4.0 INDEPENDENCE CORRIDOR TRANSIT IMPROVEMENT ALTERNATIVES

The *Independence Avenue BRT Planning and Feasibility Study* assessed various alternatives to improve bus-based transit services between Kansas City and the City of Independence. In the past, the corridor has been carefully studied for the feasibility of reintroduction of streetcars to Independence Avenue in the *NextRail KC* plan. This current planning effort is focused on the demand and feasibility of development of BRT and supporting RideKC Bus and IndeBus services in and around the Independence Avenue corridor and within the City of Independence. This section provides details of alternatives considered for alignment of BRT and RideKC Bus route improvements that include alignment selection and operations options considered. Finally, this section provides a preferred conceptual alignment and service plan that may be advanced for more detailed planning in the future.

4.1 MAX BUS RAPID TRANSIT BACKGROUND

BRT systems have developed differently to adapt to their urban environment and to meet the needs of the cities where they operate. In the mid-2000's, the KCATA developed an innovative approach to BRT planning and implementation that was scaled to the core of Kansas City with the deployment of the Main Street MAX (Metro Area Express) BRT in July 2005. Because of lower traffic volumes and low levels of congestion, the Main Street MAX did not require the construction and high capital cost of dedicated bus guideways to achieve improved travel speeds and reliability allowing the project to be delivered more economically than other BRT projects in the United States at that time.

The MAX system featured a branded identity that used specialized BRT vehicles and incorporated a uniquely designed stations as seen in **Figure 45**. Stations consist of a lighted shelter with an accompanying 15-foot-high identifying marker, containing a real-time next bus arrival display. To improve travel time and schedule reliability, Main Street MAX collaborated with the City of Kansas City to develop MAX 'Bus Only Lanes' in the Main Street corridor for the peak hours in the peak travel direction (i.e. northbound in the AM peak / southbound in the PM peak). Another important component improving reliability was in introduction of Transit Signal Priority (TSP) to the Kansas City region. TSP systems communicate between an Automatic Vehicle Locator (AVL) on-board the BRT vehicles and TSP equipped traffic signals. When a BRT vehicle is operating behind schedule the TSP system may hold a green light longer allowing the BRT vehicle to advance through the intersection, or may shorten the duration of a red signal to allow the bus to advance.

Figure 45: Original MAX BRT Branding, Station, Vehicle

The MAX BRT model had proven so successful that planning began for the second route in the Troost Avenue corridor in 2007 and began operation in 2011. Troost MAX greatly improved transit service in one of the most heavily utilized routes in the Kansas City metro and incorporated new, environmentally friendly features that built on the foundation of the Main Street MAX. These 'green' features included diesel-electric hybrid BRT vehicles, rain gardens at select stations, pervious pavement at park and

ride lots and other features. Troost MAX was also the first to incorporate public art as another way for transit to improve and promote the community it serves. Troost MAX experienced similar success as Main Street MAX and led to the development of the third MAX line in the Prospect Corridor that is currently under construction. Prospect MAX is planned to begin operation late in 2019. If feasible, and implemented, a MAX service in the Independence corridor would be the fourth MAX BRT corridor in Kansas City.

4.2 INDEPENDENCE AVENUE TRANSIT OPERATIONS PLANNING

4.2.1 ALIGNMENT ALTERNATIVES

One of the first steps in assessing the feasibility of a future BRT service in the Independence Avenue study area is to determine the most appropriate alignment. The portion of the existing 24 Independence operating along Independence Avenue in Kansas City was would remain on that street from approximately Charlotte Street to the city boundary with the City of Independence. Two areas that presented multiple routing alternatives were within the City of Independence and downtown Kansas City.

CITY OF INDEPENDENCE

Through the planning process, four route alternatives were developed for the portion of 24 Independence in the City of Independence, including the current alignment along Winner Road. These four alternatives are depicted in **Figure 46** below.

The process for evaluating a preferred route for enhanced bus transit in Independence included a broad range of criteria. The existing bus route along Winner Road was evaluated, along with proposed routes on Truman Road and US Highway 24. Among

Figure 46: 24 Independence Alignments in Independence, MO

the categories used for weighing the most optimal route, were employment density, projected ridership demand, existing infrastructure, approximated travel time, economic development opportunities, and connections to other transit services.

Figure 47 presents recent average weekday passenger boarding activity on 24 Independence for all bus stops in the City of Independence along its current alignment along Winner Road to the Independence Transit Center. Most bus stops along the Winner Road alignment have fewer than five-passenger boardings per day. The two most significant stops in terms of passenger boarding activity are the Independence Transit Center where transferring to and from all IndeBus system routes occur. This location has the greatest boarding activity in the city. The other important location is the bus stop located on US 24 Highway at Brookside Avenue. This stop provides another connection point to the IndeBus system with a transfer opportunity to/from the IndeBus Orange Route.

Utilizing an initial scoring system based upon these factors, as seen in **Table 10**, the Winner Road corridor was not comparable to the other two corridors in overall suitability. Thus, a more detailed comparative study was done between Truman Road and the 24 Highway alternatives. Although both routes were similar in certain regards, the Truman Road corridor proved more efficient based upon a set of critical factors. These included overall location, proximity to transit-dependent populations, the presence and condition of connecting sidewalks, existing transit stops, and directness of service to the Transit Center, which reduces overall operations and maintenance costs.

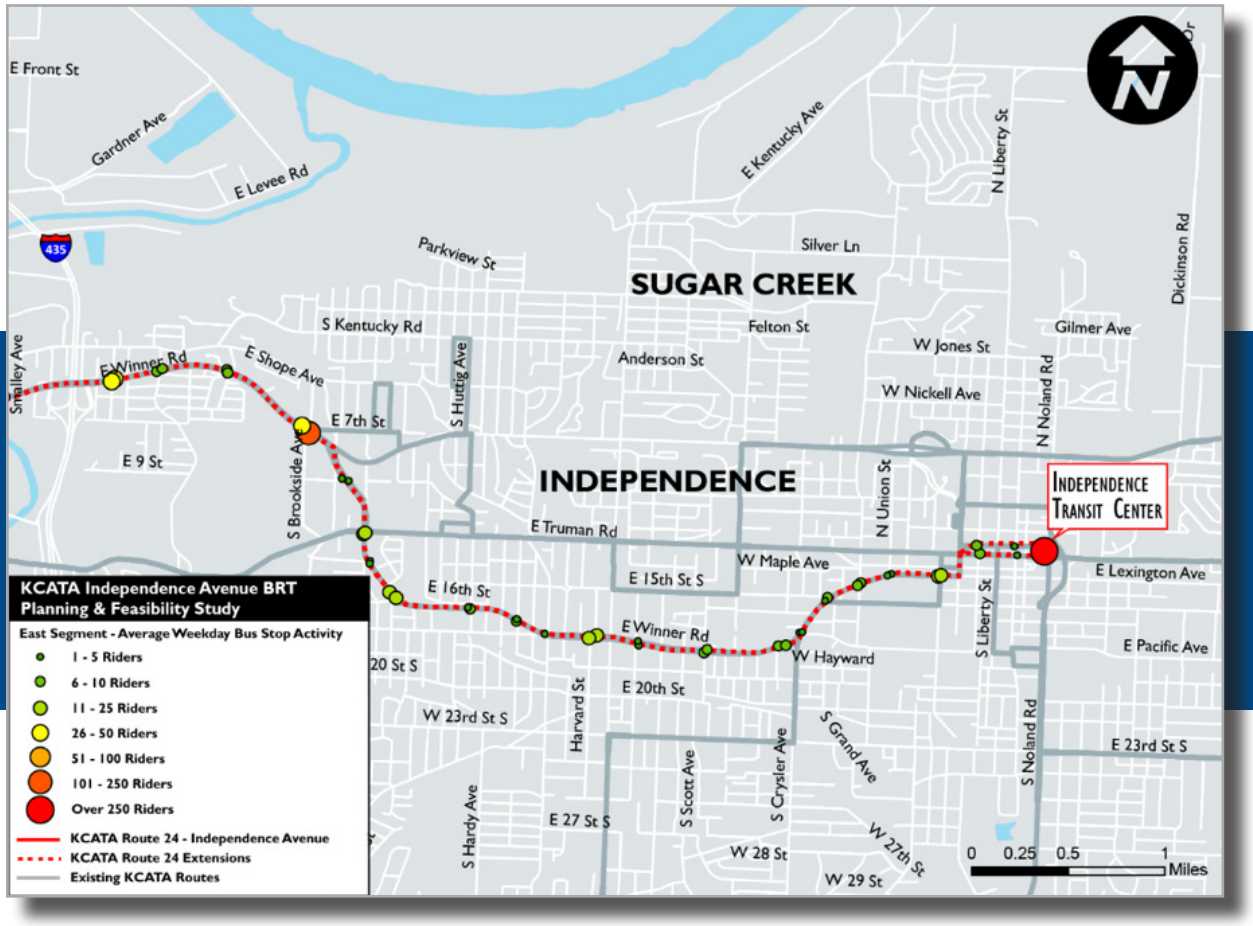


Figure 47: 24 Independence Weekday Boarding Activity in Independence

Alignment Alternative	Estimated Population (1/4 mile)	Estimated Employment (1/4 mile)	Corridor Length (miles)	Approx. Travel Time (minutes)	Pedestrian Infrastructure/ Connectivity	Live - Work Analysis	Economic Development Opportunity	Major Destinations Directly Served
E - 1: Winner	**23,905**	**25,346**	**12.6**	**44.0**	**1**	**2**	**5.82 (4)**	**4**
E - 2: Truman	**20,257**	**24,111**	**11.5**	**40.5**	**2**	**1**	**25.45 (1)**	**5**
E - 3: 24 Hwy	**21,581**	**23,476**	**12.0**	**42.0**	**4**	**4**	**34.02 (1)**	**3**
E - 4: Bess Truman	**20,377**	**23,658**	**11.7**	**41.0**	**3**	**3**	**31.04 (3)**	**3**

Table 10: Transit Alignment Selection Criteria and Scoring

Each alignment alternative closely examined the number of nearby residents and employment opportunities to the proposed route as well as how directly that alignment reached the Independence Transit Center. Winner Road had the highest number of residents and jobs within ¼ mile of the alignment. Truman Road had the lowest number of residents within ¼ mile while 24 Highway had the lowest number of jobs within ¼ mile. The Truman Road alternative was the most direct in terms of route mileage and travel time.

The analysis also examined the ease of access to a transit alignment by reviewing the availability of sidewalks in the area surrounding a proposed transit route as well as slopes to determine how easily a transit user could safely walk to a bus alignment. This is shown as a composite score as 'Pedestrian Infrastructure/Connectivity'. Winner Road and Truman Road scored the highest in terms of sidewalk availability and more level terrain. Details on this walkability analysis can be viewed in Appendix 3.

The alignment selection analysis examined the number of people traveling to the areas around the four alignment alternatives for employment as well as residents living in those same areas traveling to work in the Kansas City region. This Live/Work analysis showed that the Truman Road alternative had the greatest number of people coming to that corridor for employment. The alignment criteria also examined the potential for future redevelopment along potential alignments. Both Truman Road and 24 Highway scored highest in terms of acres ready for potential redevelopment. More details on this Live/Work Analysis are available in Appendix 4.

Economic Development Opportunity was measured assessing the total number of acres of developable parcels along each alignment alternative. The numbers shown in parentheses represents an informal ranking of development potential for each alignment based on experience of the development community. Results of this examination are in Appendix 5.

With these considerations, Truman Road is the preferred route for future RideKC transit service within the City of Independence. If 24 Independence is moved from its current alignment along Winner Road further assessment of IndeBus service would be needed to determine best ways to provide transit service coverage to areas that would potentially lose direct access to 24 Independence.

It was determined early in the planning study that annual operating costs along with lower ridership demand made BRT service infeasible at this time for the City of Independence. Plans were developed for improved local bus service within the City of Independence, with the overall goal of establishing

a future Truman Road corridor that could be further developed to BRT when ridership demand increased and additional operational funding was identified. Hourly local RideKC Bus service would be maintained.

DOWNTOWN KANSAS CITY

In the downtown Kansas City portion of the study area, four initial route alignment alternatives were assessed as shown in **Figure 48**. Early in the route alignment evaluation process, the study assessed where residents along potential route alignments lived and worked. This analysis showed a high concentration of people traveling to the Crown Center and Hospital Hill areas for employment. Because of the high number of work trips being made to this area, it was determined that an optimal alignment for a future BRT service would directly connect to Crown Center with a one-seat ride. Three of the initial BRT route alternatives in downtown Kansas City share a similar southern terminus point near the vicinity of the intersection of Grand Boulevard and 27th Street. This location would be coordinated with the planned southern extension of the KC Streetcar.

A secondary purpose for including Grand Boulevard as a primary corridor for the Independence Avenue BRT is the potential discontinuation of the Main Street MAX in the Grand Boulevard Corridor in the next five to ten years. Planning and engineering are rapidly advancing to extend the KC Streetcar from its current terminus at Main Street and Pershing Road south along Main Street to approximately 51st Street and Brookside Boulevard. It is assumed when the KC Streetcar becomes operational in this corridor, the Main Street MAX would no longer be operated as it would provide a redundant service. The future discontinuation of Main Street MAX

Figure 48: Downtown KC BRT Alignment Alternatives

Alignment Alternative	Estimated Population (1/4 mile)	Estimated Employment (1/4 mile)	Corridor Length (miles)	Approx. Travel Time (minutes)	Pedestrian Infrastructure/ Connectivity	Live - Work Analysis	Economic Development Opportunity	Major Destinations Directly Served
W-1: River Market / Crown Center	**14,335**	**69,176**	**5.8**	**20.5**	**Good**	**1**	**40.82 (2)**	**11**
W-2: 11th / 12th TEC Corridor	**13,846**	**48,259**	**2.7**	**11.5**	**Good**	**4**	**13.99 (2)**	**7**
W-3: EVTC / Crown Center	**15,863**	**69,973**	**5.0**	**17.5**	**Good**	**3**	**37.80 (1)**	**14**
W-4: Admiral / Grand	**14,335**	**69,176**	**5.0**	**17.5**	**Good**	**2**	**35.56 (3)**	**9**

Table 11: Downtown BRT Alignment Evaluation

would leave the Grand Boulevard Transit Emphasis Corridor (TEC) without a high frequency MAX route. Proposed alignment alternatives for the future Independence Avenue BRT would maintain a high-frequency transit service in the Grand Boulevard corridor.

To more objectively evaluate each of the proposed alignments, several criteria were developed to better determine the benefits of each option. A summary of evaluation criteria and scoring are summarized in **Table 11**.

In this evaluation, the W-3: East Village Transit Center (EVTC) to Crown Center route served the greatest number of residents and employees as well as the most major destinations. Alternative W-3 would serve the EVTC, the Government District, and the Crown Center area.

Alternative W-3 had multiple operational challenges that required further investigation before recommending it as one of the final alternatives. These challenges included providing direct service to the EVTC in both directions (i.e. outbound and inbound), utilizing the existing MAX BRT station on E 11th Street at Grand Boulevard while allowing for an immediate left turn onto Grand Boulevard when traveling southbound, and routing through the EVTC located on the southeast corner of E 12th Street and Charlotte Street.

Further evaluation determined that the W-3: East Village Transit Center/Crown Center alignment alternative was not optimal given the operational challenges noted above. The study team and advisory committee recommended advancing the planning and feasibility study with two alignment alternatives in the downtown area which would include Alternative W-4: Admiral / Grand and a new alternative.

PASEO / 11TH AND 12TH STREET ALTERNATIVE

With the operational challenges identified in Alternative W-3, a new alignment option was developed that had not been previously considered. This new alternative (Alternative W-5), depicted in **Figure 49**, would turn south from Independence Avenue in the inbound direction, onto Paseo Boulevard, then turn west on 12th Street. The BRT alignment would then serve the EVTC at a new station located on E 12th Street at Charlotte Street before turning north on Charlotte Street for one block, then west on 11th Street, before turning south on Grand Boulevard. As with the other alternatives, this option would terminate south of Crown Center near 27th Street. The exact terminus and layover point not yet been identified. This will allow service to Crown Center in both the inbound and outbound directions, limiting the need for passengers to wait through the trip's layover. This alignment better

serves the EVTC in both travel directions, provides direct service to the Government District as well as utilizes the Transit Emphasis Corridor (TEC) stations along 11th / 12th Streets and Grand Boulevard.

This alignment will require careful coordination with planned bicycle infrastructure soon to be constructed on Grand Boulevard at 12th Street. In the northbound direction, MAX buses would need to make a right turn from Grand Boulevard onto E 12th Street, which could create a potential conflict point between cyclists and buses. The safety improvements, such as the addition of a bicycle phase to the existing traffic signal, as a mitigation and safety enhancement for BRT operation and cyclists traveling in the area are part of the plan's recommendations.

This alterative will require more detailed investigation in the area along E 12th Street from Paseo Boulevard to Troost Avenue where roadway widths are constrained. Additionally, within this segment of E 12th Street, the City of Kansas City has conceptual plans for the construction of a two-way cycle track along the northern side of E 12th Street. The cycle track facility would further constrain the existing roadway capacity potentially making it challenging for the incorporation of rapid bus service through this corridor.

Between the Paseo and Troost Avenue, this segment of the conceptual alignment is currently a one-way street in the eastbound direction. If this alignment alternative were to be implemented, KCATA would need to coordinate closely with the City of Kansas City to either develop a bus only counter-flow lane or have this segment of the corridor be converted

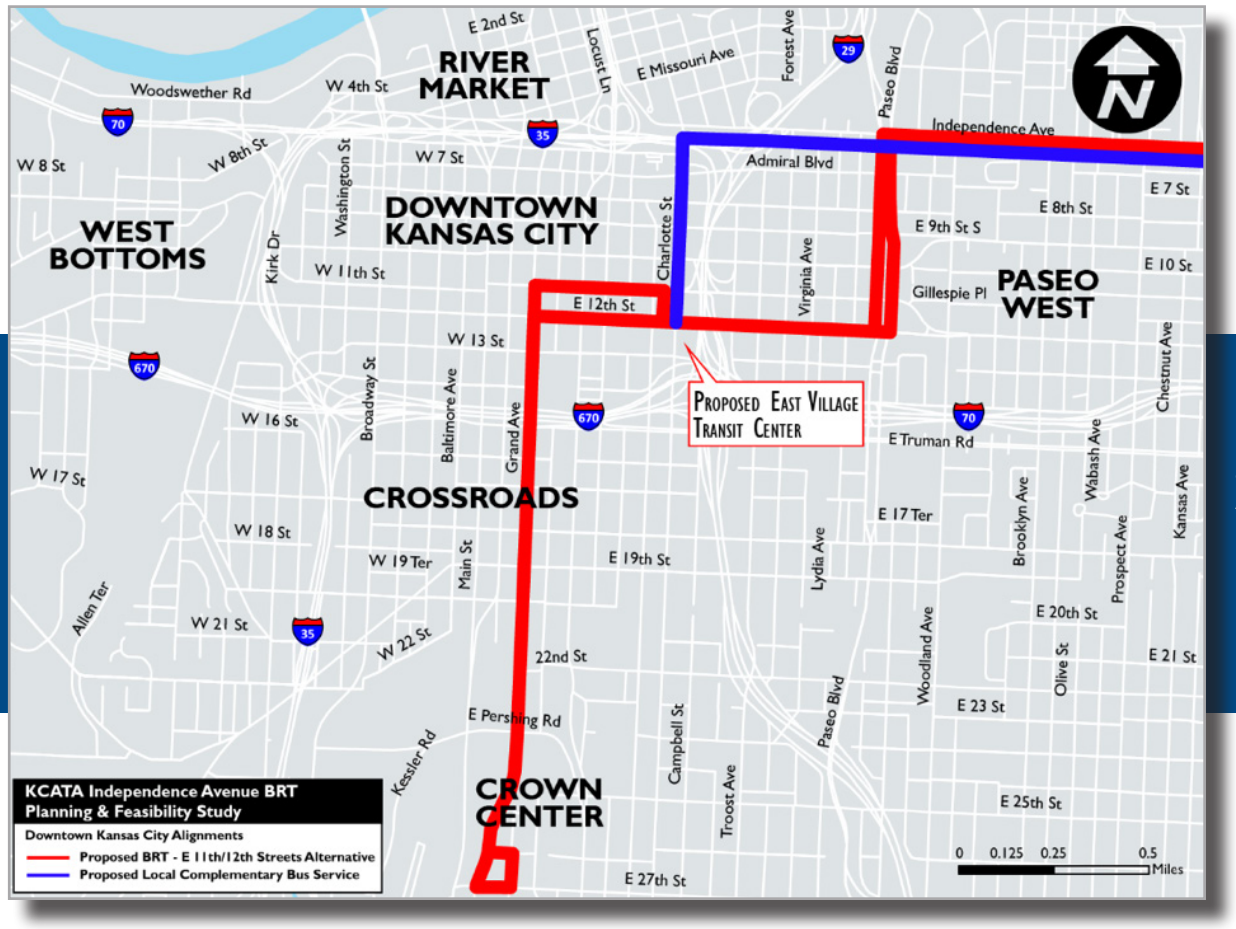


Figure 49: Paseo / 11th and 12th Route Alernative

into a two-way operation for all modes. The segment of the corridor along E 12th Street west of Troost Avenue currently operates as a one-way street in the eastbound direction but there are already plans to convert this segment of the corridor west of Troost Avenue to a two-way operation as part of the Prospect MAX and East Village Transit Center project.

ADMIRAL / GRAND BOULEVARD ALTERNATIVE

The second alternative to be carried forward in the BRT planning assessment is the 'Admiral / Grand' alignment (Alternative W-4) depicted in light blue in **Figure 50** below. This alignment would turn south on Charlotte Street from Independence Avenue in the inbound direction to Admiral Boulevard, then east to Grand Boulevard, where the route would turn south on Grand Boulevard, terminating near 27th Street south of Crown Center. This option would provide MAX BRT Service for almost the entire length of the Grand Boulevard TEC Corridor. It is assumed that once streetcar service is extended to the Plaza, the Main Street MAX route would be discontinued, leaving the Grand TEC Corridor without MAX BRT service. This alternative would keep high frequency BRT service on the Grand TEC Corridor if the Main Street MAX is suspended by the streetcar extension. The east/west portion of this alternative along Admiral would also require conversion to two-way traffic operations in the future if this alternative is selected.

The 'Beyond the Loop' Planning and Environmental Linkages (PEL) study is currently exploring options for the reconstruction of the interchange of Missouri Highway 9 and Interstate 29/35 that would lower the roadway profile to be at-grade. This change would allow Independence Avenue to be reconnected with

Figure 50: Admiral / Grand Alternative

Alignment Alternative	Estimated Population (1/4 mile)	Estimated Employment (1/4 mile)	Corridor Length (miles)	Approx. Travel Time (minutes)	Pedestrian Infrastructure/ Connectivity	Live - Work Analysis	Economic Development Opportunity	Major Destinations Directly Served
W – 1: River Market / Crown Center	14,335	69,176	5.8	20.5	Good	1	40.82 (2)	11
W – 2: 11th / 12th TEC Corridor	13,846	48,259	2.7	11.5	Good	5	13.99 (2)	7
W – 3: EVTC / Crown Center	15,863	69,973	5.0	17.5	Good	3	37.80 (1)	14
W – 4: Admiral / Grand	14,335	69,176	5.0	17.5	Good	2	35.56 (3)	9
W – 5: Paseo / 11th & 12th	18,650	67,595	6.2	21.7	Good	4	29.14	8

Table 12: Downtown BRT Alignment Evaluation Criteria

the River Market area and open a direct connection to Grand Boulevard from Independence Avenue. If this significant change were to take place in the future, it is recommended that the alignment would be rerouted to operate along Independence Avenue to Grand Boulevard and continue towards Crown Center. The BRT route in this alternative would provide high frequency service along the full Grand TEC Corridor, but would not directly serve the EVTC or the Government District.

The local route, shown in the darker blue above would turn south on Charlotte Street and layover at the EVTC. Other operational options for 'local' service are being assessed including BRT only along Independence Avenue with no underlying local service.

4.2.2 ALIGNMENT SELECTION CRITERIA

With two potential BRT alignment alternatives being advanced, one of the two options will need to be selected for assessment of traffic impacts using a VISSIM traffic micro-simulation.

To determine which of the two remaining alignment alternatives should be modeled, the previous alignment rating criteria was updated to include Alternative W-5 and is presented in **Table 12**. This analysis shows that Alternative W-5 serves the highest population within a ¼ mile of the proposed alignment. While not the highest, the Paseo Alternative also serves over 67,000 jobs in an approximate ¼ mile along the alignment. Because of these factors, the consultant team recommended modeling the Paseo Alternative for VISSIM traffic modeling to assess traffic impacts.

4.3 SERVICE PLAN

For the previous MAX BRT corridors, KCATA has provided both high-frequency/limited stop rapid service complemented with local bus service on the same alignment. The underlying local service generally operates at a reduced headway (e.g. 30 or 60 minutes) and has a shorter span of service compared to the BRT service. The local service utilizes all existing bus stops along the corridor that would not be served by the proposed BRT service. BRT Station generally characterized by a station/stop spacing of 2-3 stations/stops per mile compared to 5-8 stops per mile for local bus service. The Independence Avenue BRT Planning Study has used this past service model as a foundation for the service planning component of the study.

