



THE POTENTIAL OF RAIL SERVICE TO WEST CHESTER BOROUGH

A Report of the Advisory Ad Hoc Committee
to Reestablish Rail Service to West Chester



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D R A F T – September 16, 2015

TABLE OF CONTENTS

EXECUTIVE SUMMARY	i
INTRODUCTION	1
BACKGROUND	1
CURRENT CONDITIONS	4
Railroad Physical Plant	4
Service Area Demographics	6
RIDERSHIP POTENTIAL.....	9
ALTERNATIVES ASSESSMENT	11
Alternatives Development.....	11
Rolling Stock Technologies.....	12
Alternatives Definition.....	14
Cost Estimation	14
COST EFFECTIVENESS EVALUATION	19
CONCLUSIONS	20

EXECUTIVE SUMMARY

The last passenger train service to the Borough of West Chester ceased operations in September 1986 after 154 years of continuous service due to deteriorating track conditions and low ridership. In March 2014, the Borough Council established the Advisory Ad-hoc Committee to Reestablish Rail Service to West Chester. This report documents the Committee's conclusion that the restorations of passenger rail service to West Chester is technically feasible and represents a cost-effective transportation investment comparable with other regional transportation projects.

SEPTA WEST CHESTER LINE (c. 1986)



The Southeastern Pennsylvania Transportation Authority (SEPTA) is currently advancing plans to restore service on the first three miles of its West Chester Line from Elwyn to Wawa (US Route 1). Population in areas of Chester and Delaware Counties surrounding the 9.4 miles of the line between Wawa and West Chester has grown dramatically in the past three decades since passenger rail service was suspended. It is projected by the Delaware Valley Regional Planning Commission (DVRPC) that it will continue to grow and by 2040, it will be more than 50 percent greater than it was when passenger trains last operated.

DVRPC produced an independent ridership forecast for the restoration of rail service to West Chester in 2011, concluding a restored service would attract up to 1,910 passenger weekday trips by 2035. Capital cost estimates by the Borough Committee documented in this report conclude that it would cost between \$100,300,000 and \$111,900,000, resulting in a cost-per-new-rider ranging from \$79,362 to \$100,300. *These preliminary, order-of-magnitude cost estimates are meant to serve as a starting point for evaluation of alternatives and may not fully capture all of SEPTA's unique infrastructure and operating requirements.*

The conclusion of this report is that the restoration of West Chester rail service would be a cost-effective investment of public funds and warrants further analysis of infrastructure and operating requirements and costs in conjunction with SEPTA, DVRPC, Chester County, and Delaware County.

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INTRODUCTION

West Chester Borough is a growing municipality situated about 25 miles west of Philadelphia and 15 miles north of Wilmington. It is the county seat of Chester County, Pennsylvania and is a university town as well as an important cultural center that regularly attracts visitors from across the Delaware Valley region to its historic streets, shops and restaurants.

The Borough was a nexus of steam railroad and interurban (nowadays “light rail”) passenger services for over 150 years from 1832 until the last service ceased operations in 1986. In March, 2014, the Borough Council established the Advisory Ad-hoc Committee to Reestablish Rail Service to West Chester. Since its inception, the Committee has held public meetings, engaged stakeholders, met with transportation and public officials, and conducted technical analyses to raise awareness of the potential and need for West Chester passenger rail service and foster support for its restoration.

This report documents the Committee’s conclusion that the restorations of passenger rail service to West Chester is technically feasible and represents a cost-effective transportation investment comparable with other regional transportation projects.

BACKGROUND

Passenger rail service first arrived in the Borough of West Chester in 1832 at the very dawn of North American railroading. The West Chester Railroad Company extended a nine-mile rail road to the Borough from “West Chester Intersection” (now Malvern), roughly following the modern day alignments of King Street and Phoenixville Pike. People and goods were initially hauled in horse-drawn carriages riding on rails. The Borough’s second rail road arrived from the south in 1858 in the form of the West Chester & Philadelphia Railroad, which constructed a new 26½-mile line from West Philadelphia via Media. The latter road was electrified in 1928 while passenger service on the former road ceased soon thereafter in 1932 (tracks on the original rail road were removed in the 1960s).



A SEPTA Route R3 train boards passengers at West Chester Station on Market Street in the summer of 1986.

Passenger service continued over the southern route to Center City via Media as part of the Southeastern Pennsylvania Transportation Authority (SEPTA) regional rail network until September 1986. At time service was suspended, the predominant service on SEPTA Route R3 (as the service was then known) was between Center City and Elwyn with a limited number of “short turns” at Media and Secane. Most of the service to and from West Chester consisted of shuttle trains that required Center City passengers to change trains at Media.

SEPTA ROUTE R3 SERVICE FREQUENCIES (1986)

<i>Trains between:</i>	Weekday	Saturday	Sunday
Media/Elwyn and Center City	49	38	26
Secane and Center City	1	0	0
West Chester and Center City	7	1	0
West Chester and Media (Shuttle)	11	15	0
TOTALS	68	54	26

Source: SEPTA Route R3 Timetable, effective August 3, 1986

By the 1980s, there were nine stations on the 12.4 miles of the SEPTA West Chester Line in Delaware and Chester Counties west of Elwyn—Williamson School, Glen Riddle, Lenni, Wawa, Glen Mills, Cheney, Westtown, West Chester University (Niels Street), West Chester (Market Street).

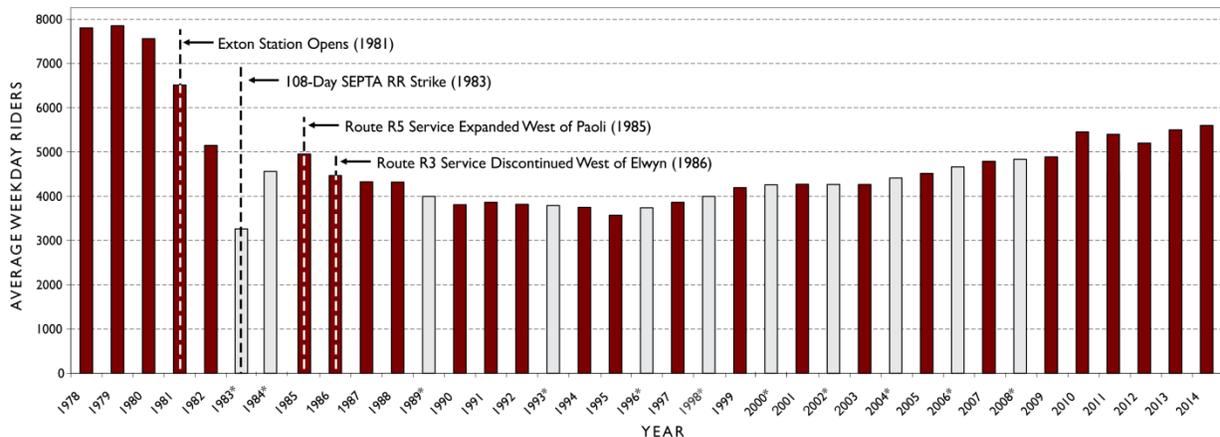
SEPTA WEST CHESTER LINE (c. 1986)



Two major factors led to the suspension of SEPTA rail service west of Elwyn:

1. Most of the rail on the SEPTA West Chester line between Elwyn and West Chester was very light (90 pounds per yard) and laid in 1927. SEPTA suspended rail service in the early summer of 1986 to perform intensive track maintenance, restoring the line to service on August 3. In the six weeks that followed, however, track condition unexpectedly deteriorated rapidly from Federal Railroad Administration (FRA) Class 3 (allowing passenger operations up to 60 miles per hour) to FRA Class 2 (limited passenger operations to no more than 30 miles per hour). The reduction in speeds rendered West Chester rail service impractical and uncompetitive with other SEPTA bus and rail services operating in the vicinity. This experience demonstrated that the existing rail and ties needed to be completely replaced before passenger service could be restored, which was beyond SEPTA's fiscal capabilities at that time.
2. In 1981, Amtrak and SEPTA opened Exton station with a large park-ride lot, just four miles from West Chester with easy highway access on PA Route 100. In 1985, SEPTA expanded Route R5 west of Paoli with funding provided by PennDOT as part of the Schuylkill Expressway Reconstruction Project. The combination of the new station and expanded train service had a pronounced effect on West Chester Line ridership. By 1986, ridership on the line west of Elwyn had fallen to 108 weekday passenger trips, 92 of which were to or from the two Borough stations.

