Section 2: Transit Planning for Major Investments and New Starts

- Introduction and Assignments
- New Starts/Alternatives Analysis/Major Investments
- New Starts/Alternatives Analysis/Major Investments – power point
- Transit Technology Alternatives
- Transit Technology Alternatives – power point

Analysis Procedures

- Environmental Impact Assessment
- Environmental Impact Assessment – power point
- Environmental Justice and Transportation Planning
- Environmental Justice and Transportation Planning – power point
- Transit and Land Use
- Transit and Land Use – power point
- A Transportation Modeling Primer
Transit Planning for New Starts

New starts is the term used by the Federal Transit Administration for the process of funding major new fixed guideway transit facilities such as light rail transit lines, bus rapid transit, commuter rail or heavy rail transit. Such systems are eligible for federal capital funds to pay a portion of their costs. To receive such funding, agencies must conduct a series of planning and analysis steps that meet specific guidelines and may also include a full environmental impact statement.

This section gives overviews of the new starts process, environmental impact analysis and environmental justice. Most new starts projects involve an environmental assessment or impact statement and environmental justice is often a major concern in planning and design. These topics should be reviewed first. These are:

- New starts procedures for major investments in Transit
- Environmental Impact Assessment
- Environmental Justice Process

Since the regulations and procedures are subject to change, you should consult the Federal Transit Administration web site on new starts to find the latest information and procedures. This is at:


This section also includes some useful background information on the technologies typically considered in a new starts process, the relationship between transit and land use and the travel demand forecasting. These are:

- Transit Technology Alternatives
- Transit and Land Use
- A Travel Modeling Primer

All of the material except the travel modeling primer is also given in power point format.

To get an understanding of how the process works in practice, consult the web pages for communities that are actively involved in new starts planning. For a current list, see the latest FTA annual report on new starts

http://www.fta.dot.gov/planning/newstarts/planning_environment_2618.html

The report lists the projects that are currently underway as well as those that are being considered for selection by FTA.

Links to most transit systems in the North America can be found on the Web site of the American Public Transit Association.

http://www.apta.com/links/transit_by_mode/

This site also lists proposed light rail projects, both active and inactive.
Questions:

1) Using the annual report of new starts by FTA and the specific web site of a project, identify the factors that led to full funding agreements for the current year for a specific community. What factors led to the rating of that particular system. List the following
   a. Cost effectiveness
   b. Specific actions that enhance the connection between land use and transit.
   c. Sources of funding
2) Find an environmental analysis for a community that has gone through the new starts process and describe the following:
   a. Findings of the environmental analysis,
   b. Was it a full EIS, FONSI, or a categorical exclusion?
   c. What impacts were ‘significant’?
   d. How were the negative impacts mitigated?
3) Explain the rationale for the Federal Transit Administration of the use of environmental effects as a basis for selection of new starts projects among competing cities
4) Compare the process used to determine federal funding for new transit systems to that used to for new highways. How are they different? Discuss if the use of different procedures is ‘fair’. What suggestions do you have to change the process? (For background see: http://www.brook.edu/es/urban/publications/20031215_Beimborn.pdf)
5) Assume that a community wishes to compare bus rapid transit and light rail transit along a similar corridor. Assume that both systems provide the same travel times; How would they be similar of different on the following criteria?
   a. Cost of infrastructure (roadways vs. rails, maintenance facilities, station or stops, vehicles)
   b. Attractiveness of places along the route as a place for real estate development
   c. Frequency of service to carry the same level of demand
   d. Permanence (once built, will remain)
6) What characteristics of bus rapid transit would likely be more attractive to users than light rail? What characteristics of light rail would be more attractive to users than bus rapid transit? Do a subjective rating of each on a +5 (highly favors rail) to a -5 (highly favors bus) rating system. Consider the following characteristics:
   a. Ability to attract occasional users such as tourists
   b. Ability to attract usage for special events such as festivals and sporting events
   c. Ability to attract usage for off peak times such as mid day and evenings
   d. Effects from the need to transfer between vehicles
   e. Frequency of service
   f. Effects of comfort level on the vehicles
   g. Effects of the look and image of the vehicles.
   h. Differences in the noise level of the vehicles
7) Bonus! What changes in travel forecasting models do you feel should be made to accommodate the differences that you found in the above question?
Transit system comparison

A community is looking at three major transit alternatives. These are described at the end of this assignment and should be compared using the following criteria: (The data for this example does not represent a particular community.)

