Memorandum

To: Burlington Transportation Plan Steering Committee
From: Norm Marshall, Smart Mobility, Inc.
Subject: Briefing Document for February 21, 2007 Meeting
Date: February 16, 2007

At our past meetings, we have focused on different elements of the transportation system including pedestrians, bicycles, public transportation, car traffic, street design, parking and travel demand management. At the February 21 meeting, we will build on this work and develop one or two preferred scenarios that integrate these transportation elements into overall strategies. If the Steering Committee reaches consensus quickly, we will end the meeting with one preferred scenario. If not, we will work to structure the areas of disagreement into two competing scenarios. We will then do additional analysis of the two scenarios and work towards consensus at the following March Steering Committee meeting.

I strongly encourage each of you to attend this meeting if you are able, because this is a point in the process where your "Steering" role is particularly important. We want to sort through the various ideas that we have discussed to date, and decide which of these ideas are going to be the cornerstones of the new Transportation Plan. A two-hour time slot is not much time to resolve such broad issues. In order to jump start the process, we have prepared this briefing document that presents four preliminary scenarios, and analysis as to how these scenarios would likely perform. Please review this material prior to the meeting. It will provide a useful starting point for the Steering Committee's work on developing one or two preferred scenarios.

Preliminary Scenarios

The four preliminary scenarios include both transportation and land use. One reason to include land use in work on the Transportation Plan is that the Burlington's land use future is uncertain. The magnitude of future growth in the City and the locations of this growth will strongly affect the performance of the future transportation system. Some transportation elements will perform very differently with different future land use patterns. For example increased transit service will be much more effective if the future includes more transit-oriented development. The Vision section of the transportation chapter of the 2006 *Municipal Development Plan* includes this linkage between transportation and land use, stating:

> *…transportation functions as part of an interconnected system which offers a range of choices that are safe, affordable, efficient, and convenient for residents, employees, and visitors alike. As a result, rail, air, ferries, transit, cycling, and walking are successfully competing with the automobile for the dominant mode of choice. Local and regional multimodal corridors and centers are maximizing our use of existing infrastructure, while eliminating congestion, preserving air quality, and conserving energy. Commuters, families, and employers are benefiting from a diverse array of transportation demand management strategies such as car- and van-pools, flexible work schedules, and telecommuting. Land use and transportation decisions are considered together, significantly reducing the need for individual automobiles and large parking facilities. Greater use of rail for freight has been embraced as an effective means of removing trucks from neighborhood streets. City streets are attractive public spaces, and function*

as part of a system of interconnecting streets. Circulation within the downtown, waterfront, neighborhood activity centers, and institutional campuses is predominantly oriented to the pedestrian. A series of trails and paths provide access between neighborhoods and areas of protected open space and large parking facilities." (p. V-1)

Our public involvement work including the neighborhood meetings and the Legacy Town Meeting has suggested that this vision is still very much alive. Therefore, in developing the preliminary alternatives, we are assuming that the transportation direction will continue to be multimodal – emphasizing walking, biking, transit, and travel demand management. The question then is how far in that direction the preferred scenario will go.

On the land use side, the Municipal Development Plan has a number of policies that support growth, including:

- *Encourage mixed-use development patterns, at a variety of urban densities, which limit the demand for parking and unnecessary automobile trips, and support public transportation.*
- *Strengthen the City Center District (CCD) with higher density, mixed-use development as part of the regional core while ensuring that it serves the needs of city residents, particularly those in adjacent neighborhoods.*
- *Target new and higher density development into the Downtown, Downtown Waterfront, Enterprise District, Institutional Core Campuses, and the Neighborhood Activity Centers.*
- *Strengthen the Pine Street corridor for commercial - industrial development while minimizing adverse impacts on adjacent residential neighborhoods.*
- *Encourage light industry, the creative arts and technologies, and manufacturing and incubator space for new and emerging business in appropriate locations including the Pine Street corridor. (p. I-3 – I-4)*

In the 2000 *Legacy Project Action Plan*, there is some quantification of how much growth might be considered.

