Memo

Date:	Wednesday, May 16, 2018
Project:	KC Streetcar, Main Street Extension Best Lane Analysis
To:	Project Management Team (PMT)
From:	Jennifer Schwaller, Christopher Kinzel, Molly Nick - HDR
Subject:	KC Streetcar Main Extension Station-Stop Analysis

The enclosed information details the station-stop analysis.

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Stop Locations

Background

During the planning for the Downtown streetcar Line, locating station-stops was largely an "internal" effort of the project team, with focused localized stakeholder feedback in certain areas helping to guide final locations (especially as the project went into design). This situation has changed dramatically during the Main Street Extension planning. There is now corridor-wide interest in where the station-stops will be located, and the study team has received many expressions of preference for station-stop locations, as stakeholders have now seen the economic and community benefits of having a nearby station-stop. Thus, the selection of station-stop locations has become a matter of more intense early public scrutiny – and a defensible, transparent, criteria-based methodology is needed to aid the process.

Downtown Process

The Downtown line's stop locations were based on a fairly simple process. An initial principle of two-block spacing was developed based on the experience of streetcars in other cities and the desire for the streetcar to function as a "pedestrian accelerator", enhancing walkability and connectivity throughout downtown. As a starting point, even-numbered streets were initially proposed through most of the route (8th, 10th, 12th, 14th, 16th, 18th, 20th). As the project moved into environmental planning, and then conceptual and detailed design, items such as development plans, stakeholder business operations, and bus operations began to influence station-stop location – and the final locations evolved and experienced one consolidation (7th, 9th, 12th, 14th, 16th, 19th).

Station-Stop Quantities vs. Larger Goals

As a southward extension on Main Street is contemplated, the effect of the route nearly tripling in length must be taken into account in the selection of station-stop locations. In contrast to Downtown, streetcar operations through Midtown will be a delicate balance between serving short (Downtown-like "pedestrian accelerator" scale) and longer (public transit scale) trips. Having too many station-stops could unnecessarily add expense (approximately $300,000 in capital costs per station-stop, plus ongoing maintenance) as well as dwell-time delays (30-50 seconds per location) affecting running time and reliability. Having too few station-stops could result in curtailed access and reduced development/redevelopment opportunities. The system must be efficient, reliable and safe – key elements of the Purpose and Need – but it cannot sacrifice mobility, convenience and economic development – also key elements of the Purpose and Need. The system must also truly function as an upgrade from the Main MAX bus service it will largely supplant – not only from perspectives such as accessibility and ridership attractiveness, but also in terms of perceived reliability and operational efficiency.

General Spacing Considerations

The 2014 NextRail process, which evaluated the Main Street Extension along with several other potential extensions, included conceptual drawings showing station-stops at Grand Boulevard, Linwood Boulevard, Armour Boulevard, 39th Street, 43rd Street, 45th Street, Ward Parkway North, and 51st Street. This layout largely mimicked the Main MAX stop layout, which generally has stops spaced at about a half-mile, or every four blocks. The Main MAX stops, in turn, were chosen based on the general principle that no person on the route should need to walk more than one-quarter mile, or two blocks, to a MAX stop. This is a fairly standard distance used for walking to transit – for example, FTA indicates that bus or streetcar passengers are usually willing to walk up to ¼ mile or five minutes to reach stops – and the streetcar study team adopted it early in the process as a reasonable spacing for station-stops. Thus, the NextRail station-stops appeared to be a good starting point for the current effort.

However, given the larger goals of the current study, the study team wanted to be thorough about evaluating potential locations. It was possible that conditions had changed since the MAX stops were laid out, or since NextRail was completed; or that additional variables needed to be considered. Thus, in evaluating potential stop locations, the study team looked at essentially every public-street intersection along the corridor, with the exception of a few minor "T" intersections.

It is important to note that, for this evaluation exercise, the study team was only focused on intersections – in other words, what intersections the station-stop would be near. Station-stops will ultimately be placed in the vicinity of intersections, but the evaluation was not concerned with near-side vs. far-side, or proximity to the intersection proper.

The evaluation took place in multiple steps: (1) An initial technical screening, (2) Formal and informal public engagement, and (3) A refined evaluation that incorporated additional system-level considerations.

Step 1: Initial Screening

Initial Criteria and Evaluation

As stated previously, the initial station-stop screening effort involved looking at essentially every intersection of public streets along the route, to ensure a holistic evaluation of suitability throughout the corridor. The analysis was conducted by the study team, but was also vetted by a Working Group, composed of corridor stakeholders, at several key milestones. The analysis was at a high level – for example, detailed economic impact evaluations weren't conducted, and qualitative metrics were used for several of the criteria. The intent of the evaluation was to be comparative, so that potential station-stops would be evaluated against each other. Any intersection along the corridor would likely be an excellent candidate for a station-stop, but only a finite number can be implemented – thus, measures were developed to help establish distinctive features of locations that would be most suitable.

Six primary criteria were evaluated:

Regional Connectivity | Bus Integration | Potential Ridership |
Pedestrian Demand | Economic Development | Local Expressed Desire

Two additional criteria – Spacing and Curb Stop Need – were also considered during this evaluation, but at a lesser level (a "pass-fail" consideration of sorts) as described later.

For each intersection, each of the six primary criteria were evaluated on a 1-5 scale, with a rating of "5" indicating "best meets" and a rating of "1" indicating "least meets". The evaluation criteria, and the resulting scores for each, are described below.

Regional Connectivity

Regional connectivity was defined as being in close proximity to, and providing connections to, other transit routes connecting beyond the immediate area. These are routes that have regional significance in the transit network. Additionally, locations that would address future regional transit needs, as identified by the ATA or in the Smart Moves long-term plan, also scored well. The score was a subjective evaluation based on these elements. **Table X-1** summarizes the evaluation of this criterion. Very few locations along the corridor provide significant regional connectivity – the areas near the Plaza, 39th Street, and 31st Street / Linwood Boulevard are the standout locations.

Table X-1: Initial Station-Stop Evaluation Criterion: Regional Connectivity

Location		Score	Justification
1	27th	2	Potential connections to regional routes; MAX stop at 29th
2	Grand	2	
3	Warwick	2	
4	30th	1	No regional connectivity
5	31st	4	#31 service to Blue Ridge Crossing in Independence (transfer hub); Important transfer location in core system; MAX Stop
6	Linwood	4	MAX stop
7	E 34th	1	No regional connectivity
8	Armour	1	No regional connectivity
9	36th	1	No regional connectivity
10	37th	1	No regional connectivity
11	38th	1	No regional connectivity
12	39th	4	#39 serves KCK by the KU Medical Center; Important transfer location in core system; High transfer location; MAX stop
13	Westport	1	No regional connectivity
14	40th	1	No regional connectivity
15	41st	1	No regional connectivity
16	43rd	1	No regional connections
17	44th	1	No regional connectivity
18	45th	1	No regional connections
19	46th	1	No regional connectivity
20	Cleaver II	5	#35, #47, #55, and #401 serve this location; This location would become a very important node; Potential connection for new streetcar connector to Waldo/Brookside; Plaza MAX stop
21	Ward	5	
22	Volker	2	Would allow for regional connectivity and continuous access along the Creek, but not as good transfer location as existing Plaza stop or stop on the north side of the Creek
23	49th	2	
24	51st	2	Terminus stop; New streetcar connector to Waldo/Brookside could serve this location; UMKC shuttle serves this location

Bus Integration

Bus integration was evaluated on three measures, as shown in **Table X-2**:

- *Connections* – The number of existing (and planned) bus routes with connections serving the location.
- *Transfers to Main MAX* – The daily number of passengers transferring between the current Main MAX service and existing conventional bus routes is an indicator of anticipated bus integration with the proposed streetcar extension, because the streetcar will have service characteristics somewhat similar to those of the MAX. Transfers are not a comprehensive measure, though, because they only occur in the vicinity of current MAX stops and data is not available at non-MAX locations.
- *Weekday Service Levels* – The frequency and span of bus service in the vicinity of the location.

The locations that scored highly for regional connectivity (the areas near the Plaza, 39th Street, and 31st Street / Linwood Boulevard) also scored well for bus integration. A second tier of locations with all-day service but lower frequencies (30-45 minutes) also scored fairly well for this criterion. An important location to note is the area of Crown Center (27th Street to Grand Boulevard), which is an important location for ATA's operations and serves a great number of routes, but most of the routes are either infrequent, don't cover the full day, or both – so those intersections received relatively low scores.