**Costs**
- Capital costs
  - Vehicles
  - Guideway
  - Shops
  - Stops/stations
- Total Capital Cost
- Annual capital cost
- Annual operating cost
- Annual revenue
- Net cost
- Total capital cost per mile

**Level of Service**
- Average Headway-peaks
- Average Headway-base
- Transfers/trip
- Operating hours/day
- Average fare
- Average speed

**Impact**
- Population served
- Jobs served
- Congestion effect
- HH displaced
- Development effect
- Energy saved
- Jobs created

**Travel Demand**
- Trips/day
- Passenger miles
- Passenger hours
- Extra total cost/new annual trip
- Extra annual capital cost/extra annual trip
- Extra annual net cost/extra annual trip

a) Determine vehicle fleet size for each alternative. Use the fleet size calculation procedures in the transit operations section. Add spare vehicles.

b) Determine the capital costs for vehicles, shops, guideway and stations/stops. Convert these to annual costs using the annualizing factors.

c) Determine daily cost of operations and daily revenues using the operating cost per vehicle hour and average fares.

d) Using the other information given, calculate the information needed for the other criteria.

e) Complete an evaluation matrix using the criteria given above.

b) Identify advantages and disadvantages of alternatives of the bus rapid transit system over the base alternative. What will be gained and lost by choosing alternative two over alternative one.

c) Choose either alternative one or two (the one you prefer and compare it to alternative three using advantages, disadvantages, gains and losses.

d) Make a recommendation and discuss your selection.
**Bonus!**

e) Which data has the most important effect on your recommendation? What analysis or further work would you do to increase confidence in your recommendation?

f) What additional information would you need to make a comparison of these alternatives using FTA criteria?

g) After either the bus rapid transit of light rail system is operating, the local bus service would likely remain, assume that demand on the local bus will be reduced by 50%, how would this affect your decision?

h) How would the conclusions change if only one route were built?
### Data for transit alternatives

<table>
<thead>
<tr>
<th></th>
<th>Local bus</th>
<th>Bus rapid</th>
<th>Light rail</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating days/yr</td>
<td>300</td>
<td>365</td>
<td>365</td>
</tr>
<tr>
<td>Peak period</td>
<td>4</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Base Period</td>
<td>6</td>
<td>12</td>
<td>12</td>
</tr>
<tr>
<td>Vehicle seats</td>
<td>50</td>
<td>80</td>
<td>150</td>
</tr>
<tr>
<td>Maximum load factor</td>
<td>120%</td>
<td>150%</td>
<td>150%</td>
</tr>
<tr>
<td>Pct spares</td>
<td>10%</td>
<td>10%</td>
<td>10%</td>
</tr>
<tr>
<td>Pct layover</td>
<td>10%</td>
<td>10%</td>
<td>10%</td>
</tr>
<tr>
<td>Peak/base veh</td>
<td>50.00%</td>
<td>50.00%</td>
<td>50.00%</td>
</tr>
<tr>
<td>Pct peak hr trips</td>
<td>20.00%</td>
<td>20.00%</td>
<td>20.00%</td>
</tr>
<tr>
<td>Average fare</td>
<td>$1.20</td>
<td>$1.20</td>
<td>$1.20</td>
</tr>
<tr>
<td>Average trip length</td>
<td>8</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td>Transfers/trip</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
</tr>
<tr>
<td>gal fuel saved/trip</td>
<td>0.5</td>
<td>0.5</td>
<td>0.8</td>
</tr>
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</table>

#### Route one

<table>
<thead>
<tr>
<th></th>
<th>Length</th>
<th>Stations/stops</th>
<th>Speed</th>
<th>Daily trips</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>10</td>
<td>40</td>
<td>15</td>
<td>4,500</td>
</tr>
</tbody>
</table>

#### Route two

<table>
<thead>
<tr>
<th></th>
<th>Length</th>
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<th>Speed</th>
<th>Daily trips</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>10</td>
<td>40</td>
<td>15</td>
<td>4,000</td>
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</table>

### Costs/Revenue

<table>
<thead>
<tr>
<th></th>
<th>Cost/vehicle</th>
<th>Cost/shop</th>
<th>Cost/mile guideway</th>
<th>Cost/station or stop</th>
<th>Operating cost/veh hr</th>
<th># of shops</th>
<th># miles guideway</th>
<th>Annualiz factor- veh</th>
<th>Annualiz - guideway</th>
<th>Annualiz - shop</th>
<th>Annualiz - stations</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$200,000</td>
<td>$1,000,000</td>
<td>$8,000,000</td>
<td>$3,000</td>
<td>$60.00</td>
<td>1</td>
<td>20</td>
<td>0.10</td>
<td>0.02</td>
<td>0.03</td>
<td>0.05</td>
</tr>
</tbody>
</table>
### Impacts

