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SOME CONSIDERATIONS ON WHY SLOW ROUNDABOUT DEVELOPMENT IN VERMONT DEMANDS ATTENTION AND THE LARGER PICURE OF VERMONT GROUND TRANSPORTATION

A MONOGRAPH

By Tony Redington

The following monograph comes about as a response to a message regarding roundabout considerations in Vermont by Bruce Nyquist, P.E., Vtrans Traffic and Safety Engineer.

During the delay in response to your August 15 message--in great part because of travel--did get the opportunity to view and photograph the two new roundabouts in Manchester Center, the Cambridge roundabout (VT 5/108), the Hyde Park roundabout (VT 15/100) and the new Keene (NH) roundabout at Maple Ave./Old Walpole Road/Surrey Rd./Court Street, the fourth in my hometown finished last year.

Major Intersections along high-speed roadways (40 mph and above)

The fifth Keene roundabout now going forward by the NHDOT brings out the key reason why—and real world example--roundabouts are the only choice for intersections along high speed roads (40 mph and above)--something, as you know, comes from among others the counsel of Barry Crown, perhaps the most experienced roundabout designer and software author on the planet. (“Crown’s Rule”, roundabouts only at high-speed intersections, can be found in all his basic roundabout workshops.) He deserves major credit (though with a lot of help and years of volunteer efforts as you well know) for the $60 million Keene Bypass project being stopped and converted to four roundabouts---one already built handling 60,000 average daily traffic.

The other Keene roundabouts are: (1) the first, a single laner in front of the Monadnock Region Medical Center and (2) a $4 million all-city-financed two laner at Marlboro/Main/Winchester Streets which forms a gateway to Keene State College and along with Central Square defines the downtown core.

High-speed intersections and the roundabout: Crown's Rule

That fifth Keene roundabout on a 55 mph speed zone will be between the Keene Bypass Roundabout and the Keene Turn Roundabout 15 miles distant in Brattleboro, about three miles from downtown Keene at NH 9/Base Hill Road cross intersection. That intersection along a straight section of NH 9 at the bottom of a long ascending grade to the west has long been a high accident section. After the latest NHDOT 2010 effort involving a median treatment on NH 9 outward in both directions from the intersection and further tweaking of the signals, another fatal crash occurred within two years. "Crown's Rule" proven again. The NHDOT in fact truly seeks to address the safety there and now--finally it must be said—decided to employ the only known treatment for high speed cross intersections providing a modicum of safety: the roundabout. To deal with the high-speed approach NHDOT on the west leg a curving of the eastbound approach roadway (the downgrade) will be utilized, a recognized treatment, to constrain approach speeds. While the roundabout does not promise to be a cure all for crashes at high-speed intersections, it surely will reduce the numbers of crashes, the severity of any resulting injuries and avoidance of the T-bone crashes. And at high-speed intersections benefit cost for car travel is highest. As you know, the Maryland State Highway Administration (MSHA) pioneered along with Florida and Vermont the beginnings of roundabout development in the eastern United States. And MSHA first installed roundabouts to respond to mostly rural high-speed (40-50 mph on one or more approaches) intersections where no solutions had been found to crashes with serious and fatal injuries—roundabouts slashed injury crashes by 88% (see FHWA website:

http://safety.fhwa.dot.gov/intersection/resources/casestudies/fhwasa09018/).

Note the Keene Base Hill Road/NH 9 project for the NHDOT does stand above in priority in comparison to other choices, such as the three intersections (perhaps four when you consider the nearby entrance to the new NH 9 entrance to a major shopping complex just beyond the Bypass) along the Keene Bypass—two of the three remaining Bypass signaled intersections (Main Street the exception) involve no

bicycles or walkers. As you know a fatality for benefit cost analysis is valued at a $6.1 million and an injury $126,000 (FHWA, 1999 dollars). (Note the excellent Cambridge Systematics paper showing in large metros fatalities and injuries more than twice the cost of congestion--the study sponsor, AAA supports a “zero fatality rate” policy, one it calls for declaration through a White House safety conference.)

