RESOURCE SYSTEMS GROUP INCORPORATED

Final Report:

GROUND ACCESS STUDY OF THE BURLINGTON INTERNATIONAL AIRPORT

Chittenden County, Vermont

Prepared for:

Chittenden County Metropolitan Planning Organization

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331 Olcott Drive, White River Junction, Vermont 05001

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1.0 INTRODUCTION AND BACKGROUND

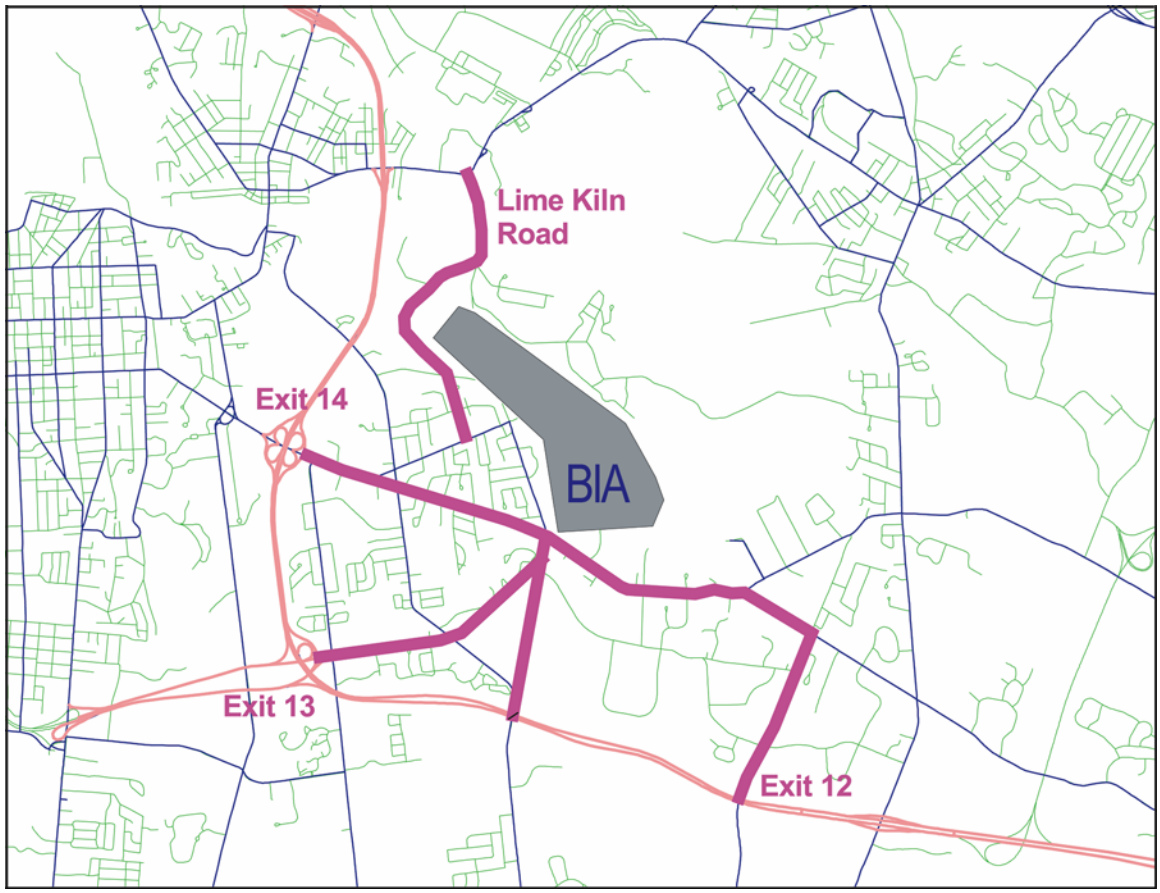
Burlington International Airport (BIA) is located in South Burlington. In addition to Vermont, the Airport market area includes Northeastern New York and portions of Southern Canada. Other airports in the region that provide alternatives for passenger and cargo traffic include Manchester (NH), Albany, Montreal, and Plattsburgh.

The purpose of this transportation planning study is to develop alternatives for securing safe and efficient ground access to the Burlington International Airport (BIA) from key points within the region and to recommend a preferred alternative for establishing such access for the foreseeable future.

Ground access refers primarily to roadway access to the airport for passengers and freight. The primary mode of travel for passenger access is the automobile, but bus and light rail modes play a critical role in providing ground access to larger US airports. For freight and support services, truck access is clearly the primary mode of travel.

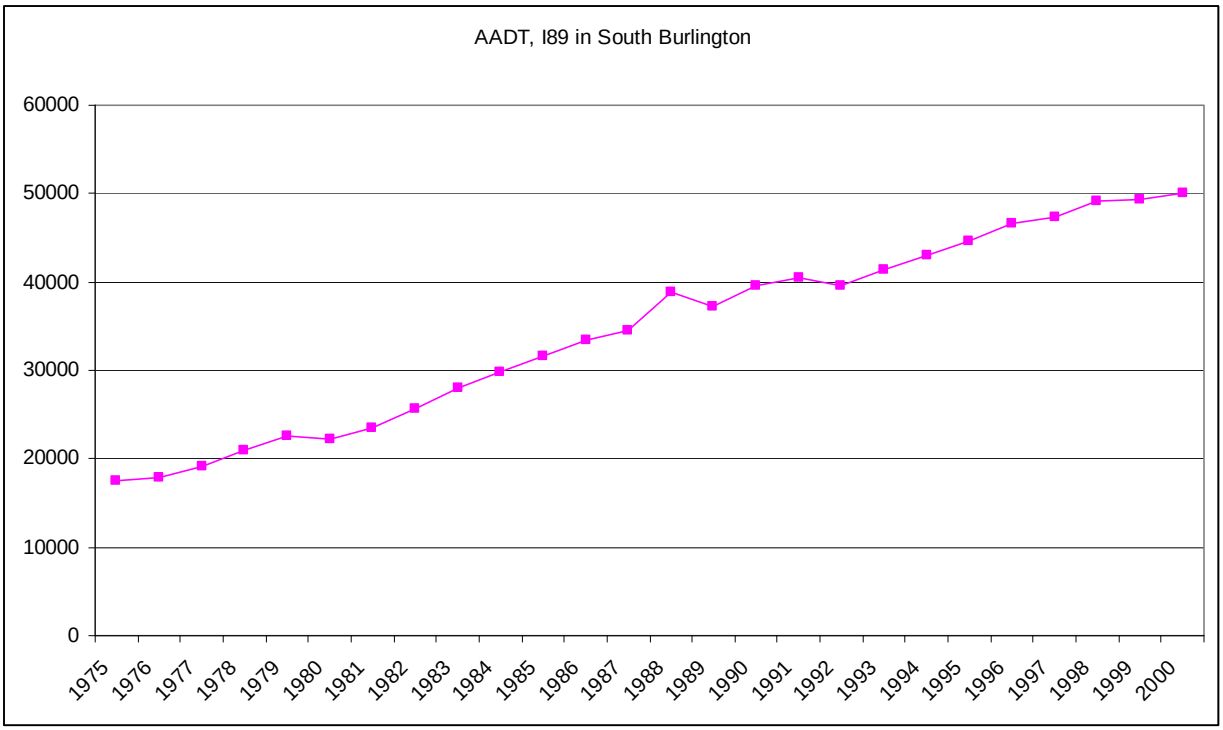
Figure 1 shows the key access routes to BIA.

Figure 1: Key Access Routes to the Burlington International Airport



The issue of ground access to BIA is of growing importance because travel congestion in and around BIA has been steadily increasing. Interstate 89 in the vicinity of the airport has shown relatively constant growth rates in traffic from year to year since 1975 (Figure 2).

Figure 2: Average Annual Daily Traffic, I89 in South Burlington, 1975-2000 (CTC D091)



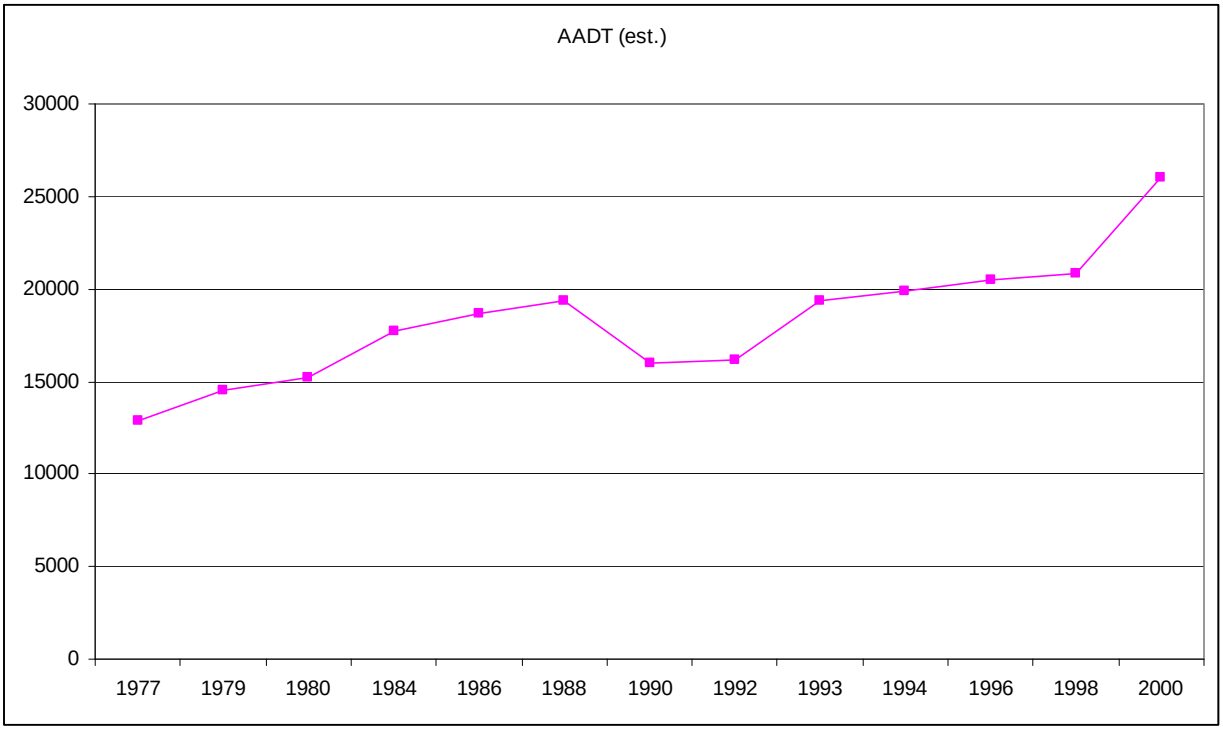
From I89, Williston Road (US 2) is the most traveled arterial for gaining access to BIA. From I89, the traveler has a choice of two exit ramps. From Exit 12, a traveler proceeds north along VT2A to Williston Road (US 2) and continues west on Williston Road to Airport Parkway. Exit 12 is currently the access route to which the traveler from the south is directed via airport signage. Marshall Avenue and Kimball Avenue provide an alternative route from Exit 12 to Williston Road, and many people familiar with the local roadways select this route. From Exit 14, the traveler proceeds in an easterly direction along Williston Road and can gain access to the airport using a variety of routes, including White Street and Airport Drive.

From areas proximate to Exit 13, a traveler proceeds east and north along Kennedy Drive to its intersection with Williston Road and Airport Drive[1].

The trend in traffic on Williston Road in the vicinity of BIA is shown in Figure 3.

[1] As discussed in detail later in this report, Exit 13 is not currently a full service interchange, which means it does not serve traffic from all directions.

Figure 3: Estimated Average Annual Daily Traffic, Williston Road at Kennedy Drive, Selected Years 1975-2000



The drop in traffic shown for the early 1990s is partially due to the economic recession that prevailed locally and nationally during those years. Aside from those years, traffic on Williston Road in the immediate vicinity of BIA has been growing steadily, with more acute increases indicated in the most recent traffic data.

In addition to these routes, travelers from points north can potentially access BIA from VT 15 and Lime Kiln Road. This route is considered a minor access point, primarily because the I89 ramp set at Exit 15 in Winooski does not provide for southbound exiting or northbound entering travel. Hence, VT 15 serves primarily local traffic originating in communities to the immediate north and northeast of BIA.

The traffic data described above translates into a more congested travel situation immediately proximate to BIA, particularly during peak travel periods. Of greatest concern is the PM peak travel period (4 PM – 6 PM) because a high fraction of daily passenger arrivals and departures occur during this time frame. In addition, as overall traffic volumes increase, the intensity of traffic will spread into off peak periods, affecting travel efficiency during the "shoulders" of the peak. Airport-related traffic – passenger and goods-movement – is traveling in an increasingly congested traffic stream.

The lack of good accessibility motivates the planning initiative to improve ground access conditions. Inaccessibility has direct implications for the region's economy. Economic costs are experienced annually in the form of congestion-induced delays. These costs include lost income to air travelers, automobile, limousine and taxi drivers and airport employees. Other possible economic losses relate

to the ultimate loss of businesses that may choose to relocate to areas with improved freight access. For these reasons, gaining and securing efficient ground access to BIA is an important travel issue for the region.

Study Steering Committee

The Chittenden County Metropolitan Planning Organization (CCMPO) has initiated this transportation planning study. As part of the overall study organization, the CCMPO established a Steering Committee, which helped define the study's objectives and direction throughout the planning process. Table 1 shows the composition of the Steering Committee.

