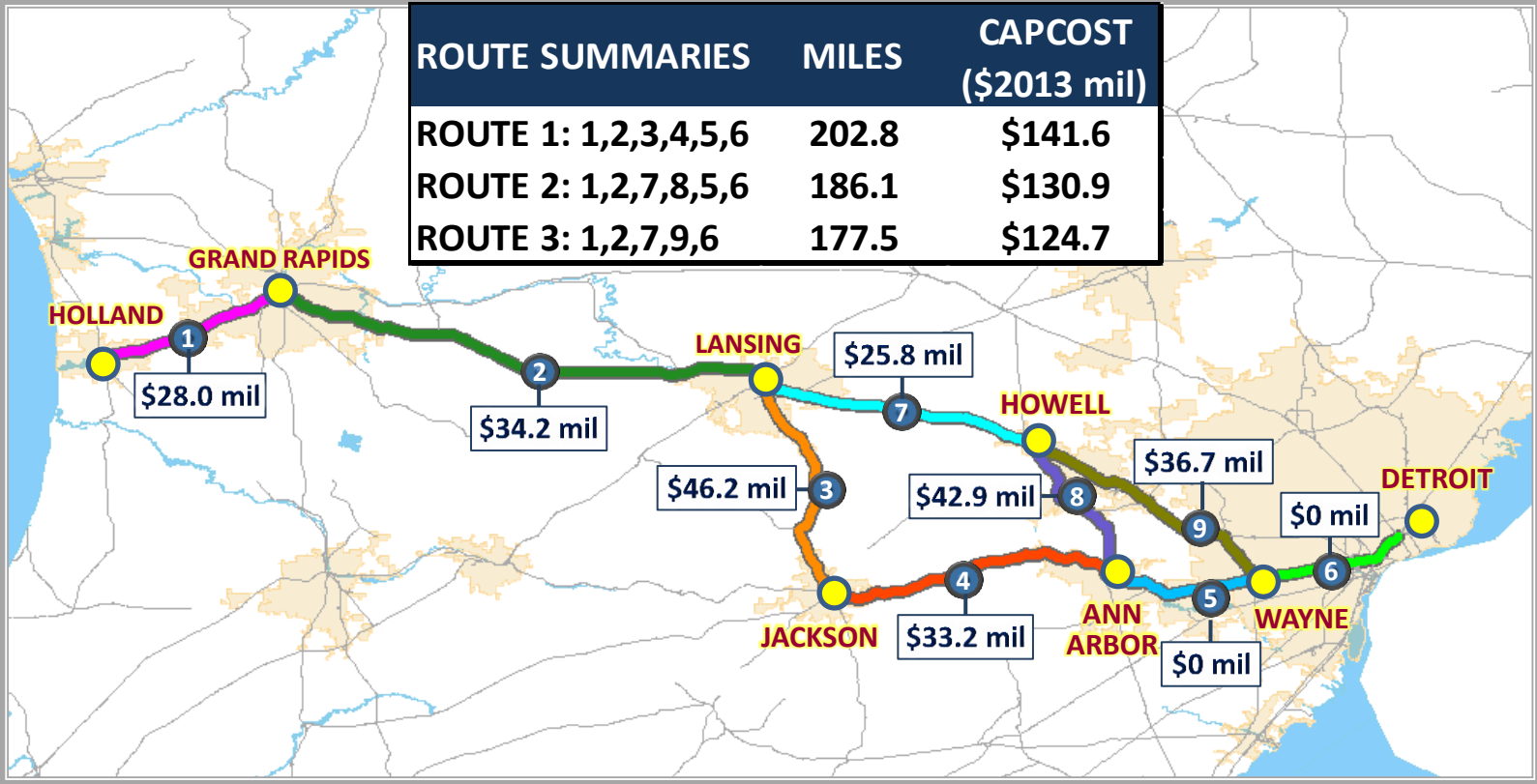
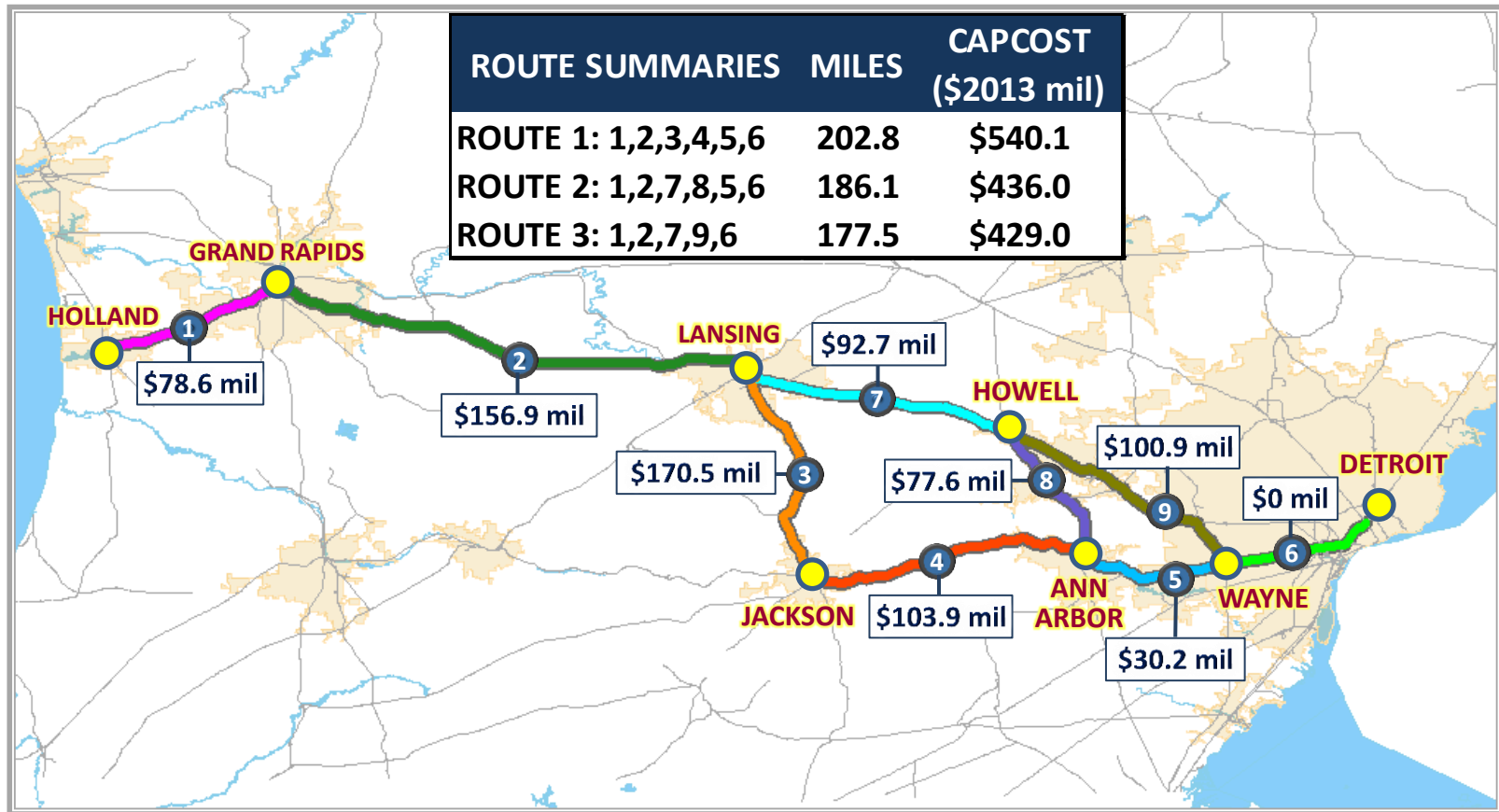


Technical Appendix C: CAPITAL COSTS

Michigan Coast to Coast Infrastructure Capital Costs: 79 mph



Michigan Coast to Coast Network Capital Costs: 110 mph



Michigan Coast to Coast Network Equipment Capital Cost

Alternative	Daily Roundtrips	2030 Peak Segment Riders	2030 Required Train Size	Rotation Sets	Protect Sets	Total Sets	Total Seats	Cost per Seat (\$2013K)	Equipment Cost (\$2013M)
Route 1 79-mph	2	307,138	290	2	1	3	869	\$62	\$53.9
Route 1 79-mph	4	516,666	244	4	2	6	1,461	\$62	\$90.6
Route 1 110-mph	4	744,234	351	4	2	6	2,105	\$72	\$151.5
Route 1 110-mph	8	1,123,984	265	6	3	9	2,384	\$72	\$171.6
Route 2 79-mph	2	311,885	294	2	1	3	882	\$62	\$54.7
Route 2 79-mph	4	511,952	241	4	2	6	1,448	\$62	\$89.8
Route 2 110-mph	4	722,913	341	4	2	6	2,044	\$72	\$147.2
Route 2 110-mph	8	1,073,488	253	6	3	9	2,277	\$72	\$163.9
Route 3 79-mph	2	281,531	265	2	1	3	796	\$62	\$49.4
Route 3 79-mph	4	458,430	216	4	2	6	1,296	\$62	\$80.4
Route 3 110-mph	4	639,575	301	4	2	6	1,809	\$72	\$130.2
Route 3 110-mph	8	927,578	219	6	3	9	1,967	\$72	\$141.7

