Why not Pave the Tracks?

White Paper No. 4

Some critics of the SMART passenger train project have speculated that it might be cheaper and easier to simply pave over the Northwestern Pacific (NWP) right-of-way for use as an exclusive bus road. For a number of reasons, however, turning the railroad into a bus road isn't cheaper or easier, and it offers fewer benefits and greater safety risks than the SMART project. Here's why:

Wrong Place for a Busway

Busways that use their own exclusive rights-of-way are relatively rare. Where they exist, their purpose is to serve short, urban corridors with frequent station spacing. The goal is to provide quality transit service with a price tag lower than the $15-50 million per mile cost of electrified light rail (streetcars). Whether busways in exclusive rights-of-way are indeed a better and/or cheaper option than light rail in these types of short, urban corridors is a matter of great controversy.

SMART's long, 70-mile corridor from Cloverdale to Larkspur would be a poor choice for a busway. An exclusive busway in the NWP right-of-way would be uncompetitive in both performance and cost when compared to a passenger- rail service such as the one that SMART is proposing.

It also would be environmentally inferior to the SMART project. Buses can't meet SMART's air-quality benefits because they use more fuel per passenger mile than SMART. And paving the 70-mile NWP right-of-way would replace the railroad's permeable and relatively narrow track bed with hundreds of new acres of impermeable blacktop. In addition to impeding drainage in the corridor, a busway also would increase runoff problems.

The key disadvantage of buses in busways is that they are relatively slow. In corridors that are short and have frequent station stops, the drawback of a lower speed is less significant. Not surprisingly, the few exclusive busways that exist in the U.S. all serve relatively short corridors with frequent stops. In Pittsburgh, PA, which has three busways, corridor lengths range from 4 to 9 miles and stations are spaced every ½ to 1 mile apart. In Miami, the South Miami-Dade Busway is 13 miles long with stations roughly ½ mile apart. In Los Angeles, the Orange Bus Rapid Transit Line is 14 miles long, and has stations 1 mile apart. The SMART corridor, by contrast, is 70 miles long and has proposed stations spaced about every 5 miles apart on average.

The average speed of buses on the Los Angeles Orange Line is 16 mph in one direction and 20 mph in the other. The average speed on Miami's busway is 13-20 mph depending on the route, while the average speed on Pittsburgh's busways ranges from 10-15 mph. With those types of speeds it would take about 3.5 to 7 hours for a bus to run the length of the SMART corridor from Cloverdale to Larkspur, as compared to about 90 minutes for the proposed rail service. A busway's travel time could be slightly improved if its station spacing were the same as SMART's (one station every 5 miles), but it would still be nowhere near rail's travel time.

Why so slow? That stations are tightly spaced and top speeds are generally limited to around 55 mph is only part of the reason. Another is the fact that buses move through intersections very slowly.

In L.A., Orange Line vehicles must approach intersections at speeds of no more than 25 mph, forcing them to slow down every time they near a crossing. The Orange Line busway's traffic signals are tied into a regional control system. The system tries to estimate when buses will arrive at their traffic lights based on their schedule. Sometimes it works, but sometimes it doesn't and buses hit red lights and come to a complete stop. To make matters worse, within a few days after opening, three collisions on this busway prompted the Los Angeles Metropolitan Transportation Authority to issue a "slow order" that limited travel through intersections to 10 miles per hour.

The Miami-Dade busway has true signal pre-emption, meaning that it will not encounter red lights at crossings. When buses approach intersections, they trigger lights to turn green. However, the Miami busway also has a history of frequent collisions, which prompted local traffic authorities to limit bus speeds through intersections to 15 mph.

If constructed in the NWP right-of-way, a busway could use signal preemption technology, at an added cost, to avoid being delayed by red lights. However, buses would still have to slow down considerably as they approached intersections. Given that the NWP right of way has approximately 100 grade crossings, a busway here would be guaranteed to have very slow average speeds.

Pulling drivers out of their cars and off the Highway 101 corridor will require a faster transit service. Caltrain, the commuter rail system on the San Francisco Peninsula, has average speeds of 31 mph for local service, and 48 mph for express "baby bullet" service. The BART system's average speed is about 40 mph. The SMART train will have a top speed of around 80 mph with an average speed of 45 mph (93 minutes for 70 miles), faster than BART and akin to the popular Caltrain baby bullet.