Table 1: BIA Ground Access Study Steering Committee

Name, Title	Affiliation
J.J. Hamilton, Airport Manager	Burlington Int'l Airport
Robert McEwing, Airport Engineer	Burlington Int'l Airport
Scott Bascom, Planning Coordinator	Vermont Agency of Transportation
Juli Beth Hoover, City Planner	City of South Burlington
Dan Bradley	Burlington Dept. of Public Works
Sonny Audette, State Representative	City of South Burlington
Peter Keating, Senior Planner	CCMPO
Gerald Proulx, Citizen/Neighbor	South Burlington
Tim Shea	Lake Champlain Regional Chamber of Commerce
Sam Matthews	Greater Burlington Industrial Corporation
Michael Munson, Planner	Town of Williston

The Steering Committee established the planning horizon for the ground access study and determined that travel conditions in 2010 and 2020 should be evaluated in the process of developing an overall ground access plan.

Overview of Analysis

This transportation study has the following parts:

- Section 2.0 Context for Considering Airport Access
- Section 3.0 The Access Alternatives
- Section 4.0 Approach to Evaluating the Alternatives
- Section 5.0 Alternatives Analysis
- Section 6.0 Recommended Approach to Securing Access to BIA

2.0 CONTEXT FOR CONSIDERING AIRPORT ACCESS

There are several important facts about the use and users of the Airport that provide the context for evaluating future access to the BIA.

According the recent data from the Federal Aviation Administration, BIA ranks 119th in the US in passenger enplanements. Table 2 shows where BIA ranks relative to the 5 largest US airports and to other regional airports.

Table 2: Selected US Airports, Ranked by Passenger Activity (1999)

Rank	ID	Airport (City, State)	1999 Passenger Enplanements
1	ATL	THE WILLIAM B HARTSFIE(ATLANTA,GA)	38,136,866
2	ORD	CHICAGO O'HARE INTL(CHICAGO,IL)	34,050,083
3	LAX	LOS ANGELES INTL(LOS ANGELES,CA)	30,830,915
4	DFW	DALLAS/FORT WORTH I(DALLAS-FORT W,TX)	27,990,212
5	SFO	SAN FRANCISCO INTERNA(SAN FRANCIS,CA)	19,249,988
18	BOS	GENERAL EDWARD LAWRENCE (LOGAN, BOSTON,MA)	13,183,145
47	BDL	BRADLEY INTL(WINDSOR LOCKS,CT)	3,148,196
58	PVD	THEODORE FRANCIS GREEN(PROVIDENCE,RI)	2,556,183
71	MHT	MANCHESTER(MANCHESTER,NH)	1,397,024
77	ALB	ALBANY INTL(ALBANY,NY)	1,140,518
98	PWM	PORTLAND INTL JETPORT(PORTLAND,ME)	678,852
119	BTV	BURLINGTON INTL(BURLINGTON,VT)	434,111

BIA differs from larger urban airports in that it lacks limited access arterials serving its passenger and freight facilities. As described above, Williston Road and VT 15 are multi-function arterials, which serve through traffic as well as a substantial amount of local commercial and residential traffic. Thus, airport-generated traffic is included in a mixed traffic stream, which can significantly lengthen the time required to access the airport.

This general access problem is a chronic one for regional airports in northern New England. The main access to Manchester (NH) Airport is via Brown Avenue, a commercial arterial similar in character to Williston Road. There are ongoing planning efforts focused at creating a dedicated limited access highway linking Manchester Airport with I93. Albany International Airport is served from I87 (Exit 4), but the traveler must drive ¾ of a mile on the commercial Route 155 (the Albany-Shaker Road) to gain access to the airport. Portland International Jetport has a mix of direct access from the Maine Turnpike (Exit 7A) and more congested access via other suburban arterials (e.g. Maine Mall Road, Western Avenue, Congress Street). Thus, BIA's ground access challenge is one shared by many similarly sized regional airports.

2.1 HISTORICAL AIR SERVICE

According to the US Department of Transportation's FAA Master Record, there are 129 aircraft based at the Airport. There is an average of 303 aircraft operations[1] per day, translating into over 110,000 annual operations. From 1990 to 1999, total annual passenger traffic at Burlington International Airport has averaged 852,400 passengers, with an even split of enplaning and deplaning passengers (Table 3).

Table 3: Historical Passenger Traffic

Year	Enplaned	Deplaned	Total
1990	425,750	428,131	853,881
1991	405,346	407,745	813,091
1992	424,163	420,661	844,824
1993	410,364	408,992	819,356
1994	414,475	442,162	883,637
1995	421,235	424,361	845,596
1996	414,688	419,481	834,169
1997	431,934	434,926	866,860
1998	439,139	445,922	885,061
1999	435,555	442,283	877,838
2000	451,582	453,000	904,582
2001	520,171	515,067	1,035,238
Annual Average			872,011

Sources: Burlington Airport Records and FAA Aviation Forecasts

Several airlines serve Burlington. US Airways and United Airlines provide main-line service to Pittsburgh, Philadelphia and Chicago. US Airways Express, United Express, Continental Express,

[1] A landing or a take off counts as one operation.

and American Eagle provide express service to other Northeastern cities. Northwest Airlines provides non-stop service to Detroit. Delta provides regional jet service to Cincinnati and Boston.

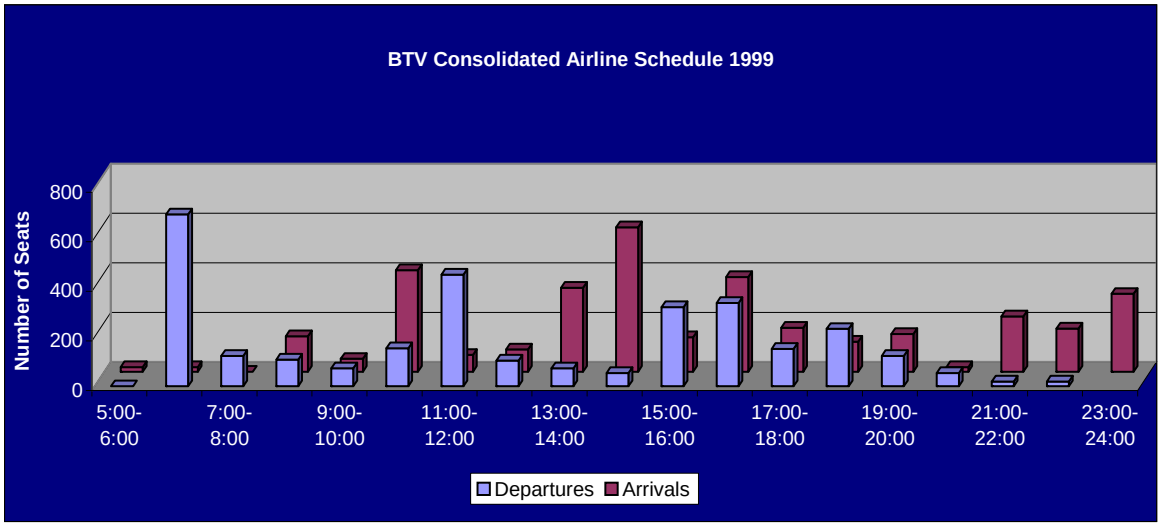
Reflective of the market history of BIA, New York, Washington, Boston, and Philadelphia receive the most frequent scheduled services. Pittsburgh and Philadelphia hubs serve as one-stop markets to Southern cities. United provides jet service to Chicago with connections to Western destinations.

The most dramatic recent change to air service at BIA is the introduction of low cost jet service to JFK provided by Jet Blue. Jet Blue tickets to JFK start a $49 one way. JFK passengers can go on from JFK to cities in Florida for as little as $79.

Published airline schedules and OAG were reviewed to develop an estimate of the consolidated air service schedule. This review indicates that in 1998, approximately 3200 arrival and departure seats were served daily at BIA. This number has likely increased with the initiation of Jet Blue and Northwest Airlines service at BIA.

Figure 4 illustrates estimated airline seat availability for airline arrivals and departures on an hourly basis. Peak periods for arrivals based on available seats are 10:00-11:00 AM, with 1:00-5:00 PM being the peak 4 hour period. Departure passenger peaks are at 6:00-7:00 AM, 11:00 AM-12:00 PM, and 4:00-5:00 PM. Combined arrival and departure peaks occurred 10:00 AM-12:00 PM and 2:00-5:00 PM.

Figure 4: Average Hourly Seat Availability (1999)



Source C & S Engineers, Inc.

The data in Figure 4 show that peak morning passenger activity occurs prior to 7 AM, which is before peak traffic activity on the access routes to the airport (typically 7:30 – 8:30 AM). Afternoon airport activity tends to overlap with the peak vehicular period on the surrounding roadways, which is between 4PM and 6PM. The heaviest passenger departure times are between 3 PM and 5 PM, and the heaviest passenger arrival times are between 2 PM and 5 PM.

Peak air travel at BIA occurs in the months of July, August, and October. These peaks in activity coincide with the height of the summer tourist season and the peaks of the fall foliage seasons.

In 1998, average monthly passenger activity amounted to 73,755 passengers. The peak month was August, which saw approximately 15% greater passenger activity than the average month. Table 4 estimates monthly and daily peak traffic for 1998 and 1999.

Table 4: Passenger Activity Data, 1998 and 1999

	Total Passengers	Average Month	Peak Month	Peak Day
1998	885,061	73,755	84,818	2,827
1999	877,838	73,153	84,126	2,804

1. Average month multiplied by 1.15%
2. Peak month divided by 30

2.2 FORECASTED PASSENGER TRAFFIC

Table 5 shows historic and forecasted passenger enplanements. Total passenger activity (arrivals + departures) is approximately equal to twice the number of enplaned passengers.

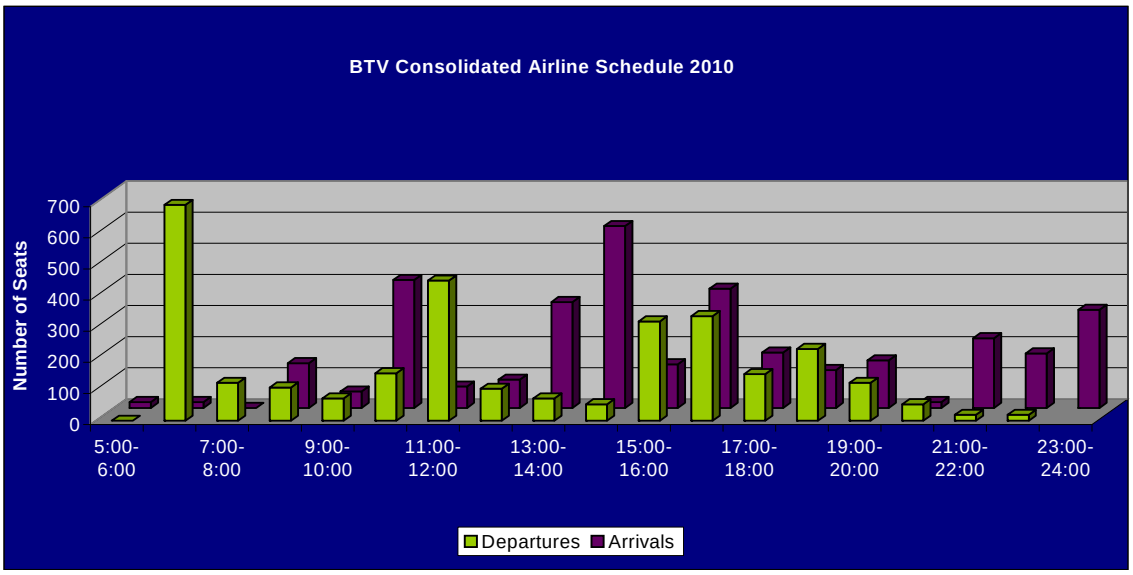
Table 5: Historical and Forecast Passenger Enplanements for BIA

Historical	Enplaned Passengers
1990	423400
1995	423800
1999	432300
Forecast	
2010	556000
2020*	638600

*Extrapolated by C&S Engineers, Inc.

The forecasts for passenger activity shown in Table 5 are aggressive. They reflect a 28% growth in annual passenger activity to 2010 and a further 14% growth between 2010 and 2020. The passenger arrival and departure forecast for 2010, translated into hourly activity for a typical day, is shown graphically in Figure 5. This information is a trend extrapolation of existing conditions and thus, implies that no fundamental changes in airline scheduling will be implemented. If this is the case, we can expect that ground travel to and from the BIA related to peak period passenger activity will overlap with PM peak hour traffic on the surrounding roadway network. The PM peak period for roadway travel coincides with the two busiest passenger airline hours of the day (arrivals + departures). This finding further reinforces the need to establish an efficient ground access route to BIA.