The foregoing, as did my original message, places the high-speed intersections first and foremost the standard treatment for high-speed intersections. Of course, this entire discussion does not apply at all across the lake in New York State (or Florida, Virginia and two Canadian provinces, Alberta and British Columbia) where the roundabouts unless unfeasible remain by policy the standard treatment. The New York State Department of Transportation (NYSDOT) backs up their “roundabouts only” policy, almost a decade old, with a central office roundabout design unit responsible for review of any NYSDOT investment in intersections where something other than a roundabout is proposed. The fatalities along the US 7 corridor in Addison and Chittenden County alone--even in the absence of bicycle and walker usage--suggest the roundabout treatment even with acquisition of right of way when needed. Note the Brattleboro Keene Roundabout at $4 million arguably has already paid for itself in reduced injuries per year since 1999 when it was built--about 120 injuries based on the previous five-year rate and not including the one fatality in the last five years of the signal configuration. (In the initial five roundabout years injuries “before” injuries of 55 dropped to one.) And, as you know, tens of thousands of gallons of gasoline are saved each year at this intersection through conversion to a roundabout (note the VAOT study of hours of stop delay before and after the roundabout).

So, what continues today along US 7 major high speed intersections with signs or signals amounts to a form of "Russian highway roulette" whether at Ferry Road in Charlotte, Ferrisburgh State Highway, VT 103 in Clarendon and the intersections north of that point to U.S. 4 in Rutland (all fatality crash sites)--and yes, Little Chicago Road in Ferrisburgh. Unfortunately conscious decisions to build higher injury rate signals rather than roundabouts at US 7/VT 103, Taft Corners and US 2/Industrial Drive in Williston (now nearing construction and speed limits along those roadway approaches are 30-35 mph) provide us with a test of safety performance of intersections where roundabouts were predicted to perform at a higher level but were rejected for traffic signals. Over the next few years the wisdom of those choices can be easily assessed. It is suggested here what will happen because of the rejection of the roundabout choice will not be pretty. Finally, the discussion to this point addresses primarily the car mode only, not walking and bicycling aspect (although a bicyclist fatality did take place at the US 7/Ferry Road intersection).

The basic safety by the numbers for roundabouts—car occupants, walkers and bicyclists

First and foremost one must consider the incontrovertible evidence that roundabouts substantially reduce injury rates for the principle modes: walking, bicycling and car travel. For overall safety, the authoritative U.S. study by the Insurance Institute of Highway Safety (2000) found anything but a roundabout generated serious and fatal injuries at a rate about 900 percent higher than the average of signals and stop control level. (The study language that roundabouts reduce serious and fatal injuries about 90% translates—using arithmetic—one roundabout to ten non-roundabout injuries, so one calculates non-roundabout injuries occur at an 900% greater rate.) The roundabouts surveyed in the before and after analysis were both single and multi-lane—and the statistical measures compared the "after" performance against typical intersections thereby avoiding the "reduction to the mean" issue. Results did to a great extent reflect car travel as the U.S. walking mode share still remains below those of many developed nations, and very far below the bicycle mode share—with American bicyclists primarily younger adult males.

But two studies—one Dutch and the other Swedish—examining single lane roundabouts clearly show the safety benefits to those who walk and bike reach near the same levels of safety gain as the overall numbers in the U.S. study. And secondary findings of both those studies point to a major breakthrough for bicycle facility design and the pivotal role roundabouts play in that breakthrough—a subject to be discussed in detail later in this monograph. In the U.S. any discussion of the walking and bicycling mode takes place during a time when car occupant fatalities in recent years have decreased, walking fatalities increased, and while bicycle fatalities have decreased the decrease is slower so that overall bicycle fatality numbers represent a slow increase in the overall share of U.S. highway fatalities.

