BANFIELD TRANSITWAY PROJECT

Light Rail Transit Line
and
Banfield Freeway Improvements

FINAL ENVIRONMENTAL IMPACT STATEMENT

August, 1980

U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
AND
URBAN MASS TRANSPORTATION ADMINISTRATION

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FINAL ENVIRONMENTAL IMPACT STATEMENT

Administrative Action

BANFIELD TRANSITWAY PROJECT

Light Rail Transit Line
and
Banfield Freeway Improvements

Multnomah County, Oregon

U.S. DEPARTMENT OF TRANSPORTATION
Federal Highway Administration
Urban Mass Transportation Administration

Oregon State Highway Division
and
Tri-County Metropolitan Transportation District

FHWA-OR-EIS-78-3-F
UMTA-OR-23-9001
Oregon Project No. IX-F-U-323(29)

Submitted pursuant to 42 U.S.C. 4332 (2)(C) and 23 U.S.C. 128 (a).

7-31-80
Date

Roger K. Scott
Federal Highway Administration

7/30/80
Date

James E. [signature] for PB
Urban Mass Transportation Administration

6-30-80
Date

[signature]
Assistant State Highway Engineer
Oregon State Highway Division

MAY 30, 1980
Date

Paul Bay
Paul Bay, Executive Director
Planning and Development
Tri-County Metropolitan Transportation District

SUMMARY

(a) Urban Mass Transportation Administration/Federal Highway Administration: Administrative Action.

( ) Draft (X) Final

( ) Section 4(f) Statement attached

(b) This Environmental Impact Statement (FEIS) has been prepared under the joint lead agency concept. The Urban Mass Transportation Administration (UMTA) and Federal Highway Administration (FHWA) are the agencies with prime responsibility for the preparation of the FEIS and associated project development responsibilities.

At the local level the Oregon Department of Transportation has primary responsibility for Project advancement. Assistance and technical data have been supplied by the Tri-County Metropolitan Transportation District of Oregon (Tri-Met), the City of Portland, Multnomah County, and the Metropolitan Service District (MSD), formerly the Columbia Region Association of Governments (CRAG).

(c) The following individuals can be contacted for additional information concerning the proposed Project and environmental statement:

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(d) General Project Statement

There will be a 47% increase in East Multnomah County population and estimated increase of 37,000 jobs in downtown Portland by 1990 which will create approximately 18,200 additional peak hour commuter trips through the Banfield corridor.

Various solutions to accommodate this increased travel demand have been suggested over the past few years. Five basic transportation alternatives were evaluated in the Draft Environmental Impact Statement. They ranged in complexity from the base condition of No-Build to the proposed Project.

The purpose of the Banfield Transitway Project is to provide a multi-modal transportation system that will accommodate: (1) projected increases in automobile trips to destinations outside of downtown Portland; and (2) commuter trips to downtown Portland with a higher level of transit service. The intent is to provide such a facility within environmental constraints consistent with local and regional goals, while minimizing disruptions to local communities.

The Banfield Transitway Project will consist of a light rail transit (LRT) system connecting downtown Portland with the City of Gresham that will operate on both city arterials and in exclusive rights-of-way, and improvements to the Banfield Freeway between the I-5 and I-205 corridors.

The LRT system consists of high-quality trunk line 14.9 miles long, serving principal destinations between the system's western terminus at 11th Avenue in downtown Portland and its eastern terminus in Gresham. The line will be served by a total of 29 transit stations. About 80 percent of these stations will be connected with an expanded east Portland and east Multnomah County bus system. Seven of these stations will feature park-and-ride facilities.

The Banfield Freeway will be reconstructed between the I-5 and I-205 corridors. Between I-5 and 33rd Avenue, the reconstruction will be minor, except for the addition of a fourth lane westbound from 37th to 16th Avenues. Between 33rd Avenue and I-205, the freeway reconstruction will consist of widening to six lanes with shoulders. Ramp metering will be provided at on-ramps.

The Banfield Freeway improvement itself will cost $98.0 million and the LRT system $208.1 million, for the total estimated cost at completion in 1985 of $306.1 million. Please note that these figures are recent estimates in 1980 dollars inflated at an annual rate of 12.0%. Other estimates, in this report are in 1978 dollars, unless otherwise noted.

(e) Other Alternatives Considered

Alternatives in addition to the selected alternative are listed below:

(1) No-Build - the Banfield Freeway would revert to its original design (the existing High Occupancy Vehicle (HOV) demonstration project lanes would be removed).

(2) Low Cost Improvements - express bus lanes on selected city arterials and selected traffic improvements on arterial streets would be provided. Two suboptions were considered.

(3) High Occupancy Vehicle Lanes - 2 preferential lanes for use by high occupancy automobiles and other mass transit vehicles would extend the existing HOV lanes on the freeway from Holladay Street to I-205. Three design variations were considered.

(4) Separated Busway - an exclusive 2-way busway from the downtown transit mall to the I-205 busway, with 6 standard freeway lanes plus full shoulders on the Banfield Freeway would be provided. Two suboptions were considered.

(f) Summary of Impacts

Transportation

Construction of Project facilities will impose relatively minor impacts on the existing transportation networks along the Project route. Construction of freeway improvements will be coordinated so as not to interfere with peak-hour traffic. Lane closures will be minimized as will the use of freeway lanes by construction equipment. Construction of LRT facilities along the entire alignment will occur primarily within the reserved LRT right-of-way, thereby reducing interference with freeway and arterial traffic. Some street closures and reduced access to local businesses and residences will occur during construction of LRT facilities in east Portland and east Multnomah County; however, these impacts will, for the most part, be temporary.

Downtown operation of the LRT facilities will cause closure of the ramp from the Steel Bridge to Front Street. First Avenue, Yamhill Street, and Morrison Street will remain open for local circulation at station locations. This will cause diversion of through traffic to the "next available" street. Parking will be eliminated on 1st Avenue, Yamhill Street, and Morrison Street, thereby reducing access to local properties and eliminating downtown parking opportunities. LRT in the Banfield corridor will greatly improve transit connectivity between downtown, east Portland, and east Multnomah County. Assuming systemwide transit improvements in other corridors, 1990 bus departures from the downtown and 1990 on-mall bus volumes would remain approximately the same as with the existing and No-Build conditions. However, if transit improvements are effected in other corridors, bus volumes in the downtown will exceed mall capacity by 1990 and double bus volumes on off-mall streets.

In east Portland, the Project will decrease the growth of traffic volumes along the Banfield Freeway and arterial streets as compared to the No-Build condition. Even with the freeway improvements, 1990 traffic will exceed the capacity of the Banfield Freeway. However, the incorporation of ramp metering and additional westbound lanes as part of the Project will serve to reduce 1990 freeway congestion. LRT in the Banfield corridor in combination with freeway improvements will reduce 1990 traffic on east Portland arterials compared to the No-Build and existing conditions. On the other hand, some properties will lose their access to Holladay Street as a result of construction and operation of LRT facilities. Alternate access either exists or will be provided. Curb parking will also be eliminated along Holladay Street.

In east Multnomah County, arterial traffic volumes will be greater than the existing condition, but slightly less with the Project than under the No-Build. Project development will result in some out-of-direction travel along Burnside Street due to turning restrictions imposed on traffic accessing Burnside Street from abutting properties and certain cross streets. These turning restrictions will result in minor increases (less than .15%) in total vehicle miles travelled and will increase emergency vehicle response times to some locations.

The Project, by locating LRT in the Banfield corridor augmented by a north/south feeder bus system, will significantly improve transit service on the East Side. For instance, it is projected that 42,500 person trips will be made on LRT on an average weekday in 1990. This improved transit service will increase accessibility between locations in east Multnomah County and the CBD as well as between East Side locations.

Energy

Transportation now accounts for 27 percent of total energy consumption in the Portland SMSA. Automobile travel consumes 75 percent of all transportation energy, while transit uses only 1 percent.

Compared to the No-Build condition, the Banfield Transitway Project will result in 52 million fewer automobile vehicle miles traveled by 1990. As a result, congestion on the Banfield Freeway and principal east/west arterials will be lessened, and the energy savings from this reduced congestion will be comparable in magnitude to the energy savings from the LRT system operation. The LRT system would provide a nonpetroleum-based transportation alternative that would assume greater significance in the event of a reduction in gasoline availability due to a supply cutoff, rationing program, or rising costs.

The congressionally mandated improvements in automobile fuel efficiency through 1985 will result in changing annual energy savings of the LRT system through at least 1990. These annual LRT energy savings were found to be particularly sensitive to ridership levels, the degree of shift in travel mode from automobiles to LRT, and the propulsion energy requirements that will be needed for LRT cars. The average annual savings for the entire Project, based on 1990 estimates, will be at most about 190 x 10^9 BTU, equivalent in energy content to about 1.5 million gallons of gasoline. However, the actual reduction in gasoline consumption will be greater; for the maximum projected 1990 energy savings, it will be about 3 million gallons annually, which is still less than 1 percent of current gasoline consumption in the MSD region. The total LRT system electrical demand of up to 29 million KWHe per year will constitute less than 0.1 percent of current annual power sales of Pacific Power & Light and Portland General Electric combined; this represents a small incremental addition to the region's electric power demands. Transportation energy consumption in the region will continue to be dominated by automobile travel.

Land Use

The Project generally conforms with local land use plans and policies, providing a significantly greater degree of conformance than would occur under the No-Build condition. In particular, the Project is consistent with major regional goals of: (1) improving the flow of goods and services and strengthening the local economy, (2) increasing the viability of the Portland central business district and enhancing its role as a regional center, and (3) concentrating growth where it can be better served by all public services, including transit.

Access will be improved along the entire Banfield Transitway Project corridor; therefore, it will provide a focus for more efficient and orderly regional growth. Induced growth opportunities in the downtown and east Portland areas are limited by the already developed nature of these areas. Development will primarily take the form of minor in-filling and pressure for use intensification near transit stations. Also, loss of on-street parking and local access in some areas may cause a shift to transit-oriented businesses where existing businesses currently rely on automobile patrons.

In east Multnomah County, opportunities to promote compact land development patterns and focus regional growth into patterns more economically served by transit are greater. Thus, land use changes will be more substantial in this area, although controls will be needed to prevent adverse sprawl and other undesirable development patterns. The adoption of such controls are presently underway, as evidenced by recent revisions to the Multnomah County Comprehensive Framework Plan which call for concentrating growth where it can be served by public transit. The major changes in development patterns in east Multnomah County will occur around transit stations, where a shift to higher density multi-family residential, office, and commercial development is expected.

The Project will require approximately 47 acres for right-of-way, most of this in east Multnomah County. Displacement of structures will be relatively low because existing right-of-way will accommodate much of the expansion. At a conservative maximum, partial property acquisitions will affect 10 multi-family units and 2 business properties. Entire acquisitions will involve 65 family units (46 single-family), and 13 businesses. Most property displacements will occur along the Banfield Freeway, although structures may not be displaced in all cases. The Project will also require acquisition of easement on right-of-way owned by the Union Pacific Railroad. Right-of-way acquisitions will reduce the property tax base by an estimated $4.9 million. On the other hand, land values along the Project corridor are expected to rise.

Socioeconomics

The Project, while not directly causing population growth, will have an effect on its spatial distribution. Growth is expected to concentrate to a greater extent within the Project corridor. Minor Project-related population growth will occur within the central business district and east Portland, except near transit stations. Significant increases will occur in east Multnomah County. The 1990 population level is projected to be 35 percent greater than the 1976 level in the Project corridor, compared to a 26 percent increase under the No-Build condition. A 210 percent increase is projected around transit stations in east Multnomah County.

Under the No-Build condition, increased street congestion will have an adverse effect on the area's livability, thereby slowing its forecasted rate of population growth. On the other hand, the Project will provide better regional accessibility by funneling more transit trips within the Project corridor. Neighborhood livability and community institutions will generally benefit. Proximity impacts that will occur include: (1) higher traffic levels around transit stations, (2) parking removals, (3) temporary interference during construction, and (4) decreased community circulation along Burnside Street where street closures restrict access and cause out-of-direction travel for residents and emergency vehicles. While street closures will create barriers to social interaction patterns, the impact on community cohesion is expected to be minor because pedestrian crossings will be provided.

Suburban employment and economic development trends would be reinforced under the No-Build condition due to effectively higher transportation costs to the central business district. As a consequence, increased development in the suburbs would result in their becoming more autonomous. The Project will assist in concentrating employment growth in the transitway corridor and reinforce the economic status of the central business district. Induced employment due to development opportunities captured, in part, as a result of improved regional access is estimated to be over 11,000. A shift in employment from outside to inside the Project corridor is expected, particularly in east Multnomah County.

The Project construction expenditures of $288.8 million (est. 1983 dollars) will realize increases in total regional personal income and employment. Ninety-eight persons will be employed for operation of the LRT. Road-user benefits estimated at $10.1 million will accrue in 1990, as compared to the No-Build condition.

Cultural Resources

A determination of no adverse effect on the Portland Skidmore/ Old Town Historic District, the Yamhill Historic District, and numerous other cultural properties has been made by UMTA and FHWA and concurred in by the Advisory Council on Historic Preservation. These conditions of this determination agreed to by UMTA and Tri-County Metropolitan Transportation District, are stated in Section 4.6, Cultural Resources.

An Archeology Reconnaissance survey has revealed that there are no apparent archaeological sites on the project. The project will not use or adversely impact any 4(f) type lands.

Aesthetics

Construction and operation of the Banfield Transitway Project will add new visual elements to the existing setting. The overhead wire network will add visual complexity, expecially in the downtown and Holladay Street areas and the Banfield Freeway, where few overhead wires/support poles currently exist. Although transit stations will be designed to be architecturally compatible with existing structures, the island stations on Holladay and Burnside Streets will be intrusive into the existing visual setting. Right-of-way acquisition, new construction, and noise barriers will impose new freeway-related views from adjacent properties.

In general, the Project will cause incremental changes in the existing visual character on a localized basis, with these changes generally in conformance with the transportation setting and uses of these areas.

Air Quality

An analysis was conducted to predict the future air quality for carbon monoxide (CO), nitrogen oxides (NO_x), nonmethane hydrocarbons (HC), total suspended particulates (TSP), and lead (Pb) resulting under both the 1985 and 1990 No-Build and Project conditions. In addition, the relationship of HC and NO_x to ozone was assessed.

Meterological and traffic data provided by the Oregon Department of Environmental Quality (DEQ) and Oregon Department of Transportation (ODOT) were input to the EPA HIWAY model and to the background model MLTBOX to assess the air quality impact of each condition for the years 1985 through 1990.

CO, NO_2 (nitrogen dioxide), HC, TSP, and Pb were compared to applicable national and Oregon ambient air quality standards. CO concentrations were slightly higher with the Project than under the No-Build condition for both 1985 and 1990 at some selected receptors. This was due to the deliberate selection of specific receptor locations that were most susceptible to any adverse effects from the Banfield Transitway Project. These locations are near road segments that have projected increases in traffic volume or decreases in vehicle speeds. All selected receptor locations indicated a decrease in predicted 1990 CO concentrations over those predicted for 1985. Concentrations of CO exceeding the 8-hour national and Oregon State ambient air quality standards are expected at a few locations at least through 1990. Mitigation measures have been proposed for all problem areas and an ongoing Air Monitoring Program will ensure that the project does not cause or contribute to Air Quality Standard violations.

Predicted concentrations of HC, TSP, and Pb at the selected receptors also tended to be higher with the Project than without. There were some predicted violations of air quality standards for both NO_2 and Pb. Predicted HC and TSP concentrations were all well over the standard. Predicted NO_2 and HC concentrations were generally higher for 1985 than for 1990. Predicted TSP and Pb concentrations for 1990 were generally higher than for 1985. All of the predictions for these pollutant concentrations were based on unverified proportional modeling techniques and were only used for a qualitative comparison of alternatives.

The total emissions analysis indicated that the Project will result in a significant overall decrease in emissions in 1985 and 1990 for all pollutants studied. This would indicate that for most locations in the Project area, the Project will result in reduced pollutant concentrations. On the basis of the HC and NO_x analysis, the Project will also result in a decrease in the production of ozone.

Acoustics

The Federal-Aid Highway Program Manual (FHPM) 7-7-3 defines the analysis procedure for assessing highway traffic noise impacts. The analysis indicates that significantly fewer structures will be within the 67 dB equivalent sound level contour based on peak-hour traffic conditions with the Banfield Transitway Project than under the No-Build condition. The number with the Project will be slightly more than under existing conditions. A tabulation follows:

Alternative	Single-Family Residences	Multi-Family Structures	Public Buildings	Hotels and Motels
Existing 1979 Conditions	127	75	5	1
1990 Banfield Transitway Project	155	86	5	1
1990 No-Build	229	104	6	1

Construction of barriers along the Banfield Freeway would mitigate most noise impacts within this area. Approximately 125,000 square feet of barriers are proposed for further consideration at an estimated cost of approximately $2.5 million.

LRT operations will result in maximum sound levels exceeding the permissible nighttime maximum sound levels of 60 dB and 50 dB as established by the Oregon Department of Environmental Quality and the City of Portland's noise ordinance, respectively. Since operations will generally result in maximum sound levels equal to truck activities within the area, a variance to these regulations may be required. A total of 92 single-family dwellings and 14 multi-family dwellings along Burnside Street will experience single-event sound levels greater than 75 dB for LRT operations.

LRT maintenance activities are exempt from the Oregon noise regulations. Since maintenance activities will generally occur indoors, LRT maintenance yard activities in excess of 70 feet distance to the property line will comply with the applicable noise ordinance.

LRT operations at curve sections at 1st Avenue and Yamhill Street, 1st Avenue and Morrison Street, 11th Avenue and Yamhill Street, and 11th Avenue and Morrison Street are anticipated to result in a maximum sound level of 87 dB at sidewalk level and at 10 feet from the center of the near track. Operations at curve sections will therefore result in noise impact unless mitigation measures are incorporated at these curves. Operations along straight segments within the Portland central business district are not anticipated to exceed the suggested LRT maximum permissible sound level of 85 dB within this area.

Construction activities will comply with the City of Portland's noise ordinance, with construction activities limited to allowable hours.

Natural Environment

The Banfield Transitway traverses a largely urbanized portion of the Portland metropolitan area; therefore, its impacts on existing natural conditions are minor. There are no apparent geologic hazards, slopes have low erodability and are generally stable, and the few habitat types present have been largely shaped by man's use of the land.

The proposed LRT maintenance and storage facility between 199th Avenue and the Portland Traction Company tracks borders the 100-year floodplain of Fairview Creek. The site includes a few small areas within the ponding area that is in the 100-year floodplain. All potential impacts on flooding problems will be avoided by controlling the use of these very small portions of the site.

The Project will result in a long-term loss of ground water recharge areas to paved impermeable surfaces, but these losses will be minor in magnitude. They will contribute to the continuing alteration of the hydrologic character of the urban watershed. Other potential construction impacts will be mitigated by design or construction practices such as drainage control and revegetation.

(g) Recipients of the DEIS*

Federal Agencies

U.S. Department of Agriculture
- Soil Conservation Service
- Washington USDA, Soil Conservation Service
- National Forest Service
- U.S. Forest Service, Region 6

U.S. Department of the Army
- Washington Department of Army Corps of Engineers
- Vancouver Barracks

U.S Department of Commerce
- National Oceanic and Atmospheric Administration
- National Marine Fisheries Service
- Northwest Regional National Marine Fisheries Service

*U.S. Department of Energy, Region X

U.S. Department of Housing and Urban Development

U.S. Department of the Interior
- *Secretary of the Interior
- Environmental Project Review
- Assistant Secretary, Program Policy
- Deputy Assistant Secretary, Environmental Affairs
- National Park Service
- Fort Vancouver National Park Service
- Bureau of Sport Fisheries and Wildlife
- Bureau of Indian Affairs
- Bureau of Land Management
- Bureau of Outdoor Recreation, Pacific Northwest Office
- Geological Survey
- Bureau of Mines
- Bureau of Reclamation
- Bonneville Power Administration

*Agencies which commented on the DEIS (indicated with an asterisk) will receive copies of the FEIS. Some of these agencies were not part of the original recipients list for the DEIS.

U.S. Department of Transportation
- Federal Aviation Administration
- Federal Aviation Agency, Seattle Office
- Coast Guard Commander (OAN)

*U.S. Environmental Protection Agency, Region X

State Agencies

Department of Transportation
State Department of Agriculture
Budget Division, Executive Department
Assistant to Governor, Natural Resources
Columbia River Gorge Commission
Economic Development
State Engineer
*Department of Environmental Quality
Federal Cooperative Extension Service
*Department of Fish and Wildlife
Department of Forestry
Geology and Mineral Industries
Health Division, Department of Human Resources
Housing Division, Department of Commerce
Division of State Lands
Local Government Relations Division, Executive Department
State Marine Board
Nuclear and Thermal Energy Council
State Soil and Water Conservation Commission
Traffic Safety Commission
State Water Resources Board
Willamette River Park System Committee
Oregon Coastal Conservation and Development Commission
Governor's Committee for a Livable Oregon
Oregon Roadside Council
Oregon State Library
District Courts
Public Utilities Commission
*State Historical Preservation Office

Other Agencies

City of Portland
- Public Works Department
- Public Works Administration
- Planning Commission
- Portland School District No. 1J
- City Council
- City Engineer
- City Traffic Engineer
- City Planning Bureau
- Fire Bureau
- Office of Neighborhood Association
- *Portland Historical Landmarks Commission
- *Yamhill Historic District Association
- *Skidmore/Old Town Historic District Association

Multnomah County
- Planning Commission
- Education Department
- County Libraries
- County Commissioners
- Fire District No. 10
- Division of Engineering Services
- Department of Environmental Services

Clackamas County
- Public Works Department
- Planning Department
- Intermediate Education District
- David Douglas District No. 40
- Planning Commission
- *County Commissioners

Centennial School District No. 28JT
David Douglas School District No. 40
Gresham Union High School District No. 2J
North Clackamas School District No. 12
Reynolds School District No. 7
Park Rose School District No. 3

Port of Portland
- Portland International Airport

City of Fairview
City of Troutdale
City of Maywood Park
City of Wood Village
City of Happy Valley
City of Johnson City
City of Sandy
City of Gresham

*Metropolitan Service District
(formerly Columbia Region Association of Governments)

Tri-County Metropolitan Transit District of Oregon
(Tri-Met): Board of Directors
Planning and Development Department

*Oregon Environmental Council

*Oregon Student Public Interest Research Group

Pacific Northwest River Basins Commission

*Oregon Lung Association

Private Schools

Judson Baptist College
Multnomah School of the Bible
Columbia Christian College
Portland Christian High School
Portland Christian School
Portland Adventist Academy
Warner Pacific College
Lutheran High School
Central Catholic High School

Hospitals

Woodland Park Hospital
Shriners Hospital for Crippled Children
Providence Hospital
Gresham Community Hospital
Holladay Park Hospital
Portland Adventist Medical Center
*Providence Child Care Center
*Providence Medical Center

Churches

Bethlehem Lutheran
East Hill Church

Utility Districts

Powell Valley Road Water District
Portland General Electric Company
Pacific Power & Light Company
City of Portland Water Bureau
Northwest Natural Gas Company
Pacific Northwest Bell
Hazelwood Water District
General Telephone
Rockwood Water District

Miscellaneous Groups

*Oregon Coalition for Children
League of Women Voters of Portland
Oregon Roadside Council
Gateway Boosters
Lents Booster Club
STOP
Northwest Steelhead Council
*Union Pacific Railroad
*Sierra Club-Columbia Group
*Village Retirement Groups
*Citizens for Better Transit
*Oregon Highway Users Federation
*City Club of Portland
*ECCC (East County Concerned Citizens)
*Freightliner Corporation
*Lloyd Corporation
*Oregon Association of Railway Passengers
*Associated Oregon Industries
*Portland District Council of Carpenters

Neighborhood Associations

Alameda Neighborhood Association
Boise Citizens Improvement Association
Brooklyn Action Corp
*Buckman Community Association
Burnside Community Council
C.E.N.T.E.R.
*Centennial Planning Group
Columbia Neighborhood Association
Concordia Community Association
Creston Neighborhood Association
Downtown Community Association
Eliot Neighborhood Development Association
Errol Heights Improvement Association
Foster-Powell Neighborhood Association
Grant Park Neighborhood Association
Hollywood Neighborhood Association
Hosford-Abernathy Neighborhood Development
Humboldt Neighborhood Improvement Organization
Inner Southeast Coalition
Irvington Community Association
Kenilworth Neighborhood Association
Kerns Neighborhood Association
King Improvement Association
*Laurelhurst Neighborhood Association
Linnton Community Center
Montavilla Community Association
Mount Scott-Arleta Neighborhood Association
*Mount Tabor Neighborhood Association

Neighborhood Associations (Continued)

*Neighborhoods West/
Northwest Inter-Neighborhood Transportation Committee
*Normondal Local Citizens Advisory Committee
Northeast Coalition
Piedmont Neighborhood Association
Powell Butte Area
Reed Neighborhood Association
*Richmond Neighborhood Association
Rose City Park Citizens Association
Sabin Community Association
Sellwood-Moreland Improvement League
South Tabor Community Association
*Southeast Uplift Advisory Board
Sunnyside Neighborhood Association
Woodstock Neighborhood Association

PREFACE

ENVIRONMENTAL IMPACT STATEMENT FOCUS

Section 102 (2)(c) of the National Environmental Policy Act (NEPA), enacted into law in January 1970, explicitly states that all agencies of the federal government shall include in every proposal or recommendation for major federal actions which have the potential of significantly affecting the quality of human environment, a detailed statement of alternatives to the proposed action. The environmental impact statement (EIS) has become the accepted form in which such a description and analysis of projects requiring federal approval and/or funding has been offered for approval, modification, or rejection by concerned agencies and the public. This final environmental impact statement (FEIS) is prepared in conformance with the NEPA and appropriate policy and procedural memoranda of the U.S. Federal Highway Administration and the Urban Mass Transportation Administration. Its purpose is to present in an objective manner a description of the proposed Banfield Transitway Project, an examination of relevant and feasible alternatives to the Project, and an analysis of the anticipated effects of the Project on the natural and human environment.

The Banfield Transitway Project FEIS represents a concerted effort to provide the reader with an easily understandable document. The major findings of the environmental analyses are summarized herein. In addition, the FEIS provides the reader with an overview of the planning and study process which has preceded it, and summarizes the evaluation of Project alternatives.

The FEIS is supplemented by individual technical reports printed separately from this document, that represent the primary base material for the analysis presented. The reports are based primarily on support documents prepared specifically for the Banfield Transitway Project draft environmental impact statement (DEIS) and additional studies conducted subsequent to the DEIS.

The technical reports and additonal support documents may be reviewed at the Metropolitan Branch Office of ODOT at 5821 N.E. Glisan Street, Portland, Oregon 97213.

TABLE OF CONTENTS

TABLE OF CONTENTS (Continued)

TABLE OF CONTENTS (Continued)

TABLE OF CONTENTS (Continued)

TABLE OF CONTENTS (Continued)

TABLE OF CONTENTS (Continued)

TABLE OF CONTENTS (Continued)

TABLE OF CONTENTS (Continued)

TABLE OF CONTENTS (Continued)

LIST OF TABLES

LIST OF TABLES (Continued)

LIST OF TABLES (Continued)

LIST OF FIGURES

LIST OF FIGURES (Continued)

LIST OF ACRONYMS

AWD - average weekday

CAC - Citizen Advisory Committee

CBD - central business district

CBO - Congressional Budget Office

CRAG - Columbia Region Association of Governments

dB - decibel

DEIS - Banfield Transitway Project draft environmental impact statememt

DEQ - Oregon Department of Environmental Quality

FEIS - Banfield Transitway Project final environmental impact statement

GPD - General Pedestrian Dependency

GTF - Governor's Task Force on Transportation

HOV - high occupancy vehicle

ITP - Interim Transportation Plan for the Portland-Vancouver Metropolitan Area

LCDC - Oregon Land Conservation and Development Commission

LOS - level of service

LRT - light rail transit

MI - mobility index

MSD - Metropolitan Service District

PGE - Portland General Electric Company

PPL - Pacific Power and Light Company

PVMATS - Portland-Vancouver Metropolitan Area Transportation Study

SEL - single event level

SHPO - State Historic Preservation Office

SIP - State Implementation Plan

SMSA - Standard Metropolitan Statistical Area

TAC - Technical Advisory Committee

TCS - Transportation Control Strategy

TSP - total suspended particulates

UMTA - Urban Mass Transportation Administration

Tri-Met - Tri-County Metropolitan Transportation District

UGB - Urban Growth Boundary

v/c - volume to capacity

VMT - vehicle mile traveled

vph - vehicles per hour

1.0 BACKGROUND OF THE PROJECT

1.1 PROJECT NEED

The purpose of the Banfield Transitway Project is to provide a multi-modal transportation system that will accommodate: (1) projected increases in automobile trips to destinations outside downtown Portland; and (2) commuter trips to downtown Portland with a higher level of transit service. The Project will include light rail transit (LRT), a supporting bus network, and improvements to the Banfield Freeway.

Population projections for east Multnomah County reflect a forecasted increase of 47,000 in the 20-year period 1970-1990. Economic projections over the same time period indicate that an estimated 37,000 new jobs will be available in the downtown Portland area. These increases will contribute to a total demand of 18,200 person trips in the peak-hour commuter period through the heavily populated east Portland area by 1990. Approximately 4,200 of these trips are expected to commute to the downtown Portland area. Travel through east Portland to other destinations is expected to have a nominal increase.

The existing Banfield Freeway and other parallel arterials at 28th Avenue, including existing transit service, have the capacity to handle a total of 16,400 person trips per hour. Study of traffic flow on the existing system indicates that it is currently being used at near capacity. In addition, current assessment of downtown Portland indicates that utilization of existing parking is rapidly approaching established limits. These traffic conditions have led to associated environmental problems. Rising use of the automobile has compounded region-wide problems of fuel availability, air quality, and the development of efficient patterns of urban growth.

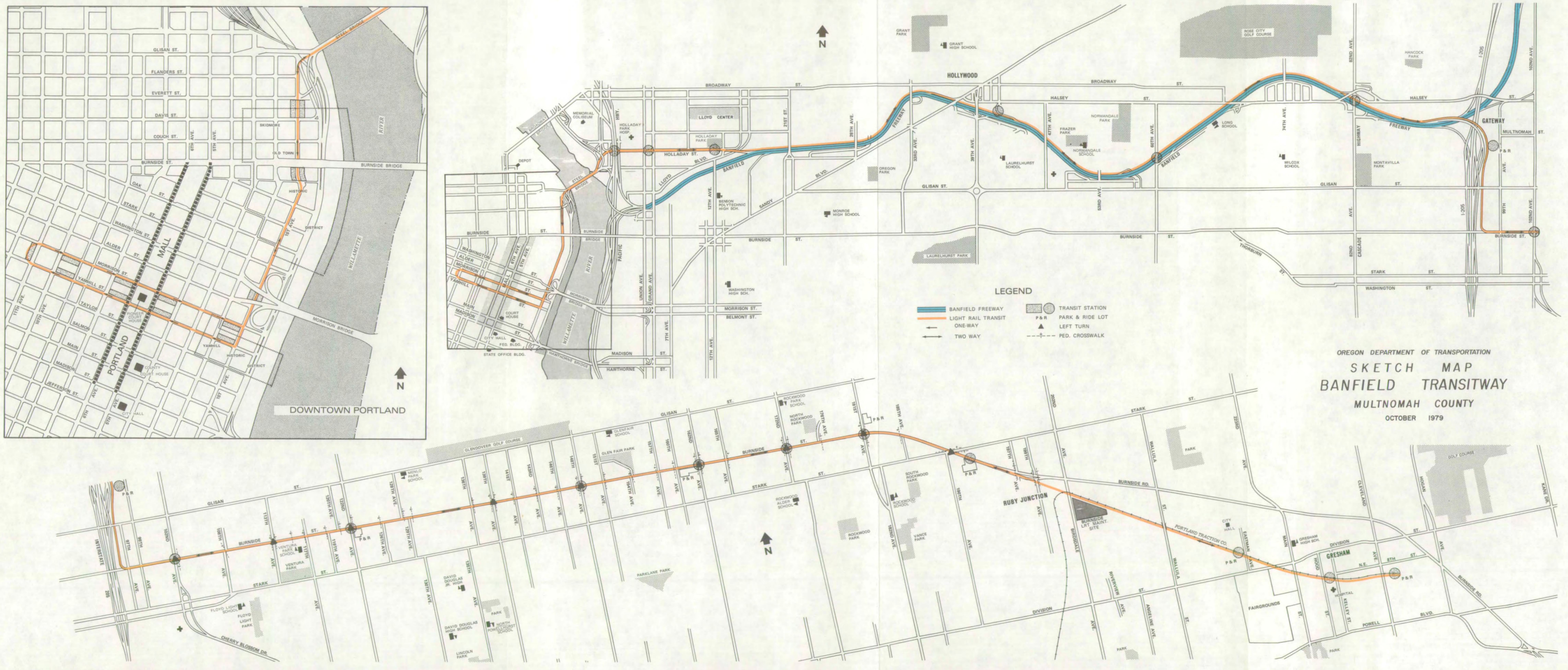
The growth projected for the area will lead to severe congestion along the Banfield Freeway, arterials in east Portland and east Multnomah County, and the Portland Central Business District (CBD), with attendant adverse effects on noise, air quality, and other environmental qualities. Unless transportation improvements are implemented, the economic, social, and environmental viability of the area will be diminished.

The LRT system will utilize electrically powered vehicles on a 14.9-mile (23.8-kilometer) fixed-rail facility between the Portland CBD and Gresham (see Figure 1.1-1). The downtown Portland segment will operate on 1st Avenue and Yamhill and Morrison Streets to serve the Portland Mall and other significant downtown destinations. The LRT will cross the Steel Bridge to Holladay Street and continue eastward along the Banfield Freeway to the I-205 corridor. The Banfield Freeway will be reconstructed and widened between I-5 and I-205. The LRT will continue along I-205 to Burnside Street and then east along Burnside Street and the Portland Traction Company right-of-way to the center of Gresham. A detailed description of the Project is presented in Section 3.0 of this Final Environmental Impact Statement (FEIS).

The Project will increase the capacity of the Banfield Freeway and parallel arterials and will improve traffic conditions in the East Side area. In addition, it will provide a high level of accessibility to the area, including the Portland CBD, the Coliseum, Lloyd Center, Hollywood and Gateway Shopping Centers, nearby institutional facilities, and the urbanized area of east Multnomah County between Portland and Gresham.

1.2 PROJECT BACKGROUND

The sections below provide the background information on planning for transportation needs in the area, and the concepts and design considerations underlying the Project. These sections summarize the extensive background information contained in the Banfield Transitway Draft Environmental Impact Statement (DEIS) (U.S. Federal Highway Administration 1978) and other Project reports and documents.


OREGON DEPARTMENT OF TRANSPORTATION
SKETCH MAP
BANFIELD TRANSITWAY
MULTNOMAH COUNTY
OCTOBER 1979
LEGEND
BANFIELD FREEWAY
LIGHT RAIL TRANSIT
ONE-WAY
TWO WAY
TRANSIT STATION
P&R
PARK & RIDE LOT
LEFT TURN
PED. CROSSWALK
DOWNTOWN PORTLAND
N
HOLLYWOOD
GATEWAY
RUBY JUNCTION
GRESHAM
BURNSIDE LRT MAINT. SITE
PORTLAND TRACTION CO.
WILLAMETTE RIVER
PORTLAND MALL

1.2.1 Regional Transportation Concerns

The Banfield Transitway Project is the end result of 6 years of regional transportation planning directed at assessing and resolving existing and projected traffic congestion problems along the Banfield Freeway and arterial streets connecting the Portland CBD and east Multnomah County. The development of the Banfield Transitway Project is based on efforts to achieve regional transportation goals and objectives. The Project was conceived and designed with the objective of meeting the 1990 traffic demands along the Banfield Freeway corridor. Regional transportation concerns found in land use and transportation plans provided the basis for the Project planning process; these concerns are addressed below.

Population and economic growth in the area, as well as land use and development trends associated with this growth, were critical concerns in Project planning. The rapid growth rate of the Portland metropolitan area has resulted in extensive suburban development. The conversion of new land to more intensive use has created a demand for more extensive transportation facilities. This in turn has fostered more suburbanization and has accelerated the effects of urban sprawl. Such developments in the past have encouraged public policy to project future demands for urban and suburban transportation needs based on projected growth patterns, and then to plan a street and highway system to support them. Land use and transportation goals in effect for the region state that this tendency is to be avoided.

A second area of concern which directly affected the planning and implementation of the Banfield Transitway Project was air quality. The Willamette Valley is a natural basin with a high tendency to trap air pollutants. Air quality problems in the region are largely related to the level of automobile use. Total emission levels are expected to decline in the remaining decades of the century due to the implementation of currently authorized control measures. However, projected increases in the population in the Willamette Valley anticipated by the year 2000 may negate most of this improvement. Current planning in the

Portland metropolitan area is in accordance with the State Implementation Plan for achieving air quality standards. Alternative modes of travel which potentially lessen the use of the private automobile and improvements to the Banfield Freeway are consistent with these plans.

Another concern was energy conservation. The rising cost and dwindling supplies of petroleum fuels have prompted planners to consider transportation modes other than the conventional automobile.

Cost effectiveness and funding are other factors that were considered. Public transit has the potential for moving more people at less cost per capita than facilities designed for conventional automobile traffic. Although transit improvements have historically received a smaller share of public dollars earmarked for transportation expenditures, mechanisms for increasing funding of transit projects have been instituted. The federal government, through the Urban Mass Transportation Administration (UMTA), has been assisting metropolitan areas in the financing of public transit since 1964. This assistance has grown steadily and is now almost one-fourth of the highway construction funding level.

These regional transportation concerns are reflected in the goals and objectives established for the Banfield Transitway Project, which are discussed below.

1.2.2 Regional Transportation Planning Efforts

The first major transportation study for the Portland metropolitan area, the Portland-Vancouver Metropolitan Area Transportation Study (PVMATS), was initiated in 1959. This study focused almost entirely on automobile-based transportation systems to meet future regional transportation demands. As originally conceived, the study attempted to identify and resolve transportation problems by proposing an extensive system of streets and highways necessary to handle the projected 1990 level of traffic. The study, as released in map form in 1970, outlined 54 individual projects, including 7 new freeways, at an estimated cost of over $1.8 billion in 1969 dollars (Oregon Department of Transportation, Metropolitan Branch 1979). The costs of previously planned freeways (I-80N, I-205, and I-505) were not included in this estimate.

In 1969, the Oregon State Legislature, responding to the need to reinforce statewide public transportation use passed legislation providing a public tax subsidy for transit use within specified transit districts in the major urban areas of the state. In response to this action, the Tri-County Metropolitan Transportation District (Tri-Met) was formed in the Portland ara. Tri-Met, having purchased the private bus companies in the area, began an improvement program with the intent to increase ridership throughout the 3-county (Multnomah, Clackamas, and Washington) service area.

The regional planning organization, the Columbia Region Association of Governments (CRAG, now the Metropolitan Service District [MSD]), also initiated a comprehensive long-range regional planning process, and concluded that the metropolitan area should greatly expand its public transportation network through the following elements: (1) exclusive transitways, (2) reserved lanes for buses, and (3) an extensive system of park-and-ride stations. CRAG further recommended that the PVMATS be reexamined in light of the proposed 1990 bus plan.

Other major determinants responsible for changes in policy direction centered on the recognition that prevailing planning practices were becoming insensitive to both citizen concerns and environmental problems. Concerns about the impacts of unrestrained growth on surrounding rural land and the ability of the community to effectively provide public services to such an area led to actions aimed at comprehensive land use planning. Consequently, in May 1973, the governor formed the Governor's Task Force (GTF) on Transportation. The GTF, which was designated a formal subcommittee of the CRAG Board, was composed of policy-level representatives from surrounding counties, the Oregon Department of Transportation (ODOT), Tri-Met, CRAG, and the Port of Portland. The GTF was chaired by the mayor of Portland.

Development of a regional transit proposal was facilitated by the passage of the Federal Aid Highway Act of 1973. Provisions of the act provided that states and local jurisdictions could withdraw an interstate segment from the interstate system and use the available funds for mass transportation projects. It further provided that a state could exchange interstate highway funds for general revenue funds under UMTA on a dollar-for-dollar basis. Under the terms of this act, the proposed Mount Hood Freeway was withdrawn from the interstate system and the funds authorized for it were made available for other transportation investments in the Portland area.

The GTF began a sketch planning work program which deleted the Mount Hood Freeway as an assumed project and instead focused on identified corridors with the potential to accommodate the Mount Hood travel demand. Transit corridors included: (1) the Banfield Freeway from the Willamette River to its intersection with the proposed I-205 corridor and then eastward to Gresham on local arterials, and (2) the Johnson Creek right-of-way from the Portland CBD to Gresham along existing rail lines. The GTF examined a range of possible transit modes which might be employed in the region, including light rail transit.

The GTF was assimilated into the CRAG work program in 1974, with the mandate of the GTF being assumed by the CRAG staff and other local agencies. The GTF's recommendations were incorporated into, and provided much of the basis for, the regional Interim Transportation Plan (ITP) adopted by the CRAG Board of Directors in June 1975 to replace the obsolete PVMATS.

The regional ITP identified 4 corridors (Banfield Freeway, Oregon City and Johnson Creek, Sunset, and I-5 North) as the focal points for future traffic demand within the region. Three of these (the Banfield Freeway, Oregon City and Johnson Creek, and Sunset corridors) were identified in the ITP as possible projects to be funded from the Mount Hood transfer funds. The Banfield Freeway and Oregon City and Johnson Creek corridor studies were given the highest priority to determine the most advantageous link between the Portland CBD and the I-205 corridor to the east.

In November 1976, CRAG determined that the development of a transitway along the Oregon City and Johnson Creek corridor was in direct conflict with CRAG's stated 1990 transportation goals and objectives. This conflict was due primarily to the occurrence of seasonal flooding along Johnson Creek, low population density and rural land uses along the corridor, and a lack of urban services needed to support the extensive capital outlay required to fund such a project. Therefore, only the Banfield corridor was carried forward for detailed study.

The Banfield Freeway corridor extends eastward from the Willamette River for a distance of approximately 6 miles (10 kilometers) to the I-205 corridor. The freeway and arterials in this corridor serve the east Portland and east Multnomah County areas as the primary commuter routes to and from the Portland CBD and the north Portland business/industrial complex.

The Oregon Department of Transportation and Tri-Met began initial studies into the feasibility of developing a transitway in the Banfield Freeway corridor in July 1975. The purpose of the transitway studies was to seek long-term relief from the traffic congestion along several arterials (including the Banfield Freeway) connecting east Multnomah County with the Portland CBD and, as such, was responsive to the concepts of corridor development eastablished in the ITP.

A Technical Advisory Committee (TAC) and Citizen Advisory Committee (CAC) were established in 1975 to guide the Project development process. The purpose of the TAC was to determine the specific goals and objectives of the Project and to provide technical determinations as to the feasibility of Project options. The purpose of the CAC was to provide citizen input into Project design and to promote public awareness of the Project.

The statement of goals and objectives of the TAC outlined 3 principal purposes: (1) to guide the continuing development of service concepts and facility designs, (2) to ensure that the Project conformed with local and regional goals and desires, and (3) to provide a mechanism for evaluating the various alternatives under study. The goals and objectives in the development of the Banfield Transitway Project are outlined in Table 1.2-1.

Numerous concepts for the proposed transitway were initially considered, including alternative locations within the corridor and various transportation modes. Many of the original concepts were determined to be either too expensive relative to the benefits anticipated, impractical from an engineering standpoint, or environmentally unacceptable. These were dropped from further consideration. Five major alternatives were retained for further study in a draft environmental impact statement.

Alternatives studied in the Banfield Transitway Project DEIS included: (1) the No-Build option, which involved no traffic capacity or operational improvements to the street and freeway network; (2) low-cost improvements, focusing on improvements to city arterial streets in east Portland, (3) high occupancy vehicle (HOV) lanes on the Banfield Freeway from 16th Avenue to I-205; (4) a separated busway along the Banfield Freeway; and (5) a light rail transit system along the Banfield Freeway and one of several east/west arterials connecting east Multnomah County with the Portland CBD. These alternatives and the selection process are described in detail in Section 2.0.

TABLE 1.2-1

GOALS AND OBJECTIVES FOR THE BANFIELD TRANSITWAY PROJECT

Goals	Objectives	Evaluation Criteria
I Pursue regional and local planning objectives and policies	1. Encourage citizen participation in project planning	
	2. Conform with appropriate policies and objectives of LCDC, CRAG, Tri-Met, City of Portland, and other relevant agencies	
II Provide the capacity for projected travel demands in a safe and efficient manner	3. Reduce peak-hour congestion on the Banfield Freeway	1990 p.m. pk-hr V/C ratio on Banfield Freeway 1990 p.m. pk-hr overcapacity lane mi. on Banfield
	4. Increase the proportion of East Side trips using Transit through:	1990 orig. ES[a] transit pass (daily/annual) 1990 mode split (ES total daily/ES pk-hr/downtown-ES pk-hr) 1990 ES auto VMT
	a. shorter transit travel times	1990 p.m. pk-hr aggregate travel time among selected ES zones (composite/downtown)
	b. more extensive transit service	ES system line miles 1990-ES-transit VMT (daily/annual)
	c. more diverse transit system orientation	ES system connectivity (cyclomatic no.)
	5. Reduce the growth of transportation-related accidents in the East Side	1990 annual ES traffic accidents
	6. Maximize the efficiency of the East Side transportation system	1990 annual auto travel cost savings Transit capital cost per 1,000 transit passenger 1990 annual ES transit oper. cost per passenger (gross/net) 1990 total ES transit annual cost per passenger 1990 annual originating ES transit passenger per transit VMT
III Improve the quality of the environment	7. Reduce through auto and transit traffic on east Portland arterials	1990 annual auto VMT on east Portland arterials 1990 annual through transit VMT on east Portland arterials 1990 p.m. pk-hr overcapacity lane mi. on east Portland arterials
	8. Reduce transportation-related air pollution in the East Side	1990 annual ES emissions ($CO/HC/NO_x$)
IV Coordinate transportation with land development	9. Support urban activity centers in east Portland through increased transit access	1990 pk-hr ES transit trips to selected urban centers
	10. Encourage the development of transit-supportive land uses in east Multnomah County and along I-205	1990 pk-hr ES transit trips to travel zones in affected areas
V Reduce energy consumption	11. Reduce transportation-related energy consumption in the East Side	1990 annual ES energy consumption (BTU/gal. gasoline/KWH) by autos and transit
	Constraints	
	12. Minimize project costs	Capital cost (project/transit) Cost of transit vehicles required in 1990
	13. Minimize long-term public costs	1990 annual ES transit operations cost (gross/net) 1990 total ES total annual cost
	14. Minimize property acquisition	Properties affected (number/acres) No. displacements (families/businesses) Right-of-way costs
	15. Minimize air quality impacts	1990 Total Emissions Summary (CO, HC, NO_x) 1990 significant local increases in CO concentrations
	16. Minimize noise impacts	Average change in L_{10} dBA for selected ES receptor sites (Banfield/arterial streets) Average CBD L_{10} dBA levels attributable to transit vehicles in 1990 for selected receptor sites
	17. Minimize transit energy consumption	(see 11: 1990 annual ES energy consumption (BTU/gal. gasoline/KWH) by autos and transit)
	18. Minimize off-Portland Mall transit operation downtown	1990 p.m. pk-hr movements above Portland Mall capacity
	19. Minimize loss of neighborhood parking spaces	No. on-street parking spaces removed
	20. Minimize impact on land and water resources	Loss of productive habitat (acres) Potential slope erosion (acres) Rock quantities (excavation/surplus/aggregate) Increased runoff area (acres) Floodplain encroachment (acres)

(a) ES = East Side

2.0 PROJECT ALTERNATIVES AND ALTERNATIVE SELECTION

2.1 INTRODUCTION

The Banfield Transitway Project as discussed in this Final Environmental Impact Statement (FEIS) was originally one of five transportation options proposed to accommodate future transportation needs of east Portland and east Multnomah County (see Section 1.1). The 5 alternative transit schemes were discussed in detail in the Draft Environmental Impact Statement (DEIS) and are summarized here (U.S. Federal Highway Administration 1978). Alternatives selected for study in the DEIS included: (1) the No-Build option, which involved no traffic capacity or operational improvements to the street and freeway network; (2) Low-Cost Improvements, focusing on improvements to city arterial streets in east Portland rather than improvements to the Banfield Freeway; (3) the construction of improved High Occupancy Vehicle (HOV) Lanes on the Banfield Freeway extending from the freeway's Lloyd Center exit near 16th Avenue to the I-205 corridor; (4) the establishment of Separated Busways along the Banfield Freeway; and (5) the incorporation of a Light Rail Transit system along the Banfield Freeway and one of several east/west arterials connecting east Multnomah County with the Portland central business district (CBD). The alternatives are summarized in Figure 2.1-1. Detailed descriptions of these alternatives are presented below. The impacts identified in the DEIS for each of the alternatives are outlined in Table 2.1-1.

2.2 PROJECT ALTERNATIVES

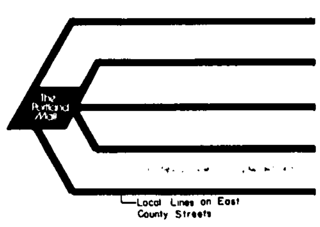
The process of selecting one of the alternatives began with the release of the DEIS. Subsequent to the selection of one of the light rail options, further design modifications were made.

EAST SIDE TRANSIT OPERATIONS STUDY

BANFIELD TRANSITWAY PROJECT ALTERNATIVES

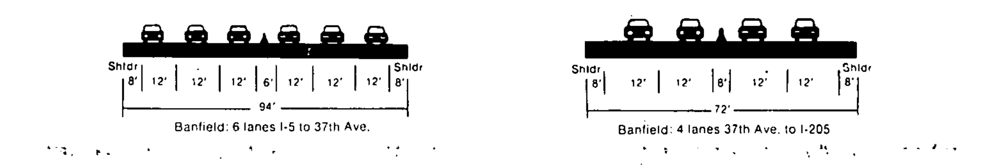
Transit System Concept	Name and Description of Alternative	Cross-Sections of Alternative

NO-BUILD

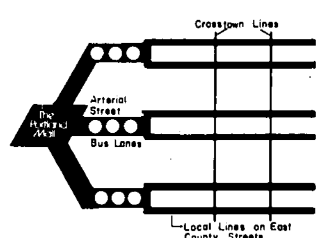


Alternative No. 1: No-Build

The Banfield Freeway would be operated the way it was prior to 1976, with six traffic lanes west of 37th Avenue and four lanes east of 37th.



LOW COST IMPROVEMENTS

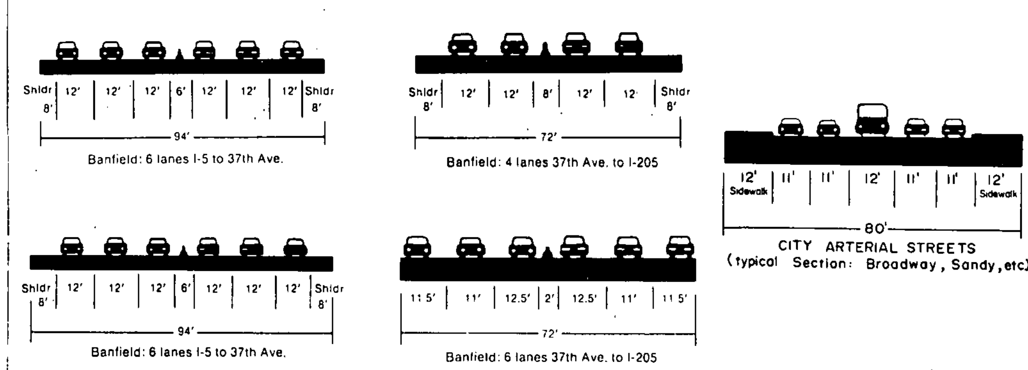


Alternative No. 2a: Low Cost Improvements

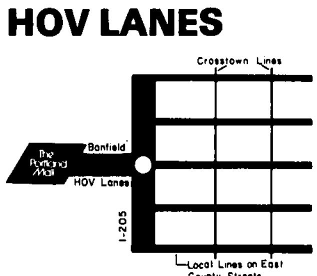
A series of reserved bus lanes would be established on city streets; in addition, traffic improvements would be made at the Burnside/Sandy/12th and the Broadway/Sandy intersections. The Banfield Freeway would revert to its pre-1976 condition, with the HOV lanes removed and four traffic lanes reestablished east of Hollywood.

Alternative No. 2b: Low Cost Improvements plus Minimum 6-Lane Banfield

In addition to the bus lanes on city streets, the existing HOV lanes on the Banfield Freeway which are east of 37th Avenue, would be converted to general traffic lanes. This would result in six continuous lanes on the freeway from I-5 to I-205; the portion east of 37th would have narrow lane widths and no shoulders.



HOV LANES



Alternative No. 3a: HOV Lanes plus 6/4 Lane Banfield

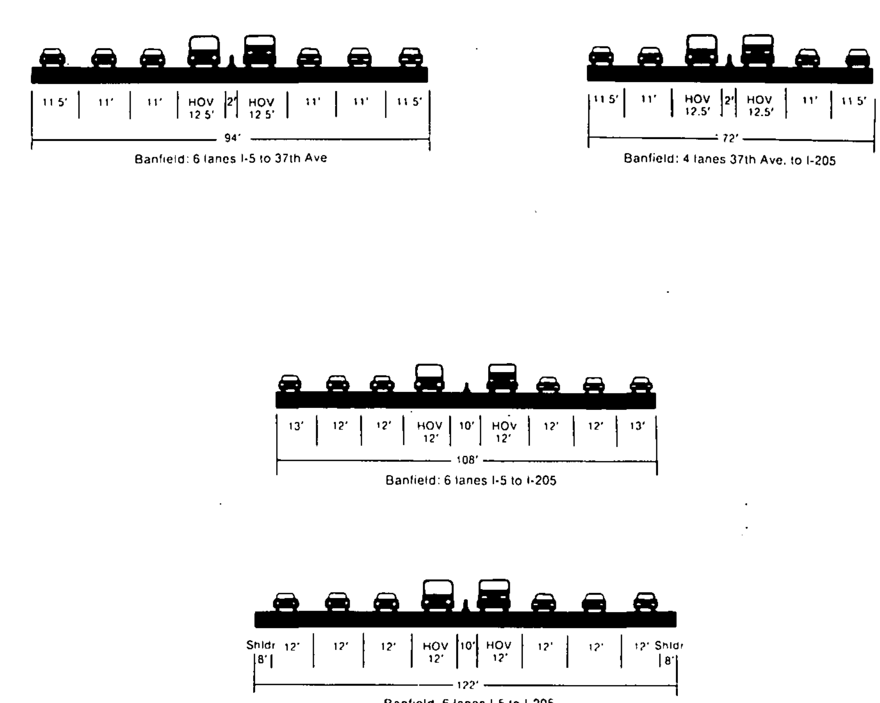
This is a minimum improvement option in which the present eastbound HOV lane would be extended back to the new ramp at Lloyd Center, and both HOV lanes would be extended easterly to the new ramp at I-205. General traffic would continue to use only four freeway lanes east of Hollywood during peak hours; there would be minimum lane widths and no shoulders in this section. Improvements at the Burnside/Sandy/12th and Broadway/Sandy intersections would also be required to improve the flow of traffic on city streets.

Alternative No. 3b: HOV Lanes plus 6-Lane Banfield

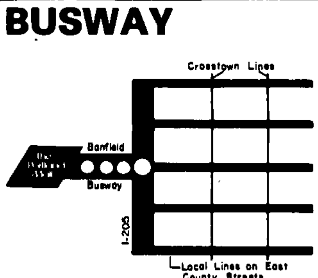
Under this scheme, the Banfield Freeway would be rebuilt to allow 6 standard width traffic lanes between I-5 and I-205 with two additional HOV lanes in the center. Provisions would be made for converting these HOV lanes to a separated busway or a light rail line with stations at some future date. There would be no shoulders on the freeway in this section, only emergency turnouts.

Alternative No. 3c: HOV Lanes plus 6-Lane Banfield with shoulders

This alternative is identical to 3b above, with the addition of 8-foot shoulders for the full length of the Banfield to improve operational safety.



BUSWAY

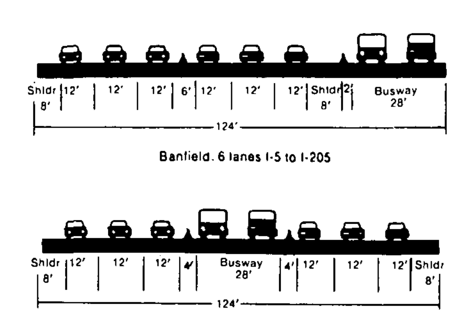


Alternative No. 4a: Northside Busway plus 6-Lane Banfield with shoulders

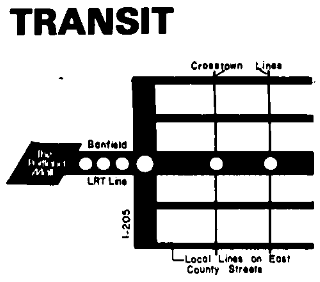
The busway would be constructed between the freeway and the Union Pacific Railroad. The Banfield would be rebuilt to allow six standard width traffic lanes between I-5 and I-205, with 8-foot shoulders for its full length.

Alternative No. 4b: Median Busway plus 6-Lane Banfield with shoulders

The busway would be constructed in the center of the freeway where existing HOV lanes are located. The Banfield would be rebuilt to allow six standard width traffic lanes with 8-foot shoulders.



LIGHT RAIL TRANSIT

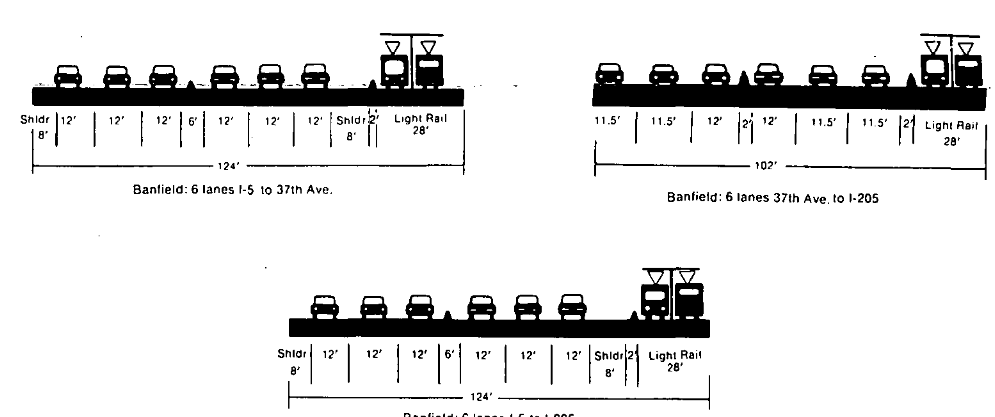


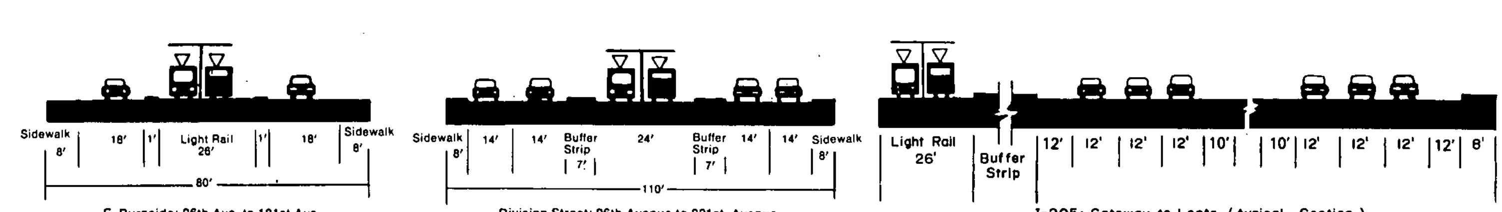
Alternatives No. 5-1a, 5-2a, 5-3a: LRT plus Minimum 6-Lane Banfield

Two light rail tracks would be constructed along the Banfield between the freeway and the Union Pacific Railroad. The existing HOV lanes on the freeway, east of 37th Avenue, would be converted to general traffic lanes. This would result in six continuous lanes on the freeway from I-5 to I-205; the portion east of 37th would have narrow lane widths and no shoulders.

Alternatives No. 5-1b, 5-2b, 5-3b: LRT plus Standard 6-Lane Banfield with Shoulders

These alternatives would be identical with their counterparts listed above, except that the Banfield Freeway would be reconstructed to allow six standard width traffic lanes between I-5 and I-205, with 8-foot shoulders.





In Alternative 5-1a and 5-1b, the light rail line would continue south from Gateway along I-205 to E. Burnside Street and then east to Gresham in a reservation in the center of E. Burnside Street. Burnside would be constructed to provide one traffic lane and shoulder on each side of the light rail reservation.

In Alternative 5-2a and 5-2b, the light rail line would follow I-205 to Division Street, then continue to Gresham in a reservation in the center of Division Street. Division would be modified to provide two traffic lanes and a buffer strip on each side of the light rail reservation.

In Alternatives 5-3a and 5-3b, the light rail line would continue south from Gateway in a reserved right-of-way along I-205, terminating at Foster Road.

FIGURE 2.1-1

TABLE 2. -1

SUMMARY IMPACT MATRIX

ECONOMICS

ALTERNATIVES		PROJECT CONSTRUCTION COSTS ($ MILLIONS)	TOTAL SYSTEM COSTS (MILLION $)	1990 ANNUAL OPERATING COST (MILLION $)	1990 NET OPERATING COST (MILLION $)	1990 TOTAL TRANSIT ANNUAL COST (MILLION $)	1990 TOTAL TRAFFIC SAVINGS (MILLION $)	1990 TOTAL ANNUAL TRANSIT COST PER PASSENGER ($)	1990 NET OPERATING COST PER PASSENGER ($)	GENERAL ECONOMIC CONDITIONS
No-Build	1	0.0	13.0	12.1	8.0	13.7	0	0.59	1.01	Would not support area economy
Low Cost Improvements	2a	7.1	27.0	15.3	10.7	18.1	6.4	0.70	1.18	2a would generally not encourage economic activity
	2b	9.7	29.4				8.7			2b would generally support area economy
High Occupancy Vehicle Lanes	3a	13.7	71.8	15.9	10.4	21.1	7.4	0.57	1.21	3a would support area economy but not as well as 3b or 3c
	3b	67.1	125.2			25.8	9.2		1.41	Would support area economy
	3c	75.4	133.5							
Separated Busway	4a	83.3	143.3	17.9	12.1	28.6	8.3	0.63	1.48	Would support area economy
	4b	79.6	139.6			28.3			1.47	
Light Rail Transit	5-1a,b	119.7	159.0	14.4	8.6	27.0	10.1	0.45	1.40	Would support area economy
		129.9	169.2							
	5-2a,b	144.6	188.3	14.4	8.8	29.3	8.5	0.47	1.57	
		154.8	198.5							
	5-3a,b	108.5	151.7	13.8	8.2	25.8	6.3	0.49	1.48	
		118.7	161.9							

TRAFFIC AND TRANSIT

ALTERNATIVES		1990 PEAK-HOUR TRAFFIC CHARACTERISTICS	1990 VEHICLE MILES TRAVELED (MILLIONS)	1990 PREDICTED TRAFFIC ACCIDENTS	1990 EAST SIDE TRANSIT PASSENGERS (MILLIONS)	TRANSIT SAFETY	TRANSIT ADAPTABILITY	DOWNTOWN TRANSIT OPERATIONS	TRANSIT SERVICE QUALITY
No-Build	1	Greatest increases on Banfield Freeway and arterial streets. Greatest number of overcapacity lane miles.	985.0	Greatest number of traffic and transit accidents	13.5	Street operation subject to traffic accidents	Flexible to changes in operations Not a long-term transit investment	Up to 400 buses downtown in peak hour Up to 55 buses routed off mall in peak hour	Good area coverage, but low connectivity, much deuplication of routing
Low Cost Improvements	2a	Most arterial traffic of build alternatives in East Portland.	942.0	4 to 5% less accidents than no-build but similar to HOV(3a)	15.3	Generally safe in exclusive bus lanes	Flexible to changes in operations Not convertible Cannot insure long-term transit use	Up to 585 buses downtown in peak hour Up to 215 buses routed off mall in peak hour	Improved connectivity and schedule frequency Possible delay to non-peak suburban buses
	2b	Similar to bus alternatives 4a, 4b and LRT options 5-1 and 5-2.	942.1						
High Occupancy Vehicle Lanes	3a	More arterial street traffic in E. Portland than 3b or 3c.	942.9	Slightly higher than (3c) or (3d)	18.3	Generally safe on Banfield segment	Not flexible to changes in operations Possible convertibility to busway or LRT (3b and 3c) Cannot insure long-term transit use	Up to 609 buses downtown in peak hour Up to 230 buses routed off mall in peak hour	Improved connectivity and schedule frequency Much duplication of service on Banfield
	3b	Least increase in traffic of all alternatives on Banfield Freeway and city arterials.	945.4	Lowest of all bus options					
	3c								
Separated Busway	4a	Would reduce growth in traffic slightly more than LCI and LRT options.	947.7	Similar to HOV (3b) and (3c)	19.2	Very safe on Banfield, but high annual mileage increases chance of accidents	Flexible to changes in operations Possible convertibility to LRT Good assurance of long-term transit use	Up to 630 buses downtown in peak hour Up to 230 buses routed off mall in peak hour	Improved connectivity High schedule frequency Much duplication of service on Banfield
	4b								
Light Rail Transit	5-1a,b	Would reduce growth in traffic. Approximately as effective as LCI and Separated Busway options.	927.5	Lowest accident level of all alternatives	19.2	Rail system high in safety Feeder buses safe due to low annual mileage	Rail lines limited in flexibility Feeder buses very flexible to changes in operations High assurance of long-term transit use	Up to 500 buses downtown in peak hour Up to 150 buses routed off mall in peak hour (as few as 345 buses would be routed downtown if LRT lines are developed in two additional corridors)	High level of passenger comfort, but more peak-hour standees Transfers required for many downtown trips High connectivity Low route duplication increases efficiency Good travel speeds
	5-2a,b		940.7	Higher than (5-1)	18.6				
	5-3a,b	Least effective of build options in reducing traffic growth.	971.4	Highest accident level of all build alternatives	17.4				

TABLE 2.1-1

SUMMARY IMPACT MATRIX

		LAND USE		SOCIO-CULTURAL										NATURAL AND ENVIRONMENTAL RESOURCES								
ALTERNATIVES		LAND DEVELOPMENT POTENTIAL	CONFORMANCE WITH PLANS AND POLICIES	POPULATION CHANGE	NEIGHBORHOOD CHANGES	ACCESS TO COMMUNITY INSTITUTIONS	ACCESS FOR TRANSPORTATION DISADVANTAGED	RIGHT-OF-WAY COST (MILLION $)	ACRES REQUIRED	HOUSEHOLD UNITS RELOCATED	BUSINESSES RELOCATED	HISTORIC PROPERTIES & VISUAL IMPACTS	PRODUCTIVE HABITAT LOST (ACRES)	POTENTIAL SLOPE EROSION (ACRES)	POTENTIAL SLOPE EROSION (ACRES)	INCREASED RUNOFF AREA (ACRES)	FLOOD PLAIN ENCROACHMENT (ACRES)	1990 AIR QUALITY	NOISE LEVEL CHANGE	1990 TOTAL EAST SIDE FUEL CONSUMPTION (1000 GALLONS)	1990 TOTAL EAST SIDE ENERGY REQUIREMENT (BTUS x 10^9)
No-Build	1	Continuation of suburban development trends	Does not conform to area plans.	Consistent with CRAG projections	Some traffic intrusion into neighborhoods	Some reduction in access	No change in access to transportation options	—	—	—	—	No major historic impacts identified No visual impacts	—	—	—	—	—	Significant total emission reduction over 1975 levels	+1 to 2dBA	42,800	5,400
Low Cost Improvements	2a 2b	Continuation of suburban development trends	Does not conform to area plans.	Consistent with CRAG projections	Some traffic and greater transit intrusions into neighborhoods	Some improvement in access	Improvement in access to transportation options	0.01	0.4	—	—	No major historic impacts identified No visual impacts	1.8	—	—	1.2	—	Total emissions slightly decreased over no-build	+1 to 16dBA	40,800	5,200
High Occupancy Vehicle Lanes	3a	Higher density clustering possible around I-205 transit stations	Conforms to all area plans.	Opportunity to concentrate population around transit stations	Generally beneficial to neighborhoods	Some improvement in access	Improvement in access to transportation options	1.3	2.4	98	4	Some historic property removal required Minor visual impacts	1.8	2.7	2.7	2.3	—	Total emissions slightly decreased over no-build	+1 to 4dBA	41,200	5,200
	3b							11.9	20.5	145	13		7.5	9.6	9.6	20.9	—			41,300	5,200
	3c							13.1	20.5	175	13		11.2	8.4	8.4	27.6	—			41,300	5,200
Separated Busway	4a	Higher density clustering possible around I-205 transit stations	Conforms to all area plans	Opportunity to concentrate population around transit stations	Generally beneficial to neighborhoods	Some improvement in access	Improvement in access to tranpsortation options	12.9	22.7	168	12	Some historic property removal required Minor visual impacts	7.6	7.8	7.8	25.8	—	Total emissions slightly decreased over no-build	+2 to 3dBA	41,800	5,300
	4b							13.1	22.7	175	13			8.4	8.4						
Light Rail Transit	5-1a,b	Higher density clustering possible in central East County and Gresham around transit stations	Conforms to all area plans	Opportunity to concentrate population around transit stations	No severe impacts. Potential neighborhood division.	Some improvement in access	Improvement in access to transportation options	13.1(a) 14.7(b)	43.6(a) 47.0(b)	27(a) 70(b)	5(a) 11(b)	No Adverse Effect	38(a) 45(b)	7.8(a) 8.4(b)	7.8(a) 8.4(b)		10.8	Total emissions decreased more than any other alternative over no-build	+2 to 5dBA	39,700	5,100
	5-2a,b				Lack of neighborhood identifications in East County.			30.4(a) 33.2(b)	67.8(a) 71.2(b)	151(a) 194(b)	57(a) 63(b)		33(a) 40(b)			26(a) 30(b)	1.5			40,300	5,200
	5-3a,b	High density clustering possible around I-205 transit stations			No severe impacts			9.9(a) 12.7(b)	18.4(a) 21.8(b)	16(a) 59(b)	4(a) 10(b)		29(a) 37(b)			16(a) 30(b)	—			41,500	5,300

2.2.1 No-Build -- Alternative 1

2.2.1.1 DESCRIPTION

Under the No-Build alternative, no traffic capacity or operational improvements would be implemented to existing street and freeway networks. The Banfield Freeway would be restored to its pre-1976 configuration. This would entail: (1) elimination of the HOV lanes, (2) relocation of portions of the concrete median barrier, and (3) restriping the freeway between I-5 and 37th Avenue to reinstate 6 travel lanes with shoulders and restriping between 37th Avenue and I-205 to provide 4 lanes with shoulders.

Under the No-Build alternative, the existing transit system would be essentially operated through the 1990 study year as it is operated today. However, buses would be added to meet increased demand. Transit vehicles would operate in mixed traffic on the existing street and freeway network with no preferential treatment except along the Portland Mall (6th and 7th Avenues) which would remain exclusively reserved for buses.

The impacts accruing under the No-Build alternative result from no major transportation improvements along the Banfield Freeway corridor or in east Multnomah County. Therefore, the No-Build alternative provides the basis of comparison for the 4 basic Build alternatives.

2.2.1.2 IMPACTS

2.2.1.2.1 Traffic and Public Transit

The No-Build alternative would result in the most adverse traffic conditions of all the alternatives. The No-Build alternative would generate the highest peak-hour traffic volumes in the Portland CBD. However, limited availability of downtown parking would likely preclude severe impacts. Levels of service would deteriorate substantially along the Banfield Freeway due to a significant increase in traffic volumes and total vehicle miles traveled. Capacity deficiencies would be most severe along the Banfield Freeway west of I-205. Traffic flows along the Banfield Freeway would slow and be interrupted during peak traffic hours. Congestion would increase in east Multnomah County as well, particularly along east/west arterials serving I-205. However, levels of service east of I-205 would remain satisfactory beyond 1990 under the No-Build alternative as well as all other alternatives.

Selection of the No-Build alternative would also result in changes in traffic patterns and circulation. The deterioration of levels of service along the Banfield Freeway would result in increased use of arterials and neighborhood streets in east Portland. The completion of I-205 would divert north/south traffic in east Multnomah County from 82nd, 102nd, and 122nd Avenues to I-205. East/west traffic would be diverted from Halsey Street to Division, Glisan, and Stark Streets, which would interchange with the Banfield Freeway via I-205. Existing traffic capacity surplus and limited downtown parking should preclude changes in circulation patterns within the Portland CBD.

The No-Build alternative would result in the highest number of 1990 accidents of all alternatives considered. Under this alternative, accidents along the entire corridor would increase by approximately 21 percent over 1975 levels.

The 1990 No-Build transit system would remain essentially the same as today. Population and employment increases in east Portland and east Multnomah County, combined with static transit service levels, would likely induce higher ridership. The increased traffic congestion on transit routes would reduce 1990 transit schedule reliability and possibly increase 1990 transit accident rates. Reduction in schedule reliability would likely be greatest under this alternative than for any other alternatives. Downtown 1990 transit operations and volumes would not be significantly different from current levels.

2.2.1.2.2 Economics

The Banfield Freeway corridor is currently one of the most congested transportation corridors in the region. Adoption of the No-Build alternative, resulting in increased congestion, would adversely affect the movement of commuters and goods along the corridor. Workers would tend to locate closer to their places of work, and employers would tend to locate closer to customers. Access to more distant customers would be severely reduced by the reduction in levels of service along the freeway. Therefore, adoption of the No-Build alternative would adversely affect overall regional productivity.

The No-Build alternative would provide the lowest level of access to the Portland CBD. Transportation within downtown and to downtown would cost more than under any of the other alternatives. Automobile usage would tend to increase due to the lack of incentives to use transit services; therefore, congestion would continue to increase. This congestion would have severe impacts on downtown businesses, which would tend to relocate to outlying areas where transportation costs would be less.

Similarly, increased congestion on arterials and neighborhood streets in east Portland would decrease property values as the quality of life deteriorated. The high costs of transportation to downtown and other employment areas would result in redistribution of some residential uses from east Portland to the Portland CBD.

East Multnomah County would tend to become more autonomous under the No-Build alternative. With few incentives to use existing transit services, heavy dependence on the automobile would remain. The high cost of transportation due to congestion throughout the Banfield Freeway corridor would discourage commuting to the Portland CBD and other parts of the region. Since I-205 is not expected to experience significant congestion during 1990 peak hours, considerable commercial and industrial growth would be expected to occur along the I-205 corridor. Therefore, a redistribution of employment from the Portland CBD to the I-205 corridor in east Multnomah County would result.

Assessments of transportation costs indicate that the No-Build alternative would have the lowest capital costs and 1990 transit costs of all alternatives. However, while the transit benefits provided by the No-Build alternative would be the least of all alternatives, traffic congestion would be the greatest. Therefore, while the No-Build alternative is the least expensive initially, the resultant poor levels of service associated with this alternative would ultimately result in the highest transportation costs per passenger.

2.2.1.2.3 Land Use

The No-Build alternative entails the least direct land use impacts since no acquisition for right-of-way would be required. However, indirect land use impacts may be the most severe of all the alternatives.

The No-Build alternative, by not encouraging increased transit use, would reinforce existing reliance on the automobile. The resultant congestion would impede the flow of goods and services and thus would adversely affect the regional and local economies. Adoption of this alternative would not promote orderly growth and concentration of population, commercial uses, and employment centers, and public facilities in urban areas. Therefore, the No-Build alternative is inconsistent with local land use plans and policies directed at promoting economic development, improved transit and traffic movement, and orderly growth.

Adoption of the No-Build alternative would not directly stimulate land development in the Portland CBD. As congestion would increase over time along access routes to the CBD, accessibility would decrease. Eventually, development opportunities would decrease. Similarly, as mobility in east Portland would be reduced, development opportunities would decrease. The lack of an improved transit system in east Multnomah County would eliminate the potential for concentrating future development. The high cost of transportation under the No-Build alternative would result in a redistribution and intensification of commercial and industrial land uses in east Multnomah County. This development would be automobile oriented and, as such, would likely occur along the I-205 corridor where

1990 traffic volumes are not expected to be high enough to cause severe peak-hour congestion.

2.2.1.2.4 Sociocultural Resources

Population estimates for 1990 if the No-Build alternative were selected would not differ significantly from CRAG 208 population forecasts for 1990. These forecasts assume a convenient and supportive regional transportation system. Under the No-Build alternative, 1990 regional population would be expected to decrease slightly in comparison to CRAG forecasts. No-Build downtown and east Portland populations would not vary significantly from CRAG population projections. However, the 1990 population of east Multnomah County under the No-Build alternative may be less than that forecasted by CRAG, which is based on convenient access to the Portland CBD.

Traffic congestion would significantly reduce accessibility to local and regional services and facilities under the No-Build alternative. Congestion on major arterials in east Portland would result in spill-over of traffic to local streets. This would in turn result in noise and air quality impacts as well as disruption of neighborhood cohesion. These impacts would be less severe in east Multnomah County.

No displacement of existing land uses would occur under No-Build conditions. Therefore, there would be no displacement of residents.

The No-Build alternative would impose no significant adverse effects on historical properties in east Portland and east Multnomah County. However, increased congestion along access routes to the Portland CBD would eventually impede downtown development opportunities. Since some of this development may occur in existing downtown historical districts such as Skidmore/Old Town and Yamhill (see Section 4.6), historical properties in these districts could be affected.

2.2.1.2.5 Air Quality

Under all Project alternatives, including the No-Build condition, 1990 levels of air pollutants would be significantly less than under existing conditions. This improvement is due to existing and proposed motor vehicle emission control and not to the implementation of transportation system improvements.

The No-Build alternative would result in slightly higher 1990 concentrations of carbon monoxide (CO) and hydrocarbons (HC) than each of the Build alternatives. 1990 concentrations of CO and HC would be significantly reduced under all alternatives (including the No-Build). Nitrogen oxide (NO_x) concentrations would increase slightly under all alternatives. NO_x concentrations under the No-Build would be comparable with those occurring under all Build alternatives.

2.2.1.2.6 Natural Environment

The No-Build alternative would have no significant impacts on the natural environment.

2.2.1.2.7 Energy

The No-Build alternative would consume slightly more total energy in 1990 than any of the other alternatives (see Table 2.1-1). However, the rates of energy consumption for all alternatives would be similar. Under the No-Build alternative, 3 to 8 percent more petroleum-based fuels would be expended per year than under the Build alternatives, depending upon which Build alternative is considered. Total 1990 energy consumption under the No-Build alternative would be approximately 14 percent less than that consumed under existing conditions. This decrease would result from a substantial increase in expected automobile fuel efficiency in 1990.

2.2.1.2.8 Noise

In the Portland CBD and east Portland, existing noise levels are in excess of the FHWA designated design level of L_{10} 70 dBA for residential receptors. Future noise levels resulting from adoption of the No-Build alternative would be slightly higher than existing noise levels in both areas, primarily due to increased automobile traffic. In the Portland CBD, future noise levels would increase by 1 to 2 dBA under No-Build conditions. However, these levels would approximate downtown noise levels under each of the Build alternatives. The No-Build alternative would increase future noise levels by approximately 2 dBA over existing levels along the Banfield Freeway. However, these levels could be reduced to L_{10} 70 dBA or lower through construction of freeway noise barriers at certain locations.

2.2.2 Low Cost Improvements -- Alternatives 2a And 2b

2.2.2.1 DESCRIPTION

Under the Low Cost Improvements (LCI) alternative, an improved transit system would be operated along arterial streets in east Portland. No provisions for express bus service on the Banfield Freeway would be implemented. The existing HOV lanes would be eliminated.

The LCI alternative would be based upon a systemwide network of radially oriented transit corridors serving the metropolitan area. These corridors would consist of several different bus routes funneled together onto the same street. Various "Transportation Systems Management" techniques, including exclusive bus lanes, traffic signal preemption, and regulation of curb parking, would be employed on these streets to improve transit system efficiency. These techniques, while providing preferential treatment for transit, would require a minimum of actual construction.

Three transit corridors would be established in east Portland: (1) along Broadway and Weidler Streets, diverting in the Hollywood District to Sandy Boulevard and Halsey Street; (2) along Burnside and

Stark Streets; and (3) along Division Street. These corridors are depicted in Figure 2.2-1.

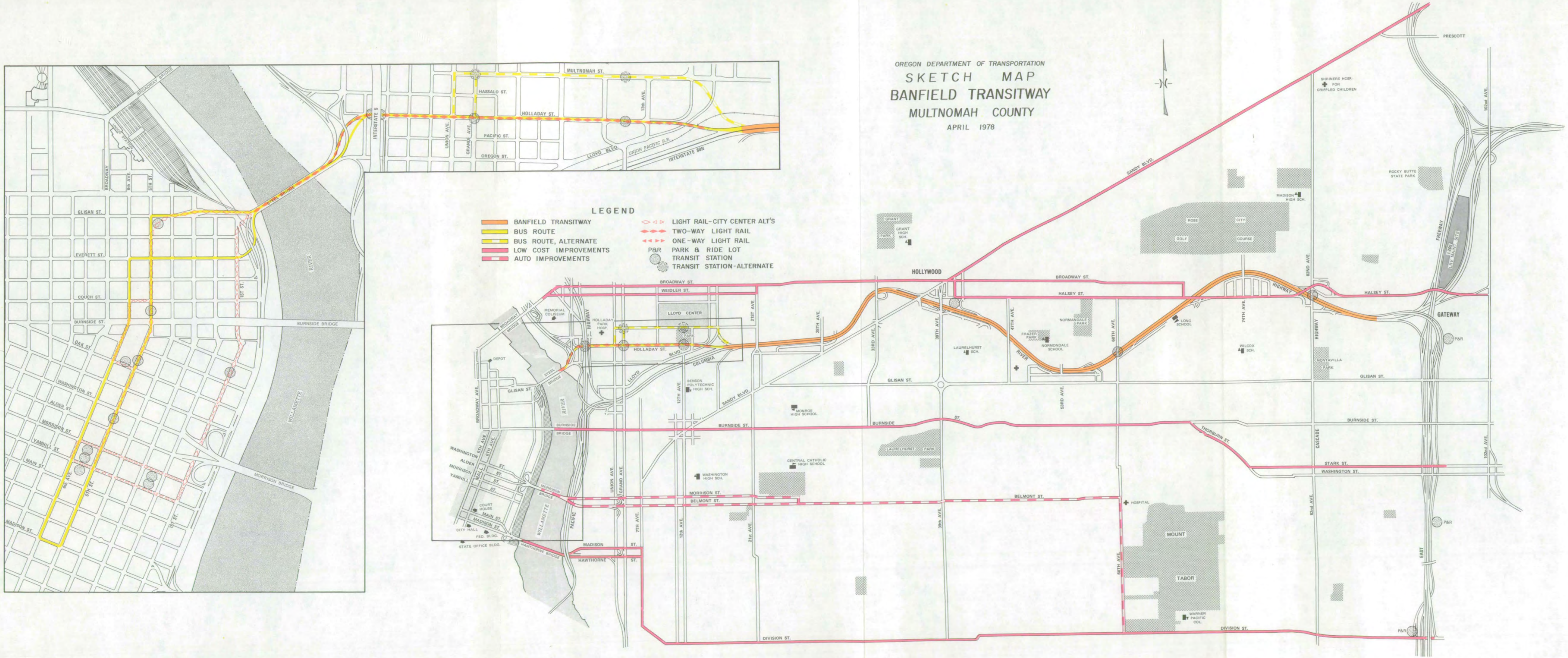
Most street segments along these corridors would be restriped to create one lane at or near the center of the street. This lane would be reserved for buses during peak traffic periods. At other times, the lane would revert to use for regular traffic or for left turns. A reserved lane would not be created along street segments where no traffic congestion is forecast. Express buses would operate in mixed traffic along these segments.

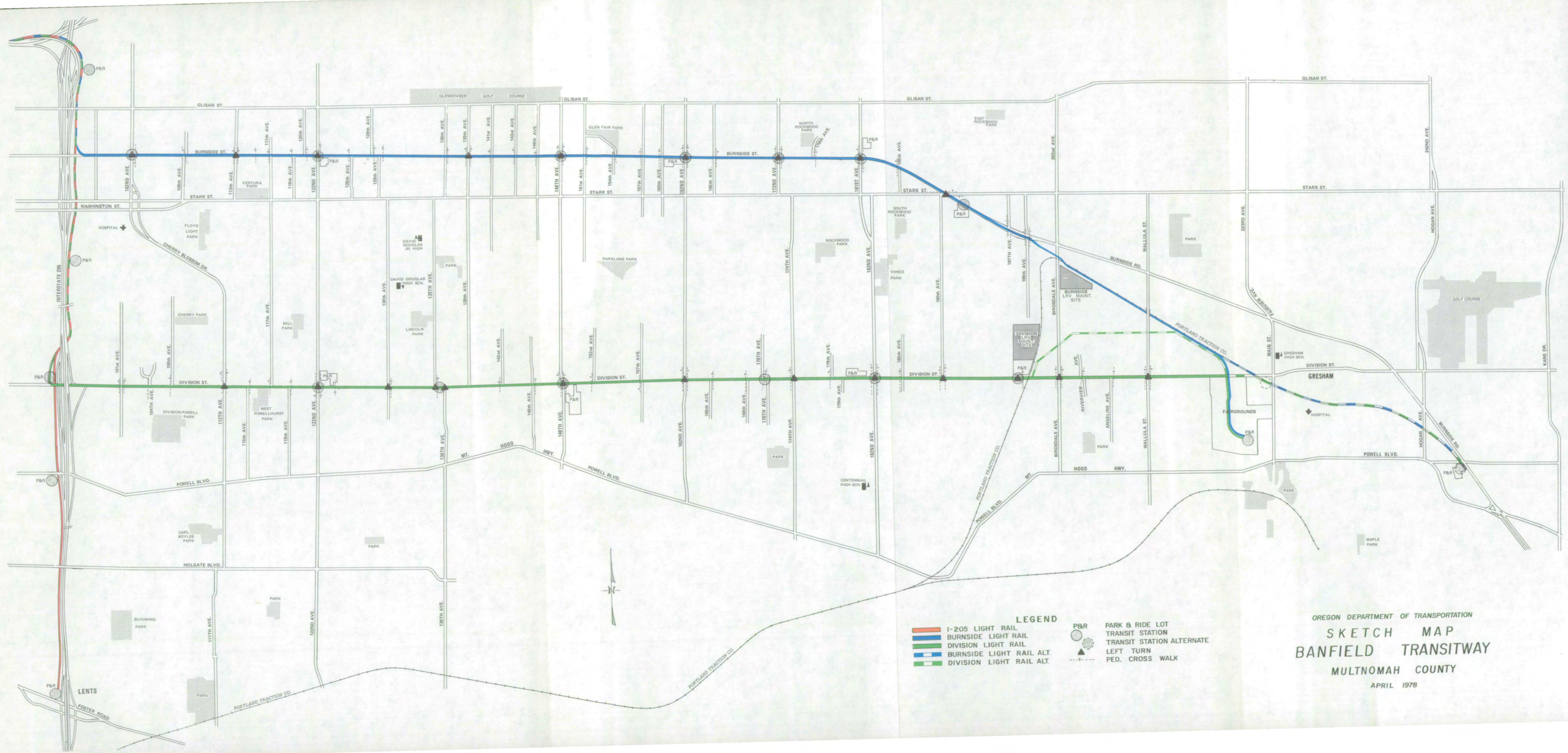
Under this alternative, suburban buses would make local stops in east Multnomah County on the arterial streets. As they approached the more congested urban area (west of I-205), they would be channeled together onto the corridor streets with reserved bus lanes. They would then operate as "limiteds" directly into downtown Portland.

The lanes exclusively reserved for transit would be used by buses only during peak traffic hours in the peak direction of travel (toward downtown Portland in the morning, away from it in the evening). Only the suburban limited buses would use the reserved lanes. The suburban limiteds would make stops only at designated transfer points as they traveled through east Portland. Passenger-waiting islands would be constructed along the median bus lanes at these transfer points.

Suburban limited service would be operated throughout the day (not just during peak periods). This would provide the metropolitan area with a full-time network of rapid transportation comparable to that in the other Build alternatives. During off-peak hours (and during peak hours in the nonpeak direction), both the suburban limited and urban local buses would operate in mixed traffic lanes.

A system of buses providing local service would also operate on the arterial streets in east Portland. These buses would operate in regular traffic lanes so as not to interfere with the limiteds.


OREGON DEPARTMENT OF TRANSPORTATION
SKETCH MAP
BANFIELD TRANSITWAY
MULTNOMAH COUNTY
APRIL 1978
LEGEND
BANFIELD TRANSITWAY
BUS ROUTE
BUS ROUTE, ALTERNATE
LOW COST IMPROVEMENTS
AUTO IMPROVEMENTS
LIGHT RAIL-CITY CENTER ALT'S
TWO-WAY LIGHT RAIL
ONE-WAY LIGHT RAIL
P&R PARK & RIDE LOT
TRANSIT STATION
TRANSIT STATION-ALTERNATE
MULTNOMAH ST.
HASSALO ST.
HOLLADAY ST.
PACIFIC ST.
OREGON ST.
LLOYD BLVD.
UNION PACIFIC R.R.
INTERSTATE 80N
INTERSTATE 5
UNION AVE.
GRAND AVE.
13th AVE.
BROADWAY BRIDGE
GLISAN ST.
EVERETT ST.
COUCH ST.
BURNSIDE ST.
BURNSIDE BRIDGE
OAK ST.
WASHINGTON ST.
ALDER ST.
MORRISON ST.
YAMHILL ST.
MAIN ST.
MADISON ST.
MORRISON BRIDGE
WILLAMETTE
RIVER
BROADWAY
6th AVE.
5th AVE.
1ST ST.
SANDY BLVD.
PRESCOTT
SHRINERS HOSP. FOR CRIPPLED CHILDREN
102nd AVE.
ROCKY BUTTE STATE PARK
MADISON HIGH SCH.
ROSE CITY GOLF COURSE
GRANT PARK
GRANT HIGH SCH.
HOLLYWOOD
BROADWAY ST.
WEIDLER ST.
HALSEY ST.
LLOYD CENTER
MEMORIAL COLISEUM
HOLLADAY PARK HOSP.
HIGHWAY
DEPOT
STEEL BRIDGE
COLUMBIA
BENSON POLYTECHNIC HIGH SCH.
21ST AVE.
28TH AVE.
33RD AVE.
39TH AVE.
47TH AVE.
60TH AVE.
74TH AVE.
82ND AVE.
LAURELHURST SCH.
FRAZER PARK
NORMANDALE PARK
NORMANDALE SCHOOL
LONG SCHOOL
WILCOX SCH.
MONTAVILLA PARK
GATEWAY
FREEWAY
EAST
P&R
GLISAN ST.
53RD AVE.
MONROE HIGH SCHOOL
BURNSIDE ST.
THORBURN ST.
LAURELHURST PARK
CENTRAL CATHOLIC HIGH SCHOOL
WASHINGTON HIGH SCH.
CASCADE
STARK ST.
WASHINGTON ST.
MORRISON ST.
BELMONT ST.
HOSPITAL
MOUNT TABOR
WARNER PACIFIC COL.
DIVISION ST.
MADISON ST.
HAWTHORNE ST.
HAWTHORNE BRIDGE
PACIFIC
COURT HOUSE
CITY HALL
FED. BLDG.
STATE OFFICE BLDG.
MALL
12th AVE.
7TH AVE.
20th AVE.


OREGON DEPARTMENT OF TRANSPORTATION
SKETCH MAP
BANFIELD TRANSITWAY
MULTNOMAH COUNTY
APRIL 1978
LEGEND
I-205 LIGHT RAIL
BURNSIDE LIGHT RAIL
DIVISION LIGHT RAIL
BURNSIDE LIGHT RAIL ALT.
DIVISION LIGHT RAIL ALT.
P&R
PARK & RIDE LOT
TRANSIT STATION
TRANSIT STATION ALTERNATE
LEFT TURN
PED. CROSS WALK
GLISAN ST.
BURNSIDE ST.
STARK ST.
WASHINGTON ST.
DIVISION ST.
POWELL BLVD.
HOLGATE BLVD.
MT. HOOD HWY.
BURNSIDE RD.
CHERRY BLOSSOM DR.
FOSTER ROAD
PORTLAND TRACTION CO.
INTERSTATE 205
GRESHAM
LENTS
FAIRGROUNDS
GLENDOVEER GOLF COURSE
GOLF COURSE
BURNSIDE LRV MAINT SITE
DIVISION LRV MAINT SITE
HOSPITAL
102ND AVE.
122ND AVE.
148TH AVE.
162ND AVE.
172ND AVE.
181ST AVE.
182ND AVE.
223RD AVE.
242ND AVE.
HOGAN AVE.
KANE DR.
MAIN ST.
WALLULA ST.
BIRDSDALE AVE.

Automobile capacity on the select transit streets would be maintained at approximately current levels by removing parking and by operating buses in mixed flow during the nonpeak hours. In most cases, the reserved bus lanes would function as turning lanes for automobiles during off-peak periods.

Two design options, "a" and "b," are included under the LCI alternative. The only difference between Alternatives 2a and 2b would be in the number of freeway lanes on the Banfield Freeway east of 37th Avenue. Alternative 2a would restore the Banfield Freeway to the original freeway configuration that existed prior to 1976: 6 standard lanes west of 37th Avenue and 4 standard lanes east of 37th Avenue. Alternative 2b would entail the conversion of the existing HOV lanes to unrestricted use. This would result in 6 minimum freeway lanes without shoulders between 37th Avenue and I-205 and 6 freeway lanes with shoulders from I-5 to 37th Avenue.

Under both LCI alternatives, provisions could be made to improve traffic operation on the Banfield Freeway through ramp metering. Ramp metering is a control strategy which improves traffic flow on a congested freeway by employing signals to limit the amount of entering traffic.

2.2.2.2 IMPACTS OF LOW COST IMPROVEMENTS

2.2.2.2.1 Traffic and Public Transit

Both LCI alternatives would result in lower 1990 traffic volumes on the Banfield Freeway and city arterials than the No-Build alternative. On the other hand, 1990 peak-hour volumes and volume/capacity ratios under the LCI alternatives would approximate HOV Alternative 3a, the Separated Busway alternatives (4a and 4b), and the LRT Burnside and Division alternatives (5-1 and 5-2).

Congestion would be higher along the Banfield Freeway under Alternative 2a than under Alternative 2b, since Alternative 2a would not increase the capacity of the freeway. Although congestion would increase on east Multnomah County arterials serving I-205, this congestion would not be as great as that generated under the No-Build.

Traffic volumes downtown would increase under both the LCI alternatives, although not as much as under the No-Build.

Traffic and circulation patterns under Alternatives 2a and 2b would differ somewhat due to the provision for widening the Banfield Freeway under Alternative 2b. Under Alternative 2a, overall traffic patterns would be similar to those occurring under the No-Build. Unlike the No-Build, improved transit service under Alternative 2a would reduce traffic on some city streets. Operation of exclusive bus lanes on designated arterials could result in some capacity reductions and diversion to other streets. However, the parking removal proposed with the transit improvements under both LCI alternatives would likely result in maintenance of existing arterial street capacity. Automobile circulation in the Portland CBD would be similar to the No-Build. However, transit improvements under Alternative 2a would result in more buses entering downtown and modifications to transit circulation, such as contraflow bus lanes on Yamhill and Morrison Streets.

Under Alternative 2b, as compared to either the No-Build or Alternative 2a, Banfield Freeway travel would increase, travel on parallel arterials would decrease, and travel on north/south arterials interchanging with the Freeway would increase. East Multnomah County peak-period circulation would differ slightly from both the No-Build and Alternative 2a. Widening of the Banfield Freeway would attract more traffic, resulting in greater use of arterials providing access to the freeway from east county locations. However, levels of service east of I-205 would remain satisfactory beyond 1990. Circulation patterns in the Portland CBD would be similar to Alternative 2a.

Both LCI alternatives would reduce 1990 traffic accidents compared to the No-Build due to the incorporation of an improved transit system. However, Alternative 2b would be more effective at reducing accidents than Alternative 2a since fewer vehicle miles would be traveled on arterials.

Under both LCI alternatives, 1990 transit ridership would increase by 13 percent as compared to 1990 No-Build conditions. However, this increase would be a lower level of transit service resulting in a lower patronage level than any of the other Build alternatives. The LCI alternatives, like all other Build alternatives, entail improved transit system coverage, frequency, and connectivity than the No-Build alternative.

The LCI alternatives would result in a significant increase in the number of buses operating in downtown areas outside the Portland Mall. This increase would be inconsistent with downtown transit circulation policies directed at minimizing off-Mall bus use of city streets. However, this condition also would occur under the HOV (Alternative 3) and Separated Busway (Alternative 4) options.

2.2.2.2.2 Economics

Adoption of either of the LCI alternatives would result in a slightly improved transportation system than the No-Build alternative could provide. Employment would be more concentrated and would remain generally centered around the Portland CBD. Regional productivity would be generally higher. Compared to other Build alternatives, the LCI alternatives would cost less to implement, but would result in reduced levels of service.

Improved bus service under the LCI alternatives would result in greater use of cross-Mall streets downtown. This would provide greater access to businesses along these streets. In east Portland, several east/west arterials would be converted from automobile-oriented streets to express bus routes with automobile traffic. Removal of parking and reduction in access due to the incorporation of curbside exclusive bus lanes could reduce sales at businesses along designated bus routes. Congestion in east Multnomah County would be reduced slightly when compared with the No-Build condition, making transportation to other areas of the region less expensive. Development and associated economic growth could occur around the transit station to be developed at Gresham.

Assessments of costs and benefits associated with the LCI alternatives indicated that capital costs associated with these alternatives would be approximately twice the capital costs associated with the No-Build alternative and significantly less than those associated with the other Build alternatives. Total annual cost for the LCI alternatives would be lowest of all the Build alternatives. However, the LCI alternatives also would have the greatest net costs per transit passenger of all alternatives.

2.2.2.2.3 Land Use

Consistency of the LCI alternatives with land use plans and policies is mixed. The alternatives would increase reliance on transit as provided for in several existent planning policies. However, Alternative 2a conflicts with the Interim Transportation Plan for the Portland-Vancouver Metropolitan Area (ITP) (Columbia Region Association of Governments 1975) and the Arterial Streets Classification Policy (Portland, City Council 1977) since it: (1) precludes the construction of exclusive transitways in the Banfield Freeway corridor as provided for in the ITP and Arterial Streets Classification Policy, and (2) forces increased future traffic onto certain arterials in conflict with the ITP and Arterial Streets Classification Policy. The LCI alternatives are generally consistent with land use and transit policies in the Portland CBD.

The LCI alternatives would have little effect on land development opportunities in the region. No major transit stations would be developed along the LCI route. Therefore, the development anticipated under other Build alternatives would not materialize. The LCI alternatives provide impetus to extension of the Portland Mall which would create additional transit capability. Intensified transit usage of downtown streets may result in redevelopment of some areas. Alternative 2b would provide some relief of congestion on east Portland arterials with accompanying benefits to adjacent land uses. Land development opportunities in east Multnomah County would be the same as under No-Build conditions.

2.2.2.2.4 Sociocultural Resources

The LCI alternatives, like all the Build alternatives, would improve transportation of goods and people within the region. Growth within the region would be concentrated along certain corridors, including the Banfield Freeway and parallel arterials. The LCI alternatives would have no significant impacts on forecasted 1990 population or population distributions in east Portland or east Multnomah County, although some population increases may occur around transit transfer points.

Access to transportation under the LCI alternatives would be improved over the No-Build condition. Either LCI alternative would provide residents in east Portland with the best access to the Portland CBD over all other alternatives. Several school attendance areas would be bisected by bus routes under the LCI alternatives. However, school traffic safety would be greater than under the No-Build alternative. Access from east Multnomah County destinations to other parts of the region would be facilitated compared to the No-Build alternative, but would be the least of all Build alternatives.

The LCI alternatives would have minor proximity effects in the Portland CBD and east Portland. In both areas, the increase in bus and automobile traffic would increase noise impacts on adjacent locations. In east Portland, operation of the improved transit system would sever existing neighborhood boundaries and adversely affect neighborhood cohesion. The degree of this impact would be greater than the other Build alternatives, but less than the No-Build alternative.

No displacement of existing land uses would occur under the LCI alternatives. Therefore, no displacement of residents would be required.

Under the LCI alternatives, impacts on historic buildings and districts located downtown would be similar to those accruing from the No-Build condition; that is, increased congestion could limit future development of historical properties. No other significant impacts on historic properties would be expected to occur under the LCI alternatives.

2.2.2.2.5 Air Quality

Air quality impacts accruing under the LCI alternatives would be approximately the same as under all other Build alternatives. Under both LCI alternatives, 1990 concentrations of all pollutants, with the exception of NO_x, would decrease significantly over existing conditions. Although 1990 emissions under the LCI alternatives would be somewhat less than under the No-Build alternative, the difference would be insignificant.

2.2.2.2.6 Natural Environment

The LCI alternatives would not impose any significant impacts on the geology of the region. Some minor erosion impacts may occur due to construction associated with this alternative. However, these impacts could be mitigated through application of standard construction techniques.

Water quality impacts would accrue under these alternatives, like all Build alternatives, due to the introduction of settled pollutants into surface waters and storm sewers. The introduction of nonlethal concentrations of toxic trace metals into the surface waters of the region, such as the Willamette, Columbia, and Sandy Rivers, may stress aquatic organisms.

Construction associated with the LCI alternatives would also result in a minor loss of habitat (1.8 acres). This represents the smallest such loss under any of the Build alternatives (see Table 2.1-1).

2.2.2.2.7 Energy

Total 1990 energy required under the LCI alternatives would be considerably less than under existing conditions (due to increased automobile fuel efficiency) and comparable to both the 1990 No-Build and other Build alternative energy requirements (see Table 2.1-1).

2.2.2.2.8 Noise

As discussed for the No-Build alternative, estimated future noise levels for all Build alternatives would be approximately the same. The LCI alternatives may increase 1990 noise levels at certain residential receptors along arterials in east Portland by as much as 16 dBA. Although noise levels at these receptors would exceed federal design levels, mitigation of noise impacts through construction of noise barriers would not be feasible at these locations due to roadway access requirements.

2.2.3 High Occupancy Vehicle (HOV) Lanes - Alternatives 3a, 3b, and 3c

2.2.3.1 DESCRIPTION

The High Occupancy Vehicle alternative would entail the development of preferential lanes between the Portland Mall and I-205 corridor for peak hour use by high occupancy automobiles and other mass transit vehicles. All 3 alternatives entail the extension of existing HOV lanes on the Banfield Freeway westerly to 16th Avenue (Lloyd Center exit) and easterly to the I-205 corridor to connect with the proposed I-205 busway. The 3 alternatives, 3a, 3b, and 3c differ as to the number and design of freeway lanes on the Banfield Freeway between 37th Avenue and I-205.

Alternative 3a would leave the freeway along this segment in its present configuration: 4 minimum lanes and no shoulders. Alternative 3b would entail the addition of 2 lanes with no shoulders along this segment, while 2 lanes with paved shoulders would be added along this segment under Alternative 3c. Emergency turnouts would be provided in lieu of shoulders under Alternatives 3a and 3b. In all cases, the HOV lanes would be open to general traffic during off-peak hours. Therefore, Alternative 3a would provide 6 freeway lanes from I-205 west to 37th Avenue and 8 lanes west of 37th Avenue for general traffic during off-peak hours. Alternatives 3b and 3c would provide 8 freeway lanes for general traffic during off-peak hours from I-5 to I-205.

Each of the HOV alternatives would use the same routing for buses. The bus route would commence at its western terminus in the Portland Mall and proceed outbound along 6th Avenue to Everett Street before crossing the Steel Bridge. Inbound buses would enter the Portland Mall from the Steel Bridge via Glisan Street and 5th Avenue. Peak-hour parking and right turn movements at certain locations would be restricted. Exclusive bus lanes would be established along downtown bus routes. On-street parking would be removed to accommodate these exclusive lanes.

Buses would cross the Steel Bridge in mixed traffic. Ramp metering could be used to control automobile access to the bridge. Another ramp would be constructed at the east end of the Steel Bridge to give outbound buses exclusive access to Holladay Street at Occident Street. Automobiles would use existing routing to Oregon Street. Inbound buses would share the Holladay Street/Steel Bridge ramp with automobiles.

From the Steel Bridge eastward, the inbound and outbound bus routes would either use Holladay Street exclusively to 13th Avenue, or a combination of Holladay Street and Multnomah Street to 16th Avenue. Under the latter option, buses would be routed from Holladay Street to Multnomah via Grand Avenue, with buses proceeding eastward on Multnomah Street to 16th Avenue. These buses would operate in reserved lanes.

Automobile access to Holladay Street from local streets intersecting from the north would be prohibited between 1st and Union Avenues as would free right turns from Holladay Street to these streets. A 3-phase signal would probably be necessary at Occident Avenue to partially compensate for these restrictions.

A ramp and approach would be constructed to connect the bus route along either Holladay Street or Multnomah Street with the Banfield Freeway HOV lanes. From the liftout ramp eastward, both buses and carpools would use the HOV lanes to the transitway terminus at I-205. Carpools would not be given preferential treatment once they leave the Banfield Freeway HOV lanes.

Upon entering the Banfield Freeway HOV lanes, buses would operate express to I-205. At this point, a ramp would be constructed to connect the HOV lanes with the proposed I-205 busway. This ramp would be reserved for buses only.

Transit stations in the Banfield Freeway HOV system would be proposed for east Portland only. On-street stations would be located on Holladay Street between 1st Avenue and Occident Street (Coliseum Station), 6th Avenue and Union Street (Union/Grand Station), and between 11th and 13th Avenues (Lloyd Center) (see Figure 2.2-1). The Union/Grand and Lloyd Center stations would be located on Multnomah Street under the Multnomah Street option, while the Coliseum Station would be in the same location as under the Holladay Street option.

Provisions would be made under HOV Alternatives 3b and 3c for the future potential development of additional stations to serve the Hollywood District, 60th Avenue, and 82nd Avenue.