Michigan Coast to Coast Network Capital Cost Summary

Alternative	Daily Roundtrips	Equipment Cost (\$2013M)	Infrastr Cost (\$2013M)	TOTAL Cost (\$2013M)
Route 1 79-mph	2	\$53.9	\$141.6	\$195.5
Route 1 79-mph	4	\$90.6	\$141.6	\$232.2
Route 1 110-mph	4	\$151.5	\$540.1	\$691.6
Route 1 110-mph	8	\$171.6	\$540.1	\$711.7
Route 2 79-mph	2	\$54.7	\$130.9	\$185.6
Route 2 79-mph	4	\$89.8	\$130.9	\$220.7
Route 2 110-mph	4	\$147.2	\$436.0	\$583.2
Route 2 110-mph	8	\$163.9	\$436.0	\$599.9
Route 3 79-mph	2	\$49.4	\$124.7	\$174.1
Route 3 79-mph	4	\$80.4	\$124.7	\$205.1
Route 3 110-mph	4	\$130.2	\$429.0	\$559.2
Route 3 110-mph	8	\$141.7	\$429.0	\$570.7

INFRASTRUCTURE COST ESTIMATES FOR 79 MPH AND 110 MPH OPTIONS

COAST-TO-COAST RAIL STUDY

TEMJ

Infrastructure Cost Estimate for Holland to Detroit at 79-mph maximum speed

Revised on 11/18/2015

			Segment 1 CSX Holland to Grand Rapids 24.8 miles		Segment 2 CSX Grand Rapids to Downtown Lansing 64.3 miles		Segment 3 NS/J&L Downtown Lansing to Jackson 37.6 miles		Segment 4 MDOT/NS Jackson to Ann Arbor 38.9 miles		Segment 5 MDOT/NS Ann Arbor to Wayne 19.5 miles		Segment 6 MDOT/NS/CN Wayne to Detroit New Center 17.7 miles		Segment 7 CSX Downtown Lansing to Ann Pere Jct 34.3 miles		Segment 8 GLC/AA Ann Pere Jct to Ann Arbor 25.5 miles		Segment 9 CSX Ann Pere Jct to Wayne 36.4 miles		
Item	Unit	YR 2015 Unit Cost (1000s)	Quantity	Amount	Quantity	Amount	Quantity	Amount	Quantity	Amount	Quantity	Amount	Quantity	Amount	Quantity	Amount	Quantity	Amount	Quantity	Amount	
Trackwork																					
1.1	Single Track on Existing Roadbed (141# CWR, Conc. TF)	per mile		\$ 1,246		-		-		-		-		-		-		-		-	
1.2b	HSR on New Roadbed & New Embankment	per mile		\$ 1,873	5.0	9,364	5.0	9,364		-		-		-	5.0	9,364		-	7.0	13,110	
1.3	Timber & Surface w/ 33% Tie replacement	per mile	24.8	\$ 279	6,910	64.3	17,915		-		-		-	34.3	9,557		-	36.4	10,142		
Total Track Costs					6,910	27,279	9,364	-	-	-	-	18,921	-	-	-	23,251					
Turnouts																					
4.1	#24 High Speed Turnout	each		\$ 565	2	1,129	2	1,129		-		-		-	2	1,129		-	6	3,388	
Total Turnouts Cost					-	1,129	1,129	-	-	-	1,129	-	-	3,388							
Curves																					
9.1	Elevate & Surface Curves	per mile		\$ 93		-		-		-		-		-		-		-		-	
Total Curves Cost					-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Signals																					
8.2	Install CTC System (Single Track)	per mile		\$ 230	5.0	1,148	5.0	1,148		-		-		-	5.0	1,148		-	7.0	1,607	
8.21	Install CTC System (Double Track)	per mile		\$ 377		-		-		-		-		-		-		-		-	
8.3	Install PTC System Overlay on top of CTC	per mile		\$ 181		-		-		-		-		-		-		-		-	
8.6	Control Points	each		\$ 870	2	1,740	2	1,740		-		-		-	2	1,740		-	4	3,480	
8.7	Signals for Turnout	each		\$ 502	2	1,004	2	1,004		-		-		-	2	1,004		-	6	3,012	
Total Signals Cost					-	3,892	3,892	-	-	-	3,892	-	-	8,099							
Stations / Facilities																					
2.1	Full Service - New	each		\$ 1,000		-		-	1	1,000		-		-	1	1,000		-	1	1,000	
Total Station Cost					-	-	1,000	-	-	-	1,000	-	-	1,000							
Crossings																					
7.41	Convert Flashers Only to Dual Gate	each		\$ 75	15	1,125	25	1,875		-		-		-	11	825		-	13	975	
Total Crossings Cost					1,125	1,875	-	-	-	-	825	-	-	975							
Segment Totals					8,035	34,176	15,385	0	0	0	25,767	0	36,714								
Placeholders																					
	"All In" Rate for High Speed Double Track (Dearborn to Wayne Comp)	each		\$ 3,320		-		-	10.0	33,200		-		-		-		-		-	
	"All In" Rate for 79-mph Rehab Jointed Train (WALLY Comp)	per mile		\$ 820		-		-	37.6	30,832		-		-	25.5	20,910		-		-	
	Purchase Mainline Track (at MDOT NS Rate)	per mile		\$ 1,000		-		-		-		-		-		-		-		-	
	Purchase Branchline Track (at MDOT NS Rate)	per mile		\$ 1,000		-		-		-		-		-	2	2,000		-		-	
	Turnaround Servicing Base at Holland	each	1	\$ 20,000	20,000		-			-		-		-		-		-		-	
	Bridge at Ann Arbor	each		\$ 20,000		-		-		-		-		-	1	20,000		-		-	
TOTAL					28,035	34,176	46,217	33,200	-	-	25,767	42,910	36,714								
NOTES																					
MDOT Purchased NS line \$140 million for 135 miles of track or approx 1 million per mile																					