<table>
<thead>
<tr>
<th></th>
<th>20,000</th>
<th>20,000</th>
<th>20,000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Population served</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Jobs served</td>
<td>9,000</td>
<td>9,000</td>
<td>9,000</td>
</tr>
<tr>
<td>Congestion effect</td>
<td>none</td>
<td>none</td>
<td>reduced</td>
</tr>
<tr>
<td>HH displaced</td>
<td>none</td>
<td>none</td>
<td></td>
</tr>
<tr>
<td>Development effect</td>
<td>none</td>
<td>$20,000,000</td>
<td>$80,000,000</td>
</tr>
</tbody>
</table>

**Notes:**
- Annualization factors are used to convert initial costs to annual costs.
- Average operating cost includes all costs
- Trips made by transfer do not produce revenues

### Acknowledgements

Some of this material was developed as part of work being conducted by the Great Cities University consortium under the lead of the University of Alabama at Birmingham using funds provided by the Federal Transit Administration of the U.S. Department of Transportation.

The opinions expressed are the product of independent university work and not necessarily those of the sponsoring agencies or of the agencies supplying data for the project.
New Starts/Alternatives Analysis/Major Investments

Resources:

Federal Transit Administration rules and guidelines are on their web page. See: http://www.fta.dot.gov/planning/planning_environment_5221.html

These include specific funding allocations for the current year to projects, procedural guidelines, and specific technical guidance for the preparation of funding applications for new starts money. Anyone involved in this process should consult FTA to make sure that they are following the most up to date regulations and procedures.

An important resource is the FTA annual report of the status of the new starts program which indicates the allocation of funds to separate projects and also explains the process that is used to rate competing projects. This is given in an appendix of the new starts annual report. In addition FTA provides reporting instructions for the Section 5309 new starts criteria. This available from the following web site: http://www.fta.dot.gov/15052_ENG_HTML.htm

In addition FTA conducts outreach meetings and new starts roundtables that provide briefings on the latest procedures. These should be consulted for more information.

Overview

New starts is the term used by the Federal Transit Administration for the process of funding major new fixed guideway transit facilities such as light rail transit lines, bus rapid transit, commuter rail or heavy rail transit. Such systems are eligible for federal capital funds to pay a portion of their costs. To receive such funding, agencies must conduct a series of planning and analysis steps that meet specific guidelines and may also include a full environmental impact statement.

Federal legislation "directs FTA to evaluate and rate candidate New Starts projects as an input to Federal funding decisions and at specific milestones throughout each project's planning and development. TEA-21 further establishes a comprehensive planning and project development process which New Starts projects must follow, and which is intended to assist local agencies and decision makers evaluate alternative strategies for addressing transportation problems in specified corridors and select the most appropriate improvement to advance into engineering, design, and construction. Planning and project development for New Starts projects is a continuum of analytical activities carried out as part of the metropolitan planning and National Environmental Policy Act of 1969 (NEPA) review processes."2

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New starts funding is limited and communities must compete with each other for funds. It is a competitive process, in that different projects are rated by FTA and only those ranked above others will be eligible for federal funds. The process used to rate projects is shown in the figure on the following page: (note that this process changes over time, it is important to use the latest information and guidance from the FTA web page)

The new starts process includes a sequence of studies as shown in the figure below. First and alternatives analysis (AA) is conducted. This typically follows a regional planning effort and looks at possible alternatives in a given corridor in the community. The purpose of the alternatives analysis is to an alternative that the community feels best meets its needs at a reasonable cost. It is the alternative that is better than any other for serving a travel market given reasonable funding assumptions (LPA: locally preferred alternative).

The alternatives analysis is used to select the mode (technology) to be used and its alignment in a specific corridor. Alternative technologies such as bus rapid transit, light rail, heavy rail and others would typically be considered in the AA.

Following the selection of a LPA and approval of the Federal Transit Administration, the project advances to preliminary engineering. In Preliminary engineering, the final scope of the project and its cost are developed. A key element of this step is meeting the requirements of the National Environmental Policy Act and often this means the preparation of an environmental impact statement.