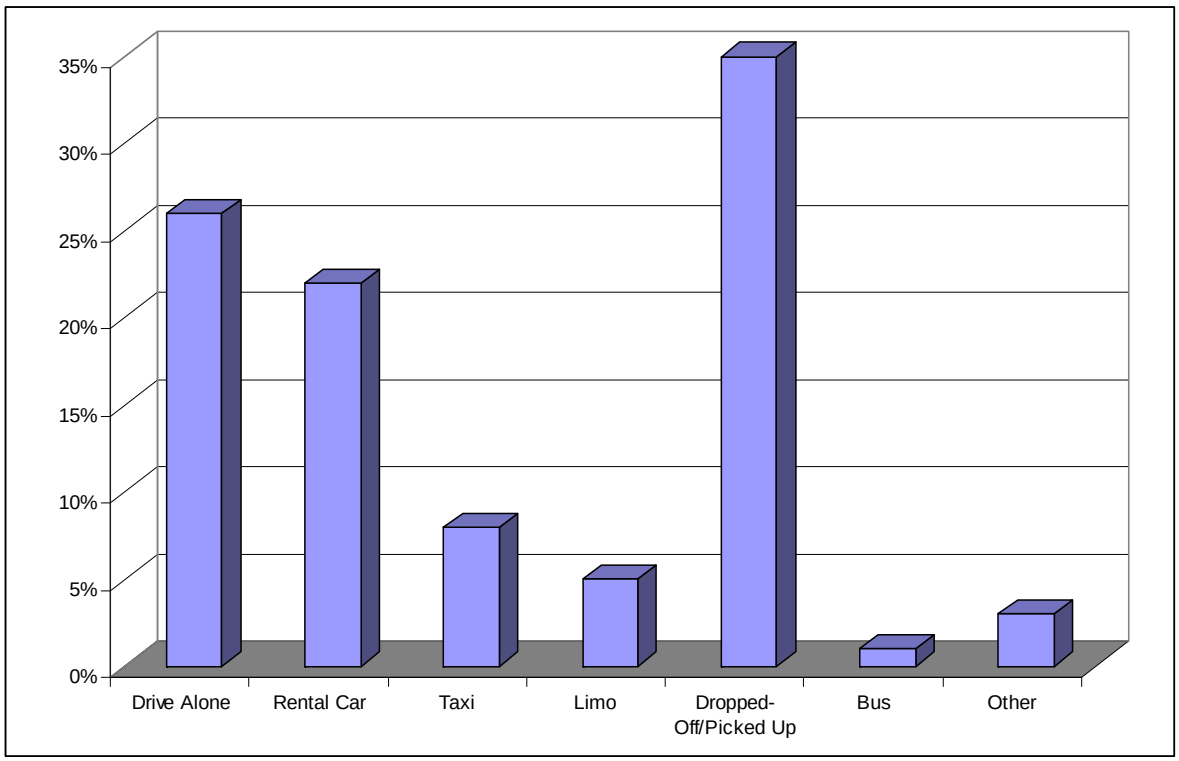
Figure 5: Projected 2010 Airline Schedule for BIA



This analysis helps focus the overall analysis of ground access to the BIA. The subsequent analysis will be based on access during the PM peak travel period: 4:00 PM – 6:00 PM. As discussed, the peak hours of traffic related to the Air Passenger Terminal roughly coincide with the peak hour of travel on the regional road network.

A previous parking study conducted for the BIA involved a survey of passengers using the facility. Figure 6 shows one of the results of the survey, depicting the tendency of airline passengers to arrive at the airport using a particular mode. As shown, less than 10% of access is accomplished through non-automobile means.

Figure 6: How Airline Passengers Get to the BIA



Based on traffic data collected at the Airport Terminal entrance and exit on Airport Drive, we have estimated AM and PM peak hour traffic for 2000, 2010, and 2020. In addition to traffic accessing BIA for air passenger travel, there is other BIA-generated traffic using Airport Drive. There are 2 components of this traffic – employees and General Aviation. The sum of these traffic sources – passenger and employee– is shown in Table 6.

Table 6: Estimated Average AM and PM Peak Hour Vehicle Arrivals + Departures at the Air Passenger Terminal, 2000 – 2020

	AM Peak Hour		PM Peak Hour	
	Arriving	Departing	Arriving	Departing
2000	87	78	184	266
2010	120	108	254	367
2020	143	129	303	438

There are 2 key points to derive from the data presented in Table 6:

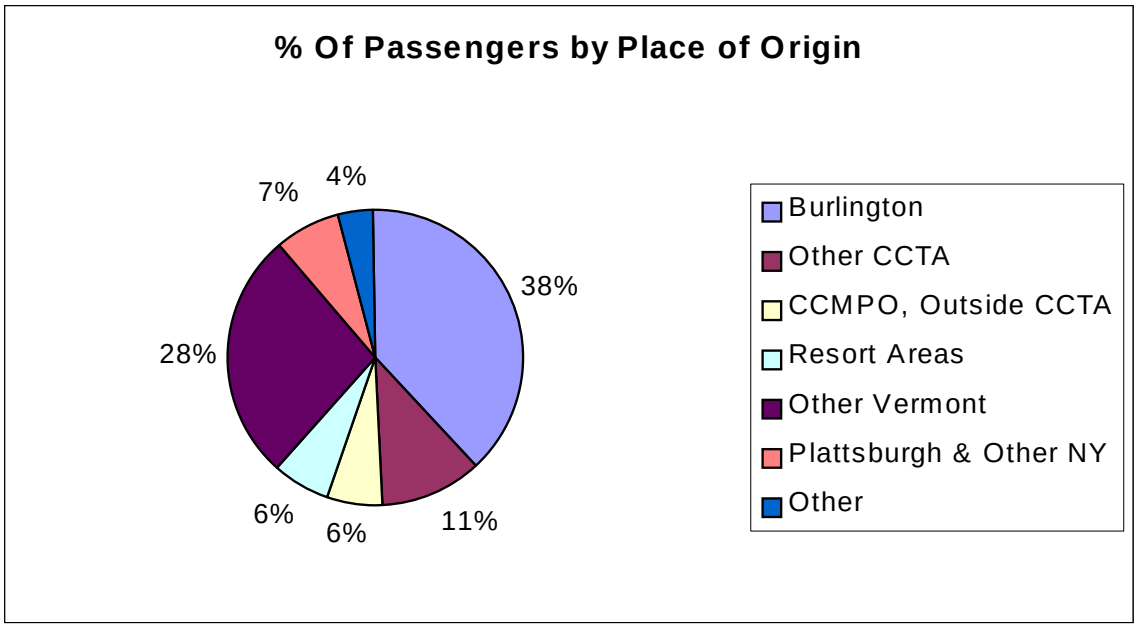
1) As a traffic generator, the BIA currently generates an estimated 450 PM peak hour vehicle trips. To provide perspective, this amount is less than 2/3 of the amount of traffic that would be anticipated from a 65,000 square foot supermarket, which is a standard module size for this use.

2) As air passenger activity at BIA expands, so too does the amount of peak hour traffic generated by the facility. At projected 2010 activity, the BIA is estimated to generate traffic at an amount roughly equivalent to a 65,000 square foot supermarket.

Not included in the traffic estimates for Table 6 is traffic related to an expansion in the South End.

Figure 7 shows where BIA customers come from. It shows that the largest segment – 38% – originate in Burlington, with another 11% originating from the other CCTA[1] member communities: South Burlington, Shelburne, Winooski, and Essex.

Figure 7: Origins of BIA Airline Passengers



2.3 TRUCK ACCESS TO THE AIRPORT

During meetings with the Airport Director, Airport Engineer, and the study Steering Committee, the ability for truck traffic to access the airport was identified as a critical issue. In general, there are concerns that truck traffic critical to airport operations must navigate streets that pass through residential areas or are congested with local traffic. The airport administration expressed particular concern that constrained access could deter significant cargo development plans for the south side of the airport. Determining the extent of the truck access issue requires estimating current use, forecasting future development and consequential increased activity, as well as estimating periods of peak activity.

[1] CCTA is the Chittenden County Transportation Authority, which provides the region's fixed bus transit service.

2.3.1 Key Access Points

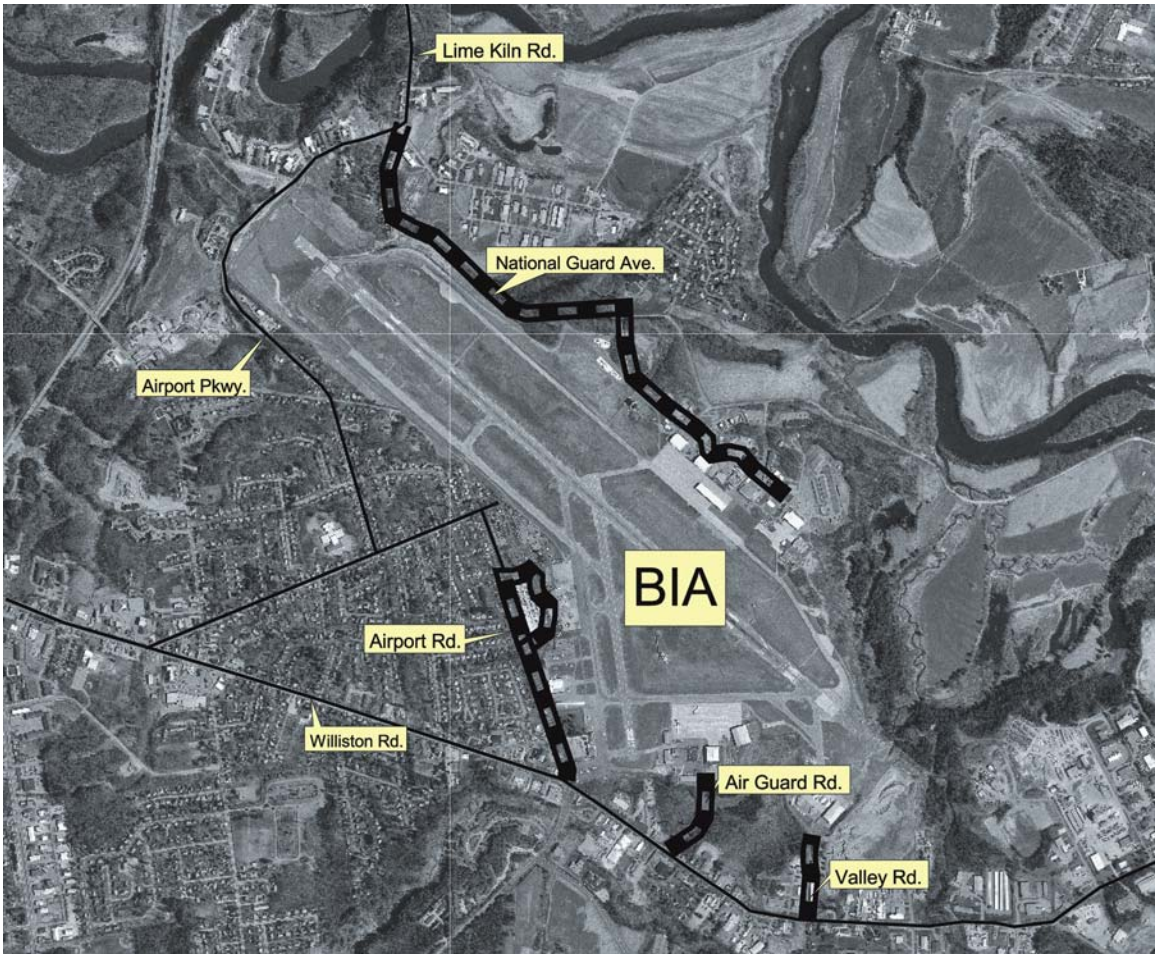
There are three (3) significant access points used by trucks providing access to the BIA:

- Valley Road at Williston Road, which provides access to Federal Express, Airborne Express, Heritage Flight, the airport Fixed Base Operator, as well as airport fuel deliveries;
- Air Guard Road at Williston Road, which provides access to the Army Guard Facilities, Airport maintenance and vehicle storage, Pratt and Whitney and Aviation; and
- Airport Drive to the Passenger Terminal, which provides access to the Passenger Terminal driveways, sewer and air carrier passengers, as well as terminal tenants.

Truck access to the Vermont Air National Guard facilities at the north end of the airport is via National Guard Avenue, which can be accessed from Airport Parkway and Lime Kiln Road.

These four access points are shown in Figure 8.

Figure 8: BIA Access Points



2.3.2 Air Cargo

The airport sponsor is currently in the planning phases to develop a site south of the Airport served by the Valley Road Access. BIA's master planners, Campbell and Paris, have provided a preliminary development plan. The preliminary development plan is based on an Air Cargo forecast that provides data regarding the current air cargo loads at BIA and predicts future cargo business. This information, along with tenants' interviews, forms the basis for determining truck traffic to and from BIA.

Table 7 summaries cargo activity at BIA for the 12 months ending March 2000.

Table 7: Burlington Freight and Mail by Carrier, 12 Months Ended March 2000

Carrier	Departures	Freight and Mall Tons	% of Total	Jet Passenger Enplanements
Federal Express	268	2,311	65.4%	-
Airborne Express	N/A	743	21.0%	-
DHL	254	238	6.7%	-
US Airways	1,774	147	4.2%	129.920
United	844	78	2.2%	74,806
Zantop	1	10	0.3%	-
Continental Express	1,913	3	0.1%	55,783
Ultair	2	1	0.0%	-
Total BIA	**5,005**	**3,531**		

*Airborne Express data from actual airport reports. DHL data estimated for the 1st quarter of 2000.

As indicated in Table 7, Federal Express accounted for 65.4% of the freight traffic at Burlington International Airport for the 12 month period ending March 2000.

Federal Express' current operations include two 727-200 flights Monday through Friday. There is a morning operation between 7:20AM and 8:20AM and an evening operation between 8:35PM and 9:35PM. Average truck traffic for each flight includes 3 tractor-trailers and one 25' straight truck. Truck activity begins approximately one-half hour before each flight and ends approximately one-half hour after each flight. On an average weekday there are 16 total truck operations daily to service Federal Express.

According to the Federal Express Burlington Station Manager, December is the peak month for total freight and truck traffic. He estimated that activity is 25% greater than the average, or about 20 trucks daily.

Truck traffic originates from an off-airport Federal Express sort facility in Williston, about 2.5 miles away from the airport. According to airport management, BIA has entered into discussions with Federal Express to locate a regional consolidated operation on the airport. If this occurs, based upon existing aircraft operations the truck traffic is estimated by the Federal Express Station Manager to increase to 60 per day. Many of these trucks would be single unit parcel trucks (approximately 1 ton) typically used for customer deliveries.

