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STREETCARS — WHITE PAPER

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cc: Project Management Team, Planning Commission, Transportation Commission

DIRECTION TO THE PLANNING COMMISSION AND TRANSPORTATION COMMISSION

Five sets of white papers are being produced to present information on tools, opportunities, and potential strategies that could help Ashland become a nationwide leader as a green transportation community. Each white paper will present general information regarding a topic and then provide ideas on where and how that tool, strategy, and/or policy could be used within Ashland. You will have the opportunity to review the content of each white paper and share your thoughts, concerns, questions, and ideas in a joint Planning Commission/Transportation Commission meeting. Based on discussions at the meeting, the material in the white paper will be: (1) revised and incorporated into the alternatives analysis for the draft TSP; or (2) eliminated from consideration and excluded from the alternatives analysis. The overall intent of the white paper series is to explore opportunities for Ashland and increase the opportunities to discuss the many possibilities for Ashland.

STREETCARS WHITE PAPER INTRODUCTION

This white paper describes the types of streetcar services in use in the U.S., including where they are located, the reasons they were built or retained, and the costs of constructing and operating them. The white paper also provides examples of other types of downtown circulators.

WHAT IS A STREETCAR?

A streetcar is an electrically powered rail car that is operated singly or in short trains in mixed traffic on track in city streets.[1] There are three main types of streetcar lines operated in the U.S.:

- *Modern streetcar* lines use streetcars based on European designs that provide near-level boarding in the middle of the vehicle. A bridgeplate can extend from the side of the vehicle to allow wheelchairs, strollers, and similar items to be rolled directly into the streetcar. Portland (pictured to the right) opened the first modern streetcar system in the U.S. in 2001 and lines also operate in Tacoma and Seattle. Washington, D.C. is constructing a modern streetcar system and others are in the planning stages, generally in larger cities.

- *Historic streetcar* lines are operated with vehicles constructed 60 years or more ago in cities that never fully abandoned their original streetcar lines: Boston, New Orleans, Philadelphia, and San Francisco (pictured to the right). These streetcars have high floors, requiring passengers to climb steps to board the vehicle, and are not always wheelchair-accessible. As vehicles are refurbished or placed in service on new lines, provisions are made for accommodating wheelchairs to satisfy Americans with Disabilities Act (ADA) requirements—for example, by retrofitting wheelchair lifts or by constructing high-level boarding platforms at stations.

- *Vintage streetcar* lines are operated using historic vehicles from other cities or using new streetcars designed to resemble historic vehicles. The streetcars have been outfitted or retrofitted with wheelchair lifts. These can be found in mid-size and smaller cities; the streetcars in smaller cities, such as Astoria (pictured to the right) are often powered by generators that are towed with the vehicle, rather than from overhead electrical

[1] Kittelson & Associates, Inc., et al., *TCRP Report 100: Transit Capacity and Quality of Service Manual,* Transportation Research Board of the National Academies, Washington, D.C., 2003.

lines. Many vintage streetcar lines, particularly those primarily catering to tourists, operate reduced hours compared to typical transit routes.

The streetcar mode differs from the light rail mode (such as Portland's MAX system) in that streetcars are narrower and shorter than light rail vehicles, to better fit into an urban street setting. (In particular, this allows streetcars to turn tighter corners than light rail vehicles.) With the exception of downtown areas, light rail tends to operate in a separated right-of-way either within a street or in an off-street right-of-way, while streetcars mostly operate in mixed traffic along urban streets. Streetcar systems are typically designed with relatively frequent stop spacing (similar to bus stop spacing, every few blocks), while light rail typically provides ½ mile or greater stop spacing outside of downtown areas. The combination of a shared right-of-way and frequent stops results in average speeds for streetcars that are relatively low.

REASONS FOR BUILDING STREETCARS

Modern Streetcars

A key objective of all of the modern streetcar systems constructed to date in the U.S. has been to serve as a catalyst for the redevelopment of an area. A secondary objective has been to serve a transportation function—the need to move passengers from one point to another, particularly in areas where car ownership is low by choice (e.g., a desire to live in the city center, with limited and high-cost parking), design (e.g., high-rise residential), and/or circumstances (e.g., low income). The transportation need might just as well have been served by another transit mode (for example, a bus circulator), but the civic investment in fixed streetcar infrastructure was felt to better signal to potential developers the community's seriousness about redevelopment. Streetcars also were felt to be more attractive than buses to potential higher-income residents of redevelopment. Finally, streetcars' use of electricity as their power source results in quieter operations and no point-source emissions, compared to typical diesel-powered buses, helping them to better integrate into a dense urban setting.