Ridership

The anticipated number of riders, based on streetcar ridership markets, is also a key differentiator in selecting station-stop locations. At the time of the initial station-stop location evaluation, the study team was in the midst of developing a ridership forecasting model; thus, only preliminary estimates were available. Furthermore, the way ridership models are built is not completely conducive to making an intersection-by-intersection comparison: models assume a set of stops, and then forecast ridership based on the market served by that set of stops. It is not practical to model every possible combination of potential station-stops to determine some "optimal" ridership-conducive arrangement. Thus, un-modeled intervening potential locations were evaluated on a more qualitative basis based on the model's output and the evaluation team's knowledge of the local ridership markets.

At this preliminary stage, the team used daily Main MAX boardings as one indicator of ridership potential, tempered and supplemented by ongoing ridership forecasting and corridor knowledge. **Table X-3** summarizes the evaluation.

Table X-2: Initial Station-Stop Evaluation Criterion: Bus Integration

Location		Score	Connections	Transfers to MMAX	Weekday Service Levels (freq = frequency)
1	27th	2	Routes 77, 201, 236, 237, 229 & JoCo (404, 435, 519, 563, 569, and 595) serve this location	0	**#77:** 1-hr freq (5:30a-12:30a); **#201:** 30-min freq (5a-11:30p); **#236:** 30-min freq (6:15a-7:15a & 4:30p-5:30p); **#237** 2 trips in peak periods; **#229:** 30-60-min freq (5a-11:45p); **#404:** 30-min freq (5:45a-7:45a) & 1-hr freq (3:15p-5:15p); **#435:** 1 trip in midday; **#519:** 20-min freq (5:30a-6:45a) & 30-min freq (3:15p-6:15p); **#563:** 2 trips in AM & PM; **#569:** 30-min freq (5:45a-7:45a & 3:45p-5:45p); **#595:** 30-min freq (5:45a-7:45a & 3:30p-6p)
2	Grand	2		0	
3	Warwick	2		0	
4	30th	1	Non-continuous. Routing crosstown routes would require bubble.	NA	NA
5	31st	5	Route 31; Major crosstown route	230	#31: 15 min freq for most of service period (4:30a-12:30a)
6	Linwood	5	Equivalent of #31	Equivalent of #31	Would have equivalent of #31 service, although not quite as direct
7	E 34th	1	Non-continuous. Routing crosstown routes would require bubble.	NA	NA
8	Armour	3	Route 35; Good east-west connectivity; Connects Westport & Plaza (major activity centers); MAX stop	70	#35: 30 min freq (4:45a-10:00p)
9	36th	1	Residential neighborhood road, not a major arterial, more stop signs and less priority given to E-W movement (compared to Armour)	NA	NA
10	37th	2	Route 35; Based on 35th Street; Minimal need for transit integration, assumption that 35 should/would connect at 35th Street		
11	38th	2	Non-continuous. Routing crosstown routes would require bubble.	NA	NA
12	39th	5	Route 39; Major crosstown route	340	#39: 20 min freq (5:00a-12a)
13	Westport	3	Moderate need for transit integration, based on Route 35		
14	40th	1	Non-continuous. Would make for difficult routing alignments for crosstown routes.	NA	NA
15	41st	1		NA	NA
16	43rd	1	MAX stop	NA	NA
17	44th	1	Non-continuous. Would make for difficult routing alignments for crosstown routes.	NA	NA
18	45th	2	MAX stop; Non-continuous cross street	NA	NA
19	46th	1	Non-continuous. Would make for difficult routing alignments for crosstown routes.	NA	NA
20	Cleaver II	5	Route 35, 47, 55, 401, and the future Waldo-Brookside connector; Would become very important node	100	#47: 30 min freq for most of service period (4:30a-11:00p)
21	Ward	5			
22	Volker	2	Routing connecting bus routes would be difficult, but feasible	NA	NA
23	49th	2		NA	NA
24	51st	3	Waldo-Brookside connector and UMKC Shuttle service	Unknown for Shuttle	UMKC Shuttle: 45 min frequency (7:00a-7:30p)

Table X-3: Initial Station-Stop Evaluation Criterion: Potential Ridership

Location		Score	Total MMAX Ons	Notes
1	27th	4	NA	Rationale: Future development on east side along 27th Street and will capture rides on south side of Crown Center
2	Grand	4	25	
3	Warwick	4	NA	
4	30th	2	NA	Further away from Linwood shopping center than 31st (a large driver of ridership in the area). Proximity to Union Hill and Fed. Reserve would not offset loss in ridership, resulting in a lower projected ridership.
5	31st	5	320	High percentage of ridership is from transferring passengers. Serves CCVI, Union Hill, Ability KC
6	Linwood	5	180	Linwood Shopping Center (Costco, Home Depot) is large driver of ridership
7	E 34th	3	NA	Further away from Linwood Shopping Center (than Linwood), but still within proximity. Also in proximity to residential on Armour & new residential on Main Street, but may lose transferring passengers from #35.
8	Armour	4	310	Gathers residential riders and provides access to major activity centers.
9	36th	2	NA	Would still serve residential neighborhoods, but is further away from higher-density residential along Armour.
10	37th	2	NA	Lower rating than Armour, because assumes most transfers from route #35 will happen at Armour.
11	38th	3	NA	Would still capture transferring riders from 39th Street cross-town route, but would be an inconvenient transfer. Still serving commercial area on Main Street, capturing some of the same ridership that the 39th Street stop captures on MMAX.
12	39th	5	580	--
13	Westport	3	NA	Assumed high ridership (#35 & #39), but less convenient transfer from #39 than on 39th Street. Lower rating than Armour, assumes most transfers from route #35 will happen at Armour.
14	40th	2	NA	Still in proximity to Westport, but located south of Westport Rd, which is the "main" entrance to Westport from the East; probably equal ridership potential as 41st
15	41st	2	NA	--
16	43rd	3	219	43rd provides access to St. Luke's to the west and light commercial in the proximity of the intersection. Existing ridership is relatively high on the corridor with no crosstown route.
17	44th	2	NA	More difficult (than 43rd Street) to get to St. Luke's, because many will not cut through park. No signalized crossing point/access for pedestrians.
18	45th	3	50	Potential to serve museums, Art Institute, and residential to the east. Serves employment at node (Century Towers, hotels, etc.)
19	46th	2	NA	Does not directly serve the Plaza, nor does it well serve the employment to the north. Would capture some residential to the east.
20	Cleaver II	5	450	Serves the Plaza
21	Ward	5	NA	
22	Volker	3	NA	Potential to serve the public library and commercial/employment in the SW quadrant; would serve research center and offices to east on Volker, unlikely to well-serve areas north of Brush Creek
23	49th	3	NA	
24	51st	4	104	Serves UMKC and residential/commercial to west around Main Street

Pedestrian Demand

Existing pedestrian demand is an indicator of potential high-activity areas that could be well-suited for station-stop locations. A new streetcar station-stop would be expected to induce pedestrian demand (and even spur new development that generates new pedestrian activity), but areas with already high activity have the best chance for initial and long-term success. The best information available on this measure comes from peak-period traffic counts conducted in the fall of 2017. These counts included pedestrians crossing each leg of each intersection evaluated. The evaluation summed these counts for both the a.m. and p.m. peak hours for use as an indicator for each intersection. Note that, at a small number of intersections, pedestrian volumes had to be estimated because counts were not available. The summed peak-hour values were normalized to a 1-to-5 scale, with values of 200 and above receiving a rating of 5.

The evaluation is summarized in **Table X-4**. At several locations – 31st Street, Armour Boulevard, 39th Street – activity is likely heavily influenced by the existing high-use bus stops. Other locations – 43rd Street, 45th Street, Cleaver II Boulevard, and 51st Street, are affected by significant nearby pedestrian generators (the Plaza, hotels, UMKC, and St. Luke's hospital, to name a few). Two other high-activity areas are located near gas stations with convenience stores (44th Street and 38th Street).