COAST-TO-COAST RAIL STUDY

Infrastructure Cost Estimate for Holland to Detroit at 110-mph maximum speed

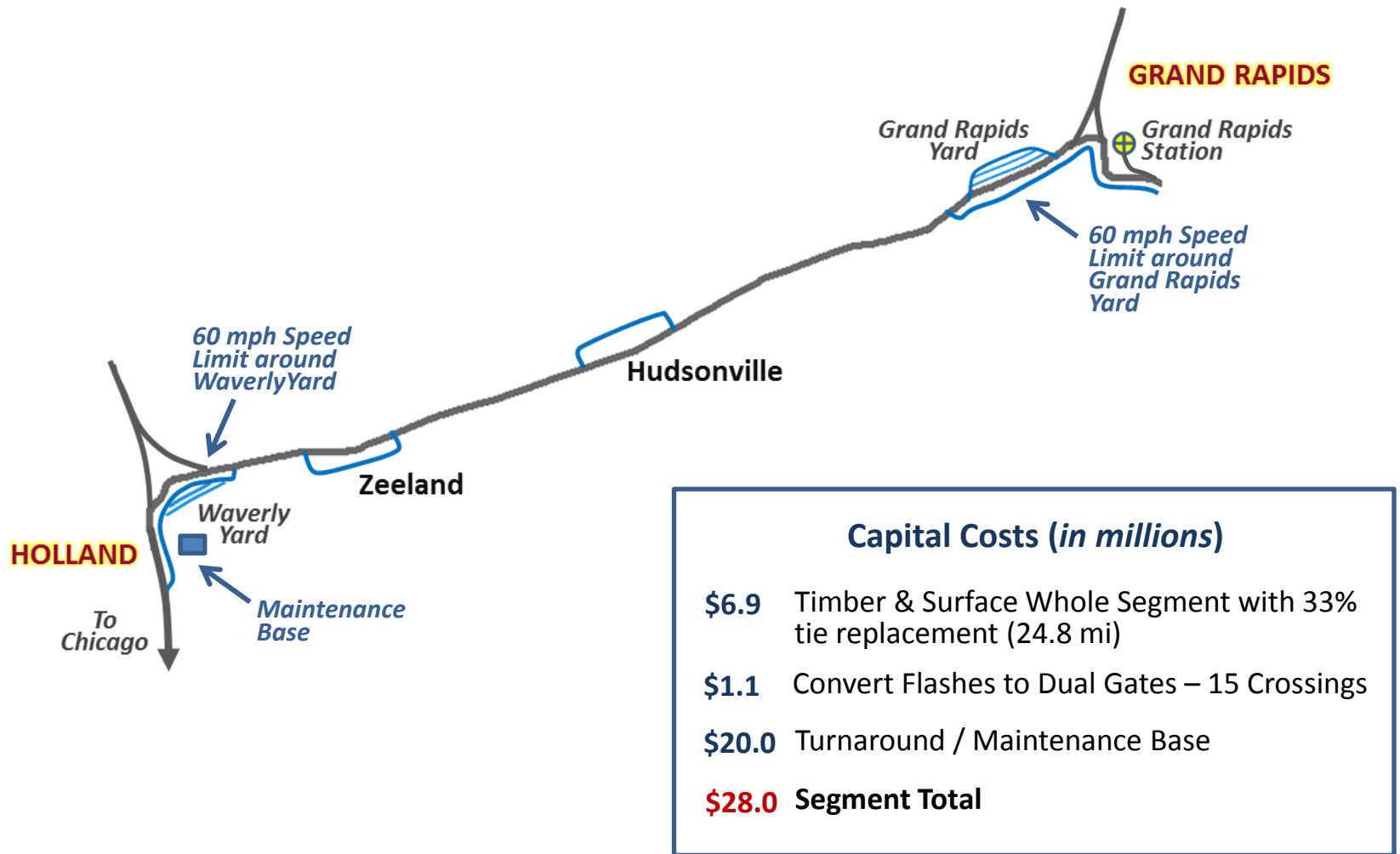
Revised on 11/18/2015

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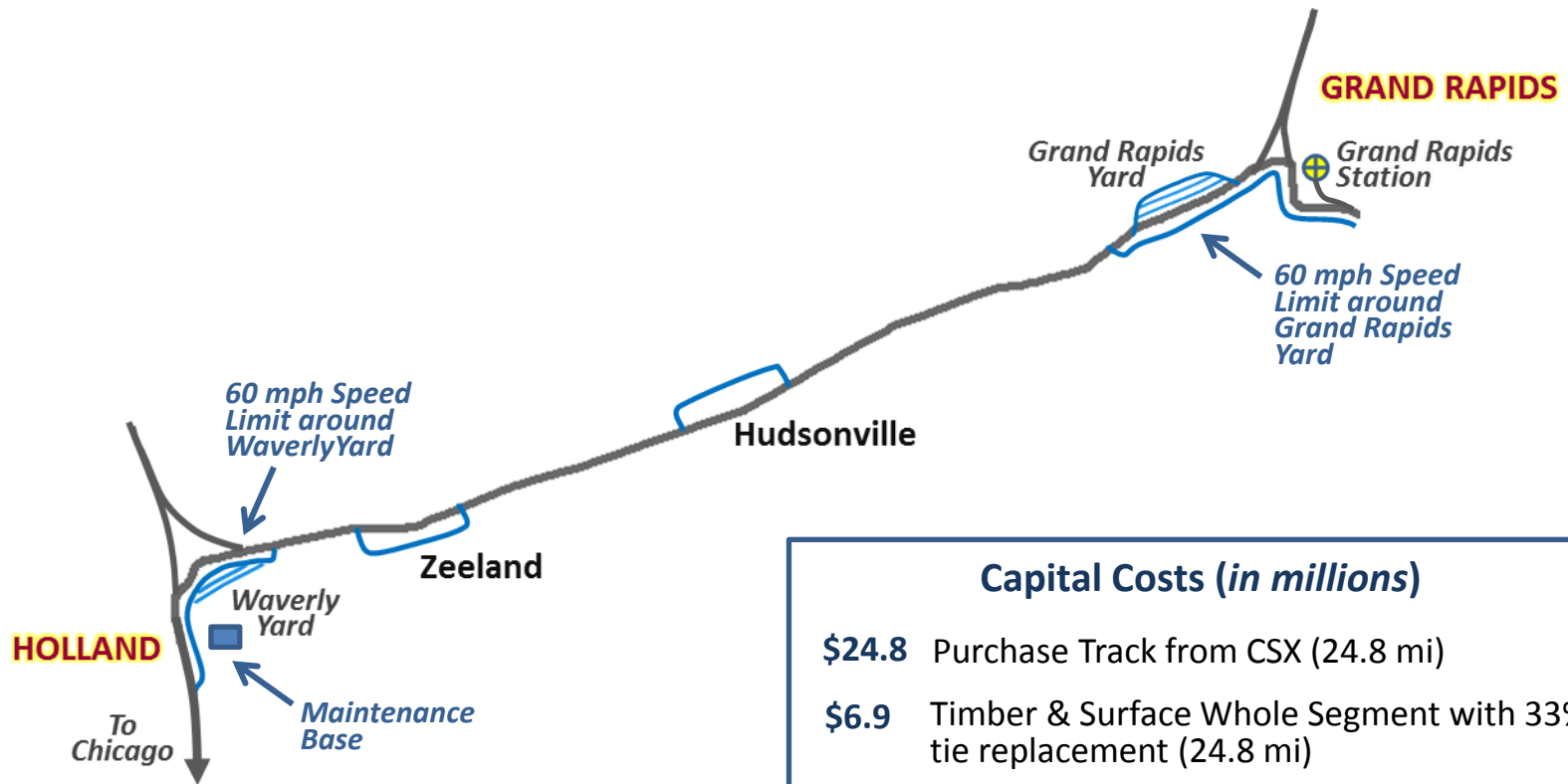
Item	Unit	YR 2015 Unit Cost (1000s)	Segment 1		Segment 2		Segment 3		Segment 4		Segment 5		Segment 6		Segment 7		Segment 8		Segment 9	
			Quantity	Amount	Quantity	Amount	Quantity	Amount	Quantity	Amount	Quantity	Amount	Quantity	Amount	Quantity	Amount	Quantity	Amount	Quantity	Amount
			CSX Holland to Grand Rapids 24.8 miles		CSX Grand Rapids to Downtown Lansing 64.3 miles		NS/J&L Downtown Lansing to Jackson 37.6 miles		MDOT/NS Jackson to Ann Arbor 38.9 miles		MDOT/NS Ann Arbor to Wayne 19.5 miles		MDOT/NS/CN Wayne to Detroit New Center 17.7 miles		CSX Downtown Lansing to Ann Pere Jct 34.3 miles		GLC/AA Ann Pere Jct to Ann Arbor 25.5 miles		CSX Ann Pere Jct to Wayne 36.4 miles	
Trackwork																				
1.1	Single Track on Existing Roadbed (141# CWR, Conc. TF)	per mile	\$ 1,246	-	-	-	37.6	46,854	-	-	-	-	-	-	-	25.5	31,776	-	-	-
1.2b	HSR on New Roadbed & New Embankment	per mile	\$ 1,873	-	10.0	18,728	10.0	18,728	-	-	-	-	-	10.0	18,728	-	-	12.0	22,473	-
1.3	Timber & Surface w/ 33% Tie replacement	per mile	\$ 279	24.8	6,910	64.3	17,915	-	-	-	-	-	-	34.3	9,557	-	-	36.4	10,142	-
Total Track Costs				6,910	36,643	65,582	-	-	-	-	-	-	28,285	31,776	32,615					
Turnouts																				
4.1	#24 High Speed Turnout	each	\$ 565	-	2	1,129	2	1,129	-	-	-	-	2	1,129	-	-	6	3,388	-	-
Total Turnouts Cost				-	1,129	1,129	-	-	-	-	-	-	1,129	-	3,388					
Curves																				
9.1	Elevate & Surface Curves	per mile	\$ 93	3.40	316	9.50	884	-	-	-	-	-	5.2	484	-	-	8.2	763	-	-
Total Curves Cost				316	884	-	-	-	-	-	-	-	484	-	763					
Signals																				
8.2	Install CTC System (Single Track)	per mile	\$ 230	-	10.0	2,296	27.6	6,338	-	-	-	-	10.0	2,296	25.5	5,855	12.0	2,755	-	-
8.21	Install CTC System (Double Track)	per mile	\$ 377	-	-	-	10.0	3,765	-	-	-	-	-	-	-	-	-	-	-	-
8.3	Install PTC System Overlay on top of CTC	per mile	\$ 181	25	4,498	64.3	11,661	37.6	6,819	-	-	-	34.3	6,221	25.5	4,625	36.4	6,602	-	-
8.6	Control Points	each	\$ 870	-	2	1,740	2	1,740	-	-	-	-	2	1,740	-	-	4	3,480	-	-
8.7	Signals for Turnout	each	\$ 502	-	2	1,004	2	1,004	-	-	-	-	2	1,004	-	-	6	3,012	-	-
Total Signals Cost				4,498	16,702	19,666	-	-	-	-	-	-	11,261	10,480	15,849					
Stations / Facilities																				
2.1	Full Service - New	each	\$ 1,000	-	-	1	1,000	-	-	-	-	-	1	1,000	-	-	1	1,000	-	-
Total Station Cost				-	-	1,000	-	-	-	-	-	-	1,000	-	1,000					
Crossings																				
7.3	Four Quadrant Gates	each	\$ 361	61	22,048	103	37,229	126	45,543	-	-	-	45	16,265	37	13,374	30	10,844	-	-
Total Crossings Cost				22,048	37,229	45,543	-	-	-	-	-	-	16,265	13,374	10,844					
Segment Totals				33,772	92,587	132,919	0	0	0	58,424	55,629	64,458								
Placeholders																				
	"All In" Rate for Double Track (Dearborn to Wayne)	each	\$ 3,320	-	-	-	-	31.3	103,916	9	30,212	-	-	-	-	-	-	-	-	-
	Purchase Mainline Track (at MDOT NS Rate)	per mile	\$ 1,000	24.8	24,800	64.3	64,300	-	-	-	-	-	34	34,300	-	-	36.4	36,400	-	-
	Purchase Branchline Track (at MDOT NS Rate)	per mile	\$ 1,000	-	-	37.6	37,600	-	-	-	-	-	-	-	2	2,000	-	-	-	-
	Turnaround Servicing Base at Holland	each	\$ 20,000	1	20,000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Bridge at Ann Arbor	each	\$ 20,000	-	-	-	-	-	-	-	-	-	-	-	1	20,000	-	-	-	-
TOTAL				78,572	156,887	170,519	103,916	30,212	-	92,724	77,629	100,858								