Portland Streetcar

The Portland Streetcar opened in July 2001. Owned by the City of Portland, it was originally designed primarily as a catalyst for the redevelopment of old railyards (now the Pearl District), it provided a circulation function, connecting the Pearl District (5,000+ residential units) to Portland State University (enrollment 27,000), downtown Portland (83,000 jobs), and the retail district in Northwest Portland. The 4-mile (end-to-end) line has been expanded twice since opening, first to the existing Riverfront office and retail district, and then to the South Waterfront

redevelopment area. A new streetcar line is being constructed to areas across the Willamette River from Downtown Portland and plans are being made to extend the original line south as an interurban streetcar line to the suburb of Lake Oswego. The streetcar also serves a distribution function, taking light rail passengers to their final destinations and connecting with the aerial tram to Oregon Health and Sciences University. Its daily ridership has grown from 4,500 after its first year of operation to 12,400 in spring 2010. Rides are free within the downtown free-rail zone and cost $2.05 outside that zone (good all day). Passengers with an aerial tram ticket, or a bus or light rail transfer from TriMet (the regional transit provider), issued at any time during the day, can also ride the streetcar for free. Service is provided every 13 minutes on weekdays. Current operating costs of $5.5 million per year are covered by a combination of TriMet ($3.2 million, in exchange for Portland providing traffic signal priority for buses), City transportation funds ($1.8 million), and fares and sponsorships ($0.5 million).[2] The original line (2.4 miles one-way) cost $57 million to construct.

Tacoma LINK

Tacoma LINK, operated by Sound Transit, the regional transit provider for the Seattle area, is a 1.6-mile line that connects a commuter rail station and parking garage south of downtown Tacoma to a bus transfer center in downtown Tacoma (23,000 jobs). The line also serves several museums, the convention center, and the Tacoma campus of the University of Washington (enrollment 3,300) along the way. Tacoma and Sound Transit are in the early stages of planning extensions to the line, which opened in 2003. Daily ridership has grown slowly from 2,400 in the first year of operation to 3,100 in 2009. Service is provided every 10 minutes on weekdays, and rides are free. Current operating costs of $3.3 million per year are covered from Sound Transit's operating revenue.[3] The line cost $78 million to construct.

South Lake Union Streetcar (Seattle)

The South Lake Union Streetcar is a 1.3-mile line that connects Westlake Center in downtown Seattle (light rail, regional bus, and monorail connections) to the Fred Hutchinson Cancer Research Center (2,300 jobs), passing by recreation and retail areas along Lake Union and through a corridor planned for future

[2] Portland Streetcar website, www.portlandstreetcar.org

[3] National Transit Database.

high-density office and residential development. The line opened in December 2007 and carried an average of 1,400 passengers per day in 2009. The one-way fare is $2.25, or a valid King County Metro bus transfer or ORCA card (regional farecard); Sound Transit light rail and regional bus transfers are not accepted. Service is provided every 15 minutes. The line is owned by the City of Seattle and operated by King County Metro. Current operating costs of $2.4 million per year are covered 75% by King County Metro and 25% by the City of Seattle, after farebox recovery.[4] The line cost $56 million to construct. Plans are underway for a second streetcar line serving the First Hill area.

DC Streetcar

Washington, D.C. is currently constructing two streetcar lines as the initial lines in what is eventually planned to be a system that reaches most corners of the city. The first line is expected to open in late 2012. Unlike the other modern streetcar lines described above, Washington's lines are intended as line-haul routes, providing a transit capacity and image upgrade on streets currently served by buses. The initial lines are also focused on lower-income neighborhoods in the city, with a goal of spurring new economic activity in those neighborhoods. A unique challenge being faced in the development of the city's streetcar system are city ordinances protecting view corridors that prohibit overhead wires in those corridors. Although the city has already purchased the same streetcar model used in the three cities described above, it is investigating technology that would allow the streetcars to travel under their own power for short distances across the view corridors. Phase 1 of the H Street–Benning Road line (2 miles) is currently budgeted at $50 million to construct.