Other characteristics (e.g. peak/midday frequencies, service span, etc.) of the service plan for the corridor were modeled to meet the BRT service requirements to qualify the project for the Federal Transit Administrations (FTA) Small Starts Capital Investment Program, to provide the optimal level of service to meet the projected demand for transit, and to maintain transit connectivity with the City of Independence and the IndeBus system.

Currently, transit service along the Independence Avenue corridor is provided by RideKC 24 Independence – Independence. The route operates between downtown Kansas City and the intersection of Winner Road and White Avenue near the Kansas City/Independence border with hourly extensions to the Independence Transit Center via Winner Road along with some trips to Brookside. Most trips utilize a bus pull-off located on White at Beacon as a layover and turn around point to return westbound towards downtown Kansas City. 24 Independence offers 15-minute headways between downtown Kansas City and Winner Road/White Avenue throughout much of the day on weekdays with 20-minute headways on Saturdays and 30-minute headways on Sundays. Service to the east of Winner Road/White Avenue to the Independence Transit Center in Independence, MO is provided hourly during weekdays and Saturdays with no service on during the evening, Sundays, or holidays.

4.3.1 OPERATIONS PLANNING ALTERNATIVES

For planning purposes, the preferred alignment for the BRT service along the Independence Avenue corridor will operate between Crown Center and an unspecified eastern terminus facility located near Winner Road and White Avenue where a new transit facility/mobility hub would be developed for a BRT turnaround, as well as a potential location to provide bicycle or car share facilities and possibly accommodate other modes of travel. Between Crown Center and Independence Avenue,

Figure 51: Operations Alt. 1 - BRT with Local Service to City of Independence

the alignment would operate along The Paseo and 11th/12th Streets and utilize the existing transit emphasis corridor (TEC) stations along 11th/12th Streets and Grand Boulevard used by other MAX routes. The BRT alignment is illustrated in red in **Figure 51**.

For each of the following alternatives, peak vehicle needs are detailed to operate the proposed service plan. For the peak vehicle analysis compressed natural gas or diesel buses are assumed. If zero-emission battery electric buses are utilized, the peak vehicle requirement would need to be reexamined depending on recharging needed of an electric MAX BRT fleet for Independence Avenue.

ALTERNATIVE 1 – BRT WITH LOCAL SERVICE TO CITY OF INDEPENDENCE

Alternative 1 mirrors previous MAX BRT services profiles that operate BRT in combination with underlying local service to continue providing service to stops located between MAX stations. For this alternative, the local service would operate between the proposed East Village Transit Center (EVTC) located on Charlotte Street between 12th and 13th Streets and the Independence Transit Center along Independence Avenue and, within the City of Independence, Truman Road. The proposed local service is recommended to operate along Truman Road rather than Winner Road as the existing 24 Independence utilizes.

The BRT service would operate along the corridor with 10-minute headways during the peak and midday on weekdays, 30-minute headways during weekday evenings, 15-minute headways on Saturdays, and 30-minute headways on Sundays and holidays.

The local service would operate hourly on weekdays and Saturdays. No Local service would be operated on Sundays and holidays to match existing IndeBus operations. Under the proposed service plan, Alternative 1 would require 5 BRT vehicles and 2 local buses to operate during peak service. Local bus service would be operated using a 30-foot heavy-duty bus. **(Table 13)**

ALTERNATIVE 2 – BRT WITH INDEPENDENCE CONNECTOR ROUTE

Alternative 2 would operate the same level of BRT service as described In Alternative 1. The major difference in this alternative involves truncating the local bus service to operate solely between the proposed mobility hub near Winner Road/White Avenue and the Independence Transit Center rather than operate local service along the entire length of the proposed corridor **(Figure 52)**. The proposed Independence Connector route would require a transfer to the high-frequency Independence MAX BRT service at the proposed mobility hub for riders traveling to/from the City of Independence.

By truncating the underlying local service, this alternative would not have any local bus service along the segment of the corridor with proposed BRT service (i.e. Crown Plaza to Winner Road/White Avenue via EVTC and Independence Avenue). This

		Weekday	Saturday	Sunday
Alternative 1	BRT Buses	5	4	2
	Local Buses	2	2	9
	Total Buses	7	6	2

Table 13: Alternative 1 Peak Vehicle Requirements

Figure 52: Alternative 2 - BRT with Independence Connector Route

is largely due to the proposed BRT station spacing along the corridor being, on average 0.3 miles apart, which is shorter than the average 0.5-mile station/stop spacing distances used on previous MAX corridors and very similar to current stop spacing recommendations for local bus services. The proposed closer station/stop spacing would continue to be convenient for residents and riders along the corridor without the need for underlying local service.

The proposed connector route would be timed to meet the BRT service hourly Monday through Saturday with no service on Sundays or holidays to match existing IndeBus operations. This alternative would require 5 BRT vehicles and 1 local vehicle to operate the service in peak weekday periods. Local bus service would be operated using a 30-foot heavy-duty bus. **(Table 14)**

		Weekday	Saturday	Sunday
Alternative 2	BRT Buses	5	4	2
	Local Buses	1	1	0
	Total Buses	6	5	2

Table 14: Alternative 2 Peak Vehicle Requirements

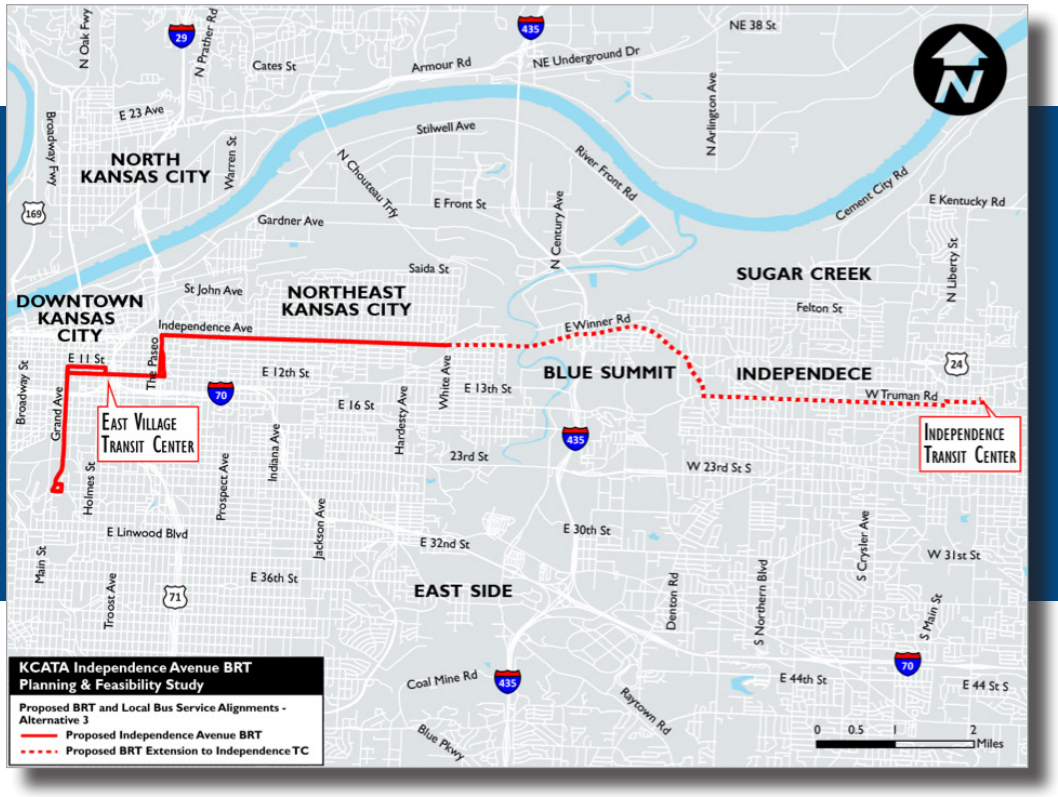


Figure 53: Alternative 3 - BRT with Local Extension to Independence

ALTERNATIVE 3 – BRT WITH LOCAL EXTENSION TO INDEPENDENCE

Alternative 3 would operate similarity to the Main Street MAX route where BRT vehicles would operate beyond the designated BRT corridor but provide local bus type service (i.e. lower frequency, fewer amenities, etc.), as shown in **Figure 53**.

In this alternative, the Independence Ave MAX would operate as a BRT service with 10-minute headways on weekdays between Crown Center and the proposed mobility hub at Winner Road and White Avenue. Once an hour, a red MAX vehicle would continue east to the Independence Transit Center via Truman Road. This hourly extension would operate as a local service. The hourly local extension to the Independence Transit Center would be operated on weekdays and Saturdays, with no service on Sundays and holiday to match IndeBus operations.

Alternative 3 would require a total of 7 BRT vehicles to support the operations plan at peak periods on weekdays (**Table 15**). The extension to the

		Weekday	Saturday	Sunday
Alternative 3	BRT Buses	5	3	2
	Local Segment Buses	2	2	0
	Total Buses	7	5	2

Table 15: Alternative 3 Peak Vehicle Requirements

Independence Transit Center would require two MAX vehicles to operate this portion of the route. For all peak vehicle fleet needs, FTA typically requires a twenty percent spare vehicle ratio. In recent years KCATA has had challenges securing consistent funding for vehicle replacement, especially for MAX services. It is recommended that KCATA consider a thirty percent spare vehicle ratio for the Independence Avenue BRT fleet to have sufficient spare vehicles as buses begin to reach the end of their useful life. In this scenario the seven peak vehicles needed in Alternative 3 would require an additional three vehicles to meet a thirty percent spare ratio.

4.3.2 OPERATIONAL ALTERNATIVES DETAILS

An operational summary for each of the three BRT and local bus service plans is presented in **Table 16**. BRT services would operate between 4:00 AM to 1:00 AM on weekdays with local service operating between 5:00 AM and 8:00 PM. Weekday headways for the MAX BRT would be similar to the other KCATA MAX routes with 10-minute headways throughout the AM/PM peaks and midday and 30-minute headways during weekday evenings. Both headways and span of service for the proposed MAX service are reduced on Saturdays, Sundays, and holidays to be in proportion with ridership demand.

Local service would operate between 5:00 AM and 8:00 PM Monday through Saturday and maintain a consistent 60-minute headway at all times of operation. No service would be provided on Sundays and holidays to match IndeBus operations. Since service to Independence is not provided on Sundays and holidays, it is recommended that underlying local service in Kansas City also not operate as it would be redundant with proposed MAX service. With this, only MAX service would

	Weekday					Saturday					Sunday				
	Span	Headway				Span	Headway				Span	Headway			
Alternative		AM	Mid	PM	Night		AM	Mid	PM	Night		AM	Mid	PM	Night
1 – MAX BRT	4:00a - 1:00a	10	10	10	30	5:00a - 1:00a	15	15	15	30	6:00a - 12:00a	30	30	30	30
1 – Local	5:00a – 8:00p	60	60	60		5:30a – 8:00p	60	60	60						
2 – MAX BRT	4:00a - 1:00a	10	10	10	30	5:00a - 1:00a	15	15	15	30	6:00a - 12:00a	30	30	30	30
2 – Local Connector	5:00a – 8:00p	60	60	60		5:30a – 8:00p	60	60	60						
3 – MAX BRT	4:00a - 1:00a	10	10	10	30	5:00a - 1:00a	15	15	15	30	6:00a - 12:00a	30	30	30	30
3 - Local Extension	5:00a – 8:00p	60	60	60		5:30a – 8:00p	60	60	60						

Table 16: Operational Alternatives - Span and Headways

Table 17: Annual Operations and Maintenance Cost Estimation

Alternative	Total Annual Revenue Miles	Total Annual Revenue Hours	Total Annual O&M Cost	KCATA Annual Cost Increase	KCATA Annual Cost Percent Increase	City of Independence O&M Share	Percent Increase for City of Independence
Existing 24 Independence	269,578	27,721	$2,569,830	NA	NA	$108,805	NA
1	461,182	33,603	$4,200,393	$1,630,563	63.5%	$122,523	12.6%
2	425,723	30,875	$3,891,514	$1,321,514	51.4%	$134,655	23.8%
3	407,966	33,387	$3,967,474	$1,397,645	54.4%	$178,843	64.4%

operate along the corridor and only to the proposed mobility hub near Winner Road/White Avenue Mobility Hub on Sundays and holidays.

4.4 ANNUAL OPERATION AND MAINTENANCE COST ESTIMATION

Annual operations and maintenance (O&M) costs for each alternative were estimated using current transit service cost parameters provided by KCATA as well as annual O&M cost share calculations for the City of Independence. The total number of annual revenue miles and hours of service for both the BRT and underlying local service for each alternative was calculated to project the annualized O&M costs. To accurately estimate the total annual O&M costs, the annual direct labor charge (based on revenue hours), annual direct mileage charge, the indirect mileage, and annual capital cost mileage (all based on revenue miles) totals were included in the complete service cost estimation for each alternative. A summary of existing service on 24 Independence and the estimated annual O&M costs for each alternative are presented in **Table 17**.

Of the three service alternatives developed, Alternative 1 which provides MAX BRT service along with underlying local service from the Independence Transit Center to the EVTC has the highest estimated annual O&M cost with a 63.5 percent increase in annual service costs. Despite having the highest overall O&M cost increase, Alternative 1 would have the smallest incremental change to the City of Independence's annual service contract with KCATA (12.6 percent cost increase) since only minimal increases to service (e.g. service span) for the City of Independence are recommended in this alternative.

Alternative 2, that provides MAX BRT to the Independence Avenue corridor along with a new connector route operating between the Independence Transit Center and the Winner Road/ White Avenue Mobility Hub, has the smallest increase to annual O&M costs with a 51.4 percent increase.

Alternative 3 would provide MAX BRT service to the Independence Avenue corridor between Crown Center and the Winner Road/White Avenue Mobility Hub with an hourly extension of a MAX vehicle to the Independence Transit Center from 5:00 am until 8:00 pm on weekdays and 5:30 am until 8:00 pm on Saturdays. Alternative 3 would have a 54.4 percent increase to annual O&M costs but would have the greatest increase for the City of Independence with a 64.4 percent increase to their annual service contract with KCATA due to extending service later into the evenings.

4.5 ADDITIONAL OPERATIONAL ALTERNATIVES CONSIDERED

In conjunction with Operational Plans 1, 2 and 3 discussed above, several other transit improvements or adjustments were considered to adjacent or connecting routes to enhance the overall transit network around the Independence Avenue corridor.

TRUMAN ROAD CORRIDOR CONNECTION

An additional alternative that was considered in the City of Independence involved the full discontinuation of 24 Independence. To offset this loss of service, 15 Truman Road and 16 Truman Road Limited would have existing AM and PM peak service expanded to provide all-day transit service from the Independence Transit Center to downtown KCMO along the Truman Road corridor. As alternatives 1, 2 and 3 each proposed some form of connection between the City of Independence along the Independence Avenue corridor, additional services to Routes 15 and 16 was not developed in further detail.

MAINTAINING TRANSIT SERVICE TO COLUMBUS PARK NEIGHBORHOOD

Alternative 3, which proposed using Paseo Boulevard to 12th Street along with no underlying local bus route, would cause the Columbus Park neighborhood to lose connectivity to transit services. To mitigate this loss of service the study team developed a proposed adjustment to 11 Northeast / Westside. 11 Northeast/Westside's existing alignment is seen in **Figure 54**. 11 Northeast / Westside intersects Independence Avenue and

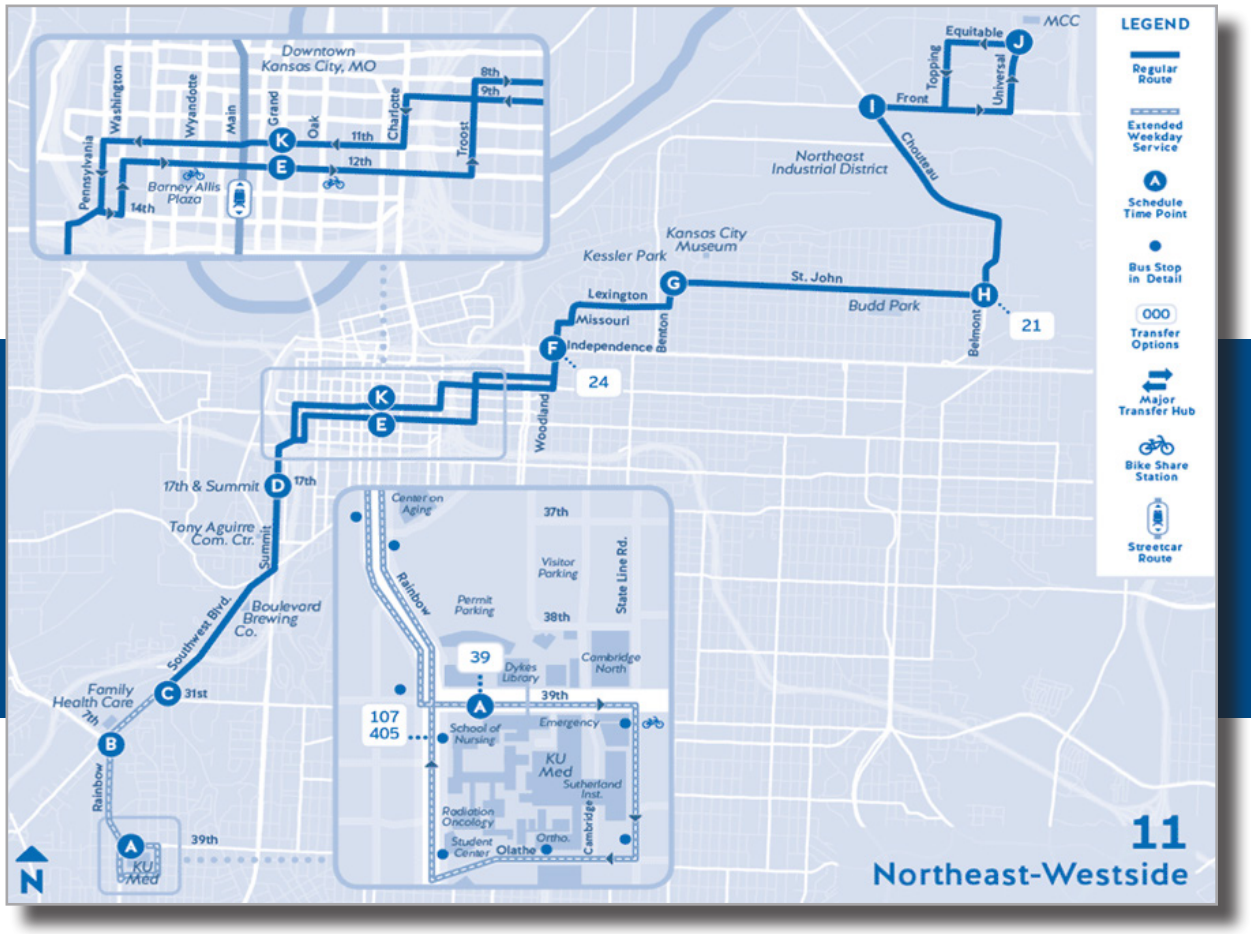


Figure 54: 11 Northeast / Westside

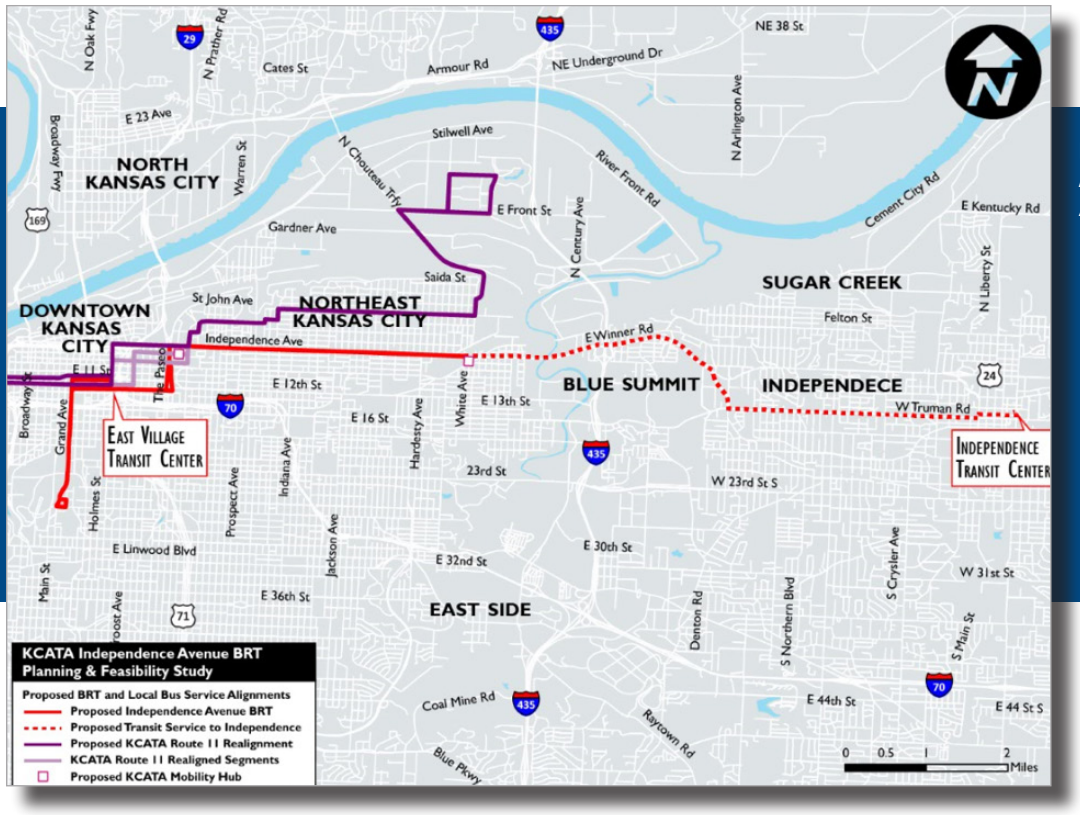


Figure 55: 11 Northeast / Westside Realignment Alternative

Woodland Road and continues south to 8th Street / 9th Street as the route approaches downtown Kansas City from the east.

Alternative 3 would shift transit service away from Columbus Park an alternative alignment of 11 Northeast / Westside was developed as displayed in **Figure 55**. This adjustment would have Route 11 turn west from Woodland Road on Independence Avenue to Charlotte Street for its inbound trip. From Charlotte Street, Route 11 would travel south to 11th Street where it would rejoin its current alignment. For the outbound trip the revised Route 11 would us 12th Street, then travel north on Charlotte to Independence Avenue where it would turn east until Woodland Road, where it would rejoin the existing alignment. This is illustrated in the dark purple line above.

This adjustment to Route 11 would maintain transit service to the Columbus Park neighborhood. Further analysis of impacts to current ridership along 8th / 9th Streets would need to be examined and public comment prior to any route adjustment would also be required.

RIDEKC ROUTE ADJUSTMENTS FOR EASTERN MOBILITY HUB (INDEPENDENCE AVE /WINNER RD)

To improve connectivity with multiple routes at the planned mobility hub near the intersection of Independence Avenue and Winner Road, three other RideKC Bus routes operating in the area could adjust their current alignments to serve the new hub. These routes include 9 9th Street, 21 Cleveland / Antioch, and 23 23rd Street. Conceptual route adjustments are described below.

9 – 9TH STREET

Figure 56 illustrates a proposed relocation of the 9th Street route's eastern terminus near Truman Road and Ewing Road north to the new mobility hub. 9th Street would discontinue the segment

Figure 56 (right): 9 - 9th Street Realignment

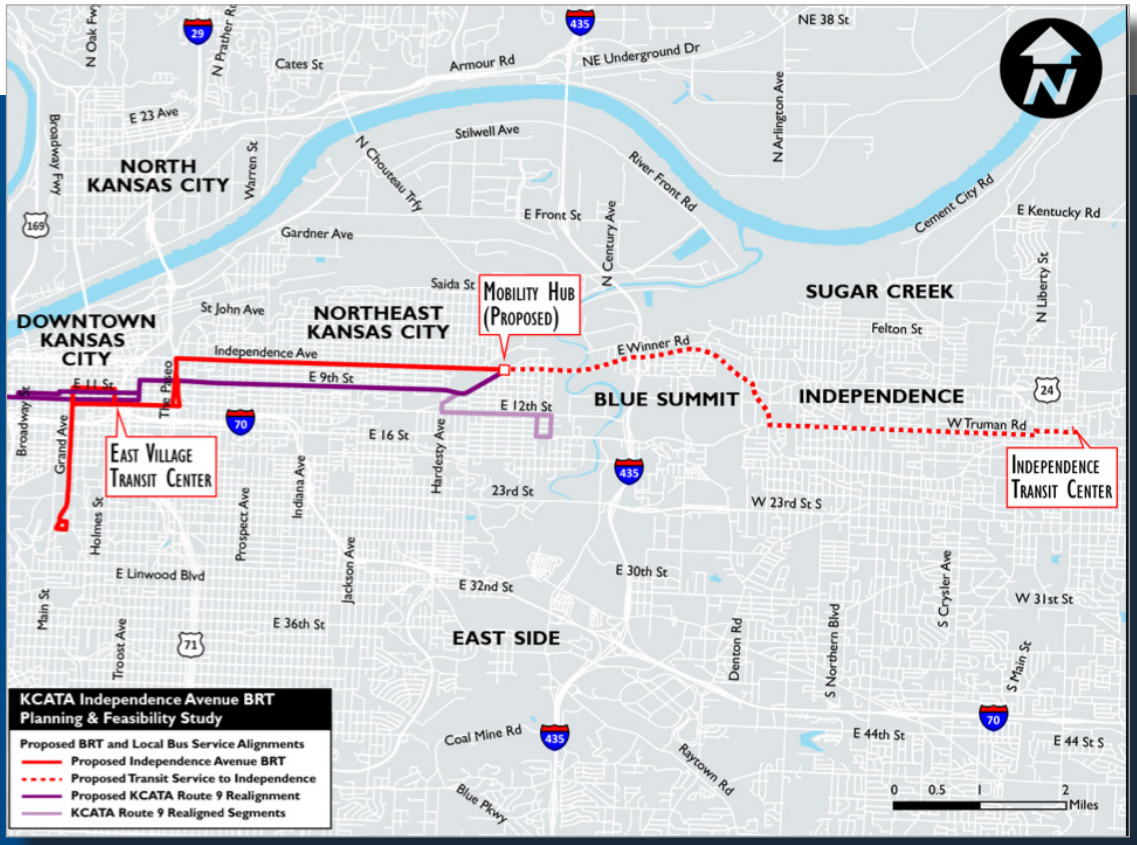


Figure 57 (left): 21 Cleveland / Antioch Realignment

along 12th Street. Further analysis would need to be developed to assess ridership impacts cause by the discontinuation of service along this segment of 12th Street to Ewing.