SEPTA ROUTE R3 MEDIA/ELWYN LINE RIDERSHIP (1978-2015)



Data Source: DVRPC Wawa to West Chester Regional Rail Extension – Ridership Forecast (1978-2009)
 SEPTA Conductor Counts (2010-2015)

* - Estimated - data unavailable

A temporary Route R3 Shuttle Bus service began substituting for rail service west of Elwyn on Friday, September 19, 1986.

The SEPTA West Chester Line continued in service after the suspension of the passenger trains for SEPTA operator training and Amtrak maintenance of way trains obtaining ballast rock from a quarry in Glen Mills. Both activities have since ceased.

CURRENT CONDITIONS

Railroad Physical Plant

Despite nearly three decades without routine passenger and freight service, the West Chester Line facilities have remained intact and under SEPTA ownership.

SEPTA WEST CHESTER LINE (c. 2015)



A single track continues to link West Chester with the existing end of electrified SEPTA Media/Elwyn regional rail service at Elwyn Station, adjacent to PA Route 452 in Middletown Township, Delaware. Much of the original 1927 end-battered rail that contributed to the 1986 service suspension is still in place atop deteriorating wooden ties with the underlying roadbed and drainage systems extensively compromised due to lack of maintenance. The current condition of track ranges from FRA Class I (limiting passenger trains to no more than 15 miles per hour) to “excepted track” (upon which passenger trains are prohibited).

The overhead wires for electrification have been removed but the support structures from which the catenary system was suspended remain intact. The line was never signalized for train control west of Elwyn and crossing gates and signals at at-grade highway crossings, where they formerly existed, have been removed. Former passenger station buildings stand at Westtown, Cheney, and Glen Mills, all of which have been repurposed for commercial use.

A typical stretch of the West Chester Line west of Elwyn as it appears today at the former SEPTA Cheney Station (now a US Post Office). Overhead wires have been removed although “H-Frame” support structures for electrification remain.



SEPTA in conjunction with Delaware County is actively developing the *Elwyn-to-Wawa Rail Restoration Project*, which provides for restoration of rail service over the easternmost three miles of the West Chester Line from the existing service terminus at Elwyn, Delaware County, to a new terminus adjacent to US Route 1 at Wawa, Delaware County. The total cost of the Elwyn-to-Wawa Rail Restoration Project is \$127.2 million.

The current scope of work for this project consists of:

- Track bed reconstruction including crossties, continuous welded rail and track interlockings;
- Catenary system rehabilitation;
- Bi-directional signal system with automated train controls and positive train control with associated communications system improvements;
- Replacement of three bridges, rehabilitation of one bridge and three culverts;
- A railcar storage/layover yard and crew facility;
- A new traffic intersection and access road connecting U.S. Route 1 to the station;
- A new station building with a passenger waiting area and restroom facilities fully compliant with the Americans with Disabilities Act of 1990;
- A high-level island platform with canopy and windscreens;
- A pedestrian underpass with accessible ramps and stairways; and
- A 500+ car parking deck.

On December 31, 1996, SEPTA leased the westernmost seven miles of its West Chester Line to 4 States Railway Service, Inc., a railway management company doing business as a new West Chester Railroad Company (WCR). Working in association with an all-volunteer West Chester Railroad Heritage Association, WCR operates a seasonal excursion service for tourist between West Chester and Glen Mills using historic rolling stock. In 2003, the Borough of West Chester extended zoning protection to the SEPTA right-of-way within its boundaries, designating it a “transportation corridor.”



A family on an outing to West Chester boards a WCR excursion train at the location of the former SEPTA station on Market Street.

Service Area Demographics

The prospective service area for West Chester rail service in Chester County and Western Delaware County is presently characterized by rapid population growth. Both counties face many challenges balancing future growth pressures while trying to preserve open space and mitigating traffic congestion.

Population in the 13 municipalities surrounding the West Chester Line west of Wawa has grown 33 percent between 1990 (the US Census closest to the suspension of rail service in 1986) and 2014. The greatest growth during this period took place in the Delaware County municipalities (47 percent versus 26 percent in Chester County). According to forecasts by the Delaware Valley Regional Planning Commission (DVRPC), population in the subject municipalities will continue to grow another 13 percent at least through 2040 (eight percent and 17 percent in Delaware and Chester County municipalities, respectively).

Collectively, these figures represent an overall population increase of 50 percent from 1990 to 2040 in the municipalities surrounding the West Chester Line west of Wawa since the suspension of rail service.

HISTORIC AND FORECASTED POPULATION GROWTH IN MUNICIPALITIES
 SURROUNDING THE SEPTA WEST CHESTER LINE (WEST OF WAWA)

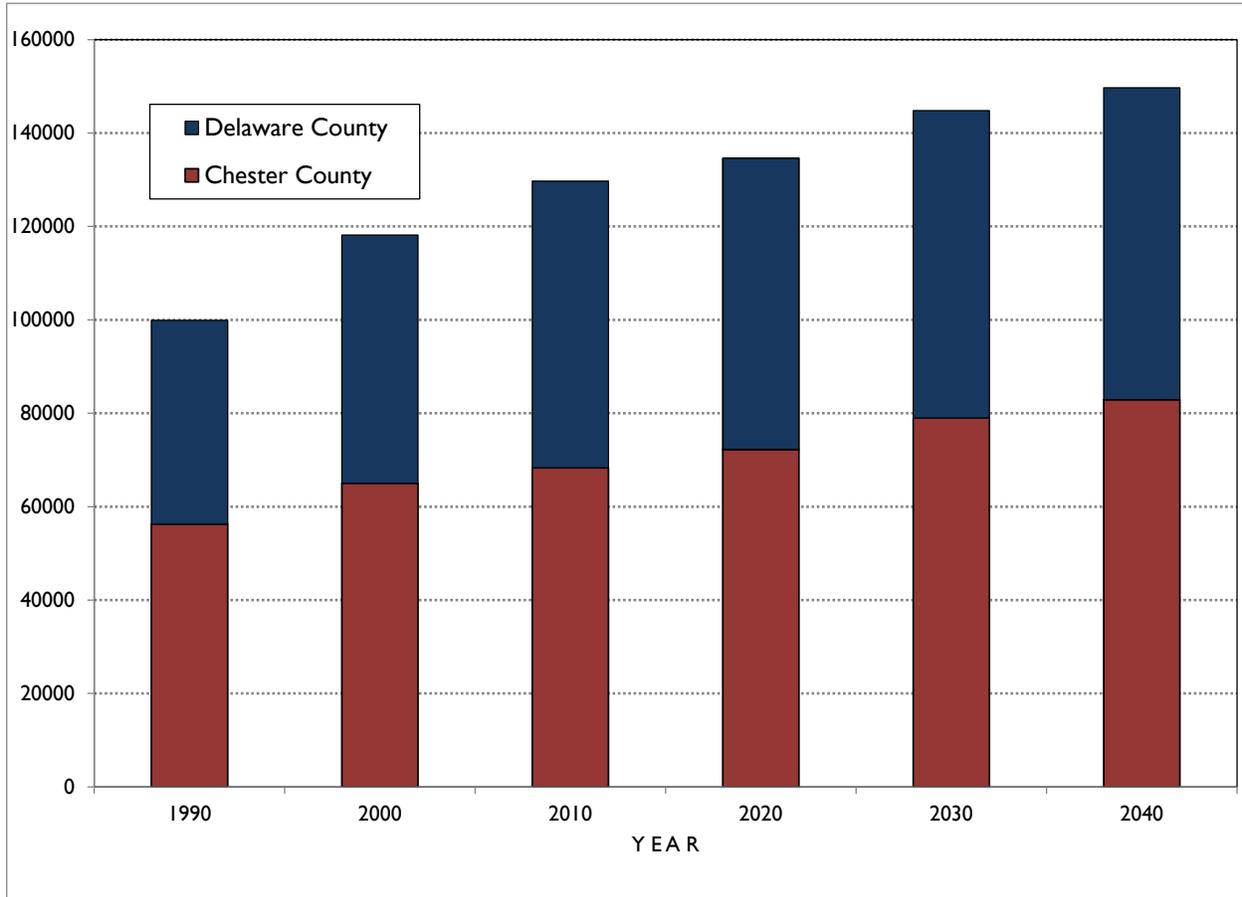
CHESTER COUNTY	1990	2000	2010	2014	CHANGE (1990-2014)		2020	2030	2040	CHANGE (2014-2040)	
					#	%				#	%
Birmingham Township	2,636	4,220	4,208	4,257	1,621	61%	4,494	4,986	5,272	1,015	24%
East Bradford Township	6,440	9,405	9,942	10,038	3,598	56%	10,893	12,528	13,479	3,441	34%
Thornbury Township	1,131	2,678	3,017	3,336	2,205	195%	3,242	3,627	3,852	516	15%
West Chester Borough	18,041	17,861	18,461	19,189	1,148	6%	18,919	19,706	20,164	975	5%
West Goshen Township	18,082	20,495	21,866	23,050	4,968	27%	23,154	25,367	26,655	3,605	16%
Westtown Township	9,937	10,352	10,827	10,919	982	10%	11,545	12,778	13,496	2,577	24%
Chester County Subtotal	56,267	65,011	68,321	70,789	14,522	26%	72,247	78,992	82,918	12,129	17%

