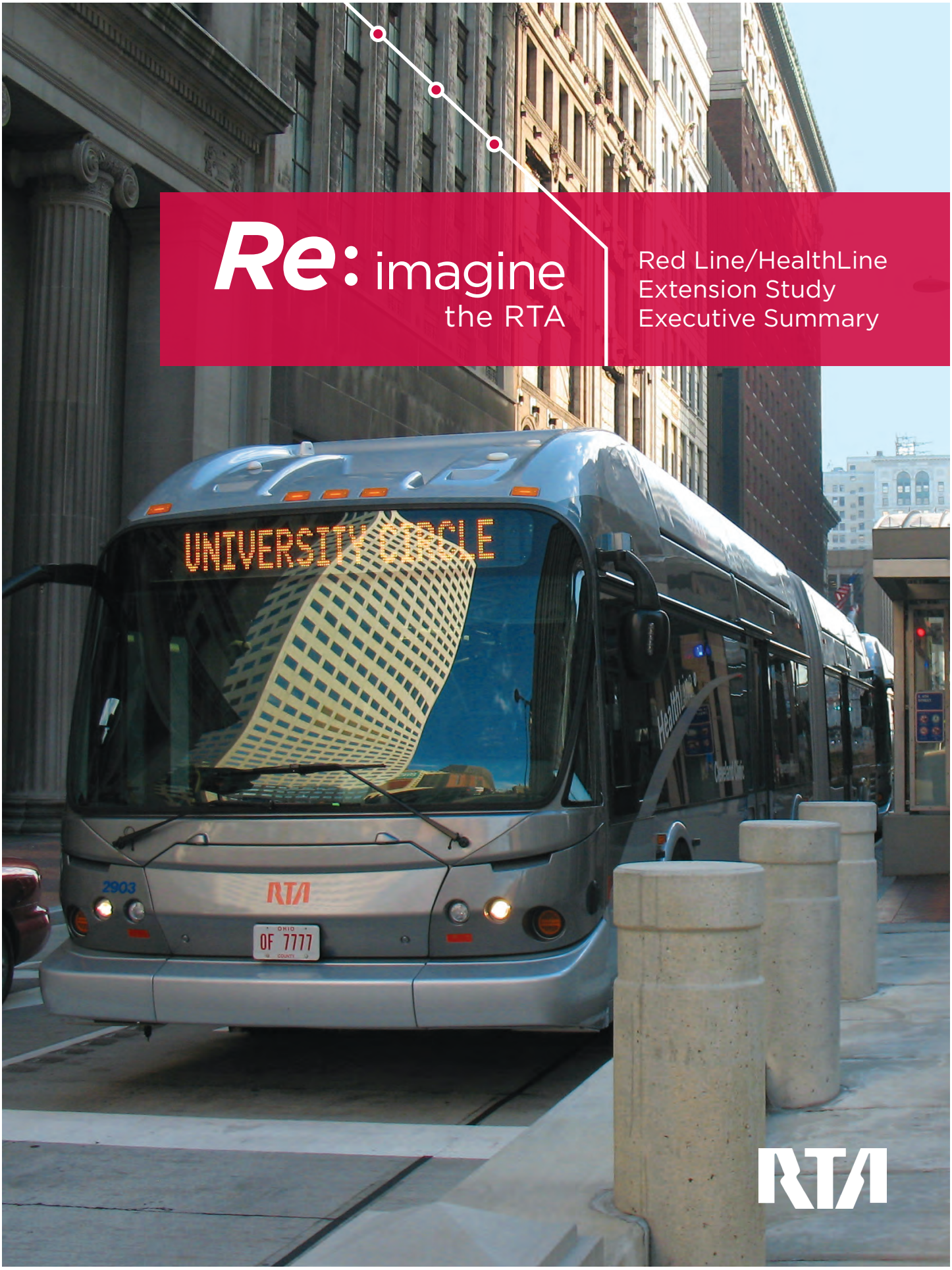
Re: imagine the RTA

Red Line/HealthLine Extension Study Executive Summary



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Overview

The Greater Cleveland Regional Transit Authority (RTA) examined potential HealthLine bus rapid transit and Red Line rail extensions that best satisfy mobility needs of people living in Collinwood, East Cleveland, and Euclid.

After several years of technical analysis and an award-winning, collaborative public outreach effort among the RTA, its study partners and a variety of stakeholders, the study is now complete.

Highlighted in this executive summary are a high-level study process overview and resulting findings. Detailed technical documentation is contained in the study's technical memoranda and reports, which are referenced throughout this summary. All project documentation also can be found on the RTA study website: riderta.com/majorprojects/redlinehealthlineextension.

Purpose and Need

Many studies and activities from 1960 to 2015 have led to the Red Line/HealthLine Extension Study. Each prior study focused on the need to provide an efficient, safe, economical, and balanced transportation system (with auto, transit, and non-motorized modes of travel) that would minimize the impact to the environment and complement the community's development patterns.

The travel mode choices for people who live or work in the study area are currently limited to automobiles, local bus service, or travel by auto to the RTA Red Line or HealthLine Louis Stokes Station at Windermere. The Windermere station is the closest location where residents of Lake County, Euclid, Collinwood, and East Cleveland can access the RTA rapid transit network.

The proposed Red Line/HealthLine extension would extend the rapid transit lines east to serve additional neighborhood-oriented stations in East Cleveland, Collinwood, Nottingham, and Euclid, which would give more people the choice of walking or driving to rapid transit stations nearer to where they live. This could decrease overall travel times, eliminate the need for non-productive parking spaces, decrease air pollutant emissions, and reduce current congestion levels on local arterial roads. Mode shift is very measurable and reflected in the alternatives analysis through increased ridership.

Employment, medical, and education centers located in University Circle can be reached directly via the RTA HealthLine and Red Line without the need for "the last mile" transit distribution system. This means people can very easily reach their final destinations in University Circle by walking, thereby eliminating the need for more parking in the area or a bus transfer.

