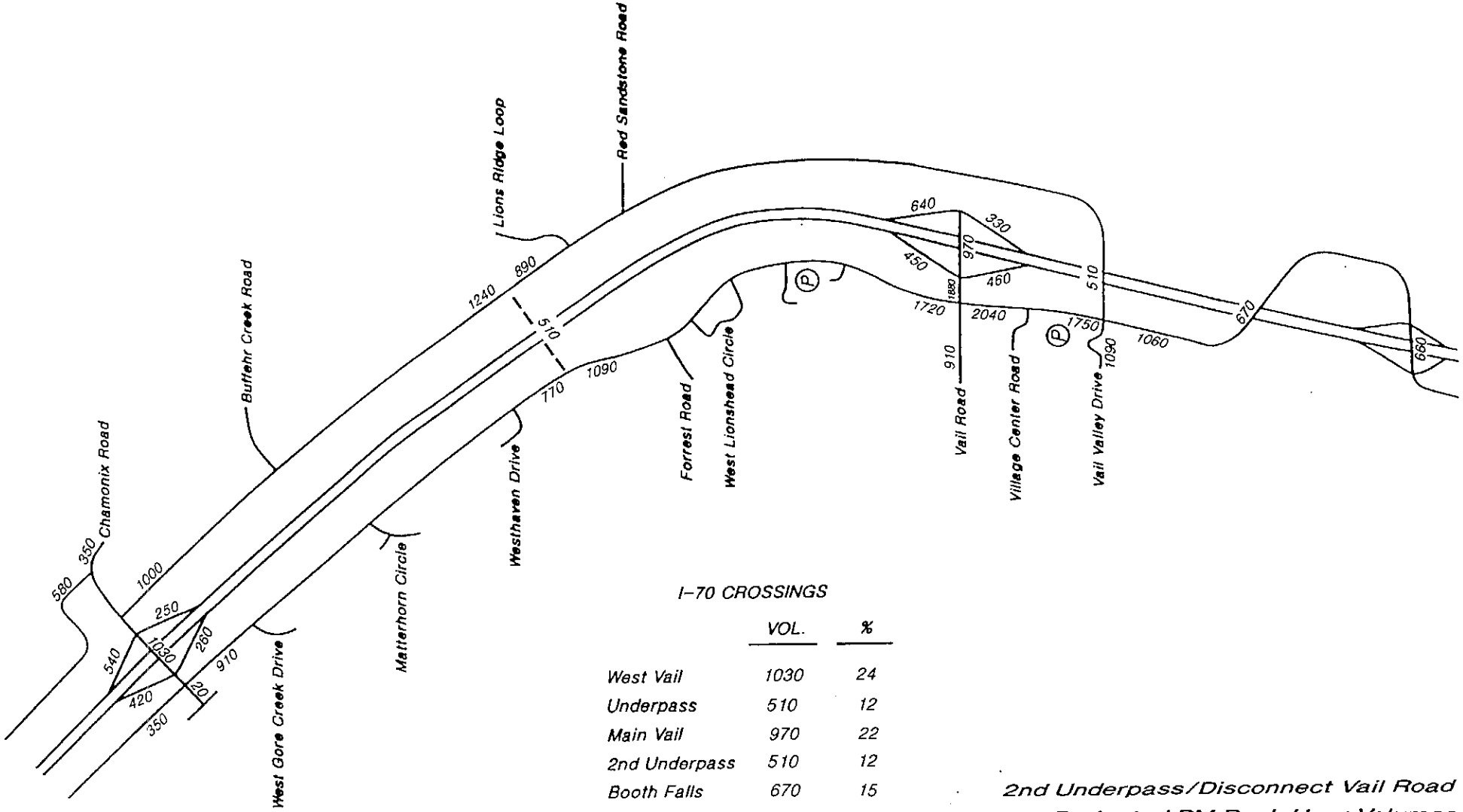
New Underpass
Projected PM Peak Hour Volumes



I–70 CROSSINGS

	Vol.	%
West Vail	1030	24
Underpass	650	15
Main Vail	1270	30
Booth Falls	670	16
East Vail	660	15
	4280	100

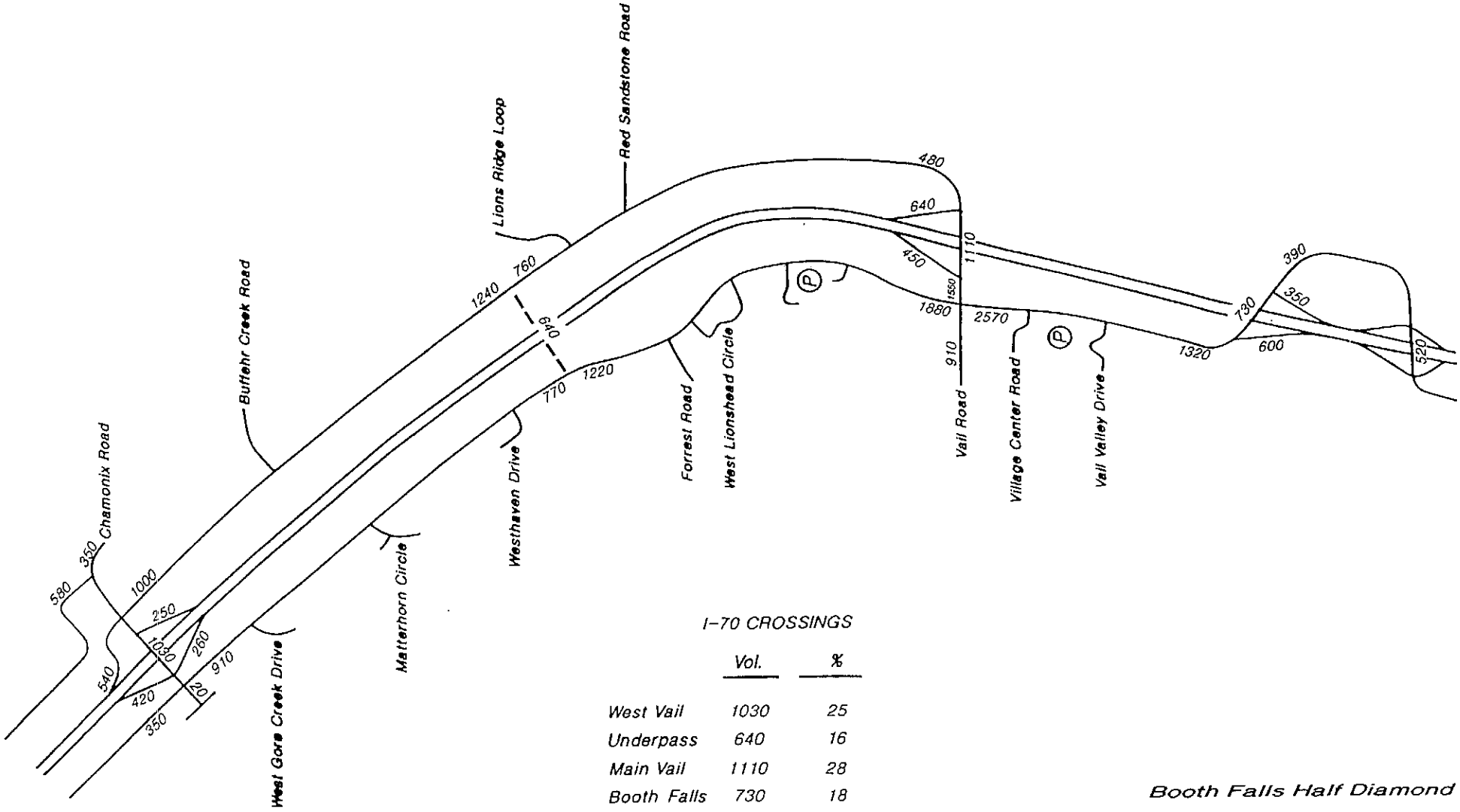
New I–70 Access–Red Sandstone
Projected PM Peak Hour Volumes



I–70 CROSSINGS

	VOL.	%
West Vail	1030	24
Underpass	510	12
Main Vail	970	22
2nd Underpass	510	12
Booth Falls	670	15
East Vail	660	15
	4350	100

2nd Underpass/Disconnect Vail Road
Projected PM Peak Hour Volumes



I–70 CROSSINGS

	Vol.	%
West Vail	1030	25
Underpass	640	16
Main Vail	1110	28
Booth Falls	730	18
East Vail	520	13
	4030	100

Booth Falls Half Diamond
Projected PM Peak Hour Volumes

APPENDIX C

EXISTING PEAK HOUR TURNING MOVEMENT COUNTS

FELSBURG
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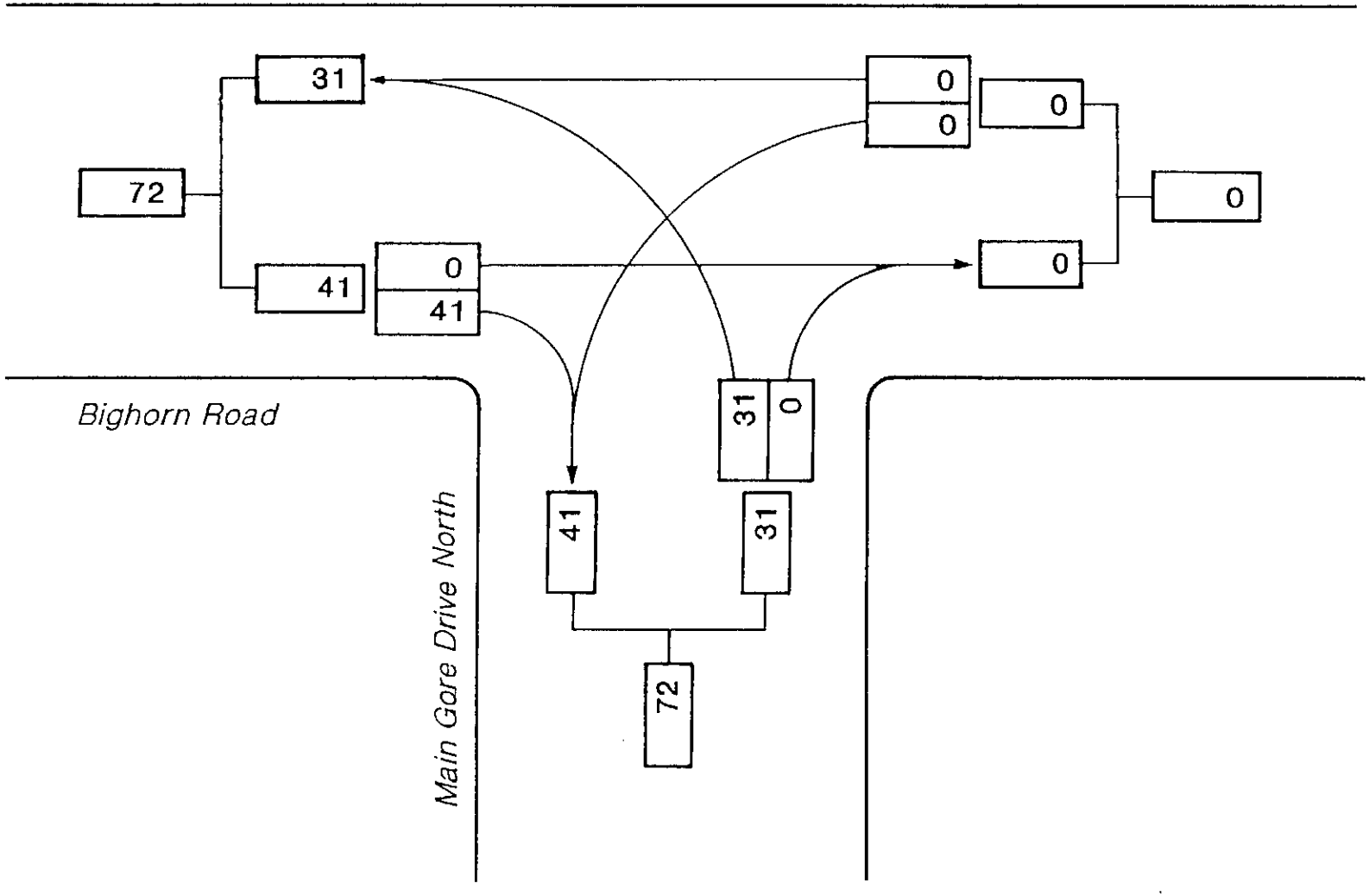

Figure 1
P.M. Peak Hour TMC
March 1990

FELSBURG
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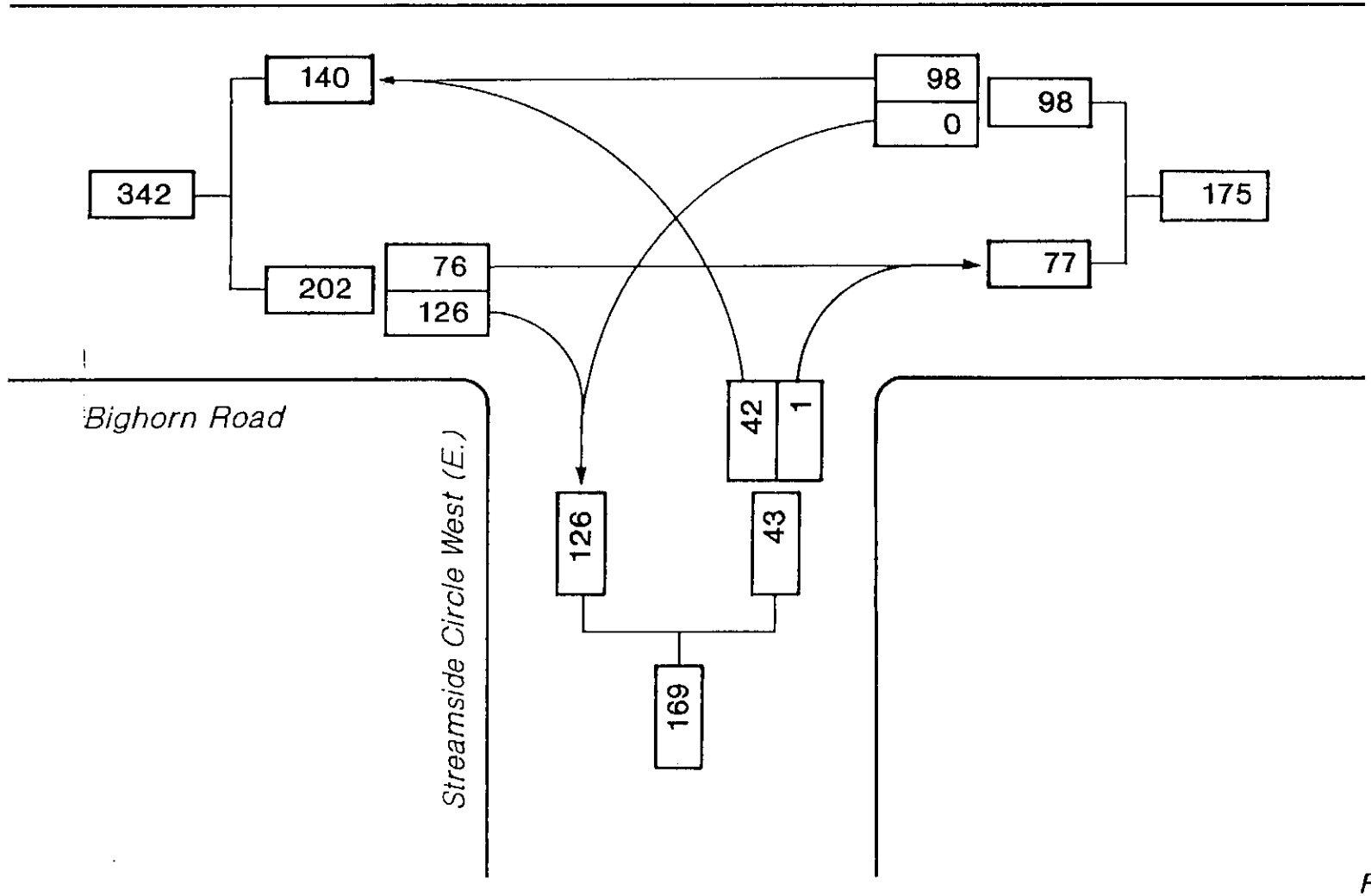

