

Appendix A

Travel Forecasting Results

To	April Manlapaz, URS	Page	1
CC	Dan Meyers, URS Angie Christo, AECOM		
Subject	Nicollet-Central Transitway Alternatives Analysis (AA) Initial Ridership Forecasts (5th Revision)		
From	Pat Coleman, AECOM Andrew Walker, AECOM Srikanth Neelisetty, AECOM		
Date	July 31, 2013 (Revised October 8, 2014)		

This technical memorandum documents the initial forecast results for alternatives for the Nicollet-Central corridor. A more detailed description of the forecast results can be found in the ridership chapter of the Detailed Evaluation Report. The travel demand modeling approach for the Nicollet-Central Transit Alternatives entails a two-step approach. The first step uses a version of Metropolitan Council's (Met Council) travel demand model that has been validated for study area conditions for the concurrent Midtown Corridor Alternatives Analysis. It is then combined with a "hybrid" incremental data-driven approach to better reflect route boarding patterns in the Nicollet-Central corridor to capture some "short trips" or "micro scale" travel movements and markets that a regional model is not designed to do. The validation of these procedures is described in an April 22, 2013 technical memorandum.

Forecasts were then "built up" with model-derived forecasts with the Met Council model and the incremental survey trip table "grown" to 2030 by applying a Fratar model process using Met Council's demographic forecasts. The 2030 Midtown Corridor version of the Met Council model has been used to generate incremental transit trips (i.e. new riders) for the alternatives. Additionally, per the Federal Transit Administration's (FTA) direction, the bus to rail transfer penalties associated with the Bottineau Corridor in the model have also been applied to both the survey trip table assignments and the Met Council model runs for path consistency.

It should be noted that this ridership forecasting approach and service planning assumptions for this study differs from that employed in the Arterial Transitway Corridors Study and so forecasts may not be directly comparable. Some of the differences include:

- The ATCS uses a previous version of the Met Council model with different calibration assumptions, 2030 demographic forecasts, and 2030 background transit service assumptions.
- The ATCS assumed proposed rapid bus service on Nicollet and Central as separate corridors (with no through routing).
- In each corridor the rapid bus service for the ATCS is longer than in Nicollet-Central with the Nicollet service running from American Boulevard to 3rd Street and the Central service running from the Leamington Ramp to the Northtown Transit Center.
- The ATCS assumed different modifications to Routes 10,17,18, and 59.

Alternatives Modeled

The following alternatives were modeled:

- Project No Build
- Starter Streetcar
- Full Streetcar (via the Hennepin Avenue Bridge)
- Full Streetcar (via the Central Avenue Bridge)
- Enhanced Bus

The Project No Build alternative contains the following regional transit improvements:

- Central Corridor LRT interlined with SWLRT (Green Line)
- Bottineau LRT interlined with Hiawatha (Blue Line)
- I-35W BRT (Orange Line)
- Red/Cedar BRT
- W Broadway Arterial BRT
- Robert St Arterial BRT
- Chicago-Emerson/Fremont Arterial BRT
- Snelling Ave Arterial BRT
- East Seventh Street Arterial BRT
- West Seventh Street Arterial BRT
- American Boulevard Arterial BRT

For the Build alternatives, the service planning diagrams in Attachment 1 illustrate the service patterns and trips per hour by segment for the local bus, limited stop, and “line haul” service for each alternative. The Equilibrated Starter Streetcar plan is not shown as the only difference is the assumption of 10 minute peak and off peak headways. For the Project No Build, local bus service includes Routes 10 and 18 while the limited stop service is defined as the existing Route 59.

For purposes of facilitating the summary and presentation of ridership forecast results as well as other detailed evaluation results, the Nicollet-Central corridor has been divided into eight segments, illustrated in Figure 2.

These forecast results assume that the modern streetcar alternatives would have the same rail bias as Hiawatha and the other LRT lines under construction or consideration in the Twin Cities. Even though modern streetcar is an untested transit system concept in the Twin Cities, this rail bias was considered to be similar and has the following range of values:

- From 1 minute of equivalent in-vehicle time (IVT) for an off-peak, non-work trip with a bus transfer (i.e. it is not rail only)
- To 25 minutes of IVT for a peak work trip that is rail only.

The Enhanced Bus alternative is also an untested transit system concept in the Twin Cities. However, there is no comparable bias for it in the Met Council travel demand model. For this reason, it is coded with an IVT discount of 10 percent, or assumes that it would run 10 percent faster than scheduled in the travel demand model). This IVT discount provides for alternative-specific service attributes as defined in the Nicollet-Central Transit Alternatives Detailed Definition of Alternatives (prepared under separate cover) and includes features such as transit signal priority and BRT-like branding.

Forecast Results

Several measures are reported for each alternative forecast and can be considered as part of the overall evaluation process:

- *Boardings by Segment* include Routes 10, 18, and 59 in the No-Build and “Local Bus,” “Limited Stop,” and either “Enhanced Bus” or “Streetcar” in the Build alternatives. In some cases changes to the service plan can result in fewer boardings per segment than in No Build. An example includes the “Local Bus” boardings in the Enhanced Bus alternative.
- *Project Boardings* are defined as boardings on either the enhanced bus streetcar or modern streetcar alternative and is the same as FTA’s Project Trips measure.
- *Other Corridor Boardings* include the following routes: 17, 25, 61, and 568. This measure also includes the other local bus and limited-stop bus routes specific to the Nicollet Central corridor, defined today and in the No-Build alternatives as Routes 10, 18 and 59.
- *Total Boardings* is the sum of Project Boardings and Other Corridor Boardings for all the of the segments
- *Project Boardings of Transit-Dependents* are defined as the subset of Project Boardings attributed to zero-car households.
- *Peak Period Loads* are defined as the maximum peak period load on the “line haul” service; in this case, it is either the Enhanced Bus or Modern Streetcar service itself. The peak period defined in the model is the combination of the AM (6:45-9:30 PM) and PM (2:30-6:00pm) peaks for each direction; these loads must be further factored to get a peak hour load. This information will be used to compare forecast demand (ridership) to capacity (service levels) and assist in identifying potential high-level refinements to the service plan to balance demand and capacity. This information will also inform similar high-level refinements to the capital and operating and maintenance cost estimates of the LPA.

