Pre-Metro: Conversion Now or Never

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This paper develops as a case study the 60-year experience of a light-rail transit system that was conceived as a pre-metro line with the option for eventual conversion to full metro or semi-metro status. It describes the metro features originally included and the added facilities aimed toward upgrading to metro. It explains the opportunities for full conversion that were passed by and the conflicts between incompatible regional rapid transit plans and competing rail technologies. The accumulation of factors both physical and political that finally arrested the development of this light-rail operation are laid out step by step. Forces and counterforces that acted on this system as the wider community worked slowly toward regionalization of transit are described. Special attention is given to those local community concerns that finally closed the door to metro conversion when at last the opportunity and funding to convert seemed to be available. Guidelines are developed for planners, designers, and civic and transit leaders.

The former Shaker Heights Rapid Transit System (SHRTS) was constructed in large part on open land to encourage house and lot sales in the Van Sweringen brothers' real estate development, which was begun in 1907 on the uplands east of Cleveland. From the beginning, the long-term plan was that this operation would reach its own terminal in downtown Cleveland entirely independently of the street railway system. The designers of the system called for heavy all-steel suburban cars with steps and traps and for eventual installation of high platforms at locations with sufficient volume. This particular technique was used by several systems from 1900 to 1930; it was really a compromise between interurban and commuter railroad designs and can be described as a final maturing of interurban technology. The term semi-metro is now used for at-grade systems with high platforms.

To obtain transit service for the land development as quickly as possible, it was decided to build SHRTS from the outside in, by using the existing street railway network for temporary entrance to the central city. This was done in two stages. From 1913 to 1920, the northern (Shaker Boulevard) branch was operated by the Cleveland Railway under contract as a southern parallel branch of their Fairmount streetcar line, which began operation in 1907. Conventional single-unit streetcars were used. Access to Fairmount Boulevard was via Coventry Road. The combined Shaker-Fairmount operations were entirely on private right-of-way through a golf course and on boulevard medians as far in as Cedar Road in Cleveland Heights. Following a short stretch of street operation, there was considerable additional private right-of-way used by three car lines from the top of Cedar Hill to Euclid Avenue.

This interurban arrangement, with its long slow ride downtown along Euclid Avenue, was replaced in 1920 with a much faster approach that used a new high-speed exclusive right-of-way from Moreland Circle (later Shaker Square) to East 34th Street. At that location a ramp provided access to the inner-city tracks of the street railways. The southern (now Van Aken) branch of SHRTS was also completed at that time. Thus, the system entered its second and better-known interurban state; it was commonly referred to as the Cleveland Rapid Transit System. During this period it was operated under lease by Cleveland Railway, which was reimbursed for the sizable operating losses. A 5-cent premium was charged for rides east of East 34th Street, which made the total fare 10 cents. A fleet of streetcars built in 1914 was modified for higher speed operation and converted to multiple-unit use as traffic grew; the fleet increased from 4 cars initially to 36 by 1927.

Various combinations of streetcar routings for SHRTS were used in downtown Cleveland while the Union Terminal project was being completed. Although operation on the street railways was slow because of the conflict with city streetcars and motor vehicles, the downtown distribution pattern finally selected was highly effective. However, the developers of the rapid transit system wanted to promote their own complex of new buildings in the immediate area of the new terminal irrespective of the needs of their transit riders. This was the largest American development of commercial buildings in a coordinated group until Rockefeller Center. It was an unanticipated outgrowth of the original Van Sweringen rapid transit plan, which had envisioned a subway and a simple terminal at the western edge of downtown, on the edge of the river bluffs, even more remote from the center.

In 1930, operation into the Union Terminal was begun, and the remainder of street running was given up at once. A completely new operating organization was started; its wages were lower than those paid by the Cleveland Railway, and it had its own new maintenance shops but the same old multiple-unit streetcars. Fares were raised from 10 cents to 15, and riding volume immediately dropped 30 percent. Some of this decrease must be attributed to the sacrifice of good downtown distribution. The faster running time to the outer ends of the branches made possible two extensions in 1930 while preserving the by-then rigidly established 1-h round trip. Operating losses were reduced by a combination of lower wages, reductions in distance traveled made possible by a new yard at the outer end, and very strict economy measures.