The Red Line/HealthLine Extension Study focused on addressing the future mobility problems in the study area by providing:

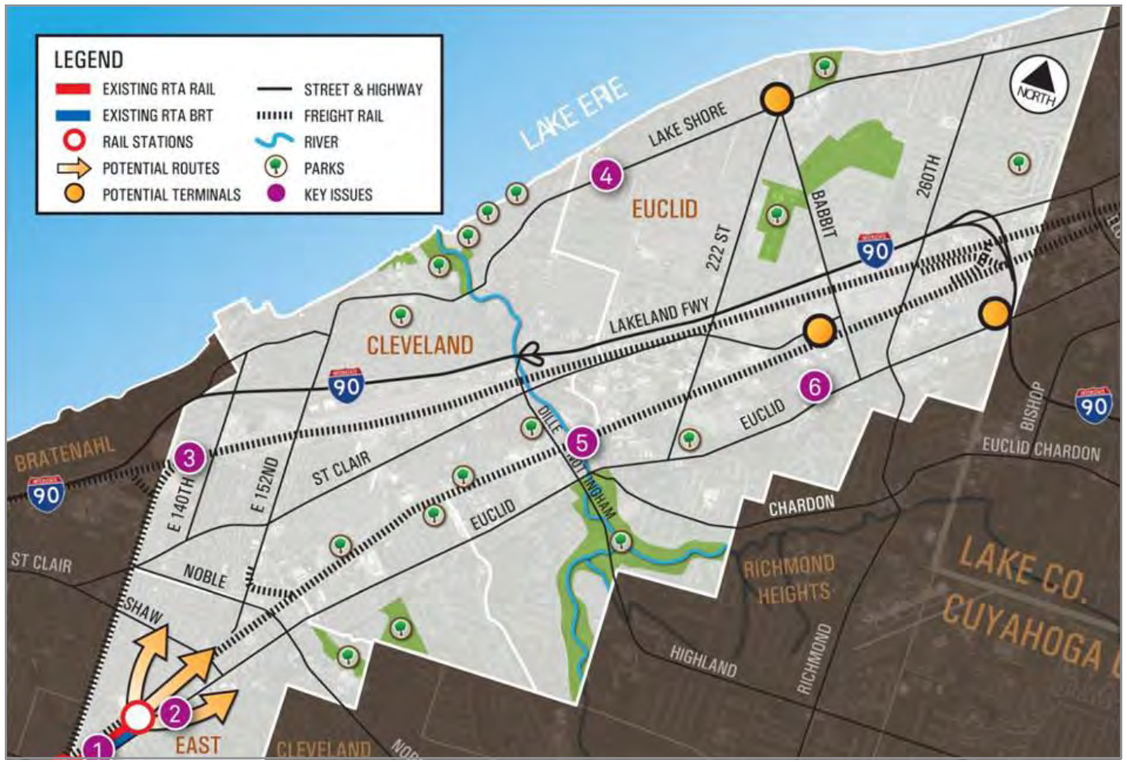
- Improved transit service from the northeast quadrant of Cuyahoga County to University Circle and Midtown, and points beyond and in between; and,
- More connections to the regional transit system from neighborhood stations to which people can walk

The study also aimed to support land use as well as community reinvestment plans and redevelopment goals, including:

Mobility Need	Enhancing transportation options, service, and connections to current and emerging transportation markets for study area residents.
Transportation Network	Refining the transportation network to meet new markets, enhance and maintain current markets, and develop cost effective alternatives to driving alone in cars. Increased demand for transit is occurring due to the overall increased cost of driving automobiles and travel time due to congestion.
Land Use and Community	Developing alternatives that support community reinvestment and redevelopment goals.
Sustainability, Public Health, and Environmental Stewardship	Providing sustainable transit facilities and amenities that promote walking and bicycle use; encouraging transit as a healthy and environmentally friendly, sustainable commuting choice; and supporting sustainable design and green principles for implementation and operation of transit facilities.

Study Area and Existing Conditions

The study area for the Red Line/HealthLine Extension Study centered on the St. Clair Avenue corridor running east from Downtown Cleveland to Euclid. The western boundary of the study area starts at the CSX Short Line right-of-way in and adjacent to the former Cleveland Union Terminal railroad, and extends east along the southern boundary, which is the ridgeline separating the lake plain from the Heights area of Cleveland. The study area also is bound by Lake Erie on the north and Lake County on the east, and contains portions of three cities: Cleveland, East Cleveland, and Euclid. For certain limited purposes the study area extended into some of the western portions of Lake County. The transit alternatives evaluated are located within the defined limits of this study area, as illustrated below.



Population in Study Area

Census Year	Cuyahoga	Lake	Cleveland	East Cleveland	Euclid
1970	1,721,300	197,200	750,903	39,600	71,552
1980	1,480,400	212,800	573,822	36,957	60,000
1990	1,412,140	215,500	505,616	33,096	54,875
2000	1,393,978	227,510	478,403	27,217	52,717
2010	1,280,122	230,040	396,815	17,843	48,920

For the past 40+ years, the Greater Cleveland area population has been decreasing due to migration patterns and the severe decline in manufacturing employment. In particular, the population of Cuyahoga County has declined by 471,178 (27.4%) since 1970. This shift in population has significantly impacted travel patterns (in the study area) and RTA sales tax revenue receipts. Over the next 30-year horizon, Cuyahoga County is projected to lose another 120,000 people, while the surrounding counties gain 107,000. This population shift will lower Cuyahoga County's share of the five-county region from 65 percent in 2000 to less than 60 percent in 2035. The Northeast Ohio Areawide Coordinating Agency (NOACA) projects by 2035 the study area population will decrease by 6% overall. The Cuyahoga County portion of the study area will decrease by 14%. However, the Lake County portion will remain relatively stable with a 0.4% increase.

On a positive note, the study found **Alternative B,** the Red Line extension to Babbitt Road, would attract over 13,400 daily riders. Of these 13,400 average daily riders, 11,100 are new daily riders who currently drive cars. In addition, an investment in transit would help arrest outward migration and encourage transit-oriented development near stations at Noble Road and Euclid Square Mall. An investment in bus rapid transit would similarly encourage reinvestment in neighborhoods adjacent to the improved bus lines such as Five Points, Waterloo Arts District and Nottingham Village as well as along Lake Shore Boulevard in Euclid.