DELAWARE COUNTY	1990	2000	2010	2014	CHANGE (1990-2014)		2020	2030	2040	CHANGE (2014-2040)	
					#	%				#	%
Chadds Ford Township	3,118	3,170	3,640	3,737	619	20%	3,730	4,044	4,134	397	11%
Chester Heights Borough	2,273	2,481	2,531	2,622	349	15%	2,540	2,573	2,582	-40	-2%
Concord Township	6,933	11,239	17,231	17,533	10,600	153%	17,635	19,041	19,445	1,912	11%
Edgmont Township	2,735	3,918	3,987	4,061	1,326	48%	4,112	4,547	4,672	611	15%
Middletown Township	14,130	16,064	15,807	15,945	1,815	13%	15,925	16,334	16,452	507	3%
Thornbury Township	4,728	5,787	8,028	7,844	3,116	66%	8,173	8,680	8,825	981	13%
Upper Providence Township	9,727	10,509	10,142	10,332	605	6%	10,240	10,581	10,679	347	3%
Delaware County Subtotal	43,644	53,168	61,366	62,074	18,430	42%	62,355	65,800	66,789	4,715	8%

BOTH COUNTIES	1990	2000	2010	2014	CHANGE (1990-2014)		2020	2030	2040	CHANGE (1990-2014)	
					#	%				#	%
TOTAL (Service Area MCDs)	99,911	118,179	129,687	132,863	32,952	33%	134,602	144,792	149,707	16,844	13%

Sources: U.S. Census Bureau (1990-2010)
 Pennsylvania State Data Center (2014 Estimate)
 Delaware Valley Regional Planning Commission (2020-2040 Forecasts)

HISTORIC AND FORECASTED POPULATION GROWTH IN MUNICIPALITIES
SURROUNDING THE SEPTA WEST CHESTER LINE (WEST OF WAWA)

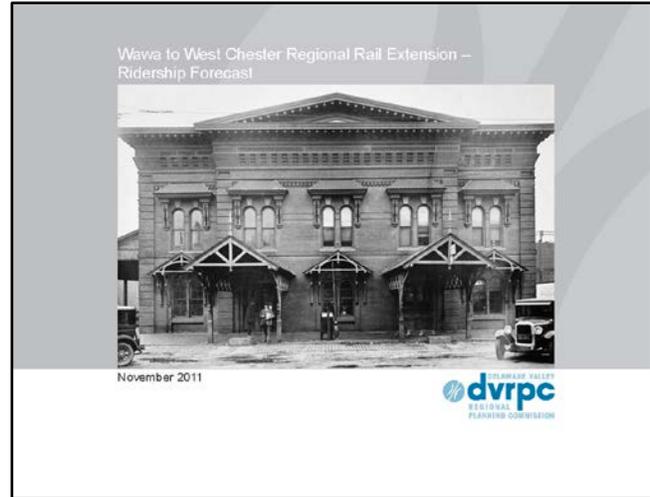


Not entirely captured in these statistics is the emerging trend of people rediscovering the quality of life and other benefits associated with living in walkable, bikeable, transit-oriented and mixed-use communities like West Chester Borough (the only County Seat in the SEPTA service area without regional rail service). These changing demographics have already contributed to a radical change in travel trends: commuting by non-automotive means (transit, walking, or biking) has increased in recent years to record highs while the number of miles driven—which has increased almost every year since World War II—peaked in 2007 and has remained stagnant since. “Millennials”, the youngest generation of adults, have been shown to seek out housing opportunities that require fewer driving trips and are more amenable to public transit, and will—in all likelihood—be less auto-dependent than previous generations.

These demographic trends demonstrate that the market for West Chester rail service has significantly improved in the three decades since that service was suspended and that the travel market is expected to continue to improve at least for the next quarter century.

RIDERSHIP POTENTIAL

DVRPC produced a ridership forecast for the restoration of rail service to West Chester as part of its Fiscal Year 2011 Unified Planning Work Program at the request of Chester County and SEPTA (go to <http://www.west-chester.com/DocumentCenter/View/931> for the complete report). The study was a rigorous evaluation of ridership potential on the West Chester line under certain constraints and assumptions, with additional examination of diversion effects from existing SEPTA services. It compared Year 2035 forecasts under a no-build scenario with forecasts for two “build” scenarios.



Both “build” scenarios assumed a West Chester terminus at Market Street and the same three intermediate stations between West Chester and Wawa—West Chester University (Niels Street), Westtown (on PA Route 926), and Cheyney (Station Road in Thornbury Township, Delaware County). The two “build” scenarios are:

- I. A direct service extension (a one-seat ride between West Chester and Center City) with a 63-minute runtime between West Chester and Center City (57 minutes via peak express trains)



2. A shuttle service extension (a two-seat ride requiring a change of trains at Wawa) with a 68-minute runtime between West Chester and Center City (62 minutes via peak express trains)



Ridership forecasts are highly influenced by travel time and service frequency. The assumed levels of service for the DVRPC analysis were:

RIDERSHIP FORECAST ASSUMED SERVICE FREQUENCIES

<i>Trains between:</i>	Direct (one-seat ride) Scenario	Shuttle (two-seat ride) Scenario
Media/Elwyn/Wawa and Center City	31	23
Secane and Center City	2	2
West Chester and Center City	25	30
West Chester and Wawa (Shuttle)	0	11
TOTALS	58	66

Weekend service was not analyzed in the report.

Source: Wawa to West Chester Regional Rail
 Extension – Ridership Forecast

The DVRPC study findings may be summarized as follows:

- The direct one-seat ride scenario was forecasted to attract 1,910 weekday trips on the line between West Chester, Elwyn, and Philadelphia in 2035. About 1,400 of these trips represent new transit riders.
- The shuttle two-seat ride scenario was forecasted to attract about 1,350 weekday trips on the line between West Chester, Elwyn, and Philadelphia, which is about 30 percent less than that forecasted for the direct scenario in 2035. About 1,000 of these trips represent new transit riders.
- A portion of the trips forecasted for the West Chester Line are diverted from existing Thorndale line ridership at Exton, Malvern, and Paoli. This is a conservative estimate of diversion on net ridership, as some back filling would occur at Paoli/Thorndale Line stations where parking is presently extremely constrained.
- The West Chester terminus and the West Chester University stations each attracted about 30 percent of ridership on the extension, regardless of the service scenario.
- The Cheyney University and Westtown stations each attract about 20 percent of ridership on the extension.
- While the Thorndale line has a higher frequency of service and faster travel times on average to Center City Philadelphia, individuals in certain locations in the study area will find travel via a West Chester extension more advantageous.
- Bus trips are forecast to be relatively flat under any alternative.

The DVRPC study did not examine weekend service, capital and operating costs, station location and design, or operational details.

ALTERNATIVES ASSESSMENT

The methodology used to assess the potential feasibility of restoring rail service to West Chester consists of three parts:

1. Develop alternatives for West Chester service based on the two scenarios DVRPC used to forecast ridership in sufficient detail to estimate order-of-magnitude capital cost.
2. Estimate order-of-magnitude capital costs for each alternative.
3. Evaluate the estimated cost-per-new-rider for each alternative relative to that for other comparable passenger rail projects in the Delaware Valley.

Alternatives Development

The DVRPC report identified two basic service concepts—direct or shuttle service. Following standard industry practice and in order to stay consistent with the assumptions upon which the ridership

forecasts were based, each alternative developed must use the same operating schedules and station locations that were used in the DVRPC study. Similarly, track, signal, communication, and structural requirements would not significantly differ between rail alternatives at this level conceptual of analysis.

Rolling stock, on the other hand, could vary between alternatives, depending on whether it is a direct or shuttle scenario. Any alternative employing a direct scenario must operate rolling stock compliant with FRA regulations governing joint use of track with SEPTA's conventional commuter trains and freight trains. Direct scenario alternatives must also be capable of drawing propulsion power from the overhead catenary system when operating through the Center City Commuter Connection (CCCC or the "Center City tunnel").

Shuttle scenario alternatives have more flexibility. As they only travel as far as Wawa, they do not travel through the CCCC or mix with SEPTA conventional commuter trains. They could employ diesel-powered rolling stock or lightweight rolling stock that is not compliant for joint use under FRA regulations.