Historic Streetcars

While most U.S. cities tore up their streetcar lines by the 1950s, they survived in a few cities. In three cases, tunnels—either downtown or through hills—gave streetcars a competitive time advantage over buses and automobiles and allowed the systems to survive. In San Francisco, light rail has replaced streetcar on most surviving routes, but historic streetcars operate on Market Street downtown and along the waterfront to the Fisherman's Wharf area, serving both commuters and tourists (18,500 per day in 2007). Philadelphia operates five streetcar lines into downtown via a tunnel and two more that connect to the city's rapid transit system west of downtown. Philadelphia also re-introduced streetcars on an eighth route (Girard Avenue) in 2005 after a 13-year absence. Boston operates four streetcar lines (collectively referred to as the Green Line) that take advantage of a downtown tunnel, plus one suburban line that connects to rapid transit. In the fourth city, New Orleans, the historic St. Charles streetcar line has served residents and tourists alike since the 1800s, and the city has constructed two new vintage streetcar lines.

[4] City of Seattle Office of Policy and Management, *South Lake Union Streetcar: Capital Financing and Operating and Maintenance Plan,* April 13, 2005, and National Transit Database.

Vintage Streetcars

Kenosha Streetcar

Kenosha, Wisconsin (population 98,000) constructed a 1-mile (one-way) vintage streetcar line in 2000 to connect a new commuter rail station with a bus transfer center and a lakefront location slated for residential and recreational redevelopment. The line is operated with streetcars acquired from Toronto. Average daily ridership in 2009 was 124, with annual operating costs of $300,000. The fare is $1, or a valid bus transfer. The streetcar operates weekends only from 10 am to 5:30 pm in January and February, 10 am to 2 pm weekdays and 10 am to 5:30 pm weekends in March, and 10 am to 6:30 pm weekdays and 10 am to 5:30 pm weekends the rest of the year. Service is usually operated every 30 minutes; more frequently for holidays and special events. The line cost $5.2 million to construct.

Memphis Trolley

Memphis, Tennessee (population 676,000) operates a downtown circulator with vintage streetcars imported from Australia and Portugal. The line was first developed in 1993 as a 1.25-mile line as part of the redevelopment of the downtown's Main Street pedestrian mall. A 2-mile one-way loop along the Mississippi riverfront was added in 1997, and an additional 1.25-mile extension was added in 2005 to connect downtown Memphis (27,000 jobs) with the Memphis Medical Center (29,000 jobs).[5] Average daily ridership in 2009 was 3,100, with an annual operating cost of $4.1 million. The fare is $1 (50 cents at lunchtime) and service is operated every 10 minutes on Main Street, 13 minutes along the riverfront, and 16 minutes to the medical center. Capital costs for the system (including extensions) total $104 million.

[5] http://www.railwaypreservation.com/vintagetrolley/memphis.htm

Astoria Riverfront Trolley

A volunteer group in Astoria, Oregon (population 9,700) operates a vintage streetcar along the Columbia riverfront, using existing railroad tracks. Aimed primarily at tourists, the streetcar operates hourly between noon and 7 p.m. every day during the summer and hourly between noon and 6 p.m. on Fridays, Saturdays, and Sundays the rest of the year. The fare is $1. As the line is not electrified, the streetcar tows a generator that provides power.

Lowell National Historical Park

The National Park Service operates a trolley service over 1.2 miles of existing track that transports visitors between the various mill sites and museums within Lowell National Historical Park in Lowell, Massachusetts. The trolley operates daily March through November, with schedules varying based on visitor levels to the park. The trolley is free. Average daily summer ridership (4 months) in 2000 was about 650 passengers per day, with park visitation of 392,000 during that time.[6]

Other Systems

- Savannah, Georgia (population 135,000) started a streetcar along a 1-mile stretch of River Street (a popular restaurant and entertainment district) in February 2009, using existing track and a refurbished streetcar from Melbourne, Australia. It operates Thursday through Sunday and is fare-free. Chatham Area Transit operates the streetcar for the city. The streetcar was retrofitted with a hybrid biodiesel-electric propulsion system in lieu of installing overhead wires on River Street.
- Tampa, Florida (population 343,000) opened the 2.4-mile Teco Line Streetcar in 2002. It connects the convention center on the south edge of downtown to the cruise ship dock, an aquarium, and the Ybor City entertainment district. A 0.3-mile extension that opened in December 2010 extended the line to a parking garage closer to the middle of downtown. The line operates from 11 a.m. to 10 p.m. (Monday-Thursday), 2 a.m. (Friday and Saturday), and 8 p.m. (Sunday), with service every 10–15 minutes. A $2.50 one-way fare is charged. In 2009, the line had an average weekday ridership of 1,100 and annual operating costs of $2.4 million.