Alternatives Analysis Process

An "alternatives analysis" for the Red Line/HealthLine Extension Study followed Federal Transit Administration (FTA) guidelines to develop and evaluate public transit options for solving defined mobility problems in an urban travel corridor. The analysis, which evaluated the benefits, costs, and impacts associated with various transit options, is often the first step in a lengthy process of seeking and obtaining federal grants to assist in funding a transit improvement. Also, it answers many important questions, such as:

- Which mode of transit matches the local community's travel needs, desires, and values?
  - Is it heavy rail, commuter rail, streetcar, bus rapid transit, or express bus?
  - Where would the new transit service operate? In railroad right-of-way or on the street? If the street, what street(s)?
- Where should stations be located?
- How will a new transit system stimulate local economic development?
- How will engineering and environmental challenges be met?
- What will it cost to build and operate?
- How will it improve public transit ridership?

Core to the Red Line/HealthLine Extension Study is defining and evaluating all reasonable alternatives. The initial analysis phase focuses on:

- Identifying the problem(s);
- Creating a set of goals and objectives to evaluate potential solutions to the problem(s); and,
- Developing a list of potential solutions, or alternatives.

Process Chart

Public Involvement

Public involvement and community and stakeholder outreach occurred during every phase of this study. The outreach strategies included an award-winning, innovative mix of approaches matched with the unique characteristics of the study area. The study team applied creative video strategies featuring citizen comments and used them in engaging and customized social media messaging. The team designed and developed an interactive website that incorporated all of these outreach tactics. The outreach strategies also included a multitude of events, public meetings, and community gatherings. Overall, through the public meetings, project website, videos, and social media, there were over 7,500 public interactions during this process.

To expand buy-in, understanding, and feedback throughout the study, two key committees were established:

- The Steering Committee, comprising individuals from the economic development, planning, and community development departments from each city in the study area; and,
- A Stakeholder Involvement Committee, selected after a series of small meetings with the Steering Committee as well as community leaders, which made recommendations to the study team on the organizations and individuals with whom they should engage.

Before each round of public meetings, the study team held meetings with the Steering and Stakeholder Committees to update them on the study progress, and provide them an opportunity to review and provide feedback on the proposed presentation for the upcoming public meetings. The study team received valuable recommendations from each Committee on how to make the presentations more engaging, easier to understand, and more visual.

Overall, through the public meetings, project website, videos, and social media, there were over 7,500 public interactions during this process.

Four rounds of public meetings were held, all well-received by the attendees. The first round of meetings was held in September 2013 when the study was introduced. A second round of meetings was held in December 2013 when the study team presented the initial screening of reasonable alternatives being advanced to more detailed technical study. The third round of public meetings occurred in May 2014 when the study team presented initial findings of the second level screening analysis. The final public meeting was held in February 2016 and the final recommendation was presented to the public.

Above left: Maribeth Feke (left, GCRTA) and Brian Kennedy (AECOM) accept the NAEP's 2016 Environmental Excellence Award for Public Involvement for the Red Line/HealthLine Extension Study. Above right: Maribeth Feke and Ken Sislak (AECOM) engage with stakeholders during a public meeting at the East Cleveland Public Library.

Alternatives Considered

Initial Alternatives and Screening

During the Tier 1 screening phase, RTA worked together with the cities of Cleveland, East Cleveland, and Euclid, as well as stakeholders to identify the most attractive technology, alignment, and station locations for the proposed Red Line/HealthLine extensions. More than 17 different alignment options were evaluated in the initial screening process with particular emphasis placed on identifying station locations that will provide convenient access for passengers to reach key residential, business, and community attractions. The evaluation of the initial and promising alternatives resulted in six Build alternatives which advanced to the Tier 2 screening. (Note: The Tier 1 screening is documented in the Tier 1 Initial Alternatives Screening Report (December 2013).

For the Red Line along the Norfolk Southern (NS) right-of-way, the technology options were heavy rail transit (HRT) and diesel-multiple unit (DMU). The Rapid+ streetcar technology option and bus rapid transit were considered for the in-street alignments serving the Waterloo Arts District and Nottingham Village.

The technology options eliminated from further analysis were the DMU trainsets and the Rapid+ streetcar option because they were determined to be cost prohibitive. (Note: The detailed findings of the comparative analysis are contained in the Tier 2 Detailed Alternatives Screening Report (August 2014).

Upon conclusion of the Tier 1 and 2 screenings, three alternatives remained:

- Red Line HRT extension along the NS **(Alternative B);**
- HealthLine BRT extension serving Waterloo Arts District **(Alternative E);** or
- HealthLine BRT extension serving Nottingham Village **(Alternative G).**

In addition, during public meetings in May 2014, a **Hybrid** alternative was developed. This alternative included a shortened extension of the Red Line to Noble Road and a combined operation of bus rapid transit services serving the route alignments of both **Alternative E** and **Alternative G.** The four Build alternatives evaluated in the Final Report were defined by a route alignment, station locations, and technology.

Technology Options Considered

	 Heavy Rail Transit	 Diesel Multiple Unit	 Rapid+ (Streetcar)	 Bus Rapid Transit
Transitway	Operates on exclusive grade spearated right-of-way adjacent to Class 1 railroad.	Operates on Red Line between Tower City and Windermere and on NS track east of Windermere.	Operates on Red Line between Airport and Windermere and streets east of Windermere.	Vehicles operate in right-of-way exclusive for buses or in mixed traffic on city streets.
Station Spacing	Approximately every one—two miles	Approximately every one—two miles	In-street running stations every 1/2 mile	In-street running stations every 1/2 mile or closer
Vehicle Type	Electrically powered vehicles with overhead wires.	Diesel-electric or diesel powered rail vehicle.	Electrically powered vehicles with overhead wires.	Diesel-electric hybrid or diesel/CNG powered vehicle.
Passenger Capacity	80	60	80	50

Alternative B: Red Line Extension

Alternative B is an electrified heavy rail extension of the existing Red Line that would begin at Louis Stokes Station at Windermere and continue east to Euclid adjacent to the Norfolk Southern (NS) freight railroad corridor. **Alternative B** would end at the Euclid Park-N-Ride near the intersection of St. Clair Avenue and Babbitt Road in the vicinity of Euclid Square Mall.