Figure 2

P.M. Peak Hour TMC

March 1990

FELSBURG
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ULLEVIG

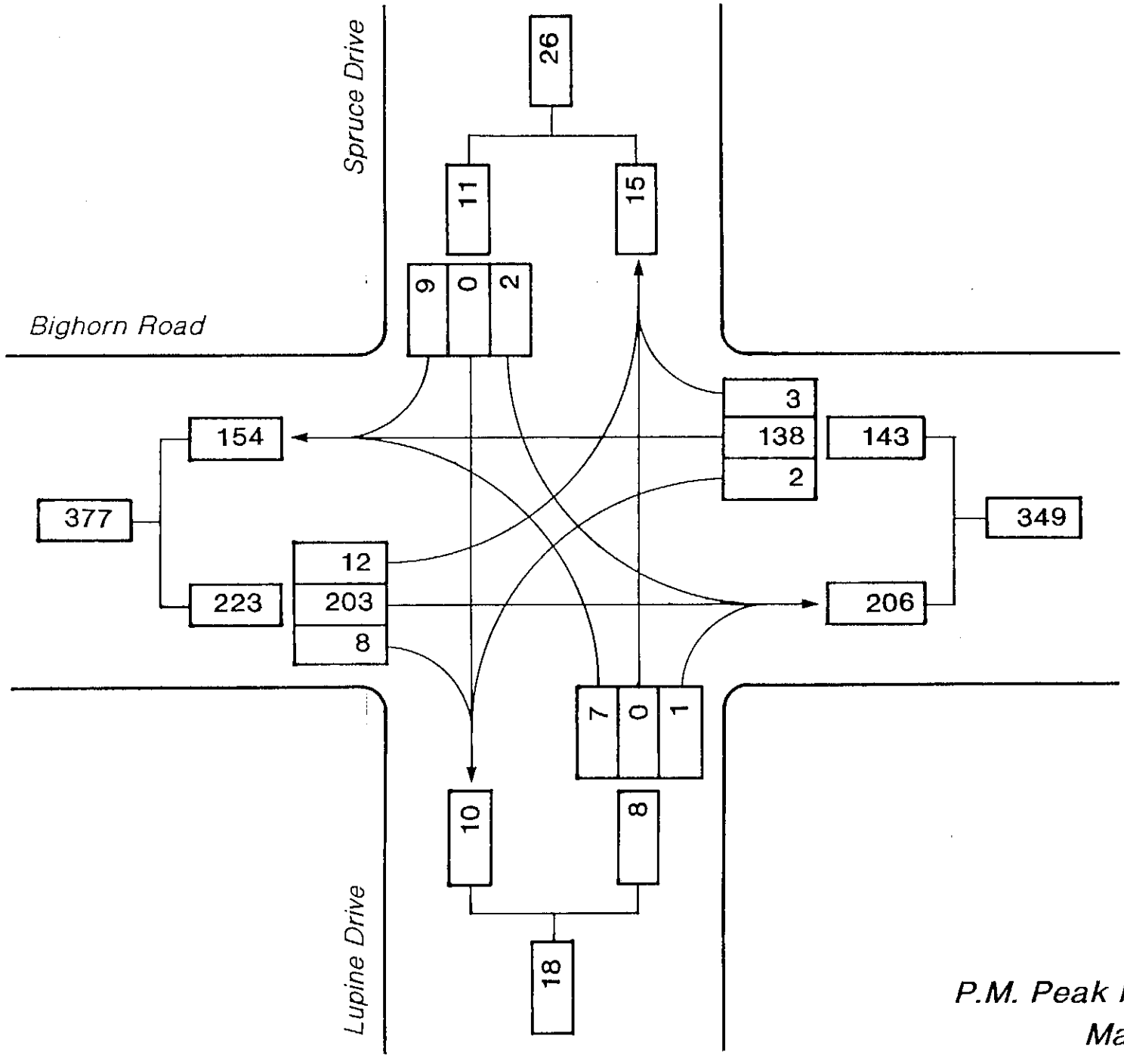

Figure 3
P.M. Peak Hour TMC
March 1990

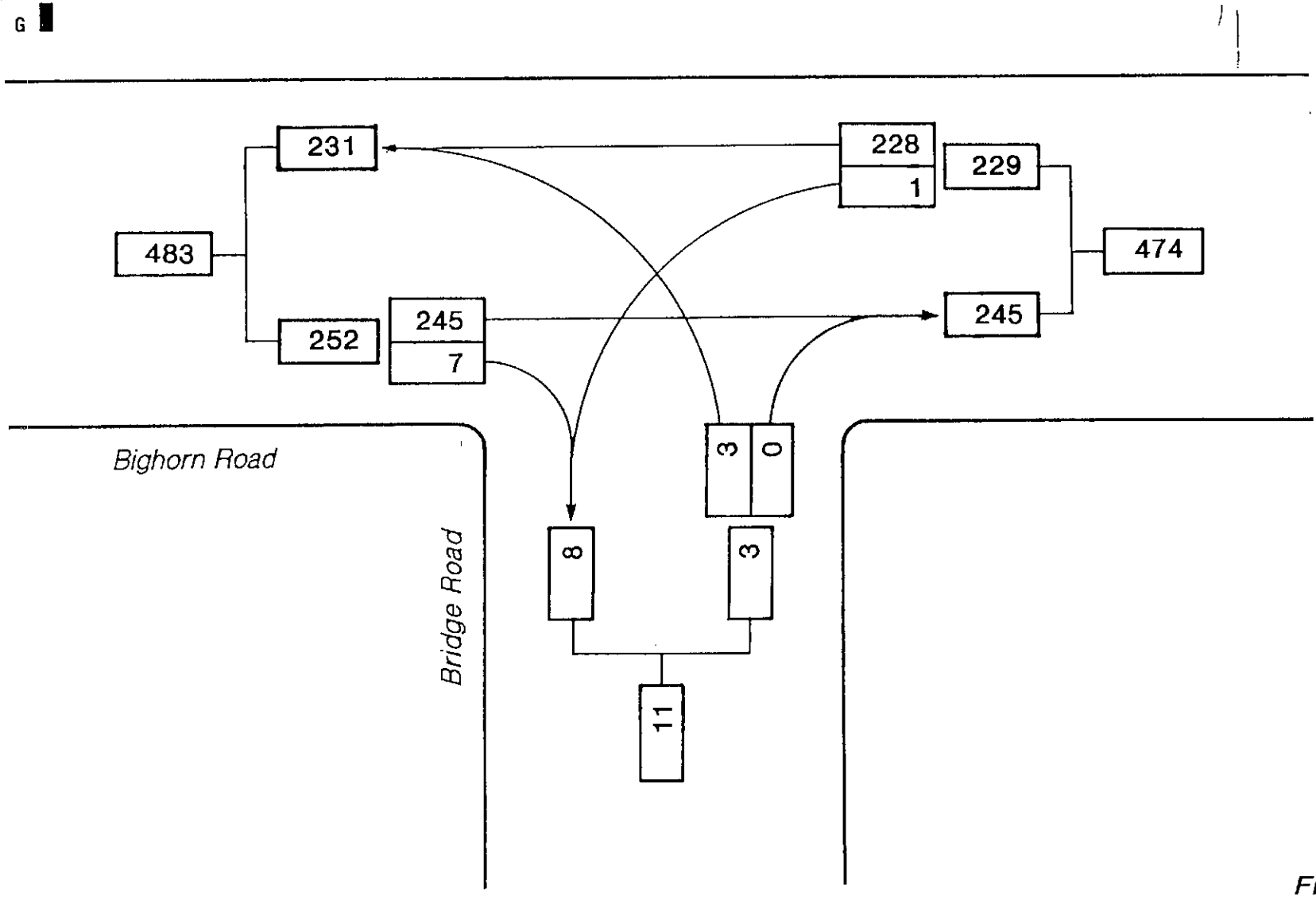

Figure 4

P.M. Peak Hour TMC

March 1990

FELSBURG
HOLT &
ULLEVIG

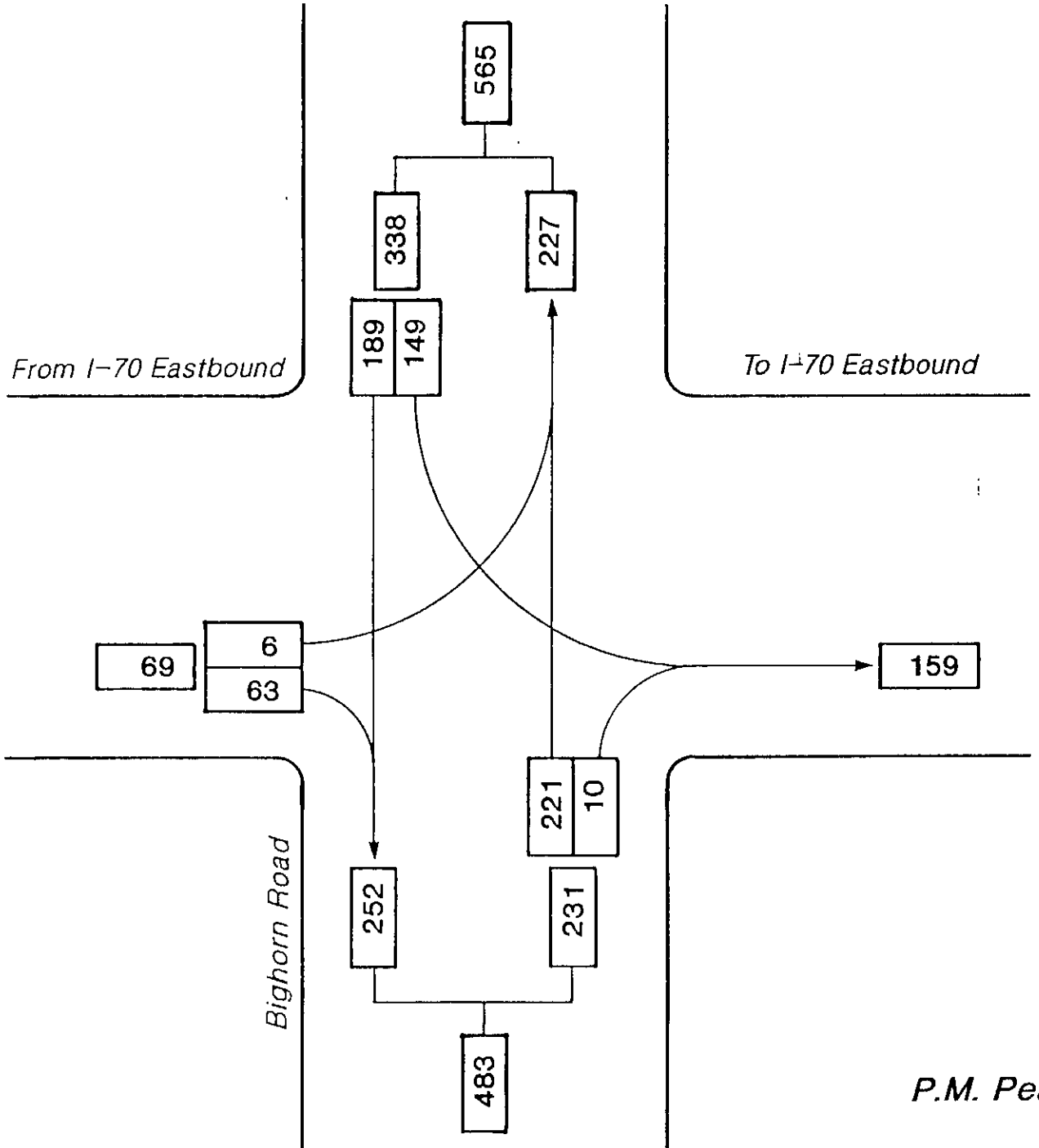

Figure 5
P.M. Peak Hour TMC
March 1990

FELSBURG
HOLT &
ULLEVIG

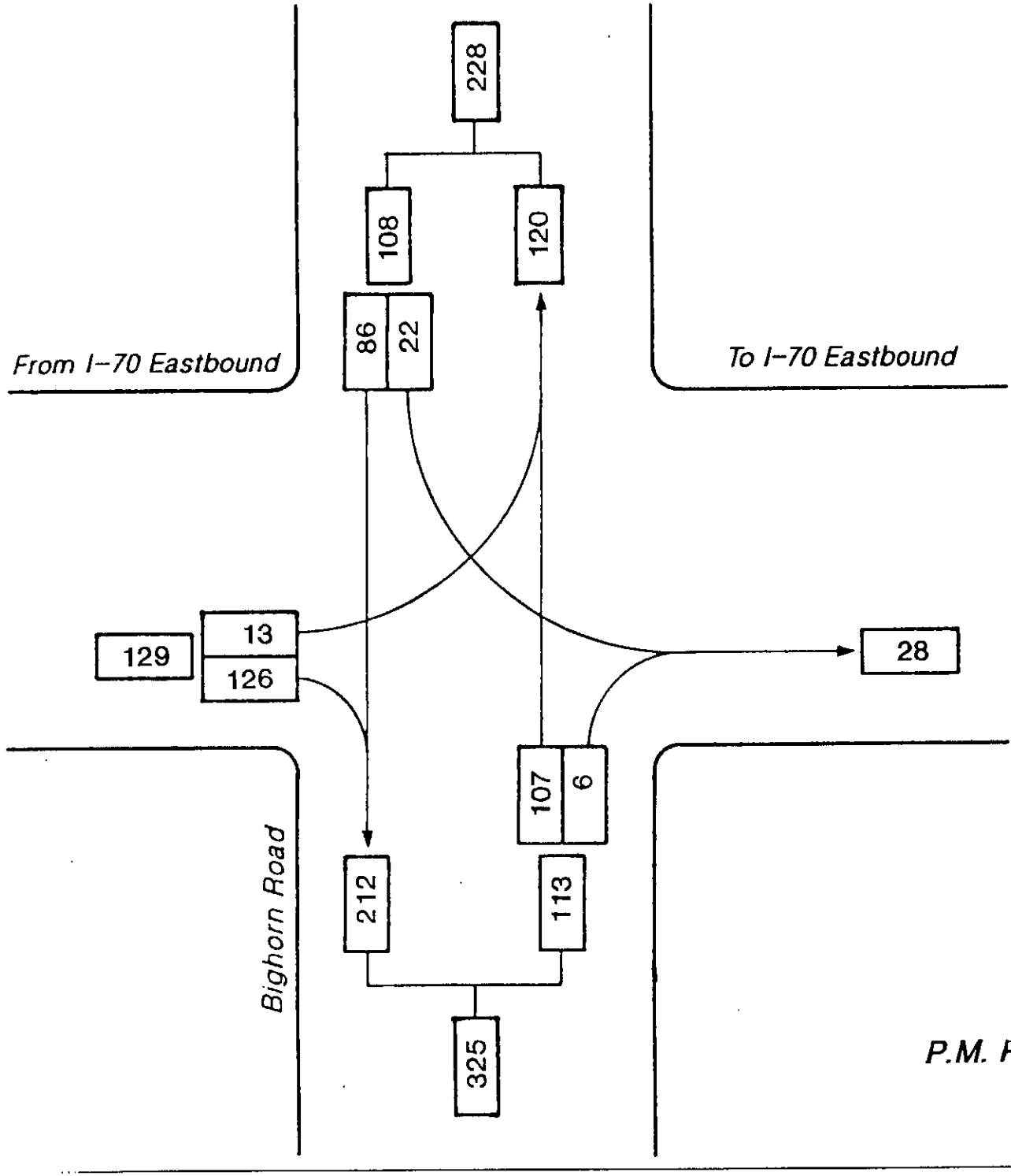

Figure 5a

P.M. Peak Hour TMC

July 1990

FELSBURG
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ULLEVIG

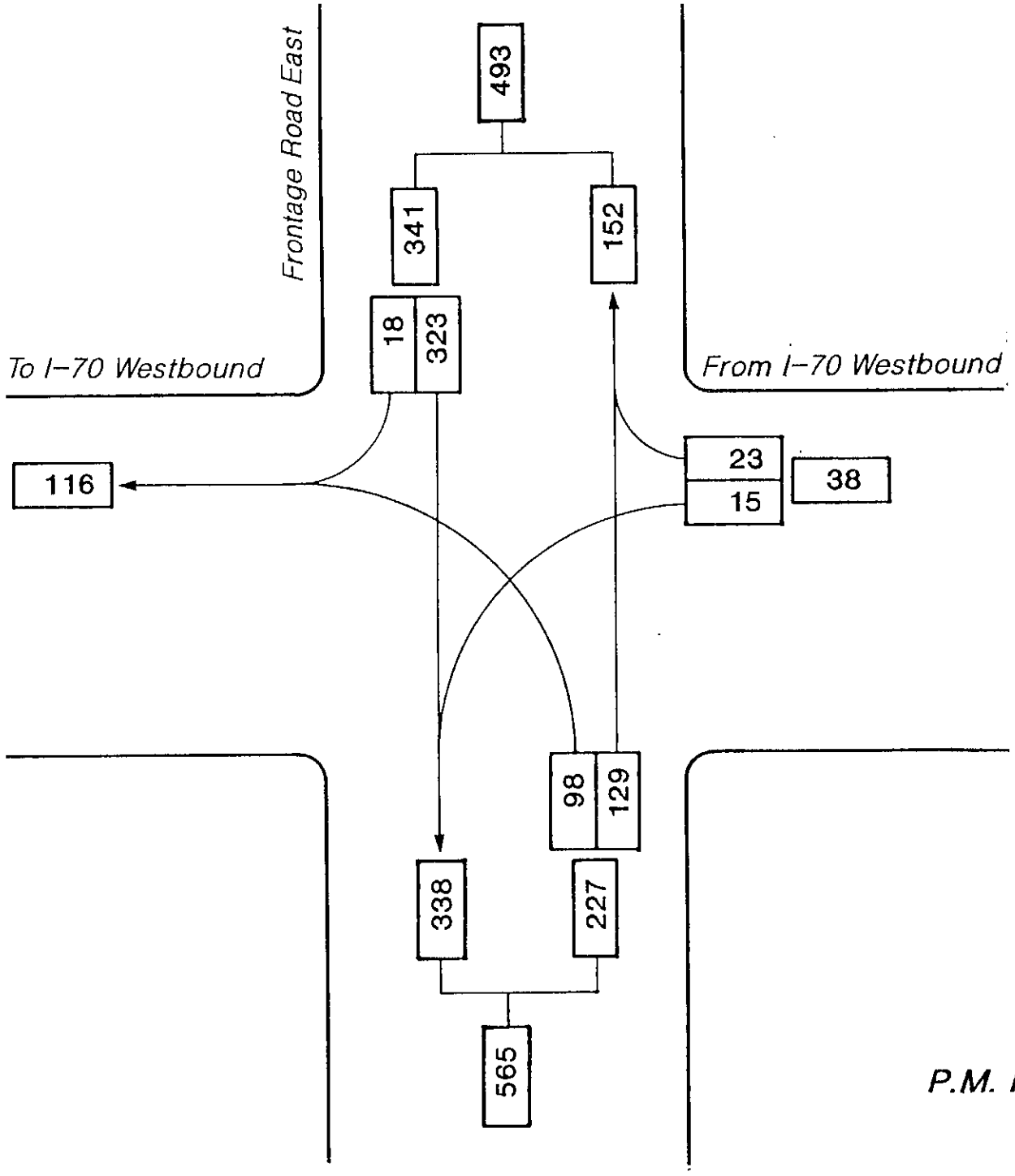

Figure 6
P.M. Peak Hour TMC
March 1990

FELSBURG
HOLT &
ULLEVIG

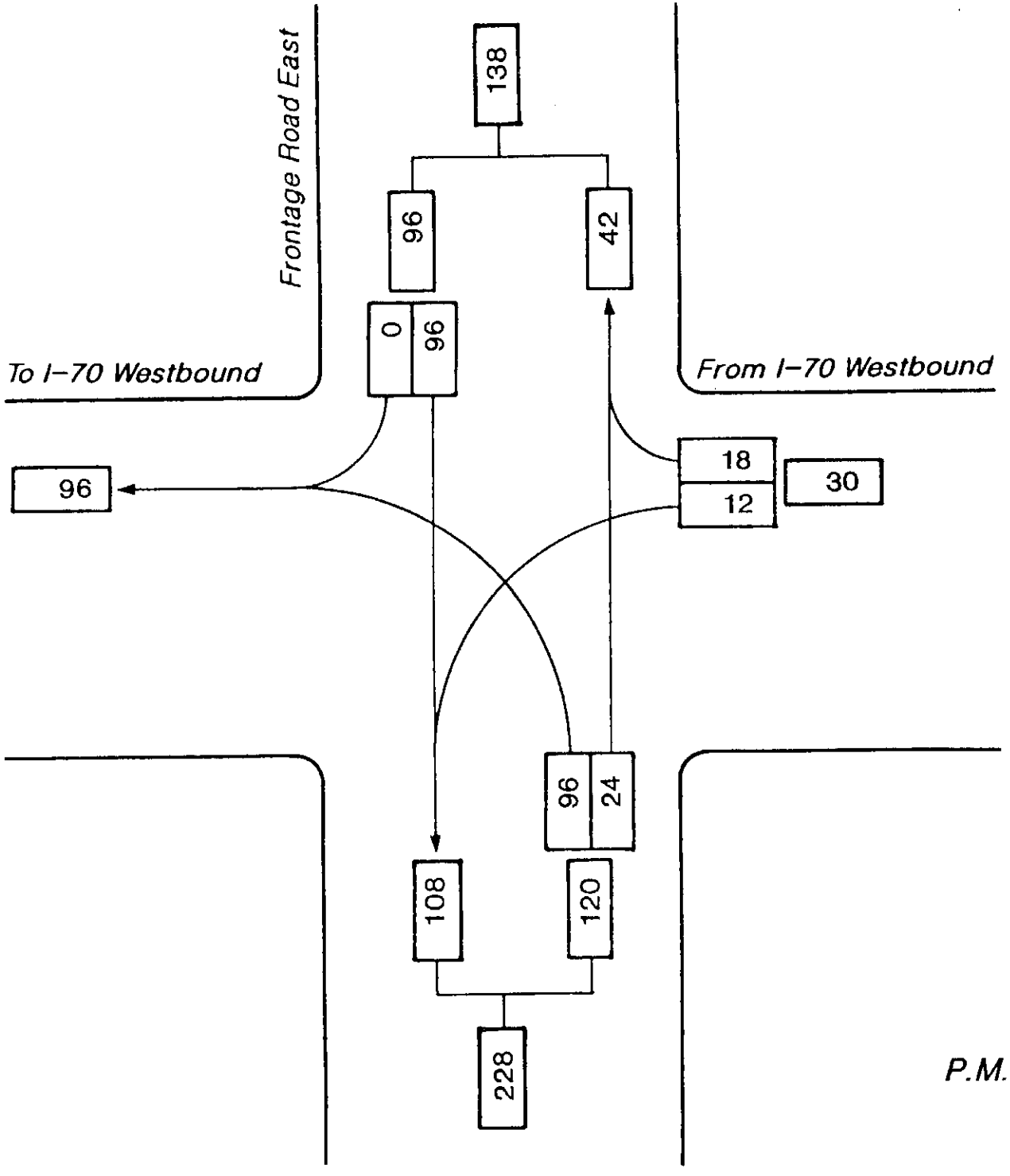

Figure 6a
P.M. Peak Hour TMC
July 1990

FELSBURG
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ULLEVIG

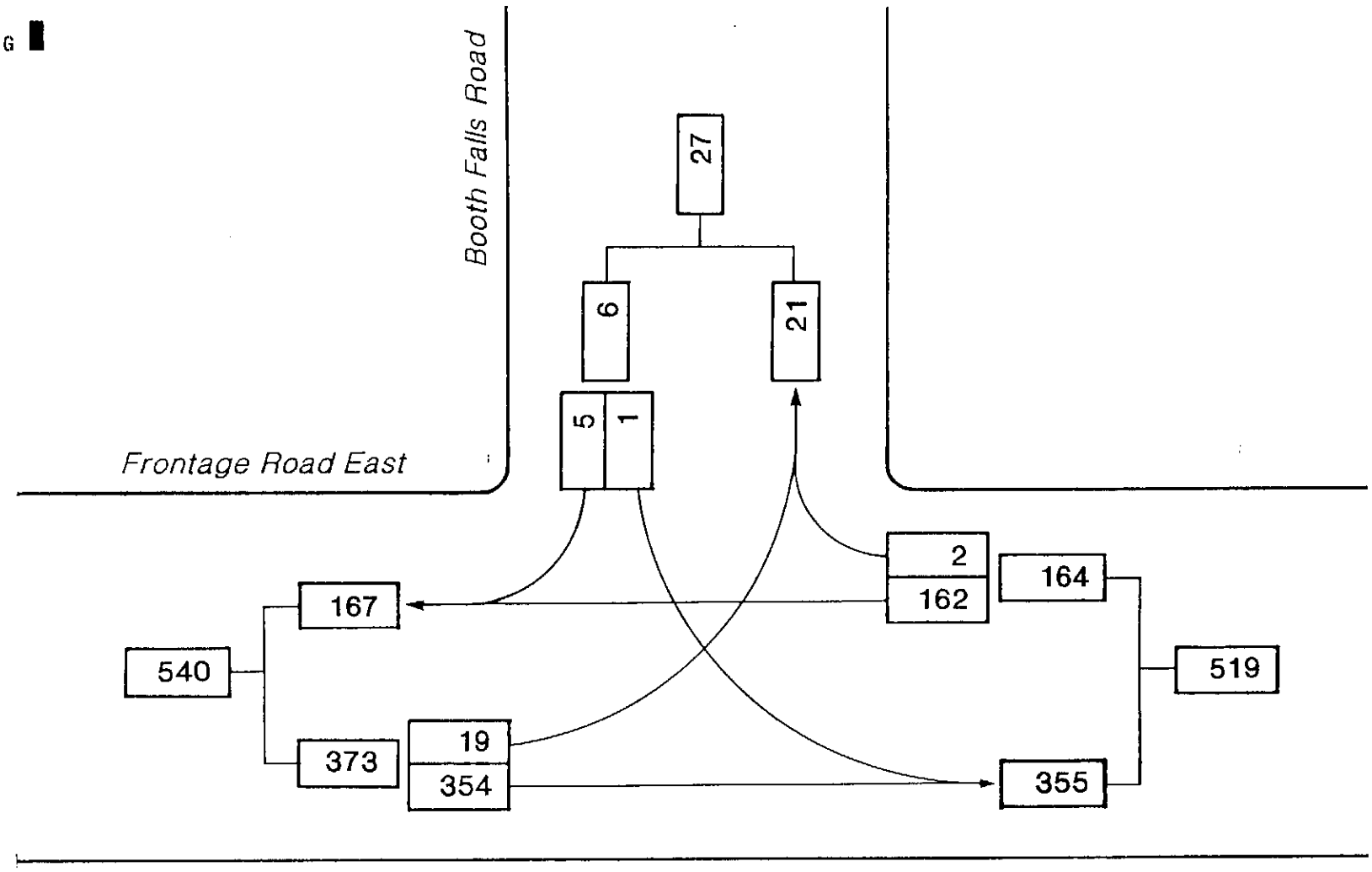


Figure 7

P.M. Peak Hour TMC

March 1990

North

FELSBURG
HOLT &
ULLEVIG

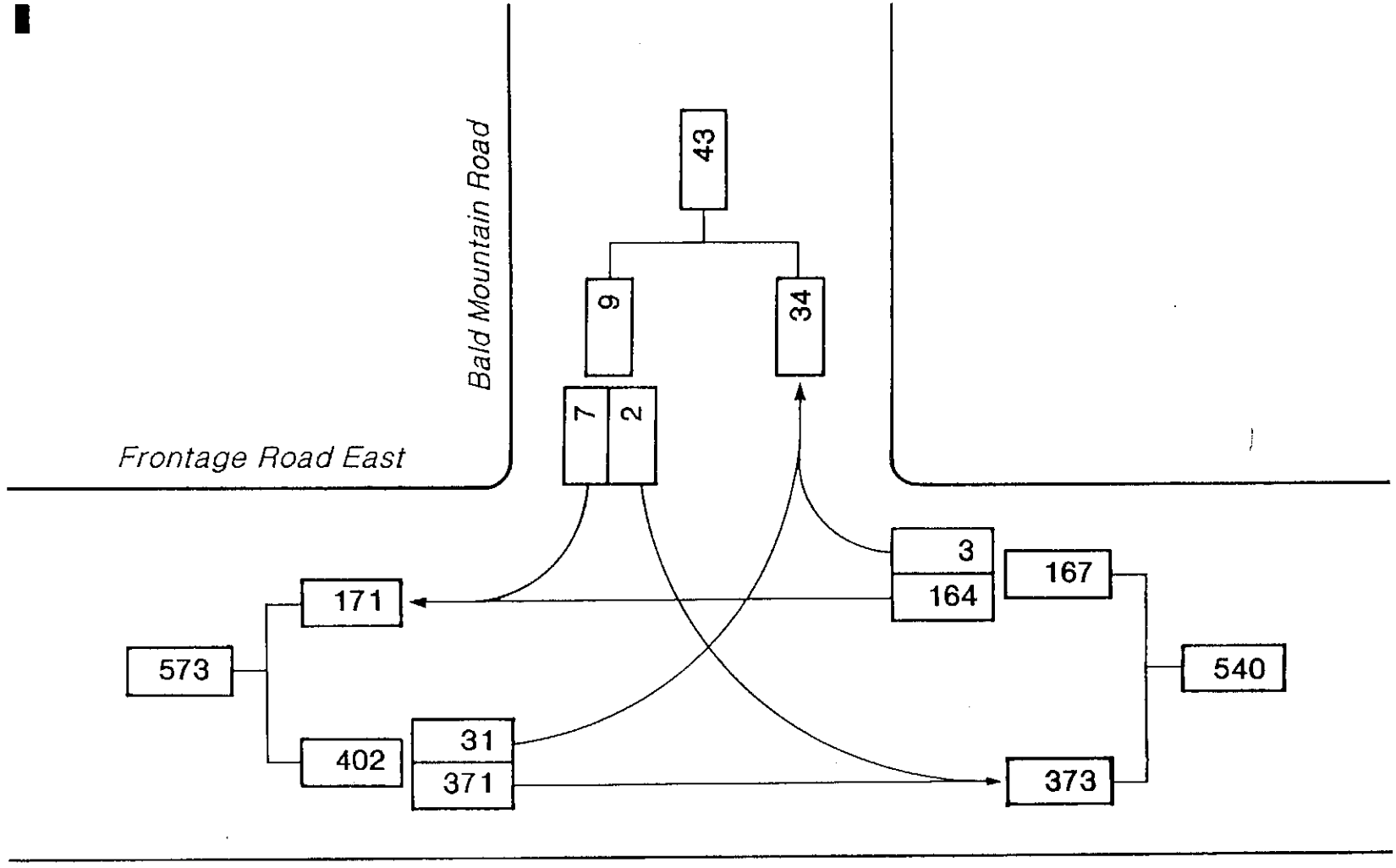


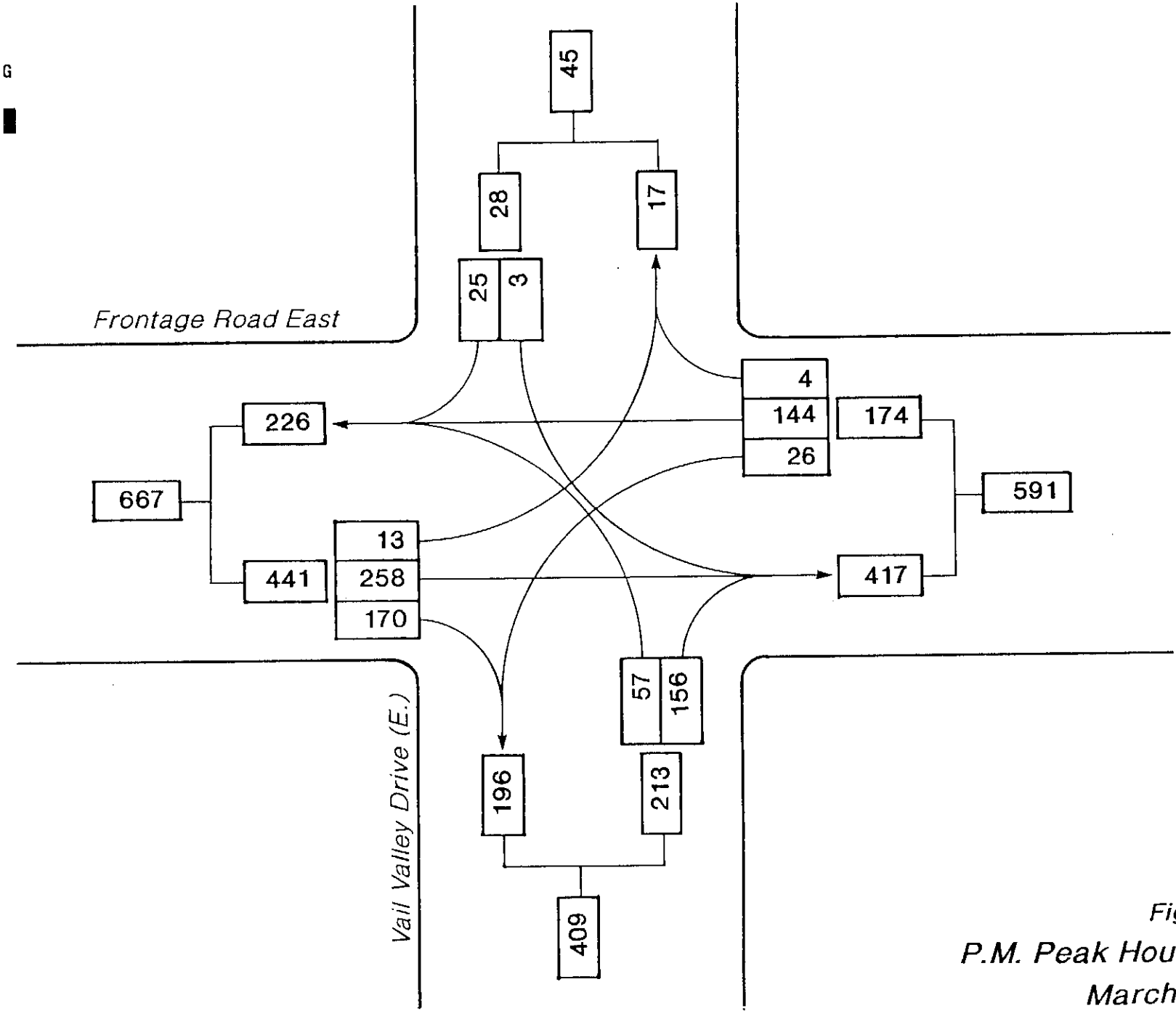