Table X-4: Initial Station-Stop Evaluation Criterion: Pedestrian Demand Levels

	Location	Score	Pedestrian Demand Levels (AM + PM Intersection Volumes)
1	27th	2	58
2	Grand	1	2
3	Warwick	2	67
4	30th	2	40*
5	31st	4	162
6	Linwood	3	141
7	E 34th	3	100*
8	Armour	5	226
9	36th	2	74
10	37th	3	100
11	38th	4	150*
12	39th	5	543
13	Westport	2	86
14	40th	2	85
15	41st	3	100*
16	43rd	4	189
17	44th	4	175
18	45th	5	272
19	46th	2	72
20	Cleaver II	4	162
21	Ward	2	84
22	Volker	1	21
23	49th	2	74
24	51st	5	467

** Estimated based on available information*

Economic Development

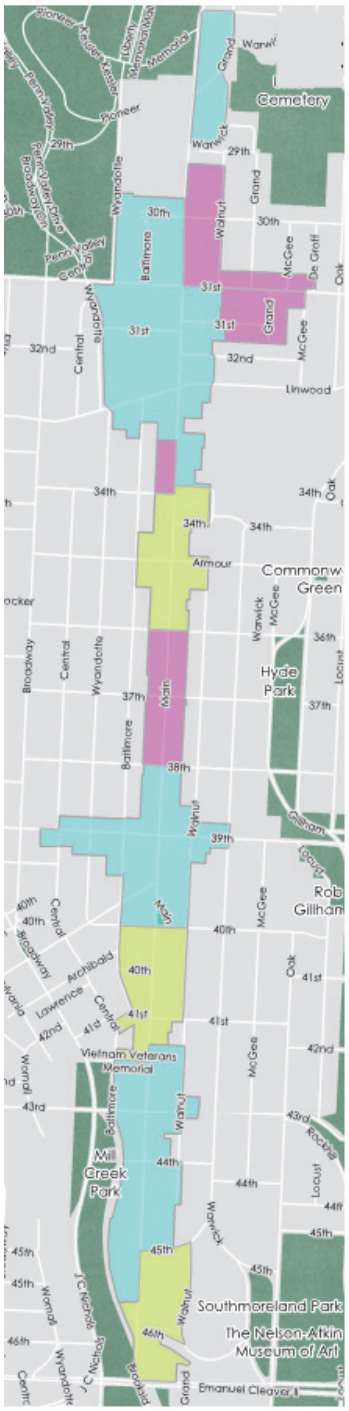
Streetcars have been shown to spur economic development, particularly near station-stops. This has certainly been the case with the Downtown Starter Line, and is one of the motivations behind the desire to extend the line. The team evaluated the economic development potential near each intersection at a simplistic high level, using information extracted from the City's Main Street Corridor Overlay District document, the purpose of which is to guide future development along Main Street. The document identifies three types of "zones" along Main Street, as defined below and mapped at right:

A. Neighborhood Main Street (least dense): Critical mass of walkable service for adjacent neighborhood.

B. Transit Node (most dense): An appropriate mixture of density and uses around rapid transit stops to support transit investment.

C. Transitional: A balanced transition from Transit Nodes to Neighborhood Main Streets.

To arrive at a score for a particular intersection, each of the intersection's four quadrants, if considered a strong candidate for development or redevelopment, was assigned a point value based on its zone type (A = 1, B = 3, C = 2). The four quadrant scores were summed, and the resulting intersection totals were normalized on a 1-to-5 scale. **Table X-5** summarizes the results of the analysis. The two highest-scoring areas were Linwood Boulevard and 44th Street. Areas near Crown Center (27th Street and Grand Boulevard) and 36th Street also scored well.



Main Corridor Overlay Zones

Table X-5: Initial Station-Stop Evaluation Criterion: Economic Development

	Location	Score	Overlay District Development Types	# of Redevelopment "Quadrants"
1	27th	3	B	2
2	Grand	3	B	2
3	Warwick	2	A B	1
4	30th	2	A B	1
5	31st	3	B	2
6	Linwood	5	B	4
7	E 34th	2	A B C	2
8	Armour	2	C	2
9	36th	3	A C	4
10	37th	2	A	3
11	38th	2	A B	2
12	39th	2	B	1
13	Westport	1	B	0
14	40th	1	C	0
15	41st	2	C	2
16	43rd	2	B	1
17	44th	4	B	3
18	45th	1	B C	0
19	46th	1	C	0
20	Cleaver II	2	B	1
21	Ward	1	NA	0
22	Volker	1	NA	0
23	49th	1	A	1
24	51st	2	B	1

Local Expressed Desire

As mentioned previously, with the success of the Downtown line, public interest in station-stop locations has intensified, and the vast majority of comments the study team has heard regarding station-stops have been requesting or favoring a particular location. Given the effect local stakeholder opinions had on the starter line, the team felt it was important to reflect positive or negative indications received from stakeholders in the station-stop evaluation, and denoted this criterion "Local Expressed Desire". The team used a fairly simple scoring approach to this criterion:

- 5: Stakeholders were strongly in support of a given location and felt it was important.
- 4: A stakeholder or stakeholders expressed a strong preference for a station-stop location, but were not adamant about it in light of the competing interests along the route.
- 3: No special preference was heard from stakeholders regarding the station-stop.
- 2: Opposition to the station-stop location was heard from one or more stakeholders.
- 1: Strong opposing feedback was received regarding the station-stop.

It is important to note that these assessments were based on individual interactions with stakeholders in the months leading up to the first public meeting. The public meeting feedback, and the team's response to it, are described in a later section.

Table X-6: Initial Station-Stop Evaluation Criterion: Local Expressed Desire

Location		Score	Notes
1	27th	5	Crown Center and MainCor have expressed a strong desire for 27th Street (as opposed to Grand Ave) to better serve potential future development.
2	Grand	2	
3	Warwick	3	--
4	30th	3	--
5	31st	4	CCVI has expressed an interest in a stop nearby to serve their frequent field trips to teach children cane skills. Union Hill has also expressed interest in a stop in this vicinity.
6	Linwood	4	MainCor has suggested a stop somewhere between 31st and Linwood to serve both corridors.
7	E 34th	3	--
8	Armour	5	MAC apartments have hundreds of apartment units on Armour and are highly desirous of a stop there
9	36th	3	--
10	37th	4	The Whole Person has expressed a desire for a stop close to their location if possible to serve their employees and clients.
11	38th	3	--
12	39th	3	--
13	Westport	3	--
14	40th	3	--
15	41st	3	--
16	43rd	4	Capitol Federal has expressed interest in a stop near their location to serve their customers along the corridor.
17	44th	2	Nelson-Atkins, Kemper, and KCAI strongly desire a stop at 45th Street to connect to with the Arts Ribbon, and have expressed a concern about the desirability of a 44th Street stop.
18	45th	5	
19	46th	3	--
20	Cleaver II	5	A Plaza stop is a fairly universal goal expressed by stakeholders interested in the extension.
21	Ward	3	--
22	Volker	3	Plaza Library expressed a strong desire for a Library stop right before the public meeting, after the initial evaluation had been completed.
23	49th	3	--
24	51st	5	UMKC considers 51st Street as the northernmost place the streetcar could stop and effectively serve the University. VanTrust (developer of property on SE corner) expressed support for a stop at this location.

Two additional criteria were proposed by the team at the beginning of the initial screening.

Spacing

This criterion was initially envisioned as one that could be used to generally ensure reasonable station-stop spacing, to balance transit access with efficient operations. Near the outset of the analysis, it was decided that inter-stop spacing on the order of a half-mile (four blocks, more spread out than the two/three-block spacing on the Downtown Starter Line) would be a reasonable target to consider. This would translate to roughly a quarter-mile (two-block) walk from any spot on Main Street to a station-stop, a very reasonable and common distance for access to transit. The thinking was that spacing considerations could only be truly examined after a set of station-stops had been developed, to ensure that the recommendations arising from the other criteria were within reasonable tolerances.

This measure did not evolve into an initial criterion for individual station-stops, because that could lead to a situation in which two station-stops deemed to be poorly spaced could both score poorly. Instead, for the initial evaluation, the main spacing-related consideration was whether the stops generally achieved the goal for half-mile spacing, given the strength of the other ratings. As detailed in later sections, this goal was determined to be met conceptually during the initial evaluation, but was revisited more quantitatively during the refined evaluation (Step 3) described later.

Physical Capacity

This criterion was included to address any potential “pinch points” along the corridor where a stop might not be able to fit within the right-of-way. As the initial evaluation proceeded, none of the intersections presented themselves as “fatal flaws” at which a stop couldn’t somehow be made to fit – given that stops could potentially “slide” up and down the corridor. Thus, all intersections were on essentially on equal footing and this criterion didn’t come into play.

Figure **X-1** maps the ratings for the initial six criteria.