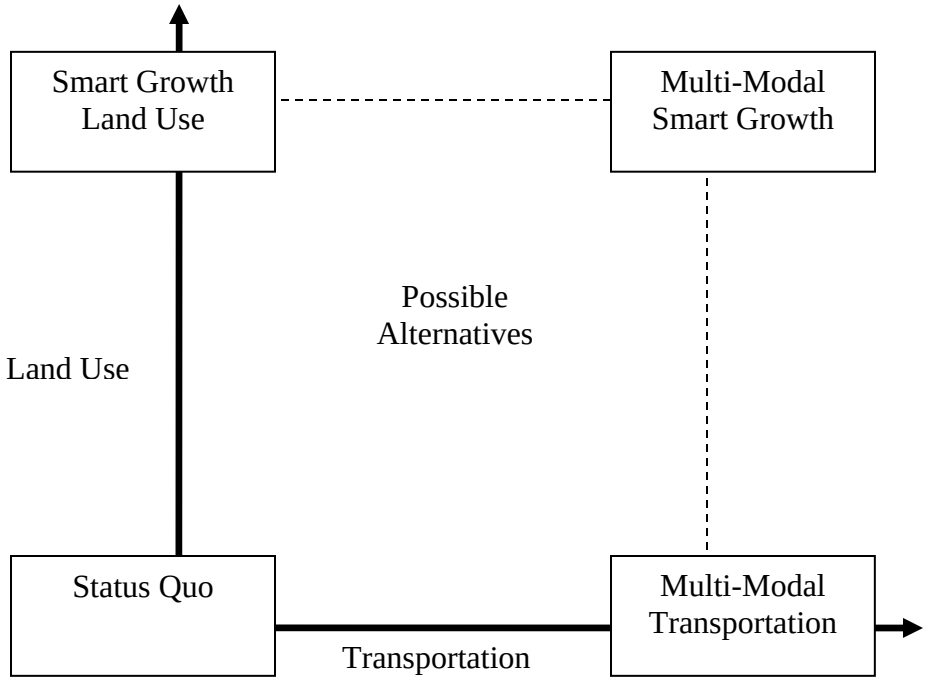
The Legacy Project believes that the most desirable means of both achieving a robust economy and countering sprawl is substantial, well-planned growth within the city of Burlington itself. The city has recently experienced a loss of retail business and a significant slowing in its population growth as compared to the rest of Chittenden County. If we reverse this process and Burlington were to absorb a higher percentage of local growth—as a means of countering suburban sprawl—the population could reach as high as 65,000 in 30 years. (p. 10)

We assume that this is the direction that might be encouraged: higher-density mixed land use in targeted areas. (We have labeled this "smart growth" as a shorthand version of a complex strategy.) Again, the question is how far this direction will be pushed.

As shown in the figure below, the four preliminary alternatives are intended to bound the range of possibilities for the preferred alternative. At the lower left hand corner is the status quo, an

alternative with no changes from existing policies and trends. At the upper right hand is an alternative that pushes on both the transportation and land use dimensions. The other two alternatives push along only one of the two dimensions, transportation or land use.

Preliminary Alternatives Bound the Preferred Scenario



Status Quo Scenario

In this scenario, everything is assumed to remain more or less as it is today. Burlington's population and employment have been fairly constant since 1990, and it is assumed that this trend will continue. Similarly, except for the transportation projects already in the works (particularly the Southern Connector), the transportation system will remain as it is today.

Multi-Modal Transportation Scenario

In this scenario, in addition to completing planned transportation projects, there would be a shift in emphasis further towards walking, biking, and transit. This would include:

- Priority high frequency direct bus routes
- Improved pedestrian crossings
- Complete bicycle network including separate lanes where heavy traffic and/or higher traffic speeds
- Lowered traffic speeds to promote walking and bicycle safety and level of service, especially in Downtown

Smart Growth Land Use Scenario

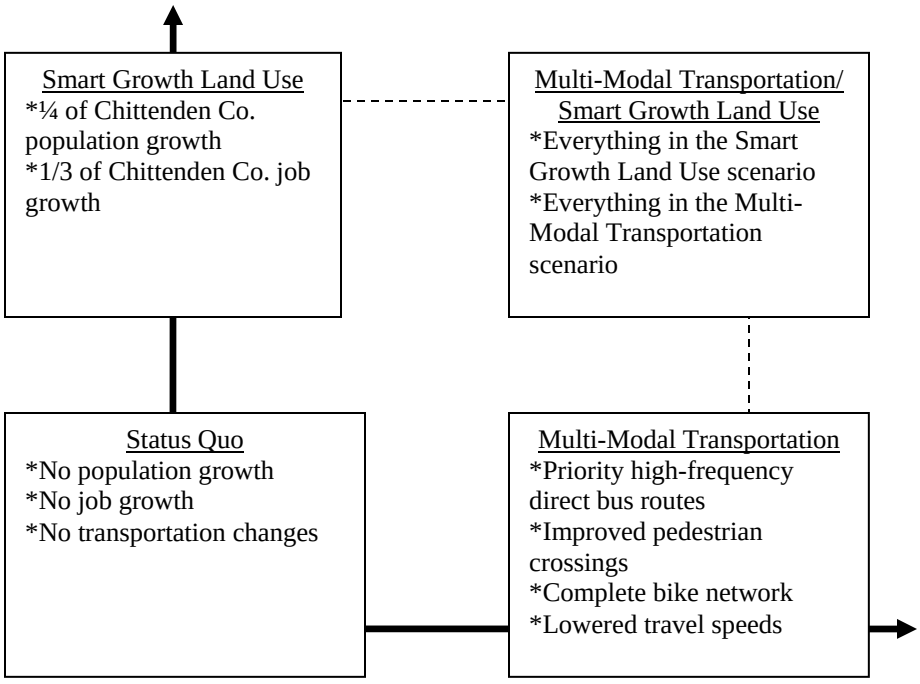
In this scenario, it is assumed that Burlington would maintain the same share of Chittenden County's population and employment that it does today, i.e. about ¼ of the population and 1/3 of the employment. Over the period, 2010-2020, CCMPO is forecasting an additional 8,000 households, and 16,000 jobs. Therefore, Burlington would need to gain an average of 200 households per year and 500 jobs per year.