Figure 8

P.M. Peak Hour TMC

March 1990

North

FELSBURG
HOLT &
ULLEVIG



North

Figure 9
P.M. Peak Hour TMC
March 1990

FELSBURG
HOLT &
ULLEVIG

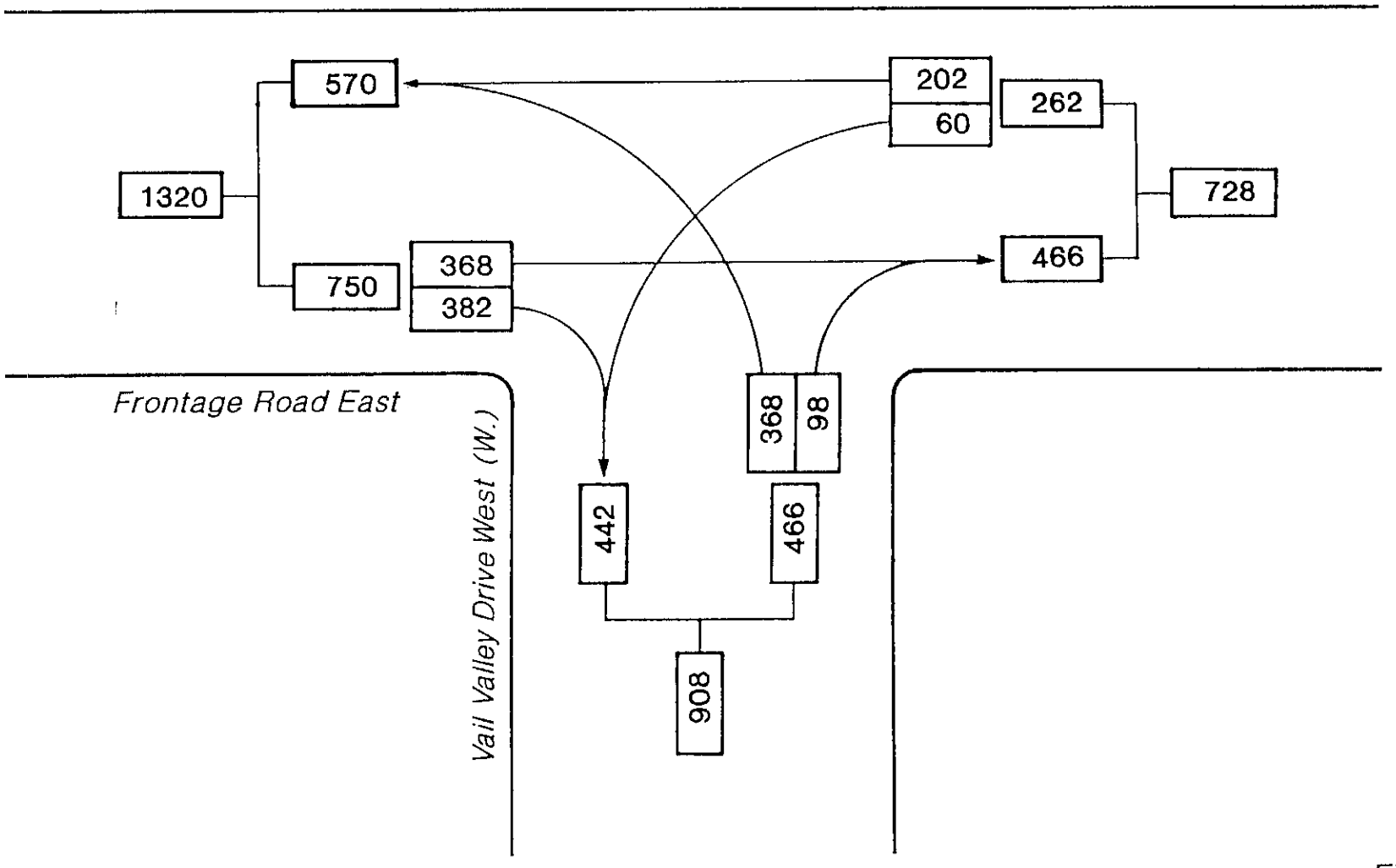


Figure 10

P.M. Peak Hour TMC

March 1990

FELSBURG
HOLT &
ULLEVIG

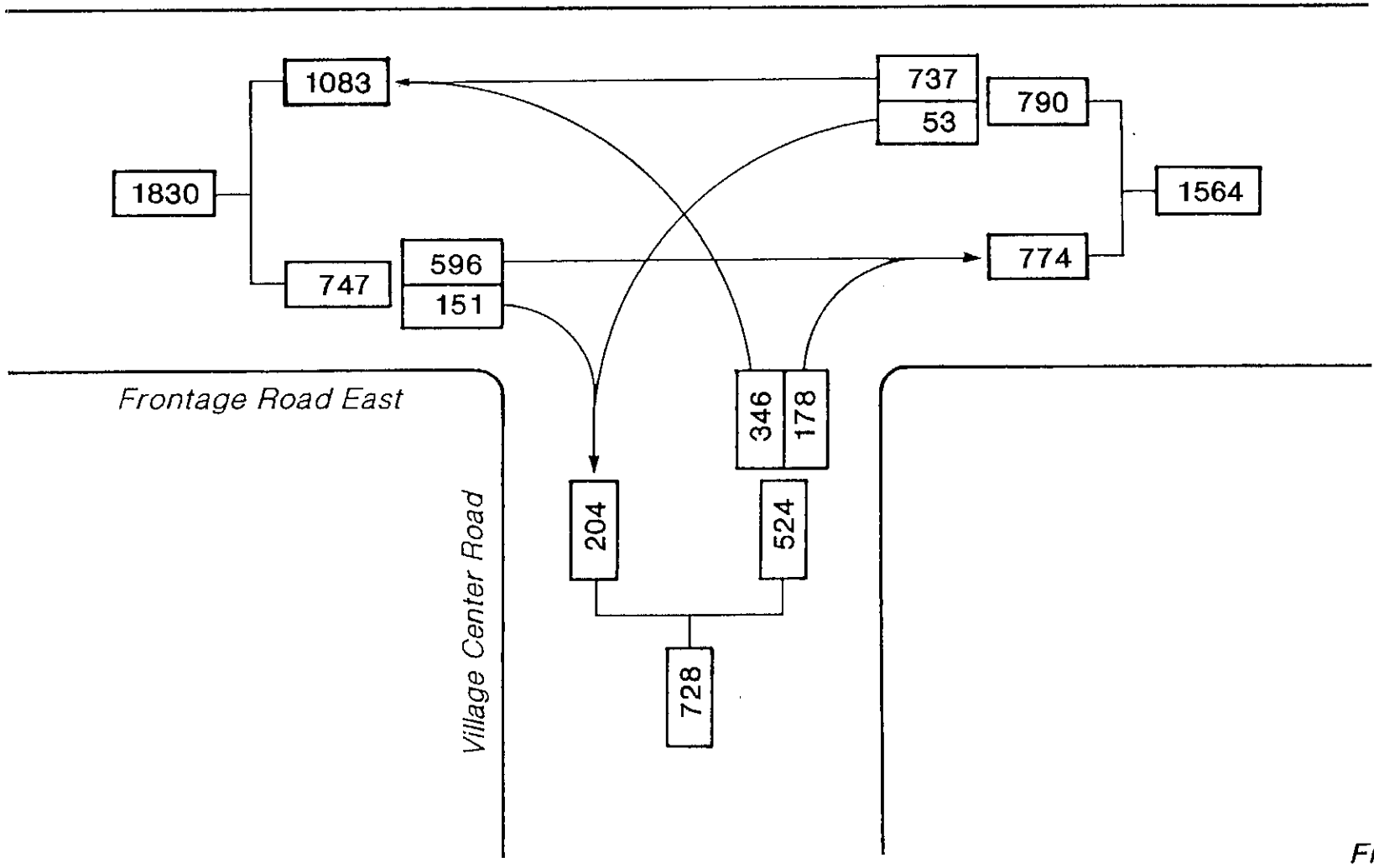


Figure 11

P.M. Peak Hour TMC
March 1990

FELSBURG
HOLT &
ULLEVIG

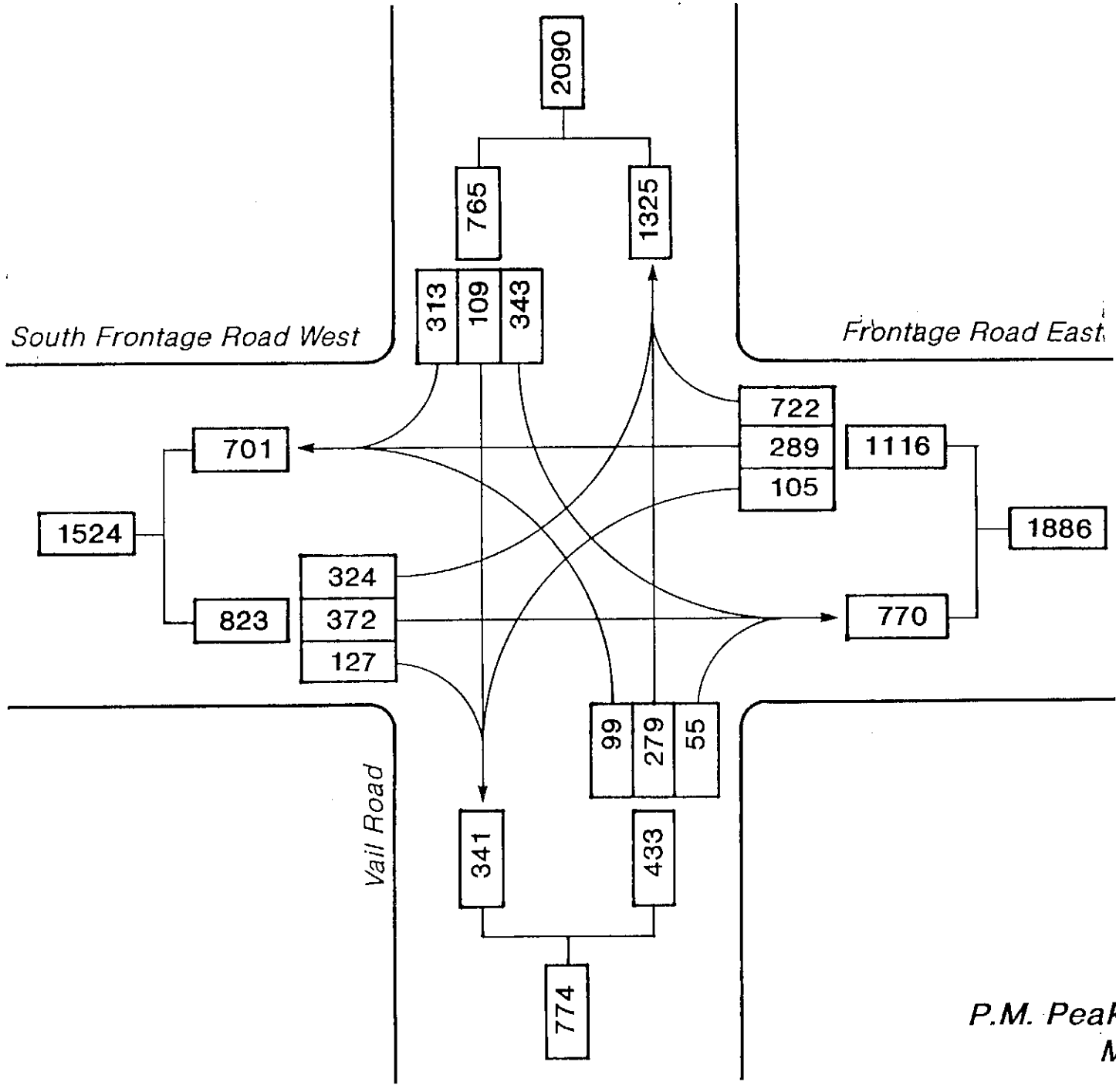


Figure 12
P.M. Peak Hour TMC
March 1990

FELSBURG
HOLT &
ULLEVIG

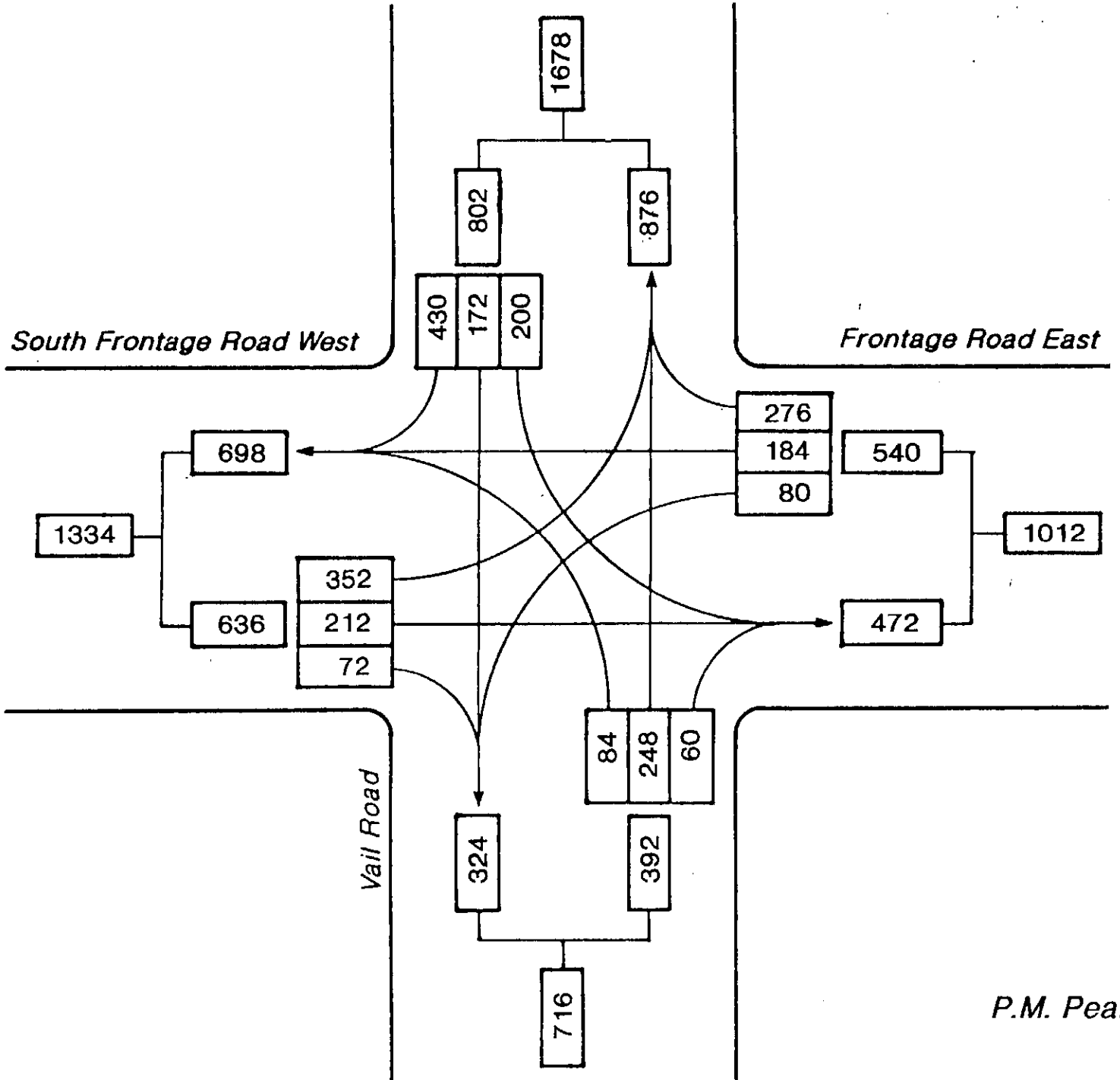


Figure 12a
P.M. Peak Hour TMC
July 1990

North

FELSBURG
HOLT &
ULLEVIG

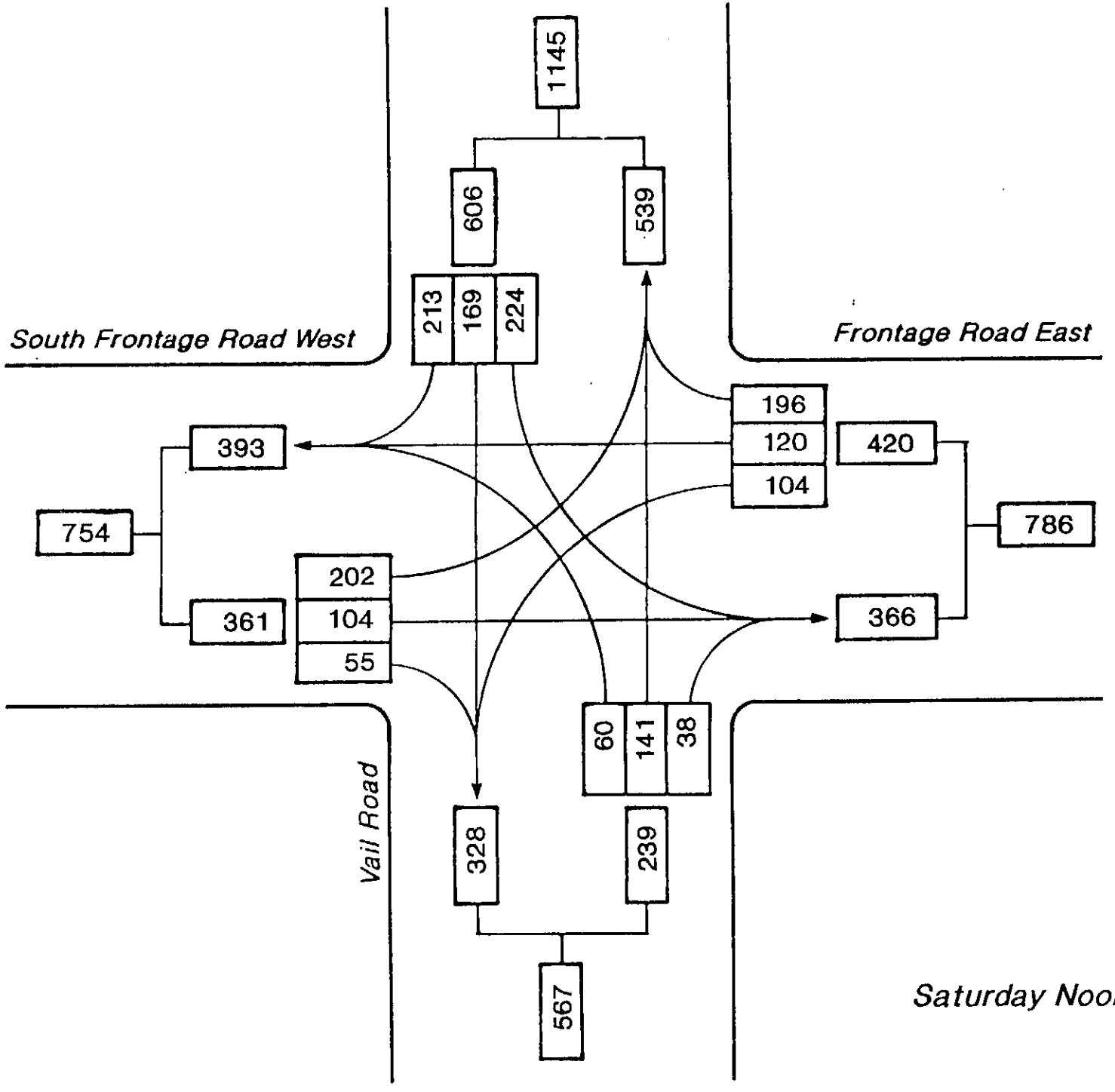


Figure 12b
Saturday Noon Hour TMC
July 1990

FELSBURG
HOLT &
ULLEVIG

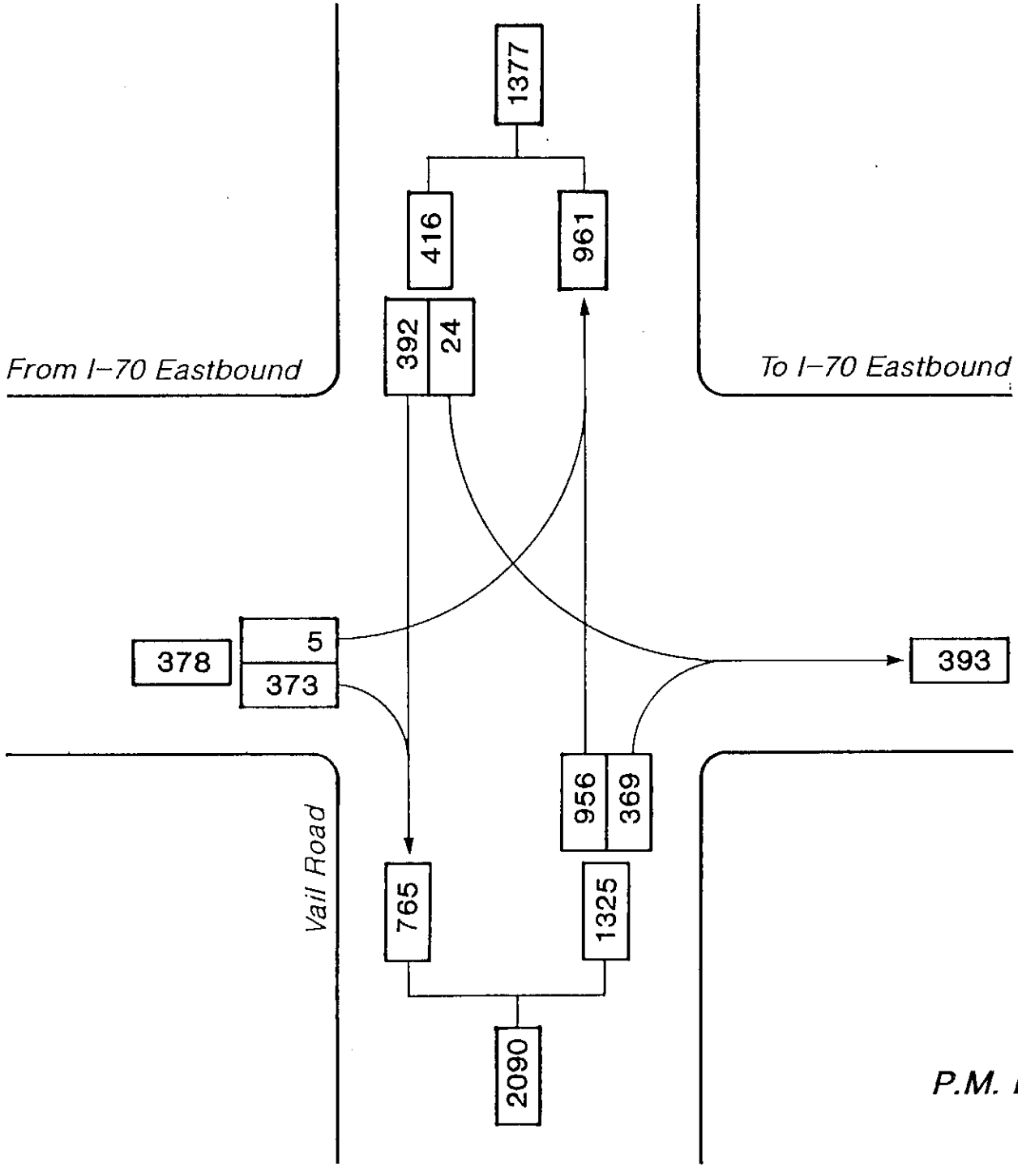


Figure 13
P.M. Peak Hour TMC
March 1990

FELSBURG HOLT & ULLEVIG

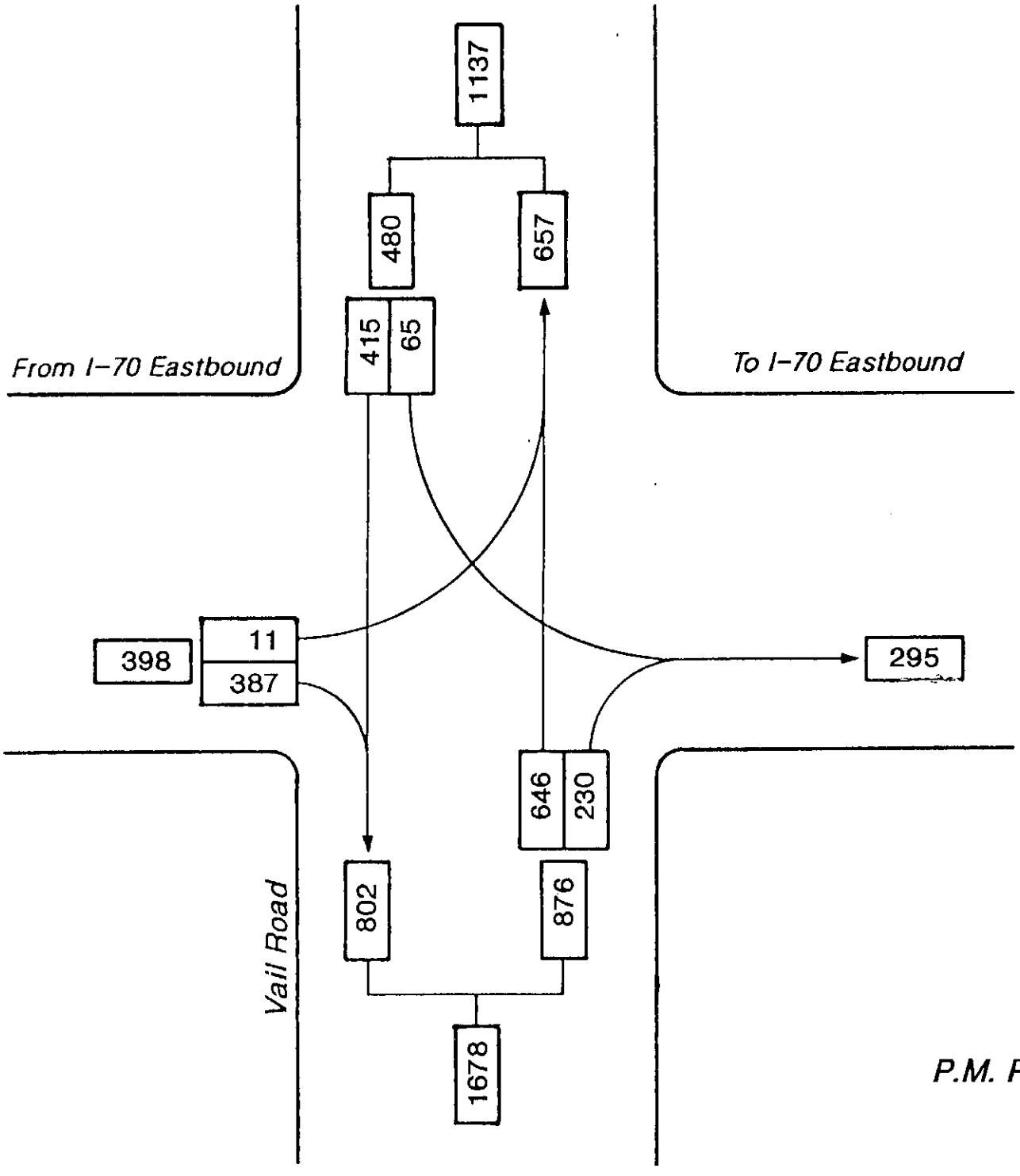


Figure 13a
P.M. Peak Hour TMC
July 1990

FELSBURG
HOLT &
ULLEVIG

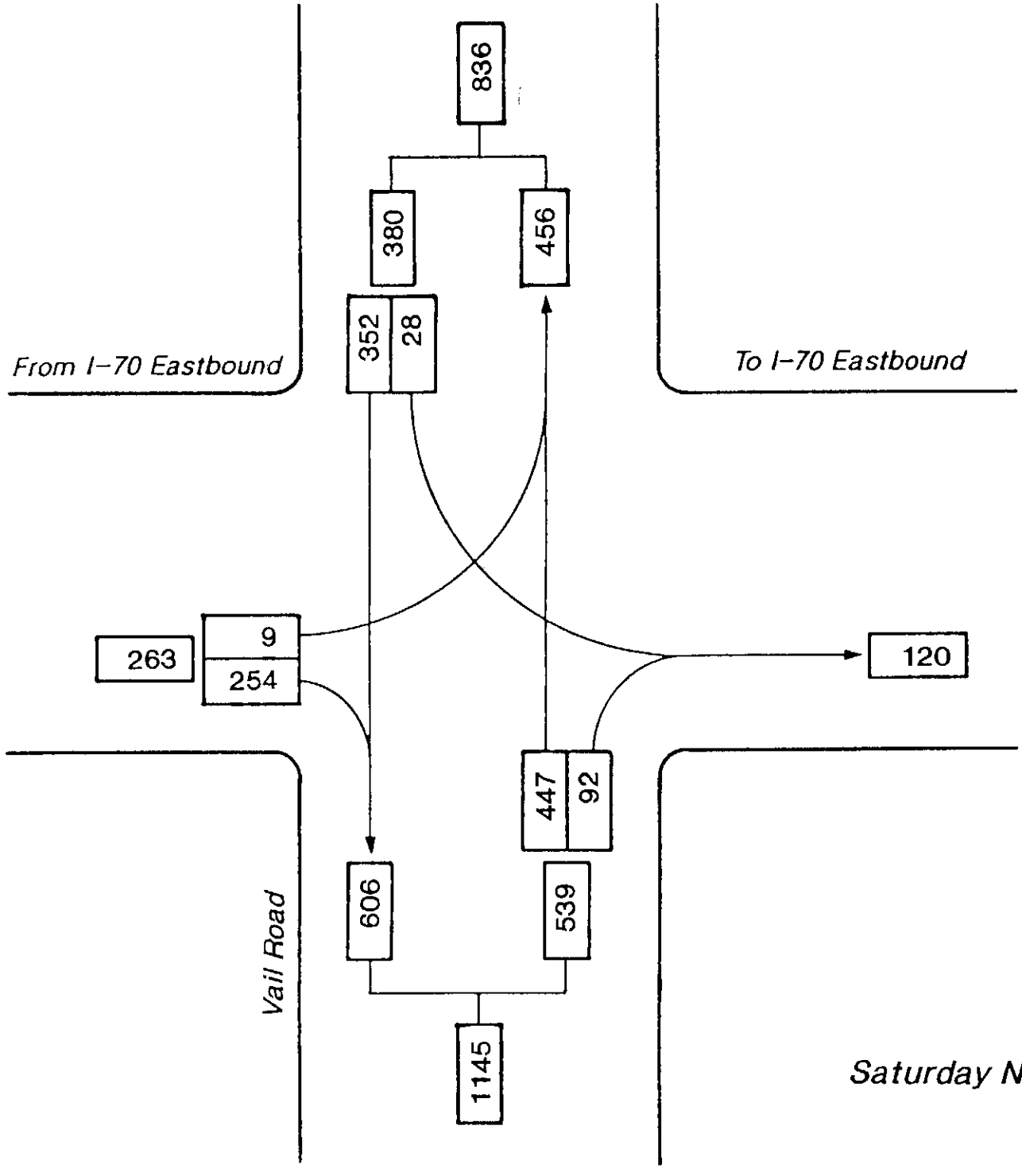
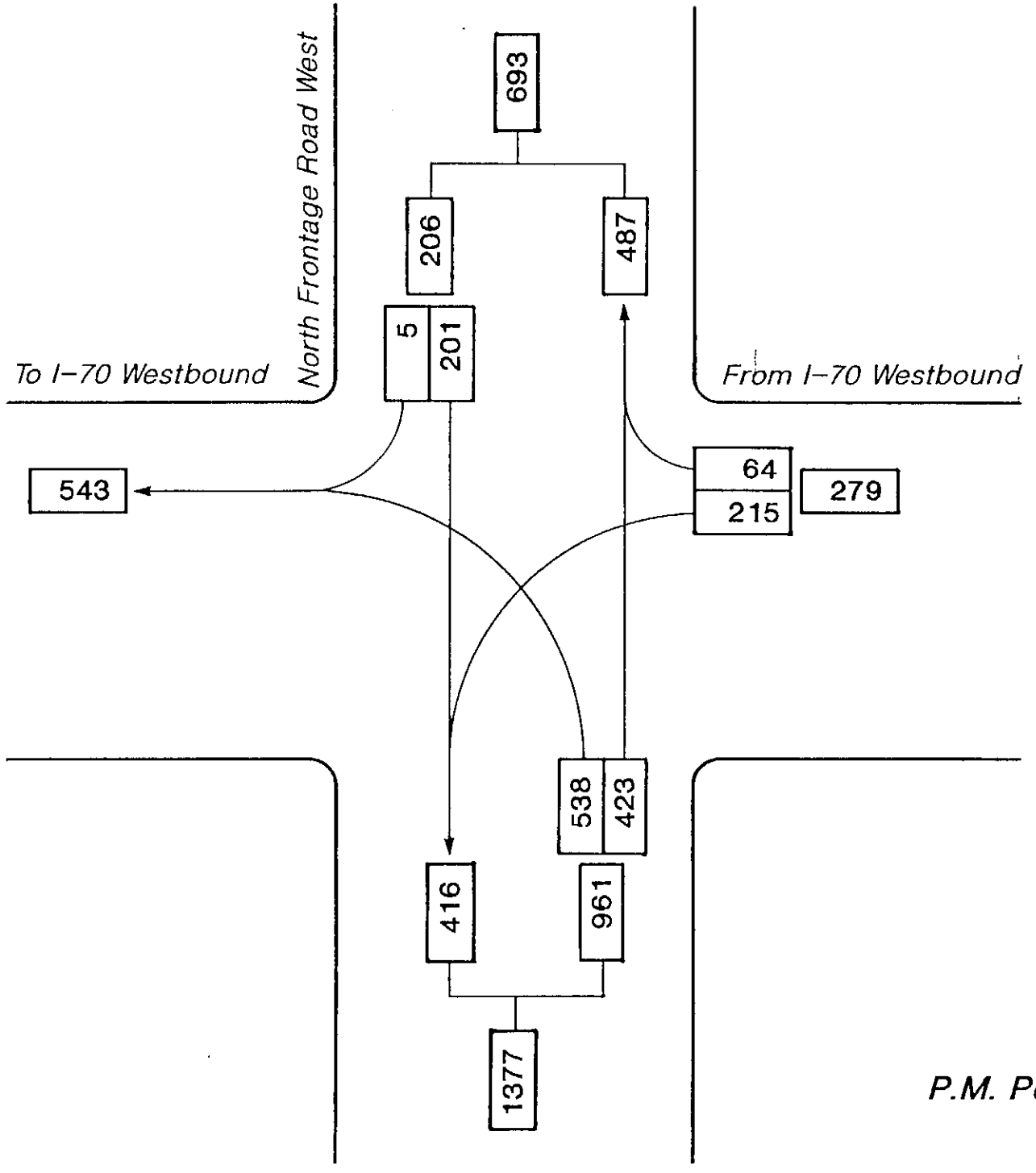