Final Design takes place following FTA approval and involves the preparation of construction documents and final cost estimates. When FTA issues a Full Funding Grant Agreement, then project construction can proceed. As shown in the diagram, the overall process can take a minimum of 6-12 years. In many locations it can be longer if there are major local issues such as financing to resolve.

**Relationship to Environmental Impact Assessment**

Very often a new starts project will also include a full environmental impact assessment (EA) and an environmental impact statement (EIS). Procedures for preparing an EA and EIS are complex and involve a full examination of the impacts of the project on the natural and man-made environment. An overview of FTA Environmental analysis procedures are given on the FTA web site.

For some projects, an EIS is performed automatically because of the nature of the projects, in other cases, an environmental assessment is first performed to determine if there are impacts on the environment from the proposed project and if those impacts are “significant”. If the impacts are not significant, a FONSI (finding of no significant impact) is issued, they are deemed to be significant, then an EIS is issued. The EA study is similar in either case, but the end documents are different.

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3Introduction to FTA’s new Starts Program, APTA Beginners Course, APTA annual Conference, Dallas, Sept 29, 2005
http://www.fta.dot.gov/grant_programs/transportation_planning/major_investment/17811_ENG_HTML.htm
The EA is normally done as part of the alternatives analysis phase where different modes and locations are examined. Projects are scoped out for the alternatives analysis and for the EA. Project scoping includes a definition of the alternatives and the criteria to be used to evaluate the alternatives. As part of the alternatives analysis, impacts are analyzed for each alternative. Selection of a 'locally preferred alternative' (LPA) should be made by considering the impacts. Before a project can proceed to preliminary engineering, the environmental impact issues should be addressed.

New Starts Process

- Project Development: Typically 6-12 Years
  - FTA Approval Required
  - Alternatives Analysis 1-2 years
  - Preliminary Engineering 2-3 years
  - Final Design 3-7 years
  - Construction
  - Operation
  - FTA Approval Required for Full Funding Grant Agreement (FFGA)
Alternatives:

The alternatives analysis phase of the process involves the selection of a preferred technology and alignment. Alternative technologies that may be considered are light rail, heavy rail, commuter rail, bus rapid transit and others (see the section of the course dealing with alternative technologies). Alternative alignments must also be considered for each of the technologies. This can result in a large number of combinations. In some places, the technology choices are narrowed down to a set of promising alternatives to reduce the number of combinations. This is an important step in defining the scope of the study.

A key alternative that must be included is the base line alternative. The base alternative is the best that can be done to provide transit service without the construction of some sort of guideway. This alternative is used as a basis for comparison to all the other ‘build’ alternatives. Benefits of a build alternative are found by comparing it with the base alternative.
Project Justification and Rating:

Projects are rated in two general areas - project justification and financial rating. These two factors are combined into an overall rating.

The FTA New Starts Evaluation and Rating Framework

Project justification includes: cost effectiveness, transportation supportive land use policies and future patterns, mobility improvements, environmental benefits, operating efficiencies, and other factors. Cost effectiveness is measured by annualized total capital and operating costs per dollar of incremental value of transit user benefits.

In addition, SAFETEA-LU legislation has added two additional criteria: Economic Development and reliability of the forecasting methods used (for both ridership and costs).
<table>
<thead>
<tr>
<th><strong>Criterion</strong></th>
<th><strong>Measures/Categories</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Cost Effectiveness</td>
<td>• Incremental Cost per Hour of Transportation System User Benefit</td>
</tr>
<tr>
<td>Transit Supportive Land Use and Future Patterns</td>
<td>• Existing Land Use &lt;br&gt; • Transit Supportive Plans and Policies &lt;br&gt; • Performance and Impacts of Policies</td>
</tr>
<tr>
<td>Mobility Improvements</td>
<td>• Normalized Travel Time Savings (Transportation System User Benefit per Project Passenger Mile) &lt;br&gt; • Low-Income Households Served &lt;br&gt; • Employment Near Stations</td>
</tr>
<tr>
<td>Operating Efficiencies</td>
<td>• System Operating Cost per Passenger Mile</td>
</tr>
<tr>
<td>Environmental Benefits</td>
<td>• Change in Regional Pollutant Emissions &lt;br&gt; • Change in Regional Energy Consumption &lt;br&gt; • EPA Air Quality Designation</td>
</tr>
</tbody>
</table>

The **cost effectiveness** measure is the total annual cost divided by the user benefits.