The Municipal Development Plan emphasizes pedestrian- and transit-oriented mixed-use growth and transportation demand management (TDM). It is assumed that all growth would be of these development types. Furthermore, it is assumed in this scenario that parking minimum requirements would be eliminated as recommended in Donald Shoup's the *High Cost of Free Parking*, which we discussed in our January meeting.

Combined Multi-Modal Transportation/Smart Growth Land Use Scenario/

This scenario includes all of the elements of the Smart Growth Land Use and Multi-Modal Transportation scenarios.

Summary of Four Preliminary Alternatives



Scenario Performance

We are developing a game and computer model based on Chittenden County, called *Getting Around Sustainably* (GAS). The game involves making land use and transportation decisions for a center city (Burlington) and the surrounding area (Chittenden County). Decisions are made at 5-year intervals and a computer model estimates outcomes from the decisions which are compared to a baseline scenario like the Status Quo scenario in this memo. We used this GAS model to evaluate the four preliminary scenarios. GAS and the computer model are described in more detail in an Appendix.

We use transportation models because it is challenging to think through the complexity interactions between land use and transportation without models. For example, transportation models have been used to help understand the impacts of large urban developments including the Filenes development, the FAHC expansion, and the Winooski Falls project. In all three cases, local traffic impacts due to intensified uses were generally outweighed by regional benefits, assuming these projects offset possible suburban development. Despite their value, models are imperfect, and model outputs should not be accepted blindly. The best practice to consider the model results carefully, and to think through whether they look reasonable. Model results can teach and lead to more sophisticated mental models. Challenging models when they do not seem reasonable provides necessary feedback that can lead to better computer models.

The following pages show the modeled performance of the four scenarios over a 25-year time period. This is a longer period than we are focused on in the development of the Burlington Transportation Plan, but it is useful to keep the long-term consequences of alternatives in mind in any planning process.

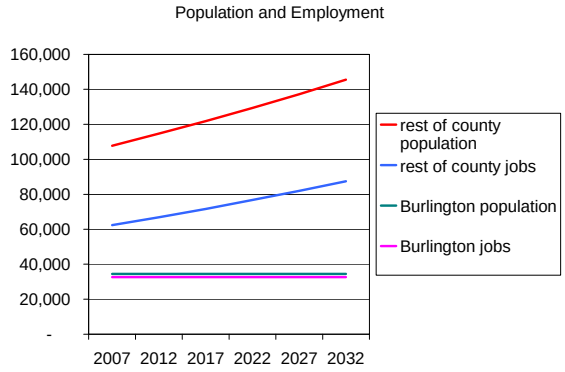
For each alternative, four graphs are shown of performance measures over time. These include:

- Population and employment growth in Burlington and in the rest of Chittenden County
- Non-motorized (walking and biking) and transit mode shares for Burlington and the rest of Chittenden County (car share not shown because it would make it hard to see changes in the alternative mode shares)
- Vehicle Miles of Travel (VMT) for Burlington residents, the rest of Chittenden County and the total for Chittenden County – VMT also is an indicator of energy use and greenhouse gas emissions
- Travel time, including time spent in cars, using transit, and walking/biking for Burlington residents