Rolling Stock Technologies

There are three basic options for rolling stock for West Chester rail service:

1. Electric Multiple Unit (EMU) Trains. These are the ubiquitous self-propelled electric railcars SEPTA operates throughout the regional rail network (e.g.: Silverliner IVs & Vs). They are the easiest technology option to integrate with the regional rail system as SEPTA is already set up to maintain this type of equipment. They are compatible with either direct or shuttle scenarios but require re-electrification of the West Chester Line to operate.



A trio of SEPTA Silverliner V EMUs.

2. Dual-Power Locomotive trains. These locomotives are capable of propelling trains by generating power internally with an on-board diesel power plant or by drawing power from overhead catenary when available. They would be coupled with push-pull passenger coaches such as SEPTA uses for revenue service elsewhere on regional rail line. The ALP-45 DP (for "dual power") locomotive was introduced to the North American market in 2008 and is presently used for commuter service in North Jersey and Montréal. It would be relatively

simple to integrate dual-power locomotives operationally with the regional rail system but a location on the far side of the CCCC would need to be identified and adapted for maintenance as SEPTA is not presently set up to maintain this type of equipment. They are compatible with only direct scenarios as economy of scale issues would make them inefficient for shuttle service. They would not require re-electrification of the West Chester Line to operate.



NJ Transit and Agence Métropolitaine de Transport ALP-45DP locomotives.

3. Diesel Multiple Unit (DMU) Trains. Several new rail systems have chosen to use lightweight diesel self-propelled railcars from foreign manufacturers that conform to European safety standards—including the NJ Transit River LINE in South Jersey, Ottawa ON, Northern San Diego County, as well as Austin and Denton TX. This rolling stock option may offer reduced operating costs and open up off-branch alignment options as some DMUs (such as the Stadler GTW 2/6 vehicle shown here) are capable of operating in street alignments like a light rail vehicle. They could not, however, operate east of Wawa and would require a separate track at Wawa positively separated from other SEPTA trains. This option would also require a new dedicated maintenance and storage facility as it would be unable to access any existing SEPTA facility. DMUs would only be compatible with shuttle scenario alternatives but would not require re-electrification of the West Chester Line



A train of Stadler GTW 2/6 DMUs on a run between Trenton and Camden on the NJ Transit River LINE.

Alternatives Definition

Based on the DVRPC report service concepts and consideration of rolling stock technology options, four alternatives were defined for West Chester rail service:

- Alternative 1: Direct service between West Chester and Center City using EMUs (conventional SEPTA rolling stock). This alternative requires re-electrification of the West Chester Line.
- Alternative 2: Direct service between West Chester and Center City using dual-powered locomotives and conventional push-pull coaches. This alternative does not require re-electrification of the West Chester Line.
- Alternative 3: Shuttle service between West Chester and Wawa using EMUs (conventional SEPTA rolling stock). This alternative requires re-electrification of the West Chester Line.
- Alternative 4: Shuttle service between West Chester and Wawa using DMUs. This alternative does not require re-electrification of the West Chester Line.

Cost Estimation

Rough order-of-magnitude capital cost estimates were developed for the each alternative using cost factors drawn from recent engineering and construction projects in the Northeastern United States. Costs were developed for each of the ten following standard cost categories (SCCs) prescribed by the Federal Transit Administration (FTA) for planning studies:

- 10 Guideway, Track, Structures
- 20 Stations, Stops, Terminals
- 30 Support Facilities
- 40 Sitework/Special Conditions
- 50 Systems
- 60 Right of Way, Land, Improvements
- 70 Vehicles
- 80 Professional Services
- 90 Unallocated Contingency
- 100 Finance Charges

These preliminary order-of-magnitude cost estimates are meant to serve as a starting point for evaluation of alternatives. They may not fully capture all of SEPTA's unique infrastructure and operating requirements, hence the reason further, more detailed study is necessary beyond the limited order-of-magnitude assessment of costs contained in this report.

INFRASTRUCTURE

10 Guideway, Track, Structures

Track requirements were based on a single-track with one intermediate passing siding sufficiently long (3615 feet) and #20 turnouts at both ends for “rolling meets,” two tracks with a #10 turnout at the West Chester terminus, and an allowance for modifications to the new interlocking at Wawa. The estimate provided for complete replacement of existing tracks with 132-pound rail, wooden ties, and special work. An allowance was also provided for inspection and some degree of rehabilitation to existing undergrade bridges and for the rehabilitation of eight at-grade highway crossings. Estimated costs for guideway, track, and structures are identical for all alternatives except for those requiring re-electrification (Alternatives 1 & 3) which contain an allowance in the structures category for rehabilitation of existing catenary towers.

20 Stations, Stops, Terminals

A total of four new simple passenger stops with 200-foot high-level platforms and prefabricated passenger shelters were assumed along with an allowance for modifications to Wawa Station for Alternatives 1, 2 & 3). Alternative 4 (DMU) addresses the same number of stations by with low-level platforms compatible with the low-floor rolling stock. Allowances were also made for basic amenities (benches, signage, lighting, landscaping) and accessibility components to conform to the Americans with Disabilities Act of 1990.

The number of parking spaces assumed per station was not identified in the DVRPC report. An allowance for 850 additional surface parking spaces was provided in each alternative with the assumption they will be distributed between stations during a later stage of project development.

30 Support Facilities

No allowance was made in the estimates for Alternatives 1, 2 & 3 as they will be fully integrated with the SEPTA regional rail network. For Alternative 4 (DMU) an allowance was made for one maintenance facility, adequately scaled for a small fleet of self-propelled rail vehicles. Heavy repairs and component maintenance should be handled off-site by contract vendors to keep the size of the on-line facility and staffing to a minimum.

40 Sitework/Special Conditions

The same amount was estimated for all alternatives new track for brush cutting, clearing and grubbing, subgrade, subballast, and trackbed as there are no significant differences between them.

50 Systems

The West Chester Line was previously a “dark railroad” with no signals west of Elwyn, operating under authority of timetable and train order, which is no longer acceptable operating practice for passenger trains under present-day FRA regulations. The systems estimates for all alternatives include signaling the entire branch and intermediate interlockings, positive train control, and reestablishing crossing protection (gates and flashers) at eight at-grade highway crossings. The system estimates for the two

EMU alternatives requiring electrification (Alternatives 1 & 3) include restoration of catenary, contact wire and feeders cables. Estimated costs for electrification do not include new substations or related components as it is assumed that the electric power will be fed to the West Chester Line from the existing Lenni Substation as before.

60 Right of Way, Land, Improvements

No costs were estimated at this point of project development for property acquisition as all improvements are anticipated to occur within SEPTA right of way..

70 Vehicles

The number and type of vehicles assumed for the cost estimate varied between all alternatives depending upon the service scenario (direct or shuttle), the operating schedule, and the degree of integration anticipated with the SEPTA regional rail network.

Alternative 1: Direct service between West Chester and Center City using EMUs.

Based on DVRPC ridership estimates and operating schedules, the cost estimate assumes acquisition of seven new Silverliner V-like EMUs to be added to existing train consists. No maintenance spaces were assumed as this alternative will be fully integrated with SEPTA regional rail operations and maintenance.

Alternative 2: Direct service between West Chester and Center City using dual-powered locomotives and conventional push-pull coaches.

Based on DVRPC ridership estimates and operating schedules, the cost estimate assumes acquisition of seven new ALP-45DP-like locomotives and seven additional push-pull coaches to be added to existing train consists. No maintenance spaces were assumed as this alternative will be fully integrated with SEPTA regional rail operations and maintenance.

Alternative 3: Shuttle service between West Chester and Wawa using EMUs.

Based on DVRPC ridership estimates and operating schedules, the cost estimate assumes acquisition of five new single Silverliner V-like EMUs to operate as one-car trains. No maintenance spaces were assumed as this alternative will be fully integrated with SEPTA regional rail operations and maintenance.

Alternative 4: Shuttle service between West Chester and Wawa using DMUs.

Based on DVRPC ridership estimates and operating schedules, the cost estimate assumes acquisition of six new Stadler GTW 6/2 DMUs to operate as one-car trains. One maintenance spaces was assumed as this alternative as this operation will not be fully integrated with SEPTA regional rail operations and maintenance.

SOFT COSTS

80 Professional Services

Standard factors were applied to rolling stock and infrastructure costs to account for the anticipated "soft costs" associated with project development, including:

- Contractor mobilization
(ten percent of Items 10 through 50)
- Design engineering
(ten percent of Items 10 through 70)
- Environmental studies
(two percent of Items 10 through 50)
- Construction management
(five percent of Items 10 through 50 and Item 70)

90 Unallocated Contingency

A 30 percent contingency was added to the infrastructure and rolling stock costs (Items 10 through 50 and Item 70) to account for unknown factors and undiscovered situations that were not accounted for at this level of analysis.