Figure X-1: Initial Screening of Potential Stop Locations

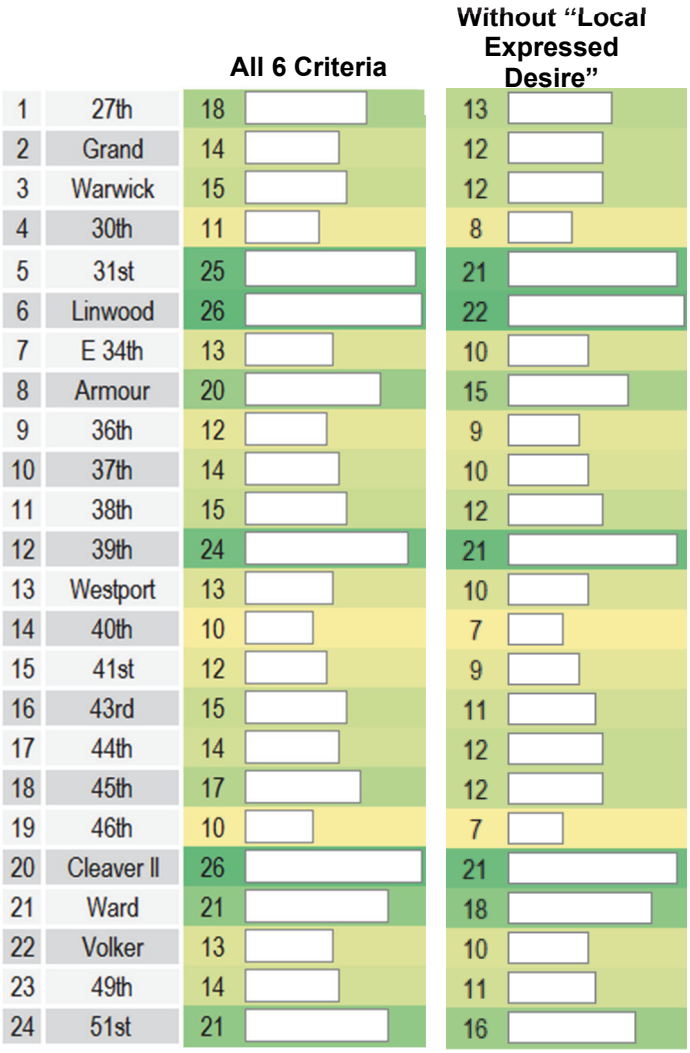
For each of the 24 intersections evaluated, the team summed the scores for the six criteria described above, resulting in a composite score. The chart on the left side of **Figure X-2** illustrates each stop's composite score resulting from this calculation.

The study team was also interested in the scoring of just the technical considerations without the stakeholder opinions. Thus, the chart on the right side of **Figure X-2** illustrates the sum without the "Local Expressed Desire" criteria.

The results organized themselves into the following patterns:

- Three high-scoring isolated locations: Armour Boulevard, 39th Street, and 51st Street.
- Two high-scoring pairs of adjacent intersections: 31st Street / Linwood Boulevard, and Cleaver II Boulevard / Ward Parkway.
- Two moderate-scoring clusters of nearby intersections, at approximately reasonable spacing to fill in the gaps of the other five: 27th Street / Grand Boulevard / Warwick Trafficway, and 43rd Street / 44th Street / 45th Street.

Figure X-2: Initial Composite Scoring of Potential Stop Locations (north to south)



As the team considered these results, some of the multi-intersection issues seemed easily resolved:

- 27th Street / Grand Boulevard / Warwick Trafficway: Based on several factors – the strong preference expressed by Crown Center and other stakeholders for 27th Street, the large development site adjacent to the intersection, and the favorable spacing from Union Station – 27th Street was identified as the recommended location.
- Cleaver II Boulevard / Ward Parkway: These intersections are close together, and both have fairly similar access to the Country Club Plaza; thus, they were considered as essentially one location, because the station-stop could shift either way.

The remaining two multi-intersection clusters were harder to resolve, and the study team invested more time analyzing their relative benefits as described in the following sections.

Initial Focused Evaluation: 31st Street / Linwood Boulevard

31st Street and Linwood Boulevard received equally strong ratings. However, due to their proximity, the project team evaluated a consolidated station-stop at either cross-street, or between cross-streets. A consolidated station-stop was supported by the previously mentioned Working Group. The following information helped inform the initial decision on where to locate a consolidated station-stop in the vicinity of the 31st Street and Linwood Boulevard area.

Ridership Market, 31st Street / Linwood Boulevard

The existing Main MAX has stops at both 31st Street and Linwood Boulevard. The 31st Street stop has approximately 66 percent more ridership than the Linwood Boulevard stop (**Table X-7**). However, based on 2017 Automated Pedestrian Counters (APC), 80-85% of Main MAX riders at the 31st Street stop are transfer passengers with the 31st Street route; signifying the importance of connecting to the local east-west connector in the area.

Table X-7: 31st Street & Linwood Boulevard Main Max Ridership

	31st Street			*Linwood Boulevard*		
	On	**Off**	**Total**	**On**	**Off**	**Total**
Northbound	129	159	288	98	86	184
Southbound	190	123	313	81	97	178

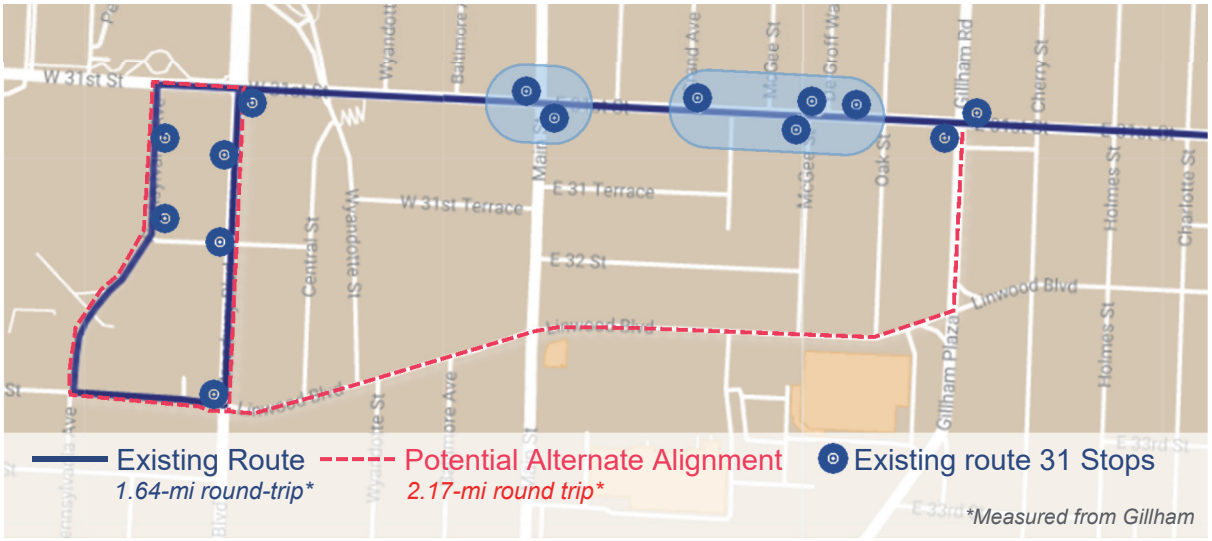
The Main MAX Linwood Boulevard stop has high ridership, all of which originates or is destined for the immediate surrounding area (no transfers). This is likely due to the greater number of jobs and activity in the Linwood Shopping Center than near 31st Street. However, both intersections have future economic development potential.

Route 31 (31st Street)

Connections to local routes, particularly the 31st Street route, are important to ensure the streetcar is a fully integrated, functioning, core route of the RideKC transit system. While Route 31 (Blue Ridge to Penn Valley) currently runs on 31st Street in the vicinity of Main Street, there is potential for the route to run on Linwood Boulevard at the west end of the route to connect to a potential Streetcar station at Main Street and Linwood Boulevard (**Figure X-3**).

The stops that would be affected by a new alignment on Linwood Boulevard are highlighted in light blue in the Figure. The ridership on Route 31 between Gillham Road and Main Street is relatively small (34 total on/offs, or 17 round trips). Of the total ridership on Route 31 at Main Street, 480 to 510 trips are transfers which could be facilitated at a Linwood Boulevard streetcar station-stop. The remaining 90 to 120 trips (45 to 60 passengers) would be required to make a longer walk (roughly one-quarter mile to a Linwood Boulevard station-stop on Main Street).