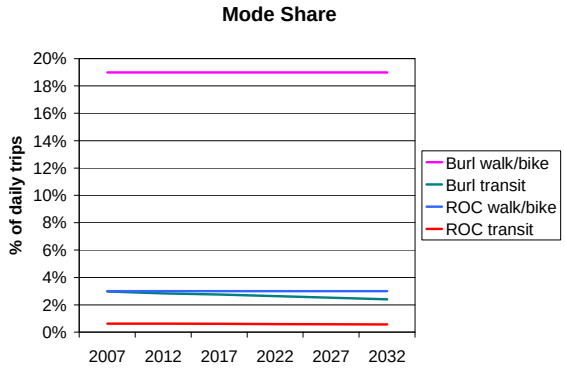
The modeling and graphics assume that other municipalities in Chittenden County make no changes in their transportation policies. If Burlington took a leadership role in these areas, it is likely that there also would be changes in other municipalities, and the full results of changes in Burlington would be greater than shown.

Status Quo Scenario

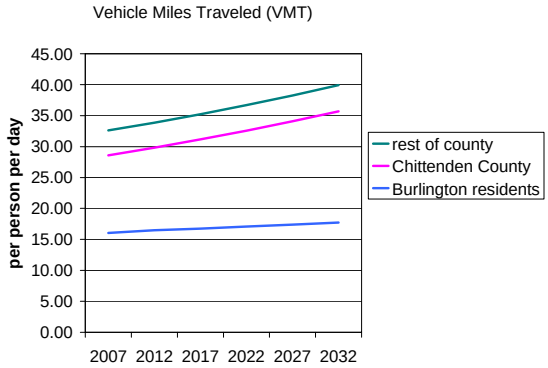
In the Status Quo scenario, population and employment in Burlington are held constant. (Note: the population numbers are household population and exclude "Group Quarters", e.g. UVM dormitories.) There is strong growth in population and employment in the rest of the county based on CCMPO forecasts.



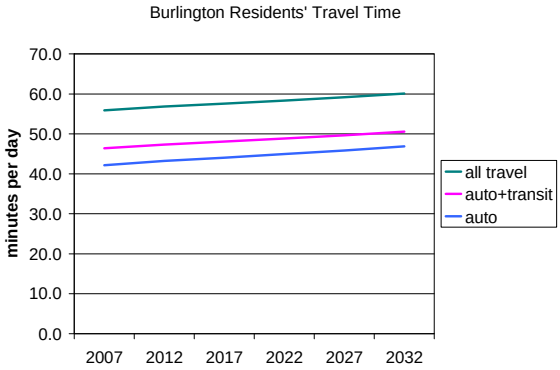
The transportation system is assumed to stay the same. The share of trips made by walking and biking remains constant. There is a small decline in transit share as land use in the county becomes more decentralized.



Vehicle Miles Traveled (VMT) per person for Burlington residents increases as land use becomes more decentralized. There is strong VMT growth in the rest of the county.

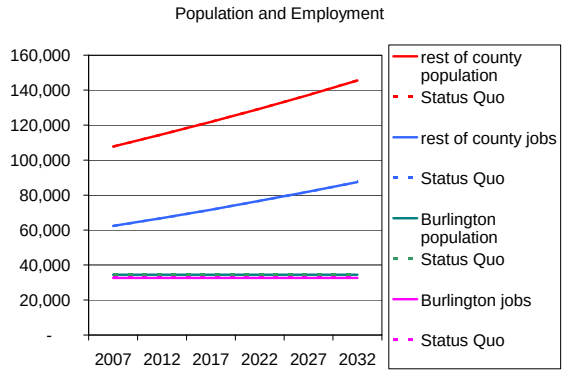


The increased VMT per person and some increased congestion causes the time Burlington residents spend in cars to increase over time.

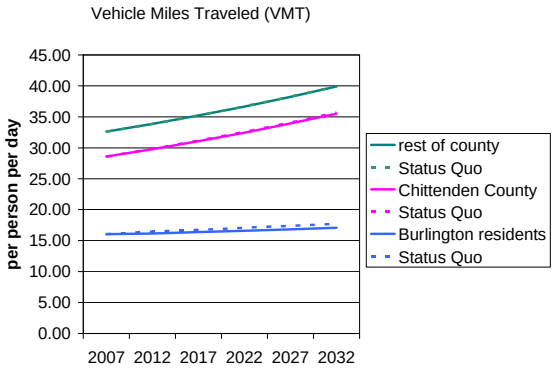


Multi-Modal Transportation Scenario

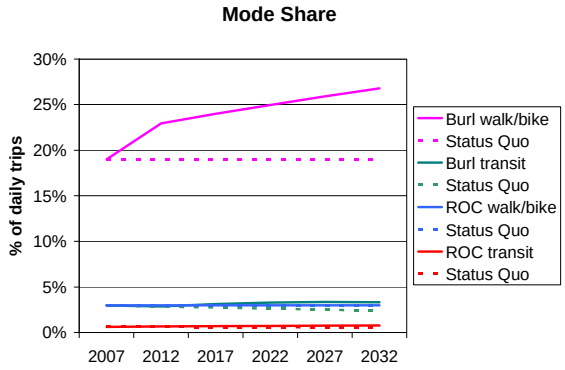
In this scenario, Burlington population and employment are held constant as they were in the Status Quo scenario.