COSTING SEGMENT DETAIL MAPS

Holland to Grand Rapids (Segment 1): 79 mph Upgrade



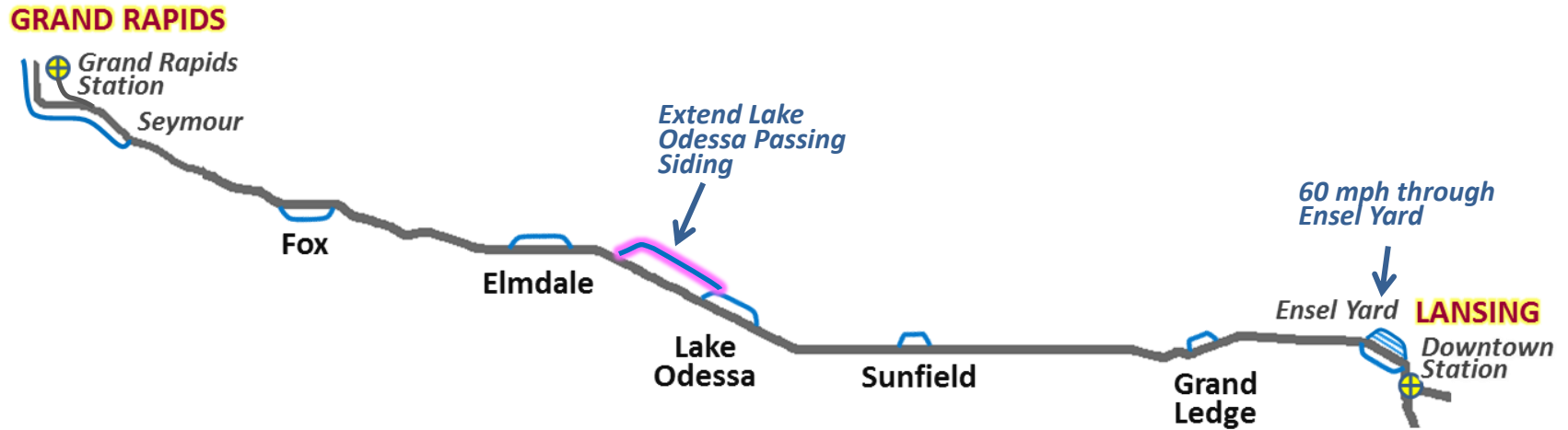
Holland to Grand Rapids (Segment 1): 110 mph Upgrade



Capital Costs (in millions)

\$24.8	Purchase Track from CSX (24.8 mi)
\$6.9	Timber & Surface Whole Segment with 33% tie replacement (24.8 mi)
\$0.3	Elevate and Surface Curves
\$4.5	PTC Overlay
\$22.1	Quad Gate - 61 Crossings
\$20.0	Turnaround / Maintenance Base
\$78.6	Segment Total

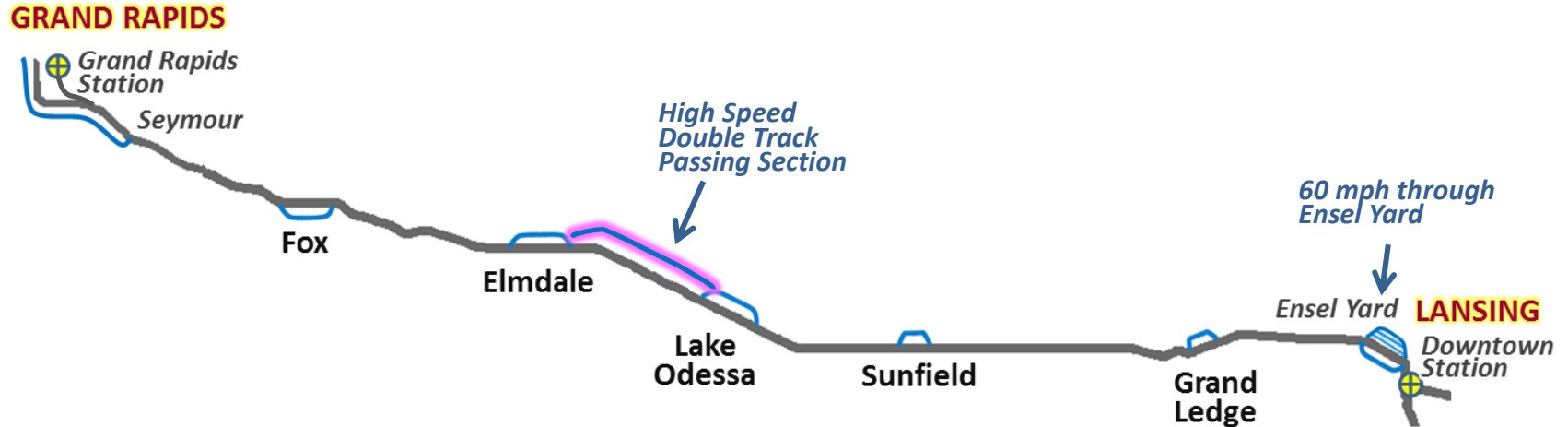
Grand Rapids to Lansing (Segment 2): 79 mph Upgrade



Capital Costs (*in millions*)

- \$17.9** Timber & Surface Whole Segment with 33% tie replacement (64.3 mi)
- \$14.4** Extended Passing Track with Signals
- \$1.9** Convert Flashers to Dual Gates
- \$34.2** Segment Total

Grand Rapids to Lansing (Segment 2): 110 mph Upgrade

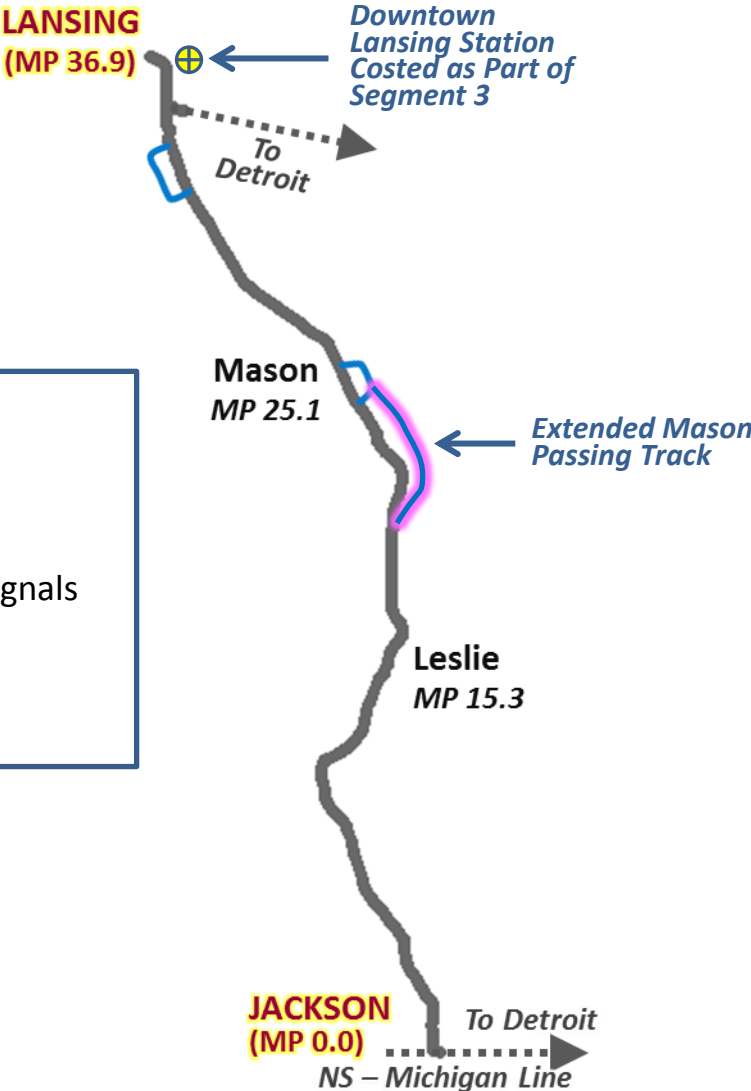


Capital Costs (in millions)