2.3.3 Aviation Fuel Deliveries

Fuel deliveries are made on a daily basis to BIA. These deliveries originate from the New York City area and most likely arrive to the airport via routes VT 22A and US 7 to I89. There are two airport destinations for these deliveries: The Air National Guard and the BIA fuel farm accessed from Valley Road. According to the Air National Guard Security Chief, most commercial deliveries to the Guard use Exit 14 to Williston Road, to White Road, and then to the Airport Parkway. He stated that deliveries originating from the north currently cannot use the Lime Kiln Bridge due to the bridge's structural deficiencies.

There are 15 to 20 weekly deliveries of fuel to the Air National Guard. These deliveries usually occur during normal business hours, Monday through Friday.

The General Manager of Heritage Flight, the primary Fixed Base Operator (FBO) located off Valley Road, stated that Heritage does virtually all the commercial fueling at BIA. According to the Manager, Heritage receives an average of three 7500-gallon deliveries daily. Fuel deliveries to the Airport Fuel Farm arrive via Exit 13 to Kennedy Drive, to Williston Road, and then to Valley Road.

2.3.4 Additional Airport Truck Traffic

Additional airport truck traffic is generated by the Air Guard and by Heritage Flight. For the Air Guard, Guard Security estimates 12 to 15 commercial trucks weekly (other than fuel deliveries). For Heritage Flight, one glycol delivery per month from fall through spring is estimated.

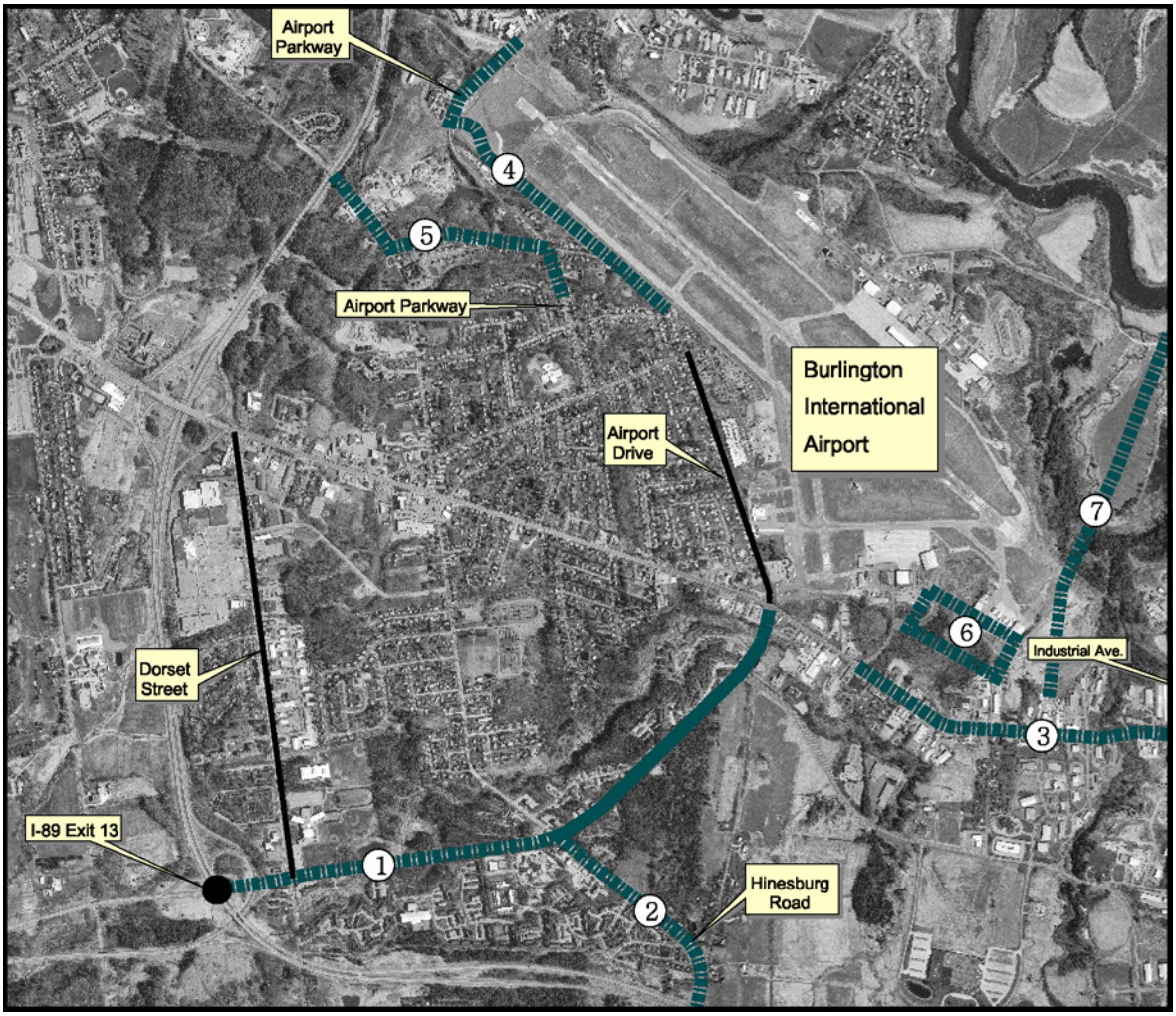
3.0 THE ACCESS ALTERNATIVES

Over the course of this project, a total of eight access alternatives were evaluated. These access alternatives were developed from several sources, including recommendations from the Steering Committee and from public meetings held in January and July 2001.

A total of eight distinct ground access approaches are presented. For each approach described below, a preliminary qualitative assessment of each alternative is provided.

Figure 1 shows an aerial photograph of the study area, with specific access alternatives labeled. Each access alternative is described below in greater detail.

Figure 9: BIA Access Alternatives



Alternative 1: Exit 13-Kennedy Drive.

This alternative would involve the construction of a full ramp set at the I89-I189 interchange. Currently, only a limited number of exchange movements are permitted at this interchange, as shown in Figure 10.

Figure 10: I89 Exit 13 Existing Ramps, and Additional Ramps Required for Full Service

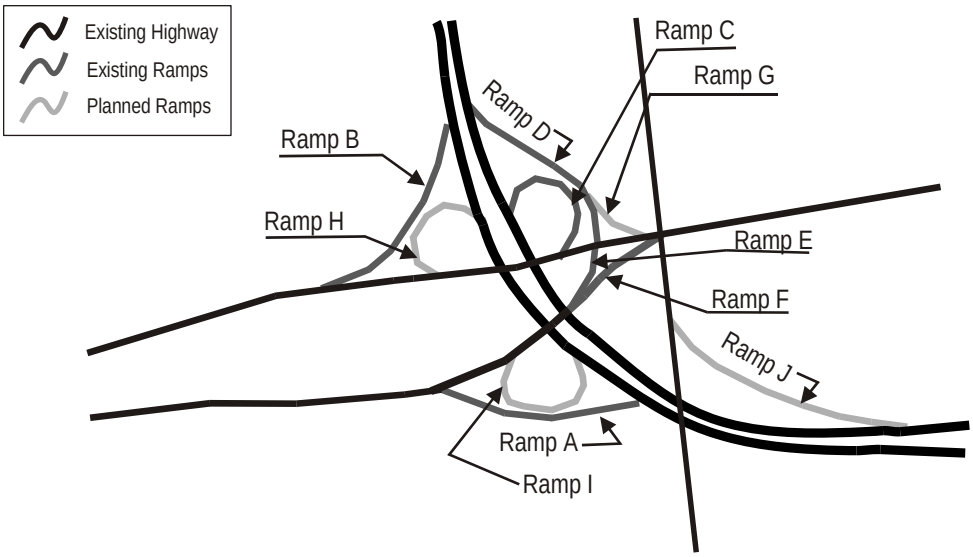
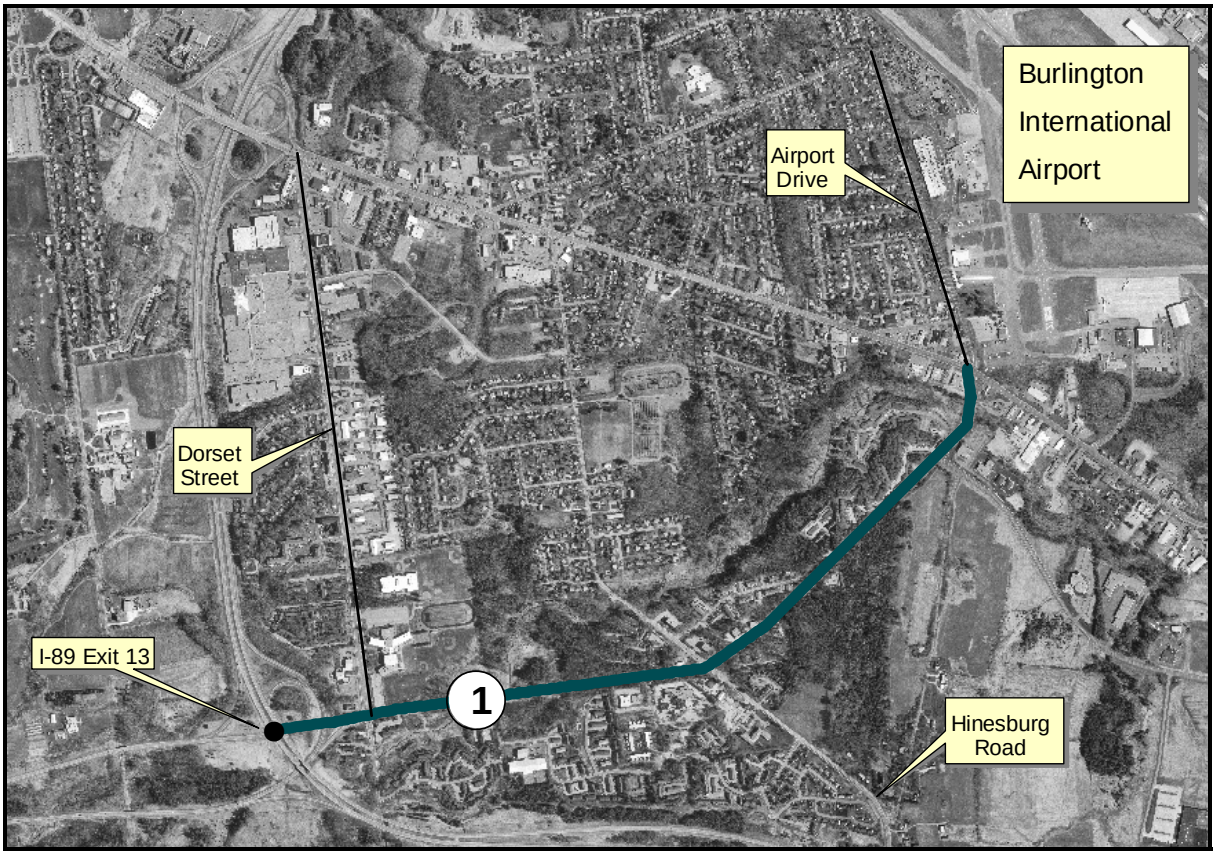


Figure 11 provides an area map of this alternative. This option is attractive because, at the current time, access along Kennedy Drive has been well managed. This means that there are relatively few curb cuts over its approximately 1.5-mile length between Dorset Street and Williston Road. Fewer curb cuts leads to fewer conflicts, allowing traffic to flow more freely. During travel time trials, Kennedy Drive was consistently free flowing, even during peak travel periods.

Kennedy Drive's alignment makes it a logical candidate for future BIA access since it leads directly to Airport Drive at Williston Road. In this way, Kennedy Drive resembles the exclusive airport freeways more typical of larger urban areas. In addition, Kennedy Drive is scheduled for capacity improvements that will result in the creation of a 4-lane cross-section between Dorset Street and Kimball Avenue. This construction project is on the CCMPO's Transportation Improvement Program (TIP), and construction is scheduled for the 2003-2004 construction season.

The segment of Airport Drive leading to the passenger terminal drive from its intersection with Williston Road will, under this scenario, continue to be the "front door" driveway to the Airport for passengers. Airport Drive acts as the dividing line between the industrial/transportation functions of the airport on the easterly sideline and the residential neighborhood on the westerly sideline. Airport Drive is a basic two-lane cross-section. It is undetermined at this point in time whether capacity improvements to Airport Drive will be necessary in the future.

