

CLEVELAND, OHIO

EUCLID AVENUE BRT

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CLEVELAND, OHIO (USA)

Euclid Avenue BRT

SUMMARY

The planned 6.6-mile [10.6-km] 30-station Euclid Avenue BRT will include a total package of improvements. Articulated hybrid-electric diesel buses will operate in exclusive arterial street median bus lanes for the western 4.5 miles [7 km] and in mixed traffic for the eastern 2.5 miles [4 km]. It will have attractively designed stations, and buses will get preference at traffic signals.

The BRT corridor is forecast to attract about 29,000 daily riders by 2025. BRT buses are expected to save up to 8 minutes per trip over existing services. Costs are estimated at about \$220 million for the Euclid Avenue BRT and a downtown Transit Zone on Superior and St. Clair Avenues.

The Euclid Corridor Transportation Project has received general community support. An environmental assessment was completed in August 2000. The final design was commenced in August 2002. Construction is expected to occur from 2004–2006, with operations beginning in late 2006.

CITY DESCRIPTION

The Cleveland urban area is situated south of Lake Erie and divided by the Cuyahoga River. The urbanized area contains almost 2,000,000 people of which almost 500,000 live in the city. The Cleveland Central Business District (CBD) contains 100,000 jobs. The University Circle Area, located about 3 miles [5 km] to the east along Euclid Avenue, is the region's second largest employment center, with about 40,000 jobs.

The Greater Cleveland Regional Transit Authority (GCRTA) serves approximately 1.4 million people living in Cuyahoga and surrounding counties in Ohio. GCRTA operates a scheduled fleet of 702 buses on 98 routes and a total fleet of 108 rail vehicles on the Red, Blue, and Green Lines. In the fiscal year ending December 1998, the GCRTA provided transit service for approximately 209,000 riders (i.e., individual boardings) each weekday. Of those boardings, the rapid transit system carried slightly more than 33,000 passengers, while the bus system carried about 176,000 passengers. Over 60 percent of the average daily rail and bus boardings occur in the 6.6-mile [10.6-km] Euclid Corridor from Downtown Cleveland to the Stokes Rapid Transit Station in East Cleveland⁽¹⁾.

PLANNING AND IMPLEMENTATION BACKGROUND

Euclid Avenue was Cleveland's great street during the nineteenth century, and the locus of streetcar lines for the first half of the twentieth. Since the early 1900s it has been the main public transit route serving Greater Cleveland. Extending from Public Square eastward to the suburbs of Lake County is the prime access route to the University Circle Area, the "Heights," and East Cleveland. It remains the heaviest transit corridor with peak-hour one-way bus volumes of 40 buses in the downtown area.

The Euclid Avenue Corridor is one of the oldest areas of Cleveland. Consequently, it has undergone redevelopment a number of times, as the city expanded from a mercantile town in the 1800s to the modern, industrial city it is today. Large areas of the Corridor were cleared in the 1960s as part of urban renewal programs to revitalize Downtown Cleveland office and housing markets and encourage further development of University Circle. Today, the Corridor is once again in transition, as Cleveland solidifies its economic position in national and world markets. The city's growing legal and financial sectors have concentrated in the Downtown, and major medical and educational/constitutional activities are found throughout the Corridor.

When the Red Line rapid transit was built in the 1950s, it utilized rights-of-way along existing railroad lines to reduce costs, rather than directly penetrating the Euclid Avenue Corridor with much heavier ridership potential. The rail line's single CBD station (at Tower City) limited its ability to conveniently serve much of the CBD. This gave rise to various plans in the 1950s and 1960s to provide better CBD distribution (via subway) and possibly extend rapid transit eastward via the Euclid Avenue Corridor. These rapid transit proposals were never realized, probably because of the cost concerns of some public officials. However, the need for better transportation has received increased attention since the mid-1970s. In the early 1980s, studies by the Regional Transit Authority (RTA) and Northeast Ohio Coordinating Agency identified the Euclid Corridor as the priority corridor for transit investment.

Around 1985, the city initiated the *Dual Hub Corridor Alternatives Analysis/Draft Environment Impact Statement*, which was completed in February 1993. This study identified several alternatives, about 30 of which were explored in detail. Alternatives included do nothing, Transportation Systems Management (TSM), and rail improvements. A subway under Euclid Avenue between Public Square and University Circle was estimated to cost \$1 billion. This led to a Light Rail Transit (LRT) option that combined short subways in the Downtown and University Circle with surface operations elsewhere. Costs were estimated at \$750 million.