Figure X-3: Route 31 Existing and Potential Routing – West End



31 Eastbound Stops	Ridership		
	On	Off	Total
Pennsylvania at 32nd NB	65	56	121
Pennsylvania at 31st NB	99	45	144
31st at Broadway EB	22	1	22
31st at Main EB	222	27	249
31st at McGee EB	11	1	13
31st at Gillham Plaza EB	41	13	56

31 Westbound Stops	Ridership		
	On	Off	Total
31st at Gillham Rd WB	17	32	49
31st at DeGroff Way WB	0	0	0
31st at McGee WB	1	12	13
31st at Grand WB	0	8	8
31st at Main WB Farside	16	236	252
Broadway btw 31st/32nd SB	3	28	31
Broadway at 32nd SB	2	21	23
Broadway at Linwood SB	13	36	49

A 31st Street streetcar station-stop would require all existing ridership on Main MAX at Linwood – 360 trips (180 passengers) – to walk the one-quarter mile distance. In summary: A 31st Street Streetcar station-stop would require a further walk for 180 passengers, while a Linwood Boulevard streetcar station-stop would require 60-75 passengers to walk an additional distance.

The suggested alternate routing on Linwood Boulevard (red dash in **Figure X-3**) would likely add 1-2 minutes of running time in each direction. However, based on the current running times, headways, and minimum layover, the schedules could likely absorb an additional four minutes (round trip) without needing an additional bus. This is not to ignore the fact that some riders would experience longer travel times.

Initial Recommendation: Linwood Boulevard

The study team considered the preceding information in conjunction with the overall evaluation matrix, and reached the following initial conclusions and recommendation:

- Although there are existing Main MAX stops at 31st Street and Linwood Boulevard, consolidation of those two stops to a single streetcar station-stop is sensible from an operations and investment standpoint.
- A station-stop is needed somewhere between 27th Street and Armour Boulevard, and either 31st Street or Linwood Boulevard would be a good choice (acknowledging that Linwood Boulevard results in a less regular spacing). Since either could work, the decision comes down to "tie-breakers".
- The study team initially preferred Linwood Boulevard because it appears to have greater economic development / redevelopment potential (a lot of surface parking). Also, the fact that a portion of the Route 31 bus line could be re-routed to Linwood Boulevard meant that the important functions of the 31st Street MAX stop could be transplanted to Linwood Boulevard, addressing one of the key concerns about omitting a 31st Street station-stop.
- The study team and the Working Group acknowledged that the drawback of a Linwood Boulevard station-stop is that it would not serve the Union Hill neighborhood as well as a 31st Street station-stop would.

Initial Focused Evaluation: 43rd Street / 45th Street

The study team also examined the area between 43rd Street and 45th Street, which appears to warrant a streetcar station-stop based on the evaluation matrix and the spacing goals. The existing Main MAX route has stops at both 43rd Street and 45th Street. However, due to the two intersections' proximity, the project team evaluated a consolidated station-stop at either intersection, or at 44th Street. A consolidated station-stop was supported by the Working Group. The following information was used to consider the best configuration through this section of the corridor in more detail.

Ridership Market, 43rd Street / 45th Street

Based on 2017 APC, the existing Main MAX 43rd Street stop has almost four times more ridership than the 45th Street MAX stop (**Table X-8**). The area has no existing cross-town routes, the closest being Route 39 (39th Street) to the north and Route 47 (47th Street) to the south.

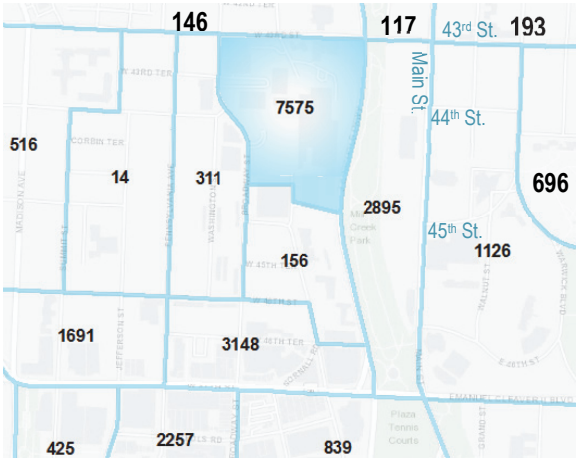
Table X-8: 43rd Street and 45th Street Main Max Ridership

	43rd Street			45th Street		
	On	Off	Total	On	Off	Total
Northbound	172	40	213	45	12	57
Southbound	46	162	208	5	47	52

Access Issues: 43rd Street / 44th Street / 45th Street

Based on the existing roadway network, 43rd Street has a major benefit of providing access to Saint Luke's Hospital and associated medical facilities, the largest employment site in the area (**Figure X-4**). A 43rd Street streetcar station-stop would also better serve the northern portion of the Southmoreland Neighborhood (nearly 900 residents between 41st Street and 43rd Street).

Figure X-4: Employment – Vicinity of St. Luke's



While a 44th Street or 45th Street station-stop would provide access to the American Century Towers and surrounding hotels, the market is "single-loaded", limited by Mill Creek Park. If a 44th Street or 45th Street station-stop were to be pursued (without a 43rd Street station-stop), an enhanced pedestrian connection would be necessary to connect riders to the Saint Luke's Hospital area. A pedestrian connection would be better facilitated at 44th Street than at 45th Street, but would likely require a signalized crossing of Main Street.

Figure X-5: 44th Street Right-of-Way (ROW)

A paved, ADA-accessible trail could provide access through Mill Creek Park, or a covered sky bridge could provide direct access from the station-stop to the hospital. There is right-of-way (ROW) for 44th Street west of Main Street (**Figure X-5**) that could be used for the connection.

There are plans for a Cultural District "Art Ribbon" connecting key art destinations on the east side of Main Street, including the Kemper Museum of Contemporary Art, the Kansas City Art Institute, and the Nelson-Atkins Museum of Art. The preferred station-stop location for access to the Art Ribbon, as expressed by the three institutions, is 45th Street; however, a station at 44th Street could also provide easy access (see **Figure X-6**).

Figure X-6: Cultural District Access

A 45th Street station-stop would provide a connection to the Art Ribbon, serve downtown visitors staying at the nearby hotels, and serve employment near the 45th Street intersection. A 43rd Street stop might have greater ridership potential and would likely better serve the Saint Luke's Hospital (compared to 45th Street), the largest employer in the area. 44th Street has the potential to serve both markets, but, as stated earlier, the effectiveness of a 44th Street station-stop would rely on a significant investment in pedestrian connections through Mill Creek Park.

Initial Recommendation: Retain Both 43rd Street and 45th Street

The study team considered the preceding information in conjunction with the overall evaluation matrix, and reached the following initial conclusions and recommendation:

- Although there are existing Main MAX stops at 43rd Street and 45th Street, the study team and Working Group at first recommended that consolidation of those two stops to a single streetcar station-stop would be sensible from an operations and investment standpoint.
- A station-stop is needed somewhere between 39th Street and the Plaza, and either 43rd Street or 45th Street would be a good choice (acknowledging that 45th Street results in a less regular spacing).
- Given that the 43rd and 45th Street station-stops would serve two very different ridership markets (43rd: St. Luke's, Southmoreland; 45th: hotels, large office buildings, Cultural District), the study team, with the concurrence of the Working Group, reversed the decision to consolidate the stops and carried forward a recommendation of providing station-stops at both 43rd Street and 45th Street.

Initial Overall Station-Stop Recommendations

Based on the preceding analysis, the study team's initial recommendation included the following new streetcar station-stop locations:

- 27th Street
- Linwood Boulevard
- Armour Boulevard
- 39th Street
- 43rd Street
- 45th Street
- Country Club Plaza (Cleaver II Boulevard / Ward Parkway N.)
- 51st Street

The next steps of the process resulted in refinements to these recommendations.

Step 2: Formal Public Engagement

As mentioned previously, the study team met with numerous stakeholders "one-on-one" during the initial months of the evaluation. These meetings influenced the initial screening results presented in the previous section. The Working Group also had input and feedback at several milestones during the initial screening.

