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LIGHT RAIL TRANSIT FOR THE PORTLAND METROPOLITAN REGION:

A STATUS REPORT AND ANALYSIS

by
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for
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INTRODUCTION

A. What Is Light Rail Transit (LRT)?

In the Portland Metropolitan Area the regional mass transit service agency, the Tri-County Metropolitan Transportation District of Oregon (Tri-Met), defines Light Rail Transit in the following way:

Light Rail Transit (LRT) is a form of electric rail transit that evolved from the streetcar. It uses relatively large vehicles, powered by an overhead wire, that can operate singly or in short trains of two or more cars. While Heavy Rail Transit, such as BART or the subway systems of East Coast cities, has power collection and train characteristics that require a fully grade-separated trackway, LRT systems do not need to be grade separated. Consequently, they can operate on city streets, transit malls and street medians as well as grade-separated right-of-ways. As a result of this versatility, LRT systems can be built for far less cost than other forms of rail rapid transit, an important consideration in places such as Portland where very high passenger capacity (over 20,000 passengers an hour) is not required.

The development of LRT first occurred in Europe where numerous cities began to improve their street car systems in the 1960's. In the past few years, the concept has attracted interest in North America where all of the remaining streetcar systems are upgraded and new LRT systems are being built in Edmonton, Calgary, Toronto, and Buffalo. A number of other cities are planning for LRT. Worldwide, LRT is operated in over 300 cities.¹

Contrasting heavy rail and light rail may help make the picture clearer. Light rail can operate "at grade" (on the streets) or "grade separated" (having its own separate right-of-way). Heavy rail must always be grade separated.

Light rail is basically a modernized trolley car. The LRT

¹Tri-County Metropolitan Transportation District of Oregon, Light Rail Transit Engineering Descriptions and Operational Features, (December, 1977), p. 1.

car can be operated manually in mixed traffic, i.e., on the surface in a right-of-way shared with auto and bus. It may be operated as an individual car or linked with other cars to form a train; thus giving great flexibility in terms of ridership capacity.

The capacity requirements to make LRT a going concern are much lower than for heavy rail. Several local transportation planners said that a corridor carrying 100,000 trips per day would support LRT. Also, it is characteristic of LRT to be linked with a bus feeder system to reinforce ridership.

Heavy rail involves trains of cars pulled by a power source--a locomotive. It is not economical to operate a railroad with a single car pulled by a locomotive; i.e., there are minimum thresholds of necessary ridership in order to support the operation of a railroad. The standard citation of necessary passengers is around 20,000 per hour.

Finally, there are considerable cost differences in constructing the two modes. The most often cited example of the going rate for heavy rail is BART in San Francisco. Its current construction cost figure approximates \$1.6 billion. By contrast the Tri-Met estimate for constructing a three corridor LRT system for Portland is around \$289.7 million (in 1976 dollars).

In Portland, light rail would be a surface transit operation with a fully grade-separated section along parts of the Banfield corridor* (and probably grade-separated in other corridors along freeways) breaking into a mixed traffic pattern as it approaches the end of the line. Also, the mode would operate on the surface along city streets as it makes its way through the downtown.

*This is the corridor receiving greatest attention now. It would, if built, be the first of a three-corridor system. It is, naturally, convenient to refer to it to give substance to the examples in this paper.

B. The Status of Light Rail

Light rail is being given very serious consideration in the Portland Metropolitan Area. In the fall of 1978 several government jurisdictions (see a listing in Appendix I) will make decisions on an alternative for improving one major corridor in the region. Tri-Met staff has formally recommended that the best alternative is LRT. While this current activity pertains to a single corridor decision the fact is that a three corridor LRT system has been proposed. The case may be fairly made that present attention on one corridor provides an opportunity to profile some issues which will certainly apply to other corridors if the proposal is carried forward.

Thus, one purpose of this paper is to provide a status report on the region's interest in Light Rail Transit. One element of such a report is some historical perspective on the emergence of LRT as a serious transit option for this region. A second element to review is the political side of the current intense interest in LRT. This involves reviewing what the jurisdictions making the decisions about Portland's transit future see as the benefits of this particular alternative. Such a review must inevitably look at the individual corridor decision that is the present focus of attention. However, since LRT has been proposed as a region-wide mode, what is critical in review of a single corridor is what it teaches about perspectives which other jurisdictions in other corridors may adopt. Moreover, it provides a "case study" which, upon careful review, summarizes issues the region as a whole must confront.

C. Analytical Review

The above report confines itself to articulation of perspectives as

learned from reading a brief history and interviewing key staff from the jurisdictions involved. This in itself is no contribution to furthering understanding about what light rail means for this region. Therefore, a final purpose of this paper is to contribute to an analytical review of research efforts which have culminated in the attention given to LRT. The intent is to use this review as a basis for stimulating further dialogue on LRT as an option for the region.

The elements of the status report provide the foundation for developing a set of review questions. These review questions attempt to analyze some of the dimensions of light rail for this region which remain unclear or suggest problem areas which might benefit from further investigation. The intent of the questioning is to provide a focus for dialogue to contribute to increased understanding of the nature of urban mass transit and its place in regional transportation policy.

D. Format

These purposes suggest a natural division of the paper into three parts. The first part shall provide historical foundation from which analysis can be launched. The second part shall attend to jurisdictional perspectives on light rail; providing a foundation for understanding how light rail is being viewed among decision-making bodies. These two parts combine to form a foundation for the analytical section that is the third part of the paper. A brief conclusion will close the paper.

PART I

LIGHT RAIL TRANSIT FOR THE PORTLAND METROPOLITAN REGION

A. Historical Perspective

Perhaps a reasonable starting point is the 1956 Federal-Aid Highway Act. The significance of the act is that it initiated the Interstate Highway System. In 1959 a major Portland Metropolitan Area study produced a transportation plan for the region for the year 1990. It was basically a freeway system plan. No mass transit options were included.

The 1960s provided several pieces of Federal legislation which would prove significant for events in the 1970s. These 1960 milestones included the formation of UMTA (1964), the National Environmental Policy Act (1969), A-95 review clearinghouses and hence the formation of a regional unit for this purpose (the Columbia Region Association of Governments, CRAG), and finally 1969 saw the release of the transportation plan for the region begun in the 1950s; an ambitious 54 new freeway and arterial streets program with its non-attention to mass transit.

Trends of the 1960s started to interfere with the ambitious freeway plans for Portland. The Federal Clean Air Act of 1970 was a major constraining factor to such plans. Still, 1971 saw CRAG adopt the regional plan with its highway orientation. A major collision was shaping, though, as in 1972 the Oregon Clean Air Act passed followed by amendments in 1973 which included the Portland Transportation Control Strategy; being a motor vehicle inspection and maintenance plan with traffic flow management,

parking space control, and a public transportation emphasis.

Clearly one central dynamic in the changing orientation toward favoring urban mass transit was a strong environmental movement which was responsible for the several pieces of legislation listed above.