100 Finance Charges

Finance charges were not considered at this level of analysis.

COST ESTIMATE

An order-of-magnitude estimate was produced for each of the alternatives for the restoration of rail service to West Chester applying cost factors drawn from a library of other recent rail construction projects, modified to reflect the Northeast US construction market.

Summary of Estimated Capital Costs	Alternative 1 West Chester EMU Direct Service	Alternative 2 West Chester Dual Powered Direct Service	Alternative 3 West Chester EMU Shuttle Service	Alternative 4 West Chester DMU Shuttle Service
Weekday Ridership	1910 trips	1910 trips	1350 trips	1350 trips
New Weekday Ridership	1410 trips	1410 trips	1000 trips	1000 trips
10 Guideway, Track, Structures	\$ 12,800,000	\$ 11,400,000	\$ 12,800,000	\$ 11,400,000
20 Stations, Stops, Terminals	\$ 7,200,000	\$ 7,200,000	\$ 7,200,000	\$ 5,000,000
30 Support Facilities	\$ -	\$ -	\$ -	\$ 8,000,000
40 Sitework/Special Conditions	\$ 11,400,000	\$ 11,400,000	\$ 11,400,000	\$ 11,400,000
50 Systems	\$ 14,000,000	\$ 9,500,000	\$ 14,000,000	\$ 9,500,000
60 ROW, Land, Improvements	\$ -	\$ -	\$ -	\$ -
70 Vehicles	\$ 28,000,000	\$ 87,000,000	\$ 20,000,000	\$ 38,400,000
SUBTOTALS*	\$ 73,400,000	\$ 126,500,000	\$ 65,400,000	\$ 83,700,000
80 Professional Services	\$ 16,500,000	\$ 23,700,000	\$ 15,300,000	\$ 18,000,000
90 Unallocated Contingency	\$ 22,000,000	\$ 38,000,000	\$ 19,600,000	\$ 25,100,000
100 Finance Charges	Not Estimated			
TOTALS	\$ 111,900,000	\$ 188,200,000	\$ 100,300,000	\$ 126,800,000

* Does not include right of way (Line 60) or "soft costs" (Lines 80, 90, 100).

These preliminary order-of-magnitude cost estimates are meant to serve as a starting point for evaluation of alternatives. They may not fully capture all of SEPTA's unique infrastructure and operating requirements, hence the reason further, more detailed study is necessary beyond the limited order-of-magnitude assessment of costs contained in this report.

COST-EFFECTIVENESS EVALUATION

COMPARISON BETWEEN ALTERNATIVES

The cost estimates for the four West Chester rail service alternatives were evaluated and compared in terms of their relative cost-effectiveness based on two metrics: cost per mile and cost per new rider.

West Chester Extension

Alternative 1 (EMU Direct)	Alternative 3 (EMU Shuttle)
9.4 miles	9.4 miles
\$ 111,900,000 cost	\$ 100,030,000 cost
1410 new riders	1000 new riders
\$ 11,904,255 per mile	\$ 10,641,489 per mile
\$ 79,362 per new rider	\$ 100,030 per new rider

Alternative 2 (DP Direct)	Alternative 4 (DMU Shuttle)
9.4 miles	9.4 miles
\$ 188,200,000 cost	\$ 126,800,000 cost
1410 new riders	1000 new riders
\$ 20,021,277 per mile	\$ 13,489,362 per mile
\$ 133,475 per new rider	\$ 126,800 per new rider

The two non-electrification alternatives (Alternatives 2 & 4) proved the least cost-effective and most expensive overall. This was for two different reasons. The poor performance of Alternative 2 is attributed to the expense of the ALP-45DP locomotive (\$10,200,000 to \$12,000,000 per unit based on recent sales). While Alternative 4 did better, lack of integration with the SEPTA regional rail network incurs significant cost for a new, stand-alone support facility and an additional vehicle as maintenance spare (especially when the basic DMU costs 60 percent more than its EMU counterpart). Neither technology can offer a less expensive option to re-electrification reusing existing catenary towers.

Of the electrification alternatives (Alternatives 1 & 3), Alternative 3 had the lowest overall costs and the lowest cost per mile but Alternative 1 had the lowest cost per new rider, which arguably the better metric for judging the cost-effectiveness of public investment. Scrutinizing the estimates, the difference in capital costs is completely attributable to the additional EMUs needed for the direct service scenario.

In all likelihood, an actual restored service to West Chester will be a blend of direct and shuttle services, as was the case with the last SEPTA R3 schedule, rather than all one or the other, as presumed by the DVRPC study.

COMPARISON WITH OTHER REGIONAL PROJECTS

The estimated costs-per-new-rider for each West Chester rail service alternative was evaluated relative to two comparable passenger rail projects in the Delaware Valley—the pending SEPTA Wawa Extension and the NJ Transit River LINE.

SEPTA Wawa Extension	NJ Transit RiverLINE
3.0 miles	34.0 miles
\$ 127,200,000 cost	\$ 1,100,000,000 cost
1000 new riders	9014 new riders
\$ 42,400,000 per mile	\$ 32,352,941 per mile
\$ 127,200 per new rider	\$ 122,032 per new rider

The cost-per-new-rider for the SEPTA and NJ Transit projects are 45 and 53 percent higher than Alternative 1 for West Chester rail service (direct EMU service) as well as higher than Alternative 3 (shuttle EMU service).

CONCLUSION

The conclusion of this assessment demonstrates that the restoration of West Chester rail service would be a cost-effective investment of public funds and warrants further analysis in conjunction with SEPTA, DVRPC, Chester County, and Delaware County.

MEDIA/WEST CHESTER SERVICE (Direct Service to West Chester)