After developing initial station-stop recommendations, the study team shared them with the public at an open house on April 3, 2018. Station-stop locations were just one piece of the overall information shown at the open house, which also presented an overview of the study process, the TDD, and the Best Lane analysis. The open house information was also posted on-line for another 17 days to encourage feedback from those unable to participate. In addition, several emails and letters, as well as a petition, were received after the open house, and a few additional stakeholder meetings were held. The following is a summary of feedback received from these various forums:

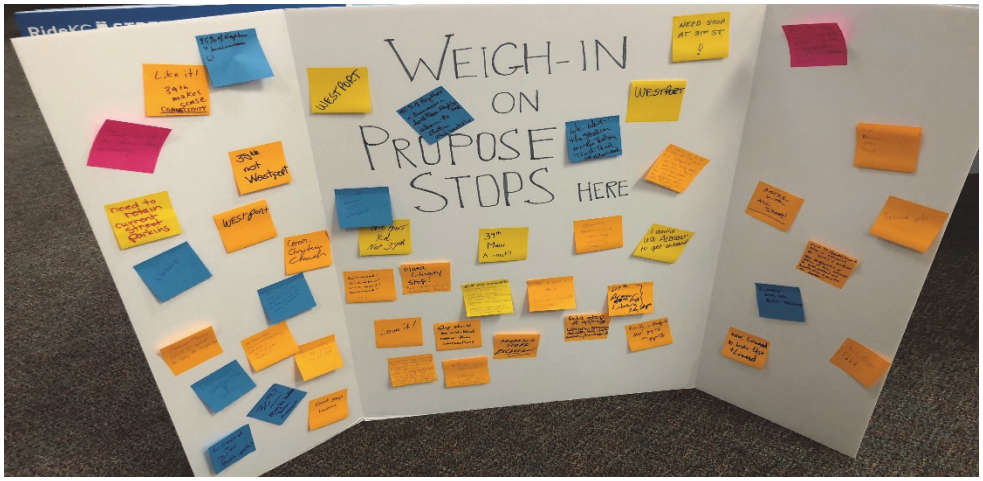
Open House

Of the 49 participants who provided comments on proposed stop locations:

- 19 expressed support for the recommendations as presented.
- 23 were specific to stop locations.
- 7 could be considered/addressed in design when finalizing actual locations (vs. intersections) and/or mid-block stops.

The top three requests for station-stops in the open house comments were locations that were not in the initial recommendations. This is not surprising, since participants desiring a station-stop and not seeing it on the list would be the most likely individuals to request that station-stop, while participants satisfied with the list would generally be more likely to give blanket approval (even if they had focused interest in a specific station-stop location). These three stops were:

- 31st Street (5 comments)
- 49th Street/Plaza Library (5 comments)
- Westport Rd (4 comments)



On-line Survey

A total of 187 unique participants took part in the survey in the days following the open house. The majority of respondents who provided feedback on proposed station-stop locations strongly encouraged an additional station-stop at 31st Street; many respondents specifically indicated/referred to this addition as a "Union Hill" stop. This additional station-stop was referenced in 133 surveys.

Station-stop highlights from the survey included:

- *General:* 36 respondents were in support of the station-stops as presented/recommended.
- *Linwood / 31st Street:*
  - 82 respondents indicated a preference for 30th Street and/or 31st Street – many specifically referencing Union Hill, plus a few references to Longfellow.
  - 40 respondents specifically preferred 31st Street as an additional station-stop location.
  - 11 respondents indicated a preference of 31st Street over Linwood Boulevard.
  - 3 of the respondents in support of the station-stops as presented/recommended specifically indicated a support for a Linwood Boulevard station-stop.
- *43rd Street / 45th Street:* 5 respondents recommended consolidation of these station-stops.
- *Plaza Library:* An additional station-stop at this location was referenced twice.

Email

Twenty (21) email comments were received via info@kcstreetcar.org. Of these comments, 16 (76%) were related to station-stop location – all of them requesting a stop at 31st Street. Two of the other comments were related to station-stops – they recommended/requested station-stop names (*Unicorn Theater Stop/39th Street* and *Westport/39th Street*).

Letters

Letters were received on behalf of organizations/neighborhoods along the extension. Below is a list of letters received to date related to station-stop locations:

- *31st Street (9 letters, 10 entities):*
  - Ability KC Board of Directors in support of a station-stop north of the intersection of Main Street and 31st Street
  - BMO Financial Group (on behalf of Ability KC via current chair of facilities committee) in support of an addition of a 31st Street station-stop
  - Fairfield Inn by Marriott in support of a station-stop north of 31st Street
  - JE Dunn Construction Company in support of a 31st Street station-stop
  - Kansas City KBS (KCPT) in support of a 31st Street station-stop

- One Park place Homeowners Association in support for the addition of a 31st Street station-stop
- Shops at Union Hill in support for the addition of a 31st Street station-stop
- Union Hill Properties in support for the addition of a station-stop north of 31st Street
- Co-signed on behalf of Union Hill Homes and the Union Hill Neighborhood requesting addition of a 31st Street station-stop

- *45th Street (1 letter, 3 entities):*
  - Co-signed on behalf of Nelson-Atkins Museum of Art, Kemper Museum of Contemporary Art, and the Kansas City Art Institute expressing support for the extension and reinforcing a 45th Street Stop – proposing a unique visual identity that would distinguish it as a gateway to the "Art Walk" initiative connecting the institutions.

Petition

A petition was initiated by the Union Hill neighborhood with support from the nearby neighborhoods/resident, requesting the addition of a 31st Street stop. The petition included 370 signatures when it was hand-delivered to the KC Streetcar Authority on April 20, 2018.

Follow-up Meetings

As is evident above in the preceding descriptions, the idea of a 31st Street station-stop received significant feedback in various public forums. In the days and weeks following the public meeting, the study team met with interested parties including representatives of Union Hill, CCVI, Ability KC, and development interests to obtain more information as the station-stop decisions were refined. These meetings revealed valuable information on development plans, equity concerns, accessibility issues, and current employment patterns.

A follow-up meeting was also held with a Westport business owner. Among the items discussed were the initial station-stop locations.

Step 3: Refined Evaluation

Step 1 of the process arrived at a set of potential station-stops through a series of numeric rankings based on both quantitative and qualitative data. These station-stops were, on average, spaced at distances felt to be reasonable for the corridor. Step 2 exposed this set of station-stops to the public, allowing the team to further understand the criteria that truly mattered to the public in selecting station-stop locations.

As the study team considered the next round of refinements, the evaluation hinged on overarching considerations of operational effectiveness, stop spacing and equitable access to service. Although the initial station-stop list met criteria and provided reasonable operational spacing, should any adjustments be considered from the standpoint of improving operational performance, spacing, and equitable access to service? Specific questions the study team formulated included:

- Would there be gaps in access based on the goal of having a station-stop accessible from anywhere on the corridor within a five-minute walk?
- Would there be additional opportunities for stop consolidation and improved operational efficiencies while meeting the five-minute-walk goal?

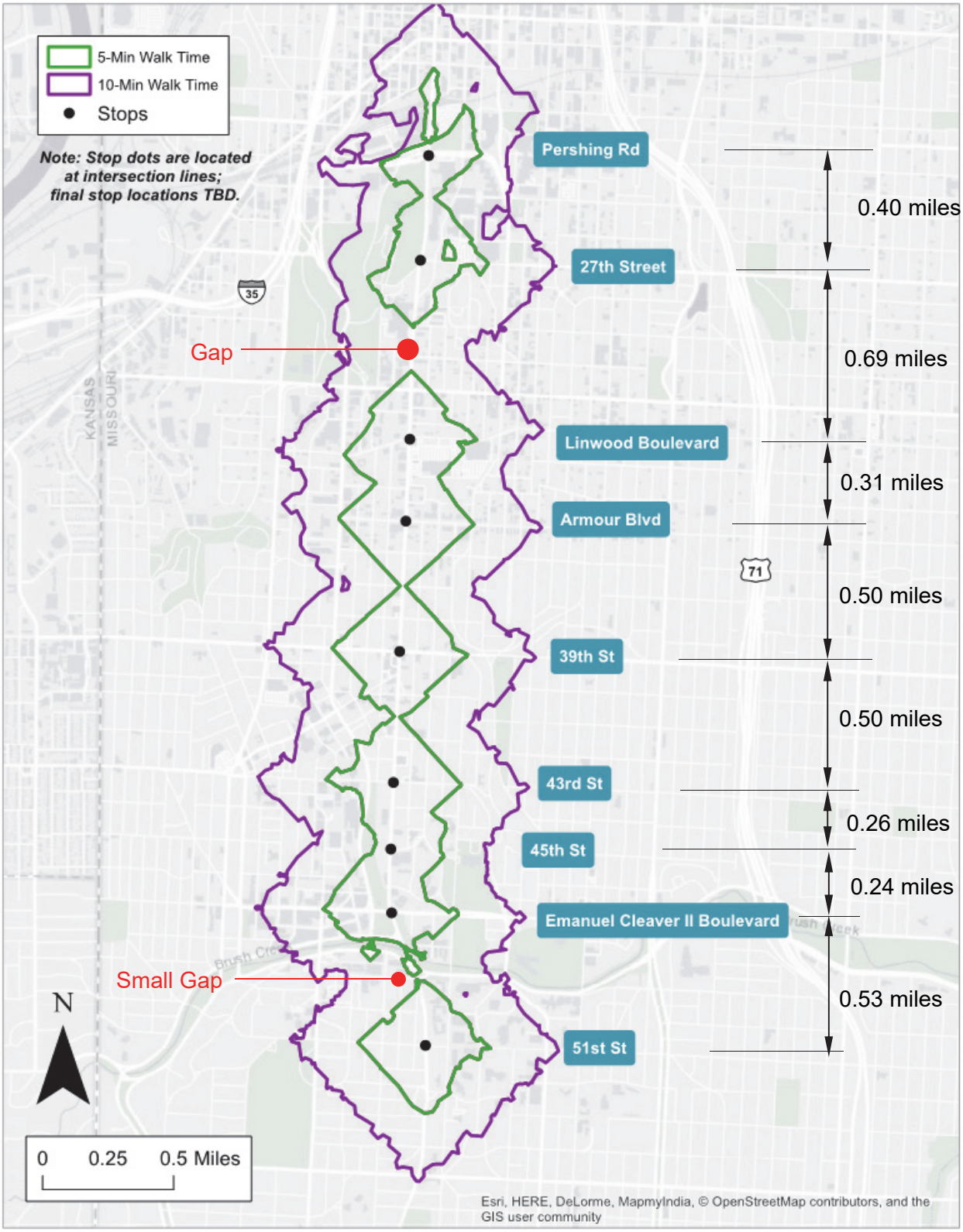
To evaluate equity issues, the study team examined walk-sheds, as described in the following section.