One other central dynamic which boosted attention on urban mass transit was an energy crisis which hit the 1970s. There can be little dispute that the single most significant event which modified public consciousness about energy was the 1973 oil embargo. Long gasoline lines, the instability created by uncertainties over reliability of supply, cost of supply, and future reliability certainly stimulated thinking about what the future of urban mass transportation would be. The belief in the indefinite extension and unimpinged use of the automobile was confronted by the long-range reality that petroleum was a finite resource whose price would rise as its supply diminished. While it may be difficult to document the direct effect upon individual thinking, the consequence of the emergent energy crisis has certainly been to reinforce the trend toward giving serious attention to mass transit alternatives for urban areas.

These dynamics saw their political and bureaucratic expression in events concerning transit in the Portland Metropolitan Area. In 1973, several things occurred which reinforced the changing trend of the 1960s: (1) a Governor's task force on transportation involving most of the local government jurisdictions and the state reviewed the organization of CRAG and transportation alternatives to the proposed Mt. Hood Freeway, (2) the Federal-Aid Highway Act of 1973 provided for transfer of interstate highway funds to urban mass transit systems, (3) the 1990 transportation as a result, was reviewed and subsequent additional study of busway options were incorporated, and (4) a Public Utilities Commission report on LRT

potential for three established corridors in the region was published.

The emerging change of emphasis crystallized in late 1973 and early 1974 around decisions concerning the proposed Mt. Hood Freeway. February 1974 saw a U.S. District Court ruling that the Mt. Hood Freeway was not selected in accordance with Federal requirements. This action stimulated efforts culminating in Oregon's Governor formally requesting withdrawal of the Mt. Hood Freeway from the interstate highway system in 1975.

Further activity in 1975 focused efforts toward considering freeway alternatives. The final report of the Governor's Task Force took a system view of the region suggesting LRT, busway, and combinations of both as corridor alternatives. This work, extended by CRAG, became the regional Interim Transportation Plan. When the ITP was formally approved the previous freeway oriented plan was dropped.

With all of this completed, efforts were begun to develop transit alternatives including several studies to review the status of major corridors, and to focus on a specific corridor in need of attention--the Banfield.

From 1975 through 1977 activity solidified the region's commitment to transit alternatives: more funds were opened for transit by the Federal-Aid Highway Act of 1976, the Mt. Hood Freeway was officially withdrawn from the interstate system by the United States Department of Transportation (May 1976), local action established Banfield as the priority corridor and the U.S. DOT approved transfer of funds for preliminary engineering to begin on this corridor.

Since 1977 there has been substantial research into the transit alternatives first stimulated by the Governor's Task Force. Most of this

research, however, has been focused upon the Banfield corridor. A February 1977 interim report on LRT feasibility was issued by Tri-Met. CRAG approved LRT as an alternative to be included in the Banfield review the same month. June 1977 saw Tri-Met extending the focus to a regional system of buses and LRT. August 1977 saw Tri-Met articulate its ideas in a sketch plan for regional transit. December 1977 marked the release of four technical reports relating to the Banfield project by Tri-Met; one was a general East Side Transit Operations review, and three related to planning for LRT. August 1978 culminated the process in the Tri-Met staff recommendation of light rail as the best mode for the Banfield corridor.

B. Conclusion: LRT In A Regional Context

The historical trend has seen emergence of transit as important to the region. Various factors have combined to lead to the current serious attention to light rail as the best future transit mode to pursue. What this means to the region is somewhat unclear in that attention has been so heavily focused upon an individual corridor decision that the region as a whole has been neglected.

Based on a review of planning documents from Tri-Met, the current LRT mode decision on a single corridor is in fact the beginning of a regional LRT system. An August 1977 sketch planning analysis by Tri-Met (Regional Development Alternatives) shows the regional potential of LRT. The sketch plan states that "...LRT plans for the Portland region present a unique opportunity. This is to develop the first full regional system of this type where the inherent technical characteristics of the technology are fully exploited to provide a high quality transit system at moderate costs. Thus far this has not been done in any U.S. city (p. 2)."

The Tri-Met sketch of a regional system involves three lines. The first line is the Banfield corridor extending to Gresham (with a branch to Lents along I-205). The second line is the Sunset corridor to Beaverton. The third line is to Oregon City via Milwaukie and Gladstone. The dates for completing this system are 1983 for Banfield, 1987 for Sunset, and 1990 for Oregon City. Another line which might be given consideration involves a route along I-5 to the north (apparently to Vancouver). Estimated complete regional system costs (apparently in 1976 dollars, although this goes unstated) is \$289.7 million with an estimated \$5.8 million operating cost. The total line length would be 37.2 miles using 63 vehicles (see Appendix II for a map depicting the system).

The estimation that in fact a regional system of LRT is the agenda may be subject to some dispute; i.e., not everyone in the region may agree with this contention. However, the case has been made with sufficient strength to make it the working premise of this paper. While the next section may give some focus to the specific corridor decision now on the docket, it is illustrative for regional issues it raises, and from which analytical questions may unfold.

PART II

JURISDICTIONAL PERSPECTIVES ON LIGHT RAIL AS A TRANSIT OPTION

A. Introduction

Insight into what LRT means to the region can be obtained by reviewing the viewpoints of various jurisdictions involved in the LRT decision. While the focus in this section is on a specific corridor, the purpose is to illuminate concerns of significance for the entire region. The following review is based on interviews with key staff in each jurisdiction.*

B. Tri-Met

Tri-Met staff recommends LRT for the Banfield corridor. The recommendation is based on over 30 months of intensive research and analysis. The reasons for LRT stack up as follows: operating costs will be lowest; more riders will use it; the cost per ride is lowest; downtown bus volumes will be lowest; the Banfield/Burnside alignment will serve future travel needs; citizens favor it; it is quieter than buses; it requires fewest property acquisitions and family and business relocations; it is energy efficient.

Overriding the above view is a perspective on the transit decision as an investment opportunity/decision: how best shall public dollars be spent to maximize their returns and benefits?

For Portland the investment in public transit should take into account four points. First, LRT will be the most productive mode. It requires

*The summary sections on each jurisdiction are interpretations derived from interviews by the writer. Misinterpretations, incompleteness of representation of jurisdictional viewpoint, etc., is entirely the responsibility of the writer.

least labor cost and carries riders to destinations more quickly. Hence, it is the most efficient in terms of services as well as other operating costs.

Second, LRT has the ability to handle the largest volumes of riders. This means that as demand increases, the cost of providing for additional service does not outpace demand. Further, given fuel crises, an operating electric LRT provides reliable transit that can accommodate potential sudden surges in ridership. Finally, the capacity argument reinforces the productivity argument; productivity would clearly improve with increased ridership.

Third, with a clear LRT line fixed changes in where people move to jobs can be accommodated. The LRT line increases the flexibility of bus lines which connect to the rail line.

Fourth, by fixing the main transit routes in a more permanent alignment land-use patterns may be further stabilized. Developers will know the region's long-term commitment to a specific land-use pattern by constructing light rail. Accordingly, developers will make location decisions which will reinforce the LRT line and desired land-use patterns.

Thus, while the option is initially a technical decision among alternatives, the decision is at base an investment of public dollars which will make a difference to the communities of the region. LRT is not only a transit mode, it is a tool for helping shape the communities of the region.