Figure 13b
Saturday Noon Hour TMC
July 1990

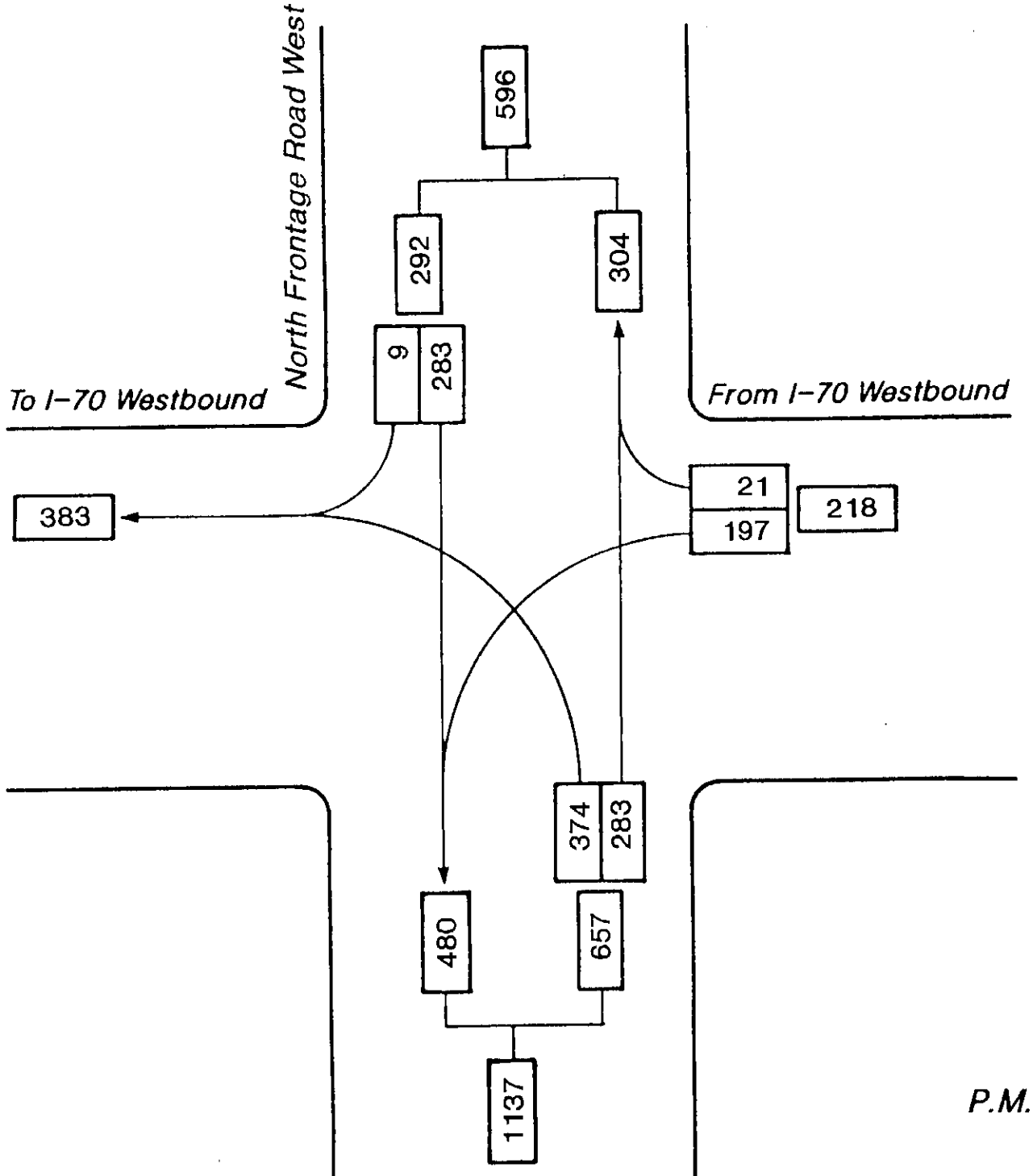
FELSBURG
HOLT &
ULLEVIG



North

Figure 14
P.M. Peak Hour TMC
March 1990

FELSBURG
HOLT &
ULLEVIG



North

Figure 14a
P.M. Peak Hour TMC
July 1990

FELSBURG
HOLT &
ULLEVIG

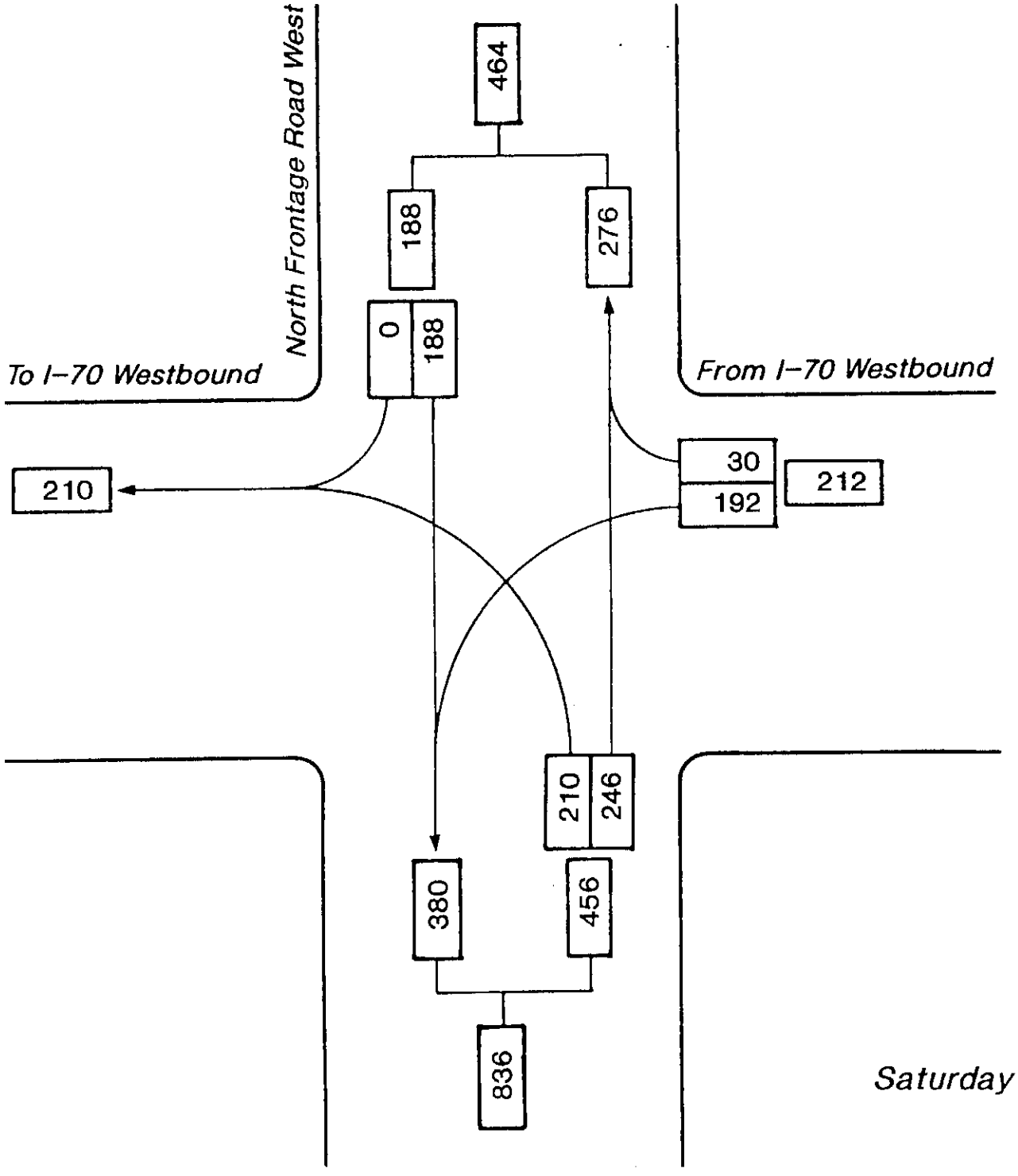


Figure 14b
Saturday Noon Hour TMC
July 1990

FELSBURG
HOLT &
ULLEVIG

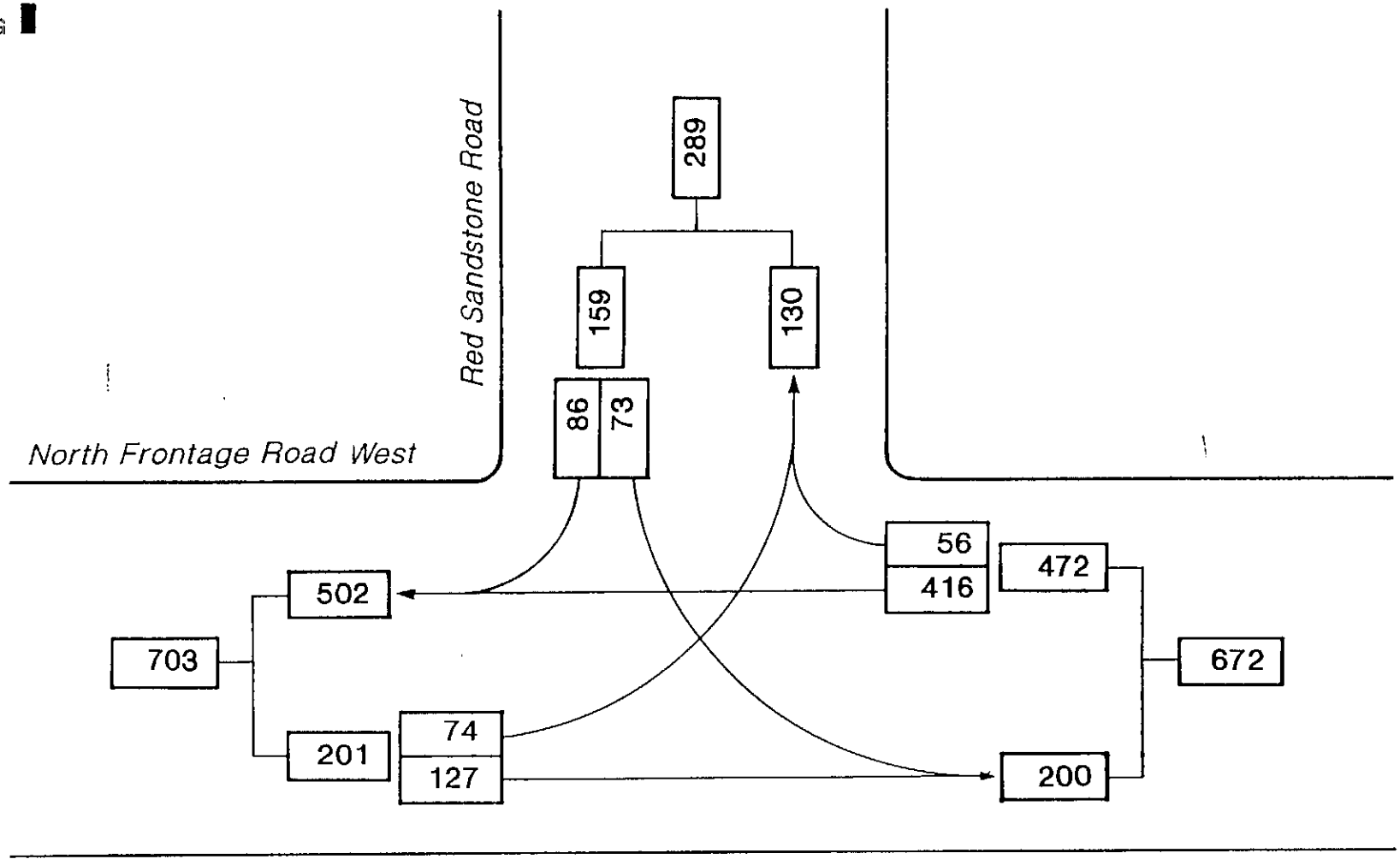


Figure 15

P.M. Peak Hour TMC

March 1990

North

FELSBURG
HOLT &
ULLEVIG

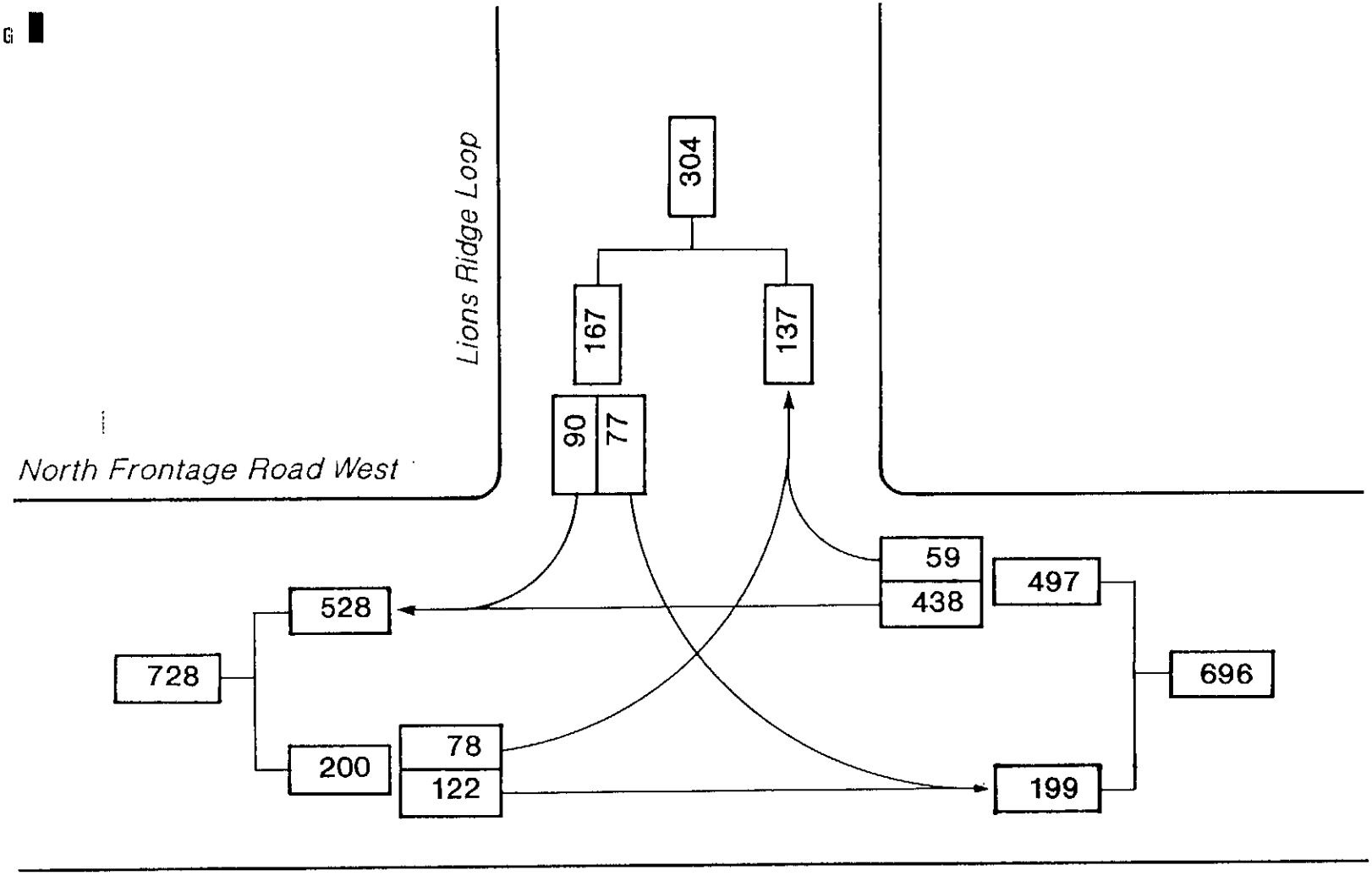


Figure 16
P.M. Peak Hour TMC
March 1990

North

FELSBURG
HOLT &
ULLEVIG

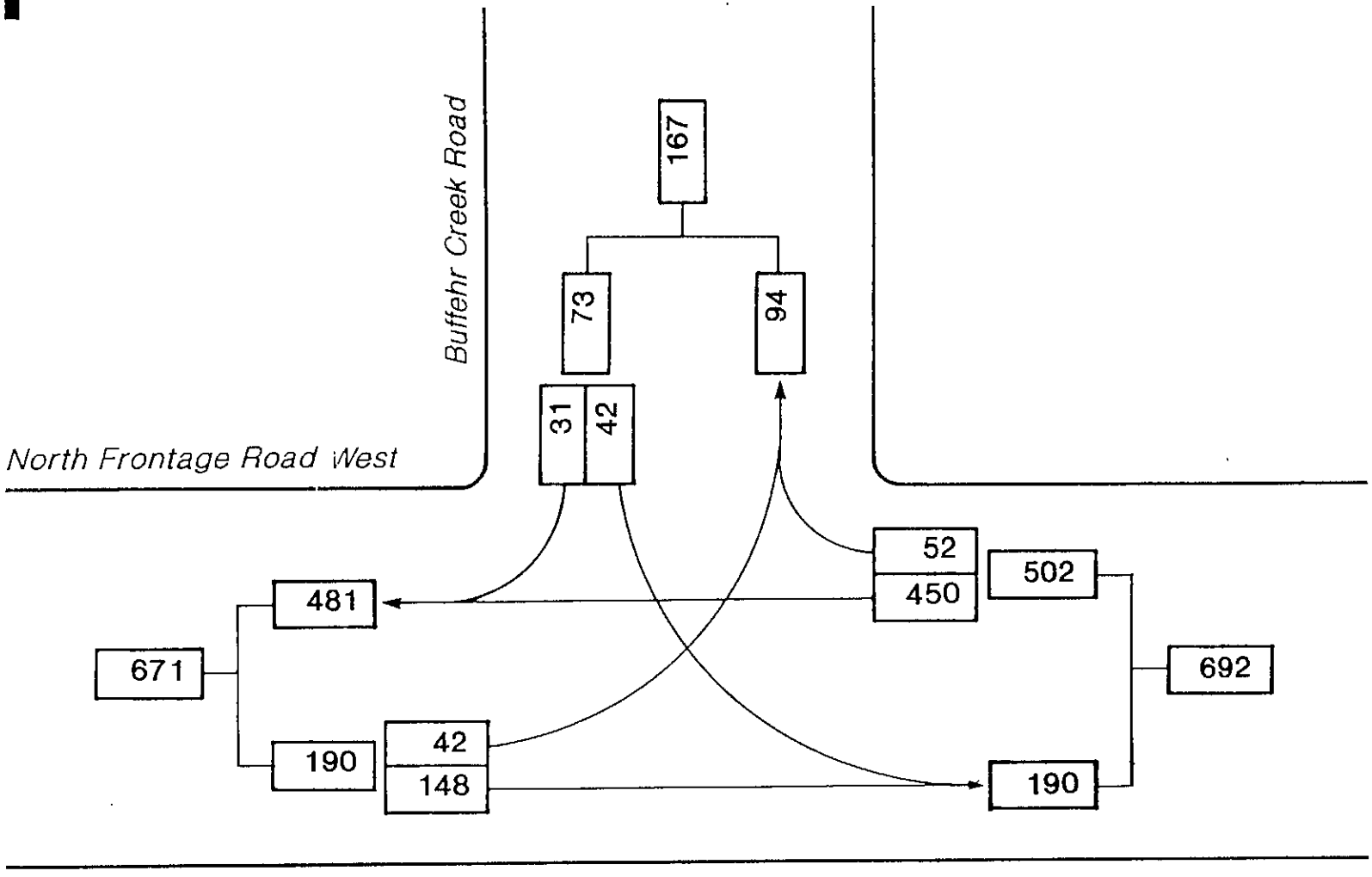