Alternative B best meets the purpose of the project—to accommodate existing and projected travel demand in the corridor. The Red Line extension alternative is expected to attract over 13,400 daily customers or over four million riders annually. Of the 13,400 average daily riders, the Red Line extension would attract 11,100 new daily riders who had not previously used transit. This increased ridership is equivalent to the current average combined daily ridership of the Blue and Green Lines serving residential neighborhoods in Shaker Heights. Also, the automobile driver conversion to transit customers means there would be fewer cars on the local roads and fewer Vehicle-miles Traveled (VMT). The Red Line extension would eliminate 75,240 VMT daily from the highway network and the city of Cleveland, resulting in cleaner air and less congestion.

From an economic development perspective, **Alternative B** would directly serve the study area's two very large opportunities for transit-oriented redevelopment: the industrial triangle at the proposed Noble Road Station and the expansive vacant land at the Euclid Park-N-Ride near Babbitt Road and Euclid Square Mall. The Noble Road Station could become a new transit hub with associated mixed-use transit-oriented development just down the hill from the General Electric NELA Park campus. The Red Line terminus near Euclid Square Mall could provide the stimulus needed to encourage developers to re-imagine the land occupied by the mall and redevelop the area into a transit-oriented village with a mixed-use housing, commercial office, and retail uses. The Red Line extension would cost over $916.0 million. Funding would be pursued through the FTA Capital Investment Grant New Starts program and would require a 50 percent local funding match.

Red Line Rapid Train at Louis Stokes Station at Windermere.

History of the RTA Red Line: Legacy of Post-World War II Modernization

Above left: PCC Streetcar at St. Clair Avenue. Above right: CTS Rapid Train at West 117th Street and Madison Avenue.

The Cleveland Transit System (CTS), which is one of RTA's predecessor transit agencies, studied ways to provide rapid transit services to East Cleveland and Euclid in the 1940s. The November 1944 study "A Modernization Plan for the Cleveland Transit System," examined light rail transit services linking what is today's Red Line to the Euclid Avenue and St. Clair Avenue streetcar lines at Windermere. CTS began to acquire a fleet of Presidents' Conference Committee (PCC) streetcars designed to operate in trains in anticipation of implementing light rail transit. The plan was to develop a system nearly identical to the Shaker Heights Rapid Transit "that operations could be coordinated on a cooperative basis." Maps from the plan showed how the St. Clair streetcar line would operate in the streets from Euclid Beach over East 152nd Street or from St. Clair and Brussels, and from Euclid and East 276th Street to Windermere. Streetcar trains would then operate over right-of-way of what is today's existing Red Line to University Circle and Downtown, including sharing tracks with the Shaker Heights Rapid Transit from East 55th Street to Downtown.

However a year later in October 1945, the CTS revised this plan and instead decided on constructing a high-platform, Chicago-style rapid transit line. The CTS rapid transit opened in 1955 operating between Windermere and Downtown Cleveland. A series of line extensions were constructed that now provides Red Line service from Windermere to Cleveland Hopkins International Airport. Today, the RTA operates two legacy rail transit systems that are largely incompatible: the high-platform airport to Windermere Red Line and the low-platform Blue and Green Lines of the former Shaker Heights Rapid Transit lines.

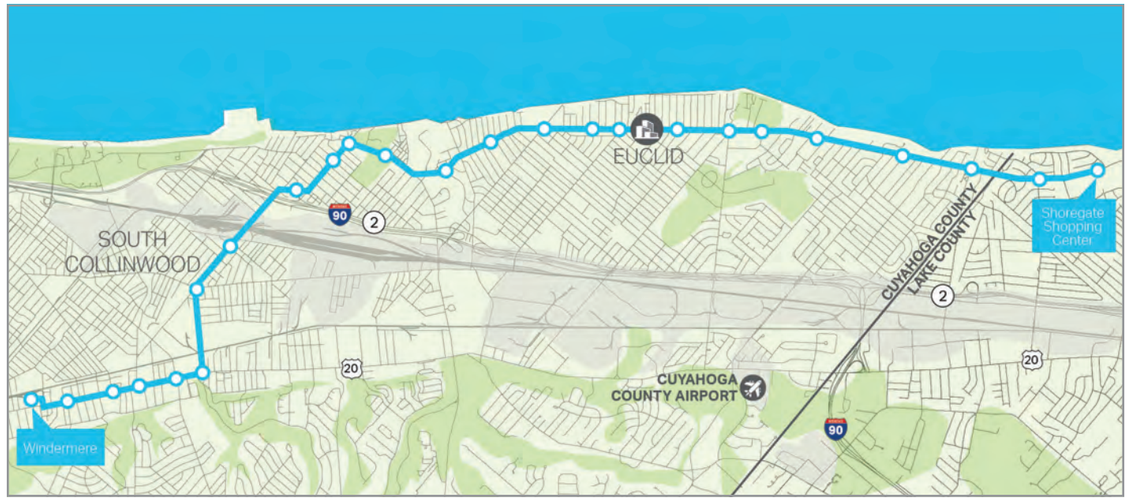
Alternative E: HealthLine BRT Extension via Waterloo Arts District

Alternative E is a HealthLine bus rapid transit extension that would begin at Louis Stokes Station at Windermere and run east along Euclid Avenue to Ivanhoe Road, where the alignment would turn north to East 152nd Street and St. Clair Avenue. At Five Points (a unique part of the city where five streets connect at one intersection) the alignment would continue north on East 152nd Street crossing over the CSX railroad on a bridge to Waterloo Road, then turning east through the Waterloo Arts District to East 156th Street. The alignment again turns north on East 156th Street until reaching Lake Shore Boulevard, where it turns east to East 300th Street terminating at Shoregate Shopping Center.

Alternative E is expected to attract nearly 10,100 daily customers or over three million riders annually. Of the 10,100 average daily riders, the HealthLine extension would attract 3,900 new daily riders who had not previously used transit. The substantial difference in new riders when compared to the Red Line extension is because most of the HealthLine extension riders are being diverted from local bus services. The HealthLine extension would eliminate 26,450 Vehicle-miles Traveled (VMT) daily from the highway network, which is 65.8 percent fewer VMT than the Red Line extension. This would result in cleaner air and less congestion, but not as much as the Red Line extension. Health, safety, and environmental benefits computed based on the change in VMT would therefore be lower too. But because the capital cost of the HealthLine **Alternative E** extension is $431.5 million it has a similar rating for environmental benefits because it's less expensive to build, operate, and maintain. This capital cost is approximately 50 percent less than **Alternative B.** Funding would be pursued through the FTA Capital Investment Grant New Starts program and would require a 50 percent local funding match.