21 – CLEVELAND / ANTIOCH

Currently 21 Cleveland / Antioch intersects the Independence Avenue corridor at Topping Avenue, near the Price Chopper grocery store, the travels east/west along Independence Avenue between Topping and Van Brunt Boulevard where the route turns south. 21 Cleveland / Antioch is unique in the RideKC system in that it is the only route to travel north and south across the Missouri River without passing through downtown, providing excellent north/south connectivity to the east side of Kansas City. The proposed realignment of 21 Cleveland / Antioch in **Figure 57** would bring the alignment east from Topping Avenue to the mobility hub, then south along Winner Road, connecting to 9th Street where the route would rejoin its current alignment at Van Brunt Boulevard.

23 – 23RD STREET

Today 23-23rd Street's eastern terminus is located on Wheeling Avenue, north of 23rd Street. The proposed realignment as displayed in Figure 58 would extend the route north, along Topping Avenue, then northeast along Winner Road to terminate at the new mobility hub.

By adjusting these routes to the mobility hub a new multi-route transfer location would be created providing connectivity to and from multiple corridors in all directions to the east side of the Independence Avenue corridor and surrounding area.

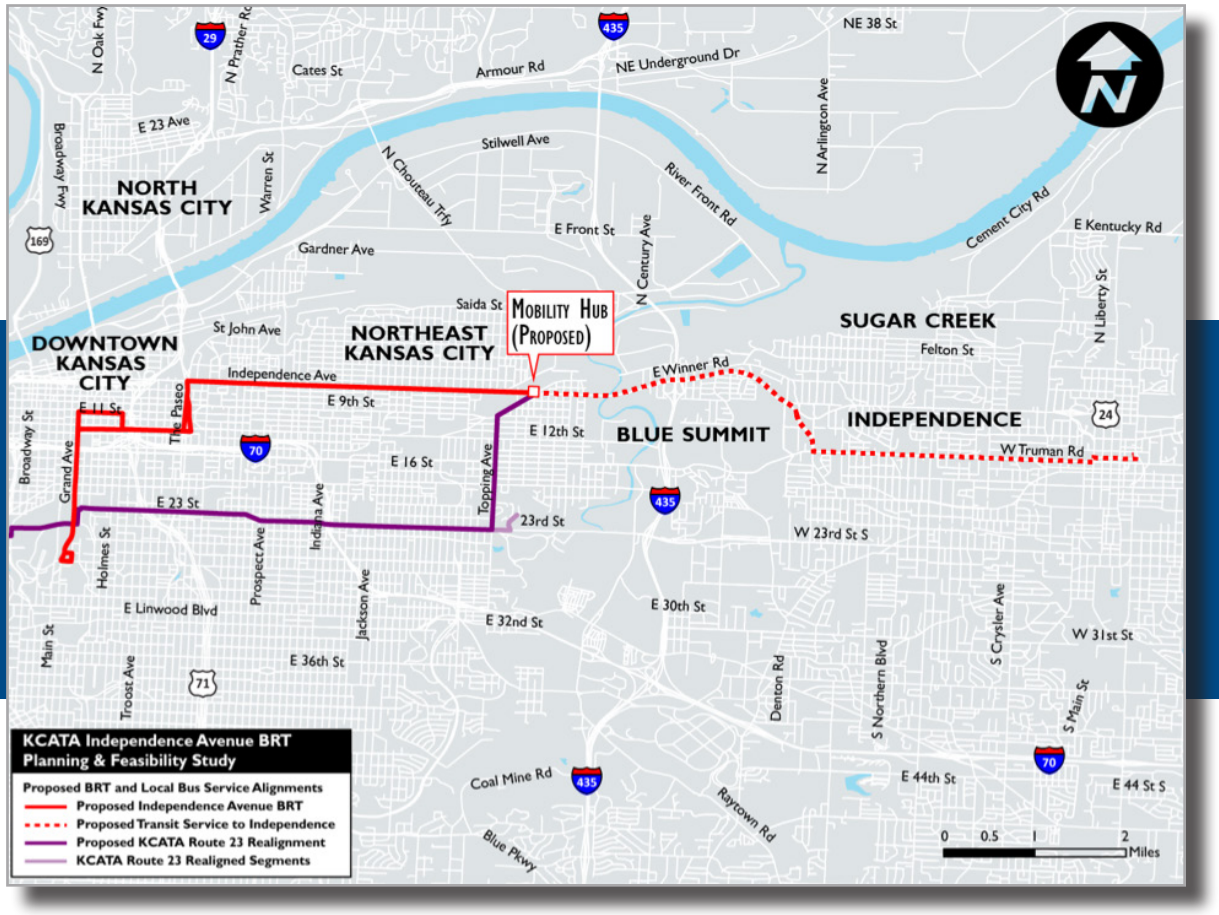


Figure 58: 23 23rd Street Realignment

4.6 PREFERRED OPERATIONS PLAN

Of the three operational alternatives developed and analyzed, Alternative 3 provides the appropriate balance of improved rapid bus service and convenience for residents along the Independence Avenue corridor and maintains the existing one-seat ride for transit users to/from the City of Independence. With this, Alternative 3 is recommended for further detailed planning in future phases of the Independence MAX BRT study.

While Alternative 3 will require more annual investment in transit service for the City of Independence, the realignment to Truman Road and the introduction of MAX buses would serve as an incremental step towards the future of potential BRT in Independence as transit ridership demand increases.

Potentially, Alternative 3 could also be the first MAX route in the KCATA system that would not also operate underlying local bus service. Given that planned BRT station spacing currently averages 0.3 miles between stations (less than 0.5-mile station spacing from previous MAX routes) the need for a local route overlay is unnecessary and would provide overly duplicative transit service along the Independence Avenue corridor.

5.0 INDEPENDENCE CAPITAL ELEMENTS

5.1 BRT STATION AREA PLANNING

5.1.1 STATION DESIGN AND BIKE LANE INTEGRATION

Kansas City's Bicycle Master Plan (planning currently in-progress) contemplates the integration of on-street bicycle facilities along the Independence Avenue corridor. Although the final configuration and feasibility of this integration was not specifically part of this project, potential integrated solutions for how both transit and bicycle facilities can function along the corridor safely and efficiently were studied. This analysis identified specific influencing factors and helped to establish the framework necessary to guide the station concept design process.

All proposed stations along the Independence Avenue corridor BRT route are recommended to be raised platform transit stations. Raised platforms provide for level-boarding which allows for quicker bus loading and unloading activity. In addition to time savings, these raised platforms also provide an elevated visual presence and sense of permanence for transit service along the corridor. It also illustrates a stronger level of investment in this new BRT service that can build momentum with the adjacent communities relating to transit services.

Raised platforms are approximately 14 inches above the street and require an accessible ramped transition on each end down to the adjacent sidewalk level. Directional buffered bicycle lanes are anticipated to be used on each side of the existing corridor and will be adjacent to the proposed BRT station locations. With the recent addition of motorized scooters in Kansas City, these bicycle lanes will also be used by other modes of personal transportation as a "mobility" lane. Its adjacency to the station and the need for pedestrian access to and from these stations across this mobility lane necessitates some increased attention to detail in the design and configuration of these stations.

The use of visual and/or physical features can provide users with more awareness regarding the potential for conflicting movements in these locations. The initial concept for these stations anticipates the mobility lane to be at street elevation until it approaches the BRT station, where it will ramp and transition 6" above the street elevation for the length of the BRT station. Once past the station, the lane will transition and return to street elevation. Additional signage and pavement markings are

anticipated to be explored to compliment this design approach. Some deviations from this approach may be necessary in certain locations along the corridor to avoid costly storm drainage and/or other utility infrastructure modifications.

Independence Avenue generally has three different roadway cross-section conditions that will influence transit station and mobility lane solutions:

- 56 feet curb to curb without on-street parking
- 56 feet curb to curb with on-street parking
- 48 feet curb to curb

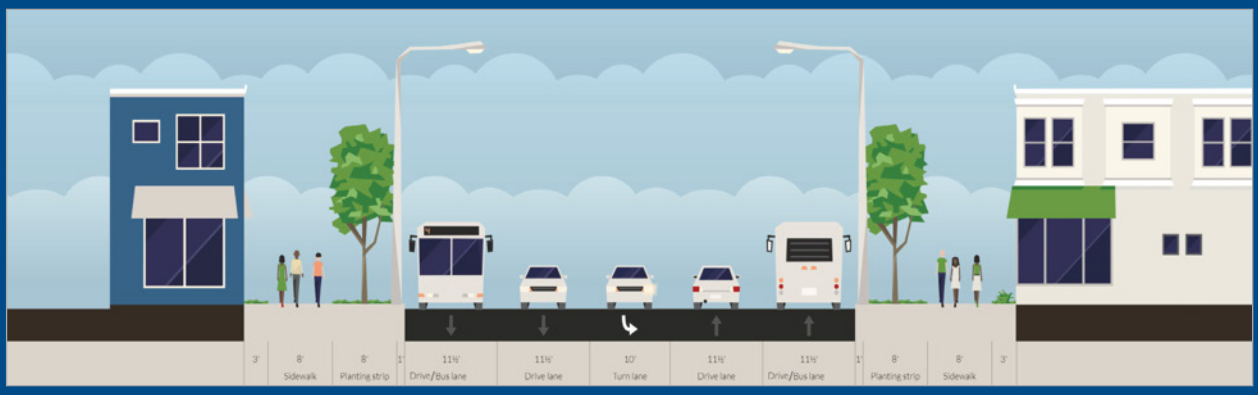
The following illustrates how a mobility lane can be integrated with a BRT station in each of these three general conditions throughout the corridor. For clarity, all grade-transition ramps are represented as a triangle on the plans and shaded in a lighter color.

The following present the existing street profile for these three sections of Independence Avenue as well as a conceptual street profile that incorporates the protected bicycle lane and BRT stations.

HIGHLAND TO BENTON (56' CURB TO CURB)

This section of the corridor has five total traffic lanes: four through lanes and one center turn lane. There is typically a landscape bed behind the street curb with an adjacent sidewalk. The existing dimension from curb to curb is 56 feet. (**Figure 59**)

Figure 59 (right): Highland to Benton Existing Street Profile



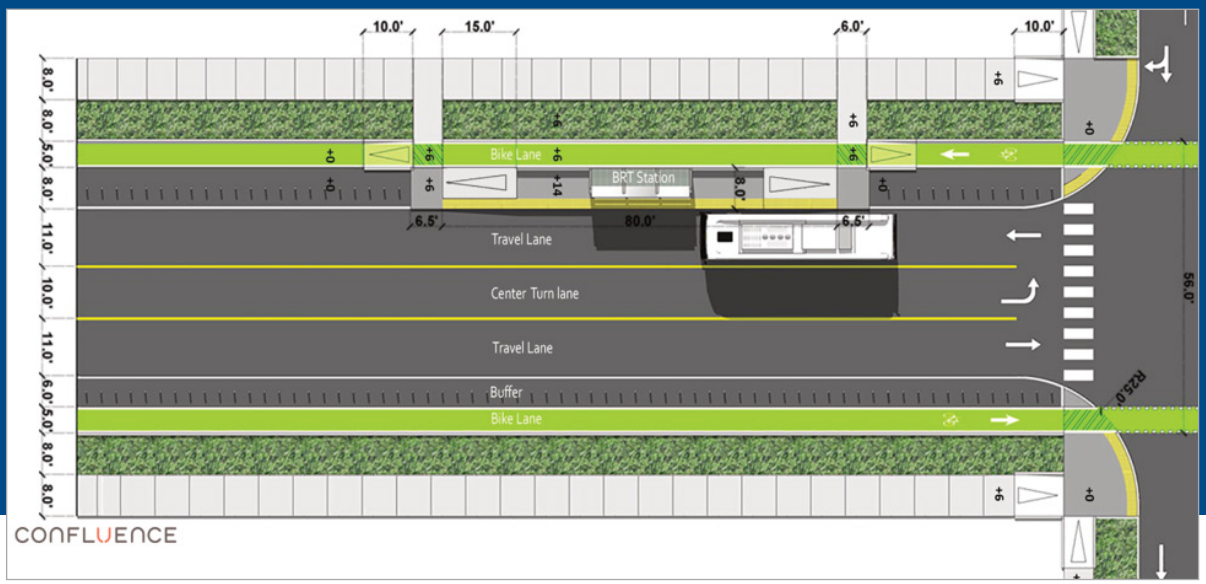


Figure 60 (left): Highland to Benton with Bike Lane

Figure 61: Highland to Benton with Bike Lane Oblique View

Maintaining the existing 56-foot curb to curb width, the proposed concept for this section of the corridor is to maintain the existing turn lane while reducing the number of travel lanes from four to two. Adjacent to the travel lanes would be an 8-foot wide raised platform BRT station. Between the curb and the station would be a 5-foot, one-directional mobility lane. A similar 5-foot mobility lane would be placed on the opposite side of the street. Both mobility lanes would be protected by vertical elements and/or painted buffer areas, with the width of the buffer space varying based on the BRT station location. (**Figure 60** and **Figure 61**)

BENTON TO HARDESTY (56' CURB TO CURB, WITH PARKING)

This section of the corridor has four through lanes of traffic with a parking lane on each side. There is typically a landscape bed behind the street curb with an adjacent sidewalk. The existing dimension from curb to curb is 56 feet. (**Figure 62**)

The proposed concept for this section of the corridor is to maintain the existing curb to curb width except where the BRT stations are located. (**Figure 63**) The roadway section in these locations is proposed to be adjusted to include two travel lanes with a center turn lane. Parallel parking can remain in certain areas where there are no BRT stations. Additional study of this "road diet" approach and the corridor's parking usage/needs should be completed in conjunction with the next phase of design. It was noted that several businesses along the corridor rely heavily on existing on-street parking stalls. Final station locations will need to consider the need for highly-used parking areas wherever possible. These concepts may result in adjusting the street alignment at certain intersections to allow some of these parking areas to remain.

Mobility lanes are provided on both sides of the street and are protected by vertical elements and/or painted buffers areas – including areas where on-street parking is maintained. The 8-foot wide BRT station is proposed to be placed adjacent to the travel lanes. Due to the recommended 8-foot minimum width for BRT stations, the street width and mobility lane alignment will need to be adjusted at these station locations. The mobility lane will use the ramp location to adjust the lane's direction and

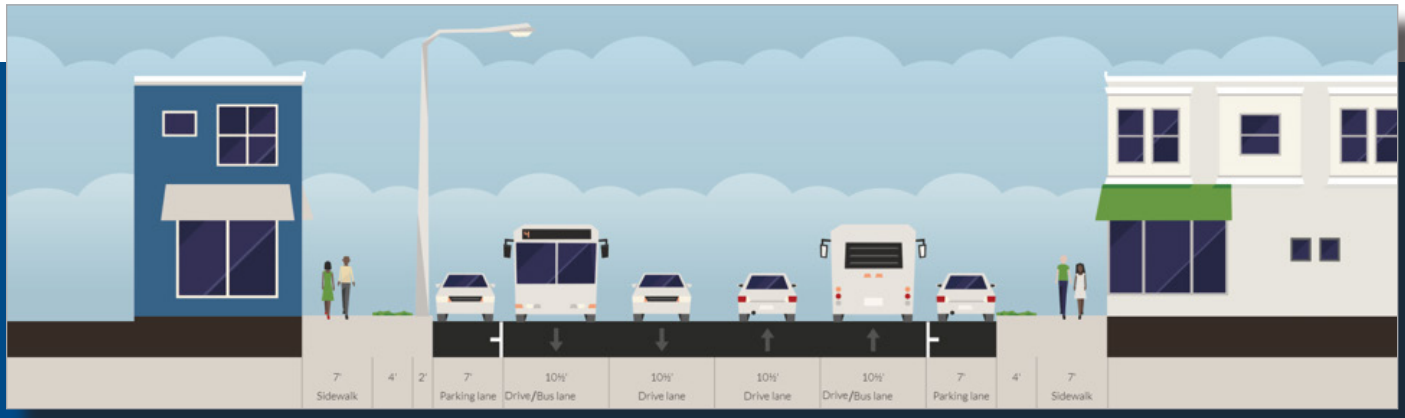


Figure 62: Benton to Hardesty Existing Street Profile

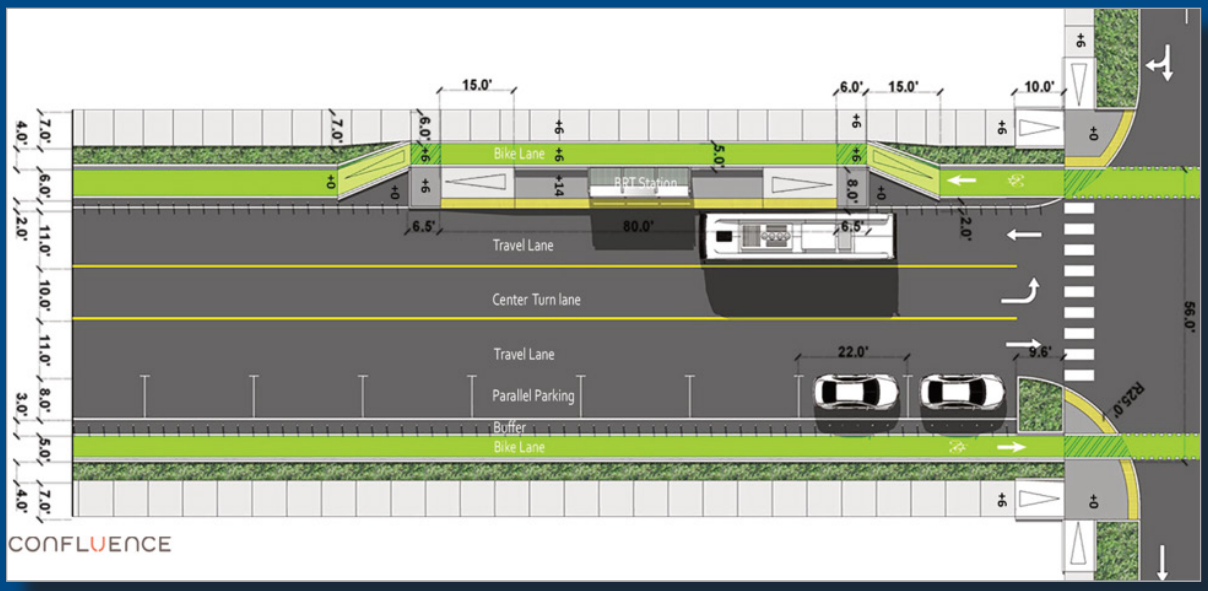


Figure 63 (left): Benton to Hardesty with Bike Lane

Figure 64 (right): Benton to Hardesty with Bike Lane Oblique View

elevation, and the width of this lane is proposed to be reduced to 4-feet for the length of the station. (**Figure 64**)

HARDESTY TO BEACON (48' CURB TO CURB, NO PARKING)

This section of the corridor has four existing lanes of traffic. There is typically a narrow landscape bed between the street curb and existing sidewalk. The existing dimension from curb to curb is 48 feet as depicted in **Figure 65**.

The proposed concept for this section of the corridor is to maintain the existing curb to curb width in all areas along the corridor except for where the BRT stations are located. The proposed roadway section has two travel lanes with a center turn lane. Protected mobility lanes are provided on both sides of the street and are protected by vertical elements and/or painted buffer areas. The 8-foot wide BRT station is proposed to be placed adjacent to the travel lanes. Due to the recommended 8-foot minimum width for BRT stations, the street width and mobility lane alignment will need to be adjusted at these locations. The mobility lane will use the ramp location to adjust the lane's direction and

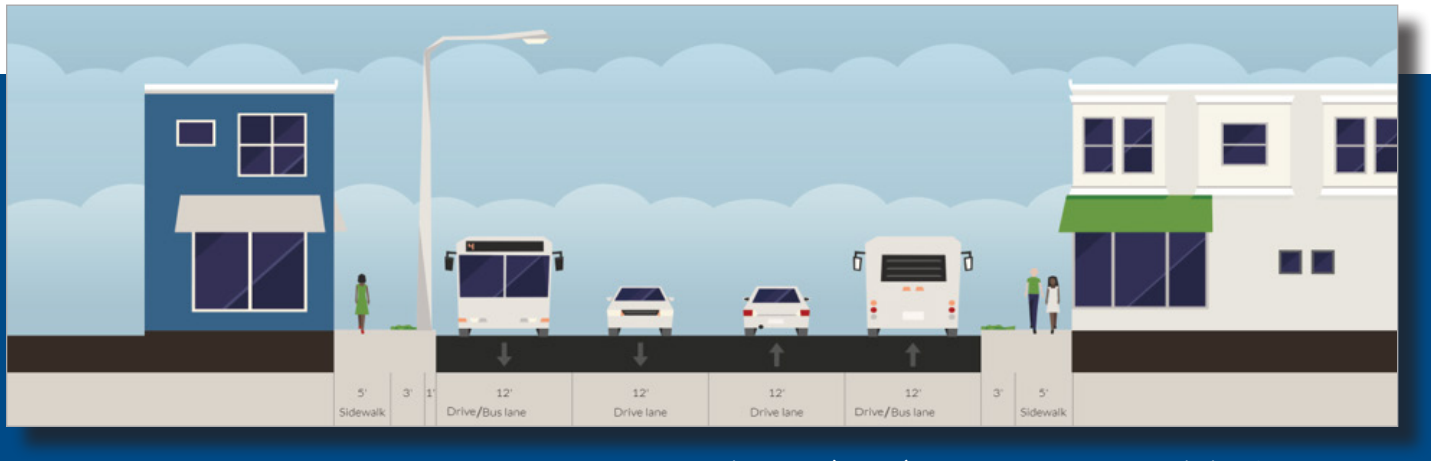


Figure 65 (above): Hardesty to Beacon Existing Street Profile

Figure 66: Hardesty to Beacon with Bike Lane

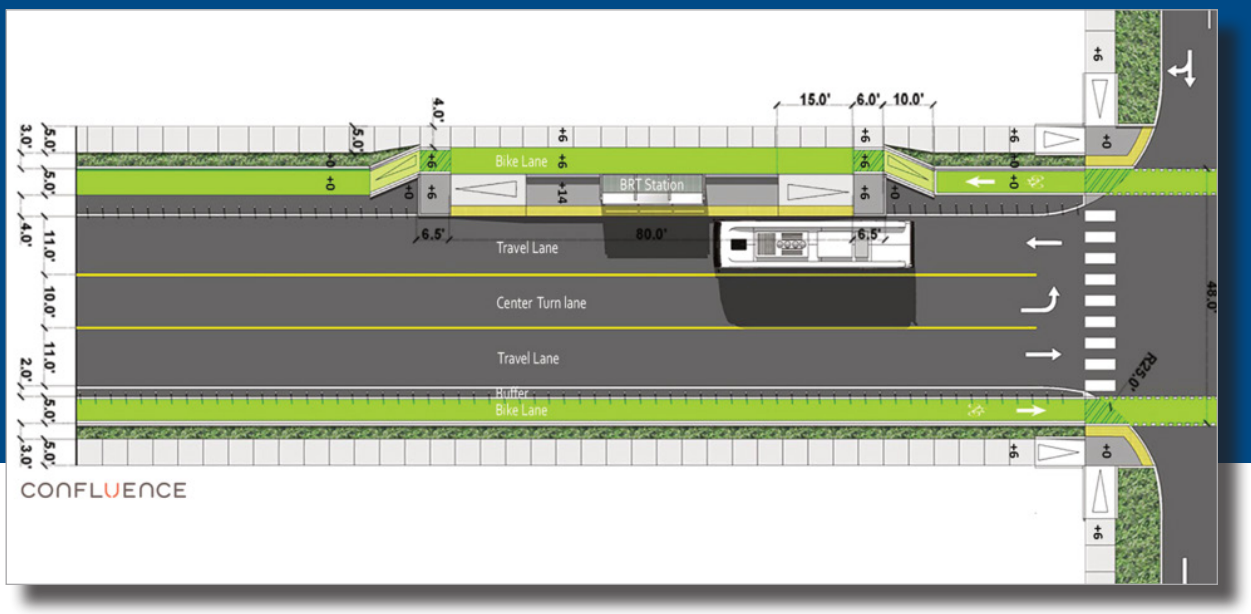


Figure 67: Hardesty to Beacon with Bike Lane Oblique View

elevation, and the width of this lane is proposed to be reduced to 4-feet for the length of the station. This proposed concept is shown in **Figure 66** and **Figure 67**.