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[6] Volpe National Transportation Systems Center, *Lowell National Historical Park: Alternative Transportation System—Historic Trolley Planning Study, Final Report,* Cambridge, Mass., December 2002.

- Little Rock, Arkansas (population 252,000) opened the River Rail Streetcar in 2004. One route ("South") circulates through downtown Little Rock, while a second line ("North") connects and circulates through the downtowns of Little Rock and North Little Rock, and also serves the Clinton Presidential Library. The South route operates every 15 minutes from 11 a.m. to 7 p.m., while the North route operates every 25 minutes from 8:30 a.m. to 10 p.m. (to midnight Thursday-Saturday), with service to the Clinton library ending just before 6 p.m. In 2004, the line had an average weekday ridership of 700, but this has declined every year to just 275 in 2009. Annual operating costs were $900,000 in 2009. The fare is $1.
- Tucson, Arizona (population 544,000) has the Old Pueblo Trolley, which is a volunteer-run streetcar that runs as a museum and tourist attraction from the edge of downtown to the University of Arizona on Friday nights and weekends. An upgrade and extension of the line into downtown as a modern streetcar has been funded.

CONSTRUCTION COSTS AND CONSIDERATIONS

The following sub-sections present costs and considerations related to street capital as well as operations and maintenance costs. Track length, number of streetcars (i.e., desired headway of service), and maintenance facilities are the most significant contributes to initial capital costs.

Track and Power

The cost of constructing track and power systems for a modern streetcar has varied widely from city to city. Costs vary because the characteristics of streetcar lines vary and the street and underground utility conditions vary. In some cases, a streetcar route may require bridge or overpass construction, escalating the cost significantly. If building a streetcar line is part of a larger project then identifying the separate construction cost of the streetcar infrastructure may be difficult.

As a general predictor of cost, $10 million per mile is a useful benchmark for modern streetcars, including track on-grade, track power, overhead poles, signals and modest passenger loading platforms. Some systems can be constructed for slightly less and some systems have cost much more, especially when built for joint use with light rail. When premium station design is desired, that component of the system can become a significant cost factor. Examples of modern street system costs are:

- **San Francisco —** The F line, a double-track line built to light rail standards for joint use, cost approximately $30 million per mile. The project included extensive visual enhancements.
- **Tampa, Florida —** A 2.3-mile line that includes some heritage streetcars, cost $13.7 million per mile.
- **Portland, Oregon —** The first 4.6-mile loop of Portland's modern streetcar system cost $12.4 million per mile to construct. The eastside extension of the system, currently under

construction is costing approximately $10 million per mile according to Stacey Whitbeck, the general contractor for construction.

- **Little Rock, Arkansas** — A 2.1-mile line was constructed for $7.1 million per mile.
- **Kenosha, Wisconsin** — This heritage streetcar cost approximately $2 million per mile to build.

Vehicles

Modern street car vehicles typically cost between $3.5 and $4.5 million each to purchase, depending on manufacturer and features. Portland's eastside streetcar extension will purchase 6 additional vehicles for $20 million. Heritage or replica streetcars are considerably less expensive, typically costing between $600,000 and $900,000 per vehicle.

Stops/Stations

The baseline passenger loading facility of streetcar is usually referred to as a platform rather than a station. It is elevated to match the low-floor characteristic of the streetcar vehicle and provides little in amenities beyond a shelter and schedule. The schedule information may include a real time display for the arrival of the next streetcar. When premium quality stations are desired to meet larger objectives of system identity or urban design with a given context, the costs go up significantly. These costs can be $150,000–$200,000 per station, including station platform, curb and sidewalk work, custom designed shelters, additional passenger amenities, landscaping and public art.

Maintenance Facility

Maintenance facility costs, like track and power costs, will vary greatly. A typical cost range is $3 million to $5 million, with the upper end of costs incurred with wheel truing equipment is included.

Potential Costs for an Ashland Streetcar

This subsection outlines a rough planning level cost estimate for a potential streetcar route in Ashland. To generate a cost estimate, an approximate route was identified, as well as an assumed headway between streetcars.