PRE-METRO FEATURES

The most conspicuous pre-metro characteristic of the original SHRTS construction was the large clearance envelope provided in tunnels and underpasses. These were built to standard railroad clearances in effect at the time of original design (circa 1912). In addition, all overpasses were built to Cooper E-60 loading capacity, a typical steam railroad standard (1). The distance between track centers was greater in cuts than on fills or at surface level in order to allow for portal overhead catenary supports on fills while leaving space for side drainage and center-mounted T-shaped supports in the cuts. Because of shortages of materials during World War I, the line was built largely with center-mounted concrete interurban railway poles, a temporary feature that has lasted until today. The approach to Union Terminal from East 34th Street (opened in 1930), was built to the original specifications with structural steel mainline railroad catenary designed for 3000-V standards; this demonstrates that the original pre-metro design was still very much in the minds of the engineers. Oddly enough, the outer extensions opened at the same time were given typical street railway overhead that used center-mounted steel poles.

Platforms for the light-rail transit (LRT) lines in Union Terminal were all built "temporarily" at the top of the rail or slightly above. The yellow pine wood used has lasted until now, with replacement only in areas of high wear. All stairways up to the concourse level began

their permanent construction at a high-platform level with steps of wood from the low level to the doors. The reverse was done in Kenmore Square in the newer part of Boston's Central Subway (Green Line), where the inside tracks at station platforms were temporarily installed at a high level to allow later conversion to metro status while keeping the platforms intact.

At the time Moreland Circle was redesigned and converted to Shaker Square in the late 1920s, the Van Aken line was relocated for about 0.4 km (0.25 mile); a tedious reverse curve with generous track centers was built to allow for large cars. Third-rail ties were installed on this work, just in case exclusive Shaker Heights chose third-rail power pickup from high-platform cars rather than the more conspicuous overhead catenary. Fortunately, the third-rail idea never got beyond that one relocation job.

METRO PLANS

Proposals were developed for permanent stations at several locations. Most of the drawings remaining show high platforms in a semi-metro style. Strangely enough, the only permanent station structures actually built in the 1920s (Lynnfield, Coventry, and Courtland) all had low platforms at commuter railroad height. This ambivalence at that early date is typical of the history of the system and is an important part of what developed later.

Most of SHRTS was conceived in the 1920s by the Van Sweringen interests as a high-platform line to run alongside their Nickel Plate Railroad, and the platforms for it in Cleveland Union Terminal were built accordingly. Actually, when the line was finally completed in 1954, the track level in Union Terminal was raised slightly to conform with the modern car-floor height, which was somewhat lower than had been planned.

Other rapid transit lines to the far corners of Cuyahoga County were also planned by the Van Sweringens when their railroad empire was at its height. All these followed existing railroad rights-of-way, except for proposed extensions to the Shaker Heights branches. Strangely, none of the proposals in other directions took off cross-country into open land. The developers were promoting their Union Terminal complex but did not get involved in trying to repeat their original success through additional suburban real estate. All new lines were intended to be high-platform commuter operations imitating the recently rebuilt Illinois Central Gulf Railway Company facilities in Chicago, which had some semi-metro characteristics. The spacing of openings in bridges built over the Nickel Plate Railroad in that era allowed for a third rail in the center strip between pairs of future transit tracks, an interesting engineering hedge against the later choice of technology.

Preliminary design was begun on rolling stock that would serve the entire rapid transit network, including the Shaker Heights lines. The surviving drawings show a car that looks like a somewhat shrunken Illinois Central or Lackawanna-Morris and Essex car. It is not clear from the plans what degree of grade separation was to be provided, but the bridge projects already completed in the central city assured that the inner parts of all the lines would permit high-speed running.

This concept and its routings conflicted with a 1919 subway plan prepared for the city of Cleveland in which the Cleveland Railway streetcars were to operate in subways downtown in the manner of Boston's Central Subway (2). The Cleveland plan did not attempt to coordinate the rapid transit system then coming into being with the local street railway system, although the SHRTS streetcars could have used the never-built downtown trolley subway. The 1919 plan was to include metro clearance standards for tunnels in case it was later decided to go to full-scale rapid transit. It even suggested eventual use of long stretches of elevated railways down the main streets of the outlying districts, a concept that would be intolerable today; see Figure 1.