Figure 17

P.M. Peak Hour TMC

March 1990

North

FELSBURG
HOLT &
ULLEVIG

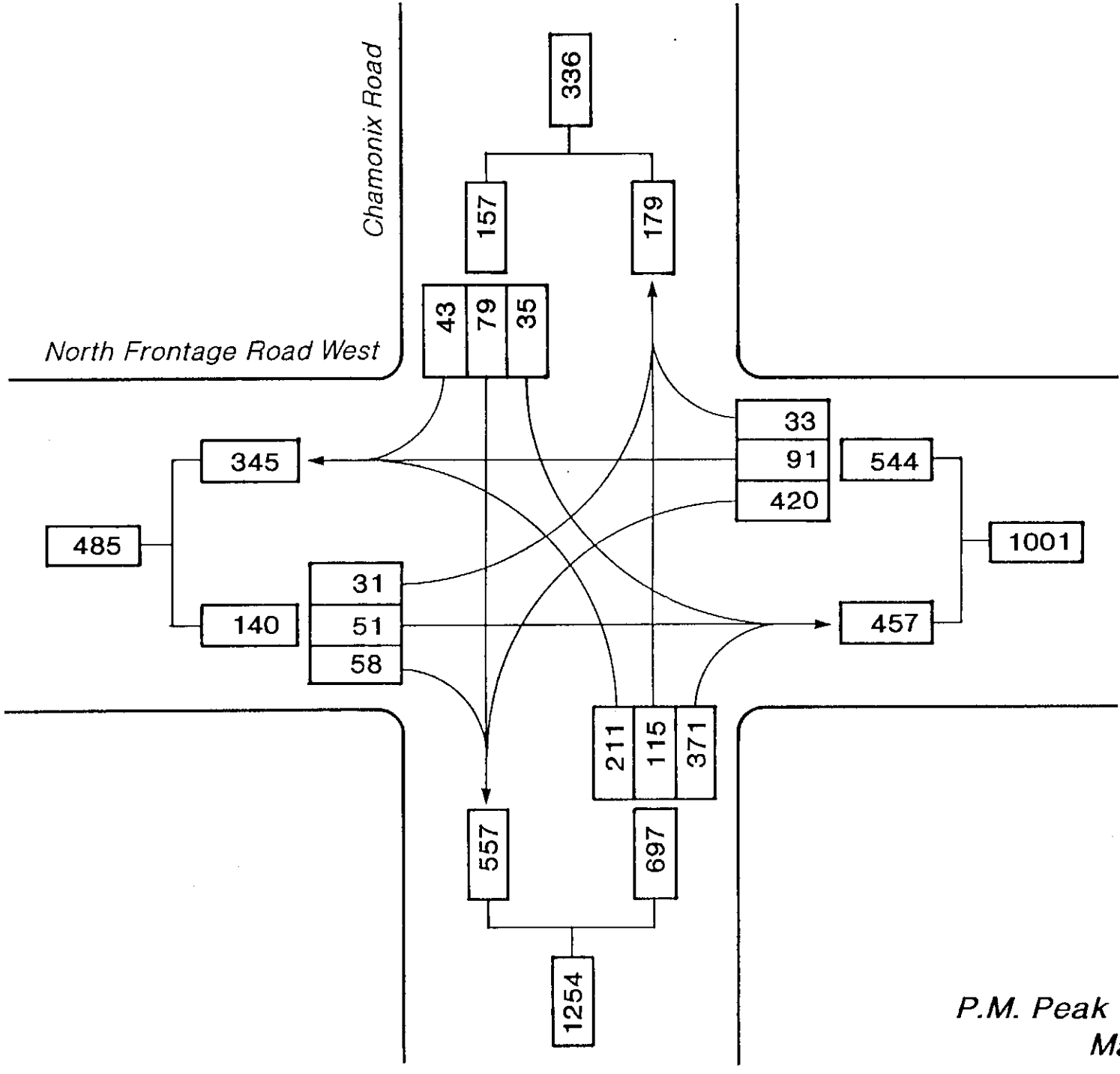


Figure 18
P.M. Peak Hour TMC
March 1990

North

FELSBURG
HOLT &
ULLEVIG

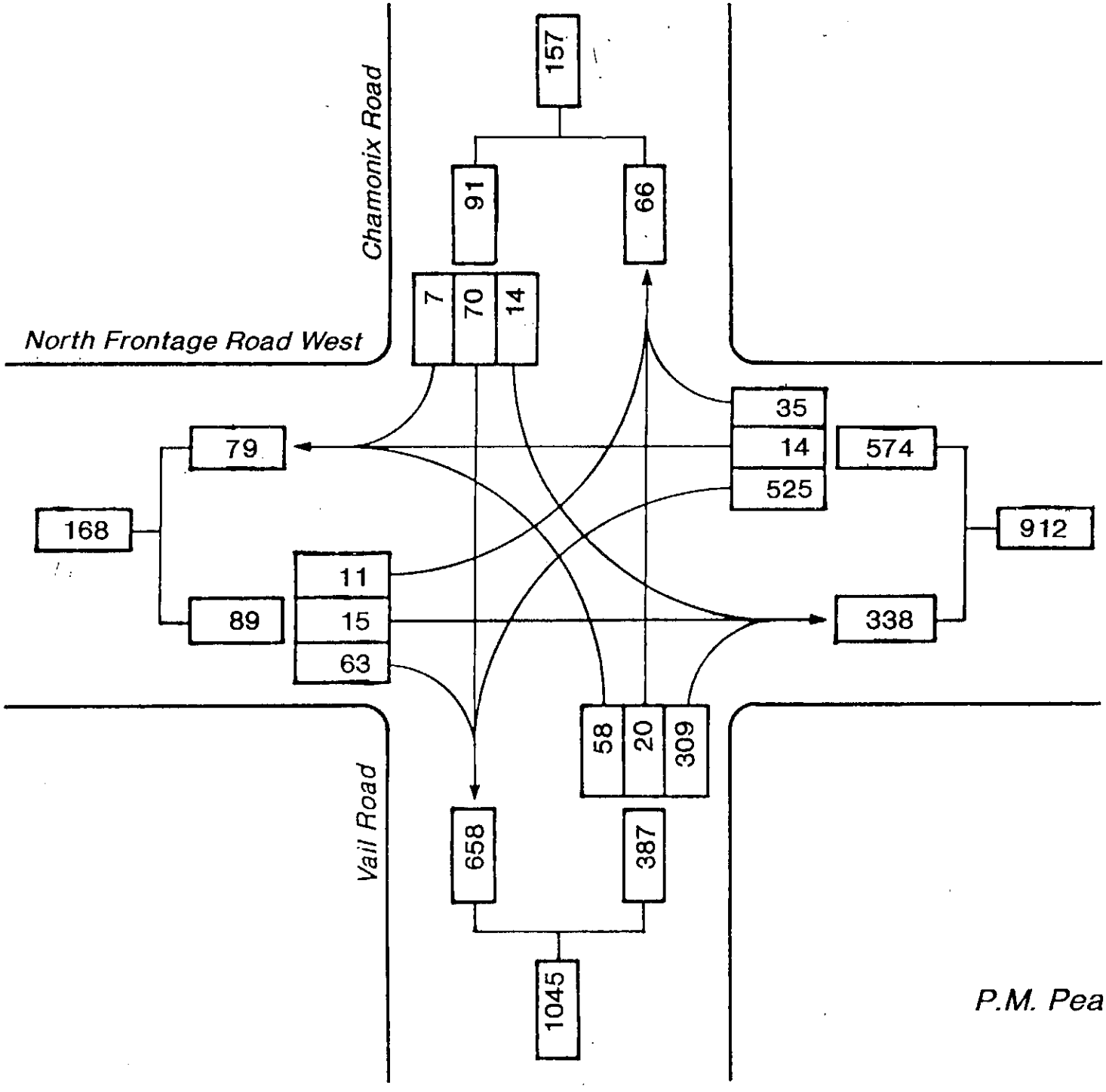
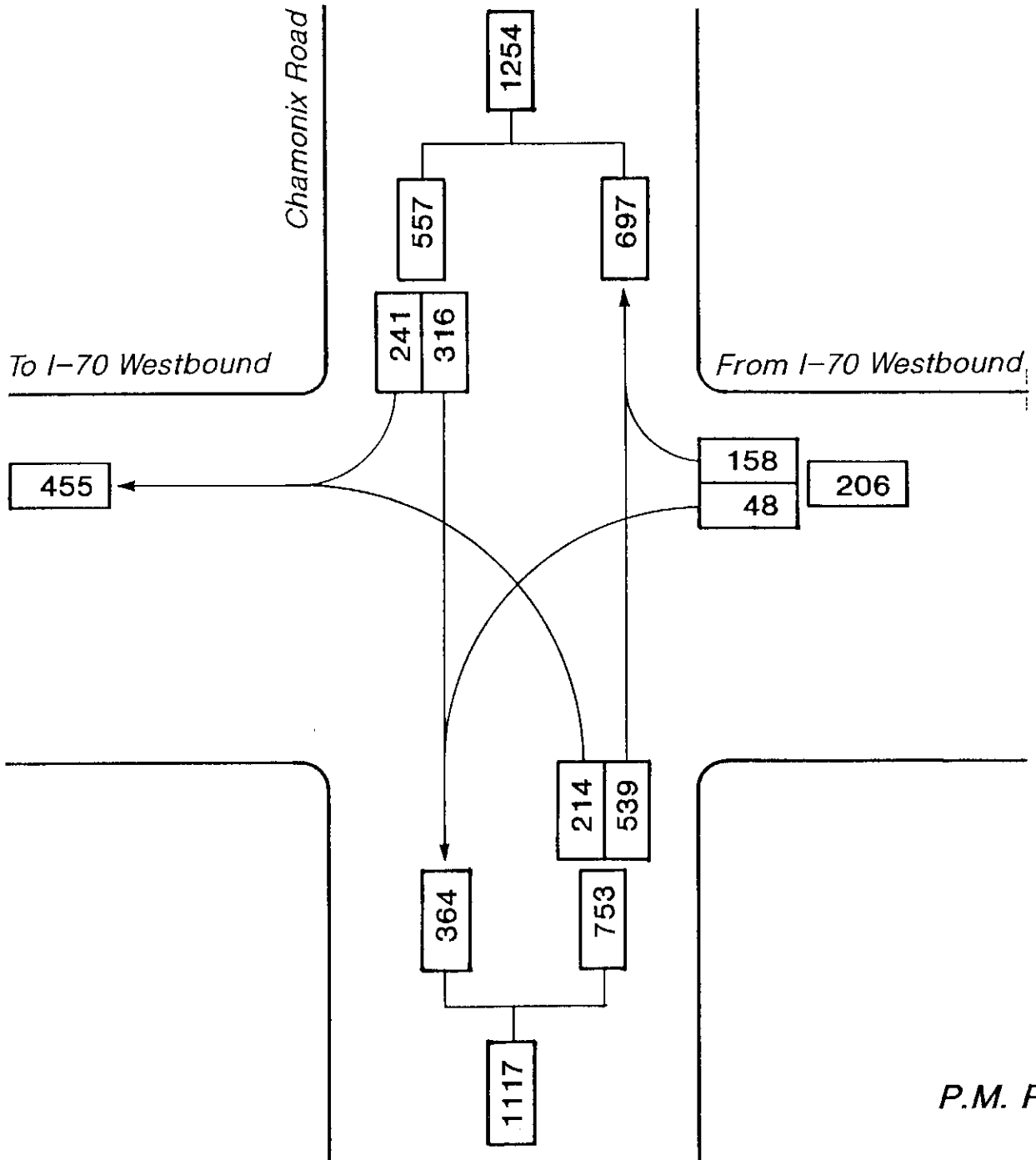


Figure 18a
P.M. Peak Hour TMC
July 1990

FELSBURG
HOLT &
ULLEVIG



North

Figure 19
P.M. Peak Hour TMC
March 1990

FELSBURG
HOLT &
ULLEVIG

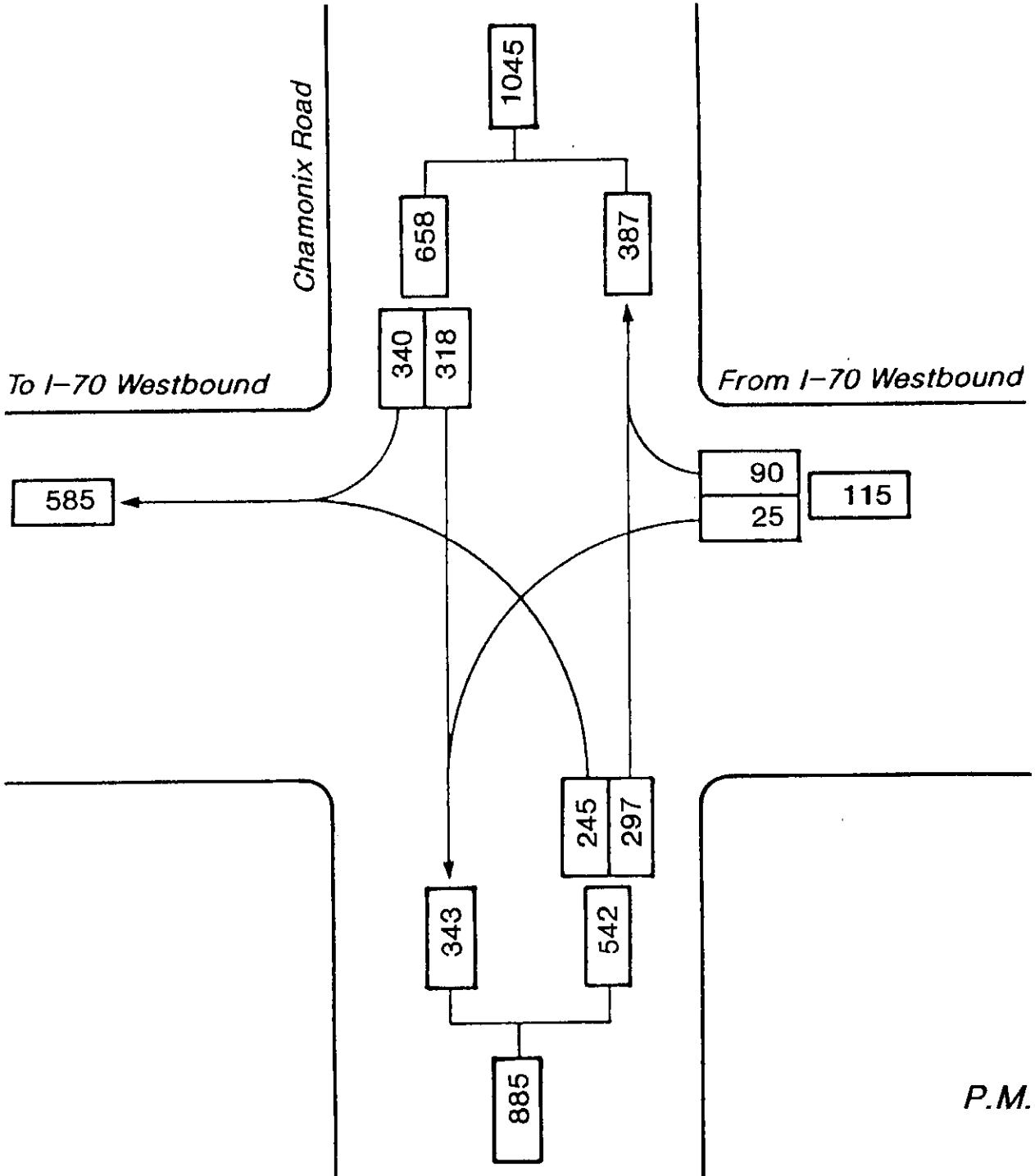


Figure 19a
P.M. Peak Hour TMC
July 1990

FELSBURG
HOLT &
ULLEVIG

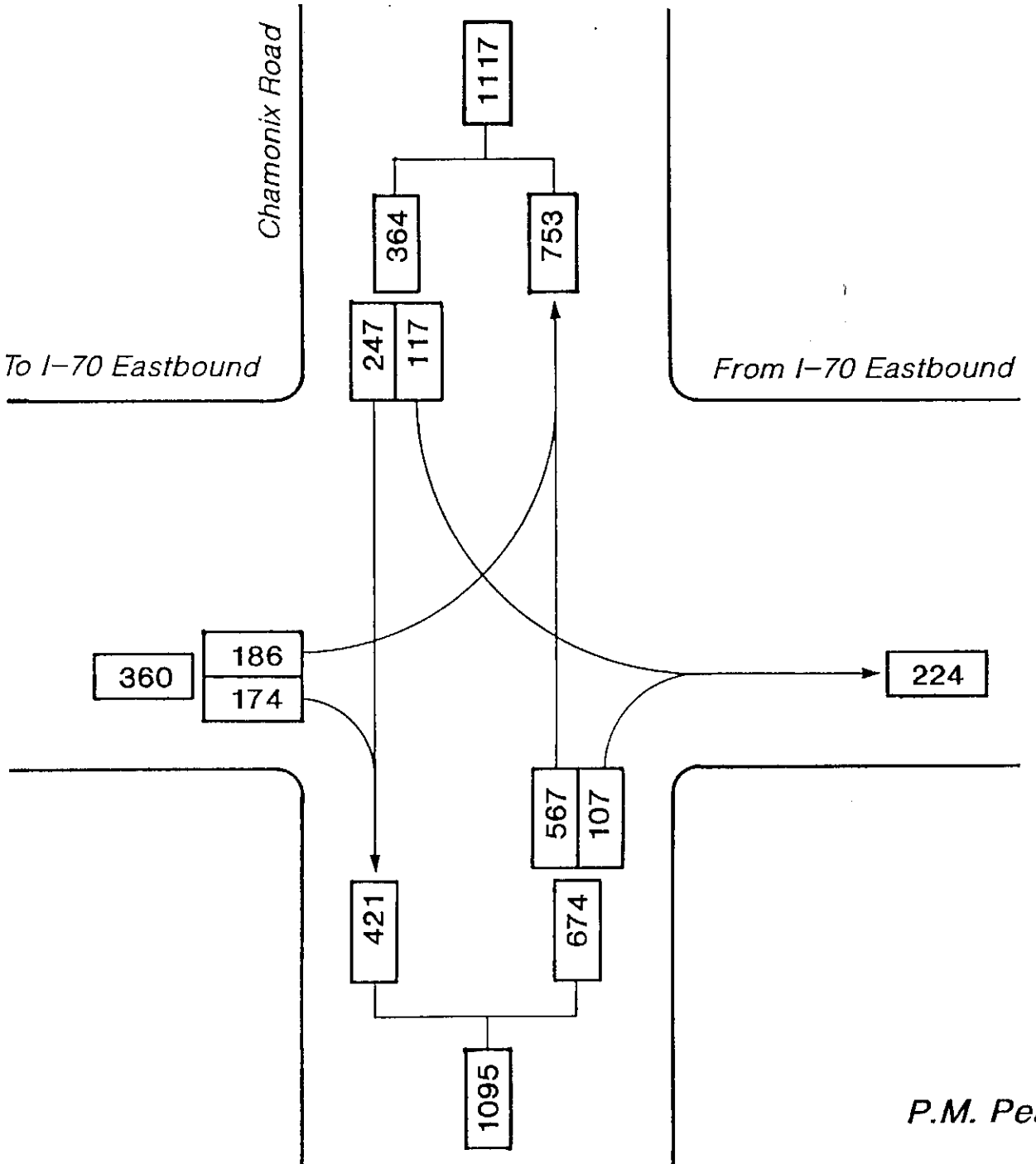
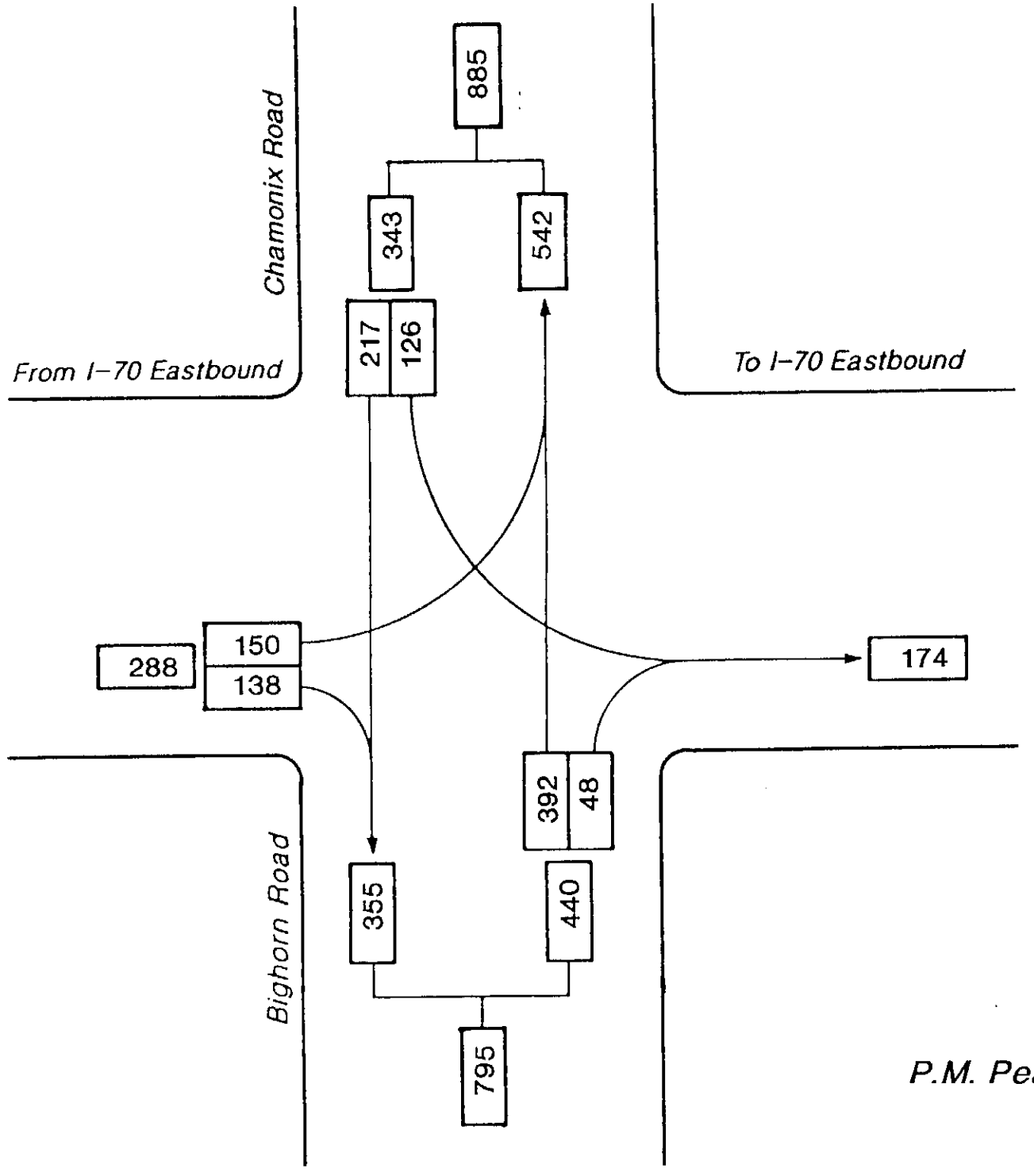