The *Dual Hub Corridor Transitional Analysis*, initiated in 1993 and completed in December 1995, further evaluated the project alternatives with respect to the Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA). Alternatives evaluated included (1) Do Nothing, (2) BUS/TSM Alternative, (3A) Downtown Red Line Extension, (3B) Downtown Red Line Relocation, and (4) Huron-East 9th Street Subway/Euclid At Grade Operations (2 alternatives, 4A and 4B).

The locally preferred alternative for the Euclid Corridor Transportation Project included the Euclid Avenue Bus Rapid Transit (BRT), the St. Clair Superior Avenue Transit Zone, and East 17th and East 18th Street improvements, plus Red Line station improvements. CBD merchants, the city, and the RTA supported this plan.

An environmental assessment and Section 4(f) Evaluation were completed August 25, 2000. Final design was commenced in August 2002. Construction is expected to occur from 2004–2006.

THE EUCLID CORRIDOR TRANSPORTATION PROJECT

The Euclid Corridor Transportation Project includes a series of transportation improvements that are designed to achieve more efficient transit service along Euclid Avenue and improve access between Downtown Cleveland and University Circle. Additional objectives include increased pedestrian safety, newly designed streetscapes, and increased economic development potential.

PROJECT OVERVIEW

The project will extend from Downtown Cleveland to the Stokes (Windermere) Rapid Transit Station – a distance of about 7 miles [11.3 km]. The western 4.5 miles [7.3 km] will have median bus lanes, and buses will operate in mixed traffic for the eastern 2.5 miles [4 km]. The proposed routes are shown in [Figure 1](#). They include the following:

1. *Bus Rapid Transit (BRT) Service Along Euclid Avenue* between Downtown Cleveland and the Stokes Red Line Station in Windermere. Hybrid diesel electric buses would operate in exclusive median bus lanes between Public Square and 107th Street and in mixed-flow curb lanes east of 107th Street. There would be approximately 30 bus stops along the 6.6-mile [10.6-km] route, half of the current number.
2. *Streetscape Improvements* along Euclid Avenue, including a tree-lined street, new sidewalks, and a landscaped central median (West of 107th Street).
3. *A Downtown Transit Zone* bounded by West 3rd Street, St. Clair Avenue, East 17th Street and Superior Avenue. This zone includes exclusive bus lanes on Superior Avenue and St. Clair Avenue.
4. *Two New Downtown Transit Centers*, one on West 3rd Street and one on East 23rd Street.
5. *Improved Access to Three Red Line Transit Stations* – East 55th Street, East 105th Street, and University-Cedar.

The Euclid Avenue BRT will include the following:

- Dedicated bus lanes;
- Fewer bus stops;
- Traffic signal priorities for buses;
- Low-floor, possibly divided, multi-door articulated buses to facilitate passenger loading and unloading;
- Improved (i.e., off-board) fare collection to reduce delay; and
- Passenger shelters at all stations.

GENERAL FEATURES

The design features for the Euclid Avenue BRT will make full use of the 100-foot right-of-way that is generally available. More space is provided for transit, pedestrians, and landscaping and less space for traffic and parking. The planned reallocation of street space is shown in [Table 1](#).

Street Design

The BRT plan provides for two travel lanes plus median bus lanes between Public Square and East 107th Street and four travel lanes (including shared curb lanes to the east). Throughout, there would be additional left-turn lanes at key intersections. Three basic treatments are planned:

1. Between Public Square and East 18th Street, median bus-only lanes will be flanked by a central landscaped median and separated from a single traffic lane each way by a 1-foot rumble strip. Buses would receive and discharge passengers at median stations. Only BRT pollution-free buses would operate along Euclid Avenue in this area.
2. Between East 17th Street and East 107th Street, median bus-only lanes will be flanked by a central landscaped median and be separated from a single traffic lane each way by a 1-foot rumble strip. Special right-side far side stations will be provided at bus stops.
3. Between East 107th Street and the East City Limits, buses will operate in the curb lanes in mixed traffic flow. [Figure 2](#) gives a plan view of typical conditions in the corridor.
4. The “rumble strips” that delineate the median bus lanes will permit buses and cars to change lanes when the lane they are using is blocked. However, the absence of a physical barrier (e.g., a low mountable curb) will require steady enforcement of the bus lanes. The bus lanes would also be available for use by emergency vehicles.