APPENDIX 2

Sample Schedule

West Chester to
Center City
Direct Service
Scenario

Source: DVRPC

Trains to Wawa & West Chester

Temple University	6:06a	6:59a	7:41a	8:04a	8:34a	9:23a	10:28a	11:33a	12:38p	1:43p	2:39p	2:52p	3:16p	3:55p	4:23p	4:41p	4:53p	5:10p	5:14p	5:39p	6:09p	6:54p	7:54p	8:44p	9:44p	10:54p	11:54a		
Market East	6:12a	7:05a	7:47a	8:10a	8:40a	9:29a	10:34a	11:39a	12:44p	1:49p	2:45p	2:58p	3:22p	4:01p	4:29p	4:47p	4:59p	5:16p	5:20p	5:45p	6:15p	7:00p	8:00p	8:50p	9:50p	11:00p	12:00p		
Suburban Station	6:17a	7:10a	7:52a	8:15a	8:45a	9:34a	10:39a	11:44a	12:49p	1:54p	2:50p	3:03p	3:27p	4:06p	4:34p	4:52p	5:04p	5:21p	5:25p	5:50p	6:20p	7:05p	8:05p	8:55p	9:55p	11:05p	12:05p		
30th Street Station	6:21a	7:14a	7:56a	8:19a	8:49a	9:38a	10:43a	11:48a	12:53p	1:58p	2:54p	3:07p	3:31p	4:10p	4:38p	4:56p	5:08p	5:25p	5:29p	5:54p	6:24p	7:09p	8:09p	8:59p	9:59p	11:09p	12:09p		
University City	6:24a	7:17a	7:59a	8:22a	8:52a	9:41a	10:46a	11:51a	12:56p	2:01p	2:57p	3:10p	3:34p	4:13p	4:41p	4:59p	5:11p	5:28p	5:32p	5:57p	6:27p	7:12p	8:12p	9:02p	10:02p	11:12p	12:12p		
49th Street	6:28a	7:21a	8:03a	8:26a	8:56a	9:45a	10:50a	11:55a	1:00p	2:05p	3:01p	3:14p	3:38p	4:17p	4:45p	EXPRESS	5:15p	EXPRESS	5:36p	6:01p	6:31p	7:16p	8:16p	9:06p	10:06p	11:16p	12:16p		
Angora	6:30a	7:23a	8:05a	8:28a	8:58a	9:47a	10:52a	11:57a	1:02p	2:07p	3:03p	3:16p	3:40p	4:19p	4:47p		5:17p		5:38p	6:03p	6:33p	7:18p	8:18p	9:08p	10:08p	11:18p	12:18p		
Fernwood-Yeadon	6:32a	7:25a	8:07a	8:30a	9:00a	9:49a	10:54a	11:59a	1:04p	2:09p	3:05p	3:18p	3:42p	4:21p	4:49p		5:19p		5:40p	6:05p	6:35p	7:20p	8:20p	9:10p	10:10p	11:20p	12:20p		
Lansdowne	6:34a	7:27a	8:09a	8:32a	9:02a	9:51a	10:56a	12:01p	1:06p	2:11p	3:07p	3:20p	3:44p	4:23p	4:51p		5:21p		5:42p	6:07p	6:37p	7:22p	8:22p	9:12p	10:12p	11:22p	12:22p		
Gladstone	6:35a	7:28a	8:10a	8:33a	9:03a	9:52a	10:57a	12:02p	1:07p	2:12p	3:08p	3:21p	3:45p	4:24p	4:52p		5:22p		5:43p	6:08p	6:38p	7:23p	8:23p	9:13p	10:13p	11:23p	12:23p		
Clifton-Alden	6:37a	7:30a	8:12a	8:35a	9:05a	9:54a	10:59a	12:04p	1:09p	2:14p	3:10p	3:23p	3:47p	4:26p	4:54p		5:24p		5:45p	6:10p	6:40p	7:25p	8:25p	9:15p	10:15p	11:25p	12:25p		
Primos	6:39a	7:32a	8:14a	8:37a	9:07a	9:56a	11:01a	12:06p	1:11p	2:16p	3:12p	3:25p	3:49p	4:28p	4:56p		5:26p		5:47p	6:12p	6:42p	7:27p	8:27p	9:17p	10:17p	11:27p	12:27p		
Secane	6:41a	7:34a	8:16a	8:39a	9:09a	9:58a	11:03a	12:08p	1:13p	2:18p	3:14p	3:27p	3:51p	4:30p	4:58p		5:10p		5:28p	5:39p	5:49p	6:14p	6:44p	7:29p	8:29p	9:19p	10:19p	11:29p	12:29p
Morton	6:44a	7:37a	8:19a	8:42a	9:12a	10:01a	11:06a	12:11p	1:16p	2:21p	3:17p	3:30p	3:54p	4:33p	5:01p		5:13p		5:31p	5:42p	5:52p	6:17p	6:47p	7:32p	8:32p	9:22p	10:22p	11:32p	12:32p
Swarthmore	6:46a	7:39a	8:21a	8:44a	9:14a	10:03a	11:08a	12:13p	1:18p	2:23p	3:19p	3:32p	3:56p	4:35p	5:03p		5:15p		EXPRESS	5:44p	EXPRESS	6:19p	6:49p	7:34p	8:34p	9:24p	10:24p	11:34p	12:34p
Wallingford	6:49a	7:42a	8:24a	8:47a	9:17a	10:06a	11:11a	12:16p	1:21p	2:26p	3:22p	3:35p	3:59p	4:38p	5:06p	5:18p	5:47p	6:22p		6:52p		7:37p	8:37p	9:27p	10:27p	11:37p	12:37p		
Moylan-Rose Valley	6:51a	7:44a	8:26a	8:49a	9:19a	10:08a	11:13a	12:18p	1:23p	2:28p	3:24p	3:37p	4:01p	4:40p	5:08p	5:20p	5:49p	6:24p		6:54p		7:39p	8:39p	9:29p	10:29p	11:39p	12:39p		
Media	6:56a	7:49a	8:31a	8:54a	9:24a	10:13a	11:18a	12:23p	1:28p	2:33p	3:29p	3:42p	4:06p	4:45p	5:13p	5:25p	5:39p	5:54p	6:00p	6:29p	6:59p	7:44p	8:44p	9:34p	10:34p	11:44p	12:44p		
Elwyn	7:00a	7:53a	8:35a	8:58a	9:28a	10:17a	11:22a	12:27p	1:32p	2:37p	3:33p	3:46p	4:10p	4:49p	5:17p	5:29p	6:03p	5:58p	6:04p	6:33p	7:03p	7:48p	8:48p	9:38p	10:38p	11:48p	12:48p		
Wawa	7:05a	7:58a	8:40a	9:03a	9:33a	10:22a	11:27a	12:32p	1:37p	2:42p	3:38p	3:51p	4:15p	4:54p	5:22p	5:34p		6:09p	6:03p	6:38p	7:08p	7:53p	8:53p	9:43p	10:43p	11:53p	12:53p		
Cheyney			8:46a								3:44p			5:00p		5:40p			6:44p	7:14p	7:59p		9:49p	10:49p					
Westtown			8:49a								3:47p			5:03p		5:43p			6:47p	7:17p	8:02p		9:52p	10:52p					
WCU			8:53a								3:51p			5:07p		5:47p			6:51p	7:21p	8:06p		9:56p	10:56p					
West Chester			8:55a								3:53p			5:09p		5:49p			6:53p	7:23p	8:08p		9:58p	10:58p					

Trains to Center City

West Chester		5:47a	6:15a	6:42a	6:58a		7:33a		7:55a			8:38a	9:41a							3:50p		4:43p		6:14p	6:56p		7:55p	8:43p		10:20p	
WCU		5:49a	6:17a	6:44a	7:00a		7:35a		7:57a			8:40a	9:43a							3:52p		4:45p		6:16p	6:58p		7:57p	8:45p		10:22p	
Westtown		5:53a	6:21a	6:48a	7:04a		7:39a		8:01a			8:44a	9:47a							3:56p		4:49p		6:20p	7:02p		8:01p	8:49p		10:26p	
Cheyney		5:56a	6:24a	6:51a	7:07a		7:42a		8:04a			8:47a	9:50a							3:59p		4:52p		6:23p	7:05p		8:04p	8:52p		10:29p	
Wawa	5:30a	6:02a	6:30a	6:57a	7:13a		7:48a		8:10a		8:24a	8:53a	9:56a	10:53a	11:58a	1:03p	2:11p	2:58p	3:46p	4:05p	4:30p	4:58p	5:38p	6:29p	7:11p	7:59p	8:10p	8:58p	9:59p	10:35p	10:59p
Elwyn	5:35a	6:07a	6:35a	7:02a	7:18a		7:53a		8:15a		8:29a	8:58a	10:01a	10:58a	12:03p	1:08p	2:16p	3:03p	3:51p	4:10p	4:35p	5:03p	5:43p	6:34p	7:16p	8:04p	8:15p	9:03p	10:04p	10:40p	11:04p
Media	5:39a	6:11a	6:39a	7:06a	7:22a	7:13a	7:57a		8:19a		8:33a	9:02a	10:05a	11:02a	12:07p	1:12p	2:20p	3:07p	3:55p	4:14p	4:39p	5:07p	5:47p	6:38p	7:20p	8:08p	8:19p	9:07p	10:08p	10:44p	11:08p
Moylan-Rose Valley	5:41a	6:13a	6:41a	EXPRESS	EXPRESS	7:15a	EXPRESS		8:21a		8:35a	9:04a	10:07a	11:04a	12:09p	1:14p	2:22p	3:09p	3:57p	4:16p	4:41p	5:09p	5:49p	6:40p	7:22p	8:10p	8:21p	9:09p	10:10p	10:46p	11:10p
Wallingford	5:43a	6:15a	6:43a	EXPRESS	EXPRESS	7:17a	EXPRESS		8:23a		8:37a	9:06a	10:09a	11:06a	12:11p	1:16p	2:24p	3:11p	3:59p	4:18p	4:43p	5:11p	5:51p	6:42p	7:24p	8:12p	8:23p	9:11p	10:12p	10:48p	11:12p
Swarthmore	5:45a	6:17a	6:45a	EXPRESS	EXPRESS	7:19a	EXPRESS		8:25a		8:39a	9:08a	10:11a	11:08a	12:13p	1:18p	2:26p	3:13p	4:01p	4:20p	4:45p	5:13p	5:53p	6:44p	7:26p	8:14p	8:25p	9:13p	10:14p	10:50p	11:14p
Morton	5:48a	6:20a	6:48a	7:12a	7:28a	7:22a	8:01a		8:28a		8:42a	9:11a	10:14a	11:11a	12:16p	1:21p	2:29p	3:16p	4:04p	4:23p	4:48p	5:16p	5:56p	6:47p	7:29p	8:17p	8:28p	9:16p	10:17p	10:53p	11:17p
Secane	5:51a	6:23a	6:51a	7:15a	7:31a	7:25a	8:04a	7:47a	8:31a	8:10a	8:45a	9:14a	10:17a	11:14a	12:19p	1:24p	2:32p	3:19p	4:07p	4:26p	4:51p	5:19p	5:59p	6:50p	7:32p	8:20p	8:31p	9:19p	10:20p	10:56p	11:20p
Primos	5:53a	6:25a	6:53a	7:17a	7:33a		8:12a		8:47a		9:16a	10:19a	11:16a	12:21p	1:26p	2:34p	3:21p	4:09p	4:28p	4:53p	5:21p	6:01p	6:52p	7:34p	8:22p	8:33p	9:21p	10:22p	10:58p	11:22p	
Clifton-Alden	5:55a	6:27a	6:55a	7:19a	7:35a		8:14a		8:49a		9:18a	10:21a	11:18a	12:23p	1:28p	2:36p	3:23p	4:11p	4:30p	4:55p	5:23p	6:03p	6:54p	7:36p	8:24p	8:35p	9:23p	10:24p	11:00p	11:24p	
Gladstone	5:56a	6:28a	6:56a	7:20a	7:36a		8:15a		8:50a		9:19a	10:22a	11:19a	12:24p	1:29p	2:37p	3:24p	4:12p	4:31p	4:56p	5:24p	6:04p	6:55p	7:37p	8:25p	8:36p	9:24p	10:25p	11:01p	11:25p	
Lansdowne	5:57a	6:29a	6:57a	7:21a	7:37a		8:16a		8:51a		9:20a	10:23a	11:20a	12:25p	1:30p	2:38p	3:25p	4:13p	4:32p	4:57p	5:25p	6:05p	6:56p	7:38p	8:26p	8:37p	9:25p	10:26p	11:02p	11:26p	
Fernwood-Yeadon	5:59a	6:31a	6:59a	7:23a	7:39a		8:18a		8:53a		9:22a	10:25a	11:22a	12:27p	1:32p	2:40p	3:27p	4:15p	4:34p	4:59p	5:27p	6:07p	6:58p	7:40p	8:28p	8:39p	9:27p	10:28p	11:04p	11:28p	
Angora	6:02a	6:34a	7:02a	7:26a	7:42a		8:21a		8:56a		9:25a	10:28a	11:25a	12:30p	1:35p	2:43p	3:30p	4:18p	4:37p	5:02p	5:30p	6:10p	7:01p	7:43p	8:31p	8:42p	9:30p	10:31p	11:07p	11:31p	
49th Street	6:05a	6:37a	7:05a	7:29a	7:45a		8:01a		8:24a		8:59a	9:28a	10:31a	11:28a	12:33p	1:38p	2:46p	3:33p	4:21p	4:40p	5:05p	5:33p	6:13p	7:04p	7:46p	8:34p	8:45p	9:33p	10:34p	11:10p	11:34p
University City	6:10a	6:42a	7:10a	7:34a																											