Figure 20
P.M. Peak Hour TMC
March 1990

FELSBURG
HOLT &
ULLEVIG



North

Figure 20a
P.M. Peak Hour TMC
July 1990

FELSBURG
HOLT &
ULLEVIG

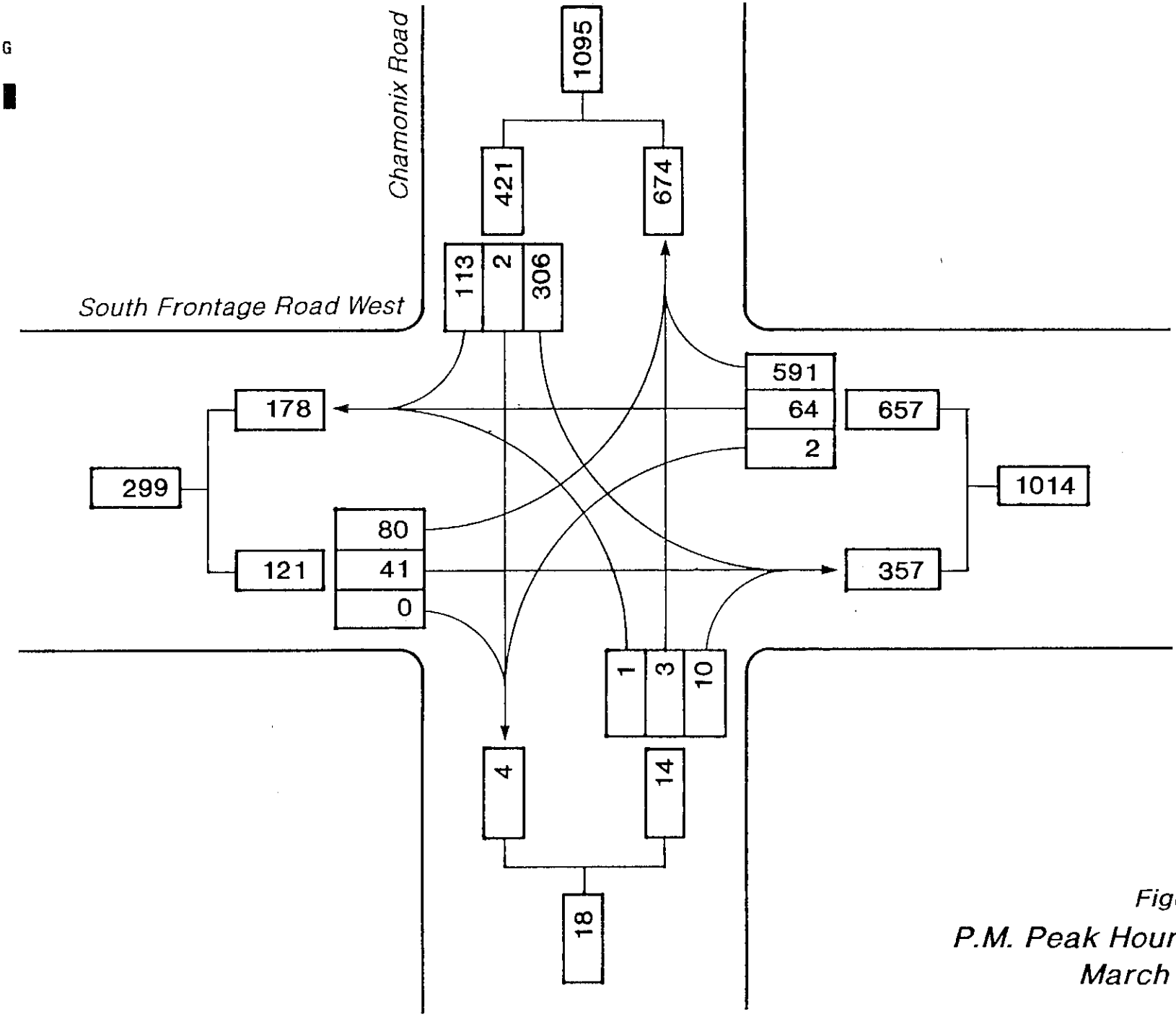


Figure 21
P.M. Peak Hour TMC
March 1990

FELSBURG
HOLT &
ULLEVIG

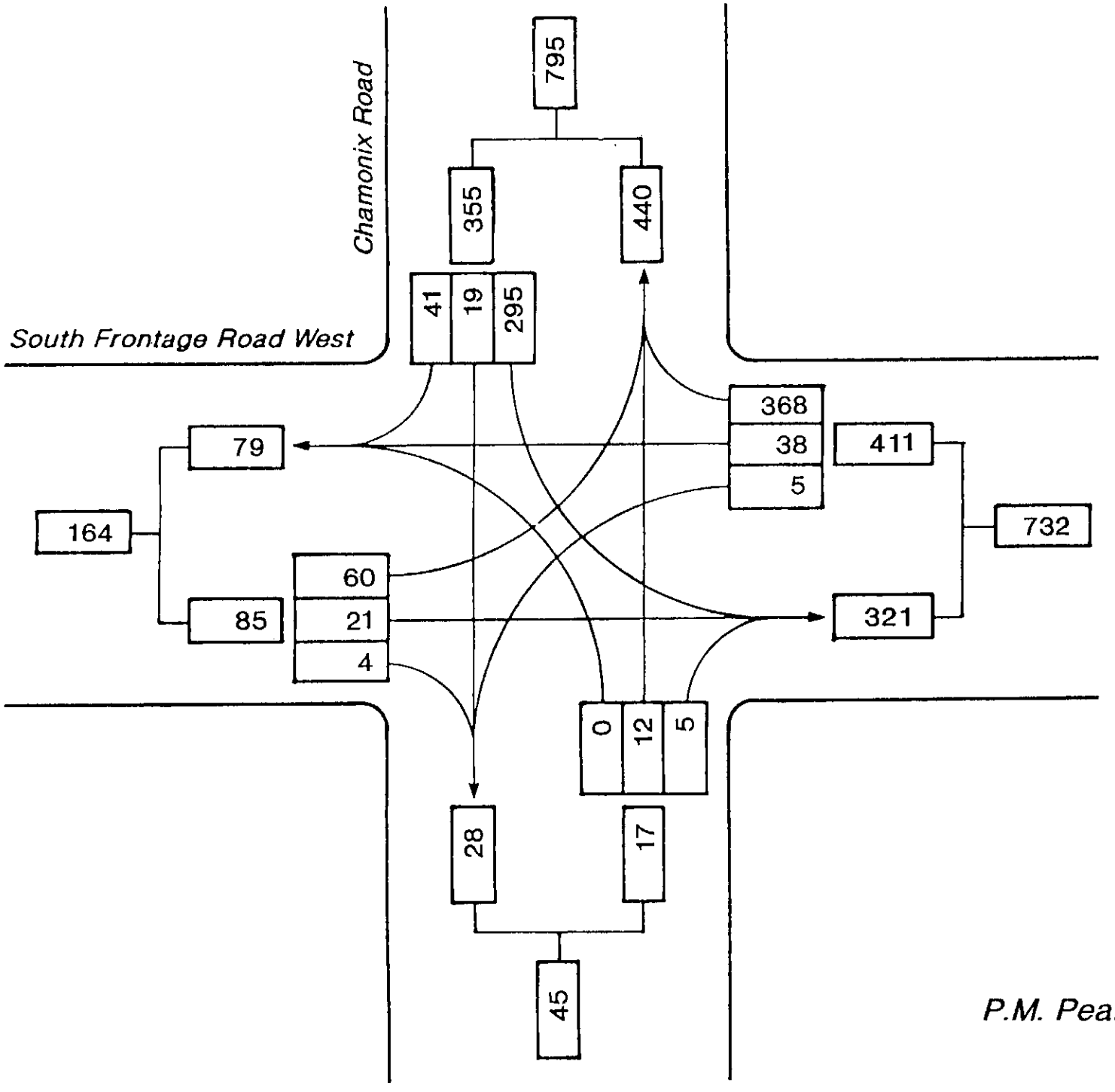


Figure 21a
P.M. Peak Hour TMC
July 1990

FELSBURG
HOLT &
ULLEVIG

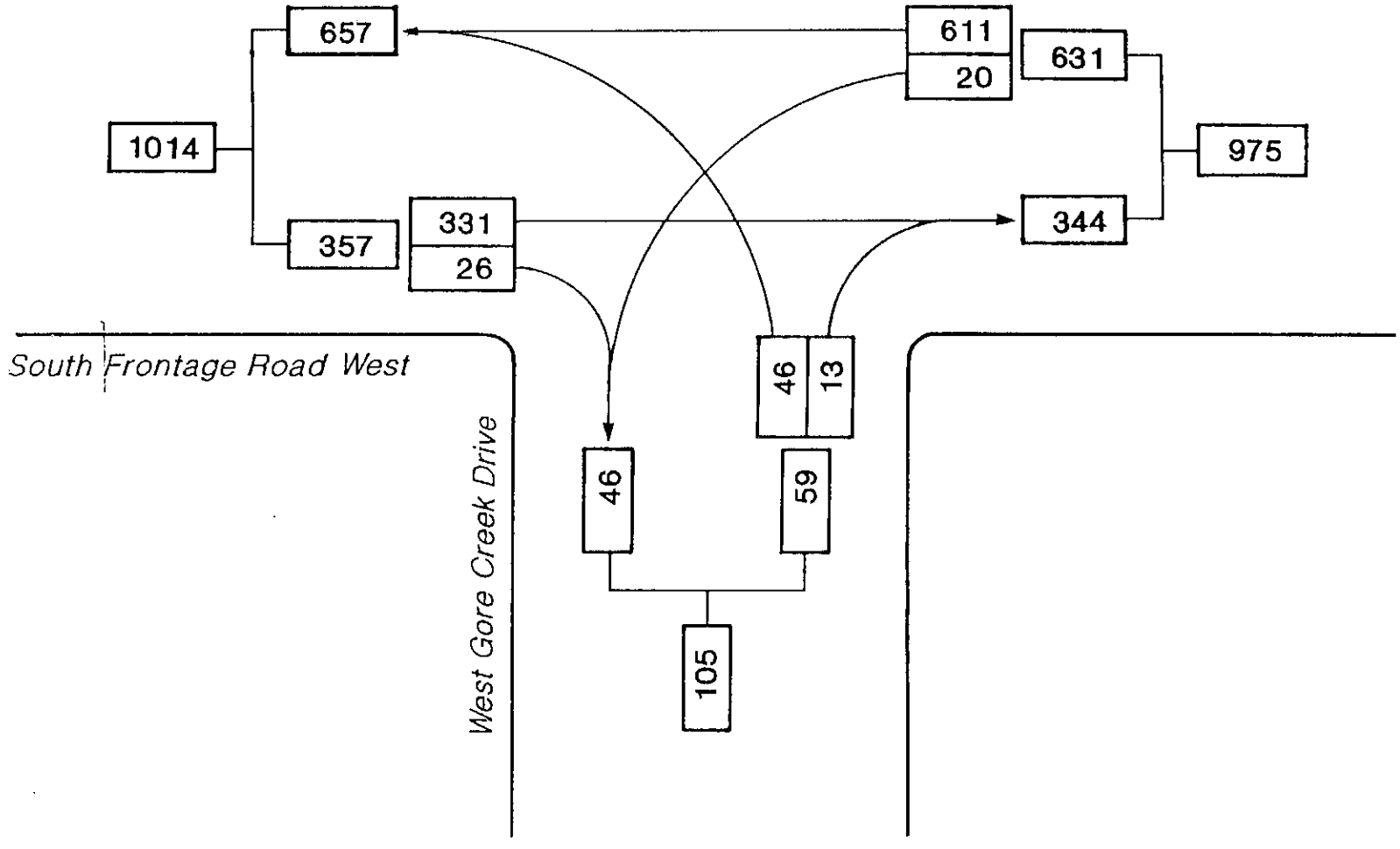


Figure 22

P.M. Peak Hour TMC

March 1990

FELSBURG
HOLT &
ULLEVIG

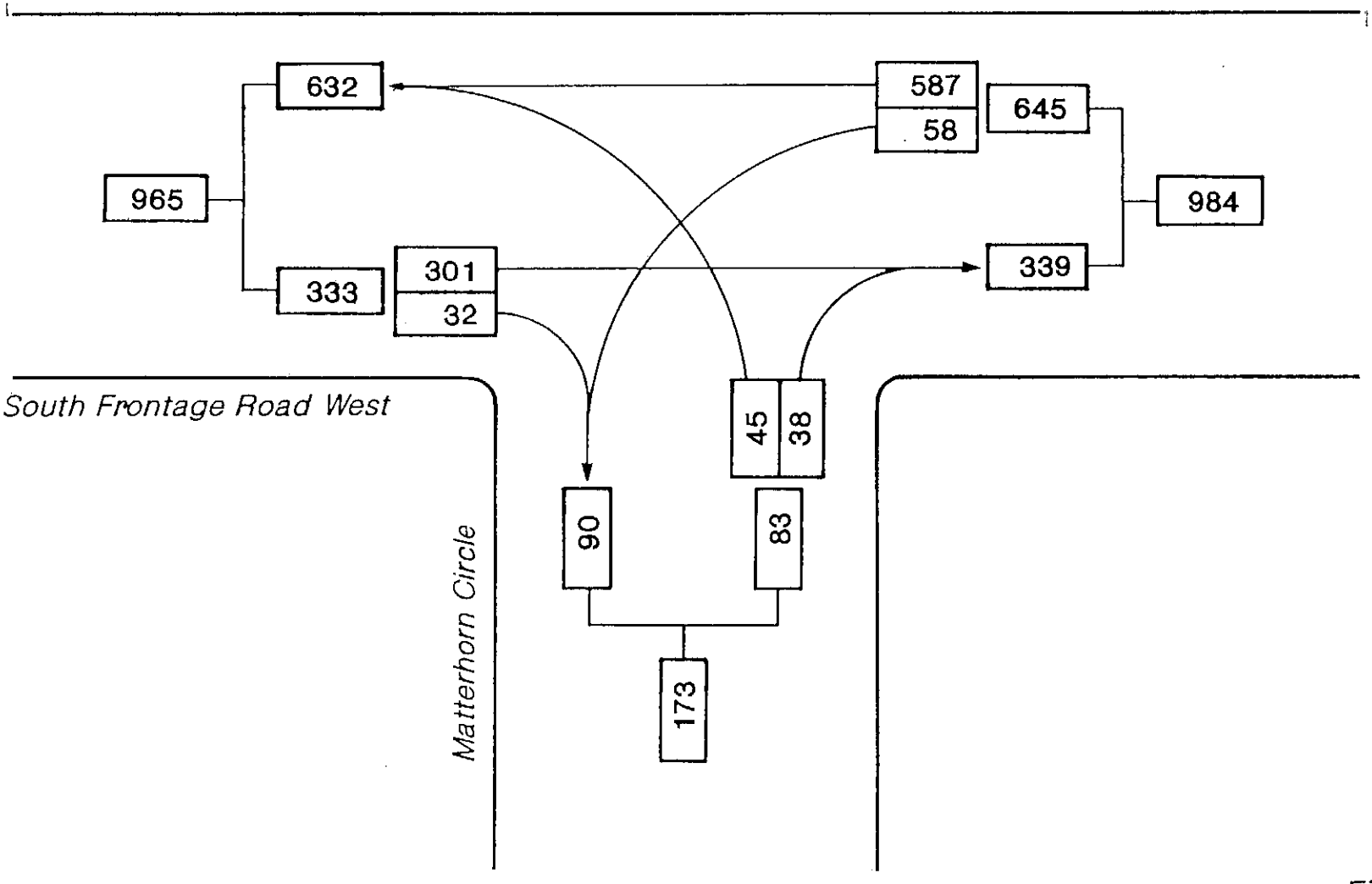


Figure 23

P.M. Peak Hour TMC

March 1990

North

FELSBURG
HOLT &
ULLEVIG

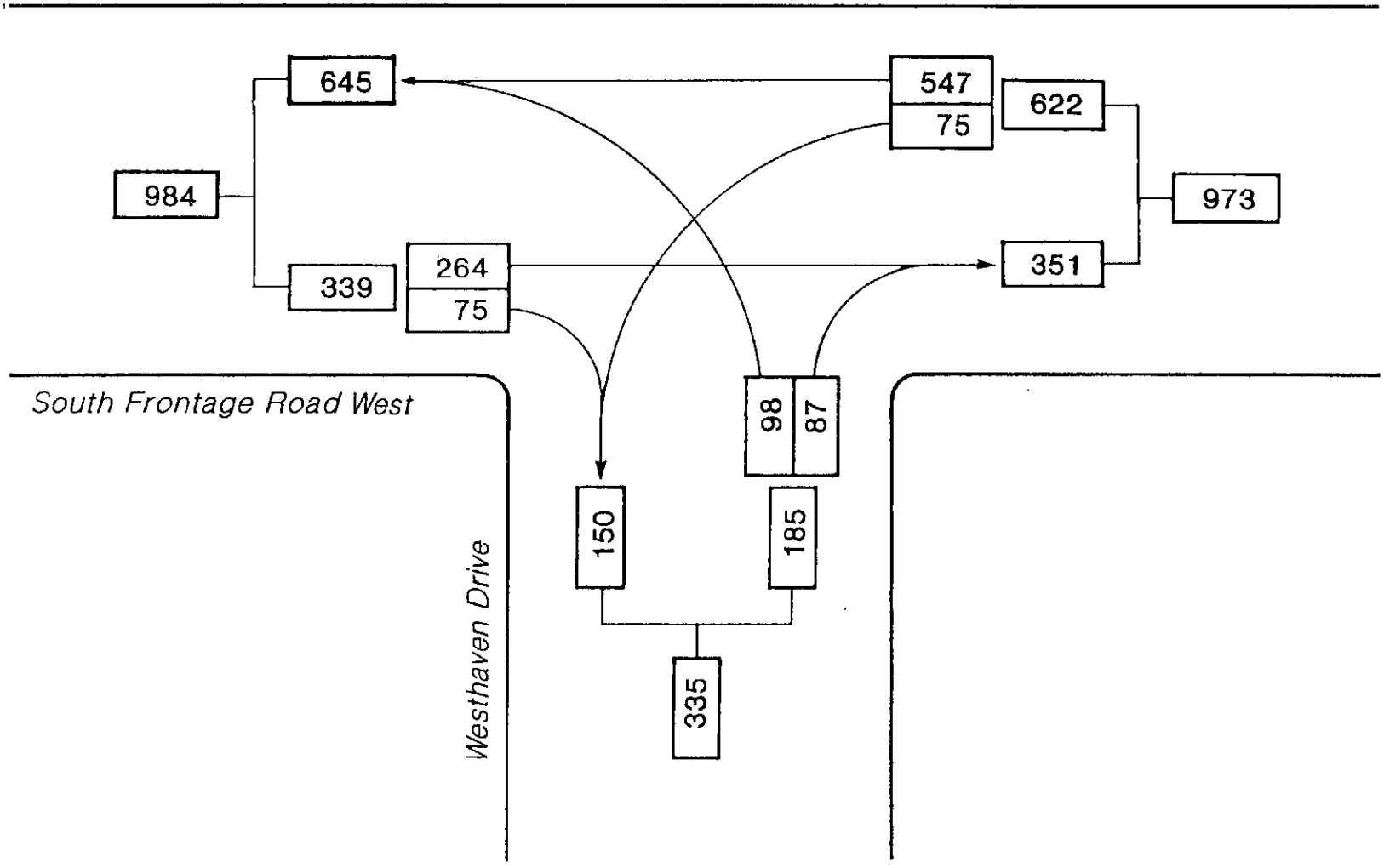


Figure 24

P.M. Peak Hour TMC

March 1990

North

FELSBURG
HOLT &
ULLEVIG

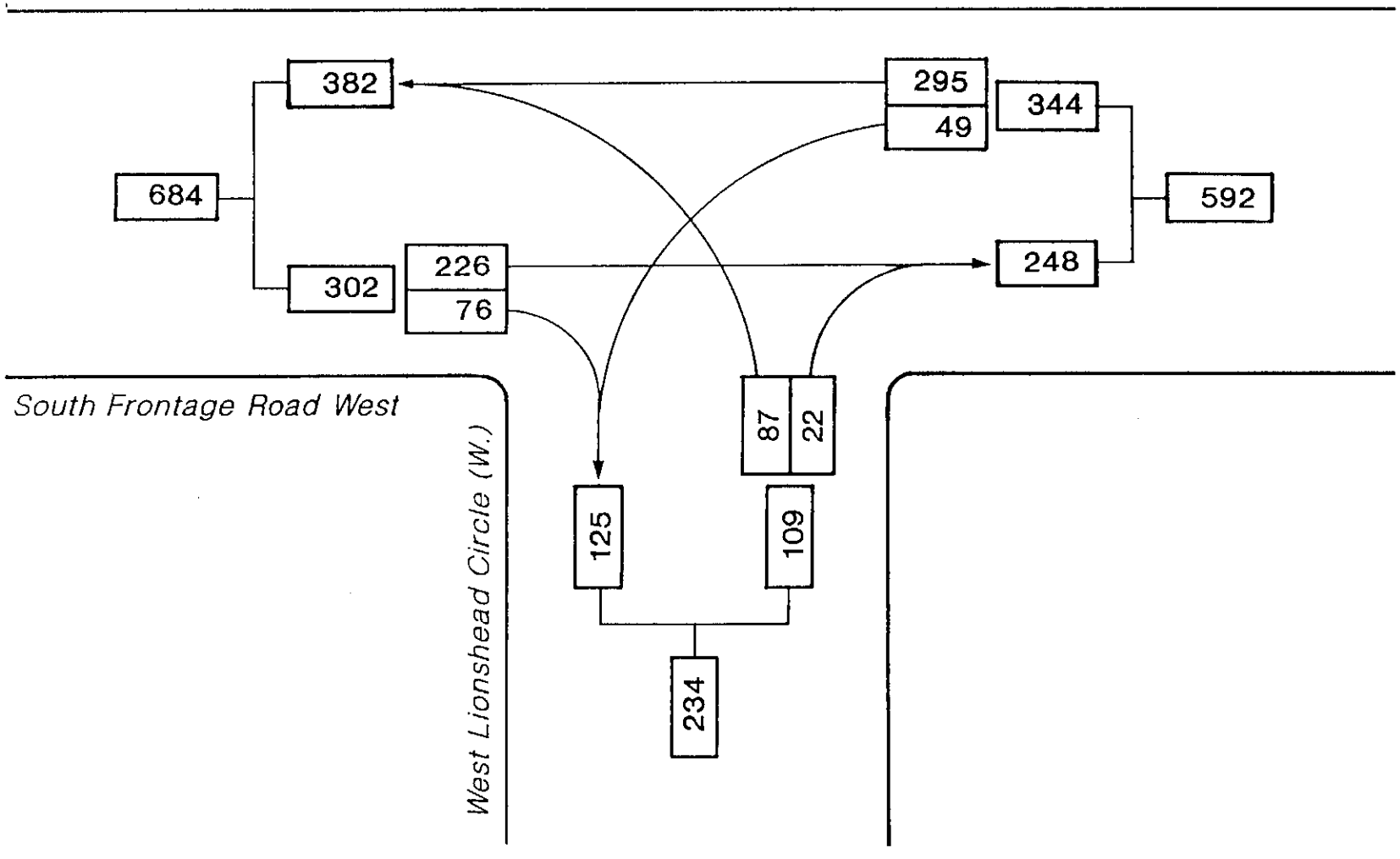


Figure 25

P.M. Peak Hour TMC
March 1990

FELSBURG
HOLT &
ULLEVIG

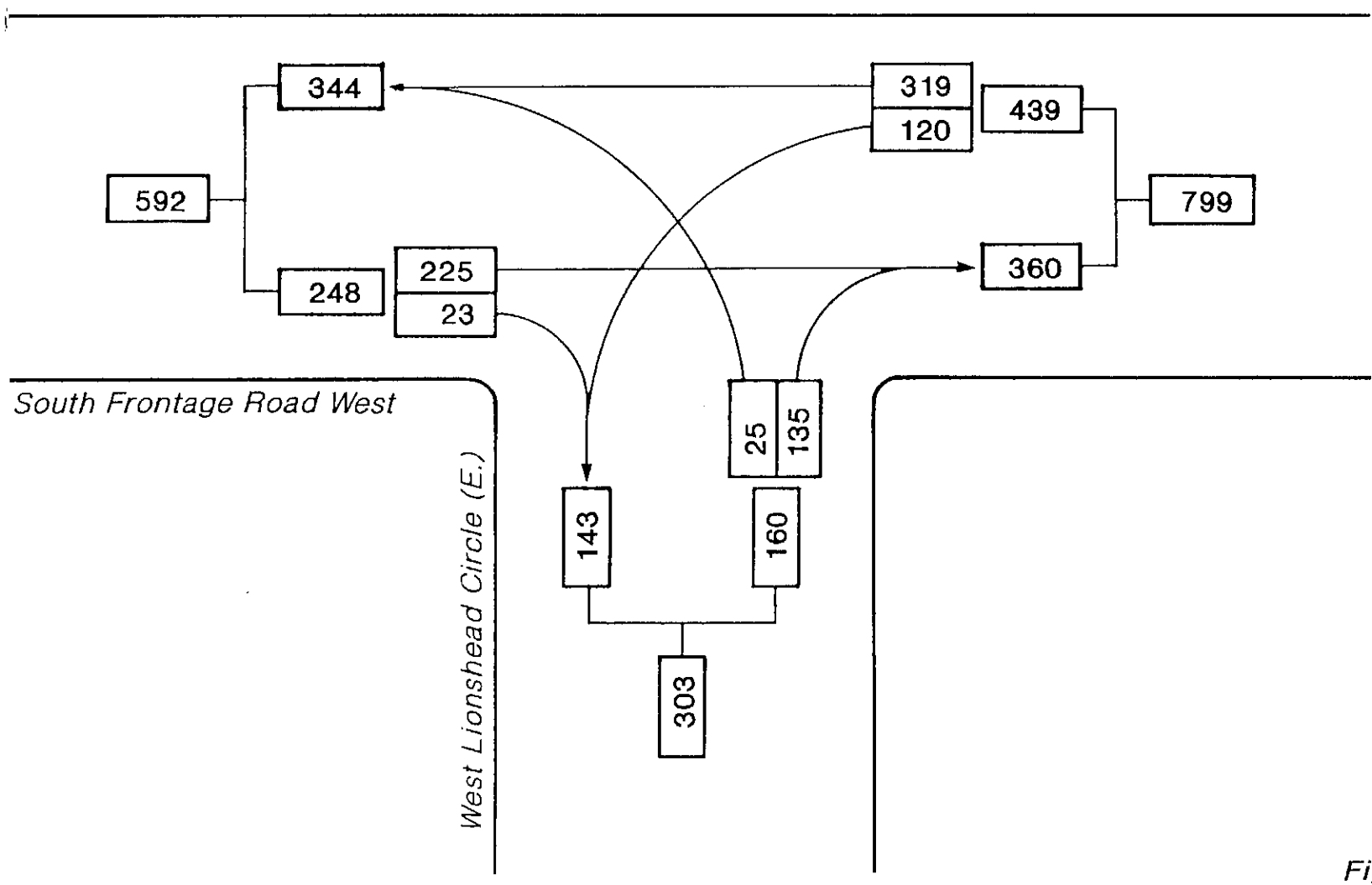


Figure 26

P.M. Peak Hour TMC

March 1990

APPENDIX D

EXISTING PEAK HOUR INTERCHANGE TRAVEL PATTERNS

FELSBURG
HOLT &
ULLEVIG

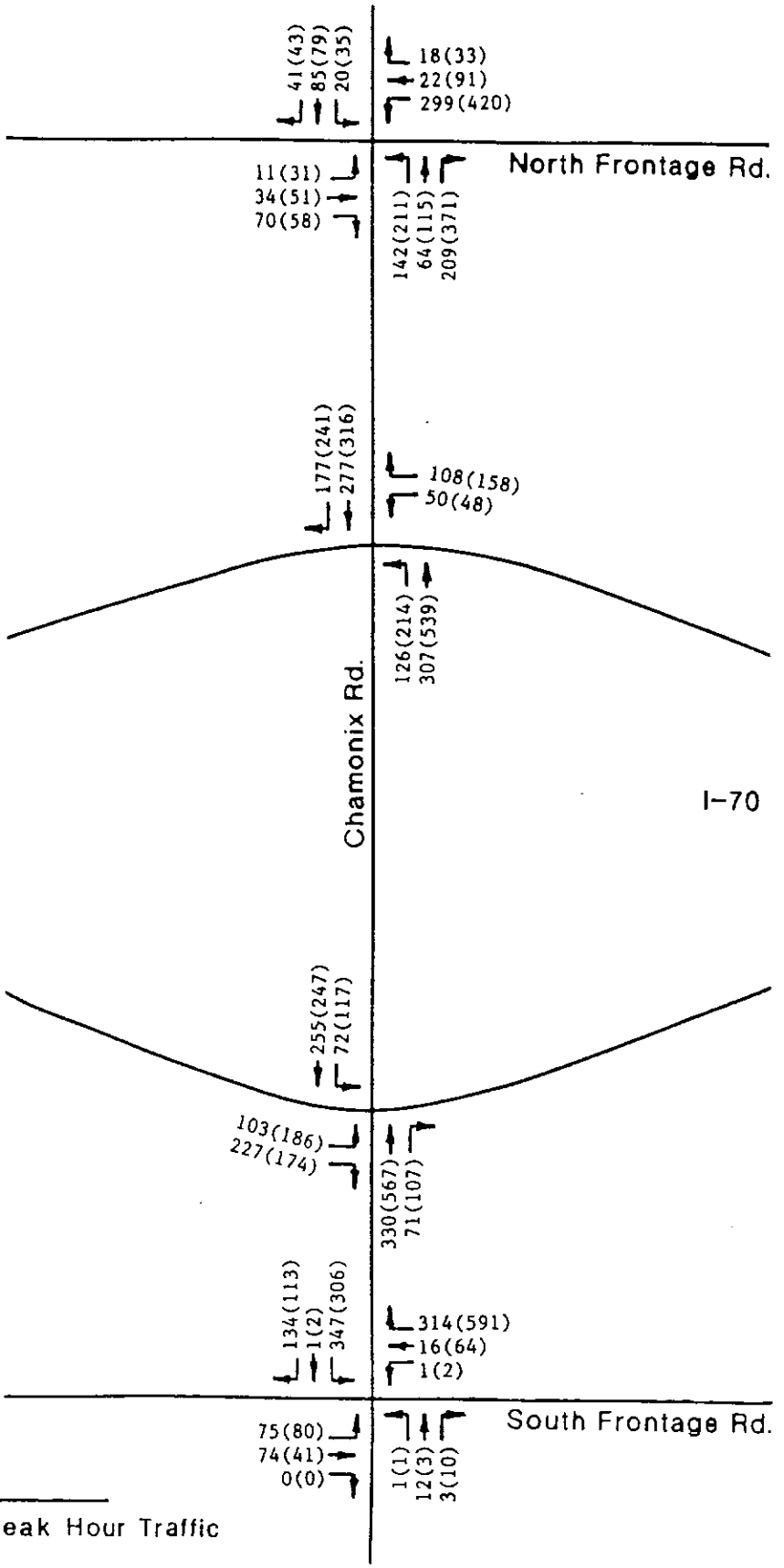


Figure 1

West Vail Interchange Turning Movement Counts

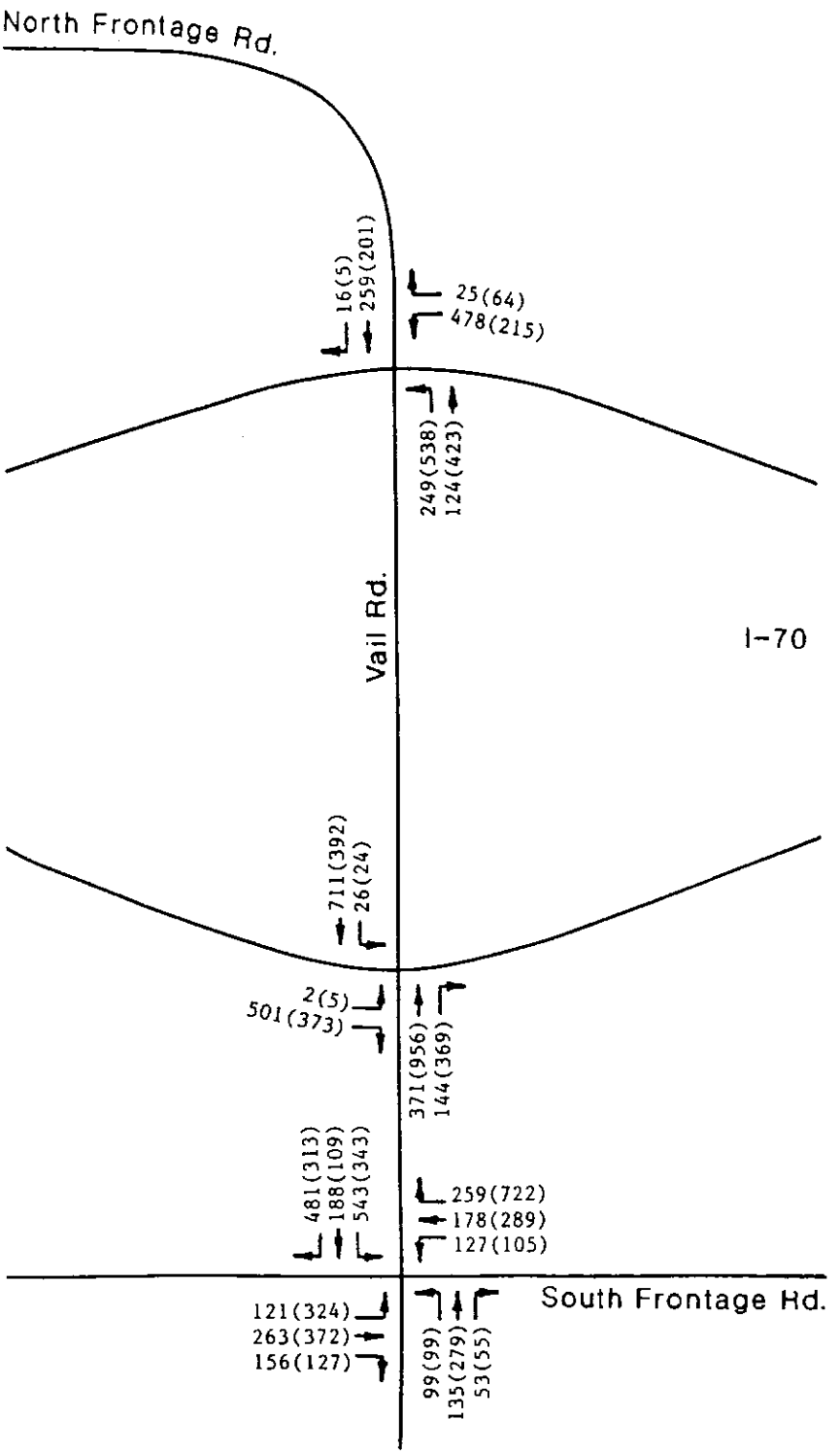
March, 1990

North

West Vail Interchange Routing Movements, March, 1990

From/To	N. Frontage Road West Leg	N. Frontage Road East Leg	Chamonix North Leg	WB On Ramp	EB On Ramp	S. Frontage Road West Leg	S. Frontage Road East Leg	Chamonix South Leg
A.M. Peak Hour								
N. Frontage Rd. - West Leg	-	34	11	28	11	9	22	-
N. Frontage Rd. - East Leg	22	-	18	116	48	37	97	1
Chamonix - North Leg	41	20	-	33	13	11	28	-
WB Off Ramp	37	54	17	-	-	14	36	-
EB Off Ramp	36	51	16	-	-	63	164	-
S. Frontage Rd. - West Leg	13	19	6	24	13	-	74	-
S. Frontage Rd. - East Leg	56	80	24	101	53	16	-	1
Chamonix - South Leg	0	5	1	1	5	1	3	-
P.M. Peak Hour								
N. Frontage Rd. - West Leg	-	51	31	25	15	4	13	1
N. Frontage Rd. - East Leg	91	-	33	178	87	41	114	-
Chamonix - North Leg	43	35	-	38	15	8	18	-
WB Off Ramp	48	85	25	-	-	13	34	1
EB Off Ramp	60	96	30	-	-	47	127	-
S. Frontage Rd. - West Leg	11	23	6	27	13	-	41	-
S. Frontage Rd. - East Leg	92	165	54	187	93	64	-	2
Chamonix - South Leg	-	2	-	-	1	1	1	-