Stations

Each of the 30 bus stops will be designed to accommodate two buses simultaneously. The stations will have shelters and amenities and may include fare vending machines to speed passenger boarding. Stations will be spaced at about 150 foot intervals as compared with the existing 500-foot spacing.

Traffic Controls

The BRT plan calls for a computerized coordinated traffic signal system along Euclid Avenue. Special signal phases would be provided for left turns to avoid conflicts with buses and opposing traffic. The signal would increase the green time for Euclid Avenue when buses approach intersections outside of the downtown area.

Parking and Loading

Curb parking along Euclid Avenue (and along the Superior-St. Clair Transit Zone) will generally be prohibited although provisions will be made for curb parking and loading at selected locations. The number of curb spaces available will be reduced from 726 to 208. Through most of the Corridor, however, there are unused spaces along side streets or in garages. Some of the remaining spaces will be designated for goods delivery and drop-off. Additional pullovers for deliveries are being evaluated.

Transit Operations

The BRT service plan will break the existing Route 6-Euclid Avenue bus route into two sections. Between Public Square and Stokes Terminal (Windermere), articulated 60-foot diesel-electric hybrid buses would provide BRT service. They would have doors on both sides to allow “left-side” passenger loading and unloading from a center island in Downtown Cleveland and “right-

side” passenger access elsewhere. “Conventional” motor coach buses would operate east of the Stokes Rapid Transit Station to East 276th Street as Route 28. Other bus routes currently operating along Euclid Avenue (e.g., Route 9, Mayfield Avenue) would continue to operate on 17th Street, where they will be diverted to the St. Clair/Superior Avenue Transit Zone between Public Square and East 17th Street.

Fare Collection

Fare collection may involve pre-purchase at stations or be located on board vehicles. It is still to be finalized.

Service Frequencies

Existing and anticipated service frequencies are shown in [Table 2](#). The BRT service plan proposes 5-minute weekday, Saturday base, and peak-period headways and 15-minute frequencies at other times. Existing frequencies range from 6 minutes on weekdays to 20 minutes on Sundays.

Travel Time Savings

Anticipated Route 6 travel time savings with the BRT service are shown in [Table 3](#). The bus-only lanes, reduced stops, and traffic signal improvements are expected to save over 8 minutes travel time between Public Square and East 105th Street – a savings of over 1 minute per mile. These travel time savings assume that buses are able to fully pre-empt traffic signals at minor intersections outside of the Downtown Area.

Ridership

Ridership forecasts for the Year 2025 with and without the BRT service are shown in [Table 4](#). The BRT alternative is anticipated to have 29,500 daily boardings as compared with 26,100 for the No-Build Alternative – a 13 percent gain. This translates to an estimated 8.6 million boardings per year for the BRT Alternative and 7.6-million boardings per year for the No-Build Alternative. Thus the BRT Alternative results in an additional 1 million transit boardings per year by 2025. Comparison of systemwide *linked* trip forecasts for the No Build and BRT Alternatives indicates that the BRT Alternative results in an additional 701,500 new linked transit trips per year by 2025.

Project Costs

The total capital costs for the Euclid Corridor Transportation Project have been estimated at \$292 million. Sixty-one percent is expected to come from federal funds and 39 percent from local funds⁽²⁾.

The estimated capital costs for the Euclid BRT and Downtown Transit Zone components have been estimated at \$220 million (in 2003 dollars) of which 80 percent is for construction, 16 percent for vehicles, and 4 percent for right-of-way⁽³⁾.

The estimated change in annual operating and maintenance costs (in 1999 dollars) approximated \$1,084,000. It reflects a 9 percent increase in peak buses, an annual 71,400 additional bus revenue miles, and an annual \$16,500 additional revenue bus hours.

ASSESSMENT

The Euclid Avenue BRT plan contains a total package of improvements: bus-only lanes, stations with provisions for off-vehicle fare collection, traffic signal priorities to expedite bus flow, articulated multi-door buses, and increased spacing of bus stops. The plan has been generally accepted by the Downtown merchants and the community.

Two main thrusts of the plan are (1) improving the physical environment along Euclid Avenue and (2) applying innovation in both roadway design and vehicle technology. Important plan components include wider sidewalks with improved landscaping.

The focus on urban design and landscaping features led to the use of median bus lanes separated from general traffic lanes by a “rumble” strip. This “ribbon” treatment permits vehicles to use the adjacent lane to pass blocked vehicles. However, the design will require more enforcement than the more conventional treatment of a physically separated median busway. Another concern with the median bus lane design is the lateral transitions by buses at stations.