Figure 11: Area Map for Alternative 1

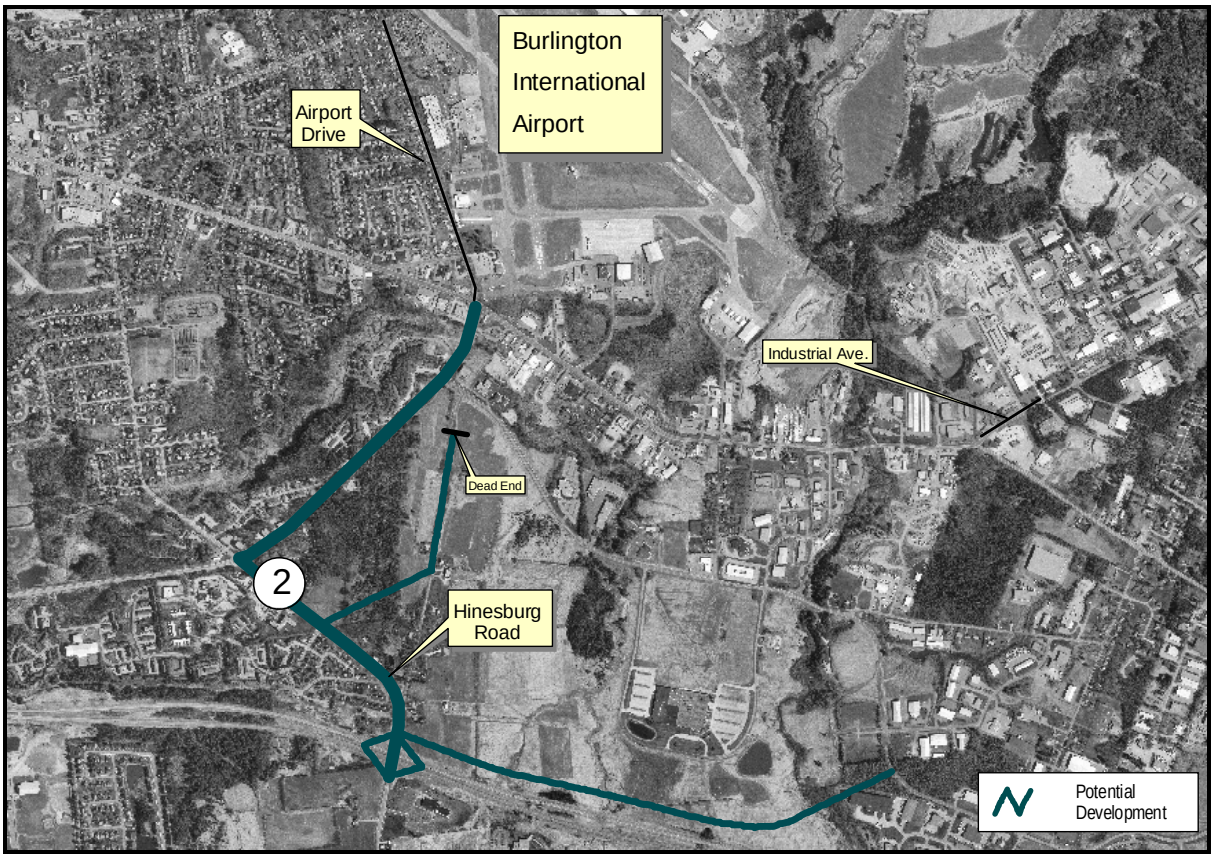


For freight movement into and out from the Airport, this access alternative is also attractive. From the Kennedy Drive/Williston Road intersection, trucks have a larger 4-lane arterial to traverse in accessing the future development slated for the airport's South End. Williston Road in this segment is very poorly access managed, with multiple curb cuts and a high amount of travel friction. However, this may be the least costly route of accessing the South End development simply because the 4-lane cross-section already exists.

Alternative 2: Exit 12A/Hinesburg Road.

This alternative would involve the creation of a new interstate ramp set at Hinesburg Road (Route 116), referred to here as Exit 12A. Airport access would continue along Hinesburg Road to Kennedy Drive and then proceed on Kennedy Drive to the Airport, matching Alternative 1 for passenger and freight arrivals/departures. Figure 12 shows the general area plan for this alternative.

Figure 12: Area Map for Alternative 2



This alternative has been the focus on ongoing planning discussions within South Burlington and at regional planning levels. The City of South Burlington has zoned the area proximate to the new ramp set for large lot industrial development. Thus, the land use impacts associated with these roadway changes would be significant.

Discussions with South Burlington officials indicate that this alternative would ideally be packaged with other complementary improvements as part of an overall plan to provide improved access to South Burlington's core area. Related improvements would be:

- converting Old Farm Road into a dead-end road at its northerly terminus with Kimball Avenue
- constructing a new road over the O'Brien property from Hinesburg Road to a point directly across from Hayes Ave.
- constructing a new interstate frontage road extending from Hinesburg Road by the new ramp set to Marshall Avenue in Williston.

As with Alternative 1, this alternative would represent a major increase in capacity for the region. It differs from Alternative 1 in that it would change the function of the portion of Hinesburg Road north of the interstate from rural highway to minor arterial. The recommendation to dead end Old

Farm Road is in part a response to the increased traffic this rural local road would receive were it to remain a through route.

Both Alternatives 1and 2 have also been evaluated by the I89 Urban Improvements Study, conducted by VTrans. The purpose of this study is to analyze the impacts of major improvements to Interstate 89 within the Williston to Winooski corridor.

Alternative 3: Widen Williston Road

Williston Road changes from a 4-lane cross-section to a 2-lane cross-section approximately 1,350 feet west of Valley Road (approx. 810' east of Air Guard Road). Valley Road is the probable access to the South End commercial development proposed by BIA. Alternative 3, advocated by the BIA, consists of widening Williston Road to 4 lanes (2 eastbound and 2 westbound). Figure 13 shows the segment of Williston Road that would require widening.

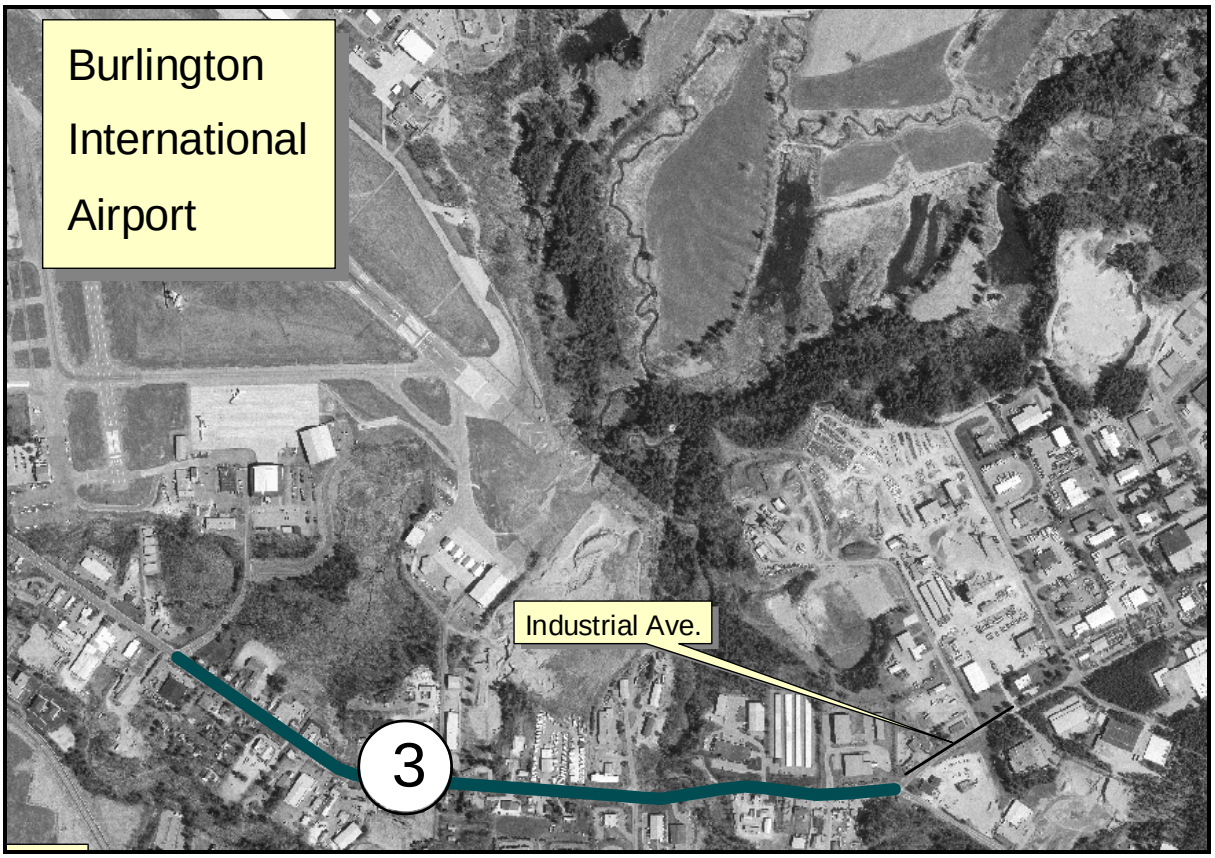
It is possible that Exit 12 would continue to be used for Airport access even if Alternative 1 were developed. Widening Williston Road could improve service to the Airport from Exit 12. Traffic data from 1998 for this segment of Williston Road show an average daily traffic (AADT) of around 20,000 vehicles (count station D036). This amount of traffic does not, in itself, suggest congested or over-capacity conditions. However, because of the high density of driveway access points, the roadway tends to operate below capacity. From a traffic capacity standpoint, the key problem with this section of Williston Road is that its function as an arterial has been compromised in order to provide plentiful access to the abutting commercial properties. As with many road expansion projects, it would be reasonable to expect that congestion levels following construction would, in a relatively short period, approach congestion levels experienced pre-construction.

Widening the roadway to 4 lanes would also be a major public works project for the region[1]. Although the segment is less than 1 mile in length, there are several abutting landowners. This alternative should only be considered along with significant efforts to manage access to Williston Road between Kennedy Drive and Industrial Avenue. Such access management efforts would include:

- delineating undefined driveway areas with curbing
- combining adjacent driveways
- eliminating driveways where reasonable access is otherwise provided
- possible construction of alternative routes (e.g. inter-lot connections)
- prohibiting left turns at more hazardous locations
- developing safe pedestrian/bicycle pathways to facilitate non-auto trips within the corridor

[1] It is assumed that sufficient right of way exists to construct a 4-lane cross-section. Right of way widths were not verified.

Figure 13: 2-Lane Section of Williston Road



Alternative 4: Realign Airport Parkway/Extend Airport Drive

No matter which access alternative is selected and ultimately improved, there will continue to be a desire to use the Lime Kiln Bridge, and the roadways leading to the bridge, as an access to the airport. It is likely that this set of roads – Lime Kiln Road, Airport Parkway, and Airport Drive – will continue to carry 10-20% of airport-related traffic under any access development scenario. This is because I89 is not convenient for much of the regional traffic wishing to access the airport. Thus, such traffic will continue to use established routes to get to the airport.

This alternative involves the realignment of Airport Parkway and Airport Drive to create a more direct route to the airport. This alternative complements the projected reconstruction of the Lime Kiln Bridge, slated to occur over the next 1-3 years.

Figure 14 shows the approximate alignment of this alternative. At the point where Airport Parkway turns to the southeast, the recommended new alignment would bring the roadway parallel to the taxiway and extend in a southeasterly direction to the point where Airport Drive now ends. Much of this new alignment could be located on Airport property, according to the Airport Engineer, Bob McEwing.

Figure 14: Area Map Showing a Re-Alignment of Airport Parkway

Alternative 5: New Ramps Accessing Patchen Road from I89

At a public meeting it was recommended that a new ramp set on I89 between Exits 14 and 15 be considered for developing an access road to the airport. Figure 15 shows the approximate alignment of the new ramp set leading to Patchen Road. As with Alternative 2, creation of a new ramp set would bring development pressures (and re-zoning pressures) to the Patchen Road area. Furthermore, a portion of the new ramp set would likely infringe upon a capped landfill. Environmental regulations would prohibit construction of a new roadway over the old landfill. This constraint is a fatal flaw of this alternative.

Figure 15: Area Map Showing Approximate Location of a Proposed I89 Ramp Set to Patchen Road

Alternative 6: Re-Orient Passenger Terminal and Related Service Toward Williston Road

One recommendation that came from a public meeting was to re-orient the passenger terminal toward Williston Road. This could presumably take place on land that has been slated for the South End Development, off of Valley Road, as shown in Figure 16. None of the airport master planning work in the past 10 years has seriously considered this option. The South End commercial improvements that the BIA is planning would be seriously compromised with this alternative.

It appears that the motivation for this alternative was to try to move the airport-related traffic out of the residential neighborhoods adjacent to the airport. This alternative would likely have a minimal effect in accomplishing this objective. Airport-bound traffic that currently uses the Lime Kiln Bridge would likely continue to do so even if the passenger terminal were moved off of Williston Road.