FELSBURG
HOLT &
ULLEVIG



Legend

XX(XX) AM(PM) Peak Hour Traffic

Figure 2

Main Vail Interchange Turning Movement Counts

March, 1990

North

Main Vail Interchange Routing Movements, March, 1990

From/To	S. Frontage Road East Leg	Vail Road	S. Frontage Road West Leg	EB On Ramp	WB On Ramp	N. Frontage Road
A.M. Peak Hour						
S. Frontage Rd. - East Leg	-	127	178	42	146	71
Vail Road	53	-	99	35	67	33
S. Frontage Rd. - West Leg	263	156	-	67	36	18
EB Off Ramp	204	48	249	-	-	2
WB Off Ramp	228	94	156	-	-	25
N. Frontage Rd.	111	46	76	26	16	-
P.M. Peak Hour						
S. Frontage Rd. - East Leg	-	105	289	117	341	264
Vail Road	55	-	99	73	116	90
S. Frontage Rd. - West Leg	372	127	-	179	81	64
EB Off Ramp	154	34	185	-	-	5
WB Off Ramp	104	41	70	-	-	64
N. Frontage Rd.	85	34	58	24	5	-

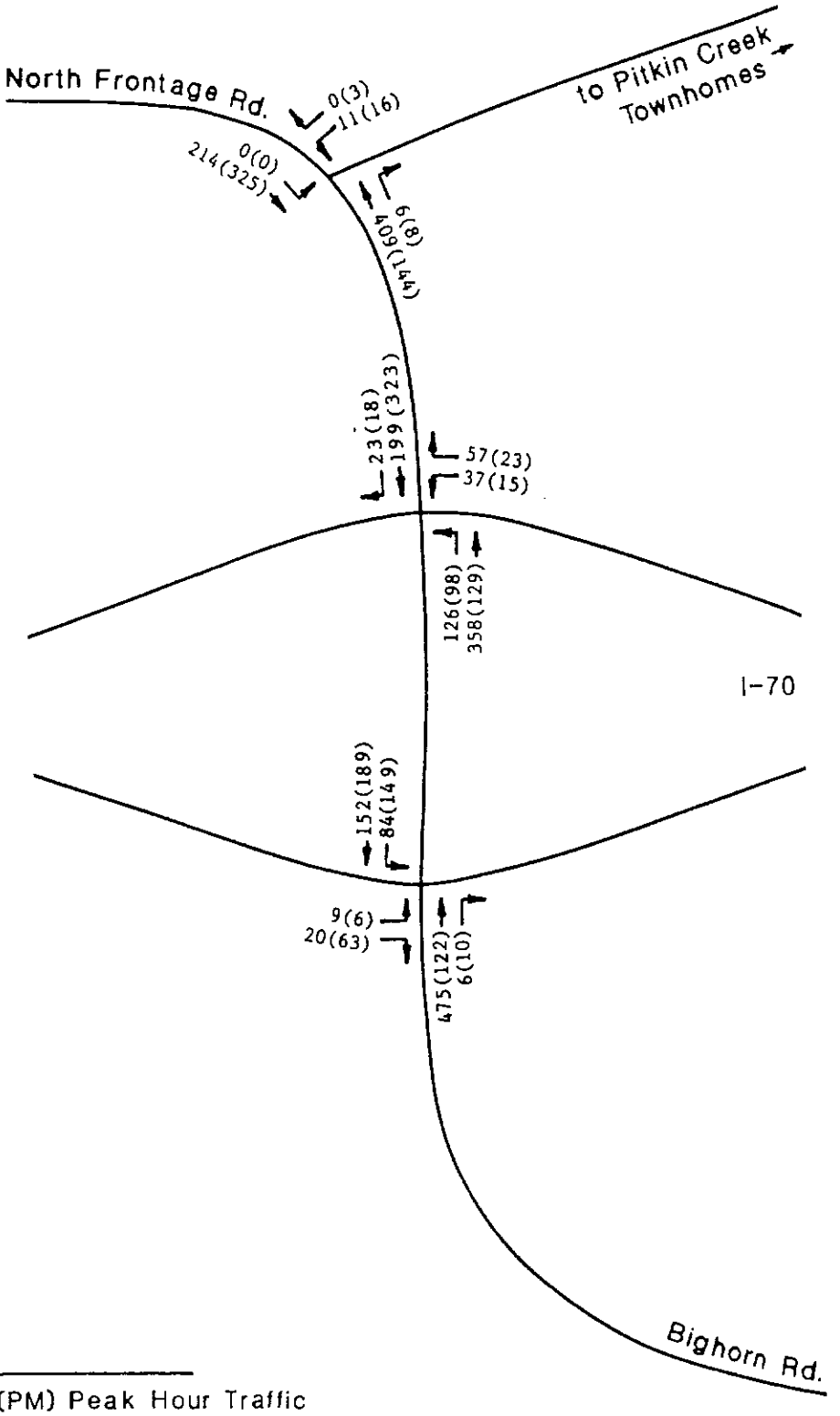


Figure 3

East Vail Interchange Turning Movement Counts

March, 1990

North

East Vail Interchange Routing Movements, March, 1990

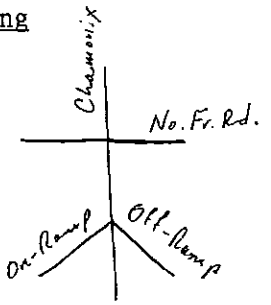
From/To	N. Frontage Road	Pitkin Cr. T.H.	WB On Ramp	EB On Ramp	Bighorn Rd.
A.M. Peak Hour					
N. Frontage Rd.	-	-	12	84	115
Pitkin Cr. T.H.	-	-	11	-	-
WB Off Ramp	54	3	-	-	37
EB Off Ramp	6	3	-	-	20
Bighorn Road	349	-	126	6	-
P.M. Peak Hour					
N. Frontage Rd.	-	-	10	149	166
Pitkin Cr. T.H.	3	-	8	-	8
WB Off Ramp	18	5	-	-	15
EB Off Ramp	3	3	-	-	63
Bighorn Road	123	-	98	10	-

APPENDIX E

WEST VAIL INTERCHANGE LOS ANALYSIS

WEST VAIL INTERCHANGE LOS ANALYSIS - NORTH SIDE OF INTERCHANGE

Existing



P.M. Peak Existing Volumes - North Side

4-way Stop Analysis (Highway Capacity Manual)

EB and WB Approaches - 544 + 140 = 684

NB and SB Approaches - 157 + 753 = 910

Off-Ramp - 206 (add to lower of EB-WB & NB-SB)

EW - 890, NS - 910 → LOS C is 1,193 (2 x 2 assume V/C = 0.75)

Total Approximate Volume = 1,800; Multiply by 5/4 to account for 5-legged intersection (increase driver confusion, etc.)

Eff. Total Approximate Volumes = 2,250

2,250/(1,193/0.75) = 1.41

Future - No Improvements

Projected volumes are 18% higher than existing

1.41 x 1.18 = 1.67

Future Volumes with Simba Run Underpass

Revised volumes with Underpass (Existing P.M.)

V/C will still be >1.0 with All-Way Stop Control. Try DRC (Signal) Analysis

WEST VAIL INTERCHANGE LOS ANALYSIS - NORTH SIDE OF INTERCHANGE

With existing configuration, a 5-phase signal would be most appropriate (1 phase for each approach).

Sum Critical Movements

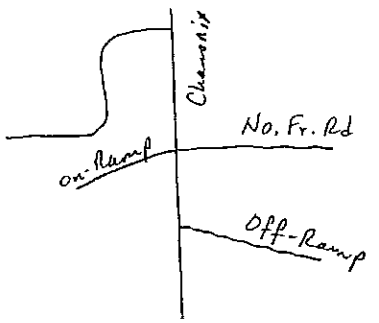
148 ↓ 140 → 498 ← 591 ↑ 206 ↖ = 1,583

18% Growth Yields 1,868

For 5-phase signal, LOS E/F Threshold (V/C = 10.0) is Approximately

1,325 - 1,868/1,325 = 1.41

Future Volumes with Underpass and Reconfiguration (Included Adding Lanes)



Revised Existing P.M. Peak

Unsignalized intersection analysis done for north "T" intersection - operates OK. (Analysis on Next Page)

South intersection will probably require DRC. Sum Critical Movements (4-Phases)

124 + 330 + 591 + 158 = 1,203; x 1.18 for Growth = 1,420

LOS E/F for 4-Phase Signal is 1,375

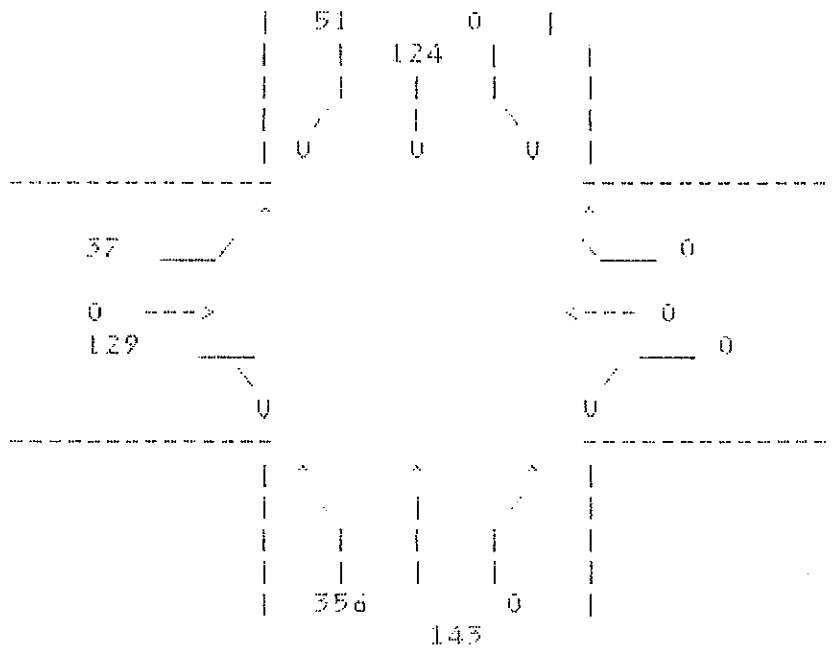
1,420/1,375 = 1.03

3/6

UNSIGNALIZED INTERSECTION CAPACITY ANALYSIS

INTERSECTION: CHAM/RE-AL N. FRNT

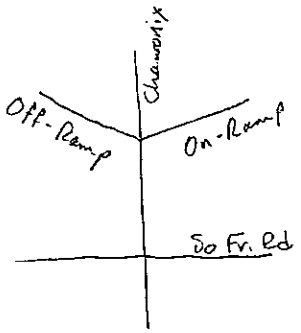
TIME PERIOD: 1.18 FACTOR PM JOB: VAIL TP



	MAJOR ROADWAY (35 MPH)		MINOR ROADWAY (1-WAY STOP)	
APPROACH	NB	SB	EB	WB
MOVEMENT	L		L R	
CONTROL	UNC		STOP STOP	
VOLUME (VPH)	356		37 129	
VOLUME (PCPH)	392		41 142	
CONFLICTING FLOW	175		649 150	
CRITICAL GAP (SEC)	4.5		6.0 5.0	
POTENTIAL CAPACITY	1125		453 1036	
PERCENT OF CAPACITY	35		14	
IMPEDENCE FACTOR	0.74		0.91	
ACTUAL CAPACITY	1125		336 1036	
SHARED LANES				
SHARED LANE CAPACITY				
RESERVE CAPACITY	735		296 894	
LEVEL OF SERVICE	A		C A	
AVERAGE QUEUE				
AVERAGE DELAY (SEC)				

WEST VAIL INTERCHANGE LOS ANALYSIS - SOUTH SIDE OF INTERCHANGE

Existing



P.M. Peak Existing Volumes

4-Way Stop Analysis (Highway Capacity Manual)

EB and WB Approaches - 657 + 121 = 778

NB and SB Approaches - 364 + 14 = 378

Off-Ramp - 360 (add to lower of EB-WB and NB-SB)

EW - 778, NS - 738 → LOPS C is 1,184 (assume V/C - 0.75)

Total Approximate Volume = 1,516; Multiply by 5/4 to account for 5-legged intersection (increased driver confusion, etc.)

Eff. Total Approximate Volume = 1,895

1,895/(1,189/0.75) = 1.20

Future - No Improvements

Projected volumes are 18% higher than existing 1.20 x 1.18 = 1.42

Future Volumes with Simba Run Underpass

Revised Volumes with Underpass (Existing P.M.)

Try 4-Way Stop Analysis

EB and WB Approaches - 495 + 121 = 616

NB and SB Approaches - 277 + 14 = 291

Off-Ramp Approach - 360 (add to smaller of EB-WB and NB-SB)

WEST VAIL INTERCHANGE LOS ANALYSIS - SOUTH SIDE OF INTERCHANGE

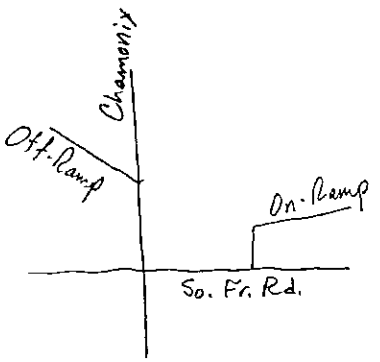
EW - 616, NS - 651 → LOS C is 1,185 (2 x 2 assume V/C = 0.75)

Total Approximate Volume = 1,267; Multiply by 5/4 to account for 5-legged intersection (increase driver confusion, etc.)

Eff. Total Approximate Volume = 1,584; Multiply by 1.18 for growth → 1,584 x 1.18 = 1,869

1,869/(1,185/0.75) = 1.18

Future Volumes with Underpass and Reconfiguration (Included Adding Lanes)



Revised Existing P.M. Peak

Unsignalized analysis done for EB on-ramp intersection - operates OK (see next page)

Chamonix/S. Frontage Road intersection needs to be evaluated - try 4-Way STOP

EB and WB Approaches	-	402 + 121 = 523
NB and WB Approaches	-	277 = 14 = 291
Off-Ramp	-	360 (add to smaller of EB-WB and NB-SB)

EW - 523, NS - 651, LOS C is 1,425 (assume V/C = 0.75) average of 2 x 2 and 2 x 4

Total Approximate Volume = 1,174; multiply by (something less than 5/4 to account for multi-leg intersection. Do not use 5/4 since intersection was cleaned up some with relocation of EB on-ramp). Use 1.2

1,174 x 1.2 = 1,409

Multiply by 1.18 to account for growth

1.18 x 1,409 = 1,662

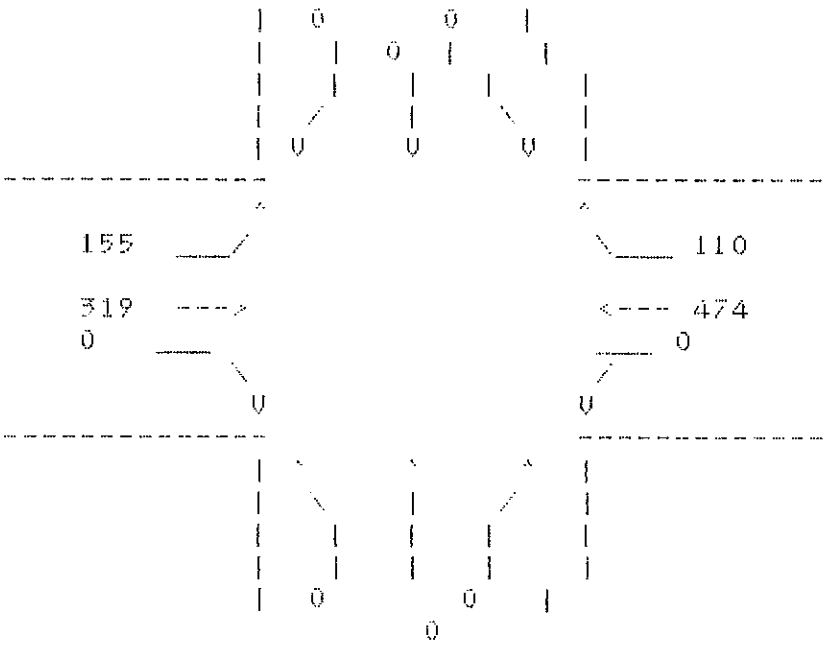
1,662/(1,425/0.75) = 0.87

6/6

UNSIGNALIZED INTERSECTION CAPACITY ANALYSIS

INTERSECTION: S. Fr. Rd./EB On Ramp

TIME PERIOD: 1.18 factor PM W/UP JOB: Vail TP



	MAJOR ROADWAY (35 MPH)		MINOR ROADWAY (2-WAY STOP)	
APPROACH	EB	WB	NB	SB
MOVEMENT	L			
CONTROL	UNC			
VOLUME (VPH)	155			
VOLUME (PCPH)	171			
CONFLICTING FLOW	584			
CRITICAL GAP (SEC)	4.5			
POTENTIAL CAPACITY	734			
PERCENT OF CAPACITY	23			
IMPEDENCE FACTOR	0.84			
ACTUAL CAPACITY	734			
SHARED LANES				
SHARED LANE CAPACITY				
RESERVE CAPACITY	504			
LEVEL OF SERVICE	A			
AVERAGE QUEUE				
AVERAGE DELAY (SEC)				

APPENDIX F

MAIN VAIL INTERCHANGE LOS ANALYSIS

MAIN VAIL INTERCHANGE LOS ANALYSIS - VAIL ROAD/NORTH RAMPS

Existing

Critical movement at this intersection is the left turn off of the ramp. Both A.M. and P.M. volumes were evaluated and it was found that the A.M. peak hour was more critical. Unsignalized analysis (next page) yield a LOS F with reserve capacity at 156. LOS thresholds are as follows:

> - 400	LOS A →	<0.60
300 - 400	LOS B →	0.60 to 0.70
200 - 300	LOS C →	0.70 to 0.80
100 - 200	LOS D →	0.80 to 0.90
0 - 100	LOS E →	0.90 to 1.00
< 0	LOS F →	1.00
		Assign V/C Ratio to Thresholds

1 vehicle of reserve capacity would be equivalent to 0.001 of V/C. So, 156 is 1.156 or 1.16 for left turn in A.M. peak hour.

Future - No Improvements

Volumes were increased 18% and analysis was redone

Reserve Capacity is 325
From Above, V/C = 1.325, say 1.33 A.M. Peak

Future - With Simba Run Underpass

Volumes were adjusted to reflect UP (page 4 for analysis)

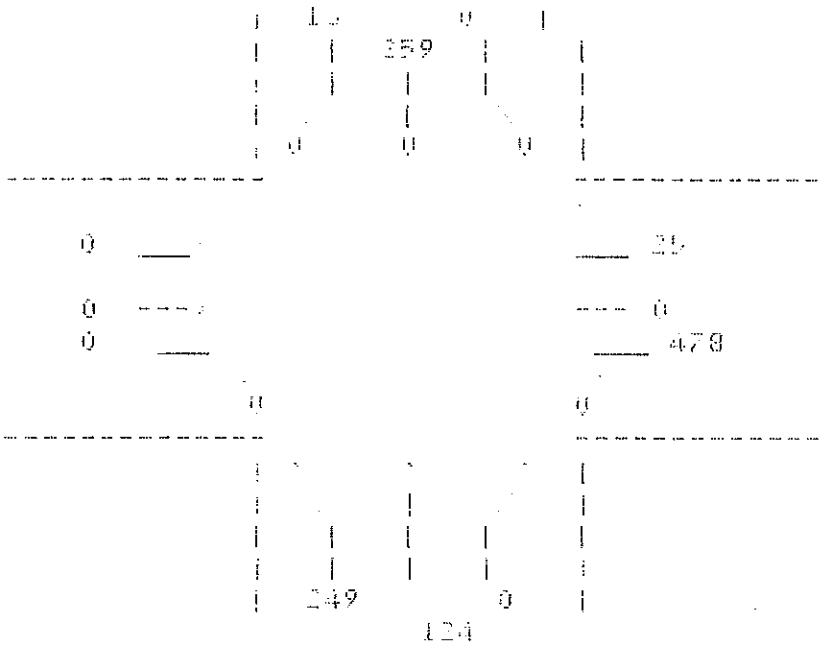
Reserve Capacity is 209
From Above, V/C = 1.209, say 1.21 A.M. Peak

2/17

UNSIGNALIZED INTERSECTION CAPACITY ANALYSIS

INTERSECTION: N. FRNT WB I-70

TIME PERIOD: DO NOTHING EXIST AM JOB: VAIL TP



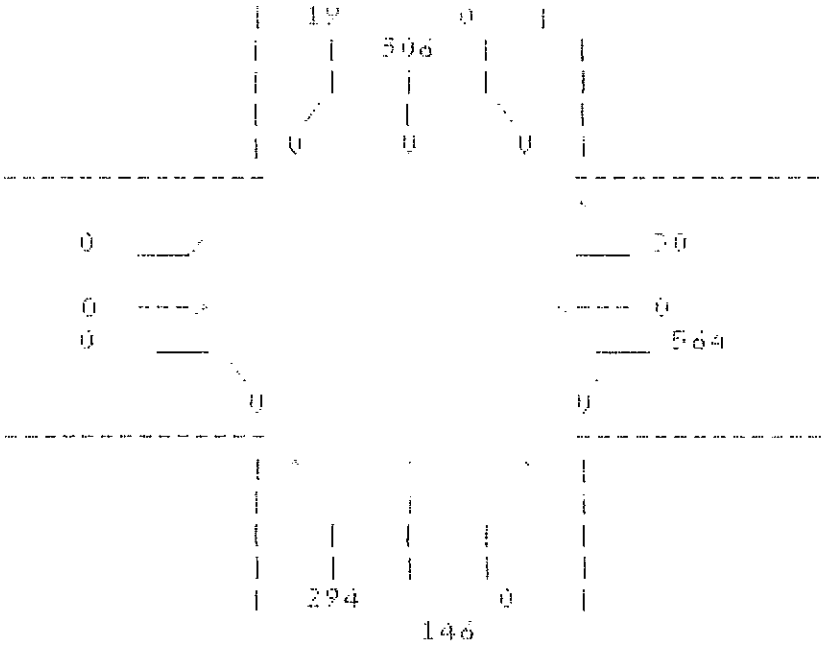
	MAJOR ROADWAY (35 MPH)		MINOR ROADWAY (1-WAY STOP)	
APPROACH	NB	SB	EB	WB
MOVEMENT	L		L	R
CONTROL	UNC		STOP	STOP
VOLUME (VPH)	349		478	35
VOLUME (PCPH)	374		526	38
CONFLICTING FLOW	375		648	124
CRITICAL GAP (SEC)	4.5		6.0	5.0
POTENTIAL CAPACITY	1025		454	1064
PERCENT OF CAPACITY	27			3
IMPEDENCE FACTOR	0.81			0.98
ACTUAL CAPACITY	1025		370	1064
SHARED LANES				
SHARED LANE CAPACITY				
RESERVE CAPACITY	751		-156	1036
LEVEL OF SERVICE	A		F	A
AVERAGE QUEUE				
AVERAGE DELAY (SEC)				

UNSIGNALICED INTERSECTION CAPACITY ANALYSIS

3/17

INTERSECTION: N. FRNT. WB I-70

TIME PERIOD: DO NOTHING FUTURE AM JOB: VAIL TP



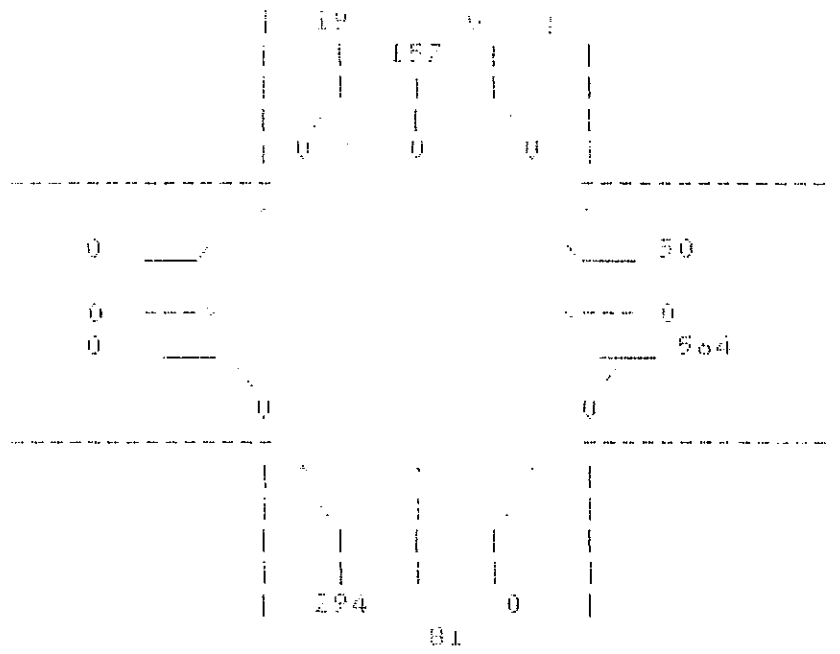
	MAJOR ROADWAY (35 MPH)		MINOR ROADWAY (1-WAY STOP)	
APPROACH	NB	SB	EB	WB
MOVEMENT	L			L R
CONTROL	UNC			STOP STOP
VOLUME (VPH)	294			564 30
VOLUME (PCPH)	323			620 33
CONFLICTING FLOW	325			765 146
CRITICAL GAP (SEC)	4.5			6.0 5.0
POTENTIAL CAPACITY	975			339 1039
PERCENT OF CAPACITY	33			3
IMPEDENCE FACTOR	0.76			0.98
ACTUAL CAPACITY	975			295 1039
SHARED LANES				
SHARED LANE CAPACITY				
RESERVE CAPACITY	652			-325 1006
LEVEL OF SERVICE	A			F A
AVERAGE QUEUE				
AVERAGE DELAY (SEC)				

4/17

UNSIGNALIZED INTERSECTION CAPACITY ANALYSIS

INTERSECTION: N. FRNT. WB I-70

TIME PERIOD: DO NOTHING FUTURE AM WITH UNDERPASS JOB: VAIL II



	MAJOR ROADWAY (35 MPH)		MINOR ROADWAY (1-WAY STOP)	
APPROACH	NB	SB	EB	WB
MOVEMENT	L			L R
CONTROL	UNC			STOP STOP
VOLUME (VPH)	294			504 30
VOLUME (PCPH)	323			620 33
CONFLICTING FLOW	176			551 81
CRITICAL GAP (SEC)	4.5			6.0 5.0
POTENTIAL CAPACITY	1134			514 1111
PERCENT OF CAPACITY	29			3
IMPEDENCE FACTOR	0.80			0.98
ACTUAL CAPACITY	1124			411 1111
SHARED LANES				
SHARED LANE CAPACITY				
RESERVE CAPACITY	801			-209 1078
LEVEL OF SERVICE	A			F A
AVERAGE QUEUE				
AVERAGE DELAY (SEC)				

MAIN VAIL INTERCHANGE LOS ANALYSIS - VAIL ROAD/NORTH RAMPS

Future - Alternative 3 (Red Sandstone Partial Interchange) and Underpass

This interchange alternative does not affect operations along the north side of the interchange.

the V/C is identical to the previous calculations

1.21 A.M. Peak

Future - Alternative 7 (Vail Valley Connection) and Underpass

This interchange alternative simplifies the north ramps intersection; only two movements would be occurring - the left turn onto the WB on-ramp and the left turn off of the WB off-ramp. An unsignalized LOS analysis was run (p.56) with a resulting reserve capacity of 45 vehicles for the left turn off. From page 1,

V/C = 0.955 or 0.96 A.M. peak

Future - Alternative 8 (Booth Falls Ramps) and Underpass

North ramp operations would be divided in this alternative. The left turns onto WB on-ramp would remain at the Main Vail interchange, but they would be the only movement along the north side of the interchange and would be free flow. Hence, there is no longer an intersection at that location and therefore no intersection LOS problems.