The maximum investment takes place in the central section of the corridor where there is relatively little street traffic congestion. There is little improvement to bus operations through the heavily traveled, congested University Circle Area.

The combined effects of fewer stops, priority lanes, and traffic signal preference are expected to save *local* buses over 1 minute per mile – up to 8 minutes for the 6.6 miles [10.6 km] between Public Square and the Stokes Transit Center.

On the positive side, the project has been well publicized, and there has been more than a decade of working with the community.

LESSONS LEARNED

Several lessons emerge from the Euclid Corridor Transportation Project:

1. Corridor development and public transportation planning should be done concurrently. This involves working with large developments (e.g., Cleveland Clinic.) in terms of building setbacks and orientation. A “transit overlay” zoning district may be appropriate.
2. Community support and consensus is essential and should be sustained through the life of the project. Stakeholders should “buy into” the project early. Local funding should be established as soon as possible.
3. The project should reflect the transportation needs of the Corridor and there must be a clear justification of the project in terms of its costs and benefits.
4. Early action is essential. When a project is protracted, continuity of public agency staff (and interested parties) can prove difficult. Therefore, protracted transportation planning is not conducive to early action.
5. Arterial street space can be given to transit and pedestrians where there is adequate traffic capacity on parallel arterial streets.

6. There should be a reasonable balance between urban design and traffic/transit operational considerations. Factors such as the ability to pass stopped vehicles and to easily enforce the transit priority lanes should be carefully considered in developing BRT plans. Suitable provisions for loading and parking are essential.

APPLICABILITY ELSEWHERE

The use of wide streets with rights-of-way of 100 feet or more (such as Euclid Avenue) afford promise for total packages of BRT service in other cities.

PEOPLE CONTACTED

- | | | |
|----|------------------------------------------------------------|----------------|
| 1. | Ken Sislak, Wilbur Smith & Associates | Feb. 1, 2001 |
| 2. | Glen Havinoviski, Wilbur Smith & Associates | Feb. 2, 2001 |
| 3. | Graig Amundsen, BRW | March 1, 2001 |
| 4. | Linda Hendricksen
Cleveland Department of City Planning | March 12, 2001 |
| 5. | Jerri Chaiken
Greater Cleveland RTA | April 10, 2001 |

REFERENCES

1. Bus Rapid Transit Environmental Assessment and Section 4(f) Evaluation Summary. Euclid Corridor Transportation Project. City of Cleveland, August 25, 2000. Prepared for Greater Cleveland Regional Transit Authority by BRW.
2. Greater Cleveland Regional Transit Authority. The Euclid Corridor Transportation Project Frequently Asked Questions (Not dated).

Table 1: Planned Changes in Euclid Avenue Street Use

LOCATION	<i>Estimated 2000 ADT</i>	TRAVEL LANES	
		<i>Existing (1)</i>	<i>Proposed (2)</i>
Public Square to East 17 th Street	16,000	4	2+2 Bus
East 17 th Street to East 107 th Street	17,000	4	2+2 Bus
East 107 th Street to Mayfield Road	35,000	4	4
Mayfield Road to 120 th Street	25,000	4	4

(1) Parking is permitted but restricted to peak hours

(2) Parking would generally be prohibited

Source: Existing- Dual Hub Corridor Alternatives Analysis, 1985.

Proposed- Environmental Assessment and Section 4F Evaluation, August 24, 2000.

Table 2: Existing and Proposed Service Frequencies

	PEAK/BASE PERIOD		EVENING PERIOD	
Day of Week	<i>Existing Route 6</i>	<i>Proposed BRT</i>	<i>Existing Route 6</i>	<i>Proposed BRT</i>
WEEKDAY	6	5	15	15
SATURDAY	10	5	15	15
SUNDAY	20	15	20	15

Source: *Euclid Corridor Improvement Project Parking and Access Study*. Wilbur Smith Associates, February 2000.