**User benefits** are found by comparing the proposed project with a base alternative. User benefits consist of changes in the following components of trip characteristics:
- In-vehicle time
- Walk and wait time
- Number of transfers
- Mode specific constants

These factors are weighted in their importance based on calibration results of local travel demand models. For example, assume an alternative reduces travel time by five minutes and also reduces walking time by five minutes for some users. Local travel models show that wait time three times as important as travel time since travelers typically think that wait time is more important than traveling time. Thus the total benefit is twenty minutes, since the savings in walk time is weighted differently than savings in travel time. This is done for all travelers and all trip purposes to get an estimate of overall user time for an alternative. User benefits are then the savings in user time for an alternative as compared to the baseline alternative.
The costs of an alternative are the annualized total capital cost of the project in base year dollars and the annual operating and maintenance costs of the project. The cost effectiveness measure is then the total annual cost divided by the user benefits. If a community has low number, it indicates a good project since it costs a smaller amount to create benefits than in another community.

The local travel forecasting results are interpreted by software (Summit) developed by FTA to calculate cost effectiveness measures. Calculation of user benefits may require some modifications to the regional travel demand model set employed in the alternatives analysis study effort in order to produce the set of fixed person trip tables and generalized cost files which are read into the "Summit" software developed by FTA to generate the measure.4

The second criteria used by FTA are transportation supportive land use policies and future patterns. Transit and land use are highly related and should be planned together. This criteria looks at how well transit projects facilitate and enhance land use along their routes. Separate criteria are used for different phases of analysis – depending if the project is in preliminary engineering and/or final design. (A variety of criteria are used as given on the tables on the following pages5. The general categories are" characteristics of existing land use in the corridor, the presence of transit supportive plans and policies and the performance impact of the land use plans and policies. These criteria are used to encourage a mix of programs that lead to a good fit between land use and transit service.


### Table II-3 Ratings Applied in Assessment of Land Use Criterion

#### I. EXISTING LAND USE

**Existing Land Use**

<table>
<thead>
<tr>
<th>Phase of Project Development</th>
<th>Land Use Assessment Ratings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preliminary Engineering and Final Design</td>
<td>HIGH (5) Current levels of population, employment, and other trip generators in station areas are sufficient to support a major transit investment. Most station areas are pedestrian-friendly and fully accessible.</td>
</tr>
<tr>
<td></td>
<td>MEDIUM (3) Current levels of population, employment, and other trip generators in station areas marginally support a major transit investment. Some station areas are pedestrian-friendly and accessible. Significant growth must be realized.</td>
</tr>
<tr>
<td></td>
<td>LOW (1) Current levels of population, employment, and other trip generators in station areas are inadequate to support a major transit investment. Station areas are not pedestrian-friendly.</td>
</tr>
</tbody>
</table>

Ratings based on assessment of the following:
- Existing corridor and station area development;
- Existing corridor and station area development character;
- Existing station area pedestrian facilities, including access for persons with disabilities; and
- Existing corridor and station area parking supply.

#### II. TRANSIT-SUPPORTIVE PLANS AND POLICIES

**Growth Management**

<table>
<thead>
<tr>
<th>Phase of Project Development</th>
<th>Land Use Assessment Ratings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preliminary Engineering and Final Design</td>
<td>HIGH (5) Adopted and enforceable growth management and land conservation policies are in place throughout the region. Existing and planned densities, along with market trends in the region and corridor are strongly compatible with transit.</td>
</tr>
<tr>
<td></td>
<td>MEDIUM (3) Significant progress has been made toward implementing growth management and land conservation policies. Strong policies may be adopted in some jurisdictions but not others, or only moderately enforceable policies (e.g., incentive-based) may be adopted regionwide. Existing and/or planned densities and market trends are moderately compatible with transit.</td>
</tr>
<tr>
<td></td>
<td>LOW (1) Limited consideration has been given to implementing growth management and land conservation policies; adopted policies may be weak and apply to only a limited area. Existing and/or planned densities and market trends are minimally or not supportive of transit.</td>
</tr>
</tbody>
</table>

Ratings based on assessment of the following:
- Concentration of development around established activity centers and regional transit; and
- Land conservation and management.
### Table II-3 Ratings Applied in Assessment of Land Use Criterion (cont.)