Transit operations between east Multnomah County and the Banfield Freeway HOV facility would be connected by the proposed I-205 busway, which would operate between the Airport Interchange and Foster Road. Major transit stations would be developed as part of the I-205 busway at Sandy Boulevard, Gateway, Mall 205, Division Street, Powell Boulevard, and Lents. An additional station would be developed at Gresham. This station would provide express bus service to the I-205 busway.

2.2.3.2 IMPACTS OF HOV

2.2.3.2.1 Traffic and Public Transit

The HOV alternatives would be relatively effective at reducing automobile traffic on the Banfield Freeway and city arterials. The HOV lanes would attract a significant number of single-occupant automobile trips to higher-occupancy carpools. Peak-hour levels of service on the Banfield Freeway west of 37th Avenue under these alternatives would be very poor. However, peak-hour traffic service elsewhere would be generally better under the HOV alternatives than the other Build alternatives. Alternative 3a, when compared to other build alternatives, would result in increased congestion on east Multnomah County east/west arterials accessing I-205 and along some segments of east Portland arterials. This increased congestion would be primarily due to the lack of additional freeway capacity east of 37th Avenue under Alternative 3a. Levels of service east of I-205 would remain satisfactory beyond 1990 under all HOV alternatives.

Circulation and traffic patterns under the HOV alternatives would vary with the design option considered. Under Alternative 3a, 1990 circulation patterns would be approximately the same as those described for the No-Build alternative. The patterns in the Lloyd Center area of east Portland would vary with the route selected for exclusive bus lanes between the Banfield Freeway and the Steel Bridge. Congestion on arterials and residential streets would be less than that occurring under the No-Build alternative. However, traffic would increase over existing levels on east-west arterials accessing the Portland CBD. Peak-period traffic patterns in east Multnomah County under Alternative 3a would be affected by the completion of I-205 and would vary only slightly from those described for Alternative 2a. Traffic patterns in east Multnomah County areas would be oriented along east/west arterials serving the completed I-205 busway. The emphasis on transit under Alternative 3a would result in fewer peak-hour automobile trips. Downtown traffic patterns under Alternative 3a would be similar to existing patterns.

HOV alternatives 3b and 3c, which incorporate widening of the Banfield to 6 lanes, would result in a diversion of some traffic from parallel arterials to the Banfield Freeway east of 39th Avenue. Traffic on the Banfield Freeway would be greatest under Alternatives 3b and 3c than under any other Build alternative. Travel patterns in east Multnomah County would approximate those described for Alternative 2b. Downtown traffic patterns would be similar to existing traffic patterns.

A significant reduction in accidents would occur under HOV Alternatives 3b and 3c. This reduction would be exceeded only by Alternative

5-1 (LRT/Burnside). However, Alternative 3a, by promoting increased arterial street travel, would result in more accidents than all Build alternatives except for Alternatives 2a and 5-3.

All HOV alternatives would permit future transportation improvements along the Banfield Freeway corridor. Future freeway lanes could be added under Alternative 3a, and lanes could be converted to general traffic or exclusive busway lanes under Alternatives 3b and 3c.

Public transit ridership under all HOV alternatives would be slightly less than the Separated Busway alternative (Alternative 4) and the LRT/Burnside alternative (Alternative 5-1), but significantly greater than ridership under the No-Build and LCI alternatives. Levels of ridership would be approximately the same for all HOV alternatives (see Table 2.1-1).

The HOV alternatives would provide better public transit system coverage, frequency, and connectivity than the No-Build and LCI alternatives. HOV transit service quality would be approximately the same as other Build alternatives.

The mixing of transit and general traffic in HOV lanes during off-peak hours would increase the risk of transit accidents on the Banfield Freeway.

2.2.3.2.2 Economics

The HOV alternatives would facilitate movement of goods and people along the Banfield Freeway corridor. Implementation of these alternatives could also promote the establishment of HOV lanes elsewhere within the region. This would result in a general improvement in the regional economic environment.

Economic impacts on the Portland CBD under the HOV alternatives would include a potential increase in development potential along downtown bus routes, both along the Portland Mall and certain off-mall streets, such as Yamhill, Morrison, and Glisan Streets. Loss of on-street parking to accommodate the exclusive bus lanes along 5th and 6th Avenues might cause a loss in sales for some businesses due to lack of available nearby parking.

The establishment of HOV lanes would permit a greater volume of traffic to be accommodated along the Banfield Freeway. The transit stations to be developed in east Portland under all HOV alternatives would improve accessibility between employment centers in east Portland and the CBD. This would have a tendency to concentrate economic development in existing centers.

In east Multnomah County, commercial and residential development would concentrate around the I-205 busway transit stations at Sandy Boulevard, Gateway, Mall 205, Division Street, Powell Boulevard, Lents, and Gresham.

Project costs associated with the HOV alternatives would vary significantly with the design option selected. Alternative 3a would cost approximately $72 million as compared to $125.2 and $133.5 million for Alternatives 3b and 3c, respectively (see Table 2.1-1). The costs of the latter two options are roughly equivalent to project costs for the Separated Busway alternatives (Alternatives 4a and 4b), but are significantly less costly than the LRT alternatives (Alternatives 5-1, 5-2, and 5-3) which range from $152 million to $198.5 million.

Net transit costs per passenger under the HOV alternatives would be less than any of the other alternatives except for the LRT alternatives. Total annual systems costs are less than all other Build alternatives except for the LCI alternatives. The total savings in transportation costs over the No-Build alternative are second only to Alternative 5-1 (LRT/Burnside).

2.2.3.2.3 Land Use

The consistency of the HOV alternatives with existing land use plans and policies, like the LCI alternatives, is mixed. All HOV alternatives are consistent with existing planning policies to the degree that they would improve the flow of goods and services and promote the concentration of population and employment around transit systems. The HOV alternatives are not consistent with the ITP which recommends an exclusive bus or rail corridor along the Banfield Freeway. However, they are consistent with the Arterial Streets Classification Policy to the degree that they improve traffic and transit east of 37th Avenue.

The HOV alternatives would have no major direct land development impacts in the Portland CBD. However, developmental opportunities would occur around transit stations in east Portland and along the I-205 busway. While such opportunities would be small around east Portland stations, they could be significant around the I-205 busway stations. Specific land use development impacts near I-205 busway stations would generally include intensification of housing and commercial uses. The degree of intensification would depend upon the relative importance of the station within the busway. These impacts are summarized in Table 2.2-1.

2.2.3.2.4 Sociocultural Resources

Population and population distribution in the Portland CBD would not be significantly affected by adoption of any of the HOV alternatives. A moderate increase in population compared to CRAG forecasts would be expected to occur near transit stations established in east Portland and along the Banfield Freeway corridor. More significant population increases (compared to 1990 CRAG forecasts) would occur near I-205 busway stations in east Multnomah County. These increases would be greater under the HOV alternatives than under the LCI alternatives (Alternatives 2a and 2b) when compared to 1990 CRAG forecasts.

TABLE 2.2-1

TRANSIT STATION IMPACTS
EAST MULTNOMAH COUNTY STUDY AREA
(I-205)

Location	Description of Station Zones	Land Use with Continuation of Current Trends (No-Build Condition)	Land Use With Reorientation to Transit-Supportive Uses
Gateway (East side of Freeway)	Commercial core on Halsey and Weidler Streets and single- and multiple-family development to the south.	On-going multi-family development should continue along with increased commercial activity with the opening of the I-205 Freeway.	A high-density activity center is possible with 2,000 new residents and 500 new jobs in the area. High-density residential south of the planned commercial/hotel complex would be appropriate and consistent wit existing plan designations.
Mall 205 (East side of Freeway)	A major shopping center, a private school, and hospital, as well as other commercial uses are located to the east of I-205. To the west of I-205, single-family residences are predominant. Commercial uses along Stark, Berrydale Park, and Clark School are also on the fringe of the station area.	Increased activity at the shopping center with the opening of the freeway.	An additional 1,500 jobs and 400 persons could be accommodated in this area. Land uses west of the alignment are quite stable. Development of a large amount of potentially developable and redevelopable land, as well as commercial expansion of Mall 205, could be expected. Multi-family and office uses could also develop.
Division Street (West side of Freeway)	Residential and strip commercial along Division Street. There are also several areas of vacant land.	Considerable development could occur once Division becomes a major interchange at I-205.	Medium- and high-density residential development would be emphasized; approximately 2,640 residents could be situated in this area. Removal of some single-family housing would be necessary. Upzoning of single-family and strip commercial to higher density levels would be necessary.
Powell Boulevard (West side of Freeway)	Considerable vacant land exists, much of it dedicated to the defunct Mount Hood freeway interchange. A bowling alley, school, and State Police office building are also in this area.	Land conversion could be considerable with the opening of I-205.	As with Division Street, medium- and high-density residential development and local commercial would be emphasized with a possible increase of 2,200 persons in this area. Upzoning of some single-family areas and limiting of strip commercial development would be necessary.
Lents (West side of Freeway)	West of the station is the Lents commercial center, a deteriorating commercial area. Single-family residential is predominant to the east of I-205.	Should undergo change from a neighborhood and pedestrian-oriented shopping district to a commercial center serving I-205.	Approximately 1,400 new residents and 350 new jobs are possible for this area. Moderate and high-density housing surrounding a neighborhood commercial core would be appropriate.

The HOV alternatives, like all Build alternatives, would increase regional and local accessibility by increasing transit options and reducing congestion. The emphasis on transit under the HOV alternatives would provide greater mobility for the "transportation disadvantaged" than the LCI alternatives or the No-Build alternative. The development of transit stations and feeder bus systems in east Portland and east Multnomah County would improve the access of area residents to outside locations as well as to local neighborhoods and institutions.

The proximity effects of the HOV alternatives would be similar to those of the LCI alternatives in the Portland CBD in that they would impose minor noise impacts due to increased automobile and bus traffic. The HOV alternatives would have generally positive proximity impacts in east Portland since development of HOV lanes on the Banfield Freeway would reduce the amount of traffic on arterial streets. Implementation of this alternative would impose no significant positive or negative proximity impacts in east Multnomah County.

Under the HOV alternatives, a low-income 90-unit residential hotel in the Portland CBD would be displaced. HOV Alternative 3a would have minimal additional displacement impacts. As many as 175 residences and 13 businesses would also be displaced along the Banfield Freeway due to freeway improvements under HOV Alternatives 3b and 3c. Displaced residents would have to be relocated.

Alternatives 3b and 3c would require the acquisition of a portion of the Union Pacific right-of-way.

Implementation of the HOV alternative would not have significant impact on any historic property along the Project route.

2.2.3.2.5 Air Quality

Air quality impacts under the HOV alternatives would be approximately the same as described for the LCI alternatives. Generally, pollutant emissions and concentrations would be slightly less than under the No-Build alternative and comparable to the other Build alternatives.

2.2.3.2.6 Natural Environment

The HOV alternatives, like the other Build alternatives, would impose no significant geologic impacts. Although some minor soil erosion may occur, standard erosion control measures would minimize such impacts. Development of the HOV lanes (particularly under design options 3b and 3c) would require the commitment of substantial quantities of rock. However, maximum rock quantities required would be approximately the same as required for Separated Busway Alternative 4a and all LRT alternatives.

The development of HOV lanes would result in additional pavement surfaces ranging from 2 to 28 acres (see Table 2.1-1). Surface water runoff to receiving waters (the Willamette River) would increase proportionately, but the increased effluent would not be expected to significantly affect the water quality or fishery resources.

Loss of habitat under the HOV alternatives would range from 2 to 11 acres (see Table 2.1-1). Such loss would not be significant.

2.2.3.2.7 Energy

Under the HOV alternatives, 1990 energy consumption in the Banfield Freeway corridor would be significantly less than existing energy consumption (due to increased automobile fuel efficiency) and comparable to all other alternatives including the No-Build (see Table 2.1-1).

2.2.3.2.8 Noise

Under the HOV alternatives, future noise levels would increase slightly over 1975 noise levels. Noise levels at receptors along the Banfield Freeway would increase 1 to 2 dBA for HOV Alternative 3a and from 1 to 6 dBA for HOV Alternatives 3b and 3c. Average L_{10} 70 dBA distance (or that distance at which the FHWA noise standard of 70 dBA is exceeded less than 10 percent of the time) would increase 40 feet west of 37th Avenue and 55 feet east of 37th Avenue under Alternative 3a. This distance would increase 35 feet along the length of the Banfield Freeway under Alternatives 3b and 3c.

2.2.4 Separated Busway - Alternatives 4a And 4b

2.2.4.1 DESCRIPTION

Under this alternative, an exclusive, separated busway would be developed along the Banfield Freeway corridor. This busway would follow the same route as that described for the HOV alternatives. Two design options, 4a and 4b, are associated with the Separated Busway alternative. Alternative 4a entails the development of a separated busway parallel to the north side of the Banfield Freeway, while Alternative 4b would place the busway in the median between the freeway traffic lanes. Both options would incorporate two 2-directional bus travel lanes. The bus lanes would be separated from freeway automobile lanes by concrete barriers.

Under both Alternatives 4a and 4b, the Banfield Freeway would have 2 additional standard lanes with shoulders added between 37th Avenue and I-205, thereby providing the Banfield Freeway with 6 standard lanes and shoulders between I-5 and I-205. General traffic, including carpools, would be permitted to use these 6 lanes only, while the separated busway would be reserved for use by buses. This operational characteristic of the Separated Busway alternative differs from the HOV alternative in that the HOV alternative permits the use of the HOV lanes by general traffic during offpeak hours.

The Separated Busway would have its eastern terminus at the I-205 corridor where it would connect with the proposed I-205 busway via a ramp to be constructed as part of this alternative.

The Separated Busway alternative would provide for the construction and operation of transit stations at the same east Portland locations as those proposed for the HOV alternative. In addition, the Separated Busway alternative would provide for transit stations to be constructed and operated along the Banfield Freeway in the Hollywood area at 60th Avenue and 82nd Avenue (see Figure 2.1-1). Bus feeder lines would serve each of these stations.

2.2.4.2 IMPACTS OF SEPARATED BUSWAY

2.2.4.2.1 Traffic and Public Transit

The Separated Busway alternatives would result in slightly higher 1990 peak-hour traffic volumes than the HOV alternatives and lower volumes than would occur under the No-Build and LCI alternatives. Peak-hour traffic volumes would be similar to LRT alternatives 5-1 and 5-2.

Under these alternatives, peak-hour traffic on the Banfield Freeway would increase while arterial peak-hour travel would decrease. Improved traffic flow would occur on both the freeway and east Portland arterials compared to existing and 1990 No-Build conditions due to addition of separated bus lanes on the Banfield Freeway lanes east of 37th Avenue. In east Multnomah County, 1990 levels of service along arterials would deteriorate compared to existing conditions, but would represent an improvement when compared to 1990 No-Build conditions. Traffic volumes on streets accessing the Banfield Freeway would also increase. Downtown 1990 traffic would increase compared to existing conditions but would be less than under 1990 No-Build conditions. Automobile circulation downtown would be similar to existing conditions.

The Separated Busway alternatives would result in lower 1990 accident rates than the No-Build condition and Alternatives 2a, 3a, and 5-3. However, accident rates would be slightly greater under the Separated Busway alternatives than under LCI Alternative 2b, LRT Alternatives 5-1 and 5-2, and HOV Alternatives 3b and 3c.

Ridership on public transit would increase significantly under the Separated Busway alternatives when compared to the No-Build condition. These alternatives also would result in the highest transit ridership of all Build alternatives and the greatest number of buses in the Portland CBD. Like the other build alternatives, public transit convenience would be greatly enhanced under the Separated Busway alternatives.

The Separated Busway concept would likely afford the greatest degree of transit safety of all bus-oriented alternatives. Conflicts with general traffic would be virtually eliminated along the Banfield Freeway.

2.2.4.2.2 Economics

The regional economic impacts under the Separated Busway alternatives would be similar to such impacts under the HOV alternatives. However, the Separated Busway alternatives would tend to encourage separated busways in other parts of the region as opposed to the HOV alternatives, which would encourage a HOV lane development regionally. The development of separated busways regionally would involve higher construction costs than the No-Build or LCI alternatives but, like the HOV alternatives, would substantially increase levels of service throughout the region. This improvement would have positive regional economic impacts.

Economic development would likely occur around transit stations in east Portland and east Multnomah County. Access to downtown and other areas where intense economic activity currently exists would be facilitated. Therefore, the Separated Busway alternatives, like the HOV alternatives, would promote the concentration of economic activities.

Project construction costs associated with the Separated Busway alternatives would be somewhat higher than the HOV alternatives, but significantly less than those costs associated with the LRT alternatives (see Table 2.1-1). Related transit costs would be the same as those incurred under the HOV alternatives, but would be significantly higher than those incurred under all other Build alternatives. While total Project costs would be approximately the same for both Separated Busway alternatives, these costs would be significantly greater than the No-Build and LCI alternatives, somewhat greater than the HOV alternatives, and somewhat less than the LRT alternatives.

Total annual 1990 transit cost per passenger would be relatively high under the Separated Busway alternatives, exceeded only by the LCI alternatives. Similarly, total annual transit costs associated with the Separated

Busway alternatives would be exceeded only by LRT Alternatives 5-2a and 5-2b (see Table 2.1-1).

Total 1990 savings accruing under the Separated Busway alternatives would be relatively high. However, significantly greater savings would be realized under LRT Alternatives 5-1 and HOV Alternatives 3b and 3c (see Table 2.1-1).

2.2.4.2.3 Land Use

The Separated Busway alternatives would be consistent with existing land use and transportation plans and policies to the same degree as the HOV alternatives.

Developmental opportunities generated by the Separated Busway alternatives would be similar to those generated under the HOV alternatives. Generally, land use impacts would be most significant in east Portland and east Multnomah County. Some pressure for more intensive transit-supported land use around transit stations would likely occur, although existing land uses around transit station locations in east Portland are generally intensive. Land use conversion may, therefore, be costly and perhaps restrictive near these locations.

In east Multnomah County, land use around transit stations in the I-205 corridor would be less intensive, and greater pressure for transit-supportive development would be likely (see Table 2.2-1).

2.2.4.2.4 Sociocultural Resources

The impacts imposed by the Separated Busway alternatives on 1990 regional and downtown population would be generally the same as imposed by the LCI and HOV alternatives. Population (1990) near the drawing areas of transit stations in east Portland and east Multnomah County would increase in comparison to CRAG forecasts. These increases would be more substantial around transit stations in east Multnomah County.

Access to other locations within the region would be generally improved under the Separated Busway alternatives as would access to neighborhoods and other community institutions. Mobility of the transportation disadvantaged would also be enhanced.

The Separated Busway alternative would generate minor proximity impacts in the Portland CBD similar to those generated by the HOV alternatives. These would include increased noise levels and removal of one residential hotel. In east Portland, proximity impacts associated with these alternatives would again essentially be the same as under the HOV alternatives. Construction of additional freeway lanes for exclusive use of buses would displace about the same number of residents and businesses as development of the HOV lanes. Proximity impacts in east Multnomah County would be minimal.

Right-of-way, acquisition, and displacement impacts for Separated Busway Alternatives 4a and 4b are nearly the same as for HOV Alternative 3c. Alternative 4a would have slightly lower associated costs and displacement.

The Separated Busway would impose no significant impacts of historical properties along the Project route.

2.2.4.2.5 Air Quality

Air quality impacts imposed under the Separated Busway alternatives would be similar to those impacts described for the LCI and HOV alternatives.

2.2.4.2.6 Natural Environment

Geologic impacts accruing from development of the Separate Busway alternatives, like all other alternatives, would be relatively insignificant. The potential for minor erosion would exist, but such impacts would be mitigated through application of standard erosion control measures. Rock quantitites required for the Separated Busway alternatives would be comparable to that required under the other Build alternatives.

Water quality impacts would be essentially the same as described under the HOV alternatives, since increased surface runoff area under the Separated Busway alternatives would be approximately the same as Alternatives 3b and 3c. Impacts on fishery resources of receiving waters would also be insignificant.

Habitat loss under the Separated Busway alternatives would be minor. Therefore, impacts on the terrestrial environment would be insignificant.

2.2.4.2.7 Energy

Energy impacts accruing under the Separated Busway alternatives would be essentially the same as described above for the LCI and HOV alternatives.

2.2.4.2.8 Noise

Future downtown noise levels under the Separated Busway alternatives would increase 1 to 8 dBA over existing and No-Build noise levels depending upon receptor location. The most significant increase in downtown noise levels compared to other alternatives would occur at the west end of the Steel Bridge where levels would increase by 8 dBA over all other alternatives due to a significant increase in bus traffic at this location. The resultant 74 dBA noise level would exceed the FHWA level of L_{10} 70 dBA for residential type receptors but would meet the L_{10} 75 dBA level for commercial/industrial receptors. Since commercial/industrial uses prevail at this location, this impact would not be significant.

Implementation of the Separated Busway alternatives would increase future noise levels along the Banfield Freeway by an average of 3 dBA compared to existing conditions, which already exceed the L_{10} 70 dBA FHWA standard for residential receptors. However, noise impacts imposed by the Separated Busway alternatives like those under the HOV alternatives, could be mitigated through construction of noise barriers near critical receptors.

2.2.5 Light Rail Transit - Alternatives 5-1a, 5-2a, And 5-3a And 5-1b, 5-2b, And 5-3b

2.2.5.1 DESCRIPTION

Under these alternatives, a light rail transit (LRT) system would be developed to connect the Portland CBD with destinations in east Portland and east Multnomah County. This system would use electrically powered vehicles capable of operating on tracks in 1- or 2-car trains. Light rail vehicles would be capable of accommodating 3 times the number of passengers as a conventional bus. Depending upon the option considered, the LRT system east of I-205 would extend east to Gresham (Alternatives 5-1 and 5-2) or south to the Lents District along the eastern edge of the I-205 corridor (Alternative 5-3) (see Figure 2.2-2). Existing bus routes in east Portland and eastern Multnomah County would be augmented to provide a collector and feeder bus system serving the LRT corridor.

These alternatives would also incorporate improvements to the Banfield Freeway. Under all LRT options, the Banfield Freeway would have 6 traffic and no HOV lanes between I-5 and I-205. The only difference between "a" and "b" options is that the Banfield Freeway between 37th Avenue and I-205 would have minimum lane widths and no shoulders under "a" and standard lane widths with shoulders under "b."

Three downtown alignment options were considered for the Light Rail alternatives. The first option (On-Mall/Oak Street) would descend from the Steel Bridge on the south side of the Glisan Street ramp in a double track arrangement, turning south on 5th Avenue to Davis Street. At Davis Street, a single track would continue on 5th Avenue to Oak Street, turning west to 6th Avenue and returning to Davis Street to close the loop (see Figure 2.2-2).

The second option (On-Mall/Pioneer Square) is the same as the On-Mall/Oak Street option except that the double track on 5th Avenue would be extended to a turnaround loop using Morrison street, Yamhill Street, and 6th Avenue.

The third alternative (Cross-Mall) would employ a new ramp from the Steel Bridge descending to the intersection of Everett Street and 1st Avenue. Double track would continue along 1st Avenue to a loop encompassing Morrison Street, Yamhill Street, and the west side of 6th Avenue.*

Holladay Street between the Steel Bridge and the Banfield Freeway would serve as the downtown connection for all light rail alternatives. Two options for the location of the light rail line on Holladay Street were proposed. The first option would locate the light rail track on the north side of Holladay Street from Occident Avenue to the Banfield Freeway. The second option would locate the tracks on the south side of Holladay Street as far as Union Avenue. At Union Avenue the tracks would cross to the north side of Holladay Street and continue to the Banfield Freeway.** For both options, 2 westbound travel lanes for automobiles and trucks would remain on Holladay Street.

A new ramp would be constructed to connect the Holladay Street route at 13th Avenue with the Banfield Freeway light rail alignment, which would lie between the freeway and the Union Pacific Railroad tracks. The light rail alignment would parallel the north side of the Banfield Freeway to I-205, where a ramp would be constructed to provide access to the Gateway Station. The light rail line paralleling I-205 would take the place of the planned I-205 busway. This line would continue adjacent to I-205 either to Burnside Street, Division Street, or the Lents District.

Under Alternative 5-1,*** the light rail line would leave the I-205 right-of-way at Burnside Street and proceed east on Burnside in a reserved median right-of-way to 199th Avenue, where the alignment would enter the Portland Traction Company right-of-way. The alignment would follow the north side of the existing track before crossing over to the south side

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*The Cross-Mall alignment was ultimately selected as part of the preferred alternative (see Section 2.3.2). However, the alignment was extended to 11th Avenue prior to incorporation.

**The second option was ultimately selected as part of the preferred alternative.

***Alternative 5-1 was ultimately selected as part of the preferred alternative.

at 202nd Avenue. The alignment would then either turn into the median of 221st Avenue to enter the Old Fairgrounds area or would continue along the Portland Traction Company right-of-way to an alternative station site at 1st Avenue and Burnside Street near Powell Boulevard.* The number of automobile lanes along Burnside Street would be the same as today with one lane on each side of the light rail alignment. Special lanes with signalization would be provided at selected intersections for left turn and U-turn movements.

Alternative 5-2, the Division Street alignment, would leave the Gateway area and also follow the I-205 transitway alignment to Division Street. The route would then proceed east in a median track on Division Street. The Division LRT alignment, like the Burnside Street alignment, would either terminate at the Fairgrounds site in Gresham or an alternate site in the vicinity of 1st Avenue and Burnside Street near Powell Boulevard. The light rail alignment would access the latter site by turning southeasterly off Division Street at approximately 223rd Avenue, then following the Portland Traction Company right-of-way in the same fashion as Alternative 5-1.

The number of automobile lanes along Division Street would be the same as today with 2 lanes on each side of the light rail alignment. Special lanes with signalization would be provided at selected intersections for left turn and U-turn movements.

Alternative 5-3 would operate along I-305 between Gateway and the Lents District. The light rail line would follow the busway previously planned as a component of I-205; that is, the alignment would parallel the east side of the freeway north of Division Street, pass under the freeway in a short tunnel near Lincoln Street, then parallel the west side of the freeway between Division Street and Foster Road to the Lents District.

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*The Gresham City Council selected a site near 8th Street and Cleveland Avenue in Gresham as the eastern terminus of the LRT route associated with Alternative 5-1 (see Section 2.3.2).

Two to six transit stations would be build in the downtown Portland area depending on the LRT alternative.* Similarly, 11 to 16 stations would be constructed outside of downtown Portland (see Figures 2.2-1 and 2.2-2).

A light rail vehicle storage and maintenance facility would be constructed as part of each LRT alternative (see Section 3.2.4). The location of this facility would depend upon which LRT alternative is selected. The proposed locations are depicted on Figure 2.2-2. The exact design of the facilities to be incorporated would depend upon the type of LRT vehicle employed.

2.2.5.2 IMPACTS OF LIGHT RAIL TRANSIT**

2.2.5.2.1 Traffic and Public Transit

LRT alternatives 5-1 (Burnside Street alignment) and 5-2 (Division Street alignment) would result in overall 1990 traffic conditions similar to those discussed for the Separated Busway alternatives. Traffic volumes would be generally lower than under the No-Build and LCI alternatives and would be slightly lower than volumes generated under the Separated Busway alternatives. This stems from the effectiveness of Alternatives 5-1 and 5-2 in attracting transit trips.

Along the Banfield Freeway and east Portland arterials, peak-hour traffic volumes occurring under Alternatives 5-1 and 5-2 would be very similar to those occurring under the Separated Busway alternatives. Freeway traffic volumes would be slightly higher near 47th Avenue.

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*Certain station locations for the Burnside Street-Gresham LRT route and the Cross-Mall downtown alignment option were later modified as part of the preferred alternative.

**The impacts summarized below are those presented in the DEIS and, as such, provided the basis for selection of the preferred alternative. The impacts associated with Alternative 5-1b, which ultimately became the preferred alternative, were refined and updated for presentation in Section 4 of this report.

Peak-hour traffic volumes along Burnside and Division Streets east of I-205 would be only slightly less than under the Separated Busway and HOV alternatives and LCI Alternative 2b due to the tendency of I-205 to attract peak-hour automobile trips under these latter alternatives. Alternative 5-3 (I-205) would result in the highest peak-hour traffic volumes east of I-205 of all LRT alternatives since LRT service would be oriented along I-205 and would not extend to Gresham.

Downtown peak-hour traffic under all LRT alternatives would be similar to the HOV and Separated Busway alternatives, although downtown p.m. peak-hour bus traffic would be approximately 20 percent less under the LRT alternatives. Despite this reduction, traffic circulation in the Portland CBD under the LRT alternatives would not differ significantly from either existing or No-Build conditions. Minor differences in circulation patterns could be expected to result, depending on which of the 3 alternate downtown routes were selected: (1) On-Mall/Oak Street; (2) On-Mall/Pioneer Square; and (3) Cross-Mall. All proposed downtown routes would reduce bus volumes and concentrate bus traffic on the Mall and a few cross streets. Under the On-Mall/Pioneer Square option, all bus traffic would be eliminated on 5th Street. Under the Cross-Mall option, bus traffic would be eliminated on Yamhill and Morrison Streets. The Cross-Mall option would result in the greatest reductions of off-mall bus traffic.

Traffic volumes along the Banfield Freeway would be reduced due to the improved transit capability provided by the LRT. Under all LRT alternatives, option (b), which provides for full shoulders, would provide better levels of service than option (a).

In east Multnomah County, adoption of either Alternative 5-1 (Burnside Street alignment) or 5-2 (Division Street alignment) would result in out-of-direction travel; that is, automobile and bus traffic would be required to travel in the opposite direction of ultimate destinations to link up with either Burnside or Division Streets in the intended direction of travel. This condition would result from left-hand turning restrictions across LRT tracks along Burnside and Division

Streets from abutting properties and certain cross streets. These restrictions would provide maximum safety and operating conditions for the light rail facility.

On Burnside Street, 11 north/south streets would remain open across the LRT tracks: 102nd, 113th, 122nd, 139th, 148th, 162nd, 172nd, and 181st Avenues, Stark Street, 199th, and 202nd Avenues (see Figure 7.1-2). Left-turn lanes would be established from these streets onto Burnside Street. On Division Street, 12 cross streets would remain open: 122nd, 130th, 135th-136th, 148th, 162nd, 169th-170th, 174th, 182nd, 190th, 196th, 202nd, and 212th Avenues. Turning refuges would be provided at the intersections of these streets and Division Street to minimize out-of-direction travel.

There are 541 properties abutting Burnside Street where full east/west access would be affected. Another 38 properties on side streets connecting directly to Burnside Street would also be affected. In contrast, 1,700 properties and 2,950 housing units on Division Street and adjacent streets would be affected by out-of-direction travel.

Traffic would increase along all streets left open across both Burnside and Division Streets under both LRT alternatives. Much of this traffic would not combine along Burnside or Division Streets, but would terminate at park-and-ride stations located at certain cross streets.

LRT Alternative 5-1 (Burnside Street alignment) would be the most effective of all alternatives in reducing accident rates, although resultant rates would be only slightly better than the HOV, Separated Busway, and remaining LRT alternatives. Under all LRT alternatives accident rates in east Multnomah County would be reduced as compared to other alternatives and the existing condition, due to general reductions in automobile traffic along arterials east of I-205. Reductions in the numbers of buses operating downtown would also reduce conflicts with automobiles and increase traffic safety.

The quality of transit service would be greatly improved under all LRT alternatives as compared to either existing or No-Build conditions. These alternatives would feature increased transit capacity due to the larger capacity of light rail vehicles compared to conventional buses and improved transit connectivity between eastern Multnomah County and the Portland CBD. Alternatives 5-1 (Burnside Street alignment) and 5-2 (Division Street alignment) would provide the greatest coverage area of all LRT alternatives, as well as the shortest overall travel times between Gresham and other locations in the Banfield Freeway corridor. Alternative 5-3 (I-205 LRT alignment) would be the least effective of all the Build alternatives in accommodating trips to and from suburbs east of I-205, since bus/rail connections would be required for most suburban residents.

LRT systems would be generally reliable. However, such systems are vulnerable to interruptions. LRT service could be interrupted by power failures, equipment failures, and blockages of the right-of-way. Power failures would occur only rarely. Equipment failures are uncommon assuming responsible maintenance. The effects of such a failure could be utilized by incorporating an auxilliary motor into each LRT vehicle or by operating LRT vehicles in trains of 2 or more. Blockages of the LRT rights-of-way could cause serious interruptions due to the confinement of LRT vehicles to a fixed track. The addition of switchback tracks and bypasses at regular intervals would allow continuous operation of the system on both sides of the blockage.

Light rail accident rates would likely be low due to a relatively high degree of separation between LRT vehicles and general traffic under all 3 LRT alternatives. Although over 90 percent of all LRT rights-of-way along each proposed LRT alignment would be separated from automobile traffic, conflicts would occur downtown and at grade crossings along Holladay Street under all LRT alternatives. Conflicts would also occur at grade crossings along Burnside and Division Streets under LRT Alternative 5-1 and 5-2, respectively. The potential for rear-end collisions between LRT vehicles would be low due to the low frequency of vehicles and the incorporation of signals and automatic train stops.

The LRT alternatives would be the least vulnerable of all Build alternatives to future conversion to general traffic use. The LRT system would represent a substantial commitment to alternate modes of transit. Development of LRT facilities along the Banfield Freeway would likely exert pressures for LRT development along other corridors accessing downtown (such as the Sunset and Oregon City corridors). Such development would further reduce automobile and bus trips in the region and would generally benefit downtown transit and circulation conditions.

2.2.5.2.2 Economics

As discussed above, development of one of the LRT alternatives in the Banfield Freeway corridor would exert pressure for development of LRT systems elsewhere in the region. A regional LRT system, if supported by appropriate land use policies, would have the effect of concentraing population and employment around transit stations, thereby promoting growth management concepts. The capital costs of such a regional system would be high relative to the other Build alternatives. However, the costs of moving people and services would be reduced over the long term.

The LRT alternatives proposed for the Banfield Freeway corridor would increase downtown ridership, since LRT vehicles are capable of accommodating more passengers than buses. Transit-related congestion, air pollutants, and noise levels would be reduced in the Portland CBD compared to bus-oriented alternatives. Therefore, the Portland CBD would become a more attractive place to work and shop.

The 2 On-Mall LRT routes (Oak Street and Pioneer Square) would both increase ridership to and along the Mall, while reducing the number of buses operating on the Mall. Both On-Mall options would promote continued economic development along the north of the Mall. However, approximately 100 parking spaces would be removed under both options.

The Cross-Mall option would result in the establishment of a major transportation corridor along 1st Avenue from the Steel Bridge to Yamhill Street and along the loop formed by Yamhill and Morrison Streets (see

Figure 2.2-1). Economic development would be promoted along this route. This option would not serve the full length of the mall or the area north of the mall. Therefore, the mall and areas to the north may not develop as rapidly as under the other 2 downtown options. Approximately 235 parking spaces would be removed along the route to accommodate the LRT facilities.

In east Portland, the LRT alternatives would impose economic impacts similar to the Separated Busway alternatives, which feature the same routing and transit station locations. Economic development would intensify and concentrate around transit stations. All of the LRT alternatives would facilitate commuter travel between downtown and east Portland locations. The Burnside and Division Street LRT alternatives would make employment centers in east Portland, such as Lloyd Center, much more accessible to locations east of I-205.

LRT would impose the most significant economic changes within east Multnomah County, since it is the only alternative that provides a fixed transit facility east of I-205. Economic activity would be concentrated and intensified around transit stations rather than dispersed along arterials. The costs of public services would be reduced.

The Burnside Street LRT alignment (Alternative 5-1) would have the greatest potential of all LRT alternatives for concentrating population and employment around transit stations. Burnside Street would change from a residential arterial to a minor arterial with commercial and business development around transit stations. All on-street parking would be removed on Burnside Street.

The Division Street LRT alignment (Alternative 5-2) would generate some development around transit stations. However, Division Street is already extensively developed. Therefore, much of the increased trade that would be generated by development of an LRT alignment along Division Street would be absorbed by existing businesses. Access to existing businesses along Division Street would be reduced due to LRT facility development and the removal of parking from I-205 to Gresham. This reduced accessibility could reduce sales of impacted businesses.

The I-205 LRT alignment (5-3) would impose the least significant economic impacts of all the LRT alternatives. Some development would occur around transit stations, but the extent of such development would be limited due to the proximity of I-205. Transit-generated development would be greatest at the Division Street and Powell Boulevard stations, and would be enhanced at existing retail centers at Gateway and Mall-205.

The LRT alternatives would have the highest associated construction costs, total Project costs, and total annual costs of all alternatives (see Table 2.1-1). Compared to the other LRT alternatives, the Division Street alignment (Alternative 5-3) would have the highest such costs.

The LRT alternatives would also have the lowest 1990 net cost per passenger of all alternatives (see Table 2.1-1). The Burnside Street alignment (Alternative 5-1) would have the lowest such cost of all LRT alternatives.

2.2.5.2.3 Land Use

The LRT alternatives conform to existing land use plans and policies to the same degree as the Separated Busway alternatives. However, the LRT alternatives would be more effective in supporting the role of the Portland CBD as a regional center by providing a multi-model transportation system capable of facilitating the flow of goods and services within the region. The Burnside Street and Division Street LRT alternatives would promote the concepts of ordered growth contained in existing plans and policies by encouraging the intensification of development in support of transit.

Minor land development opportunities would be created in the Portland CBD under all LRT alternatives. Both On-Mall LRT route options (Oak Street and Pioneer Square) would require the conversion of existing land uses at 4th and 5th Avenues and Glisan Street to transit station use. Surrounding land uses may potentially be converted to transit-oriented uses as well. The LRT Cross-Mall option would not present significant, direct development opportunities, although it could indirectly stimulate redevelopment along 1st Avenue and the north waterfront area.

In east Portland, development is already relatively intensive. Therefore, developmental opportunities presented by the LRT alternatives would be limited. Some minor transit-oriented development would likely occur near transit stations.

East of I-205, LRT Alternatives 5-1 (Burnside Street alignment) and 5-2 (Division Street alignment) would present significant transit-oriented development opportunities compared to other alternatives. These opportunities would be greater for the Burnside Street alignment since existing development is less intense than along Division Street.

Along Burnside Street, mixed-use centers would likely develop around planned LRT station zones. These centers would feature high-density residential, neighborhood/community commercial, office/professional, public service, and light industrial and other transit-oriented uses. Three station zones would be particularly well suited for such development: Gateway/102nd Avenue, Rockwood (162nd-192nd Avenues), and Gresham. A summary of land use impacts around station zones along Burnside Street is presented in Table 2.2-2.

Development potential at transit station zones along the Division Street alignment would be distinctly different from the Burnside Street alignment due to several constraints. Division Street is an intensely used 4-lane intra-county arterial which will be supported by a full interchange with I-205. Development patterns and land uses along Division Street are well established, particularly around future station zones such as Gateway, Mall-205, 122nd, 148th, and 182nd Avenues, and the Fairgrounds. Land uses in these areas would remain automobile-oriented due to the high cost of conversion to transit-oriented uses. On the other hand, transit-oriented development could occur around the Division/I-205, 136th, 170th, and 199th Avenue station zones as well as the Gresham station alternative at 1st Avenue and Burnside Street. Land use impacts associated with the Division Street LRT alignment are summarized in Table 2.2-3. The land use impacts accruing near the Gateway, Mall-205, and Division Street/I-205 zones are summarized in Table 2.2-1, while land use impacts accruing near both Gresham station alternatives (Fairgrounds and 1st Avenue and Burnside Street) are summarized in Table 2.2-2.

TABLE 2.2-2

TRANSIT STATION IMPACTS
EAST MULTNOMAH COUNTY STUDY AREA
(Burnside Street Corridor)

Location	Description of Station Zones	Land Use with Continuation of Current Trends (No-Build Condition)	Land Use With Reorientation to Transit-Supportive Uses
102nd Avenue	Low-density single-family developmen with some commercial, small industrial and community service uses.	Some infilling of residential and commercial uses on vacant parcels.	Some 50 acres of land could be converted to multi-family residential, supporting approximately 2,000 persons. Would require upzoning in southeast quadrant to allow for multiple-family. Some conversion of single-family units would be anticipated.
122nd Avenue	Located on a north-south arterial with substantial strip commercial with single-family behind the commercial uses, some vacant land.	Some additional commercial development with perhaps some multi-family development on vacant land.	Approximately 900 jobs and 1,400 residents could be supported at this station. Intensive residential along with some office, public service, or neighborhood commercial uses are desirable. May require change of zoning from commercial and single-family to multi-family.
148th Avenue	Predominately low-density single-family with some multi-family development at the intersection. Large amount os vacant land. scattered throughout area.	Additional multi-family; perhaps some commercial development.	Approximately 1,300 additional residents on about 40 acres of land coudl be anticipated. Upzoning of single-family to multi-famliy/medium-density residential would be necessary. Multiple-family infilling and some single-family conversions would be anticipated.
162nd Avenue	Predominately multi-family residential. Some single-family residential and open space and community service. Commercial uses along Glisan and Stark Streets.	Further infilling of multi-family development.	The station could support up to 1,700 additional residents, in multi-family units. Expanded multiple-famliy and some local convenience commercial uses would be appropriate. Some upzoning of existing single-family areas will be necessary.
172nd Avenue	A transition area from single-family to multi-family with some commercial activity along Stark Street.	Additional multi-family with perhaps some additional commercial development.	Development could include 2,300 additional residents and 1,800 new multi-family dwelling units into the area. Could support medium- to high-intensity residential uses. Upzoning of single-family to multi-famliy areas would be necessary.
181st/Rockwood	The triangle of Burnside, 181st Avenue, and Stark Street contains major automobile-oriented mixed uses in east Multnomah County. Multi-family and single-family residences lie adjacent to this center.	This commercial center would continue to develop and perhaps expand with some additional multi-family residential.	The center would be oriented to transit-supportive commercial uses and high-density residential uses. Approximately 700 new jobs and 1,300 new residents could be accommodated. Upzoning of single-family areas would be necessary.
192nd Avenue	A mix of vacant land, commercial, and industrial uses, as well as scattered single-family and multi-family residential.	Gradual infilling of vacant land to other uses.	Good potential for development with 1,700 new residents and 700 new jobs possible in the area. A mix of intensive residential, community commercial, and industrial uses would be appropriate. Major zone changes would not be necessary.
Fairgrounds	This site is under single ownership and is scheduled to be developed into a multi-use center, including an auditorium, offices, and multi-family residential.	Center would probably develop, but would not be transit oriented.	High-density residential, office/professional, and community commercial can be assumed. No change in land use policy is expected here.
1st Street and Burnside Street (Alternative to Fairgrounds)	Ongoing commercial development in this area including a major shopping center, several new restaurants, and multiple-family development. There are large amounts of as yet undeveloped land.	Continued development of this area to commercial and multi-family uses.	Approximately 2,215 new residents and 1,000 new jobs could be supported at this station site. High-density residential, office/professional, and community commercial can be assumed.

TABLE 2.2-3

TRANSIT STATION IMPACTS
EAST MULTNOMAH COUNTY STUDY AREA
(Division Street Corridor)

Location	Description of Station Zones	Land Use with Continuation of Current Trends (No-Build Condition)	Land Use With Reorientation to Transit-Supportive Uses
122nd Avenue	Strip commercial on both Division Street and 122nd Avenue, with single-famliy and some multi-family behind the commercial properties.	Some additional commercial and multi-family possible.	An additional 400 residents and 250 jobs is possible. Development options limited by lack of redevelopable parcels. Continued commercial infilling and increase in multiple-family residences.
136th Avenue	A multi-famity residential core with some retail, and a wrecking yard.	Additional multi-family and commercial uses.	Some public development may be necessary here. A maximum additional 1,500 residents could be put into this area. Intensive redevelopment of the area to high- and medium-density multiple-family development with some local commercial would be beneficial. Is consistent with plan policies.
148th Avenue	Strip commercial on both Division Street and 148th Avenue, with some multi-family uses.	Some increase in commercial activity possible.	Approximately 500 additional residents and 100 jobs are possible. Redevelopment opportunities are constrained by existing single- and multiple-family development immediately to the north. Further infilling of vacant land and redevelopment to medium-density residential and local commercial could be expected. Is consistent with plan.
170th Avenue	A multi-family residential core with a 300-unit trailer park, as well as some commercial activity in the station area.	Some increase in multi-family development and/or commercial uses is probable.	Redevelopment would require considerable property assemblage and plan policy changes to achieve an increase of 2,400 persons and 50 jobs.
182nd Avenue	Some locally-oriented commercial development with a school and single-family residences in the area.	Relatively small increases in commercial activity.	Approximate increase of 300 persons and 150 jobs could occur. Minor impact on development patterns expected. Continuation of existing trends with some intensification of automobile-oriented commercial anticipated. Consistent with plan.
199th Avenue	Largely undeveloped open land with a gravel quarry in the area.	Some conversion to urban uses can be expected.	Because of the amount of undeveloped land, an approximate increase of 500 jobs and 2,000 persons is possible. Upzoning of strip commercial and single-family residential would be necessary.

2.2.5.2.4 Sociocultural Resources

The LRT alternatives, like all other Build alternatives, would facilitate the movement of people between east Multnomah County and the downtown along the Banfield Freeway corridor. This would support controlled growth within the county, particularly east of I-205.

Population increases in excess of CRAG forecasts for 1990 would occur along LRT routes and major station areas, particularly those in the I-205, Burnside Street, and Division Street corridors. Growth outside of the LRT corridors would occur at slower rates than CRAG forecasts indicate.

Access to transit facilities would be generally enhanced under all LRT alternatives. The development of LRT facilities and feeder bus systems would significantly increase access from east Multnomah County locations to east Portland and the downtown. Minor impacts on local accessibility would result from requirements for out-of-direction travel under the Burnside Street and Division Street options. However, access to local institutions and neighborhoods would generally be facilitated through transit improvements.

All LRT alternatives would reduce proximity effects in the downtown area as compared to other alternatives. Downtown traffic would be reduced as would associated noise and air pollutant levels. In east Portland, proximity effects imposed by the LRT alternatives would be generally beneficial. Traffic and associated adverse impacts would be funneled along the Banfield Freeway corridor instead of along arterial streets. East of I-205, the proximity effects of the LRT alternatives would be the most severe of all alternatives. Restricted access, out-of-direction travel, and removal of on-street parking would decrease the livability of residences along the Burnside Street and Division Street routes. Single-family residences would be replaced by multi-family housing or other more intense uses in station zones. Prolonged construction of LRT facilities would also impose significant proximity effects on nearby receptors along all routes. These impacts would be most severe on residential uses.

Land acquisitions and displacements would be required under all LRT alternatives. Relatively few households and businesses would be required under the no-shoulder option (a). The full-shoulder option (b) would require the relocation of as many as 50 families. A portion of the Union Pacific Railroad right-of-way paralleling the north side of the Banfield Freeway would also be acquired under the (b) option.

Alternative 5-1 (Burnside Street LRT alignment) would require the relocation of 32 residential and business uses under the (a) design option for the Banfield Freeway and 260 uses under the (b) option. Alternative 5-2 (Division Street LRT alignment) would require relocation of 210 uses under the (a) option and 260 uses under the (b) option. Alternative 5-3 (I-205 LRT alignment) would require 20 relocations under the (a) option and 70 relocations under the (b) option.

Visual impacts imposed under the LRT alternatives would be the most significant of all alternatives due primarily to the incorporation of an overhead power system requiring electrical wires, feeder cables, and support poles.

Several historic districts and buildings of potential historic significance could be affected by development of downtown LRT facilities. The degree of impact would depend upon the downtown route option selected. The On-Mall options would require removal of a portion of a block currently bounded by Glisan and Flanders Streets, and 4th and 5th Avenues. This block and several surrounding blocks are currently being considered for designation by the Portland Landmarks Commission.

Under the Cross-Mall option, the LRT would be routed through the Skidmore/Old Town and Yamhill Historic Districts. Mitigation measures would be necessary to minimize proximity effects on nearby structures of historic significance.

All downtown LRT route options would facilitate access to historic districts and, as such, would likely promote redevelopment and restoration of historic properties.

2.2.5.2.5 Air Quality

Air quality impacts accruing under the LRT alternatives in 1990 would be the same as those described for the other Build alternatives. Generally, 1990 concentrations of air pollutants would be significantly decreased compared to existing conditions and slightly decreased compared to the 1990 No-Build condition. These decreases would primarily result from improvements in automobile emission characteristics and not as a result of implementing transportation system improvements.

2.2.5.2.6 Natural Environment

The LRT alternatives, like all other Build alternatives, would not impose significant geologic impacts. Required quantities of excavated rock would be approximately the same as HOV Alternatives 3a and 3b and Separated Busway Alternative 4a. Some érosion potential would be created during construction, but application of standard control resources such as revegetation would mitigate long-term effects.

In addition to the runoff considerations discussed for other Build alternatives, construction of LRT Alternative 5-1 (Burnside Street alignment) could result in minor temporary degradation of water quality and fish habitat in Fairview Creek. The proposed Burnside Street maintenance and storage facility would encroach on 10.9 acres of the Fairview Creek floodplain. Runoff from paved surfaces could cause some deterioration of water quality in Fairview Creek unless mitigation measures are implemented. The proposed park-and-ride station at 162nd Avenue would require the filling of a shallow draw, along which runoff from adjacent streets is currently conducted. Alternate means of accommodating obstructed or diverted surface water runoff would have to be developed.

A park-and-ride station along the Division Street alignment at 199th Avenue would encroach on 1-1/2 acres of Fairview Creek floodplain. Again, alternate means of accommodating obstructed or diverted surface water runoff would have to be developed.

The LRT alternatives would result in the greatest loss of habitat and plant growth productivity of all Build alternatives. However, the maximum loss of habitat would be 45 acres under Alternative 5-1b. This loss would be insignificant.

2.2.5.2.7 Energy

Total 1990 annual energy consumption would be slightly less for the LRT alternatives than for the other Build alternatives (see Table 2.1-1). The use of electricity to power light rail vehicles would save about 1.25 million gallons of oil annually.

2.2.5.2.8 Noise

The LRT alternatives, when compared to other alternatives, generally would reduce future noise levels of certain receptors in the Portland CBD, east Portland, and east Multnomah County. This reduction would result from the replacement of buses by quicker, higher-capacity light rail vehicles along LRT corridors. Significant spot reductions in noise levels would occur at some locations.

Under Alternative 5-1, noise levels along Burnside Street in east Multnomah County would increase 1 to 2 dBA compared to both existing and 1990 No-Build conditions. The same increases would occur along Division Street under Alternative 5-2. These increases in noise levels indicate that increases in 1990 traffic volumes along Burnside and Division Streets would offset any noise reduction from LRT facilities to these corridors.

In comparing the Division Street route to the Burnside Street route, the latter would be exposed to the least offensive noise environment. Most receptors with noise levels in excess of L_{10} 70 dBA along Burnside and Division Streets cannot be mitigated because they require direct road access. Barriers could not be constructed where frequent gaps in the wall or berm are needed. Therefore, except for the schools and other institutional receptors, no mitigation can be provided. The schools could be afforded barrier or architectural-type mitigation.

Alternative 5-3 (I-205 route) would use the I-205 facility from the Banfield Freeway to Foster Road. A noise analysis of this system and its effect on adjacent structures indicates that no change will result from the LRT operation. The influencing effect of the light rail vehicles when combined with the freeway-generated noise is imperceptible. The only noise affecting adjacent structures would be that of the normal freeway traffic. As indicated in the I-205 Environmental Impact Statement (U.S. Federal Highway Administration, Oregon, Department of Transportation, Highway Division, and Washington, State, Department of Highways 1976), all impacted receptors would be afforded attenuation sufficient to reduce the noise environment to an acceptable level of L_{10} dBA or lower.

2.3 ALTERNATIVE SELECTION

2.3.1 Selection Process

The release of the Banfield Transitway DEIS in March 1978, followed by a public hearing on April 6, initiated the local decision-making process on the Project. The DEIS allowed decision makers to examine a wide range of technical information in one unified source. The public hearing allowed citizens and civic organizations to comment on the Project and to express their concerns and preferences for transportation improvements (see Section 8).

Four local jurisdictions were responsible for determining which of the Project alternatives should be implemented. The 4 jurisdictions were: (1) Tri-Met, the agency responsible for building and operating the transit elements of the Project; (2) Multnomah County, in which the entire Banfield Transitway Project will be located; (3) the City of Portland, where the western half of the Project will be located; and (4) the City of Gresham, which had an interest in those alternatives extending into Gresham.

The Tri-Met Board received a recommendation from its staff on August 24, 1978 (Tri-Met, Planning and Development Division 1978b) which supported light rail transit in the Banfield/Burnside alignment

(Alternative 5-1). A month of informal briefings and meetings ensued. A public hearing was held on September 20, 1978, with a special board meeting to adopt a resolution in favor of the Project on September 26, 1978. This resolution was passed by a vote of 4 to 1 (2 members were absent). Concurrently, the Multnomah County Board of Commissioners reviewed public response at a hearing on September 21. The board adopted its resolution on October 5, 1978, calling for the Banfield Freeway/ Burnside Street LRT alignment, coupled with a widening of part of the Banfield Freeway to 6 lanes with shoulders (Alternative 5-1[b]). The vote was unanimous, 5-0.

The Gresham City Council held a public meeting to hear public opinions on the Project on October 5, 1978. Their resolution in favor of LRT Alternative 5-1(b) was passed in a meeting held on October 10. The vote was 5 in favor and 1 against.

The City of Portland held a hearing and voted to adopt the light rail alternative on October 26 by a 4-0 vote (1 member was absent). The city's resolution endorsed LRT Alternative 5-1(b), but deferred its decision on the LRT alignment in downtown Portland until adequate community review could be accomplished. A committee composed of downtown residents, property owners, and business people was then formed to review alternative downtown alignments (see Section 2.3.3).

After the 4 principal jurisdictions involved selected LRT Alternative 5-1(b), the CRAG Executive Board endorsed this action in a meeting held on November 16, 1978. Their vote was unanimous with the 11 members present in favor (2 were absent). The Project was then reviewed by OTC. The OTC endorsed Alternative 5-1(b) by a 5-0 vote on December 19, 1978.

2.3.2 Basis for Selection

2.3.2.1 GENERAL

The reasons for selection of Alternative 5-1(b) as the preferred alternative were outlined in resolutions adopted by each of the local reviewing jurisdictions. Each reviewing jurisdiction determined that the combination of Banfield Freeway improvements and the LRT alignment incorporated in Alternative 5-1(b) would provide the best overall levels of traffic and transit service. Alternative 5-1(b) would impose the least adverse impacts on the human and natural environments while providing significant benefits.

The discussion below summarizes the benefits associated with the preferred alternative as compared to the other alternatives considered. This brief comparative analysis is presented in the same format as the data presented in the DEIS (U.S. Federal Highway Administration 1978) and Section 4.0 of the FEIS. The intent of this discussion is to document the relative benefits of Alternative 5-1(b) as they were determined by the jurisdictions in the selection process. Emphasis is placed on the reasons for selection stated in the jurisdictional resolutions contained in the Banfield Transitway Decision Process report (Tri-Met and Oregon, Department of Transportation 1979a). Data contained both in the DEIS and the Staff Recommendation to the Tri-Met Board of Directors (Tri-Met, Planning and Development Division 1978b) are presented in the analysis below since these data provided the basis for selection of the preferred alternative by the jurisdictions.

2.3.2.2 TRAFFIC AND PUBLIC TRANSIT

2.3.2.2.1 Traffic

The LRT alternatives will be effective in reducing traffic growth along the Banfield corridor (see Table 2.1-1). Future peak-hour levels of service on the Banfield Freeway will be improved compared to the No-Build and LCI Alternative 2a and approximately equal to LCI Alternative 2b and the Separated Busway alternatives. LRT will also reduce traffic on east Portland arterials. Compared with other LRT alternatives, the preferred alternative will be significantly more effective in reducing traffic growth than Alternative 5-3 and will cause less disruption to traffic patterns in east Multnomah County than Alternative 5-2.

2.3.2.2.2 Public Transit

According to the Tri-Met preferred alternative report (Tri-Met and Oregon, Department of Transportation 1979b), the LRT alternatives will offer greater transit speeds, safety, rider comfort, and schedule reliability than all other alternatives. Greater transit speeds and safety will result from reduction in transit/automobile conflicts. This reduction will be achieved through the establishment of separated LRT routes where possible.

Rider comfort will be enhanced by the smooth acceleration and ride afforded by the LRT. Noise levels in light rail vehicles are also less than those in buses.

The establishment of feeder bus lines routed to LRT stations will maximize transit availability to residents east of I-205. The coordination of bus and LRT schedules to achieve "timed transfers" will enhance overall transit schedule reliability. The LRT will also reduce the number of buses downtown from east Multnomah County locations.

LRT has greater potential for attracting ridership than the bus-oriented alternatives. Rail transit offers more comfort and reliability. In addition, studies have indicated that the public generally regards LRT as being a more "attractive" mode of transit (Tri-Met and Oregon, Department of Transportation 1979b).

LRT has the greatest potential to respond to sudden ridership increases due to the large reserve capacity of light rail vehicles. This potential becomes even more significant if future local or national policies would encourage a large shift from use of private automobiles to mass transit.

LRT offers greater long-term reliability than bus-oriented alternatives. Reserved bus and carpool lanes on freeways have traditionally come under fire from motorists using the same roadway. As congestion increases, motorist opposition to such lanes increases. LRT, using an exclusive right-of-way, is far less vulnerable to conversion pressures, thereby providing a long-range transit investment.

LRT in the Banfield Freeway/Burnside Street corridor, the preferred alternative, provides a high level of transit service between downtown Portland, east Portland, and east Multnomah County destinations. While the preferred alternative and Alternative 5-2, LRT in the Banfield Freeway/Division Street corridor, provide the best transit service to locations east of I-205, the preferred alternative imposes the least disruptive impacts on east Multnomah County locations.

2.3.2.3 ECONOMICS

The LRT alternatives will offer the greatest support to the economic vitality of downtown Portland. LRT, by reducing the number of buses operating downtown, will reduce noise and traffic congestion. This in turn will enhance the attractiveness of the downtown and promote additional commercial and business development.

Although the initial capital cost is greater, the total transportation costs associated with the LRT alternatives are lower than those accruing under the No-Build condition and LCI Alternative 2a. Light rail is less expensive to operate than the bus-oriented alternatives, since fewer drivers are needed.

As discussed above, LRT vehicles have reserve capacity to handle surges in transit ridership. Since large increases in ridership can be accommodated without the addition of more vehicles or drivers, LRT is less susceptible to rising labor costs. The longer operational life of light rail vehicles compared to buses provides additional operational savings. Perhaps more importantly, future transportation savings will accrue from the LRT's ability to reduce 1990 congestion in the Banfield corridor through the promotion of transit ridership. This cumulative operational savings will roughly equal the local share capital investment in light rail within the first 7 years of operation (when compared to bus-oriented alternatives). Even greater savings will be realized when reductions in congestion resulting from the freeway improvements implemented under the Project are considered.

The HOV and Separated Busway alternatives require almost as much construction money as the preferred alternative, without achieving either the improvement in transit service or the savings in transit operating costs.

The costs of transit operations in east Portland and east Multnomah County will be lower with light rail than with any of the all-bus alternatives. Over the useful life of the light rail facility, these operating cost savings will offset the initial capital investment.

The LRT is better able than buses to handle unexpected surges in transit ridership that might occur if gasoline prices or availability change dramatically. While such effects are not included in patronage projections, should they occur, the operating cost savings of light rail improve even more dramatically.

The capital costs, total system cost, and 1990 total annual transit costs are less for the preferred alternative than for Alternative 5-2 (LRT Division Street alignment).

2.3.2.4 LAND USE

The preferred alternative is consistent with land use and transportation plans and policies. All LRT alternatives offer great opportunity to focus and enhance development and redevelopment of Portland and Multnomah County by promoting growth around transit stations. The preferred alternative offers the greatest development potential around stations of all LRT alternatives. Resultant compact growth patterns will increase transit effectiveness and reduce overall transportation costs.

2.3.2.5 SOCIOCULTURAL RESOURCES

The LRT alternatives will impose the least negative proximity effects on the downtown and neighborhoods along the Project route. By reducing the number of buses in these areas and the amount of "through" traffic on neighborhood streets, noise and air pollution will be reduced. Access to neighborhood institutions will be generally improved as will access for the transportation disadvantaged.

The preferred alternative will have less severe acquisition and relocation impacts than the HOV, Separated Busway, and LRT Alternative 5-2. The preferred alternative will also have less disruptive effects on neighborhood cohesion than Alternative 5-2.

2.3.2.6 AIR QUALITY

The preferred alternative will reduce air pollution compared to other alternatives, including No-Build.

2.3.2.7 NATURAL ENVIRONMENT

The preferred alternative will not impose significant impacts on the geologic, water quality, or biological characteristics of the region.

2.3.2.8 ENERGY

The LRT will reduce overall transportation energy requirements, compared to the other Project alternatives. Light rail vehicles would operate on electric power which is less subject to the cost and availability problems associated with petroleum energy sources.

The preferred alternative will consume slightly less total energy than the other LRT alternatives.

2.3.2.9 NOISE

Significant spot reductions in noise levels will occur downtown and along some neighborhood streets in east Portland and east Multnomah County under the preferred alternative.

2.3.3 Downtown Transit Alignment Decision

Tri-Met and the City of Portland conducted an extensive investigation of downtown alignment alternatives between October 1978, when the City Council selected Alternative 5-1(b) as the preferred alternative, and June 1979, when the City Council's downtown alignment decision was made. The alignments presented in the DEIS (see Section 7.6.2.1) were subsequently modified and extended. Alternative downtown alignments, as they were finally considered for selection, included: (1) the Mall alignment, (2) the Cross-Mall alignment, and (3) the 4th and Broadway alignment (Portland, Bureau of Planning 1979a).

The Mall alignment would enter downtown at the Steel Bridge and travel in both directions along Glisan Street to 5th and 6th Avenues. Light rail vehicles would either turn around at the transportation center, or would travel southbound on 5th Avenue and northbound on 6th Avenue to terminals at either Columbia, Mill, or Harrison Streets. The LRT would operate in a reserved lane, with the flow of traffic. A 3-lane mall design would be incorporated primarily because of its ability to accommodate a large number of light rail vehicles without decreasing the capacity of the bus mall.

Stations would be spaced approximately every 4 blocks along the mall and would be located on "soft blocks" to allow for the expansion of sidewalk space and the introduction of amenities when redevelopment occurs on that block.

The Mall alignment could also be operated against traffic (contra-flow) in a third mall lane or mixed with traffic in the bus passing lane. Contra-flow operation could require changes in the timing of the signal system which could add to traffic congestion.

The Cross-Mall alignment would enter downtown on a new ramp from the Steel Bridge and would travel in reserved lanes in both directions on 1st Avenue, to Morrison and Yamhill Streets. Light rail vehicles would travel on Morrison and Yamhill Streets to 9th and Park Avenues where the alignment would turn south to a station location near Portland State University.

The Cross-Mall alternative could be modified to allow for 2-way movement on either Morrison or Yamhill Streets. However, this would remove automobile access entirely from the street selected for the LRT alignment. The Cross-Mall alignment could also be modified to terminate at a station on 11th Avenue between Yamhill and Morrison Streets. This modification would result in reduced coverage of the downtown (especially Portland State University) and a longer route to the Macadam corridor.

The 4th and Broadway alignment would enter downtown from the Steel Bridge and travel in both directions on Glisan Street to 4th and 6th Avenues. Vehicles would then run with traffic on 6th Avenue (northbound) and against traffic on 4th Avenue. South of Burnside Street, the alignment would occupy the west lane of 4th and the east lane of Broadway Street, and operate against traffic to Columbia, Mill, or Harrison Streets.

This alternative could be modified to allow for different operating arrangements on 4th Avenue and Broadway Street or to allow for 2-way movement on either 4th Avenue or Broadway Street.

The Portland Bureau of Planning, in its Assessment of Alternative Alignments for Light Rail Transit in Downtown Portland of May 1979 (Portland, Bureau of Planning 1979a) recommended that the City Council select the Yamhill-Morrison Cross-Mall alignment ending at 11th Avenue for incorporation into the Project. This recommendation was based on the alignment's comparative effectiveness in supporting: (1) the adopted access policies for the downtown, (2) the adopted downtown land use and development concepts, (3) the future growth of transit ridership to and within the downtown, both from the Banfield as well as other corridors, and (4) the concepts of economic and efficient transit operations. The Cross-Mall alternative also resulted in the least disruptive construction impacts of all downtown transit alignments.

A detailed analysis of the downtown transit alignment alternatives, the criteria for selection of the preferred alignment, and the Portland Bureau of Planning recommendations to the Portland City Council are presented in Assessment of Alternative Alignments for Light Rail Transit in Downtown Portland (Portland, Bureau of Planning 1979a).

2.3.4 Additional Refinements to the Preferred Alternative

Several additional refinements were recommended for incorporation into Alternative 5-1(b) as a result of the decision-making process and follow-on design studies. Recommended refinements included:

- Establishing the eastern terminus of the Burnside LRT alignment along the Portland Traction right-of-way at a point located just east of Cleveland Avenue in Gresham.
- Establishing transit stations in Gresham at the Gresham Terminal (8th and Cleveland), Gresham Center (7th and Hood), and new Gresham City Hall (12th and Eastman) instead of the Gresham Fairgrounds area or at 1st and Burnside Street.
- Establishing transit stations in Sullivan Gulch at 42nd, 60th, and 82nd Avenues.

The refinements were ultimately incorporated as part of the preferred alternative as addressed in the FEIS (see Section 3.0).

3.0 DESCRIPTION OF THE PROPOSED PROJECT

3.1 INTRODUCTION

The Banfield Transitway Project entails the development of a transportation system along the Banfield Freeway/Burnside Street corridor capable of transporting high volumes of passengers. This proposed transportation improvement will consist of: (1) a light rail transit (LRT) system connecting downtown Portland with Gresham and (2) improvements to the existing Banfield Freeway between the I-5 and I-205 corridors (see Figure 1.1-1). The project description below will focus on the LRT system, proposed improvements to the Banfield Freeway, accessibility by patrons to the project facilities, the project schedule, and costs associated with project development. The Project study area has been subdivided for ease in presentation here and in Section 4.0 according to recognizable physical or civil delineations. The subdivision identifies 3 basic areas (Figure 3.1-1):

1. The downtown and Steel Bridge connection
2. East Portland, including
   a. Holladay Street
   b. the Banfield Freeway
   c. I-205
3. East Multnomah County.

East Portland and east Multnomah County together are known as the East Side.

3.2 THE LRT SYSTEM

3.2.1 General Description

Light rail is a modern form of streetcar capable of transporting large numbers of passengers along city streets or reserved rights-of-way. Light rail vehicles travel along tracks and are powered from overhead electrical wires. Such vehicles can either move singly or may be coupled into trains.

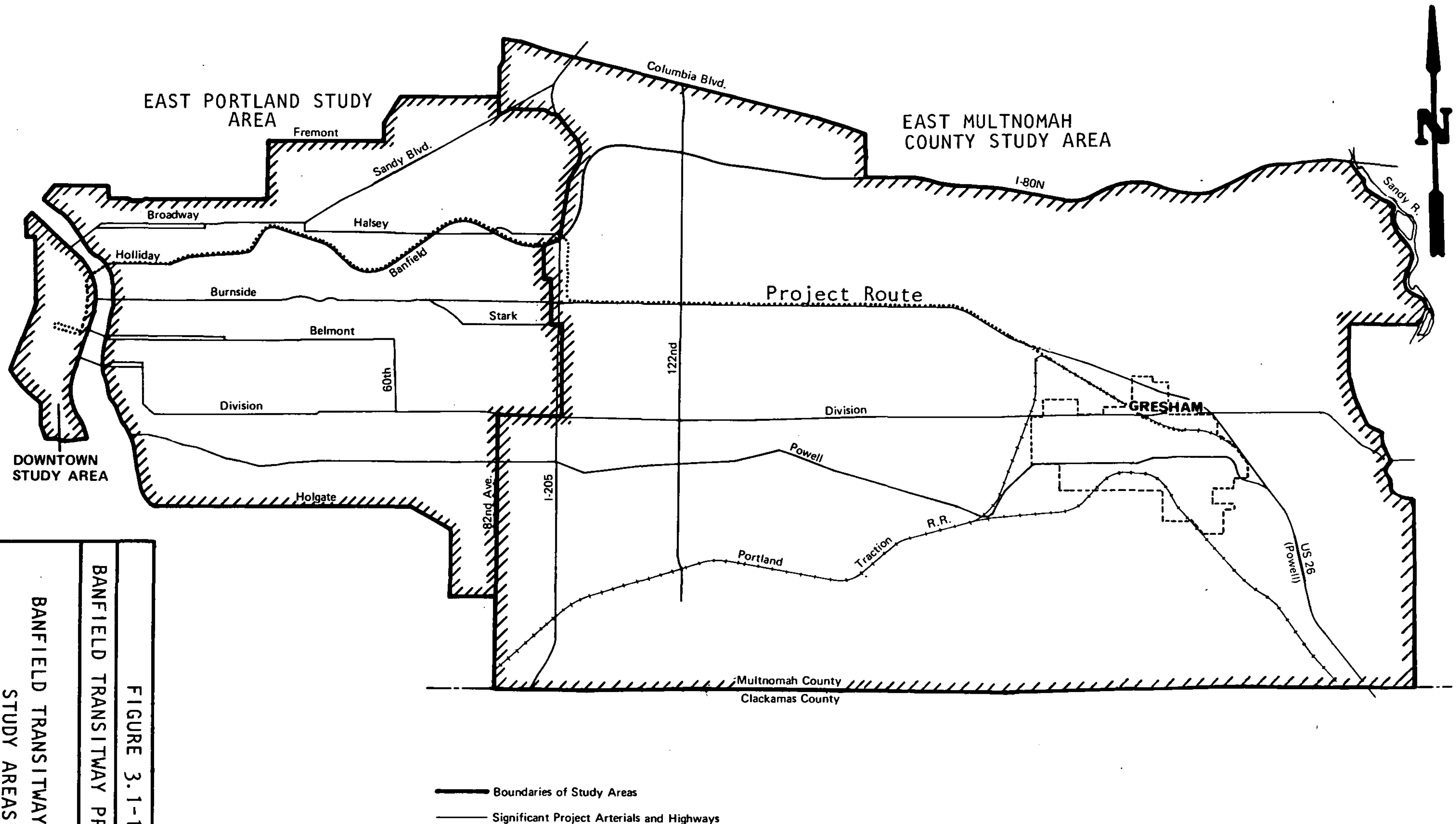


FIGURE 3.1-1

BANFIELD TRANSITWAY PROJECT FEIS

BANFIELD TRANSITWAY PROJECT
STUDY AREAS

The LRT system will consist of a high-quality trunk line 14.9 miles long, serving principal destinations between the system's western terminus at 11th Avenue in downtown Portland and its eastern terminus east of Cleveland Avenue on the Portland Traction Company right-of-way in Gresham. The line will be double track throughout with the exception of a single track section from Ruby Junction (near 199th Avenue) to the Gresham terminal and a single track loop on Morrison and Yamhill Streets in downtown Portland. The line will be served by a total of 29 transit stations representing 25 station access points in each direction. Approximately 80 percent of these stations will be connected with an expanded east Portland and east Multnomah County bus system. Seven of these stations will feature park-and-ride facilities. An LRT system maintenance and storage facility will be constructed near Gresham.

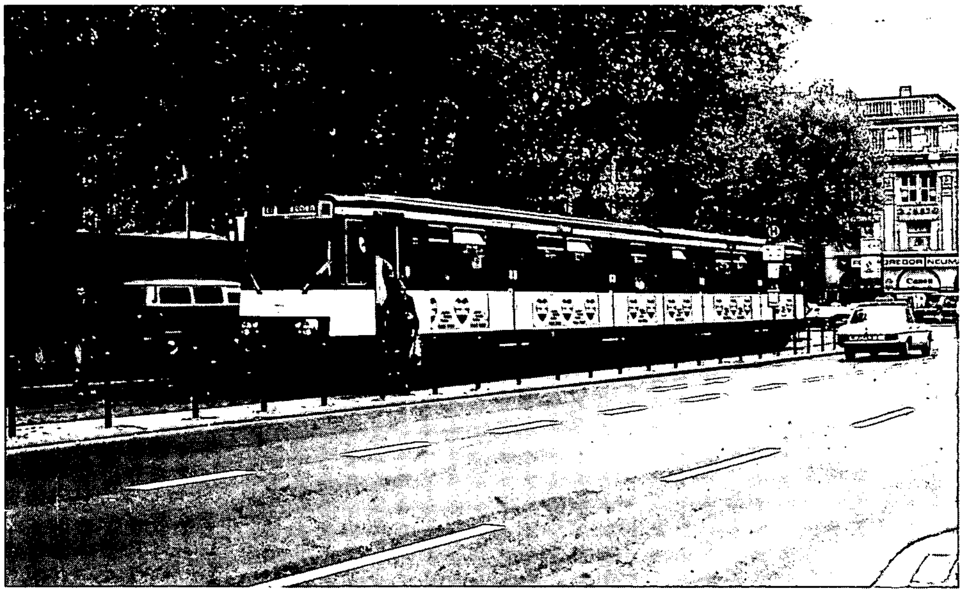
The LRT vehicle to be used on the Banfield Transitway Project has not been selected. A "Type B" vehicle was used for preliminary design work done for the project facilities (Tri-Met, Planning and Development Department 1977b). This 6-axle vehicle, developed by Duwag, is one of the larger vehicles available that could be operated in a two-car train in downtown Portland without overhanging the curb sections when turning. A 2-car train employing Type B vehicles would be 184 feet (56 meters) long. Typical scenes of vehicles used in LRT systems in operation, including the Duwag "Type B" vehicle, are illustrated in Figure 3.2-1.

3.2.2 Alignment

3.2.2.1 DOWNTOWN AND THE STEEL BRIDGE CONNECTION

The downtown segment of the proposed LRT system is that portion of the proposed LRT system west of I-5, including the downtown and the Steel Bridge. The alignment will utilize a Cross-Mall configuration to serve downtown destinations and connect with the Portland Mall (see Figure 3.2-2).

A new ramp will be constructed from the west end of the Steel Bridge down to street grade on 1st Avenue. A double track will provide



a) DUWAG TYPE B VEHICLE USED FOR PRELIMINARY DESIGN

b). LRT AND AUTOMOBILES SHARING DOWNTOWN STREETS

FIGURE 3.2-1A
BANFIELD TRANSITWAY PROJECT FEIS
TYPICAL SCENES OF AN LRT SYSTEM

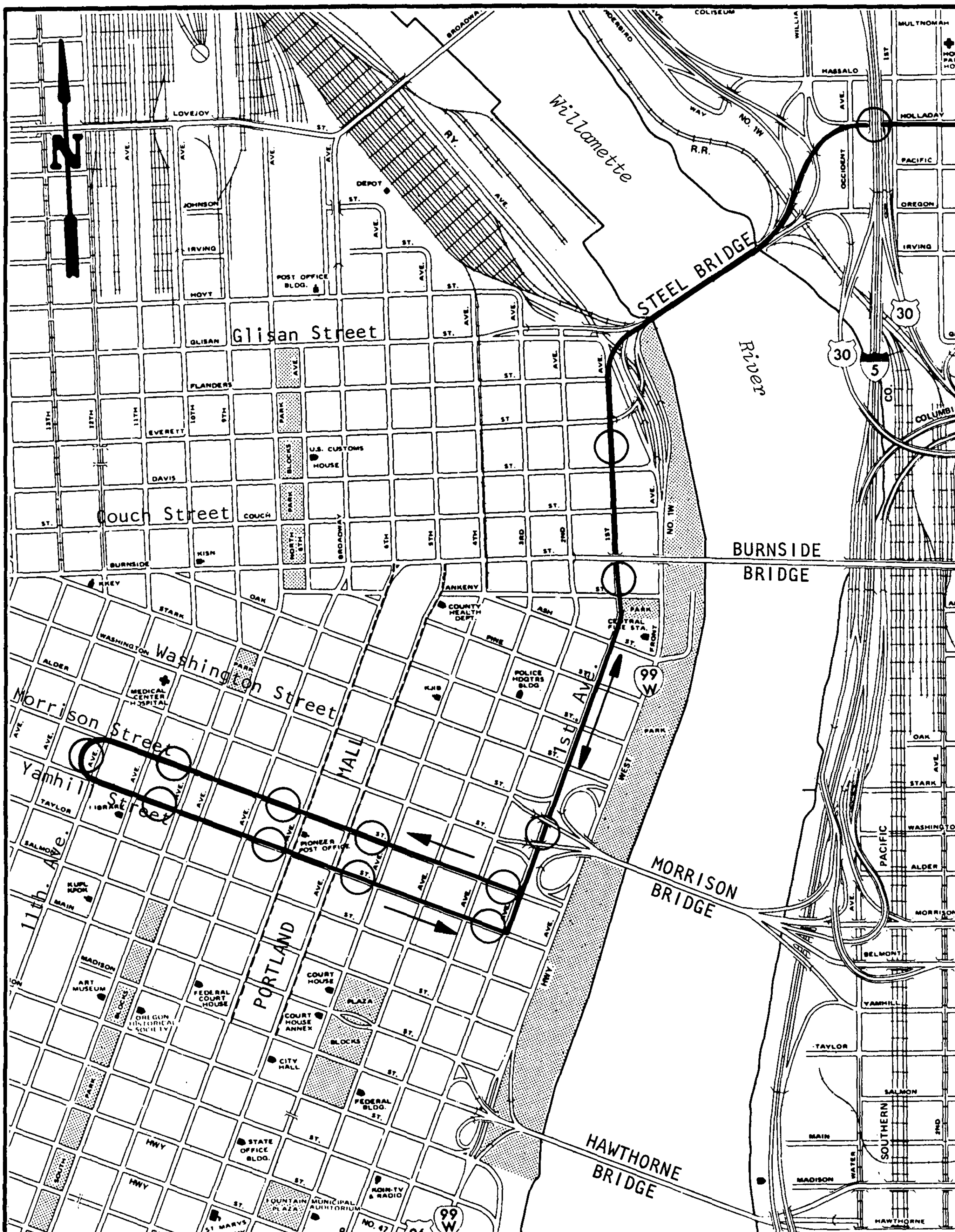
c) LRT SYSTEM IN FREEWAY SETTING

d) LRT SYSTEM IN SUBURBAN AREA

FIGURE 3.2-1B

BANFIELD TRANSITWAY PROJECT FEIS

TYPICAL SCENES OF AN LRT SYSTEM



LEGEND:

○ TRANSIT STATION LOCATIONS

— LRT ALIGNMENT

FIGURE 3.2-2

BANFIELD TRANSITWAY PROJECT FEIS

DOWNTOWN AND
STEEL BRIDGE ALIGNMENT
AND
TRANSIT STATION LOCATIONS

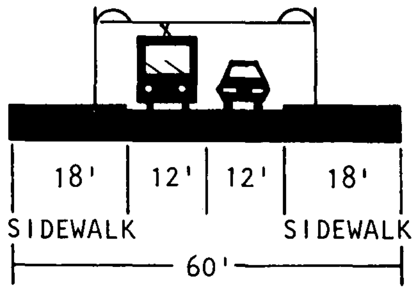
2-way travel along 1st Avenue to Morrison Street, where the alignment will split into a 1-way single track loop using Yamhill and Morrison Streets to 11th Avenue. A single southbound track will be constructed on 1st Avenue between Morrison and Yamhill Streets. A terminal station will occupy the eastern half of the block formed by 11th and 12th Avenues and Yamhill and Morrison Streets.

The direction of LRT travel within the downtown loop will be with the flow of conventional (automobile/truck) traffic along both Yamhill and Morrison Streets. The north side of Yamhill Street and the south side of Morrison Street will be used for the LRT tracks. At least one lane will be reserved for conventional traffic throughout the Yamhill/Morrison Street loop, including Yamhill Street between 1st and 2nd Avenues, where through traffic will be prohibited because of the turning movements of the LRT vehicles. Local traffic will be permitted on Yamhill Street in the block from 1st to 2nd Avenues. A typical cross section of the LRT/street system on the Yamhill/Morrison Street loop is presented in Figure 3.2-3a.

One lane will be reserved for conventional traffic along the LRT alignment on 1st Avenue between Yamhill and Morrison Streets will be allowed in one lane for local circulation. Through traffic will be discouraged. Conventional traffic will not be permitted to use 1st Avenue between Washington and Morrison Streets. A LRT/pedestrian mall will be constructed in these locations. A typical cross section of the LRT/street alignment along 1st Avenue is presented in Figure 3.2-3b.

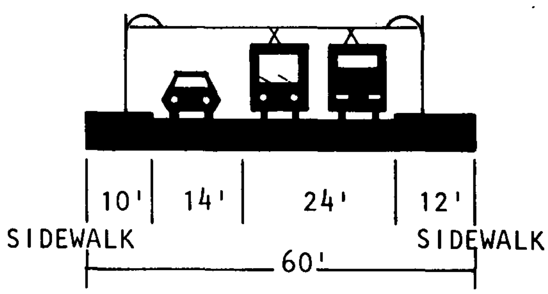
The LRT will enter and depart the downtown segment via a new ramp from 1st Avenue to the Steel Bridge. The 2 tracks of the LRT alignment will cross the Steel Bridge in the center 2 lanes, which at one time were used by street cars. The bridge deck will be paved to permit shared lanes with conventional traffic. On the eastern end, the alignment will use an existing ramp connecting the Steel Bridge with Holladay Street (see Figure 3.2-2).

a.



YAMHILL STREET (LOOKING EAST)

b.



1st. AVENUE
SOUTH OF BURNSIDE STREET (LOOKING NORTH)

NOTE: THESE SKETCHES ARE SCHEMATICS ONLY AND ARE NOT TO SCALE.

FIGURE 3.2-3

BANFIELD TRANSITWAY PROJECT FEIS

TYPICAL CROSS-SECTIONS OF THE LRT ALIGNMENT IN DOWNTOWN PORTLAND

A total of 12 LRT stations will serve the downtown segment of the LRT system, 8 in each direction (see Figure 3.2-2). General descriptions of these stations are contained below in Section 3.2.3.

3.2.2.2 EAST PORTLAND

The east Portland segment of the LRT system will extend from the Holladay Street connection on the west to the Interstate-205 (I-205) corridor to the east (see Figure 3.2-4). The length of this segment is approximately 5 miles. The LRT will consist of a double-track (2-direction) configuration along this entire segment.

3.2.2.2.1 Holladay Street

As stated above, an existing ramp will connect the LRT alignment on the Steel Bridge with Holladay Street. The ramp passes under the I-5 Freeway in the vicinity of Holladay Street and Occident Avenue. The LRT alignment will extend along the southern side of Holladay Street eastward to Union Avenue where the tracks will cross over to the northern side of Holladay Street. The LRT tracks will continue eastward on the northern side of Holladay Street to the vicinity of 16th Avenue. As in the downtown, operation of the LRT on Holladay Street will be in reserved lanes that are not shared with other traffic. A ramp will be constructed to connect the Holladay Street LRT alignment to an exclusive, grade separated right-of-way along the northern edge of the Banfield Freeway (see Figure 3.2-4).

Two westbound travel lanes for conventional traffic will remain the length of Holladay Street. The LRT and conventional traffic lanes will be separated by an at grade, curb high divider, except at intersections. A typical cross section of the LRT/street alignment along Holladay Street is presented in Figure 3.2-5a.

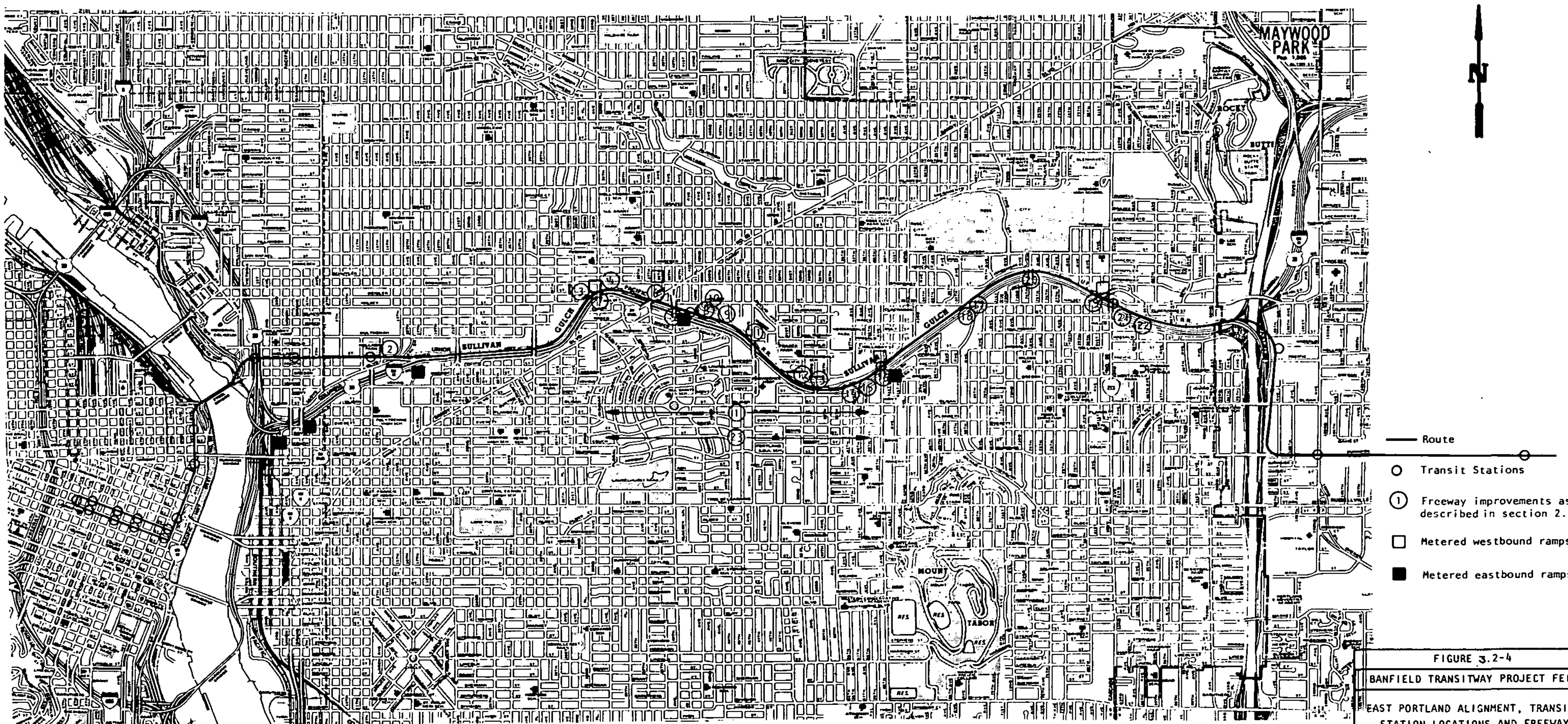
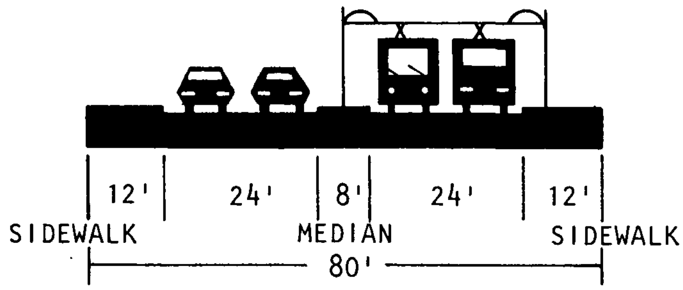


FIGURE 3.2-4

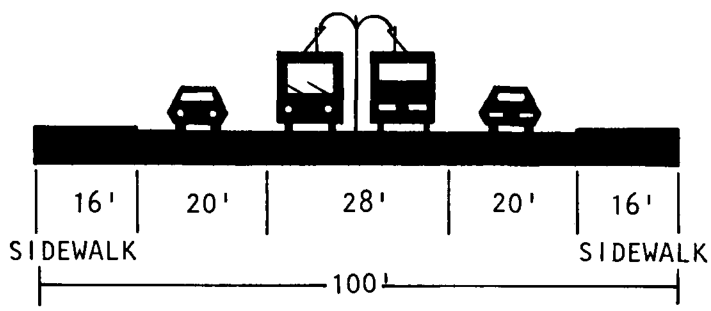
BANFIELD TRANSITWAY PROJECT FEIS

EAST PORTLAND ALIGNMENT, TRANSIT STATION LOCATIONS AND FREEWAY IMPROVEMENTS a.



HOLLADAY STREET EAST OF UNION AVENUE
(LOOKING WEST)

b.



BURNSIDE STREET

NOTE: THESE SKETCHES ARE SCHEMATICS ONLY
AND ARE NOT TO SCALE.

FIGURE 3.2-5

BANFIELD TRANSITWAY PROJECT FEIS

TYPICAL CROSS-SECTIONS OF THE LRT ALIGNMENT ON HOLLADAY AND BURNSIDE STREETS

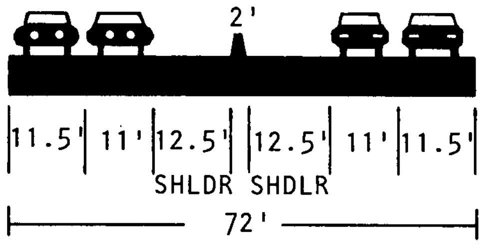
3.2.2.2.2 Banfield Freeway and I-205

The LRT alignment will be in its own right-of-way adjacent to the Banfield Freeway from 16th Avenue eastward for approximately 4 miles to the vicinity of the I-205 corridor near Gateway Shopping Center (see Figure 3.2-4). Specifically, the reserved LRT right-of-way will parallel the northern edge of the Banfield Freeway at grade between the freeway and the Union Pacific Railroad.

A lift-out ramp will convey the LRT tracks over the I-205 and Banfield Freeways to the east side of the I-205 corridor. A major transit focal point that interchanges bus and LRT passengers will be created adjacent to the Gateway Shopping Center The LRT tracks will then extend in a southerly direction along its reserved right-of-way paralleling the eastern edge of I-205 for approximately one-half mile to Burnside Street.

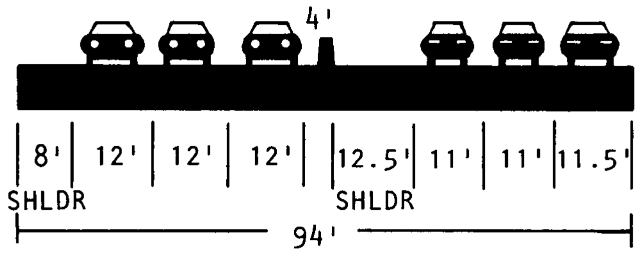
The portion of the LRT alignment paralleling the Banfield Freeway will be 29 feet wide. Improvements made to the Banfield Freeway will result in a total freeway/LRT right-of-way approximately 130 feet in width except at stations, which will be wider. These improvements, which include widening and relocation of a segment of the existing freeway are discussed under the Freeway Improvements section (Section 3.3) below. Typical cross sections of the LRT/Banfield Freeway right-of-way are presented in Figure 3.2-6.

A total of 4 stations will serve the Banfield Freeway/I-205 segment of the LRT system (see Figure 3.2-4). A general description of these stations is presented in Section 3.2.3.



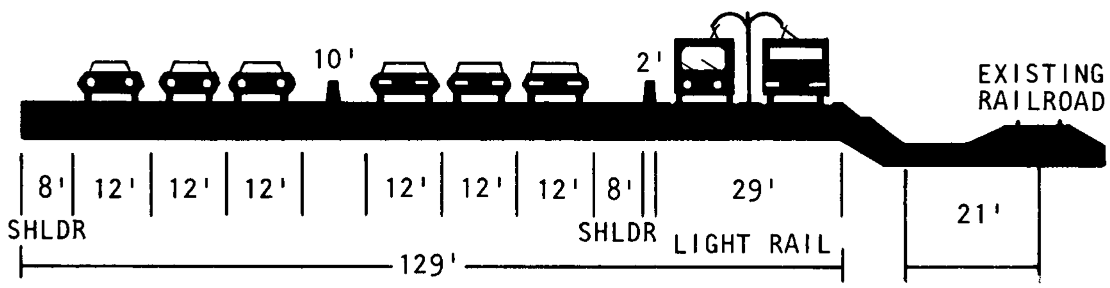
a.

EXISTING 37th. AVENUE TO I-205



b.

EXISTING I-5 TO 37th. AVENUE (LOOKING WEST)



c.

PROPOSED BANFIELD FREEWAY (LOOKING WEST)

NOTE: THESE SKETCHES ARE SCHEMATICS ONLY
AND ARE NOT TO SCALE.

FIGURE 3.2-6

BANFIELD TRANSITWAY PROJECT FEIS

EXISTING CONDITIONS AND TYPICAL CROSS-SECTIONS OF THE LRT ALIGNMENT AND FREEWAY IMPROVEMENTS ON THE BANFIELD FREEWAY

3.2.2.3 EAST MULTNOMAH COUNTY

One-half mile south of Gateway Shopping Center, the LRT alignment will leave the I-205 corridor, turn east and enter the center of a reconstructed Burnside Street (see Figure 3.2-7). The LRT alignment along Burnside Street will extend from the vicinity of 97th Avenue eastward to 199th Avenue, or a distance of approximately 5 miles. At 199th Avenue, the alignment will leave Burnside Street and share the Portland Traction Company right-of-way eastward. The eastern terminus of the LRT alignment will be located just southeast of the intersection of Cleveland Avenue and 8th Street in Gresham.

The LRT alignment along Burnside Street will consist of a double track configuration in the center of the rebuilt street (see Figure 3.2-5). The existing right-of-way will accommodate the LRT and Burnside Street except for transit station locations where some additional right-of-way may be required. The alignment will narrow to a single track along the Portland Traction Company right-of-way which will be placed to the south of the Portland Traction Company tracks on a separate roadbed section. However, a right-of-way will be acquired for a second track.

The LRT alignment will continue to share the Portland Traction Company right-of-way on a single track through Gresham to the eastern terminus of the line, just east of the downtown. The alignment will pass within several blocks of City Hall and Gresham Hospital.

A total of 10 LRT stations will serve the east Multnomah County segment of the LRT system (see Figure 3.2-7). A general description of these stations is presented below in Section 3.2.3.

3.2.3 Transit Stations

Transit stations will be along the length of the LRT route (see Figures 3.2-2, 3.2-4, and 3.2-7). Station sites were selected on the basis of their conformity with the following criteria:

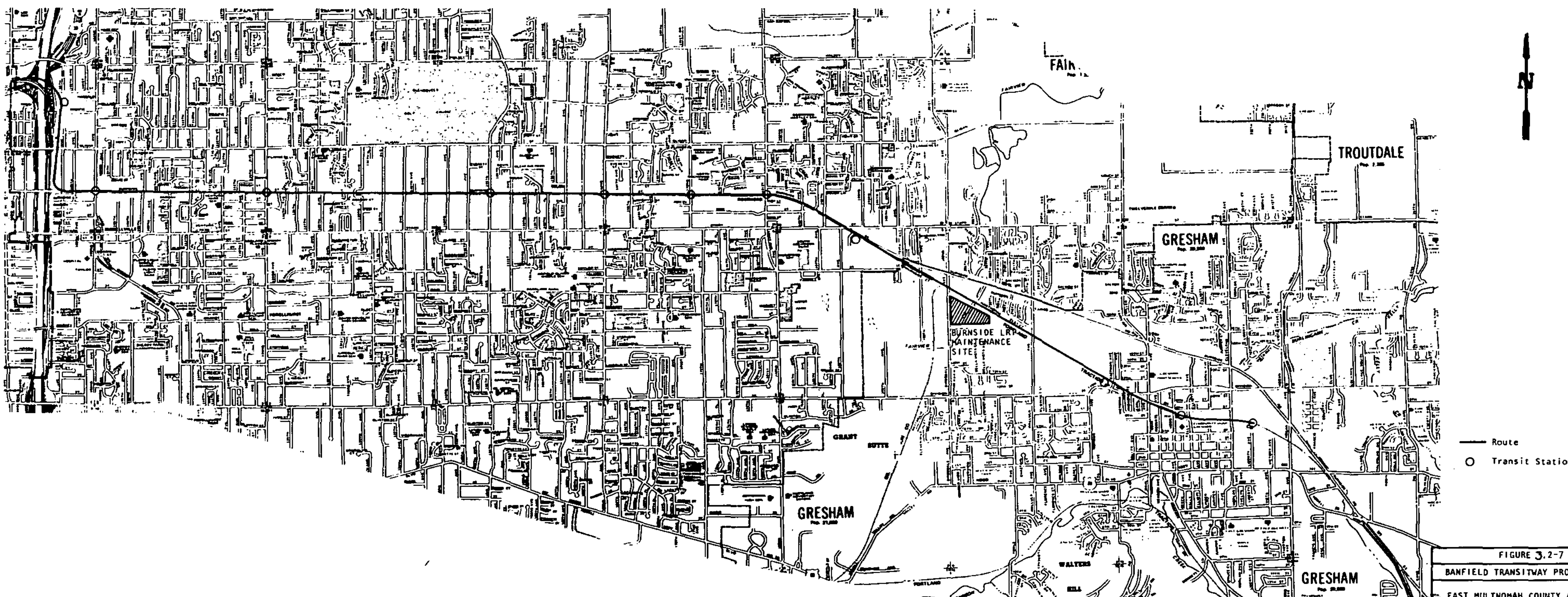


FIGURE 3.2-7

BANFIELD TRANSITWAY PROJECT FEIS

EAST MULTNOMAH COUNTY ALIGNMENT, AND TRANSIT STATION LOCATIONS

- proximity to areas with high potential for generating transit trips (such as commercial, high-density residential and high employment developments) both now and up to 1990
- logical connection points to local service
- minimization of out-of-direction travel
- availability of existing right-of-way
- minimization of displacement where right-of-way was required
- pedestrian access
- minimization of automobile conflicts
- minimization of environmental impacts
- compatible development with adjacent land and community objectives

The vast majority of LRT stations will be simple in design and construction. Stations will be, for the most part, street- or sidewalk-level platforms with shelters to protect waiting passengers from the weather, together with benches, lighting, and informational signs. Three different types of stations will be constructed to meet ridership requirements. The broad classification of station and platform types as indicated in Table 3.2-1 are described below.

Type A: Major Activity Service - Station areas which will accommodate high volume and automobile/bus/pedestrian transfers.

Type B: Minor Activity Service - Station areas which will accommodate moderate volume and some automobile/bus/pedestrian transfers with adequate provision for high-peak demands.

Type C: Local Area Service - Station areas which will accommodate moderate volume patronage and little or no transfer traffic.

Station features for each station type will reflect ridership levels of the LRT system at that location. All will provide aids for the handicapped. The exact combination of features to be incorporated into each station will vary with location, spacing between stations, and projected ridership volume.

Downtown station platforms will generally consist of concrete extensions of existing sidewalks adjacent to the track rights-of-way.

TABLE 3.2-1

LRT STATION LOCATION AND TYPE

Designation	Location	Type[b]	Use[a]: Walk-On	Use[a]: Bus Transfer	Use[a]: Kiss-and-Ride[c]	Use[a]: Park-and-Ride Spaces[d]
	Downtown and Downtown Connection					
Yamhill	Yamhill Street between 1st and 2nd Avenues	B	H	H	--	--
Yamhill	Yamhill Street between 4th and 5th Avenues	A	H	H	--	--
Yamhill	Yamhill Street between 6th and Broadway Avenues	A	H	H	--	--
Yamhill	Yamhill Street between 9th and 10th Avenues	B	H	H	--	--
Eleventh	11th Avenue between Yamhill and Morrison Streets	B	H	H	--	--
Morrison	Morrison Street between 10th and 9th Avenues	B	H	H	--	--
Morrison	Morrison Street between Broadway and 6th Avenues	A	H	H	--	--
Morrison	Morrison Street between 5th and 4th Avenues	A	H	H	--	--
Morrison	Morrison Street between 2nd and 1st Avenues	B	H	H	--	--
First	1st Avenue between Alder and Washington Streets (both sides)	B	H	H	--	--
First	1st Avenue between Ash and Ankenny Streets (both sides)	B	H	H	--	--
First	1st Avenue between Davis and Everett Streets (both sides)	B	H	H	--	--

(a) L = light
M = moderate
H = heavy
VH = very heavy
(b) See text on preceding page.
(c) Commuters dropped off in the vicinity of the station.
(d) Commuters parking automobiles at the stations.

TABLE 3.2-1

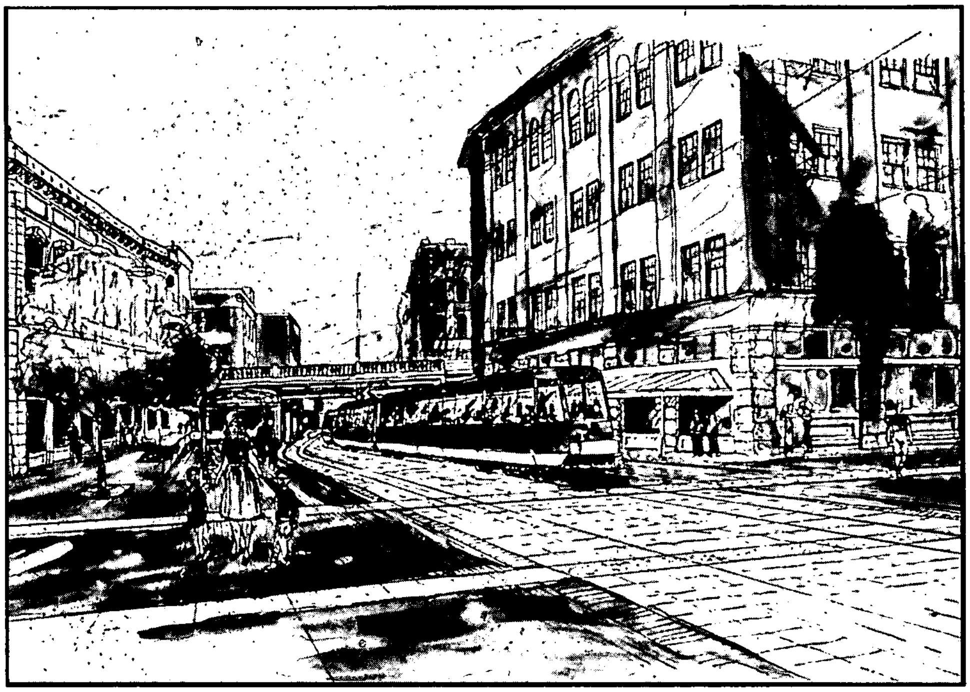
Designation	Location	Type[b]	Use[a] Walk-On	Bus Transfer	Kiss-and-Ride[c]	Park-and-Ride Spaces[d]
	East Portland					
Coliseum	Holladay Street between Occident and First Avenues	B	L	H	L	--
Union/Grand	Holladay Street between Union and Grand Avenue	B	H	H	L	--
Lloyd Center	Holladay Street at Holladay Park	A	VH	H	L	--
Hollywood	Banfield right-of-way near 39th Avenue	A	H	H	L	--
60th	Banfield right-of-way and 60th Avenue Overpass	C	H	M	H	--
82nd	Banfield right-of-way and 82nd Avenue Overpass	C	H	L	M	--
Gateway	Gateway Center at 97th Avenue and Multnomah Street	A	H	VH	M	418
	East Multnomah County					
102nd	Burnside Street at 102nd Avenue	C	M	L	L	--
122nd	Burnside Street at 122nd Avenue	B	L	L	M	250
148th	Burnside Street at 148th Avenue	C	L	L	L	--
162nd	Burnside Street at 162nd Avenue	C	L	--	L	250
172nd	Burnside Street at 172nd Avenue	C	L	--	M	--
181st	Burnside Street at 181st Avenue	B	H	L	M	250
192nd	South of Stark Street at 192nd Avenue	C	M	L	L	300
City Hall	11th Drive and Eastman Avenue	A	M	L	H	185
Gresham Hospital	7th Street and Hood Avenue	A	H	H	H	--
Gresham Terminal	Southeast of intersection of 8th Street and Cleveland Avenue	A	M	--	H	425

Station platforms along the Holladay Street segment generally will consist of platforms facing the sidewalk on the north side of Holladay Street to provide boarding for westbound riders, and curb high facing platforms between Holladay Street and the track right-of-way for eastbound riders. Because of the track alignment and station design, no significant noise or aesthetic impacts will occur to Holladay Park. Stations along the LRT right-of-way adjacent to the Banfield Freeway will consist of island platforms located between the westbound and eastbound tracks. Stations along the east Multnomah County segment from I-205 to Gresham will be curb high platforms between the light rail tracks and the Burnside automobile lane to facilitate passenger loading and unloading (see Figure 3.2-8).

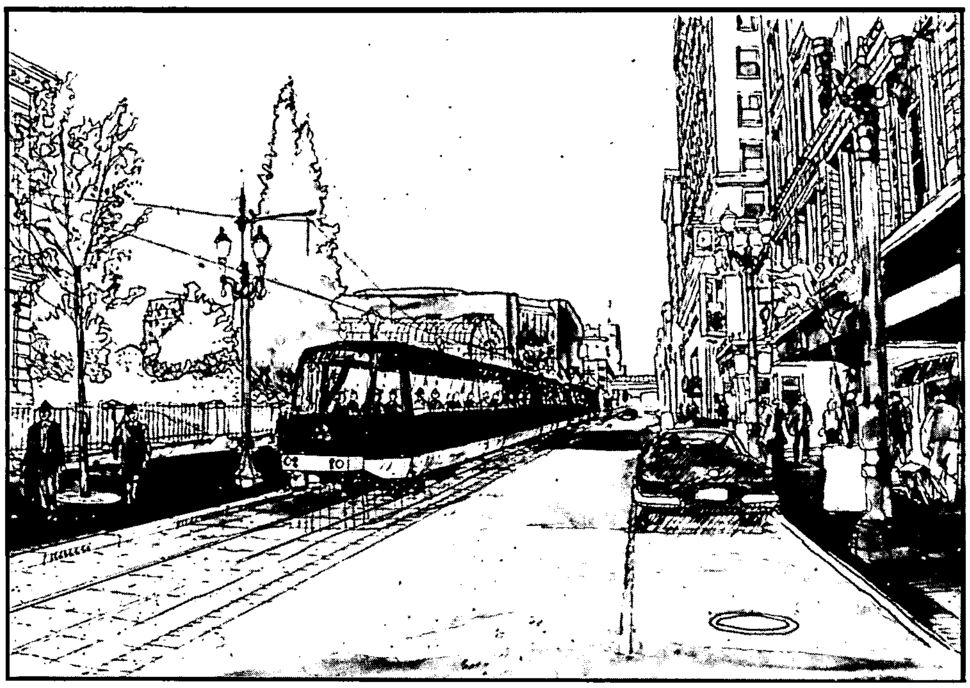
Some stations will be more complex because of their level of use and the physical components of the LRT system. This is particularly true for the downtown terminal, Hollywood and Gateway stations, stations along the Banfield Freeway in the Sullivan Gulch area, and 2 stations in Gresham: Gresham Hospital and the terminal. The downtown Portland and Gresham terminal stations will have storage tracks to accommodate LRT vehicles.