In addition to the above measures, there are two others that are reported as changes from Project No Build:

- *New Riders* reflect the difference in regional transit linked trips between each build alternative and the Project No build. This is a regional measure so a decrease in ridership due to a

change in service in one part of the corridor may offset an increase in ridership from the streetcar or other proposed improvements.

- *VMT Savings* are an estimate of the difference in auto Vehicle Miles of Travel (VMT) between each build alternative and the Project No Build. This measure is expressed as a savings so that a positive number corresponds with a decrease in VMT while a negative number denotes an increase in VMT.

Table 1a shows these measures forecast for an average weekday in 2030. Table 1b shows the measures for Project No Build and Starter Streetcar for an average weekday in 2010.

While project boardings are strong for each of the alternatives, ranging from 13,000 for Enhanced Bus to approximately 20,000 for Full Streetcar, the other measures are not as consistent. For example, the estimates of New Riders are modest and in some cases negative, as in the case of VMT savings.

“Test Runs” (Sensitivity Tests)

To isolate the impacts of the service planning assumptions on overall transit system performance, three “test runs were made:

- Starter Streetcar starter line with No Build Service Plan
- Full Streetcar via Hennepin Avenue with No Build Service Plan
- Enhanced Bus with No Build Service Plan

Table 2 shows the same measures forecast for an average weekday in 2030. Only the travel demand model was run for the sensitivity tests.

Following are some conclusions that can be drawn from these sensitivity tests:

- New riders and VMT savings are higher when the background bus service (in the Project No Build) is not changed. This is likely because existing riders are not “lost” when existing local (Route 10, 18) and limited stop (Route 59) service patterns are changed. This is further supported by a “winners and losers” analysis. Figures 1 and 2 show the difference in transit trip productions and attractions between the Full Streetcar and No Build alternatives. The reds show loss in riders resulting from the change in the background bus service plan. These service planning changes causing these losses are combination of changes in combined headways and stopping patterns which result, in some cases, in riders having to transfer where they formerly had a “one seat” ride in the No Build alternative. Riders that find this new option unattractive are switching to the auto mode.
- Project Boardings are lower since riders are not, in some cases, forced to transfer to the “line haul” service (i.e. the streetcar or enhanced bus).
- There is wider range in the number of Project Boarding between “regular” and “test” runs for Enhanced Bus than the Streetcar alternatives because, in most cases, the rail bias is more than the enhanced bus bias (or IVT discount).

- The Starter Streetcar starter line alternative has the narrowest range between the “regular” and test” runs. Thus, it also probably has the most balanced service plan of the three Build alternatives.

Further equilibration and refinement to the alternative service plan could lead to an optimal combination of project boardings, VMT savings, and new riders.

Please feel free to call or email with questions or comments.