A streetcar route that exactly duplicates the current transit routes in Ashland would be difficult to construct because of the at-grade crossing of the Central Oregon and Pacific Railroad tracks on Tolman Creek Road (between Siskiyou Boulevard and Ashland Street). Although two examples of streetcar–railroad grade crossings exist (Tampa and Philadelphia), such crossings are normally grade-separated for safety reasons. A double-tracked route that ran from downtown Ashland to just west of the Ashland Street/Tolman Creek Road intersection would total approximately 5 track miles (2.5 miles one-way). At a 10-mph average speed, 4 streetcars would be required to

operate the route at 15-minute headways (one spare would also be required). Three stops are assumed for downtown Ashland, three stops are assumed for Siskiyou Boulevard and three stops are assumed for Ashland Street. A site for a maintenance facility would also be required near the line in an appropriately zoned area; there might be additional track required to run to the maintenance facility.

Capital costs are roughly estimated as:

- Track: $50 million ($10 million per mile with 5 miles of track)
- Stops: $1.4 million to $1.8 million ($150,000 to $200,000 per stop with 9 stops total)
- Vehicles: $17.5 million to $22.5 million ($3.5 million to $4.5 million per vehicle with 5 vehicles)
- Maintenance facility: $3 million to $5 million
- Estimated Total Capital Costs: $71.9 million to $79.3 million

Operating costs would be expected to be similar to the South Lake Union Streetcar in Seattle, around $2.5 million per year.

The following section discusses other kinds of downtown circulators that are rubber-tire and as a result have substantially lower capital costs.

OTHER KINDS OF DOWNTOWN CIRCULATORS

Many cities operate bus circulators in their downtown area and/or to major trip generators (e.g., universities) or tourist attractions. Service is frequent and often free.

- Chattanooga, Tennessee (population 171,000) operates battery-powered electric buses in its downtown area, connecting to the convention center, parking garages, and nearby tourist attractions. Service is free and operates every five minutes. The batteries do not last the entire day; the buses need to swap their batteries out for fresh ones in the middle of the day. Service operates until 11:30 p.m.
- Denver, Colorado (population 610,000) operates hybrid electric/compressed natural gas buses along its 16th Street Mall, connecting light rail and bus stations to retail and employment locations located in the corridor. Service is free and operates as frequently as every 2 minutes. Service operates until 1:30 in the morning.
- Orlando, Florida (population 235,000) operates the LYMMO shuttle, connecting a remote parking garage to downtown office buildings and retail. Buses travel in dedicated lanes and receive priority at traffic signals. Service is free and operates as frequently as every 5 minutes. Service operates until midnight.
- Boulder, Colorado (population 100,000) operates the HOP shuttle, connecting downtown to the University of Colorado. The fare is $2.25 (the same as other local bus routes); however, university-affiliated riders ride free as part of a university pass program. Service operates as frequently as every 7 minutes and as late as midnight.

Capital costs for a standard bus are approximately $500,000 each, but special-purpose vehicles and hybrid vehicles will cost more. As discussed in the transit white paper, operations costs per revenue hour vary widely between transit agencies; however, $100 per revenue hour per bus is normally at the high end of costs for bus service. Total operations costs for a route will depend on (1) the number of vehicles operated (which in turn depends on the route length, service frequency, and bus speeds) and (2) the hours of the day and week that service is provided.

NEXT STEPS

Recommended steps for pursuing streetcar are as follows:

- A key first step is identifying the purpose(s) of the streetcar: as a catalyst for development, as a downtown circulator, or both.
    - If intended as a catalyst for development, Ashland should identify corridors or districts where high-density development is appropriate and feasible. The route would then connect the new developments (as they are built over time) to services and trip attractors of interest to those living and/or working in the developments.
    - If intended as a downtown circulator, the route would likely serve the same destinations as the current bus circulator, plus any planned future transit center or station (to serve transfers to and from longer-distance routes).
    - If both, development would need to be focused along the downtown circulator route, as winding the route around the city to try to serve both functions would result in slow travel times that would be unattractive to potential riders.
- Once the purpose of the streetcar was established, a planning study would then establish routing, potential stop locations, operating characteristics, ridership and cost forecasts, potential funding sources for capital and operating costs, and (if intended to serve as a development catalyst) needed comprehensive plan and zoning changes.
- Streetcar projects are eligible for competitive capital grant funding through the FTA Small Starts and Very Small Starts programs, but do need to demonstrate cost-effectiveness, along with other criteria. If the planning study establishes that streetcar is viable, continue with preliminary and final engineering and construction, as funding becomes available. If not (or as an interim measure until streetcar is constructed), consider improvements to the existing downtown bus circulator (e.g., more frequent service, expanded service hours).