CONTINUED USE OF LRT EQUIPMENT

When the SHRTS lines began operation into Cleveland Union Terminal, the vintage 1914 streetcars leased from Cleveland Railway were kept in use as an economy measure. The depression struck, SHRTS was taken over by creditors, and all thought of new rolling stock was put aside. Survival became the order of the day. Work on the rapid transit line to East Cleveland was abandoned, even though structures for catenary were in place and rail, ties, and wire to finish the job were on hand (3).

The multiple-unit center-door streetcars required two persons in the lead unit; this causing the management to run long trains as infrequently as possible in the rush periods. The receivers brought in an imaginative marketing person as general manager, and soon second- and third-hand single-unit low-capacity deluxe lightweight interurban cars took over the evening and Sunday service and some base-period day work (4).

When the municipality of Shaker Heights bought the line in 1944, the selling banks required the buyer to agree to replace the rolling stock within a set period. The banks wanted to encourage continuing development of the open land the line ran to, since they were holding many mortgages. Near the end of World War II, the newly formed Cleveland Transit System (CTS) prepared a plan for system conversion that involved wide use of LRT in the outer city and inner ring of suburbs with high-speed private right-of-way service through the central city and used as a trunk line the unfinished rapid transit system with short extensions on each end (5). City service was to emphasize trolley coaches. This plan was highly compatible with SHRTS in its arrested form; indeed its lines were shown as elements in the countywide network; see Figure 2.

On the basis of that endorsement of LRT and the desire to keep the purchase cost down, in 1946 SHRTS ordered (as an add-on to an order then being built for Chicago Surface Lines) a fleet of 25 extralong multiple-unit all-electric Presidents' Conference Committee (PCC) cars 2.7 m (9 ft) wide. It was hoped these cars would be compatible with the Cleveland rapid transit services that would be built.

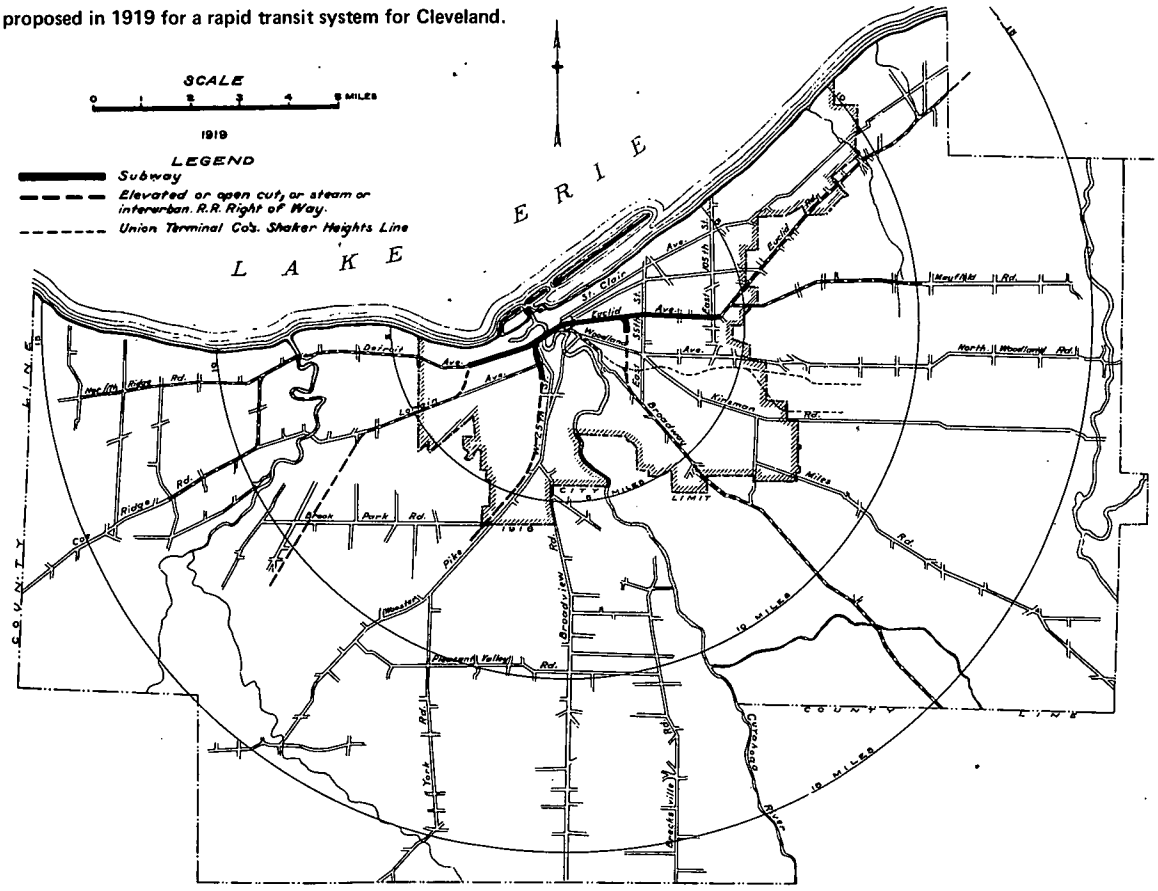
Meanwhile, CTS bought 75 PCC cars capable of later conversion to multiple-unit use. The plan was to use these new cars first in surface work until the rapid transit system was completed and then to use them on the new service. Unfortunately, the more popular 2.5-m (8.3-ft) width was selected. This was the width of existing Cleveland cars at the time, and it was felt that mixing widths in street running would be hazardous. However, this dimension is not suited to two-and-two transverse seating ahead of the center door.