Two transit stations in Sullivan Gulch will be split level. The 60th and 82nd Avenue overpasses will be widened to provide for bus transfers and automobile pick up and delivery. Patrons will access the LRT system below from the overpass using elevators and stairways. At the lower level, the station will be at grade between the LRT tracks (see Figure 3.2-8c). At the Hollywood station a major at-grade bus transfer station will be located north of the Banfield Freeway and will be connected to the at-grade LRT station by a pedestrian sky bridge which crosses the freeway.

A major station will be located at Gateway Shopping Center. The Gateway Station will serve a variety of functions (see Table 3.2-1) including provision of the closest park-and-ride to downtown Portland. To meet patronage forecasts, a long LRT line will run from the downtown to Gresham, while a short LRT line will run from the downtown to the Gateway Station. Therefore, the design of the station includes a turnback loop and a storage track for the LRT vehicles.



a) 1st. AVENUE AT ANKENNY STREET

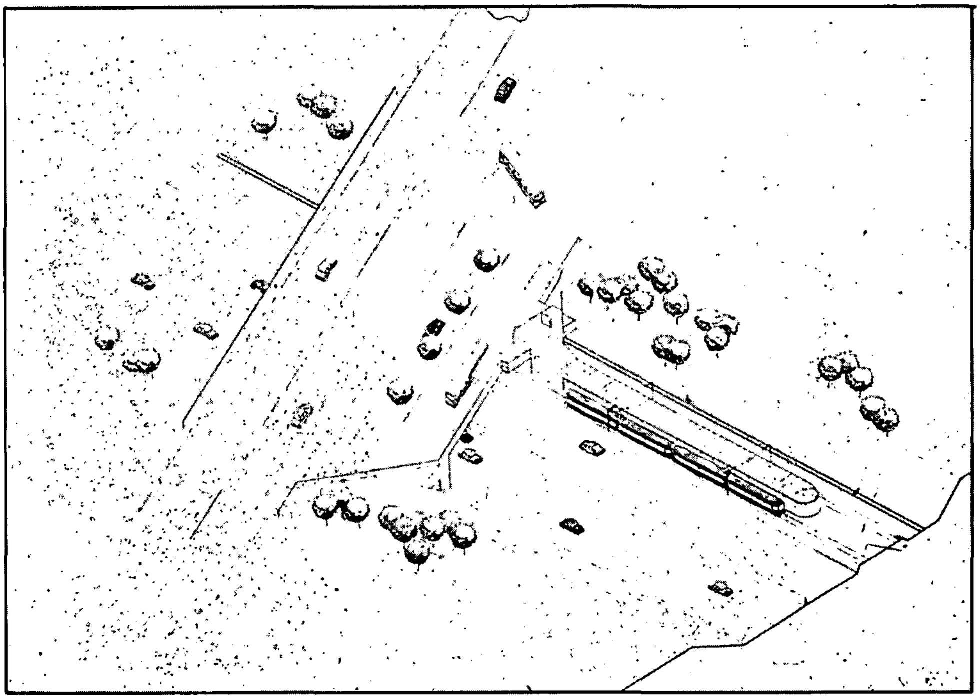


b) MORRISON STREET (LOOKING WEST)

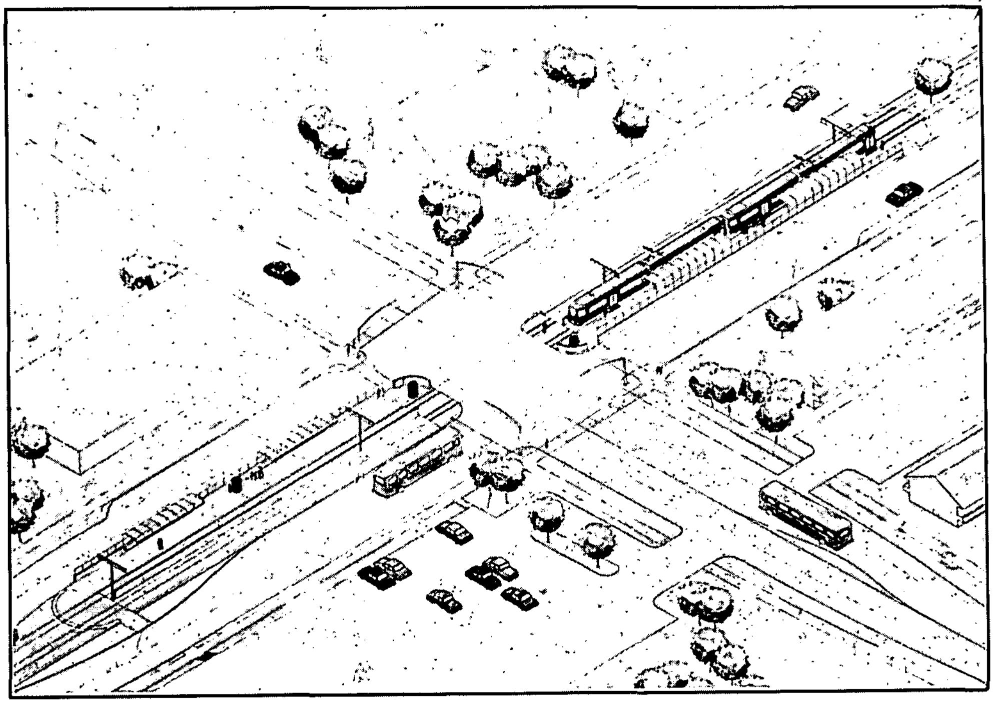
FIGURE 3.2-8A

BANFIELD TRANSITWAY PROJECT FEIS

PROPOSED LRT TRANSIT STATIONS AT REPRESENTATIVE LOCATIONS



c) BANFIELD FREEWAY AT 82nd AVENUE



d) BURNSIDE STREET AT 162nd AVENUE

FIGURE 3.2-8B

BANFIELD TRANSITWAY PROJECT FEIS

PROPOSED LRT TRANSIT STATIONS AT REPRESENTATIVE LOCATIONS

3.2.4 Maintenance and Storage Facility

A light rail maintenance and storage facility covering approximately 11 acres will be located in the Gresham area.* The facility will consist of a car barn with maintenance bays, workshop, machine shop, maintenance pits, wash racks, a gantry for maintenance of roof-mounted equipment and outside storage and maintenance tracks. The final design of the maintenance and storage facility will depend upon the type of vehicle employed in the system.

3.2.5 Service Characteristics

The LRT line will be designed to provide service between downtown Portland and destinations in east Multnomah County for a 19-hour period each day. The 1990 service plan calls for 10-minute frequency during the day and service at 15-, 20-, or 30-minute intervals as appropriate in the early morning and the late evening periods. Between downtown Portland and Gateway, 5-minute intervals will be provided during the peak hours.

The LRT service is planned to provide a 20-minute trip from downtown Portland to Gateway, and a 38-minute trip from downtown Portland to downtown Gresham. Speeds on the rail line will vary from about 15 mph in downtown Portland, up to 45 mph along Burnside Street, and up to 55 mph along the Banfield Freeway. The overall average speed, including stop time, will be about 23 mph. The proposed service is designed to provide seats for all passengers except during peak periods. Vehicles will be operated singly or in trains of 2 cars each, as dictated by passenger loadings at various times of the day.

Access to the Project facilities via automobile, bus, pedestrian, and bicycle is discussed in Section 3.4 below.

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*Since the development of the Project map, the site depicted in Figure 1.1-1 has been moved to a location immediately to the west of the Portland Traction Company rail line and Burnside Court, as shown in Figure 4.10-1.

3.3 FREEWAY IMPROVEMENTS

The Banfield Freeway will be reconstructed between the I-5 and I-205 corridors (see Figure 3.2-4). Minor reconstruction will occur between I-5 and 33rd Avenue. This will include the addition of a 4th lane westbound from 37th to 16th Avenues. Ramp metering will be provided at all on-ramps to control the injection of traffic to the freeway (see Figure 3.2-4). This will permit the controlling of traffic volumes entering the Banfield Freeway during peak hours, thereby maintaining smooth traffic flow conditions and providing more efficient freeway travel. Reconstruction between 33rd Avenue and I-205 will entail widening the Banfield Freeway from its present 4-lane configuration with HOV lanes in some sections (see Figure 3.2-6a and b) to a 6-lane configuration with shoulders (see Figure 3.2-6c). Other freeway improvements include the construction, reconstruction, or realignment of overpasses and on- and off-ramps. Freeway improvements subject to final design, shown on Figure 3.2-4, include:

1. Constructing retaining walls throughout the Project between the freeway and the railroad to establish the LRT area and maintain the 21-foot minimum clearance requirement for the railroad.
2. Construction a new LRT ramp from Holladay Street to the Banfield Freeway between 13th and 16th Avenues.
3. Constructing a new eastbound off-ramp from the Banfield Freeway to 33rd Avenue.
4. Reconstructing the westbound on-ramp from 33rd Avenue to the Banfield Freeway.
5. Constructing new freeway on- and off-ramps at 39th Avenue on the south side of the Banfield Freeway.
6. Reconstructing the Sandy Boulevard overpass and westbound on-ramp to provide space for the LRT.
7. Replacing and lengthening the 39th Avenue structure to accommodate freeway widening.
8. Reconstructing the 42nd Avenue pedestrian overpass.
9. Constructing a new westbound off-ramp from the Banfield Freeway to 44th Avenue.

10. Modifying Halsey Street between 44th Avenue and 39th Avenue.
11. Reconstructing and lengthening the 47th Avenue overpass.
12. Reconstructing the connection between Irving and 52nd Avenue.
13. Reconstructing and lengthening the 53rd Avenue overpass.
14. Reconstructing the off-ramp eastbound from the Banfield Freeway to 57th Avenue.
15. Reconstructing the on-ramp and associated overpass structure to connect 58th Avenue northbound to westbound Banfield Freeway.
16. Replacing and lengthening the 60th Avenue overpass.
17. Replacing and lengthening the Halsey Street at 68th Avenue overpass.
18. Realigning eastbound off-ramps from the Banfield Freeway to Halsey Street to accommodate the freeway widening.
19. Restructuring and lengthening the Halsey Street at 81st Avenue overpass.
20. Restructuring and lengthening the 74th Avenue overpass.
21. Replacing and lengthening the 82nd Avenue overpass.
22. Reconstructing the eastbound off-ramp from the Banfield Freeway at 82nd Avenue to connect with Multnomah Street.
23. Constructing noise barriers and adding additional lighting.

It will be necessary to relocate approximately 65 existing family dwelling units and 13 commercial establishments immediately adjacent to the south edge of the existing freeway right-of-way in the vicinities of 33rd Street, Sandy Boulevard, 39th Street, 47th Street, the 5100 block of Irving Street, and along Hoyt Street between 53rd and 58th Avenues to provide for planned transit and freeway improvements.

3.4 ACCESS TO PROJECT FACILITIES

The Banfield Transitway Project improvements provide for facilitating automobile, bus, pedestrian and bicycle access to the completed project facilties. These improvements include the incorporation of "park-and-ride" and "kiss-and-ride" facilities* at stations located at Gateway, 122nd, 162nd, 181st, and 192nd Avenues, City Hall (Gresham), and Gresham terminal (see Figures 3.2-4 and 3.2-7, and Table 3.2-1).

Tri-Met bus service will be substantially modified to serve the LRT line. Feeder bus lines will be established and/or augmented to provide regular service to stations along the entire LRT alignment and improve north/south crosstown services. To minimize the inconvenience of bus/LRT transfer, all feeder lines will employ a timed-transfer concept at points of intersection with the light rail line; that is, buses will wait at designated locations near LRT stations to ensure connection of transfers with LRT vehicles. Application of this concept will be particularly important in early morning and evening hours when service frequencies (and, hence, waiting times) are longer. Major bus connection points occur at the Pioneer Square Park (next to the Transit Mall) in the downtown, at the Coliseum and Lloyd Center stations, at 42nd Avenue in Hollywood, and at the Gateway and Gresham Hospital stations.

Twelve cross streets will remain open along Burnside Street once the LRT is operational: 102nd, 113th, 122nd, 139th, 148th, 162nd, 172nd, 181st Avenues, Stark Street, 199th, 202nd, and Wallula Avenues.**

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*Park-and-ride facilities will permit commuters to park private automobiles at LRT facilities. These facilities will consist of paved parking areas and pedestrian access from parking areas to the LRT station. Kiss-and-ride facilities will permit the dropping off of commuters in the vicinity of LRT stations. These facilities will consist of drop-off lanes and pedestrian access from these lanes to the LRT station.

**Tri-Met, in conjunction with neighborhood associations, is currently studying the potential barrier effects of the Project. As a result of this effort, additional cross streets may be designated during final Project design.

Generally, these cross streets are spaced at 1/2-mile intervals. Traffic will only be able to cross Burnside Street at these cross streets. Where cross traffic is eliminated, cars will be able to make right turns only to and from Burnside Street. Many of the side streets connect to Glisan Street, 1/4 mile north of Burnside Street, or Stark Street, 1/4 mile south of Burnside Street. Streets that connect only to Burnside Street would require that cars turn right and then select a route that corresponds to their direction of travel. This will have some impact on local circulation and, therefore, access to the project facilities from certain locations (see Section 4.2). However, many of these cross streets will provide direct access to stations and as such will serve as collector streets for automobile and bus traffic bound for LRT park-and-ride and kiss-and-ride facilities.

Pedestrian and bicycle facilities will be developed in the vicinity of those stations where such modes of travel are desirable or feasible. For example, the downtown segment of the LRT system will be oriented to the pedestrian user. As discussed above, downtown stations will essentially be extensions of existing sidewalks along 1st Avenue, Yamhill, and Morrison Streets. In addition, a pedestrian/bike path to be developed in conjunction with and parallel to the I-205 freeway could provide a means of access to the Gateway LRT station at the intersection of the Banfield Freeway and I-205. Pedestrian and bicycle access to stations could be developed along other arterials in the Banfield Freeway segment of the project (between I-5 and I-205). The arterials designated for pedestrian and bicycle use in Portland's arterial streets policy are also consistent with county plans.

Pedestrian access to LRT stations along Burnside Street will be primarily via crosswalks across Burnside Street and sidewalks leading to stations. Pedestrian crossings of the tracks will only be provided at certain locations between stations and intersections.

Pedestrian and traffic signalization near LRT stations will be phased to maximize the safety of system users and to facilitate access to the stations.

Access to the LRT system for handicapped persons will be provided through station design features. Station features will include elevator service from overpasses along the Banfield Freeway segment of the line to the waiting platforms below. A lift device incorporated into the vehicle itself or permanently fixed as part of the station design is being considered.

3.5 PROJECT SCHEDULE AND CONSTRUCTION

If federal approval is obtained, final design engineering, right-of-way acquisition, preparation of bidding documents, construction of the rail line and freeway improvements, and purchase of LRT vehicles will take an estimated 60 months. Providing federal approval is obtained by May 1980, the Banfield Transitway Project will be operational by early 1985. Certain segments of the proposed LRT line could be in operation prior to 1985.

Construction of Project facilities along the Banfield Freeway will be phased to minimize traffic impacts along the freeway corridor during the 48-month design and construction period. Existing traffic capacity of the freeway will be maintained.

The Project will not require the use of any unique construction methods. All Project construction will adhere to City of Portland guidelines restricting hours of work, maximum permissible noise levels, etc. During construction, disruption of traffic flow along the Banfield Freeway and streets affected by LRT construction will be minimized (see Section 4.2).

Construction of the freeway improvements associated with the Project will begin 12 to 18 months after Project initiation and will require 42 months to complete. Construction of the improvements will be done in segments of up to one mile in length, each segment consisting of one or more contract sections. Construction contracts will be awarded as soon as right-of-way acquisition and design are completed for a contract unit.

Early work will include reconstruction of the overcrossings and some associated approach construction. Precast bridge construction techniques will be utilized where possible to reduce construction times and minimize impacts to the freeway and arterial streets. The majority of the concrete bridge elements will be precast at a separate location, trucked to the site, and then set into place; the remaining elements will be poured in place at the bridge location. Following the overcrossing reconstruction contracts, work will commence on widening the remaining portions of the freeway. These sections will include construction of retaining walls and grading and paving of roadway sections to ultimate width.

Sullivan Gulch will require more excavation in the deeper sections while areas where the freeway is near grade of the adjacent topography will require less excavation. Most excavation work will be accomplished through use of power shovels. Haul loads will be confined to legal limits whenever hauling is done over portions of the roadway that will become part of the new roadway sections. This requirement will eliminate the use of heavy hauling equipment; trucks will be used instead of earthmovers. Other equipment used will include most types of normal construction equipment. Compressors and jackhammers will be required in some cases to handle demolition work. Pile driving equipment will also be required to construct some bridge footings.

Construction of LRT facilities in urban and suburban streets will be controlled to insure minimal disruption to normal traffic flow and access to buildings and properties along the work area. Only segments of a particular street will be closed at one time. During such closures, provisions will be made to handle diverted traffic.

Typical construction in the urban streets will begin with relocation and rehabilitation of utility services along and beneath the street, followed by reconstruction of the street and sidewalks. This will include necessary provisions for placement of the light rail trackage.

Subsequently, the track will be laid and aligned to grade. During this process the electrification support poles will be placed on their foundations, the attachments and suspension hardware rigging will be erected, and the trolley wiring will be strung. Finally, accessory systems will be installed.

Along those sections where the light rail trackage will not be in urban streets, there will be no street and sidewalk reconstruction. In its place will be the preparation of a subgrade to take the track ties and ballast.

Construction of the maintenance facility, transit stations, and electric power substations will follow normal building construction methods. In addition, a test track will be built near the maintenance facility to be used for acceptance testing of the LRT vehicles.

3.6 PROJECT COSTS AND FUNDING

The capital cost estimated for the total project is $306.1 million at time of completion in 1985 (see Table 3.2-2). This is an increase over other estimates in this report which show the estimated costs in 1978 dollars. Annual project operating costs are estimated at approximately $17.0 million (1978 dollars) in 1990 (see Table 3.2-3).

TABLE 3.2-2

ESTIMATE OF BANFIELD TRANSITWAY PROJECT CAPITAL COSTS[a]

Cost Item		Cost in Millions
BANFIELD PROJECT CAPITAL COST		
Banfield Freeway Improvements:		$98.0
LRT Fixed Facilities:		
Track Work	$25.5	
Electrification and Signal System	25.6	
Stations	9.9	
Maintenance Facility and Equipment	16.4	
	$77.4	77.4
Associated LRT Construction:		
Downtown Utility and Street Improvements	$ 9.3	
Burnside Utility and Street Improvements	17.9	
Miscellaneous Structural and R.O.W.	47.3	
I-205 Structures	9.3	
Park-and-Ride Facilities	3.6	
	$87.4	87.4
26 LRT Vehicles		43.3
Total Project Start-Up Costs		$306.1

(a) derived from Tri-Met and ODOT estimate (4-1-80) projected at 12% annual inflation rate through completion of project in 1985.

TABLE 3.2-3

ESTIMATE OF LRT OPERATING COSTS, 1990[a]

	Number of Employees	Annual Expense (in 1978 $)
Maintenance of Way and Power	16	$ 475,960
Maintenance of Equipment	36	1,144,380
Transportation	42	1,046,000
Electrical Energy	--	649,870
Injuries and Damages	--	139,680
General Administration	2	50,020
Purchasing and Stores	2	38,390
Subtotal	98	$ 3,544,300
East Side Bus Operation Associated with the Banfield Transitway[b]		$13,500,000
Total		$17,044,300

(a) Derived from Tri-Met 1979b.
(b) Worst case condition in 1978 dollars.

4.0 SUMMARY OF ENVIRONMENTAL CHARACTERISTICS, IMPACTS, AND PROPOSED MITIGATION

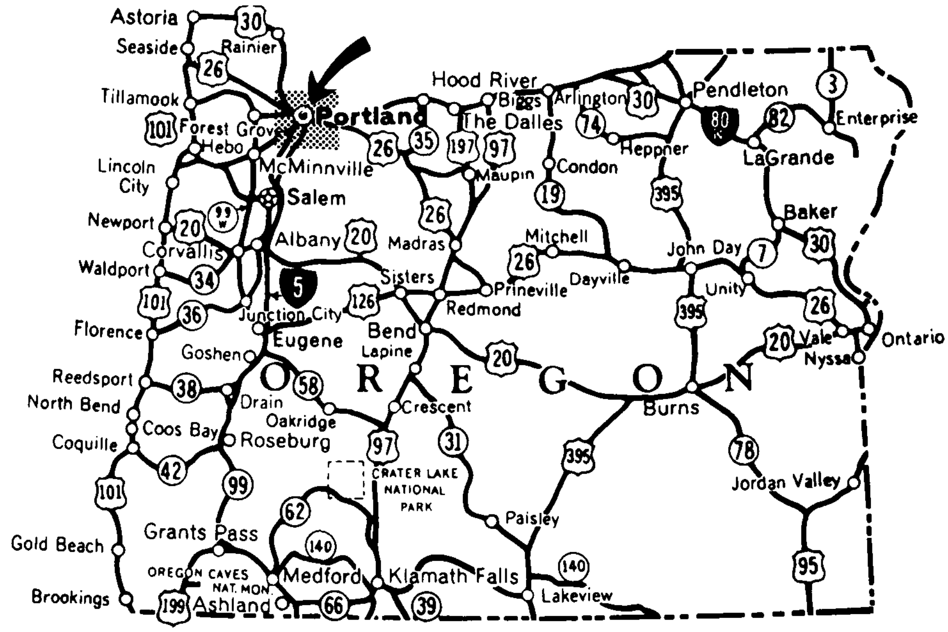
This section summarizes the environmental baseline characteristics for the Banfield Transitway Project study areas. In addition, the projected environmental impacts associated with the Project and the No-Build condition are discussed, and measures to mitigate some of the impacts are presented. The technical reports of this FEIS contain more detailed descriptions of the environmental characteristics of the Project study areas and the impacts associated with the various alternatives.

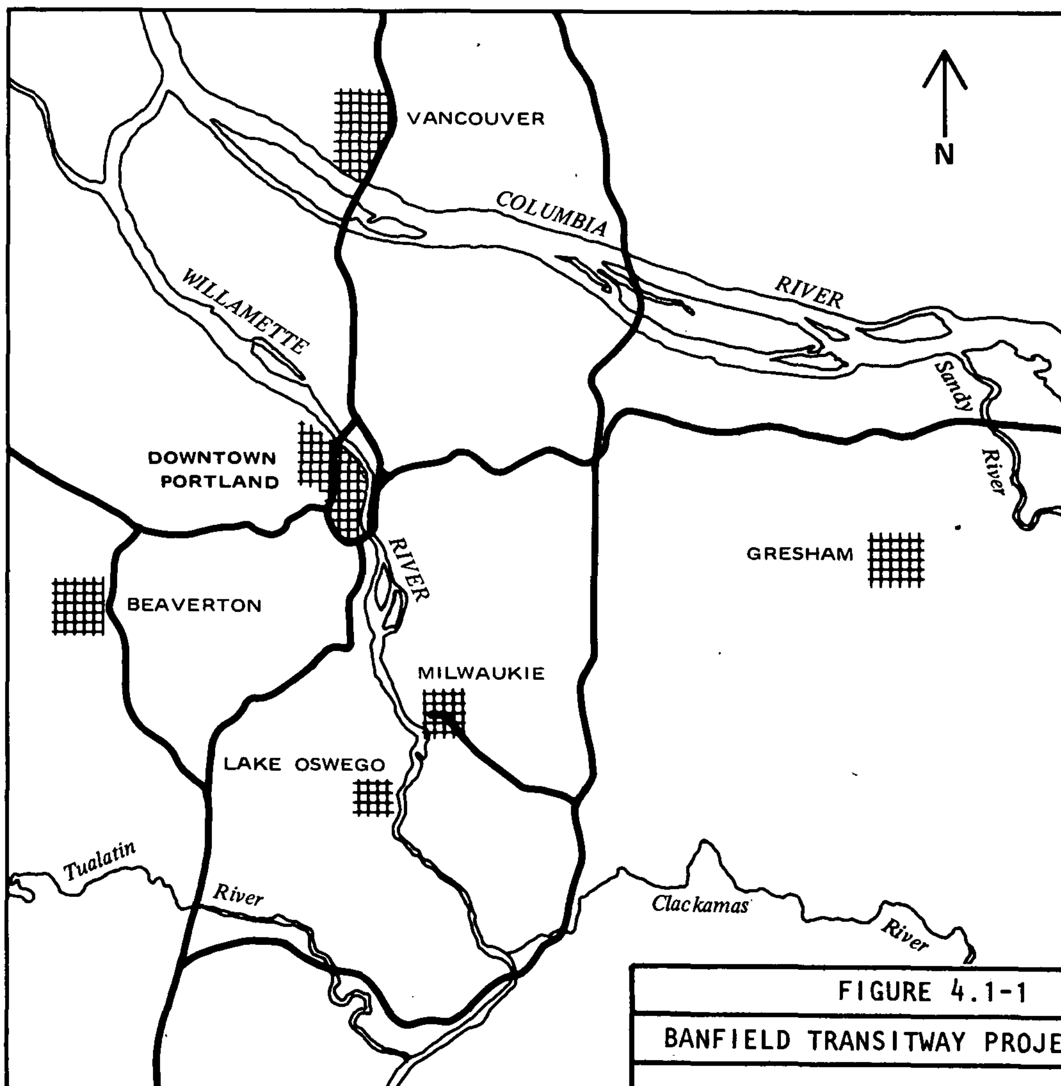
4.1 ENVIRONMENTAL SETTING

4.1.1 Regional Setting

Portland lies in the northern end of the Willamette Valley near the confluence of the Willamette and Columbia Rivers (Figure 4.1-1). The region is physically dominated by this riverine environment and associated basins. The predominant geographic features in the Portland region are the Tualatin Mountains (West Portland Hills) west of the city and a broad alluvial terrace, dotted by numerous small, wooded hills, reaching to the foothills of the Cascade Range to the east.

The Portland metropolitan area is a major finance and trade center that serves an extensive tributary area of the Columbia Basin. Its strong regional economy has experienced sizable growth in population and work force levels in response to the expansion of the regional economic base. Nearly 1/2 of Oregon's 2 million residents live in the City of Portland and its immediate fringes. The urban population level approximately doubled between 1940 and 1975, to 1,090,700 persons, and is projected to reach 1.6 million by the year 2000. Correspondingly, employment levels are expected to increase to 700,000 by the year 2000. Approximately 55 percent of the region's 1970 employed work force were employed within the City of Portland; 45 percent of those working in Portland resided elsewhere.





PORTLAND METROPOLITAN AREA

FIGURE 4.1-1

BANFIELD TRANSITWAY PROJECT FEIS

REGIONAL LOCATION MAP

Land use patterns in the region are diverse. They range from fully developed urban patterns in the central part of Portland to rural nonfarm and agricultural uses in the outlying areas. The urbanized portion of the region's land base amounted to about 620 square miles (1,600 square kilometers) in 1975. The area devoted to urban activity approximately quadrupled between 1940 and 1975, when the area experienced a doubling of population.

The development of the Portland metropolitan area was strongly influenced by the region's transportation network. Public transportation was the dominant mode when the majority of Portland's arterial streets were developed. The presence of early streetcar lines was a catalyst for development of most of Portland's present neighborhood commercial centers. Although city buses and larger volumes of automobile traffic later replaced the streetcar lines, the majority of arterial streets retain the width and alignment characteristics of the streetcar era. Continued suburban growth has brought about extension of this transportation network, greater commuter range, and corresponding neighborhood, industrial, and commercial development.

Today, the Portland Transit Mall and the inner-city freeway loop which encircles the Portland central business district (CBD) are the heart of the regional transportation pattern (see Figure 4.1-2). A network of radial routes tie the central business district together with an outer belt of circumferential freeways. The 2 major east and west radials are the Banfield Freeway and Sunset Highway, respectively.

4.1.2 Project Setting

The project setting extends from downtown Portland eastward along the Banfield Freeway corridor through east Portland and east Multnomah County to the suburb of Gresham (see Figure 3.1-1). The Portland CBD, the western terminus of the light rail transit facility, is experiencing substantial growth and continues to be the focus of economic activity for the region. Lying immediately to the west of the Willamette River, the CBD experiences a major daily inflow and outflow of workers from elsewhere in the Portland metropolitan area.

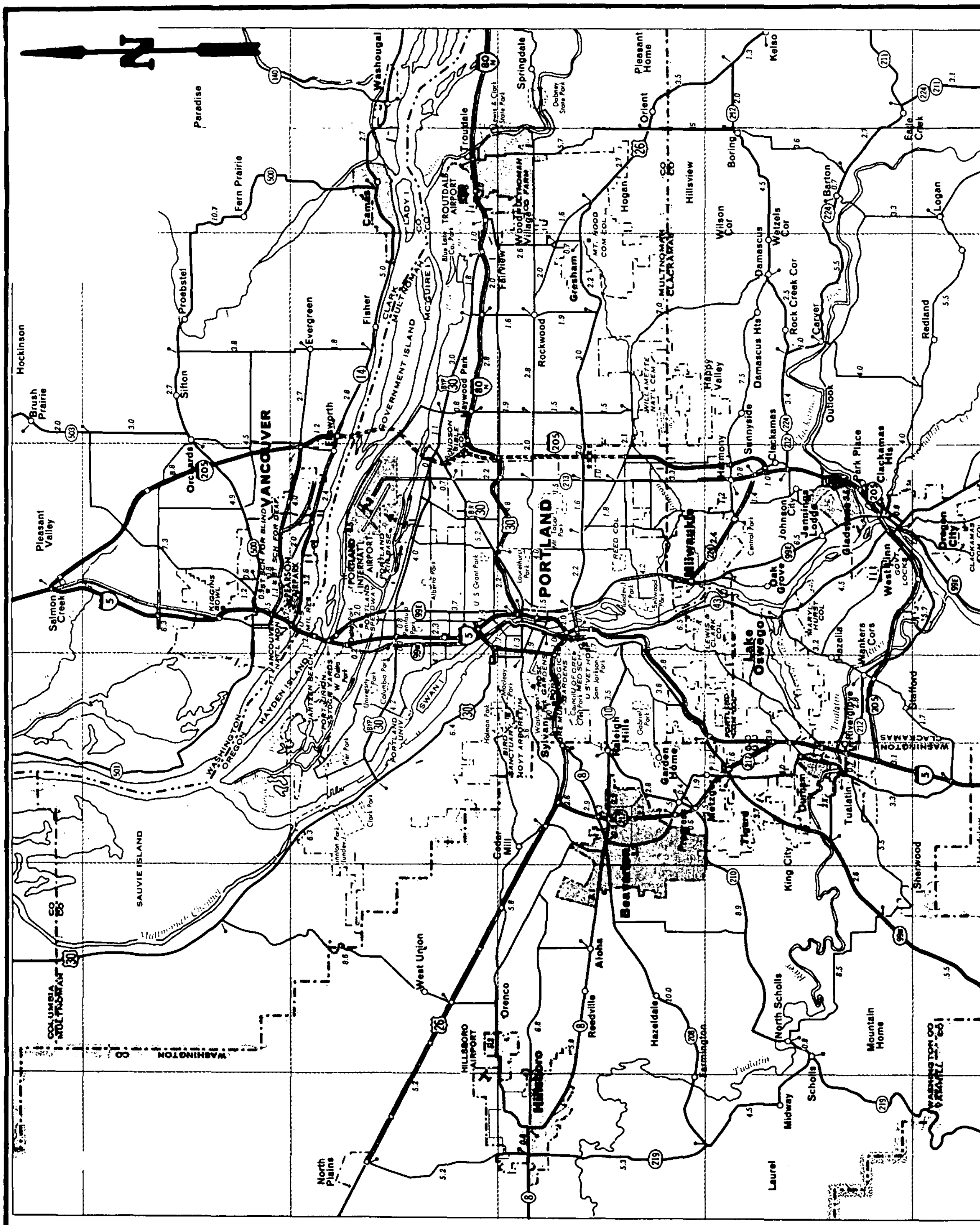


FIGURE 4.1-2

BANFIELD TRANSITWAY PROJECT FEIS

REGIONAL
TRANSPORTATION NETWORK

A mixture of industrial, commercial, and residential uses typify the setting immediately along both sides of the Willamette River. Trade activity has been a primary stimulus for development in this area. Extending east from the Willamette River, the Banfield Freeway is a dominant element of the project setting. The freeway occupies a natural drainage depression, locally referred to as Sullivan Gulch, for a distance of approximately 6 miles to the I-205 corridor. In addition to the Banfield Freeway, the depression is occupied by a single track of the Union Pacific Railroad. The freeway is the primary radial artery presently connecting downtown Portland with the eastern portion of the metropolitan area. It also services the greater east Multnomah County area, one of the fastest growing residential sections of the region.

Development in the east Portland area near the Banfield Freeway is generally typified by medium density residential patterns, with locally dominant commercial, industrial, and other activities such as hospitals and government offices present along major arterials. Two major retail and office centers in east Portland, Lloyd Center and Hollywood, are located near the Banfield Freeway. These centers, particularly Lloyd Center, which is the largest concentration of office and commercial development in the region outside of downtown Portland, service a patronage area extending beyond the setting of the Banfield Freeway corridor.

East Multnomah County generally consists of low-density single- and multi-family residential development with some commercial and higher density residential development along major streets and at some intersections. This pattern is typical for Burnside Street, the location of most of the light rail transit alignment in the east Multnomah County area. Some nearby arterials, such as Division Street, have experienced more highly concentrated strip commercial development reflective of dependency upon the automobile. This portion of the project setting is a major drawing area for suburban transit lines and for much of the traffic on the Banfield Freeway. Furthermore, it is expected to absorb a large share of growth in this part of the region.

The City of Gresham, the eastern terminus of the light rail transit facility, is one of the fastest growing suburbs of Portland. It is a bedroom community that provides a major daily inflow of workers to the Portland CBD. Gresham has a relatively small industrial base, and an expanding level of commercial activity to serve its growing population.

4.2 TRANSPORTATION

In this section, the proposed traffic and transit improvements are evaluated from the standpoint of existing and future transportation conditions. Future transportation conditions are evaluated for the year 1990, to be consistent with areawide land-use planning forecasts of population and employment. Existing conditions generally pertain to the years 1975 or 1976, unless otherwise indicated.

4.2.1 Existing Conditions

4.2.1.1 DOWNTOWN PORTLAND

Most traffic entering the downtown from points east of the Willamette River crosses 1 of 8 bridges: Fremont, Broadway, Steel, Burnside, Morrison, Hawthorne, Marquam, or Ross Island. The downtown street system is basically a one-way grid of east/west and north/south streets.

Traffic circulation and parking is guided by Downtown Parking and Circulation Policy, adopted in February 1975 (Portland, City Council 1975). The policy designated downtown streets according to their intended function--either traffic access, local service, or nonautomobile-oriented streets. Also, downtown Portland is subject to a Transportation Control Strategy (TCS). The TCS was developed in response to the regulatory requirements of the Oregon Department of Environmental Quality (DEQ), which is charged with the responsibility of administering the clean air standards of the U.S. Environmental Protection Agency. The TCS sets forth a broad range of actions on the part of the city, Tri-Met, and other agencies, which would lead to conformance with the clean air standards, including the Downtown Parking and Circulation Policy.

The city's policies, the TCS, and other downtown planning efforts have resulted in significant changes in downtown transportation. These changes have included a decline in through traffic (the completion of I-405 contributed substantially to this), a decline in automobile circulation traffic, and increased use of transit.

Downtown Portland is the focus of the current Tri-Met transit system. It is estimated that 85 percent of regional transit trips terminate in or pass through the downtown area (DeLeuw, Cather & Co. 1973). In December 1977, the Portland Mall on 5th and 6th Avenues between Madison and Burnside Streets opened. Operation of the mall has improved the efficiency of transit by reducing bus travel times and concentrating bus volumes on the mall streets and several intersecting east/west streets, thereby relieving congestion on streets no longer needed for downtown transit circulation.

4.2.1.2 EAST PORTLAND

The Banfield Freeway section passing through east Portland is the most heavily traveled east/west route in Oregon. Peak-hour volumes near 33rd Avenue averaged 5,300 vehicles per hour (vph) in the morning (westbound) and 5,000 vph in the evening (eastbound) in 1975. These volumes are in excess of the freeway level of service (LOS) D design capacity (4,950 westbound, 4,580 eastbound). As a result, travel is normally slow and interrupted. Table 4.2-1 lists the traffic volumes and levels of service at the heaviest traveled 6-lane section (28th Avenue) and 4-lane section (47th Avenue).

The increasing congestion problem on the Banfield Freeway and associated east/west oriented arterials led to an effort to improve traffic flow. The Banfield Freeway HOV lanes project was an experiment designed with the principal intent of reducing the peak-hour congestion problem. The project itself consisted of a restriping of the newly paved roadway surface to provide both a 4-lane and 6-lane section which would be opened to all traffic, plus the addition of 2 median lanes to be utilized exclusively by buses and automobiles carrying 3 or more persons. The hours of restricted use are currently between 6:30 and 9:30 a.m. in the westbound lane and between 3:30 and 6:30 p.m. in the eastbound lane.

The effectiveness of the HOV lanes on the Banfield Freeway has been mixed. In 1976, 6 percent of the peak-hour vehicles were carrying 20 percent of the peak-hour travelers. Vehicle occupancy rates in the

TABLE 4.2-1

1975 PEAK HOUR TRAFFIC VOLUMES: BANFIELD FREEWAY

Location	Lanes[a]	Westbound A.M. Peak Hour Capacity	Westbound A.M. Peak Hour Volume	Westbound A.M. Peak Hour Volume/ Capacity Ratio[b]	Westbound A.M. Peak Hour Operating Level of Service[c]	Eastbound P.M. Peak Hour Capacity	Eastbound P.M. Peak Hour Volume	Eastbound P.M. Peak Hour Volume/ Capacity Ratio[b]	Eastbound P.M. Peak Hour Operating Level of Service
28th Avenue	6	4,950	5,320	1.07	E	4,580	4,980	1.09	E
47th Avenue	4	3,300	3,990	1.21	F	3,300	4,060	1.23	F

(a) Both directions.
(b) Ratio greater than 1 means the street is operating above capacity.
(c) Levels of Service (LOS) are designated A through F as follows:

- LOS A and B correspond to free traffic flow with few delays on arterials; 50 to 60 mph on freeways.
- LOS C corresponds to stable flow, restricted freedom to maneuver on arterials; 40 to 50 mph on freeways.
- LOS D corresponds to unstable flow, variations in traffic speeds on arterials; 35 to 40 mph on freeways.
- LOS E corresponds to long delays at intersections on arterials; 30 to 35 mph on freeways.
- LOS F corresponds to forced flow, intermittent movement, and long lines on arterials; 0 to 30 mph (stop-and-go) conditions on freeways.

westbound lanes varied from 1.24 to 1.29 passengers per vehicle, while in the eastbound lanes they varied from 1.29 to 1.40. Prior to implementation of the demonstration project, these rates were 1.22 and 1.28, respectively.

It cannot be demonstrated that the HOV lanes have been able to attract enough traffic from the unrestricted lanes to greatly improve levels of service on the freeway. However, it can be stated that during the peak-hour periods the HOV lanes do provide a considerably better level of service than in the adjacent travel lanes.

Table 4.2-2 lists the arterial street capacities at a 28th Avenue screenline. Congestion would be extreme on several arterial streets if parking were not removed during the p.m. peak hour. However, removal of parking will generally maintain the overall screenline capacity at a level greater than traffic volumes, although volumes on individual streets may exceed capacity.

TABLE 4.2-2

ARTERIAL CAPACITIES AND P.M. PEAK-HOUR VOLUMES: 28TH AVENUE

Street	D Level of Service Capacity: Parking Not Removed	D Level of Service Capacity: Parking Removed	1975 P.M. Peak Direction Volumes	Volume/Capacity Ratio[a]: Parking Not Removed	Volume/Capacity Ratio[a]: Parking Removed
Broadway Avenue	1,000	1,200	1,300	1.30	1.08
Sandy Boulevard	1,350	1,350	1,400	1.04	1.04
Glisson Street	1,000	1,000	730	0.73	0.73
Burnside Street	600	1,250	1,100	1.83	0.88
Stark Street	540	1,000	690	1.28	0.69
Belmont Street	600	900[b]	860	1.43	0.96
Total	5,090	6,700	6,080	1.19	0.91

Data from: ODOT, Traffic Section, Project Analysis Unit 1978.
(a) Ratio greater than 1 means the street is operating above capacity.
(b) At 39th Avenue.

4.2.1.3 EAST MULTNOMAH COUNTY

In suburban east Multnomah County, traffic volumes on the Banfield Freeway are considerably less than freeway volumes in the urbanized area to the west. This is due in part to the presence of several major east/west arterial streets in east Multnomah County, including Halsey, Glisan, Burnside, Stark, Market-Main, Division, and Powell Streets. Major north/south arterials include 102nd, 122nd, 148th, 162nd, and 181st Avenues.

In general, there are few peak-hour capacity deficient streets in this study area because of the wide streets and relatively low volumes. The deficiencies that do exist are on streets west of and including 122nd Avenue. Table 4.2-3 lists the volumes, capacities, and levels of service (LOS) on the east/west arterial streets at 3 screenline locations. Capacity deficient streets are those with volume/capacity (v/c) ratios over 1.0 (LOS E or F) (ODOT, Traffic Section, Project Analysis Unit 1978).

4.2.1.4 EAST SIDE TRANSIT SERVICE

The East Side study area used for transit analysis encompasses parts of more than 30 Tri-Met routes. These follow the grid pattern of the arterial street system, forming a network of north/south and east/west routes. Fourteen radial routes and three crosstown lines comprise the core of the existing East Side transit network (see Table 4.2-4 and Figure 4.2-1) (Tri-Met, Planning and Development Department 1977a).

4.2.2 Impacts

4.2.2.1 CONSTRUCTION

4.2.2.1.1 General

Construction of the freeway improvements and LRT facilities associated with the Project will result in temporary changes in traffic patterns and additional truck and heavy equipment traffic near work sites. However,

TABLE 4.2-3

SCREENLINE TRAFFIC VOLUMES AND CAPACITIES

	Screenline West of 122nd Avenue				Screenline West of 181st Avenue				Screenline West of 202nd Avenue			
Location	Volume[a]	D Level of Service Capacity	Volume/ Capacity Ratio[b]	Level of Service[c]	Volume[a]	D Level of Service Capacity	Volume/ Capacity Ratio[b]	Level of Service	Volume[a]	D Level of Service Capacity	Volume/ Capacity Ratio[b]	Level of Service
Banfield Freeway	2,000	3,300	0.61	B	1,720	3,300	0.52	B	--	--	--	--
Halsey Street	1,810	1,200	1.51	F	260	800	0.33	A	--	--	--	--
Glisan Street	900	1,000	0.90	D	550	1,000	0.55	B	490	1,100	0.45	B
Burnside Street	670	700	0.96	D	500	800	0.63	B	880	1,400	0.63	B
Stark Street	1,120	1,000	1.12	E	900	1,100	0.82	C	880	800	1.1	E
Market Street	290	600	0.48	B	150	360	0.42	B	--	--	--	--
Division Street	1,160	1,250	0.93	D	840	1,450	0.58	B	700	1,400	0.5	B
Powell Boulevard	680	830	0.82	C	550	790	0.70	C	400	1,220	0.33	B
Arterial Total	6,630	6,580	1.01	E	3,750	6,300	0.60	B	3,350	5,920	0.57	B
Screenline Total	8,630	9,880	0.87		5,470	9,600	0.57		3,350	5,920	0.57	

(a) 1975 p.m. peak hour eastbound.
(b) Ratio greater than 1 means the street is operating above capacity.
(c) See the footnotes to Table 3.2-1 for Level of Service (LOS) descriptions.

TABLE 4.2-4

SUMMARY OF EXISTING EAST SIDE TRANSIT SERVICE (1976)

Route No.	Route Name	Outbound Terminal: Urban	Outbound Terminal: Suburban	No. Daily Bus Trips[(a)]	Days of Operation	P.M. Peak Hour Outbound Riders[(b)]: 21st Ave.	P.M. Peak Hour Outbound Riders[(b)]: 105th Ave.	Total Daily Line Riders
Radial (Downtown-Oriented) Lines								
9	Powell	Harmony Rd.[(c)]	Gresham	78	Every Day	420	140	5,540
12	Foster	105th Ave.[(c)]	--	63	Every Day	300	--	3,630
14	Sandy Boulevard	86th Ave.	Parkrose	82	Every Day	390	10	5,260
17	Fremont Express	--	145th Ave.	26	Mon.-Sat.	80	70	580
18	Troutdale	--	Troutdale	25	Mon.-Sat.	150	140	1,080
19	East Glisan	110th Ave.	Gresham	73	Every Day	400	200	4,350
19	Hawthorne	122nd Ave.	Gresham	73	Every Day[(d)]	600	280	4,050
20	East Burnside	Mall-205	Mt. Hood C.C.	65	Every Day[(d)]	370	170	4,350
21	Mount Tabor	Mall-205	182nd Ave.	72	Every Day[(d)]	310	90	4,650
26	Holgate	--	136th Ave.	62	Every Day	340	100	2,840
40	Halsey	92nd Ave.	132nd Ave.	50	Every Day[(d)]	340	40	2,070
44	Gresham/Lloyd	--	Gresham	32	Mon.-Sat.	130	130	1,320
90	Banfield Flyer	--	Mall 205[(e)]	3	Mon.-Fri.[(f)]	50	--	100
91	Banfield Flyer	--	Multnomah Kennel Club	7	Mon.-Fri.[(f)]	160	160	320
Crosstown Lines		Terminals						
73	92nd/ 102nd Avenue	Sandy Blvd.[(g)]	Hinkley St.[(g)]	12	Mon.-Fri.	--	--	170
74	Boring/Sandy/ Troutdale	Troutdale[(g)]	Boring[(g)] Sandy[(g)]	20	Mon.-Fri.	--	--	140
77	Northeast/ Northwest[(h)]	Northwest 25th Ave.	Northeast 47th Ave.	25	Mon.-Fri.	--	--	570

Data from: Tri-Met 1976.
(a) Number of round trips per weekday.
(b) Number of riders crossing these points outbound during p.m. peak hour.
(c) Route splits at 84th Avenue; one terminal at 105th and Harold, the other at 103rd and Foster.
(d) Suburban trips operate Mon.-Sat. only.
(e) Mall-205 listed as "suburban" terminal because route caters to suburban park-and-ride passengers.
(f) Operates peak hours only (a.m. = inbound, p.m. = outbound).
(g) Some trips operate directly to downtown Portland via East Glisan, East Burnside, Hawthorne, and Powell routes.
(h) This route treated as a radial line in subsequent analyses because of its east-west orientation.

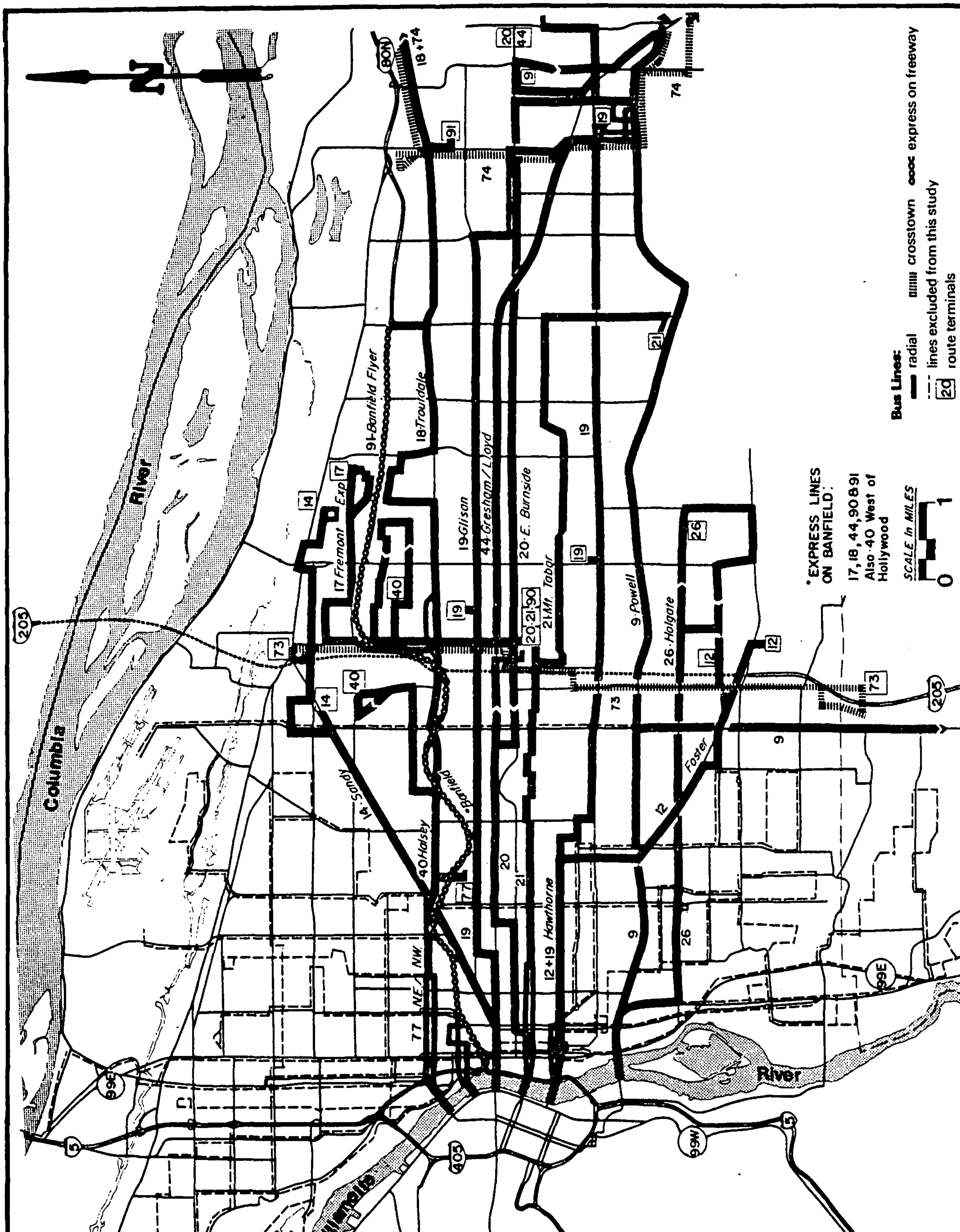


FIGURE 4.2-1

BANFIELD TRANSITWAY PROJECT FEIS

EAST SIDE TRANSIT NETWORK
1976

disruption of traffic flows along the freeway and arterials affected by LRT construction will be minimal.

4.2.2.1.2 Freeway Construction

Freeway construction activities will require the use of typical working construction equipment, including pile drivers, cranes, backhoes, bulldozers, compaction units, graders, paving machines, tractors, and trucks of various sizes for delivery of construction materials. Construction vehicle operations and other construction activities requiring use or closure of adjacent freeway lanes will not interfere with freeway traffic flows due to the mitigative measures discussed below.

Excess materials excavated at certain Project work sites will be used for fill at other work sites, where feasible, or disposed of at approved sites (see Section 4.10.2 of the FEIS). Either existing freeway sections or new sections constructed as part of the Project will be used for such haul trips. Trucks, rather than heavy earthmovers, will be used to haul excavated material, since haul loads will be restricted to legal load limits whenever hauling is done over portions of the new or existing roadway. Haul trips will be conducted on new, unopened portions of the freeway when possible to reduce disruptions of freeway traffic. However, if excavated materials cannot be used as fill material on the Project, haul trips must use existing streets and roadways to reach a suitable dump site. Earthwork excavation and disposal will generate 10,000 to 12,000 one-way truck trips per mile of the Project.

The City of Portland requires that the existing capacity of freeways be maintained during the peak hour, even if freeway construction is being undertaken. Disruption of freeway traffic flows will be minimized during construction by providing adequate freeway capacity to accommodate peak-hour traffic. Whenever possible, this will be accomplished by: (1) scheduling intense freeway construction activities (such as off-site haul trips, activities requiring use of existing freeway lanes, etc.) to coincide with non-peak hours; (2) using new, unopened freeway segments for haul trips; and (3) minimizing peak-hour freeway lane closures.

During peak-hour construction activities that require lane closures, additional freeway capacity will be created either by: (1) converting shoulders to temporary freeway lanes, or (2) reducing lane widths and establishing an additional lane within the existing freeway right-of-way where the total right-of-way width is sufficient.

Freeway construction also may create airborne dust that could affect the visibility of drivers on nearby freeway lanes, thereby slowing traffic flows and potentially increasing accident rates. This impact is not expected to be significant due to the employment of dust-reducing techniques employed by contractors (see Section 4.2.3).

4.2.2.1.3 LRT Construction

Construction of the LRT facilities along urban streets will follow standard street construction practices to minimize traffic disruptions and other impacts associated with Project construction. Trackwork, electrification masts, and trolley wires will be installed using conventional construction equipment and techniques. Most equipment will be track-borne.

LRT construction impacts will be generally minor, since such construction will, for the most part, occur within a right-of-way exclusively reserved for LRT. LRT construction will have its greatest disruptive effects on urban streets. Such construction impacts will include reduced access to some streets and properties and minor disruption of arterial street traffic flows.

Impacts associated with LRT construction along the Banfield Freeway and the Portland Traction Company will be less severe than those associated with urban streets. Construction along the Banfield Freeway will be done in conjunction with the adjacent freeway construction. LRT construction along the freeway may cause very minor disruptions of freeway traffic and may contribute incrementally to airborne dust, but these impacts will be insignificant. Construction of LRT facilities along Burnside Street and the Portland Traction Line will not impose significant impacts on east Multnomah County traffic.

Construction of the shops, stations, and electric power substations will follow normal building construction methods. Typical construction-related impacts on traffic will include minor disruptions due to additional truck traffic in the vicinity of the work sites. Although LRT construction impacts will be temporary and, as such, are expected to be minor, mitigative measures described in Section 4.2.3 will further reduce the impacts associated with construction.

4.2.2.2 OPERATIONS

4.2.2.2.1 Downtown

LRT vehicles will operate in both directions on 1st Avenue. LRT stations will be incorporated on 1st Avenue between Everett and Davis Street, Ankeny and Ash Streets, and Washington and Alder Streets. Streets will be closed to automobile and truck traffic in these blocks. One lane will be reserved for conventional traffic along the LRT alignment on 1st Avenue from Washington Street to Glisan Street. Traffic on 1st Avenue between Yamhill and Morrison Streets will be allowed in one lane for local circulation. Through traffic will be discouraged. Conventional traffic will not be permitted to use 1st Avenue between Washington and Morrison Streets. A LRT/pedestrian mall will be constructed in these locations.

The closing of the ramp from the Steel Bridge to Front Street and the closing of 1st Avenue at the stations will result in the diversion of through traffic to the "next available" street. This closure will be coordinated with the City during the design phase. The majority of traffic on 1st Avenue and the Front Street ramp will probably use 3rd Avenue (CH2M Hill 1978a), a traffic access street in the Downtown Parking and Circulation Policy. This additional traffic can be accommodated on 3rd Avenue.

The elimination of parking on 1st Avenue will reduce accessibility to local properties and parking by employees. However, the spaces lost will be eligible for replacement and probably will be replaced under the provisions of the policy. Parking in the downtown core is at a premium for both customers and employees, and any permanent or short-term parking removal will affect both (CH2M Hill 1978a) (See Section 3.4-14).

LRT trains will operate on Yamhill and Morrison in a with-flow operation. Local traffic will be permitted between 1st and 2nd Avenues on Yamhill Street. Loss of parking spaces will occur on these streets as on 1st Avenue. Displaced traffic will probably use Washington, Alder, Taylor, and Salmon Streets. The amount of displaced traffic will be small and will not significantly affect the volume/capacity ratios on Washington, Alder, and Taylor Streets. The majority of traffic diverted from 1st Avenue will probably go to Front Avenue. Traffic diverted from Yamhill and Morrison Streets will be absorbed by the remaining street network, with the majority going to Salmon and Taylor Streets. These conclusions are based upon consultation with the Portland Traffic Bureau. In final design, the diversity of displaced traffic will be coordinated with the City of Portland.

4.2.2.2.2 East Portland

TRAFFIC VOLUMES

Traffic volumes on the Banfield Freeway and arterial streets are expected to increase 5 to 50 percent over existing levels through the 1990 project design year, as summarized in Table 4.2-5. LRT will reduce traffic volumes compared to No-Build conditions in 1990 (see Table 4.2-5).

Although reductions in traffic volumes will occur with LRT in the Banfield corridor, traffic would still exceed the capacity of the Banfield Freeway between 16th and 33rd Avenues (the 28th Avenue screenline) without the ramp metering proposed for this section of the freeway. Peak-hour ramp metering (plus a westbound auxiliary lane) will result in a LOS D on this segment of the freeway instead of the levels listed in Table 4.2-5.

The Banfield Freeway capacity east of 37th Avenue (the 47th Avenue screenline) will be increased by 50 percent with the proposed addition of 2 lanes. This additional traffic capacity will improve 1990 travel conditions between 37th Avenue and I-205 compared to existing conditions. Volume to capacity ratios on this freeway section will still remain high, even with LRT in the corridor. However, the ramp metering will help maintain LOS D as discussed above.

LRT in the Banfield Freeway corridor will generally result in improved traffic conditions on east Portland arterials and the Banfield Freeway compared both to 1990 No-Build and existing conditions. For instance, it is projected that 42,500 person trips will be made on LRT in the year 1990 on an average weekday. Average 1990 peak-hour travel speeds will increase (see Table 4.2-6) and traffic accident rates will decrease (see Table 4.2-7) (ODOT, Traffic Section, Project Analysis Unit 1978).

CIRCULATION

The basic LRT alignment for Holladay Street will restrict street width for automobile traffic to 2 lanes. This will result in a significant reduction in Holladay Street approach capacity at all signalized intersections. However, the effect of this reduction on the quality of Holladay Street traffic will not be overly significant since the existing signalized intersections are underutilized. With improved transit service in the corridor, automobile traffic on Holladay Street is not expected to increase significantly (Parsons Brinckerhoff Quade & Douglas, Inc. and Louis T. Klauder & Assoc. 1978b). Further, since no streets will be completely closed, the vehicular circulation pattern of the study area will not be altered greatly (Parsons Brinckerhoff Quake & Douglas, Inc. and Louis T. Klauder & Assoc. 1978b).

TABLE 4.2-5

1990 VOLUMES AND CAPACITIES

Location	No-Build Banfield Freeway	No-Build Arterials	No-Build Total	Banfield Transitway Project Banfield Freeway	Banfield Transitway Project Arterials	Banfield Transitway Project Total
28th Avenue Screenline:						
P.M. Peak-Hour Volume	5,850	6,750	12,600	6,240	5,980	12,220
Capacity[a]	4,580	6,700	11,280	4,950	6,700	11,650
Ratio	1.28	1.01	1.12	1.26	0.89	1.05
Level of Service	F	E		F[b]	D	
47th Avenue Screenline:						
P.M. Peak-Hour Volume	4,400	4,720	9,120	5,340	3,420	8,760
Capacity[a]	3,300	3,850	7,150	4,950	3,850	8,800
Ratio	1.33	1.23	1.28	1.08	0.89	1.00
Level of Service	F	F		E[b]	D	

(a) Level of Service D (see the footnotes to Table 4.2-1).
(b) Levels of Service will be improved to D with operational improvements.

TABLE 4.2-6

1990 P.M. PEAK-HOUR TRAVEL SPEEDS

Facility	Section	Average Speed No-Build	Average Speed Banfield Transitway Project
Banfield Freeway	East Portland	23 mph	32 mph
East/West Arterials	East Portland	13 mph	22 mph

TABLE 4.2-7

VEHICLE MILES OF TRAVEL AND ACCIDENTS

Location	VMT Freeways (annual million vehicle miles)	VMT Arterials	VMT Total	Accidents
East Portland:				
1975	199	218	417	2,040
1990 No-Build	276	225	501	2,212
Banfield Transitway Project	282	189	471	1,936

Vehicle access points exist on both sides of Holladay Street between 2nd and 9th Avenues. The LRT alignment will block access at several of these driveways. Therefore, these existing access points should be closed and alternate access provided on adjacent cross streets. Alternative access points on cross streets already exist (Parsons Brinckerhoff Quade & Douglas, Inc. and Louis T. Klauder & Assoc. 1978b).

Curb parking will be eliminated in the area as well. This will cause inconvenience to travelers and affected businesses (Parsons Brinckerhoff Quade & Douglas, Inc. and Louis T. Klauder & Assoc. 1978b).

The LRT alignment for the Holladay Street on-ramp to the Steel Bridge provides for a double track occupying the entire ramp width with the westbound track sharing space with a single automobile lane. With LRT sharing the roadway, congestion during the peak periods is expected. More critical to the capacity problem is the narrow width under the northbound off-ramp and the existence of steep grades that will increase accident potential with mixed LRT/automobile use. This limitation will be eliminated by appropriate Project design. The westbound LRT merge with automobiles from the Williams Avenue on-ramp will be controlled by a traffic signal(Parsons Brinckerhoff Quade & Douglas, Inc. and Louis T. Klauder & Assoc. 1978b).

The pattern of traffic circulation in east Portland largely depends on the capacity of city streets and the Banfield Freeway to accommodate future growth in automobile traffic and transit demand. With the Project, the widening of the Banfield Freeway between 37th Avenue and I-205 to 6 lanes will result in fewer trips on east/west arterials in east Portland and more trips on the freeway.

The removal of suburban buses from the east Portland arterials would be a secondary traffic benefit.

4.2.2.2.3 East Multnomah County

TRAFFIC VOLUMES

Traffic service east of I-205 on the Banfield Freeway (122nd and 181st Avenues) will remain satisfactory beyond 1990, with or without the Project (see Table 4.2-8). The Project will have only a small influence on Banfield traffic conditions outside the Portland urban area (east of 181st Avenue).

East of I-205, in Multnomah County, arterial traffic volumes will be greater than today, but slightly less with the Project than under No-Build conditions (see Table 4.2-8). In this area, there is essentially little difference in the 1990 quality of arterial travel between the Project and the No-Build condition. This is partially due to the strong influence of I-205 in attracting automobile trips.

Except for 181st Avenue, peak-hour travel speeds on the arterials in the east Multnomah County area are predicted to be 1 mph faster with LRT than under No-Build (see Table 4.2-9). As in east Portland, accident rates in east Multnomah County will be less with the Project than for the 1990 No-Build condition (see Table 4.2-10). However, unlike east Portland, accidents in east Multnomah County are predicted to increase by 1990 (as compared to 1975) as a result of the large increase in VMT.

Traffic impacts due to LRT and park-and-ride and kiss-and-ride activity in the Gresham area were estimated and superimposed on the existing and forecast 1990 volumes to obtain a relative measure of traffic impact (CH2M Hill 1978c).

The construction and operation of LRT stations at 221st and Division, 8th and Hood, and 8th and Cleveland (the first and the last with park-and-ride facilities) will result in increased volume/capacity ratios from a "No-Build" range of 0.96 to 1.22 to a range of 1.07 to 1.52 with LRT at intersections along Division Street, Cleveland Street, 8th Street, and Hogan Avenue. This represents a significant deterioration of travel quality along this segment of Division Street.

TABLE 4.2-8

1990 VOLUMES AND CAPACITIES

Location	No-Build Banfield Freeway	No-Build Arterials	No-Build Total	Banfield Transitway Project Banfield Freeway	Banfield Transitway Project Arterials	Banfield Transitway Project Total
122nd Avenue Screenline:						
P.M. Peak-Hour Volume	2,820	8,480	11,300	2,900	7,610	10,510
Capacity[(a)]	3,300	6,830	10,130	3,300	6,830	10,130
Ratio	0.85	1.24	1.12	0.88	1.11	1.04
Level of Service	C/D	F		D	E/F	
181st Avenue Screenline:						
P.M. Peak-Hour Volume	2,540	5,740	8,280	2,510	5,220	7,730
Capacity[(a)]	3,300	6,300	9,600	3,300	6,300	9,600
Ratio	0.77	0.91	0.86	0.76	0.83	0.80
Level of Service[(b)]	C	D		C	C/D	

(a) Level of Service D.
(b) See Table 3.2-1 for level of service (LOS) descriptions.

TABLE 4.2-9

1990 P.M. PEAK-HOUR TRAVEL SPEEDS

Facility	Section	Average Speed No-Build	Average Speed Banfield Transitway Project
Banfield Freeway	East Multnomah County	47 mph	47 mph
East-West Arterials	East Multnomah County	21 mph	22 mph
181st Avenue	Banfield to Burnside	10 mph	9 mph
Burnside Street	181st to Main	14 mph	15 mph

TABLE 4.2-10

VEHICLE MILES OF TRAVEL AND ACCIDENTS

Location	VMT Freeways (annual million vehicle miles)	VMT Arterials (annual million vehicle miles)	VMT Total (annual million vehicle miles)	Accidents
East Multnomah County:				
1975	40	285	325	2,340
1990 No-Build	118	366	484	3,105
Banfield Transitway Project	113	343	456	2,914

CIRCULATION

In east Multnomah County, some local out-of-direction travel is unavoidable. This stems from restrictions of left turns across the LRT tracks from certain cross streets and properties abutting Burnside Street; only right turns are allowed at such locations. These restrictions are necessary to provide maximum safety and operating conditions for the LRT facility. The number of properties affected by out-of-direction travel impacts is presented in Table 4.2-11.

These turning restrictions will affect emergency vehicles as well, impairing emergency access to some properties. The distance added to fire response on Burnside Street due to Project-related out-of-direction travel requirements is presented in Table 4.2-12).

TABLE 4.2-11

IMPACT OF OUT-OF-DIRECTION TRAVEL ON BURNSIDE STREET

	Distance Traveled Out-of-Direction		
	0 to 1/4 Mile	1/4 to 1/2 Mile	Over 1/2 Mile
To and From the East:			
Properties Affected	160	309	74
Housing Units Affected	491	623	220
To and From the West:			
Properties Affected	172	308	46
Housing Units Affected	511	865	82

Data from: ODOT 1977.

TABLE 4.2-12

DISTANCE ADDED TO FIRE RESPONSE ON BURNSIDE STREET

	Distance Increase		
	0 to 1/4 Mile	1/4 to 1/2 Mile	Over 1/2 Mile
To Nearest Fire Station:			
Properties Affected	376	40	10
Housing Units Affected	1,145	56	8
To Back-Up Station:			
Properties Affected	276	41	143
Housing Units Affected	770	215	226

Data from: ODOT 1977.

4.2.2.4 EAST SIDE TRANSIT

East Side (east Portland and east Multnomah County) annual transit ridership is summarized in Table 4.2-13.

TABLE 4.2-13

EAST SIDE PUBLIC TRANSIT RIDERSHIP AND OPERATIONS DATA

	1976 Existing	1990 No-Build	1990 Banfield Transitway Project
Originating Trips	10,016,000	13,518,000	19,223,000
Transit Vehicle Miles	5,784,000	7,263,000	8,781,000 to 9,300,000
Passenger-Miles per Passenger	5.22	5.76	7.16
Passengers per Vehicle Mile	1.73	1.86	2.19

Data from: Tri-Met, Planning and Development Department 1977a; Parsons Brinckerhoff Quade & Douglas, Inc. and Louis T. Klauder & Assoc. 1978a.

The p.m. peak-hour outbound transit ridership for the East Side area has been tabulated at 2 screenlines (Tri-Met, Planning and Development Department 1977a).

- At 21st Avenue

1976 Existing:	Banfield Bus Lines	900
	Other Bus Lines	3,140
		4,040
1990 No Build:	Banfield Bus Lines	1,390
	Other Bus Lines	4,020
		5,410
1990 LRT:	Banfield LRT	5,120
	Bus Lines	1,370
		6,490

- At 105th Avenue

1976 Existing:	Banfield Bus Lines	540
	Other Bus Lines	990
		1,530

1990 No Build:	Banfield Bus Lines	950
	Other Bus Lines	1,290
		2,240

1990 LRT:	Banfield LRT	2,610
	Bus Lines	560
		3,170

Screenline data indicate that transit ridership with LRT will represent a 20 to 40 percent increase over transit ridership under the No-Build conditions. These data illustrate the ability of the LRT to attract ridership as compared to buses.

The Project will increase transit use in all subareas. Table 4.2-14 shows the increase of transit trip ends* in 8 subareas both for the 1990 No-Build and LRT conditions. The greatest relative difference in transit use occurs in areas not directly served by the Banfield Freeway corridor (for example Oregon City and West County). This indicates that upgrading of transit in the corridor plus the supporting bus network strongly influence total systemwide transit usage.

TABLE 4.2-14

1990 P.M. PEAK-HOUR TRANSIT TRIP ENDS

Area	1990 No-Build	1990 Banfield Transitway Project	Trip End Ratio Build/No-Build
Downtown	17,532	24,654	1.41
East Portland	6,537	7,980	1.22
Eastern Multnomah County	4,204	6,270	1.49
Oregon City Area	4,534	7,319	1.61
N.W. Industrial Area	1,908	2,695	1.41
North Portland	4,914	6,748	1.37
West County	7,380	14,545	1.97
Others	1,329	3,504	2.64
Total	48,338	73,715	1.52

Data from: Tri-Met 1978f.

* A trip end is the origin or destination of a trip.

4.2.2.4.1 Transit Network

The transit network assumed for the No-Build condition is the 1976 system, operating under 1990 conditions of population and employment. For the LRT a more elaborate network was assumed (see Figure 4.2-2).

The LRT line will have headways of 10 minutes during peak and midday periods and 30 minutes during the evening. These will be supplemented by a 10-minute peak-hour only service between downtown Portland and Gateway, resulting in an effective headway of 5 minutes along the Banfield Freeway. The schedules of LRT trains will be coordinated with those of the feeder bus system at station areas so that transferring passengers will not be inconvenienced by long waiting periods (Tri-Met, Planning and Development Department 1977a).

Transit network operations are summarized in Table 4.2-15.

A significant advantage of the Project over the No-Build is its degree of connectivity. The Project is more highly "connected" in the sense that it has a more elaborate network of crosstown routes, as well as more locations where routes converge. Thus, more transfers are possible, opening up a greater variety of travel opportunities.

Transit schedule reliability is considered critical in maximizing ridership. Rail operation is more reliable than buses during adverse weather conditions, such as snow and ice. In addition, equipment failures are not common on electrically powered vehicles. If a motor failure occurs, other motors in the vehicle or in the train can maintain propulsion (Tri-Met, Planning and Development Department 1978b).

The chief source of reliability is the operation of LRT on its own right-of-way. Most of the Banfield/Burnside route is separated from competing automobile traffic, reducing the congestion and delay common in today's transit operations (Tri-Met, Planning and Development Department 1978b).

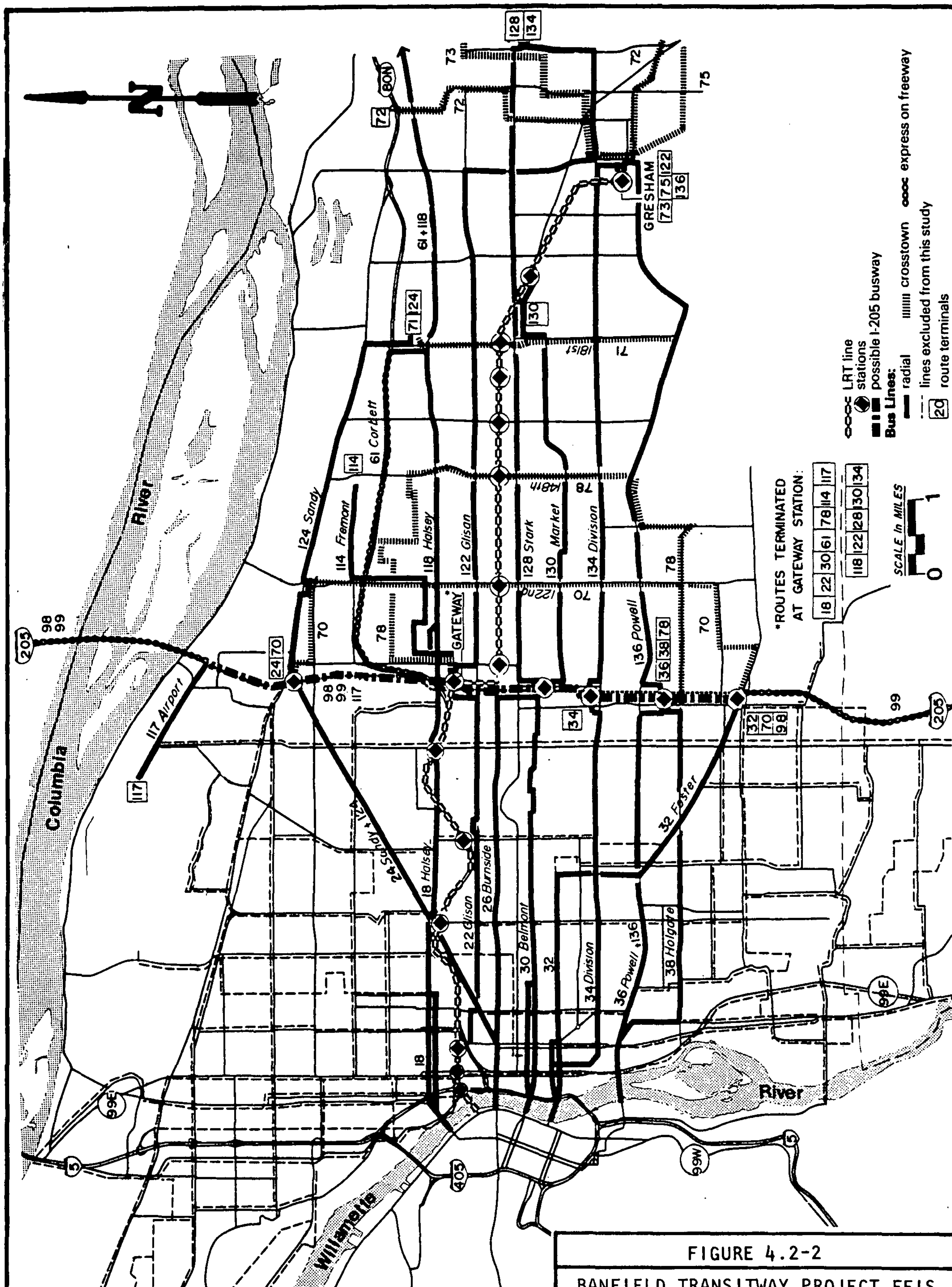


FIGURE 4.2-2

BANFIELD TRANSITWAY PROJECT FEIS

BANFIELD/BURNSIDE LRT NETWORK
1990

<u>TABLE 4.2-15</u>

1990 TRANSIT OPERATIONS DATA

Network	Number of Lines[a]	One-Way Line Miles[b]	Vehicles Required at Peak Hour[c]	Daily Vehicle Miles	Daily Vehicle Hours
1976 Existing:					
Banfield Bus Lines	7	98.2	26	4,502	244
Other Bus Lines	27	298.8	93	15,583	1,022
Total	34	397.0	119	20,085	1,266
1990 No-Build:					
Banfield Bus Lines	7	98.2	29	5,090	276
Other Bus Lines	27	298.8	115	20,130	1,438
Total	34	397.0	144	25,220	1,714
1990 Banfield Transitway Project					
Banfield LRT	3	29.3	34 to 37	3,520 to 5,300[d]	153[e]
Bus Lines	27	246.4	154	25,750	1,604
Total	30	275.7	184	29,270	1,757

Data from: Tri-Met Planning and Development Department 1977a; Parsons Brinckerhoff Quade & Douglas, Inc. and Louis T. Klauder & Assoc. 1978a.

(a) Distinct variations in routing are considered separate lines.
(b) Length of lines, including overlaps.
(c) Includes back-up vehicles.
(d) Car-miles.
(e) Car-hours.

Blockages of the right-of-way are a potential problem on rail lines. An automobile stalled at a grade crossing, a disabled LRT car on the main line, or a section of damaged overhead wire can interrupt service. Experience with existing rail lines in other cities suggests that such interruptions are rare and can be managed if proper facility design is undertaken and operating procedures for interruptions laid out in advance (Tri-Met, Planning and Development Department 1978b).

Transit travel times for the Project, based on trips from downtown Portland to various destinations during the p.m. peak hour are shown in Table 4.2-16. These estimates allow for transfer times necessary to reach the given destination.

TABLE 4.2-16

TRANSIT TRAVEL TIMES[a]

Condition	Time from Downtown Portland, in Minutes: Hollywood	Gateway	Lents	Gresham
1976 Existing	19	26	42	56
1990 No-Build	21	29	46	62
1990 Banfield Transitway Project	15	20 to 21	30	38 to 40

(a) The p.m. peak hour, outbound.

To show the effectiveness of the Project on a broader scale, travel times were analyzed among a number of selected zones in the East Side, plus downtown Portland. Data in Table 4.2-17 reflect the significant travel time differences between the 1990 No-Build and the Project.

TABLE 4.2-17

TRAVEL TIME COMPARISON FOR 7 SELECTED ZONES
(PERCENT OF TIME INCURRED COMPARED TO NO-BUILD)

Condition	Composite (percent)	Downtown (percent)
No-Build	100	100
Banfield Transitway Project	80	81

4.2.2.4.2 Safety

The LRT accident rates vary considerably given the experience in other cities. An analysis was conducted of 6 systems from which data were available to compare the accident rates of LRT and buses. The accident rate of the LRT ranged from a low of 0.1 to a high of 2.5 times the bus rate. Accident rates seem to be directly proportional to degree of separation of LRT from automotive traffic.

This relationship is illustrated in Figure 4.2-3. Philadelphia, at the high end of the accident range, has only about 12 percent of its routes separated in reservations or private rights-of-way. Newark, at the low end, has fully separated LRT operations. Over 90 percent of the Banfield Transitway Project trackage will be separated from automobile traffic. Using the curve plotted in Figure 1-3, the LRT line should experience less than half of the accident rate of buses in Portland (Tri-Met, Planning and Development Department 1978b). The incorporation of features such as signals with automatic train stops along the Banfield Freeway portion of the route and separation of any street-running portions by curbs or paint striping will proportionally improve the safety characteristics of the line (Tri-Met, Planning and Development Department 1978b).

4.2.2.5 DOWNTOWN TRANSIT OPERATIONS

Downtown transit operations must be considered in light of not only East Side transit operations, but also in light of operation of the total system. Bus departures from downtown Portland during a typical peak hour are summarized in Table 4.2-18. Departures on lines serving the East Side would not, by themselves, create circulation problems. It is only when total bus departures to all parts of the system are examined that the extent of downtown operations comes into focus (Tri-Met, Planning and Development Department 1977a).

In calculating these total system-wide departures, 2 cases were developed. In the first, service improvements were assumed only for the East Side. The service levels on bus lines to all other parts of the region would remain at about 238 peak-hour departures as programmed for 1978, the first year the Portland Mall was in operation. Since it is probably unrealistic to expect no system-wide changes in the future, a second case was developed in which improvements were assumed for other parts of the region, with corresponding increases in vehicle frequencies. This condition is summarized in the last column of Table 4.2-18.

A second aspect of downtown circulation relates to travel on and off the Portland Mall. The capacity of the mall is estimated at 220 to 260

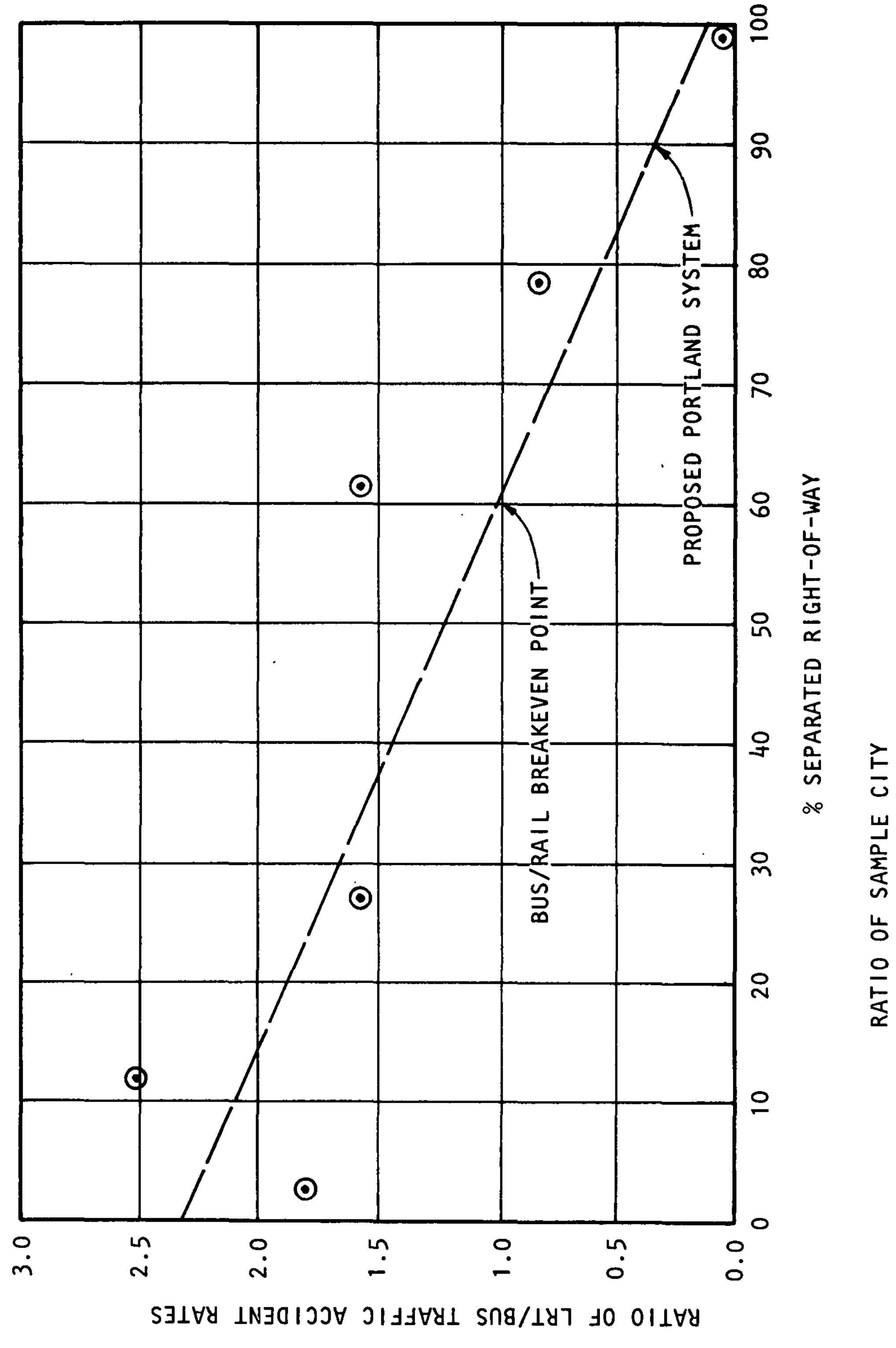


FIGURE 4.2-3

BANFIELD TRANSITWAY PROJECT FEIS

RELATIONSHIP BETWEEN LRT
ACCIDENT RATES AND
DEGREE OF SEPARATION OF LRT

bus movements per hour per direction. With allowance for the looping of buses on certain lines, this is equivalent to about 200 buses per hour on each of the 2 mall streets, or a total of 400. Based upon the bus departures arrayed in Table 4.2-18, the number of vehicles using the mall was estimated and the results are summarized in Table 4.2-19. The same 2 basic cases were assumed: service improvements only in the East Side and service improvements throughout the transit system.

Assuming no system-wide improvements, the Project would not result in overloads on the mall or force any additional buses to non-mall streets. If system-wide improvements are made, the Project would generate bus volumes exceeding mall capacity by 1990. The number of buses using non-mall streets will be doubled, reflecting both the ceiling on mall capacity and the increase in service on routes served from cross-mall streets (Tri-Met, Planning and Development Department 1977a).

The proposed Cross-Mall alignment will probably result in the concentration of the majority of transfers at one point: Pioneer Courthouse Park. This will be an advantage in terms of clarity of the system from the users' viewpoint, but a disadvantage in terms of the magnitude of pedestrian traffic concentrated at one point and additional out-of-direction travel for certain through trips. The introduction of off-mall bus circulation would alleviate the problem of crowding but reduce the clarity of a single transfer point.

TABLE 4.2-18

P.M. PEAK-HOUR BUS DEPARTURES FROM DOWNTOWN PORTLAND

		East Side Improvements		System-Wide Improvements	
	Buses to East Side	Buses to Other Areas	Total Bus Departures	Buses to Other Areas	Total Bus Departures
Existing System	107	238	345	238	345
1990 No-Build	111	238	349	289	400
1990 Banfield Transitway Project	78[(a)]	238	316	422	500

Data from: Tri-Met, Planning and Development Department 1977a).
(a) In addition, up to 16 LRT departures would be scheduled to the East Side.

TABLE 4.2-19

P.M. PEAK-HOUR BUSES ON AND OFF THE PORTLAND MALL

	Mall Capacity (Buses per Hour)	East Side Improvements		System-Wide Improvements	
		Buses On-Mall	Buses Off-Mall	Buses On-Mall	Buses Off-Mall
Existing System	400	295	50	295	50
1990 No-Build	400	299	50	345	55
1990 Banfield Transitway Project	400	266	50	400	100

Data from: Tri-Met, Planning and Development Department 1977a.

4.2.2.6 EAST SIDE NEIGHBORHOOD TRANSIT IMPACTS

Transit-related vehicle miles traveled (VMT) will increase in both the urban and suburban portions of the East Side. While this increase is more dramatic in the suburban portion, its effects could be critical in the urban area. This is because much of the impact in urban neighborhoods can be attributed to suburban services which simply pass through without providing much local service (Tri-Met, Planning and Development Department 1977a). This occurrence is highlighted in Table 4.2-20, which indicates the daily transit VMT expected in east Portland.

TABLE 4.2-20

DAILY TRANSIT VMT IN EAST PORTLAND

Condition	Local Service	Through Service	
	Arterial Streets	Arterial Streets	Banfield
1976 Existing	4,948	3,756	1,646
1990 No-Build	7,465	5,047	1,883
1990 Banfield Transitway Project			
Rail	--	--	1,772 to 2,500
Bus	7,840	1,029	--

Data from: Tri-Met, Planning and Development Department 1977a; Parsons Brinckerhoff Quade & Douglas, Inc. and Louis T. Klauder & Assoc. 1978a.

The LRT project will <u>decrease</u> through-transit vehicle trips from east Multnomah County and produce a slight increase in local service. The LRT will impose no significant proximity impacts on properties along the Banfield Freeway, since rail car VMT in that corridor will be low (1,722 to 2,500 per day) and the rail cars will emit no pollutants (see Section 4.8 and the Air Quality Technical Report).

4.2.3 Mitigation

4.2.3.1 CONSTRUCTION

Construction of the freeway improvements and the LRT facilities will follow generally accepted procedures. Contractors also will be required to follow guidelines on construction practices within the appropriate jurisdictions (City of Portland, Multnomah County, etc.), including limiting working hours in residential areas to specified hours.

Mitigation of freeway construction impacts will include the maintenance of freeway capacity during non-peak hours as well as the peak hour to the greatest extent possible by applying the methods described above in Section 4.2.2.1.2.

The effects of construction-generated dust on nearby traffic will be mitigated through the application of standard construction practices such as wetting down project work sites at specified intervals, wetting down haul loads consisting of excavated earth, and reducing speeds of trucks operating on the unimproved right-of-way (see Section 4.0 of the Air Quality Technical Report).

4.2.3.2 OPERATIONS

4.2.3.2.1 Downtown

Impacts on downtown circulation and parking are complex. Existing curb parking (approximately 235 spaces) will be lost on 1st Avenue and Morrison and Yamhill Streets, with development of the LRT. With downtown parking already at a premium, some adverse impact is unavoidable until the parking removed is replaced off-street (still remaining within the parking supply "ceiling" of the Downtown Parking and Circulation Policy).

In addition, lane capacity will be lost on downtown streets. Traffic displaced by lane reductions (and street closings at stations) will probably use the nearest available parallel street. Parking prohibitions on these streets, coupled with improved signal timing provided by upgraded control systems, will help provide adequate capacity for displaced traffic.

Additional restrictions on turning vehicles along LRT alignments are unavoidable. However, continuous monitoring of the systems operation will be conducted to identify areas where turning restrictions are not warranted.

4.2.3.2.2 East Portland

BANFIELD FREEWAY

Even though implementation of the proposed Banfield Transitway Project will improve 1990 estimated p.m. peak-hour v/c ratios on the Banfield Freeway by up to 19 percent, forecasts still anticipate that capacities at LOS D will be exceeded during peak hours. Several actions and secondary impacts will act to mitigate this adverse impact:

- Development of the freeway ramp metering with auxiliary lines will significantly improve freeway traffic flow.
- Worsening conditions during peak hours on the freeway will act as an incentive to work rescheduling and ride-sharing programs, reducing vehicular demand.
- Worsening conditions also will act as an incentive for the greater utilization of the person capacity of the LRT.

HOLLADAY STREET

Impacts along Holladay Street involve loss of curb parking for seven blocks, pedestrian conflicts, traffic operations problems near the Steel Bridge, and loss of access to adjacent property.

The loss of curb parking is unavoidable, but will not be critical since there is a generous off-street supply in the vicinity.

Pedestrian conflicts can be resolved as part of adaptation of the traffic signal system (possibly with barriers at critical locations).

Traffic operations problems near the Steel Bridge may be mitigated by diverting automobile traffic to the Williams Avenue on-ramp via 1st Avenue and Hassalo Street. Alternately, Holladay Way will be closed between Multnomah and Holladay Streets. The Holladay Street approach to the Steel Bridge will then be converted to exclusive LRT use (Parsons Brinckerhoff Quade & Douglas, Inc. and Louis T. Klauder & Assoc. 1978).

The most serious problem is that of restrictions on access, an impact that could be mitigated through relocations of driveways as suggested in Traffic Engineering Study of the Holladay Street Area of the Banfield/Burnside LRT Line (Parsons Brinckerhoff Quade & Douglas, Inc. and Louis T. Klauder & Assoc. 1978b).

4.2.3.2.3 East Multnomah County

Mitigation of arterial capacity deficiencies forecast for the east Multnomah County area include work rescheduling, ride-sharing, and greater use of LRT. Traffic engineering improvements such as signal optimization and intersection widening will also be implemented to increase capacities.

Turning restrictions along Burnside Street, resulting in out-of-direction travel and reduced access to adjacent properties, are unavoidable. Several mitigating measures have been suggested in terms of relocated access from side streets, but this remedy has limited application (CH2M Hill 1978b). Additional crossing points can be developed after operating experience is gained with LRT along this arterial.

Similarly, adverse impacts on emergency access routes can be reduced if "emergency vehicle only" crossings are installed between planned intersections, or if pedestrian crosswalks are designed to be used by emergency vehicles.

Standard traffic engineering techniques involving channelization, signals, and warning devices will be applied to facilitate pedestrian crossings near stations along Burnside Street.

Widening of streets serving LRT stations in Gresham (Cleveland and Hogan Avenues, 8th and Main Streets) can mitigate Project-generated adverse impacts (CH2M Hill 1978b). These street widenings will be coordinated with the City during design.

4.3 ENERGY

This section considers the direct and indirect energy effects of the proposed Banfield Transitway Project. Transportation energy demands have received greatly increased study since the oil embargo of 1973-1974. Many of these recent studies have emphasized the need for a total systems approach to transportation energy analysis rather than an analysis of propulsion energy requirements alone. However, general agreement on the need to consider all components of energy impacts has not avoided considerable controversy over specific proposed methodologies. Furthermore, different estimates with a broad range of variation are available for some parameters of the total system analysis, while for others the data are very sparse and therefore less reliable. These difficulties of methodology and data availability were considered in carrying out this investigation. First, a comprehensive methodology addressing both direct (propulsion) and indirect (nonpropulsion) energy components was selected and an analysis performed using the best obtainable or estimated values for the Project. A number of subsequent analyses were then performed varying the "base case" data values to gauge the sensitivity of the results. Several factors that were not directly considered within this methodology were evaluated independently. Conclusions were based on this entire set of analyses, rather than on any one analysis. Details of the data assumptions and methodology used in these analyses are presented in the Energy Technical Report.

4.3.1 Introduction

Both the LRT and Banfield Freeway components of the Project will contribute to the total energy requirements and effects of the Banfield Transitway Project. Construction activities will require energy for the additional Banfield Freeway lanes (including excavation, retaining walls, and noise barriers), bridge reconstruction, the LRT right-of-way, and associated facilities such as the LRT stations and maintenance yard. The manufacture of LRT vehicles and their delivery will also consume energy. Operation of the Project will require propulsion energy for the LRT system; lighting for vehicles, parking areas, stations and buildings, rights-of-way, and work areas; and vehicle and roadway maintenance. Thus, many more factors than propulsion energy alone must be considered.

The transportation impacts of the Project will also affect total transportation system energy consumption, in particular through the effects on traffic congestion, restricted access across the LRT right-of-way, and shifts in the use of various transportation modes (private automobile, bus, LRT). These indirect traffic impacts have energy consequences as important as the construction and operation energy requirements, and they are included in this analysis.

Transportation is one of the largest users of energy. Nationally, it accounts for 25 percent of all energy consumed and 53 percent of total petroleum use. In the Portland SMSA, where 27 percent of the region's total energy use is for transportation, the automobile is dominant, accounting for fully 75 percent of transportation energy use (Portland, Bureau of Planning 1979g; Portland, Bureau of Planning, Policy Analysis Section 1977). Transit in the Portland SMSA uses only one percent of total transportation energy. The relatively small current contribution of transit to total transportation activity reflects a nationwide long-term trend since 1945 of reduced transit use and increasing dominance of the private automobile. As a result of this trend, even significant increases in transit use will have only small effects in the short term on total transportation energy consumption. However, as the response to the oil embargo of 1973-1974 showed, external events can significantly affect the continued reliance on private automobiles. Considering the potential of urban public transit to produce energy conservation, one study concluded:

> "Although the short-term energy conservation potential of increased public transit use is slight, this does not mean that transit improvement programs should be abandoned. Changes in urban travel patterns are likely to require at least a decade because of long lags associated with changes in land use patterns, automobile ownership, and individual attitudes toward public transportation. Thus, unless transit improvement projects are undertaken now, the long-term potential [energy] benefits of transit will never be realized." (Stuntz and Hirst 1976)

The Columbia Region Association of Governments (CRAG) has made several policy statements supporting more efficient regional energy use. These include the following objectives:

1. "that the transportation system will use each available mode of travel as appropriate for efficiency and energy conservation." (Interim Transportation Plan for the Portland-Vancouver Metropolitan Area (1975))

2. "that the development of energy-consuming activities shall minimize the use of nonrenewable resources and encourage the use of energy from renewable energy sources, based on sound economic principles." (Columbia Region Association of Governments Goals and Objectives and Implementing Rules (1976a))

3. "that plans for the construction or improvement of major transportation facilities shall identify the positive and negative impacts of such facilities on energy use and resources." (Columbia Region Association of Governments Goals and Objectives and Implementing Rules (1976a))

4.3.2 Existing Transportation Energy Requirements

In August 1976 a CRAG study of critical energy issues for the region was released. The transportation section of this report summarized the current situation in the region:

> "The region's transportation system is totally petroleum dependent, with patterns of urban sprawl constraining reductions in private car use, or shifts to other transit forms powered by alternative fuels. The region has experienced a significant rate of increase in private vehicle petroleum consumption in excess of increases in the number of cars in use." (Weinstein 1976)

As suburban growth patterns continue, there is greater energy consumption due to an increase in the miles of travel per vehicle per year, as well as an increase in the number of vehicles.

Tri-Met took over operation of the mass transit (bus) system for the CRAG region in 1969, and since then it has expanded the system significantly.

From 1970 to 1974 there was an increase in transit ridership from 16.6 million to 24 million passenger trips per year. While this growth slowed immediately after the 1973-1974 oil embargo was terminated, in recent years it has resumed. By 1979, passenger trips had increased to over 40 million. Much of this increased ridership reflects a growth in the bus system rather than an increase in average bus occupancy; total bus miles traveled increased from 12.9 million to 19.8 million between 1974 and 1979. Over that period, average occupancy has increased only about 7.5 percent. Like many other transit systems, Portland's transit system shows considerable peaking in use during morning and evening rush hours. During these peak periods, the high occupancy rate results in an energy efficiency several times greater than that for the overall transit system including both on- and off-peak hours. The systemwide average occupancy of Tri-Met buses was 8.8 passengers as of January, 1978 (Tri-Met 1978b).

The total transportation energy consumption in the CRAG region for 1974 was estimated at 396.6 million gallons of gasoline: 393 million gallons for privately owned vehicles and 3.6 million gallons of diesel fuel for Tri-Met buses. The annual energy savings from transit ridership in 1974, compared to the energy required if all bus riders traveled by private automobile at the region-wide average occupancy of 1.3 people per car, was about 3.5 million gallons of gasoline. As automobile mpg improves, these savings will be reduced. The same level of ridership in 1990 would result in savings of only one fourth as much (0.8×10^6 gallons of gasoline). This simple analysis, of course, does not take into account the equity issue (not everyone has private transportation available), nor does it consider the difference between regular and diesel fuel. However, it does show that the current level of transit use represents a savings of less than one percent of total current regional transportation energy consumption, based on propulsion energy alone. Even if transit ridership were to double or triple, as a result of a shift from automobile travel, the net effect on total transporation energy consumption in the CRAG region would amount to only a few percent.

The 1975 travel in the Banfield Transitway Project corridor that will be influenced by the LRT line and associated highway improvements was estimated by Tri-Met to be 669 million VMT by private automobile and 5.8 million VMT by transit bus. The resulting energy consumption was almost 48.5 million gallons of gasoline for privately owned vehicles and 1.45 million gallons of diesel fuel for Tri-Met buses.

4.3.3 Analysis of Project Energy Requirements and Impacts

The energy impacts of the Project will be discussed under 3 headings: construction energy requirements, operating energy requirements, and the energy consequences of traffic impacts of the Project. Following these discussions, the payback period for the required construction energy from net operation and maintenance energy savings for the Project will be considered.

4.3.3.1 CONSTRUCTION ENERGY REQUIREMENTS

The energy consumed in construction activities--including both the energy used to produce the materials and the energy consumed in construction operations--has generally been estimated by several methodologies. The results of these different methodologies have shown wide variation when applied to the same project, the lack of agreement reflecting the difficulty of identifying and accounting for all direct and indirect energy components in construction activities (see U.S. Congressional Budget Office 1977; U.S. Federal Highway Administration, Office of Environmental Policy and Planning 1976)

Construction energy consumption for the Banfield Transitway Project was estimated by 2 procedures. In the first (DeLeuw, Cather and Co. 1975), energy values that were developed on a lane-mile and track-mile basis were applied to the total distances for each type of construction in the Project. The energy values used represented the average values in the report; the difference factor between maximum and minimum values ranged from 2.85 for roadway construction energy estimates to almost 8 for bridge construction energy estimates. The result using this method is an estimate for construction energy of $2{,}459 \times 10^9$ BTU. Not included in this estimate is the energy required for construction of facilities associated with the LRT, such as stations, park-and-ride facilities, and maintenance yards. These were assumed to add 50 percent to the energy needed for the construction of the LRT track alone, or an additional 186 x 10^9 BTU. Thus, the total construction energy for the Project by this methodology would be 2,645 x 10^9 BTU.

The second approach was based on economic input/output models to estimate energy consumption for construction expenditures within major industries. This procedure has typically produced higher energy estimates which have been referred to as probable upper bounds on the "true" values (U.S. Congressional Budget Office 1977). The Department of Energy Region X Office in Seattle used this approach to estimate energy consumption for construction of the Banfield Transitway Project (U.S. Department of Energy, Region X 1978). Their resulting estimate of 14,300 x 10^9 BTU is more than 5 times higher than the estimate obtained using the first methodology.

4.3.3.2 OPERATING ENERGY REQUIREMENTS

Vehicle propulsion energy, while not the only energy component to be considered under operating energy requirements, is nonetheless the single most important factor. Therefore, as an introduction to the discussion of Project operating energy requirements, 2 aspects of propulsion energy will first be considered: the mandated automobile fuel efficiency standards, and a comparison of propulsion energy requirements for different vehicles.

4.3.3.2.1 Automobile Fuel Efficiency

The energy efficiency of transportation, measured in BTU per vehicle mile traveled (VMT), can be directly improved if propulsion energy requirements are reduced. In the Energy Policy and Energy Conservation Act of 1975, 89 Stat. 871, as amended, Congress mandated increasingly strict standards for automobile fuel efficiency through 1985. These standards rise from 18 mpg in 1978 to 27.5 mpg by 1985. However, because new vehicles replace only about 10 percent of the existing fleet each year, the average fuel efficiency for all vehicles will rise much more slowly than these mandated standards. For the analyses carried out here, only fleet average mpg were used. Congestion effects were looked at separately, but the effect of other traffic characteristics (which do not differ markedly across the study area) on mpg were not considered. The increase in automobile mpg alone will result in major short-term savings in transportation energy consumption. However, over time the increase results in a shifting basis for making energy comparisons for alternative transportation modes. Any alternative transportation mode that shows an energy savings compared to the 1977 fleet average mpg figure, for example, will have that energy savings reduced as the automobile fleet average mpg increases. All energy comparisons will therefore have to specify the time frame being considered. This increase in fuel efficiency in the dominant transportation mode, automobile travel, will also affect the payback period for the energy invested in constructing the Project, since the energy savings will not be constant from one year to the next.

If no further significant increases in automobile fuel efficiency take place beyond 1985, additional fuel savings in the 1990s and beyond would depend on a reduction in actual automobile travel (through ride-sharing or fewer trips) and a shift to greater use of more efficient transportation modes.

In contrast to automobile fuel efficiency, bus fleet average fuel consumption is not expected to improve substantially from the current 4 mpg. Any improvement due to express running and posible technical improvements (which are still experimental at this time) will likely be balanced by the additional impacts (weight, stops) of increased ridership and traffic congestion in some locations.

4.3.3.2.2 Fuel Efficiency of Transportation Vehicles

A comparison of different vehicles with respect to their propulsion energy requirements can provide information on their potential energy efficiencies. The energy efficiency in BTU/VMT and the energy intensity in BTU/passenger-mile for several alternative transportation modes were compared; for details, see the Energy Technical Report. Five vehicles are included in this comparison: average 1977 and 1990 cars, a 40-foot transit bus, and 2 representative LRT cars, the Duwag B and Boeing cars. The final decision on the type of LRT car to be used in the Project has not been made, but these 2 cars are representative of the size vehicle needed to satisfy projected system operating characteristics. Since the propulsion energy requirements for LRT cars are system-specific, and because only very limited data are available for comparison, these propulsion energy values are not available other than within a fairly broad range. Probable upper and lower bounds for propulsion energy, in KWHe* per car-mile, were used for the LRT car calculations.

The results show the potential energy savings available through the use of bus or LRT transportation modes in comparison with private automobile travel. The greater propulsion energy required for transit vehicles such as buses and LRT cars is more than made up for by their large capacities. However, realization of these potential energy savings depends heavily on attracting a sufficient number of riders. The energy intensity of transportation vehicles varies inversely with the actual number of passengers carried. Thus, car pooling or increasing transit ridership are effective ways of reducing the energy intensity for transportation. The current energy intensity of Tri-Met buses, for example, is 3,693 BTU/passenger-mile, based on an average occupancy of 8.8. At crush capacity of 70, however, the energy intensity for Tri-Met buses drops to only 464 BTU/passenger-mile, only 1/8 of the current figure, and far lower than the projected 1990 automobile value even at full occupancy (1,437 BTU/passenger-mile).

Comparison of energy intensities between buses and LRT cars are also valuable in highlighting the importance of ridership. If the average occupancy for the LRT were to be only 25 people, the results show it would be 2 to 3 times more energy efficient to use buses, based on propulsion energy requirements alone. The actual selection of an LRT car and the system operating characteristics are based on projected ridership,

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*KWHe is the energy consumption of electricity at the point of delivery. It should be contrasted to the input energy required to produce that electricity, KWHt--thermal energy consumed.

and especially peak hour ridership. Because of the peaking characteristics of transit systems, it is difficult to operate at an overall systemwide average above 50 percent capacity. Since peak service is designed around nominal capacity, the most relevant comparison among vehicles for energy intensity is probably at 50 percent of nominal capacity (recognizing that this represents different numbers of passengers for different vehicles). These resulting energy intensities show that the LRT vehicles could have up to a 28 percent advantage compared to bus, if propulsion energy requirements turn out to be near the estimated lower bound figures. This result is based on propulsion requirements for single mode travel only; it does not, for example, include automobile travel to get to an LRT station, and thus is not as complete as the total LRT system analysis below.

4.3.3.2.3 Propulsion Energy Requirements of Alternatives

Based on Tri-Met projections for automobile, bus, and LRT vehicle miles of travel in 1990, the total energy consumed in propulsion requirements for the Banfield Transitway Project corridor passenger transportation was calculated for 3 conditions: existing (1975) passenger travel; assuming the No-Build condition; and assuming completion of the Banfield Transitway Project, including both the LRT line and freeway improvements. Automobile travel will clearly continue to dominate fuel consumption through 1990. However, the increase in automobile fuel efficiency is greater than the increase in automobile VMT, resulting in a net <u>decrease</u> in fuel consumption from 1975 to 1990, even under the No-Build condition. Compared to constant automobile mpg efficiency, this savings amounts to more than 24 million gallons of gasoline annually by 1990 and will result in an actual decrease in yearly gasoline consumption from 1975 levels of more than 8 million gallons.

Using the probable upper and lower bounds for LRT propulsion energy, which vary by 50 percent, gives a range for total energy consumption that varies only 1.3 percent, showing the relatively small contribution of the LRT system to total energy consumption. Comparing the LRT and No-Build conditions shows that the Project would result in a savings of more than 3 million gallons of gasoline (regular and diesel combined) annually in

1990. Since part of this savings is offset bythe electricity needd to run the LRT, it is also useful to look at the total energy saved: 178 to 247 billion BTUs per year, equivalent in energy content to 1.4 to 1.9 million gallons of gasoline annually. It should be noted that the energy effects of increased congestion under the No-Build condition were included by increasing the automobile fuel consumption by 2 percent for that one condition. This is discussed further under traffic impacts below.