MEDIA/WEST CHESTER SERVICE (Shuttle Service to West Chester)

APPENDIX 3

Sample Schedule

West Chester to
Wawa Shuttle
Scenario

Source: DVRPC

Trains to Wawa & West Chester

Temple University	6:06a	6:59a	7:41a	8:04a	8:34a	9:23a	10:28a	11:33a	12:38p	1:43p	2:52p	3:16p	3:55p	4:23p	4:41p	4:53p	5:10p	5:14p	5:39p	6:09p	6:54p	7:54p	8:44p	9:44p	10:54p	11:54a		
Market East	6:12a	7:05a	7:47a	8:10a	8:40a	9:29a	10:34a	11:39a	12:44p	1:49p	2:58p	3:22p	4:01p	4:29p	4:47p	4:59p	5:16p	5:20p	5:45p	6:15p	7:00p	8:00p	8:50p	9:50p	11:00p	12:00p		
Suburban Station	6:17a	7:10a	7:52a	8:15a	8:45a	9:34a	10:39a	11:44a	12:49p	1:54p	3:03p	3:27p	4:06p	4:34p	4:52p	5:04p	5:21p	5:25p	5:50p	6:20p	7:05p	8:05p	8:55p	9:55p	11:05p	12:05p		
30th Street Station	6:21a	7:14a	7:56a	8:19a	8:49a	9:38a	10:43a	11:48a	12:53p	1:58p	3:07p	3:31p	4:10p	4:38p	4:56p	5:08p	5:25p	5:29p	5:54p	6:24p	7:09p	8:09p	8:59p	9:59p	11:09p	12:09p		
University City	6:24a	7:17a	7:59a	8:22a	8:52a	9:41a	10:46a	11:51a	12:56p	2:01p	3:10p	3:34p	4:13p	4:41p	4:59p	5:11p	5:28p	5:32p	5:57p	6:27p	7:12p	8:12p	9:02p	10:02p	11:12p	12:12p		
49th Street	6:28a	7:21a	8:03a	8:26a	8:56a	9:45a	10:50a	11:55a	1:00p	2:05p	3:14p	3:38p	4:17p	4:45p	EXPRESS	5:15p	EXPRESS	5:36p	6:01p	6:31p	7:16p	8:16p	9:06p	10:06p	11:16p	12:16p		
Angora	6:30a	7:23a	8:05a	8:28a	8:58a	9:47a	10:52a	11:57a	1:02p	2:07p	3:16p	3:40p	4:19p	4:47p	EXPRESS	5:17p	EXPRESS	5:38p	6:03p	6:33p	7:18p	8:18p	9:08p	10:08p	11:18p	12:18p		
Fernwood-Yeadon	6:32a	7:25a	8:07a	8:30a	9:00a	9:49a	10:54a	11:59a	1:04p	2:09p	3:18p	3:42p	4:21p	4:49p	EXPRESS	5:19p	EXPRESS	5:40p	6:05p	6:35p	7:20p	8:20p	9:10p	10:10p	11:20p	12:20p		
Lansdowne	6:34a	7:27a	8:09a	8:32a	9:02a	9:51a	10:56a	12:01p	1:06p	2:11p	3:20p	3:44p	4:23p	4:51p	EXPRESS	5:21p	EXPRESS	5:42p	6:07p	6:37p	7:22p	8:22p	9:12p	10:12p	11:22p	12:22p		
Gladstone	6:35a	7:28a	8:10a	8:33a	9:03a	9:52a	10:57a	12:02p	1:07p	2:12p	3:21p	3:45p	4:24p	4:52p	EXPRESS	5:22p	EXPRESS	5:43p	6:08p	6:38p	7:23p	8:23p	9:13p	10:13p	11:23p	12:23p		
Clifton-Alden	6:37a	7:30a	8:12a	8:35a	9:05a	9:54a	10:59a	12:04p	1:09p	2:14p	3:23p	3:47p	4:26p	4:54p	EXPRESS	5:24p	EXPRESS	5:45p	6:10p	6:40p	7:25p	8:25p	9:15p	10:15p	11:25p	12:25p		
Primos	6:39a	7:32a	8:14a	8:37a	9:07a	9:56a	11:01a	12:06p	1:11p	2:16p	3:25p	3:49p	4:28p	4:56p	EXPRESS	5:26p	EXPRESS	5:47p	6:12p	6:42p	7:27p	8:27p	9:17p	10:17p	11:27p	12:27p		
Secane	6:41a	7:34a	8:16a	8:39a	9:09a	9:58a	11:03a	12:08p	1:13p	2:18p	3:27p	3:51p	4:30p	4:58p	EXPRESS	5:10p	EXPRESS	5:28p	5:49p	6:14p	6:44p	7:29p	8:29p	9:19p	10:19p	11:29p	12:29p	
Morton	6:44a	7:37a	8:19a	8:42a	9:12a	10:01a	11:06a	12:11p	1:16p	2:21p	3:30p	3:54p	4:33p	5:01p	EXPRESS	5:13p	EXPRESS	5:31p	5:42p	5:52p	6:17p	6:47p	7:32p	8:32p	9:22p	10:22p	11:32p	12:32p
Swarthmore	6:46a	7:39a	8:21a	8:44a	9:14a	10:03a	11:08a	12:13p	1:18p	2:23p	3:32p	3:56p	4:35p	5:03p	EXPRESS	5:15p	EXPRESS	5:44p	5:44p	5:52p	6:19p	6:49p	7:34p	8:34p	9:24p	10:24p	11:34p	12:34p
Wallingford	6:49a	7:42a	8:24a	8:47a	9:17a	10:06a	11:11a	12:16p	1:21p	2:26p	3:35p	3:59p	4:38p	5:06p	EXPRESS	5:18p	EXPRESS	5:47p	5:47p	5:52p	6:22p	6:52p	7:37p	8:37p	9:27p	10:27p	11:37p	12:37p
Moylan-Rose Valley	6:51a	7:44a	8:26a	8:49a	9:19a	10:08a	11:13a	12:18p	1:23p	2:28p	3:37p	4:01p	4:40p	5:08p	EXPRESS	5:20p	EXPRESS	5:49p	5:49p	5:52p	6:24p	6:54p	7:39p	8:39p	9:29p	10:29p	11:39p	12:39p
Media	6:56a	7:49a	8:31a	8:54a	9:24a	10:13a	11:18a	12:23p	1:28p	2:33p	3:42p	4:06p	4:45p	5:13p	EXPRESS	5:25p	EXPRESS	5:54p	6:00p	6:00p	6:29p	6:59p	7:44p	8:44p	9:34p	10:34p	11:44p	12:44p
Elwyn	7:00a	7:53a	8:35a	8:58a	9:28a	10:17a	11:22a	12:27p	1:32p	2:37p	3:46p	4:10p	4:49p	5:17p	EXPRESS	5:29p	EXPRESS	5:58p	6:04p	6:04p	6:33p	7:03p	7:48p	8:48p	9:38p	10:38p	11:48p	12:48p
Wawa ar	7:05a	7:58a	8:40a	9:03a	9:33a	10:22a	11:27a	12:32p	1:37p	2:42p	3:51p	4:15p	4:54p	5:22p	EXPRESS	5:34p	EXPRESS	6:03p	6:03p	6:03p	6:38p	7:08p	7:53p	8:53p	9:43p	10:43p	11:53p	12:53p
Wawa dp		8:03a	8:45a	9:08a	9:38a					2:47p		4:20p	4:59p		EXPRESS	5:39p	EXPRESS	6:08p	6:08p	6:08p	6:43p	7:13p	7:58p	8:58p	9:48p	10:48p		
Cheyney		8:09a	8:51a	9:14a	9:44a					2:53p		4:26p	5:05p		EXPRESS	5:45p	EXPRESS	6:14p	6:14p	6:14p	6:49p	7:19p	8:04p	9:04p	10:04p			
Westtown		8:12a	8:54a	9:17a	9:47a					2:56p		4:29p	5:08p		EXPRESS	5:48p	EXPRESS	6:17p	6:17p	6:17p	6:52p	7:22p	8:07p	9:07p	10:07p			
WCU		8:16a	8:58a	9:21a	9:51a					3:00p		4:33p	5:12p		EXPRESS	5:52p	EXPRESS	6:21p	6:21p	6:21p	6:56p	7:26p	8:11p	9:11p	10:11p			
West Chester		8:18a	9:00a	9:23a	9:53a					3:02p		4:35p	5:14p		EXPRESS	5:54p	EXPRESS	6:23p	6:23p	6:23p	6:58p	7:28p	8:13p	9:13p	10:13p			