C. The City of Portland

The problem for the city is that the Banfield freeway is a critical east side transportation route which needs improvements. The city's goals involve neighborhood preservation, a concern for arterial streets and their

relation to neighborhood quality, and keeping the downtown vital. The city (in its arterial streets policy) recognizes that as population grows pressure on the transportation system will grow. In turn arterial streets will suffer as well as neighborhood streets. Increased traffic activity does not contribute to quality of life in city neighborhoods (not to mention reduced viability of local businesses). Therefore, it is essential that actions be taken which reduce pressures from traffic.

A great concern of the city is maintenance and enhancement of downtown vitality. Transportation is regarded as having a central role to play in the downtown. A study by DeLeuw Cather (Banfield Transitway Project: Downtown Circulation Alternatives) in June 1977 states it well:

Downtown Portland is the main destination and terminus of the Banfield corridor, as well as the focal point of the three corridor system, and the existing Tri-Met bus operations. Downtown Portland is also the principal commercial and employment center in the region and is expected to maintain this regional dominance in the 1990 design year. Clearly, therefore, further transportation plans are of primary significance to the downtown area (p. 1).

Considering the central place of the downtown, it is important to insure continued ease of access to it as well as to make future decisions which will continue to reinforce its vitality.

No clear transit option nominates itself as best for addressing the concerns of the city. Furthermore, the research into transit alternatives does not show one to be markedly superior. At best, LRT may be considered attractive because it seems to provide lower operating costs.

Even though LRT provides for lower operating costs, there is a high capital cost to implementing it. The benefit of its implementation vis-a-vis the capital costs of constructing it make for a difficult trade-off for decision-makers.

The current environment of discussion finds more than one concern about the mode decision. One perspective regards LRT as the progressive option for the region because of the significant place of transit in the urban future. Another perspective argues that transit's future is unclear. With this view, LRT is not a wise decision because it locks the region into a major investment in a fixed location.

Given the city's larger concerns and its recognition of the conflicting viewpoints regarding alternatives, it should not be surprising that the bottom line is that there is no inherently superior mode choice.

As reported in the August 30, 1978 edition of the Oregon Journal (p. 7), the Mayor notes that LRT is particularly attractive because of its cleanliness and quietness. However, he also does not think the city will advocate LRT if other jurisdictions reject LRT as an alternative. That is, the political position of the city remains indefinite.

D. Multnomah County

Multnomah County's problems go beyond those of the City of Portland. Still, the county recognizes the city's concerns over its arterial streets. Thus, there is a double edge to the county's problem: first, East Multnomah County has a large growth potential. Outer east county development is mostly residential. Jobs are located mostly inside the City of Portland on the east side of the river, along the Willamette River, and in the downtown. Other job centers are Swan Island, North Portland, and the Columbia River (particularly if the County goes ahead with industrial development plans). Thus, these magnets shall continue to pull increased traffic out of east county and onto older, narrower, city streets as it makes its way to work destinations. This edge of the problem, then, makes City and

County concerns the same.

The other edge of the problem for the County is more specifically a concern with development of unincorporated areas of the east county. First, road capacity, second, a capital shortage for road maintenance and new construction, third, a dispersed pattern of current growth, and fourth, the problem of improving transit service for the area are the factors in the development picture of concern to the County.

The central problem is improved transit service. This goal is believed best served with the LRT alternative for the Banfield corridor. With a line to Gresham, a spine is fixed through east county from which north/south bus runs can be established. Accordingly, the current radial bus system can be transformed into a grid system to provide for a true transit system for the east county.

By establishing LRT in the east county, the road problems of the area can be treated. First, pressure on city arterials can be reduced. Second, the inherent limit of roads to address the problems of growth in the area will be recognized.

By constructing new roads, the problem of growth is merely moved around. The real problem relates to dispersed growth patterns. Roads per se cannot correct this dynamic. By fixing a light rail line through the county, though, a focus for growth can be created.

The county has a goal of concentrated activity patterns for the area and intensification of land-use. Beyond this, there is interest in the continued development of the area economy. LRT creates an opportunity to reinforce trends toward intensification of land-use and it also creates market area potentials which would be good for the economy.

Finally, the ridership is there to support LRT in east county. The

County argues that any corridor carrying over 100,000 trips has a sufficient demand level to justify the building of something like LRT.

Light rail for the County is more than purely a mode preference. For the County, it provides a powerful tool for directing future development: both in terms of encouraging compactness and in terms of focusing the direction/location of future growth.

Indeed, the County sees the LRT opportunity as an institutional commitment to a long-term development pattern which integrates other jurisdictions of the region as well. By fixing the light rail line, the City of Portland, Multnomah County, the City of Gresham, and Tri-Met are synchronized as to the transit and development strategies appropriate for east county.

E. The City of Gresham

The City of Gresham is at one terminus of the proposed LRT line through east county. Gresham is a small city relative to the City of Portland. It has problems specific to its area but also the result of being part of the region. The concerns specific to Gresham relate to improvement of local transit service and to development of its own downtown. Gresham sees itself on the fringe of the region and is concerned that its integration into the region be maintained.

Gresham wants better local transit service. Currently there is no north/south service through Gresham to relieve a congestion problem which is significant. There is hope that the LRT line will free buses to improve local service in general, and, in particular, to establish north/south service. The City's interest in developing its own downtown would also be served by local service improvements. Furthermore, the selection of

the terminal site itself could be of great importance to the vitality and growth of the downtown.

Gresham's place in the region also provides incentive to look to LRT. Current travel to Portland from Gresham is predominantly along the Banfield freeway. Congestion is substantial and projections indicate it will only increase. A new source of congestion will develop with the mid-1980s opening of the I-205 freeway. Gresham's fear is that the substantial additional vehicles flowing into the Banfield corridor from I-205 will create traffic congestion so great that it will virtually cut-off Gresham from access to Portland and the rest of the region. The fear is that Gresham could become an isolated community. LRT appears to be an attractive mode which will insure continued integration of Gresham in the region.

While various staff see LRT as essential, political realities are more ambivalent. Many still resent the loss of the Mt. Hood Freeway. The argument is still heard that this freeway would have solved the problems which now nominate LRT as an answer. Others express doubt about the local development opportunities presented by LRT. This climate of ambivalence thus leaves the question of LRT somewhat up in the air.

F. CRAG

CRAG is only involved in the decision process through its activities as the regional planning agency. The posture of the agency is to "check off" on the decision if there is consensus among other jurisdictions.

G. The State of Oregon

The State's posture is partially derived from its role in the Mt. Hood Freeway decision. There was a clear need to replace the Mt. Hood

Freeway with something when funds for it were withdrawn. It became clear that the Banfield corridor would be the transit facility to replace this scuttled freeway.

The State is interested in seeing a balanced facility to accommodate trip demand. The argument is made that I-205 should be an 8-lane configuration to function correctly. Given its 6-lane design transit must pick up the residual loss by eliminating two lanes.

Moreover, it is clear the region will not have new highways constructed in the foreseeable future. Thus, the current system must be adapted to meet the region's needs. In this context, it is essential that the Banfield corridor be improved.

However, given this recognition, one alternative does not immediately nominate itself over another. The State has not taken a formal position which favors one particular alternative.