Table 1a: Year 2030 Average Weekday Ridership Forecasting Summary

Route Segments	No Build				Starter Streetcar				Full Streetcar - Hennepin				Full Streetcar - Central				Enhanced Bus (IVT Discount)				Equilibrated Starter Streetcar																															
	2030 TDM		2030 Survey Trip Table Assignment (1)		2030 TDM Streetcar		2030 Survey Trip Table Assignment (2)		2030 TDM Streetcar		2030 Survey Trip Table Assignment (2)		2030 TDM Streetcar		2030 Survey Trip Table Assignment (2)		2030 TDM Enhanced Bus		2030 Survey Trip Table Assignment (2)		2030 TDM Streetcar		2030 Survey Trip Table Assignment (2)																													
	Local Bus	Limited Stop	Street car	Total	Local Bus	Limited Stop	Street car	Total	Local Bus	Limited Stop	Street car	Total	Local Bus	Limited Stop	Street car	Total	Local Bus	Limited Stop	Enhanced Bus	Total	Local Bus	Limited Stop	Enhanced Bus	Total	Local Bus	Limited Stop	Street car	Total																								
Northtown - Central/53rd	3,786	296	-	4,082	3,478	306	-	3,784	3,847	321	-	4,168	3,856	396	-	4,252	119	3,064	-	3,182	137	4,068	-	4,205	114	3,032	-	3,146	133	4,018	-	4,151	115	2,617	-	2,731	129	3,471	-	3,600	3,823	307	-	4,130	3,808	372	-	4,180				
Central/53rd - 41st	1,749	341	-	2,089	1,596	157	-	1,753	1,748	342	-	2,090	1,449	152	-	1,601	54	1,880	-	1,934	86	2,033	-	2,119	49	1,788	-	1,837	82	1,915	-	1,997	58	895	1,055	2,007	107	697	927	1,730	1,747	341	-	2,088	1,436	148	-	1,584				
41st - Lowry	808	130	-	938	793	81	-	874	824	131	-	955	778	81	-	859	-	110	2,962	3,071	-	173	2,919	3,092	-	109	2,689	2,798	-	173	2,660	2,833	-	213	857	1,070	-	135	970	1,105	821	130	-	951	769	80	-	848				
Lowry - Broadway	1,078	170	-	1,248	1,699	147	-	1,845	1,090	171	-	1,261	1,653	150	-	1,803	9	1,256	1,264	-	90	1,311	1,400	-	8	1,227	1,235	-	89	1,282	1,371	-	21	1,150	1,170	-	22	1,686	1,708	1,086	170	-	1,256	1,643	149	-	1,792					
Broadway - 7th St NE	481	90	-	571	403	22	-	425	852	163	-	1,014	830	130	-	960	-	0	623	623	-	0	712	712	-	0	540	540	-	0	631	631	-	0	450	450	-	0	453	453	724	133	-	857	680	87	-	767				
7th St NE - 3rd St/Washington	2,104	419	-	2,522	1,690	260	-	1,950	1,887	373	1,821	4,081	1,611	234	1,965	3,810	-	34	1,436	1,470	-	38	1,364	1,402	-	26	1,277	1,302	-	38	1,302	1,340	-	29	450	479	-	9	594	602	1,928	389	1,345	3,661	1,631	231	1,477	3,339				
3rd St/Washington - Grant	14,362	925	-	15,287	18,528	717	-	19,245	8,608	1,146	4,002	13,755	9,587	1,078	4,321	14,986	-	1,824	7,683	9,506	-	3,560	8,059	11,619	-	1,942	7,555	9,497	-	3,609	7,756	11,365	-	2,489	4,173	6,661	-	3,975	4,889	8,864	8,735	1,193	3,042	12,970	9,678	1,093	3,267	14,038				
Grant - Lake	2,073	-	-	2,073	3,488	-	-	3,488	-	10	2,901	2,911	-	13	2,928	2,941	-	2	2,452	2,454	-	0	2,522	2,522	-	2	2,442	2,443	-	0	2,511	2,511	-	57	1,674	1,730	-	31	1,867	1,898	-	11	2,451	2,462	-	13	2,480	2,493				
Lake - 38th	1,712	-	-	1,712	1,283	-	-	1,283	1,052	652	-	1,703	1,203	282	-	1,485	7	9	1,240	1,255	-	92	0	1,240	1,332	-	7	9	1,240	1,255	-	92	0	1,241	1,333	-	59	113	454	625	-	1,007	622	-	1,629	1,154	255	-	1,409			
38th - 46th	800	-	-	800	567	-	-	567	139	40	-	179	131	26	-	157	1	0	2,223	2,224	-	0	0	2,015	2,015	-	1	0	2,213	2,214	-	0	2,005	2,005	-	0	57	1,152	1,208	-	95	741	836	-	140	41	-	180	130	25	-	155
46th - 66th	1,524	-	-	1,524	1,027	-	-	1,027	922	737	-	1,658	608	602	-	1,209	853	394	-	1,247	868	332	-	1,200	851	394	-	1,245	867	332	-	1,199	-	-	-	634	1,141	1,775	-	456	809	1,265	908	733	-	1,641	585	586	-	1,171		
66th - American	524	-	-	524	451	-	-	451	398	272	-	398	272	-	272	181	-	-	181	81	-	-	181	81	-	-	181	81	-	-	181	81	-	-	123	-	-	48	395	-	-	395	267	-	-	267						
American - James/106th	660	-	-	660	648	-	-	648	1,206	-	-	1,206	1,163	-	-	1,163	706	-	-	706	723	-	-	723	706	-	-	706	724	-	-	724	-	-	733	-	-	756	-	-	1,203	-	-	1,203	1,158	-	-	1,158				
Total	31,659	2,370	0	34,028	35,649	1,690	0	37,339	22,569	4,084	8,724	35,376	23,139	3,142	9,213	35,494	1,919	7,323	19,873	29,115	1,986	10,293	20,139	32,418	1,908	7,307	19,181	28,396	1,978	10,173	19,388	31,538	178	8,075	12,546	20,798	295	9,806	13,388	23,488	22,515	4,068	6,837	33,420	22,938	3,037	7,223	33,198				
Other Corridor Routes Boardings	23,982		28,896		24,404		33,420		21,774		33,081		21,943		33,143		23,295		29,391		24,700		33,491																													
Regional Linked Transit Trips*	352,174		378,294		353,389		379,510		353,071		379,191		352,900		379,021		350,502		376,622		353,065		379,185																													
New Riders	1,216		1,216		1,216		1,216		897		897		727		727		-1,672		-1,672		891		891																													
Corridor Linked Transit Trips	199,225		230,745		200,414		231,934		200,101		231,621		199,938		231,458		197,581		229,101		200,101		231,621																													
Corridor Boards	58,010		66,235		59,780		68,914		50,889		65,499		50,339		64,681		44,093		52,879		58,120		66,689																													
VMR Reduction/Savings	-		-		3,016		-2,902		-2,902		-3,748		-2,902		-3,748		-9,727		-9,727		2,293		2,293																													
Project Boardings	-		-		8,724		9,213		19,873		20,139		19,181		19,388		12,546		13,388		6,837		7,223																													
Project Boardings Transit Dependents	-		-		3,930		4,151		7,436		7,536		7,285		7,363		4,544		4,849		3,033		3,204																													
Build Peak Period Load NB (towards CBD)	-		-		1,342		1,340		2,401		2,373		2,389		2,362		908		1,335		885		950																													
Build Peak Period Load SB (towards CBD)	-		-		1,105		1,086		3,613		3,454		3,159		3,012		1,200		1,177		687		685																													

* Linked trips for Build survey runs is calculated using model new riders
 (1) 2010 Survey Trip Table fratedared to 2030 using Metcouncil's Demographics + delta due to transit service changes (2030 Model - 2030 Model with 2010 networks)
 (2) (1) + delta due to alternative improvements (2030 TDM Build - 2030 TDM)
 (3) 2010 Survey Trip Table + delta due to transit service changes (2030 Model with 2010 Trip Tables - 2010 Model)
 (4) (3) + delta due to alternative improvements (2010 TDM Streetcar - 2010 TDM No Build)
 Local Bus = Route 10, Route 18, Shuttle
 Local Limited = Route 59, Limited Stop
 Streetcar = Streetcar
 Routes included in Corridor Boards = Routes 10, 11, 17, 18, 25, 59, 568, and Build Shuttles, Limited Stop Buses, Streetcar, and Enhanced Bus
 Other Corridor Routes = Route 11, Route 17, Route 25, and Route 568