Single lane roundabouts will be evaluated—they are roughly about 75% of all roundabouts built. In Vermont to date 10 of 11 roundabouts are single lane. While studies of two lane roundabout have been produced, recent design practice involves minimizing roundabout sizes when serving walkers and bicyclists since their safety depends in great part from lower speeds—and smaller roundabouts constrain speeds to a lower level than do larger roundabouts. For example, the Swedish study cited here two lane data found roughly little change in bicyclist crash rates and possibly a slight increase. However that study reported in 2001 involved roundabouts with about a 200 foot diameter typically versus the current practice of 150 to 180 foot diameter two-lane roundabouts where serving bicyclists and walkers.

Still, with the knowledge of the sizes of the study roundabouts, it can be concluded that there is a small increment of bicyclist safety at two-lane roundabouts in view of current designs which are significantly smaller diameter and beginning to employ on/off ramping or pathing so bicyclists do not have to “take the lane.” This too, will be discussed in more detail later in this monograph.

Walker and bicyclist safety at one lane roundabouts—anything but a roundabout on average generates injuries at rate of about 200% greater for bicyclists and about 700% greater for walkers

The two best studies to date determining a safety gain for walkers and bicyclists at one lane roundabouts are: (1) “What roundabout design provides the highest level of safety?”, The Swedish National Road and Transport Research Institute (VTI) (2000) http://www.alaskaroundabouts.com/Nordic2safety.pdf and (2) “The safety of roundabouts in the Netherlands” by Chris Schoon and Jaap van Minnen, Traffic Engineering and Control, March 1994.

The VTI study of 58 conversions of intersections to single lane roundabouts predicted “after” injuries and fatalities based on standard Swedish formulas, formulas applicable to either signals or sign control as Swedish research determined crash experience for both signals and signs were the same. The Dutch study produced before and after crash data on the conversion of 181 intersections to roundabouts. Most conversions were from sign control though a small number were signal to roundabout conversions. No such similar studies are possible in the U.S.—even today—for a key reason: Western European nations modal shares of those who walk and bike in urban areas average upwards of third of all trips compared less than a tenth of U.S. urban trips on foot and bicycle. A cross section of Western European walkers and bicyclists represent a cross section of population by age and skills. In the U.S. small proportion of the populace who bicycle tend to be young adults and male. One needs to keep in mind when the Dutch and Swedish studies reveal high reductions in either bicycle or walker injuries following converting intersections to roundabouts, those benefitting from the injury reductions are all ages for those who walk, and for bicyclists a cross section of all ages and skills. From another standpoint, the two studies reflect what the United States and other nations with low walking and bicycling levels can expect in terms of safety as walking and bicycling modal shares rise along with the addition of “non-traditional” populations of riders and walkers.

The reduction of walker injuries were: (1) Swedish study 78% and (2) Dutch study 89%--an average of 84% reduced incidence of walker injuries--or any intersection other than a single lane roundabout generates, on average, about a 700% greater rate of walker injuries. For bicyclists the reductions: (1) Swedish study 75% and (2) Dutch study 30%--an average of 52% reduction, or any intersection other than a single laner roundabout generates, on average, about a 200% greater rate of bicyclist injuries. Because the Dutch study revealed use of a bike lane within the roundabout generated a low percentage improvement in bicyclist safety (about a third of the conversions) that design subsequently was dropped, and other results of that Dutch study indicate that excluding laned roundabouts resulted in a bicyclist injury reduction closer to the Swedish study findings. In turn, the Swedish study—and likewise the Dutch study--found “take the lane” bicycle injuries at roughly 2.5 times the rate of roundabouts with paths which give the bicyclist the choice of taking a path through separate or shared crossings. So, the Swedish and Dutch studies indicate the true bicyclist injury reduction may reach far closer to the 84% reduction average for walkers in the two studies. One can expect further studies in this regard in the near future.

In sum, both the Swedish and Dutch studies clearly show a far higher level of safety single lane roundabout versus an alternative—an average reduction of 84% for walkers and at a minimum and likely higher than the 52% reported for bicyclists with users of all ages and skills. The quick adoption of the roundabout by some states and Canadian provinces as the standard intersection rests perhaps as much on the safety performance for walkers and bicyclists compared to signaled and signed approaches of the past as it does for the unquestioned benefits to car occupants.