In 1953 and 1954, a group of very fine, wide PCC cars compatible with SHRTS' new fleet became available from the Twin Cities. SHRTS bought 20 of these to fulfill its commitment to the banks to replace all the original rolling stock, and the sellers converted 15 of them to multiple-unit use. In recent years, these cars have been given full two-and-two seating; they are now considered the best in the fleet.

LRT VERSUS RAPID TRANSIT

At the end of World War II, new management came in at

Figure 1. Plan proposed in 1919 for a rapid transit system for Cleveland.



CTS. Streetcars were considered obsolete, and a recommendation was made to abandon the whole street railway network, including those outer parts that had been included in the 1944 LRT plan. The rapid transit concept was changed radically; a high-platform subway-and-ground-level trunk line with no grade crossings along the Nickel Plate Railroad route and the inmost part of SHRTS was to intercept most of the outer-area riders at transfer points, doing at lower cost the job that had been planned for the LRT network (3). Ability to run long trains staffed by only two persons and the elimination of all street trackage were cited as great advantages of the changed plan. Thus Cleveland was back to the Van Sweringens' plan, with its nearly full metro characteristics.

Objections were immediately made by riders, political leaders, and citizens' groups to the introduction of a need for transferring where none had existed before. Also, difficulties arose in obtaining the necessary agreements from the railroads for right-of-way. Another report by the same consultants a little more than a year later (6) proposed alternate trunk-line routes using the streetcar viaduct over the Cuyahoga Valley and the median of a never-to-be-built urban freeway. This plan recognized the option of a full return to the LRT idea.