Table 1b: Year 2010 Average Weekday Ridership Forecasting Summary

Route Segments	2010 No Build								2010 Starter Streetcar							
	2010 TDM No Build				2010 Survey Trip Table Assignment (3)				2010 TDM Streetcar				2010 Survey Trip Table Assignment (4)			
	Local Bus	Limited Stop	Street car	Total	Local Bus	Limited Stop	Street car	Total	Local Bus	Limited Stop	Street car	Total	Local Bus	Limited Stop	Street car	Total
Northtown - Central/53rd	2,842	302	-	3,143	3,093	315	-	3,408	2,889	320	-	3,209	3,214	350	-	3,564
Central/53rd - 41st	1,175	247	-	1,421	1,215	140	-	1,354	1,184	250	-	1,434	1,251	146	-	1,397
41st - Lowry	631	109	-	740	721	77	-	798	645	109	-	753	708	78	-	786
Lowry - Broadway	770	126	-	896	1,272	125	-	1,397	783	126	-	909	1,341	127	-	1,468
Broadway - 7th St NE	338	58	-	396	368	19	-	386	639	130	-	769	718	116	-	834
7th St NE - 3rd St/Washington	1,505	310	-	1,814	1,446	211	-	1,657	1,349	277	1,410	3,036	1,376	200	1,566	3,142
3rd St/Washington - Grant	11,108	755	-	11,862	16,867	705	-	17,572	6,409	900	3,495	10,803	8,650	986	3,861	13,496
Grant - Lake	1,875	-	-	1,875	3,183	-	-	3,183	-	8	2,796	2,804	-	19	2,852	2,870
Lake - 38th	1,526	-	-	1,526	1,270	-	-	1,270	789	493	-	1,282	1,023	247	-	1,269
38th - 46th	692	-	-	692	607	-	-	607	134	38	-	172	134	29	-	163
46th - 66th	1,143	-	-	1,143	913	-	-	913	684	530	-	1,214	567	512	-	1,079
66th - American	374	-	-	374	314	-	-	314	288	-	-	288	223	-	-	223
American -James/106th	512	-	-	512	520	-	-	520	937	-	-	937	927	-	-	927
Total	24,487	1,904	0	26,391	31,788	1,590	0	33,378	16,727	3,179	7,700	27,606	20,128	2,807	8,279	31,214

Other Corridor Routes Boardings	18,795	25,963	19,017	29,209
Regional Linked Transit Trips*	266,284	309,249	267,478	310,442
New Riders	-	-	1,193	1,193
Corridor Linked Transit Trips	148,253	188,675	149,421	189,843
Corridor Boards	45,186	59,341	46,623	60,423
VMT Reduction/Savings	-	-	3,121	3,121
Project Boardings	-	-	7,700	8,279
Project Boardings Transit Dependents	-	-	2,714	2,918
Build Peak Period Load NB (towards CBD)	-	-	1,332	1,379
Build Peak Period Load SB (towards CBD)	-	-	825	820

* Linked trips for Build survey runs is calculated using model new riders

(1) 2010 Survey Trip Table fratedared to 2030 using Metcouncil's Demographics + delta due to transit service changes (2030 Model - 2030 Model with 2010 networks)

(2) (1) + delta due to alternative improvements (2030 TDM Build - 2030 TDM)

(3) 2010 Survey Trip Table + delta due to transit service changes (2030 Model with 2010 Trip Tables - 2010 Model)

(4) (3) + delta due to alternative improvements (2010 TDM Streetcar - 2010 TDM No Build)

Local Bus = Route 10, Route 18, Shuttle

Local Limited = Route 59, Limited Stop

Streetcar = Streetcar

Routes included in Corridor Boards = Routes 10, 11, 17, 18, 25, 59, 568, and Build Shuttles, Limited Stop Buses, Streetcar, and Enhanced Bus

Other Corridor Routes = Route 11, Route 17, Route 25, and Route 568

Table 2: Year 2030 Corridor Ridership Sensitivity Test Summary for the Test Runs
For Comparison Purposes Only

Route Segments	No Build								TEST RUN: No Build Bus Plan + Starter Streetcar				TEST RUN: No Build Bus Plan + FULL Streetcar				TEST RUN: No Build Bus Plan + Enhanced Bus			
	2030 TDM				2030 Survey Trip Table Assignment (1)				2030 TDM Streetcar				2030 TDM Streetcar				2030 TDM Enhanced Bus			
	Local Bus	Limited Stop	Street car	Total	Local Bus	Limited Stop	Street car	Total	Local Bus	Limited Stop	Street car	Total	Local Bus	Limited Stop	Street car	Total	Local Bus	Limited Stop	Enhanced Bus	Total
Northtown - Central/53rd	3,786	296	-	4,082	3,478	306	-	3,784	3,848	321	-	4,169	3,923	339	-	4,262	3,683	295	-	3,978
Central/53rd - 41st	1,749	341	-	2,089	1,596	157	-	1,753	1,749	342	-	2,090	2,297	466	-	2,763	962	116	1,129	2,206
41st - Lowry	808	130	-	938	793	81	-	874	823	130	-	953	415	44	2,640	3,098	746	103	137	986
Lowry - Broadway	1,078	170	-	1,248	1,699	147	-	1,845	1,090	171	-	1,261	585	82	724	1,390	1,046	165	37	1,247
Broadway - 7th St NE	481	90	-	571	403	22	-	425	873	164	-	1,037	266	49	437	752	458	88	30	576
7th St NE - 3rd St/Washington	2,104	419	-	2,522	1,690	260	-	1,950	1,911	376	1,842	4,128	1,626	278	1,079	2,982	1,997	371	193	2,561
3rd St/Washington - Grant	14,362	925	-	15,287	18,528	717	-	19,245	13,276	830	3,245	17,351	11,767	676	5,752	18,195	13,438	752	1,464	15,654
Grant - Lake	2,073	-	-	2,073	3,488	-	-	3,488	1,615	-	1,546	3,161	1,465	-	1,691	3,156	1,923	-	463	2,386
Lake - 38th	1,712	-	-	1,712	1,283	-	-	1,283	1,648	-	-	1,648	1,105	-	1,045	2,150	1,292	-	192	1,484
38th - 46th	800	-	-	800	567	-	-	567	805	-	-	805	270	-	1,772	2,042	612	-	632	1,244
46th - 66th	1,524	-	-	1,524	1,027	-	-	1,027	1,542	-	-	1,542	1,811	-	-	1,811	1,185	-	357	1,542
66th - American	524	-	-	524	451	-	-	451	533	-	-	533	549	-	-	549	511	-	-	511
American - James/106th	660	-	-	660	648	-	-	648	662	-	-	662	667	-	-	667	659	-	-	659
Total	31,659	2,370	0	34,028	35,649	1,690	0	37,339	30,373	2,333	6,633	39,338	26,744	1,933	15,138	43,814	28,509	1,889	4,633	35,030
Other Corridor Routes Boardings	23,982				28,896				23,328				22,552				24,068			
Regional Linked Transit Trips*	352,174				378,294				353,313				354,765				352,267			
New Riders	-				-				1,139				2,592				93			
Corridor Linked Transit Trips	199,225				230,745				200,337				201,770				199,318			
Corridor Boards	58,010				66,235				62,666				66,366				59,098			
VMT Reduction/Savings	-				-				3,700				8,535				393			
Project Boardings	-				-				6,633				15,138				4,633			
Project Boardings Transit Dependents	-				-				2,915				5,501				1,572			
Build Peak Period Load NB (towards CBD)	-				-				669				1,769				426			
Build Peak Period Load SB (towards CBD)	-				-				1,117				3,122				618			