It Would Cost More

The SMART rail project had an estimated cost of $5.5 million per mile in 2006. The Los Angeles Orange Line Busway, which opened in 2005, had a cost of $24 million per mile ($350 million for 14 miles). The Pittsburgh East Busway Extension, which opened in 2003, had a cost of $29 million per mile ($68 million for 2.3 miles). If an exclusive busway were built in the SMART corridor, it might need proportionately fewer stations and vehicles than the Orange Line

in Los Angeles. However, even if vehicles ($15.7M) and stations ($33.6M) were completely excluded from the Los Angeles cost figures, the cost per mile would still be $21.5 million per mile.

These costs might be reasonable when compared with those of an electrified light rail service. However, the costs are far higher than SMART's proposed project. The speculation that "paving the tracks" might be cheaper than rail could stem from a mistaken assumption that roads must be cheap to build, since they are more familiar. But that is not the case.

In the NWP right-of-way, tracks could not literally be "paved over" to make way for a two-lane busway, since the presence of steel tracks and rock ballast underneath asphalt is not suitable for a road bed and would lead to rapid deterioration of the roadway. Instead, the existing tracks and ballast would have to be removed. Since the railroad track is often atop a high embankment, extensive re-grading would also be necessary.

Laying down a long swath of asphalt can also be quite expensive. The two-lane Orange Line, built at an absolute minimum width of 26-feet wide with no breakdown lanes or shoulders, had a cost of $10 million per mile ($144 million for 14 miles). In another example, the five mile, two-lane widening of Highway 101 from Wilfred Avenue to Highway 12 in Sonoma County had a cost of $28.7 million. When those costs are adjusted to account for today's materials cost, the Highway 101 widening expense would be more like $44 to $55 million, or about $8.5 to $11 million per mile. Given these two recent examples, a cost of $10 million per mile to construct a two lane road is a reasonable assumption. In the SMART corridor, this cost per mile would translate to a total cost of $700 million just to create the road.

To be "rail-like" in character, and to be similar to other exclusive busways, a busway in the NWP would need stations that included shelters, benches, lighting, amenities and park and ride lots. It would also need a new maintenance facility. Like the rail project, a busway project would require infrastructure improvements like the reconstruction of bridges and improved drainage. Both would require engineering services. Many project elements for a busway would be the same as for rail and would have the same costs as a rail project.

A busway would save the cost of acquiring 17 rail vehicles at an expense of approximately $42 million (as estimated in 2006). However, providing the same overall capacity as the proposed rail service would require 25 articulated buses, about the same number that were acquired for the Orange Line in L.A. Those buses had a total cost of about $17 million (in 2005). Because buses have a shorter useful life than rail cars – about 12 years compared to 30 for rail – the 30-year cost of buses would be about $42 million. Thus, buying buses instead of trains would offer little potential for savings.

Another significant expense for a busway could be dealing with the roughly 100 "grade crossings" (roads that cross over the tracks) on the NWP right-of-way in Marin and Sonoma Counties. Having adapted to a relatively narrow railway over decades, many of these intersections could require extensive modifications to accommodate a new bus road. And, while a busway could possibly avoid the cost of protective warning signals and gates, it would require an added expense: the creation of dozens of new signalized intersections. As mentioned

previously, a further potential added expense could be the inclusion of signal pre-emption technology at each intersection.

Compared to the estimated 2006 cost of $387 million for SMART rail, the "pave the tracks" option would be an expensive endeavor. If costs were exactly proportional to the Los Angeles Orange Line, it would cost about $1.68 billion to develop (70 miles at $24 million per mile) a busway. While the costs might be a little lower if applied to the NWP corridor, this is still not a project that could be financed with a ¼ cent sales tax in Marin and Sonoma County, and possibly not with a ½ cent sales tax either.

In addition to having higher capital costs, a busway would very likely have higher ongoing operating costs as well. The primary cost in transit operations is for labor – the price of paying drivers and mechanics. The busway project would be much more labor intensive than the rail project. A 60-seat articulated bus requires one driver. A train with a seating capacity that ranges from 200 to many hundreds would also need one driver. Even if the train included a conductor to collect fares, the ratio of workers to seats would still be much lower with the rail vehicle than with buses. SMART's proposed rail vehicles are also more fuel efficient per seat than buses. The trains proposed by SMART could get anywhere from 270 to 560 seat miles per gallon, depending upon the specific type of vehicle used and whether a train had two or three cars. By comparison, a 60-seat articulated bus would get about 180 seat miles per gallon. The busway would thus provide no real opportunity for fuel cost savings, either.

It Has Greater Safety Risks

A busway in the NWP right-of-way would come with serious safety risks. In Los Angeles, the Orange Line experienced its first collision before it officially opened in the fall of 2005. Collisions continued with an average of one per week for the first few months of operations. Altogether, in the first year, there were 31 collisions, and 2,300 near misses reported by drivers. The busway in Miami was also plagued with a high number of collisions: 67 in its first four years of operation.