Walk-Shed Analysis

The study team developed comparisons of alternative station-stop walk-sheds along the entire proposed extension route. These walk-sheds accounted for the terrain/topography and the current pedestrian network in computing walk times. The alternatives varied in the vicinities of 31st Street / Linwood Boulevard, 43rd Street / 45th Street, and Cleaver II Boulevard / Ward Parkway.

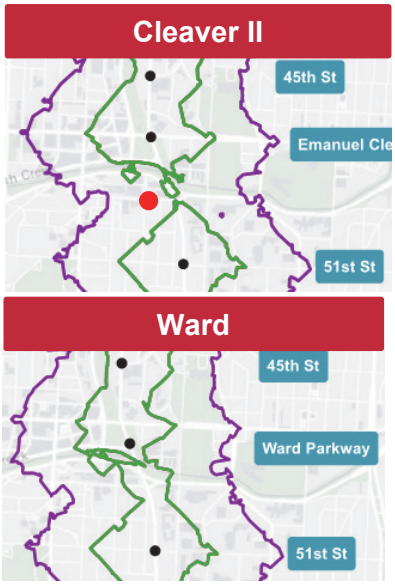
Figure X-7 illustrates the nine initially proposed station-stops as shown at the public meeting. The figure shows walk-shed boundaries representing areas within which walk times of 5 and 10 minutes to/from the station-stop can be achieved. Notable on the figure are two gaps in the 5-minute walk-time contours: one in the area of 31st Street, and a smaller one in the vicinity of 49th Street (near the Plaza Library)

Figure X-7: Walk-Sheds for Station-Stops Presented at Public Meeting



The following discussion describes the walk-shed effects, and additional considerations, related to several variant station-stop configurations.

- *Cleaver II Boulevard / Ward Parkway North:* The study team has always considered this "the Plaza stop" and therefore has been assuming it could slide north or south as needed to optimize operations while serving the Plaza. In fact, as **Figure X-2** showed, Cleaver II Boulevard and Ward Parkway North scored similarly in the initial screening – reflecting the idea that either location could serve a similar function. As the image at right shows, shifting the station-stop to Ward Parkway closes a small walk-shed gap and provides better access south of Brush Creek. Furthermore, in the period since the public meeting, the study team has been considering conceptual layouts of different alignment options, which has included physically locating stops from a feasibility standpoint. Through these efforts, it has become clear that locating the Plaza station-stop in the vicinity of Ward Parkway North, just north of Brush Creek, has several advantages: (1) it avoids the complicated and congested Cleaver II Boulevard intersection, (2) it can potentially provide better pedestrian connections to both the Plaza and a potential transit hub just east of Main Street, and (3) it better serves the Plaza Library, by virtue of being situated approximately 600 feet away from the east walkway to that facility (in contrast to a Cleaver II Boulevard location, which would be over 1,200 feet away). *Thus, the study team recommends showing the Plaza station-stop between Cleaver II Boulevard and Ward Parkway.*

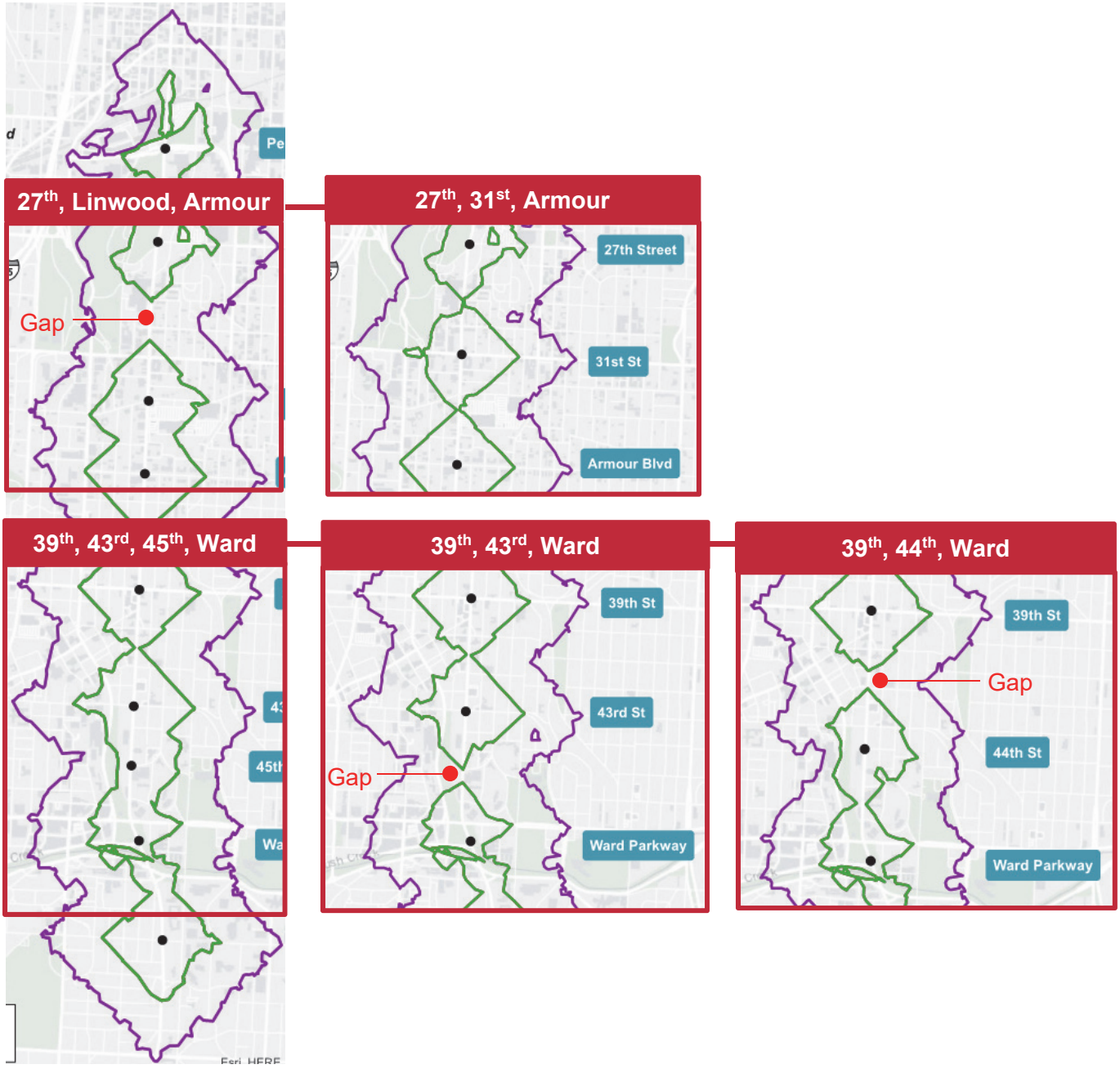


- *31st Street / Linwood Boulevard:* As mentioned previously, **Figure X-7** revealed a walk-shed gap along Main Street near 30th Street. As shown in **Figure X-8**, relocating the previously proposed Linwood Boulevard station-stop to 31st Street would eliminate this gap. The study team had already previously concluded that, operationally and financially, a consolidated station-stop would be superior to two station-stops. Given that a single station-stop at 31st Street provides better walk-shed coverage than a Linwood location, shifting to 31st Street would address both the efficiency and equity considerations. *Thus, the study team recommends shifting the station-stop previously shown at Linwood Boulevard to 31st Street.*