H. Summary of Regional Issues

Several regional issues can be derived from a look at the Banfield decision. The first issue involves transit service. At base an essential concern is provision of improved service and prevention of deterioration of service for the region. To achieve this the region must grapple with the problem of flexibility. Given the dynamics of the region, increasing population and trip demands, a transit service system must be flexible to accommodate changing activity patterns as well as increased trips. Some argue LRT enhances flexibility; other questions whether a fixed rail line actually reduces it.

Another aspect of transit service relates to selecting a mode which will accommodate increased demand in the future. However, simultaneously

the ridership to support the transit investment should be immediately available. This is important to insure the ability to help pay for the investment now.

Still further, a critical element of service involves productivity. The mode decision should contribute to improving the productivity of the system. Operating costs stack up as having great impact on productivity. The mode choice which seems to deliver the most on this score is LRT.

Finally, service provision varies with the design of the route system. There is much criticism of the present radial system. There is belief that a grid system would better serve the region. Many argue LRT will facilitate a more effective grid system design than other alternatives.

A second issue relates to regional development. Those favoring LRT argue that it presents opportunities to enhance development. First, LRT as a development tool provides the opportunity to reinforce desired land-use patterns. Second, LRT can help focus future growth patterns of the region. Third, LRT amounts to a powerful growth management tool.

A third issue involves regional integration. LRT is a tool for integrating communities into the region as a whole. Simultaneously, LRT may serve to stimulate new local development and free existing transit service resources for improved local service.

Ultimately, LRT presents an investment opportunity to the region. All of the above potential benefits of LRT will not occur if the public dollars are not spent.

PART III

ANALYTICAL REVIEW: THEORETICAL QUESTIONS ON LIGHT RAIL AS A TRANSIT OPTION

A. Introduction

There is a considerable challenge to raising theoretical questions which might suggest further areas of research (for faculty of the university and others). The following questions are posed to solicit responses to provide guidance on what research has been done in the area, and where the researchable areas remain. It is also hoped that a critical assessment of the question can be made to aid in its more reasonable formulation.

This approach seems to require a dialogue between those knowledgeable about transit and interested faculty trying to learn about it. Therefore, the intention of this section is to provide a tool for focusing such a dialogue.

This part of the paper organizes questions along disciplinary lines. The disciplinary categories are merely conventions for orderly exposition. It should be clear as the questions unfold that there are many interdisciplinary issues to be considered as well.

B. Economic Questions

Question 1: Why is the ridership present to support LRT?

Discussion. Public transit is less flexible than automobiles; transit is slower; it does not take you door-to-door; it is not available at the moment of demand (night or day); it is not private; it may not even offer

you a place to sit, i.e., it is frequently overcrowded; and it is less secure than a car. As such, there are few incentives to use it.

Further, as a corollary point, one auto trip with a particularly high demand is the journey-to-work commute. That is, auto-use will be sacrificed in other areas, e.g., recreation, to preserve the continued commute.

Charles A. Lave (1978) makes the following points on this issue:

We also gain some perspective on the long-term decline in use of transit: transit is inferior to the automobile along every dimension except cost; hence, as user incomes rise over time and people decide to spend part of their new income to buy a superior form of transportation, transit patronage must decline. That is, you cannot continue to sell a cheap substitute when income trends are making the real thing affordable to more and more people (p. 298).

Lave (1978) goes on to argue:

A great deal of research has been done on what determines the choice of transportation mode (e.g., bus versus auto) by urban passengers. These studies use statistical procedures to estimate commuters' sensitivity to the various factors involved in the mode-choice decision, and hence calculate the potential reaction of commuters to possible transit improvements such as lower fares, faster speeds, and more frequent service. It is fair to say that these studies have not indicated much commuter sensitivity to cost, the only factor in which public transportation has any possibility of comparative advantage. Lest this body of research be dismissed as somehow inadequate, or auto-biased, it should be pointed out that a number of observable real-world phenomena confirm the public's aversion to "public" transportation: (a) even in cities with good public transportation, only a small proportion of the population uses it; (b) very little diversion of people onto transit occurred during the OPEC (Organization of Petroleum Exporting Countries) gasoline crises; and (c) even in European cities with excellent transit and long traditions of transit use, as family incomes have risen over time, transit use has declined and auto use has increased. Nor have higher gasoline prices significantly affected auto travel; both computed gasoline price elasticities and observed travel behavior have shown little movement of people from autos to transit. This has also been true for other kinds of price-diversion policies, such as increased parking charges and increased bridge tolls (pp. 298-299).

Question 2: Should part of the implementation of LRT involve creating incentives to ride it?

Discussion. It seems that as long as congestion on freeways is not to the point of impassibility, the auto commute will remain attractive. It does not seem reasonable to improve the Banfield freeway by creating six standard lanes while at the same time building LRT. Perhaps the Banfield should be returned to a four lane configuration and other incentives to encourage ridership created.

The argument is frequently advanced that public transit is heavily subsidized; ignoring the heavy subsidy (in essence avoidance of paying all the costs) of the private auto. A conventional argument is that highway user-fees should be charged. Afterall, public transit at least charges user-fees. Only if user-fees are charged to the private auto will there ever be a strong incentive to substitute transit use for the auto.

On the other hand, it is pointed out that auto user-fees are charged. There are highway tolls, gas taxes, and bridge tolls which substantially pay for the maintenance of the highways. In essence, the user is paying for the system. Furthermore, user-fees in the form of bridge tolls in New York City subsidize mass transit.

What is at issue for this region seems to be several things. First, as part of the financing source the issue of auto subsidization of transit should be addressed. Second, as part of the effort to give incentive to transit use, perhaps auto user-fees should be increased to the point where the benefit of transit becomes attractive. Perhaps the region should give consideration to user-fees for highways in the form of tolls for freeway use and/or substantial increases in the gas tax.

Thus, the discussion of the subsidy issue suggests corollary questions:

Question 3: What alternative modes of financing are used in various LRT systems?

3a) What has worked?

3b) Have financing tools been tied to incentives to encourage transit use? Have they worked?

Question 4: What level of subsidy should the public be expected to assume to support LRT?

4a) merely capital costs?

4b) will operating costs have to be subsidized too? by how much?

Question 5: How much of the transit demands of the region would be absorbed by deregulating transportation?

Discussion. Kirby, et.al. (1975) argue that there are neglected options for meeting the transportation needs of urban areas. They discuss a broad category of alternatives which includes jitneys, van pools, car pools, and various types of taxi cab service used in hire and drive, hail or phone, and prearranged ride-sharing strategies. They argue the essential need is for deregulation of the transit industry to permit these modes the opportunity to work. For example, the authors cite the case of the jitney. It was regulated out of existence in the first two decades of the twentieth century because it presented such strong competition to street railways. This domain of what the authors call "para-transit" may be of central importance to a region that is facing an uncertain development future or is unclear whether heavy capital investments can be afforded or are necessary.

Question 6: Have time-cost comparisons between LRT and the auto been made to demonstrate the superiority of LRT?