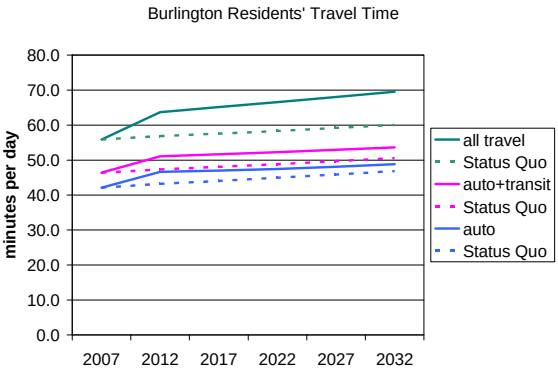
Vehicle Miles Traveled (VMT) per person for Burlington residents increases at a slower rate than in the Status Quo scenario.



Transportation investments are shifted towards transit, walking and biking. Auto speed is reduced somewhat, particularly in the downtown to emphasis pedestrian and bike safety and level of service. The result is a significant increase in walking and biking and a small increase in transit usage.

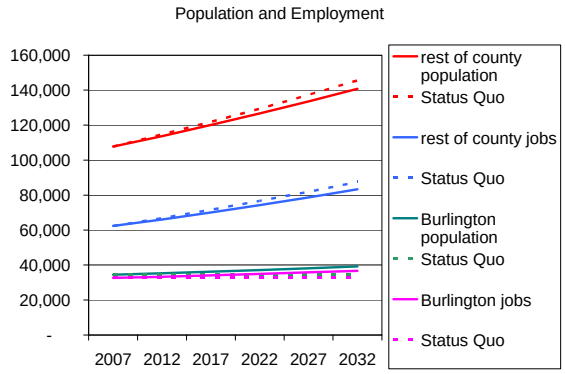


The lower road speeds add to residents' travel time for auto and transit travel. The shift to walking and biking add to walking and biking travel time.

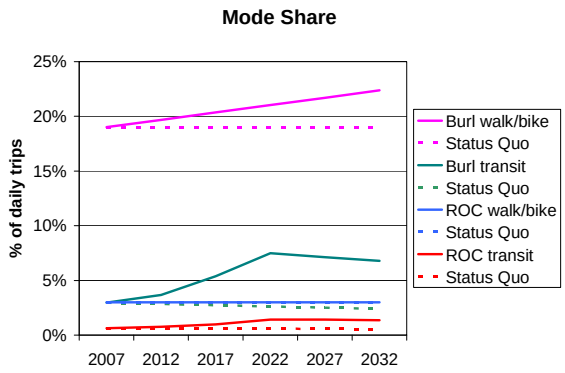


Smart Growth Land Use Scenario

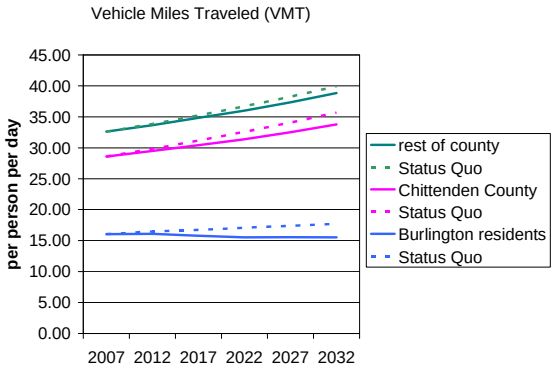
In this scenario, population and employment in Burlington growth so that the City's share of Chittenden County's population and employment is maintained



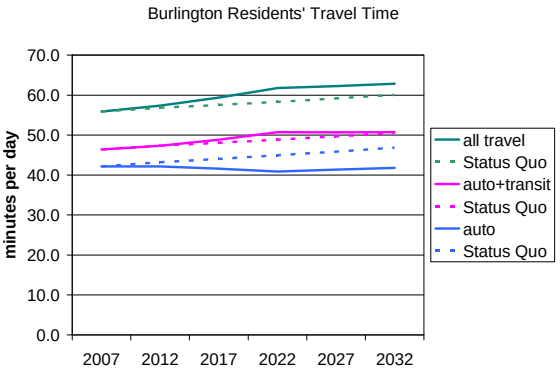
The transportation system is assumed to stay the same, but parking minimum requirements are eliminated and parking costs increase over time. Development is primarily higher density mixed use. The combination of land use and parking cost shift trips from car to alternatives. Growth in transit usage is limited by the lack of increased service in this scenario.