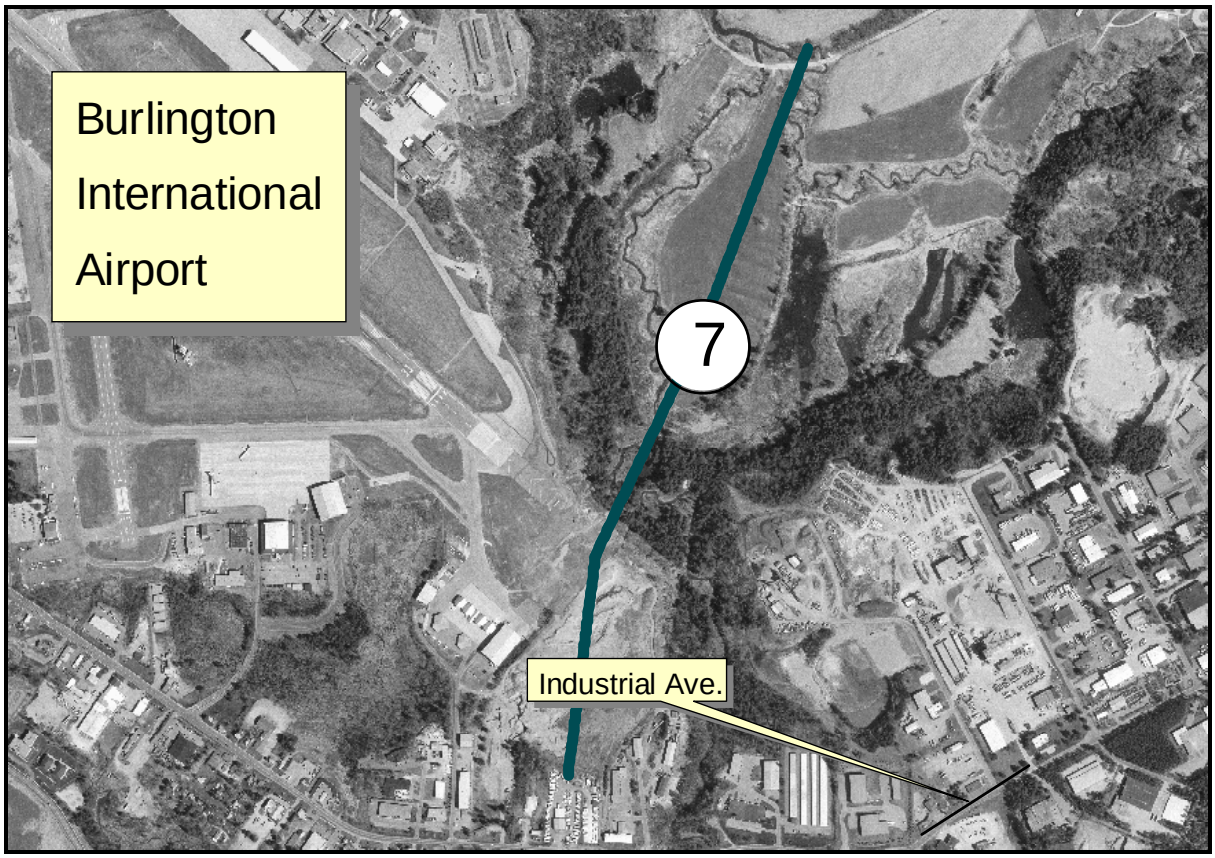
Further, the mix of uses adjacent to the airport, taken as a whole, is a major traffic generator. Adding passenger traffic to the mix of traffic on Williston Road would likely reduce the overall efficiency of access to the airport.

Figure 16: Area Map of Alternative 6 Indicating a Re-Orientation of the Passenger Terminal Toward Williston Road

Alternative 7: Development of a New North-South Roadway to Divert Traffic From the Neighborhoods

This alternative was also suggested at a public meeting. The main objective of this alternative is to provide an alternative north-south travel route to divert some of the traffic that currently uses neighborhood streets to travel between VT 15 and Williston Road. Thus, this alternative does not directly address airport access. Figure 17 shows one possible alignment of this new north-south arterial. This alignment is meant to be purely conceptual. There would very likely be severe environmental and political constraints in constructing this alternative.

Figure 17: Area Map Showing Conceptual Alignment of a New North/South Roadway



4.0 APPROACH TO EVALUATING THE ALTERNATIVES

A consistent approach was used to evaluate the eight alternatives considered in this study. The Chittenden County Travel Demand Model (the Model) was used to evaluate three key travel issues for each alternative. These issues are:

1. Impact on Adjacent Neighborhoods
2. Roadway Congestion at Key Intersections
3. Travel Times to the Airport from Key Points in the Region

4.1 IMPACT ON ADJACENT NEIGHBORHOODS

The neighborhoods situated to the west of the BIA are also positioned between two major east-west arterials – Williston Road to the south and VT 15 to the north. In recent years, traffic traveling on the neighborhood streets has been increasing, due in part to the major desire line that exists between Williston Road and VT 15.

Some of this travel desire line can be satisfied by I89, between Exits 14 and 15. However, the neighborhood streets near BIA – roughly defined as the block of residential area between Williston Road, Patchen Road, Kirby Road, and Airport Drive – provides a north-south routing alternative. Within this residential block, there are many potential routes cut-through traffic can choose to take. White Street, Airport Parkway, and Airport Drive are reported to be the main cut-through routes. Others include: Dumont Ave./Hanover St./Richard Terrace; Peterson Terrace/Mills Ave./ Elizabeth St./Patrick St.; and Airport Rd. In addition, Patchen Road is increasingly being used to as a short cut between Colchester Avenue in Burlington and points south and east.

Table 8 shows estimates of the routes BIA-generated traffic uses to and from the airport. Table 8 also shows the fraction of this total traffic volume that can be attributed to BIA.

Table 8: Estimated Routes of Traffic Accessing BIA, and Fraction of Total Traffic on Route Attributable to BIA

	% of BIA Traffic Using Route	% of Total Roadway Volume Attributable to BIA
Lime Kiln Road	12%	7%
Patchen/Kirby	11%	7%
White Street	22%	19%
Airport Drive, South of Terminal Entrance	55%	32%

The data in Table 8 show the major routes used to access BIA from all quadrants. The majority of traffic (55%) accesses Airport Drive from Williston Road at its intersection with Kennedy Drive. The remaining traffic is split among 3 other routes. One of these routes – White Street – is also served off of Williston Road.

The data in Table 8 suggest that 77% Airport-related traffic comes off of Williston Road. While there is some use of neighborhood streets by BIA traffic, the data suggest that BIA traffic is part of a larger traffic stream that is drawn to the residential streets because they offer route alternatives.

A previous study commissioned by the CCMPO stated, "the majority of the existing traffic along the corridor is through-traffic. Traffic to and from the Airport accounts for a smaller portion of the overall traffic on Airport Drive."[1] Based on turning movement counts conducted for the same study, approximately 20-30% of the traffic using Airport Drive is airport-generated traffic. This estimate is supported by the work of this study, as exhibited in Table 7. As one moves farther in the westerly direction from the BIA, the fraction of total traffic attributable to the airport diminishes from these levels.

4.2 IMPACT ON ROADWAY CONGESTION

There are 5 key intersections that the majority of airport traffic will encounter traveling to and from BIA. These intersections are:

1. Williston Road/Kennedy Drive/ Airport Drive
2. Williston Road/Dorset Street
3. VT 2/VT 2A (Tafts Corners)
4. VT 15/Lime Kiln road
5. Dorset Street/Kennedy Drive

The preferred alternatives will be evaluated for the impact on congestion at each of these pivotal intersections.

4.3 IMPACT ON TRAVEL TIMES

Preferred alternatives will be evaluated for the effect on travel times for 5 key routes accessing BIA. These routes are:

- Route 1: To/From Five Corners (Essex Junction) Using VT 15 to Lime Kiln Road
- Route 2: To/From Five Corners Using VT 2A to Williston Road via Industrial Drive
- Route 3: To/From BIA from I89 Exit 14 Using Williston Road and White Street
- Route 4: To/From BIA from Dorset/Williston Intersection Using Williston Road to Airport Drive
- Route 5: To/From BIA from I89 Exit 12 Using VT 2A to US 2 (Williston Road)

Time trials were conducted to measure current travel times by automobile during the PM peak hour. These routes and travel times are shown in Figure 18 and Table 9, respectively.

[1] Technical Memorandum from the Airport Drive/Airport Parkway Improvement Study. 15 March 2000.

Figure 18: Commonly Traveled Routes to BIA

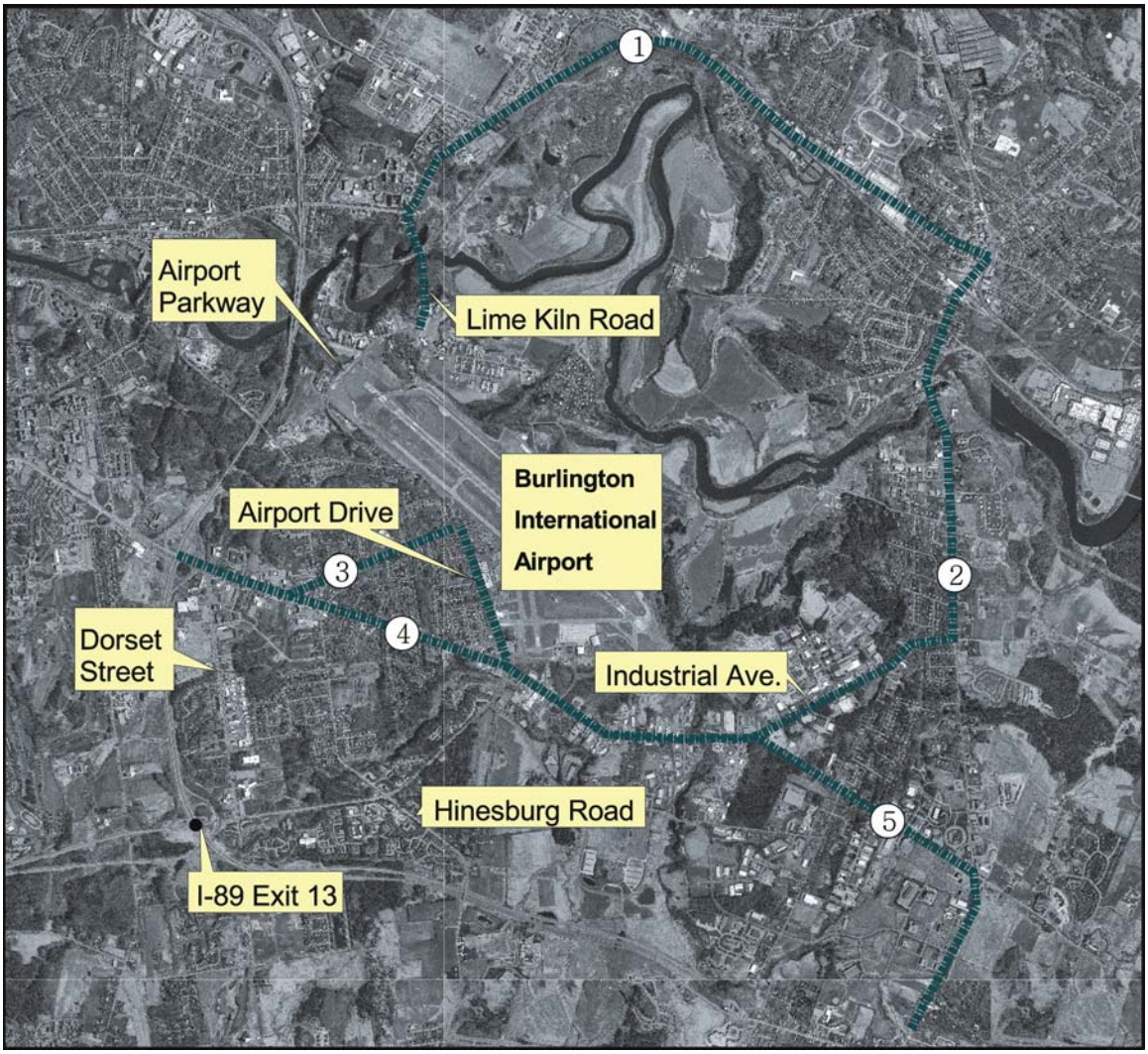


Table 9: Auto Travel Times for Specified Routes To and From BIA, PM Peak Period (Minutes)

	To Airport	From Airport
Route 1	18.3	20.8
Route 2	15.9	17.3
Route 3	13.3	6.3
Route 4	12.1	5.6
Route 5	15.0	17.3

4.4 BASE ASSUMPTIONS FOR EVALUATING ACCESS ALTERNATIVES

4.4.1 Future Roadway Infrastructure

The planning study analyzes ground access to the BIA under 2010 and 2020 travel conditions. Central to regional traffic conditions is the state of the roadway infrastructure assumed to be in place and operating in the future.

As mentioned, the key analytical tool of the study is the Chittenden County Travel Demand model. For the year 2010, we will assume the following important network changes:

- Completion of the Southern Connector
- Completion of Shelburne Road Reconstruction
- Completion of CCCH Segments A and B (from I89 in Williston to VT 2A in Essex)
- Kennedy Drive widened to 4 lanes
- Extension of Market Street from Dorset St. to Hinesburg Road, South Burlington

For the year 2020 network, we will assume full completion of the CCCH.

4.4.2 Projected Development in the Region

We identified the land use developments that can reasonably be anticipated in Chittenden County by the analysis years 2010 and 2020. The traffic from these developments will be incorporated into the travel forecasting process. Table 10 and Table 11 show the projected developments by year and location.

Table 10: 2010 Proposed Developments

Project	Municipality	Description
FAHC/UVM	Burlington	Ambulatory Care Facility, Health Science Research Facility
Main Street Landing	Burlington	Full Build Out of Phases II-III, Burlington Waterfront
Watertower Hill	Colchester	Build Out of Remaining Lots
IBM	Essex Junction	Modified Chip Fab 2000
Husky	Milton	Partial Build Out of Act 250 Permit
BIA	South Burlington	Partial Build-Out of South Development
City Center	South Burlington	Partial Build Out of City Center
Odell Parkway PUD	South Burlington	50% of Development Proposal, US 7, South Burlington
HoJo Hotel	South Burlington	Addition of 71 Units
Affordable Housing	South Burlington	South of Lime Kiln Bridge
Lowe's Home Center	South Burlington	121,000 Sq. Ft. Retail
Marceau Meadows	South Burlington	50% of Development Proposal, South Burlington, off of Hinesburg Road
IDX	South Burlington	Partial Build Out of Act 250 Permit
Maple Tree Place	Williston	50% of Permitted Mixed Use Development, Williston
Taft Corners	Williston	Commercial Park Lots 27 & 28
Winooski	Winooski	25% of Downtown Revitalization Plan

Table 11: 2020 Proposed Developments

Project	Municipality	Description
Main Street Landing	Burlington	Full Build Out of Phase IV, Burlington Waterfront
BIA	South Burlington	Partial Build Out of South Development
City Center	South Burlington	Partial Build Out of City Center
IDX	South Burlington	Remaining Build Out of Act 250 Permit
Odell Parkway PUD	South Burlington	Remaining 50% of Development Proposal, US 7, South Burlington
Marceau Meadows	South Burlington	Remaining 50% of Development Proposal
Husky	Milton	Remaining Build Out of Act 250 Permit
Maple Tree Place	Williston	Remaining 50% of Permitted Mixed Use Development, Williston
Winooski	Winooski	Add'l 25% of Downtown Revitalization Plan

It is important to note that several of the projected developments shown in the above tables are within the study area or will impact traffic through the study area. Several thousand new vehicle trips will begin or end within the study area, an area that is already highly congested by regional standards.