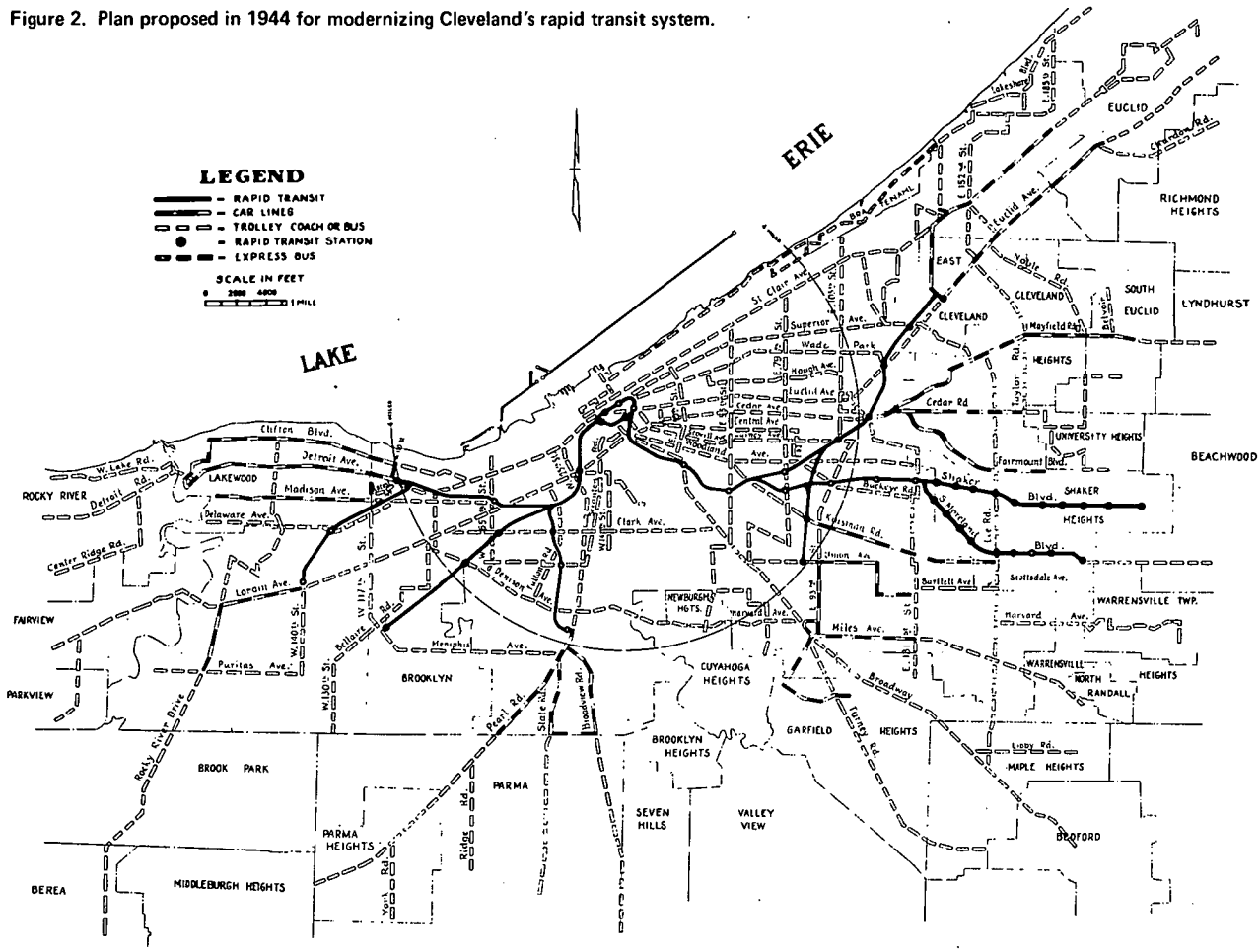
However, the idea of high-platform service with transfer from surface lines finally won out, as the popularity of the streetcar declined nationally. The street-railway network abandonments were speeded up and, well before the end of service, the 75 narrower PCC cars were sold to the Toronto Transit Commission. They were converted to multiple-unit use and are still running today; this fact is brought up periodically by a local columnist as a "Cleveland joke."

The management of SHRTS, already committed to half a fleet of new rolling stock, vigorously opposed the high-platform plan, stating that it would introduce a great stumbling block to the eventual unification of the two rapid transit systems. It was claimed that operation on the same tracks of two types of rail cars that had different floor heights and rather different weights was inherently unsafe. A compromise plan calling for a third track in the shared area was nearly adopted. Nevertheless, by terms of their lease with Cleveland Union Terminal, SHRTS was finally forced to accept a high-platform line using the same two tracks for 4.1 km (2.5 miles). To enhance safety, an automatic-stop signal system with trip levers on the cars was provided; this gave surface cars the problem of false stops as a result of snow and ice buildup at grade crossings.

A downtown subway loop distributor had always been a vital part of every Cleveland rapid transit plan, and SHRTS at first believed its cars would be prohibited from building a high-platform subway because the cost to provide additional low platforms would be considered unjustified (3). However, preliminary designs recognized the option of both levels at the same stations. As their consultants and those of the Cuyahoga County commissioners recommended, the Shaker Heights officials in the end decided to stay out of the proposed subway rather than reduce frequency or add cars to adjust for the longer running time. Their declared nonparticipation did much to bring about the eventual shelving of the project (7, 8). The never-built loop subway with tight curves stuck CTS with a fleet of very short rail cars that were ill suited economically to their present use. A review of the various subway plans for downtown Cleveland since 1909 would make a full-length paper in itself and might teach some lessons in the techniques of nonimplementation (8).