The left turns off of WB off-ramp would now take place near Booth Falls. An unsignalized LOS analysis of A.M. peak volumes there yielded a LOS F for left turns off of the off-ramp. Therefore, an all-way STOP analysis was done as follows:

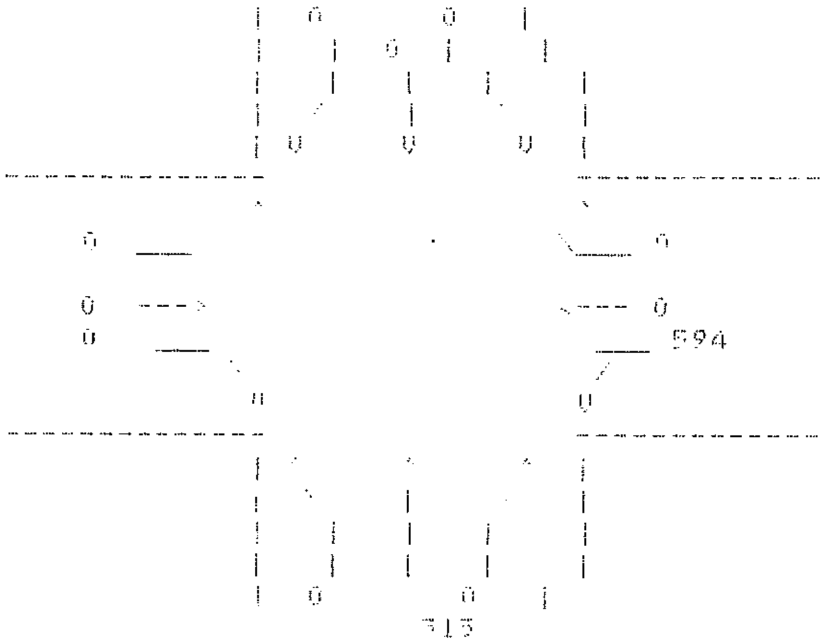
Felsburg Holt & Ullevig 09-05-1990

6/17

UNSIGNALIZED INTERSECTION CAPACITY ANALYSIS

INTERSECTION: VAIL RD/WB RAMPS

TIME PERIOD: 1.18 AM EXTENDED FR RD. Alt. 7 With Underpass JOB: VAIL TP



	MAJOR ROADWAY (55 MPH)		MINOR ROADWAY (1-WAY STOP)	
APPROACH	NB	SB	EB	WB
MOVEMENT				L
CONTROL				STOP
VOLUME (VPH)				594
VOLUME (PCPH)				653
CONFLICTING FLOW				313
CRITICAL GAP (SEC)				6.0
POTENTIAL CAPACITY				698
PERCENT OF CAPACITY				
IMPEDENCE FACTOR				
ACTUAL CAPACITY				698
SHARED LANES				
SHARED LANE CAPACITY				
RESERVE CAPACITY				45
LEVEL OF SERVICE				E
AVERAGE QUEUE				
AVERAGE DELAY (SEC)				

MAIN VAIL INTERCHANGE LOS ANALYSIS - VAIL ROAD/NORTH RAMPS

Revise Volumes at Booth Falls Off-Ramp Intersection (Existing A.M. Peak)

NB and SB Approach Volumes - 553

EB and SB Approach Volumes - 345 + 75 = 420

LOS C is 1,118 (assume V/C = 0.75)

Total Approach Volumes = 973

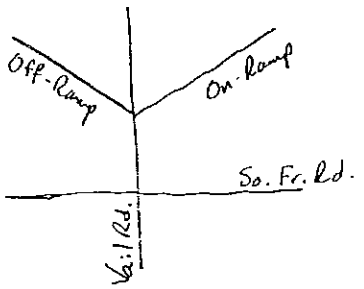
Multiply by 1.18 for Growth → 1,148

1,148/(1,118/0.75) = 0.77

MAIN VAIL INTERCHANGE LOS ANALYSIS - VAIL ROAD/SOUTH FRONTAGE ROAD (4-WAY STOP INTERSECTION)

This intersection is extremely close to the south ramps intersection and could be analyzed as a multi-legged intersection as was done for the West Vail interchange. However, patterns at the south ramps intersection are such that the largest movements are the thru movements along Vail Road and the right turns off of and onto the ramps. Left turns onto and off of the ramps are relatively light, and operations at this intersection will largely depend on operations at the 4-way. Therefore, the 4-way STOP intersection is analyzed separately and is considered to be indicative of the entire area south of the interchange.

Existing



Existing P.M. Peak Traffic (P.M. Peak Hour is Critical)

The intersection is STOP sign controlled but is controlled manually during peak periods which is essentially the same as signal control. Therefore, since a peak hour is being evaluated, this intersection will be analyzed as traffic signal controlled.

Sum Critical Movements (4-Phase Signal)

Total = 1,290

LOS E/F for 4-Phase is 1,375
1,290/1,375 = 0.94 P.M. Peak DRC

MAIN VAIL INTERCHANGE LOS ANALYSIS - VAIL ROAD/SOUTH FRONTAGE ROAD (4-WAY STOP INTERSECTION)

Future - No Improvements

Volumes will increase 18% and so will V/C ratio in this case.

V/C = 1.18 x 0.94 - 1.11 P.M. Peak DRC

Future - with Simba Run Underpass

Revised Volumes to Reflect Underpass (Existing P.M. Peak)

Sum critical movements similar to that done on page.8 (4-phase)

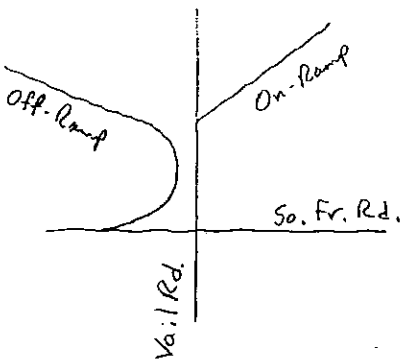
Multiply by 1.18 for growth → 1,494

LOS E/F Threshold for 4-phase Signal is 1,375

1,494/1,375 = 1.09

Future - Alternative 3 (Red Sandstone Partial Interchange) with Underpass

Revise Volumes (Existing P.M. Peak)



SUM CRITICAL MOVEMENTS

MAIN VAIL INTERCHANGE LOS ANALYSIS - VAIL ROAD/SOUTH FRONTAGE ROAD (4-WAY STOP INTERSECTION)

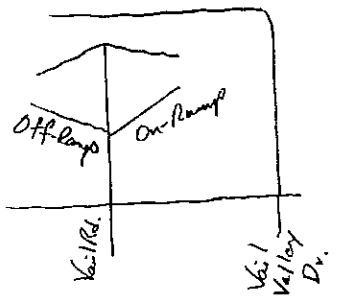
= 1,045

Multiply by 1.18 for Growth → 1,233

LOS E/F Threshold for 4-Phase Signal is 1,375

1,233/1,375 = 0.90

Future - Alternative 7 (Vail Valley Connection) with Underpass



Revised Volumes (Existing P.M. Peak)

SUM CRITICAL MOVEMENTS

Multiply by 1.18 for Growth → 1,396

LOS E/F Threshold for 4 Phase is 1,375

1,396/1,375 = 1.02

Future - Alternative 8 (Booth Falls Ramps) and Underpass

Revised Volumes (Existing P.M. Peak)

SUM CRITICAL MOVEMENTS

MAIN VAIL INTERCHANGE LOS ANALYSIS - VAIL ROAD/SOUTH FRONTAGE ROAD (4-WAY STOP INTERSECTION) SOUTH FRONTAGE ROAD/RED SANDSTONE RAMPS

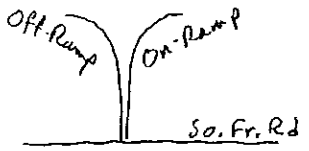
= 1,077

Multiply by 1.18 for Growth → 1,271

LOS E/F Threshold for 4-Phase is 1,375

1,271/1,375 = 0.92

Future - Alternative 3 (Red Sandstone Partial Interchange) with Underpass



Analyze South Frontage Road/Ramps Intersection (Existing P.M. Peak Volumes)

All way STOP control was originally evaluated resulting in LOS F. Therefore, DRC is evaluated (3-phase)

SUM CRITICAL MOVEMENTS

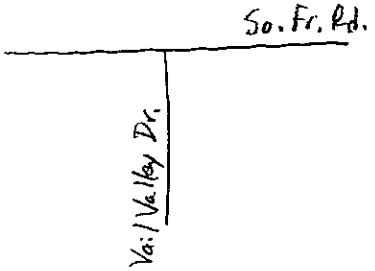
= 1,069

Multiply by 1.18 for growth → 1,261
LOS E/F Threshold for 3-Phase is 1,425
1,261/1,425 = 0.89

MAIN VAIL INTERCHANGE LOS ANALYSIS - SOUTH FRONTAGE ROAD/VAIL VALLEY DRIVE INTERSECTION

Several interchange alternatives have a direct impact on this intersection and it is therefore included in the analysis.

Existing



Existing P.M. Peak Volumes

South frontage road approaches must stop, so conduct an unsignalized LOS analysis (p. 13).

Lowest reserve capacity is 53 (WB approach) and using information derived on p.1, this corresponds to
V/C = 1,053 say 1.05

Future

Volumes are increased 18% and unsignalized analysis is rerun (p.14). Lowest reserve capacity is 239 (WB approach) and using information on p.1, V/C = 1,289 say 1.24

Future with Underpass at Simba Run

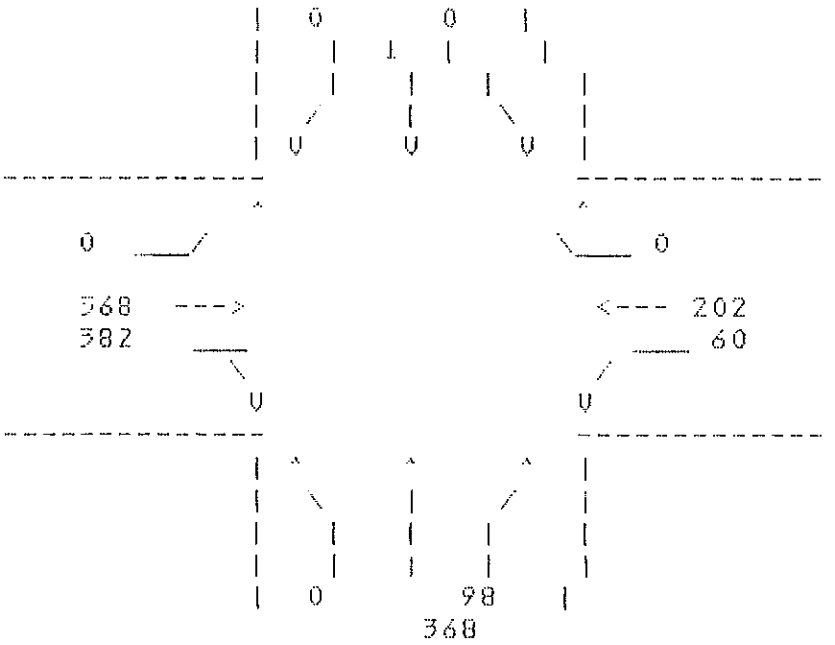
This underpass would not affect the Vail Valley Drive intersection. → still 1.24

13/17

UNSIGNALIZED INTERSECTION CAPACITY ANALYSIS

INTERSECTION: S. FR./VAIL VALLEY

TIME PERIOD: EXISTING PM JOB: VAIL TP



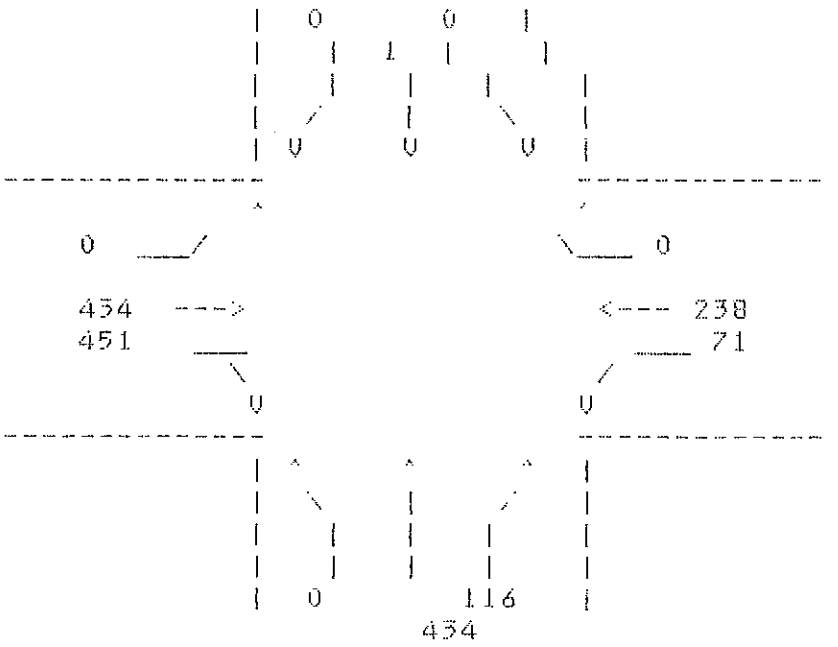
	MAJOR ROADWAY (35 MPH)		MINOR ROADWAY (2-WAY STOP)			
APPROACH	NB	SB	EB		WB	
MOVEMENT			T	R	L	T
CONTROL			STOP	STOP	STOP	STOP
VOLUME (VPH)			368	382	60	202
VOLUME (PCPH)			405	420	66	222
CONFLICTING FLOW			467	1	1168	418
CRITICAL GAP (SEC)			5.5	5.0	6.0	5.5
POTENTIAL CAPACITY			650	1199	213	687
PERCENT OF CAPACITY			62	35		32
IMPEDENCE FACTOR			0.47	0.74		0.77
ACTUAL CAPACITY			650	1199	73	687
SHARED LANES						TL
SHARED LANE CAPACITY						236
RESERVE CAPACITY			245	779		-52
LEVEL OF SERVICE			C	A		F
AVERAGE QUEUE						
AVERAGE DELAY (SEC)						

14/17

UNSIGNALIZED INTERSECTION CAPACITY ANALYSIS

INTERSECTION: S. FR./VAIL VALLEY

TIME PERIOD: FUTURE PM JOB: VAIL TP



	MAJOR ROADWAY (35 MPH)		MINOR ROADWAY (2-WAY STOP)			
APPROACH	NB	SB	EB		WB	
MOVEMENT			T	R	L	T
CONTROL			STOP	STOP	STOP	STOP
VOLUME (VPH)			434	451	71	238
VOLUME (PCPH)			477	496	78	262
CONFLICTING FLOW			551	1	1378	493
CRITICAL GAP (SEC)			5.5	5.0	6.0	5.5
POTENTIAL CAPACITY			587	1199	156	630
PERCENT OF CAPACITY			81	41		42
IMPEDENCE FACTOR			0.25	0.68		0.67
ACTUAL CAPACITY			587	1199	27	630
SHARED LANES						TL
SHARED LANE CAPACITY						101
RESERVE CAPACITY			109	705		-239
LEVEL OF SERVICE			D	A		F
AVERAGE QUEUE						
AVERAGE DELAY (SEC)						

MAIN VAIL INTERCHANGE LOS ANALYSIS - SOUTH FRONTAGE ROAD/VAIL VALLEY DRIVE INTERSECTION

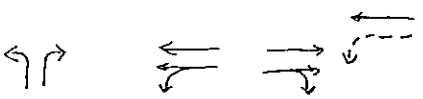
Future - Alternative 3 (Red Sandstone Ramps) with Underpass

The Red Sandstone ramps and UP do not affect this intersection. However, part of this interchange alternative would include improving this intersection; i.e. lowering and/or lane additions. Volumes shown on p.12 still apply.

All way STOP analysis resulted in a LOS F still, so try DRC with increased lane geometry.

Lane Geometry

Phasing



SUM CRITICAL MOVEMENTS

= 810

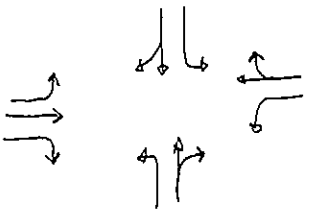
Multiply by 1.18 for growth → 956
LOS E/F Threshold is 1,425 of 3-Phase
9,560/1,425 = 0.67

MAIN VAIL INTERCHANGE LOS ANALYSIS SOUTH FRONTAGE ROAD/VAIL VALLEY DRIVE INTERSECTION

Future - Alternative 7 (Vail Valley Connection) with Underpass

We now have a 4-legged intersection. All way STOP resulted in LOS F.

Existing P.M. Peak
Revised Volumes



Assumed
Geometry

SUM CRITICAL MOVEMENTS (4-PHASE SIGNAL)

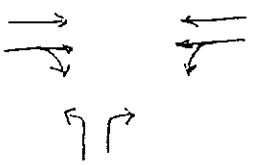
= 811

Multiply x 1.18 for growth → 957
LOS E/F Threshold is 1,375 for 4 Phases
957/1,375 = 0.70

Future - Alternative 8 (Booth Falls Ramps) with Underpass

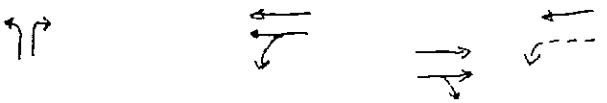
All way STOP resulted in LOS F try DRC

Existing P.M. Peak
Revised



Assumed
Geometry

Phasing



SUM CRITICAL MOVEMENTS

Multiply by 1.18 for Growth → 1,134
LOS E/F Threshold for 3-Phase is 1,425
1,134/1,425 = 0.80

APPENDIX G

FACTORS AND ASSUMPTIONS FOR PLANNING LEVEL COST ESTIMATES

COST ESTIMATES - VAIL VILLAGE DELIVERY ALTERNATIVES

Alternative 1 - Subsurface Tunnel System

Tunneling would be about 1,700' in total length. Estimated width to be ~ 35'.

35 x 1,700 x 300 = $18M

Need to install ramps, elevators, doorways to basements, etc.

~ $5 - $10M

Utility relocation/replacement

~ $5 - $10M

Contingencies, other - 25% ~ $7 - $9M

$35 to $47M → say $50 Million

Alternative 2 - Subsurface Tunnel System

Tunneling would be identical to Alternative 1 but at about 2/3 the width. Cost should be slightly more than 2/3 of Alternative cost.

$35 - $40 Million

Alternative 3 - Close-In Centralization

Garden of the Gods Site

Ramp Excavation - ~ 3,000 Yards^3

3,000 X $6 = $18,000 say $20,000

Excavation of Docking Area ~ 14,000 Yards^3

14,000 x $6 = $84,000

Removal of Asphalt ~ 3,500 Yards^2

3,500 x $ 20 = $70,000

Retaining Wall ~ 25,000 S.F. for Ramps and Docking Area

25,000 x $20 = $500,000

COST ESTIMATES - VAIL VILLAGE DELIVERY ALTERNATIVES

Structure ~ $20,000 S.F.

20,000 X $65 = $1,300,000 $1.3M

Utility Relocation/Replacement

~ $50,000 to $500,000

Contingencies, Other 20% ~ $400,000 - $500,000

TOTAL $2.4M to $2.9M or $3M

Golden Peak Tennis Courts Site

Structure - 17,000 S.F.

17,000 X $65 = $1.1M

Landscape, Tennis Courts, Misc.

~ $100,000 to $300,000

Contingencies - 20% $240,000 to $280,000

TOTAL $1.4 to $1.7M

Vail Road Site

Excavation ~ 14,000 Yards^3

14,000 X $6 = $84,000

Structure ~ 22,000 S.F.

22,000 X $65 = $1.4M

Retaining Wall ~ 10,000 S.F.

10,000 X $20 = $200,000

Ventilation, Other - $75,000 to $400,000

Contingencies - 20% $300,000 to $400,000

TOTAL $2.0M to $2.4M

COST ESTIMATES - VAIL VILLAGE DELIVERY ALTERNATIVES

Christiania Site

Excavation ~ 5,000 Yards^3

5,000 X 6 = $30,000

Structure ~ 13,000 S.F.

13,000 X $65 = $845,000 Say $850,000

Retaining Wall ~ 5,000 S.F.

5,000 X 20 = $100,000

Driveway revision for parking lot on top, parking considerations, utility, other.

~ $150,000 to $400,000

Contingency - 20% $225,000 to $275,000

TOTAL $1.4M to $1.7M

Small Vehicles for Decentralized Alternatives

7 to 10 vehicles are required

Vehicle cost ~ $15,000 each

15,000 X 7 & 10 = $105,000 & $150,000

Decentralized Alternatives

Mill Creek Alley

Relocate Creek ~ 450' length - assume excavation of 5 SF cross-section

450' X 5 X 6 = $13,000 → say $15,000

Culvert Consideration (plug, install) → $40,000

New Asphalt for Alley ~ 7,000 S.F.

7,000 X 2 = $14,000 say $15,000

Fence ~ $6,000

Contingency - 20% $15,000

TOTAL $91,000 say $100,000

COST ESTIMATES - VAIL VILLAGE DELIVERY ALTERNATIVES

Landscaping, Pedestrianization ~ $10,000 to $20,000

Walkway through buildings - impact to structural integrity of building is unknown. Estimated range. Estimated range

$300,00 - $100,000

Contingency - 20% $8,000 - $24,000

GRAND TOTAL $150,000 to $250,000 (Approximate)

Area over Mill Creek between Cyranos and Christiania

Structure over Mill Creek ~ 600 S.F.

600 X $65 = $39,000

New Asphalt ~ 2,000 S.F.

2,000 X 2 + $4,000

Contingency - 20% $8,600

TOTAL $51,600 say $50,000

CAPITAL COST ESTIMATE FOR GONDOLA TO COVERED BRIDGE AUTOMATED PEOPLE MOVER SYSTEM w/ SKIS CARRIED ON BOARD & 7 ONE-DIRECTIONAL STATIONS

	Units	# of Units	Unit Price	Total Cost
GUIDEWAY STRUCTURE				
Single Lane	meters	1,900 @	$1,800	$3,420,000
Double Lane	meters	790 @	$2,650	$2,093,500
STATIONS	each	7 @	$155,000	$1,085,000
SWITCH	each	1 @	$30,000	$30,000
TRANSFER TABLE	each	1 @	$30,000	$30,000
TRAINS (2-cars each)	each	10 @	$355,000	$3,550,000
SERVICE VEHICLE	each	1 @	$25,000	$25,000
POWER DISTRIBUTION				
Substation	each	3 @	$91,000	$273,000
Electric Service	each	1 @	$8,000	$8,000
Feeder Cable	meters	2,690 @	$302	$812,380
Power Rails	meters	3,480 @	$164	$572,720
COMMAND & CONTROL	lump sum	1 @	$3,000,000 (1)	$3,000,000
GUIDEWAY HEATING	meters	3,480 @	$250	$870,000
MAINTENANCE				
Facility	square ft	8,100 @	$50	$405,000
Equipment & Part	lot	1 @	$750,000	$750,000
			Subtotal	$16,922,600
ENGINEERING			15%	$2,538,390
TESTING			5%	$846,130
CONTINGENCIES			10%	$1,692,260
ROW AND UTILITY RELOCATION (ALLOCATION)				$2,000,000
			TOTAL	**$23,999,380**

(1) TDA adjustment based on Lea Elliott Report of 2/16/87.

Source: Number of units and unit prices from Lea Elliott Technical Memorandum for Town of Vail, 3/22/90, page 7.

MISCELLANEOUS UNIT COSTS

2-Lane Roadway	$ 500,000/Mile
3-Lane Roadway	$ 700,000/Mile
4-Lane Roadway	$ 900,000/Mile
5-Lane Roadway	$1,100,000/Mile
Landscaped Median	$ 375,000/Mile
Off-Street Trails/Paths	$ 250,000/Mile
Structures	$65-75/Square Foot