From an economic development perspective, the street-running BRT is woven into the fabric of the three communities it serves from end to end. The stations are all in the street, either at the curb with the platforms integrated into the sidewalk or in the center median in the style of the HealthLine. People would walk to these stations, which would be closer together and part of a highly visible streetscape upgrade along the corridor. The BRT is designed to serve traditional "main streets" where historically streetcar lines were once located. No single BRT station would have the ridership impact of one Red Line station, but BRT offers, in each segment, a series of stations that would serve as the backbone of an invigorated neighborhood. The HealthLine **Alternative E** extension would also seek to support a transformational market outcome in the "industrial triangle" between Euclid Avenue and Five Points and spur development in the Waterloo Arts District as well as along Lake Shore Boulevard.

Red Line/HealthLine Extension Study: Alternative E Bus Rapid Transit Extension



HealthLine Bus Rapid Transit

Above: HealthLine Bus Rapid Transit at the East 24th Street and Euclid Avenue stop.

Bus rapid transit (BRT) is characterized by use of exclusive travel lanes or reserved rights-of-way (busways) with high frequency service. Station spacing is designed to be flexible depending on the destinations in the corridor. The characteristics of this service would include substantial stations, passenger information systems, and transit signal priority that permit higher speeds and avoidance of delays from general traffic flows.

RTA's $200 million investment in the award-winning HealthLine bus rapid transit has paid dividends to the community, including more than $6 billion in new investments along the route and more planned for the future. Residents continue to see redevelopment occurring in Midtown and the University Circle area, with new growth beginning to spill over into East Cleveland as the University Circle institutions' influence expands beyond the Cleveland border.

The success of the HealthLine in attracting new transit riders, economic development, and community regeneration is serving as a model for other cities to emulate. Pittsburgh, Nashville, Salt Lake City, and other progressive communities have traveled to Cleveland to see firsthand the transformation of Euclid Avenue and the transit investment and service that fostered the changes in the urban landscape.

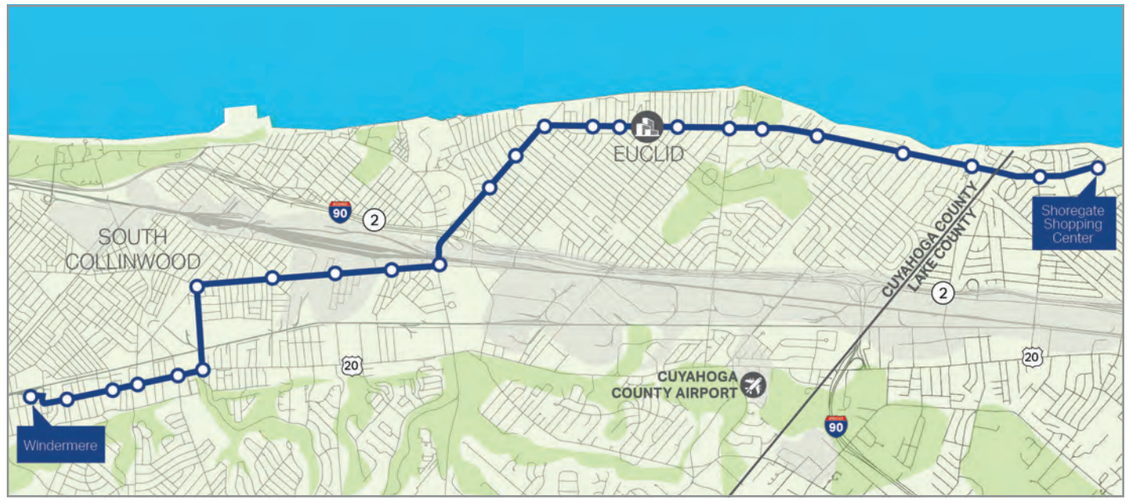
The Euclid Corridor project has generated $4–6 billion so far in new development investment to the city.

Alternative G: HealthLine BRT Extension via Nottingham Village and E. 185th St.

Alternative G is a HealthLine bus rapid transit extension that would begin at Louis Stokes Station at Windermere and run east along Euclid Avenue to Ivanhoe Road. At Ivanhoe Road the alignment would turn north and travel to East 152nd and St. Clair Avenue. At Five Points the alignment would turn east on St. Clair Avenue to Nottingham Road, turn north under the railroad overpass, and travel north on East 185th serving the East 185th commercial district up to Lake Shore Boulevard. At Lake Shore Boulevard the alignment would turn east to East 300th Street terminating at Shoregate Shopping Center. This alignment does not satisfy the statutory requirement for 50 percent of its length being in dedicated travel lanes during peak periods.

Alternative G is expected to attract over 10,420 daily customers or over 3.7 million riders annually, which is slightly more than **Alternative E.** Of the 10,420 average daily riders, the HealthLine extension would attract 4,300 new daily riders who had not previously used transit. Again, the substantial difference in new riders when compared to the Red Line extension is because most of the HealthLine extension riders are being diverted from local bus services. This HealthLine extension would eliminate 29,480 Vehicle-miles Traveled (VMT) daily from the highway network, which is 60.8 percent fewer VMT than the Red Line extension. This would result in cleaner air and less congestion, but like **Alternative E,** not as much as the Red Line extension. Health, safety, and environmental benefits computed based on the change in VMT would therefore be lower too. But because the capital cost of the HealthLine **Alternative G** extension is $427.0 million, it has a similar rating for environmental benefits because it's less expensive to build, operate, and maintain. **Alternative G** is the least expensive of all the alternatives considered. Funding would be pursued through the FTA Capital Investment Grant New Starts program and would require a 50 percent local funding match.

From an economic development perspective, **Alternative G** is designed to serve traditional "main streets" where historically streetcar lines were once located, and seek to support a transformational market outcome in the "industrial triangle" between Euclid Avenue and Five Points. It would also seek to spur development in the Nottingham Village and East 185th Street commercial district as well as along Lake Shore Boulevard.