4.3.3.2.4 LRT System Energy Analysis

The U.S. Congressional Budget Office (CBO), in a 1977 study entitled "Urban Transportation and Energy: The Potential Savings of Different Modes" (1977), developed a comprehensive methodology for the analysis of transportation energy requirements. While some portions of the methodology and conclusions of this study were controversial, it nevertheless provides the most complete method of analysis available in considering the many components of energy use in transportation systems. It considers 9 components related to energy consumption which are successively combined in a hierarchy of 4 increasingly comprehensive measures of energy use; the Energy Technical Report discusses this framework for analysis in more detail.

The CBO methodology was used to perform a set of analyses of the Banfield Transitway LRT which first used the best available data for this proposed system (base case), and then assessed the sensitivity of the results to different values in the 9 energy components included in the analysis (scenarios). A brief description of the principal elements of these scenarios is given in Table 4.3-1. Such sensitivity analyses allow the uncertainty in the values of the energy components and their net effect on the conclusions of the analysis to be investigated.

Considering all of these analyses, 3 energy components stand out as most important: the level of ridership of the LRT, in terms of average occupancy; the source of that ridership, particularly the shift from automobile to LRT; and the actual propulsion energy that will be

TABLE 4.3-1

DESCRIPTION OF SCENARIOS FOR LRT ENERGY ANALYSIS

Scenario	Prinicipal Elements[a]
1	From U.S. Congressional Budget Office (1977) study, middle estimates (from high, middle, and low analyses)
2	Base Case, using values for Banfield LRT and 1977 fleet average automobile mpg
3	Assuming projected 1990 fleet average automobile mpg
4	Using probable upper bound for LRT car propulsion energy requirements
5_{I-III}	Considering three different ridership levels, one lower and two higher than the base case
6	Including allocation for bridge reconstruction along Banfield Freeway as part of LRT construction energy requirements
7_{I-II}	Less favorable assumptions, in two levels, for access requirements
8_{I-II}	Changing assumptions (both less and more favorable than base case) for sources of LRT ridership
9	Combining less favorable assumptions for propulsion energy, ridership, construction energy, and access
10	In addition to 9, including low switch of ridership from automobiles to LRT
11	In addition to 10, using projected 1990 fleet average automobile mpg
12	Combining unfavorable assumptions as in 11, but with high ridership levels

(a) Scenarios 3 through 8 change components of the energy analysis, singly, with respect to the base case; Scenarios 9 through 12 change multiple components of the analysis, in order to assess their combined effect.

required for the LRT system. Construction and operation of the LRT system will most likely result in relatively small initial energy savings, equivalent in energy content to between 1 and 2 million gallons of gasoline annually at most. Two factors will affect these savings, in opposite directions. The increase in fleet average automobile mpg will tend to decrease the comparative energy savings of the LRT system. However, over time the ridership of the LRT is expected to increase, perhaps in response to increased highway congestion, greater time needed for automobile trips, increased gasoline costs, restrictions on fuel availability, or all of these factors. If high ridership levels are attained (average occupancy of around 80 per LRT car), the effect of increased automobile fuel efficiency could be more than counterbalanced, and the LRT system energy savings could increase somewhat. The maximum energy savings would amount to only a few percent of the total energy consumed for transportation in the Banfield corridor. For the net energy analysis and payback period calculations, the annual energy savings of the LRT system alone in 1990 were estimated to be 100×10^9 BTU, equivalent in energy content to 787,400 gallons of gasoline.

The highway improvements that are part of the Banfield Transitway Project will also require operating energy for lighting and maintenance. Lighting along the Banfield Freeway section of the Project will require an estimated 368,000 KWHe per year, or 73,600 KWHe per mile. This compares well with the figure of 65 MWHe per mile given in (U.S. Federal Highway Administration, Office of Environmental Policy and Office of Highway Planning 1976). Converting this energy to equivalent BTU, the total energy for freeway illumination is estimated at 3.1×10^9 BTU per year.

No data were found on annual maintenance energy costs per lane mile (see U.S. Federal Highway Administration, Office of Environmental Policy and Office of Highway Planning 1976). The Banfield Freeway improvements will result in a total of about 31 lane-miles of highway along the existing alignment. Preliminary investigation showed the energy probably required for driving in maintenance activities on this roadway would be less than 0.2×10^9 BTU per year. Maintenance energy requirements were assumed to be negligible and were not carried through further analyses.

4.3.3.3 TRAFFIC IMPACTS

The improvements to the Banfield Freeway, the drop in automobile VMT, and the operation of the LRT line will combine to reduce traffic congestion in the study area, although they will not eliminate it (see Traffic Analysis Banfield Transitway Study, Oregon, Department of Transportation, Traffic Section, Project Analysis Unit 1978 and the Transportation Technical Report). The Banfield Freeway betweeen Holladay Street and I-205, for example, will experience an increase in average speed during peak hour from 23 mph under the No-Build condition to 32 mph, and an improvement in level of service. Arterial streets will also benefit from reduced congestion, with an average improvement of 9 mph over the No-Build condition speeds.

The effects of reduced congestion on energy consumption for transportation were explored using data developed by the National Cooperative Highway Research Program (Traffic Analysis Banfield Transitway Study, Oregon, Department of Transportation, Traffic Section, Project Analysis Unit 1978; Claffey 1971; see also U.S. Federal Highway Administration, Office of Environmental Policy and Office of Highway Planning 1976, Appendix A). Energy consumption in gallons per mile (gpm) are given for a number of road design and traffic parameters such as speed, slope, curvature, stop-and-go cycles, and slowdown cycles. Detailed data are not available on projected conditions of this type for the Banfield Freeway and major arterials where congestion would be reduced. However, the tabled values were used to explore the possible magnitude of energy savings from reduced congestion. Considering both the lower speeds and poorer level of service on the Banfield Freeway under the No-Build condition, the congestion energy penalty avoided by the Project would likely be between 10 percent and 20 percent for a given trip. The congestion energy penalty avoided on the arterials would likely be somewhat less.

The energy savings from reduced congestion would apply to only a portion of the total VMT by automobile in 1990 for the LRT alternative, since congestion would be reduced by the Project only on certain roadways and at certain times of day. In the absence of detailed data, a figure of 2 percent of total transportation energy was used as a reasonably conservative estimate of the energy penalty avoided by reduced congestion within the Banfield Transitway Project corridor. Compared to the results of the exploratory analysis discussed above, this would suggest that 15 to 20 percent of the total VMT would benefit from this factor. The energy savings, based on 835 million automobile VMT in 1990, would be equal to 756,000 gallons of gasoline or 96 x 10^9 BTU annually. The magnitude of this estimated energy savings from reduced congestion in the Banfield Transitway Project corridor is comparable in size to that found for the LRT system itself. Moreover, it may well grow over time as LRT ridership increases.

The second traffic impact that results in an energy consumption change is the loss of access across the LRT alignment along Burnside Street for some properties (see the Transportation Technical Report). The total VMT for out-of-direction travel was estimated from the number of housing units affected categorized by extra access distance required. The result was 3,500 extra VMT per day, or 1.05 million VMT per year. In 1990, this would mean an extra energy consumption of about 47,500 gallons of gasoline, or 6 x 10^9 BTU annually.

Construction activities for the Banfield Transitway Project will result in some disruptions to traffic, such as delays or rerouting of access. While these disruptions will affect a significant number of vehicles, they will be short-lived compared to the 30-year Project lifetime that will characterize the congestion and permanent loss-of-access traffic impacts. Therefore, over the lifetime of the Project, construction traffic impacts will be a relatively minor energy component.

4.3.3.4 PAYBACK PERIODS

In order to calculate payback periods, the operating energy requirements and energy effects of traffic impacts are first combined for comparison with the construction energy requirements.

The overall operation and maintenance energy savings of the Project would result from the combination of the components discussed above as follows:

Annual energy saving = LRT energy saving +
congestion energy saving - highway lighting energy -
energy costs for access - construction traffic impacts
(prorated)

Assuming LRT energy savings of about 100 x 10^9 BTU per year in 1990 (equivalent to 787,400 gallons of gasoline), the net annual energy savings at that time would be about 187 x 10^9 BTU per year. This is equivalent in energy content to slightly less than 1.5 million gallons of gasoline per year.

The annual energy savings in transportation operations within the Banfield Transitway Project corridor were compared to the energy required for construction of the Project, and payback periods for this energy investment were calculated. As already discussed, the energy savings from the Banfield Transitway Project will not be constant from year to year, primarily because of the gradual improvement in automobile fuel efficiency and the expected increase in LRT ridership over time. No effort was made to chart a time path of annual energy savings; rather, the projected 1990 values were used as representative of average annual savings.

Based on the estimate of 187 x 10^9 BTU per year in 1990, the payback period for the entire Project (highway and LRT components) would range from 14.2 years to 76.5 years considering the 2 methods used to estimate construction energy costs. Payback periods for the LRT system alone and for the total Project were also calculated for the various scenarios considered within the CBO framework of analysis. Unless high ridership levels or significant shifts from automobile to LRT travel take place in the short term, the LRT system payback period is likely to be at least 10 years. Even at reasonably low estimated construction energy costs, the total Project payback period will probably be below 14 years only if LRT ridership levels rapidly approach an average occupancy of 70 to 80 passengers.

4.3.4 Additional Considerations

The analysis of Project energy savings thus far has not addressed several energy-related issues which should be considered in evaluating the energy impacts of the Banfield Transitway Project. They are briefly discussed in this section.

The conversion of all transportation energy requirements to BTU equivalents and the subsequent comparison of alternatives based on total energy consumption in BTUs masks any differences in the types of fuel required. The availability and vulnerability to interruption of supplies of various fuels, particularly petroleum-derived fuels, is an important concern.

The LRT system will be powered by electricity. It would thus contribute to a lessened reliance on petroleum to meet area transportation requirements since area utilities do not rely heavily on oil to generate electricity. The magnitude of actual gasoline savings would be larger than the gasoline-equivalent of total Project energy savings, since the latter includes electricity requirements in its calculations. However, the actual gasoline savings following from a shift in transportation mode to LRT would amount to no more than 7 percent of current gasoline consumption in the Project corridor, and less than 1 percent of current gasoline consumption in the CRAG region. To the extent that the LRT system will continue to rely on feeder buses and private automobiles to provide access to the LRT stations, the opportunities for gasoline savings will be reduced somewhat.

Electric power will be provided to the LRT system through multiple tie-ins with 2 utilities: Pacific Power and Light Company (PPL) and Portland General Electric (PGE). The current mix of generating facilities and capacity for these utilities is as follows (Northwest Public Power Association 1979):

PPL - 863,393 KW hydro
2,767,749 KW thermal

PGE - 661,000 KW hydro
1,766,200 KW thermal

The total amount of electricity required for the LRT system and highway illumination is small compared to the power produced by PPL and PGE. Even assuming that LRT propulsion energy requirements are as high as 15 KWHe per car-mile, the total annual electricity requirement for LRT propulsion would be only 23.9 million KWH. Adding all other electricity demands for lighting and other facilities, the total Project electricity demand annually would amount to less than 29 million KWH. The current annual sales of PPL are 22,500 million KWH, and for PGE 13,150 million KWH (Northwest Public Power Association 1979). The Project electricity demand thus constitutes less than 0.1 percent of the current sales of the 2 utilities. Some comparisons may help to place this yearly electricity demand for the Project in perspective. It is equivalent to the power produced by about 5.1 MW of baseload capacity operating year-round at 65 percent availability. This total yearly electrical consumption is also equivalent to the energy used in about 866 medium-sized (1,500 ft^2) single-family residences in a year.

The electricity required for the Project will be an incremental contribution to the growth in total demand on area utilities, and will thus contribute proportionally to the costs and environmental impacts of any needed additions to generating capacity (e.g., coal or nuclear baseload plants, natural gas or fuel-oil-fired combustion turbine units, or new hydropower facilities).

The use of comprehensive planning, zoning, and other tools to encourage a concentrated pattern of future development along the LRT system is discussed in the Land Use Technical Report. Success in achieving such a concentrated development pattern would have important results for energy consumption. Transportation energy requirements would be reduced in several ways. The total VMT would be smaller than for dispersed suburban development patterns, and the requirement to use automobiles for access to the LRT system would be greatly reduced. Increased use of the LRT system would also result in lower energy intensiveness (BTU per passenger-mile) and better energy productivity for that system. In addition to transportation energy savings, concentrated development would produce savings in construction and heating energy requirements. The potential energy savings from this indirect effect of the LRT alternative would probably be much larger than the system's operating energy savings alone.

The responses to the oil embargo of 1973 and 1974 and the gasoline shortage of 1979 illustrate the dramatic effect external factors can have on automobile travel and transit demand. The projections of travel demand and traffic conditions in the Project corridor did not address the issue of the availability of petroleum fuels. International petroleum supply cutoffs, U.S. rationing of gasoline supplies, or sharp increases in the costs of gasoline could all affect the use of the LRT system. The energy analysis, as already noted, is very sensitive to ridership levels (average occupancy) and modal shifts from automobiles to the LRT.

In the event of reduced gasoline availability from any or all of the factors listed, the LRT system would provide an alternative means of transportation which was not primarily petroleum-dependent. The energy benefits of the Project under these conditions could be higher than is reflected in the analyses; even more important would be the preservation of transportation options by a nonpetroleum based system.

4.3.5 Mitigation

The energy savings of the Project can be enhanced through minimization of energy consumption both in construction activities and in operation of the LRT system.

There are 2 areas in construction activities where minimization of energy consumption should be sought. Construction operations--the use of machinery and labor to perform the construction tasks--can be made energy efficient by minimizing haul distances, using full loads whenever possible for material transport, selecting the most energy efficient equipment available, promoting carpooling by the labor force, and similar measures. The second area for minimization of energy consumption is in the choice of materials and processes to be used in the design. Any choice must be consistent with other design parameters such as strength, maintenance requirements, expected lifetime performance characteristics in bad weather, and labor intensity required. Whenever possible, the reuse of on-site materials for aggregate or base course purposes, the use of alternative asphalt preparations (see, for example, Energy Requirements for Roadway Pavements, The Asphalt Institute 1975; Recycling the holmix way: what Texas and Oregon learned, Anonymous 1978), or even the substitution of lower energy consuming materials will be considered.

The choice of an LRT car for the Banfield Transitway Project will be based on a combination of car characteristics and system operating characteristics including projected ridership levels, headways for departures, and single- and multiple-car capacities. While some differences would appear to exist in energy intensiveness (BTU per passenger-mile) of various cars of generally appropriate size, the opportunity to capture any potential energy savings may be lost in the need to provide extra cars to meet capacity requirements, if smaller cars with lower energy propulsion requirements are chosen.

The LRT system will draw minimal power during stops (for lighting and heating the cars). Therefore, the principal opportunity for energy savings in operation of the LRT system is in technical developments to decrease power demands during acceleration and to save energy during deceleration. In order to gradually apply power during acceleration, starting resistors have typically been used in LRT cars. They result in wasting electric power in the form of heat. Chopper controls can avoid this loss by providing pulses of power during acceleration. The greater the number of stops in the system, the greater energy savings chopper controls can provide. They are being considered for the Banfield Transitway Project LRT cars, and can be used if ongoing technical studies show sufficient net energy savings to balance their cost and other requirements.

A second technical development that could provide operating energy savings is the energy storage wheel (regenerative braking system), which stores energy from a decelerating vehicle for use in subsequent acceleration. Although such devices are currently being tested, they are still considered experimental and are not yet ready for incorporation into an LRT system. However, in the future they may become a proven method for minimizing operating energy consumption.

4.4 LAND USE

4.4.1 Introduction

Transportation projects can have significant impact on land use, not only within the area immediately adjacent to the facility, but throughout an entire region. Direct impacts are related to construction of the Project, such as the conversion of existing land uses to facility rights-of-way. Indirect impacts pertain to changes in development patterns made possible in part by improved accessibility. Through time, changes in development patterns often outweigh the significance of direct effects.

A reciprocal relationship exists between land use and transportation. Whereas transportation projects can affect development patterns over a wide area, changes in land use can significantly affect the use and utility of the transportation improvement itself. Recognition of this interrelationship between land use and transportation has been of key importance to state, regional, and local governmental planning agencies involved with the development of the Banfield Transitway Project.

4.4.2 Land Use Profile

4.4.2.1 STUDY AREAS

The Banfield Transitway Project focuses on 4 geographical study areas (see Figure 4.4-1):

- The Region
- The Downtown and Steel Bridge Connection
- East Portland
- East Multnomah County

The region consists of the 4-county area comprising the Portland-Vancouver SMSA. The downtown study area is primarily coincident with the central core of the city. The east Portland study area encompasses the immediate service area for the Banfield Freeway and the major arterials which presently carry a large share of the current east/west commuter traffic. The east Multnomah County study area lies between east Portland

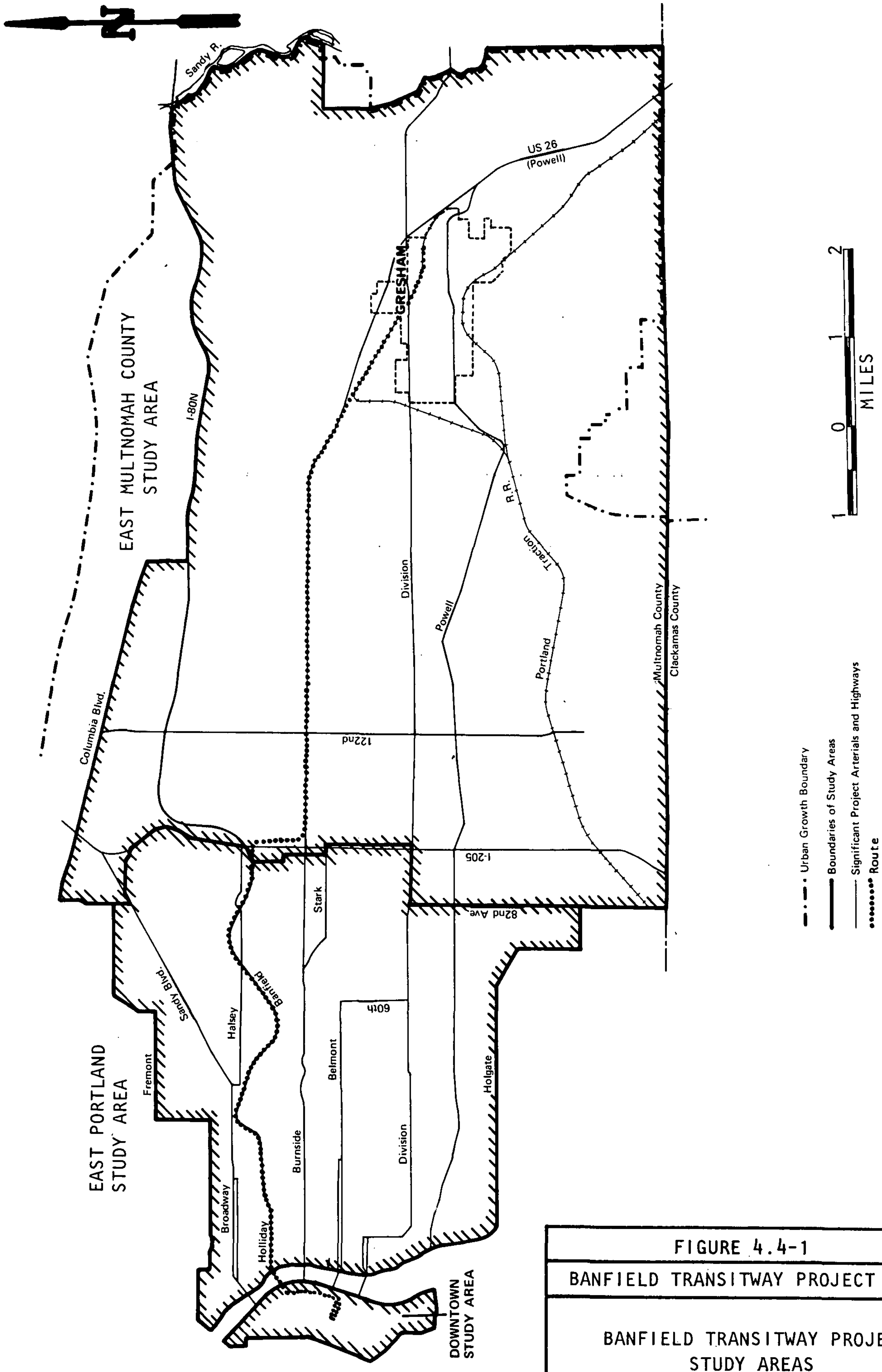


FIGURE 4.4-1

BANFIELD TRANSITWAY PROJECT FEIS

BANFIELD TRANSITWAY PROJECT
STUDY AREAS

and the adopted urban growth boundary on the west and is a major drawing area for the suburban transit routes and for much of the traffic on the Banfield Freeway. Together, east Portland and east Multnomah County comprise the East Side.

4.4.2.2 EXISTING SETTING

4.4.2.2.1 Regional

Generalized land use on a regional scale throughout the Portland metropolitan area is typical of most urban areas, with commercial and high-rise office development concentrated in the Portland central business district (CBD), the nucleus of the region. Heavy strip commercial activity radiates from the CBD along major arterials. Industrial activity in the region is concentrated primarily along major natural and man-made transportation corridors. Residential and institutional uses are dispersed throughout most of the region, with residential densities decreasing as distance from downtown Portland increases. Parks, open space, and vacant forested areas are generally found interspersed throughout the outlying areas of the region.

Current trends throughout the Portland metropolitan area indicate continued population and employment growth. Consistent with past trends, the majority of residential development associated with this growth will occur in the outlying suburban communities. The City of Portland is continuing efforts to stabilize and promote downtown Portland's residential development. However, within the Banfield Transitway Project study area, most residential development is expected to continue east of the Willamette River, particularly in the east Multnomah County study area.

4.4.2.2.2 Downtown

The downtown study area is the major retail and employment center for the Portland metropolitan area. Activity is concentrated along a commercial core running north/south from Burnside to Harrison Streets, with greater concentration along the Portland Transit Mall, generally east of Park Avenue. The majority of urban renewal and redevelopment investment has occurred in this area.

Office development is the dominant land use in the downtown study area. Residential land use has been steadily declining, with more intensive uses having gradually displaced residential activities. Industrial use is minimal in the downtown area. The majority of the public or semipublic land use in the downtown area is concentrated south of Burnside Street. The waterfront area (between Front Street and the Willamette River) is open space. Major park/open space land uses are located throughout the CBD.

Office-related development is expected to dominate development trends in the downtown study area, where employment in the business sector for the CBD is expected to expand by nearly 33 percent (representing about 89,700 new jobs) by 2000. Current planning activities in the Portland downtown area reinforce the existing high-density concentration of offices oriented around the Portland Transit Mall. Medium-density office development oriented around peripheral parking near major downtown access points is also being encouraged.

Although population in the CBD is not forecast to increase significantly by 2000, the city has developed a program to actively promote new housing and to stabilize existing housing. This program designates housing zone areas, limits the development of commercial activities, and encourages medium- and high-density housing.

The light industrial use north of Burnside Street has been gradually declining due to high property values, poor freight access, and antiquated buildings. This trend is anticipated to continue. However, in recent years numerous small shops and restaurants have opened in the Old Town portion of this area. Gradual replacement of light industrial activity by medium-density office and residential development is contemplated. Increasing development pressure is also expected to occur in the area east of the Portland Mall and along the waterfront area.

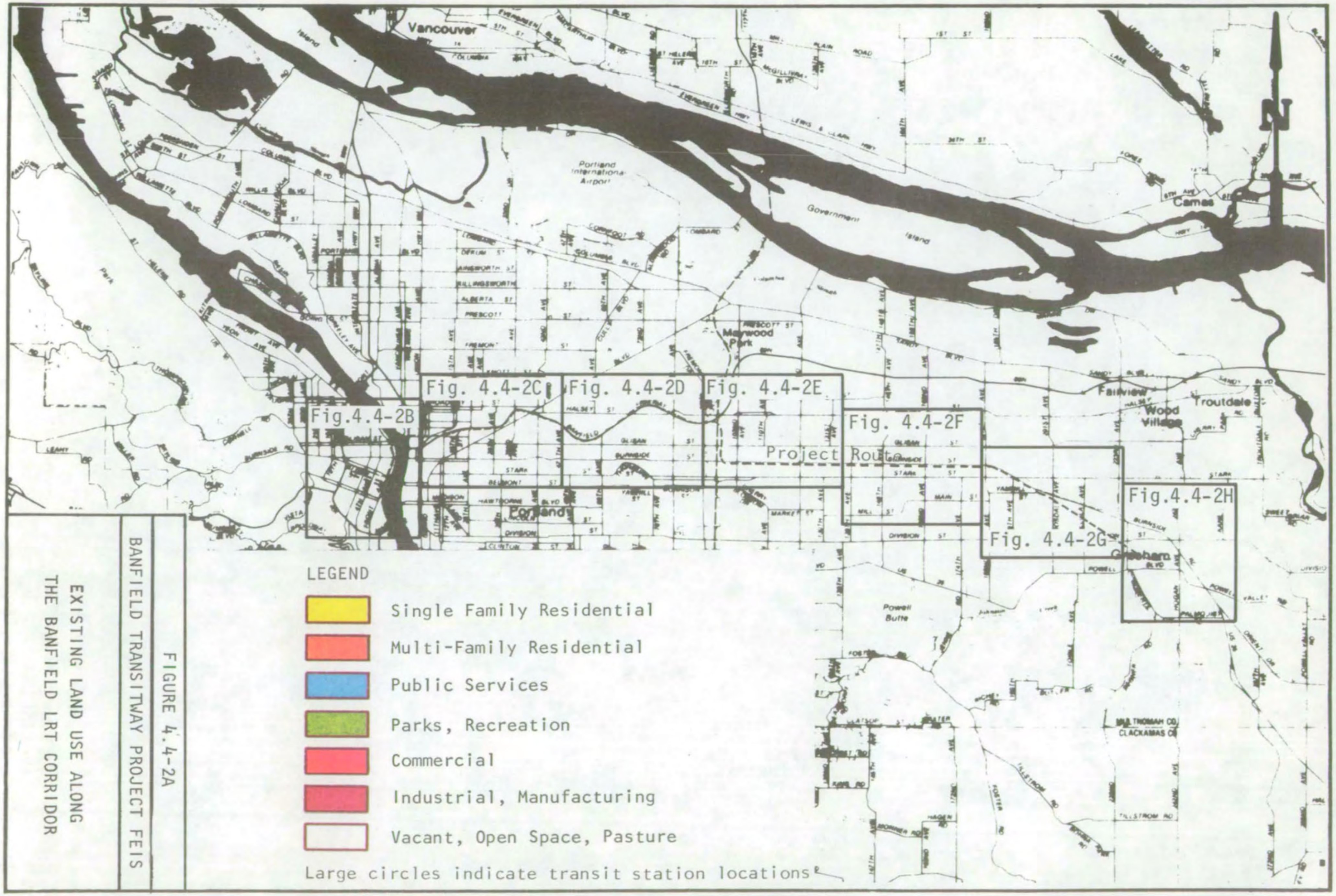
4.4.2.2.3 East Portland

The east Portland study area is basically urbanized. Residential land use is dominant, with commercial and industrial activity concentrated along major arterials and along the Willamette River. Existing land use within the Banfield Freeway corridor in the east Portland study area is shown in Figure 4.4-2 (Parts A, B, and C). Land use throughout the corridor is strongly oriented toward the adjacent freeway and railroad facilities found in Sullivan Gulch. Both the railroad and the Banfield Freeway have historically attracted business and industry because of their superior transportation opportunities. Commercial activity is highly concentrated along significant portions of the entire Banfield route. Commercial uses are particularly concentrated at Lloyd Center, and the Hollywood District (39th Avenue).

Outside of the downtown study area, east Portland exhibits the most intensively developed land use pattern. Although older single-family development is the dominant residential land use in the corridor, residential uses are characterized by a mixture of older single-family and more recent multi-family development. Some high-rise multi-family development is found in the Lloyd Center and Hollywood districts. Due to the extent of urban development throughout the east Portland area, there is little vacant residential land remaining. Public/semi-public uses, as well as parks and open space serving the east Portland area, are dispersed along the Banfield Transitway Project corridor.

EAST PORTLAND TRANSIT STATION AREAS

Six transit stations are proposed in the Project corridor in east Portland: (1) Colisum, (2) Union/Grand, (3) Lloyd Center, (4) Hollywood, (5) 60th Avenue, and (6) 82nd Avenue. A summary of existing land use in these station areas is presented in Table 4.4-1 and Parts A, B, and C of Figure 4.4-2. Generally, land use in the corridor becomes less intensive and more mixed residential/commercial/industrial eastward from the Steel Bridge to the Gateway area. Most of the area within 1/4 mile of the station sites is developed.



LEGEND

- Single Family Residential
- Multi-Family Residential
- Public Services
- Parks, Recreation
- Commercial
- Industrial, Manufacturing
- Vacant, Open Space, Pasture

Large circles indicate transit station locations

FIGURE 4.4-2A

BANFIELD TRANSITWAY PROJECT FEIS

EXISTING LAND USE ALONG THE BANFIELD LRT CORRIDOR

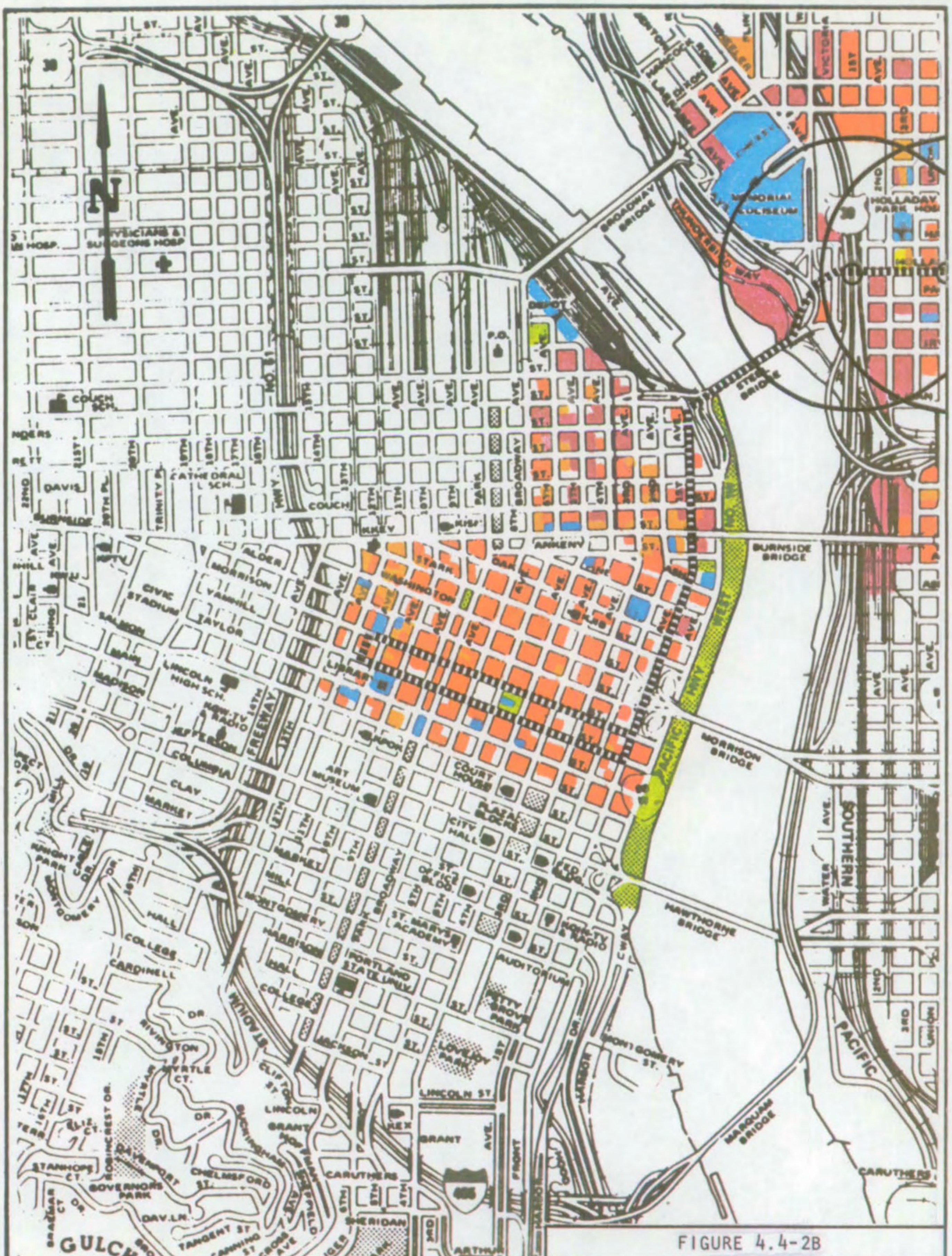


FIGURE 4.4-2B

BANFIELD TRANSITWAY PROJECT FEIS

EXISTING LAND USE ALONG THE BANFIELD LRT CORRIDOR

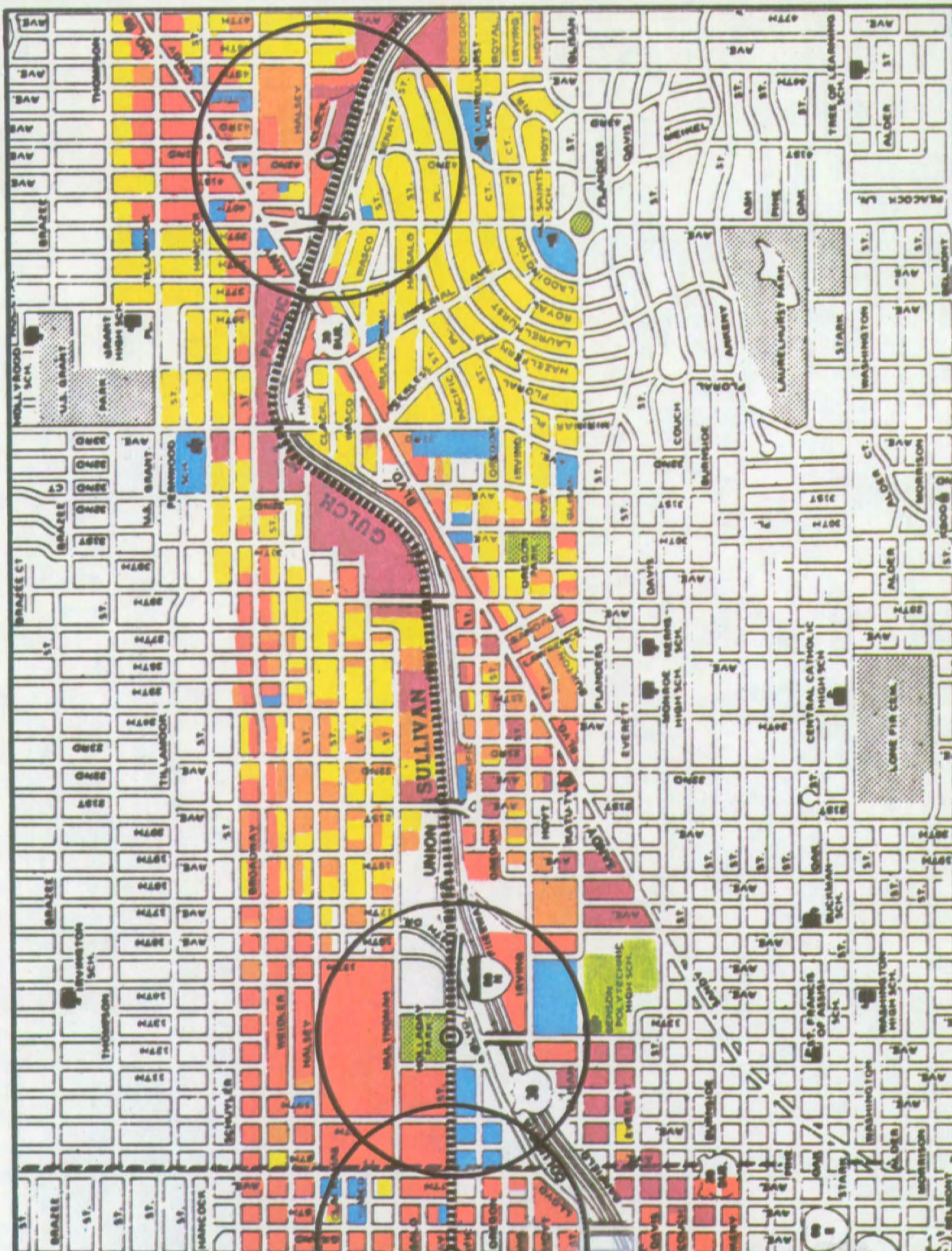


FIGURE 4.4-2C

BANFIELD TRANSITWAY PROJECT FEIS

EXISTING LAND USE ALONG
THE BANFIELD LRT CORRIDOR

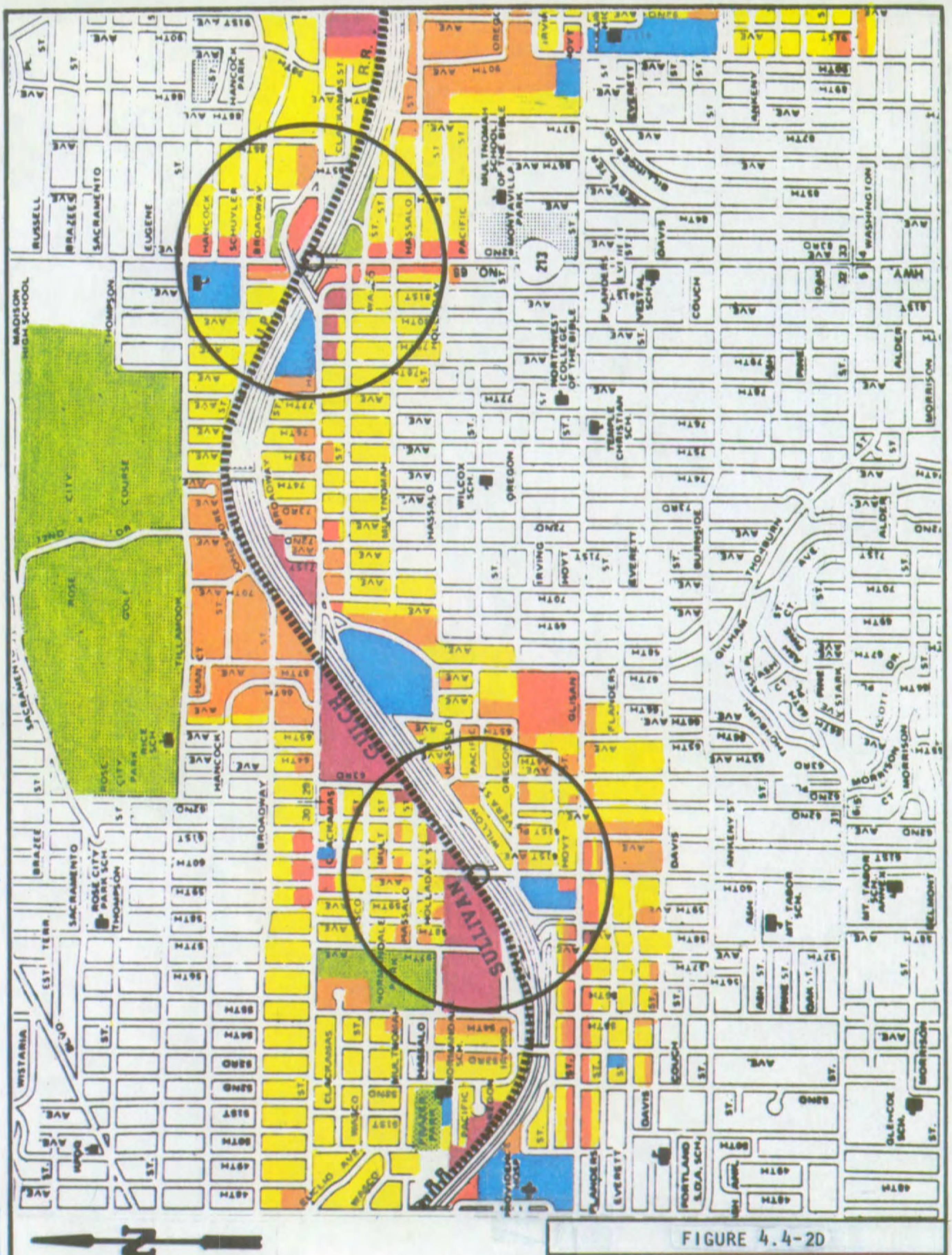


FIGURE 4.4-2D

BANFIELD TRANSITWAY PROJECT FEIS

EXISTING LAND USE ALONG
THE BANFIELD LRT CORRIDOR

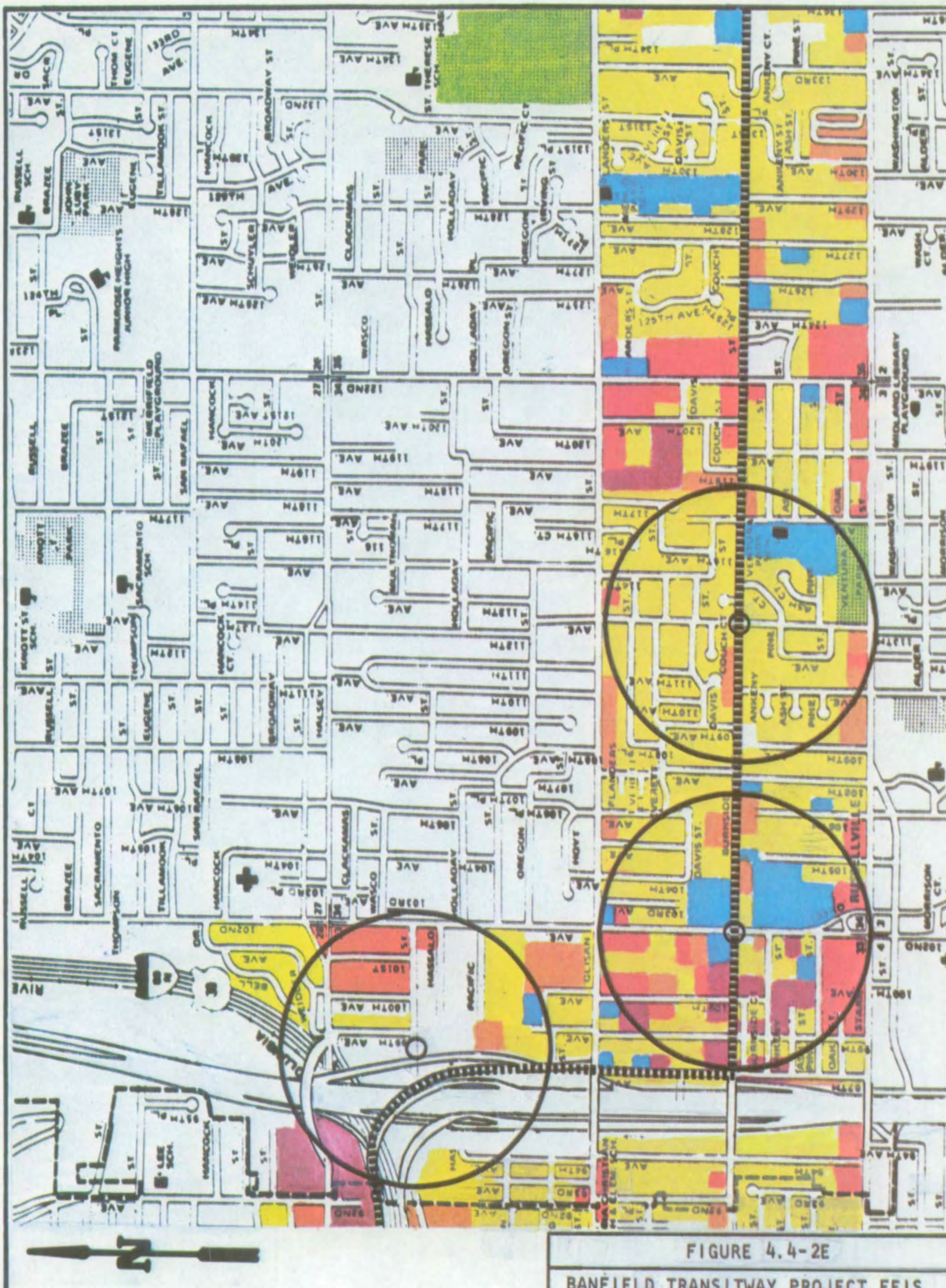


FIGURE 4.4-2E

BANFIELD TRANSITWAY PROJECT FEIS

EXISTING LAND USE ALONG THE BANFIELD LRT CORRIDOR

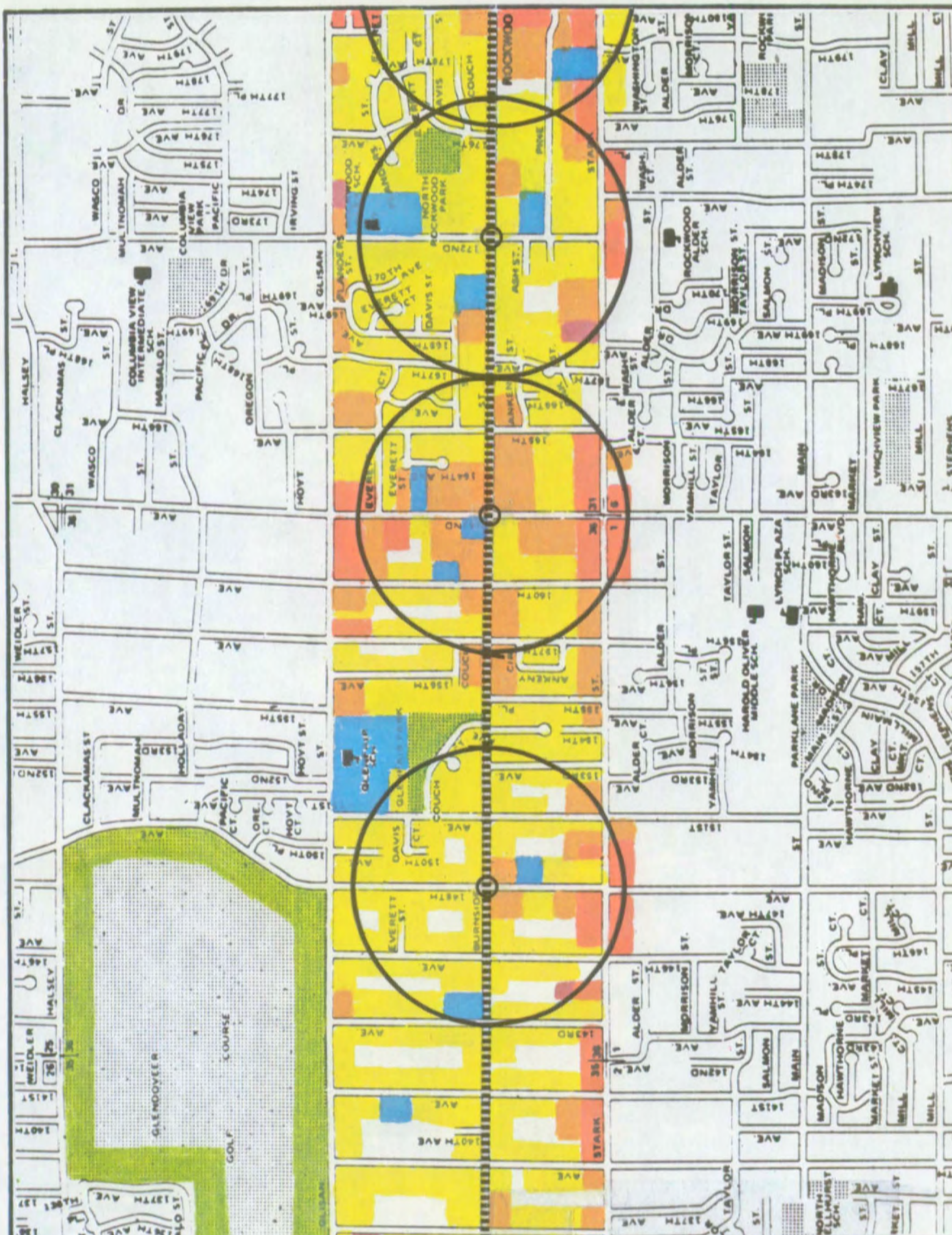


FIGURE 4.4-2F

BANFIELD TRANSITWAY PROJECT FEIS

EXISTING LAND USE ALONG THE BANFIELD LRT CORRIDOR

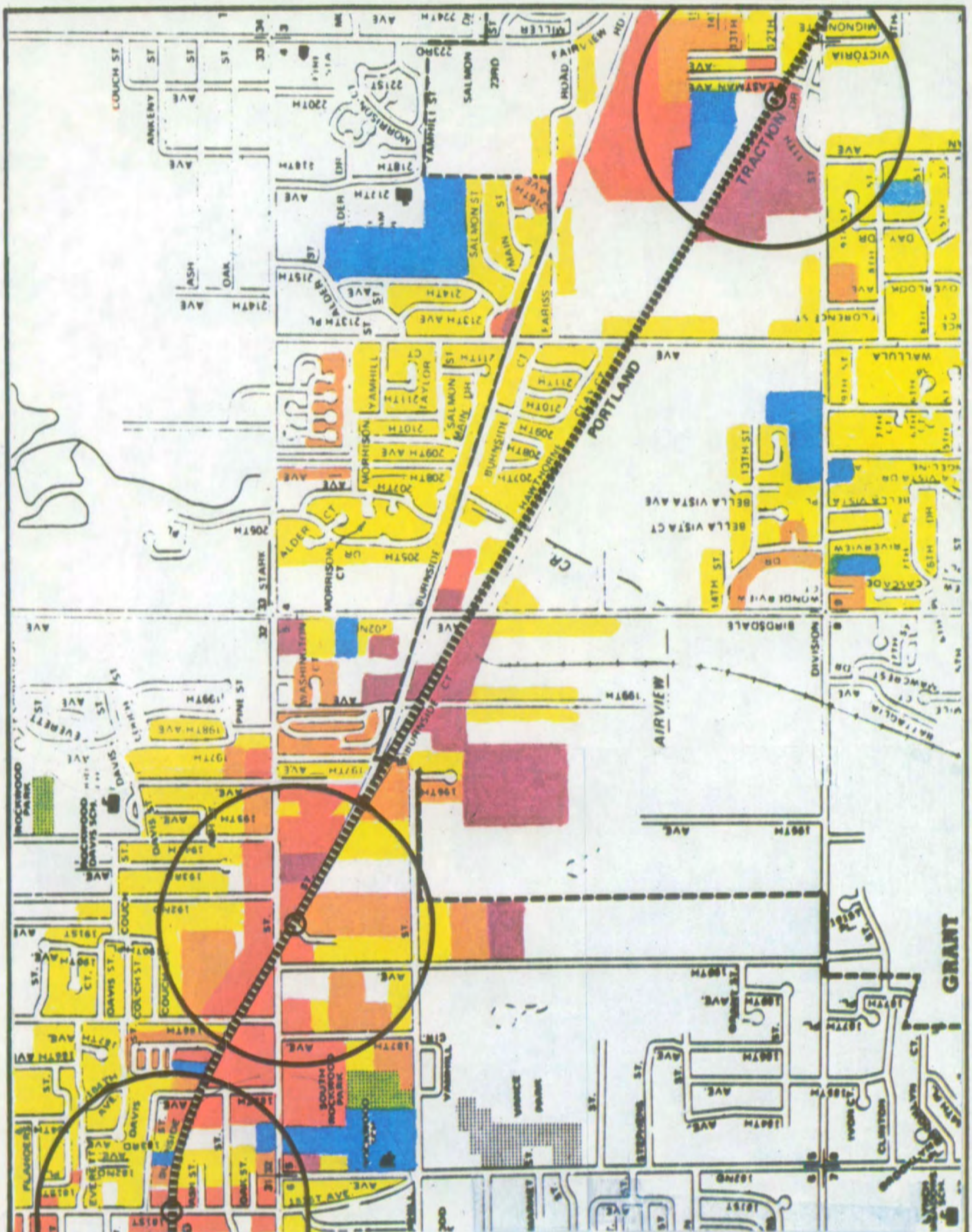


FIGURE 4.4-2G

BANFIELD TRANSITWAY PROJECT FEIS

EXISTING LAND USE ALONG THE BANFIELD LRT CORRIDOR

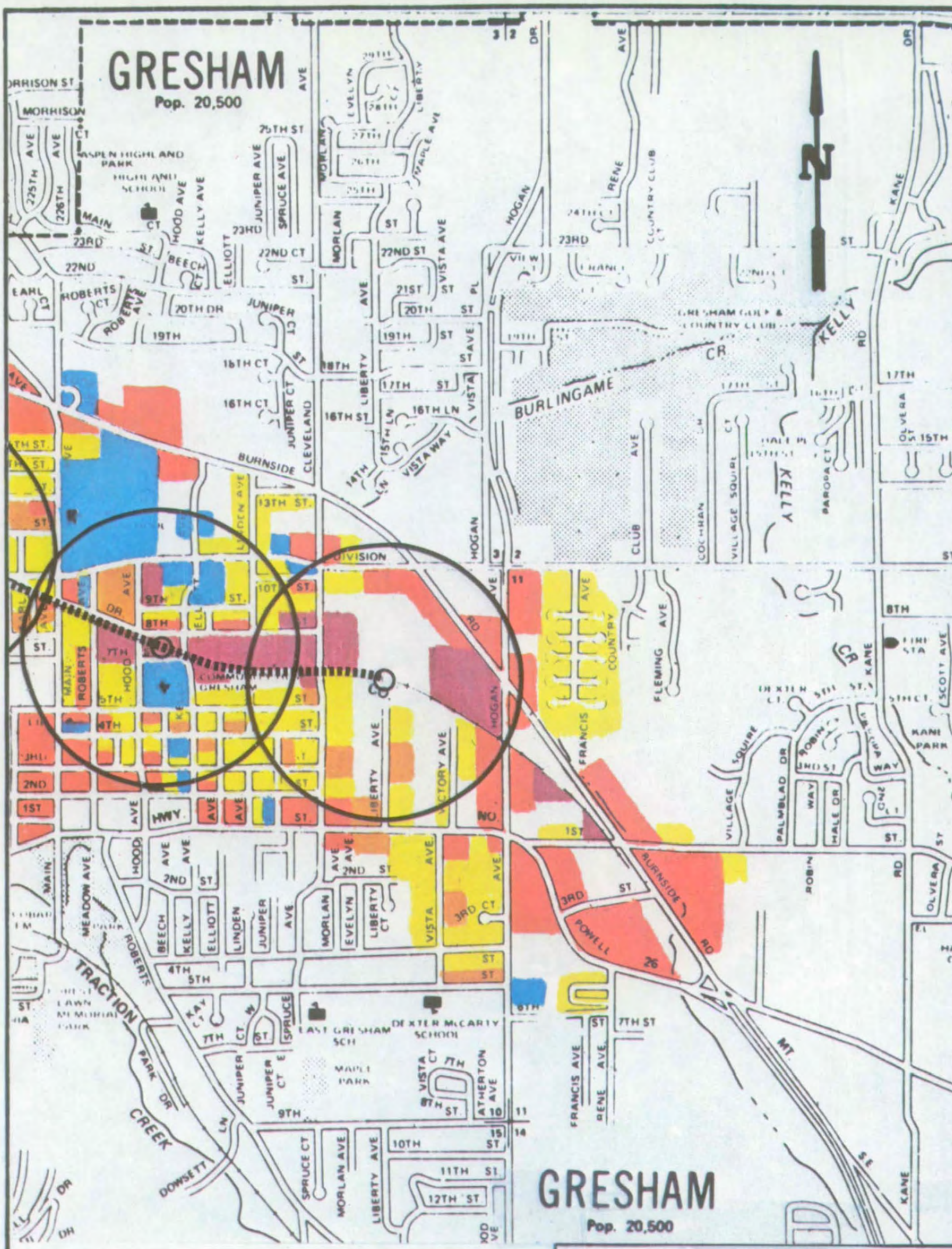
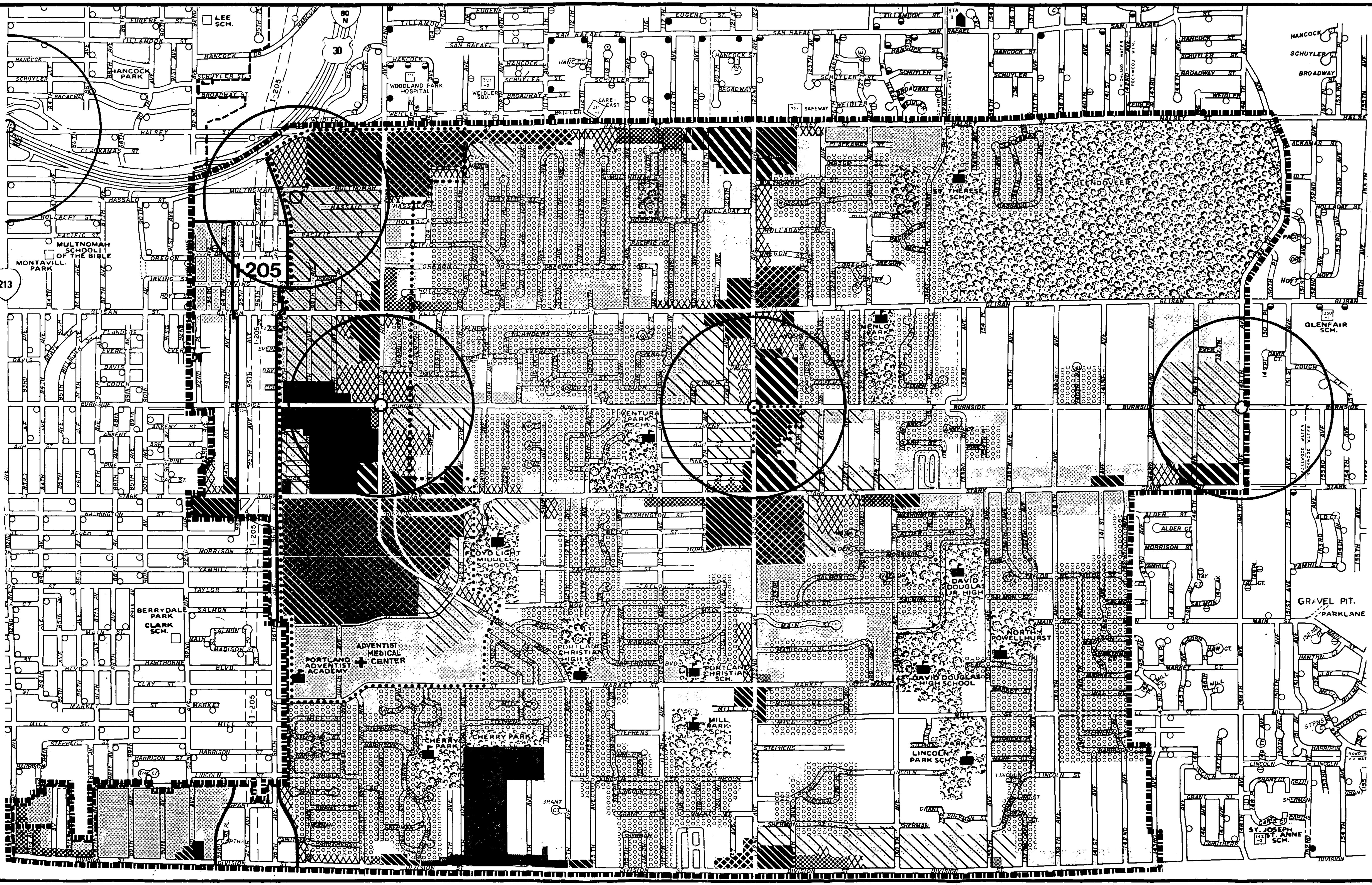


FIGURE 4.4-2H

BANFIELD TRANSITWAY PROJECT FEIS

EXISTING LAND USE ALONG
THE BANFIELD LRT CORRIDOR



N

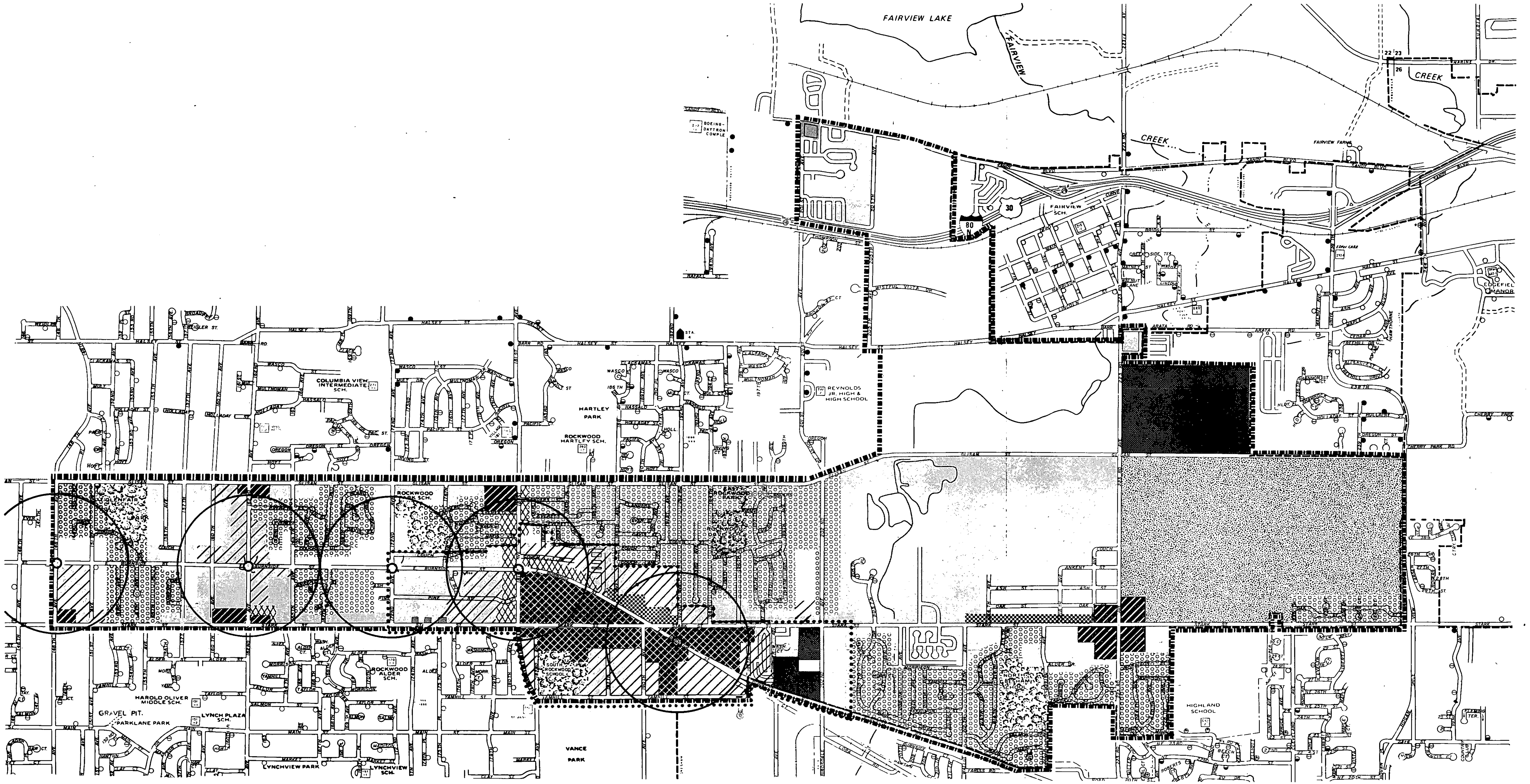
LOW DENSITY RESIDENTIAL
MEDIUM DENSITY RESIDENTIAL
HIGH DENSITY RESIDENTIAL
OFFICE
LOCAL COMMERCIAL
NEIGHBORHOOD COMMERCIAL
GENERAL COMMERCIAL
STRIP CONVERSION
EXTENSIVE COMMERCIAL
LIGHT INDUSTRIAL
SPECIAL STUDY AREA
OPEN SPACE, RECREATION, SCHOOL
DEVELOPED NEIGHBORHOOD
TRANSIT STATION LOCATIONS WITH ¼ MILE RADIUS

0 600 1200 2400 FEET

FIGURE 4.4-4

BANFIELD TRANSITWAY PROJECT FEIS

HAZELWOOD COMMUNITY LAND USE



- LOW DENSITY RESIDENTIAL
- LOW DENSITY RESIDENTIAL, DEVELOPED NEIGHBORHOOD
- MEDIUM DENSITY RESIDENTIAL
- HIGH DENSITY RESIDENTIAL
- OFFICE
- LOCAL COMMERCIAL
- NEIGHBORHOOD COMMERCIAL
- GENERAL COMMERCIAL
- URBAN FUTURE
- STRIP CONVERSION
- LIGHT INDUSTRIAL
- PARK
- REDEVELOPMENT AREA BOUNDARY
- TRANSIT STATION LOCATIONS WITH $\frac{1}{4}$ MILE RADIUS

0 750 1500 3000 FEET

FIGURE 4.4-5

BANFIELD TRANSITWAY PROJECT FEIS

ROCKWOOD COMMUNITY LAND USE

TABLE 4.4-1

EXISTING LAND USE SUMMARY: BANFIELD TRANSIT STATION AREAS

Transit Station	Land Use Description (1/4-Mile Radius)
Coliseum	Located in an industrial and commercial area. The Memorial Coliseum and Holladay Park Hospital are located in this area. Residential use is minimal.
Union/Grand	Retail and commercial office use predominates. Area contains Holladay Park Hospital and high-rise office buildings. Residential use is minimal.
Lloyd Center	Densely developed site with regional shopping center, high-rise office buildings, Holladay Park, Benson Polytechnic, and parking lots.
Hollywood	Located near an older retail and office center. Pedestrian-oriented commercial uses predominant north of the Banfield Freeway and along Sandy Boulevard. South of the Banfield Freeway, single-family residential land use is prevalent.
60th Avenue	Large industrial complexes are located north of the Banfield Freeway. Normandale Park and a mixture of single- and multiple-family residential uses are located north of the industrial uses. Single- and multiple-family residential, state office facilities, and commercial activity along Glisan Street are located south of the Banfield Freeway.
82nd Avenue	Strip commercial development along 82nd Avenue is backed by single-family residences. Light industrial uses are located along the Banfield Freeway. An elementary school is located in the northwest quadrant.

Little vacant land remains in the east Portland study area due to the extent of urban development in the area. Vacant land available for residential development is particularly sparse. Commercial development in established areas such as Lloyd Center is continuing, however, as overall employment in the area continues to rise. Currently, a general infilling and redevelopment of underutilized properties as well as an overall intensification of use is occurring throughout the study area. Single-family residential use is declining slightly, particularly along major arterials, where a conversion to commercial and multiple-family uses is occurring.

4.4.2.2.4 East Multnomah County

Existing land use in the east Multnomah County study area consists of suburban and rural land use activities, with single-family residential development as the dominant use (see Figure 4-4-2, parts C, D, and E). However, medium-density multiple-family residential development activity has increased rapidly in recent years, particularly along major arterials. The focus of higher-intensity uses such as commercial and industrial activities is centered around major transportation facilities, primarily the arterial street network.

In the City of Gresham, the downtown area contains diverse commercial activities. Commercial activities are also concentrated in a strip pattern along Broadway, Halsey, and Burnside Streets, Sandy Boulevard, and 82nd, 102nd, 122nd, and 182nd Avenues. Parks, recreation areas, and public/semi-public land uses are dispersed throughout the study area. Residential opportunities are also afforded by facilities located at high school campuses in the study area.

<u>TRANSIT STATION AREAS</u>

Eleven transit stations are proposed along the Banfield Transitway Project corridor in east Multnomah County. Seven of these stations lie within the unincorporated section of the county, four each falling in the Hazelwood and the Rockwood Community Planning area. The remaining stations all fall within the City of Gresham, adjacent to the Portland Traction Company rail line. Existing land use in the vicinity of each station is shown in Figure 4.4-2 (Parts C, D, and E).

In general, existing land use in the Project corridor along Burnside Street is largely single-family residential. Multiple-family development is located primarily along major arterials and serves as a buffer between commercial areas and single-family neighborhoods. Development patterns in the communities of Hazelwood and Rockwood were initially influenced by construction of a streetcar line built along Burnside Street at the turn of the century. Today, these communities are characterized by residential neighborhoods bounded by arterial streets and arranged in an elongated fashion around community activity centers. Commercial development has also been influenced by transportation improvements, tending to occur in strips fronting major arterials. Commercial centers, including Gateway Center, Rockwood Shopping District, and the Gresham core district represent concentrated mix-use commercial areas. Community facilities and light industrial uses are located intermittently along the Project corridor.

Growth within the east Multnomah County study area has been steady for many years, taking the form of leap-frog development since the early 1960s. Development is presently continuing at a stable rate. A substantial amount of vacant and redevelopable land proximate to existing urban services continues to be converted to residential, commercial, and industrial uses. However, the holding cost to acquire and consolidate land in Multnomah County is becoming prohibitive. Along Burnside Street, a general infilling, development/redevelopment of underutilized properties, as well as overall intensification in land use, is expected to occur as the east Multnomah County area continues to develop. Considerable development pressures are also occurring in incorporated communities in the study area along portions of Columbia River industrial areas and in several areas adjacent to Washington and Clackamas Counties. Population forecasts for the Portland metropolitan area indicate that most future residential development in Multnomah County will occur east of I-205. Table 4.4-2 summarizes the existing land uses and development opportunities associated with transit station areas in the east Multnomah County study area.

TABLE 4.4-2

EXISTING LAND USE SUMMARY: EAST MULTNOMAH COUNTY TRANSIT STATION AREAS

Transit Station	Land Use Description (1/4-Mile Radius)
Gateway (East side of Freeway)	Commercial core on Halsey and Weidler Streets and single- and multiple-family development to the south.
102nd Avenue	Low-density single-family development with some commercial, small industrial, and community services uses.
122nd Avenue	Located on a north-south arterial with substantial strip commercial with single-family behind the commercial uses, some vacant land.
148th Avenue	Predominately low-density single-family with some multi-family development at the intersection. Large amounts of vacant land scattered throughout the area.
162nd Avenue	Predominately multi-family residential. Some single-family residential and open space and community service. Commercial uses along Glisan and Stark Streets.
172nd Avenue	A transition area from single-family to multi-family with some commercial activity along Stark Street.
181st Avenue/ Rockwood Street	The triangle of Burnside Street, 181st Avenue, and Stark Street contains major automobile-oriented mixed uses in east Multnomah County. Multi-family and single-family residences lie adjacent to this center.
192nd Avenue	A mix of vacant land, commercial, and industrial uses, as well as scattered single-family and multi-family residential.
11th Avenue/ Eastman Street	A mix of vacant land, light industrial, and municipal office complex, as well as scattered residential development with shopping center and strip commercial along Burnside and Powell Streets.
7th Avenue/ Hood Street	Mixed density, predominately single-family residential, small industrial and institutional uses.
8th Avenue/ Cleveland Street	Predominantly vacant with mixed residential commercial and industrial uses scattered along major arterials.

4.4.3 Relationship of the Proposed Project to Land Use Plans

State, regional, and local public agencies are responsible for planning activities that directly affect future use of the land resources in the Banfield Transitway Project corridor. At present, these agencies are progressing toward adoption of comprehensive plans. Upon acknowledgement by the State Land Conservation and Development Commission (LCDC) these plans will become legally binding, providing the basis for all future land development decisions. This section reviews the status of the comprehensive planning program and plan for those agencies responsible for planning within the Project corridor.

4.4.3.1 STATEWIDE INFLUENCES

The State of Oregon, through passage of the Land Conservation Development Act of 1973, has become an active partner with regional and local agencies in providing for proper management of the state's land resources. Under the act, local planning throughout Oregon has become mandatory. Local planning agencies are required to develop comprehensive plans according to statewide land use planning goals and guidelines established by LCDC.

In general terms, LCDC goals require the minimization of adverse social, economic, and environmental impacts and costs when constructing transportation facilities. Goals pertaining to this Project are further discussed under Section 4.4.4.1 below.

4.4.3.2 REGIONAL COORDINATION

Within the framework of LCDC and Senate Bill 769, regional planning functions and responsibilities for the Portland metropolitan region were assumed by the Columbia Region Association of Governments (CRAG).

In 1976, CRAG adopted the Land Use Framework Element of the Regional Plan, a land development policy guide for local governments. This plan element has legal authority to direct conformance of local planning, zoning, and the extension of services. The plan element calls for staging growth through an orderly extension of public services; infilling partially developed urban and suburban areas; and urban development which enhances the efficiency of existing transportation resources and the feasibility of public transit. The plan establishes a regional urban growth boundary (UGB) and designated areas outside the UGB as rural or natural resources. The designated UGB includes existing urban areas and land with future urban potential as forecasted to meet urban population needs for a minimum of 20 years. All urbanization up to the year 2000 must occur within these boundaries and must be consistent with the policies cited above.

Since January 1, 1979, the work begun by CRAG toward development of a regional plan that would comply with LCDC guidelines has been included under the functions of a new metropolitan government, the Metropolitan Service District (MSD). The MSD boundary is smaller than that of CRAG but more inclusive than the Urban Growth Boundary (UGB) established by CRAG as part of a regional plan to meet urban growth needs for a minimum of 20 years.

A major effort is currently underway at the MSD to complete an update of the Interim Transportation Plan for the Portland-Vancouver Metropolitan Area (ITP) which was adopted by CRAG in 1975. As an interim plan, the ITP promotes intensive use of existing corridors in order to prevent adverse environmental impacts and property losses associated with urban freeways. This plan, which is geared to 1990, emphasizes the role of public transit in providing mobility in the urban area. The ITP includes the Banfield Freeway among 4 designated transit corridors which radiate from the downtown area: the Banfield, Oregon City and Johnson Creek, Sunset, and I-5 North. The Banfield corridor in the ITP is considered to consist of an exclusive busway between I-5 and I-205. As a statement of transportation policy, the ITP recognizes that project development can alter mode and route considerations in light of new information. It was in this context that the LRT mode was introduced and that the corridor extension along Division Street was changed to reflect a transit corridor along Burnside Street.

Suburban transit stations are also specified in the ITP as focal points for transit service to major residential areas of the region. Major transit stations are indicated in the ITP project study area for Gateway, Mall-205, Gresham, and Lents.

In addition to MSD, one other public agency conducts planning and implementation of transportation projects on a regional basis in the Portland metropolitan area. The Tri-County Metropolitan Transportation District of Oregon (Tri-Met), formed in 1969, is responsible for planning as well as for the operation and maintenance of public transit systems throughout the 3-county metropolitan area. As such, Tri-Met will be responsible for operation of the LRT system.

Tri-Met, in association with the Oregon Department of Transportation (ODOT), MSD, Portland, Gresham, and Multnomah County, has extensively studied bus and LRT options for the Portland CBD, east Portland, and east Multnomah County. Studies conducted on transit feasibility, transit stations, development alternatives, and land use identified LRT in the Banfield/Burnside corridor as the preferred transportation alternative for the East Side (see Section 2.3).

4.4.3.3 DOWNTOWN

The downtown study area is under the political jurisdiction of the City of Portland. Over the past several years the city has been engaged in the process of developing a comprehensive plan that will comply with the LCDC goals and objectives. The city is now in the final stages of formally adopting such a comprehensive plan.

The goals and policies in the Proposed Comprehensive Plan for the City of Portland establish a land use development scenario whereby population in the City of Portland can increase by 13.1 percent between 1977 and the year 2000 (see Table 4.4-3). The overall density within the city would increase from 5.37 persons per acre (1977) to 6.07 persons per acre (2000). Total acreage devoted to urban uses would increase by 20 percent to total 45,800 acres.

TABLE 4.4-3

PROJECTED CITY OF PORTLAND LAND USE SUMMARY

	Year 1977 Figures		Year 2000 Potential Figures: Present Zoning Pattern Continued		Discussion Draft Land Use Pattern		Proposed Land Use Plan Pattern	
Population	366,000[a]		399,000[b]		417,000[b]		414,000	
Housing	Units	Acres	Units	Acres	Units	Acres	Units	Acres
Single-Family	102,400	14,600	113,000	17,600	120,600	17,800	116,700	17,600
Multi-Family	60,200	1,800	79,900	2,300	79,300	2,000	83,900	2,300
Total	162,600	16,400	192,900	19,900	199,900	19,800	200,600	19,900
Employment	Jobs	Acres	Jobs	Acres	Jobs	Acres	Jobs	Acres
Commercial	99,600	2,200	131,800	2,900	136,900	2,800	131,900	2,800
Light Industrial	77,700	2,100	83,300	3,400	85,000	3,400	83,300	3,400
Heavy Industrial	21,400	2,100	27,900	2,800	29,800	3,000	27,900	2,800
Institutional[c]	61,700	15,300	79,900[b]	16,800	80,700	16,900	80,400	16,900
Total	260,400	21,700	322,900	25,900	332,400	26,100	323,500	25,900
Density								
Persons per Acre Citywide	5.37[a]		5.86[b]		6.11[b]		6.07	
Units per Acre								
Average Single-Family	6.97		6.41		6.77		6.64	
Average Multi-Family	33.75		34.89		38.91		36.23	
Acres of Vacant and Agriculture[d]	13,071		5,453		5,247		5,521	

Data from: Portland, Bureau of Planning 1979s.
(a) Adjusted figure based on 1978 population.
(b) Numbers are lower than shown on Discussion Draft reflecting smaller household size determined in 1978.
(c) Schools, churches, hospitals, government buildings, parks, etc.
(d) Excludes parks, streets, waterways, and railroad rights-of-way.
Note: The projections shown here have been calculated using a uniform set of assumptions.

Those goals and policies in the city's Proposed Comprehensive Plan that are based on a recognition of the interrelationship between land use and transportation are particularly relevant to the Project. Guided by these goals and objectives, the proposed comprehensive plan emphasizes development at densities which "reinforce the workability of public transit" (Portland, Bureau of Planning 1979h). The plan therefore seeks to allow for commercial expansion and higher density residential development. It concentrates high-intensity land use activities in established core employment areas and along major transit corridors, including the Banfield Freeway.

Development decisions in the downtown study area are currently being guided by the Planning Guidelines/Portland Downtown Plan, which was adopted in December 1972 (Portland 1972). The stated goal of the Planning Guidelines/Portland Downtown Plan regarding transportation is to design a balanced transportation system which is supportive of other downtown goals. Emphasis is placed on improving transit that reduces reliance on the automobile and increases the number of persons moving through the core area on multiple-passenger facilities. In addition, planning guidelines were adopted for the principal land uses in the downtown. Enhanced office-related development and strengthening the downtown retail core are emphasized.

The Downtown Parking and Circulation Policy, adopted in February 1975, provides the necessary parking and circulation elements to the downtown plan. The intent of this policy is to encourage the improvement of public transportation services to downtown. The Downtown Parking and Circulation Policy places a limit on the total number of parking spaces available for use in the downtown area. In order to clarify the major traffic access systems and to provide appropriate transit, pedestrian, and bicycle routes, the Downtown Parking and Circulation Policy classifies downtown streets into traffic access, nonautomobile-oriented, and local service streets. Morrison Street and 1st Avenue are classified as nonautomobile oriented. Nonautomobile-oriented streets are protected from further development of automobile-oriented facilities which require access to new parking. These streets may become public transit, pedestrian, or bicycle routes in the future.

4.4.3.4 EAST PORTLAND

The east Portland study area is primarily under the political jurisdiction of the City of Portland. Land use plans and policies discussed for the city are consequently applicable here. In the absence of an adopted comprehensive plan, the Arterial Streets Classification Policy, adopted in June 1977, functions as the basic transportation instrument for the city outside of the CBD. The streets classification scheme guides private development that occurs adjacent to arterial streets. The Arterial Streets Classification Policy calls for planned land use along transit streets which would reinforce existing development and provide good station access in areas surrounding transit stations. Increased housing and employment are encouraged in areas within 1/4 mile of transit stations.

The city's comprehensive planning process has assumed the modification of the Banfield Freeway in order to improve the capacity for transit and automobile movement on Portland's East Side. The Banfield and I-205 corridors are classified in the Arterial Streets Classification Policy as both regional trafficways and regional transitways. An important land use objective of these classifications is to focus new land development adjacent to the regional facilities. The basic objective of this policy is to emphasize transit service improvements to the downtown, Lloyd Center, and the Hollywood business district, thereby reducing traffic volumes within East Side neighborhoods.

4.4.3.5 EAST MULTNOMAH COUNTY

The east Multnomah County study area is divided into unincorporated and incorporated sections. A large portion of the study area running along I-205 and Burnside Street is unincorporated and falls under the jurisdiction of Multnomah County. In addition, Portland, Gresham, Troutdale, Wood Village, and Fairview have jurisdictional responsibilities in the study area.

4.4.3.5.1 Unincorporated East Multnomah County

The Comprehensive Framework Plan for Multnomah County was adopted in September 1977. The plan identifies 7 broad land use classifications including: agriculture, multiple-use agriculture, forest, multiple-use forest, rural residential, rural centers, and urban. The Banfield Transitway Project corridor lies entirely within that area classified as urban. The Urban-Rural Growth Management Policy set forth in the Comprehensive Framework Plan is intended to direct growth into appropriate locations by: (1) increasing urban densities and (2) providing for infilling of those vacant lands classified as urban that fall within the UGB established by MSD. Development policies for this area support increased transit usage by calling for:

1. Locating population concentrations, commercial centers, employment centers, and public facilities where they can be served by public transportation.

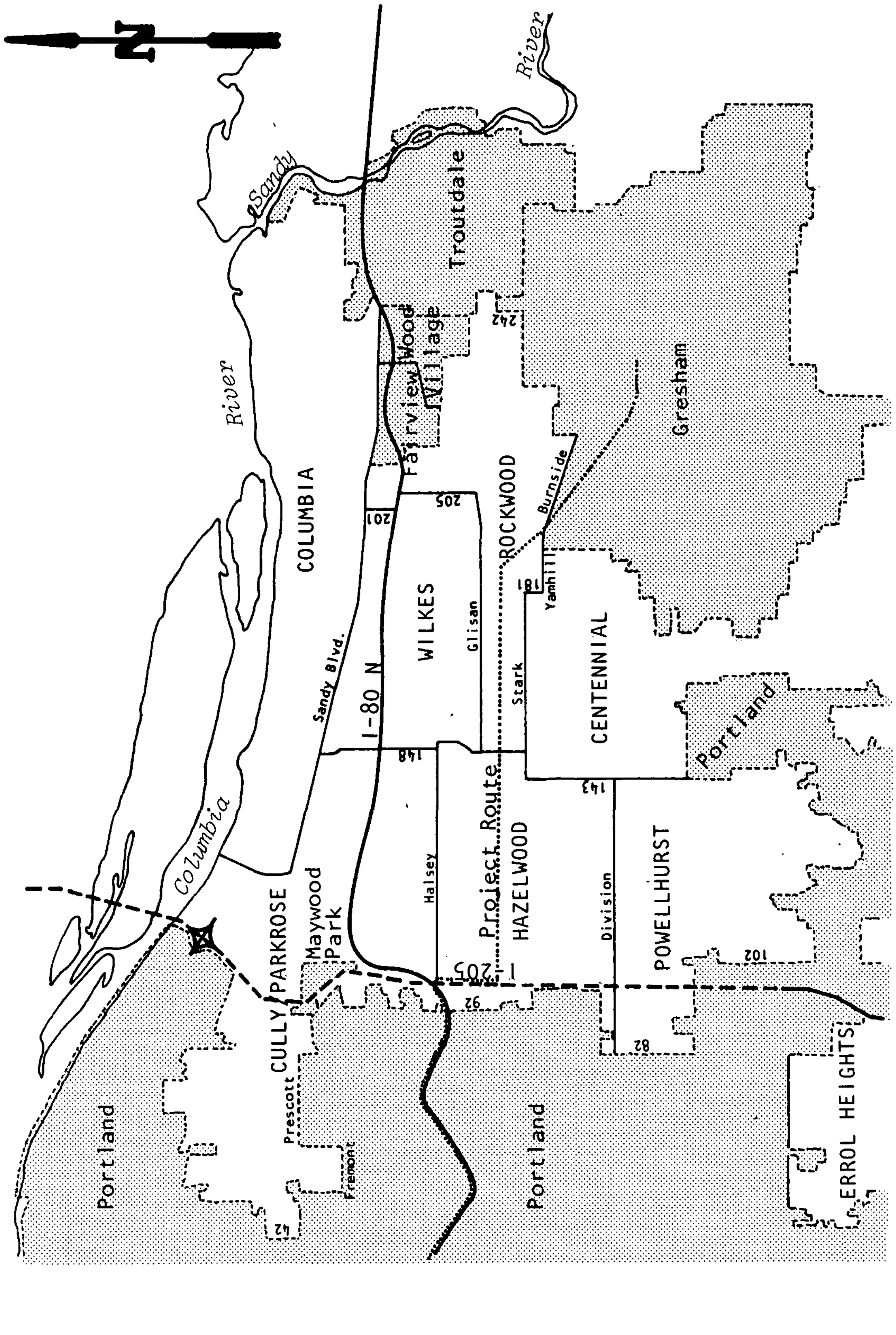
2. Increasing overall densities in urban areas.

3. Increasing density and intensity of development to reinforce transit corridors and centers and employment and commercial centers.

As part of the preparation of the comprehensive plan, Multnomah County has completely revised its zoning ordinance. The county has now adopted a revised zoning ordinance which classifies land in accordance with the county's comprehensive plan (the Comprehensive Framework Plan and applicable community plans).

Policies set forth in the Comprehensive Framework Plan were established to serve as a guide in the preparation of more detailed "Community Plans." Community Plans are intended to further refine the urban area which will receive final designation in the county Development Plan. Community planning areas of interest to this Project include Hazelwood and Rockwood (see Figure 4.4-3). The City of Gresham is the only incorporated community directly affected by the Banfield Transitway Project.

The Hazelwood Community Plan and the Rockwood Community Land Use Plan reflect the overall development strategy set forth in the Comprehensive Framework Plan for Multnomah County and expand upon that strategy



SOURCE:
MULTNOMAH COUNTY DIVISION OF PLANNING AND DEVELOPMENT.

FIGURE 4.4-3

BANFIELD TRANSITWAY PROJECT FEIS

MULTNOMAH COUNTY
COMMUNITY PLAN AREAS

to amplify local considerations. In both communities, the overriding consideration, which has been translated into the community plan depicted in Figure 4.4-4 and Figure 4.4-5 has been the preservation of the low-density residential neighborhood setting that characterizes the area. In order to achieve this goal, the community plans have established policies and implementing strategies which in general, are expected to lead to an intensification of land use activities in association with major transportation facilities and community Activity Centers, such as the Gateway Shopping Center and the Rockwood Shopping District.

Under the proposed community plans, policies are directed toward providing for infilling of developable areas at an appropriate scale of development which is compatible with adjoining activities. Strip commercial activity is to become a nonconforming use. The intent is to concentrate commercial, office, and public facilities such that the number of automobile trips can be reduced and support of an efficient public transit system is achieved. High-density residential development is to be located near transit points or station areas within walking distance. Implementation of the plans will be achieved through the use of zoning and development standards (policies) that are consistent with the related County Comprehensive Plan Policy.

The community plans for Hazelwood and Rockwood acknowledge the relationship between the development of land and transportation facilities. In general, the plans recommend that the availability of alternate transportation modes should be a consideration in approving land use actions. The plans also stress that land use decisions should not be made solely for the purpose of justifying the transit system. Sensitive to the potential impacts associated with the Banfield Transitway Project, particularly in station service areas, each plan delineates "special study areas." Special study areas consider factors such as the traffic-carrying capacity of the local road system when making land use decisions. The Gateway, 122nd Avenue, and 181st Avenue (Rockwood Shopping District) stations are designated as special study areas.

4.4.3.5.2 Gresham

The Gresham Comprehensive Plan governs land use within the City of Gresham. The structure of the Gresham Comprehensive Plan includes: (1) the Community Development Plan; (2) subsequent Functional Master Plans; (3) a Community Development Code; and (4) Community Development Standards. The proposed Community Development Plan for the City of Gresham is depicted in Figure 4.4-6 and seeks to encourage an intensification of land use activities in the city, with the emphasis on promoting an urban form that is energy efficient, reduces the stress on the natural and human environments, and generally enhances the livability of the City of Gresham. Location policies direct intensive land use activities to locate within the developing downtown core and near transit facilities. The provision and extension of mass transit service by Tri-Met is specifically encouraged as part of the overall development scheme for the city as a means of reducing the need for expanded street and parking facilities and improving environmental quality, particularly for air and noise.

Implementation of the Community Development Plan is to be achieved through a development permitting process established under the Community Development Code. Table 4.4-4 presents the percentages of land use by Development Code District that would be achieved under the Gresham Community Development Plan. The development code map is depicted in Figure 4.4-7.

TABLE 4.4-4

OCCURRENCE OF LAND USE BY DEVELOPMENT CODE DISTRICT
UNDER THE GRESHAM COMMUNITY DEVELOPMENT PLAN

Land Use	Development Code District (percent)			
	Established	Redeveloping	Developing	Urban Future
Low-Density Residential	61	0	6	33
Moderate-Density Residential	68	9	11	12
Commercial	46	51	2	1
Industrial	33	15	25	27

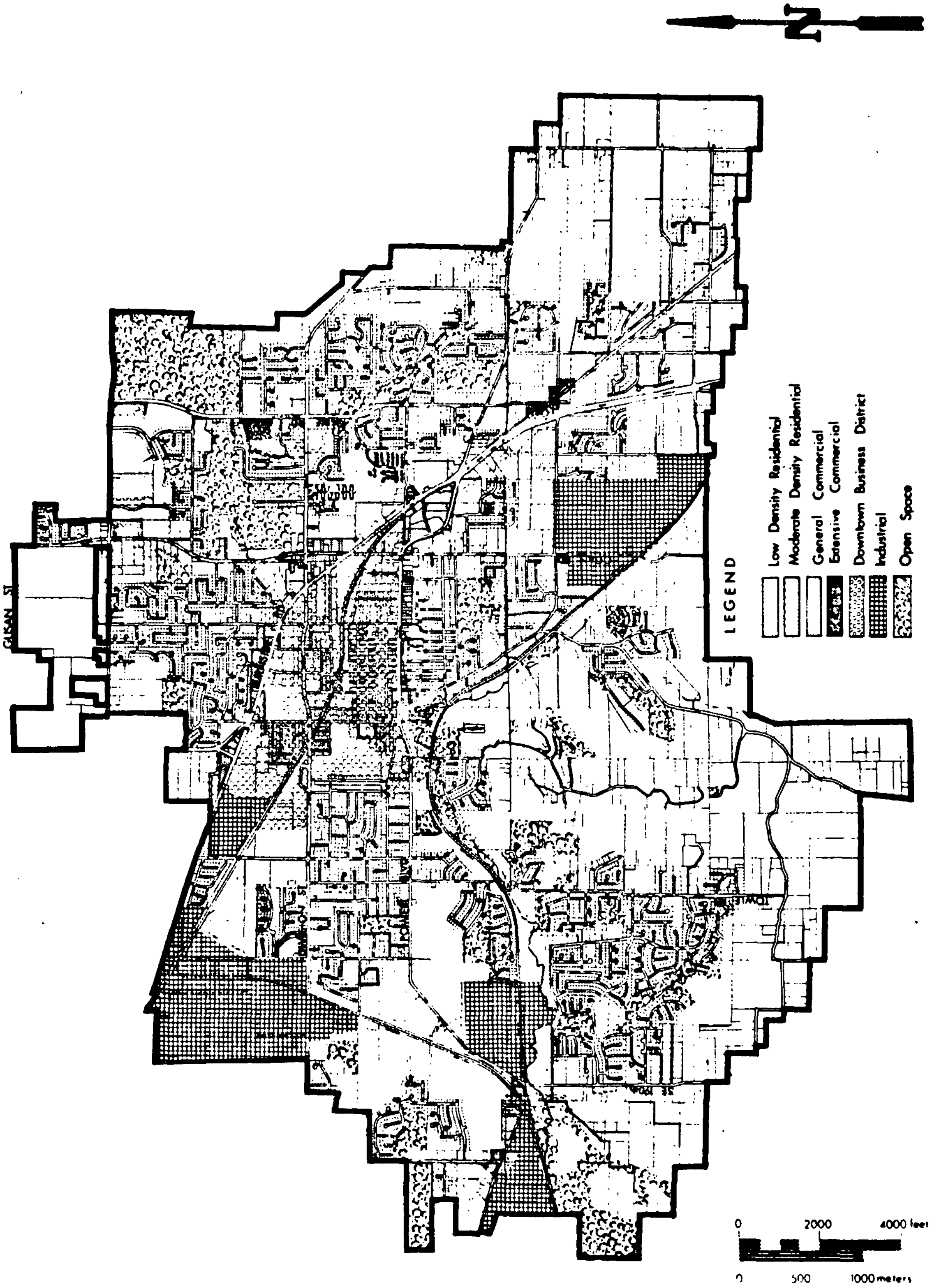


FIGURE 4.4-6

BANFIELD TRANSITWAY PROJECT FEIS

GRESHAM COMMUNITY DEVELOPMENT PLAN

SOURCE: CITY OF GRESHAM PLANNING DEPT.

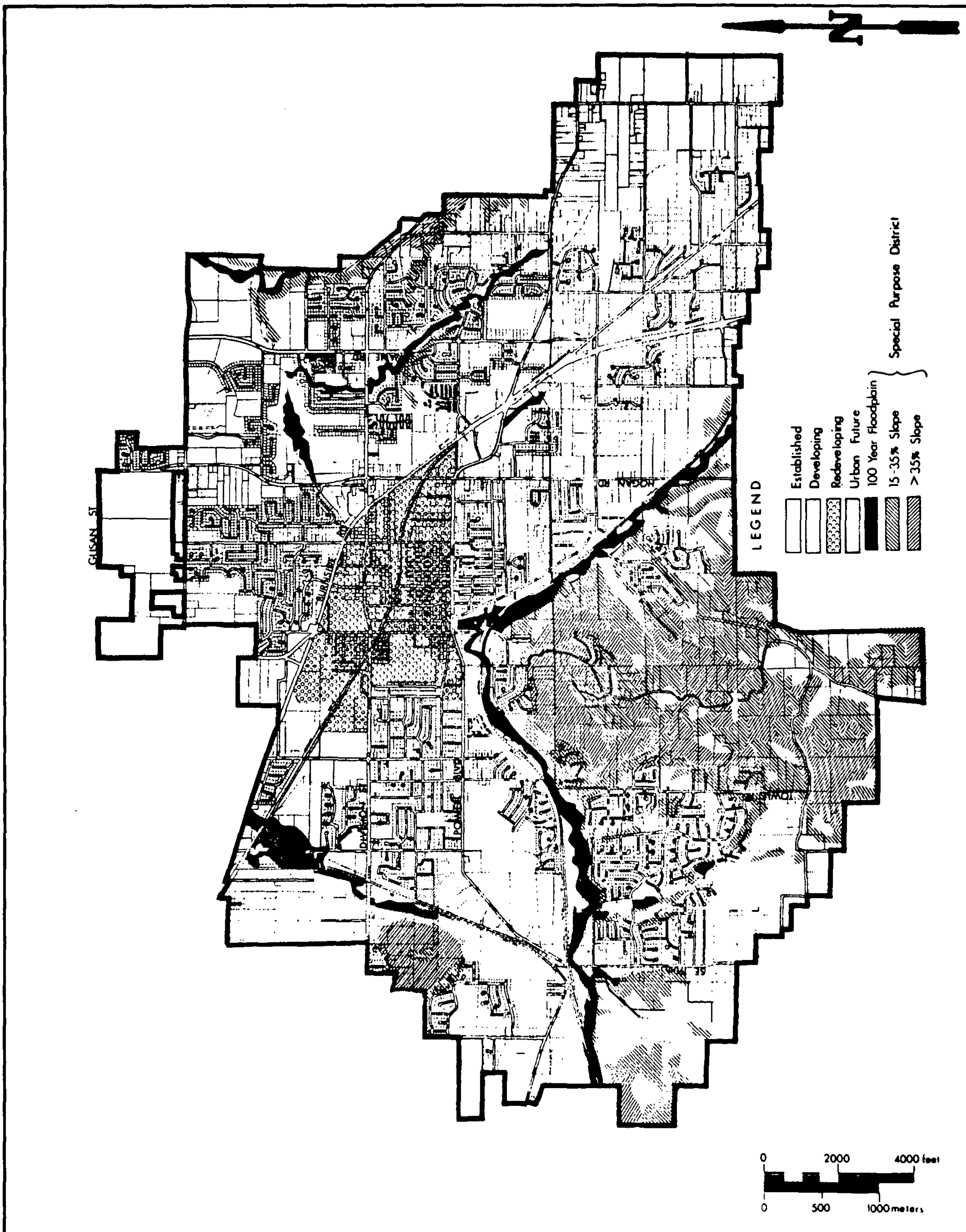


FIGURE 4.4-7

BANFIELD TRANSITWAY PROJECT FEIS

GRESHAM COMMUNITY

DEVELOPMENT CODE MAP

SOURCE: CITY OF GRESHAM PLANNING DEPT.

Preliminary work on the transportations sections of the plan for the City of Gresham indicates that the street plan will be consistent with the functional classification plan for east Multnomah County. The Functional Classification of Trafficways for the county provides that Burnside Street between I-205 and 181st Avenue has the special classification of principal transit route. The street is not regarded as an arterial or collector road.

4.4.4 Impacts

Impacts from the Banfield Transitway Project have been divided into 4 categories:

- Conformance with plans and policies
- Right-of-way impacts
- Construction impacts
- Operational impacts

4.4.4.1 CONFORMANCE WITH PLANS AND POLICIES

Planning is an ongoing process. Circumstances such as the Banfield Transitway Project often warrant alterations to existing comprehensive plans. Although transportation elements were developed at the time the documents were prepared, they are subject to reevaluation and change within the policy framework. It is in this context that the LRT mode was incorporated as part of the Banfield Transitway Project and that the Project corridor was extended along Burnside Street into Gresham.

A review of the current plans and policies presently being prepared for the region by the City of Portland, Multnomah County, and the City of Gresham, indicates that each plan has been (or is being) developed on the basis of policies set forth in the ITP, as amended, which stipulated that the Banfield corridor is to be considered an exclusive transitway. Preparation of these comprehensive plan documents has been conducted concurrently with research and planning directed at selection and implementation of a "Preferred Alternative" for the Banfield Transitway Project corridor. As such, planning activities by the various regional and local agencies throughout the Portland metropolitan area encourage transit-supportive development adjacent to the Banfield Freeway and Burnside Street, particularly in association with transit stations. The emphasis in these plans is on the necessity to increasingly promote growth patterns conducive to the economic delivery of public services, including transit. This growth is projected to occur extensively within the UBG.

4.4.4.1.1 LCDC

Table 4.4-5 summarizes the consistency of the Project alternatives with regard to statewide goals. The No-Build condition does not emphasize reliance on various modes of transportation. It does not encourage greater use of public transit (although use would increase over existing levels), and by implication, reinforces the existing principal reliance on the automobile. In addition, congestion predicted to accompany the No-Build condition is in conflict with policies aimed at strengthening the local and regional economy by facilitating the flow of goods and services, as well as with city and county policies encouraging improved transit and traffic movement.

The proposed Build condition will conform with LCDC requirements by fostering increased reliance on public transit, improving the regional flow of goods and services, and thereby strengthening the regional economy. While the emphasis of the Project is on multi-modal transportation, in conformance with LCDC requirements, the removal of parking and restriction of access will adversely affect some adjacent businesses, thereby having a negative effect on the local economy. The impact of these access restrictions to the regional economy would be minimal.

4.4.4.1.2 MSD

To be in conformance with MSD Goals and Objectives and Implementing Rules and the Land Use Framework Element of the Regional Plan, the same criteria by which the Banfield Transitway Project is considered for LCDC compliance are applicable. The Project is therefore considered to comply with regional policies and goals.

The Banfield Transitway Project conforms to the Banfield designation in the ITP, which identifies the Banfield Freeway as an express corridor

TABLE 4.4-5

LCDC GOAL CONFORMANCE REVIEW

Goal	No-Build Condition: Not Applicable	Applicable: Consistent	Applicable: Potential Conflict	Remarks
1. Citizen Involvement		X		
2. Land Use Planning			X	Planning expressly anticipates stage growth related to transportation corridor improvements.
3. Agricultural Lands		X		
4. Forest Lands	X			
5. Open, Scenic, Historic		X		
6. Air, Water, Land			X	Overall air quality would be reduced.
7. Natural Hazards	X			
8. Recreation			X	Access to local/ regional facilities would decrease.
9. Economy			X	Traffic congestion is disincentive for economic growth.
10. Housing			X	Secondary effects not compatible with growth objectives.
11. Public Facilities		X		
12. Transportation			X	Plans for region.
13. Energy			X	Increasing congestion increases energy consumption.
14. Urbanization			X	Congestion would promote suburban sprawl.
15. Greenway		X		
16. Estuary	X			
17. Coastal Shores	X			
18. Beaches, Dunes	X			
19. Ocean Resources	X			

TABLE 4.4-5

Goal	Build Condition: Not Applicable	Build Condition: Applicable — Consistent	Build Condition: Applicable — Potential Conflict	Remarks
1. Citizen Involvement		X		
2. Land Use Planning		X		
3. Agricultural Lands		X		
4. Forest Lands	X			
5. Open, Scenic, Historic	X			
6. Air, Water, Land	X			
7. Natural Hazards	X			
8. Recreation		X		
9. Economy		X		
10. Housing		X		
11. Public Facilities		X		
12. Transportation		X		
13. Energy		X		
14. Urbanization		X		
15. Greenway		X		
16. Estuary	X			
17. Coastal Shores	X			
18. Beaches, Dunes	X			
19. Ocean Resources	X			

with an exclusive transitway from at least I-5 to I-205. The suburban transit stations indicated in the ITP are integrated into the proposed Project design. The additional transit stations in the Banfield Freeway corridor are consistent with policies which concentrate development to support public transit.

4.4.4.1.3 City of Portland

The proposed Banfield Transitway Project will generally conform to the goals and policies as set forth in the Planning Guidelines/Portland Downtown Plan, as well as the proposed Portland Comprehensive Plan. The Project will promote use of mass transit, thereby reducing the reliance on the automobile as a means of commuting to the CBD.

The alignment for the LRT in the downtown does not wholly support the downtown plan land use concept. The Cross-Mall alignment does pass through the retail core, but does not directly serve the majority of the high-density office corridor. While this could become more of a concern in the future, any future expansion of LRT throughout the region envisions the main downtown alignment being in the transit mall.

It is the intent of the City of Portland to encourage the improvement of public transportation services to downtown, thereby reducing the need for downtown parking. The proposed LRT will help to accomplish this goal. The LRT system in the downtown will be heavily supported by bus. This multi-modal transit system will be highly effective in enhancing downtown Portland's role as a regional center.

The Arterial Streets Classification Policy for the City of Portland calls for improved capacity for transit and automobile movement, as well as exclusive transitways in the Project corridor. The Banfield Transitway Project will support this policy.

4.4.4.1.4 Multnomah County

Similar to policies and plans previously mentioned, the Multnomah County Comprehensive Framework Plan, together with community plans for the Project corridor, support increased transit use. Development policies in the framework plan call not only for orderly growth and increased density in the urban areas, but also for locating population concentrations, commercial and employment centers, and public facilities where they can be served by public transit. County policy, then, supports clustered development with transit stations.

4.4.4.1.5 City of Gresham

The Gresham Community Development Plan, similar to policies and plans previously discussed, provides for an intensification of land use activity in and around transit station service areas. Development policies in the plan call for staging of growth and increased density in the urban area. Locational criteria establish a basis whereby high-density residential and intensive commercial activities are encouraged to locate near transit facilities and in the downtown core district. City policy promotes clustered development in association with transit stations. To the extent that LRT enhances development opportunities along the Portland Traction rail line, an intensification of land use activity is in compliance with city policies.

4.4.4.2 RIGHT-OF-WAY ACQUISITION IMPACTS

Impacts associated with right-of-way acquisition as discussed in this report include only that area immediately within the required right-of-way. The discussion of right-of-way acquisition has assumed a maximum right-of-way width. Therefore, the Project impacts discussed below are considered to be conservative.

Three types of right-of-way impacts have been identified:

- Conversion of existing land use to Project right-of-way
- Relocation of businesses and residents
- Loss of taxable property

4.4.4.2.1 Conversion of Existing Land to Right-of-Way

As indicated in Table 4.4-6, approximately 47 acres of land lie within the proposed Banfield Transitway Project right-of-way. Somewhat less than this amount of land will actually be required for right-of-way acquisition. The majority of land needed for right-of-way (60 percent) is within the east Multnomah County study area. However, household displacements in the study area are not high, particularly in relation to

TABLE 4.4-6

RIGHT-OF-WAY IMPACTS LAND USE SUMMARY

	Study Area			
	Downtown	East Portland	East Multnomah County	Total
New Property (acres)	0.5	18.3	28.2	47.0
Partial Acquisitions (No.)				
Single-Family Units	0	0	0	0
Multiple-Family Units	0	10	0	10
TOTAL Housing Units	0	10	0	10
Business (structures)	2	0	0	2
Nonprofit Organization	0	0	0	0
Entire Acquisition Requiring Relocation				
Single-Family (No.)	0	33	13	46
Multiple-Family	0	19	0	19
TOTAL Family	0	52	13	65
Businesses	4	7	2	13
Nonprofit Organization	0	0	0	0
Estimated Tax Base Reduction (in millions)	3.8		1.1	4.9

Data from: ODOT, Metro Office Design and Right-of-Way Sections 1979.

the length of route under consideration. This is primarily due to the fact that the Burnside Street alignment generally has an existing right-of-way wide enough to accommodate the proposed LRT. Construction of the Project will result in loss of vacant land in the present right-of-way, as well as some structural displacements.

The park-and-ride lots and the storage and maintenance facility will require the largest single parcel takings, accounting for half of the structural displacements along Burnside Street. However, the greatest impact on residential lands will occur along the Banfield Freeway, particularly south of Hoyt Street. As noted previously, right-of-way acquisition of lands may only involve that portion of the property immediately fronting the proposed right-of-way. In most cases, particularly involving residential lands, the frontage is devoted to yards, driveways, and parking areas. It may be possible to acquire the frontage without relocating the existing use.

Public lands devoted to recreational use located immediately adjacent to the Banfield Transitway Project alignment include Holladay Park in east Portland, and property associated with Ventura Park School and Menlo Park School in east Multnomah County. None of the public lands will be affected by right-of-way acquisition or adversely impacted by the project.