Figure 1: Year 2030 Average Weekday Change in Transit Trip Productions

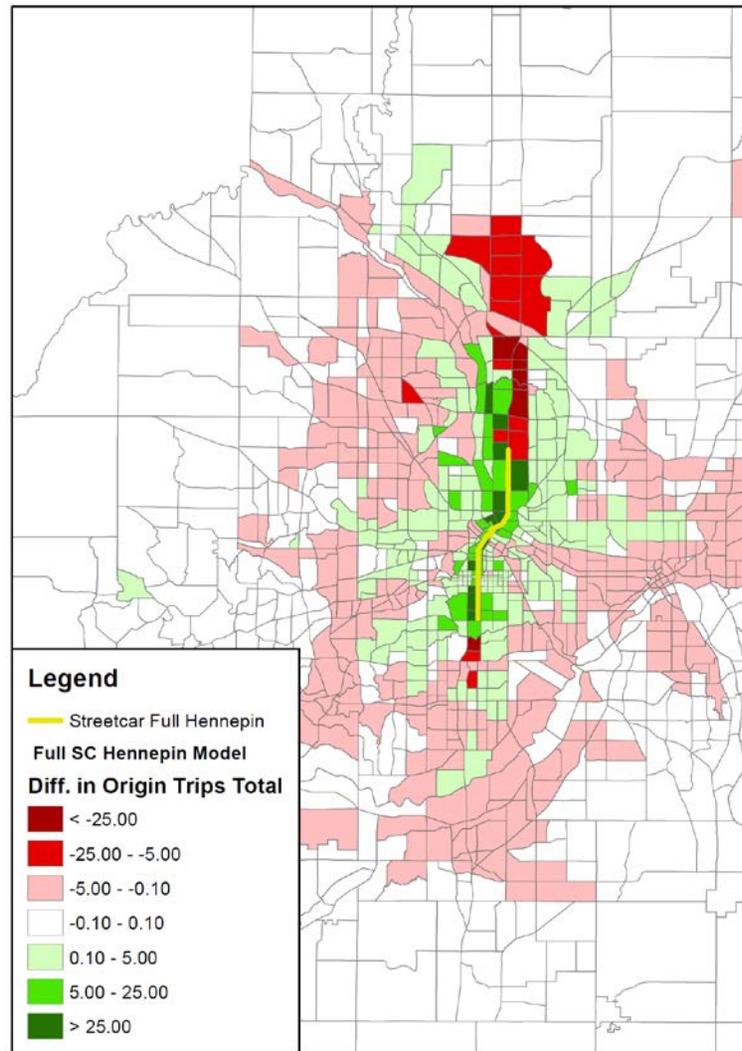
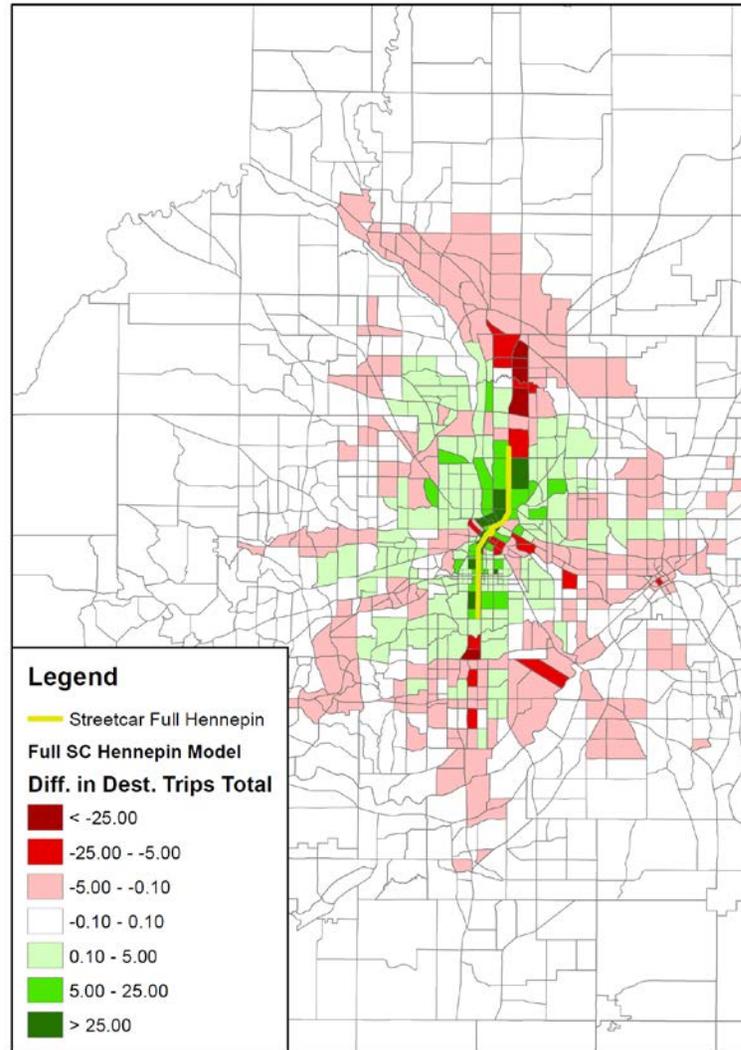
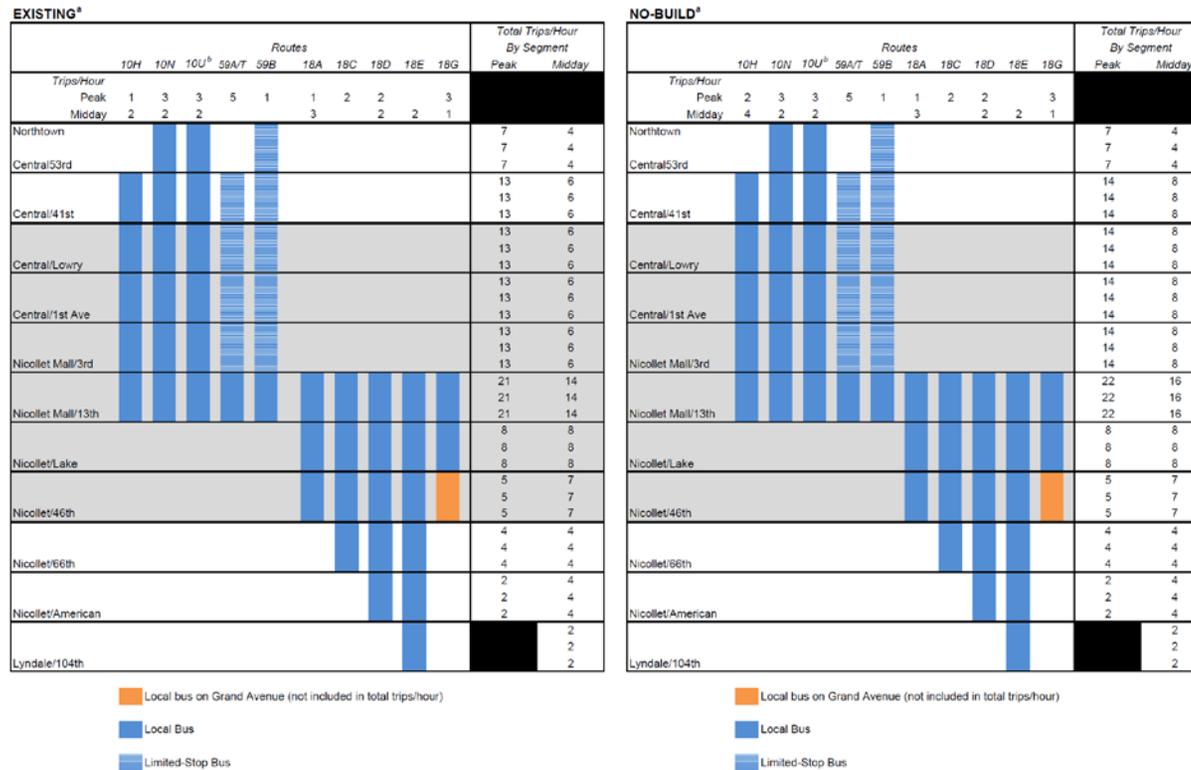