A note on roundabouts and persons with a disability

Based on the safety performance of the roundabout, my Canadian Transportation Research Forum (CTRF) paper, “Modern Roundabout Technology Unlocks the Stifled Walking Mode in the United States and Canada” (2010) proposed a “walking service level” typology ranging from “shared space” and strong traffic calming/traffic calmed roundabouts to two lane roundabouts. For all persons with a handicap, including those with severe visual disability, “shared space”, strong traffic calming and traffic calmed single lane roundabouts provided (with wayfinding) full accessibility. On the other hand other than a strongly traffic calmed signal, no other signal treatment provided accessibility for persons with a handicap. The problem lies in the fact that the traffic signal no longer provides in its generic form a safe crossing environment for those with or without a handicap. The same can probably be said for bicyclists at signals and, of course, car occupants.

Production and importance of lack thereof and congestion/sprawl connection

Few roundabouts get built either in Vermont or North America. For a decade—1993-2003—France (they lead the world in roundabouts with numbers somewhere in the mid-30,000s) built roundabouts at an U.S. equivalent rate of 7,000 a year. For Vermont that same rate would be about 20 yearly, for Chittenden County about five yearly, and for Burlington about two per year. The Vermont production rate with 11 roundabouts since 1995 is one-half roundabout per year, Chittenden County with three roundabouts about one-third of a roundabout a year, and Burlington with one roundabout about a twentieth of a roundabout a year (Burlington with a residential calming circle roundabout gets its first busy-street roundabout about 2017). The U.S. and Vermont rate represents a pitiful effort in adoption of the most important and powerful safety treatment for both urban and rural areas available, a treatment of huge benefit to all modes, able to constrain and even reverse sprawl, conserving energy, and cutting pollution (about 30 percent for all major pollutants at busy intersections compared to signals)—plus enhancing scenic quality.

My second CTRF paper (1999) pointed to the increased densities possible through greater capacity of roundabouts and reduced travel time. Metro Carmel, IN (about 70,000 population with a goal of 100 roundabouts and one signal) anecdotal comments in a community with freeway interchanges and now over 60 roundabouts confirms several minute reductions in travel times for intra-metro trips and reduced congestion—the formula lending itself to increased development densities with all the ancillary impacts—like more walking, bicycling, transit usage. This emerging context in Carmel personifies what planners and policy makers tout in seeking transportation improvements which avoid sprawl. (Note, for example, Keene's Main Street Roundabout [two laner, 25,000 AADT] impact on downtown travel as it reduced the wait time of six minutes on the Winchester Street leg to six seconds; and the Bypass Roundabout [two laner with four CTLs, 60,000 AADT] reduced wait times on busy shopping holiday shopping weekends to a few seconds from a three-cycles of a signal or more—my own experience in this case.)

Recall the role emerging roundabout technology played in stopping two "traditional" highway capacity expansion projects containing many miles of new highway lanes, extensive land takings, efforts justified part by inflated land use and traffic growth based on flawed assumptions. The New Hampshire court decision stopping the bulldozers ready to start construction cited inflated traffic projections and the new roundabout technology in its findings. The $80 million remaining cost of the Vermont Circumferential Highway (Circ) with segments literally contracted for construction and

bulldozers ready to roll stopped and then was abandoned following a federal district court decision which noted the new roundabout technology. About $40 million in planning and design funds ended up wasted expenditures on the Circ—and still the use of roundabouts to meet the needs of the area affected still remains unaddressed.

Planning and prioritization

Yes, resources are limited and yes, intersection prioritization needs to be undertaken on a region and statewide basis. Prioritization of roundabouts receives added strength through inclusion of roundabouts in the first phases of transportation planning, a provision contained in House Bill 496 with the operable language (new in CAPS): "CONSIDER, DEVELOP, AND incorporate designs that provide integrated safe and efficient transportation, INCLUDING ROUNDABOUT DESIGNS."