5.1.2 STATION LOCATIONS AND MOBILITY HUBS

The proposed Independence Avenue corridor BRT stations are to be located in the portion of the corridor between Winner Road on the east to Paseo Boulevard on the west. Proposed stations will also be incorporated along the selected alternative route (Admiral/Grand Alignment vs Paseo/11th and 12th Alignment), as shown on the map below. In the portion of the adjust route along Truman Road, in the City of Independence, the route will utilize existing stops currently in place for 15 Truman Road.

Generally, BRT stations are spaced one-half mile apart to improve travel time along an alignment. Typical local bus stops can be spaced much closer together, causing buses to stop more frequently. BRT stations along Main Street, Troost and Prospect MAX have station spacing approximately 0.5 miles apart.

Assessment of BRT station locations along Independence Avenue examined existing bus stop locations, recent passenger boarding trends, location of curb cuts and driveways, major trip generators, connections to other transit routes and intersections with major north/south streets.

Where possible, BRT stations are preferred to be on the far side of intersections with traffic signals. This allows the bus to pass through and intersection before stopping to board/de-board passengers, then continue its route. Stations located prior to a traffic signal have the potential to cause delay in the route if a bus is required to stop for passengers, then stop again for a traffic signal. In determining proposed station locations, far side locations were identified where possible.

There are forty (40) total station locations that were identified to serve the Independence MAX alignment.

- Of these forty stations, twenty-six would be new Independence MAX Stations
- Eleven stations would be part of the Transit Emphasis Corridors (TEC) in downtown

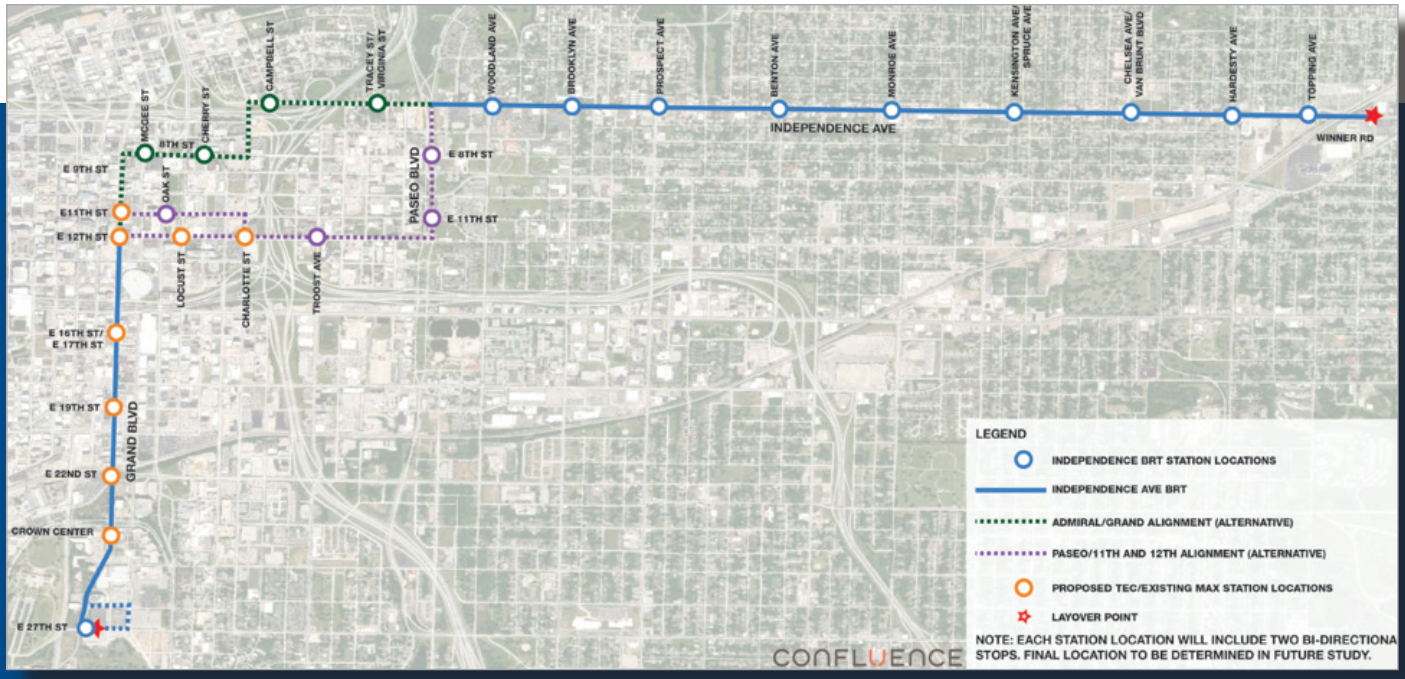


Figure 68: Proposed BRT Station Locations

In 2016, KCATA realigned much of its transit services along two primary corridors to concentrate and simplify bus service in downtown. The north/south TEC is on Grand Boulevard and the east/west TEC utilizes the 11th and 12th Street one-way couplet. The Independence MAX would also utilize three existing MAX station locations that will be constructed as part of the Prospect MAX project.

A new bus turnaround and mobility hub would be developed at the eastern terminus near Independence Avenue and White Avenue. More detailed location and operational requirements of the BRT layover and turnaround facility at this location will be determined in future phases of planning.

The exact alignment and location of a layover point at the southern/western end of the alignment has not been finalized, but currently this location is envisioned near 27th Street and Grand Boulevard.

Average station spacing for the proposed route is approximately 0.3 miles apart and closer than previous MAX routes in Kansas City. The closer station spacing is a result of the overall layout of blocks in Kansas City, where blocks are generally longer north to south and shorter east to west. **Table 18** provides details on preliminary station locations and a shown on the map in **Figure 68**.

One recommendation from the Smart Moves 3.0 20-year plan for transit and mobility involves the creation of “mobility hubs.” Mobility hubs are important to the overall system and need to be understood with a holistic, systematic approach.

The Smart Moves 3.0 mobility hub map illustrates four (4) mobility hubs along the proposed Truman (24 Independence) and Independence BRT route. Two mobility hubs are located near downtown Kansas City, one is located at the “gateway” into this corridor near I-435, and the fourth mobility hub is located near downtown Independence, Missouri.

	Station Number	Station Location	Direction	Intersection Position	Independence MAX Station	TEC Station	Existing MAX Station	Distance from Previous Station (mi)
INDEPENDENCE AVENUE	1	Layover Station at Winner Rd.	EOL	MB	1			NA
	2	Independence Ave. at Topping Ave.	WB	FS	1			0.22
	3	Independence Ave. at Hardesty Ave.	WB	FS	1			0.25
	4	Independence Ave. at Chelsea Ave.	WB	NS	1			0.27
	5	Independence Ave. at Kensington Ave.	WB	FS	1			0.33
	6	Independence Ave. at Monroe Ave.	WB	FS	1			0.37
	7	Independence Ave. at Benton Blvd.	WB	NS	1			0.35
	8	Independence Ave. at Prospect Ave.	WB	NS	1			0.35
	9	Independence Ave. at Brooklyn Ave.	WB	FS	1			0.29
	10	Independence Ave. at Woodland Ave.	WB	FS	1			0.24
Downtown / Transit Emphasis Corridors	11	Paseo Blvd. at 8th St.	SB	FS	1			0.40
	12	Paseo Blvd. at 11th St.	SB	FS	1			0.24
	13	12th St. at Troost Ave.	WB	FS	1			0.39
	14	12th St. at Charlotte (EVTC)	WB	NS		1		0.20
	15	11th St. at Oak St.	WB	NS		1		0.32
	16	Grand Blvd. at 12th St.	SB	FS		1		0.27
	17	Grand Blvd. at 16th St.	SB	FS		1		0.35
	18	Grand Blvd. at 19th St.	SB	NS		1		0.25
	19	Grand Blvd. at 22nd St.	SB	FS		1		0.31
	20	Grand Blvd. at Crown Center	SB	FS			1	0.19
	21	27th St. at Grand Blvd. (Layover Point)	EOL	FS	1			0.35
	22	Grand Blvd. at Crown Center	NB	NS			1	0.35
	23	Grand Blvd at 22nd St.	NB	FS		1		0.23
	24	Grand Blvd. at 19th St.	NB	MB		1		0.20
	25	Grand Blvd. at 17th St.	NB	FS		1		0.27
	26	Grand Blvd. at 12th St.	NB	NS		1		0.42
	27	12th St. at Locust St.	EB	NS			1	0.19
	28	12th St. at Charlotte (EVTC)	EB	FS		1		0.20
	29	12th St. at Troost Ave.	EB	NS	1			0.20
	30	Paseo Blvd. at 11th St.	NB	FS	1			0.46
	31	Paseo Blvd. at 8th St.	NB	FS	1			0.23
INDEPENDENCE AVENUE	32	Independence Ave. at Woodland Ave	EB	NS	1			0.28
	33	Independence Ave. at Brooklyn Ave	EB	FS	1			0.30
	34	Independence Ave. at Prospect Ave	EB	NS	1			0.21
	35	Independence Ave. at Benton Blvd	EB	NS	1			0.35
	36	Independence Ave. at Monroe Ave	EB	NS	1			0.37
	37	Independence Ave. at Spruce Ave	EB	FS	1			0.35
	38	Independence Ave. at Van Brunt Blvd	EB	NS	1			0.27
	39	Independence Ave. at Hardesty Ave	EB	NS	1			0.40
	40	Independence Ave. at Topping Ave	EB	NS	1			0.23
				Totals	**26**	**11**	**3**	**0.29**
		EOL = End of Line						
		NS = Nearside						
		FS = Far side						
		MB = Midblock						

In addition to the mobility hub locations identified within the Smart Moves 3.0 20-year plan (**Figure 69**), areas with potential for additional mobility services and solutions based on the proximity to supportive land uses and the potential for surrounding redevelopment activity have been identified through this planning process. These areas are roughly between a quarter- and a half-mile radius around the following intersections:

- Benton Avenue and Independence Avenue
- Eastern Terminus of Independence BRT Route
- Truman Road and River Boulevard

General areas, rather than specific locations, have been identified as future mobility sites with high potential based on the level of energy and activity (existing or proposed) occurring near these intersections. Further analysis of mobility hub components and proper location is needed and should be reviewed on a case-by-case basis. Helpful tools in identifying mobility solutions appropriate for different types of locations can be found on the RideKC Smart Moves 3.0 website (http://www.kcsmartmoves.org/).

In conclusion, proposed Independence BRT stations should be reviewed for the potential inclusion of mobility solutions. Providing additional mobility solutions in key locations along the corridor will help provide a more comprehensive multi-modal system and benefit the surrounding communities and neighborhoods.

5.1.3 STATION DESIGN

The Independence Avenue corridor is one of the most culturally diverse corridors within the Kansas City metropolitan area. Based on a series of community engagement efforts and multiple conceptual design studies, the proposed station design reinforces and celebrates this cultural diversity by integrating creative elements, such as color and pattern, as an expression of the corridor's character. This also supports the Grand Boulevard of the Americas along Grand Boulevard through downtown Kansas City (**Figure 70)**. These stations have the opportunity to serve as an iconic, unifying feature along the corridor that celebrates the many different cultures found in the surrounding neighborhoods to help reinforce a sense of pride and excitement about the adjacent neighborhoods served by this BRT service.

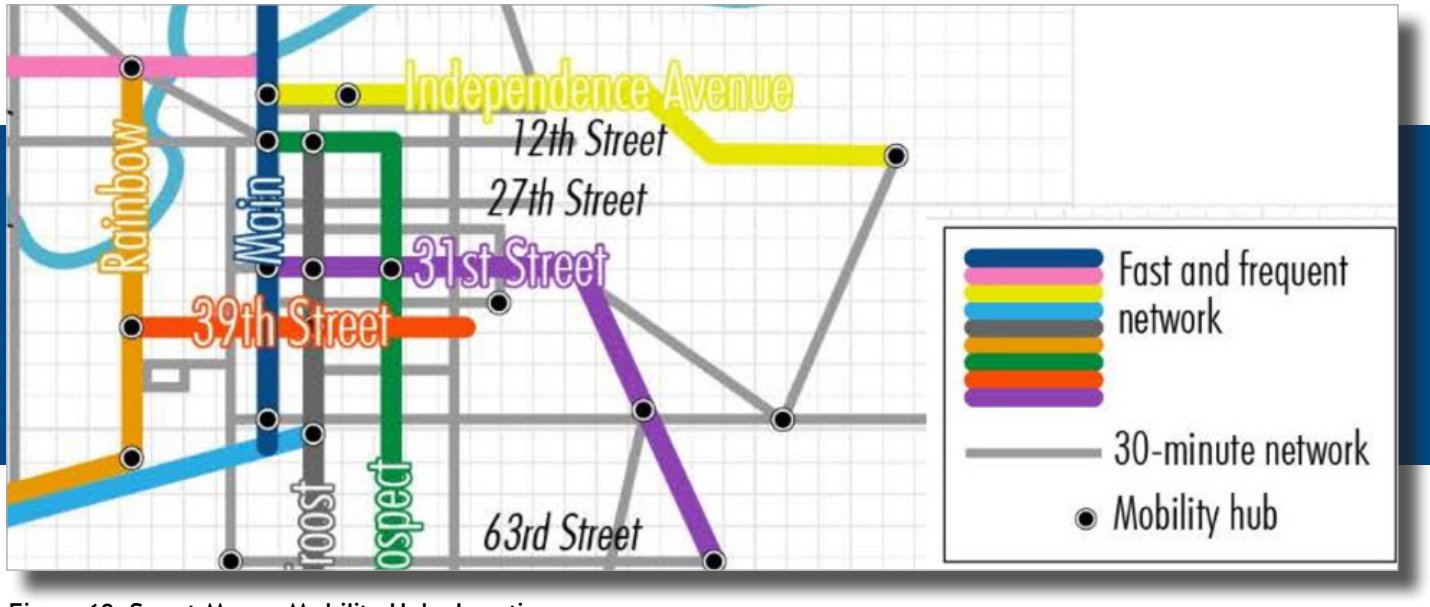


Figure 69: Smart Moves Mobility Hubs Locations

Figure 70: Independence Ave. Themes for Station Design

The station design elements and materials used to create these concepts are comprised of elements and materials already utilized by the KCATA in other station infrastructure inventories, as well as unique elements that relate to the adjacent neighborhoods and community. These elements help to define a corridor-wide aesthetic strategy and design direction for the look and feel of the proposed station infrastructure that is reflective of and supported by the surrounding communities.

A major form integrated throughout the station design is the use of angles. Each station component relates to the angled form to tie into the overall station design.

Unlike any other MAX stations throughout the metro, one of the main components unique to the new, proposed Independence BRT station is the integration of color and pattern (inspired by the community's character) to form a style of mosaic. This mosaic can be incorporated into the shelter roof, the marker design, the use of transparent panels throughout the shelter, and the lean rail accent panel. This study highlights different opportunities for creatively integrating these patterns, but final mosaic style and design is to be further explored in the next phase of design with additional community input. Some ideas that have inspired the colorful mosaic options thus far include:

- Creating an abstract of the different flags from the countries represented in the surrounding communities (**Figure 71**)
- Composing a collage of the different people and cultures in these neighborhoods (**Figure 72**)
- Integrating written words into panels in different languages that all translate to "hello" or another unifying message (**Figure 73**)

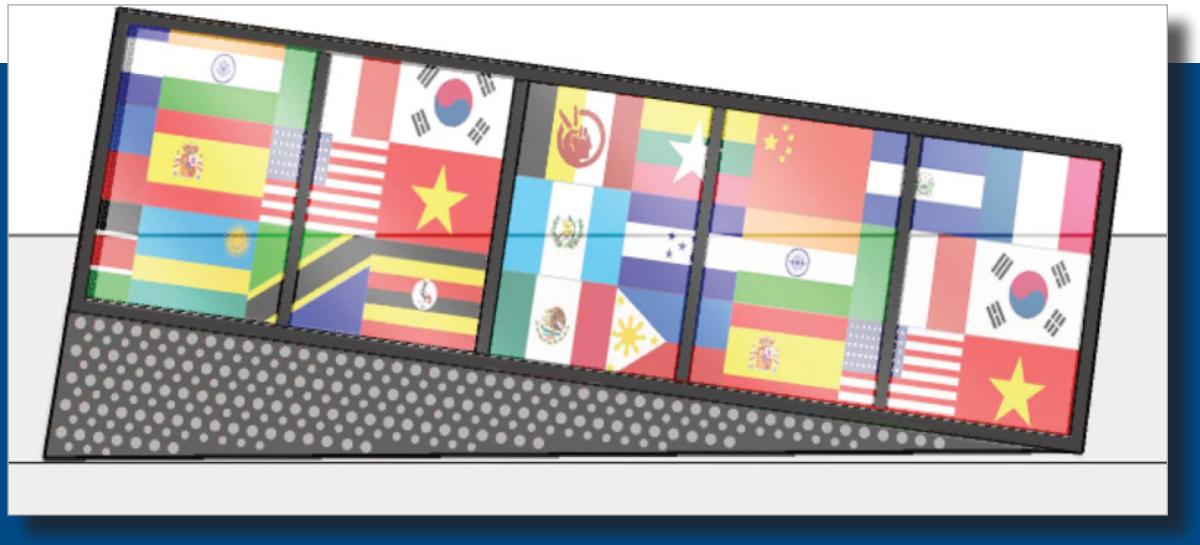


Figure 71 (right): Shelter Roof Mosaic Option 1

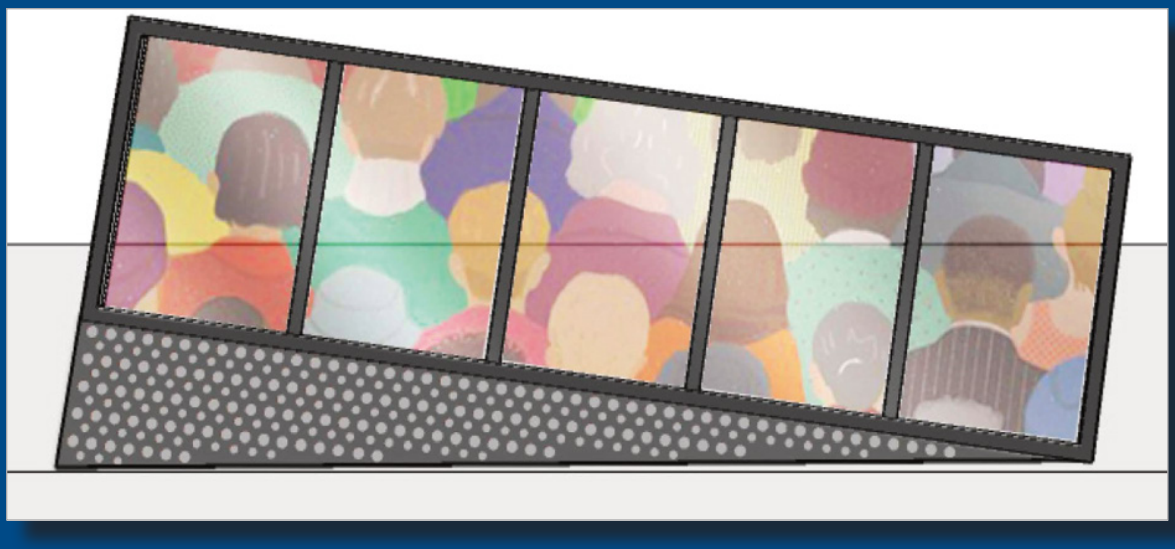


Figure 72 (left): Shelter Roof Mosaic Option 2

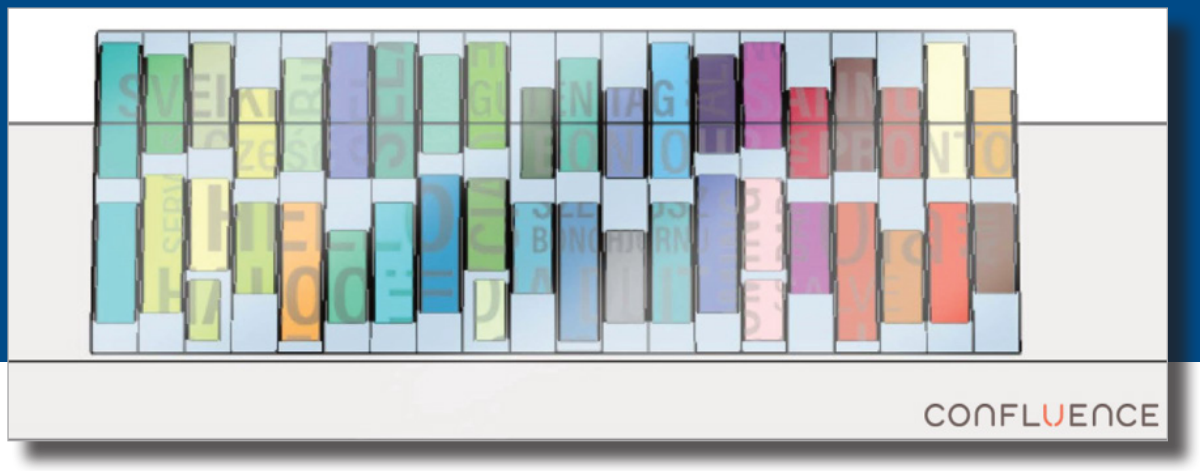


Figure 73 (right): Shelter Mosaic Option 3

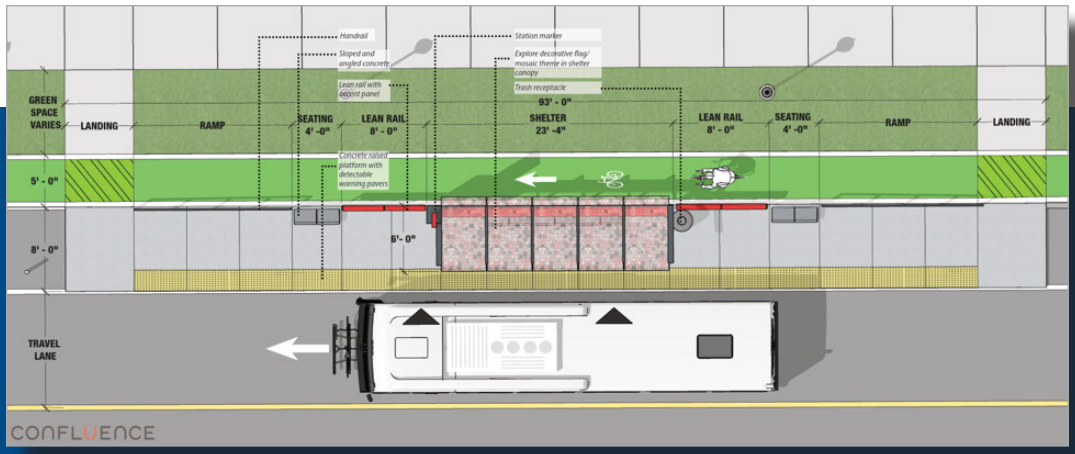


Figure 74 (left): Conceptual Independence Ave. BRT Station Layout

Figure 75 (right): Conceptual Independence Ave BRT Station Elements and Level Boarding

Proposed Independence Avenue BRT stations will be comprised of several different design components. Additional design studies and refinements of these initial concepts for each component will need to be undertaken during the next stage of the design process. A description of the design intent for each of these components is provided below in **Figure 74** through **Figure 81**:

RAISED LEVEL BOARDING PLATFORM

A raised platform is proposed at all new Independence Avenue BRT stations. This will provide level (or near-level) boarding benefits that help with quicker boarding times and can eliminate the need for the deployment of wheelchair access ramps or lifts. The platform also increases the perception of service, while providing a stronger brand and identity to the overall corridor. The approximate platform length is 93-feet to accommodate a 40-foot bus and the accessible ramps and landing lengths needed to transition from the 14-inch raised platform to adjacent sidewalk and street elevations as shown in Figure 75. Each platform would be delineated with appropriate detectable paving at its edge for safety and awareness purposes.