- *43rd Street / 44th Street / 45th Street:* The inclusion of the 45th Street station-stop has been questioned from an operational efficiency standpoint, given that it is within two blocks of 43rd Street, rather than the four blocks more typically being used along this corridor. As previously mentioned, consolidation of these two station-stops was initially considered by the study team and Working Group, but was discarded based on ridership markets served. A further examination of walk-sheds, illustrated in **Figure X-8**, lends support to retaining both locations:
  - As the figure illustrates, eliminating the 45th Street station-stop, and consolidating at 43rd Street, would result in a walk-shed gap right in the vicinity of 45th Street. The grade on Main Street south of 45th Street contributes to this gap, because walking speeds are slower on the steep hill.
  - One alternative would be to consolidate the station-stops at 44th Street, which could possibly serve both the 43rd Street and 45th Street markets, and would have potential connections to the proposed Art Ribbon. However, as the figure shows, this arrangement would create a walk-shed gap in the vicinity of 41st Street.

The only arrangement that eliminates walk-shed gaps between 43rd Street and 45th Street is to retain the two station-stops as shown at the public meeting. However, for operational reasons, these station-stops should not get any closer to each other than shown on the maps. As planning and design proceeds, the principle of keeping the 43rd Street station-stop at or north of its intersection and keeping the 45th Street station-stop at or south of its intersection should be guarded in order to facilitate efficient operations. *Thus, the study team recommends retaining station-stops at both 43rd Street and 45th Street with this important caveat.*

Figure X-8: Walk-Sheds for Stop Variants



Refined Recommendation

Based on the preceding analysis, the study team refined its recommendations to support the following station-stop locations (shown in **Figure X-9**):

- 27th Street
- 31st Street
- Armour Boulevard
- 39th Street
- 43rd Street
- 45th Street
- Ward Parkway North
- 51st Street

It is important to emphasize that the initial recommendations were also rational and would serve the corridor well, but the walk-shed mapping revealed that the refined set of station-stops would provide 5-minute walk times or better from anywhere along Main Street to a station-stop, while the initial recommendations left gaps.

As a check on the coverage of the initial and refined station-stop sets, the study team compared the population and employment bases within the walk-sheds of the two scenarios. **Table X-9** presents that comparison. It is important to note that this data is based on census estimates and census geography, which (especially in the case of population) is not extremely fine-grained in comparison to the walk-shed areas. Because only part of a census block or block group may extend into a given walk-shed, a standard methodology was used to apportion data to the walk-shed based on the ratio of the intersected area to the overall block or blockgroup area. This method inherently assumes an even distribution of population over block groups, and employment over blocks – an obvious (but expedient) oversimplification.

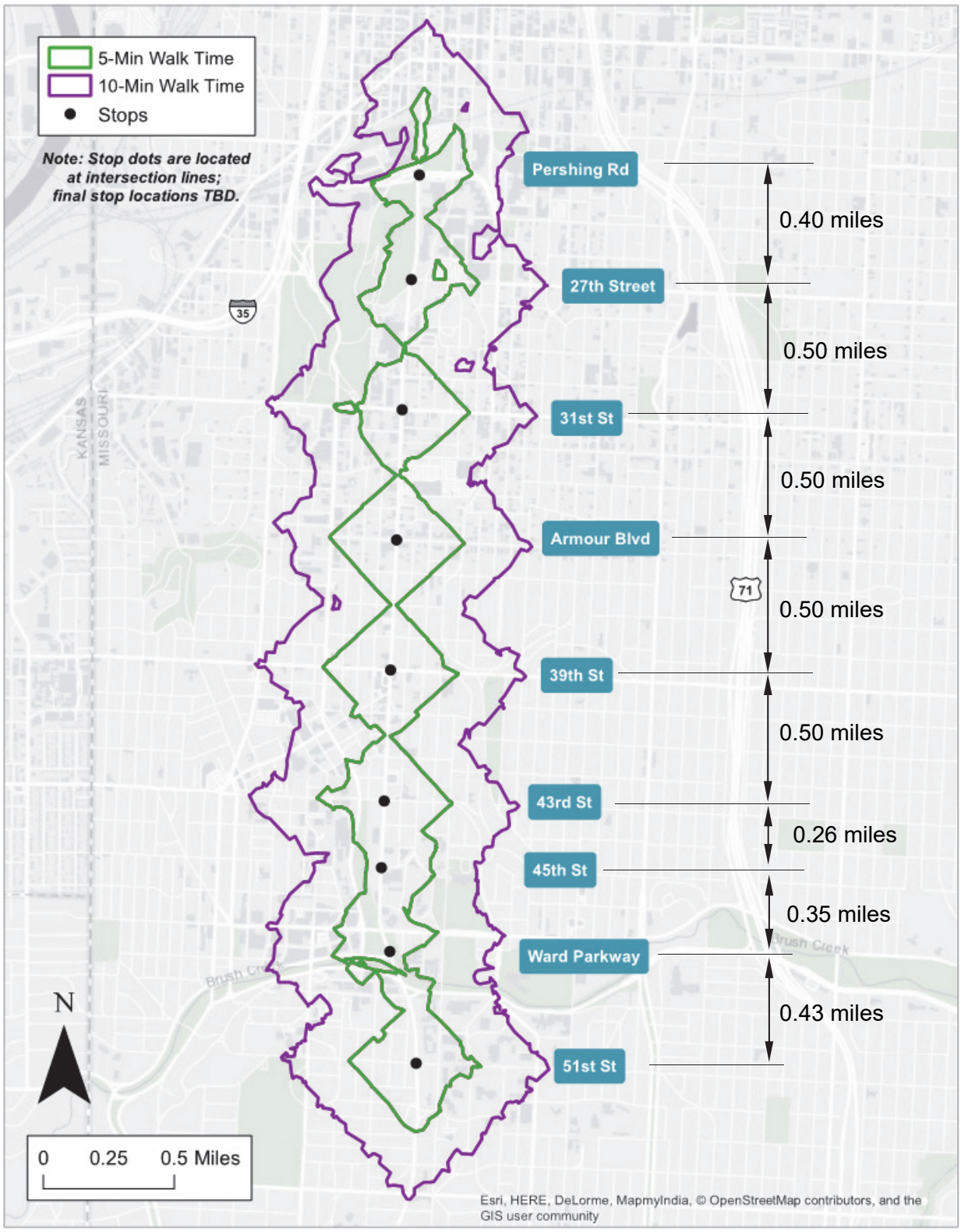
With the above caveats in mind, the overall population and employment totals within the walk-sheds of the two scenarios are very similar – within two percent in all cases but one (which is within five percent). Thus, the study team concluded that the configuration shown in **Figure X-9** serves an essentially equivalent population and employment base to the initial configuration shown at the public meeting, with the additional benefit of providing a five-minute walk time to a station-stop from anywhere along Main Street.

Table X-9: Walk-Shed Population / Employment Comparison: Initial vs. Refined Recommendation

	Population		Employment	
	Initial	Refined	Initial	Refined
Within 5-minute walk	5,660	5,814	12,908	13,538
Within 10-minute walk	16,947	16,919	42,552	42,199

Source:
Population - American Community Survey 5-Year Estimates (2012-2016), Block Group data
Employment - LEHD Workplace Area Characteristics (2015), Block data
See memo text regarding the granularity of the census geography vs. the size of the walk-sheds.

Figure X-9: Walk-Sheds for Refined Recommendation



Key Outcomes of Refined Stop Recommendations

To summarize, the refined evaluation produced a slightly revised list of station-stops with the following key outcomes:

- Provides for equitable access to streetcar service for the entire corridor (five-minute walk or better from anywhere on the alignment)
- Fills gaps in coverage that existed in the initial recommendations
- Responds directly to public input received
- Serves a greater number of people and jobs within a five-minute walk than the initial recommendations
- Improves station-stop spacing and route-wide operational performance
- Directly supports initial evaluation criteria related to regional connectivity, bus integration, ridership, pedestrian demand, and economic development
- Defines the approximate location of station-stops that will be carried forward into the design phase.

Figure X-10: Station Stop Locations Recommendation