\$64.3	Purchase Track from CSX
\$17.9	Timber & Surface Whole Segment with 33% tie replacement (64.3 mi)
\$24.9	High Speed Passing Track with Signals
\$0.9	Elevate and Surface Curves
\$37.2	Quad Gates for 103 Crossings
\$11.7	PTC Overlay
\$156.9	Segment Total

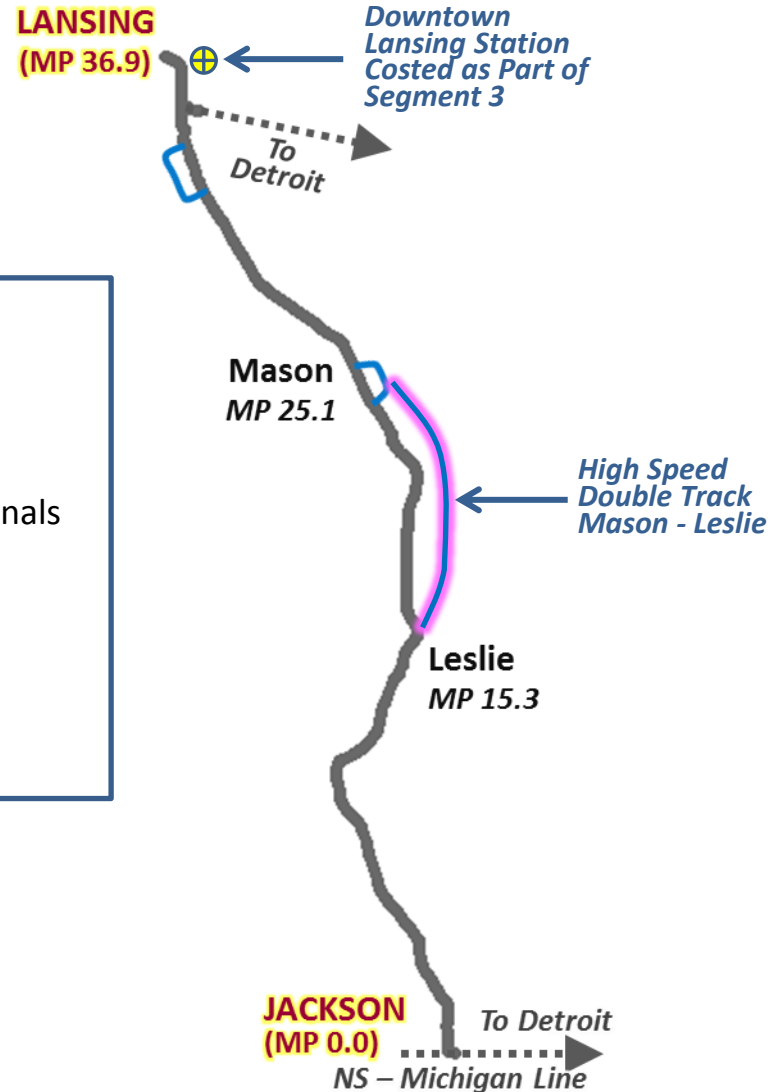
Lansing to Jackson (Segment 3): 79 mph Option

Capital Costs (in millions)	
\$30.8	Rehab and Signal for 79 mph ("WALLY" comp)
\$14.4	Extended Mason Siding with Signals
\$1.0	Stations (Platforms only)
\$46.2	Segment Total

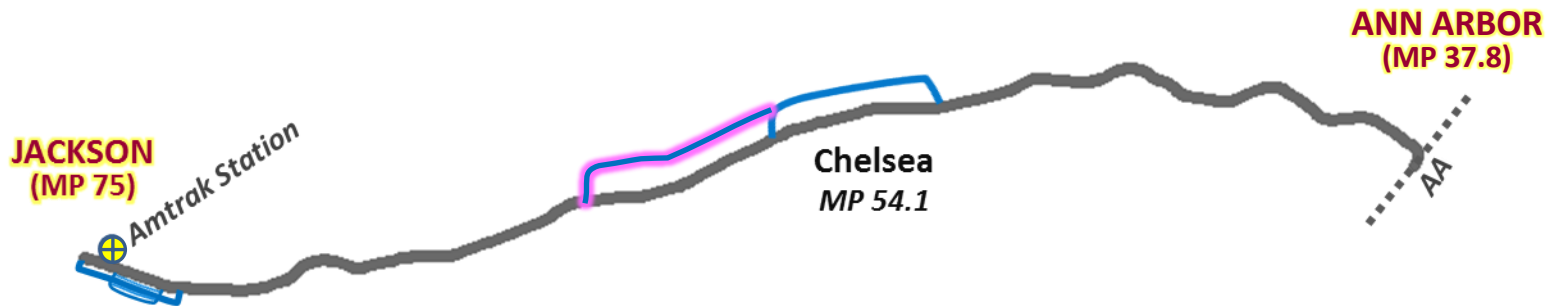


Lansing to Jackson (Segment 3): 110 mph Option

Capital Costs (in millions)	
\$37.6	Purchase Track from NS
\$46.9	Rebuild with Welded Rail
\$22.6	High Speed Passing Track with Signals
\$16.9	CTC with PTC Overlay
\$1.0	Stations (Platforms only)
\$45.5	Quad Gate - 103 Crossings
\$170.5	Segment Total



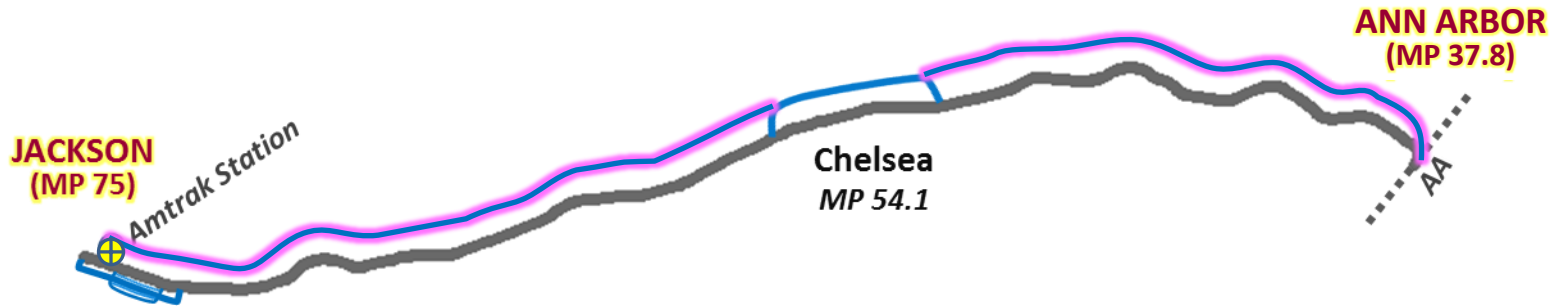
Jackson to Ann Arbor (Segment 4): 79 mph



Capital Costs (*in millions*)

\$33.2	Double Track 10.0 miles "All In Rate From Dearborn to Wayne Comp"
\$33.2	Segment Total