Increased density and shifts to alternatives to cars reverses the trend towards growth in VMT per person among Burlington residents. .

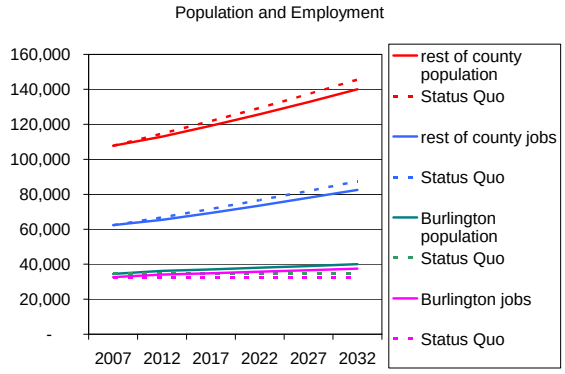


The reduced VMT per person causes Burlington residents to spend less time in cars, on average. Time spent using transit and walking and biking increases.

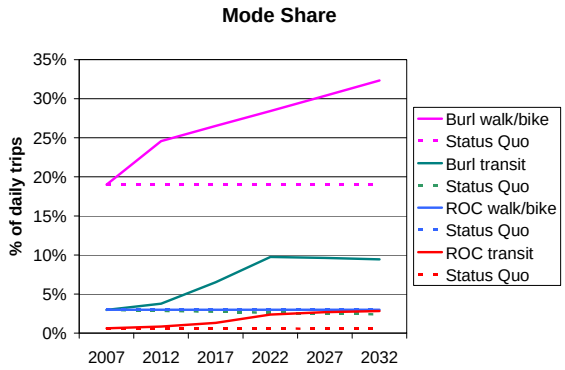


Multi-Modal Transportation/Smart Growth Land Use Scenario

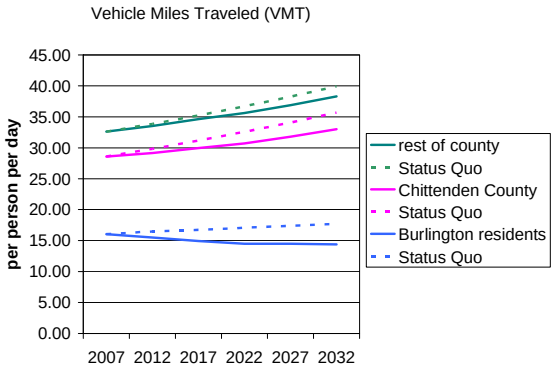
This scenario combines the changes in the Multi-Modal Transportation scenario and the Smart Growth land use scenario. Burlington's population and employment is assumed to grow as in the Smart Growth Land Use scenario



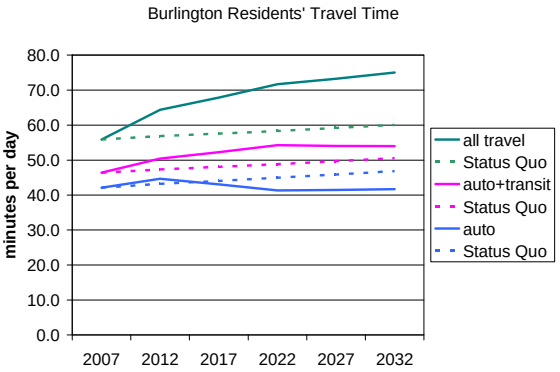
Mode shares for alternatives to cars grow by more than in the other scenarios. The transit share is limited by continuing auto-oriented development outside Burlington and lack of increased transit investment outside Burlington. The increased transit service and transit oriented development in Burlington also raises the transit mode share for commuters and visitors from the rest of Chittenden County



VMT per person for Burlington residents declines due to shifts to alternative modes.