Figure 2: Year 2030 Average Weekday Change in Transit Trip Attractions



Attachment 1: Service Planning Assumptions for the Alternatives¹



^a Based on Metro Transit January 2012 online weekday schedules. Route 10 frequencies are based on northbound while Route 18 are southbound (labeled by branch). Peak hour used is from 3:30 PM to 4:30 PM based on Fall 2012 APC data (peak for 9.2-mile corridor). Frequencies are also based on when buses leave downtown.

^b To Northtown via University Avenue.

^b To Northtown via University Avenue.

¹ Source: URS and Nelson/Nygaard

Attachment 1: Service Planning Assumptions for the Alternatives (continued)¹

ENHANCED BUS

Trips/Hour	Shuttle	Limited Stop ^{A,B}		Enh. Bus		Total Trips/Hour By Segment	
		Peak	Midday	Peak	Midday	Peak	Midday
		2	2	4	2	4	4
Northtown						6	6
Central/53rd						6	6
Central/41st						14	12
Central/Lowry						12	10
Central/1st Ave						12	10
Nicollet Mall/3rd						12	10
Nicollet Mall/13th						14	12
Nicollet/Lake						10	8
Nicollet/46th						10	8
Nicollet/66th						6	5
Nicollet/American						2	2
Lyndale/104th						2	2

- Local bus on Grand Avenue (not included in total trips/hour)
- Local Bus
- Limited-Stop Bus
 - ^A One-mile stop spacing within Study Corridor (outside downtown)
 - ^B One-half mile stop spacing outside Study Corridor
- Enhanced Bus - One-eighth to one-quarter mile stop spacing.

STREETCAR

Trips/Hour	Shuttle	Limited Stop ^{A,B}		Street-Car	Total Trips/Hour By Segment		
		Peak	Midday		Peak	Midday	
		2	2		6	2	8
Northtown						8	6
Central/53rd						8	6
Central/41st						8	6
Central/Lowry						14	10
Central/1st Ave						14	10
Nicollet Mall/3rd						14	10
Nicollet Mall/13th						16	10
Nicollet/Lake						10	6
Nicollet/46th						10	6
Nicollet/66th						4	2
Nicollet/American						2	2
Lyndale/104th						2	2