Jackson to Ann Arbor (Segment 4): 110 mph

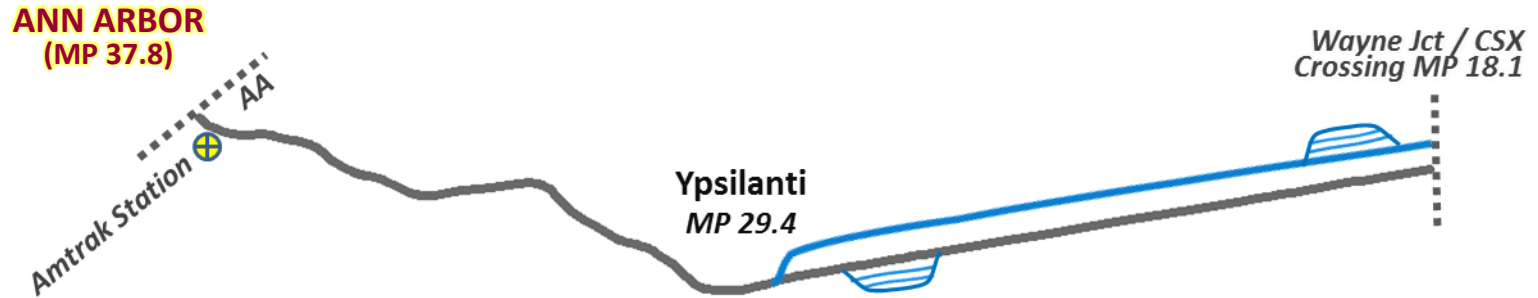


Capital Costs (*in millions*)

\$103.9 Double Track 31.3 miles
"All In Rate From Dearborn to Wayne Comp"

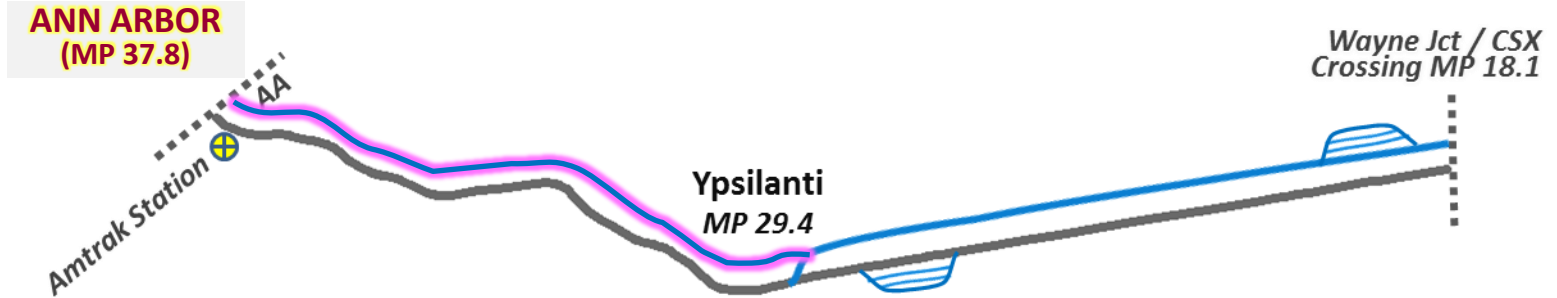
\$103.9 Segment Total

Ann Arbor to Wayne (Segment 5):79 mph



No Improvement for the 79 mph Option

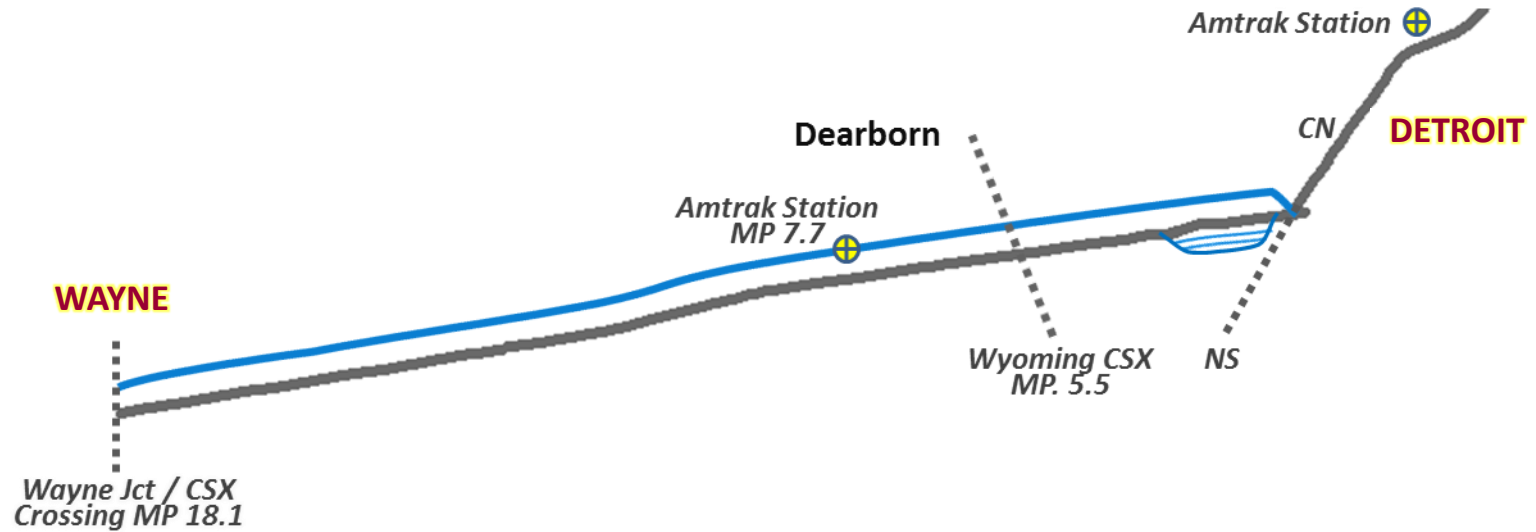
Ann Arbor to Wayne (Segment 5): 110 mph



Capital Costs (*in millions*)

\$30.2	Double Track 9.0 miles "All In Rate From Dearborn to Wayne Comp"
\$30.2	Segment Total

Wayne to Detroit (Segment 6): 79 mph

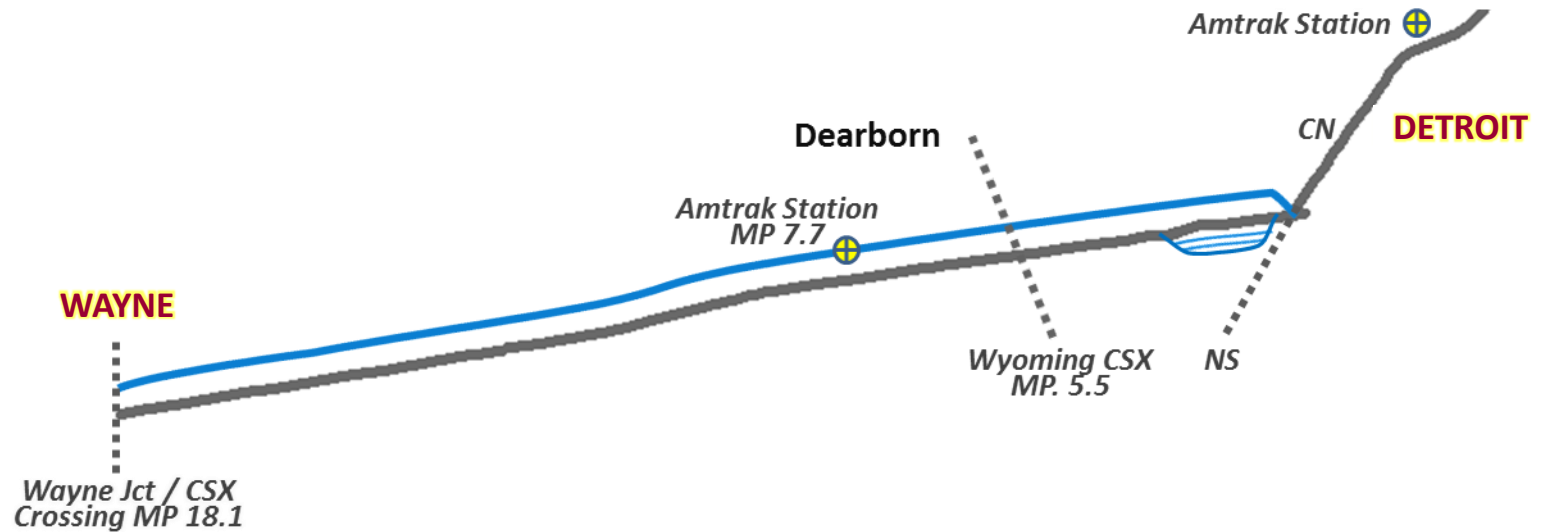


Capital Costs (*in millions*)

\$0.0 All Chicago – Detroit EIS Improvements Assumed for the 79 mph Option.