Discussion. Economic research has consistently demonstrated the central

importance of time-costs in the modal choice of commuters. If LRT is truly to draw riders out of automobiles, the issue of time-cost must be addressed. The question is a basic research question which seems important to pursue if this comparison has not been done in this region. Of course implied in the question is the deeper question of whether LRT can compete with the auto on a time-cost basis and whether this should be a basis for determining whether to commit to LRT.

C. Urban Geography Questions

Two major research areas of urban geography can be used to organize questions raised by LRT potential. These two areas are activity location and transportation/land-use studies.

1. Activity Location

Two general question areas arise here. One concerns impacts of the location of LRT lines (or alignment); the other question area involves employment location impacts.

1a. Alignment. Question 1: How critical is alignment to the success of the line? Specifically, should the alignment attempt to fit existing and emerging activity patterns?

Discussion. Literature in economic geography is filled with analysis documenting continuing trends of suburbanization of industry (both heavy and light manufacturing), warehousing, and retailing (especially in the form of shopping centers). Several things seem at issue. First, large dedications of land to industry on the urban fringe does not bode well for attempts to increase densities. Second, if economic activity is shifting to the fringe, an alignment which is essentially a classic suburban-downtown commuter line seems inconsistent. Third, the chicken and egg relationship between transportation and activity location seems to become central: can

LRT modify activity location patterns which are based on an institutionalized auto-based settlement pattern?*

Question 2: Where are people going?

Discussion. The acid test of LRT seems to be in whether it provides better service. The alignment issue has been addressed from the political perspective that least dislocation is best. A theoretical issue seems to concern whether the alignment is situated to maximize ability of riders to get to desired destination. If the service is improved in terms of travel time, but the alignment makes getting to desired destinations difficult, has service really been improved?

This question was stimulated from a review of the CRAG Travel Demand Study (May 1978). The study itself was an excellently designed and executed piece of survey research; only the results were not spatially correlated. Consequently, there is no data which give any indication of where people who live in east Multnomah County go to work, do their shopping, etc. It would seem at least theoretically important to understand internal daily urban system mobility flows to heighten the opportunity to provide better transit service; if not by alignment choice, certainly through schedule modifications to maximize service given the LRT alignment which is fixed.

Question 3: Are different alignments appropriate depending on the purpose of LRT? May an alignment for a commuter line be different than the same line if it is part of a transit system to serve an entire region?

Discussion. The issue of the purpose of LRT continues to nominate theoretical questions. If the sum total of LRT for the Portland Metropolitan Area is a single commuter line to Gresham, perhaps the alignment ques-

*The industrial issue may not be so critical in the Banfield/Burnside alignment because most of east county is residential. A commuter line may be the central need here. The questions raised here do seem reasonable if LRT as a regional system is assumed to be the ultimate end for Portland.

tion is moot. If a three corridor system is devised and all lines are merely commuter lines, perhaps alignment is moot time three. But if the region is committed to a mass transit system which enables residents of any part of the region to access the entire region, perhaps alignment becomes critical. Perhaps a solid knowledge of spatial flows of people through the urban system is critical. Perhaps selection of right-of-ways should be modified based on this information. Perhaps the attempt to select a least dislocation alignment will not best serve the region over the long-run. Freeway designers were much less considerate than LRT planners. Perhaps selection freedom for LRT alignment should be equal to that afforded freeway designers.

Finally, following this track, two last points emerge. First, if the commitment is to more than commuter lines, why is there no provision for a circle line to link all three corridors, surround the core area, and facilitate through-trains from east to west and north to south? Second, how can the alignment choice reconcile its placement uncorrelated with a transportation center to be built adjacent to the railroad station in Northwest Portland?

1b. Employment Location. Question 1: Where will jobs, and what kind of jobs, be located relative to LRT?

Discussion. This writer could find no studies which clarify who lives in east Multnomah County (e.g., class, occupation, etc.) and where residents travel to work. Further, the kinds of jobs located in various areas of the region relative to probable residents of east county, and where east county residents want to travel, is apparently unknown. This basic information seems important to determining if in fact the selected alignment will serve transit needs.

If the line is a pure suburban-downtown commuter line it seems even more important to determine employment locations. The spatial correspondence of jobs and residents seems critical because it may be that more commuters to the downtown live on the west side of the region than the east side. Another possibility relates to the scale of cross-river commuting through the core, i.e., how many live on the east side who work on the west side but not in the core? Corollary questions are suggested by this discussion.

1a) Does correlating alignment to particular types of employment make sense as a reasonable strategy for enhancing ridership potential?

1b) How stable are employment location patterns relative to residence patterns? Can alignment help stabilize these patterns? Can a bus support system satisfactorily adapt to employment/residence location dynamics?

Question 2: How many people will locate their residence in outer east county who work (a) in the core, or (b) on the east side?

Discussion. This is a more specific version of the first question. There appear to be data insufficiencies here. The central question of ridership is also implicitly raised. Likewise, the travel cost issue and hence the issue of modal competition, auto versus transit, is raised.

2. Transportation/Land-Use

Question 1: Will LRT control sprawl or will it contribute to it?

Discussion. The argument is frequently advanced that LRT can be a powerful tool to increase urban density and spatial compactness. There seem to be grounds to dispute this claim. It may be conceded that future economic development and residential development could be focused in relation to the fixed LRT line. However, this basic pattern may be only a partial achievement. It seems important to distinguish future corridor

development from the longer historical evolution of the larger settlement pattern. Thus, while the line might have some potential for increased density, will the surrounding areas be modified? The power of a settlement having at least 25 years of evolution around the automobile as the primary transportation mode to resist significant modification seems in need of serious consideration. Furthermore, the attractiveness and functional utility of the auto has hardly diminished. Thus, the use of LRT as a tool for densification must directly compete with a mode which is both still vital and the source of the current pattern.

Another significant question related to sprawl is raised by what urban geographers know of the way settlement patterns form and develop. The construction of a three corridor LRT illustrates the case. In August Losch's (1954) theory of space economies he demonstrates that over the evolution of the economy the settlement pattern takes on the shape of a pie with alternating wedges of rich and poor areas. The theoretical reasons for this occurring in Losch's model are not central to the present discussion; but his derived outcome nominates some interesting parallel questions for the Portland region.

There seems to be great confidence among planners in the light rail line's ability to focus economic activity. All the discussion is focused on corridor development, and no discussion is devoted to the consequences of this for areas away from the line. A three corridor LRT system essentially divides the region into a pie very much in the mold of Losch's hypothesized space economy. The question thus arises whether the present design and construction of a three corridor system would create fingers of dense economic activity and wedges of non-activity between the fingers. The question arises whether this present plan for a three corridor system

would in fact create a region that has distinctive city-rich and city-poor areas.

Finally, at issue is the activity pattern for those spaces between the lines. Would the three-corridor system actually contribute to fingers of density and wedges of sprawl? Thus, it seems to remain a rather uncultivated area of research to consider the spatial impacts of LRT operations.

Thus it is that the question of the purpose of LRT is raised again. Perhaps a three corridor commuter system generates a different spatial pattern than the system designed to access the entire region for all residents. Perhaps the inclusion of at least one circle line becomes critical to focusing activity in a circular fashion instead of encouraging linear growth along extensions of existing lines, leaving no incentive or ability to use the system to affect development patterns in the wedges between the corridors.