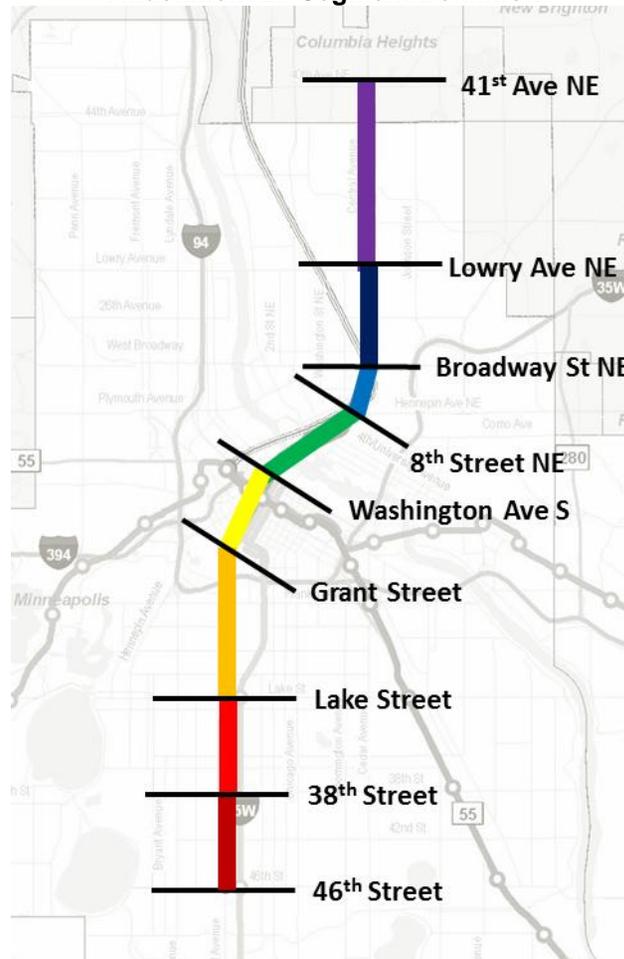
- Local bus on Grand Avenue (not included in total trips/hour)
- Local Bus
- Limited-Stop Bus
 - ^A One-mile stop spacing within Study Corridor (outside downtown)
 - ^B One-half mile stop spacing outside Study Corridor
- Streetcar - One-eighth to one-quarter mile stop spacing.

STREETCAR - PRELIMINARY STARTER LINE CONCEPT^C

Trips/Hour	Routes					Shuttle	Ltd. Stop ^{A,B}	Street-Car	Total Trips/Hour By Segment		
	10H	10N	10U ^A	59A/T	59E				Peak	Midday	
	2	3	3	5	1				2	3	3
Northtown										7	4
Central/53rd										7	4
Central/41st										14	8
Central/Lowry										14	8
Central/1st Ave										14	8
Nicollet Mall/3rd										22	14
Nicollet Mall/13th										25	17
Nicollet/Lake										11	9
Nicollet/46th										6	6
Nicollet/66th										6	6
Nicollet/American										3	3
Lyndale/104th										3	3

- Local bus on Grand Avenue (not included in total trips/hour)
- Local Bus
 - ^A To Northtown via University Avenue.
- Limited-Stop Bus*
 - ^A One-mile stop spacing where streetcar is operating (outside downtown)
 - ^B One-half mile stop spacing outside Study Corridor
- Streetcar
 - ^C Preliminary starter line is defined as the streetcar from Central/Hennepin/Seventh to Nicollet/Lake.

Attachment 2: Segment Definition²



² Source: URS.

To	April Manlapaz, URS	Page	1
CC	Dan Meyers, URS Angie Christo, AECOM		
Subject	Nicollet – Central Transitway Alternatives Analysis (AA) Validation of Ridership Forecasting Procedures		
From	Pat Coleman, AECOM Nagaraju Kashayi, AECOM Srikanth Neelisetty, AECOM		
Date	April 22, 2013		

This technical memorandum documents the efforts to implement and validate the ridership forecasting procedures for the Nicollet-Central Corridor and outlines the application procedure for forecasting.

Corridor Validation

A version of Met Council's travel demand model (validated for study area conditions for the Midtown Corridor AA) was used as a starting point. Being a regional planning tool the model is not designed to completely capture some "short trips" or "micro scale" travel movements and markets. For this reason, a "hybrid" incremental data driven approach in combination with the model-derived forecasts was implemented to better reflect route boarding patterns in the corridor.

The following steps, the results of which are summarized in Table 1, were undertaken to implement the hybrid procedure and validate it against observed data in the Nicollet-Central Corridor:

- The on board survey conducted by Metropolitan Council in the fall of 2010 was used to develop assignable transit survey trip tables (the "2010 On Board Survey" column in Table 1).
- To better match the route boarding pattern on Nicollet-Central corridor, the survey boardings in the study area for bus routes on Nicollet Mall - Routes 10,18, and 59 were reweighted using Automated Passenger Count (APC) 2012 data by segment (the "2012 APC" column in Table 1).
- Boardings by segment were summarized from the 2010 "Midtown validation" run (the "2010 TDM" column in Table 1). As expected the regional model did not capture all of the boardings in each segment.
- Since the assigned survey trip tables form the basis of the hybrid forecasting procedure a number of refinements were introduced to the networks and path parameters supporting those assignments:

- Refined walk access/egress links in the model to improve segment wise boardings for the corridor.
- Coded headway adjustments were made for Routes 10 and 18 to better replicate the ridership share between the routes where they overlap.
- Additional boarding penalties of 3 minutes were introduced at select stops on Route 18 – Lake St & Nicollet Ave, 31st St & Nicollet Ave, 31st & 1st Ave, 33rd St & Nicollet Ave, 35th St & Nicollet Ave and 38th St & Nicollet Ave.

These refinements generated reasonably good assigned survey trip table boardings by segment for Routes 10, 18, and 59 (The “Survey Trip Table Assignment” column in Table 1).

- To capture some of the special markets at existing Hiawatha stations (e.g., Nicollet Mall, Cedar-Riverside) on board survey responses were re-weighted using 2011 Fall station counts and unexpanded boardings and alightings data (for Hiawatha that was used in on board survey planning). Since the internal trips between the airports were not captured well in the survey, the survey was re-expanded to stops other than the Lindbergh and Humphrey stations. The LRT survey trip tables were further factored to reflect the trip patterns from the survey. In order to ensure the usage of LRT mode, MUSTUSEMODE was introduced in the PT scripts. A comparison between LRT “entrances” and “boardings (on +offs/2)” between the survey and survey trip table assignment is shown in Table 2.