#### II. TRANSIT-SUPPORTIVE PLANS AND POLICIES

<table>
<thead>
<tr>
<th>Transit-Supportive Corridor Policies</th>
<th>Final Design</th>
<th>Preliminary Engineering</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>HIGH (5)</strong></td>
<td>Conceptual plans for the corridor and station areas have been developed. Local jurisdictions have adopted or drafted revisions to comprehensive and/or small area plans in most or all station areas. Land use patterns proposed in conceptual plans and local and institutional plan revisions are strongly supportive of a major transit investment.</td>
<td></td>
</tr>
<tr>
<td><strong>MEDIUM (3)</strong></td>
<td>Conceptual plans for the corridor and station areas have been developed. Local jurisdictions have initiated the process of revising comprehensive and/or small area plans. Land use patterns proposed in conceptual plans and local and institutional plan revisions are at least moderately supportive of a major transit investment.</td>
<td></td>
</tr>
<tr>
<td><strong>LOW (1)</strong></td>
<td>Limited progress, to date, has been made toward developing station area conceptual plans or revising local comprehensive or small area plans. Existing station area land uses identified in local comprehensive plans are marginally or not transit-supportive.</td>
<td></td>
</tr>
<tr>
<td><strong>HIGH (5)</strong></td>
<td>Conceptual plans for the corridor and station areas have been developed. Discussions have been undertaken with local jurisdictions about revising comprehensive plans. Land use patterns proposed in conceptual plans for station areas (or in existing comprehensive plans and institutional master plans throughout the corridor) are strongly supportive of a major transit investment.</td>
<td></td>
</tr>
<tr>
<td><strong>MEDIUM (3)</strong></td>
<td>Conceptual plans for the corridor and station areas are being developed. Discussions have been undertaken with local jurisdictions about revising comprehensive plans. Land use patterns proposed in conceptual plans for station areas (or existing in local comprehensive plans and institutional master plans) are at least moderately supportive of a major transit investment.</td>
<td></td>
</tr>
<tr>
<td><strong>LOW (1)</strong></td>
<td>Limited progress, to date, has been made toward developing station area conceptual plans or working with local jurisdictions to revise comprehensive plans. Existing station area land uses identified in local comprehensive plans are marginally or not transit-supportive.</td>
<td></td>
</tr>
</tbody>
</table>

Ratings based on assessment of the following:
- Plans and policies to increase corridor and station area development;
- Plans and policies to enhance transit-friendly character of corridor and station area development;
- Plans to improve pedestrian facilities, including facilities for persons with disabilities; and
- Parking policies.
<table>
<thead>
<tr>
<th>Supportive Zoning Regulations Near Transit Stations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Final Design</td>
</tr>
<tr>
<td><strong>HIGH (5)</strong></td>
</tr>
<tr>
<td>Local jurisdictions have adopted zoning changes that strongly support a major transit investment in most or all transit station areas.</td>
</tr>
<tr>
<td><strong>MEDIUM (3)</strong></td>
</tr>
<tr>
<td>Local jurisdictions are in the process of adopting zoning changes that moderately or strongly support a major transit investment in most or all transit station areas. Alternatively: strongly transit-supportive zoning has been adopted in some station areas but not in others.</td>
</tr>
<tr>
<td><strong>LOW (1)</strong></td>
</tr>
<tr>
<td>No more than initial efforts have begun to prepare station area plans and related zoning. Existing station area zoning is marginally or not transit-supportive.</td>
</tr>
<tr>
<td>Preliminary Engineering</td>
</tr>
<tr>
<td><strong>HIGH (5)</strong></td>
</tr>
<tr>
<td>A conceptual planning process is underway to recommend zoning changes for station areas. Conceptual plans and policies for station areas are recommending transit-supportive densities and design characteristics. Local jurisdictions have committed to examining and changing zoning regulations where necessary. Alternatively, a “high” rating can be assigned if existing zoning in most or all transit station areas is already strongly transit-supportive.</td>
</tr>
<tr>
<td><strong>MEDIUM (3)</strong></td>
</tr>
<tr>
<td>A conceptual planning process is underway to recommend zoning changes for station areas. Local jurisdictions are in the process of committing to examining and changing zoning regulations where necessary. Alternatively, a “medium” rating can be assigned if existing zoning in most or all transit station areas is already moderately transit-supportive.</td>
</tr>
<tr>
<td><strong>LOW (1)</strong></td>
</tr>
<tr>
<td>Limited consideration has been given to preparing station area plans and related zoning. Existing station area zoning is marginally or not transit-supportive.</td>
</tr>
</tbody>
</table>

Ratings based on assessment of the following:
- Zoning ordinances that support increased development density in transit station areas;
- Zoning ordinances that enhance transit-oriented character of station area development and pedestrian access; and
- Zoning allowances for reduced parking and traffic mitigation.
## Table II-3 Ratings Applied in Assessment of Land Use Criterion (cont.)