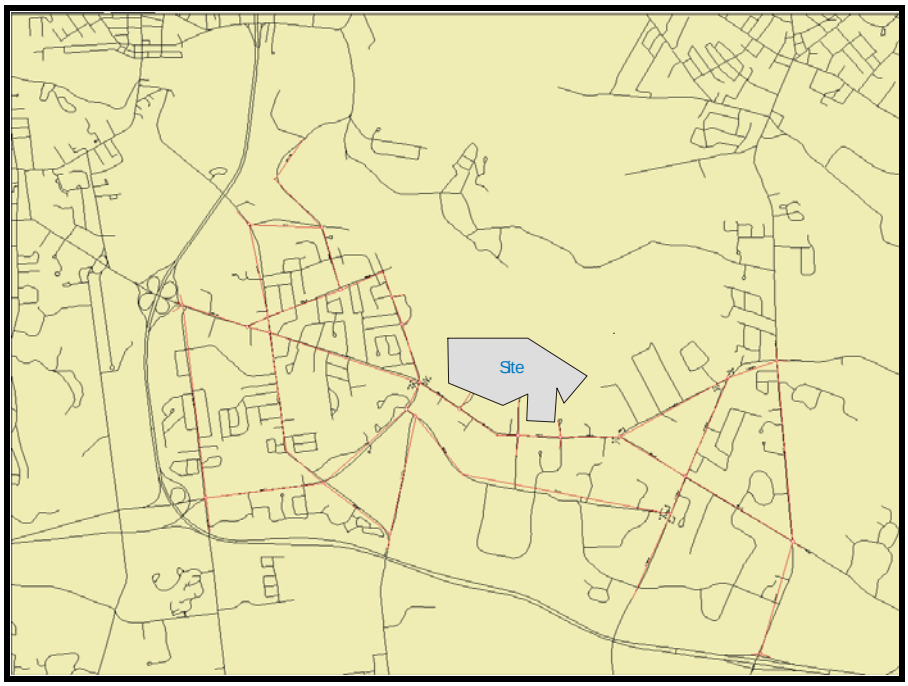
Further, it is important to note that there will be additional background growth in traffic attributable to general growth in the region. Demographic projections obtained by the CCMPO estimate average annual growth rates of 1.8-2.1% for households and 1.5-2.2% for jobs between 2000 and 2030. These growth projections will result in a net increase of over 5,000 households and over 12,000 jobs in the region by 2010. The growth specified in Table 10 and Table 11 is a portion of this overall growth projection.

4.4.4 Traffic Related to Projected Development of the South End

The BIA has submitted an Act 250 Land Use permit application for development of the South End (Figure 19). The South End Development is located in the vicinity of Valley Road on the north side of Williston Road. The BIA has targeted this parcel, which is located within the Airport Industrial Zone, for expanding air cargo facilities and related commercial activity.

The traffic study conducted for the BIA Act 250 submission projected a total build-out of 400,000 square feet of air cargo facilities, hangars, and related office buildings. Full occupancy of this development is estimated to generate 600 AM peak hour vehicle trips and 700 PM peak hour vehicle trips. For the purposes of this study, we have assumed a partial build-out of the South End proposal amounting to 40% of the full build-out by 2010 and 80% of full build-out by 2020.

Figure 19: Site Location of the South End Development



5.0 ALTERNATIVES ANALYSIS

Of the 7 alternatives presented in Section 3.0, 3 were carried forward for detailed analysis. These are:

- Alternative 1: Full Ramp Set at Exit 13
- Alternative 2: New I89 Ramp Set at Hinesburg Road (Exit 12A)
- Alternative 4: New Alignment for Airport Parkway

The BIA felt it was critical to their interests in developing the South End that a portion of Williston Road be widened to 4 lanes. This portion extends from the Air Guard Drive intersection with Williston Road in an easterly direction to the intersection of Williston Road with Valley Road. This section of roadway has a 2-lane cross-section and measures approximately 1500 feet. Future airport access routes feature Kennedy Drive as a key element. Hence, widening Williston Road to a 4-lane cross-section on the side of the future South End development closest to Kennedy Drive makes sense for the Airport. This improvement is listed in the recommendations of this report and is included within the assessment of each of the alternatives considered for further analysis below.

The 4 rejected alternatives are shown in Table 11.

Table 12: Rejected Alternatives, and Rationale for Rejection

Williston Road Widening to 4 Lanes from 2 Lanes (for entire segment extending from Air Guard Road to Industrial Ave.)[1] Major Access Management Problems Reduces Effectiveness Concerns of Adjacent Municipalities Over Resulting Traffic Growth
Patchen Road Interchange Would Result in Significant Increase in Neighborhood Traffic Ramp Construction Would Infringe on Capped Landfill
Relocating Passenger Terminal Major Recent Investments in Existing Passenger Terminal/Parking Focuses Traffic within the Williston Road Corridor
North-South Connector (location unspecified) Major Environmental Issues No Logical Northern Outlet Addresses Issues Other Than Airport Access

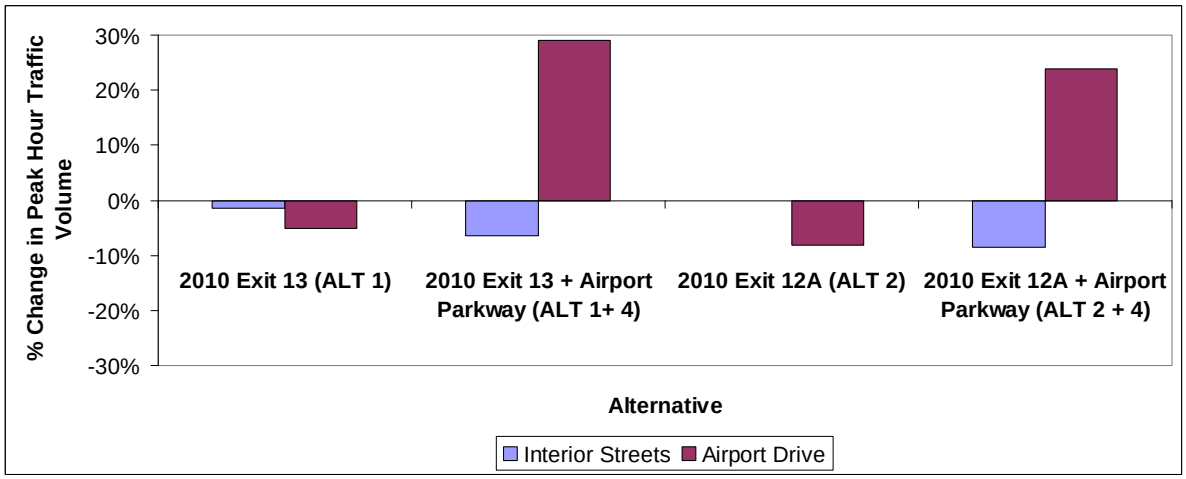
[1] As discussed elsewhere in this report, it is recommended that a 4-lane cross-section be constructed for only a portion of this section. The recommended widening would extend from Air Guard Road in an easterly direction to Valley Road. This encompasses approximately 1500 feet of roadway.

The 3 access alternatives reserved for detailed study were combined into 4 distinct alternatives. These are:

- Alternative 1: Full Ramp Set at Exit 13
- Alternative 1+4: Full Ramp Set at Exit 13 plus Realigned Airport Parkway
- Alternative 2: New Ramp Set at Hinesburg Road
- Alternative 2+4: New Ramp Set at Hinesburg Road plus Realigned Airport Parkway

Figure 20 shows the impact of each alternative on neighborhood cut-through traffic. The data in Figure 20 are based on Model runs that depicted the 4 alternatives in a travel network. The data show percentage changes in traffic for 2010 traffic conditions, relative to a No Build scenario, where no special ground access improvements are made. In Figure 20, "Interior Streets" refers to White Street, Kirby Street, Patchen Street, and Airport Parkway.

Figure 20: Impact of the Alternatives on Traffic on Neighborhood Streets and Airport Drive



Thus, Alternative 1 shows that the interior streets of the neighborhood show a slight decline in traffic volume when compared to the No Build. Airport Drive[1] declines in volume as well. When the Airport Drive realignment is included with the Exit 13 ramp set, the impacts are different. The greatest change is the nearly 30% increase in traffic volumes projected for Airport Drive. This increase is not due to Airport traffic, since the projected growth in BIA traffic is common to all scenarios evaluated. Instead, the large increase in traffic on Airport Drive is north-south travel between Williston Road and VT 15 unrelated to BIA.

A similar set of comparisons can be made when Alternative 2 is evaluated. Alternative 2 involves the creation of a new ramp set off of I89 at Hinesburg Road. By itself, Alternative 2 shows no change in affecting overall traffic volumes in the neighborhood. It also shows a nearly 10% decline in the use

[1] The volumes on Airport Drive are measured at a point north of the intersection with Williston Road, but south of the entrance to the passenger terminal.

of Airport Drive. When both Alternative 2 and 4 are combined, a nearly 10% drop in neighborhood traffic is estimated, while Airport Drive absorbs a greater than 20% increase in traffic volumes.

Table 13 shows the impacts of the alternatives on congestion at the 5 key intersections.

Table 13: Projected 2010 Level of Service at Study Intersections, by Alternative

Scenario	LOS at VT 15/Lime Kiln Road	LOS at Dorset/Kennedy	LOS at Dorset/Williston	LOS at Kennedy/Williston	LOS at VT 2A/US2
2000 Design Hour	B 12.3 sec.	C 24.5 sec.	F	C 21 sec.	D 47.6 sec.
2010 No Build	C 21.6 sec.	D 51.5 sec.	F	F	C 34.5 sec.
2010 Exit 13 (Alt 1)	C 20.6 sec.	F	F	F	D 35.3 sec.
2010 Exit 13 + Airport Parkway (Alt 1+4)	C 26 sec.	F	F	F	C 34.7 sec.
2010 Exit 12A (Alt 2)	B 16.1 sec.	C 31.1 sec.	F	F	D 37.7 sec.
2010 Exit 12A + Airport Parkway (Alt 2+4)	B 19.6 sec.	C 32.9 sec.	F	F	D 36 sec.

There are several key points from Table 13:

1. Two intersections are projected to fail under all scenarios evaluated – Williston/Dorset and Williston/Kennedy. In the case of the former, intersection volumes are actually estimated to decline in some cases but not enough to bring the intersection out of failure.
2. Congestion levels at Dorset/Kennedy are severe with the construction of the full ramp set at Exit 13. Congestion is projected to lessen at this intersection if the Hinesburg Road ramps are constructed.
3. Moderate improvements in congestion are estimated for the VT 15/Lime Kiln Road intersection when Alternative 2 is tested relative to Alternative 1.
4. All scenarios have similar impacts on the VT 2A/US 2 intersection.

Much of what drives the LOS estimates is the total traffic volume estimated for each intersection. Figures 21– 25 show the relative changes in traffic volumes at each intersection, by alternative. Each Figure shows the relative changes in 2010 and 2020 for each scenario relative to the No Build situation. In each case, the 2010 and 2020 No Build scenario represents 1.0, and the volume of each alternative is evaluated relative to that index.