Holladay Park currently experiences heavy public use. It is also the location of a major bus stop serving Lloyd Center. The proposed LRT station will be a sidewalk level platform between the existing sidewalk and curb. Minor traffic circulation changes, such as closing Holladay Way, should result in a minor reduction of auto traffic. Introduction of LRT will reduce bus traffic. Because of these factors, no increase in noise or air pollutants will occur. Visual change will be imperceptible and park occupancy will moderately increase. No park property will be required.

4.4.4.2.2 Relocation of Businesses and Residences

As noted, the <u>maximum</u> amount of land that might be needed for right-of-way has been assumed. Therefore, the estimate of actual relocations, as shown in Table 4.4-6, is on the high side. Depending upon final design modifications, the amount of property required and the number of displacements could be substantially reduced.

In 1979, ODOT conducted a preliminary relocation survey. The results of this survey indicate that the Project will require acquisition of approximately 46 single-family and between 10 and 19 multiple-family residential structures (either entirely or in part). Approximately 65 families and 13 businesses will also require relocation. No minority persons, handicapped, elderly or other disadvantaged groups were identified as being disproportionately impacted.

Requirements of the LRT in the downtown study area consist primarily of ½ block needed for a terminal and substation, between Yamhill and Morrison Streets on 11th Avenue. About half of this parcel is now a parking lot. A clothing store, beauty salon, and dance studio are in the Orton Building on the south portion.

Right-of-way acquisitions in east Portland will be significant. About 80 percent of the residential structures required by Project right-of-way are located in this study area. Many of the homes to be acquired are not within the right-of-way, but will lose some street access. This is particularly true for houses along Hoyt Street. Approximately 50 families will be affected. Most of these families live along Hoyt Street.

Businesses along the Banfield Freeway that will be relocated by the Project include a general contractor and an accounting firm. The Project will require the loss of a portion of the building housing other businesses including a bottling plant, a bag factory, a pipe producer, and a utilities and construction firm. For some, this would be the second time that their buildings have been affected by right-of-way requirements for improvements to the Banfield Freeway. In any case, the Project will not necessitate termination of business operations at these locations.

Community facilities in east Portland affected by right-of-way acquisition include a medical clinic and the Providence Child Center, both located adjacent to Providence Hospital on 47th Avenue. The medical clinic would need to be relocated, while the Child Center would lose land currently devoted to playground space. The Child Center would not be directly affected.

Required right-of-way acquisition along the Banfield Freeway also includes an easement on right-of-way belonging to the Union Pacific Railroad. At present, the railroad could construct a second track south of the existing main line. This would, however, require major modifications to several structures which currently do not meet Oregon Public Utility Commission requirements for horizontal and vertical clearance for new trackage. Freeway widening and installation of the LRT would require the second railroad track to be laid north of the main line. This location could be more expensive to the Union Pacific Railroad.

The position of the Union Pacific Railroad Company regarding the proposed Banfield Transitway Project is as follows:

> "The general public welfare and long-range public need must dictate the ultimate development of this transportation corridor. If the overwhelming public need requires construction of additional transitway for the exclusive use of public mass transit vehicles, and this need can be met only by further encroachment on the railroad right-of-way, it must be recognized that the additional encroachments will severely damage the railroad right-of-way, and that possible expansion of the railroad facilities in the transportation corridor will have been sacrificed" (Union Pacific Railroad Company 1978).

4.4.4.2.3 Loss of Taxable Property

As indicated in Table 4.4-6, the loss in taxable property due to right-of-way takings will amount to approximately $4.9 million. The tax loss impacts will not exceed 0.4 percent of the total tax base. It was determined on this basis that no increase in tax rate will be required as a result of the reduction in property tax income from right-of-way acquisition.

Tax income from land required for the Project will be permanently lost. Tax income from improvements could be restored if those improvements are replaced on other sites in the same municipality. In addition, tax losses due to the Banfield Transitway Project could be offset by future tax revenues generated by development that otherwise would not have occurred. Future savings to the public sector could also accrue if new development is concentrated adjacent to stations.

4.4.4.3 CONSTRUCTION IMPACTS

Construction activities will effectively disrupt traffic patterns in the Portland CBD and along Holladay and Burnside Streets. Although temporary in nature, these activities will require traffic (and pedestrians) to seek alternate routes. Changes in land use of adjoining properties, as well as along arterials which would experience a temporary increase in traffic, will not occur. Once construction activities are completed, circulation within the downtown and east Portland study area will resume near normal conditions. However, upon completion of construction activities along Burnside Street, access will be restricted, requiring out-of-direction travel.

Under the proposed action, the north/south streets will remain open along Burnside Street (see Figure 1.1-1). Business activities which are not located near these cross streets along Burnside Street will experience a reduction in access. This could be particularly significant for commercial activities in the Rockwood Shopping District. Should reduced access result in substantial revenue losses, business closure or relocation could occur. This will be at least partially offset by the increased sales activity the transit ridership brings to the area.

LRT construction of exclusive transit lanes will remove approximately 235 parking spaces along 1st Avenue and Morrison and Yamhill Streets in the CBD. Loss of on-street parking could affect business revenues, and therefore the nature of commercial activity along the downtown portion of the proposed Project alignment. In addition, 7 blocks of on-street parking along Holladay street and 100 blocks along Burnside Street will be removed. While significant, the removal impacts in the downtown and east Multnomah County will not be as severe as might be expected. In the downtown, such losses can be replaced elsewhere. In east Multnomah County, on-street parking along Burnside Street is not significant. However, in east Portland, removal of on-street parking will be comparatively more significant.

The businesses along Holladay Street are almost exclusively automobile-oriented. Loss of on-street parking could result in a decline in business sales and profits, forcing some establishments to terminate operations. The severity of the impact will depend upon: (1) the availability of off-street parking, (2) the type of business, and (3) the extent to which reduced sales to the automobile commuter can be recovered by increased sales to transit users. Off-street parking in areas adjacent to Holladay Street appear to be capable of accommodating some of the parking loss due to the removal of on-street parking.

As with reduction in access in east Multnomah County, on-street parking removal along Holladay Street could contribute to changes in land use, with more intense activity focused around transit stations. Whether such a pattern would actually develop will depend both upon development opportunities along Holladay and Burnside Streets and the nature of land use controls established for these areas. As noted previously, planning activities have emphasized an intensification of development within station service areas.

In addition to temporarily restricting access to land uses located along the Project alignment, construction of the LRT and Banfield Freeway improvements in east Portland will permanently remove access to some abutting residential properties. Most of these access restrictions will result in acquisition of the entire parcel.

4.4.4.4 OPERATIONAL IMPACTS

To better understand the potential changes in land use possible with the development of LRT in the Portland metropolitan area, 2 future development scenarios are presented for the Project study area.

1. No-Build - Development within the region will conform with the population and employment projections contained in the Interim Transportation Plan (ITP), wherein no explicit assumptions were made concerning the influence of transportation facilities on the distribution and focus of development.

2. Build - Population and employment will reorient around the Banfield Transitway Project. Development will be focused within the transitway corridor as set forth in comprehensive plans prepared for the Project study area (see Section 4.4.3)

This contrast will underscore the significance of positive land use controls (comprehensive plan designations, etc.) whose purpose is to achieve maximum compatibility between land use and LRT, such that benefits to be derived from a fixed-route transit system can be maximized.

Three types of long-term impacts are associated with transportation improvements:

- Induced regional growth
- Shifts in local development patterns
- Changes in land value

4.4.4.4.1 Induced Regional Growth

The Banfield Transitway Project study area exhibits a distinct urban/suburban character. Development in the study area has been significantly influenced by technical advances in transportation systems. Although development is intense in the Portland CBD, development along the alignment is predominately low-density residential, with concentrations of mixed commercial/industrial development located along major transportation arteries. As suggested by population and employment projections for the region, development in the metropolitan area is expected to continue, particularly in east Multnomah County. This trend would continue with or without improvements to the regional transportation system. However, construction of an LRT system, together with improvements to the Banfield Freeway, can have a significant bearing on the future direction and pattern of development throughout the Project study area, particularly along Burnside Street.

NO-BUILD

Under the No-Build condition, a continuation of current development trends could be expected throughout the Project study area. However, due to the built-up nature of these areas, notable changes in land use could not be expected without changes in the status quo. Through time, fewer development opportunities would arise, since accessibility to the area would be progressively constrained. Arterial and collector streets throughout the Project area would become increasingly congested. Although conversion of susceptible properties to more intensive uses could be expected to continue, the No-Build condition would discourage development in the Portland CBD and east Portland in the long run.

Increased congestion due to the continued use of the automobile encouraged by No-Build, could accelerate the rate of development of suburban, low-density sprawl in east Multnomah County. Commercial and industrial development would occur in a linear pattern along major arterials as employers moved closer to the source of labor and away from congested areas. Economic conditions would probably prevent opportunities for more concentrated urban development in east Multnomah County.

Under the No-Build condition, application of comprehensive plan designations required to prevent substantial automobile-oriented development would be very difficult to achieve or adhere to in the absence of major public transit service along the corridor.

BUILD

Development of the LRT system and improvements to the Banfield Freeway in the downtown and east Portland study areas will have limited impact on land use. Again, due to the developed nature of these study areas, a continuation of current trends (a general infilling and intensification of underutilized sites) can be expected. The Project may result in a minor increase in pressure to convert housing to low-density office uses in the South Park Blocks and AX Housing Area. However, such development will not significantly affect the character of these areas.

In east Portland, the LRT, in association with widening of the Banfield Freeway, will promote general development in the broader area, since accessibility will be improved along city streets throughout the area. Specifically, reduced traffic congestion along Sandy Boulevard will help improve conditions in the Hollywood District. Public accessibility will be increased in and around the service areas for the proposed transit stations at 60th and 82nd Avenues. Minor development opportunities exist in the vicinity of the Coliseum, Union-Grand, and Lloyd Center transit stations. While commercial and multiple use development will generally be promoted in these areas, high land conversion costs restrict major redevelopment opportunities.

The Banfield Transitway Project in east Multnomah County provides an opportunity for future development to become more concentrated, focused on the Project corridor along Burnside Street. Typical of suburban development, large amounts of land were left vacant as growth leaped to areas where the cost of land was less than in areas adjacent to existing development. The sprawl of suburban development along Burnside Street, primarily in low-density residential development, now represents an opportunity, in association with LRT, to reorient growth in east Multnomah County.

Without creative land use controls, LRT has been shown to facilitate sprawl, foster increased reliance on the automobile, raise water and air pollution levels, contribute to greater neighborhood displacement, and diminish the efficiency of the LRT system (Fajans and Dyett 1978). With creative planning techniques and favorable market conditions, light rail has been shown to reorient growth into more efficient, high-density patterns. To effect the concentration necessary to support transit, revisions of existing comprehensive plans have been made to capture the opportunity that exists along I-205 and Burnside Street (see Section 3.3.1). Much of the development proposed along the Burnside Street corridor will consist of low-rise, medium-density apartments, shops and offices, all within walking distance of LRT stations.

Tri-Met has estimated that approximately 16,000 residents and 4,000 jobs could be redirected to the Burnside Street alignment by 1990, if LRT were implemented. Station zones selected for the LRT system are carefully located in areas which are estimated to accommodate intensive transit-supportive land use and which also support community objectives. The following discussion examines the station areas more closely with respect to local shifts in development patterns that could be induced by development of the LRT system.

4.4.4.4.2 Shifts in Local Development Patterns

Opportunities for intensifying land use in a manner compatible with increased utilization of public transit in east Multnomah County are summarized in Table 4.4-7 for the 11 stations between and including Gateway and Gresham. The table also depicts a continuation of present land use trends by including a description of existing land use and of future development probable with the LRT system.

A light rail facility in the center of Burnside Street and supported by transit stations at or near major intersecting streets offers high potential for land development in support of transit. Three areas are particularly well suited for more intensive development: (1) Gateway/122nd Avenue; (2) Rockwood (162nd-192nd Avenues); and (3) Gresham (City Hall,

TABLE 4.4-7

TRANSIT STATION IMPACTS
EAST MULTNOMAH COUNTY STUDY AREA

Location	Land Use with Continuation of Current Trends	Land Use with Reorientation to Transit-Supportive Uses
Gateway (East side of Freeway)	Ongoing multi-family development should continue along with increased commercial activity with the opening of I-205 Freeway.	A high-density activity center is possible with 2,000 new residents and 500 new jobs in the area. High-density residential south of the planned commercial/hotel complex would be appropriate and consistent with existing plan designations.
102nd Avenue	Some infilling of residential and commercial uses on vacant parcels.	Some 50 acres of land could be converted to multi-family residential, supporting approximately 2,000 persons. Would require upzoning in southeast quadrant to allow for multiple family. Some conversion of single-family units would be anticipated.
122nd Avenue	Some additional commercial development with perhaps some multi-family development on vacant land.	Approximately 900 jobs and 1,400 residents could be supported at this station. Intensive residential along with some office, public service, or neighborhood commercial uses are desirable. May require change of zoning from commercial and single-family to multi-family.
148th Avenue	Additional multi-family with perhaps some commercial development.	Approximately 1,300 additional residents on about 40 acres of land could be anticipated. Upzoning of single-family to multi-family/medium-density residential would be necessary. Multiple-family infilling and some single-family conversions would be anticipated.
162nd Avenue	Further infilling of multi-family development.	The station could support up to 1,700 additional residents, in multi-family units. Expanded multiple-family and some local convenience commercial uses would be appropriate. Some upzoning of existing single-family areas will be necessary.
172nd Avenue	Additional multi-family with perhaps some additional commercial development.	Development could include 2,300 additional residents and 1,800 new multi-family dwelling units into the area. Could support medium- to high-intensity residential uses. Upzoning of single-family to multi-family would be necessary.
181st Avenue/ Rockwood Streeet	This commercial center would continue to develop and perhaps expand with some additional multi-family residential.	The center would be oriented to transit-supportive commercial uses and high-density residential uses. Approximately 700 new jobs and 1,300 new residents could be accommodated. Upzoning of single-family areas would be necessary.
192nd Avenue	Gradual infilling of vacant land to other uses.	Good potential for development with 1,700 new residents and 700 new jobs possible in the area. A mix of intensive residential, community, commercial, and industrial uses would be appropriate. Major zone changes would not be necessary.
111th Avenue/ Eastman Street	Limited infilling of designated station area to other (mixed) uses.	Moderate to high-density residential and mixed office/ professional development associated with commercial redevelopment of Fairground property can be assumed.
7th Avenue/ Hood Street	Infilling of commercial and residential uses.	Multiple-family infilling and some single-family conversions would be anticipated; however, low-density character would predominate, with mixed institutional/office development.
8th Avenue/ Cleveland Street	Gradual infilling of vacant land to other uses, primarily industrial.	Approximately 2,215 new residents and 1,000 new jobs could be supported at this station site. High-density residential, office/professional, and community commercial can be assumed.

Gresham Hospital, and Gresham Terminal). Each area could be planned as a mixed-use center with high-intensity residential, neighborhood/community commercial; office/ professional/public service; and light industrial (labor intensive) uses. By establishing such transit-supportive zones, a basis for an efficient combination of residential, commercial, and light-industrial development would be created. Additional analysis of development expected to occur around each east Multnomah County transit station is presented in the Land Use Technical Report in the appendices to the FEIS.

4.4.4.4.3 Impacts on Land Value

Once operational, the Banfield Transitway Project can have an impact on property values, particularly in east Multnomah County. Experience with other freeway investment projects and suburban radial rail facilities such as Washington Metro indicates that with completion of such projects, property values along the proposed alignment corridor rise.

Competition for developable land, particularly in the station areas, can raise the price of land adjacent to the Project corridor. As the value of land increases, marginal land use activity can find it difficult to compete with development which uses land more intensively. A similar occurrence can take place along streets which gain traffic due to the barrier effect imposed by a light rail system along city streets. These effects can be particularly relevant in east Multnomah County.

4.4.5 Mitigation of Adverse Land Use Impacts

4.4.5.1 RIGHT-OF-WAY ACQUISITION IMPACTS

The Oregon Department of Transportation, through its State Highway Division, follows an orderly procedure in acquiring land. This involves public hearings, professional appraisals, personal contacts, and allowance for appeals. Property will be obtained for the market value or just compensation will be paid for any change in value if a portion is taken.

The Relocation Assistance Program aids all those who must move; the assistance is especially valuable for those with special problems, such as churches, businesses, and low-income tenants. Although monetary help is given, other types of assistance are important.

A review of classified ads shows that there is no shortage of homes, rental units, or business sites in the general area of the Project, especially for properties in average price ranges. In the event that a home owner or tenant, because of extremely low income, is not able to find adequate replacement housing, "housing replacement as last resort" (Section 26) might be needed. In this case, suitable housing would be provided with federal aid.

In general, finding replacement housing is easier in an urban area like Portland than in an isolated small community. In a single month, almost 2,000 houses were advertised in the eastern suburban areas of Portland, and advertised rental units were also plentiful.

All replacement housing offered will be fair housing open to all persons regardless of race, color, religion, sex, or national origin. Fair housing will be available to all affected persons regardless of race, color, religion, sex, or national origin.

Businesses and nonprofit organizations are eligible to receive moving expenses, as well as reimbursement for expenses in searching for a new location. In addition, relocation agents and the Portland Office of Planning and Development help by providing information on suitable replacement sites. The Portland Economic Development Loan Fund could also be used to help offset relocation expenses for small businesses adversely affected by the Project.

The Relocation Assistance Plan for housing and businesses will be updated and modified to reflect the latest information available on project design and actual relocations.

4.4.5.2 CONSTRUCTION IMPACTS

Construction impacts relate primarily to removal of on-street parking and the attendant effect on land use activity. Unlike right-of-way acquisition, no compensation is paid for removal of on-street parking. At present, there are no federal or state regulations which allow the Oregon State Highway Division to compensate businesses for the removal of on-street parking. On-street parking is part of the street system and under public ownership; hence, its removal does not require any acquisition of private land.

Some nonmonetary assistance and loans can be provided to businesses. The City of Portland can build off-street parking and tax the adjacent businesses for the cost of acquiring the land, as well as constructing and maintaining the facility.

In a project such as this, where federal funds are involved, the Small Business Administration can make direct loans to those businesses that have been adversely impacted by parking removal. The Small Business Administration will also provide advisory assistance; retired businessmen can assist businesses to adapt to the changes resulting from on-street parking removal.

4.4.5.3 OPERATIONAL IMPACTS

A major concern expressed by community groups was the effect that the Project could have on established developed areas, particularly residential neighborhoods. It will be important to ensure that these effects occur in a manner consistent with comprehensive plans and policies prepared by local jurisdictions. Accordingly, effective coordination with local government planning agencies will ensure that land use control mechanisms are adequate to manage growth and development in a manner which is compatible with existing development.

Local jurisdictions are committed to development of a land use pattern which will support LRT. Local policies consistent with transit-supportive development already exist. How well these controls and incentives are utilized by local jurisdictions will determine the extent of associated land use implications of LRT. In this regard, what is needed are implementation mechanisms to encourage the level of development desired within the Project corridor. Along with incentives for development in station areas, some disincentives to development outside the corridor will be necessary. Tri-Met, Multnomah County, and the City of Portland have comprehensively studied mitigational needs and techniques. Following is a description, in general, of mitigational measures which are oriented toward transit station areas in the Project corridor.

These controls can be applied through the enactment of a temporary ordinance. The intent of the ordinance will be to prevent further incompatible development until the planning process is completed and permanent controls (e.g., plan designations and zones) to implement the plan are adopted. Development which is in accord with policies of the contemplated plan can proceed. These controls are therefore a short-term means of minimizing the intrusion of nonconforming uses in transit station zones. The most common interim development control is a moratorium on development. Development moratoria (in the form of building permits, water and sewer extensions, subdivison, and zone change moratoria) can be enacted to preserve transit-supportive development opportunities until the rudiments of a long-range plan is in place.

Long-term development controls can be used to promote the long-term fundamental shifts in development patterns necessary for transit-supportive land use. These controls normally take the form of comprehensive plan designations. Zoning is the implementing mechanism. While these are necessary conditions in the pursuit of desired land use goals, they are not sufficient to assure a timely response on the part of the land development market. Potentially developable land may remain vacant and not support the transit system.

A number of governmental responses of a more permanent nature can provide incentives to stimulate the private development market. These include:

- Special Zoning Districts
- Transit Station Development Districts
- Transportation Corridor Development Corporation
- Urban Renewal
- Urban Development Action Grants
- Site Value Taxation
- Joint Development/Value Capture
- Land Banking

While some of these means of implementing desirable land development in the vicinity of transit stations may be provocative, they nonetheless establish an important basis from which transit-supportive development can proceed. Many of the techniques such as interim zoning, development moratoria, and urban renewal are already available under existing statuatory powers of local jurisdictions. Others, such as transportation development corporations, would require cooperative agreements between governments, if not new enabling legislation. In any event, a range of mitigative tools are currently or potentially available to better guarantee the success of transit-supportive development in the study areas.

4.5 SOCIOECONOMICS

This section describes the social and economic impacts stemming from the construction and operation of the Banfield Transitway Project. As noted in Section 4.4, the development pattern throughout the Portland metropolitan area has been directly influenced by technical advancements in transportation. These advancements have also shaped the pattern of social and economic interaction within neighborhoods, communities, and the region as a whole. The proposed improvements to the Banfield Freeway, together with development of the LRT system, will have a significant impact on interaction patterns throughout the region.

4.5.1 Existing Setting

4.5.1.1 SOCIAL PROFILE

4.5.1.1.1 Population

Population growth in the Portland, Oregon-Vancouver, Washington Standard Metropolitan Statistical Area (SMSA) has been significant over the past 19 years (1960-1979), increasing by over 183,470 to more than 1,190,000 persons. Nearly 90 percent of this population growth has taken place in the suburban communities surrounding the City of Portland (Metropolitan Service District 1979h). As noted in Table 4.5-1, specific growth rates have differed in various parts of the SMSA. Multnomah County experienced the slowest rate of population change. Washington County had the largest population increase, followed by Clackamas and Clark County.

In 1979, slightly more than 66 percent of Multnomah County's population resided in the City of Portland. Population growth in both Multnomah County and the City of Portland has been relatively stable since 1960. A significant increase in county population, however, has occurred in the incorporated cities in the eastern part of the county (Table 4.5-2). While in-migration has played an important role in population growth rates throughout the region, population changes in Multnomah County and the City of Portland have been due primarily to natural increase.

TABLE 4.5-1

POPULATION CHANGE
PORTLAND, OREGON-WASHINGTON, STANDARD METROPOLITAN STATISTICAL AREA
(Period from 1960 to 2000)

	Population				Rate of Change (%)		
	1960	1970	1979	2000	1960-70	1970-79	1979-2000
Clackamas County	113,038	166,088	231,000	231,200	46.9	39.1	0.0
Multnomah County	522,813	554,668	558,600	637,607	6.1	0.7	14.1
Washington County	92,237	157,920	222,100	298,876	71.2	40.6	34.6
Clark County	93,809	128,454	178,900	237,385	36.9	39.3	32.7
Total SMSA	821,897	1,007,130	1,190,600	1,500,885	22.5	18.2	26.1

Data from: Columbia Region Association of Governments 1978f.
Center for Population Research and Census 1979.
U.S. Bureau of the Census 1962.
U.S. Bureau of the Census 1972.

TABLE 4.5-2

POPULATION CHANGES FOR INCORPORATED
AND UNINCORPORATED AREAS OF MULTNOMAH COUNTY
(1960-1979)

	Population			Rate of Change (%)	
	1960	1970	1979	1960-70	1970-79
Multnomah County	522,813	554,668	558,600	6.1	0.7
Portland	372,298	380,060	370,000	2.1	-2.6
Fairview	578	1,045	1,820	80.8	74.2
Gresham	3,944	10,030	31,700	154.3	216.1
Maywood Park[a]	--	1,230	900	--	-26.8
Troutdale	522	1,661	4,575	218.2	175.4
Wood Village	822	1,533	2,340	86.5	52.6
Unincorporated Multnomah County	144,649	159,109	147,265	10.0	-7.4

Data from: U.S. Bureau of the Census 1971.
Center for Population Research and Census 1979.

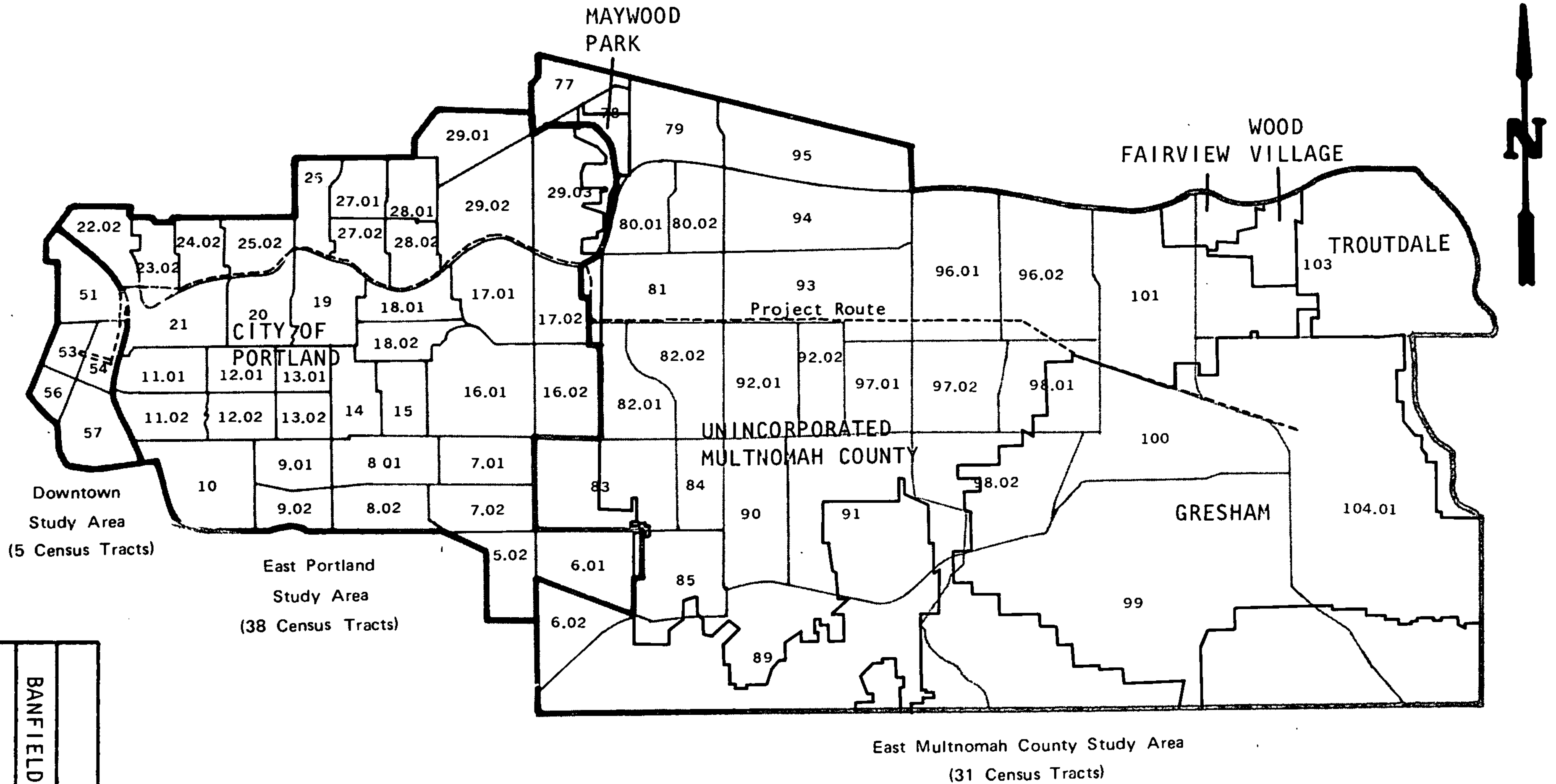
(a) City of Maywood Park incorporated in August 1967. Population decrease is primarily due to residential displacement from I-205 corridor.

By the year 2000, the population of the Portland region is expected to increase by more than a quarter over 1979 levels to a total of 1,500,885 persons (Table 4.5-1). Based on past trends, most of this growth will occur in the outlying suburban communities. Multnomah County is expected to experience a 14 percent growth rate to a total of 637,607 persons, representing about 43 percent of the region's total population (Metropolitan Service District 1979h).

The Banfield Transitway Project study area includes portions of Portland's East Side, as well as east Multnomah County (Figures 4.5-1 and 4.5-2). As indicated in Table 4.5-3, population in the study areas has declined since 1970, with the exception of east Multnomah County. In 1977, it was estimated that 61 percent (183,050 persons) of the Project study area population resided in that area defined by the Banfield Transitway corridor. Population in the corridor is forecast to increase by 34,831 persons (23.5 percent), to total 183,050 persons by the year 2000. Approximately 92 percent of this increase is forecast to occur in the east Multnomah County study area. The highest rate of growth in this study area is expected to occur in the incorporated cities of Gresham, Troutsdale, Fairview, and Wood Village.

4.5.1.1.2 Selected Socioeconomic Characteristics

The region's population is following a national trend, wherein smaller family size and increased longevity is gradually leading to an aging of the population base. In 1977, persons age 65 and over comprised 12 percent of the region's population over age 5 (121,142 persons) (Columbia Region Association of Governments 1977a). Thirty-one percent (38,237 persons) of the region's elderly population resided in the Banfield Transitway Project study area, with 62 percent (23,751 persons) of these living in the east Portland study area. As indicated in Table 4.5-4, the highest proportion of young population to study area population is found in east Multnomah County. The region is primarily a middle-income area, with a low percentage of Blacks and other minoritoes. Income is lowest in the downtown and increases as one moves out through east Portland to east Multnomah County. In 1977, 29 percent of the region's households were considered to be low income. Nearly 43 percent of these households were located on Portland'd East Side (Metropolitan

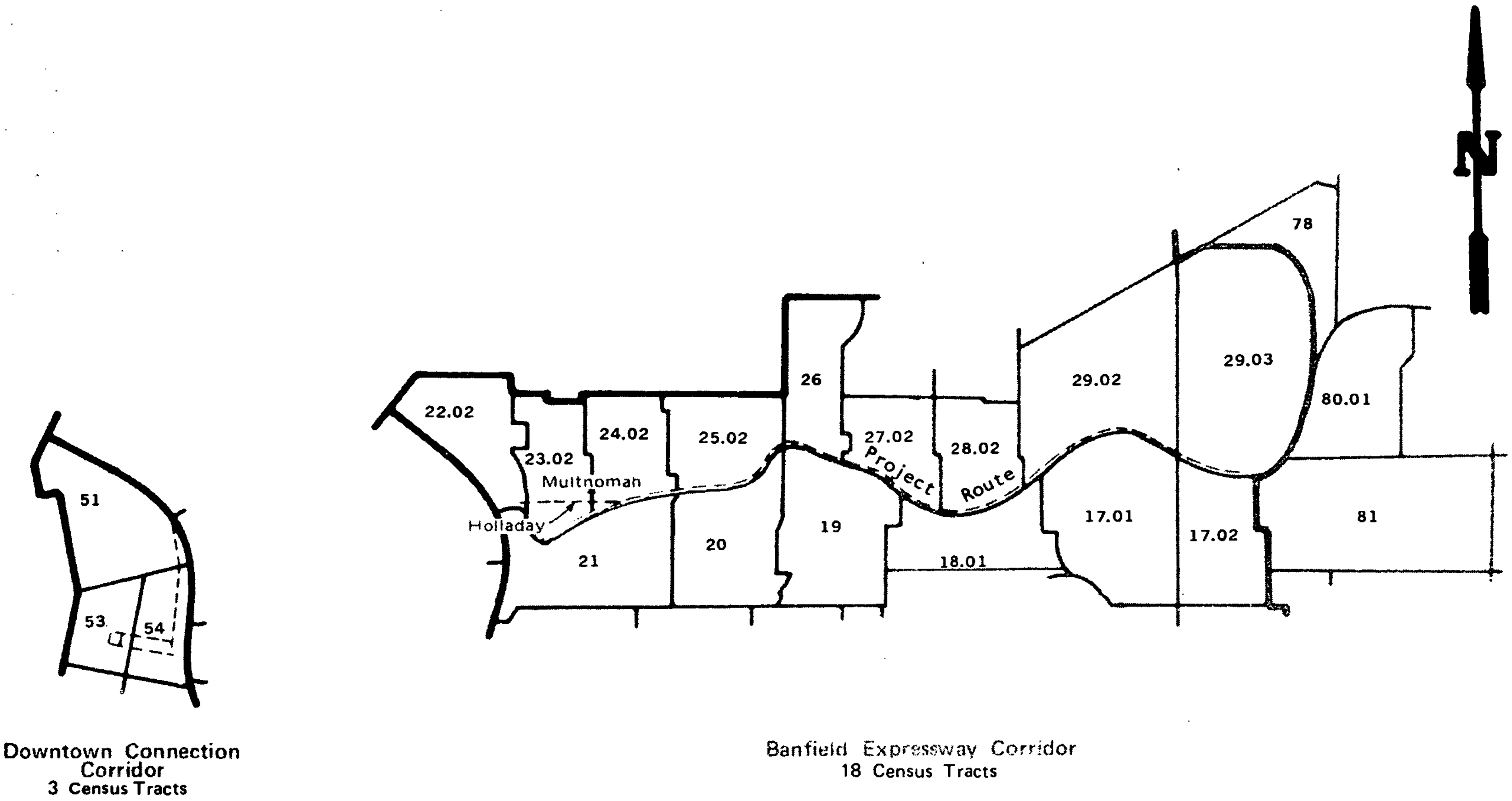


Numbers are Census Tracts established by the U.S. Bureau of the Census in the 1970 Census.

FIGURE 4.5-1

BANFIELD TRANSITWAY PROJECT FEIS

PROJECT STUDY AREAS



Note Numbers are U.S. Bureau of the Census, Census Tracts

FIGURE 4.5-2A

BANFIELD TRANSITWAY PROJECT FEIS

PROJECT STUDY CORRIDOR AREAS BY CENSUS TRACT

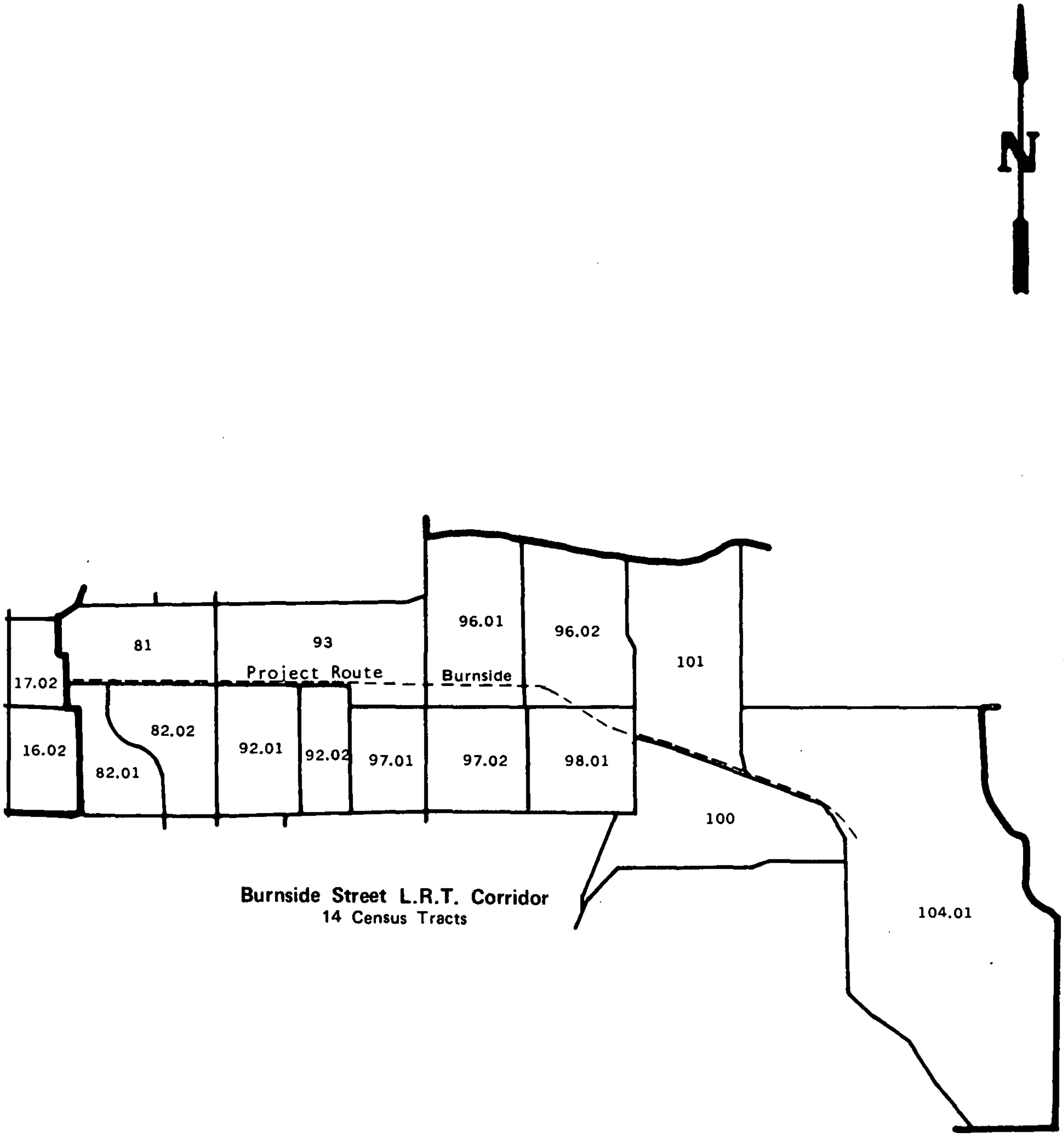


FIGURE 4.5-2B

BANFIELD TRANSITWAY PROJECT FEIS

PROJECT STUDY CORRIDOR AREAS
BY CENSUS TRACT

TABLE 4.5-3

POPULATION CHANGES IN THE PROJECT STUDY AREAS
(1960-2000)

Study Area	Population				Rate of Change (%)		
	1960	1970	1977	2000	1960-70	1970-77	1977-2000
Downtown	12,615	8,290	7,857	10,700	-34.3	-5.2	7.5
East Portland	155,753	155,070	147,120	148,250	-0.4	-5.1	0.8
Banfield Transitway Corridor[(a)]	--	--	66,737	68,000	--	--	1.8
East Multnomah County	102,073	137,975	154,916	210,250	35.2	12.3	35.7
Banfield Transitway Corridor[(a)]	--	--	89,558	106,600	--	--	19.0
Total	270,441	301,335	309,893	369,200	11.4	2.8	18.4

Data from: Columbia Region Association of Governments 1978f.
(a) Corridor population included in study area total.

TABLE 4.5-4

SUMMARY OF SOCIOECONOMIC DATA,
SMSA AND THREE PROJECT STUDY AREAS
(1970 Census)

Characteristic	SMSA	Downtown Study Area	East Portland Study Area	East Multnomah County Study Area
Population[a]	1,125,005	7,857	147,120	154,916
Sex: (%)				
Male	48.2	60.4	45.7	49.0
Female	51.8	39.6	54.3	51.0
Age:[a] (%)				
Under 5	7.8	0.6	6.4	8.6
15-18	23.7	3.8	19.2	25.8
19-64	57.8	69.8	58.1	57.8
65 and over	10.7	25.8	29.1	7.8
Race: (%)				
Black	2.3	3.0	1.2	0.3
White	97.7	97.0	98.8	99.7
Spanish Language	1.4	2.3	1.4	0.7
Socioeconomic Characteristics				
Marital Status: (%)				
Single	22.7	43.7	23.5	21.2
Married or Separated	64.5	24.8	58.5	68.4
Divorced or Widowed	12.8	31.5	18.0	10.4
Education[b]				
High School Graduate (%)	62.9	48.5	58.9	62.6
Median School Yrs. Completed	12.4	10.9	12.1	12.3

Data from: Columbia Region Association of Governments 1977a.
U.S. Bureau of the Census 1972.
Columbia Region Association of Governments 1978f.
Center for Population Research and Census 1979.

(a) 1977 figures.
(b) For those 25 and over in age.

TABLE 4.5-4

Characteristic	SMSA	Downtown Study Area	East Portland Study Area	East Multnomah County Study Area
Socioeconomic Characteristics				
Income:				
Median Family Income in 1969	$10,458	$8,209	$9,433	$10,846
Persons with income below the poverty level (%)	9.7	34.2	12.3	7.5
Families with income below the poverty level (%)	6.9	10.4	8.0	5.9
Older persons (65 and over) income below the poverty level (%)	24.1	31.2	31.6	18.9
Housing:				
Total units[a]	447,439	5,547	65,486	59,409
% change 1970-77	25.5	1.6	4.5	38.8
Single-family units:[a]				
total	326,630	255	41,538	42,655
% of total housing	70.0	4.6	63.5	71.8
% change 1970-77	18.1	45.4	2.9	18.9
Multiple-family units:[a]	120,809	5,292	23,903	16,754
% of total housing	27.0	95.4	36.5	28.2
% change 1970-77	47.5	0.2	7.4	141.2
Owner-occupied housing (%)	65.0	1.7	55.3	70.7
Renter-occupied housing (%)	35.0	98.3	44.7	29.3

(a) 1977 figures.

TABLE 4.5-4

Characteristic	SMSA	Downtown Study Area	East Portland Study Area	East Multnomah County Study Area
Transportation				
Means of Getting to Work (All Workers): (%)				
Private Automobile:				
Driver	73.1	18.6	65.4	78.0
Passenger	10.3	6.1	11.8	10.1
Bus	5.8	19.1	11.7	4.8
Walked	5.7	44.4	6.4	2.7
Other	5.1	11.8	4.7	4.4
Automobiles per Household: (%)				
None	13.8	72.7	21.0	6.4
1	45.8	22.8	50.2	46.4
2	33.5	4.1	23.8	39.7
3 or more	6.9	0.4	5.0	7.5

Service District 1977h). Educational attainment, like income, tends to increase outward from the downtown (see Table 4.5-4).

Housing in the Portland metropolitan region is characterized by the predominance of the single-family home, although there has been a 47.5 percent increase in the number of apartments, duplexes, townhouses, and mobile homes in recent years (see Table 4.5-4). In 1977 multiple-family units represented approximately 27 percent of all housing units. The most dramatic increase in the number of total housing units in the Project area between 1970 and 1977 has occurred in east Multnomah County (38.8 percent increase). Multiple family housing units increased by 141 percent in this area over the same period. Residential development in Multnomah County is expected to follow the trend established over the past 19 years. Between 1977 and 2000, the total number of housing units in the county is forecast to increase by approximately 40,000 dwelling units, of which 30,527 units (77.7 percent) will represent new multiple-family dwelling units. Single-family housing, however, will continue to characterize housing throughout the metropolitan area.

4.5.1.1.3 Community Cohesion

Community cohesion can be viewed as the degree to which a particular community manifests any of the above mentioned characteristics. The degree of community cohesion is directly proportional to: (1) the degree of homogeneity of a community; (2) the frequency of daily social interactions, use of common facilities, or interaction at local social, religious, or political institutions; and (3) cultural, political, and social perceptions.

In the City of Portland, successful adaptation to changes occurring in recent years can be traced to the renewed interest of area residents in preserving, restoring, and enhancing existing neighborhoods, while acknowledging a need to accommodate the demands that a growing area faces. An outgrowth of this interest has been the formation of approximately 58 neighborhood associations representing 68 neighborhoods (three associations are composed of more than one neighborhood). These associations are recognized by the city as political units with delineated boundaries. Figures 4.5-3 and 4.5-4 show the relationship of the Banfield Transitway Project alignment to the boundaries established by the neighborhood associations. (Census tract and neighborhood boundaries are not usually contiguous.) Neighborhood associations are beginning to develop in the east Multnomah County area. In the interim, community planning areas have been formed in unincorporated east Multnomah County. The community plan areas in the study areas are shown in Figure 4.5-3. Figure 4.5-4 also indicates an index of community stability for each of the census tracts along the study route. As noted, the downtown corridor has the highest index value, indicating low stability. The east Portland corridor has the lowest values (higher stability) of the 3 study areas.

The Project study area contains a well developed system of public, quasi-public, and private facilities and services which support community interaction. Figure 4.5-5 identifies the community institutions (churches, schools,parks, fraternal associations, government offices, ambulances, hospitals, fire and police stations, public utilities, and senior care centers) which directly line the study route. (For the location of other institutions within 1/4 mile on each side of the study route, refer to Figure 4.4-2.)

4.5.1.1.4 Transportation

Residents in the Portland metropolitan area are highly dependent upon the automobile for transportation. In 1977, nearly 97 percent of work trips in the region were made in either an automobile or bus. The east Multnomah County study area had the highest proportion of persons (88.1 percent) using the automobile as a means of transportation for home-based work purposes in 1970.

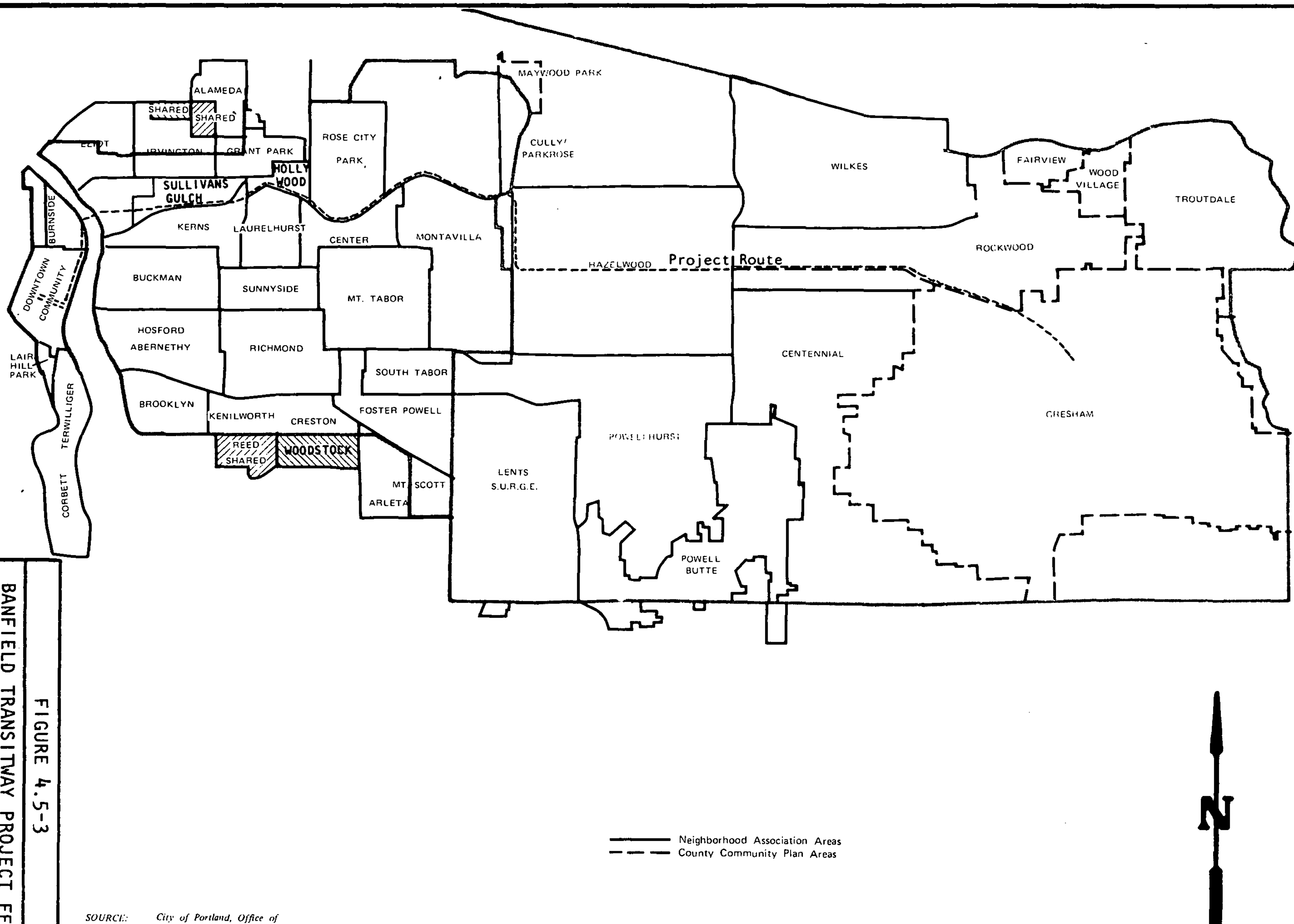


FIGURE 4.5-3

BANFIELD TRANSITWAY PROJECT FEIS

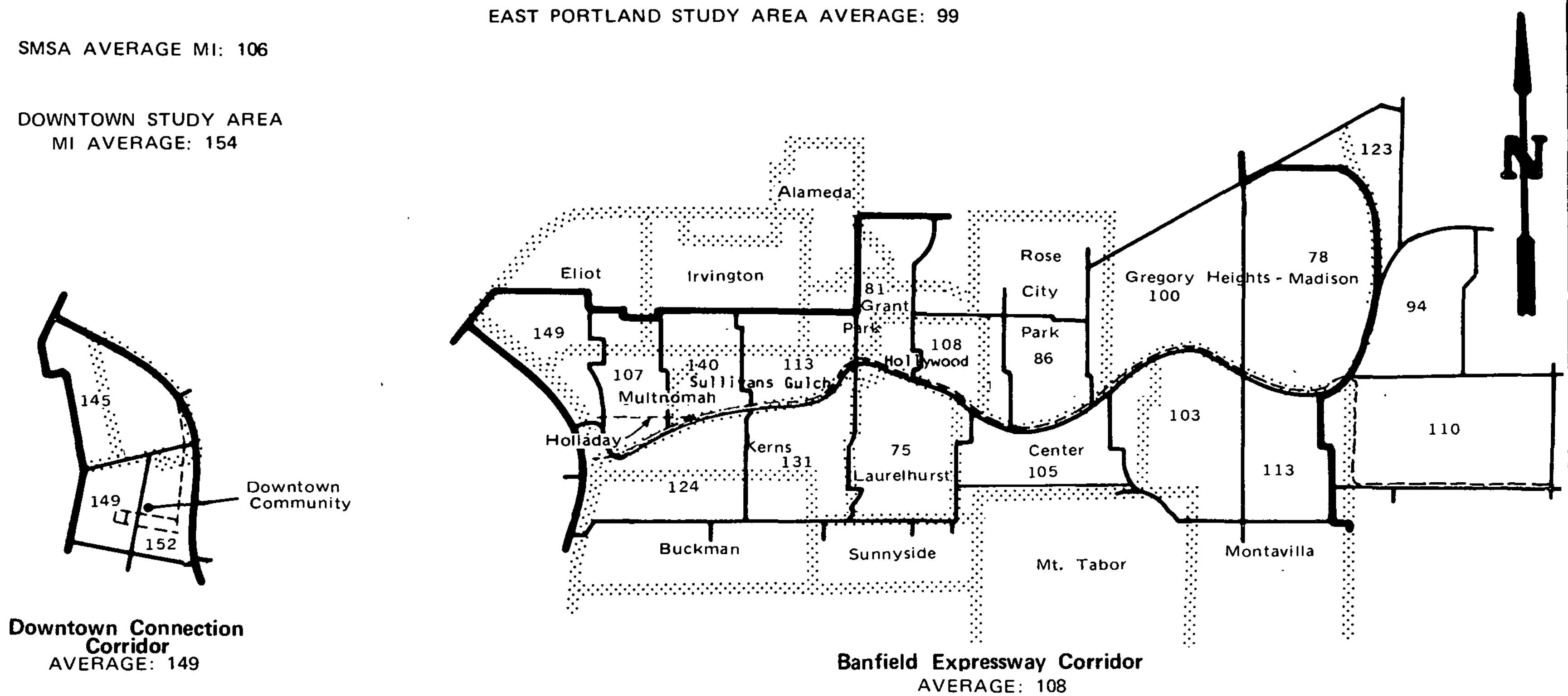
NEIGHBORHOOD ASSOCIATIONS AND EAST MULTNOMAH COUNTY COMMUNITY PLAN AREAS

SOURCE: *City of Portland, Office of Neighborhood Associations, 1977; Multnomah County, Division of Planning and Development, 1978.*

BANFIELD TRANSITWAY PROJECT FEIS

FIGURE 4.5-4A

RELATIONSHIP BETWEEN PROJECT CORRIDORS, NEIGHBORHOOD ASSOCIATION BOUNDARIES, AND RESIDENTIAL STABILITY



LEGEND

- Neighborhood Association Boundary / Community Plan Area
- Census Tract Boundary
- Project Route
- 110 Mobility Index (M.I.)

(The lower the value, the higher the residential stability of the Census Tract.)

SOURCE
City of Portland, Office of Neighborhood Associations, 1977; U.S. Bureau of the Census, Census Tracts, 1970, Portland, Oregon-Washington, SMSA, 1972.

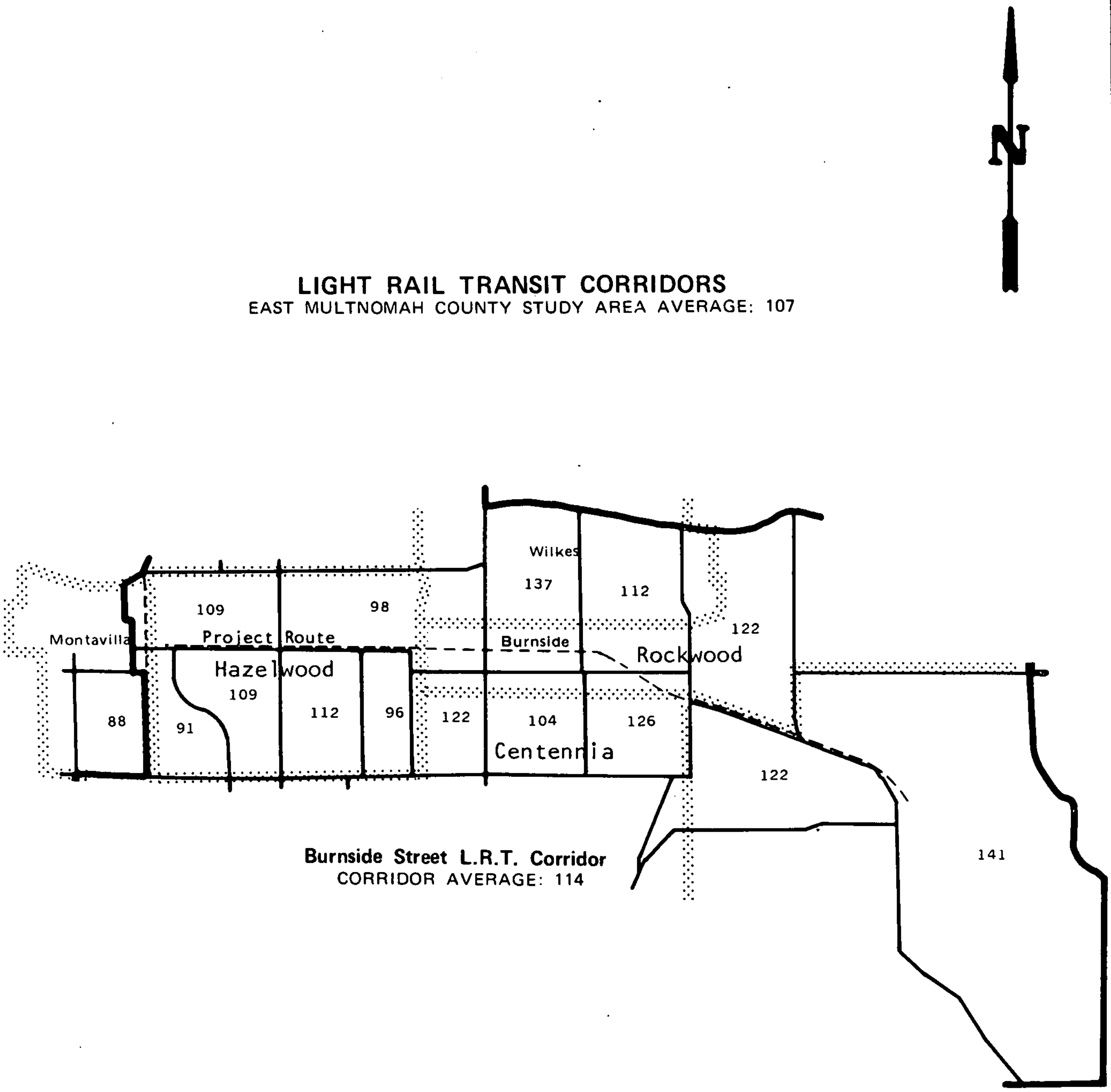


FIGURE 4.5-4B

BANFIELD TRANSITWAY PROJECT FEIS

RELATIONSHIP BETWEEN PROJECT CORRIDORS, NEIGHBORHOOD ASSOCIATION BOUNDARIES, AND RESIDENTIAL STABILTY

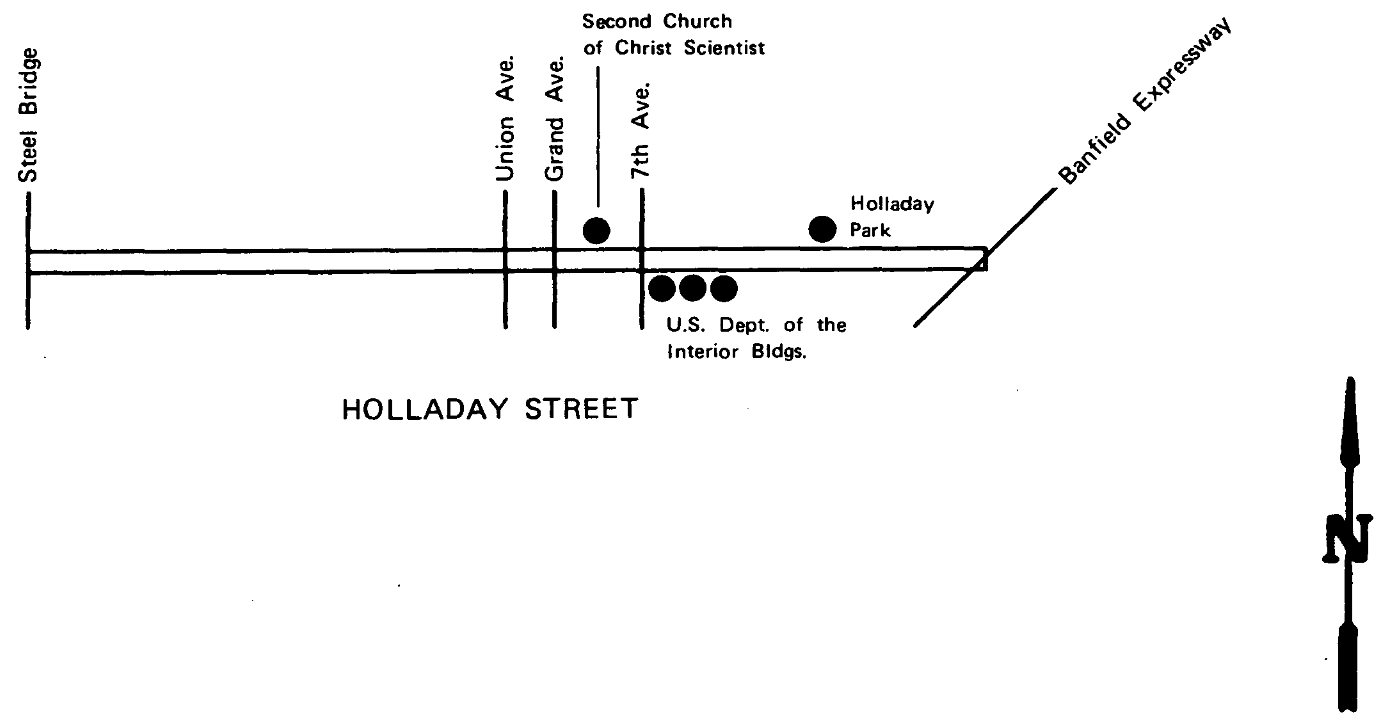


FIGURE 4.5-5A

BANFIELD TRANSITWAY PROJECT FEIS

COMMUNITY INSTITUTIONS ALONG HOLLADAY STREET

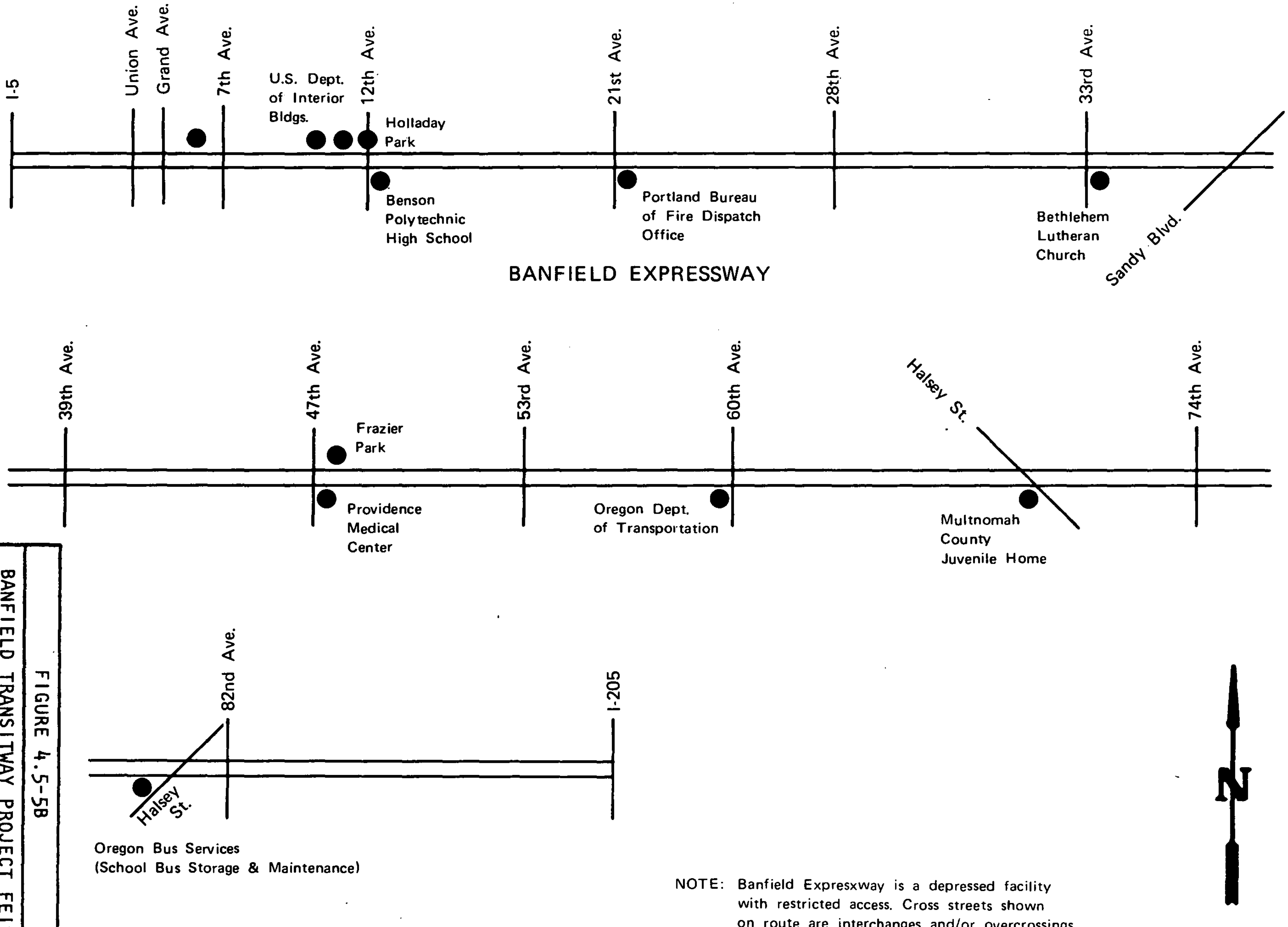


FIGURE 4.5-5B

BANFIELD TRANSITWAY PROJECT FEIS

COMMUNITY INSTITUTIONS ALONG THE BANFIELD FREEWAY

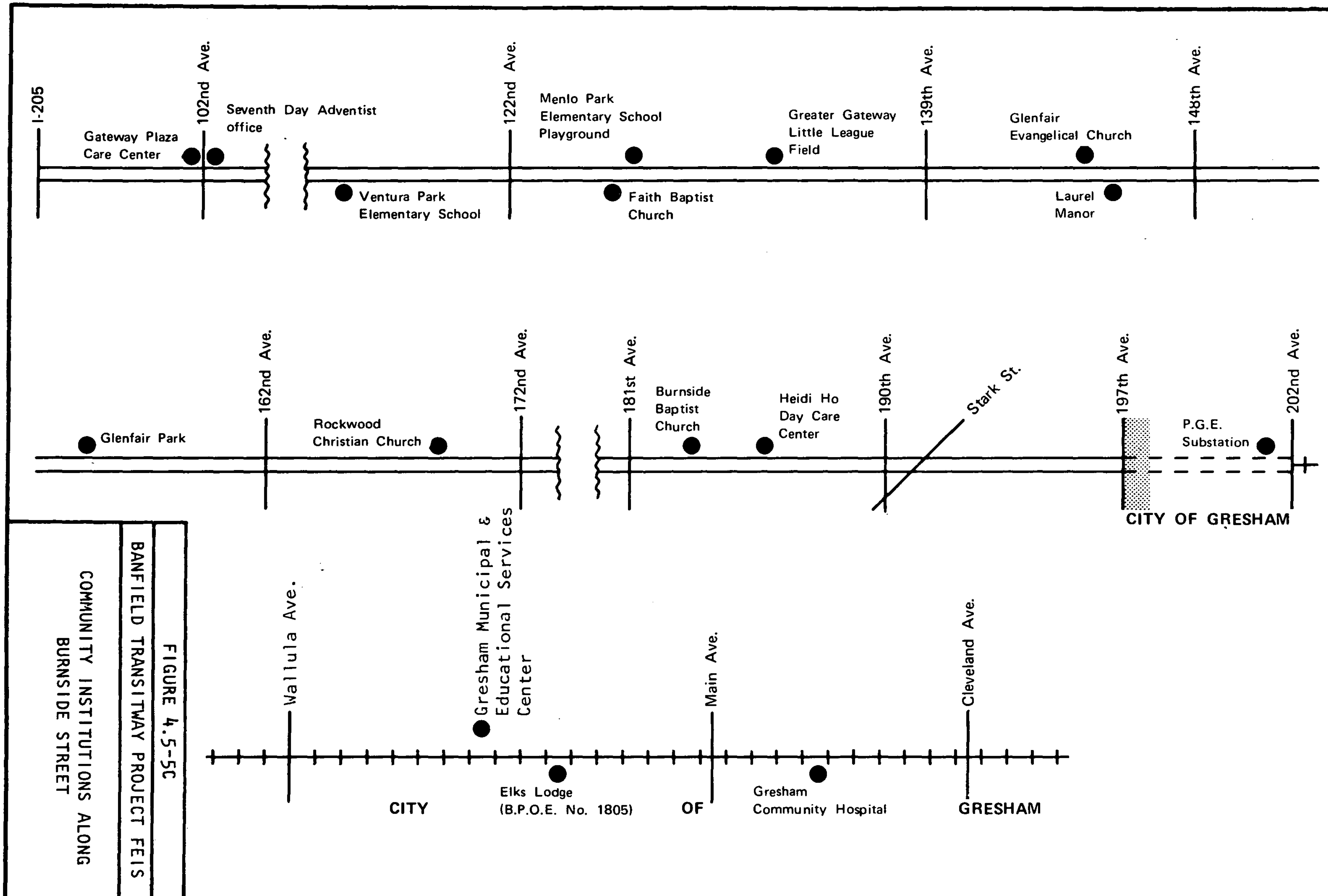


FIGURE 4.5-5C

BANFIELD TRANSITWAY PROJECT FEIS

COMMUNITY INSTITUTIONS ALONG BURNSIDE STREET

Tri-Met is the regional transit agency and provides bus service in the metropolitan area. In 1970, Tri-Met carried about 60,000 passengers on the average weekday. By October 1979, the figure had more than doubled to 145,400 passengers. Approximately 10 percent of Tri-Met's passengers are over 65 years of age.

Taxi and walking are other modes of transportation in use throughout the Banfield Transitway Project study area. The latter mode is most common in the more densely populated sections of the metropolitan area. It is particularly used by young adults and the elderly, primarily due to their low percentage of automobile ownership.

Figure 4.5-6 reveals some indications of general pedestrian dependency in the project corridor study areas. As indicated, the highest pedestrian dependency is in the downtown, the Lloyd Center area, and in those neighborhoods bordering the river in east Portland. The lowest values are in the east Multnomah County study area.

Certain elements of the population (the poor, the young (age 10-15), the elderly, and the disabled or handicapped) do not share the same level of mobility enjoyed by most of the population. These groups, for physical, economic, or legal reasons, are unable to drive their own cars and are thus defined as "transportation disadvantaged."

While no attempt is made to determine the distribution of the transportation handicapped and disadvantaged, in part this can be surmised from the facts noted above:

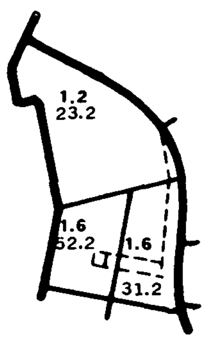
- 31 percent of the region's elderly population live in Portland's East Side.
- nearly 43 percent of the region's low-income households are located in Portland's East Side.
- 45 percent of the region's no-automobile households are concentrated in Portland's East Side.

A direct correlation between these 3 groups has been noted by MSD. Persons in low-income and no-automobile households tend to be older (almost 50 percent are age 65 or over) and have little ability to drive

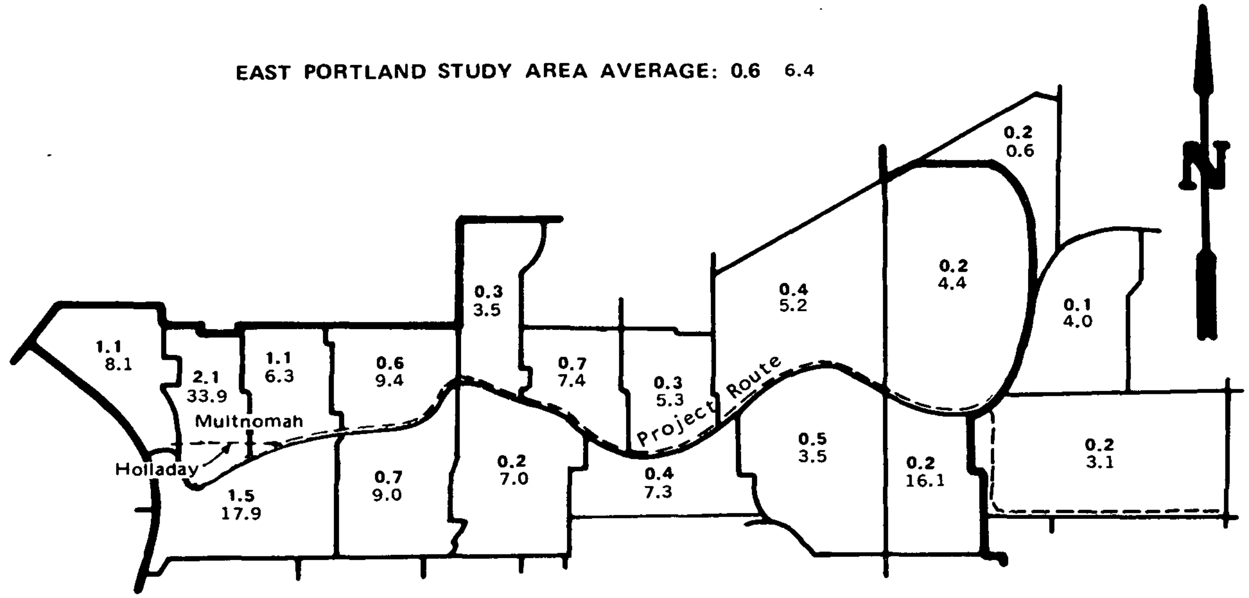
SMSA AVERAGE: 0.4 5.7

EAST PORTLAND STUDY AREA AVERAGE: 0.6 6.4

DOWNTOWN STUDY AREA AVERAGE: 1.2 44.4



Downtown Connection Corridor
CORRIDOR AVERAGE: 1.5



Banfield Expressway Corridor
CORRIDOR AVERAGE: 0.6

FIGURE 4.5-6A

BANFIELD TRANSITWAY PROJECT FEIS

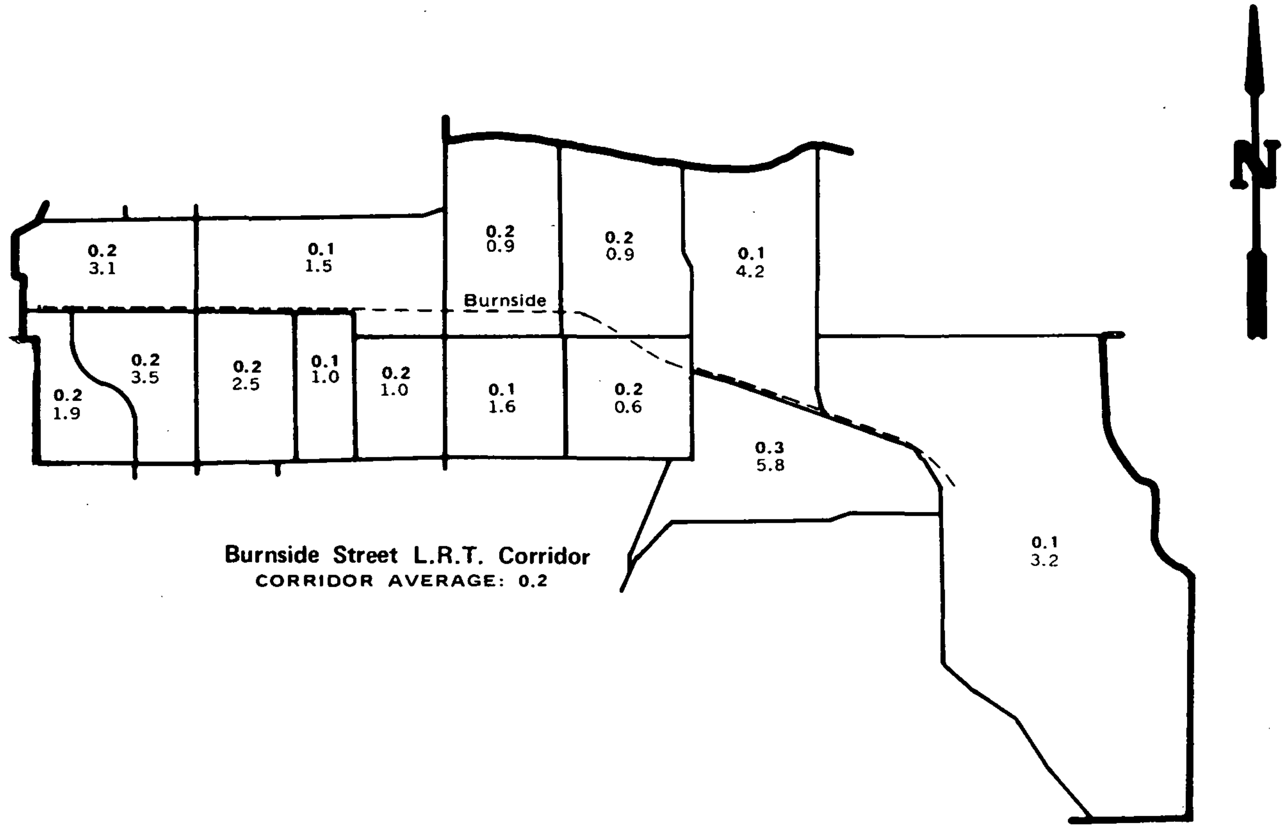
GENERAL PEDESTRIAN DEPENDENCY AND PERCENTAGE OF WORKERS WHO WALKED TO WORK (1970 CENSUS)

(The higher the value, the higher the dependency on Pedestrian Travel.)

0.0 - Percentage of workers who walks to work

0.0 - General Pedestrian Dependency (GPD)

SOURCE
U.S. Bureau of the Census, Census Tracts, 1970, Portland, Oregon-Washington, SMSA, 1972.



EASTERN MULTNOMAH COUNTY STUDY AREA AVERAGE: **0.2**
2.7

FIGURE 4.5-6B

BANFIELD TRANSITWAY PROJECT FEIS

GENERAL PEDESTRIAN DEPENDENCY
AND PERCENTAGE OF WORKERS
WHO WALKED TO WORK (1970 CENSUS)

an automobile (40 percent of low-income households and 76 percent of no-automobile households do not hold a valid driver's license) (Metropolitan Service District 1979h).

4.5.1.2 ECONOMIC PROFILE

The Portland metropolitan region had a total employment of approximately 513,730 persons in 1976, a 47.9 percent increase over 1970 (Metropolitan Service District 1979h). The economy is highly diversified as shown in Table 4.5-5, with manufacturing the largest contributing employment sector. The diversification of the regional economy has followed a specific geographic pattern. Significant employment growth between 1960 and 1976 has occurred in the Portland CBD, in east Portland (along the Banfield Freeway corridor), and in Gresham. In 1977, over 60 percent of the region's employment opportunities (representing 250,680 jobs) were located within the City of Portland (Metropolitan Service District 1979h). Approximately 28 percent (69,810) of the jobs in the city were in the Portland CBD.

Employment in the region is not expected to grow as rapidly in the next several decades as it has in the past. Regional employment is expected to increase by 53 percent to 784,757 jobs (an increase of 271,027 over 1976 levels) by the year 2000. As with population growth, the trend will be strongly oriented to suburbanization, with nearly two-thirds of these new jobs located in the outlying counties (Metropolitan Service District 1979h). Multnomah County is expected to experience a slower rate of growth in employment (a 27 percent increase) than the other counties in the region. However, in absolute terms, with a total gain of 90,552 new jobs expected by 2000, the county will experience over 34 percent more new jobs than any other county in the Portland SMSA.

As indicated in Table 4.5-6, employment in the Project study area, not unlike the region, is concentrated in the manufacturing, retail trade, and service sectors. Employment in the Project study area is projected to increase by 125 percent (100,000 persons) between 1970 and

TABLE 4.5-5

DIVERSIFICATION OF EMPLOYMENT BY INDUSTRY: 1976, 2000
(In Percent of Total)

	Portland-Vancouver SMSA			Multnomah County		
Major Employment Sector	1976	2000	% change 1976-2000	1976	2000	% change 1976-2000
Self-employed	10.5	8.3	21.3	9.2	8.0	11.0
Construction	3.8	3.4	36.7	3.4	3.4	27.8
Manufacturing	18.3	19.6	63.4	15.6	16.4	34.1
Transportation and Other Public Utilities	6.0	4.6	16.3	7.9	6.8	9.5
Wholesale Trade	7.4	6.7	37.4	8.5	8.2	22.3
Retail Trade	15.4	13.8	36.5	14.4	12.6	10.8
Finance, Insurance,	6.5	7.4	73.7	8.1	8.3	30.5
and Real Estate	17.5	20.3	77.0	18.7	20.5	39.3
Government Services	14.5	15.9	67.8	14.1	15.5	39.9
TOTAL EMPLOYMENT	513,730	784,757	52.8	332,531	423,083	27.2

Data from: Columbia Region Association of Governments 1978f.

TABLE 4.5-6

LABOR FORCE EMPLOYMENT BY OCCUPATION
PORTLAND SMSA, EAST PORTLAND, EAST MULTNOMAH COUNTY
(1970, Percentage of Total)

Occupation	Portland SMSA	East Portland	East Multnomah County
Construction	5.9	4.7	6.8
Manufacturing	21.0	16.8	19.3
Transportation	5.2	5.4	5.8
Communication, Utilities, and Sanitary Services	3.5	4.1	3.7
Wholesale Trade	6.9	8.0	7.6
Retail Trade	16.3	18.9	18.0
Finance, Insurance, and Real Estate	6.4	7.6	6.5
Services	27.0	27.8	25.7
Public Administration	4.3	4.8	4.2
Other	3.5	1.9	2.4

Data from: U.S. Bureau of the Census 1971.

TABLE 4.5-7

DOWNTOWN EMPLOYMENT

Type of Employment	1970	1977	1995 Low[a]	1995 High[b]	2000[c]
Office	39,200	60,000	84,000	90,100	--
Retail	8,300	8,000	11,000	12,100	8,410
Manufacturing	--	6,000	6,000	6,000	5,600
Total Employment	47,500	74,000	101,000	108,200	89,680
Students	4,000	10,000		16,000	--
Residential Population	20,000	11,300		14,300	10,700

Data from: Portland, Bureau of Planning 1979.
(a) 1,500 employees or 315,000 square feet per year.
(b) 1,900 employees or 400,000 square feet per year.
(c) Columbia Region Association of Governments 1978.

1990 (derived from Tables 4.5-7 and 4.5-8). East Multnomah County will experience a 123 percent increase in employment. In absolute terms, with a total gain of 42,200 new jobs expected, the downtown area will experience over 32 percent more new jobs than east Multnomah County. Most of the increase in employment in the Project study area is expected to be in retail, commercial, and office-related activity.

Two important retail centers are located in the east Portland study area: Lloyd Center and the Hollywood District. Lloyd Center, which features a regional shopping center, several high-rise office buildings, and residential towers, is the second largest concentration of office and commercial activity in the region. Hollywood is an older, less developed retail and office center, drawing primarily upon the east Portland service area.

Once the proposed Project alignment leaves Holladay Street, it enters Sullivan Gulch (the Banfield Freeway corridor). Sullivan Gulch is, and has been for some time, a major transportation corridor. In addition to the Banfield Freeway, the corridor also contains the main line of the Union Pacific Railroad. The rail line handles about 11 percent of the company's total freight as well as serving over 40 industries on the north side of the corridor.

The Union Pacific Company has long-range plans to install an additional mainline track within their existing right-of-way. Although possible, any construction by the railroad would require major structural modifications and additions to railroad crossings in order to meet horizontal and vertical clearance requirements of the Oregon Public Utilities Commission. Double tracking would increase the movement capacity over 4 times.

The proposed LRT alignment in east Multnomah County passes through the communities of Hazelwood, Rockwood, and Gresham. Existing economic conditions for the station locations in these communities are summarized in Figures 4.5-7 and 4.5-8. In general, east Multnomah County has a diverse economic base with the potential for future expansion, particularly along the proposed LRT alignment. Communities along the alignment

TABLE 4.5-8

BANFIELD TRANSITWAY PROJECT CORRIDOR:
EAST PORTLAND STATION AREA POPULATION
(Station Area Population Within 1/4 Mile of Station)

Station	1970 Population Base	Revised 1990 Population	Population Increase (No.)	Population Difference (percent)
East Portland				
Coliseum	231	169	-62	-26.9
Union/Grand	359	314	-45	-12.5
Lloyd Center	289	294	5	1.7
Hollywood	1,764	1,842	78	4.4
60th Avenue	1,297	1,345	48	3.7
82nd Avenue	1,102	1,099	-3	-0.2
Total	5,042	5,063	21	0.4
East Multnomah County				
Gateway	278	2,278	2,000	719.4
102nd Avenue	708	1,980	1,272	179.7
122nd Avenue	674	2,049	1,375	204.0
148th Avenue	581	1,873	1,292	222.4
162nd Avenue	1,401	3,068	1,667	119.0
172nd Avenue	1,048	3,318	2,270	216.6
181st Avenue	1,365	2,644	1,279	93.7
192nd Avenue	1,194	2,873	1,679	140.6
Gresham(a)	500	3,900	3,400	680.0
Total	7,749	24,023	16,234	209.5

Data from: Tri-Met 1977.
(a) Figure assumes population within 1/2 mile for Gresham only.

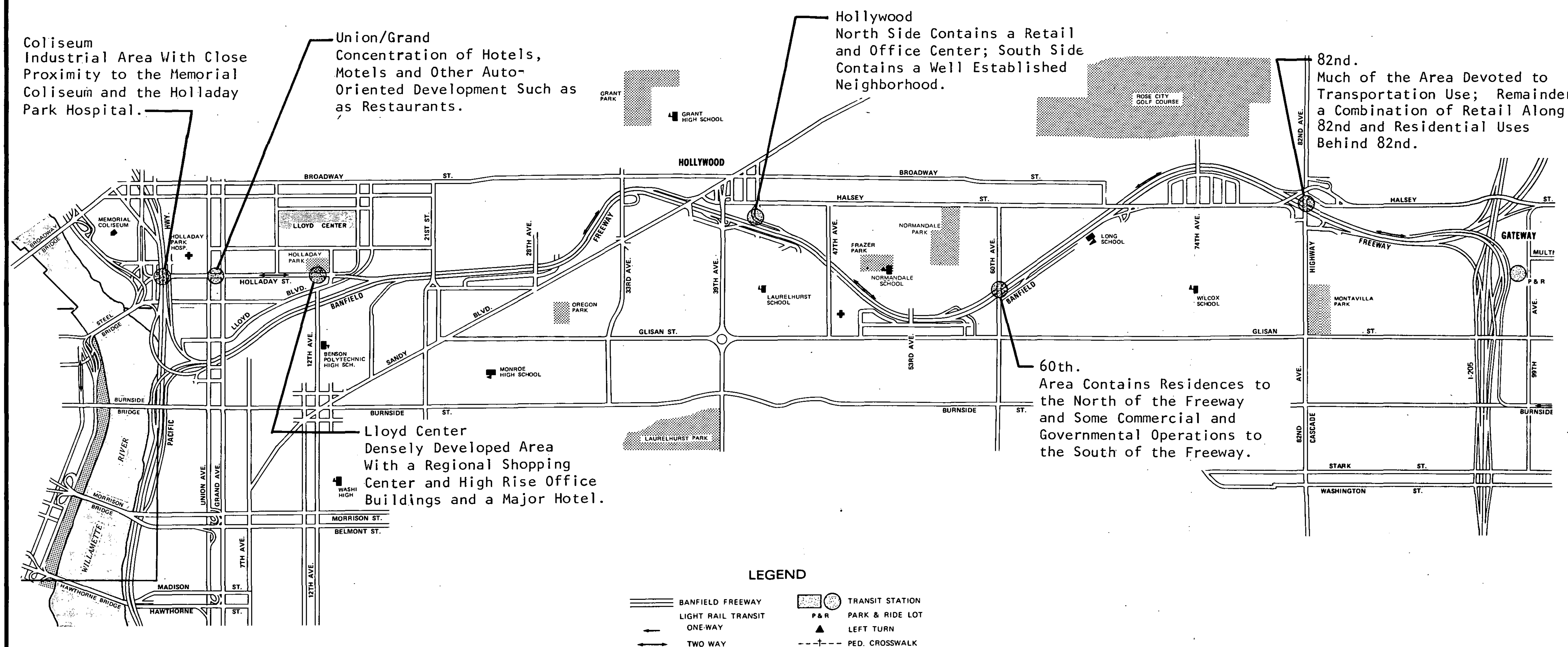


FIGURE 4.5-7

BANFIELD TRANSITWAY PROJECT FEIS

EXISTING ECONOMIC SETTING, TRANSIT STATIONS, EAST PORTLAND

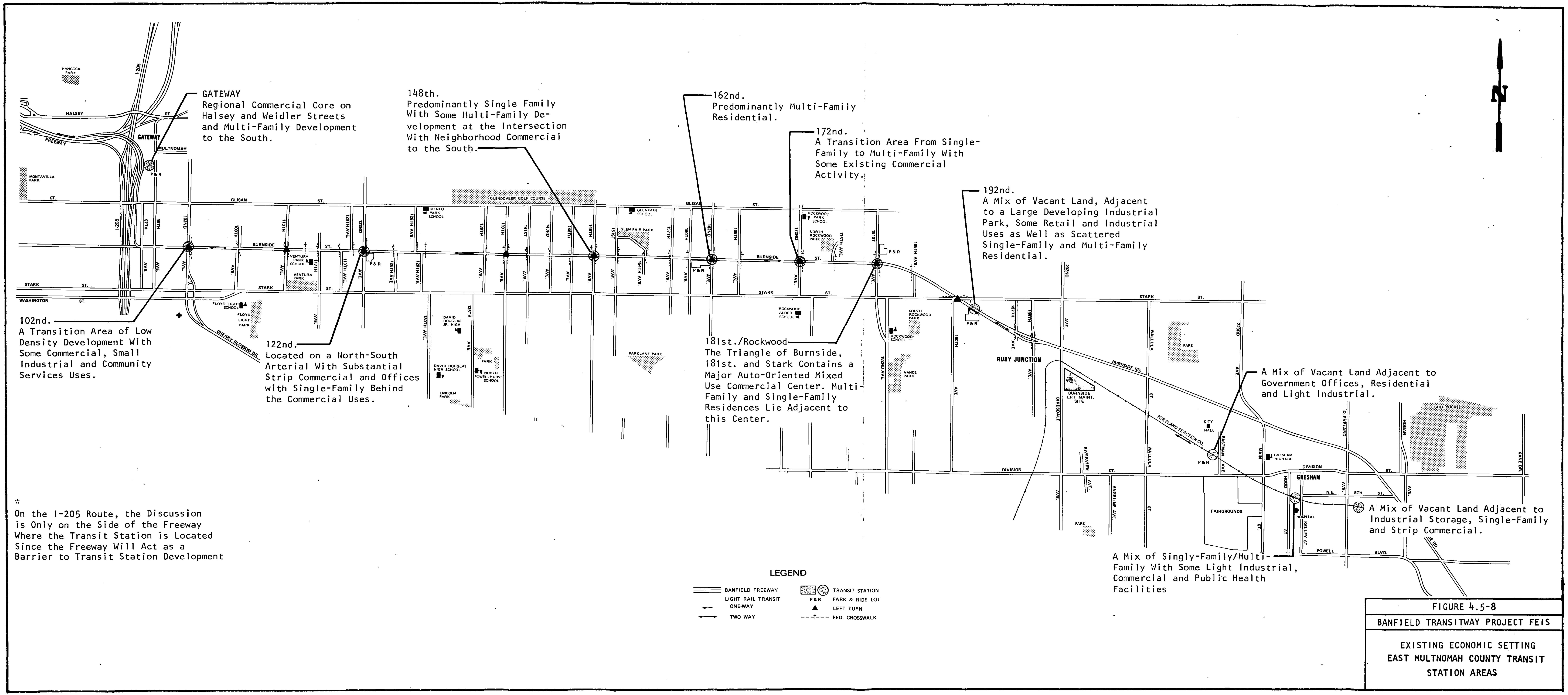


FIGURE 4.5-8

BANFIELD TRANSITWAY PROJECT FEIS

EXISTING ECONOMIC SETTING
EAST MULTNOMAH COUNTY TRANSIT STATION AREAS

contain a young, highly educated labor force and growing residential population.

While development potential along the corridor is generally high, the level of community services currently available--sewers, drainage facilities, water--constitutes a serious constraint to development. In addition, land consolidation would generally be required to support development. However, land holding costs throughout Multnomah County have risen to the point where private acquisition and aggregation of developable land is becoming infeasible.

4.5.2 Impacts

The social and economic impacts accruing under each of the 2 development scenarios evaluated in Section 4.4.3.4--the No-Build and Build--are evaluated below.

4.5.2.1 SOCIAL IMPACTS

4.5.2.1.1 Population

Population growth or decline in any given area is caused by a multitude of factors, including the health of the economy, demographic characteristics (fertility,mortality, migration), availability of developable land and municipal services, accessibility, and government controls on land use. While transportation improvements can make major changes in accessibility, generalizations about the effect on population should be viewed cautiously, since transportation is only one of the multiple factors that can affect population change.

NO-BUILD

In the short run, the No-Build condition would have an insignificant effect on the population growth rates as projected by MSD for the Project study area as a whole. Population increases now occurring could be expected to continue. However, in the long run, the No-Build condition could influence population by slowing the projected rate of growth, particularly in east Multnomah County. Given present and projected traffic volumes for roadways in the study area, congestion and traffic delays would increase under the No-Build condition. Regional accessibility would decline, particularly between the central city and suburbs in east Multnomah County where social and economic interdependencies would be weakened significantly. Competition between the areas for retaining and/or attracting new development would be heightened. In general, No-Build would tend to promote suburban sprawl.

Anticipated economic and residential development slated for east Multnomah County may not be completly realized under a No-Build condition. The County's declining percentage of the SMSA's total population would probably accelerate with the No-Build condition. Cumulatively, No-Build could cause a slight reduction in the region's total future population since Multnomah County's share of the projected growth would be inhibited.

BUILD*

The Build condition will greatly improve access throughout the East Side. While improved access can stimulate and significantly increase regional population growth, it will directly affect the spatial distribution of population growth in the east sector of the Portland-Vancouver SMSA. The opportunity for reorienting future growth in the Project study area depends upon planning activities of local and regional agencies. In general, a shift in population growth rates is expected to occur under the Build condition, with projected population increasing within the Project corridor and decreasing outside and immediately adjacent to the corridor.

*Abstracted in part from Light Rail Transit Land Use Considerations (Tri-Met 1977).

An intensification of development around transit stations is projected to occur under the Build condition (see Section 4.4). Redistribution of population is expected to be most significant in east Multnomah County. As indicated in Table 4.5-8, the Project will result in an increase in population in the station areas of east Multnomah County by 16,234 persons between 1975 and 1990. The reallocated forecast projects a 35.4 percent increase over 1977 levels, to a total of 88,015 persons in 1990. Population in the influence zone of the transit stations would occur in part as a result of single-family residential conversion to multiple-family uses, as well as residential infilling at higher densities than originally projected.

The Project will not significantly affect population downtown or in east Portland, due to the developed nature of these areas. Moderate increases in population would occur in the 1/4-mile radius influence zone of the transit stations in east Portland, particularly at Hollywood, 60th, and 82nd Avenue stations. Population at these locations is expected to result from conversion of single-family to multiple-family residences. The level of population growth induced by LRT in the downtown study area is expected to fall within the range projected for the CBD (see Table 4.5-3).

4.5.2.1.2 Community Cohesion

The cohesive quality of a region, community, and neighborhood is largely based on the level of social and economic interaction that is achieved. By creating better accessibility, transportation systems can effectively change the amounts and trends of desirable interaction in which area residents engage. Transportation systems can enable residents to obtain jobs which can enhance the overall socioeconomic status of a community. If constructed along a boundary of a neighborhood, they can also promote neighborhood stability. However, for residents and institutions abutting the transportation route, the construction and operation of transportation facilities constitute a "necessary nuisance," which contributes to the level of noise and air pollutants in the area. Rarely are the impacts of transportation improvements clearly all beneficial or all harmful within a community. The more usual case is that some people or institutions may gain, while others may suffer disproportionally.

ACCESSIBILITY

No-Build

No-Build traffic conditions in 1990 indicate that most of east Portland's streets will become increasingly congested. The peak travel hours would extend over a longer period of time without any improvements to regional transportation systems. Mass transit would have to compete in this congestion. Regional accessibility, particularly in east Portland, would be adversely affected.

Through traffic in the east Portland study area has been identified as one factor that has placed pressure on the stability of area neighborhoods. Under the No-Build condition, increases in through traffic coupled with local traffic would adversely affect the livability of these neighborhoods. Access to major community instititutions would be reduced. The impact on emergency services would be particularly significant. Access to Providence, Holladay Park, and Portland Adventist Hospitals, fire protection, police protection, and ambulance service would decrease. Emergency vehicles would not be able to operate as effectively in higher volumes of traffic. In the long run, this would decrease the quality of service and could necessitate the extension and duplication of more services.

The increase in traffic could also lead to a higher incident of accidents on local streets, thereby greatly reducing the safety of motorists and pedestrians. Traffic increases could have significant impacts on schools in the Project area. School attendance areas in the Project study area could effectively be severed by increased local traffic. This in turn would ultimately require school boundary readjustments or adoption of more stringent school crossing procedures to ensure the safety of children walking to and from area schools.

While not as severe, reduction in accessibility in east Multnomah County under the No-Build condition would be significant. The east Multnomah County area is presently heavily automobile oriented; the No-Build condition would increase this dependency. As in east Portland, this would increasingly generate conflicts between the automobile and other modes of transportation (e.g., walking and bicycling). Reduction in regional accessibility would reduce the level of economic and social interaction between the Portland CBD (downtown study area) and outlying areas such as Gresham (east Multnomah County). Under the No-Build condition, the downtown area would decline as the cultural and business center for the region.

Build

Improved accessibility throughout the Portland metropolitan region is the single most important socioeconomic impact arising from construction of the Banfield Transitway project. Area residents will likely gain direct and immediate benefits due to the reduced travel times attributable to the Project. Benefits to the general public at large will include increased exposure to a wide variety of employment, shopping, educational, recreational, and cultural opportunities.

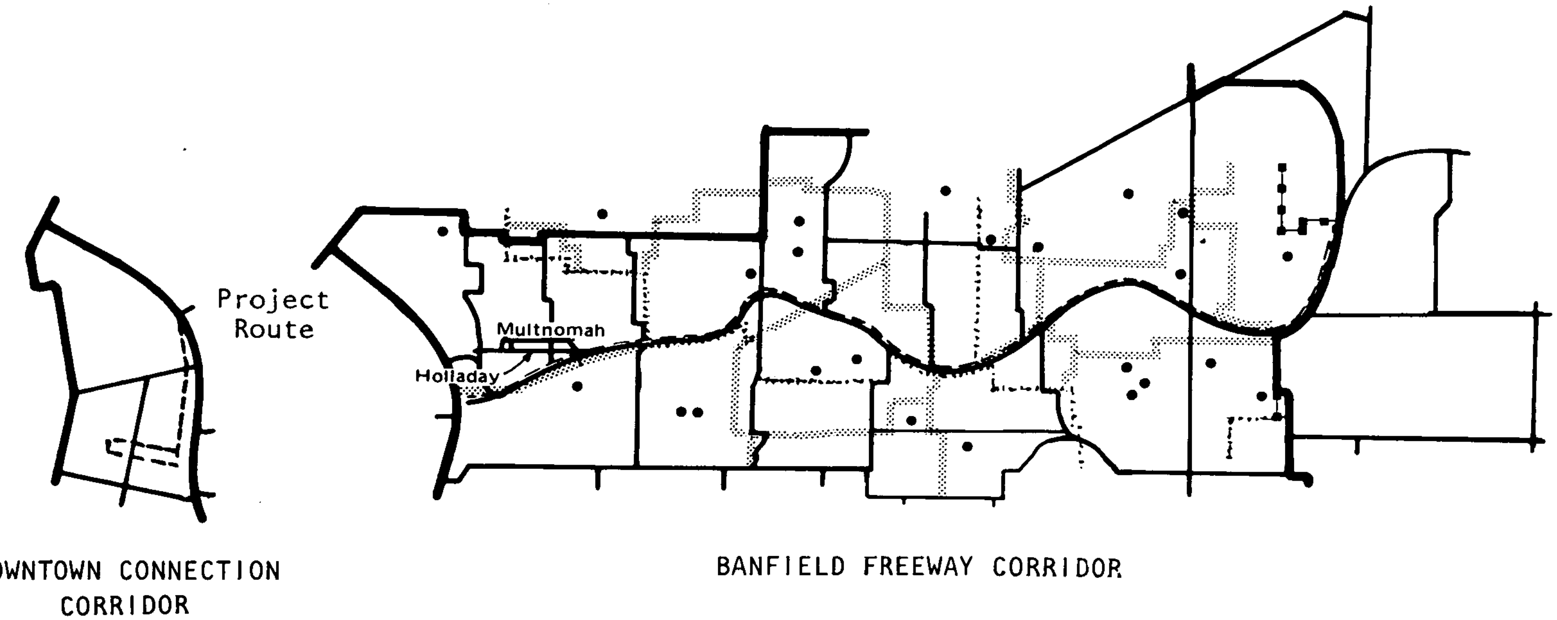
By providing a faster and more convenient alternative route and transit mode, the Build condition is expected to attract motorists away from traditional travel patterns, thereby reducing traffic on local streets. While traffic around transit station locations will increase the absorption of through traffic by the Banfield Freeway (and LRT) generally will reduce the number of vehicles on neighborhood streets throughout the Project study area. This will result in fewer accidents on local streets and greater pedestrian safety.

The proposed Project alignment is located in and along established transportation corridors. For example, in east Portland, the Banfield Freeway is used as a boundary for school and other service areas. The Build condition, therefore, will not dissect or disrupt any service areas in the east Portland study area. Access across the Banfield Freeway will not be changed as a result of the Build condition. Access to institutions, and other community activity centers bordering the freeway will, therefore, not be adversely affected by the Project. However, in east Multnomah County the Build condition will adversely affect access to residences and institutions located along the Burnside Street alignment, and in the corridor paralleling the Project route. Due to the limited number of grade crossings provided for automobile-oriented travel, community circulation will necessitate out-of-direction travel for some local trips.

Reduced access in east Multnomah County due to out-of-direction travel could be particularly significant in the communities of Hazelwood and Rockwood where public institutions in the transitway corridor, together with commercial shopping areas, are focal points for community interaction. Under the Build condition, 12 north/south streets along Burnside Street will remain open (see Section 3.4). Among these are 102nd and 112nd Avenues, which form major north/south elements to the local grid street pattern in Hazelwood, while 181st Avenue serves as a major arterial in Rockwood. Access to community activity centers due to out-of-direction travel will not be affected adversely by the Build condition, since no significant change in present travel patterns are necessitated.

The Burnside Street LRT route will bisect several elementary school attendance areas in the study area (see Figure 4.5-9). Local school districts may elect to readjust attendance ares to border the LRT route.

Community institutions bordering Burnside Street will benefit from better regional accessibility. However the delivery of emergency services to the communities of east Multnomah County will be adversely affected by the degree of out-of-direction travel. Out-of-direction travel resulting from limited grade crossings along Burnside Street could effectively increase the response time to the nearest fire station. Representatives of Multnomah County Fire District 10 and the Insurance Services Corporation, which establishes fire insurance ratings for the area, do not consider it



LEGEND

- Route
- District Boundary
- Secondary School Boundary
- Elementary School Boundary
- School

SOURCE Portland Public Schools, District 1, 1977

FIGURE 4.5-9A

BANFIELD TRANSITWAY PROJECT FEIS

SCHOOLS AND SCHOOL BOUNDARIES

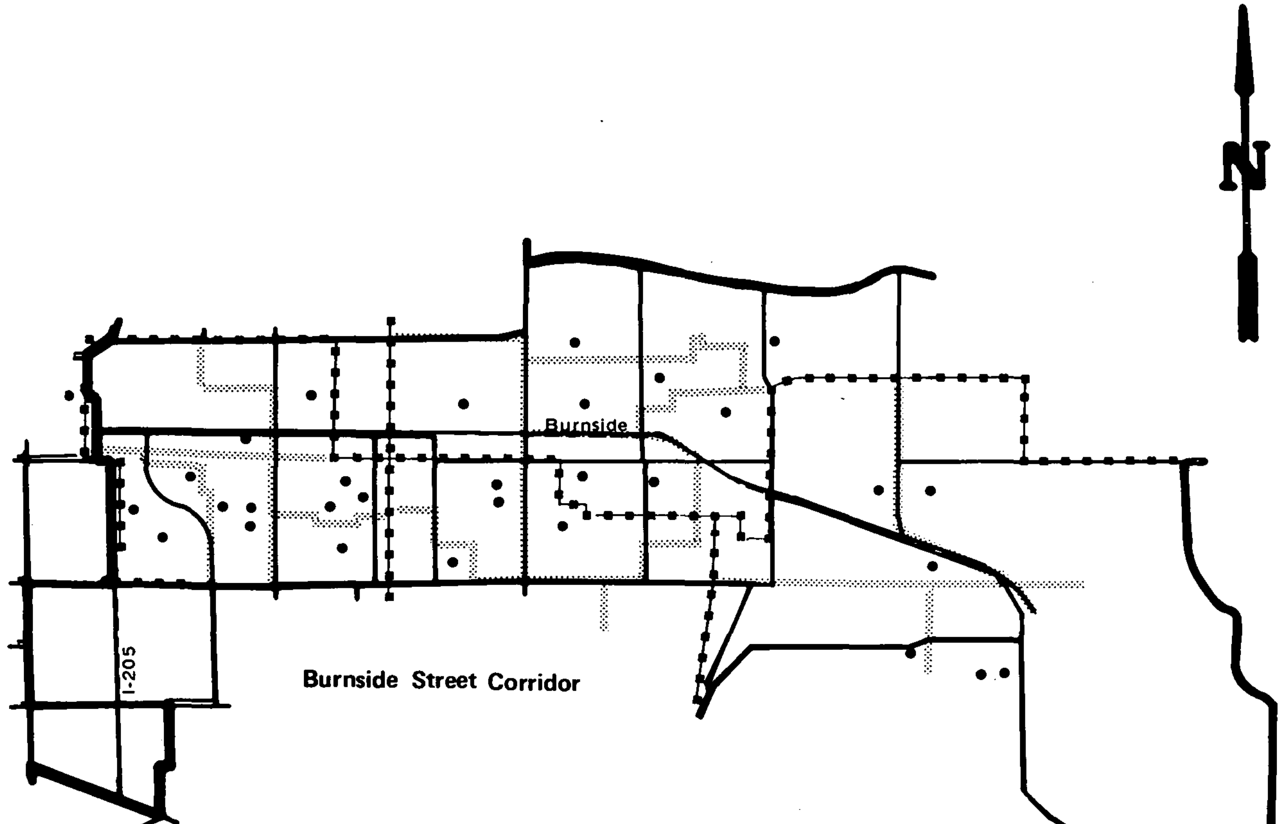


FIGURE 4.5-9B

BANFIELD TRANSITWAY PROJECT FEIS

SCHOOLS AND SCHOOL BOUNDARIES

TABLE 4.5-9

ESTIMATE OF BANFIELD TRANSITWAY PROJECT CAPITAL COSTS

Cost Item	Cost Millions in 1978 $		
BANFIELD PROJECT CAPITAL COST			
Banfield Freeway Improvements:		$58.6	
LRT Fixed Facilities:			
Track Work	$18.5		
Electrification and Signal System	10.5		
Stations	8.4		
Maintenance Facility and Equipment	6.5	43.9	
Associated LRT Construction:			
Downtown Utility and Street Improvements	4.3		
Burnside Utility and Street Improvements	9.6		
Miscellaneous Structural and Right-of-Way	15.4		
I-205 Structures	4.9		
Park-and-Ride Facilities	3.6	37.8	
26 LRT Vehicles		20.8	
Total Project Start-Up Costs (1984)			$161.1
ADDITIONAL TRI-MET 1990 CAPITAL COSTS:			
8 LRT Vehicles			6.4
Total 1990 System Capital Cost			$167.5

Data from: Tri-Met, Planning and Development Division 1978b.