SHELTER

The Independence Avenue BRT shelter is influenced by the previous shelters designed for other MAX

routes and transit facilities throughout the metro. It is simple in form to provide protection from weather conditions and has an angled roof to reinforce the overall station design and form. The Independence Avenue BRT shelter is stylized with a unique roof design that brings the shelter to life. The roof design may explore a patterned mosaic that would be applied to the transparent roof panels (**Figure 76**). These transparent panels could either be glass or polycarbonate panels and will require more extensive design detailing before determining specific material selections and attachments details. The columns supporting the vertical wall panels are anticipated to support standard 4'x8' transparent panels currently in use by KCATA at other MAX stations. These panels will hover above the concrete platform to provide space between the panels and platform for ventilation and maintenance purposes. Concrete seating is placed in front of the transparent panels and is proposed to provide a solid connection to the platform to minimize areas that collect debris. A colored beam that attaches to the columns in front of the transparent panels contains the station name. Seating is placed at the center of the shelter, allowing for ADA-accessible waiting areas for wheelchair accommodations on either side of the seating. Although the standard shelter station prototype size is approximately 23 feet in length, the design for these shelters could be expanded or reduced in length to reflect anticipated ridership in each location (**Figure 77**).

The shelter incorporates one transparent side wall panel to provide additional protection from weather conditions. The panel is cut and angles at the base to tie into the overall station design and form. An alternative to the side panel that could be explored in the next phase of design is the specific location of the panel. This panel could be alternatively considered for placement near the center of the shelter to provide separation between smokers and non-smokers while still under the protection of the roof.

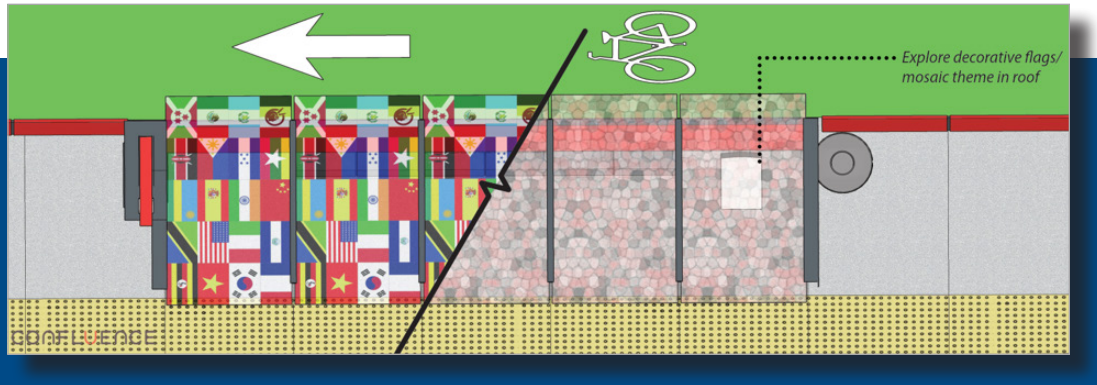


Figure 76 (right): Conceptual BRT Shelter Mosaic Roof Panels

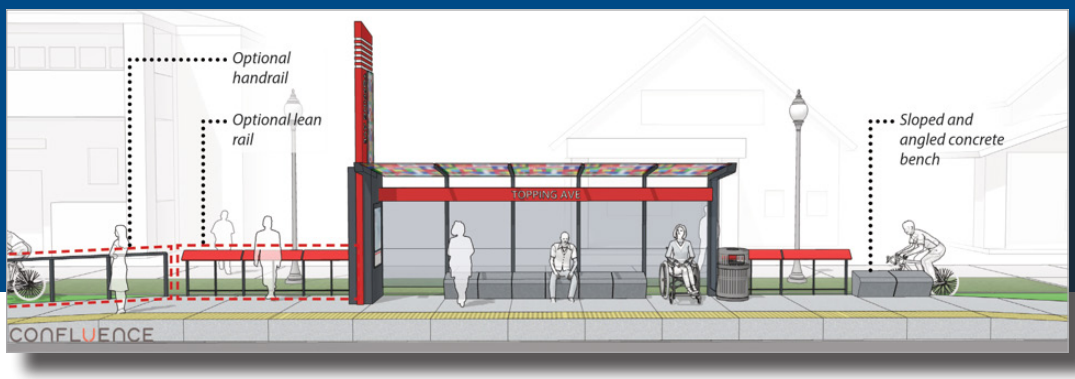


Figure 77: Independence Ave. BRT Station Concept Elevation

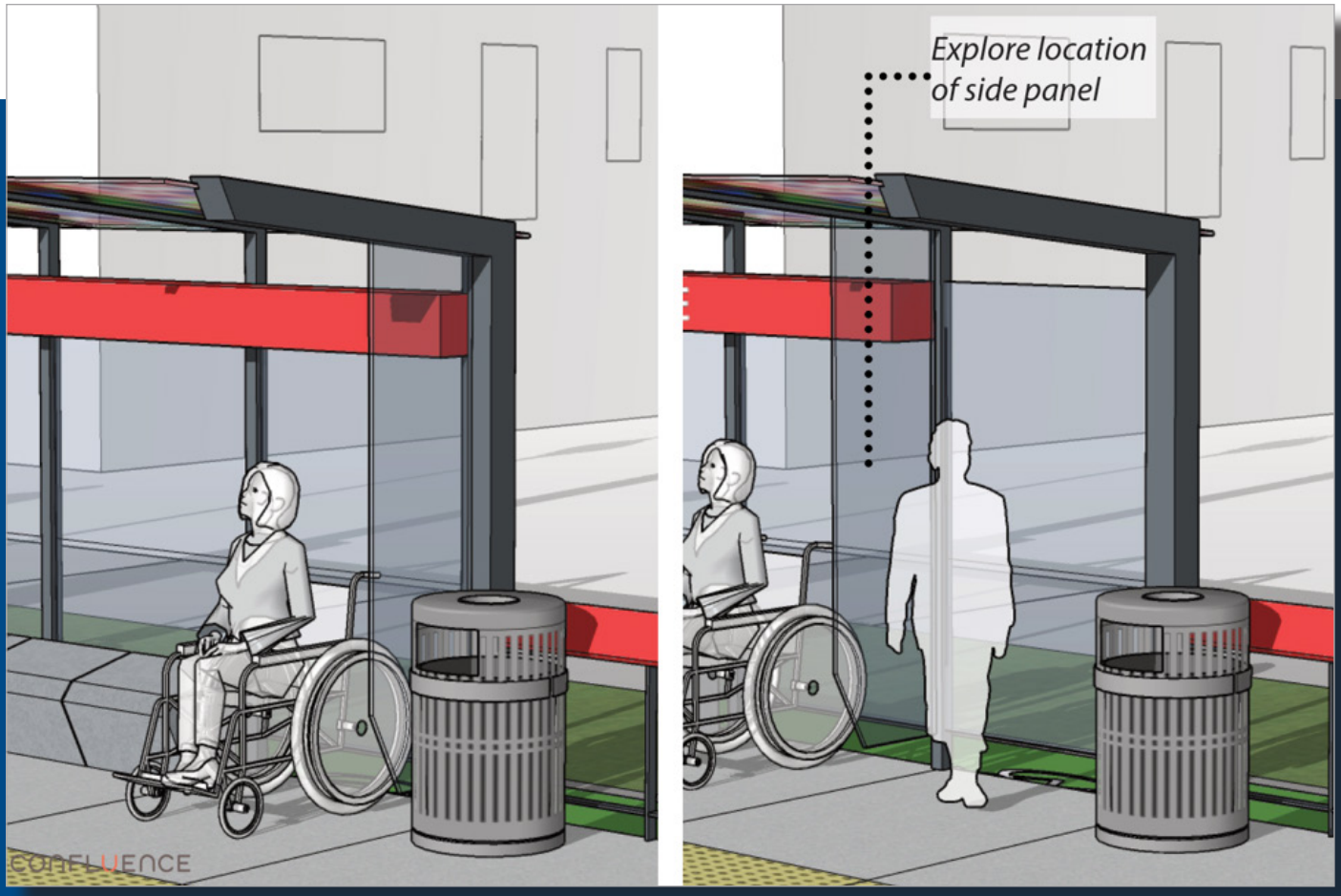


Figure 78: Conceptual BRT Station Side Panel Option

The shelter primarily consists of transparent panels and is intended to be transparent to allow views through the structure and promote safety. Each shelter and its surroundings should be reviewed on a case-by-case basis to allow for the highest amount of transparency. Integrated lighting is also included to provide enhanced visibility and a stronger sense of pedestrian safety during evening hours (**Figure 78**).

INTEGRATED STATION MARKER WITH DIGITAL DISPLAY + INFORMATION PANEL (OPTION)

The marker offers a unique identity component to the overall station design. One option for the marker design is integrated into the shelter to serve as a wall to protect from weather conditions. The marker is made up of two components: the cabinet and the blade as shown in **Figure 79**. The cabinet will include a real-time digital display along with an interactive integrated information panel. The blade will penetrate and protrude from the cabinet and will integrate solid and/or patterned mosaics and the station location name. The top of the blade is angled to reinforce the overall station design form and incorporates striped elements at the top – which could include aesthetic lighting.

SEPARATE STATION MARKER (OPTION)

Another potential marker design is to separate the blade and cabinet separate from the digital display. In this case, the digital display would be integrated into the back of the shelter, while the marker itself would be less of a structural component and more of a standalone station/system identity component – in similar fashion to the original Main Street Max station markers. This can allow the marker to have a narrower overall profile width as envisioned in **Figure 80**. The blade will integrate solid and/or patterned mosaics where the station location name is placed, and the top will be angled to match the overall station design and form. Separating the cabinet (with the integrated information panel) from the blade allows for the back of the information panel to have an engaging graphic or digital component that can relate and provide information to adjacent mobility lane users.

SEATING

Each station has the potential to provide seating inside and outside of the shelter. The proposed seating elements are made of concrete and are sectioned approximately every two-feet to provide individualized seating. These seats support the overall station design and form by slightly tilting from back (high side) to front (low side) to provide a temporary seating solution and discourage long-term usage.

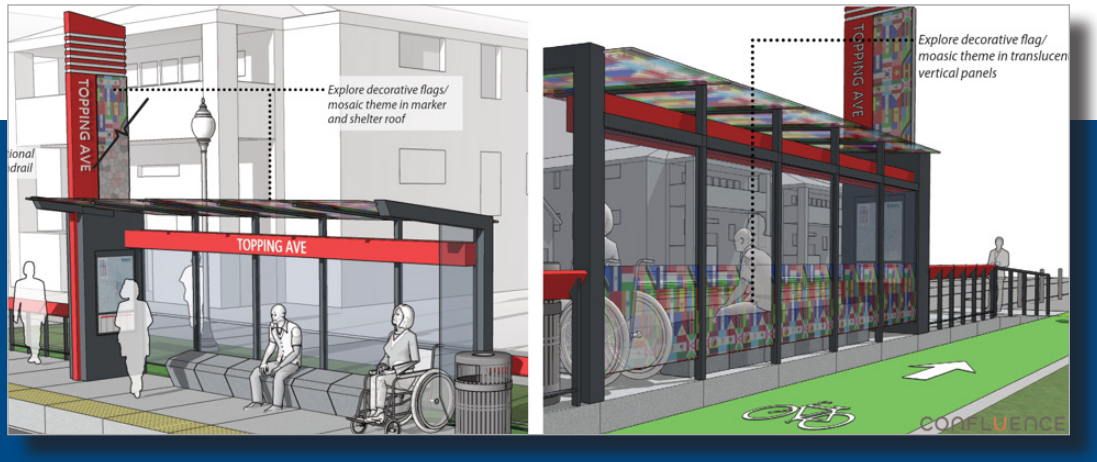


Figure 79 (right): BRT Station Marker with Integrated Interactive Information Kisok

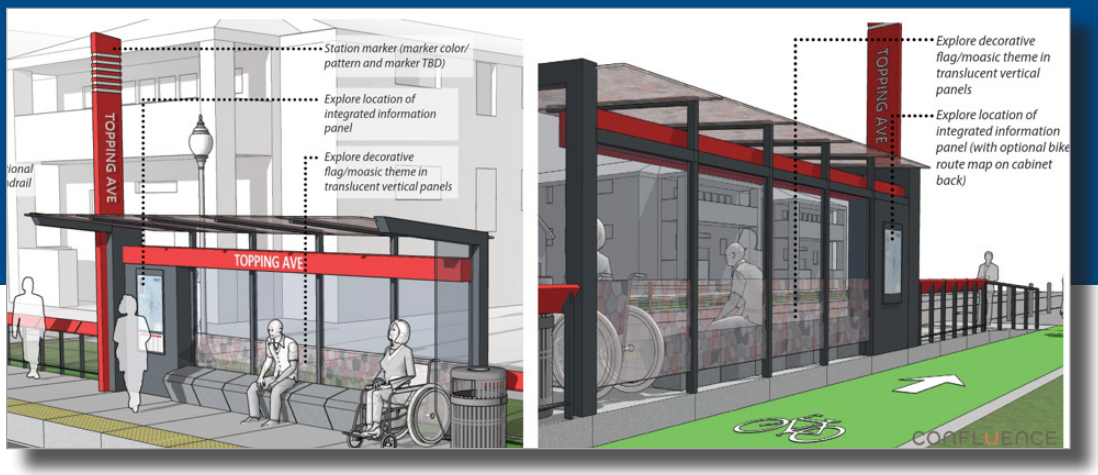


Figure 80 (left): BRT Station Narrow Marker Option

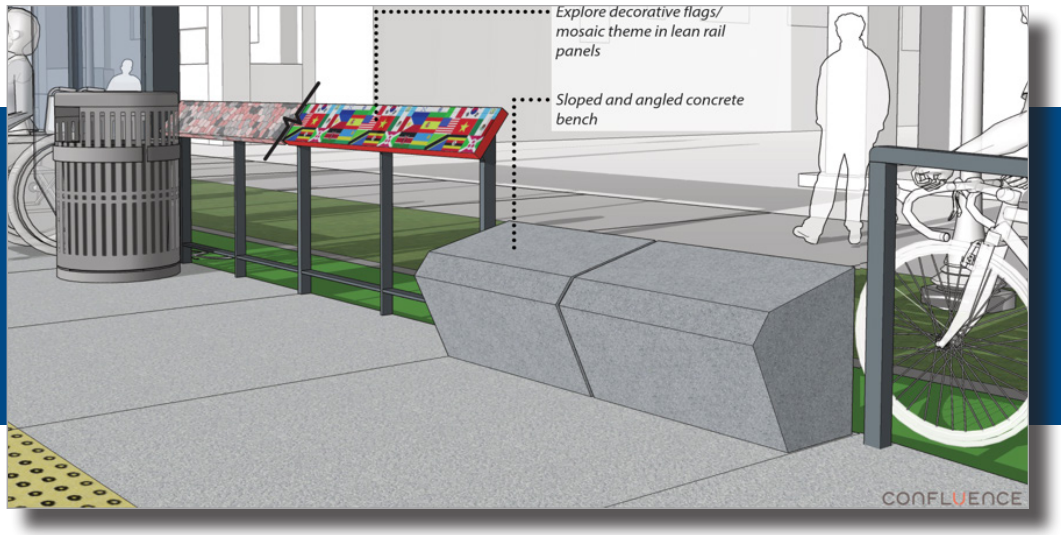


Figure 81: BRT Station Leaning Rail Concept

LEAN RAILS

Lean rails are provided outside of the shelter for an additional waiting accommodation. Lean rails should be fabricated of durable material with a graphic accent panel attached to the top. It is angled to provide an appropriate support for waiting transit riders while also tying into the overall station design and form. The graphic accent panel should incorporate solid and/or patterned mosaics that compliment other elements used throughout the station (Figure 81).

HANDRAILS

In addition to the lean rails, standard stainless-steel handrails should be explored along the ramped portion of the raised platform to provide vertical separation and safety between mobility lane users and transit users. Handrails should be in accordance with ADA accessibility standards.

LITTER RECEPTACLE + RECYCLING

Litter receptacles should be provided at stations. Ridership volumes will inform total quantity of receptacles to be placed. Recycling bins could also be provided. Litter and recycling receptacles should match other MAX route receptacle and recycling furnishings to maintain consistency – and should complement the final design of these shelters and amenities.

SITE LIGHTING

Safety around each station is important. Shelters will be lighted sufficiently to provide visibility and increase the safety to transit users. The marker will also be illuminated to appear as the route's "beacon" and highlight each station clearly along the corridor. The station location beam within the shelter should also be lit. Surrounding street lights should be provided for additional illumination and should be reviewed on a case-by-case basis.

OTHER ELEMENTS AND FEATURES

Landscaping at stations is encouraged and should be evaluated on a case-by-case basis. Where possible, include landscaping that is low maintenance, easily established, can withstand tough, streetscape conditions, and is low growing to maintain site lines. Pragmatic use of site-specific opportunities to reduce stormwater runoff and increase soil percolation through the integration of landscape areas should be explored and encouraged during the next phase of design.

Off-board fare collection, such as ticket vending machines, may be considered for inclusion on

stations, especially along the Independence Avenue portion of the BRT alignment. As the conceptual road-diet reconfiguration of traffic to one travel lane in each direction, it will become highly important to shorten dwell times at stations. Having passengers pay for their fare prior to the BRT vehicle's arrival will help achieve this goal and improve travel time along the route.

The future of Independence Avenue includes a major bike facility, and bike racks should be included at stations to match demand as appropriate. The furnishing should match other MAX route bike rack furnishings. Quantity should be reviewed on the level of bike facility usage.

INDEPENDENCE AVENUE BRT STATION VISUALIZATION

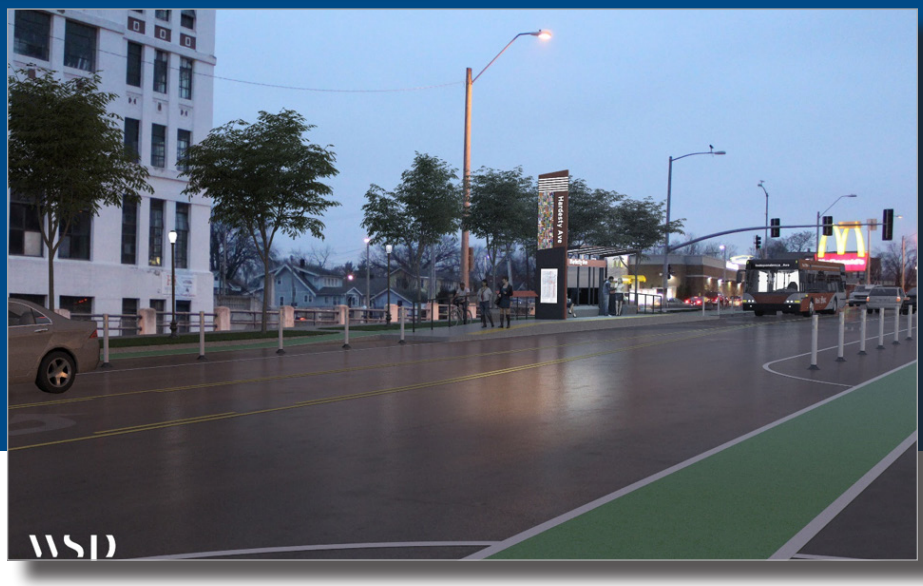
To better understand and contextualize how the Independence Avenue MAX BRT would be integrated within the existing street two station renderings were developed to illustrate the interaction of the BRT along with protected bicycle lanes. The images are conceptual in nature and are likely to evolve through future phases of project development.

Independence at Woodland – Westbound

Figure 82 (left): Independence at Woodland MAX Station

Independence at Hardesty - Eastbound

Figure 83 (right): Independence at Hardesty



5.1.4 BRT STATION CAPITAL COST ESTIMATION

Utilizing the most current information possible from construction costs for the Prospect MAX project an opinion of probable costs for BRT stations for the Independence Avenue MAX BRT project was developed. The BRT station capital cost estimation considers the station elements detailed in the section above along with a twenty percent risk contingency and allocation for engineering, or soft costs'. Capital cost figure have also been escalated to anticipated year of expenditure cots, which is currently 2023. The estimated cost per BRT station in 2023 dollars is approximately $400,000. Details of station capital cost elements are shown in **Table 19 (next page)**.

KCATA is currently piloting a new 'conductive concrete' in some of its Prospect Avenue MAX stations to assist with ice/snow melting on concrete station platforms. Conductive concrete was not included in the base station estimation, but has been included as a separate 'add alternate' option should conductive concrete wish to be incorporated into the Independence Avenue BRT stations.

5.2 VEHICLES

5.2.1 PROPULSION ALTERNATIVES

5.2.1.1 ELECTRIC

Currently new battery electric, or zero emission, propulsion technologies are rapidly emerging for heavy duty public transit vehicles (**Figure 84**). Several of the major public transit bus manufactures now offer fully battery electric vehicles. In 2017 the San Joaquin Regional Transit District (RTD) converted its existing Bus Rapid Transit (BRT) Express Route 44 to 100% battery-electric, zero-emissions buses. The route was the first in the U.S. to feature an all-electric bus service.

Today about half of the KCATA bus fleet is fueled by Compressed Natural Gas (CNG) and soon KCATA will begin a pilot project testing two Gillig all-electric buses. Using the lessons learned from the electric vehicle pilot, the Independence Avenue BRT line should further explore a BRT vehicle fleet comprised of some or all vehicles powered by battery electric in the next phase of planning.

Figure 84: Gillig 40-Foot Battery Electric Bus

Assessment of electric BRT vehicles will need to include several factors that may impact over all BRT fleet needs. Peak vehicle demand noted in the operations section assumed CNG vehicles. If an all-electric bus fleet is desired, the total number of buses needed to operate the BRT and local service in the Independence corridor will need to be reassessed depending on the battery charge capacity impacting the range of buses and potential needs of on-route recharging.

The variables that effect the range of electric vehicles include:

- **Vehicle size and weight**
- **Battery size, weight and storage capacity**: Higher capacity batteries, some with capacities above 400, 500 or even 600 KW, give buses a longer range that more closely launches the refueling range of diesel vehicles. But, larger capacity batteries increase vehicle weight and can reduce the seating capacity of the bus. They also cost more and take longer to fully recharge than lower-capacity batteries.

Table 19: BRT Station Opinion of Probable Costs

Component	Cost	Qty	Unit	Total (2018 dollars)	Total (2023 dollars - 15% increase)
Demo					
Concrete demolition	$7.00	744	SF	$5,208.00	$5,989.20
Curb demolition	$7.00	93	LF	$651.00	$748.65
Proposed					
Shelter	$85,000.00	1	EA	$85,000.00	$97,750.00
Marker	$30,000.00	1	EA	$30,000.00	$34,500.00
Display - Double Sided	$27,000.00	1	EA	$27,000.00	$31,050.00
Electrical Power	$15,000.00	1	LS	$15,000.00	$17,250.00
Real Time Signage	$12,000.00	1	EA	$12,000.00	$13,800.00
6" Concrete	$18.00	744	SF	$13,392.00	$15,400.80
Concrete bus pad	$18.00	500	SF	$9,000.00	$10,350.00
Detectable Warning Pavers	$375.00	19	EA	$6,975.00	$8,021.25
Concrete curb	$40.00	93	LF	$3,720.00	$4,278.00
Precast Concrete Seat	$400.00	20	LF	$8,000.00	$9,200.00
Trash	$1,500.00	1	EA	$1,500.00	$1,725.00
Railing	$80.00	30	LF	$2,400.00	$2,760.00
Bike Rack	$750.00	1	EA	$750.00	$862.50
Lean Rail	$400.00	24	LF	$9,600.00	$11,040.00
Utility / Stormwater Adjustment Contingency	$20,000.00	1	LS	$20,000.00	$23,000.00
Subtotal				$250,196.00	$287,725.40
Contingency (20%)				$50,039.20	$57,545.08
Subtotal				$300,235.20	$345,270.48
Soft Costs (15%)				$45,035.28	$51,790.57
TOTAL				**$345,270.48**	**$397,061.05**
Add Alternate					
Concrete Deduct	$18.00	-744	SF	-$13,392.00	-$15,400.80
Conductive Concrete	$40.00	744	SF	$29,760.00	$34,224.00
Conductive Electrical Equipment	$23,500.00	1	LS	$23,500.00	$27,025.00
Electrical Upgrade	$8,400.00	1	LS	$8,400.00	$9,660.00
Subtotal				$298,464.00	$343,233.60
Contingency (20%)				$59,692.80	$68,646.72
Subtotal				$358,156.80	$411,880.32
Soft Costs (15%)				$53,723.52	$61,782.05
TOTAL				**$411,880.32**	**$473,662.37**

- **Passenger load**: Electric vehicles are much more sensitive to weight than diesel vehicles, and use significantly more energy when fully loaded than when empty.
- **Speed**: Electric motors have a flat torque curve that results in battery-electric vehicles accelerating much more quickly than a diesel vehicle. However, battery-electric vehicle range is more sensitive to acceleration and higher speeds than diesel vehicles, resulting in lower ranges for routes requiring more acceleration and higher speed operation.
- **Grade**: The flat torque curve of electric motors allows battery-electric vehicles to climb hills faster than diesel vehicles. However, their range is much more sensitive to grade changes than diesel buses, resulting in lower range on hilly routes.
- **Outdoor temperatures**: Battery-electric vehicle range is effected by ambient temperature in two ways. Batteries perform less well in cold (particularly below freezing) temperatures, resulting in lower range during cold-weather months. Battery-electric vehicles also use more of their energy for providing heat and air conditioning when required, reducing range during both Summer and Winter months.
- **On-route charging**: To compensate for battery-electric vehicles' lower range, manufacturers offer the option of on-route charging. High-powered (up to 500 KW), high-speed chargers are located at layover locations for vehicles to partially recharge during layover periods at the end of each trip, extending their range between full charges to match, or exceed, the range of diesel vehicles. Because of high costs and operational complications, on-route charging is not considered best practice and is considered best avoided if possible.