The time has long past for regional planning agencies to evaluate the major intersections for roundabout conversion (generally, the junction of two collector or higher level roadways) and prioritize the resulting conversion candidates. Most signalized intersections can be converted to roundabouts. In Vermont all the intersections along Putney Road in Brattleboro, all intersections in Manchester Center, for examples, are moving toward roundabouts based on plans from almost two decades ago. Carmel, IN is two thirds of the way to being a 100-roundabout, one signal metro (it has already converted its several freeway interchanges to roundabouts). The first metro evaluated for signals to roundabout conversions, Missoula, MT, identified 80%--48 signals out of 60--convertible to roundabouts (study was completed about 2000). Based on my own observations certainly at the very least an 80% conversion rate appears very possible here in Vermont.

No obstacles prevent the evaluation and prioritization for signal to roundabout conversions here in Vermont as it can easily be accomplished in a period of a year or so through the regional transportation programming which Vtrans controls and funds. In this regard, Vtrans must insist on quality planning at all levels as well as quality in design and construction. Unrealistic and fanciful population, AADT, and AVMT numbers which vary from the current flat to declining trends now more than two decades old must be justified against historical and current trends since the 1990s. (A decline in population in Vermont last year, New England AVMT average change of 3% 2000-2010, and Vermont still not at 2008 employment numbers, a surge in public transit and Amtrak this past decade, and flat car journey to work numbers by car dating

to 2000—all show the new pattern of where Vermont is and where it is going in transportation: traveling by car increasingly becomes a smaller part of the total pie.)

Resources

Regarding resources, clearly the long term--quarter century long now in Vermont--of stable or declining car travel in our Vermont urban areas, now a statewide phenomenon, leaves historical funding of transportation derived from car travel no longer either sustainable, much less able to meet the needs of a modern transportation system--increasingly passenger rail, walking and bicycling. (By just about any measure, the United States belongs in a second tier or nations in transportation and within that tier somewhat below Canada with its advanced major urban area transportation systems.) A modern system demands annual investments for non-highway modes plus deferred highway needs totaling overall in the vicinity of $150-200 million a year in Vermont. The first states, Massachusetts and Virginia, tackled this issue head-on earlier this year with Virginia, for example, abolishing the gas tax for a dedicated across-the-board sales tax for transportation. A financing solution which involves a sharp increase in federal transportation funding combined with Vermont broad base taxation (including a carbon tax) as well as progressive taxes on income or sales must be sought to address the non-highway transportation oriented modes, urban walking and bicycling infrastructure, rail passenger services—and yes deferred highway maintenance and capital investments.

Federal and state tax policy built on car oriented transportation require changes as we seek to reduce petroleum use with over half the use in Vermont ascribable to motor vehicle travel. Take the federal expenditures for property tax and mortgage interest deductions on income taxes which played a huge part in U.S. sprawl last century. Vermont homeowners on a pro-rata basis receive a $350 million benefit for just one of four households while rental support for low and moderate-income households totals $120 million. From a transportation standpoint removal of homeownership subsidies would create incentives to live in more urban locations where cars can be used less and all other forms of transportation more. Canada, for comparison, at the national level does not have a highway program (or any other transportation program), provides no homeownership tax benefits like the U.S., uses far higher provincial and federal gas taxation so their retail gas prices always remain about a dollar a gallon higher than the U.S.—and their urban development density is half again the U.S. European urban densities are about twice that of the U.S. In a word, the low densities of suburban and exurban U.S. sprawl arose as a direct result of, primarily, federal policies of housing subsidies to middle and high income households and low gasoline taxes for all drivers in spite of being an net importer of petroleum.

Sudden change in what constitutes walkable and bikable busy streets and the direct role of the roundabout

At the same time another inescapable change now emerges: walking and bicycling infrastructure depends on pathed roundabouts at key intersections and cycle track (or a side path/combination track-sidepath) in all downtowns, village centers and built up areas. (This also means retrofit to the degree possible of Keck Circle in Montpelier, the Middlebury roundabout, Manchester Center roundabouts, etc.). Achieving truly walkable and bikable downtowns and village centers, complete streets if you will, cannot be accomplished with bike lanes and sharrows. Only cycle track and pathed roundabouts at key intersections (or strong traffic calming) provide the separation of modes enabling safe movement for all regardless of age and skill. Thanks to research and papers Professor John Pucher of Rutgers University who alone or in combination with other researchers compared walking and bicycling in the U.S. to Western Europe, particularly Germany and the Netherlands, we know that walking and bicycling per mile of travel is several times more dangerous here than in German and Dutch urban areas where heavy walking and bicycling infrastructure investments have been made over a long period of time, including roundabouts, cycle track, and other traffic calming measures. A lot of the conflicts between motorists, walkers, and bicyclists in the U.S. disappear with the advent of proper infrastructure for each mode in our urban areas.