Question 2: Does LRT encourage extended suburbs and hence increase pressure on the urban growth boundary?

Discussion. This issue was raised in discussion of the larger issue in Question 1 by implication. If a linear extension of the line is easier than original construction, it seems that it makes outer suburban areas, e.g., Sandy, more attractive places to live. First residents begin by driving to the Gresham terminal and riding the LRT to Portland, then there are enough commuters for them to begin demanding a line extension. While Oregon's land-use laws may prohibit the line extending beyond the current growth boundary, the question is whether such a scenario would in fact increase pressure on land-use planning agencies to change the boundary.

Question 3: How important is it to link LRT planning to the economic geography of the region?

Discussion. Two specific concerns implied in the question are as follows. First, there is a planning concern. The specific question is why LRT alignment is not correlated with current planning for a bus-rail transportation center in Northwest Portland. This oversight suggests there may be a need for more thorough and coordinated planning in the region.

Second, there is a concern over the relation of the space economy of the region to LRT alignments. There is a problem posed by "industrial sprawl" in suburbs. How can the industrial population of these areas be served by transit which is as convenient as the auto? Transit has a difficult challenge to accommodate sprawling industrial acreage. It seems important to know what is the percentage of potential ridership from industrial employees, what are the transit needs of this employment sector, as well as whether it is in fact a potential transit rider group.

In this issue is a difficult problem for transit service. On the one hand, the impact of such industrial patterns on transit service, if demanded, must be determined. On the other hand, assessment of impact on industrial activity patterns of the region of a full service mass transit system, if implemented, is needed.

Finally, there is the problem of LRT alignment impact on retailing activity. Will LRT reinforce core area retailing activity vis-a-vis regional shopping centers? What will LRT do to retailing at Mall 205, and Lloyd Center? If LRT is built along Sunset, what impact will it have on Washington Square? If the Oregon City LRT is built, what impact will it have on the Clackamas Town Center?

Question 4: Are marginal properties along proposed LRT lines sufficient to make a difference to density levels in the corridor?

Discussion. The major criteria for alignment of the Banfield corri-

dor was availability of right-of-way which caused minimal dislocation. A question arises from this relating to the level of development already present along the corridor. Tri-Met studies confirm the minimal land capture needed to provide for the line. Since it is so minimal, and since the land is mostly dedicated along the entire stretch of the line, how will densification occur? The fact is that while dislocations caused by Tri-Met are minimal, to accomplish significant increases in densities, private development will have to dislocate residences in a considerable fashion. Of course, the market serves to compensate for dislocation. However, at issue is an earlier point: how powerful is the current settlement pattern to resist densification? Also, at issue are matters of jurisdictional policy and neighborhood impacts. The City of Portland has a neighborhood preservation and enhancement policy. If LRT presents attractive development opportunities, what impact will it have on surrounding neighborhoods? Will they be changed from single family to multiple family dwelling units? Will neighborhoods give way to commercial and other economic activity?

Finally, the similarity between LRT and freeways merits noting. Like freeways, LRT needs a feeder system for loading. For freeways, the feeder system is the network of city streets leading to on and off ramps. For LRT it is a bus system and walking distance; with a good bet being that walking distance will be a significant factor considering bus rides of any distance are a disincentive to ridership because of the time-cost issue. If the available marginal lands are limited, and both residential and commercial activity compete for them, will there be an appreciable increase in real density in areas without much greater land-use change than estimated?

D. Institutional Questions

The following questions related to issues of how the LRT system would function once in place are largely operational issues. However, the focus is on the question of how to institutionalize LRT in the region.

Question 1: For whom is LRT a service improvement?

Discussion. The central issue of service seems to require addressing the issue of time savings. The incentive to ride transit has proved to be in its potential for time saving. While the actual line haul time for an LRT ride may be shorter than a bus (and perhaps during peak hours the auto), the question is for whom? It would seem the only percentage of the riders who save time are those who can walk to a station. If a bus feeder is used to reach the station time adds up: wait for the bus, time on the bus, wait for the train, time on it (and if a transfer to another bus is required, then time cost increases further). Several corollary questions arise:

- 1a) What percentage of ridership really gains time?
- 1b) If time gained on LRT is lost getting to it, where is the improved service?
- 1c) Will people in the region be willing to double transfer in some cases?

When the inelastic demand for the auto journey-to-work trip is recognized as well, two more questions which have been asked before merit asking again: is the ridership really there to support LRT? and what must be done to give incentive to ride LRT? The latter seems to be a central research question.

Question 2: Does implementation of LRT require basic changes in the current transit system?

Discussion. The question addresses the issue of the design of the feeder bus system relationship to LRT. Will all buses feed the LRT line? What radius from the core will be served by buses as currently provisioned? Will far east county residents be able to choose between a bus or LRT to reach downtown? (If so, there is an implied competition set up between LRT and buses.) What of transfers for residents in one quadrant wanting to reach a diagonal quadrant? For example, if a resident of the far south-east wanted to reach the inner northeast, or northwest, would a bus to LRT to bus transfer system be required? Take the opposite case. Could a Gresham resident make a trip to Mall 205 without using the LRT? These questions serve to suggest problems of implementing LRT in fact create problems for the entire system. While these difficulties may be comparatively easy engineering/scheduling problems for operations researchers and planners, the question of adaptation of the patron to these new modifications seems to remain a question. Perhaps there are some sociological and marketing research questions worth pursuing concerning how patrons can most efficiently learn and adapt to transit system changes.

Question 3: Even if the region can finance capital construction costs, can LRT be maintained over the long-run?

Discussion. In a report by the Tri-Met Planning and Development Department on "European Light Rail and Bus Transit Systems," (July, 1978), the following points were made:

a) "...an initial impression is that the Banfield LRT operating costs are understated by roughly 25% to 35%, that is by a detectable but not an unreasonable amount for this point in the planning process (p. 6)."

b) "A second major impression carried back concerns the extensive maintenance and support requirements of LRT (p. 6)."

c) "Two opposing conditions should be cited which would affect operating costs. First, there would undoubtedly be significant 'learning curve' or 'start-up' costs associated with operating an initial LRT line which are not accounted for in the current Banfield estimates. Second, new equipment and new fixed facilities should not require as much maintenance during such a start-up period as those of older systems, such as those in Europe. A corollary trend...is that as new equipment tends to become more sophisticated, more costly maintenance may be required (emphasis added; p. 6).

This report goes on to say that maintenance requirements and support functions to operate LRT are extensive. "It was observed to require as many or more people to maintain an LRT system and keep it operational as it takes drivers (p. 7)." The report says that LRT maintenance requirements are more extensive than diesel buses. While maintenance cost is offset by increased driver productivity, the report goes on to say that the operational cost differences between LRT and buses is actually in the 10% to 25% range favoring LRT and not the 50% to 100% range (p. 7). The August 1978 summary of the staff recommendations for LRT on the Banfield corridor stress the operating cost savings of LRT. There seems to be some need for clarification as to whether the August conclusion takes into account the July report's findings.