A detailed analysis of the Independence Avenue BRT alignment and service plan will be required if an electric bus fleet is envisioned. Other impacts will include capital costs of electric vehicles that may range from $800,000 to $950,000. Along with the upfront capital costs for the vehicles there are infrastructure and capital cost implications for the KCATA maintenance and bus storage facility at 18th Street and Forest. Assessment of electric power needs and bus charging equipment will need to be detailed, as well as, on-going operations costs for electric power costs for bus charging.

5.1.1.2 COMPRESSED NATURAL GAS

Over the last five to ten years KCATA has been working to have much of its bus fleet powered by compressed natural gas (CNG). CNG provides significant operational cost savings to KCATA compared to traditional diesel. The other primary benefit to CNG fueled buses is improved air quality from greatly lowered carbon dioxide and other greenhouse gas emissions. BRT vehicles on the Independence Avenue could be purchased at a lower price per vehicle than electric and would not require the installation of additional charging infrastructure in the bus storage facility. KCATA has successfully deployed CNG vehicles on other BRT lines in the system and have proved reliable and cost effective.

5.2.2 VEHICLE SIZE AND CAPACITY NEEDS

Many BRT systems in the United States and internationally have utilized single articulated vehicles to manage larger passenger volumes. These vehicles are generally sixty feet in length and can accommodate approximately eighty passengers (seated and standing). Given current passenger loads it is anticipated that articulated buses would not be required to meet passenger loading needs. The current forty-foot BRT vehicle that has been utilized on all previous KCATA MAX alignments is recommended for the Independence Avenue Corridor.

5.3 MULTIMODAL CONNECTIVITY IMPROVEMENTS

5.3.1 SIDEWALKS AND CROSSINGS

Having safe and continuous sidewalks between Independence Avenue BRT stations and adjoining neighborhoods is important for improving mobility options, attracting new riders, supporting neighborhoods and development, and the overall success of the project. High-level survey has revealed that sidewalk infrastructure on the corridors that connect proposed BRT stations would need approximately $2.5-million in sidewalk improvements to enhance neighborhood connectivity to the stations (See **Table 20** for general recommendations and cost estimates for connecting pedestrian corridors). Detailed pedestrian improvement capital cost estimate information is provided in Appendix 6.

This project provides a valuable opportunity to identify, prioritize, and potentially fund sidewalk improvements, repairs, and replacements critical for accessing enhanced transit planned for Independence Avenue. The following are strategies to be considered through the advancement of the Independence Avenue BRT project that could improve the supporting pedestrian network, community access to transit, and multimodal travel options along the corridor:

- **Conduct a more-detailed inventory and assessment of the sidewalk network to confirm necessary improvements and cost estimates.** For the scope of this planning effort, the assessment of the pedestrian network was conducted at a high-level to determine the general conditions of the neighborhood corridor network and to develop order of magnitude costs for targeted improvements. As the project advances, it is recommended that a more detailed assessment of the corridors' pedestrian infrastructure needs be conducted using the City of Kansas City's sidewalk inspection prioritization system and Public Works engineering estimates. The assessment should inventory the type of construction materials used (e.g., asphalt/concrete), width, presence or absence of a landscape buffer between back of curb and sidewalk, impediments to travel (e.g., utility poles, landscaping, etc.), compliance with ADA accommodations and a condition assessment. This information should be mapped in Geographic Information System (GIS) mapping software and should be used to develop a more-detailed sidewalk improvement program for the project.
- **Consider options to improve sidewalk connections between the proposed BRT and KCATA local bus routes operating on parallel corridors beyond ¼-mile of Independence Avenue.** The pedestrian assessment focused on examining the sidewalk network within a ¼-mile of the proposed BRT (from Smart Avenue to 9th Street), yet pedestrian improvements beyond this distance should also be considered to improve access to nearby KCATA routes. (**Figure 85**) Local KCATA bus routes 11-Northeast, 9-9th Street, and 12-12th Street operate within ½-mile of the proposed Independence Avenue BRT on parallel corridors (St. John Avenue, 9th Street, and 12th Street) and together provide critical service coverage in northeast Kansas

Figure 85: Photo courtesy of http://kcmo.gov/gokc/sidewalk-projects

City. Improving pedestrian conditions of neighborhood corridors that intersect all four routes, from St. John Avenue to 12th Street, would further enhance neighborhood transit access, multimodal connectivity in the Northeast area, and the overall community impact of this project.

- **Prioritize corridors for sidewalk improvements to maximize public benefit of available funding.** The high-level sidewalk condition inventory revealed there is significant need for improved pedestrian infrastructure in the study area. Yet, improvements are tied to the amount of public funding that can be secured for or leveraged in support of this project which may not meet total community need. Though all corridors accommodate pedestrian movement and are important neighborhood connections, it is recommended that pedestrian corridors for improvement are prioritized through the inventory and assessment process. Pedestrian corridor prioritization should consider best opportunities through this multimodal project to serve and attract riders, maximize public benefit, and support community needs and preferences.
- **Seek opportunities to coordinate pedestrian improvements with City of Kansas City's GO KC Sidewalk Program.** In 2017, City of Kansas City voters approved a 20-year bond program that dedicates $150-million in for sidewalk repair in residential areas (**Figure 86**). The City has developed a data-driven scoring program–known as the Systematic Inspection Prioritization Point System–that prioritizes sidewalk repair projects based upon location in relationship to key locations and demographic factors. Geographic factors for each sidewalk segment weighed in the point system include schools, libraries, community centers, hospitals and safety net provider, median household income, transit stops, parks, grocery stores, arterial streets, vehicle access, population density, employment density, and transportation terminals, and scoring totals result in a priority ranking of 1 to 5. Several of the connecting corridors have sidewalk segments with Priority 1 or Priority 2 designations, making them likely candidates for City repair. Independence Avenue BRT planning efforts should consider coordinating these City and BRT pedestrian priority projects and leveraging bond funding as local BRT project match and to maximize related pedestrian improvements.
- **Pursue and support local efforts for "Safe Routes to School Funding" (SRTS) to improve pedestrian routes between schools and the Independence Avenue BRT.** Many Kansas City students, especially older ones, use KCATA services to get to and from school, and good sidewalks between school and bus stops are critical for student safety. Several schools are within immediate walking distance of the Independence Avenue BRT including Woodland Elementary School (Woodland/7th), Scuola Vita Nuova Charter School (Brooklyn/Independence), Garfield Elementary School (Prospect/ Amie), and Northeast Middle and High School (Van Brunt/Thompson). Opportunities to pursue SRTS grant funding and technical assistance through MARC are encouraged to improve the pedestrian environment and transit access for schools along the corridor.

Figure 86: GO Bond Improvements in Kansas City

Table 20: Pedestrian Corridor Improvements and Estimated Costs

BRT Station	Pedestrian Corridor	Direction	From	To	Recommended Repair	Estimated Cost
Paseo/11th Street, SB	12th Street	westward	Paseo Blvd	Virginia Ave	ADA ramps/crosswalks	**$8,000**
Paseo/11th Street, NB	12th Street	eastward	Paseo Blvd	Woodland Ave	ADA ramps/crosswalks	**$23,000**
Paseo/ 8th St, SB	8th Street	westward	Paseo Blvd	Virginia Ave	ADA ramps/crosswalks	**$8,000**
Paseo/8th Street, NB	8th Street	eastward	Paseo Blvd	Woodland Ave	50% sidewalk repair; ADA ramps/crosswalks	**$62,000**
Ind./Woodland Ave, EB	Woodland Ave	southward	Independence	9th Street	50% sidewalk repair; ADA ramps/crosswalks	**$56,000**
Ind./Maple Blvd, WB	Maple Blvd	northward	Independence	Missouri Ave	25% spot sidewalk repair; ADA ramps/crosswalks	**$36,000**
Ind./Brooklyn Ave, EB	Brooklyn Ave	southward	Independence	9th Street	25% spot sidewalk repair; ADA ramps/crosswalks	**$65,000**
Ind./Brooklyn Ave, WB	Brooklyn Ave	northward	Independence	Lexington Ave	25% spot sidewalk repair; ADA ramps/crosswalks	**$73,000**
Ind./Prospect Ave, EB	Prospect Ave	southward	Independence	9th Street	25% spot sidewalk repair; ADA ramps/crosswalks	**$67,000**
Ind./Prospect Ave, EB	Prospect Ave	northward	Independence	Lexington Ave	75% sidewalk repair; ADA ramps/crosswalks	**$138,000**
Ind./Benton Blvd, EB	Benton Blvd	southward	Independence	9th Street	25% - 50% sidewalk repair; ADA ramps/crosswalks	**$140,000**
Ind./Benton Blvd, WB	Benton Blvd	northward	Independence	Lexington Ave	50% sidewalk repair; ADA ramps/crosswalks	**$134,000**
Ind./Monroe Ave, EB	Cleveland Ave	southward	Independence	9th Street	75% sidewalk repair; ADA ramps/crosswalks	**$143,000**
Ind./Monroe Ave, WB	Monroe Ave	northward	Independence	Smart Ave	75% sidewalk repair; ADA ramps/crosswalks	**$190,000**
Ind./Spruce Ave, EB	Spruce Ave	southward	Independence	9th Street	75% sidewalk repair; ADA ramps/crosswalks	**$154,000**
Ind./Kensington Ave, WB	Kensington Ave	northward	Independence	Smart Ave	25% spot sidewalk repair; ADA ramps/crosswalks	**$68,000**
Ind./Van Brunt Blvd, EB	Van Brunt Blvd	southward	Independence	9th Street	75% sidewalk repair; ADA ramps/crosswalks; local bus stop needs (#21-Cleveland/Antioch)	**$170,000**
Ind./Chelsea Ave, WB	Chelsea Ave	northward	Independence	Thompson Ave	50% sidewalk repair; ADA ramps/crosswalks	**$89,000**
Ind./Hardesty Ave, EB	Hardesty Ave	southward	Independence	9th Street	25% spot sidewalk repair; ADA ramps/crosswalks	**$49,000**
Ind./Hardesty Ave, WB	Hardesty Ave	northward	Independence	Smart Ave	25% spot sidewalk repair; ADA ramps/crosswalks	**$53,000**
Ind./Topping, WB	Topping Ave	northward	Independence	Smart Ave	50% sidewalk repair; ADA ramps/crosswalks	**$80,000**
Ind./Topping, WB	Wilson Avenue	northward	Independence	Belmont Ave	100% sidewalk replace: ADA ramps/crosswalks; local bus stop needs (#21-Cleveland/Antioch)	**$44,000**
* Please note that these are planning-level cost estimates intended to provide order of magnitude work and associated costs.					SUBTOTAL	$1,850,000
					Design & Engineering (15%)	$280,000
					Contingency (20%)	$370,000
					ESTIMATED TOTAL	**$2,500,000**

- **Pursue USDOT BUILD grant application funding for improving the study area's sidewalk network in conjunction with the BRT project.** In 2010, the region successfully secured a USDOT TIGER grant that provided $25-million for street infrastructure, sidewalk improvements, and bus stop improvements in the Green Impact Zone – urban neighborhoods adjacent to the Troost MAX BRT route. The northeast neighborhoods have similar demographic characteristics and aging infrastructure and could also greatly benefit from neighborhood sidewalk and street improvements tied to enhanced transit. Pursuing a similar grant request, this time through the BUILD program as companion project to the Independence Avenue BRT, could provide funding for a transformative package of multimodal infrastructure improvements to further leverage public investment and enhance rapid transit access, mobility options, economic development, and quality of life in the northeast neighborhoods.

5.3.2 PROTECTED BIKE FACILITY ON INDEPENDENCE AVENUE

This study has assumed a single-lane, curbside located protected bicycle lane on both the north and south side of Independence Avenue from Paseo Boulevard to Winner Road, approximately 2.8 miles in length. These bicycle lanes would generally be between 4 – 6 feet in width with a fixed separation buffer width not less than 2 feet wide. Existing curb to curb street widths, lane widths and travel lane configurations were assessed in this segment of the study area. Incorporation of proposed bicycle lanes are assumed to fit within the existing roadway widths to minimize capital costs and other right-of-way impacts.

To safely incorporate the bicycle lane with the BRT station siting, the protected bicycle lane would remain curb running with the BRT station platform located on an 'island'. This allows the BRT vehicle to pull up to the level boarding platform at the station to board/de-board passengers without having to encroach on the bike lane and reducing potential for bicycle/bus crashes. In the proposed concepts, the bicycle lane would narrow to approximately four feet wide at the BRT stations and raise up four to six inches. The narrowing of the bicycle lane primarily to fit all uses within the constrained roadway width, but also will slow cyclists at this area where potential conflicts with transit users may exist, making a safer environment for all users of this space.

Reallocation of the existing roadway along Independence Avenue would have several impacts to the corridor which will require more detailed analysis and engagement with business owners, property owners, residents and the public as the planning process advances from the feasibility study in to more detailed phases.

To incorporate the protected bicycle facility, a 'road-diet' would occur on Independence Avenue, reducing two travel lanes in both the east and west bound directions to one travel lane in each direction, with a center turn lane. This reconfiguration will likely have impacts to on-street parking, especially in the segment between Benton Boulevard and Hardesty Avenue. In this segment, parallel parking is allowed between 7 AM and 6 PM parking and is limited to 2-hours. To incorporate the protected cycle lane, parallel parking would need to be removed from one side of Independence Avenue impacting upwards of approximately 130 parking stalls. Today parking stalls are not striped so assumptions were made on the length of typical parking stalls divided by available curb length in the segments. A more detailed parking demand analysis should be conducted in the next phase of project development to determine the actual usage of parking and need is for adjacent businesses and residents.

Development of a protected bicycle facility and needed road diet would have impacts to existing

a future traffic operations for both BRT vehicles and auto/truck traffic in the Independence Avenue corridor. Traffic counts and traffic signal timing information was collected from the City of Kansas City to assess impacts of an Independence Avenue road-diet for bicycle lanes. Current Average Daily Traffic (ADT) throughout this three-mile portion of Independence Avenue ranges between 13,000 and 15,000. According to the Mid America Regional Council's regional travel demand model, ADT is anticipated to increase less than 1 percent over the next twenty years.

As indicated in **Table 21** and **Table 22** the current travel time from Paseo Boulevard to Winner Road is 9 minutes and 20 seconds in the eastbound direction in the weekday PM peak hour and 10 minutes and 15 seconds in the westbound direction. Currently traffic signals in this corridor are not coordinated making travel times less efficient. The Independence Avenue corridor is also not currently part of the Operation Green Light program that works to coordinate traffic signals across the metro region. In the proposed scenario, the road diet lane configuration is assumed as is new traffic signal timing and coordination for the entire length of this segment of Independence Avenue to better optimize traffic flow. In the eastbound direction, it is estimated that travel time in the 3-mile section would only increase by 18 seconds and increase 33 seconds in the westbound direction.

Table 21: Independence Avenue Eastbound PM Peak Travel Time Impacts

Street Segment	PM Eastbound Travel Time		
	Existing	Proposed	Difference
Paseo Blvd. to Prospect Ave.	1 min 25 sec	1 min 31 sec	7 seconds
Prospect Ave. to Benton Blvd.	1 min 22 sec	1 min 8 sec	-13 seconds
Benton Blvd. to Van Brunt Blvd.	2 min 2 sec	1 min 59 sec	-3 seconds
Van Brunt Blvd. to Hardesty Ave.	1 min 47 sec	2 min 0 sec	13 seconds
Hardesty Ave. to Winner Rd.	2 min 45 sec	2 min 59 sec	13 seconds
Total	9 min 20 sec	9 min 38 sec	**18 seconds**

Table 22: Independence Avenue Westbound PM Peak Travel Time Impacts

Street Segment	PM Westbound Travel Time		
	Existing	Proposed	Difference
Winner Rd. to Hardesty Ave.	2 min 33 sec	2 min 33 sec	1 seconds
Hardesty Ave. to Van Brunt Blvd.	1 min 38 sec	1 min 59 sec	21 seconds
Van Brunt Blvd. to Benton Blvd.	2 min 1 sec	2 min 4 sec	2 seconds
Benton Blvd to Prospect Ave.	1 min 34 sec	1 min 45 sec	11 seconds
Prospect Ave to Paseo Blvd.	2 min 29 sec	2 min 27 sec	-2 seconds
Total	10 min 15 sec	10 min 48 sec	**33 seconds**

Using capital cost estimates from the City of Kansas City's Bicycle Master Plan, the conservative cost per-mile for a Major Separated Bicycle facility, as planned for Independence Avenue, is $1,500,000. Using this cost per-mile for the approximate 3-mile segment of Independence Avenue from Paseo Boulevard to White Avenue, it is estimated that inclusion of the protective bicycle facility could add an additional $4.5 million to the total project capital costs. This cost estimate is conservative at this level of conceptual planning and will be further refined in future phases of project design and engineering.

Overall, inclusion of protected bicycle lanes in the Independence Avenue corridor from Paseo Boulevard to White Avenue with planning for development of MAX BRT appears feasible. As noted above, much more detailed analysis will be required working with the City of Kansas City, business, property owners and other stakeholders to more fully define impacts to parking and traffic and better define the estimated capital costs associated with bicycle facilities. More detailed discussion regarding traffic impacts for the complete Independence Avenue BRT planning concept is provided later in Section 9.0

OTHER ON-STREET BICYCLE FACILITIES - RECOMMENDATIONS

Building upon the City's current efforts to update and implement its local bicycle plan (Bike KC), there are specific opportunities to improve the multimodal connections and neighborhood reach of the Independence Avenue BRT. Several on-street, shared-lane bicycle routes currently intersect the Independence Avenue BRT corridor and have potential to provide extended "first / last-mile" travel to area neighborhoods both north and south of the corridor. The current facilities are basic in nature, typically having "sharrow" signage that require shared lane space between vehicles and bicycles. To further enhance the attractiveness of the corridor's bicycle network and connectivity with the Independence Avenue BRT, the following strategies are recommended:

- **Support and coordinate with local plans to create protected bikeways along Paseo Boulevard and design their interface with BRT stations on Paseo.** The City is planning to add protected bike lanes on both sides of Paseo Boulevard, providing a continuous 9-mile route between Independence Avenue and S. 85th Street. Future planning and engineering efforts for the Independence Avenue BRT should consider design treatments to best integrate the bikeway with BRT station and platform placement and maximize bike-transit connections.
- **Support and coordinate with local plans to create bikeways along Lexington Avenue/ Gladstone Boulevard and connections to Independence Avenue BRT stations at Woodland and Topping.** Another priority for the City is to develop a 6.6-mile bikeway via Lexington Avenue and Gladstone Boulevard through several northeast neighborhoods, with connections to Independence Avenue at Woodland Avenue and Wilson Avenue/Topping Avenue. Planning and design considerations should examine how to best link and integrate the bikeway with the westbound BRT stations planned on Independence Avenue at Woodland and Topping.
- **Examine opportunities to extend bicycle lane striping on Benton Boulevard from Truman Road to St. John Avenue.** The City recently added bicycle lane striping on Benton Boulevard between Truman Road. A second phase of this project includes extending the Benton Boulevard bikeway to St. John Avenue, crossing Independence Avenue at Benton Boulevard. Planning efforts should examine how to best connect this bikeway with the BRT stations planned at Benton Boulevard for improved bicycle access between the

BRT and neighborhoods north and south of Independence Avenue.

- **Support and coordinate with the City's efforts to add lane striping and markings for on-street bike routes.** There are other designated shared-lane bike routes in the area that will intersect the Independence Avenue BRT–including routes along 11th Street, 12th Street, Woodland Avenue, N. Chestnut Trafficway/Chestnut Avenue, Wilson Road, and Winner Road. Partnership opportunities with the City in upgrading the bike route infrastructure to include dedicated lane striping and enhanced route signage are encouraged for the improved safety and attractiveness of bicycling to and from transit.
- **Incorporate amenities that support bicycle travel at BRT stations and mobility hubs to encourage and support bicycle travel with transit.** The Independence Avenue BRT stations and mobility hubs are prime locations to incorporate amenities that support bicycle transportation–like bike racks, bike lockers, repair stands, drinking water fountains–and encourage bike-transit trips.
- **Feature bicycle route network maps at BRT stations and mobility center kiosks.** Independence Avenue BRT stations and mobility centers will serve as community landmarks and central gathering points to access alternative transportation options, and bicycle network maps should be displayed at station kiosks to promote bicycle travel options available from each station. Such maps can help potential and current bicycle riders feel more comfortable about bicycling and navigating the nearby areas.

6.0 DEVELOPMENT INTRODUCTION

6.1 DEVELOPMENT INTRODUCTION

Well-functioning cities typically succeed due to a having dynamic mix of places to work, reside, shop, worship, and be entertained. As importantly for this aggregation to work, communities need safe, reliable access to and between these destinations – by foot, vehicle, and rail. The KCATA is in a fairly atypical position in that it can utilize its resources throughout the Independence Avenue corridor to both enhance its own assets and leverage conduit for proximate development. These types of commitments often build upon themselves and create positive long-term cyclical effects. This is the potential impact of dependable, safe transit and an organization dedicated to such upfront programmatic and physical investments. The reciprocal benefit to the KCATA can be increased ridership, as well as an evolving source of potential future value capture that can trigger even greater prospective investment.

In analyzing prime locations for Transit Oriented Development (TOD) hubs and a logical Independence Avenue terminus point, study focused on developing a strategy for targeting the most impactful parts of the corridor. This approach is often manifested by identifying an underperforming node prime for redevelopment within a currently healthy or positively transitioning area. Ideally the transit-related infrastructure investment would serve as the catalyst for additional neighboring redevelopment.

6.1.1 FINANCING

There are a number of financing tools for targeted redevelopment projects, many of which have been outlined in past Kansas City-area rapid transit studies. These include establishing or utilizing a Transportation Development District (TDD), Tax Increment Financing (TIF), Community Improvement District (CID) / Neighborhood Improvement District (NID), Enhanced Enterprise Zone (EEZ), Urban Renewal Areas (URA), or other overlay that allows for more favorable financing, such as through property tax abatements, retail tax recapture, or income tax credits. In addition to these more recognized programs administered primarily by the City (EDCKC), State (MODED), and Federal (FTA) government, newer and lesser used programs such as Opportunity Zones, PACE/Clean Energy Districts, and the EB-5 program should also be considered. For instance, these tools would be particularly relevant for creating a potential terminus hub for the MAX line in the vicinity of Winner Road. Specifically, the area north of Independence Avenue is within the designated Opportunity Zone #01550. This overall area is also within Kansas City's Commercial PACE Zone and MO Clean Energy District (MCED). Additionally, the nearby Hardesty Renaissance redevelopment is working to incorporate EB-5 designation into its process.

6.1.2 DESIGN AND POLICY GUIDANCE

Many of the concepts related to the design of transit oriented developments have also been covered in past area studies and are specifically explained in the City of Kansas City's adopted TOD Policy. Issues related to setback, density, contextual design, and ways to integrate multi-modal features are addressed. For the potential development sites denoted along Independence Avenue, each targeted location has its own specific design considerations based upon the property's site and context. In the spirit of form follows function, each site is driven by the purpose of the proposed development, including whether it is intended to spur adjacent redevelopment. For instance, a bus turnaround and mobility hub/transit facility near Winner Road would likely focus on further connecting the existing service-oriented neighboring businesses (e.g.,

Figure 87: Developed Area Near Winner Road

Figure 88: Vacant Sites Near 12th Street and Forest Avenue

grocery stores, bank, hardware store, etc.) (**Figure 87**). Comparatively, development around a station stop at 12th and Forest would aim at spurring new asset growth in an area currently largely bereft of retail and other needed resources (**Figure 88**).

The strong diversity of the Independence Avenue corridor has long been touted, and is complemented by the portion of the route designed to travel through Paseo West, the East Village, and Crown Center. The TOD design standards embraced throughout this corridor should be reflective of and respectful towards such a complex and colorful backdrop. This means designing both infrastructure and new construction that recognizes the diverse cultural, ethnic, and architectural elements of the area, while still offering some form of cohesiveness. Scale, massing, and fenestration can all be contextually appropriate, while materials, finishes, signage, and artwork can honor specific societal identities. Although undoubtedly a challenge, the Independence Avenue corridor presents an extraordinary opportunity to foster genuine creativity in the design of TOD projects, and thus, must be cultivated and supported accordingly.

6.1.3 PROCESS

After proper planning regarding the establishment of a terminal hub and/or other TOD development projects, the KCATA will need to determine its best course of action. Individual properties each require their own unique set of due diligence criteria to fully vet project applicability and constructability. These criteria include both physical and fiscal constraints. Several property options are detailed in other portions of this report which may require very site-specific due diligence. For this purpose, however, the following items are a fairly typical overview of what will be needed to execute an appropriate KCATA-driven TOD development.