No additional improvements beyond the EIS

Wayne to Detroit (Segment 6): 110 mph

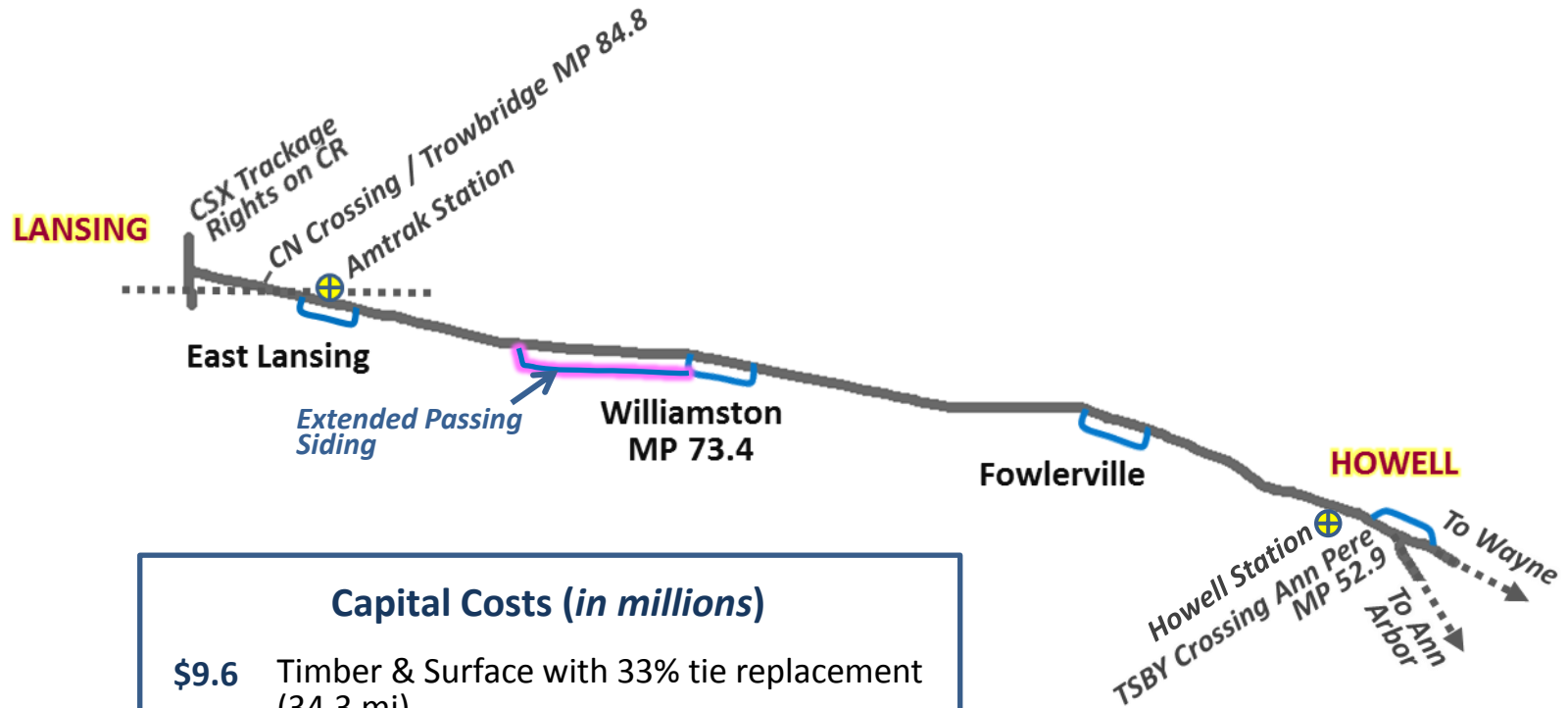


Capital Costs (*in millions*)

\$0.0 All Chicago – Detroit EIS Improvements Assumed for the 110 mph Option.

No additional improvements beyond the EIS

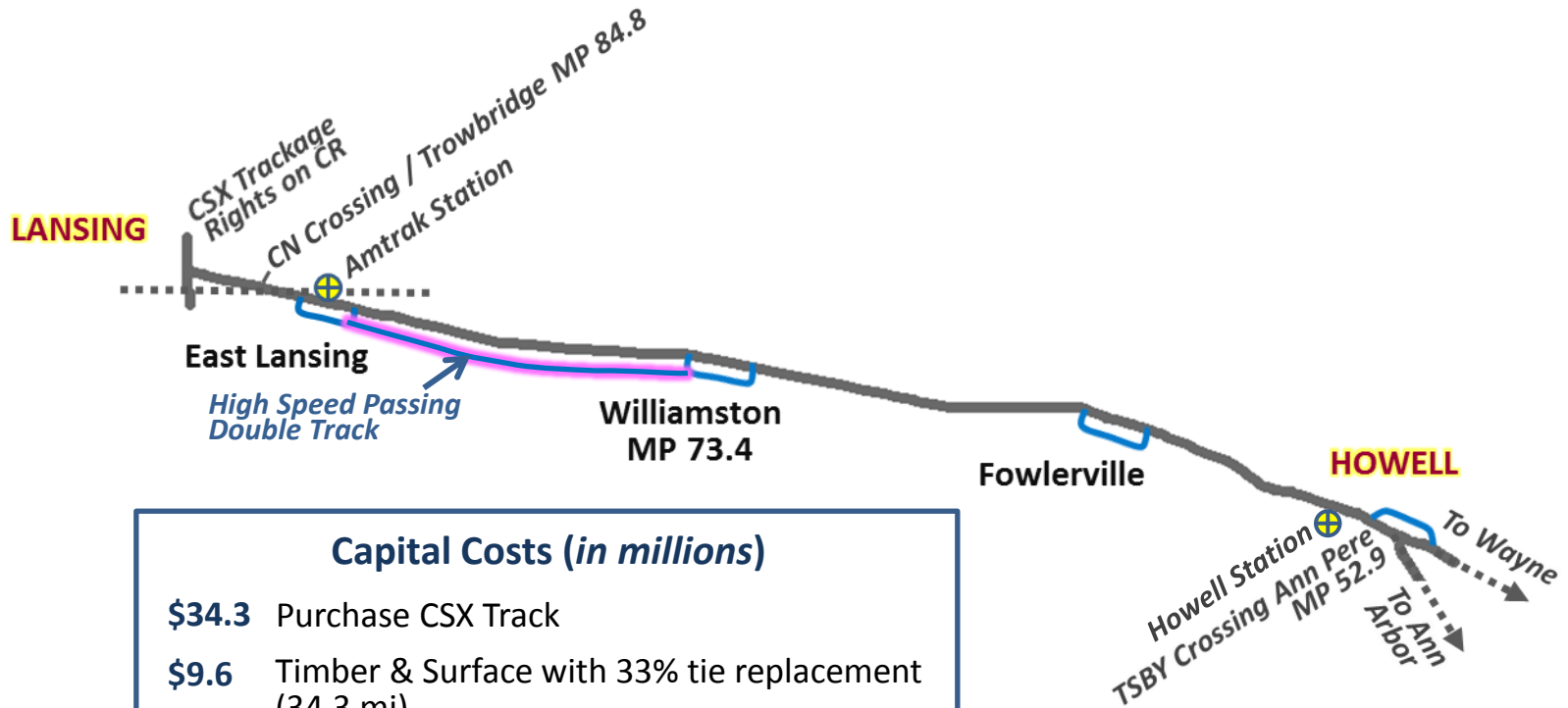
Lansing to Ann Pere Jct. (Segment 7): 79 mph Option



Capital Costs (in millions)

\$9.6	Timber & Surface with 33% tie replacement (34.3 mi)
\$14.4	Extend Passing Siding
\$1.0	Elevate and Surface Curves
\$1.0	Howell Station (Platform Only)
\$0.8	Convert Flashers to Dual Gates – 11 Crossings
\$25.8	Segment Total