It may also be important to determine the rate of inflation in the transportation sector of the economy. If inflation in the transportation sector is higher than the overall average, a question would arise concerning the true operating costs in future. In fact, it would be interesting to know if operating cost inflation estimations were made on a comparative basis for bus and LRT alternatives. Finally, it would be interesting to

know if projected operating costs in future were made with a double digit inflation rate and how the operating agency proposed to meet such cost increases.

Question 4: Is LRT insulated from the "energy crisis" because it is electrically driven?

Discussion. A case may be made that it is reasonable to hedge against declines in gasoline availability. Whether for the reason of another 1973-type oil crisis or simply because price escalation eventually makes auto use too expensive, electricity-driven LRT is indeed a form of insulation.

The issue of comparative cost advantage for electricity-driven vehicles is another question. The central question is how long will the comparative advantage last? The principle of substitution is a proven economic reality. If gasoline costs too much, a substitute is found for it. This same behavior occurs for every energy alternative. The fact is energy as a resource must be viewed as a system of interrelated alternatives. Electricity is one mode, often generated by other modes. The clear trend is for all energy sources to rise in price. Thus, while one source offers a comparative advantage in the short-run, it is reasonable to suspect that demand for it will rise as alternative supplies decline. Also, electricity is one source which is experiencing very rapid price escalation with its spiral not expected to level off for quite sometime. To arguments which see operating costs as reduced by the comparative cost advantage of electricity, the above points are addressed. That is, electricity does not insulate against price pressure which may have sizeable impacts on operating costs. However, given the Northwest's hydroelectric base, there is a reasonable case to be made for the reliability and stability of supply to be better than for petroleum.

A final issue which might be addressed in the consideration of the energy advantages and disadvantages of LRT is the net energy benefits or costs of building LRT. Lave (1978) makes the following argument regarding BART. It required an investment of 164 trillion BTUs to construct BART. Based on his analysis Lave says, "In terms of the initial energy investment in construction, thirty-four times more energy was required to build BART's rail facilities than would have been required to build highway facilities to transport an equivalent number of people (p. 302)."

Lave's analysis of daily operating energy costs found a small 680 BTU net energy saving. He estimates (given BART's patronage of 13,000 trips of 13-mile average daily length) that it would take 535 years to repay the energy costs of construction. He says that even if BART's ideal patronage were achieved (double patronage, 75% of its passengers diverted from cars, and operating at 50% load factor) it would still take 168 years to pay back the initial energy investment. Thus, Lave argues BART cannot in fact save energy.

Perhaps the net energy question should be asked for the region's transit alternatives. How would LRT stand up to other alternatives? This would be a very interesting piece of research to attempt.

Question 5: Can the region afford the LRT investment for two peak-hour loads?

Discussion. This question is an attention-getting way to inquire into expected ridership levels for an entire day's service. It seems important to determine what the daily pattern of ridership is to determine how operating costs will shape up. More importantly, researchable questions appear to exist in efforts to understand daily urban activity patterns and how conducive they are to supporting off-peak hour ridership.

Question 6: Are there institutional mechanisms available to manage the transit problem of the region without LRT?

Discussion. A frequent argument is that non-engineering solutions to human problems are overlooked or underestimated. The most common argument concerns deregulation. If the market were freed, there would be practical solutions to congestion which would meet the service needs of the region, e.g., van pools, car pools, jitneys, club buses, various taxi services, trolleys...or so the argument goes.

Other institutional alternatives involve modifying work schedules to reduce peak-hour congestion pressure. These include early and late shifts, or perhaps private company transit services. Some go so far as to suggest provisioning residential opportunity adjacent to employment wherever possible even to the point of providing subsidies to give incentive for locating close to work.

Some who regard engineering solutions as essential suggest that priorities are misplaced. There is the pro-auto constituency who claim the problems faced by urban areas can be treated by vehicle changes (make smaller cars) and/or fuel changes (use gasohol, hydrogen, methane, or propane).

Essentially, the question ponders how significant a contribution such institutional mechanisms can make to the larger-scale urban transit needs of the region.

E. Political and Policy Questions

Up to this point researchable questions have fallen within the domain of the technical problem of building LRT (in the broadest sense of the term). The fact is that there are political and policy questions which are indepen-

dent of the "technicalities" of LRT. It may be that the technical decision has very little to do with the political decision. From a theoretical viewpoint, the political and policy questions nominated are as follows.

Question 1: Should the region as a whole (and/or the State of Oregon) pay for benefits to east Multnomah County (which in turn may be unincorporated east county and Gresham)?

Discussion. The bottom line has always been how to pay for it. It seems the inevitable question relates to who should pay? Given the current political climate of "tax revolt" and possible large-scale limits on available public funds this cannot be a question to be avoided. Clearly the central challenge is to document that the level of benefit justifies the general public expense.

If the real agenda is construction of a three corridor regional LRT system using general fund money from the State budget, it is important to recognize the prevailing attitude outside the Portland area. Roads are deteriorating and hurting all localities of the state. Virtually every community of the state seeks State funds to improve roads in its area. Given limits of available State funds, justifying further expense in Portland (already perceived as reaping more than its share of State benefits) may be a very challenging endeavor.

Question 2: If a regional LRT system is the real agenda, why is this not the issue instead of merely the Banfield corridor?

Discussion. The fact is that LRT may be a very attractive and important mode for the region as a whole. It seems the case that it is essential to discuss the regional design vis-a-vis the Banfield corridor in order to confront the acid question: what are the people really getting for their tax dollars? This also addresses question 1 as well.

Question 3: Should policy coordination and consistency be required of the LRT decision?

Discussion. The problem of coordination is multifaceted. First, six jurisdictions are involved in the decision. Each jurisdiction is subject to leadership changes. It seems essential to the efficiency of implementation that decisions made by one set of leaders be binding for future leaders to avoid problems arising from changing policy horses in mid-stream. Second, there is the issue of using other policies to reinforce the decision to select LRT. For example, a decision to terminate the LRT line in Gresham may in fact undermine regional land-use policy, e.g., setting and holding the line on an urban growth boundary. On the plus side, LRT provides an opportunity to focus development by linking housing policy, economic development policy, and other traffic related policies, e.g., parking space availability, parking rates, etc., together. Perhaps additional policies, e.g., zoning changes, user-fee rates, etc., may also be integrated.

Finally, there is the issue of the internal jurisdictional policy consistency to address. Each jurisdiction must assess its own house to be sure its support of LRT serves its own ends. An interesting example of potential policy problems in this area may be the City of Portland's first source employment policy.

The first source employment policy is now highlighted in the Wacker Siltronic plant siting. The policy essentially makes the city the first source of employment of newly trained workers for Wacker. This particular illustration is not so important as the goal of this first source tactic.

The City of Portland wants to establish new jobs and maintain existing jobs for residents of the city. This auspicious goal makes policy coordination

especially important. Here is where the LRT decision enters the equation. If the city is serious about its first source policy, and more importantly keeping city jobs for city residents, why support a transit program which makes it easier for east county, non-resident suburban people to access the downtown and other employment centers of the city?

Question 4: How much difference should there be in terms of improved service to justify the dislocation of people from their homes and businesses from their sites?