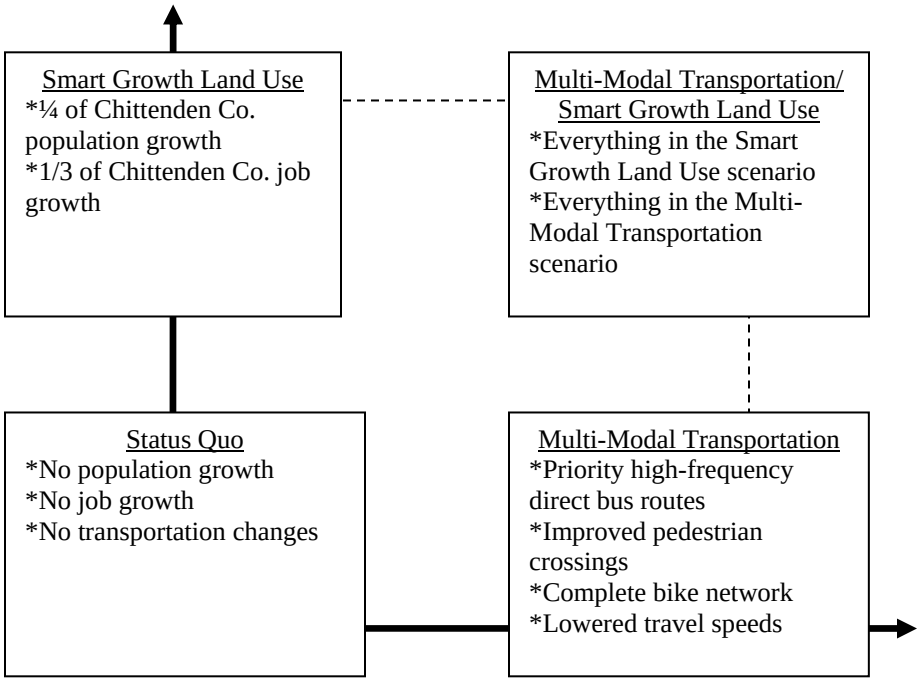
Time spent in cars by Burlington residents also declines, but there are significant increases in time spent using transit and time spent walking or biking.



Working Towards a Preferred Scenario

The four preliminary scenarios are intended to bound the decision space which the preferred scenario will be drawn from. The Municipal Development Plan and other City planning documents give the general direction of intended movement, i.e. away from reliance on cars towards a more multi-modal future, and increased population and employment within mixed use developments.

Summary of Four Preliminary Alternatives



While there appears to be general agreement about these directions, there appears to be less agreement about how fast and how far to move in these directions. In order to develop a Transportation Plan for Burlington that is a solid basis for implementation, we need to be able to be as specific as possible about what we are trying to achieve. For example, selection of the Multi-Modal Transportation scenario would lead to some reallocation of street space from cars to bike lanes and possibly to bus queue jump lanes or other space devoted to buses.

We are seeking your guidance about how far to push on each of the elements discussed above, and are hoping to reach consensus on this. It may be particularly difficult to decide what to do on the land use side, as those issues go beyond the scope of the Transportation Plan. In this case, it may be appropriate to develop two scenarios, with transportation scenarios matched to different assumptions about population and employment growth in Burlington.

Appendix: Getting Around Sustainably (GAS) Version 1

Why GAS?

On-road transportation in the U.S. produces a large share of greenhouse gas emissions, represents a large share of consumption of increasingly expensive and ultimately limited imported oil, causes air pollution that results in public health problems, represents an enormous public and private cost, kills a large number of people each year, and consumes a large and increasing amount of personal time. Many people are interested in doing better along some or all of these dimensions. However, progress is hindered by poor understanding of the complex system interrelationships that together are creating this constellation of problems. *Getting Around Sustainably* (GAS) is intended to educate the public about these interrelationships and therefore to lead to better public policy.

> "A good transportation system minimizes unnecessary transportation." – Lewis Mumford, *The Highway and the City*, 1963

Most transportation is what economists call a "derived demand" – meaning that the true economic needs are employment, schooling, shopping and visiting friends and neighbors. Transportation is a means to an end, rather than an end in itself. The amount of transportation "consumed" in order to achieve the true economic needs depends on the distribution of land uses as well as the characteristics of the transportation system.