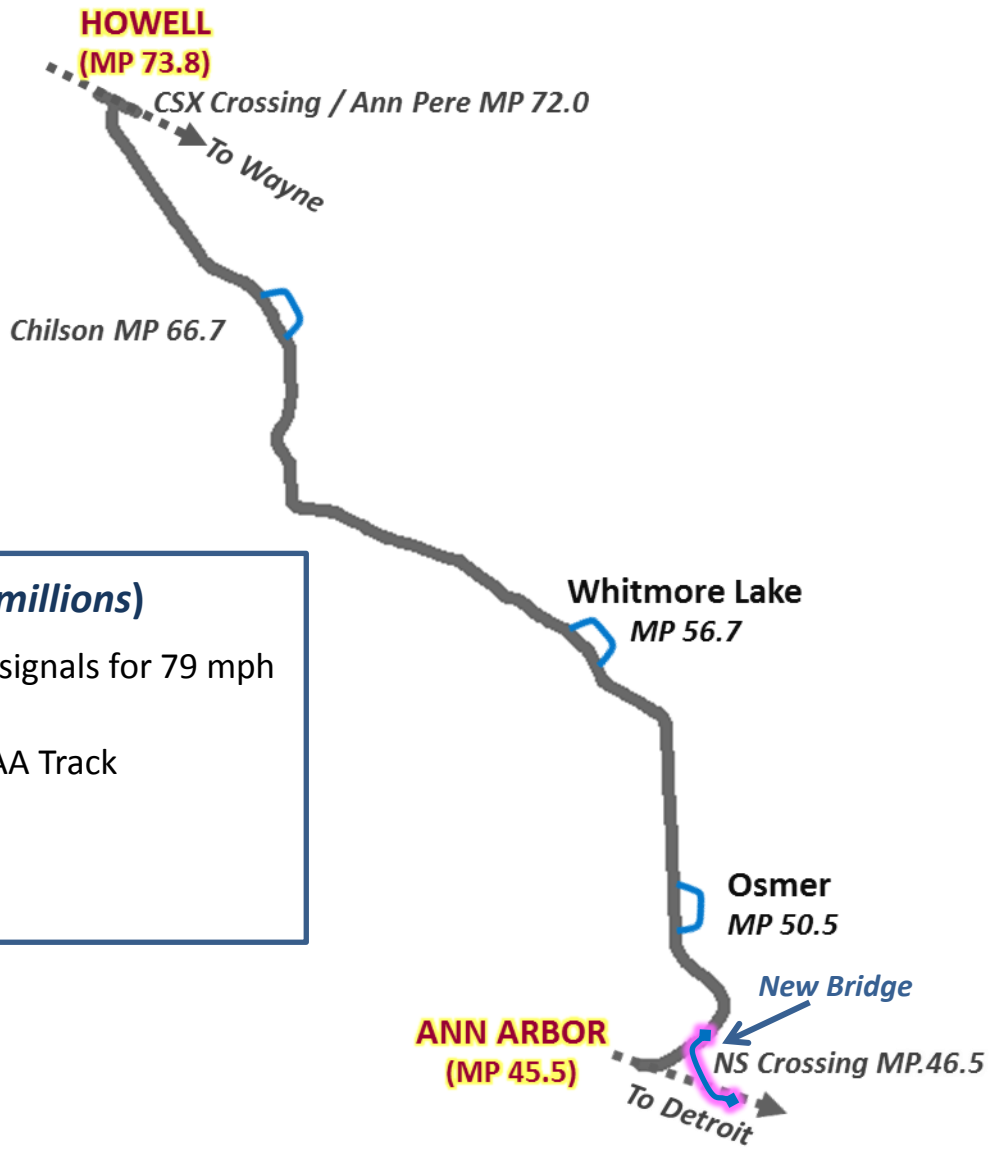
Lansing to Ann Pere Jct. (Segment 7): 110 mph Option



Capital Costs (in millions)

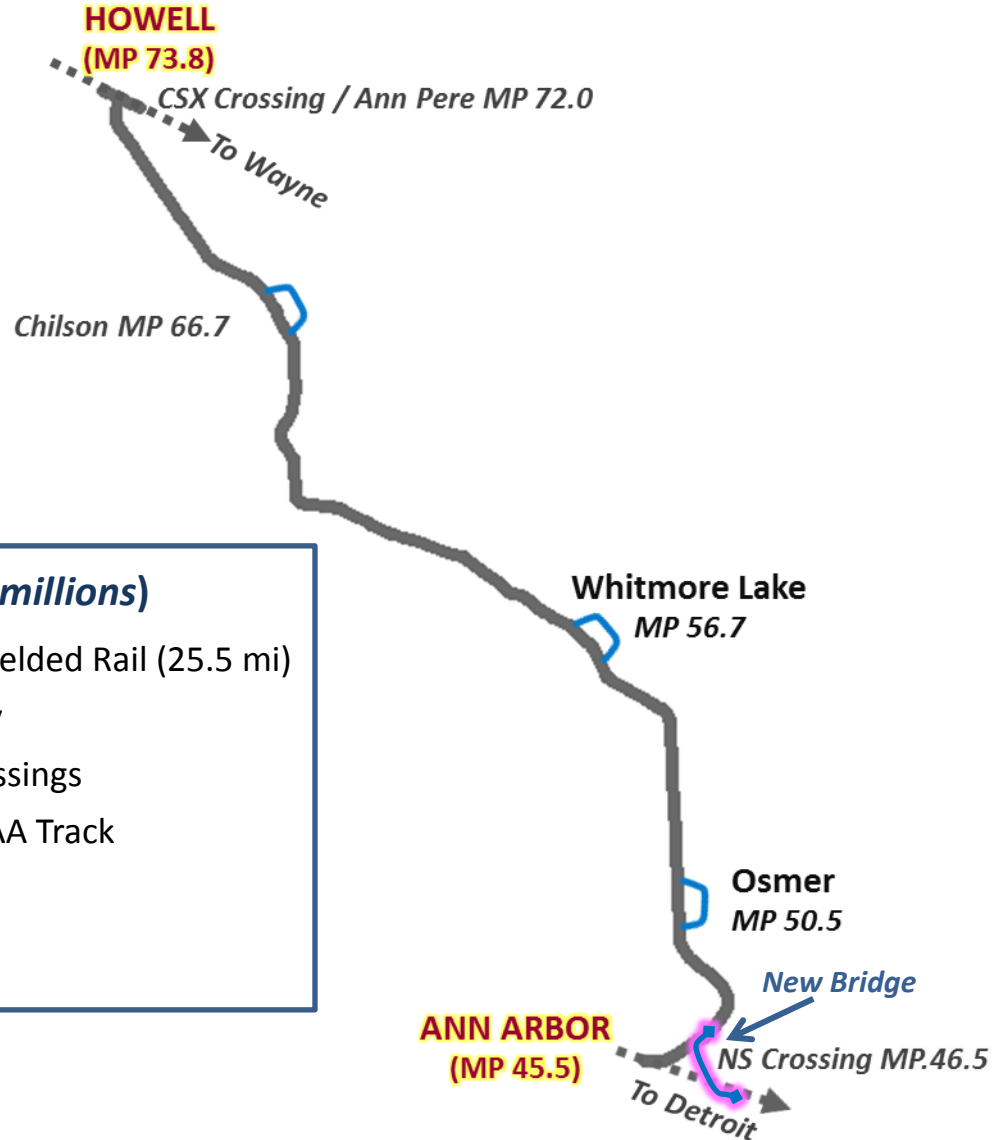
\$34.3	Purchase CSX Track
\$9.6	Timber & Surface with 33% tie replacement (34.3 mi)
\$24.9	High Speed Passing Siding with Signals
\$0.5	Elevate and Surface Curves
\$1.0	Howell Station (Platform Only)
\$16.2	Quad Gates – 45 Crossings
\$6.2	PTC Overlay
\$92.7	Segment Total

Ann Pere Jct. to Ann Arbor (Segment 8): 79 mph



Capital Costs (in millions)	
\$20.9	Rehab track and add signals for 79 mph at "Wally Rate"
\$2.0	Purchase 2 miles of AA Track
\$20.0	Bridge at Ann Arbor
\$42.9	Segment Total

Ann Pere Jct. to Ann Arbor (Segment 8): 110 mph



Capital Costs (in millions)	
\$31.8	Rebuild Track with Welded Rail (25.5 mi)
\$10.5	CTC with PTC Overlay
\$13.3	Quad Gates – 37 Crossings
\$2.0	Purchase 2 miles of AA Track
\$20.0	Bridge at Ann Arbor
\$77.6	Segment Total

Ann Pere Jct. to Wayne (Segment 9): 79 mph

HOWELL

TSBY Crossing Ann Pere MP 52.9

Brighton
MP 45.1

South Lyon
MP 36.1

Extended Siding
West of Plymouth

Salem
MP 30.9

CSX Junction
MP 25.8

Plymouth

Plymouth Station

Double Track Hix to
Newburgh Rd.

Hix Rd.

Newburgh Rd.

WAYNE

Capital Costs (in millions)

\$10.1	Timber & Surface with 33% tie replacement (36.4 mi)
\$24.6	Siding Extensions and Capacity Improvements
\$1.0	Plymouth Station (Platform Only)
\$1.0	Convert Flashers to Dual Gates
\$36.7	Segment Total

Ann Pere Jct. to Wayne (Segment 9): 110 mph

HOWELL

TSBY Crossing Ann Pere MP 52.9

Brighton
MP 45.1

South Lyon
MP 36.1

High Speed Passing
Siding West of Plymouth
(Keep passenger meets
off of CSX Mainline)

Salem
MP 30.9

CSX Junction
MP 25.8

Plymouth Station

Double Track Hix to
Newburgh Rd.

WAYNE

Capital Costs (in millions)

\$36.4	Buy CSX Track (and/or Easement south of Plymouth)
\$10.1	Timber & Surface with 33% tie replacement (36.4 mi)
\$35.1	High Speed Siding and Capacity Improvements
\$0.8	Elevate and Surface Curves
\$1.0	Plymouth Station (Platform Only)
\$10.9	Quad Gates – 30 Crossings
\$6.6	PTC Overlay
\$100.9	Segment Total