Consultants repeatedly recommended the absorption

Figure 2. Plan proposed in 1944 for modernizing Cleveland's rapid transit system.



of SHRTS into the far larger CTS, and the existence of two such different types of rail equipment was always brought up as the supposedly greatest obstacle. This incompatibility was a false issue, of course, as is illustrated by the mixed-rail networks of Boston and Philadelphia, which do not even share tracks as is done in Cleveland (9). Talk of unification always recognized the need to replace SHRTS' rolling stock and erect high platforms along the boulevards, as for a semi-metro system. The supposed savings entailed in eliminating one of the two stations in the Cleveland Union Terminal appeared attractive. The temporary low platforms could be abandoned, and perhaps the rental payments for SHRTS' facilities could be avoided.

As time went on and ridership declined on both rail systems, concepts were hinted at that seemed to call for the abandonment of one or both branches of SHRTS under CTS ownership and conversion of the fully grade-separated main line west of Shaker Square to a branch of the CTS high-platform line. This truncation would supposedly sidestep the community resistance to semi-metro operation and would balance the rail transit load between eastside and westside lines. It was even suggested seriously that the branches east of Shaker Square (which have many grade crossings) be converted to busways, as was done with a Red Arrow branch in suburban Philadelphia.

Naturally the cause of unification was hindered by the widespread belief that loss of control over SHRTS would cause Shaker Heights to no longer have any control over the physical characteristics of the line, half of whose trackage and a third of whose patronage were within Shaker Heights. Overtures from CTS to buy or lease the line were ignored, and all attempts to develop a transfer arrangement or joint fare failed. The only positive coordination was the addition of a high platform at a little-used station midway in the stretch of trackage used by both systems. This improvement provided an easy along-the-platform interchange and did much to show that the two rail technologies might coexist in a unified transit organization. Incidentally, that station now has a substantial volume of transfers among both rapid transit lines and the surface bus network; it functions as a peripheral secondary downtown access point.

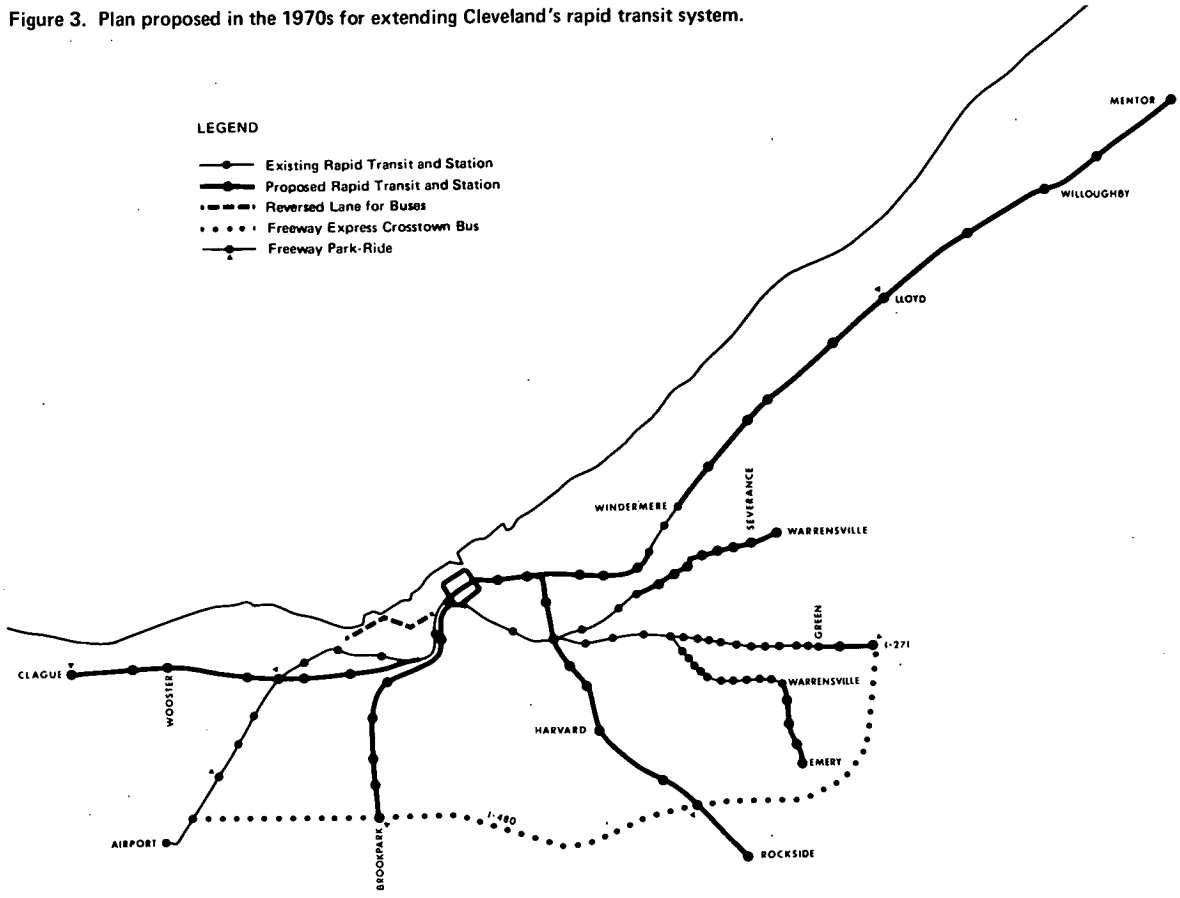
COMING OF THE REGIONAL TRANSIT AUTHORITY