**Table 3: Existing and Anticipated Route 6 Travel Times
(Peak Direction of Travel)**

ROUTE SEGMENT	DISTANCE (MILES)	BRT TRAVEL TIME ESTIMATE	ROUTE 6 DAY SCHEDULE (EXISTING)	ROUTE 6 EVENING SCHEDULE (EXISTING)
Public Square to East 55th Street	2.23	12:34	18:00	14:00
East 55th Street to East 105th Street	1.91	7:32	9:00	8:00
East 105th Street to Stokes Rapid Transit Station	2.46	12:39	14:00	14:00
Total Route	6.60	32:45	41:00	37:00

Source: Bus Rapid Transit Environmental Assessment and Section 4(f) Evaluation Summary

Table 4: Year 2025 Forecasted Average Weekday Boardings

Bus Route	No Build Alternative	BRT Alternative
6/28	17,600	20,400
7	1,200	2,200
9	4,900	3,700
32	2,400	3,200
Total	26,100	29,500

Source: Wilbur Smith Associates

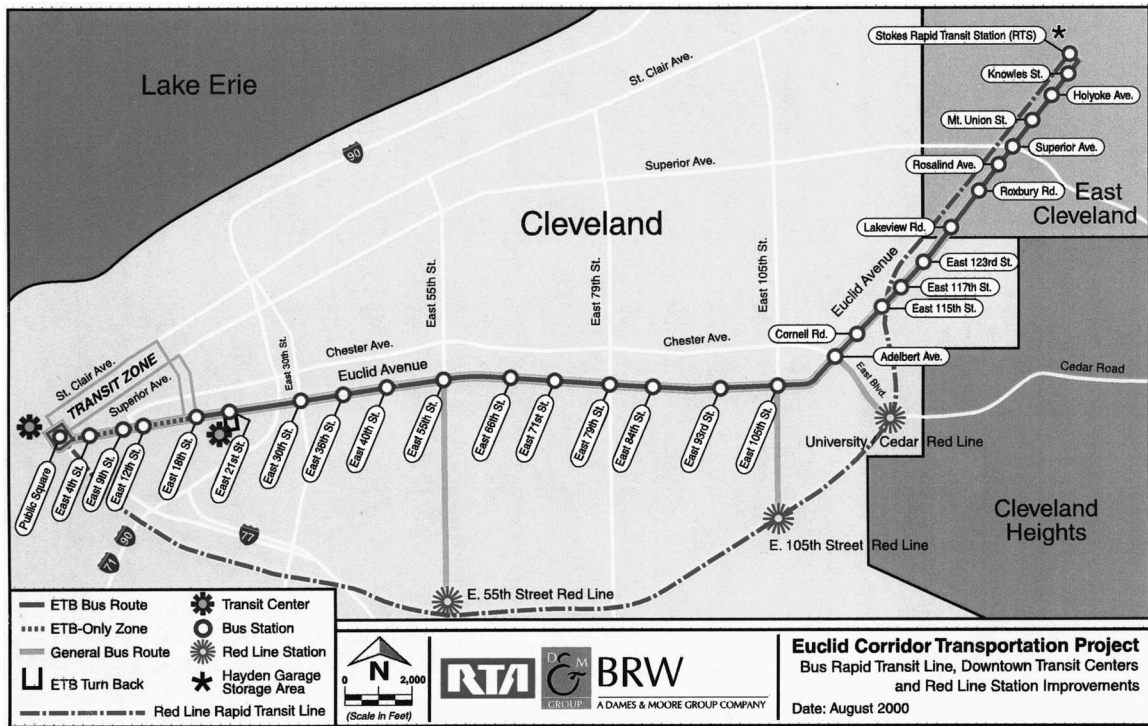


Figure 1: Proposed BRT Route

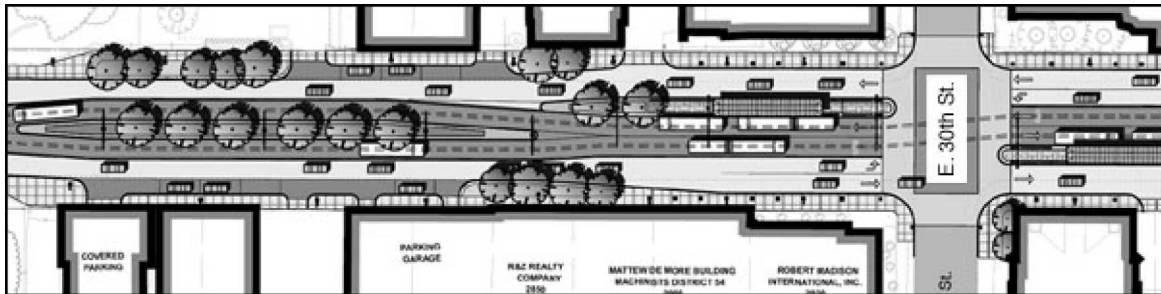


Figure 2: Plan of Typical Conditions