### II. TRANSIT-SUPPORTIVE PLANS AND POLICIES

<table>
<thead>
<tr>
<th>Tools to Implement Land Use Policies</th>
<th>Final Design</th>
<th>Preliminary Engineering</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>HIGH (5)</strong></td>
<td>Transit agencies and/or regional agencies are working proactively with local jurisdictions, developers, and the public to promote transit-supportive land use planning and station area development. The transit agency has established a joint development program and identified development opportunities. Agencies have adopted effective regulatory and financial incentives to promote transit-oriented development. Public and private capital improvements are being programmed in the corridor and station areas which implement the local land use policies and which leverage the Federal investment in the proposed corridor.</td>
<td>Transit agencies and/or regional agencies are working proactively with local jurisdictions, developers, and the public to promote transit-supportive land use planning and station area development. Local agencies are making recommendations for effective regulatory and financial incentives to promote transit-oriented development. Capital improvement programs are being developed that support station area land use plans and leverage the Federal investment in the proposed major transit corridor.</td>
</tr>
<tr>
<td><strong>MEDIUM (3)</strong></td>
<td>Transit agencies and/or regional agencies have conducted some outreach to promote transit-supportive land use planning and station area development. Regulatory and financial incentives to promote transit-oriented development are being developed, or have been adopted but are only moderately effective. Capital improvements are being identified that support station area land use plans and leverage the Federal investment in the proposed major transit corridor.</td>
<td>Transit agencies and/or regional agencies have conducted some outreach to promote transit-supportive land use planning and station area development. Agencies are investigating regulatory and financial incentives to promote transit-oriented development. Capital improvements are being identified that support station area land use plans and leverage the Federal investment in the proposed major transit corridor.</td>
</tr>
<tr>
<td><strong>LOW (1)</strong></td>
<td>Limited effort has been made to reach out to jurisdictions, developers, or the public to promote transit-supportive land use planning; to identify regulatory and financial incentives to promote development; or to identify capital improvements.</td>
<td>Limited effort has been made to reach out to jurisdictions, developers, or the public to promote transit-supportive land use planning; to identify regulatory and financial incentives to promote development; or to identify capital improvements.</td>
</tr>
</tbody>
</table>
### Table II-3 Ratings Applied in Assessment of Land Use Criterion (cont.)

#### II. TRANSIT-SUPPORTIVE PLANS AND POLICIES

**Tools to Implement Land Use Policies (Continued)**

Ratings based on assessment of the following:
- Outreach to government agencies and the community in support of land use planning;
- Regulatory and financial incentives to promote transit-supportive development; and
- Efforts to engage the development community in station area planning and transit-supportive development.

#### III. PERFORMANCE AND IMPACTS OF LAND USE POLICIES

**Performance of Land Use Policies**

<table>
<thead>
<tr>
<th>Final Design</th>
<th>HIGH (5)</th>
<th>A significant number of development proposals are being received for transit-supportive housing and employment in station areas. Significant amounts of transit-supportive development have occurred in other, existing transit corridors and station areas in the region.</th>
</tr>
</thead>
<tbody>
<tr>
<td>MEDIUM (3)</td>
<td>Some development proposals are being received for transit-supportive housing and employment in station areas. Moderate amounts of transit-supportive development have occurred in other existing transit corridors and station areas in the region.</td>
<td></td>
</tr>
<tr>
<td>LOW (1)</td>
<td>A limited number of proposals for transit-supportive housing and employment development in the corridor are being received. Other existing transit corridors and station areas in the region lack significant examples of transit-supportive housing and employment development.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Preliminary Engineering</th>
<th>HIGH (5)</th>
<th>Transit-supportive housing and employment development is occurring in the corridor. Significant amounts of transit-supportive development have occurred in other, existing transit corridors and station areas in the region.</th>
</tr>
</thead>
<tbody>
<tr>
<td>MEDIUM (3)</td>
<td>Station locations have not been established with finality, and therefore, development would not be expected. Moderate amounts of transit-supportive housing and employment development have occurred in other, existing transit corridors and station areas in the region.</td>
<td></td>
</tr>
<tr>
<td>LOW (1)</td>
<td>Other existing transit corridors and station areas in the region lack significant examples of transit-supportive housing and employment development.</td>
<td></td>
</tr>
</tbody>
</table>

Ratings based on assessment of the following:
- Demonstrated cases of development affected by transit-oriented policies; and
- Station area development proposals and status.
### Table II-3 Ratings Applied in Assessment of Land Use Criterion (cont.)