Figure 21: Kennedy/Williston Total Volume Index

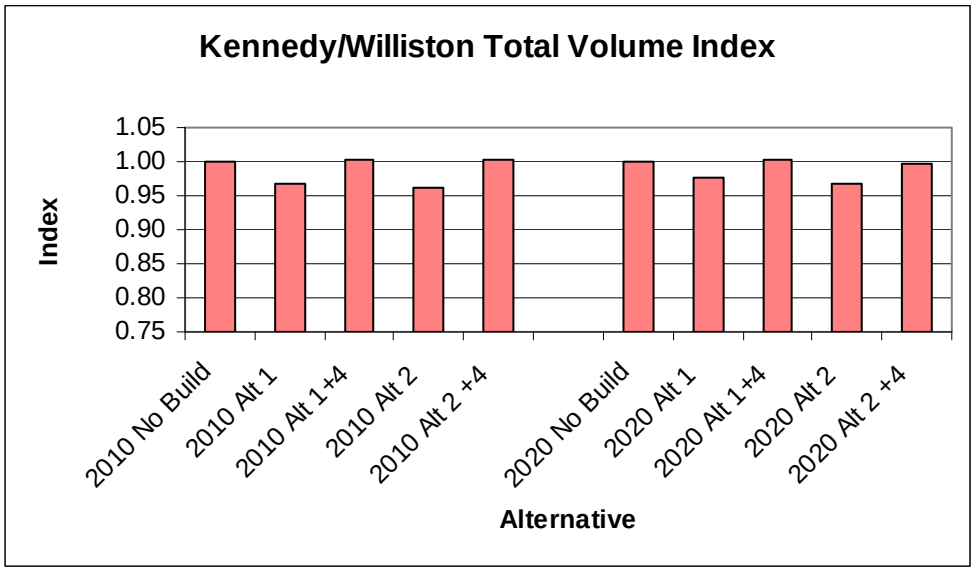


Figure 22: Dorset/Williston Total Volume Index

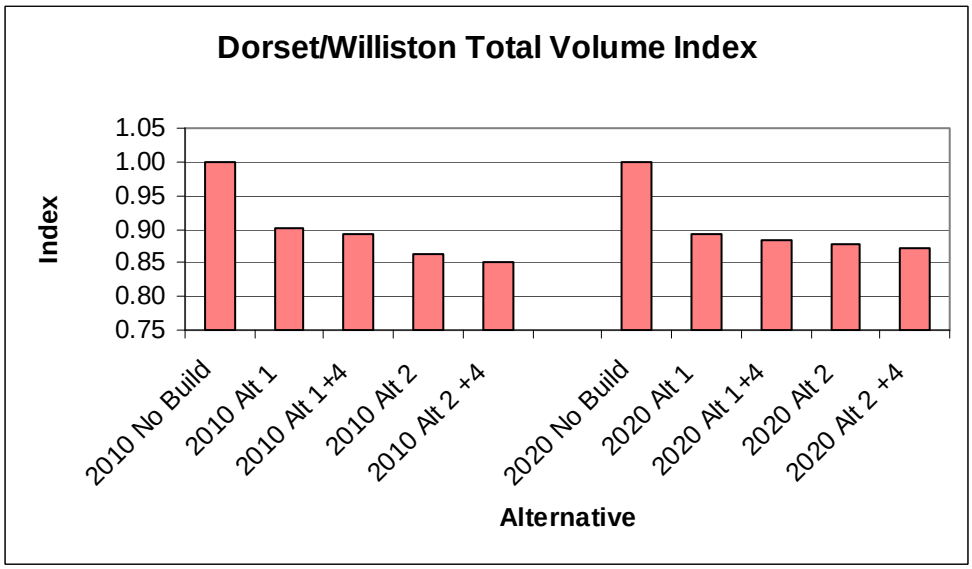


Figure 23: VT 2A/US 2 Total Volume Index

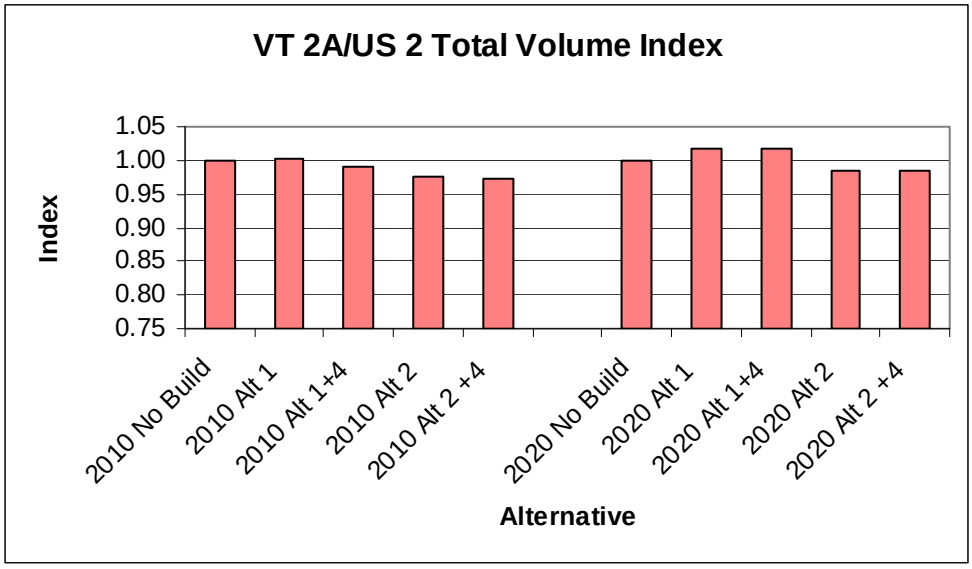


Figure 24: VT 15/Lime Kiln Road Total Volume Index

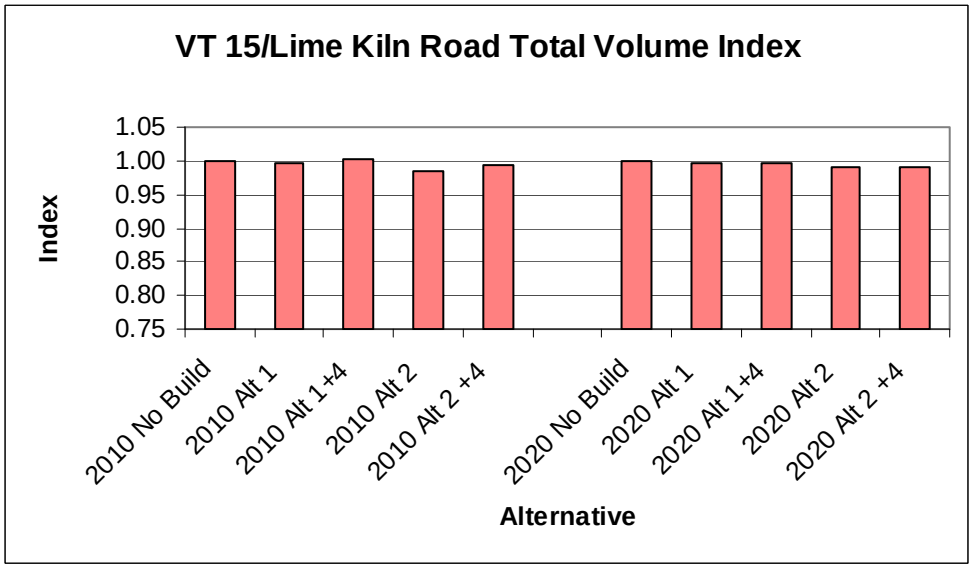
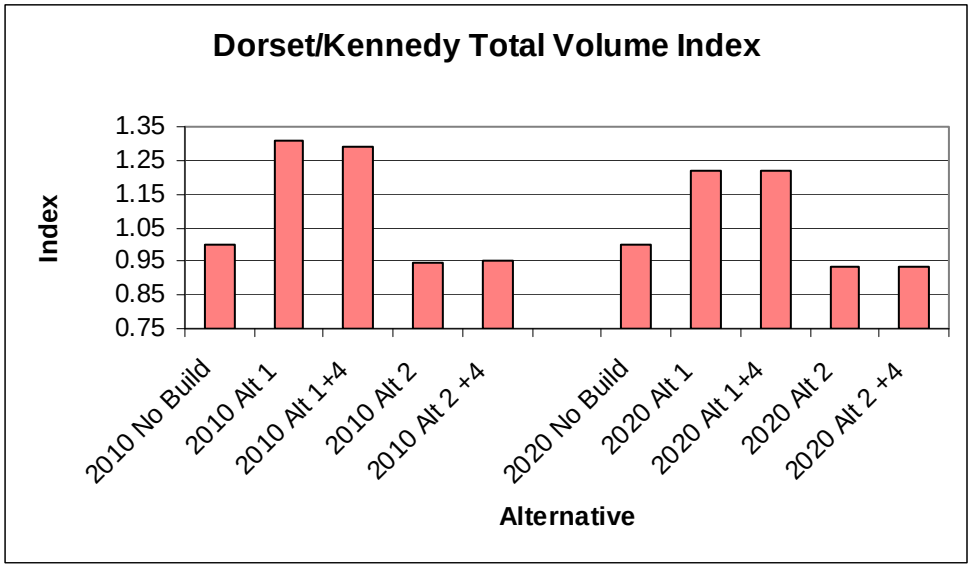
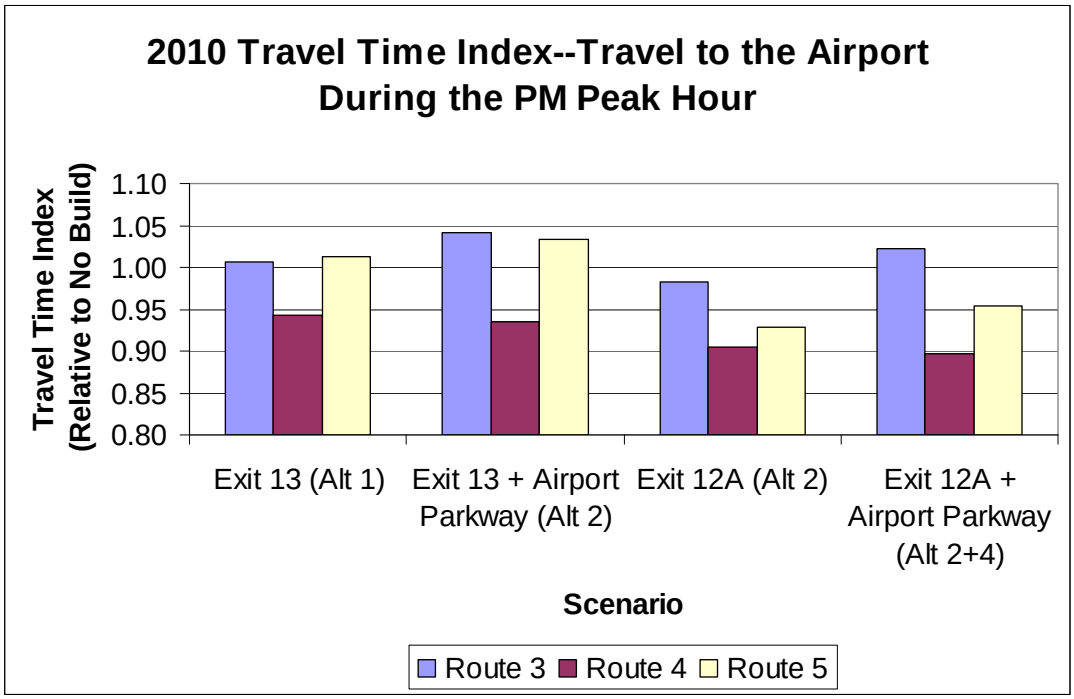


Figure 25: Dorset/Kennedy Total Volume Index



The last travel element evaluated was the travel time between BIA and various points in the region. Routes 1 and 2, to and from Five Corners, are not shown since there were no significant differences in their travel time performance between scenarios.

Figure 26: Relative Travel Times to the Airport



The data in Figure 26 are to be understood as relative to the No Build (relative to not making any improvements is an index of 1.0). The data show that the alternatives involving the new ramp set (Alt 2 and Alt 2+4) have reduced overall travel times for accessing the airport when compared to the alternatives involving completing the Exit 13 ramp set. Generally, travel times tend to increase slightly when Alternative 4 – the new Airport Parkway alignment – is included. The exception to this is Route 4, which is the route between BIA and the Dorset/Williston intersection. For this route, the construction of the re-aligned Airport Parkway results in removing some traffic from this intersection, which reduces overall delays between this point and BIA.

6.0 RECOMMENDED APPROACH TO SECURING ACCESS TO BIA

From the foregoing analysis, the study recommendations consists of 4 phases:

1. **Phase 1:** due to the high fraction of total passenger origins (49%) coming from communities served by CCTA, efforts should be made to create and improve transit service for passengers. As a start, transit service can be designed to serve peak departure times, originating in 1-2 CCTA-member communities. An airport bus service could be designed to work in cooperation with rental car agencies and/or with regional park and ride lots in order to improve efficiencies. Park and shuttle lots could work at several locations, including immediately proximate to Exits 12A and 13. This study has not identified potential properties for such lots, and this would be a logical next step as part of an overall feasibility study for this phase.

2. **Phase 2**: As a first phase in developing improved airport access, create a 4-lane cross-section extending approximately from Air Guard Road to Valley Road. This investment would assist the BIA in the development of the South End commercial area and provide a marginal increase in capacity for passenger service. Construction of this phase could occur within 5 years of preliminary engineering.

3. **Phase 3**: A second phase investment for airport access should be to improve and realign Airport Parkway. Such realignment must be sensitive to the needs of the local neighborhood. Preliminary engineering indicates that much, if not all, of the alignment could be accomplished on airport property. If this is the case, this investment could be advanced, as no right-of-way will need to be acquired, and the environmental issues appear to be minimal. Engineering design for this realignment should include sidewalks and bicycle lanes. The foregoing analysis suggests that investing in this improvement alone would not be sufficient to secure efficient access to BIA. Indeed, opening an efficient north-south route without a parallel investment in an interstate ramp would result in attracting significant traffic to Airport Parkway. Thus, investing in the new Airport Parkway alignment should be considered in tandem with a major improvement to interstate access.

4. **Phase 4**: Developing one key interstate access route makes sense in order to secure reasonable ground access to the BIA. Traffic analysis suggests that the new ramp set at Hinesburg Road would have the most benefits in terms of reduced congestion and travel times. The land use impacts of this ramp set must be carefully considered and planned for in order to ensure that the resulting corridors remain operationally efficient. A new ramp set at Hinesburg Road would likely involve a 20-year planning/engineering horizon.

   VTrans has recently commissioned an Urban Improvements study whose focus is to recommend improvements to the interstate system between Exits 12 and 15. The preliminary findings of this study recommend that Exit 13 be developed into a full service interchange.

   Due to its being more "construction-ready," this study concludes that the development of Exit 13 into a full service interchange, which would then be designated as the central I89 access to the BIA, is in the best long term interest of the region. Construction of these improvements could commence within 7-12 years of preliminary engineering. Under any improvement scenario,

Kennedy Drive should be identified as the key access arterial to the BIA. To secure this arterial, strict access management provisions should continue to govern land use development on properties fronting on Kennedy Drive.