TABLE 4.5-10

ESTIMATE OF BANFIELD TRANSITWAY PROJECT LRT OPERATING COSTS, 1990

	Number of Employees	Annual Expense in 1978 $
Maintenance of Way and Power	16	$ 475,960
Maintenance of Equipment	36	1,144,380
Transportation	42	1,046,000
Electrical Energy	--	649,870
Injuries and Damages	--	139,680
General Administration	2	50,020
Purchasing and Stores	2	38,390
Total	98	$3,544,300

Data from: Tri-Met 1979b.

likely that the overall quality of fire protection service will change enough to influence the district's rating. Therefore, fire insurance rates of individual property owners are not likely to increase as a result of the Project. To the extent that the Build condition reduces traffic congestion along major arterials in east Multnomah County, the delivery of emergency services would be enhanced.

Although the Banfield Transitway Project will improve regional accessibility, localized automobile access restrictions will occur, primarily around transit stations. However, pedestrian access throughout the Project study area will not be adversely affected. Throughout the length of the Project, freeway overcrossings (15), together with special sidewalks, cross-block walkways, signalized street crosswalks, and other new developments will improve pedestrian walk-in access to all transit stations. In east Multnomah County, bicycle and pedestrian access will be maintained at all stations and open cross streets and at 16 other locations on Burnside Street (see Figure 1.1-1), allowing for a crossing approximately every 800 to 1,200 feet. While the LRT may restrict automobile access along Burnside Street, pedestrian movement between neighborhoods and commercial centers will be maintained at near existing conditions. Some minor out-of-direction pedestrian travel may be required in order to use established walkways across Burnside Street.

All transit stations in east Portland and the larger stations along the Burnside Street alignment will provide bicycle storage facilities. For the most part, the proposed bicycle routes are compatible with the LRT route and stations. At this time, bicycle routes are not being considered for the shoulder areas along the Burnside Street alignment.

Under the Build condition, the position of the downtown study area (in relation to outlying suburban areas) as the center for commercial, office, and cultural activities will be strengthened. Reduced reliance of area residents on the automobile to gain access to Portland's CBD will reduce traffic congestion in the area, thus improving access to local functions such as shopping. Pedestrian movement and safety will be enhanced.

PROXIMITY AND NEIGHBORHOODS

Neighborhoods, as social units, are highly susceptible to changes from transportation improvements. The most readily discernible social impacts involve displacement and separation. Increased traffic on an established transportation route may also divide or disrupt neighborhood boundaries, thereby severing important social linkages and identities and requiring adjustments in boundaries. Neighborhoods are also affected by the proximity of transportation facilities, as well as by pressures for land use conversions induced by accessibility changes. The significance of these impacts is a function of several factors, including neighborhood age and stability.

No-Build

Proximity and neighborhood impacts in both the downtown and east Multnomah County study areas would be minimal under the No-Build condition. This is due in large part to the transitional nature of neighborhoods in both areas. In east Portland, the increase in the volume of traffic on city streets under the No-Build condition (particularly east/west arterials), would be significant due to the position of the study are relative to suburban areas where the majority of population growth is projected. The barrier effect of increasing traffic volumes along arterials that traverse neighborhood boundaries would reduce the cohesion of the neighborhoods. Increased traffic on local streets could require neighborhood associations to readjust boundaries or to adapt to the division of neighborhood population.

Proximity effects on the institutions and residences due to increased traffic on arterial and collector streets would increase with the No-Build. Although the Banfield Freeway is generally separated from sensitive land uses by topography, institutions and residences along other major arterials in east Portland would experience additional noise, localized air pollution, and vibration effects of increased traffic. Some on-street parking for residents and businesses would eventually be removed on these routes to lessen the traffic congestion of the No-Build condition. Conversion of residential properties abutting major arterials to more intensive uses would continue to occur with the No-Build, if not intensify. Impacts of a similar nature, although of lesser scale, would occur in east Multnomah County.

Build

Proximity impacts directly associated with construction and operation of the LRT throughout the Project study area will be minimal under the Build condition. Noise levels, localized air pollution, vibration, and disruption from construction activities, while temporary in nature, will interfere with the residents and institutions bordering the Project alignment. Most sensitive land-use receptors along the Banfield Freeway are already subjected to the proximity impacts of the freeway. Widening the freeway will only add incrementally to proximity impacts. Therefore, proximity impacts will not be as significant in east Portland, compared to downtown and east Multnomah County where regional transitway facilities (LRT) will be introduced into areas where no such facility previously existed.

As noted, the most readily discernible impacts on the cohesive quality within a neighborhood setting involve displacement and separation. Under the Build condition, 65 households will be displaced: 52 in east Portland and 13 in east Multnomah County (see Section 4.4.3.2 of the Technical Report). While the majority of these displacements (52 households) will occur in the east Portland study area, the effect on community cohesion within the affected neighborhoods is expected to be slight. This is due in pact to the relatively low distribution and number of displacements, but more importantly to their border relationship to their respective neighborhoods. Five neighborhood associations in east Portland will be directly affected by the Project due to residential displacements (see Figure 4.5-3). These include Kerns, Sullivan Gulch, Laurelhurst, C.E.N.T.E.R., and Montavilla. In each case, the number of residential displacements in relation to total number of households comprising the neighborhood is less than 1 percent. The same conditions of relatively low distribution and number of displacements occurs in the east Multnomah County study area as well. As in east Portland, construction of the Project is expected to have a minimal effect on community cohesion. No residential displacements will occur in the downtown study area.

Under the Build condition, the development pressures already being exerted on transitional neighborhoods in the City of Portland and east Multnomah County will increase, particularly in the zone of influence around transit stations. Proposed transit stations are located such that they generally correspond to areas where a high level of social and economic interaction is currently taking place. As such, under the Build condition, interaction in and around these activity centers will be reinforced. Reinforcement of the centers, as well as clustering of commercial and high-density residential development, will enhance neighborhood stability throughout the Project area.

The Project will focus development pressures in transitional areas characterized by a mixture of land use activities. Planning for new development and redevelopment, if properly undertaken, will improve localized traffic conditions on arterials in transit station service areas by connecting and consolidating facilities such as parking, pathways, and accessways. Common themes for signing and building design and consolidation of facilities where feasible will help to integrate and identify clusters of uses in the transitway corridor. Social and economic interactions will be focused, thereby stabilizing local neighborhoods. This will be particularly significant in east Multnomah County where development patterns are scattered and have lead to neighborhood deterioration in some cases. The preservation of neighborhoods and improvement of developed/developing activity centers is a design objective of community planning organizations throughout the Project study area (see Section 4.4).

As noted previously, an increase in population in the Banfield corridor is expected to occur under the Build condition. Existing neighborhood character and social life characteristics will be altered by these changes. Under the Build condition, in-migration within the transitway corridor occurs. This will influence the socioeconomic status of communities in the study area, particularly Hazelwood, Rockwood, and Gresham. The Build condition will also contribute to social mobility among people living in the study area.

The competitive growth of the suburban areas has resulted in an increase in through traffic in the neighborhoods of east Portland. In association with land use conversions, this increase in traffic has lead to neighborhood deterioration, and has placed increasing pressure on the stability of established neighborhoods. Under the Build condition, there would be less reliance on the automobile, with through transit trips accommodated within the Banfield Freeway corridor. Along Burnside Street, street closures in association with the barrier effect of the LRT will reduce traffic through adjoining neighborhoods. Any such reduction in local traffic will have the effect of increasing community cohesion.

While the barrier effect of the LRT will disrupt social interaction patterns, particularly in neighborhoods bordering Burnside Street in east Multnomah County, the impact on community cohesion will be minimal. While automobile traffic movements through neighborhoods throughout the Project study area will be reduced or restricted, pedestrian movements will be maintained. The net effect of the LRT on neighborhood associations bordering the Project alignment will be to enhance the livability of those neighborhoods, making them an even more cohesive social unit.

As noted above, traffic congestion along arterials and local streets generally will be reduced as a result of the Build condition. However, localized traffic conditions may be adversely affected, particularly in residential areas adjacent to transit stations and park-and-ride facilities in east Portland and east Multnomah County. Without proper street management schemes, local streets providing access to and from station areas may become congested, particularly during peak (rush) hour periods. Noise, vibration, and air pollution may increase to unacceptable levels. In addition, residential neighborhoods near park-and-ride facilities may experience traffic congestion above normal levels. Overflow from these park-and-ride facilities will compete with parking on residential streets provided for local use. The intrusiveness and pollution of localized traffic congestion in a residential setting can have an adverse effect on neighborhood livability.

4.5.2.1.3 Transportation

NO-BUILD

As has been noted throughout this section, the No-Build condition would result in increased traffic congestion and traffic volumes on major arterials and local city streets. Such conditions would limit mass transit options throughout the East Side area, making it a less viable means of transportation for the disadvantaged. The impact of the No-Build condition would be significant for those individuals who rely upon mass transit service, particularly in east Portland where a high percentage of the region's disadvantaged live.

BUILD

The Build condition creates major new transit facilities and stations which will improve opportunities for mobility for the transportation disadvantaged. This will have the greatest positive effect in downtown and east Portland study areas, since the proportion of transportation disadvantaged is highest is these areas. Transit stations will be designed to ensure access by handicapped persons (see Section 3.4).

4.5.2.2 ECONOMIC IMPACTS

4.5.2.2.1 No-Build

Under the No-Build condition, future economic development in the Project study area would not be deterred. Employment within the region would continue to increase, as projected by MSD. The assumptions embodied in the ITP do not account for the influence of transportation facilities on land development patterns. The distribution of increased employment as projected in the ITP favors locations that are highly accessible to automobile, truck, and rail transport. In essence, the projections have no overall geographic focus, although employment opportunities are substantial in the downtown and east Multnomah County study areas.

In the long run, however, the No-Build condition could limit where economic development would occur in the Project study area. The current trend toward employment which seeks suburban locations would be reinforced, since No-Build would do little to de-emphasize the use of the automobile. A net result would be a reduction in the level of access to and from the downtown.

Transportation costs could be expected to increase within and between the downtown and other parts of the Project study area. Without any new incentive to use transit, automobile usage would continue to be high, thereby increasing congestion (a transportation cost). Overall productivity in the Project study area would suffer.

East Portland development opportunities would remain about the same under the No-Build condition. With increased congestion on both arterials and local streets, many parts of the study area would experience deterioration of economic conditions. The same factors affecting transportation costs which could produce a decline in development in the downtown and a mixed development trend in east Portland, would tend to sever economic ties between east Multnomah County suburbs and the inner city. Because of the increased travel time to reach downtown and other parts of the region, a No-Build condition would tend to make suburban areas more autonomous. Employees would tend to locate where transportation costs would be relatively lower.

The No-Build condition would result in a savings of approximately $161.1 million in Project costs (1978 dollars) (see Section 4.5.2.3.2 below). Local governments would be spared the loss of property tax income (see Section 4.4.3.2.3). Similarly, businesses along the Project alignment would not be dislocated or suffer temporary access problems. Thus, they would not lose revenue nor experience reduced employment under the No-Build condition. In contrast, under No-Build, the region's economy would be denied the multiplier effect on income and employment that would be generated by the proposed Project.

4.5.2.2.2 Build

PROJECT CAPITAL COSTS*

The capital cost estimate for the Banfield Transitway Project is $306.1 million (1980 dollars projected to project completion in 1985). This includes all elements necessary for system start-up in 1984, including the light rail line and stations, 26 LRT vehicles, and improvements to the Banfield Freeway. The Banfield Freeway improvements will cost $98.0 million and the LRT system will cost $208.1 million. These costs are estimated to project completion in 1985 at an annual inflation rate of 12.0%.

Annual operating costs of the LRT system will be $3.5 million in 1978 dollars for a design year of 1990. Annual cost of East side bus operations associated with LRT will be an additional $13.5 million in 1990. Based upon the 1977 fare structure for Tri-Met and expected ridership estimates for the LRT (estimated at 19.2 million passenger trips), annual operating revenue will approach $6.9 million for the design year. Net costs will be financed by a combination of payroll tax and federal grants.

CONSTRUCTION IMPACTS

Income

The construction impact on total area income was estimated by using the concept of the income multiplier. When money from a metropolitan area is injected into the region's economy, a certain percentage goes toward personal disposable income, some toward savings, with the rest

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*Derived from the Staff Recommendations to the Tri-Met Board of Directors on the Banfield Transitway Project (Tri-Met, Planning and Development Department).

either absorbed in taxes or spent outside the area. The incremental effect of these spent monies can be determined by establishing a multiplier for the area, which in turn is multiplied by the initial expenditure.

In general, large metropolitan areas tend to have higher income multipliers than smaller areas. Larger areas usually provide a greater percentage of the goods and services needed to support development in the region. This results in less "leakage" of expenditures to other areas.

The income multiplier for the Portland metropolitan area is estimated to range between 1.2 and 1.5. This is considered conservative due to the size and diversity of the Portland-Vancouver SMSA. Therefore, the estimated construction cost of $140.3 million for the Banfield Transitway Project will accumulate to between $168.4 and $210.5 million in the Portland-Vancouver metropolitan area.

Employment

Estimates of total area employment due to construction are based on the following assumptions:

1. Construction cost is between 20 and 25 percent of total regional contract construction.
2. The current average earnings for all construction trades in the Portland SMSA in 1977 was $17,700 (Census 1979).
3. Construction cost estimates were in 1978 dollars; thus construction workers earned $19,293 annually in 1978 dollars (assumption of a 9 percent annual inflation rate).
4. Project construction will take 5 years.

Based on these assumptions, total direct construction labor needs for the Banfield Transitway Project have been estimated between 1,400 and 1,800 workers during Project construction, or an average of between 280 and 360 workers per year. The total induced employment increase that will take place throughout the Portland metropolitan region due to construction activities is estimated at between 1,000 and 1,500 workers over the 5-year construction period, or an average of 200 to 300 workers per year.

Accessibility

During construction, access to commercial and business properties along the Banfield Transitway Project alignment will be temporarily restricted. In addition, under the proposed Build condition, on-street parking along various segments of the LRT route will be removed permanently. The loss of such parking, as well as access restrictions, can lead to commercial revenue losses. This will be more noticeable in those areas, such as along Holladay Street and in east Multnomah County, where commercial establishments are primarily automobile-oriented (see Section 4.4.2 of the FEIS).

The Banfield Transitway Project will provide increased accessibility immediately after completion. In the long run, increased accessibility will increase growth and intensify development in the areas it will serve, particularly in east Multnomah County. Any such community growth, however, must be considered within the context of the larger regional economy. The growth projected for communities in the study area reflects primarily a relocation of economic activity from adjoining areas. Therefore, the net economic benefits stemming from the proposed Project will be much less than the immediate benefits to individual communities.

OPERATIONAL IMPACTS

Employment

Employment directly related to operational expenditures is estimated to be 98 persons (see Table 4.5-10). Induced employment due to development opportunities captured in part as a result of improved access provided by the Banfield Transitway Project, is estimated at approximately 11,340 persons (Tri-Met 1977).

In general, a shift in employment is expected to occur under the Build condition, resulting in projected increases in employment within the Banfield corridor and a corresponding decrease in areas outside and immediately adjacent to the corridor. The shift is particularly significant for east Multnomah County.

Year-1990 employment projections for the east Multnomah County study area show a dramatic increase over 1970 levels (123 percent). Under the Build condition, scattered growth would be directed to the transitway corridor along I-205 and Burnside Street. The Project will increase employment in the station areas by 4,250 persons between 1975 and 1990, as shown in Table 4.5-11. The majority of this growth is expected around the 122nd Avenue, 181st Avenue, and Gresham Station areas. Employment will generally be in the service and retail trade sectors.

Land Values

A reciprocal relationship exists between transportation projects and land development; each adds to the value or benefit derived from the other. Development, particularly if it occurs at appropriate densities, can be conducive to the economic delivery of transit and other public services. Transportation projects have the potential to redirect land development and to focus growth in a manner that is more economical for transit to serve.

Competition for developable land, particularly in the station areas, can speculatively raise the price of land adjacent to the Banfield Transitway Project corridor (Section 4.4.3.4.3). The impact of the Banfield Transitway Project on land values, however, depends to a large extent on: (1) the physical design of the Project; (2) the way in which the Banfield Freeway and LRT operate as part of the future integrated urban transportation system, (3) the availabiity of developable land; and (4) Project-induced changes in land use.

The reciprocal relationship established between the transportation system and land development opportunities is based on accessibility. The transportation system, by improving access to developed and developing areas, adds to the supply of available developable land. Various studies have confirmed that adding to the land supply may have the effect of diminishing the rate of growth of land values in areas distant from a transportation corridor, while the provision of improved accessibility

TABLE 4.5-11

BANFIELD TRANSITWAY PROJECT CORRIDOR: EAST MULTNOMAH COUNTY
(Station Area Employment Within 1/4 Mile of Station)

Station	Employment Increase	Reallocation Census Tract	Reallocation No. Employed	Total 1990 Employment
Gateway	500	81.00	500	800
102nd Avenue	0			300
122nd Avenue	900	81.00	200	1,450
148th Avenue	0			10
162nd Avenue	50	96.01	50	150
172nd Avenue	200	96.01	200	350
181st Avenue	700	96.01	200	1,075
		96.02	500	
192nd Avenue	700	98.01	700	900
Gresham[a]	1,200	100.00	1,200	1,700
Total	4,250			6,385

Data from: Tri-Met 1977.
(a) Figure assumes employment within 1/2 mile for Gresham only.

can be expected to increase the land values within and adjacent to the corridor (Lerman 1977; Ossenbruggen and Fishman 1977).

In certain areas in east Portland, and particularly around stations in east Multnomah County, changes in land value will occur as a result of the Banfield Transitway Project. In general, the Project is expected to increase the value of specific sites. Sites able to be developed at higher levels of intensity than currently exist will be most susceptible to redevelopment pressures stemming from the increase in land values. Such sites will generally be converted from either low density or very low-value residential or other uses to develop multiple-family residential, industrial, or commercial uses. The potential for redevelopment will depend on location but will be greatest in areas influenced by LRT station development. Specific development opportunities adjacent to station locations have been detailed in Section 3.4.3.2.

Fiscal Impacts

The Banfield Transitway Project is expected to have a mixed effect on land values, and therefore taxes, throughout the study area. Right-of-way acquisitions will reduce property tax revenues only slightly, while induced development will increase property values, adding substantially more to tax revenues than was initially lost. Induced development, however, may require use of locally raised taxes for construction of public facilities to serve people and businesses newly located within the Project corridor, particularly in station impact areas. Tax rates will increase in the affected jurisdictions if resulting development opportunities and tax yields do not compensate for capital improvement expenditures required to meet future needs. Should an increase in tax rates be required, communities in east Multnomah County may find it difficult to raise the necessary amounts of revenue, since their tax base is predominately residential.

Road User Benefits

The Build condition will improve traffic flow, particularly in east Portland, by diverting travelers to transit and improving capacity on the Banfield Freeway. Monetary benefits accruing to the private vehicle user with the Build condition include time savings, vehicle operating savings, and accident savings are estimated at $10.1 million in 1990.

4.5.3 Mitigation of Adverse Socioeconomic Impacts

4.5.3.1 SOCIAL IMPACTS

The Banfield Transitway Project will create several adverse social impacts. These include localized traffic increases around transit station and park-and-ride facilities. Certain major arterials will also experience: (1) traffic increases due to a shift in travel patterns (see the Transportation Technical Report); (2) reduction in the delivery of emergency services; and (3) the displacement of residences and businesses with the attendant impact on community cohesion. Final design of the selected alternative will incorporate positive measures to reduce, to the extent possible, many of these adverse social effects. Analysis and/or adjustment of existing public service boundaries to reflect changes in levels of accessibility will resolve conflicts with fire districts, other service districts, and community institutions.

The safety and movement of pedestrians and transit riders at the transfer points and stations will be investigated thoroughly once final design of the Project commences. Modifications to Project design will be made where possible to ensure and enhance the safety aspects of the LRT facility. In addition, street-management schemes such as preferential residential parking are currently under investigation. The intent would be to reduce the impact of localized traffic increases and the demand for parking around transit stations.

4.5.3.2 ECONOMIC IMPACTS

Adverse economic impacts associated with the Project are generally related to right-of-way acquisition, conversion of land uses around transit stations, and loss of parking. Steps to minimize adverse right-of-way impacts, as well as land use controls available to mitigate transit station impacts, are discussed in the Land Use Technical Report.

While provisions are made under law to compensate private owners for right-of-way acquisition, displacement, and removal of access, there are no federal or state regulations which allow the Oregon State Highway Division to compensate businesses for the removal of on-street parking. On-street parking is part of the street system and under public ownership. Since its removal does not require any acquisition of private land, no compensation for its loss is paid.

Some nonmonetary assistance and loans can be provided to businesses. The City of Portland can build off-street parking and tax the adjacent businesses for the cost of acquiring the land, as well as constructing and maintaining the facility.

In any project where federal funds are involved, such as the Banfield Transitway Project, the Small Business Administration can make direct loans to those businesses that have been adversely affected by parking removal. The Small Business Administration will also provide advisory assistance through a program whereby retired businessmen can assist those businesses to adapt to the changes resulting from on-street parking removal.

4.6 CULTURAL RESOURCES

4.6.1 Introduction

This section identifies those historic and archaeological properties which have national, state, or local significance that are within the Project impact area. Identification and protection of these properties are governed by various federal and state laws and implementing regulations. Foremost among these laws is the National Historic Preservation Act of 1966, 16 USC § 470 et seq. (1976), which established the National Register of Historic Places, and the procedures required for protection of structures which are listed, nominated, or eligible for this designation.

This report on the Banfield Transitway Project is a brief summary of the complete Cultural Resources Report and the Finding of No Adverse Effect. (These documents are available from the Oregon Department of Transportation upon request.)

The summary includes the existing setting, which indicates the significance of the area's historic resources; impacts and mitigation, describing effects of project construction and means for alleviation of these effects; and the record of coordination, documenting coordination with federal, state, and local agencies and groups.

4.6.2 Existing Setting

4.6.2.1 HISTORIC RESOURCES

Historic properties in the Project-affected area include those significant structures located adjacent to the alignment and also those in the immediate vicinity of the proposed terminal station on 11th Avenue. Sources used in identifying these properties were the National Register, Portland Historical Landmarks listings, the Statewide Inventory of Historic Sites and Buildings, and a field survey of the area involved.

A total of 46 properties,* were identified in the Project area (Figure 4.6-1). Of this total, 5 properties are listed in the National Register, 14 are eligible by virtue of their location within historic districts (determinations of eligibility were not submitted on these properties), and 19 have been determined eligible by the Department of the Interior. Of the remaining 8 properties, 7 were thought to be ineligible by SHPO, FHWA and UMTA, and the status to the one remaining building has not been resolved due to insufficient historical data.

4.6.2.2 ARCHAEOLOGICAL RESOURCES

Prior to pioneer settlement, the Portland area was inhabited by various tribes of the Chinookan Indian family. Most evidence of prehistoric existence has long since been eliminated from the heavily urbanized areas, but some undeveloped land exists in east Portland and Gresham sections of the Project.

An archaeological reconnaissance survey of the Project-affected area was performed by the Oregon State Museum of Anthropology on December 6, 1979. No archaeological sites were found during this survey, and no further mitigating action was recommended.

If evidence of previously unidentified archaeological remains are found during construction, the museum will be notified. Construction activities will cease and be resumed only when all required procedures and salvage and/or other recommended mitigation measures have been completed.

4.6.3 Impacts and Mitigation

The proposed alignment for the Banfield Transitway Project will not require removal of any properties which are considered historically significant. The effects of project construction are related to traffic patterns, parking and access, changes in visual and atmospheric quality, and the economic viability of historic properties.

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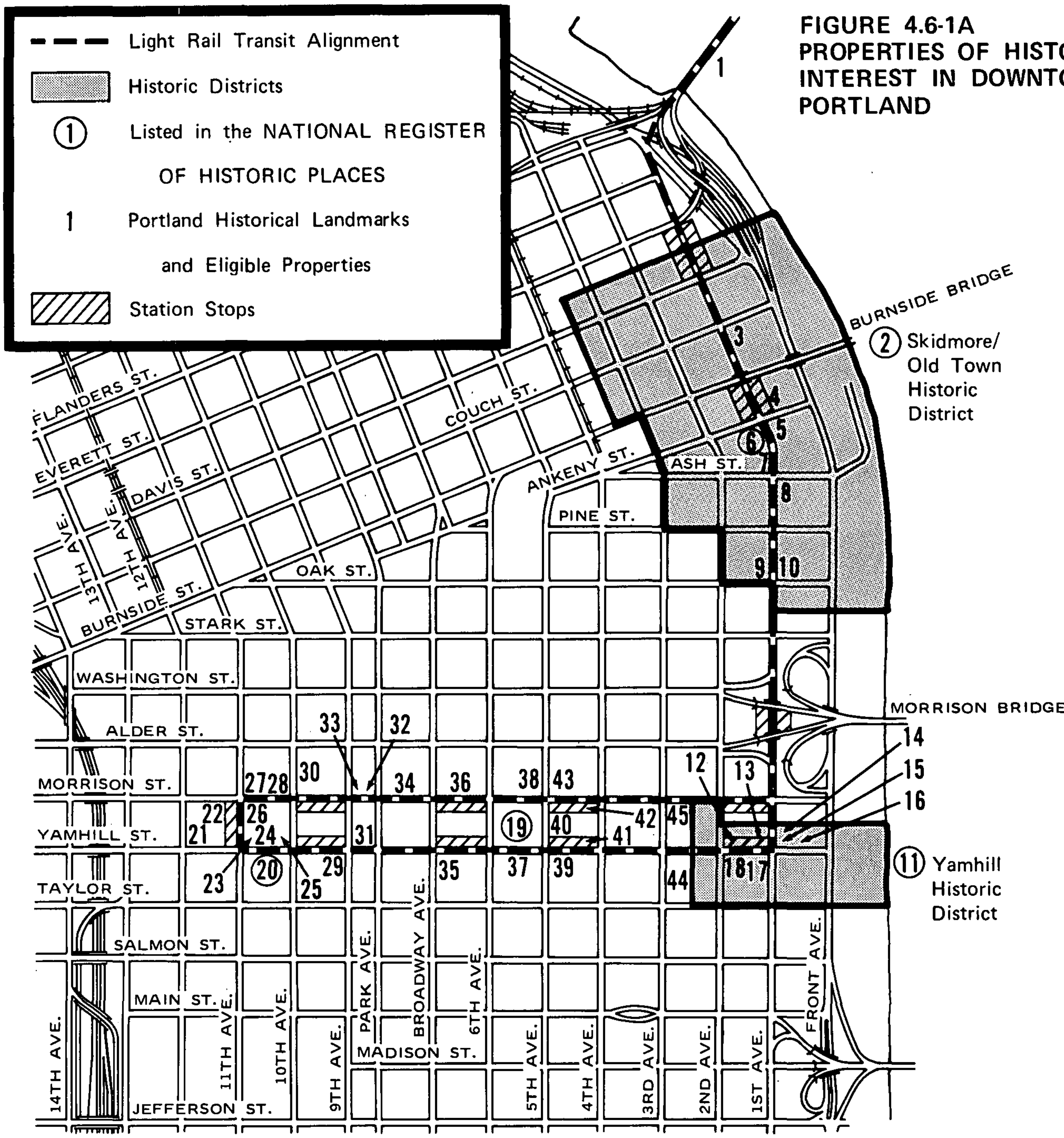
*Figure 4.6-1 lists 2 structures under No. 24, making a total of 46.

FIGURE 4.6-1A
PROPERTIES OF HISTORIC INTEREST IN DOWNTOWN PORTLAND



LIST OF PROPERTIES

1. Steel Bridge.
2. Skidmore/Old Town Historic District.
3. Blagen Block, 78 N.W. Couch.
4. Reed (Packer Scott) Building, 28 S.W. 1st.
5. Skidmore Fountain, S.W. 1st and S.W. Ankeny.
6. New Market Theatre, 50 S.W. 2nd.
7. New Market Block, 83 S.W. 1st.
8. Smith's Block, 10 S.W. Ash and 111, 117 S.W. Front.
9. Failing Building, 235 S.W. 1st.
10. Seuffert Building, 224 S.W. 1st.
11. Yamhill Historic District.
12. Willamette Block, 722-738 S.W. 2nd.
13. Strowbridge Building, 101 S.W. Yamhill.
14. Harker Building, 728 S.W. 1st.
15. Love Building, 730 S.W. 1st.
16. Van Rensselaer Building, 71-73 S.W. Yamhill.
17. Franz Building, 124 S.W. Yamhill.
18. Thomas Mann Building, 140 S.W. Yamhill.
19. Pioneer Courthouse (Pioneer Post Office), 520 S.W. Morrison.
20. Central Library, 801 S.W. 10th.
21. Tilbury-Rothman Building, 1123 S.W. Yamhill.
22. Mayer Building, 1122-1138 S.W. Morrison.
23. Professional Building, 1033 S.W. Yamhill.
24. Commercial Buildings, 1015 and 1023 S.W. Yamhill.
25. Commercial Building, 1009 S.W. Yamhill.
26. Morrison Hotel, 1022-1038 S.W. Morrison.
27. Lincoln Hotel, 1019-1037 S.W. Morrison.
28. D.W. Tilford Building (Fine Arts Bldg.), 1017 S.W. Morrison.
29. Pythian Building, 902-912 S.W. Yamhill.
30. Olds, Wortman, and King Building (The Galleria), 614 S.W. 10th.
31. Mercantile Building, 815 S.W. Yamhill.
32. Park Avenue Hotel, 803 S.W. Morrison.
33. Eaton Hotel, 626 S.W. 9th.
34. Broadway Building, 715 S.W. Morrison.
35. Journal Building (Jackson Tower), 806 S.W. Broadway.
36. Northwestern (1st National) Bank Bldg., 621 S.W. Morrison.
37. Pacific Building, 520 S.W. Yamhill.
38. Meier and Frank Building, 621 S.W. 5th.
39. The Fifth and Yamhill Food Market, 444-476 S.W. Yamhill.
40. Goodnough Building, 730 S.W. 5th Avenue.
41. Commercial Building, 411-415 S.W. Yamhill.
42. Corbett Building, 430 S.W. Morrison.
43. Kress (J.C. Penney) Building, 638 S.W. 5th.
44. Commercial Building, 804 S.W. 3rd Avenue.
45. Commercial Building, 220 S.W. Morrison.

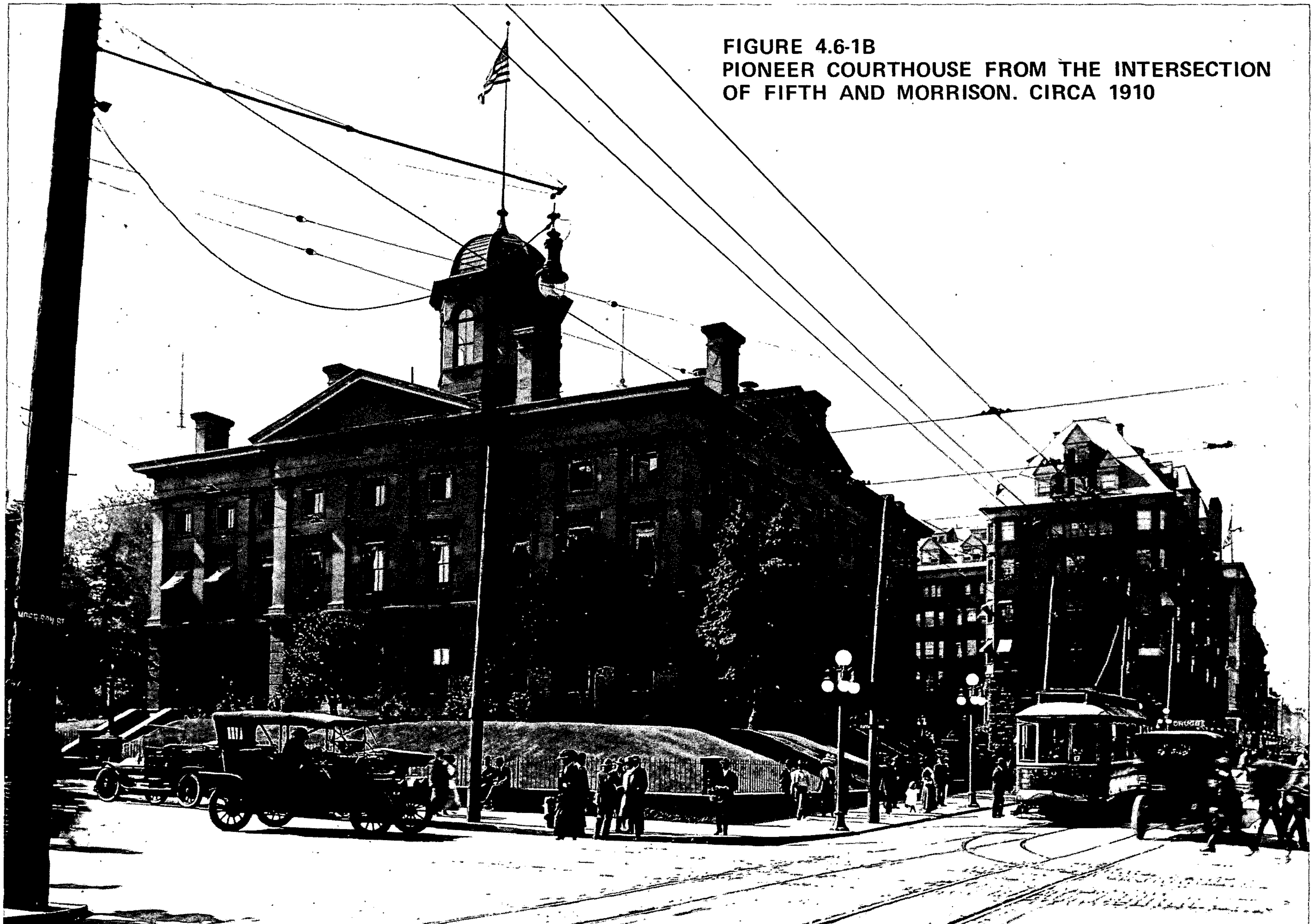


FIGURE 4.6-1B
PIONEER COURTHOUSE FROM THE INTERSECTION OF FIFTH AND MORRISON. CIRCA 1910

OREGON HISTORICAL SOCIETY PHOTO, WESLEY ANDREWS COLLECTION

These effects of project construction were evaluated in relation to the applicable criteria of adverse effect set forth in 36 CFR § 800 (1979), pursuant to the National Historic Preservation Act, resulting in a Finding of No Adverse Effect. (See the letter from the Advisory Council on Historic Preservation following this section.) A brief summary of the Project effects and findings follows.

4.6.3.1 TRAFFIC PATTERNS, PARKING, AND ACCESS

At present, access to the historic districts and other significant historic properties is limited by automobile congestion on adjacent streets and problems associated with peak-hour traffic. Prospects for accommodating increased volumes of people and greater demands for access are substantially improved with an efficient mode of public transit.

Installation of light rail trackage will require removal of one lane of through traffic in most areas of the alignment. Access will be provided for emergency vehicles, loading and unloading conveyances, and local circulation. However, First Avenue will not be a through street but will provide for local circulation.

The availability of on-street parking will be reduced along the track alignment and in the vicinity of station stops. Economic survival of the downtown area is not dependent upon this number of parking spaces, however, but on provision of adequate parking structures and on the reduced demand for automobile parking due to use of public transit.

4.6.3.2 VISUAL, AUDIBLE, AND ATMOSPHERIC CHANGES

Since streetcars were an integral part of the Portland scene preceding the era of private cars, the introduction of light rail transit is not an intrusion in mode of transportation. This change in visual character is more in contrast with the contemporary environment than with that of the historic past.

In order to protect the appearance of historic buildings, electrical supports and wiring for light rail use will not be installed in locations which distract from ornamental facades. Sheltered station stops and street furniture will be designed to complement the feeling and period quality of the surrounding historic buildings. Selection of final design for these station stops and for the terminal station on 11th Avenue will be made with the approval of the State Historic Preservation Office (SHPO) and the Portland Historical Landmarks Commission.

The Steel Bridge will be modified to provide double tracks in the center of the span in approximately the same location used by the original streetcars. Design for the proposed ramp from the main span to 1st Avenue will be subject to approval by the SHPO.

Addition of light rail transit to the downtown environment has considerable benefit in terms of environmental quality. Because the vehicles are electrically powered, they are less polluting than automobile or diesel bus modes.

In general, ambient noise levels should also experience a decrease, since modern design of trackage and wheel construction has solved most noise problems of earlier models. There is the potential for wheel squeal in turning movement in the four corners of the downtown loop. Several mitigation measures will be investigated during the final design of the system and appropriate measures will be adopted when further design details are known. Please see Section 4.9 for further detail. Vibration associated with rail vehicles has been alleviated by technical design and use of resilient materials.

4.6.3.3 ECONOMIC VIABILITY

The introduction of light rail transit portends economic growth and revitalization of the downtown area of the city where the significant historic properties are located. Without the increased availability of efficient transit, projected traffic volumes would result in additional congestion on streets adjacent to historic properties, limiting access, and reducing environmental quality.

The rail transit mode has the capability of moving large numbers of patrons into and out of the area, thereby creating a more stimulating economic climate. This prospect has a direct correlation to historic preservation, since older buildings tend to be replaced by modern structures or parking facilities unless they are in continued productive use. When their useful life expectancy is extended, the value of historic buildings appreciates and their preservation has more realistic justification and reward.

4.6.4 Coordination

The SHPO and the Portland Historical Landmarks Commission were consulted for information and opinions regarding historic properties in the Project area. Meetings were held with the City Development Commission and members of the advisory councils of the historic districts. A field survey of historic resources and an archaeological reconnaissance survey were conducted in the Project-affected area.

After consultation with the State Historic Preservation Officer, requests for Determinations of Eligibility on 20 properties were submitted to the Department of Interior. The Department of Interior found 19 properties eligible for the National Register. These properties appear in figure 4.6-1.

In compliance with the National Historic Preservation Act of 1966 § 106, 16 USC § 470f (1976), Exec. Order No. 11,593, 3 CFR § 36 (1979), and 36 CFR § 800 (1979), the FHWA, UMTA, ODOT, and SHPO agreed on the significance of historic resources and the level of effect on these properties. The Cultural Resources Report and Determination of No Adverse Effect were submitted to the Advisory Council on Historic Preservation on March 6, 1980.

In a letter of March 31, 1980, the Council objected to the determination. After considering additional information submitted by UMTA and Tri-Met on May 1, the Advisory Council stated several conditions which would have to be met for concurrence in the Determination of No Adverse Effect. Tri-Met and UMTA/FHWA have agreed to these conditions which appear in the following letter. On June 20, 1980, the Advisory Council withdrew its objection to the Determination of No Adverse Effect.

Advisory Council On Historic Preservation

1522 K Street, NW
Washington, DC 20005

Reply to:

Lake Plaza South, Suite 616
44 Union Boulevard
Lakewood, CO 80228

May 28, 1980

Mr. John B. Barber
Acting Chief
Planning and Analysis Division
Department of Transportation
Urban Mass Transportation Administration
Washington, D.C. 20590

Dear Mr. Barber:

On May 12, 1980, we received your letter of May 1, 1980, in which you determined that the Banfield Transitway Project, Portland, Oregon, would have no adverse effect on the Portland Skidmore/Old Town Historic District and numerous other cultural properties included in or eligible for the National Register of Historic Places. The Executive Director objects to your determination because the proposed changes in and limitations on the design of the project are not sufficient to ensure no adverse effect will occur.

However, pursuant to Section 800.6(a)(2) of the Council's regulations (36 CFR Part 800), the Executive Director will withdraw this objection if the following conditions are met:

1. Street traffic on Yamhill Street between First and Second avenues will not be closed.

2. First Avenue between Couch and Ash streets will be kept open on a limited basis.

3. The ramp from the Steel Bridge to street level on First Avenue will be designed to blend with the existing historic fabric of the Bridge, and all designs will be reviewed and approved by the Oregon State Historic Preservation Officer (SHPO). If agreement on the design cannot be reached by the Oregon SHPO and the Urban Mass Transportation Administration (UMTA) the disagreement will be submitted to the Council in accordance with the regulations, "Protection of Historic and Cultural Properties" (36 CFR Part 800).

4. The design for all system facilities including, but not necessarily limited to transit cars, "stations," street furniture, connections to buildings of overhead cables, street and sidewalk paving materials and patterns, and related matters in, adjacent to or affecting cultural properties will be reviewed and approved by the Oregon SHPO. If agreement on any design cannot be reached by the Oregon SHPO and UMTA the disagreement will be submitted to the Council in accordance with the regulations.

If you agree to these conditions, please sign on the concurrence line below and return this letter to us. These will then be incorporated into your determination and the Executive Director will withdraw his objection to your determination of no adverse effect.

In accordance with Section 800.9 of the Council's regulations, a copy of your determination of no adverse effect, along with supporting documentation and this concurrence, should be included in any assessment or statement prepared for this undertaking in compliance with the National Environmental Policy Act and should be included in UMTA's records as evidence of compliance with Section 106 of the National Historic Preservation Act and the Council's regulations.

Thank you for your cooperation.

Sincerely,

B. H. Seley

Acting Louis S. Wall
Chief, Western Division
of Project Review

I concur:

Edward R. Fleishman
Urban Mass Transportation Administration

6/11/80
Date

Tri-County Metropolitan Transportation District

June 5, 1980
Date

4.7 AESTHETICS

4.7.1 Existing Conditions

This section provides a description of the existing visual character of the Banfield Transitway Project rights-of-way including the Portland CBD and Steel Bridge connection, the Banfield Freeway, and east Multnomah County. A more comprehensive description of the visual character of the transitway route is presented in the Aesthetics Technical Report.

4.7.1.1 DOWNTOWN AND STEEL BRIDGE CONNECTION

Scenes of downtown Portland vary along the different streets of the alignment. The diffuse nature of 1st Avenue is due to the predominance of parking lots and diversity of building designs. The parking lots, which comprise approximately 50 percent of the land use, are interspersed with retail and industrial uses. Building design and heights are varied, ranging from 1 to 5 stories and 19th to 20th century. Most of the 19th century architecture is included in the adjacent Skidmore/Old Town or Yamhill Historic Districts (see Section 4.6). Views along 1st Avenue are interrupted by the Burnside Street and Morrison Bridge overpasses. Pedestrian and automobile activity is moderate (see Figure 4.7-1a).

Some trees are planted along the sidewalks on either side of 1st Avenue while a significant number of trees are found in Skidmore Fountain and Park at 1st Avenue and Ankeny Street. The park also features a fountain with turn-of-the-century design and a view of the Willamette River and Portland's east shore.

Utility lines along 1st Avenue are generally underground; however, some above-ground wiring used for traffic signals is present at intersections. These signals are suspended from long span wires across the street. Light poles along portions of this section are of a historical design.

a) FIRST AVENUE

b) MORRISON STREET

FIGURE 4.7-1

BANFIELD TRANSITWAY PROJECT FEIS

TYPICAL SCENES
IN DOWNTOWN PORTLAND

The remainder of the downtown segment, Yamhill and Morrison Streets, and 11th Avenue, is characterized by pedestrian and automobile activity typical of a large downtown (see Figure 4.7-1b). Land uses in this segment are primarily commercial, office, and public. Parking lots tend to disrupt the channelizing effect imposed by multistory buildings (up to 14 stories) on either side of the street. The architecture of buildings varies greatly, although light poles are of historical design. All utility wiring is underground. Traffic signals are suspended from supporting spans extending over the streets. Looking west the West Portland hills are visible, to the east, the Willamette River, and in all directions, retail advertising signs.

The U.S. Pioneer Courthouse is one of the most visually dominating features along this segment. The 3-story building is located on a landscaped knoll on the Portland Mall between Yamhill and Morrison Streets and 5th and 6th Avenues.

The LRT right-of-way departs the downtown via the Steel Bridge, a double-decked lift bridge. Conventional automobile traffic uses the upper deck, while the Union Pacific Railroad uses the lower. The bridge features twin towers, each supporting a counterweight to hold the center span when the bridge is open. Views approaching the bridge are obscured by elevated ramps. Views from the bridge include greater Portland, the West Portland hills, and neighboring bridges.

4.7.1.2 EAST PORTLAND

The visual character of Holladay Street combines primarily commercial and public uses with open space (see Figure 4.7-2). Lloyd Center is immediately adjacent to the eastern end of the street. Architecture and building height vary; building heights range from 1 to 7 stories. Pedestrian and automobile activity is intensive.

Utility wiring is above ground along Holladay Street from the Steel Bridge to 6th Avenue. From 6th Avenue to the Banfield Freeway, wiring is generally underground. Wires for traffic signals span some

a) HOLLADAY STREET

b) HOLLADAY PARK

FIGURE 4.7-2

BANFIELD TRANSITWAY PROJECT FEIS

TYPICAL SCENES ALONG
HOLLADAY STREET

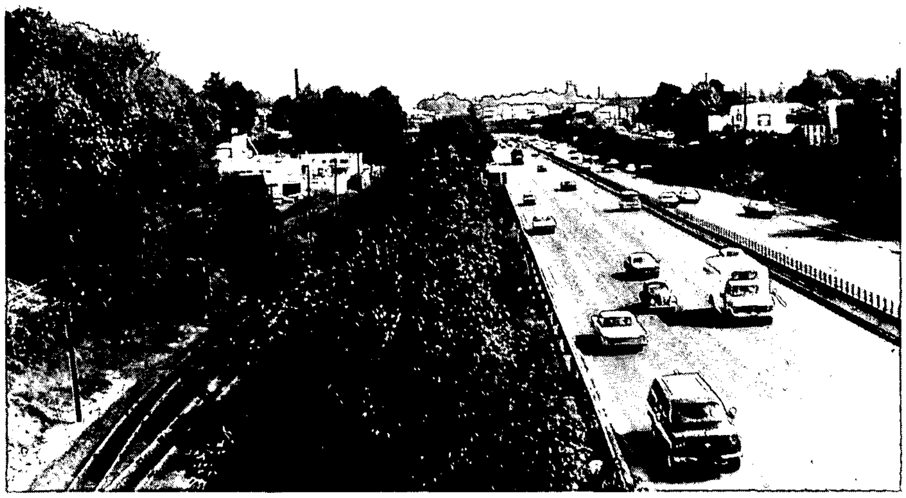
intersections. Billboards and large advertising signs at the western end of the street compete with views of the Steel Bridge, Portland, and the West Portland hills.

The visual highlight of Holladay Street is Holladay Park and a grassy plaza across Holladay Street from the park (see Figure 4.7-2b). The well-groomed sidewalks within and bordering the park are lined with trees. Trees also line the sidewalks of adjacent blocks.

Also found in east Portland is Sullivan Gulch, which contains both the Banfield Freeway and the Union Pacific Railroad tracks. Persons traveling along the Banfield Freeway are exposed to familiar freeway scenes featuring overpasses, retaining walls, directional signs, light poles at exit and entrance ramps, and vehicular activity. Views of the proposed LRT right-of-way from the freeway are obscured in places by trees and shrubs. The LRT right-of-way is at-grade with the freeway from approximately 32nd Avenue to the freeway's intersection with I-205, although minor variances exist.

Views along the freeway are channeled by the sides of Sullivan Gulch (see Figure 4.7-3). Many buildings atop the gulch are screened from view through the use of landscaping or by the sides of the gulch. East of 60th Avenue a long row of cedar trees parallels the north side of the freeway. Another noteworthy feature is the monkey puzzle tree east of the 42nd Avenue overcrossing on the south side. As the freeway emerges from the gulch, clearer views of the residential and industrial uses that predominate along the corridor are presented. Residential, commercial, and public buildings are located adjacent to the freeway in some sections.

Rocky Butte dominates the view as the LRT alignment leaves the Banfield Freeway at Gateway to occupy a reserved transitway within the I-205 right-of-way to Burnside Street. The right-of-way along I-205 is generally at ground level. Views from the proposed LRT alignment include the I-205 Freeway immediately to the west and Gateway Shopping Center and residential areas to the east.



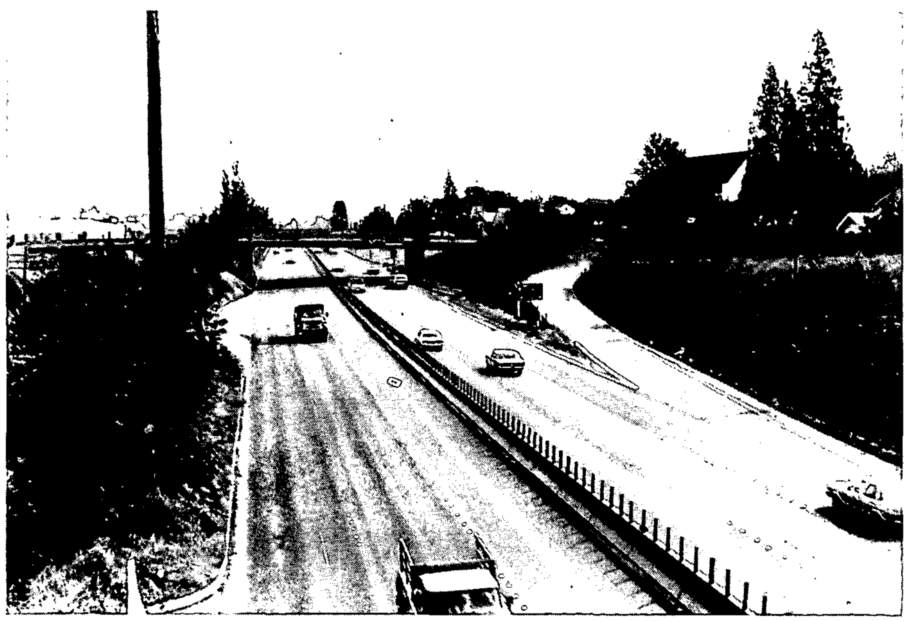


FIGURE 4.7-3

BANFIELD TRANSITWAY PROJECT FEIS

TYPICAL SCENES ALONG
THE BANFIELD FREEWAY

4.7.1.3 EAST MULTNOMAH COUNTY

From I-205 the LRT will occupy the center of Burnside Street, a suburban arterial street crossing a portion of east Multnomah County (see Figure 4.7-4). Burnside Street runs primarily through residential areas, although commercial development occurs at some intersections. In these areas advertising is present. A grassy, undeveloped right-of-way occupies 20 feet on either side of the street and contains light and utility poles. These areas are landscaped in many cases by owners of abutting properties. Large groups of trees dominate views between 148th and 152nd Avenues and east of 172nd Avenue.

East of 197th Avenue, the LRT departs Burnside Street and follows the Portland Traction Company right-of-way to Gresham. At the point of departure from Burnside Street, views from the right-of-way feature wooded vacant lands. Land uses intensify as the right-of-way approaches the center of Gresham; primary uses change from open space to residential and industrial. Pedestrian and automobile activity along the right-of-way increases proportionally, although activity is still moderate. No prominent physical features are located in the area, although low hills can be seen to the south (see Figure 4.7-5).

4.7.2 Impacts

The development of a light rail system and freeway improvements will affect the visual character of areas along the Project rights-of-way. Impacts are not expressed in terms of being negative or positive, but are presented as changes in the visual character of the affected areas.

4.7.2.1 OPERATIONAL IMPACTS

The visual impacts imposed by LRT vehicles, overhead wire network, tracks, and other LRT-related facilities by themselves are minor in many locations due to the presence of other transportation and wiring systems. However, when all LRT components are viewed together, the system represents a visually distinct element within the transportation corridor. The

a) COMMERCIAL INTERSECTION

b) RESIDENCES

FIGURE 4.7-4

BANFIELD TRANSITWAY PROJECT FEIS

TYPICAL SCENES ALONG BURNSIDE STREET

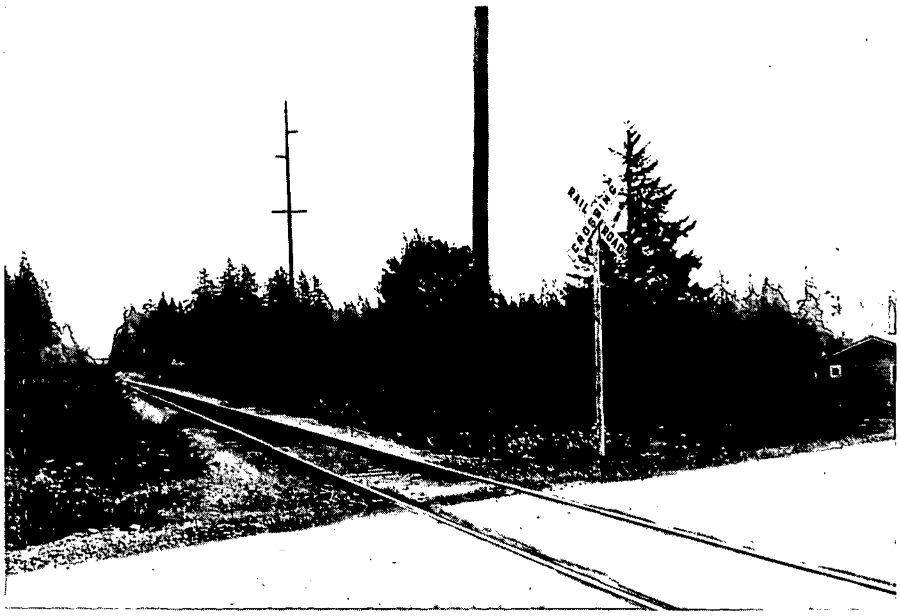


FIGURE 4.7-5

BANFIELD TRANSITWAY PROJECT FEIS

TYPICAL SCENE ALONG
THE PORTLAND TRACTION COMPANY
RAIL LINE

degree of visual impact imposed by LRT facilities will depend on their location and ultimate design.

Final decision on light rail vehicle design is subject to purchase. Preliminary design work was done using a Duwag Type B vehicle (see Figure 3.2-1). In addition to the vehicles, the overhead wire network, including support poles, will affect views along the entire LRT route. Since most existing utility wiring along the downtown segment is underground, the LRT overhead wire network will basically constitute the only above-ground wiring present along 1st and 11th Avenues and Morrison and Yamhill Streets. Side-support poles will be used in the downtown and on Holladay Street. Elsewhere, single central support poles will be used. Wires and support poles will add to the visual complexity of downtown scenes when viewed against the sky. Such visual complexity will be reduced when viewed against a backdrop of buildings or trees. Care will be taken, however, that wires and poles do not obscure architectural features of buildings.

The LRT tracks will be located along existing streets, freeway, and rail corridors throughout the entire LRT route. In the downtown and Holladay Street sections of the alignment the tracks will be placed in the pavement surfaces. Along the freeway portions and Burnside Street, conventional railway ties and ballast will be used. Reclamation of the right-of-way along Burnside Street to accommodate the LRT tracks will eliminate some landscaping and will subsequently reduce the visual buffer between the Burnside Street transportation corridor and abutting properties.

The ramps conveying the LRT tracks from Holladay Street to the Banfield Freeway and from the freeway to the Gateway area east of the I-205 corridor will join numerous other freeway ramps and overpasses already in place at these locations.

The types of transit stations to be constructed along the LRT route are described in Section 3.2.3. The architectural style, landscaping, and lighting features of the stations will be designed to be compatible with existing structures and land uses in the area. Downtown stations will generally be extensions of existing sidewalks. Part of Holladay Street and all of Burnside Street stations will be island platforms which will intrude upon views down the center of the street. Banfield Freeway stations will be multilevel, generally using existing overpasses (see Figure 3.2-8).

Seven park-and-ride facilities will be incorporated into transit stations located between Gateway and Gresham. These facilities will be generally located in residential or semi-residential areas (see Table 3.2-1). Properties with views of these park-and-ride facilities will exchange residential and vacant land views for views of transportation-related facilities and activities. Residential receptors will be most affected by this change in view.

The maintenance and storage facility to be constructed west of the intersection of Burnside Court and the Portland Traction Company rail line will be constructed in a sparsely settled residential and industrial area. The presence of the facility, which will include a car barn with maintenance bays, machine shops, a gantry, and a test track, will be most congruous in an industrial setting.

Freeway improvements planned as part of the Project will entail the construction of retaining walls, access ramps, and noise barriers, the widening of the freeway, and modifications to existing overpasses. As all such structures will be located within or adjacent to the existing freeway, their visual impact will be lessened when viewed together with existing structures. Noise barriers constructed at the top of Sullivan Gulch will obstruct some residential views.

Acquisition and clearing of some property adjacent to the freeway right-of-way, including the monkey puzzle tree and the cedar trees east of 60th Avenue, will be required. These properties will be converted to transportation-related use. Neighboring properties will exchange residential/landscaped views for views of noise barriers or freeway structures.

4.7.2.2 CONSTRUCTION IMPACTS

Construction of the light rail transit system will require the installation of poles and overhead wires, the laying of underground cable, laying track, and resurfacing of streets. These activities will create typical construction scenes consisting of construction machinery, labor crews, and stockpiled material along the entire LRT route.

Demolition of buildings along 11th Avenue between Yamhill and Morrison Streets will create rubble and temporary open space downtown prior to actual construction of the transit station and installation of the track and overhead wire network. Construction of all transit stations along the LRT route, as well as the storage and maintenance facility, will involve human and vehicular activity and create typical construction scenes at these locations. All LRT-associated construction activities will impose temporary localized visual impacts.

The Banfield Freeway improvements will require new construction and the removal of some structures. During the construction period, motorists and nearby residents with freeway views will view typical highway construction scenes such as heavy equipment operation, demolition of structures, scarred open space, developing freeway structures behind protective fencing, and stockpiled materials.

4.7.3 Mitigation

Visual impacts imposed by the LRT overhead wire network and supporting poles will be minimized in downtown Portland through the use of a single contact wire, underground cables, and some existing poles or buildings for support. New poles will reflect the design of other poles in the area. Center poles with bracket arms will be incorporated outside of the downtown. Wires are most conspicuous when seen in silhouette; however, this impact will be mitigated by landscaping where possible. All proposed mitigation measures will be coordinated with the Oregon State Historic Preservation Office.

The architectural design of transit stations will be appropriate to their location, particularly in the historic districts. Landscaping will be incorporated into station design. Park-and-ride lots will be screened using landscape techniques such as planting and berm construction. Lighting for both structures will be limited to the facility itself without spillng over to surrounding land uses.

The visual impacts imposed by freeway improvements will be mitigated by standard freeway landscaping practices such as revegetating, grading, and filling, wherever possible.

4.8 AIR QUALITY

4.8.1 Study Objectives

The primary objective of this study is to assess the anticipated impact that the implementation of the Banfield Transitway Project will have upon the ambient air quality along the Banfield Freeway corridor and the surrounding area. Specifically, the design of this air quality study is to:

1. Determine the baseline air quality levels in the Banfield Transitway Project area and the data used to validate the appropriate diffusion model.

2. Predict the impact of the Project by comparing the predicted carbon monoxide (CO) and lead (Pb) levels to the applicable ambient air quality standards and determine the first and last years of any standards violations.

3. Determine the year of maximum air quality impact, the critical year, for the specified pollutants (CO, NO_x, HC, TSP, Pb).

4. Perform an area wide total emissions and impact analysis for CO, NO_x, O_3, Pb, TSP, specifically addressing the years determined in the critical year analysis.

4.8.2 Existing Conditions

4.8.2.1 METEOROLOGY AND CLIMATOLOGY

Portland, Oregon is located on the lowlands of the Willamette and Columbia Rivers, between the Coast Range on the west and the Cascade Mountains on the east. Portland's climate is dominated by marine air from the Pacific Ocean moderated by the mountains on the coast. The Cascade Mountains generally protect the Willamette Valley from continental air masses, but in the Portland area the Columbia Gorge allows continental air to occasionally invade the area.

Poor dispersion conditions occur most frequently from October through December and result in high pollutant levels. Frontal passages and strong daytime heating are the normal reasons for improvement in dispersion conditions. Passage of frontal systems occurs on the average of once every 2 to 5 days, at which time ventilation and mixing improve. Between storms frequent clear skies induce strong radiational cooling and poor mixing conditions, resulting in poor ventilation.

Winds data for the Project area were obtained at 3 monitoring locations: the Federal Building, Lloyd Center, and Clark School. The orientation of the Willamette Valley and the location of the central business district (CBD) strongly influence the winds at the Federal Building site. The site has a high frequency of neutral stability, with winds generally from the southwest. Lloyd Center and Clark School demonstrate similar conditions, with all 3 sites exhibiting approximately the same frequency of neutral, stable, and unstable conditions.

4.8.2.2 AMBIENT AIR QUALITY

4.8.2.2.1 Ambient Air Quality Standards

The Clean Air Act Amendments of 1970, Pub. L No. 91-604, 42 U.S.C. §7401 et seq., mandated the development and reinforcement of ambient air quality standards for various air pollutants. Each standard is the maximum level which will still protect the public health and welfare. In addition, states have developed their own standards. Federal and Oregon ambient air quality standards are summarized in Table 4.8-1.

4.8.2.2.2 Ambient Pollutant Concentrations

Ambient carbon monoxide levels were measured at 6 locations within the Banfield Transitway Project area. On the basis of the CO data from these monitoring locations, 30 days were selected in the period from September 1977 through March 1978. During these 30 days, no concentrations exceeding the 1-hour CO standard were observed but on many occasions the 8-hour averaged CO value exceeded the air quality standard, especially following the afternoon peak traffic period (see Table 4.8-2).

TABLE 4.8-1

AMBIENT AIR QUALITY STANDARDS

Pollutant	Averaging Time	Federal Standards Primary (Health)	Federal Standards Secondary (Welfare)	Oregon Standards
Carbon Monoxide (CO)	8 hours[(a)]	10 mg/m^3	10 mg/m^3	10 mg/m^3
	1 hour[(a)]	40 mg/m^3	40 mg/m^3	40 mg/m^3
Total Suspended Particulate	Annual Geometric Mean	75 $\mu g/m^3$	60 $\mu g/m^3$	60 $\mu g/m^3$
	24 hours[(a)]	260 $\mu g/m^3$	150 $\mu g/m^3$	150 $\mu g/m^3$
	Monthly(b)	--	--	100 μg/m3
Lead (PB)	Monthly	--	--	3 $\mu g/m^3$
	Calendar Quarter	1.5 $\mu g/m^3$	1.5 $\mu g/m^3$	--
Nitrogen Dioxide (NO_2)	Annual Arithmetric Average	100 $\mu g/m^3$	100 $\mu g/m^3$	100 $\mu g/m^3$
Hydrocarbons (Nonmethane) (HC)	3 hours[(a)] (6-9 a.m.)	160 $\mu g/m^3$	160 $\mu g/m^3$	160 $\mu g/m^3$
Ozone (O_3)	1 hour[(c)]	235 $\mu g/m^3$	235 $\mu g/m^3$	160 $\mu g/m^3$

(a) Not to be exceeded more than once per year.
(b) 24-hour average not to be exceeded more than 15 percent of the time.
(c) A statistical standard, but basically not to be exceeded more than an average of once per year based on the most recent 3 years of data.
$\mu g/m^3$ = micrograms per cubic meter.
mg/m^3 = milligrams per cubic meter.

TABLE 4.8-2

AMBIENT CARBON MONOXIDE

Site	Period	Number of Days Standard Was Exceeded Federal and Oregon 8-Hour	1-Hour
CAMS			
718 Burnside Street	1977	44	0
(DEQ)	1978	36	0
	30 Days	20	0
4th Avenue and Alder Street	1977	14	0
	1978	9	0
(DEQ)	30 Days	3	0
Hollywood Arcade	1977	33	0
(DEQ)	1978	29	0
	30 Days	23	0
1420 Halsey Street	1977	23	0
(DEQ)	1978	17	0
	30 Days	14	0
Lloyd Center	1977	--	--
(ODOT)	1978	0	0
	30 Days	0	0
Clark School	1977	--	--
(ODOT)	1978	0	0
	30 Days	0	0

Data from the 4 DEQ monitoring sites correlated well with the afternoon peak traffic period of 4:00 to 6:00 p.m. The 2 ODOT sites were consistently lower in overall CO concentration levels and never exceeded the average 8-hour maximum standard. High values of CO concentrations at all stations occurred most frequently with nearly stable or neutral conditions. This condition, combined with light winds or, at some stations, light easterly winds, gave the highest concentrations observed during the 30 selected days. The monitoring locations nearest the most heavily traveled areas showed the highest values, while those located away from the main streets consistently gave much lower values.

The primary annual geometric mean for total suspended particulates (TSP) was not exceeded while the 24-hour primary TSP standard was exceeded twice in 1977 and 1978. The secondary standards were exceeded infrequently and occurred when mixing conditions were very poor (see Table 4.8-3). Lead standards were not exceeded at any of the 6 monitoring sites in 1977 or 1978 (see Table 4.8-4).

The nitrogen oxide (NO_x) standards were not exceeded at any of the monitoring stations in 1977 and 1978 (see Table 4.8-5). The nonmethane hydrocarbon (HC) 3-hour average standard is suspected to have been violated at 2 locations. Federal ozone (O_3) standards were violated rarely in 1977 and 1978, but the more stringent Oregon ozone standard was violated more frequently (see Table 4.8-6).

TABLE 4.8-3

TOTAL SUSPENDED PARTICULATES

Site	Period	Number of Days the 24-Hour Standard Was Exceeded: Federal Primary	Federal Secondary	Oregon	Exceeded Annual Geometric Mean: Federal Primary 75 mg/m^3	Federal Secondary 60 mg/m^3	Oregon 60 mg/m^3
CAMS							
718 Burnside Street	1977	0	0	0	no	yes	yes
(DEQ)	1978	0	2	2	no	yes	yes
Central Fire Station	1977	1	2	2	no	yes	yes
55 Ash Street	1978[a]	0	3	3	no	yes	yes
(DEQ)							
845 Couch Street	1977	0	1	1	no	no	no
(DEQ)	1978	0	0	0	no	no	no
Multnomah County	1977	0	0	0	no	no	no
Health Building	1978	0	1	1	no	no	no
(DEQ)							
Lloyd Center	1977	--	--	--	--	--	--
(ODOT)	1978	0	3	3	no	yes	yes
Clark School	1977	--	--	--	--	--	--
(ODOT)	1978[b]	1	4	4	no	yes	yes

(a) January through October.
(b) January through November.

TABLE 4.8-4

AMBIENT LEAD

Site	Period	Number of Calendar Quarters the Standard was Exceeded: Federal	Oregon
CAMS 718 Burnside Street (DEQ)	1977[(a)]	0	--
	1978	0	--
Central Fire Station 55 Ash Street (DEQ)	1977	0	--
	1978[(a)]	0	--
845 Couch Street (DEQ)	1977	0	--
	1978	0	--
Multnomah County Health Building (DEQ)	1977	0	--
	1978	0	--
Lloyd Center (ODOT)	1977	--	--
	1978	0	--
Clark School (ODOT)	1977	--	--
	1978	0	--

(a) Partial data.

TABLE 4.8-5

AMBIENT NITROGEN DIOXIDE

Site	Period	Exceeded Annual Arithmetic Average 100 mg/m^3 Federal and Oregon
CAMS		
718 Burnside Street	1977	no
(DEQ)	1978	no
Lloyd Center	1977	--
(ODOT)	1978	no
Clark School	1977	--
(ODOT)	1978	no

TABLE 4.8-6

NUMBER OF DAYS THE AMBIENT OZONE STANDARD WAS EXCEEDED

Site	Period	Federal	Oregon
CAMS			
718 Burnside Street	1977	0	2
(DEQ)	1978	0	4
Lloyd Center	1977	--	--
(ODOT)	1978	3	10
Clark School	1977	--	--
(ODOT)	1978	6	14

4.8.3 Impacts

4.8.3.1 OPERATIONAL IMPACTS

4.8.3.1.1 Emissions

SOURCES

Vehicular traffic consisting of automobiles, light-duty trucks using gasoline as a fuel, heavy-duty trucks using both gasoline and diesel fuel, and motorcycles were considered the only source of pollutants in the area. Diesel automobiles were not included since their number, and thus their effect, is relatively small. The principal pollutants emanating from the exhaust of the above-named sources are CO, HC, NO_x.

EXHAUST EMISSION STANDARDS

The U.S. Environmental Protection Agency (EPA), through amendments to the Clean Air Act, Pub. L. No. 91-604, 42 U.S.C. §7401 et seq., in 1970 required automobile manufacturers to reduce CO, HC, and NO_x emissions for the 1975 model year. The deadline for compliance with these standards has been twice extended. Exhaust emission standards under existing laws are summarized in Table 4.8-7.

TABLE 4.8-7

FEDERAL EXHAUST EMISSION STANDARDS

Model Year	Emission Standard (grams per mile)		
	HC	CO	NO_x
1975-1976	1.5	15.0	3.1
1977-1979	1.5	15.0	2.0
1980	0.41	7.0	2.0
1981 and thereafter	0.41	3.4[a]	1.0[b]

(a) Possible 2-year waiver to 7.0 grams per mile.
(b) Innovative technology or diesel waiver to 1.5 grams per mile.

RATE OF EMISSIONS

The emission rates for HC, CO, and NO_x were computed by using both EPA's Mobile Source Emission Factors (for Low Altitude Areas Only) (U.S. EPA, Office of Transportation and Land Use Policy 1978) and the estimated reduction due to Oregon's biennial inspection/maintenance program. Particulates emission rates were derived using Compilation of Air Pollutant Emission Factors (U. S. EPA, Office of Air Quality Planning and Standards, Monitoring and Data Analysis Division 1977).

The modeling period rate of emission and total emissions used the same 30 days previously discussed. The modeling was done over that portion of the Portland metropolitan area that will be affected by the Project. A complete description of the methodology and results can be found in the Air Quality Technical Report.

Table 4.8-8 shows total vehicle emissions for the Project will result in a significant overall reduction in CO and HC emissions and a slight decrease in NO_x emissions. TSP with and without lead will also be reduced by the Project. Total suspended particulates is the only pollutant that increases in total emissions between 1985 and 1990, but in all cases the Project will result in a reduction in total emissions compared with the No-Build condition.

TABLE 4.8-8

TOTAL VEHICLE EMISSIONS FOR 1985 AND 1900
IN KILOGRAMS

	1985			1990		
	No-Build	Project	Percent Difference	No-Build	Project	Percent Difference
Carbon Monoxide	57,272	53,787	-6.08	41,895	38,416	-8.30
Hydrocarbons	5,283	4,969	-5.94	3,900	3,564	-8.62
Nitrogen Oxides	7,205	7,166	-0.54	6,142	6,100	-0.68
Particulates	4,994	4,846	-2.96	5,406	5,207	-3.68
Lead	48.51	47.15	-2.80	49.51	48.04	-2.97

Slight increases in emissions are forecast at several locations within the Project area, especially in the vicinity of the Banfield Freeway.

4.8.3.1.2 Impact Assessment for Carbon Monoxide

The impact of the Project upon future air quality was addressed through the combination of 2 dispersion modeling studies. The methodology validated the models against observed CO levels for the 30 selected days from September 1977 through March 1978. The validated models were then used to predict relative impacts of the Project versus the No-Build condition in 1985 and 1990.

The highest CO concentrations attributable to the Banfield Transitway Project should occur in 1985, the critical year. The expected decrease in vehicle emissions following 1985 will decrease CO concentrations at all chosen receptor locations (see Table 4.8-9). For 12 of the 16 chosen receptors 8-hour CO averages exceeding the standard of 10 mg/m^3 are predicted both with the Project and the No-Build condition. In 1990 CO concentrations will have decreased to the point where 6 receptors are predicted to exceed the 8-hour CO standard. In both 1985 and 1990, 7 receptor locations will exhibit a decrease in concentrations due to the Project. The increases with the Project at the other 9 receptors are a result of the selection of receptors located near road segments which are expected to experience increases in traffic volumes and, in some cases, decreases in vehicle speed. Decreases in vehicle speed result in increases in CO emission rates. Only four (4) of the receptors require mitigation measures (see Section 4.8.4).

4.8.3.1.3 Impact Assessment for Nitrogen Oxides

Table 4.8-10 gives a qualitative comparison of estimated NO_2 concentrations in the Project area. Since the NO_2 standard is an annual average of 100 ug/m^3 (see Table 4.8-1), there are 4 locations which were estimated to exceed the standard in both 1985 and 1990. In almost all cases the predicted concentrations with the Project will exceed those for No-Build. For most receptors higher NO_2 concentrations will occur in 1985, the critical year.

TABLE 4.8-9

HIGHEST CONCENTRATIONS FOR 8-HOUR AVERAGES OF CARBON MONOXIDE[(a)]

		1985			1990		
		Concentration	Ending[(b)]		Concentration	Ending[(b)]	
Receptor	Condition	(mg/m^3)	Date	Time	(mg/m^3)	Date	Time
Halsey Street	NB[(b)]	10.0	9/29/77	2400	8.1	9/29/77	2400
	B[(c)]	9.9	9/29/77	2400	8.0	9/29/77	2400
Lloyd Center	NB	11.0	1/27/78	1800	8.8	9/29/77	2400
	B	11.1	1/27/78	1800	8.9	1/27/78	1800
Royal Inn Hotel	NB	22.3	1/27/78	2000	16.1	1/27/78	2000
	B	23.3	1/27/78	2000	16.8	1/27/78	2000
Holladay Park	NB	13.9	1/27/78	1800	10.5	1/27/78	1800
	B	14.0	1/27/78	1800	10.6	1/27/78	1800
23rd Avenue and	NB	17.3	12/30/77	1300	13.0	12/30/77	1300
Holladay Street	B	17.7	12/30/77	1300	13.7	12/30/77	1300
Hollywood Arcade	NB	11.0	1/27/78	2000	9.0	1/27/78	2000
	B	10.4	1/27/78	2000	8.0	1/27/78	2000
35th Avenue and	NB	11.7	12/30/77	1400	8.9	12/30/77	1400
Sandy Boulevard	B	11.6	12/30/77	1400	8.7	12/30/77	1400
Providence Hospital	NB	15.2	1/26/78	2300	11.9	1/26/78	2300
	B	15.8	1/26/78	2300	12.0	1/26/78	2300
Vestal School	NB	10.4	11/30/77	2300	7.8	11/30/77	2300
	B	10.3	11/30/77	2300	7.7	11/30/77	2300
Bell Drive	NB	7.2	11/30/77	2300	5.9	11/30/77	2300
	B	7.4	11/30/77	2300	5.9	11/30/77	2300
128th Avenue and	NB	7.7	3/16/78	2400	6.8	3/16/78	2400
Halsey Street	B	7.7	3/16/78	2400	6.9	3/16/78	2400
122nd Avenue and	NB	10.4	1/26/78	2300	8.2	1/26/78	2300
Banfield	B	10.4	1/26/78	2300	8.3	1/26/78	2300
181st Avenue and	NB	11.0	11/30/77	2300	10.1	11/30/77	2300
Halsey Street	B	11.6	11/30/77	2300	11.2	11/30/77	2300
181st Avenue and	NB	20.2	1/27/78	2000	19.4	1/27/78	2000
Glisan Street	B	20.0	1/27/78	2000	19.2	1/27/78	2000
162nd Avenue and	NB	7.9	1/27/78	2000	6.4	3/15/78	2400
Burnside Street	B	7.7	1/27/78	2000	6.3	3/15/78	2400
Division Street	NB	9.1	3/16/78	2200	7.4	3/16/78	2200
(west of Norman)	B	9.1	3/16/78	2200	7.5	3/16/78	2200

(a) Highest permissible 8-hour concentration is 10 mg/m^3 under Oregon Ambient Air Quality Standards.
(b) End of the 8-hour meteorological data period during which the highest 8-hour CO averages occurred when 1985 or 1990 traffic data and emission factors were used.
NB = No-Build condition.
B = Build (Project) condition.

TABLE 4.8-10

ANNUAL AVERAGE NO_2 CONCENTRATIONS
BASED ON HIGHEST CONCENTRATIONS FOR 24-HOUR CO AVERAGES[a,b]

Receptor	Condition	1985 Concentration (mg/m^3)	1985 Ending Date[c]	1985 Ending Time[c]	1990 Concentration (mg/m^3)	1990 Ending Date[c]	1990 Ending Time[c]
Halsey Street	NB	67	1/27/78	1800	65	1/27/78	1800
	B	70	1/27/78	1800	69	1/27/78	1800
Lloyd Center	NB	69	1/27/78	1800	67	1/27/78	2400
	B	73	1/27/78	1800	74	1/27/78	2400
Royal Inn Hotel	NB	150	1/27/78	1800	129	1/27/78	1800
	B	162	1/27/78	1800	143	1/27/78	1800
Holladay Park	NB	83	1/27/78	1800	78	1/27/78	2400
	B	88	1/27/78	1800	85	1/27/78	2400
23rd Avenue and	NB	131	12/30/77	2400	119	12/30/77	2400
Holladay Street	B	142	12/30/77	2400	134	12/30/77	2400
Hollywood Arcade	NB	88	1/27/78	1800	85	1/27/78	1800
	B	90	1/27/78	1800	85	1/27/78	1800
35th Avenue and	NB	92	12/30/77	2200	85	12/30/77	2200
Sandy Boulevard	B	96	12/30/77	2200	90	12/30/77	2200
Providence Hospital	NB	130	1/27/78	1000	120	1/27/78	1000
	B	147	1/27/78	1000	136	1/27/78	1000
Vestal School	NB	73	1/27/78	2100	69	1/27/78	2400
	B	79	1/27/78	2100	74	1/27/78	2400
Bell Drive	NB	58	1/27/78	1800	60	1/27/78	1800
	B	62	1/27/78	1800	63	1/27/78	1800
128th Avenue and	NB	63	3/16/78	2200	66	3/16/78	2200
Halsey Street	B	67	3/16/78	2200	73	3/16/78	2200
122nd Avenue and	NB	80	1/27/78	1100	78	1/27/78	1100
Banfield	B	86	1/27/78	1100	85	1/27/78	1100
181st Avenue and	NB	76	3/16/78	1900	82	3/16/78	1900
Halsey Street	B	84	3/16/78	1900	94	3/16/78	1900
181st Avenue and	NB	122	1/27/78	1700	134	1/27/78	1700
Glisan Street	B	129	1/27/78	1700	144	1/27/78	1700
162nd Avenue and	NB	60	3/16/78	700	59	3/16/78	700
Burnside Street	B	62	3/16/78	700	63	3/16/78	700
Division Street	NB	72	3/16/78	2200	71	3/16/78	2200
(west of Norman)	B	77	3/16/78	2200	78	3/16/78	2200

(a) Highest permissible annual NO_2 concentration is 100 $\mu g/m^3$ under Oregon ambient air quality standards.
(b) See Section 3.1.3.1.1 for method of deriving annual NO_2 averages from 24-hour CO averages.
(c) End of the 24-hour meteorological data period during which the highest 24-hour CO averages occurred when 1985 or 1990 traffic data and emission factors were used.
NB = No-Build condition.
B = Build (Project) condition.

Few receptors in east Multnomah County will have 1990 concentrations that exceed 1985 concentrations, in which case 1990 will be the critical year.

Overall the Project will reduce NO_x emissions in the Project area by 0.54 percent in 1985 and 0.68 percent in 1990 as compared to the No-Build case. However, in a few specific areas, NO_x emissions and therefore concentrations will increase. Maximum emissions will occur for NO_x in 1985, the critical year.

4.8.3.1.4 Impact Assessment for Hydrocarbons

Table 4.8-11 gives a qualitative comparison of the 6 to 9 a.m. maximum estimated hydrocarbon concentrations in the Project area. In 1985 and 1990 at approximately half of the receptors the HC concentrations are lower with the Project than with No-Build. In all cases the HC concentrations were estimated to exceed the standard of 160 ug/m^3 (see Table 4.8-1). The ratio of HC emissions to CO emissions is approximately 1 to 10 (see Table 4.8-8). Therefore, HC concentrations should be about one-tenth of CO concentrations. Thus a morning CO concentration of 2 mg/m^3 would be accompanied by a violation of the HC standard. For all receptors the 1985 HC concentrations are greater than the 1990 HC concentrations; therefore, 1985 is the critical year.

The Project will cause an overall reduction in hydrocarbon emissions by 5.9 percent in 1985 and 8.6 percent in 1990 as compared to the No-Build case. Again, as with NO_x, a few locations will exhibit increases; however, these locations will be mitigated as a result of the CO mitigatio measures. These are partially due to an increased volume of traffic near these locations. The overall emissions decrease steadily after 1985, making 1985 the critical year.

4.8.3.1.5 Impact Assessment for Ozone

A reduction in HC concentrations will reduce ozone more than a reduction of NO_x (Caplan 1966). The greater HC reduction with the Project, when compared with NO_x, should reduce the overall O_3 impact.

TABLE 4.8-11

MAXIMUM 6 to 9 AM AVERAGES FOR HYDROCARBONS[a,b]

Receptor	Condition	1985 Concentration ($\mu g/m^3$)	1985 Date	1990 Concentration ($\mu g/m^3$)	1990 Date
Halsey Street	NB	945	12/5/77	775	12/5/77
	B	939	12/5/77	766	12/5/77
Lloyd Center	NB	918	12/5/77	752	12/5/77
	B	911	12/5/77	742	12/5/77
Royal Inn Hotel	NB	1,435	1/4/78	1,090	12/5/77
	B	1,384	1/4/78	1,062	12/5/77
Holladay Park	NB	1,084	1/26/78	825	1/26/78
	B	1,110	1/26/78	840	1/26/78
23rd Avenue and	NB	2,237	12/30/77	1,692	12/30/77
Holladay Street	B	2,314	12/30/77	1,799	12/30/77
Hollywood Arcade	NB	1,196	12/30/77	939	12/30/77
	B	1,171	12/30/77	871	12/30/77
35th Avenue and	NB	1,284	12/30/77	975	12/30/77
Sandy Boulevard	B	1,249	12/30/77	937	12/30/77
Providence Hospital	NB	2,021	1/4/78	1,646	1/4/78
	B	1,969	1/4/78	1,494	1/4/78
Vestal School	NB	1,512	1/4/78	1,080	1/4/78
	B	1,569	1/4/78	1,104	1/4/78
Bell Drive	NB	875	1/4/78	698	1/4/78
	B	895	1/4/78	692	1/4/78
128th Avenue and	NB	605	12/30/77	533	12/30/77
Halsey Street	B	613	12/30/77	547	12/30/77
122nd Avenue and	NB	853	3/15/78	706	1/4/78
Banfield	B	856	3/15/78	707	1/4/78
181st Avenue and	NB	960	1/4/78	846	1/4/78
Halsey Street	B	1,011	1/4/78	918	1/4/78
181st Avenue and	NB	969	3/15/78	848	3/15/78
Glisan Street	B	969	3/15/78	841	3/15/78
162nd Avenue and	NB	480	1/26/78	403	1/26/78
Burnside Street	B	467	1/26/78	392	1/26/78
Division Street	NB	833	12/30/77	655	12/30/77
(west of Norman)	B	837	12/30/77	683	12/30/77

(a) Highest permissible concentration from 6 to 9 a.m. is 160 $\mu g/m^3$ under Oregon ambient air quality standards.

(b) Based on the highest 6 to 9 a.m. average CO concentration for the 30 selected days on the date given using 1985 or 1990 traffic data and emission factors. See Section 3.1.4.1.1 of the Air Quality Technical Report for the method of deriving HC averages from CO averages.

NB = No-Build condition.

B = Build (Project) condition.

This study did not attempt to evaluate the amount of O_3 produced from HC and NO_x due to vehicular traffic in the Project area. However, it can be assumed that the year of maximum HC emissions, 1985, will also be the critical year for PO_x.

4.8.3.1.6 Impact Assessment for Total Suspended Particulates

The estimated concentrations to total suspended particulates are qualitatively compared in Table 4.8-12. For all but one receptor the Project concentrations are estimated to exceed the No-Build concentrations for both 1985 and 1990. All receptors are estimated to exceed the 150 ug/m^3 standard for 24 hours (see Table 4.8-1). For all receptors 1990 will have higher concentrations than 1985, thus making 1990 the critical year.

Total suspended particulate emissions will decrease with the Project, 3.0 percent in 1985 and 3.7 percent in 1990 as compared to No-Build. There will be some increases in TSP levels due to the Project in the area along the Banfield Freeway. Unlike other pollutants, TSP emissions increase between 1985 and 1990; 1990 is the critical year.

4.8.3.1.7 Impact Assessment for Lead

The monthly predicted local lead (Pb) concentrations for the 16 receptors are given in Table 4.8-13. The Oregon State Ambient Air Quality Standard for lead is 3 $\mu g/m^3$ for a one month period (see Table 4.8-1). In 1985 seven of the 16 receptors exceed this standard for both the Project and No-Build. In 1990 the number of receptors exceeding the standard increases to 12 with No-Build and 14 with the Project. For all but one receptor the Project exceeds No-Build. For all receptors the 1990 concentrations are larger than the 1985 concentrations, making 1990 the critical year.

Overall lead emissions for the Project are less than those for No-Build, 2.8 percent less in 1985 and 3 percent less in 1990. The total emissions with the Project for 1990 are less than those for No-Build in 1985. However, both the Project and No-Build have greater emissions in 1990 than in 1985, making 1990 the critical year.

TABLE 4.8-12

HIGHEST CONCENTRATIONS FOR 24-HOUR AVERAGES OF TOTAL SUSPENDED PARTICULATES BASED ON HIGHEST 1-DAY CO AVERAGES[(a)]

Receptor	Condition	1985 Concentration ($\mu g/m^3$)	1985 Date[(b)]	1990 Concentration ($\mu g/m^3$)	1990 Date[(b)]
Halsey Street	NB	489	1/27/78	601	1/27/78
	B	500	1/27/78	625	1/27/78
Lloyd Center	NB	508	1/27/78	633	1/27/78
	B	527	1/27/78	672	1/27/78
Royal Inn Hotel	NB	1,027	1/27/78	1,134	1/27/78
	B	1,080	1/27/78	1,214	1/27/78
Holladay Park	NB	614	1/27/78	731	1/27/78
	B	638	1/27/78	770	1/27/78
23rd Avenue and	NB	971	12/30/77	1,116	12/30/77
Holladay Street	B	1,027	12/30/77	1,222	12/30/77
Hollywood Arcade	NB	606	1/27/78	751	1/27/78
	B	603	1/27/78	727	1/27/78
35th Avenue and	NB	681	12/30/77	795	12/30/77
Sandy Boulevard	B	693	12/30/77	817	12/30/77
Providence Hospital	NB	825	12/30/77	982	12/30/77
	B	896	1/26/78	1,058	1/26/78
Vestal School	NB	538	1/27/78	638	1/27/78
	B	562	1/27/78	670	1/27/78
Bell Drive	NB	415	1/27/78	547	1/27/78
	B	433	1/27/78	564	1/27/78
128th Avenue and	NB	455	3/16/78	607	3/16/78
Halsey Street	B	473	3/16/78	647	3/16/78
122nd Avenue and	NB	544	1/26/78	675	3/16/78
Banfield	B	563	1/26/78	713	3/16/78
181st Avenue and	NB	531	1/27/78	718	1/27/78
Halsey Street	B	565	1/27/78	797	11/30/77
181st Avenue and	NB	819	3/15/78	1,130	1/27/78
Glisan Street	B	829	3/15/78	1,175	1/27/78
162nd Avenue and	NB	429	3/15/78	541	3/15/78
Burnside Street	B	432	3/15/78	559	3/15/78
Division Street	NB	526	12/30/77	647	3/16/78
(west of Norman)	B	545	12/30/77	697	12/30/77

(a) Highest permissible 24-hour TSP concentration is 150 $\mu g/m^3$ under Oregon ambient air quality standards.

(b) 1-day meteorological data period during which the highest CO averages occurred when 1985 or 1990 traffic data and emission factors were used. See Section 3.1.6.1.1 of the Air Quality Technical Report for the method of deriving TSP averages from CO averages.

NB = No-Build condition.

B = Build (Project) condition.

TABLE 4.8-13

HIGHEST CONCENTRATIONS FOR 1-MONTH AVERAGES OF LEAD BASED ON HIGHEST 1-DAY CO AVERAGES[(a)]

Receptor	Condition	1985 Concentration ($\mu g/m^3$)	1985 Date[(b)]	1990 Concentration ($\mu g/m^3$)	1990 Date[(b)]
Halsey Street	NB	2.50	1/27/78	2.91	1/27/78
	B	2.57	1/27/78	3.04	1/27/78
Lloyd Center	NB	2.60	1/27/78	3.06	1/27/78
	B	2.71	1/27/78	3.27	1/27/78
Royal Inn Hotel	NB	5.26	1/27/78	5.48	1/27/78
	B	5.55	1/27/78	5.91	1/27/78
Holladay Park	NB	3.15	1/27/78	3.53	1/27/78
	B	3.28	1/27/78	3.75	1/27/78
23rd Avenue and	NB	4.98	12/30/77	5.39	12/30/77
Holladay Street	B	5.27	12/30/77	5.95	12/30/77
Hollywood Arcade	NB	3.10	1/27/78	3.63	1/27/78
	B	3.10	1/27/78	3.54	1/27/78
35th Avenue and	NB	3.49	12/30/77	3.84	12/30/77
Sandy Boulevard	B	3.56	12/30/77	3.98	12/30/77
Providence Hospital	NB	4.23	12/30/77	4.74	12/30/77
	B	4.60	1/26/78	5.15	1/26/78
Vestal School	NB	2.76	1/27/78	3.08	1/27/78
	B	2.89	1/27/78	3.26	1/27/78
Bell Drive	NB	2.12	1/27/78	2.64	1/27/78
	B	2.22	1/27/78	2.75	1/27/78
128th Avenue and	NB	2.33	3/16/78	2.93	3/16/78
Halsey Street	B	2.43	3/16/78	3.15	3/16/78
122nd Avenue and	NB	2.79	1/26/78	3.26	3/16/78
Banfield	B	2.89	1/26/78	3.47	3/16/78
181st Avenue and	NB	2.72	1/27/78	3.47	1/27/78
Halsey Street	B	2.90	1/27/78	3.88	11/30/77
181st Avenue and	NB	4.20	3/15/78	5.46	1/27/78
Glisan Street	B	4.26	3/15/78	5.72	1/27/78
162nd Avenue and	NB	2.20	3/15/78	2.61	3/15/78
Burnside Street	B	2.22	3/15/78	2.72	3/15/78
Division Street	NB	2.70	12/30/77	3.13	3/16/78
(west of Norman)	B	2.80	12/30/77	3.39	12/30/77

(a) Highest permissible 30-day lead concentration is 3 $\mu g/m^3$ under Oregon ambient air quality standards.

(b) 1-day meteorological data period during which the highest CO averages occurred when 1985 or 1990 traffic data and emission factors were used. See Section 3.1.7.1.1 of the Air Quality Technical Report for the method of deriving lead averages from CO averages.

NB = No-Build condition.

B = Build (Project) condition.

4.8.3.2 CONSTRUCTION IMPACTS

Construction activities will have 3 short-term effects on air quality: (1) a slight increase in particulate matter and nitrogen oxide emissions due to the presence of heavy diesel construction machinery, (2) an increase in particular matter concentrations due to dust stirred up by equipment entering and leaving the Project area, and (3) a slight increase in local emissions at the Project site due to decreased speeds caused by the construction activity. During construction all of the Banfield freeway overpasses in the construction area will be removed for replacement. Temporary bridges will be placed adjacent to all but 3 which now have very light traffic volumes. The detour to the temporary bridges will cause a slight decrease in average speeds. This decrease will result in an increase in CO, HC, and lead emissions and a decrease in NO_x emissions.

4.8.4 Mitigating Measures

Mitigating measures which will minimize the increases in pollutant levels during the construction phase include reduction of speed by heavy equipment to check excessive dust clouds, wetting down truck loads, and staggering tasks, such as grading, paving, and demolition, which lead to high particulate concentrations. Oregon State regulations will be followed. Watering dirt roads twice daily could reduce the dust emissions by up to 50 percent (Jutze, Axtell, and Parker 1973). Special care will be taken during construction hours to minimize the disruption to normal traffic flows and to avoid additional congestion. Increased transit utilization by commuters will be encouraged.

Construction along the Banfield Freeway is planned to maintain peak-hour traffic capacity. This will minimize speed reduction and the accompanying increase in CO, HC, and lead emissions. The construction work will be done in 4 stages. By phasing construction the total impact of the construction work will be minimal.

For the postconstruction period, reductions in traffic flow by incorporation of the LRT system, alleviation of congested areas through the use of means such as signal synchronization, replacement of older, pre-emission controlled automobiles, and more stringent automobile emission standards will aid in controlling the overall emissions and lessen their impact on the ambient air quality.

Mitigation measures may be necessary for those 4 receptors that will have CO concentrations at least 0.5 mg/m^3 higher with the Project than without (see Table 4.8-9). To reduce CO concentrations at the Royal Inn Hotel the traffic signal system on Union Avenue will be modified and synchronized. Mitigation of CO concentrations at 23rd Avenue and Holladay Street include ramp metering and better placement of signs on the Banfield Freeway. Modification and synchronization of the signals and the addition of right-turn lanes along 181st Avenue in the vicinity of Glisan Street would reduce the CO concentrations at the 181st Avenue and Glisan Street receptor. The air quality mitigation measures for Providence Hospital do not include any modifications to the Banfield Transitway Project plans. The Project will improve traffic flow and reduce overall emissions near Providence Hospital. However, the higher CO concentrations are the result of the freeway being moved closer to the hospital complex, especially the Providence Child Care Center. Possible mitigation measures would include relocating the existing preschool playground away from the freeway, sealing the first-floor windows and providing a central air conditioning system, and relocating or enclosing the sun deck on the second floor of the center. The actual form of mitigation will be based on air monitoring results and negotiated with Providence Hospital during the right-of-way acquisition phase of the Project. For more details see Section 4.2 of the Air Quality Technical Report.

4.8.5 Determination of Consistency with State Implementation Plan

Federal Regulation (FHPM 7-7-9, as revised 11-19-79) requires that a proposed project be consistent with the State Implementation Plan (SIP). The SIP is the document which describes how the State of Oregon intends to attain the national ambient air quality standards for total suspended particulates, carbon monoxide and ozone in presently designated non-attainment areas. Since the project is located in the Portland-Vancouver Interstate Air Quality Maintenance Area (a non-attainment area for these pollutants) the project must conform to these regulations. The following discussion documents the consistency of the project with the Oregon SIP.

4.8.5.1 CRITERIA

The Oregon SIP as it applies to new highway projects presently consists of ambient air quality standards (see Table 2-1), transporation control strategies and the Rules for Indirect Sources. Each of these are criteria which apply to the project. The air quality standards have been previously discussed. The other two are discussed below.

4.8.5.1.1 Transportation Control Strategies

The Oregon SIP contains several transportation control strategies including a downtown parking lid, park-and-ride lots, and a regional east side mass transit facility. These strategies were developed to restrict the use of automobiles in downtown Portland and thus, contribute to the attainment of carbon monoxide and ozone standards in the downtown and in the region, respectively. The eastside transitway project is listed as one of the required transportation control projects in the Oregon SIP.

4.8.5.1.2 Rules for Indirect Sources

The Oregon Department of Environmental Quality Rules for Indirect Sources (OAR 340-20-100 through 135) are also part of the Oregon SIP. These rules require a DEQ construction permit for any highway project (indirect source) which will have 20,000 ADT or more in the project design year. The proposed project falls under this rule. To obtain a permit, the project must not:

a. Cause or contribute to a violation of the Oregon SIP.

b. Cause or contribute to a violation or a delay in attainment of any State ambient air quality standard.

c. Cause or contribute to a violation of any State ambient air quality standard caused by any other indirect source or system of indirect sources.

As can be seen, the Rules for Indirect Sources also ensure that the State ambient air quality standards are attained and maintained.

4.8.5.2 EVALUATION OF CONSISTENCY WITH OREGON SIP

4.8.5.2.1 Transportation Control Strategies

The proposed project has been planned in conformance with the requirements of the Oregon SIP Transportation Control Strategies from the project inception. The project design has been developed in coordination with the City of Portland, Multnomah County, Tri-Met and DEQ. The project contributes to the removal of traffic from downtown streets and supports the downtown parking lid by encouraging the use of mass transit. The project fulfills the Oregon SIP requirement for a regional eastside transit corridor. The project also includes several park and ride lots and suburban transit stations which is also in conformance with the Oregon SIP. Therefore, the FHWA has determined that the project is consistent with the Transportation Control Strategy requirements of the Oregon SIP.

4.8.5.2.2 Rules for Indirect Sources

The Oregon Department of Transportation has applied for and received an Indirect Source Construction Permit (see Section 6.3). Issuance of this permit is assurance that in the judgement of the Oregon DEQ, the proposed project meets the criteria set forth in the Rules for Indirect Sources and will contribute to the attainment and maintenance of the State and Federal ambient air quality standards. Therefore, the FHWA has determined that the project is consistent with the Oregon DEQ Rules for Indirect Sources and all applicable State and Federal ambient air quality standards.

4.9 ACOUSTICS

4.9.1 Existing Sound Environment

Measurements of background ambient sound levels were conducted by Dames & Moore on September 6 through 13, 1979, at 23 locations within the study area (Figure 4.9-1). These locations were selected to represent existing sound environments at noise-sensitive land uses near the Banfield Freeway and the proposed LRT route. A summary of the sound survey results is shown in Table 4.9-1.

Downtown Portland urban noise is generally characterized by high, widely fluctuating sound levels with typical daytime equivalent sound levels (L_{eq}) varying at the 6 sites from 63 dB to 71 dB. Major noise sources within the CBD include buses, cars, pedestrians, vehicle unloading, and parking lot activities. The equivalent sound level and other acoustical nomenclature are described within the Acoustics Technical Report.

Daytime equivalent sound levels along the Banfield Freeway ranged at the 11 sites from 55 dB to 71 dB with variations resulting from fluctuations in vehicle volumes, speeds and car/truck mix throughout the day as well as variations in setback from the freeway at various sites and varying topographic conditions. Computed sound attenuation due to the barrier effect of natural topography varied from a maximum of 10 dB noise reduction for depressed sections to 0 dB noise reduction for at grade segments near Senate Street and 67th Avenue.

Measurements at 6 locations within east Multnomah County indicate daytime equivalent sound levels ranging from 52 dB to 71 dB with highest levels occurring at sites nearest the roadway and near major intersections. Computed sound levels closely correspond with measured sound levels throughout the study area.

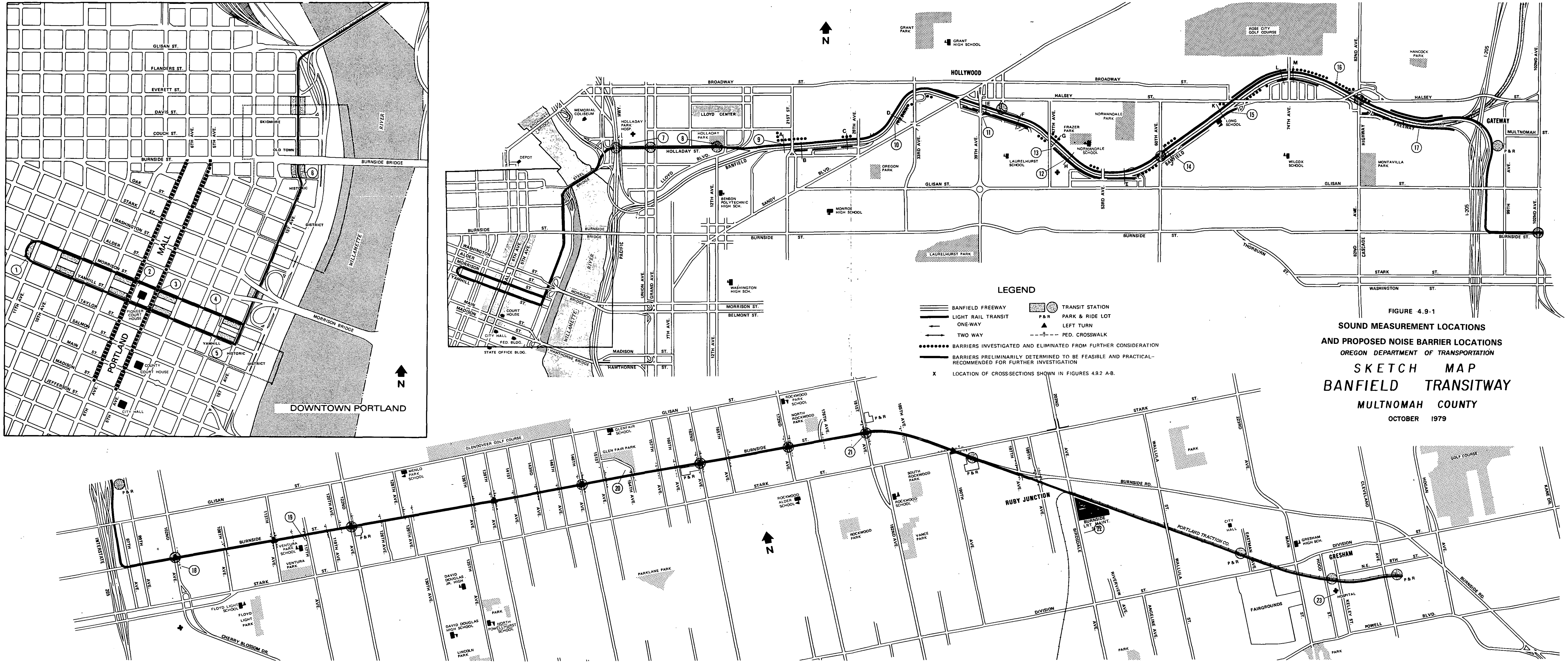


FIGURE 4.9-1

SOUND MEASUREMENT LOCATIONS

AND PROPOSED NOISE BARRIER LOCATIONS

OREGON DEPARTMENT OF TRANSPORTATION

SKETCH MAP

BANFIELD TRANSITWAY

MULTNOMAH COUNTY

OCTOBER 1979

TABLE 4.9-1

SUMMARY OF EXISTING (1979) BACKGROUND AMBIENT SOUND LEVELS

Site	Measurement Location	Distance to Center of Near Lane (feet)	Time	Date	Cars[(a)]	Trucks[(a)]	Sound Level - dB L_{10}	Sound Level - dB L_{eq}	Sources
1	Corner of Yamhill Street and 11th Avenue at Public Library	10 each	8:30 am - 9:00 am	9/10/79	57- 51-	6-Yamhill 4-11th	69	68	buses; cars; pedestrians
			2:50 pm - 3:10 pm	9/10/79	40- 74-	3-Yamhill 1-11th	67	65	traffic; pedestrians; car doors slamming
2	Corner of Morrison Street and 6th Avenue	10 - Morrison 15 - 6th	10:10 am - 10:40 am	9/10/79	10- 56-	18-6th 8-Morrison	71	69	buses; cars; pedestrians; car doors slamming
			5:15 pm - 5:45 pm	9/12/79	7- 81-	27-6th 10-Morrison	73	71	buses; cars; heavy pedestrian traffic; horns
3	Corner of Morrison Street and 5th Avenue at Courthouse	25 each	9:40 am - 10:00 am	9/10/79	44- 13-	3-Morrison 16-5th	72	70	traffic; pedestrians
			4:45 pm - 5:15 pm	9/12/79	51- 8-	3-Morrison 20-5th	73	71	traffic; heavy pedestrian traffic
4	Morrison Street near 2nd Avenue	80 - 2nd 10 - Morrison	11:50 am - 12:10 pm	9/10/79	101- 37-	4-2nd 4-Morrison	65	64	traffic; parking lot activities; pedestrians
			5:45 pm - 6:15 pm	9/10/79	60- 33-	6-2nd 1-Morrison	65	63	traffic on Morrison, 2nd, Burnside Bridge, and 1st; parking lot activities; pedestrians
5	Corner of Yamhill Street and 1st Avenue	15 - Yamhill 30 - 1st	12:25 pm - 12:45 pm	9/10/79	39- 40-	1-1st 1-Yamhill	65	63	traffic; pedestrians; car doors slamming; distant siren; aircraft flyover; van unloading handicapped
			10:35 am - 11:05 am	9/13/79	30- 39-	2-1st 0-Yamhill	65	64	traffic; small portable cement mixer across 1st (8 min)
6	1st Avenue near Burnside Bridge	60 - Burnside 10 - 1st	2:35 pm - 2:55 pm	9/10/79	18- NV-	3-1st NV-Burnside	68	66	traffic; pedestrians; UPS unloading; train whistle
			9:35 am - 9:55 am	9/13/79	15- NV-	2-1st NV-Burnside	69	67	traffic; fire truck with siren on bridge; birds; train whistle

(a) 10-minute vehicle counts compiled by Dames & Moore during their field measurement program. For a comparison of measured versus predicted sound levels, vehicle counts have been multiplied by 6 to determine an equivalent hour sound level.