Due Diligence:

- Ownership evaluation for land acquisition/ aggregation – joint or otherwise
- Analysis of general environmental issues
- Historical/cultural assets appraisal – Federal 106 and/or local review
- Initial architectural and engineering study to determine site compatibility (e.g., compare if a new transit center and turnaround could be scaled similarly to other existing centers such as the Three Trails Transit Center)
- Review of design guidelines or agency standards (e.g., City of Kansas City boulevard standards)

- Utility assessments
- On site landscape and stormwater evaluations
- Investigation of the status of sidewalk connectivity and basic quality of existing infrastructure
- Examination and engagement on neighborhood compatibility and desirability
- Financial pro forma reviews covering hard and soft costs, as well as ongoing operations and maintenance expenses
- Review of existing incentives and development overlay districts – assessing current incentives or the ability to expand and/or amend existing overlays
- Analyze need for any new development overlay, including time frame required for establishment
- Broader funding analyses, including project applicability for FTA joint development and/or other relevant programs
- Evaluation of multiple levels of jurisdictional political support

6.2 TARGETED AREAS FOR TOD

There are multiple areas and properties along the proposed Independence Avenue MAX BRT alignment that could be strong candidates for future transit oriented development. Due to the nature of real estate negotiations, specific information related to projected site acquisitions and property valuations may need to be maintained confidentially by KCATA. Details on specific properties and areas are detailed in Appendix 7.

7.0 CAPITAL AND OPERATIONS COST ESTIMATION

7.1 CAPITAL COST ESTIMATION

Capital costs for the Independence Avenue BRT project were estimated using the most current unit price information available from KCATA's recent experience constructing the Prospect Avenue MAX. Unit prices provided by KCATA were escalated by three-percent (3%) per year for five years to develop a year of expenditure (YOE) cost for major project line items. As this is a planning level estimate, a twenty percent (20%) risk contingency was included in the estimation to account for unknown issues at this level of project planning. The capital cost estimate has been prepared using the Federal Transit Administration Standard Cost Categories (SCC) format that is required for Small Starts projects.

Two capital cost estimations were developed. The first estimate totals project cost using compressed natural gas (CNG) powered BRT vehicles. The second estimate assumes the project will utilize an all-electric bus fleet to operate the BRT service. **Table 23** displays the capital cost estimate using CNG buses, and **Table 24** utilizing and all electric bus fleet. The capital cost difference between an all CNG fleet and Electric Bus fleet is approximately three million dollars.

Overall, the total project cost for the Independence Avenue BRT project that includes vehicles, stations, transit signal priority, pedestrian improvements, protected bicycle lane, mobility hub and other elements ranges between approximately $60.8 million and $63.8 million.

** The estimated costs of construction are based on WSP USA's professional experience and judgment and shall be deemed to represent the company's opinion. WSP has no control over the cost of labor, material, equipment, and other relevant factors that could influence the ultimate construction costs. Thus, our company does not guarantee that proposals, bids, or the actual facility cost will be the same as the estimate of construction cost or that construction costs will not vary from its opinions of probable cost.*

Table 23: Independence Ave. BRT Capital Cost Estimate with CNG Vehicles

		Quantity	Unit Measure	Base Year (2019) Unit Cost	YOE (2024) Unit Cost	Total
10 GUIDEWAY & TRACK ELEMENTS						
10.03	Guideway: At-grade in mixed traffic	35	EA	$15,000	$17,344	$607,042
					10 Subtotal	$607,042
20 STATIONS, STOPS, TERMINALS, INTERMODAL						
20.01	At-grade station, stops, shelters	35	EA	$345,270	$399,226	$13,972,906
20.011	Mobility Hub (Independence and Winner)	1	EA	$1,500,000	$1,734,405	$1,734,405
					20 Subtotal	$15,707,311
30 SUPPORT FACILITIES: YARDS, SHOPS, ADMIN. BLDGS						
30.04	Storage or Maintenance	0	LS	$1,000,000	$1,156,270	$0
					30 Subtotal	$0
40 SITEWORK & SPECIAL CONDITIONS						
40.01	Demolition, Clearing, Earthwork	34	EA	$15,000	$17,344	$589,698
40.06	Pedestrian / bike access and accommodation, landscaping	4	MI	$1,500,000	$1,734,405	$6,937,620
40.061	Intersection Improvements (ADA, sidewalk, crosswalks)	18	EA	$135,000	$156,096	$2,809,736
40.062	Connecting Pedestrian Facilities	1	LS	$1,840,000	$2,127,537	$2,127,537
					40 Subtotal	$12,464,591
50 SYSTEMS						
50.02	Traffic signals / TSP upgrades	34	EA	$120,000	$138,752	$4,717,582
50.05	Communications	30600	LF	$50	$58	$1,769,093
50.06	Fare collection system and equipment	18	EA	$40,000	$46,251	$832,514
					50 Subtotal	$7,319,189
60 ROW, LAND, EXISTING IMPROVEMENTS						
60.01	Purchase or lease of real estate	1	EA	$400,000	$462,508	$462,508
					60 Subtotal	$462,508
70 VEHICLES						
70.04	Bus (CNG)	10	EA	$750,000	$867,203	$8,672,025
					70 Subtotal	$8,672,025
80 PROFESSIONAL SERVICES						
80.01	Project Development/Final Design	1	LS	$3,609,813	$4,173,919	$4,173,919
80.04	Construction Administration & Management	1	LS	$1,082,944	$1,252,176	$1,252,176
					80 Subtotal	$5,426,094
					Subtotal Project Cost	$50,658,760
					Contingency (20%)	$10,131,752
					Total Project Cost Estimate	**$60,790,512**

Table 24: Independence Ave. BRT Capital Cost Estimate with Electric Bus Fleet

		Quantity	Unit Measure	Base Year (2019) Unit Cost	YOE (2024) Unit Cost	Total
10 GUIDEWAY & TRACK ELEMENTS						
10.03	Guideway: At-grade in mixed traffic	35	EA	$15,000	$17,344	$607,042
					10 Subtotal	$607,042
20 STATIONS, STOPS, TERMINALS, INTERMODAL						
20.01	At-grade station, stops, shelters	35	EA	$345,270	$399,226	$13,972,906
20.011	Mobility Hub (Independence and Winner)	1	EA	$1,500,000	$1,734,405	$1,734,405
					20 Subtotal	$15,707,311
30 SUPPORT FACILITIES: YARDS, SHOPS, ADMIN. BLDGS						
30.04	Storage or Maintenance	1	LS	$1,000,000	$1,156,270	$1,156,270
					30 Subtotal	$1,156,270
40 SITEWORK & SPECIAL CONDITIONS						
40.01	Demolition, Clearing, Earthwork	34	EA	$15,000	$17,344	$589,698
40.06	Pedestrian / bike access and accommodation, landscaping	4	MI	$1,500,000	$1,734,405	$6,937,620
40.061	Intersection Improvements (ADA, sidewalk, crosswalks)	18	EA	$135,000	$156,096	$2,809,736
40.062	Connecting Pedestrian Facilities	1	LS	$1,840,000	$2,127,537	$2,127,537
					40 Subtotal	$12,464,591
50 SYSTEMS						
50.02	Traffic signals / TSP upgrades	34	EA	$120,000	$138,752	$4,717,582
50.05	Communications	30600	LF	$50	$58	$1,769,093
50.06	Fare collection system and equipment	18	EA	$40,000	$46,251	$832,514
					50 Subtotal	$7,319,189
60 ROW, LAND, EXISTING IMPROVEMENTS						
60.01	Purchase or lease of real estate	1	EA	$400,000	$462,508	$462,508
					60 Subtotal	$462,508
70 VEHICLES						
70.04	Bus (Electric)	10	EA	$850,000	$982,830	$9,828,295
					70 Subtotal	$9,828,295
80 PROFESSIONAL SERVICES						
80.01	Project Development/Final Design	1	LS	$3,725,440	$4,307,615	$4,307,615
80.04	Construction Administration & Management	1	LS	$1,117,632	$1,292,284	$1,292,284
					80 Subtotal	$5,599,899
					Subtotal Project Cost	$53,145,105
					Contingency (20%)	$10,629,021
					Total Project Cost Estimate	**$63,774,126**

7.2 CONCEPTUAL ALTERNATIVE ANNUAL OPERATION AND MAINTENANCE COST ESTIMATION

As noted in Section 4.4, annual operations and maintenance costs were estimated for the conceptual Independence Avenue MAX BRT service with extension to the Independence Transit Center. Costs were estimated using current (2018) cost factors which include annual miles of transit service, annual platform hours, and other factors that include fuel, maintenance as well as overhead and administrative costs to estimate a fully allocated cost for transit service.

Operational costs were developed for the complete conceptual operations plan and estimated the portion of operational cost would be required from the City of Independence using existing terms of the annual transit service contract the City has with KCATA. To estimate the City of Independence share, the fully allocated cost for service was developed then deductions were made to account for passenger fare revenue, application of federal transit funds, and other offsets to determine the estimated share of the new service for the City.

Table 25 displays the annual operations and maintenance cost estimation for the proposed Independence Avenue MAX service.

Annual operational costs would increase by 54.4% from current 24 Independence service to $3,967,474.

Due to proposed expansion of transit service span later into the evening, the annual operations cost for the City of Independence would increase by 64.4% for an annual operations cost of $178,843.

Service Alternative	Total Annual Miles	Total Annual Hours	Annual Operating Cost	KCATA Annual Operations Cost Increase	Percent Change	City of Independence Annual Cost	City of Independence Percent Change
Current 24 Independence	269,578	27,721	$2,569,830	NA	NA	$108,805	NA
Independence Ave. MAX with extension to Independence Transit Center	**407,966**	**33,387**	**$3,967,474**	**$1,397,645**	**54.4%**	**$178,843**	**64.4%**

Table 25: Independence Ave. MAX Annual Operating Cost Estimation

8.0 PROJECT FUNDING ALTERNATIVES

From the beginning of the Independence Avenue BRT Planning and Feasibility Study, it was assumed that federal funding of some form would be necessary for a capital-intensive project, as MAX projects have been in the past. The Independence Avenue study sought to develop a conceptual BRT plan that would be compliant with multiple federal funding programs and score as competitively as possible in the project's evaluation. The following outlines the most likely sources of capital funding for the Independence MAX project.

8.1 SMALL STARTS

Previous MAX projects have utilized FTA's Capital Investment Grants Program to fund a significant portion of the BRT vehicles, stations, and other key capital elements of the projects. Under the Fixing America's Surface Transportation (FAST) Act, approximately $2.3 billion is available to fund capital investment for various transit modes, including BRT. Small Starts may cover up to 80 percent of capital costs up to $100 million. The Independence MAX project would be most applicable to the Small Starts program. Criteria for Small Starts projects include:

- Total project cost is less than $300 million and total Small Starts funding sought is less than $100 million
- New fixed guideway systems (light rail, commuter rail etc.)
- Extension to existing system
- Fixed guideway BRT system
- Corridor-based BRT system

BRT projects are split into two categories, Corridor-Based and Fixed Guideway. Corridor-Based BRT have the following characteristics:

- Separated right-of-way not required for entirety of corridor
- Makes a substantial investment in a specific corridor
- Defined stations
- Transit signal priority for buses
- Short headway times
- Bidirectional services for a substantial part of weekdays

As currently envisioned, the Independence Avenue MAX would be well-positioned as a Small Starts Corridor-Based BRT project. Due to constrained street ROW and limited traffic congestion, there is little need or benefit for the construction of a fixed guideway for BRT operations in the Independence corridor. **Figure 89** outlines the FTA Small Starts process.

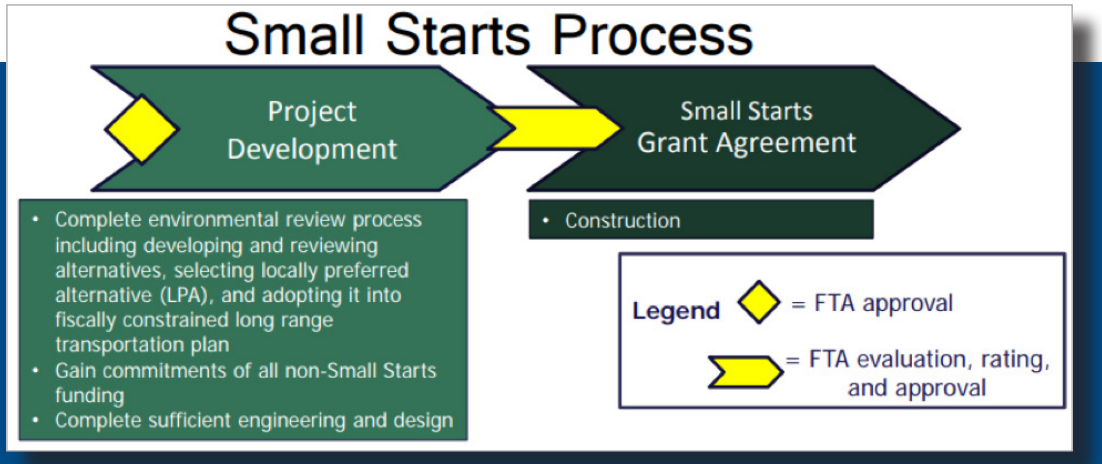


Figure 89: FTA Small Starts Process **Source: Federal Transit Administration**

If KCATA is to seek Small Starts funding, it will need to request entry into the Project Development process. In Project Development, the Independence Avenue BRT project would conduct the appropriate NEPA analysis, identify all needed local funding commitments to match federal capital funds, have the project included in the regional Long-Range Transportation Plan and develop all needed engineering and design for construction in the final phase of the Small Starts process.

In recent years FTA's Capital Investments Grants Program has become more competitive. Because of this, KCATA may need to look to multiple other sources of capital funding to construct and implement the Independence Avenue MAX project.

8.2 BETTER UTILIZING INVESTMENTS TO LEVERAGE DEVELOPMENT

The Better Utilizing Investments to Leverage Development (BUILD) is a discretionary capital grant program from the United States Department of Transportation. Between 2009 and 2017 this discretionary grant program was known as Transportation Investments Leveraging Economic Recovery (TIGER). In the most recent round of BUILD grants, $1.5 billion in capital funding was allocated to the program for nationally significant road, bridge, transit, rail, ports and other major transportation areas.

The BUILD program assesses project grant applications on the following criteria:

Merit Criteria

- Safety
- State of Good Repair
- Economic Competitiveness
- Environmental Protection
- Quality of Life
- Innovation
- Partnership
- Non-Federal Revenue for Transportation Infrastructure Investment

Other Criteria

- Demonstrated Project Readiness
- Project Costs and Benefits

Projects seeking BUILD funding must have at a minimum initiated the NEPA review process, have identified reliable sources of local match funding and be reading to move rapidly towards implementation. BUILD grants are eligible to cover up to 80 percent of project capital costs in urbanized areas. In the final year of TIGER grants in 2017, the Metropolitan Atlanta Rapid Transit Authority (MARTA) was awarded nearly $13 million for a new BRT project. In the most recent BUILD awards, a BRT project in Oklahoma City was provided more than $14 million in capital funds.

Since the TIGER/BUILD discretionary grant program was initiated a decade ago, Notice of Funding Opportunities have been published about once a year. The 2018 BUILD program funded multiple BRT related projects around the U.S. It is likely another round of BUILD grant applications may be released in the second half of 2019. The BUILD program could be another suitable source of capital project funds for the Independence Avenue MAX.

8.3 SURFACE TRANSPORTATION PROGRAM

The Surface Transportation Program (STP) is a funding allocation from the Federal Highway Administration (FHWA) to the Kansas City Region's Metropolitan (MPO), Mid America Regional Council (MARC). STP funds are generally for transportation projects that maintain important infrastructure, develop new transportation modal alternatives, or manage roadway congestion and capacity. Along with all cities, counties and state DOTs in the MARC region, KCATA is eligible to receive STP funding

for capital projects. Typically, STP funds may not be used for design or engineering activities, but could be utilized for acquisition of BRT vehicles, stations, sidewalk improvements, mobility hubs and other capital facilities needed to support the operation of the Independence Avenue MAX. It is unlikely that STP funds alone would be sufficient to fully implement the Independence Avenue MAX project but could be an important source for project components such as purchase of BRT vehicles or TSP infrastructure.

9.0 ASSESSMENT OF IMPACT AND BENEFITS

9.1 TRAFFIC IMPACTS

This section details the expected traffic related impacts of implementing the Independence Avenue MAX along the entirety of the selected alignment alternative along Independence Avenue and Paseo and 11th/12th Street and Grand Boulevard. Trafficware's Synchro/SimTraffic software was used to measure the travel time per corridor for passenger vehicles, to calculate the level of service (LOS) based on the Highway Capacity Manual (HCM), and to determine the effect of the proposed road diet on Independence Avenue. The travel time for the proposed bus routes were calculated using PTV's Vissim microsimulation software. The Vissim model was also used to verify the SimTraffic travel times.

9.1.1 PASSENGER VEHICLE ANALYSIS FOR INDEPENDENCE BRT CORRIDOR

Two conditions for the travel time and LOS analysis were analyzed:

Table 26: Eastbound/Northbound Travel Time by Corridor for Independence BRT Corridor

Eastbound / Northbound	Existing SimTraffic	Proposed SimTraffic	Difference Proposed to Existing SimTraffic	Proposed Vissim TSP	Difference Proposed Vissim to Proposed SimTraffic
Independence	**9 min 14 sec**	**9 min 18 sec**	**0 min 3 sec**	**9 min 37 sec**	**0 min 19 sec**
Paseo	**2 min 56 sec**	**2 min 35 sec**	**0 min -21 sec**	**2 min 5 sec**	**0 min -29 sec**
12th	**3 min 4 sec**	**3 min 24 sec**	**0 min 20 sec**	**3 min 49 sec**	**0 min 25 sec**
Grand	**8 min 12 sec**	**5 min 13 sec**	**-2 min -59 sec**	**3 min 58 sec**	**-1 min -15 sec**
Total	*23 min 26 sec*	*20 min 29 sec*	*-2 min -57 sec*	*19 min 29 sec*	*-1 min 0 sec*

Table 27: Westbound/Southbound Travel Time by Corridor for Independence BRT Corridor

Westbound / Southbound	Existing SimTraffic	Proposed SimTraffic	Difference Proposed to Existing SimTraffic	Proposed Vissim TSP	Difference Proposed Vissim to Proposed SimTraffic
Independence	**10 min 6 sec**	**10 min 45 sec**	**0 min 40 sec**	**8 min 51 sec**	**-1 min -54 sec**
Paseo	**2 min 39 sec**	**2 min 53 sec**	**0 min 14 sec**	**2 min 42 sec**	**0 min -11 sec**
12th	**1 min 41 sec**	**1 min 39 sec**	**0 min -2 sec**	**2 min 21 sec**	**0 min 42 sec**
Grand	**7 min 51 sec**	**5 min 50 sec**	**-2 min -1 sec**	**4 min 27 sec**	**-1 min -22 sec**
Total	*22 min 16 sec*	*21 min 7 sec*	*-1 min -9 sec*	*18 min 21 sec*	*-2 min -46 sec*

- Existing Condition (lane configurations is the same as existing in the field (including the road diet on Grand Boulevard), most recent traffic counts available from the City of Kansas City, MO, with the signal timing plan based on the City of Kansas City, MO's PM Peak Hour Synchro model)
- Proposed Phase 1 (lane configuration includes a road diet on Independence Avenue (from Winner Road to Woodland Avenue)/12th Street (from Paseo to Charlotte Street), most recent counts available from the City of Kansas City, MO, with an optimized signal timing plan based on existing travel patterns)

The average travel time for each corridor for the existing and proposed conditions from SimTraffic and Vissim are shown in **Table 26** and **Table 27** (previous page) for the eastbound/northbound and westbound/southbound directions, respectively.

The overall travel time across all corridors was reduced by the proposed plan. This reduction is primarily due to signal optimization throughout the entire study area. The road diet on Independence Avenue is expected to have minimal impact on both the eastbound and westbound travel times for the approximately 2.5-mile corridor.

This traffic modeling effort revealed potentially long vehicle queues along Independence Avenue following BRT vehicles in the road-diet street configuration. With no passing lane available, automobiles behind a BRT bus in traffic may have to essentially follow the bus for the full length of the corridor. These queues appear to have the greatest impact in both the east and west bound directions between Hardesty Avenue and Benton Boulevard, where through traffic along Independence Avenue is highest. One strategy to mitigate the longer vehicle queues following BRT buses would be to convert portions of the center bi-directional turn lane into an east bound or west bound passing lane to allow cars / trucks to pass the bus. Other mitigations can be developed and assessed in the next phase of project development.

As shown in **Table 28 (next page)**, the only intersection currently operating below an acceptable level is Independence Avenue & Hardesty Avenue. At this intersection, the proposed model added separate left-turn and through lanes on the northbound approach, which would likely fit in the existing curb width due to wide lanes currently striped there. None of the proposed intersections along the Independence BRT corridor are expected to operate below the acceptable threshold of a "D".

9.1.2 BUS ROUTE TRAVEL TIME FOR INDEPENDENCE BRT CORRIDOR

The Vissim model for the Independence BRT included Transit Signal Priority (TSP) for the bus routes and was based on the proposed signal plan in the Synchro model. TSP uses sensors for oncoming and outgoing vehicles at each intersection to detect whether a transit vehicle will be approaching the intersection around the same time the traffic signal may turn to red. The TSP will increase the green time to improve the probability that the bus will be able to make it through the signal without stopping. The TSP system utilized in the model would extend the green time up to 15 seconds.

Table 28: LOS and Delay per Vehicle for each Intersection along the Independence BRT Corridor

Corridor	Intersecting Street	HCM Intersection LOS		HCM Intersection Delay	
		Existing	Proposed	Existing (sec)	Proposed (sec)
11th Street	Charlotte Street	B	B	13.8	15.7
11th Street	I-70 Ramp	A	B	7.5	13.6
11th Street	Oak Street	A	B	10.0	14.7
11th Street	Troost Avenue	B	B	12.8	19.3
12th Street	Charlotte Street	B	B	12.8	18.9
12th Street	Holmes Street	B	C	13.2	23.4
12th Street	Locust Street	B	B	11.0	12.5
12th Street	Oak Street	C	C	21.4	24.1
12th Street	Troost Avenue	B	A	12.4	6.0
Grand Boulevard	11th Street	C	B	20.1	12.0
Grand Boulevard	12th Street	C	C	26.3	26.0
Grand Boulevard	13th Street	A	A	8.9	9.4
Grand Boulevard	14th Street	A	A	6.9	5.6
Grand Boulevard	18th Street	B	B	13.6	18.4
Grand Boulevard	19th Street	C	B	25.8	16.8
Grand Boulevard	20th Street	C	C	30.4	21.5
Grand Boulevard	22nd Street	C	C	34.2	21.0
Grand Boulevard	26th Street	B	B	13.6	14.5
Grand Boulevard	27th Street	B	B	12.5	17.7
Grand Boulevard	N. Truman Road	C	B	25.0	16.1
Grand Boulevard	S. Truman Road	C	B	23.2	20.0
Grand Boulevard	Pershing Road	C	C	23.6	24.9
Independence Avenue	Benton Boulevard	B	B	10.4	14.2
Independence Avenue	Brighton Avenue	C	B	22.4	17.9
Independence Avenue	Brooklyn Avenue	A	A	5.8	6.4
Independence Avenue	Chestnut Avenue	B	B	11.6	15.7
Independence Avenue	Hardesty Avenue	F	C	82.3	27.6
Independence Avenue	Monroe Avenue	A	A	4.1	5.3
Independence Avenue	Norton Avenue	A	A	3.8	4.3
Independence Avenue	Paseo	C	C	23.3	24.4
Independence Avenue	Prospect Avenue	C	C	27.4	26.1
Independence Avenue	Topping/Wilson Avenue	B	B	20.0	18.2
Independence Avenue	Van Brunt Boulevard	A	B	6.4	10.4
Independence Avenue	Winner Road	C	C	28.3	30.5
Independence Avenue	Woodland Avenue	A	B	7.9	11.4
Paseo	12th Street	B	C	14.3	22.3
Paseo	11th Street	A	A	7.0	7.3
Paseo	10th Street	B	A	17.1	9.9
Paseo	9th Street	C	A	27.3	8.9
Paseo	8th Street	A	B	7.7	11.1
Paseo	Admiral Boulevard	B	B	13.4	17.4
		Total Intersection Delay		719.5	661.4

The travel times and average speeds for the buses in the Vissim model are included in **Table 29**. The overall travel times and average speeds for both route directions are expected to be similar in value.

BRT Travel Times and Speeds		
Direction	**Vissim Proposed TSP Travel Time**	**Vissim Proposed TSP Speed**
Eastbound	24 min. 24 sec.	14.9 mph
Westbound	24 min. 29 sec.	14.6 mph

Table 29: Travel Time and Average Speed for Buses in the Vissim Analysis

9.2 ENVIRONMENTAL SCAN

The National Environmental Policy Act of 1969 (NEPA) made protection of the natural and built environment a national priority when it was enacted in 1969. NEPA requires varying levels of review and analysis to determine potential impacts to the environment related to any action that involves federal funding. It is anticipated that KCATA will seek federal funding assistance from the Small Starts or federal capital funding program. Because of this a NEPA review of the Independence Avenue MAX BRT project will be needed in the future to satisfy the requirements of NEPA and ensure the project no significant impact on the surrounding environment. The NEPA review process for the Federal Transit Administration is broken down into three different classes of action, or levels of review.