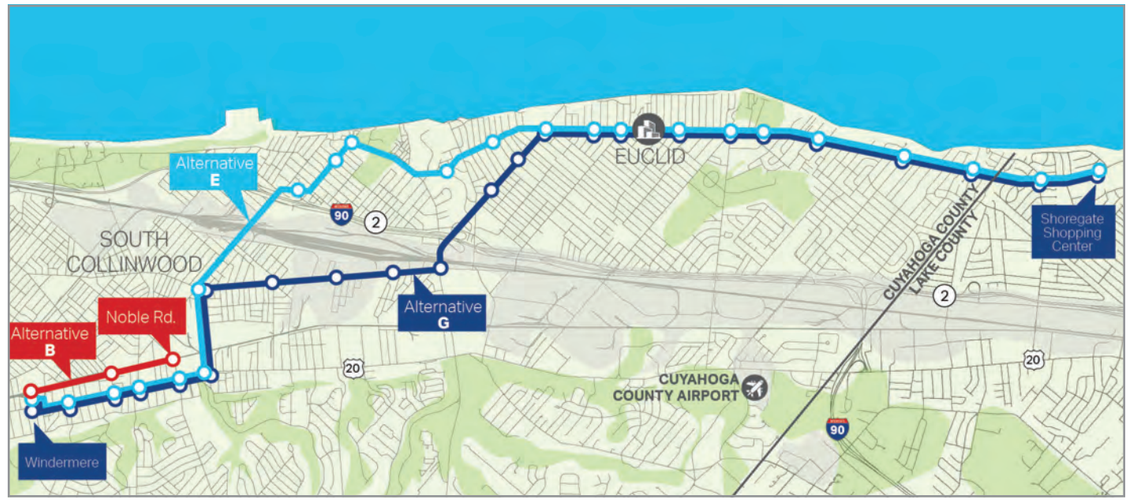


Hybrid Alternative

The **Hybrid** alternative proposes the extension of the HealthLine BRT utilizing both routes of **Alternatives E and G** and a short extension of the Red Line. The HealthLine BRT is extended to Shoregate Shopping Center on Lake Shore Boulevard. BRT trips would alternate between the alignment of **Alternative E** and **Alternative G,** with the split occurring at Five Points. The frequency of service would be every 7.5 minutes on segments of the route common to both alternatives and every 15 minutes on the "branches" serving the Waterloo Arts District and Nottingham Village. The Red Line would extend from Louis Stokes Station at Windermere to Noble Road with an intermediate station at Shaw Avenue. This would maintain a peak period service of 7.5 minutes along the entire length of the Red Line from the airport through to Noble Road, and 15 minutes along the entire line and the extension in the off-peak period.

The **Hybrid** alternative is expected to attract nearly 12,600 daily customers or over 3.7 million riders annually. Of the 12,600 average daily riders, the **Hybrid** alternative would attract 5,530 new daily riders who had not previously used transit. This is more new riders than the BRT extensions because the rail extension to Noble Road would attract more people who have more travel choices. The **Hybrid** would eliminate 31,094 Vehicle-miles Traveled (VMT) daily from the highway network, which is 58.7 percent fewer VMT than the Red Line extension and slightly higher than the BRT options. This results in cleaner air and less congestion, but not as much as the Red Line extension. Health, safety, and environmental benefits computed based on the change in VMT would therefore be lower too. But because the capital cost of the **Hybrid** alternative is $599.0 million and more than the BRT options, it has a slightly lower rating for environmental benefits because it's more expensive to build, operate, and maintain than the BRT options alone. This would be funded partially by the FTA Capital Investment Grant New Starts program and would require a 50 percent local funding match.

The **Hybrid** alternative combines the characteristics and design features of both **Alternatives E and G** and adds a short extension of the Red Line to Noble Road. The possibilities for economic regeneration stimulated by this transit investment would only be limited by imagination and developer interest and funding.



The Hybrid alternative combines the characteristics and design features of both Alternatives E and G and adds a short extension of the Red Line to Noble Road. The possibilities for economic regeneration stimulated by this transit investment would only be limited by imagination and developer interest and funding.

Re: invest
in the Red Line/HealthLine

Results

There are key differences between the Red Line and HealthLine extension alternatives. The Red Line extension **(Alternative B)** would attract more riders, has more mobility benefits, diverts more auto trips, and generally has higher levels of environmental benefit than the HealthLine extension alternatives **(Alternatives E and G)** and the **Hybrid** alternative. But the Red Line extension costs $916.0 million when compared to the HealthLine alternatives costing approximately $430 million on average or the **Hybrid** alternative costing approximately $599.0 million.

Goal 1: Mobility

Accessibility: Accessibility is measured by the number of people living or working within 1/2-mile of station entrances, which is the FTA New Starts criterion for project evaluation. Ultimately, the **Hybrid** alternative has higher accessibility because of its length and higher station area catchment compared to **Alternatives B, E, and G.** However, population density within the 1/2-mile station area catchment is highest for the Red Line extension **(Alternative B)** and lowest for the **Hybrid** alternative.

Ridership: **Alternative B** Red Line extension and the **Hybrid** alternative have the highest total daily transit trips at 13,408 and 12,592 respectively. **Alternative G** (BRT) has the second highest ridership at 10,424 trips and **Alternative E** (BRT) would attract about 400 fewer daily riders than **Alternative G.**

Mobility Benefit: HealthLine extension **Alternatives E and G** and Red Line extension **Alternative B** to Noble Road would be rated low-medium using FTA's definition for mobility improvements with the threshold being 2.5–4.9 million annual trips. **Alternative B** Red Line extension to Babbitt Road would generate 5.3 million annual trips resulting in a medium rating. The **Hybrid** alternative would also generate a medium rating.

Highway and Traffic Impacts: All of the alternatives would lower regional Vehicle-miles Traveled (VMT) for auto travel in the region. However, the **Alternative B** Red Line extension to Babbitt Road lowers VMT more than 44 percent greater than the BRT options in **Alternatives E and G.** Over 75,200 daily VMT are removed from local roads in the study area when compared to 26,453 and 29,480 VMT reductions for HealthLine extensions E and G respectively. The **Hybrid** alternative reduces 31,094 VMT daily.