TABLE 4.9-1

Site	Measurement Location	Distance to Center of Near Lane (feet)	Time	Date	Cars[(a)]	Trucks[(a)]	Sound Level - dB L_{10}	Sound Level - dB L_{eq}	Sources
7	Vacant lot between 1st and 2nd Avenues near Holladay Park Hospital	50 - Holladay 30 - 2nd 150 - I-5	5:30 pm - 6:00 pm	9/7/79	118- 21- 21- 3- 360- 380-	8-Holladay 2-1st 0-Hassalo 0-2nd 20-I-5 (N) 37-I-5 (S)	67	66	traffic
			11:20 am - 11:40 am	9/13/79	105- 23- 34- 1- 423- 413-	4-Holladay 4-1st 2-Hassalo 1-2nd 74-I-5 (N) 56-I-5 (S)	69	68	traffic; construction activities; electric saws, hammers; caterpillars; trucks
8	Holladay Park at 11th Avenue and Holladay Street	30 - 11th 50 - Holladay	4:50 pm - 5:10 pm	9/7/79	121- 75-	2-Holladay 1-11th	64	63	traffic; aircraft flyover; pedestrians; cyclists
			12:05 pm - 12:35 pm	9/13/79	161- 161-	2-Holladay 1-11th	65	64	traffic; Oktoberfest activities across street; polka music; pedestrians
9	Residential area at south-east end of parking lot east of Lloyd Center between 19th and 20th Avenues	350 - Banfield 170 - Multnomah	12:30 pm - 12:50 pm	9/6/79	440- 430-	23-Banfield (E) 22-Banfield (W)	69	69	traffic on Banfield, 21st, and Multnomah; train passby; weather station activities nearby
			5:10 pm - 5:40 pm	9/11/79	656- 589-	20-Banfield (E) 20-Banfield (W)	66	66	traffic; train passby
10	Residential area near 3135 Wasco Street	15 - Wasco 50 - Banfield	11:30 am - 11:50 am	9/6/79	440- 390-	24-Banfield (E) 24-Banfield (W)	63	63	traffic on Banfield; occasional car passby on Wasco; birds; airplane
			4:25 pm - 4:55 pm	9/11/79	600- 780-	13-Banfield (E) 13-Banfield (W)	63	63	traffic on Banfield; occasional car passby on Wasco; birds
11	Church parking lot at 39th Avenue and Senate Street	16 - Senate 150 - Banfield 230 - 39th	9:30 am - 9:50 am	9/6/79	280- 350-	31-Banfield (E) 20-Banfield (W)	69	68	traffic; pedestrian; bird
			3:30 pm - 3:50 pm	9/11/79	640- 504-	29-Banfield (E) 19-Banfield (W)	70	69	traffic; children playing; truck horn
12	Providence Hospital	60 - Banfield	9:06 am - 9:26 am	9/6/79	NV-	NV-Banfield	63	62	traffic; construction in building; drill, hammer, generator; parking lot activity
			5:20 pm - 5:50 pm	9/13/79	NV-	NV-Banfield	62	62	traffic; parking lot activities; children playing in playground

TABLE 4.9-1

Site	Measurement Location	Distance to Center of Near Lane (feet)	Time	Date	Cars[(a)]	Trucks[(a)]	Sound Level - dB L_{10}	Sound Level - dB L_{eq}	Sources
13	Parking lot of Medical-Dental Building on 47th Avenue next to Providence Hospital	25 - Banfield	8:05 am - 8:25 am	9/6/79	310- 550-	31-Banfield (E) 24-Banfield (W)	70	69	traffic; parking lot activity
			2:35 pm - 2:55 pm	9/11/79	468- 467-	25-Banfield (E) 26-Banfield (W)	71	70	traffic; parking lot activity
14	Residential area at 6204 Willow Street	15 - Willow 25 - Banfield	4:15 pm - 4:35 pm	9/6/79	570- 270-	21-Banfield (E) 10-Banfield (W)	71	70	traffic; cyclists; train passby; van backfire on Willow; jogger
			1:45 pm - 2:15 pm	9/11/79	410- 338-	20-Banfield (E) 33-Banfield (W)	73	71	traffic; neighbors talking; car start-up nearby
15	Juvenile Court Building and 67th Avenue	75 - Banfield 200 - 67th 110 - visitor pkg.	5:00 pm - 5:20 pm	9/6/79	550- 310-	13-Banfield (E) 19-Banfield (W)	68	68	traffic; parking lot activity; train passby; birds; dog
			1:00 pm - 1:30 pm	9/11/79	383- 363-	23-Banfield (E) 26-Banfield (W)	70	68	traffic; birds; wind in trees
16	Residential area at end on 79th Avenue, near Schuyler Street	170 - Banfield 110 - Schuyler	5:55 pm - 6:25 pm	9/11/79	NV-	NV-Banfield	59	59	Banfield traffic; birds; car start-up and back-up on gravel driveway nearby; nearby residence activities; small aircraft flyover
			12:15 pm - 12:45 pm	9/11/79	NV-	NV-Banfield	57	55	Banfield traffic; birds; children at school playground; school bell; infrequent traffic on local streets; distant hammering
17	Residential area at corner of Hassalo Street and 90th Avenue	80 - Hassalo 60 - Multnomah 150 - Banfield	3:30 pm - 3:50 pm	9/10/79	19- 24-	0-Hassalo 5-Multnomah	65	64	traffic; cyclists; birds; joggers
			11:05 am - 11:25 am	9/11/79	15- 27-	0-Hassalo 2-Multnomah	64	63	Banfield traffic; infrequent traffic on Hassalo and Multnomah; distant train whistle
18	Russelville School on 102nd Avenue near Burnside Street	12 - 102nd 230 - Burnside	4:10 pm - 4:30 pm	9/10/79	424-	3-102nd	73	71	traffic; parking lot activities
			10:30 am - 11:00 am	9/11/79	276-	12-102nd	73	71	traffic; cars parking nearby

TABLE 4.9-1

Site	Measurement Location	Distance to Center of Near Lane (feet)	Time	Date	Cars[a]	Trucks[a]	Sound Level - dB L_{10}	Sound Level - dB L_{eq}	Sources
19	Ventura Park School at corner of 117th Avenue and Burnside Street	25 each	8:00 am - 8:20 am	9/7/79	133- 18-	5-Burnside 1-117th	69	68	traffic; car in gravel driveway nearby; buses; pedestrians
			9:55 am - 10:15 am	9/11/79	83- 21-	5-Burnside 2-117th	69	66	traffic; children in school playground
20	Glenfair Evangelical Church	50 - Burnside	5:45 pm - 6:05 pm	9/10/79	133-	0-Burnside	62	60	traffic; airplane fly-over; car horn
			9:15 am - 9:35 am	9/11/79	63-	5-Burnside	60	59	traffic; dog barking; airplane flyover; car in nearby driveway
21	Briarwood Apartments near 181st Avenue and Burnside Street	25 - Burnside	8:40 am - 9:00 am	9/7/79	66-	4-Burnside	71	69	traffic; airplane fly-over; bus; motorcycle; pedestrians
			10:25 am - 10:45 am	9/12/79	75-	3-Burnside	69	67	traffic; airplane fly-over; dog barking; car in nearby driveway; mailman
22	New residential area south of Tri-Met car barn near 202nd Avenue	100 - 202nd 400 - Tri-Met shops	1:10 pm - 1:30 pm	9/7/79	50-	5-202nd	52	52	traffic on 202nd; birds; aircraft flyovers; distant equipment from gravel quarry; train passby
			7:45 am - 8:05 am	9/12/79	70-	1-202nd	57	57	traffic on 202nd; backhoe operating at 300 feet; airplane flyover; distant hammering
23	Gresham Hospital at corner of Hood Street and 5th Avenue	30 each	12:30 pm - 12:50 pm	9/7/79	16- 45-	1-5th 0-Hood	57	57	infrequent cars; distant airplane flyover; parking lot activities; pedestrians entering the hospital
			8:25 am - 8:55 am	9/12/79	12- 24-	1-5th 3-Hood	64	63	traffic; caterpillar in lot to west (across Hood); security alarm next door (30 seconds)

4.9.2 Projected Sound Environment

Sound levels were computed for major arterials within the east Portland and east Multnomah County study areas based on ODOT traffic data and the FHWA highway traffic noise prediction model (Barry and Reagan 1978). These sound level projections represent estimates of traffic-generated sound conditions under typical roadway and site conditions adjusting for the effects of sound attenuation provided by intervening structures and site absorption. Estimated future (1990) equivalent sound levels were determined for peak-traffic hour and peak-truck hour conditions with construction of the Project and the No-Build condition.

Peak-truck hour sound levels generally range from 1.5-3 dB higher than peak-traffic hour sound levels for the Project along the Banfield Freeway. Worst-case sound conditions are assumed to occur during the peak-traffic hour for all other major arterials. Table 4.9-2 presents computed existing (1979) and future (1990) traffic sound level projections at the 23 measurement sites for the peak-hour conditions.

Many elements affect LRT noise including vehicle speed, track-type, wheel-type, trackbed, propulsion system, air-conditioning system and vehicle-type. The engineering details of the LRT system have not been established at this time; therefore, an impact assessment calls for numerous assumptions to estimate the range of LRT operational sound levels. Preliminary design calls for the specification of continuously welded rail, periodic grinding of track and wheels, resiliently mounted tracks, and resilient wheels to help reduce the problem of "wheel squeal" on curves. Tests conducted of the Edmonton Canada LRT system, which is anticipated to be comparable to the Portland LRT system, show a maximum sound level of 75 dB at a distance of 50 feet from the center of the track. Based on the above tests and measurements of the Hague system along straight and curve segments with track embedded in concrete, typical passby sound levels of the Portland LRT system are estimated as follows:

TABLE 4.9-2

OPERATIONAL AMBIENT SOUND LEVELS AT SOUND MEASUREMENTS SITES

Col. 1A	Col. 1B	Col. 2	Col. 3	Col. 4				Col. 5	Col. 6	Col. 7
Measurement[a] Site	Area[b] Category	Measured Ambient[c] (1979) Daytime Equivalent Sound Level - dB L_{eq}	Computed 1979[d,e] Peak-Hour Equivalent Sound Level - dB L_{eq}	Projected 1990[e] Traffic Peak Hour Sound Level - dB: Traffic[f] L_{eq}	LRT[g] SEL	LRT Distance (ft)	Combined L_{eq}	Maximum Single Event LRT Passby Sound Level L_{max} [g]	Change from Existing to Build in dB (Col. 4 - Col. 3)	Projected 1990[e] Peak-Hour Sound Level w/No-Build - dB L_{eq}
1	IV	65-68	69	67	95	10	72	87	3	70
2	IV	69-71	72	73	87	10	73	79	1	73
3	IV	70-71	72	73	81	25	73	73	1	73
4	IV	63-64	68	70	87	10	71	79	3	69
5	IV	63-64	68	69	89	15	70	81	2	69
6	IV	66-67	70	71	87	10	72	79	2	71
7	III	66-68	71	71	70	205	71	62	0	71
8	III	63-64	65	66	81	50	67	73	0	66
9	III	66-69	69	69	72	290	69	64	0	69
10	V	63	68	70	72	180	70	64	2	70
11	V	68-69	72	74	74	230	74	66	2	72
12	V	62	65	69	79	130	69	71	4	66
13	V	69-70	73	NA	NA	85	NA	NA	NA	74
14	V	70-71	77	NA	NA	90	NA	NA	NA	78
15	V	68	76	77	82	165	77	74	1	76
16	V	55-59	62	63	71	175	63	63	1	63
17	III	63-64	67	70	73	240	70	65	3	68
18	II	71	69	75	73	230	75	65	6	74
19	II	66-68	61	64	91	25	70	83	9	59
20	II	59-60	61	63	85	50	66	77	5	61
21	II	67-69	68	68	91	25	72	83	4	65
22	II	52-57	56	57	69	950	57	61	1	57
23	II	57-63	56	57	67	530	57	59	1	57

Notes:

(a) Measurements at Site 19 include noise levels from school playground activities and cars traveling on a gravel driveway. Predicted traffic noise levels do not include these sources; therefore, predicted noise level increases (as shown in Col. 6, 8, and 9) are higher than they will actually be, when these existing sources are considered. The actual increase will be approximately 2 dBA (Col. 4 - Col. 2).

(b) See Table 1-2 for a description of area categories

(c) Data from: Field measurements conducted by Dames & Moore, September 6 through 13, 1979

(d) Data from: ODOT (1979) (see Appendix D, Tables D-1 through D-4 of Acoustics Technical Report).

(e) Sound levels for measurement Sites 9 through 17 represent peak-truck hour sound levels. Sound levels for measurement Sites 1 through 8 and 18 through 23 represent peak-traffic hour sound levels.

(f) Data from: ODOT (1979) (see Appendix D, Tables D-1 through D-4 of Acoustics Technical Report). Computed sound attenuation due to topography as follows Site 10 - 9 dB; Site 12 - 12 dB; Site 13 - 8 dB; Site 16 - 10 dB; Site 17 - 5 dB. See Table 2-1 for distances of measurement site to major arterials.

(g) Computed sound attenuation due to topography as follows: Site 9 - 5 dB; Site 10 - 9 dB; Site 11 - 5 dB; Site 12 - 5 dB; Site 13 - 5 dB; Site 16 - 10 dB; Site 17 - 5 dB.
Passby levels raised 10 dB for track curve noise at Sites 1 and 5.

(h) Represents the noise increase as predicted at the measurement site. Actual increases will be less than 10 dBA at the nearest sensitive receptor. See also Section 4.2 Traffic Noise Impact.

NA - Not applicable; measurement site within future highway right-of-way.

TABLE 4.9-2

OPERATIONAL AMBIENT SOUND LEVELS AT SOUND MEASUREMENTS SITES

Col. 3	Col. 4				Col. 5	Col. 6	Col. 7	Col. 8	Col. 9
Computed 1979 [d,e] Peak-Hour Equivalent Sound Level - dB L_{eq}	Projected 1990[e] Traffic Peak Hour Sound Level - dB				Maximum Single Event LRT Passby Sound Level L_{max} [g]	Change from Existing to Build in dB (Col. 4 - Col. 3)	Projected 1990[e] Peak-Hour Sound Level w/No-Build - dB L_{eq}	Change from Existing to No-Build in dB (Col. 7 - Col. 3)	Increase[h] in the Ambient ≤ dB (Col. 4 - Col. 7)
	Traffic[f] L_{eq}	LRT[g] SEL	LRT Distance (ft)	Combined L_{eq}					
69	67	95	10	72	87	3	70	1	2
72	73	87	10	73	79	1	73	1	0
72	73	81	25	73	73	1	73	1	0
68	70	87	10	71	79	3	69	1	2
68	69	89	15	70	81	2	69	1	1
70	71	87	10	72	79	2	71	1	1
71	71	70	205	71	62	0	71	0	0
65	66	81	50	67	73	0	66	1	2
69	69	72	290	69	64	0	69	0	0
68	70	72	180	70	64	2	70	2	0
72	74	74	230	74	66	2	72	0	2
65	69	79	130	69	71	4	66	1	3
73	NA	NA	85	NA	NA	NA	74	1	NA
77	NA	NA	90	NA	NA	NA	78	1	NA
76	77	82	165	77	74	1	76	0	1
62	63	71	175	63	63	1	63	1	0
67	70	73	240	70	65	3	68	1	2
69	75	73	230	75	65	6	74	5	1
61	64	91	25	70	83	9	59	2	11
61	63	85	50	66	77	5	61	0	5
68	68	91	25	72	83	4	65	3	7
56	57	69	950	57	61	1	57	1	0
56	57	67	530	57	59	1	57	1	0

Notes:

(a) Measurements at Site 19 include noise levels from school playground activities and cars traveling on a gravel driveway. Predicted traffic noise levels do not include these sources; therefore, predicted noise level increases (as shown in Col. 6, 8, and 9) are higher than they will actually be, when these existing sources are considered. The actual increase will be approximately 2 dBA (Col. 4 - Col. 2).

(b) See Table 1-2 for a description of area categories

(c) Data from: Field measurements conducted by Dames & Moore, September 6 through 13, 1979

(d) Data from: ODOT (1979) (see Appendix D, Tables D-1 through D-4 of Acoustics Technical Report).

(e) Sound levels for measurement Sites 9 through 17 represent peak-truck hour sound levels. Sound levels for measurement Sites 1 through 8 and 18 through 23 represent peak-traffic hour sound levels.

(f) Data from: ODOT (1979) (see Appendix D, Tables D-1 through D-4 of Acoustics Technical Report). Computed sound attenuation due to topography as follows Site 10 - 9 dB; Site 12 - 12 dB; Site 13 - 8 dB; Site 16 - 10 dB; Site 17 - 5 dB. See Table 2-1 for distances of measurement site to major arterials.

(g) Computed sound attenuation due to topography as follows: Site 9 - 5 dB; Site 10 - 9 dB; Site 11 - 5 dB; Site 12 - 5 dB; Site 13 - 5 dB; Site 16 - 10 dB; Site 17 - 5 dB.
Passby levels raised 10 dB for track curve noise at Sites 1 and 5.

(h) Represents the noise increase as predicted at the measurement site. Actual increases will be less than 10 dBA at the nearest sensitive receptor. See also Section 4.2 Traffic Noise Impact.

NA - Not applicable; measurement site within future highway right-of-way.

LRT Segment	Vehicle Speed	Sound Level in dB at 50 feet SEL	L_{max}
Downtown segment	15 mph	76-84	68-76
Holladay Street segment	25 mph	81	73
Banfield Freeway segment	55 mph	91	83
Burnside Street segment	35-45 mph	85-89	77-81
Portland Traction Company segment	55 mph	91	83
Gresham segment	35 mph	85	77
Maintenance Yard Loops	5 mph	60	52

SEL is the single event level which represents the sound energy of a typical single LRT passby. The SEL is used in computing the equivalent operational ambient sound level. It is added to the contribution of vehicle activities in assessing the increase in the ambient sound level. The increase in L_{eq} sound level as a result of building the LRT is shown in Table 4.9-2 (Column 4). There are two areas where slight increases (5-6 dB) in the L_{eq} noise levels will occur; these are at Measurement Sites 1 and 19. These increases are predicted at 10 and 25 feet, respectively, and because they are less than 10 dB, they are not considered significant.

L_{max} is the maximum sound level observed during the vehicle passby. The maximum sound level is assessed against the suggested LRT noise criteria (Table 4.9-4) and Oregon, Department of Environmental Quality (DEQ) standards, 340 O.A.R. § 35-035 (1979), to determine additional noise impacts. A description of acoustical nomenclature used in this report is contained within the technical report. For the downtown segment, the maximum sound level, L_{max}, will vary from 68 dB along straight sections to 76 dB along curve sections at a distance of 50 feet. A maximum sound level of 85 to 87 dB is predicted for curve sections at sidewalk level and approximately 10 feet from the center of the near track. Sound levels are attenuated by 6 dB for each doubling of distance for receptors over 50 feet from the source.

Studies completed by Wilson, Ihrig & Associates (1971) comparing curve to tangent track with the use of Bochum (resilient) wheels on the San Francisco Municipal Railway streetcars show an increase of 10 dB for vehicle operations on curved segments at low speeds (11 to 25 mph). Studies of the Muni and the Hague systems reflect a similar increase in sound level along curve track and from the use of rigidly embedded concrete track versus concrete block and ballast assemblies. Tri-Met is committed to a design to achieve a significant reduction in noise where feasible; therefore, curves will be designed at maximum radius to reduce the possibility of wheel squeal along these sections. As a comparison to LRT operational sound levels, automobiles are presently limited to a maximum sound level of 82 dB, with trucks limited to a maximum sound level of 87 dB at distances of 50 feet for speeds greater than 35 mph.

The contribution of LRT activities to each of the sound measurement locations is shown in Table 4.9-2. Due to the high ambient sound levels and the short duration of LRT passbys, the combined equivalent operational sound level is not greatly affected by LRT operations.

4.9.3 Impact Assessment

The "Procedures for abatement of highway traffic noise and construction noise" found in the Federal-Aid Highway Program Manual (FHPM 7-7-3) defines the analysis procedure for assessing highway traffic noise impacts (U.S. FHWA 1973b). A similar procedure has been used in assessing LRT system noise impacts. The analysis procedure compares predicted future (1990) traffic-generated sound levels with the design noise level/activity relationship (shown in Table 4.9-3) and existing (1979) sound levels. The FHWA design noise level criteria does not take into account the intrusiveness of short duration LRT vehicle passbys. A suggested community noise criteria applicable for LRT operations is shown in Table 4.9-4. FHPM 7-7-3 noise standards apply to the Banfield Freeway only and not to strictly transit portions of the Project. Vehicular noise levels along Holladay Street, Burnside Street, and downtown Portland have been assessed in terms of the increase in the ambient criteria only.

The Oregon Environmental Quality Commission regulations, 340 O.A.R. §35-035 (1979), regulate the maximum permissible sound levels for new industrial noise sources such as the Tri-Met maintenance facility. The allowable statistical sound levels in any 1 hour (where L_x is the sound level exceeded x percent of the time) are as follows:

TABLE 4.9-3

DESIGN NOISE LEVEL/ACTIVITY RELATIONSHIPS

Activity Category	Design Noise Levels[a] L_{eq} (dB)	L_{10} (dB)	Description of Activity Category
A[b]	57 (Exterior)	60 (Exterior)	Tracts of land in which serenity and quiet are of extra-ordinary significance and serve an important public need, and where the preservation of those qualities is essential if the area is to continue to serve its intended purpose. Such areas could include amphitheaters, particular parks or portions of parks, or open spaces which are dedicated or recognized by appropriate local officials for activities requiring special qualities of serenity and quiet.
B[b]	67 (Exterior)	70 (Exterior)	Residences, motels, hotels, public meeting rooms, schools, churches, libraries, hospitals, picnic areas, recreation areas, playgrounds, active sports areas, and parks.
C	72 (Exterior)	75 (Exterior)	Developed lands, properties or activities not included in Categories A and B above.
E	52 (Interior)	55 (Interior)	Residences, motels, hotels, public meeting rooms, schools, churches, libraries, hospitals, and auditoriums.

Data from: U.S. FHWA 1973b.

(a) Either L_{10} or L_{eq} design noise levels may be used.

(b) Parks in Categories A and B include all such lands (public or private) which are actually used as parks as well as those public lands officially set aside or designated by a governmental agency as parks on the date of public knowledge of the proposed highway project.

TABLE 4.9-4

SUGGESTED COMMUNITY NOISE CRITERIA FOR LRT OPERATIONS

Area Category	Area Descriptions	Typical Ambient Sound Levels at Night	Maximum Single Event Passby Sound Level Criteria (L_{max})
I	Quiet urban residential, open space park, suburban residential or recreational area. No near-by highways or boulevards.	35-40 dB	70 dB
II	Average urban residential, quiet apartments and hotels, open space, suburban residential, or occupied outdoor area near busy street.	40-45 dB	75 dB
III	Busy urban residential, average semi-residential/ commercial area.	45-55 dB	80 dB
IV	Commercial areas with office buildings, retail stores, etc, with daytime occupancy only. Open space, parks and suburban areas near highway or high speed boulevards with distant residential buildings.	Over 55 dB	85 dB
V	Industrial or freeway and highway corridors with either residential or commercial areas adjacent.	Over 60 dB	85-90 dB

Data from: Wilson and Box 1976.

Note: The above criteria were developed for the MARTA Rail Transit System. Analysis of MARTA passby sound level spectra and spectral levels for the proposed LRT system suggests the applicability of the above criteria for assessing LRT operations noise impact.

Time	Maximum Permissible Sound Level in dB L_1	L_{10}	L_{50}
7 a.m.-10 p.m.	75	60	55
10 p.m.- 7 a.m.	60	55	50

Construction equipment and operations are exempt from the 340 O.A.R. §35-035 (1979) regulations; however, LRT operations must comply. Maintenance operations including track grinding for the Project are exempt under subsection 5(h) of the Oregon regulations. New park-and-ride noise sources located at previously unused industrial or commercial sites are regulated, such that sound levels generated by the noise source may not exceed the ambient sound levels, L_{10} or L_{50}, by more than 10 dB in any one hour, or exceed the levels specified above.

The City of Portland's noise ordinance, Portland, OR, Ordinance 141, 882 (June 10, 1976), regulates the maximum permissible sound levels (L_{max}) of new commercial noise sources on residential zones to a daytime maximum sound level of 55 dB and a nighttime maximum sound level of 50 dB. LRT operations must comply with these standards or a variance must be requested.

Construction activities shall not exceed 85 dB when measured at 50 feet from the source with the exception of trucks, pile drivers, pavement breakers, scrapers, concrete saws, and rock drills. This standard applies to the daytime period of 7:00 a.m. to 6:00 p.m. and contains further restrictions during the nighttime, weekend, and holiday periods.

4.9.3.1 LRT SYSTEM OPERATIONAL NOISE IMPACTS

The LRT noise impact assessment was made by comparing the estimated future (1990) maximum sound level (L_{max}) for the Project with the suggested LRT passby noise criteria described in Table 4.9-4, the Oregon Department of Environmental Quality regulations, the City of Portland's noise ordinance, and the increase in the ambient criteria. The downtown and east Portland study areas are within the Area Category IV and V classifications, respectively (see Table 4.9-4 for a description of Area

Categories). Since the single event maximum LRT passby sound levels (L_{max}) will not generally exceed 79 dB at 50 feet (sidewalk level) within the downtown, and 83 dB at 50 feet along the Banfield Freeway for straight track segments, no noise impacts are anticipated for these segments based on the suggested LRT noise criteria. Track curves at the east and west ends of Yamhill and Morrison Streets are potential sources for "wheel squeal" and sound levels as high as 87 dB at 10 feet and may result in noise impacts. This could result in as much as a 5 dBA increase above existing noise levels.

Sound levels may be reduced by approximately 10 dB at curve segments with the use of a rail lubrication system, thereby, reducing potential noise impacts to pedestrians within the area. An alternative measure would be isolation of the rails along curves. Final mitigative measures will be selected by Tri-Met from the various alternatives to reduce wheel-rail noise at curves below the 87 dB maximum sound level used in the impact analysis.

The majority of the east Multnomah County study area is within the Area Category II classification. A tabulation of residences exposed to noise levels above L_{max} = 75 dB is presented in Table 4.9-5. It should be noted that many of these residences presently experience sound levels as high as 72 dB during motorcycle and truck passbys as measured by Dames & Moore. The maximum sound level of trucks is presently set at 87 dB at 50 feet for speeds over 35 mph and will therefore be greater than the maximum anticipated sound level of LRT operations along Burnside Street.

Maintenance operations will generally occur within the shop facilities resulting in sound levels within the City of Portland's maximum permissible daytime and nighttime sound levels. Operations should be restricted within 70 feet of the maintenance yard property line to assure compliance with the nighttime regulations.

Ground-borne vibrations due to LRT operations will generally be below the threshold of perception for buildings 30 feet or more from the tracks.

TABLE 4.9-5

IMPACTED STRUCTURES BASED ON SUGGESTED LRT PASSBY NOISE CRITERIA

		Impacted Structures Within L_{max} = 75dB LRT Noise Contours					
			Residences				
Road Segment	Side of Roadway	Parks or Playgrounds	Single Family	Multi-Family	Public Bldgs.	Hotels and Motels	Commercial Buildings
Burnside Street							
99th-102nd Avenues	South	-	3	-	-	-	-
99th-102nd Avenues	North		1	-	1	-	-
102nd-108th Avenues	South	(a)	2	-	-	-	-
102nd-108th Avenues	North	-	2	-	-	-	-
108th-122nd Avenues	South	(b)	5	-	-	-	1
108th-122nd Avenues	North	-	6	-	-	-	1
127th-131st Avenues	South	-	4	-	-	-	-
127th-133rd Avenues	North	(c)	10	-	-	-	-
136th-139th Avenues	South	-	-	1	-	-	-
133rd-136th Avenues	North	(d)	1	-	-	-	-
146th-151th Avenues	South	-	1	3	-	-	-
143rd-151st.Avenues	North	-	5	-	-	-	-
155th-165th Avenues	North	-	3	4	1	-	-
167th-181st Avenues	South	-	12	6	-	-	1
167th-181st Avenues	North	-	10	-	-	-	1
181st Avenue-Stark Street	South	-	4	-	-	-	-
181st Avenue-Stark Street	North	-	-	-	-	-	2
Stark Street-199th Avenue	South	-	4	-	-	-	-
Stark Street-199th Avenue	North	-	1	-	-	-	1

(a) Russellville School Playground
(b) Ventura Park School Playground
(c) Menlo Park School Playground
(d) Baseball Field

TABLE 4.9-5

Road Segment	Side of Roadway	Parks or Playgrounds	Residences: Single Family	Residences: Multi-Family	Public Bldgs.	Hotels and Motels	Commercial Buildings
		Impacted Structures Within L_{max} = 75dB LRT Noise Contours					
Portland Traction Company Segment							
199th-202nd Avenues	North	-	3	-	-	-	-
202nd-212th Avenues	North	-	3	-	-	-	-
212th-Eastman Avenues	North	-	--	-	-	-	1
212th-Eastman Avenues	South	-	1	-	-	-	-
Eastman Avenue-Main Street	North	-	7	-	-	-	-
Eastman Avenue-Main Street	South	-	4	-	-	-	2
Liberty Avenue-Bull Run Road	South	-	-	-	-	-	3
Total		4	92	14	2	0	13

LRT operations throughout the Project area will exceed the maximum permissible nighttime sound levels of L_1 = 60 dB and L_{max} = 50 dB of the Oregon Environmental Quality Commission and the City of Portland's noise ordinance, respectively. Since operations will generally result in maximum sound levels equal to or less than that for existing truck activities within the respective areas, Tri-Met may file for an exception to these regulations. Construction of barriers along the Banfield Freeway would mitigate most LRT noise impacts within this area. No barriers are proposed by ODOT or Tri-Met along other LRT segments at this time.

4.9.3.2 TRAFFIC NOISE IMPACT

Traffic noise impact assessment was made by estimating the future (1990) equivalent sound level for the Project and No-Build condition for comparison with the FHWA design noise levels (Table 4.9-3). A tabulation of FHWA Class B residences exposed to noise levels above L_{eq} = 67 dB are presented in Table 4.9-6. In general, construction of the Banfield Freeway and Burnside Street improvements would expose few noise-sensitive areas to higher noise levels than are presently experienced. Sound levels for the Project and No-Build condition will be within ± 5 dB of estimated existing (1979) sound levels and will therefore result in no noise impacts based on the increase in the ambient criteria. Increases in traffic-generated sound levels along Holladay Street, Burnside Street, and downtown Portland at noise-sensitive receptors will be less than 10 dB, thereby resulting in no noise impact based on the increase in the ambient sound criteria.

4.9.3.3 CONSTRUCTION NOISE IMPACT

During the construction period, residents within a distance of up to 1/4 mile of the Banfield Freeway and Burnside Street will be exposed to construction equipment noise. During the period of "noisiest" typical activity, sound levels of excavation activities are estimated to average 65 dB at 1,000 feet from the center of the construction activity. During "pre-splitting" activities the contribution of rock drill activities is estimated to average 74 dB at 1,000 feet from the center of construction activity.

TABLE 4.9-6

IMPACTED STRUCTURES BASED ON FHWA DESIGN NOISE LEVEL CRITERIA

		Existing 1979 Condition						No-Build (1990)						Banfield Transitway Project (1990)					
		Impacted Structures Within L_{eq} = 67 dB Traffic Noise Contours						Impacted Structures Within L_{eq} = 67 dB Traffic Noise Contours						Impacted Structures Within L_{eq} = 67 dB Traffic Noise Contours					
			Residences						Residences						Residences				
Road Segment	Side of Road	Parks	Single Family	Multi-Family[(a)]	Public Bldgs.	Hotel and Motels	Commercial	Parks	Single Family	Multi-Family[(a)]	Public Bldgs.	Hotel and Motels	Commercial	Parks	Single Family	Multi-Family[(a)]	Public Bldgs.	Hotel and Motels	Commercial
Banfield Freeway[(b)]																			
Grand-7th Avenues	South	--	--	--	--	--	2	--	--	--	--	--	2	--	--	--	--	--	2
12th-16th Avenues	South	--	--	--	--	--	1	--	--	--	--	--	1	--	--	--	--	--	1
16th-20th Avenues	South	--	--	--	--	--	1	--	--	--	--	--	1	--	--	--	--	--	1
19th-21st Avenues	North	--	6	1	--	--	--	--	6	1	--	--	--	--	6	1	--	--	--
20th-21st Avenues	South	--	--	--	(c)	--	--	--	--	--	(c)	--	--	--	--	--	(c)	--	--
21st-23rd Avenues	South	--	3	2	(c)	--	--	--	5	2	(c)	--	--	--	5	2	(c)	--	--
23rd-27th Avenues	South	--	1	6	--	--	--	--	4	7	--	--	--	--	4	7	--	--	--
21st-28nd Avenues	North	--	10	5	--	--	--	--	10	6	--	--	--	--	10	5	--	--	--
31st-33rd Avenues	South	--	5	--	--	--	--	--	6	--	--	--	--	--	8	--	--	--	--
Sandy-39th Avenue	North	--	--	--	--	--	2	--	--	--	--	--	2	--	--	--	--	--	2
34th-35th Avenues	South	--	--	--	--	--	(d)	--	--	--	--	--	(d)	--	4	--	--	--	--
37th-39th Avenues	South	--	--	--	--	--	--	--	5	--	--	--	--	--	7	--	--	--	--
39th at Senate Street	South	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	(e)	--	--
39th-44th Avenues	South	--	22	--	--	--		--	24	--	--	--	--	--	30	--	--	--	--
44th-47th Avenues	South	--	--	1	--	--		--	--	1	--	--	--	--	--	1	--	--	--
47th-49th Avenues	South	--	--	--	(g)	--	(f)	--	--	--	(g)	--	(f)	--	--	--	(g)	--	--
47th-49th Avenues	North	--	3	--	--	--	--	--	4	--	--	--	--	--	4	--	--	--	--
Pacific-Oregon Street	North	--	--	--	--	--	--	--	-	--	--	--	--	--	1	--	--	--	--
49th-53rd Avenues	South	--	6	9	--	--	--	--	7	10	--	--	--	--	9	12	--	--	--
52nd-53rd Avenues	North	--	1	--	--	--	--	--	1	--	--	--	--	--	1	--	--	--	--
53rd-59th Avenues	South	--	13	3	--	--	--	--	14	3	--	--	--	--	16	3	--	--	--
59th-60th Avenues	South	--	--	--	(h)	--	--	--	--	--	(h)	--	--	--	--	--	(h)	--	--
60th-65th Avenues	South	--	24	10	--	--	--	--	25	11	--	--	--	--	41	14	--	--	--
60th-62nd Avenues	North	--	1	--	--	--	--	--	2	--	--	--	--	--	3	--	--	--	--
65th-67th Avenues	South	--	--	--	(i)	--	--	--	--	--	(i)	--	--	--	--	--	(i)	--	--
66th-67th Avenues	North	--	--	1	--	--	--	--	--	1	--	--	--	--	--	1	--	--	--
67th-69th Avenues	South	--	1	1	--	--	--	--	1	2	--	--	--	--	1	2	--	--	--
69th-70th Avenues	South	--	--	2	--	--	--	--	--	2	--	--	--	--	--	2	--	--	--
71st-72nd Avenues	South	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1	--	--	--
72nd-74th Avenues	South	--	2	5	--	--	--	--	3	6	--	--	--	--	6	8	--	--	--
68th-74th Avenues	North	--	--	8	--	--	--	--	--	9	--	--	--	--	--	11	--	--	--
74th-78th Avenues	South	--	8	4	--	--	--	--	10	4	--	--	--	--	18	5	--	--	--
74th-79th Avenues	North	--	8	--	--	--	--	--	9	--	--	--	--	--	9	--	--	--	--
79th-80th Avenues	South	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	(j)
80th-82nd Avenues	North	--	2	2	--	--	--	--	4	2	--	--	--	--	4	3	--	--	--
82nd-84th Avenues	North	--	--	--	--	1	--	--	--	--	--	1	--	--	--	--	--	1	--
82nd-84th Avenues	South	1	7	--	--	--	--	1	9	--	--	--	--	1	10	--	--	--	--
84th-92nd Avenues	South	--	4	15	--	--	--	--	6	19	--	--	--	--	9	24	--	--	--
85th-90th Avenues	North													--	19	2	--	--	--
96th-99th Avenues	South													--	4	--	--	--	--
Total		1	127	75	5	1	8	1	155	86	5	1	8	1	229	104	6	1	9

(a) The number of impacted multi-family residences represents a tabulation of structures only and does not reflect the number of dwelling units.
(b) FHPM 7-7-3 noise standards apply to highway facilities and not to the strictly transit portions of the Project.
(c) City of Portland Government Building
(d) H.A. Anderson Building
(e) Church
(f) Medical Dental Bldg.
(g) Providence Hospital
(h) Oregon Dept. of Transportation
(i) Multnomah County Juvenile Court
(j) Office Building

4.9.3.4 PARK-AND-RIDE FACILITY NOISE IMPACT

Measurements by Dames & Moore at a similar facility in Bellevue, Washington, show background L_{10} and L_{50} sound levels of 64 dB and 57 dB, respectively, at the property line during peak morning (6:00 a.m. to 7:00 a.m.) activities. Operational sound levels for the Project could differ somewhat depending upon size of the lot, distances to idling buses, pavement types, etc., but can be expected to result in an increase in the ambient of over 10 dB at some sites. In the case of the Gresham City Hall and Gresham Terminus park-and-ride facilities, the lots would be located in existing industrial areas away from noise-sensitive receptors. Those residences anticipated to be impacted by the park-and-ride facilities include the following:

	IMPACTED RESIDENCES	
Park-and-Ride Facility	Single Family	Multi-Family
122nd Avenue	8	--
162nd Avenue	3	5
181st Avenue	5	--
192nd Avenue	2	9

Local arterials in the vicinity of the lots are not anticipated to experience a significant increase in traffic or associated noise due to park-and-ride facility operations.

4.9.4 Mitigation Measures

Two mitigation measures have been considered to reduce vehicular traffic-noise impacts from the Banfield Freeway: the use of barriers, and architectural modifications to impacted structures. Table 4.9-7 contains an identification of mitigation measures which were evaluated for impacted structures throughout the Project area. Height and location of barriers shown on Figures 4.9-1 and 4.9-2 were selected based on the amount of attenuation required and topographic conditions adjacent to the right-of-way. Of those investigated, the barriers which are preliminarily found to be feasible and practical total 124,860 square feet of barrier

TABLE 4.9-7

MITIGATIVE MEASURES TO REDUCE TRAFFIC NOISE IMPACTS

			Results							
			Barrier							
Road Segment	Side of Road	Impacted Land Uses	Height (feet)	Length (feet)	Estimated Attenuation (dB)	Cost/Barrier[a] (thousand $)	Cost/dB Reduction/ Structure (thousand $)	Cost/ Structure (thousand $)	Recommended for Further Investigation	Remarks
Banfield Freeway										
Grand-7th Avenues	South	Commercial Building	NO	NO	--	--	--	--	NO	(b)
12th-16th Avenues	South	Commercial Building	NO	NO	--	--	--	--	NO	(b)
16th-20th Avenues	South	Commercial Building	NO	NO	--	--	--	--	NO	(b)
19th-21st Avenues	North	Residences (6-SF, 1-MF)	12	650	9	156	2.48	22.29	NO	(b)
20th-21st Avenues	South	Public Building	--	--	--	--	--	--	AC	(c)
21st-23rd Avenues	South	Res. and Public Bldg. (5-SF, 2-MF)	8[d]	400	9	64	1.00	9.00	YES	(e)
23rd-24th Avenues	South	Residential (6X-MF)	10	350	10	70	1.17	11.67	YES	(e)
24th-27th Avenues	South	Residential (4-SF, 1-MF)	10	550	10	110	1.83	18.33	NO	(b)
21st-28th Avenues	North	Residential (10-SF, 5-MF)	12	1,835	10	440.4	2.94	29.36	NO	(b)
31st-33rd Avenues	South	Residential (3-SF)	10	900	10	180	6.00	60.00	NO	(b)
Sandy-39th Avenue	North	Commercial (2)	NO	NO	--	--	--	--	NO	(b)
34th-35th Avenues	South	Residential (4-SF)	8	335	9	53.6	1.49	13.4	NO	(b)
37th-39th Avenues	South	Residential (7-SF)	8	650	9	104	1.65	14.86	YES	(e)
39th at Senate St.	South	Church	--	--	--	--	--	--	AC	(c)
39th-44th Avenues	South	Residential (30-SF)	12	1,400	7-9	336	1.40	11.20	YES	(e)
44th-47th Avenues	South	Residential (1-Large MF)	8	230	7-9	36.8	4.60	36.8	NO	(b)(f)
47th-49th Avenues	South	Providence Hospital (2-Bldgs.)	8	885	7-9	141.6	8.85	70.80	AC	(g)(c)
47th-Pacific St.	North	Residential (5-SF)	12	835	9	200.4	4.45	40.08	NO	(b)
49th-53rd Avenues	South	Residential (9-SF, 12-MF)	12	965	10	231.6	1.10	11.03	YES	(e)
52nd-53rd Avenues	North	Residential (1-SF)	10	425	9	85	9.44	85.00	NO	(b)
53rd-59th Avenues	South	Residential (16-SF, 3-SF)	10	1,090	10	218	1.15	11.47	YES	(e)
59th-60th Avenues	South	ODOT	12	685	10	164.4	16.44	164.40	NO	(b)
60th-65th Avenues	South	Residential (41-SF, 14-MF)	10	1,550	9	310	0.63	5.64	YES	(e)
60th-62nd Avenues	North	Residential (3-SF)	12	495	7	118.8	5.66	39.6	NO	(b)
65th-67th Avenues	South	Juvenile Court	12	1,015	9	243.6	27.07	243.6	AC-YES	(e)(c)
66th-67th Avenues	North	Residential (1-Large MF)	12	450	9	108	12	108	NO	(b)

SF = Single-family dwelling.
MF = Multi-family dwelling.

(a) Costs based on $20 per square foot for barriers less than or equal to 12 feet in height (Versteeg 1980). Figures include material and labor costs for masonry or precast concrete barriers including engineering, grading, mobilization, and contingency costs, estimated by the Engineering Section at ODOT.

(b) NO - Infeasible when considering the social, economic, and environmental effects and the benefits of various noise abatement measures. Possible mitigation measures are outweighed by other conflicting values such as economic reasonableness, aesthetic impact, air quality, highway safety, access requirements, the difficulty of constructing barriers of sufficient height, visual requirements at highway access or egress points and intersections, and the limited ability of barriers to reduce impacts of other nearby significant noise sources.

(c) Architectural: Mitigation may be necessary. An individual analysis of each building will be conducted as part of final design. The final decision on feasibility will be documented in a noise study report.

(d) Height will vary due to topography.

(e) Barriers: Appear to be feasible and practical. An individual analysis of each barrier will be conducted as part of final design. Barrier performance and the final decision on feasibility will be documented in a noise study report.

(f) Recommended barriers will not adequately shield upper floors of multi-family dwellings and therefore also may require architectural modifications. Architectural modifications are proposed by ODOT for public buildings only.

(g) Recommended barriers will not adequately shield upper floors of Providence Hospital and therefore also may require architectural modifications.

TABLE 4.9-7

Road Segment	Side of Road	Impacted Land Uses	Barrier Height (feet)	Barrier Length (feet)	Barrier Estimated Attenuation (dB)	Cost/Barrier[b] (thousand $)	Cost/dB Reduction/ Structure (thousand $)	Cost/ Structure (thousand $)	Recommended for Further Investigation	Remarks
Banfield Freeway (Continued)										
67th-69th Avenues	South	Residential (1-SF, 2-Large MF)	10	255	9	51	1.89	17.00	NO	(b)
69th-70th Avenues	South	Residential (2-Large MF)	10	430	9	86	4.78	43.00	NO	(b)
71st-72nd Avenues	South	Residential (1-MF)	10	100	6	20	3.33	20.00	NO	(b)
72nd-74th Avenues	South	Residential (6-SF, 8-MF	10	670	9	134	1.06	9.57	YES	(e)
68th-74th Avenues	North	Residential (11-Large MF)	12	1,675	8-9	402	4.57	36.55	YES	(e)(h)
74th-78th Avenues	South	Residential (18-SF, 5-MF)	12	1,050	9	252	1.22	10.96	YES	(e)
74th-79th Avenues	North	Residential (9-SF)	12	1,405	9	337.2	4.16	37.47	NO	(b)
79th-80th Avenues	South	Office Building	NO	NO	--	--	--	--	NO	(b)
80th-82nd Avenues	North	Residential (4-SF, 3-MF)	12	355	9	85.2	1.35	12.17	NO	(b)
82nd-84th Avenues	North	Motel	12	325	9	78	8.67	78.00	NO	(b)
82nd-84th Avenues	South	Park and Residential (10-SF)	12	550	9	132	1.47	13.20	YES	(e)(i)
84th-92nd Avenues	South	Residential (9-SF, 24-MF)	(j)	(j)	(j)	--	--	--	--	(j)
85th-90th Avenues	North	Residential (19-SF, 2-MF)	(j)	(j)	(j)	--	--	--	--	(j)
96th-99th Avenues	South	Residential (4-SF)	(j)	(j)	(j)	--	--	--	--	(j)
Park-and Ride Facilities										
122nd Avenue		Residential (8-SF)	8	715	10	114.4	1.43	14.30	YES	(k)
162nd Avenue		Residential (3-SF, 5-MF)	8	1,065	10	170.4	2.13	21.30	YES	(l)
181st Avenue		Residential (5-SF)	8	600	10	96	1.92	19.20	YES	(m)
192nd Avenue		Residential (2-SF, 9-MF)	8	735	10	117.6	1.07	10.69	YES	(n)

(h) Evaluation is contingent upon ability to obtain right-of-way construction easement off of normal highway right-of-way.
(i) Barrier may be constructed as earthen berm from excess excavation material; otherwise, not recommended for further evaluation.
(j) Mitigative measures are being designed as part of the I-205 project, presently being constructed.
(k) Recommended barrier along east and south border of the lot.
(l) Recommended barrier along west, south, and east border of the lot.
(m) Recommended barrier along north and east border of the lot.
(n) Recommended barrier along east and west border of the lot.

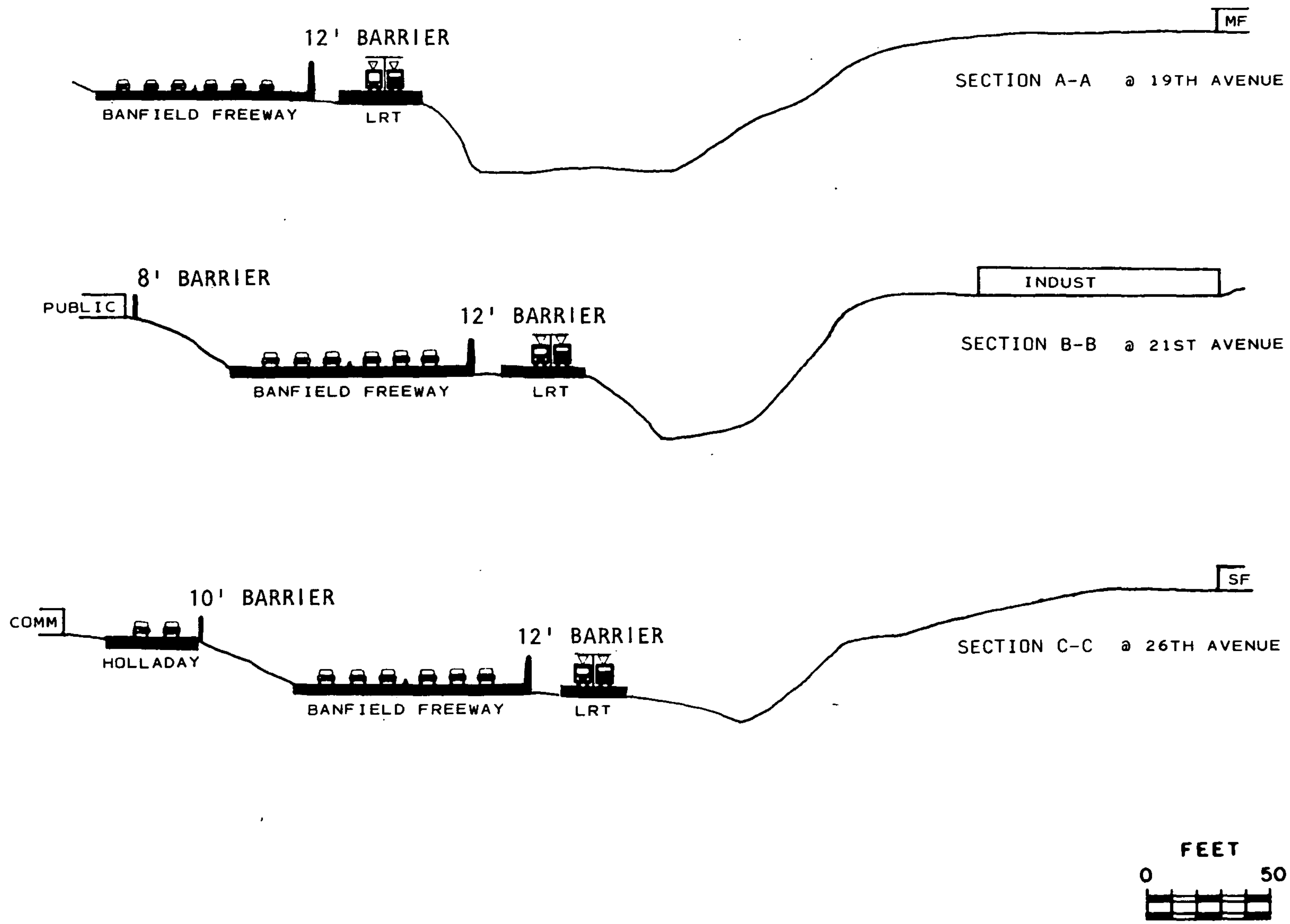


FIGURE 4.9-2A

BANFIELD TRANSITWAY PROJECT FEIS

CROSS-SECTION OF POSSIBLE BARRIERS FOR TRAFFIC NOISE CONTROL

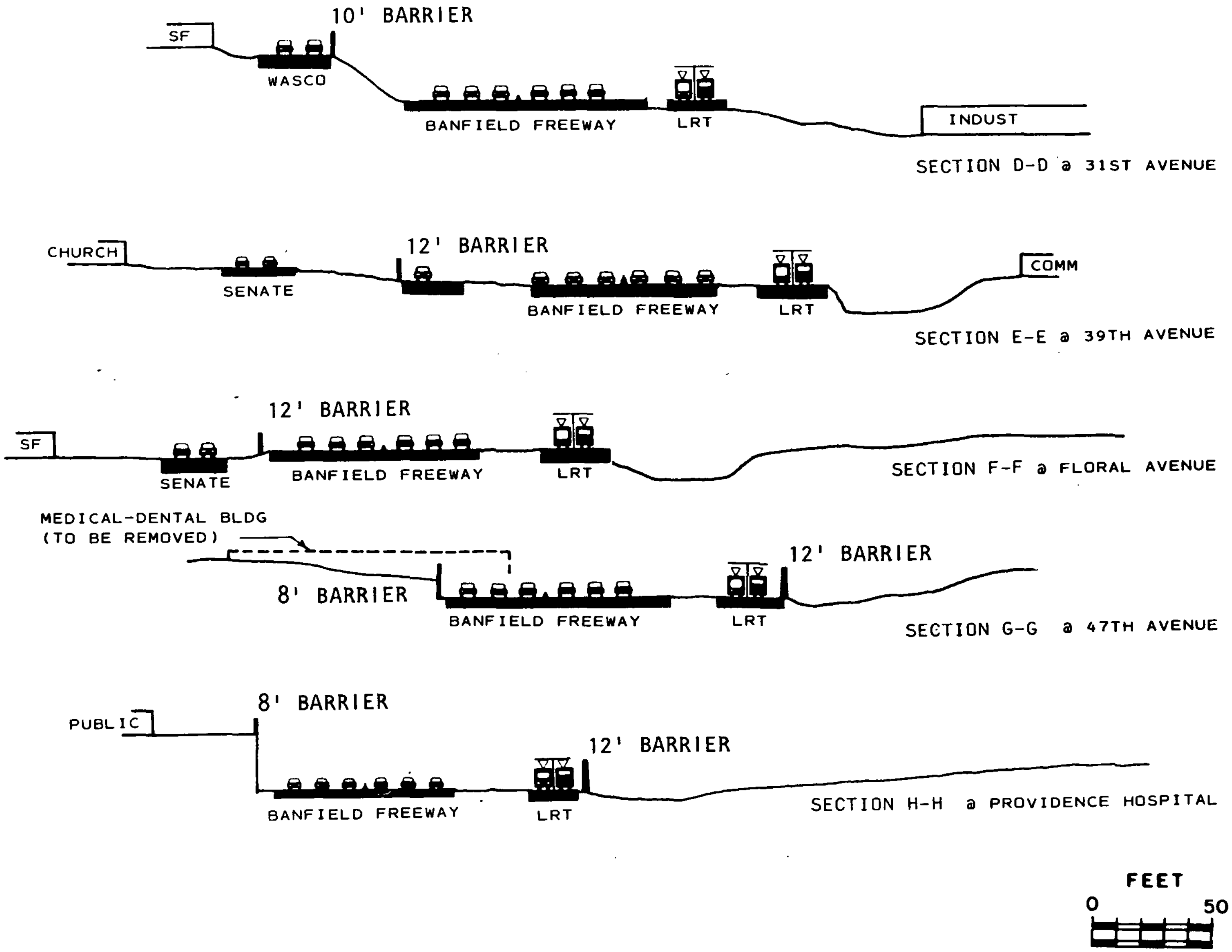


FIGURE 4.9-2B

BANFIELD TRANSITWAY PROJECT FEIS

CROSS-SECTION OF POSSIBLE BARRIERS FOR TRAFFIC NOISE CONTROL

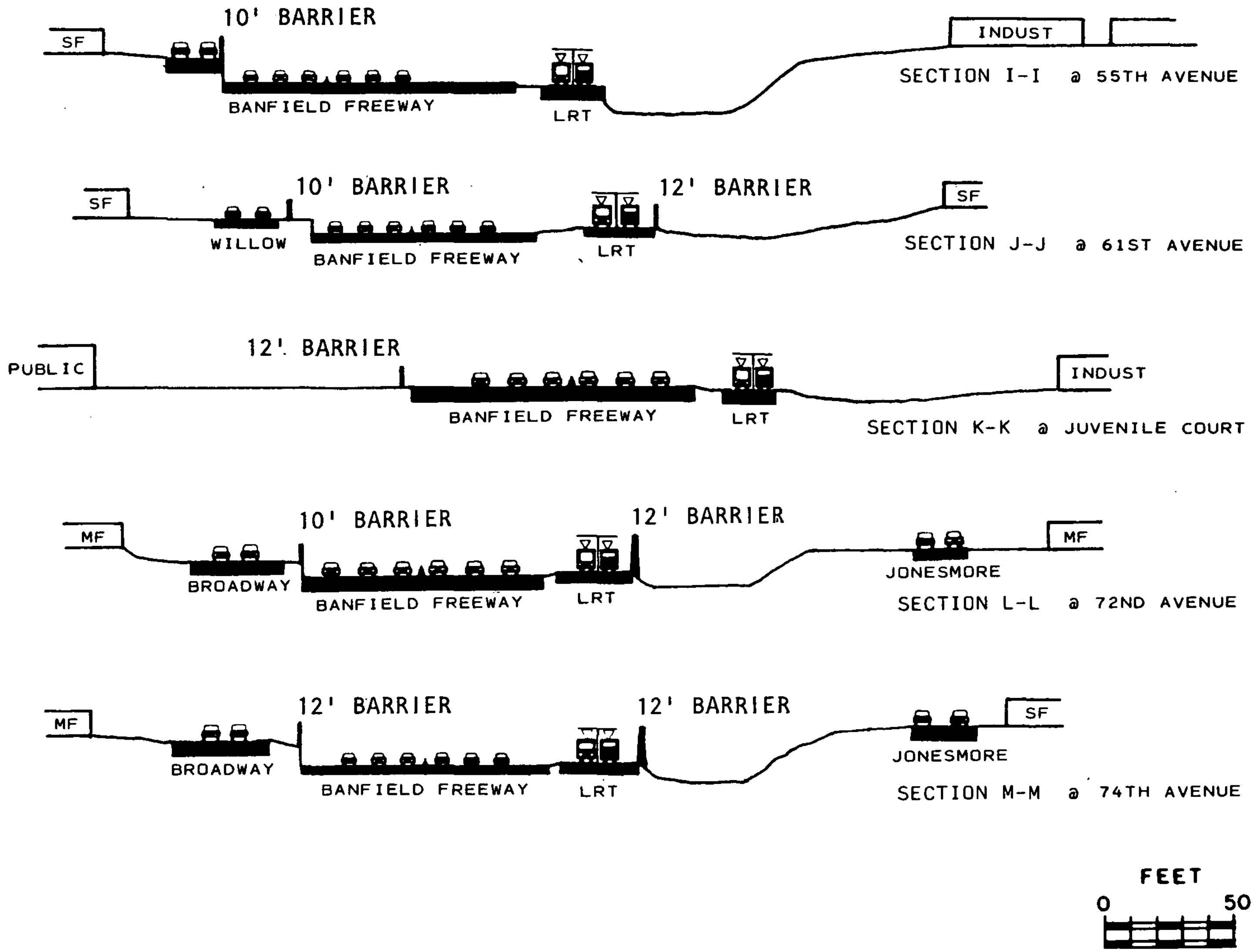


FIGURE 4.9-2C

BANFIELD TRANSITWAY PROJECT FEIS

CROSS-SECTION OF POSSIBLE BARRIERS FOR TRAFFIC NOISE CONTROL

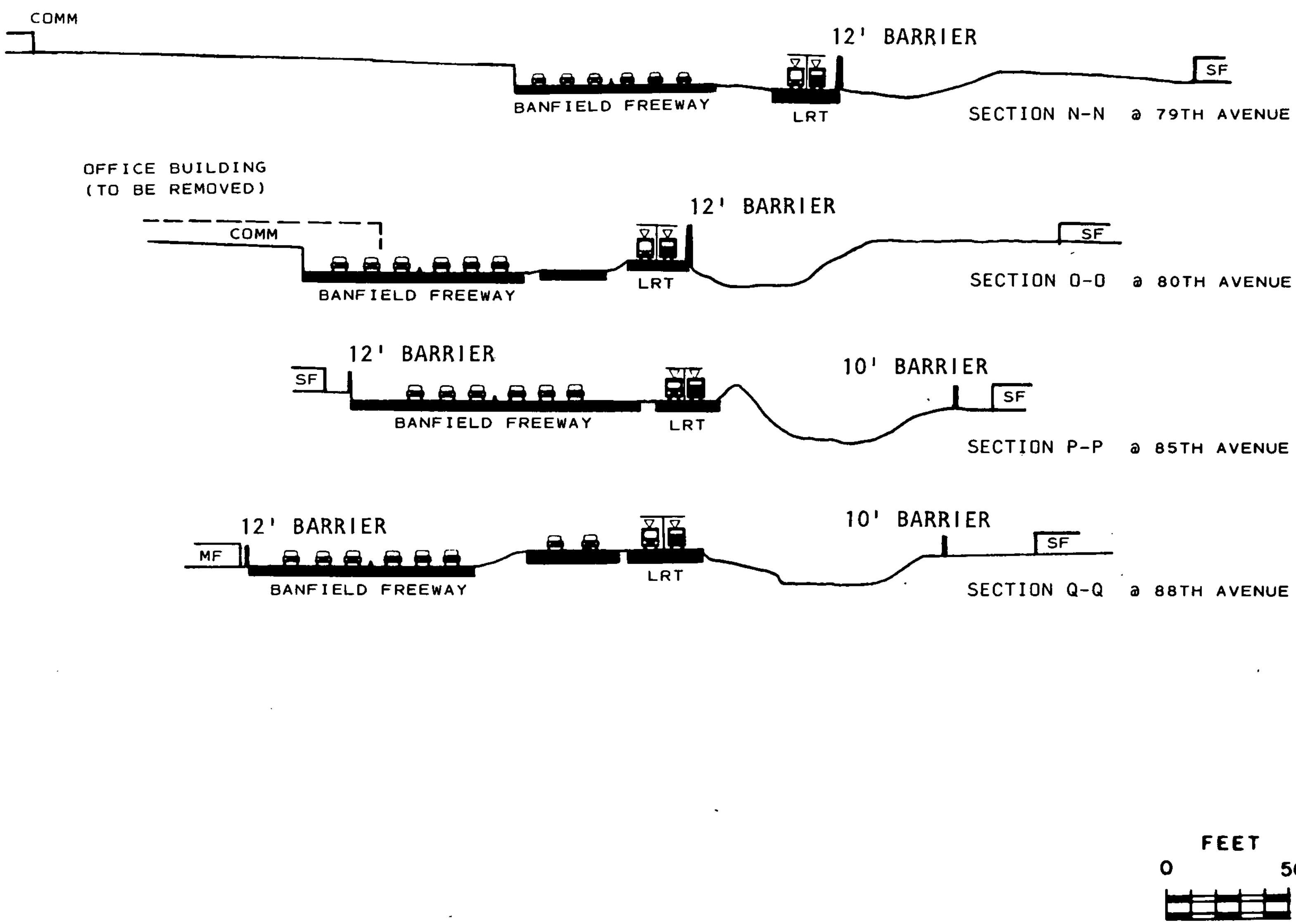


FIGURE 4.9-2D

BANFIELD TRANSITWAY PROJECT FEIS

CROSS-SECTION OF POSSIBLE
BARRIERS FOR TRAFFIC NOISE CONTROL

at an estimated cost of $20.00 per square foot, or a total of approximately $2.5 million. Architectural modifications will be made to public buildings only as required by ODOT and FHWA policy and regulations. All of the other barriers investigated were judged to be infeasible or impractical when considering the social, economic, and environmental effects and the benefits of the various noise abatement measures. Possible mitigation measures are outweighed by other conflicting values such as economic reasonableness, aesthetic impact, air quality, highway safety, access requirements, the difficulty of constructing barriers of sufficient height, and visual requirements at highway access or egress points and intersections.

Various noise mitigation measures are proposed for incorporation in the LRT design and specifications. These include the use of continuous welded rail and resilient wheels. Use of a high pressure automatic lubrication system on curves and switches or isolated rails within the downtown area has been recommended. Isolating the rails from the tie and ballast using resilient materials could also reduce noise levels. Final selection of one of these measures will be implemented by Tri-Met during design to minimize potential wheel squeal at curves.

Track grinding and wheel truing will reduce noise associated with spotted wheels or corrugated track. Use of resilient chassis mountings, forced ventilation propulsion motors, and specification of noise limits on air-conditioning and other equipment will assist in reducing interior and exterior LRT vehicle noise.

Use of properly muffled and isolated equipment will help reduce the impact of construction noise. Proper scheduling of maintenance and construction operations during the least noise-sensitive hours will reduce the occurrences of sleep interference and noise from increased traffic congestion during the peak-traffic (afternoon) hour. All construction activities will be in compliance with the City of Portland's noise ordinance.

A total of 24,900 square feet of masonry or precast concrete barriers have been recommended at the property line of noise-sensitive residences to reduce park-and-ride lot noise impacts during the early morning as shown in Table 4.9-7.

No barriers are proposed by Tri-Met or ODOT along LRT segments in the downtown, along Holladay Street, Burnside Street, and the Portland Traction Company segment, or within Gresham. It is anticipated that Tri-Met will request an exception from the Oregon Environmental Quality Commission and the Portland Noise Review Board because of the short duration of a single LRT passby, the minimal number of operations which will occur at nighttime, and because most areas presently experience motorcycle or truck passby noises greater than those anticipated for LRT operations.

4.10 NATURAL ENVIRONMENT

This section considers the relationship of the Banfield Transitway Project to the geology, water resources, and biology of the region. The Project follows existing transportation corridors and involves no major changes in their alignment. It traverses a largely urbanized portion of the Portland metropolitan area. As a result, the impacts of the Project on the existing natural conditions are minor.

The 3 study areas (downtown Portland, east Portland, and east Multnomah County) are discussed together under each aspect of the natural environment. There is a general decrease in urbanization from west to east across these areas with a corresponding increase in the potential for impacts in the eastern portions of the Project area.

4.10.1 Existing Conditions

The most significant topographic features of the Project area are the lowlands of the Willamette and Columbia Rivers. These consist of alluvial bottomlands and the somewhat higher, gently rolling riverine terraces that rise to elevations of 200 to 400 feet. Downtown Portland occupies alluvial terraces at the foot of the Tualatin Mountains, which reach an elevation of about 1,000 feet to the west of the central business district. This area is separated by the Willamette River from the gentler topography of river terraces to the east.

The most notable feature in the Project area east of the Willamette River is the natural drainage depression known as Sullivan Gulch. It crosses the extensive river terraces for nearly 7 miles from Rocky Butte to the Willamette River. The Banfield Freeway is located in this depression, which rises 200 feet at a grade of just under 1 percent, from the river eastward to I-205. Sullivan Gulch averages 160 feet in width at the bottom, 300 feet at the top, and attains a maximum depth of almost 60 feet at 16th Avenue. Geologically, the gulch is composed of a widespread veneer of gravel, sand, silt, and clays. No geologic hazards are apparent in these deposits.

Bordering the river terraces in east Multnomah County are numerous isolated hills at elevations of 400 to 800 feet. These hills, such as Rocky Butte and Kelly Butte, are composed of sedimentary and volcanic materials.

The soils in the Project area are principally silty sands and sandy silts, mixed with gravels and minor amounts of clay. Sand predominates in the western part of the Project area, while sand and gravel are predominant in the east. The soils are well drained and have moderate permeability. Some ponded water has been observed at various locations along the Union Pacific Railroad, which parallels the Banfield Freeway in Sullivan Gulch. This ponding is apparently the result of localized hardpan soil conditions.

Although minor erosion has been observed at various points along the Banfield corridor, the soils occurring along the Project alignment are generally considered to be of low erodability. Existing slopes along the freeway and Union Pacific Railroad are stable, even at steep ratios of 1-1/2:1 and even 1:1.

Evidence available from well logs in the Project vicinity indicates that the regional water table currently lies well below the anticipated Project construction zone. There is a possibility of small unmapped perched ground water zones in the region that could be affected; however, even if encountered they would be of very minor significance.

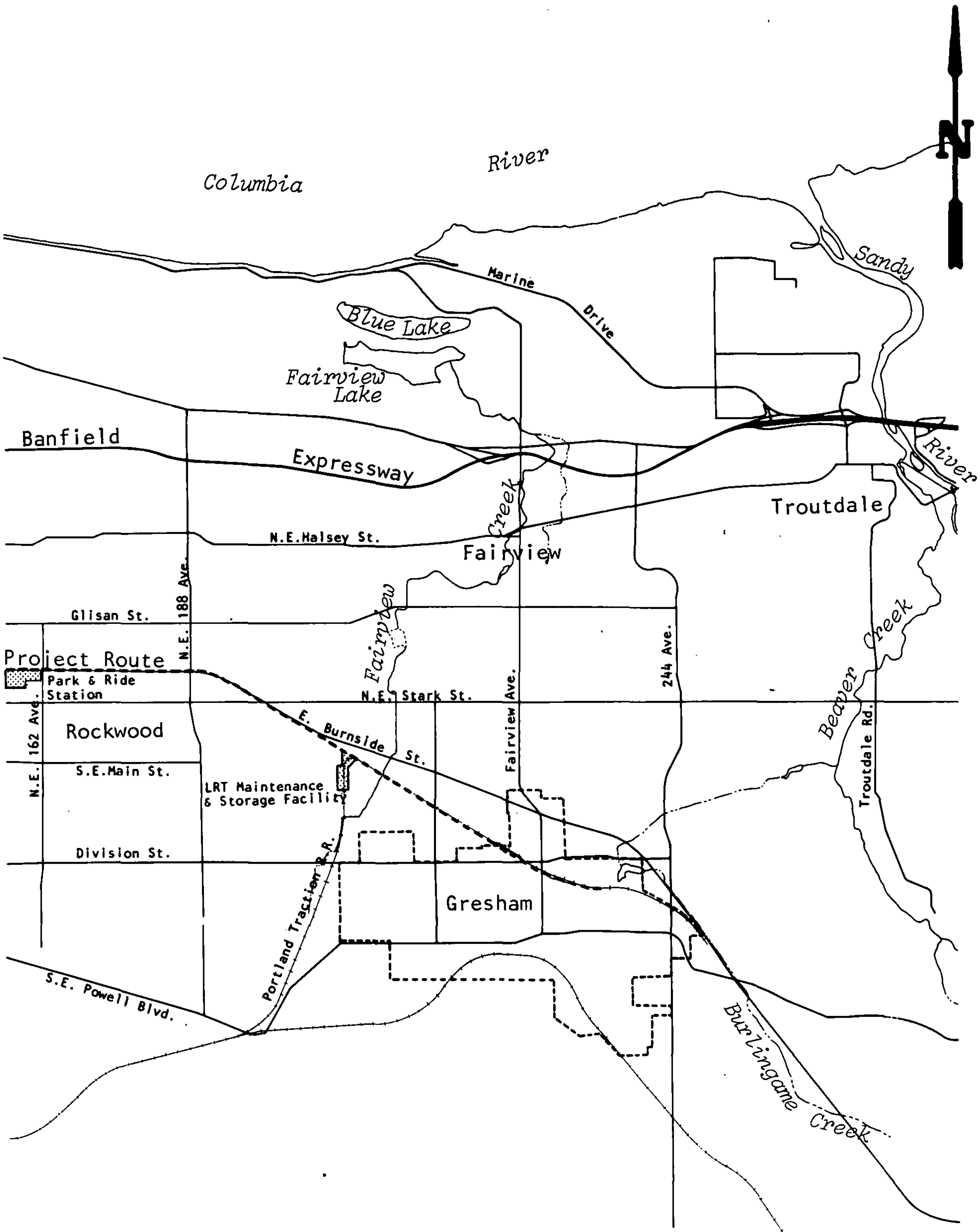
Water resources in the metropolitan region are dominated by the Columbia and Willamette Rivers. Natural drainage patterns in the region are wholly tributary to these 2 major channels. West of I-205 surface water from runoff is channeled to the Willamette River via storm sewers. Drainage from the Banfield Freeway is achieved by a storm sewer located in the center of the facility. The outfall to the Willamette River beneath Burnside Bridge has a capacity of 27 cubic feet per second; compared to the average flow of 33,000 cubic feet per second in the Willamette River itself, this outfall contributes only an insignificant increment to total flow.

Drainage in the eastern portions of the study area is generally to the north. The only 2 well-defined surface flows present are Fairview Creek and Burlingame Creek (Figure 4.10-1). Fairview Creek flows north into Fairview Lake adjacent to the Columbia River, near McGuire Island, with a total drainage area of 5.8 square miles. The drainage area where Fairview Creek crosses Burnside Road near 202nd Avenue, near the Project alignment, is about 2 square miles. Burlingame Creek is a tributary to Beaver Creek, which flows northeast into the Sandy River at the eastern edge of the study area. Near 1st Street and Burnside Road in Gresham, Burlingame Creek has undergone extensive modification as development has progressed. The creek is contained in culverts in the Project vicinity, with no open channel flows.

Water quality measurements were taken in Fairview Creek in 1973 by the Oregon Department of Environmental Quality (1973) and in 1977 by the Oregon Department of Transportation (ODOT, Environmental Section 1977). The more recent measurements show elevated turbidity and phosphate levels and depressed dissolved oxygen levels. This suggests some deterioration in water quality in recent years, probably as a result of continuing development activities and urbanization in the watershed. Several warm water fish species exist in Fairview Lake (e.g., brown bullhead and crappie) and in several small ponds north of Burnside Road (largemouth black bass) (Massey 1977). Some of these probably make their way up the creek within the Project area, at least occasionally, despite periods of minimal flow in Fairview Creek.

In biological terms, the Project area can be classified as "urban" habitat, with the relative intensity of urbanization decreasing from west to east. The existing natural environment has largely been shaped by man's use of the land, and man is everywhere the ecologically dominant species. The existing pattern of vegetation, surface features, and fauna is the result of his modification of the local environment.

Habitat types are very few in the study area. Three principal categories are present: barren lands, grasslands, and trees/shrubs/woodlands. Barren lands are defined as those lands which prohibit plant growth, such



Source:
USGS topographic maps, Camas and Damascus Oregon quadrangles, Photo revised 1970.

FIGURE 4.10-1

BANFIELD TRANSITWAY PROJECT FEIS

SURFACE WATER FEATURES
IN EAST MULTNOMAH COUNTY

as areas occupied by buildings or paved surfaces. No food is produced on barren lands, making them the least valuable biologically. The downtown area is primarily barren lands, except for parklands and riverfront areas, and the fauna present are mostly scavengers. Parklands offer some additional protective cover for birds.

Grassland habitat includes lawns, weedfields, and other broadleaf ground covers. Since seed for food is seldom produced from these lands, their value for wildlife is limited primarily to providing cover. Trees and shrubs are characteristic of many residential areas, where they are closely intermingled as a product of landscaping activities. The existing species in the Project area are a mixture of naturally-occurring remnant individuals and numerous introduced species. East of the Willamette River, both grassland and tree/shrub habitats occur in relatively small units in the vicinity of Holladay Street and the Banfield Freeway corridor. These features, transitional between the downtown area and the less urbanized east Multnomah County area, support some faunal diversity. The east Multnomah County area represents the most productive habitat of any of the study areas, with larger and more clearly defined habitat units supporting more diverse fauna. Species in the eastern portion of the Project area are less tolerant of change than the more limited fauna of the urbanized western portions.

There are no threatened or endangered species or critical habitat areas protected under the Endangered Species Act within the study areas, nor is the proposed right-of-way in or near any wetlands.

4.10.2 Impacts

The impacts of the Banfield Transitway Project on the natural environment are minor in both significance and scale. The impacts of greatest significance relate to water resources.

No major geologic impacts are expected to occur as a result of the Project. No ground water problems (except possible unmapped minor perched ground water zones), landslide areas, or other geologic hazards have been identified. Project construction activities will create the potential for minor soil erosion; total slope areas subject to possible erosion are 7.81 acres. Ditches, berms, and mulching will be used to retard erosion. Construction will also require rock excavation estimated at 372,800 cubic yards (258,600 cubic yards for the Banfield Corridor, 114,200 cubic yards for east Multnomah County up to Stark Street, and minimal amounts for the Portland Traction Company rail corridor to Gresham).

Approximately 200,000 cubic yards of excess material will be generated during Project construction. This relatively large amount of waste material will be disposed of in one of the following two ways: (1) on state-controlled disposal areas (such as the one in the vicinity of Rocky Butte Jail), and (2) on sites selected by the contractor and approved by the Oregon Department of Transportation.

Waste material treatment will be carried out in compliance with all applicable federal, state, and local laws pertaining to the environment. This includes compliance with Section 203.11 "Selection and Use of Excavated Materials," of the Standard Specifications for Highway Construction (Oregon, Transportation Commission 1974).

Construction activities will result in minor increases in paved, impermeable surfaces, principally from improvements along the Banfield Freeway and the development of associated facilities such as the LRT maintenance station and park-and-ride stations. This increase in impermeable surface area will contribute to the alteration of the hydrologic character of the urban watershed. Recharge areas and percolation to ground water reserves will be reduced, and surface runoff will be correspondingly increased. Over time, as development continues, the response time of watersheds (time to peak flows after rainfall) will be shortened; flood heights may increase, especially in smaller streams and drainage channels. The lowered ground water recharge rates may affect dilution of near-surface contaminants and the use of septic tanks and wells. These impacts are typically cumulative, representing many development actions over time. The Project increment in each instance will be minor, although it will contribute to the cumulative effect.

Construction on the Portland Traction Company section of the LRT line could result in minor degradation of fish habitat and water quality in Fairview Creek. Loss of materials into the creek could increase siltation, affect movement of fish, especially during low flows, or otherwise impact existing warm water species in lower Fairview Creek. These impacts will be largely controlled through proper construction practices and are temporary in nature.

The concentration of vehicles at park-and-ride lots and at the LRT maintenance facility creates the possibility of grease and oil washing off and contributing to water quality degradation, if uncontrolled. Such problems are of particular concern at parking facilities, where small leaks from vehicles can contribute substantial, concentrated quantities of greases and oils to be washed off into a relatively small area. These potential impacts will be controlled by collection of runoff at parking areas.

The site being evaluated for development of the LRT maintenance and storage facility is almost entirely to the west of the Portland Traction Company railroad near 199th Avenue (see Figure 4.10-1). Very small portions of this site that are to the east of the railroad are within the preliminary 100-year floodplain of Fairview Creek, as determined by the Portland District Corps of Engineers. The 100-year floodplain is a ponding area which is the result of a restricted culvert on Fairview Creek that cannot pass infrequent high flows. The proposed LRT maintenance and storage facility site itself includes a few small areas on the margin of this ponding area, but the development of the site will not encroach on the ponding area or have any effect on the floodplain. Since the maintenance and storage facility is not a station or otherwise an attractor of additional development, secondary impacts to the floodplain will not occur.

An impact on surface runoff of minor significance would occur from construction of the proposed park-and-ride station at 162nd Avenue, where runoff currently flows down a shallow draw during periods of high rainfall. Obstruction or diversion of these flows would result in some minor increases in flooding potential for surrounding areas.

No major biological impacts have been identified. The 2 most apparent impacts on the area's biological resources are a potential loss of habitat and a loss of plant productivity. These impacts combine to cause a net reduction in area faunal production. The total loss of habitat from the Project is minor, totaling only 45 acres--6 acres in the Banfield corridor and 39 acres in east Multnomah County.

The loss of plant productivity occurs when land presently supporting plant life is converted to barren land. It can be measured by the quantity of energy which would be stored in new plant growth that has been lost. Estimates of this net primary productivity loss for the Project show it not to be of major significance, considering both the number of acres and the type of habitats affected.

4.10.3 Mitigation Measures

Application of readily available mitigation measures, principally relating to construction techniques, will reduce or eliminate many of the potential impacts identified above.

The potential erosion areas will be controlled by designing cut-and-fill slopes appropriately for rock and soil materials, by controlling surface runoff using ditches and berms, and by protecting bare slopes using straw, planting stabilizing vegetation (e.g., grasses), or other types of mulching.

Rock quarry and pit sites will be reclaimed by contouring the slopes and planting vegetation where needed. Surplus material will be disposed of in a manner to preclude affecting ground water or creating unstable areas prone to erosion or landsliding, as discussed above.

The loss of ground water recharge areas to paved impermeable surfaces through construction activities will be permanent. No practical mitigation measures are available to reduce this impact, although the use of conventional tie and ballast LRT track construction over much of the alignment will minimize the area converted to impermeable surface.

The potential impact on fish in Fairview Creek from construction activities along the Portland Traction Company right-of-way will also be minimized, although probably not eliminated, by proper construction practices. Runoff into Fairview Creek from construction areas will be controlled by berms or collection ditches to reduce siltation of the creek. Oils, greases, wash water, and other similar substances used at the maintenance facility will be handled within controlled areas where spills can be contained to prevent their entry into the creek.

Reduction of pollutants entering the storm sewer system and eventually rivers and streams in the area will be accomplished by improved street cleaning procedures or by the use of catch basins. Procedures that deal with the pollutants at the source are preferable, since they have greater efficiency for small particulates.

The potential grease and oil runoff problems at park-and-ride lots and at the LRT maintenance facility parking lot will be controlled by collecting runoff in double sumps. The water at the bottom of these collection points will be removed by a hose-like siphon and routed to storm drains. The oils and greases will be periodically skimmed off, collected, and disposed of properly. The frequency of skimming will be determined by the amount of contaminants.

The oils, greases, wash waters, and other similar substances used within the LRT maintenance facility will be handled within controlled areas. All used oils and greases will be collected in containers and disposed of properly. The frequency of disposal will be determined by the amounts collected. While stored, both new and used combustible substances will be stored in proper containers in noncombustible storage areas.

To avoid reducing the volume of ponding area that is the 100-year floodplain of Fairview Creek, no fill will be placed on the small portions of the maintenance facility site that are within the floodplain unless compensating storage volume is provided. The uses of these areas will be limited to those that are not significantly affected by flooding.

For the minor drainage channel affected by the proposed park-and-ride station at 162nd Avenue, installation of a suitably sized culvert or other flow maintenance channel will eliminate any problem from obstructed or diverted flows.

The loss of biological habitat and productivity will be a long-term irreversible impact, although not of major significance. It could only be offset through creation of new habitat units at other locations in the Project region including, to a minor extent, habitat created as a result of landscaping at transit stations and park-and-ride facilities.

5.0 PROBABLE ADVERSE IMPACTS THAT CANNOT BE AVOIDED

5.1 TRANSPORTATION

Construction of Project facilities will result in some delays and rerouting of traffic along the entire alignment. Construction-related traffic impacts will be temporary.

Operation of LRT will result in a redistribution of traffic along downtown streets for the lifetime of the Project due to closures of the ramp from the Steel Bridge to 1st Avenue and portions of 1st Avenue and Yamhill and Morrison Streets to conventional traffic. The LRT will share the right-of-way with conventional traffic on 1st Avenue and Yamhill and Morrison Streets, thereby creating the potential for conflict. Some downtown parking will be eliminated.

In east Portland, the potential for conflicts between conventional traffic and light rail vehicles will occur along Holladay Street. Traffic access points to some businesses and properties and on-street parking along Holladay Street will be eliminated. However, the establishment of alternate access points and off-street parking should mitigate these impacts.

In east Multnomah County, certain properties and cross streets will lose full access to Burnside Street due to turning restrictions imposed to minimize conflicts with light rail vehicles. These turning restrictions will result in increased out-of-direction travel for conventional traffic and minor increases in response time for emergency vehicles.

5.2 ENERGY

Tne principal adverse impact of the Project with respect to energy will be the unavoidable increase in total regional electricity demand. The estimated annual consumption of up to 29 million KWHe for operation of the Project would constitute a new source of demand for area utilities (PPL and PGE).

Temporary disrupting of traffic during construction of the Project will result in increased energy consumption through delays, congestion effects, and rerouting. This increased energy consumption for transportation will be unavoidable but temporary, and will be small compared to the projected energy savings over the lifetime of the Project.

5.3 LAND USE AND SOCIOECONOMICS

Construction of the Project facilities will result in the displacement of residential, institutional, and commercial structures, resulting in the relocation both of people and businesses. Construction activities will impose proximity (noise, air quality, traffic) impacts which will have adverse impacts on the livability of adjacent residential areas.

Access to some businesses and residences will be lost or reduced during construction. Losses of access to some properties will continue for the life of the Project. Street closures along Holladay Street may result in a reorientation of some businesses from automobile users to transit patrons. LRT will result in some street closures along Burnside Street. These closures will adversely affect local access for residents and emergency vehicles, resulting in out-of-direction travel. The transit stations will create significant additional proximity impacts on nearby residential receptors, affecting general livability.

LRT facilities along Burnside Street also may have adverse impacts on neighborhood cohesiveness by creating a physical and psychological barrier to established social interaction patterns. Provision of adequate pedestrian crossings, as proposed, will mitigate these impacts.

Lands along the Project right-of-way will be converted from residential, commercial, and institutional uses to transportation use for the life of the Project. Unless land use controls implemented subsequent to Project development are directed at focusing future development near transit facilities, land use patterns in east Portland and east Multnomah County may become decentralized. A series of poorly defined and transitional activity centers could result. Haphazard infilling between these centers will result in inefficient land use patterns.

5.4 CULTURAL RESOURCES

A finding of no adverse effect on the Portland Skidmore/Old Town Historic District and numerous other cultural properties has been concurred with by the Advisory Council on Historic Preservation contingent on Tri-Met's meeting additional conditions, which Tri-Met has agreed to do.

5.5 AESTHETICS

The aesthetic quality of a particular scene is subjective. Therefore, aesthetic impacts associated with the Project are largely subject to interpretation by the individual viewer. In any case, most viewers are likely to regard the addition of some Project facilities as visually intrusive. Overhead wires, support poles, trackage, and stations associated with the LRT as well as new freeway ramps, overpasses, and noise barriers will cause the most significant changes to existing views. These facilities and structures may obscure portions of scenes viewed from various vantage points. Probably the most significant visual impact will result from installation of overhead LRT wires and poles downtown. These facilities will cause visual complexity in downtown areas where no utility poles or wires exist and will provide visual contrast with facades of historically significant buildings. Construction will impose visual impacts as well, including temporary views of stockpiled materials, scarred earth and rubble, construction activity, and developing LRT and freeway facilities. The adverse aesthetic impacts of Project construction and operation will be tempered by the adherence of the Project alignment to existing transportation corridors, thereby creating a visual unity with existing transportation networks.

5.6 AIR QUALITY

There are no unavoidable air quality impacts associated with the project. Impacts identified in this document can and will be mitigated in accordance with the DEQ Indirect Source Permit (See Section 4.8.4 and Section 6.0 of the Air Quality Technical Report.)

5.7 ACOUSTICS

Construction noise is anticipated to result in speech interference and annoyance in cases of residences within several hundred feet of construction. All construction equipment will comply with the maximum permissible sound level as per the City of Portland's noise ordinance.

LRT passbys will result in single-event short duration maximum sound levels 52 to 82 dB at distances of 50 feet from the center of the near track. In downtown areas, the construction of barriers to reduce peak passby sound levels is not feasible.

5.8 NATURAL ENVIRONMENT

Construction will result in topographical changes along the Project alignment. Excavation of 372,800 cubic yards of rock will be required to provide foundation support and fill for the Project facilities.

The construction of freeway structures, parking lots, station platforms, and other Project facilities will create impermeable surfaces resulting in loss of ground water recharge area. Erosion during construction and subsequent runoff will also result in minor degradation of fish habitat and general water quality in Fairview Creek. However, these impacts will not be significant.

Project construction and operation will result in minor losses in habitat (37.3 acres) for the life of the Project. The Project will also result in a loss of net primary production due to the loss of land capable of supporting plant life.

6.0 RELATIONSHIP BETWEEN LOCAL SHORT-TERM USES OF MAN'S ENVIRONMENT AND THE MAINTENANCE AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY

Impacts associated with the Banfield Transitway Project include the expenditure of energy and construction materials, the taking of land for rights-of-way, the displacement of residents and businesses, disruptions of traffic during construction, short- and long-term loss of access to some streets and properties, minor loss of natural habitat, minor reductions in net biological productivity, and localized proximity effects such as increased noise and air pollution. On the other hand, the Project will have a significant long-term beneficial impact on the region, compared to the No-Build condition. Transit and traffic service and efficiency on the East Side will be improved. As a result, the Project will result in greater long-term energy and human efficiency than the No-Build condition, thereby enhancing the regional economy and general quality of urban life.

The Project, by improving the efficiency of the urban transportation system, will accommodate urban expansion and long-term population/employment growth in a more concentrated, transit-supportive manner, particularly in east Multnomah County. Assuming proper application of land use control mechanisms, future development can be focused along the Project corridor, further increasing the efficiency of the urban transportation system.

While construction and operation of the Project facilities will impose adverse air quality and noise impacts on some receptors, the regional air quality and noise environments will improve, compared to the No-Build condition.

7.0 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

The Project will require the conversion of private property to publicly owned right-of-way. In addition, the development of freeway improvements and LRT facilities represents a commitment that is irreversible, at least in the short term. On the other hand, implementation of the Project will cause an intensification and increased density of development along the LRT route, particularly in the vicinity of transit stations. This will tend to reduce the requirement of converting additional land to urban development, thus reducing the commitment of such land to urban uses.

The commitment of manpower and other energy resources for construction of the Banfield Transitway Project would be only partly recoverable through recycling of construction materials (LRT rails, asphalt, cement, etc.). Most of the investment of energy in construction would be irreversible and irretrievable.

All of the operational energy requirements of up to 29 million KWHe per year would be committed irreversibly and irretrievably. This represents the principal commitment of energy resources for the Project. While irreversible and irretrievable, this investment in energy must be weighed against the energy savings attributable to other components of the Project's energy impacts. As shown by the net energy analyses, the combined results of these energy commitments and savings would produce small net annual energy savings (in relation to the total regional transportation energy use) by reducing the private automobile VMT and traffic congestion, compared to the No-Build condition. Based on 1990 estimates, the annual net energy savings for the entire Project will be equivalent to about 1.5 million gallons of gasoline (equivalent), at most.

8.0 COMMENTS AND RESPONSES

8.1 INTRODUCTION

A formal public hearing was conducted on the Banfield Transitway Project at the Floyd Light Middle School in Portland on April 6, 1978 (see Section 2.3.1). The hearing was conducted in conformance with all applicable federal regulations and requirements contained in the Oregon Action Plan.

Nearly 300 private citizens and interest groups submitted comments on the Project and the DEIS either during the public hearing or in subsequent letters to the Oregon Department of Transportation, Division of Highways.

Review and synthesis of all comments received indicated the presence of general areas of comment. These areas of comment, which are presented and responded to in Section 8.2, essentially provide a summary of all substantive public hearing comments. Specific substantive comments that are related to the generalized comments are presented immediately following the response to the generalized comment to which they apply. The comments address specific related areas of interest that either: (1) are not fully covered in the FEIS or in the response to the general comment, or (2) are significant enough to warrant individual response.

In addition to comments received by private citizens and interest groups, several state and federal agencies submitted comments on the Banfield Transitway Project DEIS. Responses to specific agency comments are presented below in Section 8.3. The agency letters are reproduced in their entirety in Section 8.4.

8.2 PUBLIC HEARING SUMMARY

This section summarizes the public hearing by presenting public comments presented in association with the hearing proceedings. Sections 8.2.1 through 8.2.9 present comments and responses keyed to the identified general areas of comment as follows:

Section	Area of Comment
8.2.1	Selection of the Banfield Corridor for a Regional Transitway
8.2.2	LRT Project Costs/Ridership Potential
8.2.3	Recommended New Alternatives/Variations on Alternatives Studied in DEIS
8.2.4	Traffic/Pedestrian Circulation
8.2.5	Reliability/Safety of LRT
8.2.6	Use of Existing Trackage
8.2.7	Adverse Proximity Impacts Imposed by LRT
8.2.8	Energy
8.2.9	LRT's Impacts on Development Patterns

Section 8.2.10 lists those persons submitting public hearing comments and the general areas of concern to which their comments are directed.

8.2.1 General Comment No. 1: Selection of Banfield Corridor

8.2.1.1 SUMMARY OF RELEVANT COMMENTS

Several comments were directed at the reasons for placing the proposed transitway project in the Banfield Corridor instead of in the Johnson Creek and Division-Powell corridor.

8.2.1.2 RESPONSE

The rationale for selecting the Banfield corridor for development as the major transportation link between east Multnomah County and the Portland CBD is documented in both the DEIS (Part A) and the FEIS (Section 1.0). Generally, the Banfield corridor was determined to be most suitable for the development of a transitway due to the presence of a major transportation system (the Banfield Freeway) within a portion of the corridor, the potential for developing substantial mass transit ridership within the corridor, and reduced potential for imposing severe adverse environmental and socioeconomic impacts as compared to this corridor. Specific reasons for the elimination of the Johnson Creek and Division-Powell corridors from consideration as major transitway corridors are presented on page 42 of the DEIS.

8.2.1.3 SPECIFIC RELEVANT COMMENTS AND RESPONSES

Comment: The DEIS indicates that Johnson Creek was eliminated in November 1976 as an alternative. This constituted an administrative decision, not a public decision as a result of a sufficiently prepared EIS as mandated under NEPA for the expenditure of all federal funds.

Response: NEPA requirements are not applicable until a Draft Environmental Impact Statement is filed on a proposal. The decision to eliminate Johnson Creek as a potential transit route was within the authority of public decision makers and did not require the approval or participation of citizens.

8.2.2 General Comment No. 2: Project Costs

8.2.2.1 SUMMARY OF RELEVANT COMMENTS

Comments concerning Project costs generally were directed at: (1) the high cost of LRT in comparison to the other alternatives considered, (2) funding strategies to be employed by Tri-Met, and (3) the sufficiency of projected LRT ridership to justify Project construction and operation.

8.2.2.2 RESPONSE

8.2.2.2.1 Comparatively High Cost of LRT

As indicated by cost data presented in Chapter 2 of the DEIS and in Table 2.2-1 of the FEIS, the total systems cost of LRT in the Banfield/ Burnside corridor is not significantly higher than costs associated with 2 of the High Occupancy Vehiclee (HOV) alternatives (3b and 3c) and both Separated Busway alternatives. While the No-Build, Low Cost Improvement (LCI), and one HOV alternative (3a) involve substantially lower total system costs, they do not afford: (1) the overall transportation and transit improvements, (2) the potential for mass transit ridership, or (3) the level of environmental protection to surrounding land uses in terms of reduced air pollution and noise afforded by the LRT-Banfield/ Burnside alternative. Section 2 of the FEIS provides a comparison of impacts for all alternatives considered and justification for selection of LRT as the preferred transit alternative.

8.2.2.2.2 Project Funding

The funding strategy for the Banfield Transitway Project is discussed in Section 3.6 of the FEIS. Project start-up costs are estimated at $161.1 million. Local match from State General Funds (over 6 years) is estimated at $15.5 million. Tri-Met will contribute $2.3 million toward construction of the Project. These expenditures are within statutory funding limits. Tri-Met will be responsible for operating the LRT facilities under established budgets. While sufficient patronage to justify the LRT is projected, any losses incurred in the operation of the LRT facilities will be borne primarily by system users through rate increases and other Tri-Met funding sources. Therefore, the Project is not expected to result in any increases in local or state taxes in support of transportation (transit) projects. It should be noted that any future request for additional revenue sources would stem from rising costs due to inflation and additional service improvements needs as they affect the overall Tri-Met system operation. Tri-Met has already begun to identify additional revenue sources should such costs be incurred.

8.2.2.2.3 Transit Ridership

LRT with a feeder bus system has the greatest potential for attracting ridership of all alternatives considered (see Chapter 1 of Part C of the DEIS and Section 2 of the FEIS). The ability of LRT in the Banfield corridor to attract ridership is discussed in Section 4.2 of the FEIS and in Section 1.2.2.3 of the Transportation Technical Report. Significant population growth is expected to occur along the Project corridor, further enhancing ridership (see Section 4.5 of the FEIS and Section 4.2.1.1 of the Socioeconomic Technical Report.

8.2.2.3 SPECIFIC RELATED COMMENTS AND RESPONSES

8.2.2.3.1 High Cost of LRT

<u>Comment</u>: The relatively high cost of LRT would be more justifiable if Oregon or American products and services were to be used in the Project. Are such products and services going to be used?

Response: Tri-Met and ODOT will be conducting most of the engineering and design services associated with the proposed system. Since normal building construction methods will be used, qualified local firms will be contracted, where possible, to install the system and construct appurtenant structures. Vehicle selection will be on a competitive bid basis.

Comment: Does the $161.1 million Project cost presented in the DEIS include costs associated with: (1) street, drainage, and sidewalk improvements required due to Project development, (2) right-of-way acquisition and relocation, (3) any widening of north/south streets used for feeder bus routes, (4) signals at all LRT crossings, and (5) any required pedestrian crossroads?

Response: All cited costs have been included in the Project cost with the exception of the cost of widening streets used for feeder bus routes. Widening of such streets will not be required by the Project and, as such, are not part of the Project cost.

8.2.2.3.2 Project Funding

Comment: What plan (project) did the Highway Commission commit to in order to obtain the transferred Mount Hood Freeway funds?

Response: Section 103(e)4 of the Federal Aid Highway Act of 1976 provides for the transfer of funds designated for interstate highway construction for use in the development of mass transit projects and the purchase of passenger equipment, such as rolling stock, for any mode of mass transit. The section contains no requirement for identifying specific mass transit projects as a prerequisite for transfer of funds. The section requires only that the transferred funds are to be used for projects within the area in which the withdrawn interstate route was located. The funds shall be made available until obligated to such projects.

Comment: Will taxes on personal income be increased to finance rising operating costs due to inflation? If so, this will have a significant adverse effect on persons living on a fixed income.

Response: Every attempt has been made to assign a cost estimate that considers changing rates of inflation. As a result, the funding strategy for the Project (see Section 3.6 of the FEIS) does not necessitate an increase in taxes due to inflation.

8.2.2.3.3 Transit Ridership

Comment: Are any specific measures being considered to increase potential ridership for LRT in the Banfield corridor?

Response: An increase in downtown parking rates is being considered as a means of increasing ridership on transit connecting the downtown area with all outlying areas. In addition, improvements in bus service specifically relating to connectivity with LRT are planned as part of the Project.

Comment: The incorporation of large light rail vehicles into the proposed LRT system will require long lead times at stations and, therefore, longer waiting periods for LRT passengers. These long waiting periods will adversely affect potential ridership necessary to sustain LRT operation.

Response: The use of large capacity light rail vehicles will result in longer headways and longer waits. However, the LRT schedules and headways will be designed to permit loading of the larger capacity vehicles to be incorporated into the system.

8.2.3 General Comment No. 3: Recommended New Alternatives and Variations on Alternatives Studied

8.2.3.1 SUMMARY OF RELEVANT COMMENTS

Several persons submitted comments recommending that specific additional alternatives and variations on existing alternatives be studied. Specific alternatives recommended are addressed below in Section 8.2.3.3.

8.2.3.2 RESPONSE

LRT in the Banfield corridor was selected as a result of data presented in the DEIS and Tri-Met's Preferred Alternative Report (see Section 2.3.2 of the FEIS). Generally, LRT was found to be cleaner and safer than other forms of transit studied. LRT also was determined to impose fewer adverse effects on neighboring residential areas than an augmented bus-oriented system while affording greater ridership potential. The Banfield corridor was selected for the transitway for the reasons discussed in Section 8.2.1.

8.2.3.3 SPECIFIC RELATED COMMENTS AND RESPONSES

8.2.3.3.1 New Alternatives for Consideration

Comment: Division Street should be expanded to 5 lanes east to I-205. In addition, the Banfield Freeway should be expanded to 6 lanes by eliminating the HOV lanes.

Response: The development of Division Street as a major regional transitway was eliminated from consideration for reasons stated in Part A of the DEIS and in Section 1 of the FEIS. In any case, the recommended development of a major bus/automobile-oriented transitway as indicated is not responsive to the changing energy environment.

In a period which calls for energy conservation due to dwindling energy supplies, particularly petroleum, Oregon has been called upon to reduce gasoline consumption. This will continue to restrict automobile usage, particularly for nonessential trips. While East Side residents may favor the automobile as the major transportation mode, LRT will provide an important alternative--one that has the potential for reducing automobile usage throughout the East Side, particularly for home-to-work trips. This in turn is expected to result in generally improved traffic conditions throughout the East Side (see Sections 4.2 and 4.3 of the FEIS).

Comment: We should be thinking about a subway system from east of Gresham to downtown Portland with park-and-ride stations along the way.

Response: The proposed LRT will provide park-and-ride facilities at selected locations along the alignment east of I-205. The cost of locating the LRT system underground is prohibitive.

Comment: Tri-Met should consider incorporating battery-powered buses into the transit system.

Response: Such buses are only experimental at present.

8.3.3.3.2 Recommended Variations on Alternatives Studied

Comment: If LRT is selected, it should extend to Gateway only.

Response: Extending LRT to Gresham will provide better transit service and opportunities for more East Side residents. This service can result in beneficial economic and growth patterns for east Portland and east Multnomah County as well as reduce the growth of traffic on the Banfield Freeway and east Multnomah County arterials.

Comment: A modified Alternative 3c should be implemented. The Banfield Freeway should be improved to permit 8 full lanes (4 in each direction) from I-5 to I-205. General traffic should be permitted to use all lanes; no restricted (HOV) lanes should be established. Transit would be permitted to use the Banfield Freeway but would operate in mixed traffic.

Response: This option would promote continued use of the private automobile as the primary mode of transportation and, as such, is not supportive of effective, energy-efficient mass transit.

Comment: The Banfield Freeway should be increased to 6 lanes with 2 additional HOV lanes and shoulders. A turn-out lane in the median also should be incorporated for use by disabled vehicles.

Response: This recommendation essentially equates to Alternative 3c with a turn-out lane added. This configuration would exceed the right-of-way available for freeway improvements. The acquisition of sufficient right-of-way to incorporate these improvements would be virtually impossible in Sullivan Gulch. East of Sullivan Gulch, acquisition of sufficient right-of-way either would require relocation of the Union Pacific Railroad further to the north or would require further encroachments into neighborhoods to the south.

Comment: The downtown portion of the LRT alignment should be extended to serve the South Auditorium Urban Renewal Area.

Response: The proposed downtown alignment addresses the immediate transit demands of the downtown Portland CBD. Future extensions of LRT service to other urban destinations, such as the South Auditorium Urban Renewal Area, could be implemented in the future, when transit demand is amply demonstrated.

Comment: If LRT is selected, the system should be designed to circle the metropolitan area to cut costs. The circumferential LRT system should be augmented by feeder bus service.

Response: The development of an LRT system circling the metropolitan area (circumferential routes) instead of a system focused on downtown (radial routes) would be contrary to the travel patterns found in the Portland area and most other regions in the country. For example, the PM peak hour trip estimates among 12 analysis zones covering the Portland area show that about 40 percent of the trips are circumferential in nature. These 40 percent are spread out over the entire urban area. In contrast, the radial-type trips amount to 32 percent of the total (the remaining 28 percent are internal trips) and are concentrated in corridors. Although there are fewer radial trips than circumferential, their concentration makes them the more desirable market for transit. This pattern of travel is one of the reasons that transit has historically been radially oriented and why cross-town transit service has so often failed.

Unit transit operating costs on circumferential routes might be less than on radial routes due to potentially higher operating speeds. However, experience has demonstrated many times that patronage is likely to be substantially lower as well. Successful cross-town transit routes are usually those that serve high trip generators such as stations on radial transit lines.

Comment: Regardless of the transit mode selected, a grid-type network, not a radial network, should be established.

Response: The cross-town feeder bus system in combination with radially oriented LRT essentially comprises a grid transit network.

8.2.4 General Comment No. 4: Traffic/Pedestrian Circulation Problems

8.2.4.1 SUMMARY OF RELEVANT COMMENTS

Comments submitted on the potential traffic and pedestrian circulation problems created by the LRT in the Banfield/Burnside corridor focused on: (1) Project-created out-of-direction travel for emergency and general traffic due to turning restrictions along Burnside Street, (2) disruptions of normal traffic circulation patterns and access to certain businesses along Holladay Street, (3) maintenance of pedestrian access along Burnside Street, and (4) the Project's impact on emergency evacuation of Portland.

8.2.4.2 RESPONSE

8.2.4.2.1 Out-of-Direction Travel Along Burnside Street

Twelve cross streets will remain open along Burnside Street once the LRT is operational: 102nd, 113th, 122nd, 139th, 148th, 162nd, 172nd, 181st, Stark, 199th, 202nd, and Wallula Avenues (see Sections 3.4 and 4.2.3.3 of the FEIS and Section 1.2.2.2.3 of the Transportation Technical Report). All other cross streets along Burnside Street will be closed. These street closures combined with turning restrictions imposed by the Burnside LRT alignment will create out-of-direction travel for both general and emergency vehicles. About 1,400 dwellings along Burnside Street will be affected by out-of-direction travel from either the east or west amounting to distances up to over 1/2 mile. Therefore, out-of-direction travel along Burnside will increase trip times and total vehicle miles traveled (VMT). Emergency response distances and times will increase accordingly. Although response times will increase due to out-of-direction travel requirements, this increase will not be substantial enough to cause an increase in fire insurance rates.

Project-created out-of-direction travel along Burnside Street is discussed in Section 4.5.2 in the FEIS text and Sections 1.2.2.2.3 and 4.3.1.2.2 in the Socioeconomic Technical Report.

8.2.4.2.2 Circulation Access Along Holladay Street

No cross streets will be closed due to Project development along Holladay Street. However, loss of some automobile access and parking will accrue to certain properties fronting Holladay Street (see Section 4.5 in the FEIS).

As a result, such businesses could experience a loss in automobile-oriented trade. Once the LRT is operational, however, pedestrian traffic along Holladay Street will increase, particularly near the site of LRT stations such as Union/Grand. This increase in pedestrian traffic will compensate, at least in part, for the loss of automobile-oriented trade.

The impacts of lost or restricted access and parking to such properties are discussed in Sections 4.4.3 and 4.5.2 of the FEIS and Sections 3.4.2 and 4.3.2.3.1 of the Land Use and Socioeconomic Technical Reports.

8.2.4.2.3 Maintenance of Pedestrian Access Along Burnside Street

The Project will not result in any significant loss of pedestrian access along Burnside Street. As indicated in Section 3.4 of the FEIS, the LRT will be at grade with Burnside Street; no protective fences will be erected. Therefore, pedestrians will physically be able to cross the LRT tracks at any point along Burnside Street. Designated pedestrian crosswalks are planned at 36 locations along Burnside, including 102nd, 108th, 113th (2 crosswalks), 117th, 119th, 120th, 122nd, 126th, 129th, 136th, 139th, and others to the east. Mid-block crossings also have been proposed near Ventura Park School, Menlo Park School, Glenfair School, and Rockwood Park School (please see Figure 1.1-1). Pedestrian signalization will be included at cross-street walkways, but is not currently planned for mid-block (school) walkways.

8.2.4.2.4 Project Effect on Emergency Evacuation

The Project is not directed at improving emergency egress from Portland. However, the Project will provide additional lanes on the Banfield Freeway east of 33rd Avenue and will incorporate improvements designed to facilitate access to the freeway from certain east Portland locations. To the extent that these improvements would facilitate movement of traffic during an emergency, the Project will have positive impacts on emergency egress.

8.2.4.3 SPECIFIC RELEVANT COMMENTS

Comment: Traffic congestion along Holladay Street would be reduced if a new off-ramp were constructed from the freeway onto 16th Avenue instead of Holladay Streeet. This would permit distribution of traffic along several arterials parallel to Holladay Street.

Response: The option of constructing a new exit ramp onto 16th Avenue as opposed to Holladay Street was considered and rejected. The 16th Avenue option would result in dramatically increased congestion along several arterials and at several intersections in east Portland. The Holladay route was determined to afford the most favorable access and circulation characteristics.

8.2.5 General Comment No. 5: Comparative Service/Safety Afforded by LRT

8.2.5.1 SUMMARY OF RELEVANT COMMENTS

Comments received on the relative degree of transit service and safety afforded by LRT as compared to buses focused on (1) the connectivity and flexibility of LRT, (2) the maintenance of transit service for the transportation disadvantaged, (3) the susceptibility of LRT service to interruptions due to power outages, (4) the susceptibility of LRT to earthquake damage, (5) the potential for increased accident rates due to conflicts between automobiles and light rail vehicles along shared rights-of-way, as well as the potential for serious accidents between light rail vehicles, and (6) pedestrian safety near LRT facilities.

8.2.5.2 RESPONSE

8.2.5.2.1 Connectivity/Flexibility of LRT

According to studies conducted by Tri-Met (Tri-Met and ODOT 1979b), a grid-type transit network comprised of LRT in the Banfield corridor augmented by a feeder bus system offers the greatest potential for attracting transit ridership of all alternatives considered (see Section 2.3.2 of the FEIS text). In addition, LRT with a feeder bus system affords the highest assurance of long-term transit use, high connectivity, and increased transit efficiency through a reduction in route duplication.

LRT adaptability and flexibility are limited since the rail lines are fixed. However, a degree of system flexibility is derived through the flexibility of feeder bus lines.

The selection of LRT for the Banfield corridor will not preclude the development of other transit modes or improvements in other corridors. However, it should be noted that regional solutions were considered in the travel forecasting and analysis that were a part of the planning for LRT and other alternatives. One test network of facilities included LRT in the Banfield corridor plus busways elsewhere (Banfield only-LRT). A second layout included LRT in the Banfield, Sunset, and Oregon City corridors (3-corridor system).

Results indicated that the 3-corridor system would increase patronage on the East Side and would reduce bus volumes on the Portland Mall. In terms of passengers per vehicle-mile, the Banfield-only LRT was slightly superior to the 3-corridor system. In terms of passenger-miles per vehicle-mile, the 3-corridor system outperformed the Banfield only-LRT option.

LRT in the Banfield/Burnside corridor will result in a reduced level of bus service from East Side locations to certain destinations, including the Portland CBD. Downtown service will be maintained on Sandy and Powell Boulevards. Local service within east Multnomah County will be maintained on all east/west arterials includng Halsey, Glisan, Stark, Market, and Division Streets. This reduction in bus service will result in a decreased level of transit service for some residences of the East Side despite the incorporation of LRT.