1. **Categorical Exclusions** (23 C.F.R 771.117): Categorical Exclusions (CEs) are granted for actions that do not individually or cumulatively involve significant social, economic or environmental impacts. The projects listed in 23 C.F.R 771.117 require little or no construction and involve minimal or no effects off-site. The regulation gives a list of the types of projects that are categorically excluded. Once FTA has determined that a CE applies, it may act on the application for financial assistance.
2. **Environmental Assessments** (23 C.F.R 771.119): FTA may require an applicant for financial assistance to prepare an Environmental Assessment (EA) when the significance of the environmental impact is not clearly established. An EA can result in either a Finding of No Significant Impact (23 C.F.R. 771.121) requiring no further environmental evaluation, or identification of potentially significant impacts requiring the applicant to conduct an Environmental Impact Statement.
3. **Environmental Impact Statements** (23 C.F.R 771.123 et seq.): Depending on the nature of the proposed project, FTA may immediately require applicants to develop an Environmental Impact Statement (EIS), or request an EIS based on the outcome of an EA. In either case, an EIS requires that a substantial technical analysis and public review process be conducted to evaluate project alternatives, identify potential social, economic and environmental impacts of the project, and designate methods to avoid or mitigate these impacts. Successful completion of an EIS results in FTA signing a Record of Decision (ROD). Once FTA has signed a ROD, the applicant can proceed with the project having complied with NEPA and FTA may act on the application for federal assistance.[4]

[4]**Federal Transit Administration, National Environmental Policy Act, Complying with NEPA.** https://www.transit.dot.gov/regulations-and-guidance/environmental-programs/national-environmental-policy-act.

Past MAX projects in the Kansas City area have been classified as Categorical Exclusions. Independence Avenue MAX is anticipated to be constructed primarily within existing city-owned right-of-way in a previously disturbed built urban environment. KCATA will need to consult with FTA to determine the appropriate class of action for the proposed Independence MAX BRT project. The following are areas of environmental concern specific to the Independence Avenue MAX project and will required further investigation as the project moves into future phases of development.

9.2.1 NEPA AREAS OF CONCERN

CULTURAL RESOURCES

Both the U.S. Department of the Interior's website and State of Missouri's State Historic Preservation Office (SHPO) were consulted to identify specific locations or districts that are listed on the National Registry of Historic Places (NRHP) along the proposed alignment for the Independence Avenue BRT project. This initial review found the following locations and areas listed on the NRHP:

- Kansas City Parks and Boulevards System –
  - Independence Avenue
  - Paseo Boulevard
- U.S. Quartermaster General Depot/Hardesty Self Storage – 5401 Independence Avenue, Kansas City, Missouri 64124
- The New England Apartments – 1116 Paseo Boulevard, Kansas City, Missouri 64106
- The McMahon Apartments – 1106 Paseo Boulevard, Kansas City, Missouri 64106
- 1106 Paseo Boulevard, Kansas City, Missouri 64106
- The Maryland Apartments – 930 Paseo Boulevard, Kansas City, Missouri 64106
- The Kessler Apartments – 924 Paseo Boulevard, Kansas City, Missouri 64106
- Henderson House – 1016 Paseo Boulevard, Kansas City, Missouri 64106

In the next phase of planning for the Independence Avenue BRT project, coordination will be required with the Missouri SHPO and the regional FTA office to review any potential effects to historic properties adjacent to the project for compliance with Section 106 of the National Historic Preservation Act of 1966. As currently planned, the Independence Avenue BRT project would not require additional land outside of existing public right-of-way and therefore unlikely to have any adverse impact or effect to any adjacent historic properties or districts listed above. Cultural Resources are also covered under Section 4(f) and discussed later.

ENVIRONMENTAL JUSTICE

The United State Department of Environmental Protection and U.S. Department of Transportation work closely to enact a 1994 Presidential Executive order mandating federal agencies incorporate environmental justice analyses that ensure the fair treatment and meaningful involvement of citizens regardless of race, color, national origin or income. Environmental Justice (EJ) analyses help to provide meaningful participation in the planning projects, like Independence Avenue MAX, and to determine if a proposed project or action will have a disproportionally high impact or adverse effects on EJ communities. According to analysis from the Mid America Regional Council[5], most the neighborhoods and census tracts surrounding the Independence Avenue corridor are Environmental Justice areas, the majority of those EJ tracts meet the criteria for both low-income and minority areas.

[5]**Mid America Regional Council Environmental Justice Analysis 2016-2020. P. 5.** http://www.marc.org/Transportation/Equity/pdf/EJ_2016-2020_adopt.aspx.

As currently planned, the Independence Avenue MAX BRT project would likely not have adverse effects or disproportionally high impact to the EJ community in the project area. As the project would increase public transit services and improve passenger amenities, the Independence Avenue MAX project would have many positive benefits to the EJ areas adjoining the corridor.

FLOODPLAINS/ FLOODING

According to the Federal Emergency Management Administration's (FEMA) National Flood Hazard Map[6], there are no portions of the proposed Independence Avenue MAX BRT project within any flood areas.

HAZARDOUS MATERIAL SITES

Along the proposed Independence Avenue BRT alignment, there are multiple locations listed as hazardous material sites. Many of these locations are active gas stations along Independence Avenue with Underground Storage Tanks (UST) for fuel. According to the Missouri Department of Natural Resources[7] these gas station sites include:

- BP Gas Station 4815 Independence Avenue, Kansas City
- 7 Eleven Gas Station 3201 Independence Avenue, Kansas City
- •BP Gas Station 1900 Independence Avenue, Kansas City
- 7 Eleven Gas Station 1700 Independence Avenue, Kansas City

Another active hazardous waste site along the Independence Avenue corridor is the former U.S. Quartermaster Depot at the southeast corner of Independence Avenue and Hardesty Avenue. In 2016 the Hardesty Renaissance Economic Development Corporation was awarded a $200,000 brownfields cleanup grant. Hazardous substances grant funds will be used to clean up Building 10 of the Hardesty Federal Complex on 605 Hardesty Avenue in Kansas City. The building was used as a United States Army Quartermaster Corps storage depot in the late 1940s and provided a variety of support functions for various federal agencies until it was closed in 2002. It has been vacant since then and is contaminated with metals and inorganic substances. Grant funds also will be used to support related community outreach activities.

A second brownfield site is located at the former Apple Market grocery store at 3719 Independence Avenue in Kansas City. This 2.21-acre site most recently housed a grocery store. Prior to this, the subject property included two gas stations, a dry-cleaning plant, a print shop, a boiler repair company, a soda water factory, a coal yard, various retail shops and restaurants, and residential development. A phase II site investigation revealed the presence of petroleum contamination in the soil and groundwater in the northwest corner of the property and tetrachloroethylene in the groundwater in the southeast portion of the site.[8]

Findings from this initial review of hazardous materials and brownfield sites along the proposed Independence Avenue MAX route indicate that sites with active UST and are being monitored, as well as several formally contaminated sites in various forms of environmental remediation. Given the proposed location of BRT stations within the existing publicly owned right-of-way, it is highly unlikely that construction of these stations would impact any USTs or areas where hazardous materials are present.

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[6] https://msc.fema.gov/portal/search?AddressQuery=Kansas%20City%2C%20MO#searchresultsanchor

[7] **Missouri Department of Natural Resources. Missouri E-Start Environmental Tracking Tool.** https://dnr.mo.gov/ESTART/.

[8] **Missouri Department of Natural Resources** http://www.dnr.mo.gov/ESTARTMAP/map/summary.action?type=s&id=3100.

NOISE AND VIBRATION

Along the proposed corridor for the Independence Avenue MAX BRT, there are several sensitive receptors for noise and vibration that may be caused by the project. These include residences, schools, parks, medical facilities, places of worship, libraries and others.

There are three levels of analysis which may be employed, depending on the type and scale of the project, the stage of project development, and the environmental setting. The technical content of each of the three levels is specified in the body of this document, but a summary of each level is given in the following paragraphs:

- Screening Procedure: Identifies noise- and vibration-sensitive land uses near a project and whether there is likely to be impact. It also serves to determine the noise and vibration study areas for further analysis when sensitive locations are present. The screening process may be all that is required for many of the smaller transit projects which qualify as categorical exclusions. When noise/vibration sensitive receivers are found to be present, there are two levels of quantitative analysis available to predict impact and assess the need for mitigation measures.
- General Assessment: Identifies location and estimated severity of noise and vibration impacts in the noise and vibration study areas identified in the screening procedure. For major capital investments, the General Assessment provides the appropriate level of detail to compare alternative modes and alignments in alternatives analysis. It can be used in conjunction with established highway noise prediction procedures to compare and contrast highway, transit and multimodal alternatives. Before basic decisions have been reached on mode and alignment in a corridor, it is not prudent to conduct the most detailed level of noise and vibration analysis. For smaller transit projects, this level is used for a closer examination of projects which show possible impacts because of screening. For many smaller projects, this level may be sufficient to define impacts and determine whether mitigation is necessary.
- Detailed Analysis: Quantifies impacts through an in-depth analysis usually only performed for a single alternative. Delineates site-specific impacts and mitigation measures for the preferred alternative in major investment projects during preliminary engineering. For other smaller projects, Detailed Analysis may be warranted as part of the initial environmental assessment if there are potentially severe impacts due to proximity of sensitive land uses.[9]

It is unlikely there will be any significant impacts to the surrounding community and sensitive receptors, as the Independence corridor currently has heavy-duty transit vehicles in operation, as well as auto and truck traffic. Rubber tire bus vehicles cause very little vibration on city streets and vehicle noise will not exceed current levels. There may be limited impacts during construction of the project, but these will be limited in duration and location.

[9]**Federal Transit Administration. Transit Noise and Vibration Impact Assessment. P. 1-4.** https://www.transit.dot.gov/sites/fta.dot.gov/files/docs/FTA_Noise_and_Vibration_Manual.pdf**. May, 2006**

SECTION 4(F) AREAS – PARKLANDS

The U.S. Department of Transportation Act of 1966, Section 4(f) requires transportation projects make special effort to preserve the natural beauty, public parks, recreational lands, and historic sites. Any federal transportation project that impacts a park or recreational land may only be approved if it can be demonstrated that no other feasible alternatives exist that would not impact parkland. This study reviewed existing parks located along the proposed Independence Avenue MAX alignment and found the following public parks adjoining the route;

- **Independence Plaza Park** – Located both north and south of Independence Avenue between Brooklyn Avenue and E. Park Avenue. There is a BRT station proposed in the eastbound direction at the south-east corner of Independence and Brooklyn Avenue. As with all proposed BRT stations included in the Independence MAX BRT project, the station would be constructed in previously built upon public right-of way, and not have any direct impact to the adjacent park.
- **Ilus Davis Park** - There is a BRT station proposed in the eastbound direction at the south-east corner of Independence and Brooklyn Avenue. As with all proposed BRT stations included in the Independence MAX BRT project, the station would be constructed in previously built upon public right-of way, and not have any direct impact to the adjacent park.
- **Washington Square Park** - There is a BRT station proposed in the eastbound direction at the south-east corner of Independence and Brooklyn Avenue. As with all proposed BRT stations included in the Independence MAX BRT project, the station would be constructed in previously built upon public right-of way, and not have any direct impact to the adjacent park.

Both Paseo Boulevard and a portion of Independence Avenue from Paseo Boulevard east to Benton Boulevard are part of the Kansas City Parks and Boulevards system that is under the direction of the Kansas City Parks Department. As the project progresses, KCATA will need to coordinate closely with the Parks Department Development Review Committee as plans are refined for station locations designs to be placed along parkways or boulevards under their jurisdiction.

WETLANDS AND WATERS OF THE UNITED STATES

According to the U.S. Fish and Wildlife Service's National Wetlands Inventory, there are no existing wetlands in the proposed project area for the Independence Avenue MAX. Also, there are no navigable waterways within the project area. The project would cross a piped subterranean riverine that runs under Independence Avenue near Cleveland Avenue and Monroe Avenue. No station or other proposed elements of the BRT project would likely impact this existing riverine.

ENVIRONMENTAL NEXT STEPS

As the Independence Avenue MAX project advances into more detailed planning, a more comprehensive NEPA review will be required in close coordination with the FTA Region VII office to determine what level of environmental, historic and noise/vibration analysis is required. At this stage in the planning process, it is not anticipated that the project would have any significant impacts to the natural or built urban environment.

10.0 PUBLIC ENGAGEMENT ACTIVITIES

10.1 PURPOSE AND GOAL OF ENGAGEMENT

Public involvement efforts were initiated to promote awareness of and encourage community participation in the Independence Avenue Bus Rapid Transit Planning & Feasibility Study process. A public engagement plan and study identity were created and key stakeholders were identified. An Advisory Committee of key stakeholders was recruited to guide the technical team and provide feedback as alternatives were developed. The Advisory Committee was also tasked with developing the study vision and Study goals:

Study Vision

"The Independence Avenue Corridor is a vibrant, culturally diverse and cohesive corridor featuring safe, fast and environmentally-conscious mobility options that conveniently and efficiently connects people to jobs, businesses, tourist attractions and services by providing enhanced public transportation to residents and visitors."

10.2 ADVISORY COMMITTEE

An Advisory Committee was established to enhance the study process. This committee was asked to perform the following tasks:

- Provide guidance on direction of Study
  - Project vision and goals
- Provide input and feedback as Study details developed
  - Alignment alternatives
  - Station locations
  - Station design and amenities
- Communicate Study information to constituencies represented

The following organizations in **Table 30** were asked to provide representation for the Advisory Committee, and those noted with an asterisk (*) attended at least one meeting during the project:

Table 30: Advisory Committee Invitees and Members

*Asian American for Equality/Hardesty Renaissance EDC	*Don Bosco Senior Center	*Jewish Vocational Service (JVS)
Blue Valley Neighborhood Association	Englewood Business Association	Kansas City School District
City of Independence – Councilman Perkins	Fairmount/Mount Washington Historical District	*Kansas City University of Medicine & Biosciences
*City of Independence – Mayor Eileen Weir	*Independence Avenue CID/ Pendleton Heights Neighborhood Association	Lykins Neighborhood Association
*City of Kansas City, Missouri – City Planning & Development	Independence Chamber of Commerce	*Mattie Rhodes Center-Northeast
City of Kansas City, Missouri – City Council	*Independence Plaza Neighborhood Association	*NEAT
Columbus Park Neighborhood Association	*Independence Square Business Association	*Northeast Kansas City Chamber of Commerce
Della Lamb	*Indian Mound Neighborhood Association	North Main Neighborhood Association (Truman Historic District)
Pendleton Heights Neighborhood Association	*Samuel U. Rodgers Health Center	Scarritt Renaissance Neighborhood Association
Sheffield Neighborhood Association	Somali Foundation	

The Advisory Committee met on the following dates:

Advisory Committee #1 - March 1, 2018
(rescheduled from February 22, cancellation due to inclement weather)
11:30 a.m. to 1:00 p.m.
KC Public Library Northeast Branch, 6000 Wilson Rd., Kansas City, Missouri 64123

The purpose of the first Advisory Committee meeting was to introduce the study to committee members and discuss the committee role, provide an explanation of Bus Rapid Transit (BRT), and inform the committee of ridership and demographic statistics in the study area. The group also participated in an interactive exercise to determine the study vision and study goals.

Advisory Committee #2 April 4, 2018
10:45 a.m. to 1:30 p.m.
BUS TOUR

The second Advisory Committee meeting consisted of a Bus Tour of the study area that began at the KCATA Offices at 18th & Lydia Ave in Kansas City, Missouri, and proceeded through the study area to include Downtown Kansas City, Independence Avenue/24 Highway, Winner Road and Truman Road. The tour ended with lunch and a discussion in Independence at the City of Independence Ennovation Center, 201 N. Forest, Independence, Missouri 64050. The purpose of the tour was to give Advisory Committee members a better understanding of route alternatives, challenges and opportunities, as well as location alternatives for station stops (**Figure 90**).

Figure 90: Advisory Committee Study Area Bus Tour

Advisory Committee #3 May 17, 2018
3:00 p.m. to 5:00 p.m.
Independence Avenue CID Office, 2657 Independence Ave., Kansas City, Missouri 64123

The Advisory Committee met a third time in May 2018 to discuss the public meetings and survey results. The technical team presented alignment alternatives and a preferred alignment option for both Downtown Kansas City and the City of Independence. An overview of station locations and character options was presented and discussed.

Advisory Committee #4 August 23, 2018
3:00 p.m. to 4:30 p.m.
Independence Avenue CID Offices, 2657 Independence Ave., Kansas City, Missouri 64123

At the final Advisory Committee meeting, the technical team presented an additional alternative for the Downtown Kansas City portion of the study area that resulted from feedback collected from Advisory Committee meetings, the public meeting, one-on-one stakeholder meetings and survey. Because a BRT option is not feasible in the Independence portion of the study area at this time, three operating alternatives were introduced (**Figure 91**).

The technical team conducted a visual preference exercise to determine the Advisory Committee preferences regarding station stop character, theme and style.

10.3 STAKEHOLDER MEETINGS

The team reached out to key stakeholders and community leaders along the Independence corridor and set up one-on-one meetings to get an introspective view on transit and mobility practices along the corridor. The team met with the following individuals and small groups as shown in **Table 31**.

Figure 91: Independence Ave. BRT Advisory Committee

Table 31: Project Stakeholder Interviews

Stakeholder Contact	Agency
Amanda Barnhart	Kansas City Public Library – Northeast Location
Charles Haynes	Independence Avenue CID
Charlie Hopper	Hardesty Renaissance Project
Chris Hardin-McKinney	Mattie Rhodes
Evie Craig	reStart
Ingrid Burnett	Missouri State Representative, 19th District
Brian Gaddie	
Earl Newill	Jackson County, Missouri - Public Works Department
Tara Burkhart and 10 members of the Jewish Vocational Services Resettlement team	Jewish Vocational Services
Mayor Eileen Weir	City of Independence, Missouri
Mayor Mike Larson	City of Sugar Creek, Missouri
James Wang	City of Kansas City, Missouri – Parks & Recreation
Bob Theis	
Amanda Jackson	Samuel U. Rodgers Health Center
Dr. Hephzibah Dutt	
Warren Adams-Leavitt	
Christine Hoxie	Westside Housing
Bobbie Baker-Hughes	
Rebecca Koop	Northeast Kansas City Chamber of Commerce

10.4 SURVEY

An electronic survey was distributed through the Advisory Committee, the KCATA email contact list, and social media outlets. Hard copies were distributed at Public Meeting #1 and on 24 Independence buses. Electronic and hard copy surveys were made available in English, Spanish, Vietnamese, Swahili and Arabic.

A total of 328 completed surveys were collected. Common themes of the survey included the following:

- Respondents described 24 Independence – Independence Avenue using one word. Some of most popular responses were: Slow, Crowded, Interesting, Good, Dirty.
- Respondents were asked the most important areas to serve in the Downtown KC portion of the Study area. The areas that were most chosen were the River Market/Columbus Park area and the Streetcar connection.
- Participants ranked the routes they felt were most important to serve. The 24 Highway to Independence Avenue route was ranked first, followed by the Truman Road to Independence Avenue route and then the Winner Road to Independence Avenue route.
- Almost 70% of respondents said they would be willing to walk farther to a transit stop that was faster and more frequent with shelters, lighting, and next bus arrival information.

Detailed survey responses and a summary of results are presented in Appendix 8.

10.5 OPEN HOUSE MEETINGS

A total of two Open House Community Meetings were conducted.

Community Meeting #1 - April 17, 2018
4:30 p.m. to 6:00 p.m.
Independence Avenue CID Office, 2657 Independence Ave., Kansas City, Missouri 64123
Approximately 24 community members attended.

The purpose of the first community meeting was to introduce the study to the public, provide an explanation of Bus Rapid Transit (BRT), and obtain feedback on transit and mobility needs and desires of the community **Figure 92** and **Figure 93**.

Figure 92: Public Meeting 1

Figure 93: Project Planners Discussing Independence Project with Transit Riders

Community Meeting #2 – September 29, 2018
10:00 a.m. to Noon
Independence Avenue CID Office, 2657 Independence Ave., Kansas City, Missouri 64123
Approximately 14 community members attended.

The purpose of the community meeting was to present route recommendations related to Independence Avenue or 24 Highway, recommended station locations, enhanced passenger amenities to improve transit experience and other amenities such as bike lanes. The community was asked to weigh in on the presented transit recommendations.

10.6 SUMMARY OF PUBLIC INPUT

Overall public input received from the online survey, stakeholder interviews and open house meeting was overwhelmingly positive. Many residents and current transit riders requested an expedited delivery of the project to implement BRT as soon as possible and believed the investment would bring many positive benefits to the Independence Avenue corridor and surrounding neighborhoods. In both stakeholder meetings and public meetings there was strong interest in connecting and improving other local routes with the planned Independence Avenue MAX, especially 11 Northeast/Westside and 9 9th Street. Residents, transit riders and stakeholders nearly all stressed the need for improved and reliable public transit service in the Independence corridor and supported the MAX project advancing towards implementation.

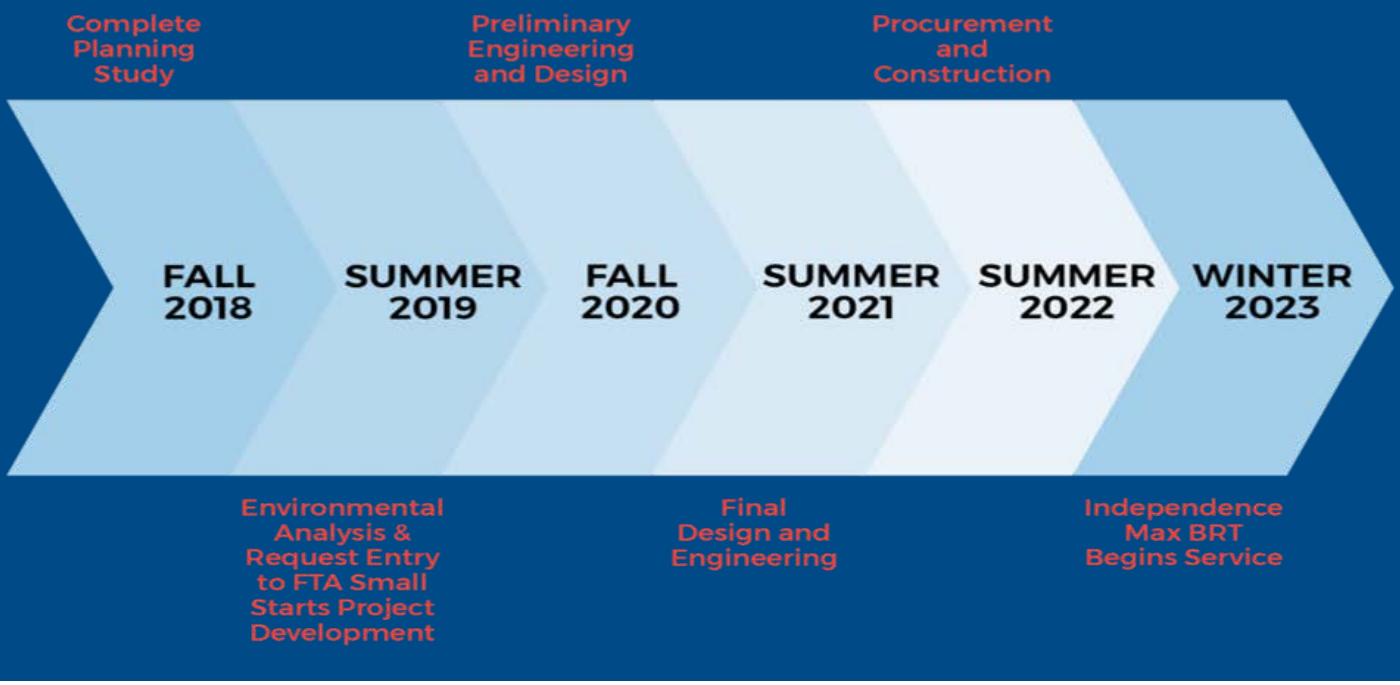
11.0 CONCLUSIONS AND IMPLEMENTATION PLAN

Planning, analysis and community input that was developed through this process has created a highly feasible project that can become the Kansas City region's fourth MAX BRT line. The proposed Independence MAX route would bring a multitude of benefits to the corridor and surrounding neighborhoods–including enhanced mobility from more rapid and reliable transit service along Independence Avenue, economic development opportunities, bicycle and pedestrian infrastructure enhancements, safety, and an overall improvement in connecting people to opportunities throughout the greater Kansas City region.

The Independence Avenue MAX project will incorporate ten-minute BRT service to one of KCATA's most utilized routes in the system and be the first primarily east / west MAX route in the metro region. In addition to BRT operations the project will incorporate planned protected bicycle lanes along Independence Avenue. Bringing the bicycle mode to the corridor will work to extend the reach and benefits of the MAX system beyond the Independence Avenue corridor.

To bring this planned vision for improved, rapid transit service to the Independence Avenue corridor, much more study, data analysis, engineering and design efforts remain. **Figure 94** presents a conceptual project schedule for the next phases of the Independence MAX project. This five-year timeframe from planning to initiation of BRT operations is consistent with KCATA's experience in development of its three previous MAX projects.

Figure 94: Conceptual Project Implementation Schedule



RideKC CONNECTING Independence Ave.

BRT Planning and Feasibility Study