Goal 2: Economy

Capital Expenditure (CAPEX): The most expensive alternative is **Alternative B** at over $916.0 million. The Red Line extension to Noble Road costs $176.2 million. The least expensive BRT alternative is **Alternative G** at $427.0 million however it does not meet the FTA requirement of more than 50 percent of the project length being in a dedicated transitway. **Alternative E** satisfies this requirement and costs $431.5 million. The **Hybrid** BRT alternative costs $599.0 million and satisfies the 50 percent requirement.

Operating and Maintenance Expenditures (OPEX): **Alternative E** has the lowest cost to operate because many of the existing local services operating along Lake Shore Boulevard could be re-routed or eliminated resulting in considerable cost savings. The net increase in OPEX is a little over $6.0 million annually for **Alternative E.** The underlying bus service plan under **Alternative G** does not change from the existing service patterns resulting in a net OPEX increase of $6.0 million. **Alternative B** adds $11.9 million to the annual cost of operating the Red Line when operating 7.5-minute headways during peak periods, and the **Hybrid** alternative adds $9.4 million to OPEX annually.

> All of the alternatives would lower regional Vehicle-miles Traveled (VMT) for auto travel in the region.

Cost-Effectiveness: **Alternative E** (BRT) is the next most cost effective of all the alternatives considered at $6.58 annualized cost per trip for the Shoregate terminus. **Alternative G** would cost $6.62 per trip but does not meet the FTA requirement of more than 50 percent of the project length being in a dedicated transitway. The Red Line extension to Babbitt Road **(Alternative B)** is the least cost effective alternative with a cost per trip of $9.41. The **Hybrid** alternative would cost per trip of $6.90. However, all of the alternatives would qualify for a medium rating for cost effectiveness.

Goal 3: Environment

Energy Consumption and Vehicle-miles Traveled (VMT): All of the Build Alternatives will reduce the number of Vehicle-miles Traveled (VMT) on highways compared to the No Build base case. However, the BRT options of Build **Alternatives E and G** will not be as beneficial as the proposed Red Line extension in decreasing VMT because the rail extension would attract substantially more new riders by diverting many more auto trips to rail than the BRT options. **Alternative B** would reduce VMT more than the BRT options of **Alternative E and G.** The **Hybrid** alternative generates less than half the VMT savings as the Red Line extension **Alternative B.**

Air Quality and Greenhouse Gas Emissions: All of the Build Alternatives will reduce the number of cars on the highways. However the BRT options for **Alternatives E and G** and the **Hybrid** alternative will not be as beneficial as the **Alternative B** Red Line extension in improving local air quality because the rail alternative would attract substantially more new riders by diverting many more auto trips to rail than does the BRT options.

Congestion Mitigation: All the alternatives will reduce the number and use of single occupant vehicles (SOV) on the highways. However, the BRT options of **Alternatives E and G** will not be as beneficial as the proposed Red Line extension in decreasing the number of SOV because the rail extension alternative would attract substantially more new transit riders by diverting many more auto trips to rail than the BRT alternatives. **Alternative B** (HRT) would divert the highest number of auto trips than any of the Alternatives being considered by attracting the most new riders to the RTA system.

Goal 4: Livability

Number of Streets Closed: No streets would be closed by the Alternatives being evaluated. All segments of city streets used for the BRT technology option in **Alternatives E and G** and the **Hybrid** alternative include "complete streets" treatments. Many segments of **Alternatives E and G** include "full BRT" dedicated median transitway and landscaping similar to the existing HealthLine.

Number of Cultural Resources Impacted: **Alternative B** impacts one historic property determined eligible for the National Register of Historic Places (NRHP). **Alternative E** contains four properties listed in the National Register of Historic Places and two properties determined eligible for the National Register of Historic Places. **Alternative G** contains five properties listed in the National Register of Historic Places and two properties determined eligible for the National Register of Historic Places. The **Hybrid** is a combination of the three other alternatives, for a total of 14 properties.

Number of Households Affected within 25 yards of Alignment: **Alternative B** is in a freight railroad right-of-way and has less than one percent of total residential households located within 25 yards of the alignment. **Alternatives E and G** both have approximately five percent of residential households located within 25 yards of BRT alignments, and The **Hybrid** alternative has slightly more than five percent of the households within 25 yards of the alignment.

Number of Zero Car Households: A key factor in evaluating service equity is to examine the extent to which any of the Build Alternatives offer new and improved services to minorities, senior citizens, low-income persons, and transit-dependent people. Therefore, the number of zero car households located within a 1/2-mile of system boarding points is an important measure of mobility improvements to these groups of people. **Alternative E** has over 4,760 zero car households within 1/2-mile of station entrances, **Alternative G** has over 3,745, and **Alternative B** has 525 zero car households. The **Hybrid** alternative has the most zero car households (5,256) within 1/2-mile of the stations because of its longer length and more stations.

Potential for Transit-Oriented Development (TOD): The HealthLine extension alternatives have the greatest potential for TOD because of the length and number of stations. **Alternative B** could have significant TOD at Noble Road Station and the Babbitt Road terminus. The **Hybrid** alternative is more likely to have the greatest potential for redevelopment because of the many routes and neighborhoods it encompasses.

Integration with Public Transport: All Build Alternatives are integrated with the existing and committed future bus system.

Re: charge
the Red Line/HealthLine

A summary of the costs, benefits, and impacts were estimated for each alternative and are summarized on the following pages. The alternatives screening and evaluation process was structured around criteria and indicators designed to reflect local goals and objectives as endorsed by the RTA, affected cities, and involved stakeholders.

The project team screened the alternatives and was unable to reach consensus on selecting a preferred alternative based on local goals and objectives and the feasibility assessment using the FTA New Starts project justification and local financial commitment criteria. All four alternatives obtained overall project ratings of medium-low using the FTA criteria.

The RTA uncovered several major transit investment opportunities in the northeast corner of Cuyahoga County that are worthy of investment, all of which are cost-effective. There is significant demand for high quality transit service with fast, reliable one-seat rides to University Circle and beyond. But while the Red Line extension generates the greatest number of transit customers for RTA, it costs over $916.0 million to plan, design, and construct. The less costly HealthLine extension options attract a high number of daily customers, but not nearly as many new transit riders as the rail transit extension.