8.2.5.2.2 Maintenance of Transit Opportunities for the Transportation-Disadvantaged

Elderly, handicapped, and other transportation-disadvantaged persons in the Portland East Side area currently must rely upon either automobile or bus as their major means of transportation. Users of the present transit system are required to transfer, depending upon origin and destination. Since transit stations will serve as bus/LRT transfer points, the rider will have a wider range of transit options available to him (her) at one location. This will benefit not only the transportation disadvantaged, but the general commuting public as well. It should be noted that special features designed to facilitate the use of LRT by the handicapped will be incorporated into the transit stations and light rail vehicles (see Section 3.4 of the FEIS text).

8.2.5.2.3 Service Disruptions Due to Power Outages

Electrical power for the LRT will be provided through multiple tie-ins (approximately 20) with 2 utilities: Portland General Electric (PGE) and Pacific Power and Light (PP&L). The incorporation of multiple electric power tie-ins, each to a separate substation, will greatly reduce the possibility of a total loss of service for any reason. The loss of any primary supply (substation) will degrade system performance somewhat (e.g., lower top speed), but the operation of the system will be maintained.

PGE experience with outages in the metropolitan Portland area has shown that downed trees are the most serious problem affecting service. The principal cause of power outages during most ice storms is downed lines caused by falling trees or branches. The location of the LRT corridor is such that almost no trees will be capable of reaching the electric lines except along the Portland Traction Company section of the alignment.

The system will be designed to withstand most severe weather without loss of service. LRT electric lines will be designed with consideration of both ice (vertical) and wind (horizontal) loadings. Possible problems of ice buildup acting as an insulator at power connections will be addressed by keeping power on to prevent ice accumulation.

8.2.5.2.4 Earthquake Damage

The Portland metropolitan area has been characterized on a seismic risk map of the conterminous United States (Algermissen, U.S. Coast and Geodetic Survey, 1969) as possessing only moderate seismic risk (Zone 2).

The LRT system would be no more susceptible to earthquake damage than the alternative systems that were considered. Furthermore, any damage to a rail system would probably be less costly and easier to repair than highway damage.

8.2.5.2.5 Accident Potential

Conflicts between automobile and LRT traffic will be minimized through the establishment of exclusive LRT rights-of-way along the Banfield Freeway, I-205, and Burnside Street and the incorporation of dividing barriers along Holladay Street. As a result, accidents involving automobiles and transit vehicles are generally expected to decline with LRT. However, conflicts between automobile and LRT traffic will occur along approximately 10 percent of the alignment when separation is not feasible. The nonseparated sections of the alignment include: (1) downtown street-running sections; (2) the Steel Bridge section; and (3) at-grade crossings along Holladay and Burnside Streets.

The potential for accidents occurring between light rail vehicles will be reduced through the incorporation of a number of safety features. Both signalization and an automatic train slip capability will be incorporated along the Banfield Freeway segment of the alignment where operating speeds will be highest. Along other segments of the alignment, lower operating speeds and manual control will be employed. Established vehicle headways will be adequate to provide a reasonable measure of safety while maintaining an acceptable level of transit service.

8.2.5.2.6 Pedestrian Safety

The LRT will run down the center of Burnside Street, separated from pedestrian activities by automobile traffic lanes. Those segments of the LRT system that run along Burnside and Holladay Streets will be separated by curbs, thereby improving the safety characteristics of the line. In addition, LRT along Burnside, Holladay, and downtown streets will use lower operating speeds and will be operated with manual control.

As indicated in Section 8.2.4, crosswalks will be provided at street crossings along Burnside Street with mid-block crossings near Ventura Park School, Menlo Park School, Glenfair School, and Rockwood Park School (see Figure 1.1-1). Pedestrian signalization will be included at cross street walkways, but is not currently planned for mid-block walkways. The relatively long interval between LRT vehicles (approximately 10 minutes) will provide an added measure of safety.

Concerns over the safety of children living and playing near the LRT facilities were expressed in several comments. The LRT will not be physically separated from residential areas or nearby streets by protective fences. However, it should be noted that the same rules of safety apply to crossing an LRT track as apply to the crossing of a street, railroad, or any other transportation corridor. Teaching children how to safely cross such corridors, including the proposed LRT alignment, is a function of the home and schools.

8.2.6 General Comment No. 6: Use of Existing Trackage

8.2.6.1 SUMMARY OF RELEVANT COMMENTS

Several comments focused on why the LRT alignment was not designed to use existing trackage, such as the Portland Traction Company's Bell Rose line and Union Pacific Railroad lines, thereby reducing construction costs.

8.2.6.2 RESPONSE

It should be noted that the primary purpose of the Project is not to facilitate travel between downtown Portland and Gresham, but to facilitate the transport of people, goods, and services from and between destinations on the East Side and downtown. Development of transit and freeway improvements along the Banfield corridor provides the greatest opportunity to accomplish this purpose. Therefore, use of existing trackage along the Portland Traction Company's Bell Rose Line to the south is precluded.

The Union Pacific Railroad line is the only existing railroad trackage along the Banfield Freeway. Use of this line is not feasible for several reasons. The Union Pacific Railroad Company will not sell the line since the line constitutes part of the system's main line serving cities in the west. The company operates several trains a day along this line. These trains move at relatively slow speeds and are often in excess of a mile long. The frequency and length of these trains precludes the sharing of the line with light rail vehicles. It should be noted that the LRT right-of-way along the Banfield encroaches upon the Union Pacific Railroad line to the greatest extent possible without adversely affecting normal operation of the line.

The Union Pacific Railroad Company is considering the future conversion of its existing line to permit operation of electrically powered locomotives. Even if this conversion takes place, the power requirements of such a system (25,000 KV) will not be compatible with the requirements of the LRT system (750-volts DC).

Finally, it should be noted that the cost of purchasing railroad rights-of-way (even if present owners desired to sell) combined with necessary trackage refurbishments would not represent a great savings over installation of new trackage over the same distance.

8.2.7 General Comment No. 7: Adverse Proximity Impacts Imposed by LRT

8.2.7.1 SUMMARY OF RELEVANT COMMENTS

Comments submitted on the potential for adverse proximity impacts imposed by the Project focused on: (1) aesthetic impacts; (2) noise impacts; (3) air quality impacts; and (4) impacts associated with relocation and acquisition of right-of-way.

8.2.7.2 RESPONSE

8.2.7.2.1 Aesthetics

Light rail transit will require an overhead wire network and supporting structures. A description of the visual character of the alignment and the aesthetic impact of adding this network is discussed in Sections 4.7.1 and 4.7.2 of the FEIS text and Sections 6.1 and 6.2 of the Supplemental Technical Reports. Generally, the greatest aesthetic impacts will occur in areas where no overhead wires currently exist (such as downtown Portland, along part of Holladay Street, and along the Banfield Freeway) and along those segments of the alignment that run through the downtown historic districts.

Visual impact of overhead wires and support poles associated with the LRT will be mitigated downtown and along Holladay Street by incorporating span wires connected to building facades. Mitigation of the visual impact along Burnside Street will be achieved through consolidation of existing and LRT-associated overhead wiring and support poles. Landscaping techniques will also be used to mitigate visual impacts of the LRT. A description of these techniques can be found in Section 4.7.3 of the FEIS text and Section 6.3 of the Technical Reports.

Section 3.6 of the FEIS describes: (1) the character of the historic districts through which the LRT alignment will pass; (2) the potential aesthetic impacts associated with the construction and operation of LRT in these districts; and (3) measures proposed to mitigate the adverse aesthetic impacts that might be imposed by LRT within these districts.

8.2.7.2.2 Noise

Project construction and operation will impose adverse noise impacts on some localized areas. Operational noise will be mitigated by noise barriers to be constructed along the Banfield Freeway where feasible and practical and where other mitigating measures do not reduce noise to required levels. The positioning and height of barriers will be adequate to mitigate noise impacts accruing from passing traffic.

Section 4.9.2 of the FEIS text and Section 2.0 of the Acoustic Technical Report present updated noise projections along the Project alignment. Project-generated noise impacts imposed on residential and other noise-sensitive uses are discussed in Section 4.9.3 of the FEIS and Section 3.0 of the Acoustics Technical Report. Contours depicting specific noise characteristics associated with the Project are presented in the Acoustics Technical Report.

Specific comments related to noise are addressed in Section 8.2.7.3.1, below.

8.2.7.2.3 Air Quality

The effects of the Project on the air quality characteristics of critical receptors are discussed in Section 4.8.3 of the FEIS text and Section 3.0 of the Air Quality Technical Report. Generally, emissions at these receptors will decrease under the Build (with Project) condition both in 1985 and 1990 compared to the No-Build condition.

8.2.7.2.4 Relocation/Right-of-Way Acquisition

Relocation and right-of-way acquisition impacts associated with the Project are discussed in Section 4.4.1 of the FEIS text and Section 3.5 of the Supplemental Technical Reports. Most of the comments related to such impacts were specific and, as such, are addressed below in Section 8.2.7.3.

8.2.7.3 SPECIFIC RELATED COMMENTS AND RESPONSES

Comment: What proximity impacts will the construction and operation of Project freeway improvements have on the Providence Child Center? How will these impacts be mitigated?

Response: The freeway improvements implemented under the Project will impose proximity impacts on the Child Center. The improvements will require the acquisition of an estimated 47 feet at one end of the Child Center property to 24 feet at the opposite end as well as the removal of the medical office building at 910 N.E. 47th. A retaining wall will be constructed along the common border of the Child Center and the Banfield Freeway as part of the Project. This wall, along with a noise barrier to be constructed atop the wall, will partially mitigate the increased proximity effects on the Child Center. The resulting noise levels at the playground should be within noise standards. The noise barrier will also serve as a safety barrier. Foliage and landscaping will be incorporated on the Center side of the barrier to further mitigate proximity impacts. Further monitoring of air quality levels will be conducted to help determine impacts. If needed, further air quality mitigation measures will be negotiated with Providence Hospital during the Right-of-way Acquisition phase of the project.

Comment: The Project will require the removal of residential structures at a time when a critical regional housing shortage exists.

Response: The residential structures removed as a result of Project development are not considered significant in relation to the existing and projected ability of the housing construction industry to keep pace with housing needs in east Multnomah County. In addition, the LRT itself has the potential to accelerate construction of housing units in the vicinity of LRT facilities, further increasing housing opportunities in east Multnomah County locations.

Comment: What right does the Highway Commission have to move people out of the houses that they paid for?

Response: Under its legislative mandate, the Department of Transportation has the power of eminent domain. This power of the state permits the taking of a property when such action is deemed to be in the interest of the state. The state is required to provide just compensation for acquired properties and assist in finding acceptable relocation properties.

Right-of-way relocation impacts are discussed in Section 4.4.1 of the FEIS text and Section 3.5 of the Supplemental Technical Reports.

Comment: What impacts will LRT on Burnside Street have on community cohesion, school districts, community character?

Response: LRT on Burnside Street will have effects on community cohesion to the extent that access to community institutions is modified. Placement of the LRT down Burnside Street should not in itself affect the delineation of neighborhood boundaries since Burnside Street already constitutes a boundary to social interaction. However, the addition of LRT with its fixed rails and overhead wire system may reinforce the permanency of Burnside Street as a neighborhood boundary. In any case, pedestrian access across Burnside Street will be maintained. In addition, bikeways will be established in conjunction with pedestrian walkways around transit stations as part of the Project. School districts may be modified to mitigate the Project-imposed out-of-direction travel impacts on school buses. The Project's impact on neighborhood cohesion and character are discussed in Section 4.5.2 of the FEIS and Section 4.3.1 of the Technical Reports.

Comment: Freeway improvements should be redesigned to ensure that the homes and businesses between 33rd and 44th Avenues on the south side of the freeway are spared.

Response: Various alternatives for Banfield Freeway ramps and overcrossings have been studied, including the treatment of the 39th Avenue interchange. The present plan is to relocate the 37th Avenue/ Sandy Blvd. intersection to the west and terminate Senate Street on either side of 39th Avenue, thereby eliminating the intersection of 39th and Senate. Only 2 structures between 33rd and 44 Avenues will be relocated due to this configuration: 1 business (H.A. Anderson Company) abutting the south edge of the freeway just east of the existing 33rd Avenue on-ramp and 1 residence south of the 37th Avenue/Sandy Boulevard intersection.

Comment: The operation of the feeder bus system will increase congestion and noise along north/south arterials, specifically 102nd, 122nd, and 148th, thereby increasing Project-imposed proximity effects on nearby residential areas. How often will these buses run? How much will noise along these arterials be increased?

Response: Analysis of both existing and forecasted traffic volumes on 102nd, 122nd, and 148th at Burnside Street indicates that present capacity usage is 79 percent, 83 percent, and 69 percent, respectively. The 1990 forecasts are generally about the same or lower than present volume levels for 102nd and 122nd. Therefore, these streets presently may be experiencing their worst levels of congestion since congestion along these streets will be reduced once I-205 is opened to traffic.

The cross-town feeder bus systems on 122nd and 148th are estimated to run at 10-minute headways during peak hours, 30 minutes midday, and 60 minutes evening. This volume of peak-hour buses would have a negligible effect on capacity at 122nd, and may reduce capacity 2 to 3 percent at 148th until that street is widened.

Feeder buses will increase noise levels by 2 dB or less over existing levels. Therefore, no significant noise impacts are expected to accrue to nearby residential areas as a result of Project operation.

Comment: Tri-Met should explore the possibility of using battery-powered buses to reduce noise and air pollution downtown.

Response: Battery-powered buses are in the experimental stages at present.

8.2.8 General Comment No. 8: Energy

8.2.8.1 SUMMARY OF RELEVANT COMMENTS

Energy-related comments were primarily directed at: (1) the source and cost of the electrical power required to operate the LRT; and (2) the amount of energy consumed by out-of-direction travel along Burnside Street with the Project. It should be noted that Section 4.3 of the FEIS presents a comprehensive net energy analysis.

8.2.8.2 RESPONSE

8.2.8.2.1 Source and Cost of Electrical Power

As indicated in Section 8.2.5.2.1, electrical power will be provided through multiple tie-ins (about 20 in number) with 2 utilities: Portland General Electric (PGE) and Pacific Power and Light (PP&L).

The total amount of electricity required for the Project will depend heavily on the propulsion energy actually required for the LRT cars. Their energy consumption is system-specific, depending on parameters of an individual system's design; there has been little operating experience with LRT systems, and their energy requirements can be projected for a planned system only within rather broad limits. The probable range of values for this Project is from 10 to 15 KWHe per LRT car-mile traveled. Using the probable upper bound value of 15 KWHe per car-mile, and including all associated electricity use at shops, maintenance yards, parking lots, and other locations, the total Project electricity consumption would be up to 29 million KWHe per year. At current rates, the annual cost for this maximum power requirement would be about $1,040,000.

8.2.8.2.2 Energy Cost of Out-of-Direction Travel

Project-created out-of-direction travel along Burnside Street will be about 3,500 VMT (vehicle miles traveled) per day. Assuming an average vehicle consumes 22.09 miles per gallon in 1990 (see Section 4.3.3.2 of the FEIS text), approximately 47,500 extra gallons of gasoline will be consumed per year due to such out-of-direction travel. This represents about 6 percent of the total energy savings attributable to LRT in the Banfield-Burnside corridor.

<u>8.2.9 General Comment No. 9: LRT's Effect on Developmental Patterns</u>

8.2.9.1 SUMMARY OF RELEVANT COMMENTS

Comments directed at Project-imposed impacts on land development focused on the effects of LRT on land uses within the corridor.

8.2.9.2 RESPONSE

As noted in Section 4.4.3 of the FEIS text and Section 3.3.2 of the Land Use Technical Report to the FEIS, regional and local comprehensive plans prepared since publication of the DEIS (1978) support the designation of the Banfield/I-205/Burnside Street alignment as a regional transit corridor. Land use designations for property within the transitway corridor have been changed where appropriate, to permit an intensification of development. Special study areas have been identified around major transit station areas. Planning within the corridor is proceeding, with Multnomah County as well as Tri-Met beginning to study development feasibility options in special study areas identified in the comprehensive plans. The objective is to prepare a corridor master plan that identifies development options available to public/private concerns, particularly in the areas adjoining transit stations. Comprehensive plans for various localities in the Project area have been submitted to MSD and LCDC for acknowledgement.

8.2.9.3 SPECIFIC RELATED COMMENTS AND RESPONSES

Comment: The contention that LRT will create the population densities required to support this high cost mode of mass transit is suspect.

Response: Neither the DEIS nor the FEIS maintain that the LRT will create supportive population and density increases. However, the development of strong land management programs based on a balanced transportation system will greatly enhance the potential for such densities to occur.

Comment: The LRT, by promoting higher densities around transit stations, will eventually result in a high density strip along the whole system. Deterioration of single-family residential areas will occur. These uses will be replaced by absentee-owned apartment dwellings with attendant local service businesses. High-density dwellings contribute to social problems. Eventually, we will have a light rail transit corridor ghetto.

Response: The LRT system by itself will not necessarily foster high-density development. Without positive land management controls, such systems have been shown to promote continued suburban sprawl. Only with such land use controls, which provide the opportunity for land use intensification in select areas, would development patterns in the LRT corridor change substantially (see Section 4.4.3.1.3 of the FEIS text and Section 4.4 of the Land Use Technical Reports).

Comment: Who will pay for redevelopment of lands around transit stations?

Response: Land redevelopment opportunities arising from LRT in the Banfield corridor will be captured solely at the expense of private developers reacting to market situations.

8.2.10 Persons Submitting Comments

The persons listed below submitted comments either in testimony at the public hearing or by letter subsequent to the public hearing. Appearing next to each person's name is: (1) the page number of the hearing transcript upon which the person's specific comments are documented and (2) one or more numbers corresponding to the specific areas of comment addressed in Section 8.2. These numbers are coded to the general areas of comment as follows:

Code Number	Area of Comment (Section)
1	Selection of the Banfield Corridor for a Regional Transitway (8.2.1)
2	LRT Project Costs/Ridership Potential (8.2.2)
3	Recommended New Alternatives/Variations on Studied Alternatives (8.2.3)
4	Traffic/Pedestrian Circulation (8.2.4)
5	Comparative Reliability/Safety of LRT (8.2.5)
6	Use of Existing Trackage (8.2.6)
7	Adverse Proximity Impacts Imposed by LRT (8.2.7)
8	Energy (8.2.8)
9	LRT Effects on Development Patterns (8.2.9)

NAME	PAGE NUMBER (TRANSCRIPT)	CODE NUMBER(S) (AREA(S) OF COMMENT)
Sylvia Bouneff	12	2, 4, 5, 7
Mr. & Mrs. John Marcoules	14	4, 9
Richard Marshall	15	4, 7
Leanne MacColl	16	
Anthony Golden	19	4
Gladys Pasel	20	7
Mrs. J. C. D'Ambrosia	22	1, 2
Ed Hughes	24	2, 7
Marie Brown	26	
Virgil Scott	26	2, 7, 9
Madeline Miles	27	
Charles Hayden	28	2
Marc Frommer	29	2, 8, 9
Beverly Bottorf	31	2
Rep. George Starr	31	8
Fred Howard	33	3
Dean Thede	34	2
Dennis Gilman	36	2
Chriss M. Hesse	38	2
Irving E. Ott	39	2
Scott Parker	41	7
Kenneth McFarling	43	
Rep. Rod Monroe	45	1, 2
H. J. Sundt	45	4
Patrick Gibson	46	
Bob Wiggin	47	
Rep. Drew Davis	55	2
Terry Parker	57	8
E. R. Poff	58	2
Douglas Allen	60	7
S. M. Ragan	62	5
Dan Smith	63	4
Elaine Bassett	64	2
Walter H. Meyer	65	2, 4, 8
Richard A. Carlson	67	2, 5
Barbara Dickson	68	2
Bonnie J. Luce	69	2, 4, 9
Robert Luce	69	2
Garry Shields	70	7
Jenn Plesman	73	2, 8
Donald W. Carlson	74	2
Robert M. Hall	75	2
Tom Armstrong	76	2
Frank Perry	77	2, 3, 4, 7
Helen R. Bakkensen	81	2
Carol Burright	82	
Bruce Etlinger	82	2, 9
Jerry A. Hoffman	84	
Stanley E. Farr	85	2, 7

NAME	PAGE NUMBER (TRANSCRIPT)	CODE NUMBER(S) (AREA(S) OF COMMENT)
Tom Magee	85	
Ray Polani	86	2
John Morrison	89	2, 8
Robert M. Johnson	93	3
Richard Patton	94	
David Rowe	95	
John S. Bergeson	95	6, 8
Ira Watson	98	
Clare Donison	99	2
Ralph Bakkensen	100	2
Dr. Lawrence Griffith	102	2
Bob Mallory	103	4
Louise Weidlich	103	2
Dick Springer	106	9
Jack N. Wall	109	1
Clinton H. Lostetter	109	2
Thomas C. Donaca	110	2
Chris & Tina Christie	111	4
Art Wickstrand	111	2
Maclay P. Nelson	112	2
David Burney	114	2, 4
Pat Fogarty	114	
Cecil S. Smith	114	2, 4, 7
Edward J. Marihart	115	
Richard Gross	116	
Viola Squires	116	6
Nancy Cunningham	116	8
Bill Jasteram	117	
Alfred Haig	117	
Thomas J. Anderson	118	
Jim Chadney	119	2
Manley J. Bakkensen	119	
Arthur W. Bergstrom	119	
Oscar L. Burns	119	
Irene A. Chadney	119	2
Robert L. Conroy	120	2
Mr. & Mrs. Ralph T. Dawson	120	
Norland A. Fuateck	120	2
Lynn Fish	120	
Ralph Frohwerk	120	2
Dud & Alta Mae Gaylord	120	
Marian E. Hallam	120	4
Virginia Harris	121	2
Edward E. Immel	121	
Jerome Isgro	121	
Eunice Jensen	121	
Robert F. Jensen	121	2
Margaret M. Jurhs	121	
Louise P. Kendopp	121	2

NAME	PAGE NUMBER (TRANSCRIPT)	CODE NUMBER(S) (AREA(S) OF COMMENT)
John R. Kline	121	1
Mrs. A. W. Kohl	121	2
Frances Kralj	122	2
Ray H. Lambeth	122	
Ben Lear	122	2
Nancy A. Miller	122	
William W. Nichols	122	2
Helen Osburn	122	
Roy Porter	122	
Ruth L. Pedersen	122	
Mr. & Mrs. Virgil C. Provo	123	2
David N. Qualls	123	
Eugene Schatz	123	
Linda K. Schatz	123	
John C. Stout	123	
Emma J. Stewart	123	7
John R. Wagner	123	
Lyle Winkel	123	6
Madeline Nickerson	123	
Walter & Julia Donat	123	
Richard S. Rodgers	124	
Arthur Van Uchelen	124	2
Roy & Betty Lou Pettyjohn	124	6
John C. Miner	124	
Ann Schilke	124	1
G. K. Guffee, M.D.	124	8
Oscar L. Larson	124	
Sam Purdy	124	
Vince Smith	125	
Jerry Johnson	125	
Del Reams	125	
Jason Shipley	125	
George Williams	125	
Mr. & Mrs. Miles C. Stanton	125	
Richard Mustonen	125	
P. Benninghoff	125	
Robin G. Plance	125	
Steve & Rita Hanston	125	2
Alice J. Durr	125	
Harry Erickson	125	
Kem B. Sypher	125	
Jacques Bergman	125	4, 5
Ernest F. Munch	126	
Mr. & Mrs. Paul E. Johnson	126	
Mr. & Mrs. Leonard M. Beckman	126	
Robert Deaton	126	7
Peggy McCluskey	126	
M. Mischa Creditor	126	
David R. Wagoner	126	

NAME	PAGE NUMBER (TRANSCRIPT)	CODE NUMBER(S) (AREA(S) OF COMMENT)
Marilyn E. Stange	126	
James Light	127	1, 4
Doryl Pierson	127	
Jerry R. Gardenhire	127	
Carole A. Weisenborn	127	
Tony Barone	127	
Phill & Jackie Colombo	127	
J. Tucker	127	
William D. Johns & Donald E. Mott	127	
Frances M. Gardner	127	7
H. W. Pribnow, Jr.	127	
Clifford Perry	127	9
Mr. & Mrs. Norman A. Cowell	127	3
Robert G. Hylton	127	
Ernest Ralph Edmundo	128	
Connie Chandler	128	
C. Tucker	128	
Mrs. Martha L. Westgate	128	
Katharine Noel Engleheart	128	
Pauline & Frank Kies, Petition	133	7
Jack E. Anderson	134	2
Kenneth Bassett	135	2
Mr. & Mrs. Henry L. Beuter	138	7
Kathi Bogan	139	
M. L. Bragg	141	7
R. F. Brice	142	6
Henry Brindley	143	9
George R. Buxton	145	
Nancy Stevens, Portland City Club	146	7, 8
Clackamas County Community	148	2
Everett Clark	149	2, 7
Grace Clark	150	2, 4
W. E. Critzer, Freightliner Corp.	151	2
Richard O. DeClerck	152	
Rosella M. DeKuyper	153	2
Yamhill Historic District Assoc.	155	7
Mr. & Mrs. Oliver O. Dillner	159	5, 8
Richard H. Divine	160	
Jo Donahue	161	
Kenneth M. Elliott	162	
Alvin & Virginia Eshelman	164	
Earl K. Grady	172	3
Mrs. Willa Griffith	173	
Mrs. Emma Gustafson	174	
Harry Harvey	177	
Mrs. William M. Haslett	178	4
Janet Hastings	179	2

NAME	PAGE NUMBER (TRANSCRIPT)	CODE NUMBER(S) (AREA(S) OF COMMENT)
Stephen Heitmann	183	
Eleanor T. Heller	185	
Richard W. & Meredith Holmes	186	
Cora M. Howes	187	
Jay C. Hoyt, M.D.	188	2
R. W. Hughes	189	
Nancy B. Hume	190	
Len Hutchinson	191	2
Charles J. Jones	192	2, 4
Elizabeth Joseph	195	
Laurence Kressel	196	7
J. Lanyon	197	
Dr. & Mrs. Michael Litt	200	
John F. Porter	201	
Robert R. Lowry	203	
Larry Lubin	205	
KayDel Marshall	208	
Irene J. Matlack	209	7
William McCready	211	8
Ronald A. McFadden	212	2, 9
Phillippe Meany	214	7
Max R. Mehlhaff	215	7
Edward & Mary Lou Menache	216	7
Mrs. Audrey Moore	217	
Robert M. Greening, Jr.	219	7, 9
Hal Oman	220	7
Vern Rifer, Oregon Env. Council	221	
Jan D. Sokol, OSPIRG	232	2, 7, 8, 9
John Osterberg	235	2
Marilyn K. Overton	236	4
Mrs. & Mrs. Lynn Parr	239	
Kenneth I. Peters	240	5
Ray Phillips	241	2, 7
LaNora Pixler	242	
Ed Pixler	244	1
Peter A. Plumridge	246	
Mr. & Mrs. Harold T. Potts	247	
William A. Rabiega	248	
Mr. & Mrs. James R. Rice	250	4
Charles L. Sauvie, AOI/CAC	251	2
Laurelhurst Neighborhood Assoc.	252	
Walt & Emma Schacher	254	
Charles P. Schade	255	
Patricia Schleiger, Normandale LCAC	256	
Mary Ann Schwab	257	
Linda J. Shanbeck	258	
J. O. Stevenson	259	6, 9
Michael Train	260	3
Walter M. Mason	262	2

NAME	PAGE NUMBER (TRANSCRIPT)	CODE NUMBER(S) (AREA(S) OF COMMENT)
Deborah Van Orden-Smith	264	
Paul R. Wemhoener	266	2
John Werneken	268	
Carleton Whitehead	269	
Leo Dean Williams	271	7
Sister M. Therese Kohles	273	7
William G. Conley	278	7
Frank Nash	280	7
Edward L. Hughes	282	
Anne F. Picco		1, 2, 4, 5, 6, 7, 9

8.3 AGENCY COMMENTS AND RESPONSES

8.3.1 Exhibit 1: U.S. Department of Interior

Comment 1: According to the DEIS (Vol. 1, page 305), "None of the build alternatives would require right-of-way from public park, open space, or recreational facilities. Consequently, the project requires no Section 4(f) involvement for park property." However, acquisition of land will be necessary for every alternative except the No-Build alternative. Volume 1, pages 235 and 237, state: "Parks, recreation areas, and public/semi-public land uses are dispersed in the study area" and "Recreational area is provided in this corridor by open space connected with school properties." Maps in the documents show that several of these kinds of lands have frontage on the transitway alternatives described. The final statement should clarify the extent of right-of-way takings in the vicinity of such lands. If any significant park, recreation, or open space lands--including school lands--which are used for public outdoor recreation purposes, are planned to be part of the acquisition for the Project, Section 4(f) will be involved.

Response 1: Section 4.4.3 of the FEIS and the Land Use Technical Report address the right-of-way needs in the vicinity of parks, recreation, and open-space lands.

Comment 2: Secondary impacts, such as air or noise impacts, could also constitute a "use" of public park or recreation properties adjacent to the proposed transitway and should be further discussed in the final statement--reference: Brooks vs. Volpe, 460 F.2d 1193 (Ninth U.S. Circuit Court, March 2, 1972). Should an alternative be selected which would either lie adjacent to or upon any park or recreation area, or historic or cultural resource, it may be necessary to prepare a Section 4(f) determination for each.

Response 2: Section 3.0 of the Air Quality Technical Report and Section 4.0 of the Acoustics Technical Report address the air and noise impacts on sensitive receptors, including recreational areas. No Section 4(f) determination is required as these impacts do not constitute a use.

Comment 3: As stated in the Summary Impact Matrix (Vol. 1), some of the Project alternatives could impact historic properties. If an alternative is selected which impacts any historic property of federal, state, or local significance, Section 4(f) would apply. This includes properties on or eligible for listing on the National Register of Historic Places as well as properties listed on the Statewide Inventory of Historic Sites and Buildings and those identified by the Portland Historical Landmarks Commission.

Response 3: Section 4(f) is not applicable for reasons stated in the response to Comment 2 above. A determination of eligibility has been made under the requirements of 36 CFR 800 and submitted to the Advisory Council on Historic Preservation for approval (see Section 4.6 of the FEIS).

Comment 4: Selection of an alternative with potential for impacting historic or cultural properties on or eligible for inclusion in the National Register will require following the procedures set forth in 36 CFR 800 to comply with the National Historic Preservation Act and Section 1(3) and 2(b) of Executive Order 11593. The final statement should document such compliance, including any required determinations of eligibility pursuant to 36 CFR 800.4(a)(2).

Response 4: Acknowledged; the FEIS documents compliance with procedures set forth in 36 CFR 800 as they apply to the preservation of historic and cultural properties potentially affected by Project development (see Response 3 above).

Comment 5: On page 340 (Vol. 1), we believe the figure 1,000,000 cfs in the last paragraph should be changed to 100,000 cfs.

Response 5: The figure 1,000,000 cfs on p. 340 of the DEIS is in error. The 6-year daily average flow for the Willamette River at Portland for the period October 1972 to September 1978 (gauge 14-2117.20, Morrison Street Bridge), as computed by the U.S. Geological Survey, is 33,010 cfs.

Comment 6: Data from the records of the Geological Survey gauge on the Willamette River differ from the data listed on Table 1 of the Water Quality Research Report. The minimum flow on August 3, 1973, was 4,520 cfs and the maximum on December 24, 1972, was 142,000 cfs.

Response 6: The U.S. Geological Survey has monitored streamflows in the Willamette River at gauge 14-2117.20, at the Morrison Street Bridge, since October 1972. Over the period of record, the extreme values for instantaneous discharges in the Willamette River at Portland are:

Minimum - 4,200 cfs on July 10, 1978
Maximum - 283,000 cfs on January 18, 1974

These values would also be essentially correct for Steel Bridge because of its proximity to the gauge at the Morrison Street Bridge.

Comment 7: Page 4 (Vol.2) of the Water Quality Research Report states in the last sentence that Fairview Creek has "suitable conditions for fish habitation." This should be reconciled with the statement on page 10 which says that "conditions in the creek . . . are poor."

Response 7: The 2 statements pertaining to stream conditions found in Fairview Creek differ because (1) the measurements were taken in 2 locations nearly 2 stream-miles apart and (2) the measurements were made 4 years apart (1973 and 1977). Furthermore, the "poor" conditions reflected in the water quality measurements taken in 1977 do not preclude the existence some distance downstream of species which are not particularly sensitive to these pollutant loads. Considered jointly, the 2 sets of stream measurements suggest a deterioration of water quality in Fairview Creek, probably due to continuing urbanization of the watershed.

In any case, the new site selected for the light rail maintenance and storage facility is not located in the Fairview Creek floodplain. Project-imposed water quality impacts are discussed in Section 4.10.2 of the FEIS.

Comment 8: In the Air Quality Research Report (Vol. 2), we suggest the final statement provide additional information on the presence and impacts of trace metals and other trace elements. Recent evidence indicates that they are important aspects of air quality and can affect water quality.

Response 8: The impacts of lead emissions are addressed in Section 4.8.3 of the FEIS and Section 3.0 of the Air Quality Technical Report. No data are available for other trace metals or trace element emissions.

8.3.2 Exhibit 2: U.S. Department of Energy

Comment 1: We note that Volume Two of the EIS, which contains the primary base material for the analysis presented in Volume One, apparently lacks any support data for the Volume One energy section. We would appreciate receiving your technical comments for future reference. We were able to perform a limited analysis of the alternatives based on the data and descriptions that were included in Volume One.

First, using general conversion factors linking construction costs and type of construction with energy use (see the DOE's State Energy Conservation Handbook, pp. 61-80), this Office calculated the energy consumption associated with construction materials and construction activities for the alternatives under consideration. To assist in your evaluation, the rough estimates of the energy invested and required for construction of the alternatives follow:

Alternative 2a	0.78 trillion BTU
Alternative 2b	1.07 trillion BTU
Alternative 3a	1.51 trillion BTU
Alternative 3b	7.38 trillion BTU
Alternative 3c	8.29 trillion BTU

Alternative 4a	9.17 trillion BTU
Alternative 4b	8.76 trillion BTU
Alternative 5-1a	13.2 trillion BTU
Alternative 5-1b	14.3 trillion BTU
Alternative 5-2a	15.9 trillion BTU
Alternative 5-2b	17.0 trillion BTU
Alternative 5-3a	11.9 trillion BTU
Alternative 5-3b	13.1 trillion BTU

Note that these energy investment estimates are greater than the "Construction Energy Estimates" provided in Table 41 on page 357. (We point out that not all of the alternatives are represented in Table 41, even though all alternatives, including the No-Build alternative, include construction.) Most energy invested in highways, bridges, overpasses, and similar structures is embodied in construction materials and is not consumed on-site. For example, considerable energy is spent in processing cement; extracting and transporting sand and gravel; extracting, transporting, and refining crude oil to produce asphalt; mixing asphalt, mining, shipping, and processing iron ore to produce steel; and in fabricating and producing reinforcing steel. In addition, the use of asphalt or road oils for binding agents and surfacing can result in large energy investments due solely to the energy content of these petroleum products. The EIS does not indicate if these factors are included in the unit rates employed in the construction Energy Estimates.

Second, we point out that while the EIS is correct in stating that the total 1990 Passenger Transport Energy requirements in the Banfield Corridor vary by only 6 percent between the alternatives, the actual difference, 352 billion BTUs, is equivalent to the annual end use energy consumption of approximately 3,600 Portland area households.

Response 1: Energy impacts associated with the Project have been reassessed in the FEIS (see Section 4.3 of the FEIS and Section 2.3 of the Energy Technical Report). The amount of energy consumed during Project-related construction and operation is compared to energy consumption under both the No-Build alternative and existing conditions. The energy expended off-site in the preparation and transport of construction materials is incorporated into the FEIS by reference to the 14.3 trillion BTU figure presented in Comment 1 of the Department of Energy's comments. This figure is likely to be higher than the actual amount of energy consumed.

The FEIS presents an overall net energy analysis that considers construction, operation, and traffic-related energy impacts. All available opportunities for energy savings have not been incorporated into the analysis. However, while it is acknowledged that substantial energy savings could be achieved through use of special construction techniques and materials, these savings would be relatively small when compared to net energy consumption during the life of the Project.

Comment 2: We note that the 1990 estimates of Passenger Transport Energy requirements for both the CRAG region and the Banfield corridor assume the use of the Duwag Type B car for the light rail transit alternatives. From Table 40, page 356 of the EIS, we see that this car consumes 78 more BTU per passenger-mile at 50 percent nominal capacity than the Boeing LRT Car. Using the 1990 estimates of LRT transit demand, we find that the use of the Duwag B car would involve the consumption of an estimated 19.1 billion BTU more than the Boeing LRT car for the 3-corridor LRT regional alternative. This is equivalent to the annual end use energy consumption of approximately 200 Portland area households. We suggest that a comparison of all the 1990 estimates for both cars would make the final EIS more complete.

Response 2: Selection of an LRV for the Banfield Transitway Project has not been finalized. Section 4.3 of the FEIS presents an energy comparison of the Project using both the Duwag Type B and Boeing LRT vehicles, which are representative of the size of vehicles that will be incorporated into the Project. Broad uncertainty exists as to the rate of energy consumption associated with each of these cars for this specific system. The figures used in this analysis (between 10-15 KWHe) reflect this uncertainty. The actual selection of the most energy efficient car must consider passenger capacity. For example, if a relatively energy efficient car with insufficient capacity is selected, a second car may have to be added to accommodate more passengers, thus increasing overall energy consumption. This uncertainty is reflected in the energy comparison in Section 4.3.

Comment 3: Other modifications to the Draft EIS which could be considered include an assessment of the energy consumption reductions which occur through less traffic congestion. This would be an especially useful addition to the discussions of ramp metering on page 100. Or, for another example, an evaluation of the grade profiles of the alternatives could be performed to determine how they might influence energy consumption. The energy consumed for maintenance might also vary greatly between the alternatives depending on the extent and design of rights-of-way, traffic volumes, and type of pavement. Similarly, the energy utilized by lighting should be considered in the Final EIS; this can vary greatly with alternative project designs and the type of lighting used. The alternatives should be compared using these or other similar criteria.

The EIS states on page 357 that "reconstructing the Banfield Freeway is the major [construction] energy consuming activity, primarily because of the relatively high energy requirements for bridge construction." This is an area where there are substantial energy conservation opportunities. In this case alternative materials, as well as alternative projects, should be evaluated in the Final EIS. For example, the use of alternative or recycled binding agents (cements, asphalts), alternative aggregates, and use of recycled steel should be considered. Similarly, the EIS should present an evaluation of the use of alternative construction techniques and procedures. Some procedures can greatly alter energy consumption during construction (e.g., using a higher moisture content and lower temperature in hot mix asphalt plants, requiring high loading efficiencies for earth moving equipment, maximizing use of on-site materials, utilizing standardized and repetitive dimensions to permit maximum reuse of forms, and encouraging carpooling by construction employees).

Response 3: Section 2.3 of the Energy Technical Report addresses the effects of traffic congestion and lighting on energy consumption associated with the selected alternative. No data are available to determine maintenance energy costs.

Comment 4: The EIS should indicate that measures will be taken to mitigate excessive or unnecessary energy consumption due to the design, construction, use, and maintenance of the eventual proposed action. Any potential for substitution of renewable energy resources for nonrenewable energy resources should also be addressed in the Final EIS.

Response 4: Mitigation of energy impacts is addressed in Section 2.3.5 of the Energy Technical Report.

8.3.3 Exhibit 3: U.S. Environmental Protection Agency

Comment 1: The air quality analysis in the draft EIS utilized the "Revised Motor Vehicle Emission Factors" (Supplement 8) released by EPA in August 1977. Since that time, the "Final Motor Vehicle Emission Factor Document" has been made available (January 1978), which reflects the best state-of-the-art information currently available. These new factors should be used in the final EIS air quality analysis for the Banfield Transitway Project.

Response 1: MOBILE-1, an EPA model, was used to assess the air quality impacts associated with development of the Project. The information contained in the "Final Motor Vehicle Emission Factor Document" was input into this model.

Comment 2: As noted on page 16 of the Air Quality Research Report, the Light Rail Transit air quality data were not available for the original air quality study. The results should be presented in the final EIS. Upon completion of the ongoing air quality field study, specific local impacts to air quality should be presented in the final EIS. An analysis of the local impacts should determine the extent of hot spot critical areas with development in the Banfield Corridor.

Response 2: LRT and local air quality impacts are discussed in Section 3.0 of the Air Quality Technical Report.

Comment 3: The downtown noise measurement sites and values, presented in Table 2, page 8 of the Noise Research Report (NRR), are for noise conditions prior to construction and operation of the Portland Mall. This table should be revised in the final EIS to reflect the noise levels presently experienced by persons using the downtown area near the Portland Mall. The draft EIS does not state what time of day nor with what sample duration the data in Table were collected. These details should be presented in the final EIS to allow the reader to determine if peak noise was measured.

Response 3: Ambient sound measurements presented in Table 2.0-1 in the Acoustics Technical Report represent noise conditions in the downtown Portland study area subsequent to the construction and operation of the Portland Mall. This table also states the time of day and duration of all collected data.

Comment 4: The draft EIS presents no data or methodology to support the statement: "It can be assumed though, an average downtown area ambient noise level of approximately 78 occurs during the noisiest period." The data presented in Table 2, which indicates that 19 of the 26 measurement sites have noise levels well below 78 dBA, does not support the 78 dBA average. Since the noise analysis of the downtown area is based on this "estimated 78 dBA," the final EIS should explain its origin.

Response 4: References to the "estimated 78 dBA average downtown area ambient noise level" have been deleted.

Comment 5: Table 3 on page 9 of the NRR presents projected downtown noise levels attributable to transit vehicles for each Build alternative. The text following the table, which discusses the assumptions used to generate the data in the table, does not present the following information relative to the Light Rail Transit options:

1. LRT type, whether 1 or 2 cars;
2. vehicle speed;
3. basic noise versus speed data for the LRT vehicle type;
4. number of LRTs per hour passing each noise measurement location.

These data should be stated in the final EIS to provide the EIS reader with a clear understanding of this alternative.

Response 5: 1. Final selection of the LRT type will be based on competitive bidding.
2. Vehicle speed in the downtown area will be limited to a maximum of 15 mph.
3. Basic noise versus speed data of an LRT vehicle are presented in Table 3.0-1 in the Acoustics Technical Report.
4. Maximum operations call for 12 LRTs per hour passing each measurement site in the downtown area.

Comment 6: The comparison between predicted noise levels (Table 3 and present transit noise levels (page 9) relies solely on the 1977 noise levels attributable to existing transit; however the draft EIS does not explain how these 6 reference levels were determined.

Response 6: Traffic data provided by ODOT and Tri-Met in conjunction with the FHWA Highway Noise Prediction Model were used in predicting traffic-generated sound levels throughout the study area. For the downtown segment, existing levels were increased, where necessary, to account for other urban noise sources, such as pedestrians, parking lot activities, etc. These increases were predicted from the comparison of measured sound levels and predicted traffic-generated sound levels for vehicle volume counts compiled simultaneously during the measurement period. These increases were used in predicting future referenced sound levels for the Build and No-Build conditions.

Comment 7: The determination of noise impact can only be accomplished after all assumptions and measured data are clearly presented. We therefore suggest that the final EIS present the discussion of downtown Portland noise in a form which clearly indicates the downtown noise levels at each of the measurement sites shown in Figure N-2 of the Noise Research Report before and after the construction of each alternative.

Response 7: Table 4-1 in the Acoustics Technical Report presents the downtown noise levels at each of the measurement positions for the existing Build and No-Build conditions.

Comment 8: Analysis of future noise levels in the Portland downtown area is particularly important considering present noise levels in many areas already exceed the Department of Housing and Urban Development's environmental noise guidelines. The Department of Housing and Urban Development has acknowledged the existence of high downtown noise levels through its recent denial of HUD funds to apartment and hotel operators.

Response 8: Analysis of measured and predicted existing and future sound levels in the Portland downtown area confirms that many areas already exceed the Department of Housing and Urban Development's Site Acceptability Standards. Although measurements confirm day/night sound levels exceeding 65 dB, special sound attenuation measures, including double glazing of windows, will bring interior sound levels within a noise level (above 65 dB but not exceeding 75 dB) that complies with HUD standards. ODOT is investigating the feasibility of financing these improvements for public buildings only. It should be noted that future noise impacts will occur in the downtown area with or without construction of the LRT system (see the Acoustics Technical Report).

Comment 9: Discussions of the noise levels along the rights-of-way of streets scheduled for Low Cost Improvements and/or Light Rail Transit alternatives are presented in terms of traffic noise increases and not in terms of numbers of residences impacted by the increased traffic noise. The streets of Broaday, Sandy, Burnside, Belmont, Division, Halsey, and 60th Avenue all pass through densely populated residential areas of east Portland. The final EIS should indicate, through the use of noise contours, the locations of those residences which will experience L_{10} 70 dBA or greater (L_{eq} 67 dBA) and/or increases over the present noise levels.

a. 0-5 dBA (slight impact)
b. 5-10 dBA (significant impact)
c. 10 dBA or greater (very serious impact)

Response 9: A tabulation of residences which experience sound levels of L_{eq} = 67 dB or greater under the existing "Build" and "No-Build" conditions is presented in Table 4-3 of the Acoustics Technical Report. Increases in sound levels will be below 10 dB resulting in no serious noise impacts based on the "change in the ambient" criteria.

Comment 10: The final EIS should include a discussion defining those measures which will be implemented to reduce construction noise. Noise produced as a result of roadway construction is regulated by the City of Portland's noise ordinance number 141882 Section 18.10.060 Construction Activities and Equipment. The following list of construction noise abatement measures is suggested:

1. the use and maintenance of properly operating mufflers and quieting devices;
2. the use of quietest available machinery and equipment;
3. the use of electric equipment in preference to gas, diesel, or pneumatic machinery;
4. locating construction equipment as far from nearby noise-sensitive properties as possible;
5. shutting off idling equipment;

6. limitation of construction hours to coincide with the normal workday period, e.g. 8:00 a.m. to 6:00 p.m;
7. scheduling the noisest operations near the middle of the day, and notifying nearby residents whenever extremely noisy work will be occurring;
8. the use of permanent or portable barriers around point noise sources.

Response 10: ODOT and Tri-Met propose to comply with the construction noise mitigation measures contained in City of Portland and appropriate federal standards governing specific construction equipment.

8.3.4 Exhibit 4: Oregon Department of Fish and Wildlife

Comment 1: The Draft EIS for the Banfield Transitway adequately assesses the fish and wildlife impacts of the various construction alternatives. We have no additional comments on the DEIS, but request that provisions be included so that this Department will be consulted prior to any construction that may have a measurable effect on fish and wildlife habitat or water quality.

Response 1: The Project construction and operational impacts on fish and wildlife are discussed in Section 4.10 of the FEIS and Sections 7.2.2 and 7.3.2 of the Natural Environment Technical Report.

8.3.5 Exhibit 5: Department of Environmental Quality

Comment 1: On page 333 of Volume 1, the following statement is made: "The Oregon State Highway Division has determined that all transportation systems proposed herein are consistent with the State of Oregon, Clean Air Act Implementation Plan." There is no foundation within the DEIS for making a determination of consistency. This cannot be done until the detailed air quality analysis contemplated for the Final Environmental Impact Statement (FEIS) is completed. That report should specifically address air quality standards.

This project will need an Indirect Source Construction Permit from the Department. The FEIS should contain a thorough examination of the chosen alternative's air quality impacts and particularly how it relates to the achievement of air quality standards. The air quality aspects should be more closely correlated with the given traffic operational characteristics, where appropriate. Why air quality improves or worsens is an important issue that should be addressed in the documentation.

Response 1: A determination of the Project's consistency with the State Implementation Plan is presented in Section 6.0 of the Air Quality Technical Report and Section 4.8.5 of this document. The air quality impacts assessment contained in the FEIS addresses the level of compliance with existing air quality standards. Relative improvement or degradations of air quality attributable to the Project are discussed.

Comment 2: Alignment options within the CBD should be explored for their potential air quality impacts.

Response 2: Alignment options within the CBD were primarily assessed in terms of their effectiveness in minimizing traffic impacts (circulation, access, and parking) and disruption of downtown activities due to construction and displacement, as well as their effectiveness in maximizing transit opportunities and the use of transit investments (Portland Planning 64). Air quality impacts were not specifically identified in the selection criteria. Subsequent contact with DEQ indicated that downtown air quality would be more appropriately addressed by DEQ SIP related analysis.

Comment 3: The Draft EIS attempted to illustrate the differences in the noise impacts between the alternatives by using a technique called "L_{10} - 70 dBA Penetration Distance." Unfortunately, these penetration distances were of little value for evaluating overall impacts.

a. Not all project alternatives gave the penetration distances for all measurement points. Most simply listed general ranges of penetration distances. Only Alternatives 1 and 2A gave complete lists of distances.

b. The penetration distances were measured from the center of the nearest traffic lane. Some alternative plans call for widening the roadway. Hence, the penetration distance reference point is different for each alternative. This means a comparison of alternatives with their penetration distances would be futile.

Response 3: Tables 3.3 through 3-5 in the Acoustic Technical Report of the FEIS present projected existing and future traffic-generated sound levels at a distance of 25, 50, 100, and 200 feet from the respective roadway. Generally, levels will not vary greatly for any of the Project alternatives. These tabulated values do not reflect the sound attenuation provided by natural topography and in some cases by intervening structures. Table 4-1 of the Acoustics Technical Report accounts for this sound attenuation in projecting future sound levels for the Build and No-Build condition at each of the measurement sites. Contours for selected areas that are susceptible to Project-imposed noise impacts have been provided in Appendix E of the Acoustics Technical Report.

Comment 4: The Draft EIS failed to include for each alternative a list of the number of residential units impacted by noise. Such a list probably would show substantial differences between the alternatives. This list would thus make ranking alternatives by noise impact easier.

The combination of adequate penetration distances and a list of residential units impacted would go a long way toward fixing the DEIS lack of a mechanism for showing overall impacts.

Response 4: A listing of the number of residences affected by noise exceeded L_{eq} = 67 dB is presented in Table 4-3 of the Acoustics Technical Report for the preferred alternative and existing and No-Build conditions. Penetration distances vary for the Build condition due to widening of the roadway. Referencing to this varying penetration distance is difficult due to the variation in roadway positioning within the right-of-way for any one segment. A comparison of varying distances is best shown in the noise contours in Appendix E of the Acoustics Technical Report.

Comment 5: The DEIS discussion of the noise mitigation measures contain the following omissions:

a. The noise barrier heights were not shown.

b. The noise levels for the alternatives with barriers installed were not shown.

c. The area north of the Banfield Freeway near 53rd Avenue was not analyzed for noise barriers. There is a critical need for noise mitigation there.

Response 5: The heights of noise barriers to be constructed as part of the Project are shown in Table 5-1 of the Acoustics Technical Report. Sound levels with construction of the barriers will be below L_{eq} = 67 dB throughout the east Portland and east Multnomah County study areas. The residential area north of the Banfield Freeway near 53rd Avenue is presently protected by the intervening commercial and industrial development adjacent to the right-of-way. These intervening structures provide approximately 5 dB sound attenuation to the area.

Comment 6: The following miscellaneous deficiencies were also found in the draft:

The Draft EIS failed to analyze the noise impacts associated with any of the transit stations (Holladay, 42nd, 60th, 82nd, etc.).

Response 6: Transit station sound levels will be below the traffic-generated sound levels at or near the stations (see the Acoustics Technical Report). Because the LRTs will be approaching the stations at lower speeds than those experienced between stations, the LRT L_{max} sound levels at the stations will be lower than at the mid-point between stations. Although pedestrian activities will increase significantly at the stations, the resulting sound levels are anticipated to remain below the peak-traffic hour L_{eq}.

Comment 7: The Draft EIS failed to analyze all of the light rail options for downtown Portland.

Response 7: Various options for the LRT system within downtown Portland, including the utilization of signalized intersections and progressive or simultaneous signal timing, will have little overall effect on the noise environment (see the Acoustics Technical Report). Other LRT options, including use of resilient track or other noise and vibration control measures, will generally result in sound levels less than those projected within the Acoustics Technical Report. Use of lubricated track systems along downtown curves will result in sound levels appreciably below those presented without such systems.

Comment 8: The Draft EIS failed to present a discussion of the noise impacts associated with Alternative 3 for downtown Portland (Volume 2, page 10).

Response 8: Alternative 3 of the DEIS has been eliminated and is not discussed in the FEIS.

Comment 9: Generally, the noise levels for the Project are in excess of the Federal Highway Administration's noise standard (L_{10} - 70 dBA) for all alternatives and for most of the measurement positions. Some alternatives show noise levels greater than 10 dBA (twice as loud) as the federal standards.

The DEQ does not consider these federal noise standards protective of residential property and therefore feels the noise levels for the Project are substantially higher than levels considered safe for health and welfare.

We have made no attempt to rank alternatives since none of the alternatives stand out as being substantially acoustically better than any other. However, the Department will make the following comments on the alternatives and their options:

Alternative 1 - No Build: Although this seems to be one of the quietest alternatives for peak noise levels, it is one of the least acoustically desirable alternatives.

a. This No-Build alternative means no money would be spent for noise mitigation of the existing noise problems.

b. Also, the traffic congestion connected with this alternative means the peak traffic/noise hours would be lengthened, thus prolonging the high noise levels.

Alternative 2(a,b) - Low-Cost Improvement: This alternative is the least desirable of the alternatives.

a. It would substantially increase the traffic volumes on many local streets. This in turn would mean much higher noise levels for these streets. A 17 dBA increase would occur on N.E. Broadway. This alternative would have the greatest number of houses impacted by noise.

b. The mitigation of these noise impacts on arterial streets is technically very difficult. Furthermore, getting the Federal Highway Administration to fund such a noise mitigation project for arterial streets would be nearly impossible. Also, this being a "low-cost" project, we even wonder if noise mitigation along the Banfield Freeway would be funded.

Alternative 3(a,b,c) - High-Occupancy Vehicle Lanes: Option 3a is preferable to Option 3b or 3c. Option 3a is significantly quieter than 3b and 3c at some locations (up to 8 dBA quieter) because 3b and 3c have wider roadways. There is little difference in noise levels between Options 3b and 3c, however.

Alternative 4(a,b) - Separated Busway: Option 4a is slightly louder (approximately 1 dBA on the north side of the Banfield Freeway than 4b. However, for all practical purposes, Options 4a and 4b are identical. The noise levels for 4(a,b) are similar to the levels for 3(b,c) and Option 5 for the area along the Banfield Freeway.

Alternative 5 - Light Rail Transit (LRT):

a. There are no significant differences between the LRT options [5(1a,2a,3d) and 5(1b,2b,3b)] near the Banfield Freeway.

b. Of the three LRT options for downtown Portland, the "Pioneer Square--On the Mall" option is the least desirable. This option would move all bus traffic off of 5th Avenue, thus cutting the bus capacity of the Transit Mall in half. An LRT line down 5th Avenue would increase 6th Avenue noise levels by 8 dBA. ALso, in the year 1990, 6th Avenue probably could not handle all the extra peak-hour buses from 5th Avenue. Hence, these extra buses and their associated noise would be forced onto other downtown streets. The sum total of all this would made the Pioneer Square option the noisiest LRT option for downtown Portland.

c. There will be no real increase in peak-hour noise levels due to the LRT in the East County area. However, we do have concerns about the noise impacts at other than peak traffic hours in the East County. This is because a single train traveling through late at night could possibly cause a large noise impact. The Highway Division should consider acquiring property along the Portland Traction Company rail lines to prevent encroachment of residential property. Also, the Division Street route is probably preferable to the Burnside Street route since Division has less houses to be impacted.

Response 9: The preferred alternative (Alternative 5-1b with the Cross-Mall downtown option) was selected on the basis of careful assessment of the relative impacts accruing to each of the alternatives addressed in the DEIS. The FEIS assesses the impacts associated with the preferred alternative only.

Comment 10: The most likely noise mitigation technique to be used in this project along the Banfield will be acoustical barriers. Table 10 in Volume 2 outlines some possible barrier noise reductions for the Freeway area. The average barrier reduction was 6-7 dBA. The noise reductions listed in Table 10 would generally bring the Banfield Freeway into compliance with federal noise standards. This is not enough! The noise levels along the freeway will still be excessive.

Although we do not know the heights of the barriers outlined in Table 10, we nevertheless recommend the barriers be constructed as tall and long as possible. In other words, the barriers should be built to give the lowest noise levels practicable, not just to meet the federal noise standards.

Response 10: Table 5-1 of the Acoustics Technical Report presents data on the barriers for the Banfield Freeway. These barriers will generally reduce noise levels by as much as 16 dB depending on height and final location of the barrier, and natural topography of the area. A reduction of 15 dB would result in exterior sound levels below the federal standards. A 15 dB noise reduction is all that can be reasonably expected from construction of a barrier; therefore, noise protection substantially beyond the federal standards would result in considerable expense and would call for architectural modifications as well as construction of barriers.

Comment 11: The DEQ's Noise Control Section recommends the following:

1. The deficiencies previously outlined be corrected in the Final EIS;
2. Alternatives 1 and 2 not be built;
3. Noise barriers be built along the Banfield so that homes receive maximum practicable noise protection, beyond the federal standards;
4. The area north of the Banfield near 53rd Avenue receive consideration for noise mitigation;
5. If the LRT alternative is considered, then:
   a. The "Pioneer Square--on the Mall" option not be built;
   b. The rails used for the LRTs be welded at the joints to reduce wheel/track noise;
   c. The area along the Portland Traction Company line be set aside as a noise buffer zone to prevent encroachment of housing developments; and
   d. An investigation be conducted into the noise impact for times other than the peak-traffic hour along the Portland Traction Company lines for the LRT options.

Response 11:
1. Identified deficiencies are corrected in the FEIS.
2. Please see the response to Comment 9 above.
3. Please see the response to Comments 5 and 10 above.
4. Please see the response to Comment 9 above.
5. a. The Cross-Mall option has been selected as the downtown LRT alignment.
   b. Rails used for the LRT system will be welded continuous rail.
   c,d. The proposed LRT noise evaluation criteria presented in Table 1-2 of the Acoustics Technical Report suggests community noise criteria for LRT operations. Compliance with these recommendations would result in minimal noise impact during nighttime hours when a single LRT passby will be considerably more intrusive.

8.3.6 Exhibit 6: Letter from Union Pacific Railroad Company

Comment 1: Project impacts on the existing Union Pacific Railroad alignment along the Banfield Freeway are not adequately addressed in the DEIS.

Response 1: Acknowledged; the impacts of the proposed Banfield Transitway Project on the railroad facilities of the Union Pacific Railroad Company are discussed in Section 4.4.4 of the FEIS and Section 3.5 of the Technical Reports.

8.3.7 Exhibit 7: County of Clackamas, Board of Commissioners

Comment 1: What are the capital match requirements of the various Banfield alternatives for both Tri-Met and ODOT?

How do these various requirements match with existing projected revenue sources; which alternatives require new revenue sources?

Response 1: Funding of the Banfield Transitway Project is discussed in Section 3.6 of the FEIS.

Comment 2: Just how available are Section 3 (UMTA Capital Grant Fund) monies and what is their potential for use on the Banfield?

Response 2: Please see Section 8.2.2.3.2 of the FEIS.

Comment 3: The other major concern of Clackamas County is the assurance that whatever alternative is selected will provide for adequate short-term transit service in the I-205 corridor and that it not jeopardize the long-term suitability of the extension of I-205 as a transit corridor.

Response 3: The Project will not jeopardize the future development of I-205 as a transit corridor.

8.4 FACSIMILES OF AGENCY LETTERS

Facsimile of agency letters are presented on the following pages.

→ EXHIBIT 1

United States Department of the Interior

OFFICE OF THE SECRETARY
WASHINGTON, D.C. 20240

ER 78/220

MAY ... 1978

Dear Mr. Green:

This is in response to the request for the Department of the Interior's comments on the draft environmental statement (DES) for Banfield Transitway, Portland, Multnomah County, Oregon.

GENERAL COMMENTS

We have reviewed the DES and note that, depending on which alternative is selected, additional documentation will be developed and circulated to satisfy the requirements of Section 4(f) of the DOT Act and Section 106 of the Historic Preservation Act.

PRELIMINARY SECTION 4(f) COMMENTS

Recreation Resources

According to the DES (Vol. 1, page 305), "None of the build alternatives would require right-of-way from public park, open space or recreational facilities. Consequently, the project requires no Section 4(f) involvement for park property." However, acquisition of land will be necessary for every alternative except the "No Build" alternative. Volume 1, pages 235 and 237 state: "Parks, recreation areas, and public/semi-public land uses are dispersed in the study area" and "Recreational area is provided in this corridor by open space connected with school properties." Maps in the documents show that several of these kinds of lands have frontage on the transitway alternatives described. The final statement should clarify the extent of right-of-way takings in the vicinity of such lands. If any significant park, recreation, or open space lands—including school lands—which are used for public outdoor recreation purposes, are planned to be part of the acquisition for the project, Section 4(f) will be involved. (1)

Secondary impacts, such as air or noise impacts, could also constitute a "use" of public park or recreation properties adjacent to the proposed transitway and should be further discussed in the final statement—reference: Brooks vs. Volpe, 460 F.2d 1193 (Ninth U.S. Circuit Court, March 2, 1972). (2)

MA PDM PDE TSE SPC

ODOT - METRO

MAY 26 1978

AM PPS aby FILE.T/A

Mr. Glen L. Green, Salem, Oregon

Should an alternative be selected which would either lie adjacent to or upon any park or recreation area, or historic or cultural resource, it may be necessary to prepare a Section 4(f) determination for each.

Cultural Resources

As stated in the Summary Impact Matrix (Vol. 1), some of the project alternatives could impact historic properties. If an alternative is selected which impacts any historic property of Federal, State or local significance, Section 4(f) would apply. This includes properties on or eligible for listing on the National Register of Historic Places as well as properties listed on the Statewide Inventory of Historic Sites and Buildings and those identified by the Portland Historical Landmarks Commission. 3

ENVIRONMENTAL STATEMENT COMMENTS

Selection of an alternative with potential for impacting historic or cultural properties on or eligible for inclusion in the National Register will require following the procedures set forth in 36 CFR 800 to comply with the National Historic Preservation Act and Section 1(3) and 2(b) of Executive Order 11593. The final statement should document such compliance, including any required determinations of eligibility pursuant to 36 CFR 800.4(a)(2). 4

On page 340 (Vol. 1), we believe the figure 1,000,000 cfs in the last paragraph should be changed to 100,000 cfs. 5

Data from the records of the Geological Survey gauge on the Willamette River differ from the data listed on Table 1 of the Water Quality Research Report. The minimum flow on August 3, 1973, was 4,520 cfs. and the maximum on December 24, 1972, was 142,000 cfs. 6

Page 4 (Vol. 2) of the Water Quality Research Report states in the last sentence that Fairview Creek has "suitable conditions for fish habitation." This should be reconciled with the statement on page 10 which says that "conditions in the creek . . . are poor." 7

In the Air Quality Research Report (Vol. 2), we suggest the final statement provide additional information on the presence and impacts of trace metals and other trace elements. Recent evidence indicates they are important aspects of air quality and can effect water quality. 8

SUMMARY COMMENTS

The "Preliminary Section 4(f) Comments" in this letter are provided to give you an early indication of our thoughts about the Section 4(f) information and involvements. They do not represent the results of formal consultation by the Department of Transportation (DOT) with the Department of the Interior, pursuant to the consultative requirements of Section 4(f) of the DOT Act. Such requirements would be fulfilled only when the Office of the Secretary of this Department comments separately on any Section 4(f) statement which may be prepared and approved by you for circulation.

As this Department has a continuing interest in the project, we would be willing to cooperate and provide technical assistance in further project assessment and in the development of additional documentation for review. The field office assigned responsibility for overall coordination of this project and for technical assistance about park, recreation, and cultural resources is: Regional Director, Heritage Conservation and Recreation Service, Northwest Region, 915 Second Avenue, Room 990, Seattle, Washington 98174.

Sincerely yours,

Larry E. Meierotto

Deputy Assistant Secretary of the Interior

Mr. Glen L. Green
Division Administrator
Federal Highway Administration
Post Office Box 300
Salem, Oregon 97308

cc: Mr. Robert A. Burco
Director
Oregon State Department of Transportation
State Highway Building
Salem, Oregon 97310

Environmental Section
May 25, 1978

cc: E. S. Hunter
D. H. Moehring
J. H. Versteeg
F. E. Terpin
Walter Hart
R. N. Bothman
Ed Hardt
Bill Geibel
Cliff Christianson
Jef Kaiser

EXHIBIT 2

Department of Energy
Region X
1992 Federal Building
915 Second Avenue
Seattle, Washington 98174
206-442-7260

April 26, 1978

Robert N. Bothman
Metropolitan Administrator
State of Oregon
Department of Transportation
5821 Northeast Glisan Street
Portland, Oregon 97213

Dear Mr. Bothman:

The Department of Energy (DOE) appreciates the opportunity to comment on the Draft Environmental Impact Statement (EIS) for the Banfield Transitway Project in Multnomah County, Oregon (FHWA-OR-EIS-78-3-D).

This Regional Office is utilizing the EIS comment process as one way to assist in achieving the purposes Congress declared when it established the Department of Energy by enacting the DOE Organization Act (42 USC 7101). Two of these purposes are:

- To achieve, through the Department, effective management of energy functions of the Federal Government, including consultation with the heads of other Federal departments and agencies in order to encourage them to establish and observe policies consistent with a coordinated energy policy, and to promote maximum possible energy conservation measures in connection with the activities within their respective jurisdictions [42 USC 7112(2)]; and

- To place major emphasis on the development and commercial use of solar, geothermal, recycling and other technologies utilizing renewable energy resources [42 USC 7112(6)] (emphasis added).

This Office therefore reviewed the referenced Draft EIS to determine not only the specific impact of the proposed action and the alternatives on energy consumption, but also: (1) the adequacy of the EIS's broad consideration of energy use, (2) the type of energy use, (3) energy conservation, and (4) the efficiency of energy use.

We found an extensive treatment of energy issues as well as a comparison of the alternatives on the basis of energy consumption and efficiency. We believe that this is the proper treatment energy issues should receive in an EIS. Your EIS is a model that this Office wishes other State and federal agencies would emulate in the preparation of their EIS's.

We note, however, that Volume Two of the EIS, which contains the primary base material for the analysis presented in Volume One, apparently lacks any support data for the Volume One energy section. We would appreciate receiving your technical comments for future reference. We were able 1
to perform a limited analysis of the alternates based on the data and descriptions that were included in Volume One.

First, using general conversion factors linking construction costs and type of construction with energy use (see the DOE's State Energy Conservation Handbook, pp. 61-80, attached), this Office calculated the energy consumption associated with construction materials and construction activities for the alternatives under consideration. To assist in your evaluation, the rough estimates of the energy invested in and required for construction of the alternatives follow:

Alternative 2a	: 0.78	Trillion Btu
Alternative 2b	: 1.07	Trillion Btu
Alternative 3a	: 1.51	Trillion Btu
Alternative 3b	: 7.38	Trillion Btu
Alternative 3c	: 8.29	Trillion Btu
Alternative 4a	: 9.17	Trillion Btu
Alternative 4b	: 8.76	Trillion Btu
Alternative 5-1a	: 13.2	Trillion Btu
Alternative 5-1b	: 14.3	Trillion Btu
Alternative 5-2a	: 15.9	Trillion Btu
Alternative 5-2b	: 17.0	Trillion Btu
Alternative 5-3a	: 11.9	Trillion Btu
Alternative 5-3b	: 13.1	Trillion Btu

Note that these energy investment estimates are greater than the "Construction Energy Estimates" provided in Table 41 on page 357. (We point out that not all of the alternatives are represented in Table 41, even though all alternatives, including the "no-build" alternative, include construction.) Most energy invested in highways, bridges, overpasses, and similar structures is embodied in construction materials and is not consumed on-site. For example, considerable energy is spent in processing cement, extracting and transporting sand and gravel, extracting, transporting, and refining crude oil to produce asphalt, mixing asphalt, mining, shipping, and processing iron ore to produce steel, and in fabricating and producing reinforcing steel. In addition, the use of asphalt or road oils for binding agents and surfacing can result in large energy investments due solely to the energy content of these petroleum products. The EIS does not indicate if these factors are included in the unit rates employed in the construction Energy Estimates. (1) contd

Second, we point out that while the EIS is correct in stating that the total 1990 Passenger Transport Energy requirements in the Banfield Corridor vary by only 6% between the alternatives, the actual difference, 352 billion Btu's, is equivalent to the annual end use energy consumption of approximately 3,600 Portland area households.

Third, we note that the 1990 estimates of Passenger Transport Energy requirements for both the CRAG Region and the Banfield Corridor assume the use of the Duwag Type B car for the light rail transit alternatives. From Table 40, page 356 of the EIS, we see that this car consumes 78 more Btu per passenger mile at 50% nominal capacity than the Boeing LRT Car. Using the 1990 estimates of LRT transit demand, we find that the use of the Duwag B car would involve the consumption of an estimated 19.1 billion Btu more than the Boeing LRT car for the 3-corridor LRT regional alternative. This is equivalent to the annual end use energy consumption of approximately 200 Portland area households. We suggest that a comparison of all the 1990 estimates for both cars would make the final EIS more complete. (2)

Other modifications to the Draft EIS which could be considered include an assessment of the energy consumption reductions which occur through less traffic congestion. This would be an especially useful addition to the discussion of ramp metering on page 100. Or, for another example, an evaluation of the grade profiles of the alternatives could be performed to determine how they might influence energy consumption. The energy consumed for maintenance might also vary greatly (3) between the alternatives depending on the extent and design of rights-of-way, traffic volumes, and type of pavement. Similarly, the energy utilized by lighting should be considered in the Final EIS; this can vary greatly with alternative project designs and the type of lighting used. The alternatives should be compared using these or other similar criteria. (3)

The EIS states on page 357 that "reconstructing the Banfield Freeway is the major [construction] energy consuming activity, primarily because of the relatively high energy requirements for bridge construction." This is an area where there are substantial energy conservation opportunities. In this case alternative materials, as well as alternative projects, should be evaluated in the Final EIS. For example, the use of alternative or recycled binding agents (cements, asphalts), alternative aggregates, and use of recycled steel should be considered. Similarly, the EIS should present an evaluation of the use of alternative construction techniques and procedures. Some procedures can greatly alter energy consumption during construction (e.g., using a higher moisture content and lower temperature in hot mix asphalt plants, requiring high loading efficiencies for earth moving equipment, maximizing use of on-site materials, utilizing standardized and repetitive dimensions to permit maximum reuse of forms, and encouraging carpooling by construction employees).

Finally, the Final EIS should indicate that measures will be taken to mitigate excessive or unnecessary energy consumption due to the design, construction, use, and maintenance of the eventual proposed action. Any potential for substitution of renewable energy resources for nonrenewable energy resources should also be addressed in the Final EIS. (4)

This Office again thanks you for the opportunity to review and comment on your Draft EIS. We are especially appreciative of your treatment of energy use as one of the areas of environmental impact considered in your EIS (just as air quality, water quality, and noise, etc., were considered), and use of energy considerations in the decision-making process. We hope our comments will be helpful to you in the preparation of the Final EIS, and in your further consideration of the alternatives. If we can be of further assistance, please do not hesitate to contact us.

Sincerely,

Jack B. Robertson
Regional Representative

cc: Lee Johnson, External Affairs Office, Region X, DOE

Robert Stern, OFfice of the Assistant Secretary for Environment, Environmentla Impact Division, NDOE

Paul Brumby, Office of the Assistant Secretary for Conservation and Solar Applications, Federal Programs Office, NDOE

Louis Lybecker, Regional Administrator, Federal Highway Administration, DOT, Portland, Oregon

EXHIBIT 3

U.S. ENVIRONMENTAL PROTECTION AGENCY

REGION X

1200 SIXTH AVENUE
SEATTLE, WASHINGTON 98101

PDM PDE TSE SPC
ODOT - METRO

APR 24 1978

REPLY TO ATTN OF: M/S 623

APR 20 1978

AM PPS ebg FILE T/A

Glen L. Green
Division Administrator
Federal Highway Administration
Post Office Box 300
Salem, Oregon 97308

Dear Mr. Green:

We have completed our review of your draft environmental impact statement for the Banfield Transitway proposal in Portland, Oregon. We would like to submit the following comments for your consideration.

Air Quality

The air quality analysis in the draft EIS utilized the "Revised Motor Vehicle Emission Factors" (Supplement 8) released by EPA in August 1977. Since that time, the "Final Motor Vehicle Emission Factor Document" has been made available (January 1978), which reflects the best state-of-the-art information currently available. These new factors should be used in the final EIS air quality analysis for the Banfield Transitway project. (1)

As noted on page 16 of the Air Quality Research Report, the Light Rail Transit air quality data was not available for the original air quality study. The results should be presented in the final EIS. (2)

Upon completion of the ongoing air quality field study, specific local impacts to air quality should be presented in the final EIS. An analysis of the local impacts should determine the extent of hot-spot critical areas with development in the Banfield Corridor.

Noise

Downtown Portland

The downtown noise measurement sites and values, presented in Table 2, page 8 of the Noise Research Report (NRR), are for noise conditions prior to construction and operation of the Portland Mall. This table (3) should be revised, in the final EIS, to reflect the noise levels presently experienced by persons using the downtown area near the Portland Mall. The draft EIS does not state what time of day nor with what sample duration the data in Table 2 was collected. These details should be presented in the final EIS to allow the reader to determine if peak noise was measured.

The draft EIS presents no data or methodology to support the statement: "It can be assumed though, an average downtown area ambient noise level of approximately 78 occurs during the noisiest period." The data presented in Table 2, which indicates that 19 of the 26 measurement sites have noise levels well below 78 dBA, does not support the 78 dBA average. Since the noise analysis of the downtown area is based on this "estimated 78 dBA", the final EIS should explain its origin. (4)

Table 3 on page 9 of the NRR presents projected downtown noise levels attributable to transit vehicles for each build alternative. The text following the table, which discusses the assumptions used to generate the data in the table, does not present the following information relative to the Light Rail Transit options. (5)

1. LRT type, whether one or two cars

2. vehicle speed

3. basic noise versus speed data for the LRT vehicle type

4. number of LRT's per hour passing each noise measurement location

These data should be stated in the final EIS to provide the EIS reader with a clear understanding of this alternative.

The comparison between predicted noise levels (Table 3) and present transit noise levels (page 9) relies solely on the 1977 noise levels attributable to existing transit, however the draft EIS does not explain how these six reference levels were determined. (6)

The determination of noise impact can only be accomplished after all assumptions and measured data are clearly presented. We therefore suggest that the final EIS present the discussion of downtown Portland noise in a form which clearly indicates the downtown noise levels at each of the measurement sites shown in Figure N-2 of the Noise Research Report before and after the construction of each alternative. (7)

Analysis of future noise levels in the Portland downtown area is particularly important considering present noise levels in many areas already exceed the Department of Housing and Urban Development's (8) environmental noise guidelines. The Department of Housing and Urban Development has acknowledged the existence of high downtown noise levels through its recent denial of HUD funds to apartment and hotel operators.

I-5 to Gresham (East Portland)

Discussions of the noise levels along the rights-of-way of streets scheduled for Low Cost Improvements and/or Light Rail Transit alternatives are presented in terms of traffic noise increases and not in terms of numbers of residences impacted by the increased traffic noise. The streets of Broadway, Sandy, Burnside, Belmont, Division, Halsey and 60th Avenue all pass through densely populated residential 9
areas of east Portland. The final EIS should indicate, through the use of noise contours, the locations of those residences which will experience L_{10} 70 dBA or greater (L_{eq} 67 dBA) and/or increases over the present noise levels.

a) 0-5 dBA (slight impact)

b) 5-10 dBA (significant impact)

c) 10 dBA or greater (very serious impact)

Construction Noise

The final EIS should include a discussion defining those measures 10
which will be implemented to reduce construction noise. Noise produced as a result of roadway construction is regulated by the City of Portland's noise ordinance number 141882 Section 18.10.060 Construction Activities and Equipment. The following list of construction noise abatement measures is suggested:

1. the use and maintenance of properly operating mufflers and quieting devices

2. the use of quietest available machinery and equipment

3. the use of electric equipment in preference to gas, diesel or pneumatic machinery

4. locating construction equipment as far from nearby noise sensitive properties as possible

5. shutting off idling equipment

6. limitation of construction hours to coincide with the normal workday period, e.g. 8:00 a.m. to 6:00 p.m.

(10) contd

7. scheduling the noisiest operations near the middle of the day, and notifying nearby residents whenever extremely noisy work will be occurring

8. the use of permanent or portable barriers around point noise sources.

Based on the concerns and issues stated above, we have rated this statement LO-2, LO (Lack of Objections), 2 (Insufficient Information). This rating will be published in the Federal Register in accordance with our responsibility to inform the public of our views on proposed Federal actions under Section 309 of the Clean Air Act, as amended.

We appreciate the opportunity to review this draft environmental impact statement. Please do not hesitate to contact me or Dennis Ossenkop, of my staff, should you have questions or desire further information regarding our comments. He can be reached at (206) 442-1595 or (FTS) 399-1595.

Sincerely,

Alexandra B. Smith

Alexandra B. Smith, Chief
Environmental Evaluation Branch

cc: Mr. R. N. Bothman
Mr. D. H. Moehring
Mr. G. A. Potter

OREGON PROJECT NOTIFICATION AND REVIEW SYSTEM

STATE CLEARINGHOUSE

EXHIBIT 4

Intergovernmental Relations Division
240 Cottage Street S.E., Salem, Oregon 97310
Ph: 378-3732

RECEIVED MAR 9 1978

PNRS STATE REVIEW

Project #: 7803 4 181   Return Date: APR - 7 1978

ENVIRONMENTAL IMPACT REVIEW PROCEDURES

1. A response is required to all notices requesting environmental review.
2. OMB A-95 (Revised) provides for a 30-day extension of time, if necessary. If you cannot respond by the above return date, please call the State Clearinghouse to arrange for an extension.

ENVIRONMENTAL IMPACT REVIEW
DRAFT STATEMENT

( ) This project does not have significant environmental impact.

(X) The environmental impact is adequately described.

( ) We suggest that the following points be considered in the preparation of a Final Environmental Impact Statement regarding this project.

( ) No comment.

REMARKS

The various impacts upon cultural resources which may be anticipated from the alternatives proposed in the Banfield Transitway Project in Multnomah County have been well outlined in the Draft Environmental Impact Statement. The necessary mitigation measures for each alternative have been thoughtfully considered also. (1)

Agency: HISTORIC PRESERVATION OFFICE
STATE PARKS & RECREATION BRANCH
525 TRADE STREET SE
SALEM, OREGON 97310

By: David G. Talbot

EXHIBIT 5

ROBERT W. STRAUB
GOVERNOR

Department of Environmental Quality

522 SOUTHWEST 5TH AVE. PORTLAND, OREGON

MAILING ADDRESS P.O. BOX 1760, PORTLAND, OREGON 97207 (503) 229-6086

May 12, 1978

Oregon Department of Transportation
Environmental Section
State Transportation Building
Salem, Oregon 97310

Attn: Mr. Gary Potter

Re: Banfield Transitway Project
#7803 4 180

Gentlemen:

The Department has completed a review of the Draft Environmental Impact Statement (DEIS) for the Banfield Transitway, one of the most important transportation issues that the Portland metropolitan region has confronted in many years. Air quality aspects of the DEIS will be addressed herein. Please see the attached memorandum for comments on noise.

The Department, of course, favors the alternative with the least associated air quality impact. On a regional basis that alternative will minimize automobile vehicle miles of travel (VMT), and at the same time will maintain reasonable levels of average travel speeds.

The "Do Nothing", Alternative 1, appears to be the least desirable of all alternatives. The performance measures of the other alternatives fall within a narrow range of each other. No single alternative commands attention as the best with regard to promoting cleaner air and meeting air quality standards within the Portland region.

Alternatives 5-1 and 5-2, LRT-Burnside and LRT-Division, respectively, have the lowest projected VMT and may be the most attractive alternatives from an air quality standpoint. The gross emissions analysis shows that Alternative 5-2 has the lowest level of emissions. Clearly, however, the greatest gains in air quality improvement can be obtained through increasing automobile occupancy. To that end, the Department recommends the following: if either the Busway or the Light Rail Transit option is chosen, then provisions should be made to utilize two of the freeway lanes (one in each direction) for limited time High Occupancy Vehicles (HOV). Alternative 2B could also include HOV lanes. Retaining this option will keep a major Transportation Control Strategy (TCS) alternative available for consideration in the next year or so when the regional TCS is developed to meet requirements of the Clean Air Act Amendments of 1977.

On page 333 of Volume 1, the following statement is made: "The Oregon State Highway Division has determined that all transportation systems proposed herein are consistent with the State of Oregon, Clean Air Act Implementation Plan." There is no foundation within the DEIS for making a determination of consistency. This cannot be done until the detailed air quality analysis contemplated for the Final Environmental Impact Statement (FEIS) is completed. That report should specifically address air quality standards. (1)

This project will need an Indirect Source Construction Permit from the Department. The FEIS should contain a thorough examination of the chosen alternative's air quality impacts and particularly how it relates to the achievement of air quality standards. The air quality aspects should be more closely correlated with the given traffic operational characteristics, where appropriate. Why air quality improves or worsens is an important issue that should be addressed in the documentation.

Alignment options within the CBD should be explored for their potential (2)
air quality impacts.

The air quality study performed by Dames & Moore for the Swan Island Transportation Access - Basin/North Going and Greeley/I-5 Projects dated March, 1978 is a good example of a highway air quality study. While it is not perfect, the report could serve as a useful guide in developing the FEIS for the Banfield Transitway.

Hopefully, these comments will prove useful in developing the FEIS and ultimately, the permit application. If you have any questions, please call me at 229-6086.

Sincerely,

Howard W. Harris

Howard W. Harris
Transportation Control Program
Coordinator

HWH:h

Attachment

cc: Robert Bothman, Metropolitan Engineer
Kay Wilcox - IRD

State of Oregon
DEPARTMENT OF ENVIRONMENTAL QUALITY

INTEROFFICE MEMO

To: Carl Simons, AQ

Date: April 26, 1973

From: Norman L. Jette, Noise NJ

Subject: Noise Comments on the Banfield Transitway Draft E.I.S. (7303-4-180)

Draft E.I.S. Deficiencies

The Banfield Transitway Draft E.I.S. has adequately presented the noise levels associated with the project alternatives, however, the Draft's analysis of these levels is inadequate. The Draft lacks a mechanism that would show the overall, macroscopic noise impact of each alternative. The technique used in the Draft of listing point-by-point project noise levels is insufficient for this purpose. This is because there is not a great deal of variation in noise levels between the alternatives. The following are some of the deficiencies in the Draft which are connected to the lack of an adequate mechanism for displaying overall impacts.

1) The Draft attempted to illustrate the differences in the noise impacts between the alternatives by using a technique called "L_{10} - 70 dBA Penetration Distance." Unfortunately, these penetration distances were of little value for evaluating overall impacts.

   a) Not all project alternatives gave the penetration distances for all measurement points. Most simply listed general ranges of penetration distances. Only Alternatives 1 and 2a gave complete lists of distances. (3)

   b) The penetration distances were measured from the center of the nearest traffic lane. Some alternative plans call for widening the roadway. Hence, the penetration distance reference point is different for each alternative. This means a comparison of alternatives with their penetration distances would be futile.

2) The Draft failed to include for each alternative a list of the number of residential units impacted by noise. Such a list probably would show substantial differences between the alternatives. This list would thus make ranking alternatives by noise impact easier. (4)

   The combination of adequate penetration distances and a list of residential units impacted would go a long way toward fixing the Draft's lack of a mechanism for showing overall impacts.

3) The Draft's discussion of the noise mitigation measures contain the following omissions:

   a) The noise barrier heights were not shown.

   b) The noise levels for the alternatives with barriers installed were not shown. 5

   c) The area north of the Banfield Freeway near 53rd Avenue was not analyzed for noise barriers. There is a critical need for noise mitigation there.

The following miscellaneous deficiencies were also found in the Draft:

4) The Draft E.I.S. failed to analyze the noise impacts associated with any of the transit stations (Holladay, 42nd, 60th, 82nd, etc.). 6

5) The Draft failed to analyze all of the light rail options for downtown Portland. 7

6) The Draft failed to present a discussion of the noise impacts associated with Alternative 3 for downtown Portland (Volume 2, page 10). 8

Discussion of Banfield Alternatives:

Generally, the noise levels for the project are in excess of the Federal Highway Administration's noise standard (L_{10} - 70 dBA) for all alternatives and for most of the measurement positions. Some alternatives show noise levels greater than 10 dBA (twice as loud) as the Federal standards. 9

The D.E.Q. does not consider these Federal noise standards protective of residential property and therefore feels the noise levels for the project are substantially higher than levels considered safe for health and welfare.

We have made no attempt to rank alternatives since none of the alternatives stand out as being substantially acoustically better than any other. However, the Department will make the following comments on the alternatives and their options:

Alternative 1--No Build: Although this seems to be one of the quietest alternatives for peak noise levels, it is one of the least acoustically desirable alternatives.

a) This "No Build" alternative means no money would be spent for noise mitigation of the existing noise problems.

b) Also, the traffic congestion connected with this alternative means the peak traffic/noise hours would be lengthened, thus prolonging the high noise levels.

9 contd.

Alternative 2(a,b)--Low-Cost Improvement: This alternative is the least desirable of the alternatives.

a) It would substantially increase the traffic volumes on many local streets. This in turn would mean much higher noise levels for these streets. A 17 dBA increase would occur on N.E. Broadway. This alternative would have the greatest number of houses impacted by noise.

b) The mitigation of these noise impacts on arterial streets is technically very difficult. Furthermore, getting the Federal Highway Administration to fund such a noise mitigation project for arterial streets would be nearly impossible. Also, this being a "low-cost" project, we even wonder if noise mitigation along the Banfield Freeway would be funded.

Alternative 3(a,b,c)--High Occupancy Vehicle Lanes: Option 3a is preferable to option 3b or 3c. Option 3a is significantly quieter than 3b and 3c at some locations (up to 8 dBA quieter) because 3b and 3c have wider roadways. There is little difference in noise levels between Options 3b and 3c, however.

Alternative 4(a,b)--Separated Busway: Option 4a is slightly louder (approximately 1 dBA) on the north side of the Banfield than 4b. However, for all practical purposes, Options 4a and 4b are identical. The noise levels for 4(a,b) are similar to the levels for 3(b,c) and Option 5 for the area along the Banfield Freeway.

Alternative 5--Light Rail Transit (L.R.T.):

a) There are no significant differences between the L.R.T. options [5(1a,2a,3d) and 5(1b, 2b, 3b)] near the Banfield Freeway.

b) Of the three L.R.T. options for downtown Portland, the "Pioneer Square--On the Mall" option is the least desirable. This option would move all bus traffic off of Fifth Avenue, thus cutting the bus capacity of the Transit Mall in half. A L.R.T. line down Fifth Avenue would increase Sixth Avenue noise levels by 8 dBA. Also, in the year 1990, Sixth Avenue probably could not handle all the extra peak hour buses from Fifth Avenue. Hence, these extra buses and their associated noise would be forced onto other downtown streets. The sum total of all this would make the Pioneer Square option the noisiest L.R.T. option for downtown Portland. 9 contd.

c) There will be no real increase in peak hour noise levels due to the L.R.T. in the East County area. However, we do have concerns about the noise impacts at other than peak traffic hours in the East County. This is because a single train traveling through late at night could possibly cause a large noise impact. The Highway Division should consider acquiring property along the Portland Traction Co. rail lines to prevent encroachment of residential property. Also, the Division Street route is probably preferable to the Burnside Street route since Division has less houses to be impacted.

<u>Project Noise Mitigation</u>

The most likely noise mitigation technique to be used in this project along the Banfield will be acoustical barriers. Table 10 in Volume 2 outlines some possible barrier noise reductions for the freeway area. The average barrier reduction was 6-7 dBA. The noise reductions listed in Table 10 would generally bring the Banfield Freeway into compliance with Federal noise standards. This is not enough! The noise levels along the freeway will still be excessive. 10

Although we do not know the heights of the barriers outlined in Table 10, we nevertheless recommend the barriers be constructed as tall and long as possible. In other words, the barriers should be built to give the lowest noise levels practicable, not just to meet the Federal noise standards. 11

<u>Conclusions and Recommendations</u>

The D.E.Q.'s Noise Control Section recommends the following:

1) The deficiencies previously outlined be corrected in the Final E.I.S.;

2) Alternatives 1 and 2 not be built;

3) Noise barriers be built along the Banfield so that homes receive maximum practicable noise protection, beyond the Federal standards;

4) The area north of the Banfield near 53rd Avenue receive consideration for noise mitigation;

5) If the L.R.T. alternative is considered, then:

a) The "Pioneer Square--on the Mall" option not be built;

b) The rails used for the L.R.T.'s be welded at the joints to reduce wheel/track noise;

c) The area along the Portland Traction Co. line be set aside as a noise buffer zone to prevent encroachment of housing developments, and

d) An investigation be conducted into the noise impact for times other than the peak traffic hour along the Portland Traction Co. lines for the L.R.T. options.

11 contd.

/dro

EXHIBIT 6

UNION PACIFIC RAILROAD COMPANY

TRANSPORTATION DIVISION

DEPARTMENT OF OPERATION

April 7, 1978

L. A. KIRKEBY
SUPERINTENDENT
OREGON DIVISION

P. O. BOX 8979
PORTLAND, OREGON 97208

D 315-2-167

PDM PDE TSE SPC
ODOT - METRO

APR 11 1978

AM PPS ebq

Mr. Robert N. Bothman, Administrator
Department of Transportation
Metropolitan Section
5821 N. E. Glisan
Portland, Oregon 97213

Dear Mr. Bothman:

Please refer to the hearing held April 6 concerning the Banfield Transitway Project. We have reviewed the Volume I of the Draft Environmental Impact Statement for this project and note one important omission.

On May 25 we furnished you with Union Pacific Railroad's Impact Statement to be included in the E. I. S. Apparently this was inadvertently omitted from the statement. Attached hereto are two copies of this statement for your ready reference. Will you please arrange to have it included in the final statement.

R-215

Yours truly,

L. A. Kirkeby

L. A. Kirkeby

IMPACT OF PROPOSED BANFIELD TRANSITWAY ON RAILROAD FACILITIES OF UNION PACIFIC RAILROAD COMPANY

HISTORY

Union Pacific Railroad Company's railroad facilities through Sullivan's Gulch were constructed in 1880-1882 on right-of-way which varied in width from 60 feet to 100 feet. The center line of the main line was located 30 feet from the right-of-way line in the narrower strips. Prior to 1915, six Portland city street bridges crossed the railroad right-of-way and Sullivan's Gulch between N. E. Union and N. E. 33rd Avenues. Nine city streets crossed between N. E. 37th and 82nd at the same grade as the railroad right-of-way and track. (1)

In 1915, the City of Portland prepared an engineering study to eliminate the grade crossings in Sullivan's Gulch. On October 27, 1915, the City passed Ordinance 31051 requiring closure of the grade crossings and construction of grade separations. The railroad tracks were depressed 11-13 feet throughout the area, and separated crossings constructed at N. E. 37th and Sandy Boulevard, 47th, 52nd, 60th, Halsey Street (Barr Road), 74th, and 82nd. The cost of the project to eliminate the grade crossings and to construct separations was shared 60 percent by the railroads, 20 percent by the City, and 20 percent by the property owners in the district directly benefited by the project. The structures were designed by the City Engineer in cooperation with Railroad engineers. The design provided for four tracks: two main line tracks flanked by a track on each side for switching. Attached is a copy of figure 7 from the City's 1915 report: an artist's sketch of the proposed 37th and Sandy Boulevard crossing showing the provision for the four railroad tracks.

In 1944, the City of Portland and State Highway Department began consideration of an east-west "super-highway" through Sullivan's Gulch. The "super-highway" was envisioned as requiring a right-of-way only 100 feet in width. Railroad and Highway engineers believed the highway facilities contemplated would have a minimal effect on the rail right-of-way and facilities, and that the north line of the highway would conform to the south line of the rail right-of-way.

From 1945 to 1947, Highway engineers made preliminary surveys for the highway, and concluded that it would be necessary for portions of the highway facility (or slopes) to encroach on the railroad right-of-way. In 1948, in response to a request from the State Highway Engineer, the Railroad stated its minimum requirements for trackage through Sullivan's Gulch (if the highway were constructed) would be two main tracks and one switch track on the north side of the main line. The

State Highway Engineer expressed doubt that three tracks could be placed through the Gulch and leave room for the highway.

Between 1948 and 1952, detailed construction plans for the Banfield Freeway were developed. Cooperative efforts of Railroad and Highway engineers minimized the number and magnitude of highway encroachments on the railroad right-of-way. The freeway was constructed between 1952 and 1956. The Railroad granted the State easements required for construction of the freeway pursuant to three agreements:

(1) dated September 8, 1952 for the N. E. 82nd to N. E. 122nd Avenue section;

(2) dated December 16, 1953 for the N. E. 42nd to N. E. 92nd Avenue section; and

(3) dated September 9, 1955 for the Willamette River to N. E. 42nd Avenue section.

As finally designed and constructed, the highway encroached no closer than 25 feet from the center line of the Railroad's main line track, except between N. E. 35th Avenue, and N. E. 37th Avenue, where the highway encroached to within 19 feet of the center line of the main track.

The construction of the freeway effectively eliminated the possibility for the Railroad to construct three tracks through Sullivan's Gulch. Double main line track, together with necessary appurtenant facilities, including an off-track equipment roadway, was, and still is possible with curative action required because of the highway encroachment between N. E. 35th and N. E. 37th.

In 1975, the State Highway Division, with the cooperation of the Railroad, completed construction of bus and motor pool (high occupancy vehicle or HOV) lanes and emergency turnouts utilizing to the extent possible easement areas previously granted by the Railroad. Additional permanent easements for this project encroached no closer than 30 feet to the center line of the main track.

FUNCTION AND USE OF RAIL FACILITIES IN SULLIVAN'S GULCH

The Union Pacific Railroad system is a major transcontinental rail line serving the central corridor of the United States with 9,500 miles of railroad. The system extends from the Omaha-Council Bluffs and Kansas City gateways on the east to Southern California and the Pacific Northwest. The main line to the Pacific Northwest follows the Columbia River from the Railroad's classification yard at Hinkle, west of Pendleton in Umatilla County. The Pacific Northwest is served through Portland.

The Albina freight terminal is Union Pacific Railroad Company's main freight terminal in the Pacific Northwest. Union Pacific's lines extend from Portland to Seattle, Washington, and rail traffic between Seattle and points east of Portland pass through the Albina freight terminal. In recent years, the Albina freight terminal has consistently handled approximately one-half million cars per year.

The attached sketch shows the general layout of Union Pacific's lines in the Portland area. From the east, there are two routes between Troutdale and the Albina terminal:

the Kenton line, and

the Sullivan's Gulch line.

Essentially all of these cars moving through the Albina terminal arrive and depart over the Kenton or Sullivan's Gulch lines. The Kenton line is a single track line via Kenton, Peninsula Junction, and St. Johns Junction. This route is 20.4 miles long and has 44 railroad-highway public or private grade crossings.

The line through Sullivan's Gulch connects (1) the Steel Bridge and railroad facilities on the west side of the Willamette River, including Portland Terminal Railroad and Burlington Northern, Inc.; and (2) the southern entrance to the Union Pacific's Albina freight terminal. In addition, a direct connection between the Sullivan's Gulch line and the UPRR-SPTCo. East Portland interchange yard is planned for construction in 1978.

The Sullivan's Gulch line also is a single track, except for 1.1 miles of double track between the Albina terminal and the East Portland UPRR-SPTCo. interchange yard.

The Sullivan's Gulch line is 16.2 miles long, 4 miles shorter, and approximately 15 minutes faster than the Kenton line. Passenger trains to and from the East used this route, and now "symbol" (fast schedule) freight trains use the route. Between the Albina yard and the East Portland UPRR-SPTCo. interchange yard, there are 5 grade crossings. Between the East Portland interchange yard and Troutdale, there are no public grade crossings, except at 238th (Arata Road at MP 14.1) and 244th (MP 14.4). There are only 2 private crossings: at Barker Manufacturing Co. (MP 2.2) and at the McGill & Son Nursery (MP 13.05). Thus, there are no public grade crossings of this line as it enters the city for a distance of 12.5 miles.

Because of the absence of grade crossings, the Railroad's line through Sullivan's Gulch compares to its Kenton line much as the Banfield Freeway compares to Sandy Boulevard. A critical difference is that a congested highway can be supplemented by another; whereas a railroad is fixed and is forever limited to its remaining right-of-way.

The Sullivan's Gulch railroad right-of-way is a unique and irreplaceable rail transportation facility.

THE FUTURE OF THE GULCH LINE AND IMPACT OF HIGHWAY ENCROACHMENTS

The natural physical grade separation from city streets which makes Sullivan's Gulch desirable as a limited access freeway for motor vehicles makes it a unique railroad throughway for ingress and egress to the Albina freight terminal.

The relative efficiency of rail traffic has permitted the Gulch line to be used since its construction in the year 1882, a period of 94 years, with only one main line track. The date at which a second main line track through the Gulch will be desirable or required cannot be predicted with absolute certainty. However, changed conditions could precipitate such a need. For example, a shortage or increase in the cost of petroleum combined with environmental concerns with respect to the ambient air quality standards in the City of Portland could precipitate a shift in freight traffic from motor vehicle to rail. In turn, this could:

(1) make practicable or necessitate construction of a second main line railroad track through Sullivan's Gulch; and/or

(2) make practicable or necessitate a change from diesel oil to electricity for motive power for railroad locomotives.

In addition, rail facilities must be maintained by equipment which travels along roadways adjacent to the trackage. There is no access between the Banfield Freeway and the railroad right-of-way, and railroad facilities cannot be maintained from the Banfield Freeway. Accordingly, it is essential to have an off-track equipment roadway alongside the railroad right-of-way for the purpose of maintaining facilities.

Because of the freeway, all industrial development must be to the north. Consequently, expansion of railroad facilities must be to the south of the existing main line. In order to accommodate the above-described facilities, the Railroad should have available 36 feet of right-of-way from the center line of its existing main track to the nearest encroachment to the south. Encroachments closer than 36 feet to the existing main line will adversely affect expansion of existing rail facilities. In general, any significant encroachment closer than 30 feet south of the center line of the existing main line track probably will preclude the possibility of electrification of this line, and encroachments closer than 25-1/2 feet south of the center line of the existing main line track probably will preclude the possibility of construction of a second main line track. Similarly, vertical clearances less than 26 feet between the top of the rail and the lowest portion of any overhead structure probably will preclude electrification of the line.

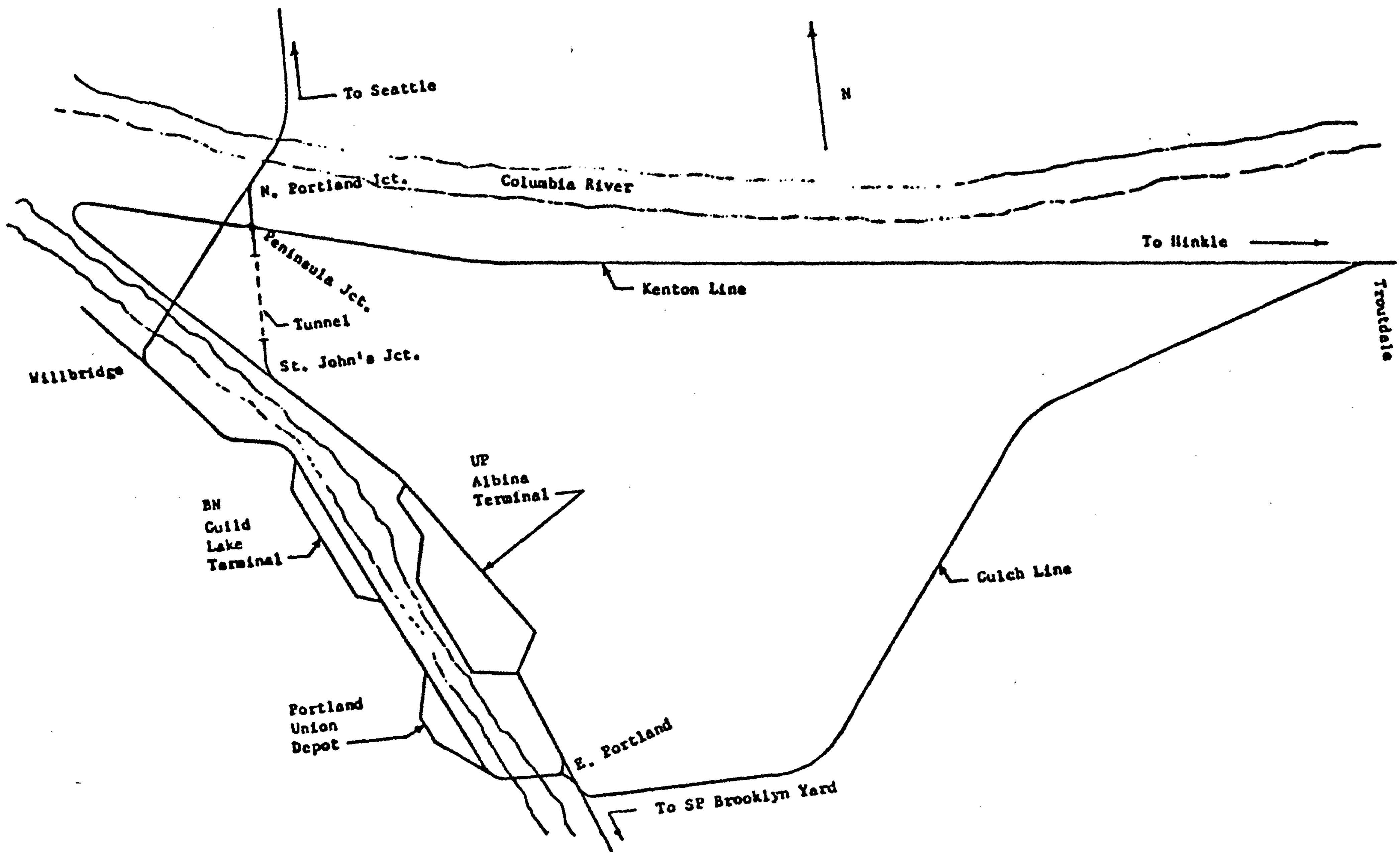
<u>CONCLUSION</u>

The railroad right-of-way, as acquired in 1880-1884 would have been adequate to meet Union Pacific's needs for access through Sullivan's Gulch in perpetuity. The Railroad's long-range planning for this corridor, as evidenced by the design of the grade separation structures constructed in the 1915-1920 project with the City of Portland, provided for 4 tracks. In order to permit construction of the existing Banfield Freeway highway facilities in 1952 to 1956, the Railroad gave up the possibility of constructing 3 tracks through Sullivan's Gulch and effectively constricted the expansion potential of the line to 2 tracks and appurtenant facilities, including an off-track equipment roadway. The construction now proposed of a mass transit corridor between the existing highway facility and the railroad facilities will further constrict the flexibility of this area as a rail transportation corridor. It will permanently and severely limit (or perhaps preclude) the construction and operation of any additional railroad facilities in the corridor, and will substantially increase the cost of any modification or proposed addition to the rail facilities.

The general public welfare and long-range public need must dictate the ultimate development of this transportation corridor. If the overwhelming public need requires construction of additional transitway for the exclusive use of public mass transit vehicles, and this need can be met only by further encroachment on the railroad right-of-way, it must be recognized that the additional encroachments will severely damage the railroad right-of-way, and that possible expansion of the railroad facilities in the transportation corridor will have been sacrificed.

* * *

May 12, 1976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Peninsula Jct.
To Hinkle
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Troutdale
Tunnel
St. John's Jct.
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Albina
Terminal
BN
Guild
Lake
Terminal
Gulch Line
Portland
Union
Depot
E. Portland
To SP Brooklyn Yard

→ EXHIBIT 7

COUNTY OF CLACKAMAS

BOARD OF COMMISSIONERS

OREGON CITY, OREGON 97045

655-8581

ROBERT SCHUMACHER, Chairman
RALPH GROENER, Commissioner
STAN SKOKO, Commissioner

May 1, 1978

Mr. Peter Cass
General Manager
Tri-Met
520 S. W. Yamhill
Portland, Oregon 97204

The Clackamas County Board of Commissioners has the following questions and concerns regarding the Draft Environmental Impact Statement of the Banfield Corridor Project.

A major concern of the County is the possible loss or shifting of the funds reserved for the Oregon City Corridor. Specific questions that the County has regarding this issue are:

1. What are the capital match requirements of the various Banfield alternatives for both Tri-Met and ODOT? (1)

2. How do these various requirements match with existing projected revenue sources; which alternatives require new revenue sources?

3. Just how available are Section 3 (UMTA Capital Grant Funds) monies and what is their potential for use on the Banfield? (2)

The other major concern of Clackamas County is the assurance that whatever alternative is selected will provide for adequate short-term transit service in the I-205 Corridor and that it not jeopardize the long-term suitability of the extension of I-205 as a transit corridor. (3)

BOARD OF COUNTY COMMISSIONERS

Ralph Groener
Chairman

Commissioner

Commissioner

/rn

APPENDIX

VICTOR ATIYEH
GOVERNOR

Department of Environmental Quality

522 SOUTHWEST 5TH AVE. PORTLAND, OREGON

MAILING ADDRESS: P.O. BOX 1760, PORTLAND, OREGON 97207

June 26, 1980

Mr. Gary A. Potter
Oregon Department of Transportation
412 Transportation Building
Salem, OR 97310

Re: Banfield Transitway
Determination of Consistency

Dear Mr. Potter:

With the proposed mitigation of projected significant net increases of 8-hour standard violation carbon monoxide concentrations at four sites to less than significant levels, the Department finds the Banfield Transitway to be consistent with the State Implementation Plan.

While this project should now not significantly increase CO levels, we are still concerned about, and question the magnitude of projected baseline levels. To resolve the discrepancy between future carbon monoxide levels projected in the Final Environmental Impact Statement and the revised State Implementation Plan submitted to EPA in July, 1979, the Department will propose, through the permit process, a program for the collection of ambient carbon monoxide data adjacent to the Banfield Freeway.

Sincerely,

Howard W. Harris

Howard W. Harris, Coordinator
Transportation Control Program
Air Quality Division

HWH:i
cc: R. N. Bothman, ODOT

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