While it is impossible to predict the travel of individuals, it is possible to predict aggregate transportation behavior based on the locations of homes and workplaces, and the characteristics of transportation options (especially travel time and cost). Important transportation/land use relationships include:

- land use decentralization causes longer trips
- balancing jobs and housing within subareas causes shorter trips
- increasing travel speed causes longer trips
- transportation requires networks, with continuous paths from origin to destination but transit, walking and biking networks are incomplete
- walking routes to transit stops are an essential part of the transit network
- driving to transit is unattractive unless driving the entire trip is involves expensive parking or significant congestion that can be avoided by using transit
- it is impractical to develop complete transit networks in decentralized areas
- more street connectivity (smaller blocks) causes more walking and biking and better transit access due to more direct routes and route choices that avoid heavy traffic
- in cases where there are choices between modes, travel time and travel cost are generally the most important factors as to which mode will be chosen; parking cost is particularly significant in encouraging alternatives to car travel

Travel behavior is a complex outcome from the interactions of all of these factors. It is impossible to juggle such a complex system mentally; therefore we rely on computer models. Computerized transportation models are required for good transportation and land use planning, but they have weaknesses. They are complex, require special expertise to use, and rely on

expensive commercial software. For these reasons they are unavailable to the general public that often views them as a "black box" that may not be trustworthy. In our experience, the public's skepticism concerning models is justified, because models are typically misused. A common claim is that a model shows that the traffic volume on a particular roadway in a distant year will be a specific number. However, the error in the model for a single roadway link may be 20% or even more for the current year. The potential error at a distant year is greater still. Even more importantly, the future traffic volume will depend heavily on future land development, macroeconomic factors including gasoline prices, and public policy. To present a single traffic future traffic volume, all of these important areas of uncertainty are ignored. It is particularly disturbing that public policy is ignored, because this shifts our collective future from something that we have control over to something that we are powerless to change. The public often rightly rejects such fatalism.

A more appropriate use of models is to compare "what if" scenarios that consider differences in future land development patterns, macroeconomic factors and public policy. While most models calculate impacts at the detailed roadway segment level, it must be understood that models are more accurate for comparing scenarios at the big picture level, e.g. total vehicle miles of travel (VMT) or total vehicle hours of travel, than for individual roadways. Furthermore, models are most useful for comparing two or more future scenarios. For example, two scenarios might compare two different future development patterns with the same level of growth. The actual level of future development could be substantially higher or lower than that modeled, so that the exact modeling results would not be right. Nevertheless, the modeling would have provided important insights about the advantages and disadvantages of the scenarios.

The *Getting Around Sustainably* (GAS) game and model allow the public to get involved in scenario development and scenario testing. Participants work in small groups to make land use and transportation public policy decisions. The decisions are input into a simple transportation model, in the form of a Microsoft Excel spreadsheet, which produces model outputs. While the GAS model may be a "black box" during a game session, our intention is to make the Excel file available when GAS is completed. Then, interested members of the public and students who are familiar with Excel will be able to "look under the hood" and even change assumptions and relationships, thereby opening the model up to the light of day.

GAS Overview

The initial setting for GAS is the Burlington Vermont region, with the City of Burlington as the center city and the rest of Chittenden County as the rest of the region. The numbers and relationships in GAS are based on real world data for Chittenden County including a Chittenden County Metropolitan Planning Organization (CCMPO) household travel survey and regional transportation model. We are hoping that GAS will be customizable to other regions, but we have not this yet.

Regional transportation models generally have hundreds of spatial zones and thousands of roadway links. GAS distills all this to the simplest possibly multi-actor framework. Instead of tens or hundreds of different governmental areas, there are two – a center city and the rest of the region. Each government is simplified so that it has two committees – with one committee

overseeing transportation, and the other overseeing land use. Therefore, there are four committees in the game. Each committee makes a set of decisions that guide the future for a five year period. The GAS model takes the decisions from all four committees and produces a snapshot of the future after five years. This is followed by additional five-year rounds so that the future is played out over 20-30 years.

The game is intended to foster discussion and peer learning; therefore each committee ideally includes 3-6 members, or a total per game session of 12-24 people. With larger numbers, multiple games can be run simultaneously. This can be beneficial during the debriefing because different outcomes from different "regions" can be compared and discussed. A facilitator with a computer is needed for each region or separate game session. Alternatively, a smaller group or a single player with computer can play all parts. Also, GAS can be played with only the center city roles or the rest of the region roles active, letting the computer play the other parts. However, this isn't ideal because it is hard to achieve significant change even with all committees moving in the same direction. With only some committees active, progress is frustratingly slow.

The transportation committees decide:

- how to split transportation spending between roads, transit and bike/ped facilities
- how to balance car speed with bike/ped level of service and safety
- where to set transit fares

The land use committees decide:

- how much of population and employment growth is in the center city vs. the rest of the region
- parking policy (minimum requirements, no requirements, maximum allowed)
- character of development (ranging from separate low-density to mixed use higher density)

Overall outcomes result from the interactions of the decisions of the two center city committees and the two rest of region committees. Performance measures are compared to a trend scenario, producing graphics like those included in the main body of this memo.