Competence, accountability, and a development process with integrity

Practically all the leading roundabout practitioners in the United States beginning with “Mr. Roundabout” Michael Wallwork of Florida during the first decade of the U.S. roundabout era (1990-2000) brought their skills, knowledge and insights to Vermont. The names include Barry Crown (designer and Rodel software author) and Clive Sawers (min-roundabout expert) of the U.K., Leif Ourston of California (designer of the first two U.S. roundabouts), Mark Lenters (now president of Ourston Roundabouts), and Howard McCulloch (consultant and head of the NYSDOT roundabout unit). Others in contact with Vermont roundabout leaders include SIDRA software and research leader Rhami Akcelik of Australia, Edward Waddell of the Michigan Department of Transportation, and Georges Jacquemart of New York (planner with projects in Vermont and author of the first Transportation Research Board study on U.S. roundabouts in 1998 “Modern Roundabout Practice in the United States”), Paul

Mackey (Rue Secure, Quebec City), and Per Garder, P.E., University of Maine at Orono. Mark Ritchie of California, Mark Johnson of Madison, WI, Ed Myers of Maryland, active designer Bill Baranowski, Ken Sides of Clearwater, FL, and Tom Hicks and Michael Niederhauser of the Maryland State Highway Administration—all deserve mention early involvement through correspondence in ongoing projects and roundabout policy development in the eastern U.S. and in some cases Vermont Two other transportation leaders must also be cited. First, the initial state walking and bicycling coordinator in the United States, Dan Burden of Florida (Walkable Communities) the "Johnny Appleseed" of bicycle and walking facilities development and safety programming, and the team leader who brought Michael Wallwork to Vermont in 1992 as part of a three day bicycle and pedestrian training conference, triggering roundabout development in the northeast. The second truly historic leader and chronicler of the full history of roundabout development from the first traffic circles more than a century ago—Kenneth Todd, P.E.—whose historical research papers and counsel to all in the 1990s and into this century gave encouragement and counsel to what in the early days was an unsettled pursuit.

These names need mention as a backdrop to the recent lack of competence and integrity in scoping intersection projects where roundabouts require first consideration, strategic planning, and design. About a third of Vermont roundabouts reveal significant design flaws as built. Many potential roundabouts get excluded early in the scoping and planning process for a variety of reasons—faulty projections of traffic "growth" (an oxymoron in Vermont today), apparent consultant ignorance (for example, not considering a double mini roundabout at the current study of Pearl Street/Colchester Avenue/Prospects Streets in Burlington), and a lack of strategic consideration of roundabouts, such as evaluating and prioritizing all roundabouts in a town/region/statewide for conversion to roundabouts followed by establishing a priority list for conversions (because of the high benefit cost ratios of roundabouts they routinely end up near the top of any prioritization of all projects considered for funding). Add to this list the lack in Vermont of benefit costing of projects in general and consideration of only direct costs in projects—excluding full external social costs, such as the value of injury reductions, motor fuel reduced, pollution reduction, scenic quality values, land use impacts, capacity value to adjacent properties—to name a few. The benefits of roundabouts to the walking and bicycling modes as well as sprawl prevention (or its contraction) often receive no attention at all.