Like transit lines throughout the country, CTS and SHRTS experienced deteriorating financial conditions in the late 1960s. By the early 1970s, it was obvious that survival required tax subsidy. Regionwide unification of all transit under a sound tax umbrella became a community objective. Areawide planning studies called for expansion of transit in several directions, much as had earlier plans for private enterprise in the 1920s and municipal ownership in the 1940s and 1950s (10).

SHRTS saw the trend toward tax-supported regionalization as an opportunity for exercising some permanent control over the character of its system while relinquishing the burden of purely local tax support. A Shaker Heights citizens' committee that had won its laurels defeating a proposed freeway parallel to SHRTS was given the assignment of developing a well-thought-out future for SHRTS.

Six physical alternatives were carefully analyzed; they

Figure 3. Plan proposed in the 1970s for extending Cleveland's rapid transit system.



ranged from complete abandonment with bus substitution on streets through busways and a semi-metro systems at grade to full cut-and-cover metro. Various combinations of some alternatives were evaluated. A minority of the committee members favored conversion to a busway on available right-of-way reaching nearly to downtown Cleveland and a wide variety of options for street distribution in the CBD. There was no support for conversion to a metro or even a semi-metro system that had platforms and clearances compatible with the CTS system. In the end, preservation of the existing pre-metro system was the overwhelming choice of the committee, even though it was believed that federal funding could become available for at least the semi-metro conversion, which would offer through routing to Cleveland's west side and airport.

The community at large, the new Regional Transit Authority (RTA), and the areawide planning agency all accepted continuation of LRT for the SHRTS lines. Regional plans (10) actually showed extensions of both branches and a load-balancing LRT line on the west side to the edge of Parma, including the option of possible future street running in that community; see Figure 3. In the special election held to provide funding for the RTA, the countywide 1 percent sales tax for transit was approved by more than 70 percent of the voters; seven out of eight voted yes in Shaker Heights.

The agreement transferring SHRTS to the RTA provided for the purchase of new LRT cars with a total capacity of 4000 seats by September 5, 1980. The size, performance, and other characteristics of these cars were closely controlled to assure the continued LRT character of the system while providing fast service. A federal grant for 80 percent of the estimated cost of those cars has been authorized, and bids have been received from two American and several overseas manufacturers. At the time this paper was written, the bid award was imminent.

Further provisions in the transfer agreement require a high level of rehabilitation of the physical plant and a specified continued maintenance program. Under the new RTA, riders are enjoying low-fare transit throughout the county and universal transfers between lines. SHRTS is at long last functioning as a major trunk line in a unified network with a high volume of transfer riding. The future of America's best-known pre-metro in its arrested-development form seems assured, at least for the life of the new generation of rolling stock.

CONVERSION PROBLEMS

The outcome of this drawn-out chain of decisions and counteractions stretching over a 60-year span casts a cloud on the whole pre-metro idea. Here was a well-developed and timely concept of pre-metro that did not go metro when the opportunity came. Indeed, the federal government was not even approached concerning whether such a conversion might be funded. There are some general lessons to be drawn here respecting conversion of LRT to full metro or semi-metro status.

One obvious drawback to conversion in the SHRTS case was the great difficulty of adding grade separations at existing crossings. There were three main objections to this.

1. Construction of grade separations would disrupt the fabric of a mature community already undergoing the pains of aging. Arterial road traffic would tend to overload alternate routes during the construction process. It was believed this activity would impair property

values, a very sensitive issue in the inner-ring suburbs.