Application for forecasting

As proposed in the 1/7/13 travel forecasting approach tech memo, forecasts will be “built up” with model-derived forecasts with the Met Council model and the incremental survey trip table “grown” to 2030 by applying a Fratar model process using Met Council’s demographics. This means the 2030 survey trip table (based the 2012 APC data expanded to 2030 forecast conditions) will form the basis for the forecasts in an application setting and the modifications described above apply only to the survey trip table assignments. The 2030 “Midtown” version of the Met Council model will be used to generate incremental transit trip (i.e., new riders) for the alternatives. The “Bottineau” bus to rail transfer penalties (per FTA direction) will be used for both the survey trip table assignments and the Met Council model runs for path consistency.

Mechanically this is accomplished in the following way:

- a) Run the 2030 Met Council model and 2030 survey trip table assignments for No Build
- b) For each alternative run the 2030 Met Council model and develop incremental transit trip tables of “new riders” by subtracting the build alternative transit trip tables from the no build transit trip tables.
- c) For each alternative assign the 2030 survey trip tables combined with each build alternative incremental transit trip tables (step b) to provide the segment level forecasts for that alternative.

* * * * *

Please feel free to call or email with questions or comments.

Table 1:- Nicollet –Central Corridor Ridership Forecasting Validation Summary

Routes- Segments	Run Time (Min)			Average Weekday Boardings			
	Observed		Modeled	Observed		Modeled	
	2010 Schedules	N-Compass 2010 Survey	2010 TDM	2010 On-Board Survey	2012 APC	2010 TDM	Survey Trip Table Assignment*
Route 10							
Grant St - Washington Ave S	13	12	9	3,226	4,408	4,170	4,937
Washington Ave S - 8th Street NE	7	7	9	487	643	464	546
8th St - Broadway St NE			2	121	352	180	121
Broadway St NE - Lowry Ave NE	9	10	3	772	1,201	653	1,042
Lowry Ave NE - 41st Ave NE	8	8	9	824	950	441	511
Subtotal	37	37	32	5,430	7,553	5,908	7,156
Route 18							
46th St - 38th St	4	4	6	822	589	1,403	588
38th St - Lake St	6	7	4	1,802	1,131	1,855	1,457
Lake St - Grant St	11	10	7	2,873	3,952	2,137	3,837
Grant St - Washington Ave S	9	9	6	2,926	5,012	2,681	4,728
Subtotal	30	31	24	8,423	10,685	8,076	10,610
Route 59							
Grant St - Washington Ave S	13	14	11	261	428	247	220
Washington Ave S - 8th Street NE		7	7		102	142	61
8th St - Broadway St NE	12		2	34			
Broadway St NE - Lowry Ave NE		6	4	116	114	227	230
Lowry Ave NE - 41st Ave NE	6	7	8	39	95	170	169
Subtotal	31	34	31	450	739	786	680
Route 10 -Rest	17	13	22	2,005	2,338	2,676	2,703
Route 18-Rest	35	35	39	1,968	2,045	2,576	1,727
Route 59 - Rest	36	31	35	225	115	590	223
Route 10- Total	54	50	53	7,435	9,891	8,584	9,858
Route 18- Total	65	66	63	10,391	12,729	10,652	12,337
Route 59 - Total	67	65	67	675	854	1,376	903
Subtotal 10,18 and 59	186	181	183	18,502	23,474	20,612	23,098
*2010 Trip Table from On-Board Survey , reweighted to APC 2012 data for routes 10, 18, and 59							

Table 2:- Average Weekday Hiawatha Station Entrances - Observed and Survey Trip Table Assignments

Entrances				
Station	Expanded Survey Observations		Survey Trip Table Assignment	
	Peak	Off_Peak	Peak	Off_Peak
Target Field Station	553	375	543	375
Warehouse District/Hennepin Avenue Station	810	985	827	986
Nicollet Mall Station	1,980	1,498	1,944	1,485
Government Plaza Station	1,082	684	1,082	684
Downtown East/Metrodome Station	915	881	908	870
Cedar-Riverside Station	496	493	496	493
Franklin Avenue Station	624	711	622	711
Lake Street Midtown Station	1,264	1,227	1,251	1,226
38th Street Station (Hiawatha Ave)	890	706	898	701
46th Street Station (Hiawatha Ave)	956	725	991	731
50th Street Minnehaha Park Station	319	224	319	224
VA Medical Center Station	583	455	571	455
Fort Snelling Station	688	471	891	616
American Blvd 34th Ave Station	257	189	246	189
Bloomington Central Station	249	158	243	159
28th Avenue Station	667	465	768	652
Mall of America Station	908	1,117	904	1,117
Total	13,242	11,364	13,504	11,674
Boardings				
Station	Expanded Survey Observations		Survey Trip Table Assignment	
	Peak	Off_Peak	Peak	Off_Peak
Target Field Station	782	371	378	229
Warehouse District/Hennepin Avenue Station	696	753	1,033	941
Nicollet Mall Station	1,861	1,497	2,484	1,781
Government Plaza Station	1,109	751	659	429
Downtown East/Metrodome Station	888	798	1,076	1,065
Cedar-Riverside Station	483	543	431	488
Franklin Avenue Station	647	726	465	596
Lake Street Midtown Station	1,370	1,213	1,096	997
38th Street Station (Hiawatha Ave)	839	650	718	455
46th Street Station (Hiawatha Ave)	878	766	931	701
50th Street Minnehaha Park Station	351	274	165	137
VA Medical Center Station	524	534	759	616
Fort Snelling Station	681	527	563	462
American Blvd 34th Ave Station	267	193	123	95
Bloomington Central Station	207	133	144	144
28th Avenue Station	540	357	740	531
Mall of America Station	1,118	1,277	1,387	1,380
Total	13,242	11,364	13,149	11,044