The disastrous Winooski traffic circle starkly demonstrates what happens when federal and state funds invested in what was to be a “roundabout” ended up as a traffic circle —about three times the size of a roundabout needed to handle the traffic volumes (probably two roundabouts occupying two thirds the current space would suffice)—and as a result the current design assures a constant flow of car occupant, bicycle, and walker injures as a result. (Not to mention the dead land contained within the 200 by 500 foot plus oval.) Other roundabouts put on display the lack of satisfactory design—the Middlebury town center and the Williston Maple Tree Place roundabouts deserve mention in this regard. The Brattleboro design error in 1999 generates mostly property damage only crashes to this day. Reputable roundabout designers and evaluators are readily available today as prime or “sub” consultants able to determine feasibility of roundabouts, assess the complicated capacity issues, and advise on particularly difficult intersections. Generally, there is an absence of employing such consultants at the earliest stages of an intersection, corridor or area planning, scoping and design. This problem can easily be resolved—in the case of Vermont—by requiring involvement of competent roundabout consultants in all phases of planning by towns, region, and the State itself by the Agency of Transportation which almost without exception controls funds project development at one stage or another through its administration of State and/or federal highway dollars.

> Fuel savings, about 30% cut in pollutants at busy intersections including greenhouse emissions

Finally, there is the question of energy use and its relation to busier roundabouts and benefit cost analysis. The VAOT study of the Brattleboro Keene Turn Roundabout identified tens of thousands of gallons of fuel saved from reduced idling time alone. At about 15,000 entering vehicles per day roundabouts begin to generate significant fuel savings over signals. These can be estimated using SIDRA and other software and these figures--along with injury reduction--need to become a standard part of benefit cost analysis. Of course with a roundabouts-only policy the only reason to do benefit cost analysis is to compare the roundabout to other non-intersection investments (New Jersey does such an analysis on all highway projects).

The gallons of motor fuel saved at moderately busy intersection are substantial, savings obtained through erasing heavy gas use in the acceleration phase to cruise speed after stops and just ordinary idling during which the motor vehicle consumes about 0.28 gallons of fuel per hour. The one empirical study of a pre-roundabout

consumption at a signalized intersection compared to the “after” consumption found the equivalent of 18,000 gallons annual reduction in fuel use and about 30% reduction of all pollutant emissions (entering vehicles 23,000 daily).

Other Transportation Deficits

The dearth of funding for transportation in the post-auto age extends to commuter rail (three corridors out of Burlington), intrastate-intercity rail, Amtrak improvements and extensions, improved public transit, and an initial light rail connecting the Burlington waterfront to the Marketplace, Fletcher Allen, the UVM campus extending to the south side of Main Street to unite that campus and terminating at the Champlain College. The private and public sectors now find the costs of “free” parking and employee economics (for the employer and the employee) clearly justifying incentives for non-car travel to work and where possible business trips during the workday. These needs and eventual likely funding suggest long range considerations in all current transportation investments.

Meeting with New Hampshire and Vermont, Richmond Park and Ride

While meetings with New Hampshire and Maine transportation department personnel regarding roundabouts deserves encouragement, meetings with the New York State Department of Transportation need to take priority since that agency designs and installs roundabouts on a full time basis. There exists in NYSDOT a variety of experience and expertise unrivaled in the northeast. Note that the tri-state area has cooperated for more than a decade since a three-state workshop on roundabout design occurred under the sponsorship of the Maine DOT and local roads programs of New Hampshire and Vermont.

The US 2/I 89 Richmond interchange decision to install “cheaper” signals remains a case in point—particularly the crossroads at the park-and-ride. Creating crossroad intersections generally needs to be avoided for the very reason T-bone crashes may occur. Also, as you know, the interchange intersections to the north side of I 89 were scoped for a roundabout. It would seem appropriate at a minimum to undertake a rigorous evaluation of the signals versus the roundabouts taking into consideration values of delay, anticipated injuries, ongoing signal upgrades, energy consumption and pollutant values, etc. These intersections require only a single lane roundabout and exploring ways to reduce construction costs with roundabout consultant firms may lead to substantial cost reductions. These decisions really involve once in a century determinations and through investigation assures the appropriate result.

Again, thank you for your note and surely we share the same concerns for creating a modern transportation system in Vermont serving all modes in an equal way and providing the kind of safety performance, particularly in the area of walking and bicycling, set by several Western European nations.

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