Discussion. In Tri-Met's report, East Side Transit Operations (December 1977), the Banfield/Burnside right-of-way impacts are summarized as "31 properties affected, 16 families and 6 businesses relocated (p. 78)." It would be interesting to know the dollar costs of these relocations. The political question seems to boil down to the following: if the only difference between LRT and other alternatives is a matter of estimated operating costs, is it worth the dislocation of people--families, and businesses?

CONCLUSION

What does Light Rail Transit mean for the Portland Metropolitan Area? Technically, it means a fixed rail transit service with the flexibility to accomodate sizeable increases in ridership. It is essentially a new form of trolley car whose greatest promise appears to be its ability to lower the operating costs of transit service.

The historical trend of recent years is one of increasing importance of urban mass transit. In the Portland area the attention to transit has taken the form of attempts to adapt an existing transportation network to future needs (admitting the days of extensive construction of new facilities is over for the foreseeable future). To planners and the operating transit agency, the transit form which best accomodates the region's needs is LRT.

Several jurisdictions must agree to support construction of LRT. A look at their separate concerns shows some very interested in the potential of LRT and others more pragmatically concerned with merely treating their own specific problems, e.g., arterial streets congestion. For these latter jurisdictions, no mode is inherently superior.

For all the work that has gone into planning for LRT there is still much about it that remains subject to question: not from the standpoint of obstructionist criticism but from the standpoint of trying to clarify and enhance understanding of what LRT means for the region. Hopefully, this paper has managed to stimulate further discussion and improved understanding of LRT and its place in the transportation future of the Portland Metropolitan Area.

APPENDIX I

The following is a list of the jurisdictions involved in the current aspect of the decision to build a light rail system in the region. These jurisdictions divide according to ones specifically affected by the Banfield corridor and ones which will be involved in decisions concerning each corridor. This distinction will be noted under each agency.

Tri-County Metropolitan Transportation District of Oregon
4314 S.E. 17th
Portland, Oregon

Tri-Met, as the regional transit agency, will be involved in all corridor decisions.

City of Portland
Planning Bureau
424 S.W. Main
Portland, Oregon

Insofar as all three proposed corridors would flow through the downtown of the City of Portland, the city will certainly be involved in all three corridor decisions.

Multnomah County
Department of Environmental Services
Planning and Development Division
2115 S.E. Morrison
Portland, Oregon

The major concern for the County will be with the Banfield project insofar as the major portion of the County is affected by this project. The other corridors more significantly impact other counties in the region.

City of Gresham
Comprehensive Planning
Gresham, Oregon

The City of Gresham is entirely concerned with the Banfield corridor.

Columbia Region Association of Governments
Transportation Division
527 S.W. Hall
Portland, Oregon

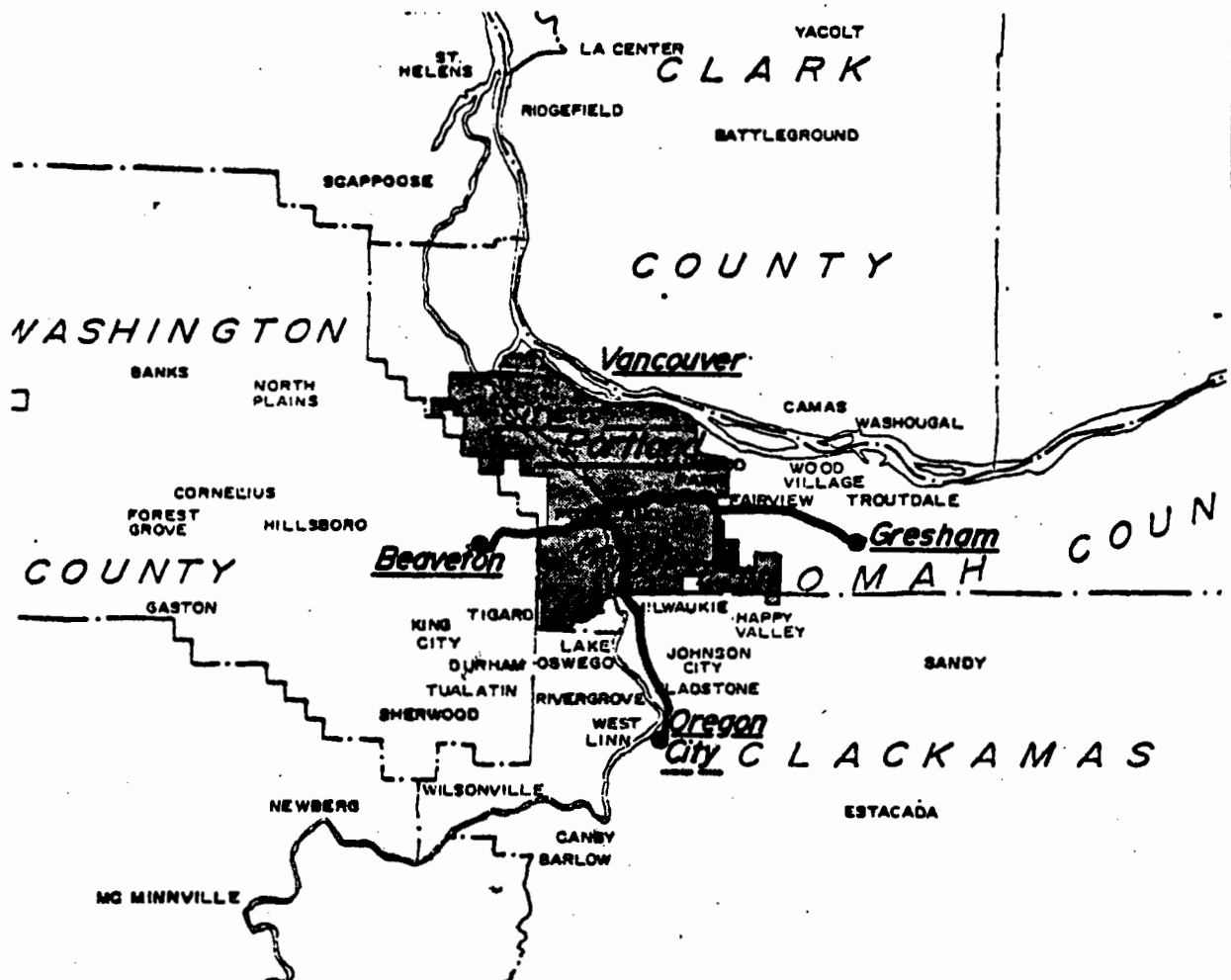
CRAG, as the regional planning agency, will have concerns regarding aspects of all three corridors of the regional system. The recent voter abolition of CRAG transfers its responsibilities to the newly reformed Metropolitan Service District. Thus, as of January 1979, MSD will assume CRAG's responsibilities.

State of Oregon
Department of Transportation
Metropolitan Branch
5821 N.E. Glisan Street
Portland, Oregon

The State of Oregon will certainly be concerned with all three corridors of the proposed regional system.

APPENDIX II

The following is a map depicting the three corridor plan for an LRT system in the region. The map is taken from Tri-Met's publication: Regional Transit Development Alternatives: A Sketch Planning Analysis, (August 1977). The map is found on page 3 of Appendix C, Executive Summary.



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