These busways lack protective gates and railroad-style warnings signals. As a result, careless drivers have often run red lights and collided with buses. On occasion, drivers have also driven onto the busway itself, thinking it was a standard road. This also led to collisions. The high number of accidents prompted strict limitations on bus speeds through intersections. It has also led to the installation of video cameras to catch red light runners, and well as strobe lights on the buses; naturally at added expense.

It's not Legal

A busway would have major disadvantages in the NWP right of way and is not the optimal transit choice. Moreover, the North Coast Railroad Authority (NCRA) has the right to operate freight rail service along the section of track north of Highway 37 in Novato, through a perpetual, exclusive easement. Removing track north of Highway 37 would be in conflict with the NCRA's rights.

To make matters even more complicated, federal law stands in the way of removing tracks to make way for a busway. The NWP railroad corridor is defined by the Federal Railroad Administration (FRA) as an "out of service" railroad, meaning that, although it is not operating, it has never been "abandoned." To remove tracks for the placement of a paved busway, the federal government would first have to declare the right-of-way "abandoned".

Alternative Variations Would Not Help

Given the difficulty of creating a busway in the NWP corridor north of Highway 37, where the NCRA retains freight operating rights, a couple of alternative busway scenarios have been conceived.

One concept would involve retaining a railroad north of Highway 37, and creating a busway south of Highway 37, with a connecting transfer facility right near the junction of Highways 101 and 37. This scenario would have the disadvantage of forcing everyone moving through the NWP corridor to make a transfer in south Novato. Moreover, the busway south of Highway 37 would still have all the aforementioned disadvantages. Buses heading to and from the transfer station on the busway would move slowly, resulting in long travel times. And, given its higher costs, a busway in Marin would add enough to project costs to put it out of range of a ¼ cent sales tax measure.

The theoretical benefit of this concept is that buses could leave the right-of-way to connect with other destinations. However, given the low average speeds in the busway, this would be of little value. Consider the following example of a train rider in Petaluma who is headed for the Marin Civic Center. With the proposed SMART project, the rider would take 24 minutes to get to the Civic Center Station. Here they could transfer to an awaiting shuttle (included in SMART's Expenditure Plan), a process that would only take a couple of minutes. The shuttle would then make a 3 or 4 minute trip to the front door of the Civic Center. Total travel time: about 30 minutes.

With the railway / busway concept, a rider would make a 16 minute train ride to the transfer facility. Buses could be waiting here for arriving trains. However, if this were the jumping off point for all southbound buses and shuttles, there could be a dozen or more different buses waiting. Since buses would have to take turns departing, it might take several minutes on average to get moving. Then, it would be a minimum 19 minute trip down to the Civic Center station where the bus would depart from the right of way where it would then make the 3 to 4 minute trip to the front door of the Civic Center. Total travel time: about 45 minutes.

It is simply more efficient to bring riders to as close to their final destination as possible via a fast-moving train, where they have the option of making a bus/shuttle transfer, than to require everyone to be distributed to points in Marin via a slow-moving busway from one point in Novato.

Another busway scenario that has been mentioned would involve a one-lane, one-way busway south of Highway 37 that would be reversible: southbound in the morning, northbound in the afternoon. Given the smaller road width, this project would be cheaper than the two lane

busway. However, it would have all the operational drawbacks previously mentioned. Moreover, it would have the extra disadvantage of only allowing travel in one direction in Marin County. This would ignore the reality of emerging 21st century commuting patterns and the increasingly important "reverse commute" – northbound travel in the morning and southbound in the evening.

Summing it up

To sum it all up, a paved busway is not cheaper or better than a rail system for this corridor, and would have the following drawbacks:

1. It would have considerably slower travel times than a train under any plausible scenario. As a result, it would attract fewer riders and would consequently have fewer transportation and environmental benefits.

2. It would cost more to build and operate

3. It would pose serious safety risks to riders, if the experience of other busways in the U.S. is any guide.

4. It is not currently legal.

The right technological and economic choice for this right-of-way is the passenger rail service proposed by SMART. This type of service currently operates in six of nine Bay Area counties and is being proposed in the other three: Marin, Sonoma and Napa. It will provide a low cost, high quality, rapid service that offers travelers an alternative to the congestion of Highway 101, providing mobility and environmental improvements to the North Bay.

For more information about the SMART project, go to www.sonomamarintrain.org or call SMART's information lines, 415-419-3510 in Marin County or 707-538-2323 in Sonoma County.