However, with documented need for RTA to allocate resources to bringing the transit system into a state of good repair (replacing the aging rail fleet and maintaining existing services) coupled with the medium-low ratings, none of the Build alternatives are being pursued at this time. The benefits created by each of the four remaining alternatives must be put on hold until the RTA financial condition and availability of other funding sources is present.

The RTA uncovered several major transit investment opportunities in the northeast corner of Cuyahoga County that are worthy of investment.

New Starts Project Justification Evaluation

FTA Criteria	Evaluation Measures	ALT B	ALT E	ALT G	Hybrid ALT
Mobility Improvement	Technology	HRT[1]	BRT	BRT	BRT/HRT
	Route Miles	6.5	10.5	10.4	15.3
	Percent miles dedicated transit	100.0%	63.8%	47.7%	56.8%
	Daily trips on project	13,408	10,082	10,424	12,592
	Percentage of trips from zero car households	31.8%	38.4%	37.4%	33.7%
	Transit dependent trips	4,270	3,871	3,902	4,244
	Weighted dependent trips	8,540	7,742	7,804	8,488
	Non-transit dependent trips	9,138	6,211	6,522	8,348
	Weighted total trips used for Mobility Benefit calculation	17,678	13,953	14,326	16,836
	Annualized mobility inprovements	5,303,400	4,185,900	4,297,800	5,050,800
	Mobility improvement rating	**Medium**	**Medium-low**	**Medium-low**	**Medium**
Congestion Relief	Stations	7	23	23	31
	Peak period frequency	7.5 min	7.5 min	7.5 min	7.5 min
	Average daily riders	13,408	10,082	10,424	12,592
	New transit riders	11,070	3,902	4,316	5,531
	Congestion relief rating	**Medium-high**	**Medium**	**Medium**	**Medium**
Environmental Benefits	Reductions in VMT (daily)	(75,240)	(26,453)	(29,480)	(31,094)
	Air quality benefit	$557,832	$195,966	$218,390	$230,345
	Greenhouse gas benefits	$456,315	$160,432	$178,790	$188,578
	Energy saving benefits	$293,469	$103,178	$114,985	$121,280
	Safety benefits	$4,827,021	$1,694,096	$1,891,289	$1,994,825
	Total environmental benefits	$6,134,637	$2,153,672	$2,403,454	$2,535,028
	Ratio benefits to annualized cost	16.2%	10.8%	11.6%	9.7%
	Environmental benefits rating	**High**	**High**	**High**	**Medium-high**
Economic Development	Growth management	Medium-low	Medium-low	Medium-low	Medium-low
	Transit supportive policies	Medium-low	Medium-low	Medium-low	Medium-low
	Supportive zoning near transit	Medium	Medium	Medium	Medium
Economic Development	Implementation tools for TOD	Medium	Medium	Medium	Medium
	Performance of TOD policies	Medium-low	High	High	High
	Potential TOD impact of project	Medium	Medium	Medium	Medium
	Plans/policies affordable housing	Medium	Medium	Medium	Medium
	Economic development rating	**Medium-low**	**Medium**	**Medium**	**Medium**
Land Use	Stations	7	23	23	31
	Square miles	5.53	18.17	18.17	24.49
	Population 1/2-mile station catchment	24,752	54,480	53,038	61,907
	Population density per mile	4,479.9	2,998.3	2,918.9	2,527.8
	Population density rating	**Medium-high**	**Medium-low**	**Medium-low**	**Low**
	Study area employment	10,050	8,744	10,117	26,755
	Downtown and University Circle	130,000	130,000	130,000	130,000
	Total Employment	140,050	138,744	140,117	156,755
	Employment rating	**Medium-high**	**Medium**	**Medium-high**	**Medium-high**
	Land use rating	**Medium**	**Medium-low**	**Medium**	**Medium-low**
Cost Effectiveness	CAPEX ($000–2014 dollars)	$917,000	$430,538	$426,944	$599,498
	Annualized CAPEX ($000)	$25,890	$13,830	$13,734	$16,785
	Annual Net OPEX ($000)	$11,950	$6,114	$7,060	$9,400
	Total Annualized Cost ($000)	$37,840	$19,944	$20,794	$26,185
	Annualized trips on project	4,022,400	3,024,600	3,127,200	3,777,600
	Cost per trip (CEI)	$9.41	$6.58	$6.62	$6.90
	Cost effectiveness rating	**Medium**	**Medium**	**Medium**	**Medium**
	Project justification summary rating	**Medium**	**Medium-low**	**Medium**	**Medium**
Financial Rating	Current capital and operating condition	Low	Low	Low	Low
	Commitment of funds	Low	Low	Low	Low
	Reasonableness of financial plan	Low	Low	Low	Low
	Financial commitment summary rating	**Low**	**Low**	**Low**	**Low**
	Overall project evaluation rating	**Medium-low**	**Medium-low**	**Medium-low**	**Medium-low**

[1] Red Line peak period frequency increased to 7.5 minutes between Tower City and Babbitt Road to equalize service between West Side and East Side. All peak period trains operate from the Airport to Babbitt Road.

Re: commit
to the Red Line/HealthLine

NOACA is in the process of updating the region's Long Range Transportation Plan for 2040. NOACA is the Metropolitan Planning Organization for Cuyahoga, Lake, Geauga, Lorain, and Medina counties. The primary job of its 45-member board, comprised largely of top elected and public agency officials, is to allocate billions of federal and state transportation dollars that flow into the region every decade. The updated long range transportation plan will focus on improving social equity, particularly for households without cars. The Red Line/HealthLine Extension Study has documented how sprawling development patterns and the outmigration of population from Cuyahoga County to outlying counties has had a detrimental impact on public transit services. RTA and community leaders are actively seeking ways to increase state and local support for increased transit funding. Without additional funding, transit service and infrastructure will continue to decline.

What's Next?

- Gain support for increased transit funding from state and local partners,
- Continue project planning efforts to improve FTA ratings,
- Select a recommended alternative,
- Study alternatives in smaller investment segments,
- Work with local communities to plan and participate in funding transit investments,
- Continue to develop transit-oriented development opportunities, and
- Develop policies that support transit with community partners.

RTA AECOM

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