2. Completed grade separations would take the form either of overpasses that would obstruct the views and cast shadows or of box cuts that would require fencing, continual litter removal, or even a lid; the cut-and-cover method of providing full metro service in two parallel boulevards was regarded as the ultimate extravagance and as hypocritical for a community that had so vigorously opposed a freeway in the same corridor.

3. Such a radical change in the physical characteristics of the line would require a disruption of rail service during construction, either through relocation of tracks or by temporary substitution of bus service. Because of the relatively light volume in each branch, where nearly all the grade crossings are, bus substitution carried with it the danger of permanence. It was remembered that this type of service had worked well in 1968 for 5 d when 15 rusted-out poles fell over on the Shaker-Green branch.

A second major drawback to metro or semi-metro conversion was the whole matter of style. High-platform rail lines at surface level would probably not be tolerated in boulevard center strips through residential areas, even if there were a high degree of grade separation. The cars are too big, the platforms introduce too many aesthetic problems, and the need for safety protection by fencing the gates is thought to be greater than for LRT lines.

An additional drawback was the belief that the danger of accidents between motor vehicles and rail cars would be magnified for a semi-metro system with grade crossings. This may have been a false issue, since new LRT cars can be as heavy, as fast, and nearly as high to the floor as high-platform cars. It was felt that federal agencies funding semi-metro service would require full protection (crossing gates with lights and bells). Considering the 0.5 km (0.3 mile) average spacing of cross streets in Shaker Heights, this apparatus at such frequent intervals was viewed as highly objectionable by the committee planning the line's future.

GUIDELINES FOR PRE-METRO DEVELOPMENT

This case study on what did not happen to SHRTS provides guidelines to those planners who want to build a pre-metro system and keep the conversion option really open over a reasonable period of time. If these points cannot be followed, then including pre-metro characteristics at the beginning may be unnecessary, and the additional costs to provide them might be avoided in favor of a somewhat lower cost straight nonconvertible LRT system. Following are the guidelines.

1. Do not wait 50 years or more to face the conversion question. The built-in resistance to change may become overwhelming.
2. Plan the grade separations in the first place and keep the needed property clear.
3. Do not use a boulevard center strip in an area of single-family houses if you ever expect to be able to convert.
4. Do not be mysterious about your ultimate plans; make sure the community knows from the beginning that conversion is an option that is being kept open.
5. Do not get into a second generation of purely LRT rolling stock; convert before that occurs or abandon the idea of conversion.
6. Do not change your plan in favor of keeping the LRT status quo and then expect to be able to change it back to metro conversion.
7. Do not mix any nonconvertible elements into the system as time passes; doing so gives comfort to the standpatters.
8. Never allow rivalry centering on choice of rail technology to develop between two transit agencies; pride may become stronger than reason.
9. Do not study the conversion question to death; changing times will bring everything full circle and provide studies to support every viewpoint.

REFERENCES

1. Inspection of Rapid Transit Bridges for City of Shaker Heights. Barber and Hoffman, Cleveland, June 1970.
2. Report on a Rapid Transit System for the City of Cleveland. Barclay, Parsons and Klapp, New York, June 6, 1919.
3. Report on Cleveland Transit Modernization to the Advisory Committee to the Cleveland Transit System. De Leuw, Cather and Co., Chicago, Oct. 1945.
4. Electric Railways of Northeastern Ohio. Central Electric Railfans' Association, Bulletin 108, Sept. 1965, pp. 90-93, 97, and 98.
5. A Modernization Plan for the Cleveland Transit System. Cleveland Transit System, Cleveland, Nov. 20, 1944.
6. Report on Rapid Transit Development for the Cleveland Transit System. De Leuw, Cather and Co., Chicago, Jan. 1947.
7. Report to the City of Shaker Heights on the Proposed Cleveland Subway and Its Relation to the Shaker Heights Rapid Transit System. Coverdale and Colpitts, New York, Sept. 15, 1956.
8. Cleveland Subway: Operating and Engineering Feasibility. Praeger-Cutting-De Leuw, Cleveland, Dec. 22, 1955.
9. A Rapid Transit Plan for Cleveland. Charles E. De Leuw, Chicago, May 31, 1956.
10. Ten-Year Transit Development Program. Alan M. Voorhees and Associates, Cleveland, Aug. 1974.