Trains to Center City

West Chester		5:42a	6:10a	6:35a	6:53a		7:15a				7:52a		8:33a	9:34a						3:26p	3:45p		4:39p	5:18p	6:10p	6:52p	7:39p		9:39p	10:39p	
WCU		5:44a	6:12a	6:37a	6:55a		7:17a				7:54a		8:35a	9:36a							3:28p	3:47p		4:41p	5:20p	6:12p	6:54p	7:41p		9:41p	10:41p
Westtown		5:48a	6:16a	6:41a	6:59a		7:21a				7:58a		8:39a	9:40a							3:32p	3:51p		4:45p	5:24p	6:16p	6:58p	7:45p		9:45p	10:45p
Cheyney		5:51a	6:19a	6:44a	7:02a		7:24a				8:01a		8:42a	9:43a							3:35p	3:54p		4:48p	5:27p	6:19p	7:01p	7:48p		9:48p	10:48p
Wawa ar		5:57a	6:25a	6:50a	7:08a		7:30a				8:07a		8:48a	9:49a							3:41p	4:00p		4:54p	5:33p	6:25p	7:07p	7:54p		9:54p	10:54p
Wawa dp	5:30a	6:02a	6:30a	6:55a	7:13a		7:35a				8:12a	8:24a	8:53a	9:54a	10:53a	11:58a	1:03p	2:11p	2:58p	3:46p	4:05p	4:30p	4:59p	5:38p	6:30p	7:12p	7:59p	8:59p	9:59p	10:59p	
Elwyn	5:35a	6:07a	6:35a	7:00a	7:18a		7:40a				8:17a	8:29a	8:58a	9:59a	10:58a	12:03p	1:08p	2:16p	3:03p	3:51p	4:10p	4:35p	5:04p	5:43p	6:35p	7:17p	8:04p	9:04p	10:04p	11:04p	
Media	5:39a	6:11a	6:39a	7:04a	7:22a	7:13a	7:44a				8:21a	8:33a	9:02a	10:03a	11:02a	12:07p	1:12p	2:20p	3:07p	3:55p	4:14p	4:39p	5:08p	5:47p	6:39p	7:21p	8:08p	9:08p	10:08p	11:08p	
Moylan-Rose Valley	5:41a	6:13a	6:41a	EXPRESS	EXPRESS	7:15a	7:46a				8:23a	8:35a	9:04a	10:05a	11:04a	12:09p	1:14p	2:22p	3:09p	3:57p	4:16p	4:41p	5:10p	5:49p	6:41p	7:23p	8:10p	9:10p	10:10p	11:10p	
Wallingford	5:43a	6:15a	6:43a	EXPRESS	EXPRESS	7:17a	7:48a				8:25a	8:37a	9:06a	10:07a	11:06a	12:11p	1:16p	2:24p	3:11p	3:59p	4:18p	4:43p	5:12p	5:51p	6:43p	7:25p	8:12p	9:12p	10:12p	11:12p	
Swarthmore	5:45a	6:17a	6:45a	EXPRESS	EXPRESS	7:19a	7:50a				8:27a	8:39a	9:08a	10:09a	11:08a	12:13p	1:18p	2:26p	3:13p	4:01p	4:20p	4:45p	5:14p	5:53p	6:45p	7:27p	8:14p	9:14p	10:14p	11:14p	
Morton	5:48a	6:20a	6:48a	7:13a	7:31a	7:22a	7:53a				8:30a	8:42a	9:11a	10:12a	11:11a	12:16p	1:21p	2:29p	3:16p	4:04p	4:23p	4:48p	5:17p	5:56p	6:48p	7:30p	8:17p	9:17p	10:17p	11:17p	
Secane	5:51a	6:23a	6:51a	7:16a	7:34a	7:25a	7:56a	7:47a	8:10a		8:33a	8:45a	9:14a	10:15a	11:14a	12:19p	1:24p	2:32p	3:19p	4:07p	4:26p	4:51p	5:20p	5:59p	6:51p	7:33p	8:20p	9:20p	10:20p	11:20p	
Primos	5:53a	6:25a	6:53a	7:18a	7:36a	EXPRESS	EXPRESS	7:49a	8:12a		EXPRESS	8:47a	9:16a	10:17a	11:16a	12:21p	1:26p	2:34p	3:21p	4:09p	4:28p	4:53p	5:22p	6:01p	6:53p	7:35p	8:22p	9:22p	10:22p	11:22p	
Clifton-Alden	5:55a	6:27a	6:55a	7:20a	7:38a	EXPRESS	EXPRESS	7:51a	8:14a		EXPRESS	8:49a	9:18a	10:19a	11:18a	12:23p	1:28p	2:36p	3:23p	4:11p	4:30p	4:55p	5:24p	6:03p	6:55p	7:37p	8:24p	9:24p	10:24p	11:24p	
Gladstone	5:56a	6:28a	6:56a	7:21a	7:39a	EXPRESS	EXPRESS	7:52a	8:15a		EXPRESS	8:50a	9:19a	10:20a	11:19a	12:24p	1:29p	2:37p	3:24p	4:12p	4:31p	4:56p	5:25p	6:04p	6:56p	7:38p	8:25p	9:25p	10:25p	11:25p	
Lansdowne	5:57a	6:29a	6:57a	7:22a	7:40a	EXPRESS	EXPRESS	7:53a	8:16a		EXPRESS	8:51a	9:20a	10:21a	11:20a	12:25p	1:30p	2:38p	3:25p	4:13p	4:32p	4:57p	5:26p	6:05p	6:57p	7:39p	8:26p	9:26p	10:26p	11:26p	
Fernwood-Yeadon	5:59a	6:31a	6:59a	7:24a	7:42a	EXPRESS	EXPRESS	7:55a	8:18a		EXPRESS	8:53a	9:22a	10:23a	11:22a	12:27p	1:32p	2:40p	3:27p	4:15p	4:34p	4:59p	5:28p	6:07p	6:59p	7:41p	8:28p	9:28p	10:28p	11:28p	
Angora	6:02a	6:34a	7:02a	7:27a	7:45a	EXPRESS	EXPRESS	7:58a	8:21a		EXPRESS	8:56a	9:25a	10:26a	11																