#### III. PERFORMANCE AND IMPACTS OF LAND USE POLICIES

<table>
<thead>
<tr>
<th>Potential Impact of Transit Project on Regional Land Use</th>
<th>Preliminary Engineering and Final Design</th>
<th>MEDIUM (3)</th>
<th>LOW (1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>HIGH (5)</td>
<td>A significant amount of land in station areas is available for new development or redevelopment at transit-supportive densities. Local plans, policies, and development programs, as well as real estate market conditions, strongly support such development.</td>
<td>A moderate amount of land in station areas is available for new development or redevelopment at transit-supportive densities. Local plans, policies, and development programs, as well as real estate market conditions, moderately support such development.</td>
<td>Only a modest amount of land in station areas is available for new development or redevelopment. Local plans, policies, and development programs, as well as real estate market conditions, provide marginal support for new development in station areas.</td>
</tr>
</tbody>
</table>

Ratings based on assessment of the following:
- Adaptability of station area land for development; and
- Corridor economic environment.

As Table II-3 indicates, FTA takes into consideration the stage of development of a proposed project in its evaluation of land use information. For example, the planning and policy oriented factors (existing land use, containment of sprawl, and corridor policies) are relevant in evaluating projects in all stages of project development, but particularly useful for projects early in project development. On the other hand, the implementation-oriented factors (supportive zoning regulations, implementation tools, and performance of land use policies) are more applicable in evaluating projects more advanced in preliminary engineering or final design.
Mobility Improvements

Mobility improvements are measured in three ways: normalized travel time savings as measured in transportation user benefits per passenger mile, Number of low income households served and number of jobs served. User benefits are measured the same as with the cost effectiveness strategies, using savings in in-vehicle travel time, walk time, wait time, transfers and mode specific constants.

Jobs and households served within ½ mile of the stations on the proposed system are estimated and reported as jobs pre station and low income households per station.

Operating Efficiencies

Operating efficiencies are measured by system operating costs per passenger mile. This is done by comparing total operating costs of the system with the new start vs. the baseline alternative.

However, FTA has found that the operating efficiency criteria does not show significant differences between competing new starts projects nationwide and does not use this criteria to select projects. All applicants tend to have similar operating efficiencies and when projects are compared from different cities, few differences the criteria does Nonetheless, it is of local importance

Environmental Benefits

Environmental benefits deal with air quality effects. If the project is in a non-attainment area for air quality and pollution levels are reduced the project gets a high rating, if the project is in an attainment area and reduces pollutants, it gets a medium rating.

Other environmental factors while important locally are not considered by FTA in their ratings because they have found that there are not major differences between competing projects among different cities.

Other Factors

FTA will also consider other factors when evaluating projects. These include:

- Environmental justice and equity
- Access to employment and welfare to work initiatives
- Livable communities and local economic development
- Innovative financing procurement and construction techniques
- Cost effectiveness with alternative land use related to economic development impacts
- Any other factor that provides additional benefits
Financial Rating

In addition to project justification using the above criteria, FTA separately looks at the financial rating of the project. Three factors are included: the share of costs from other funds than the new starts funds, the proposed capital financing plan and the ability of the agency to fund the operating and maintenance costs of the entire system once the new project is built.

Funding for the project can come from federal new starts money, other federal sources, state or local funds. A project with a high percentage of non-new starts money will be rated higher than one than has a lower share.

The capital funding plan is evaluated according to criteria give in the table on the following page. Important factors are the current capital condition, completeness of plan, commitments for funding, funding capabilities and the reasonableness of assumptions and estimates.

Similarly, the operating and maintenance plan is rated according to criteria given in the table after the capital funding factors. Important considerations are; current operating financial condition, completeness of plan, commitments for operating and maintenance funds, funding capacity and reasonableness of assumptions and estimates.

Analysis and Forecasting Considerations:

FTA requires that the travel demand models used to forecast future demand, cost analysis procedures and other procedures to assess impacts meet certain standards and that there is agreement on these methods by participating agencies. The forecasting process should use “consistent and defensible measures, reliable data and analytical data consistent with best practices and FTA requirements”6.

FTA will consider the use of ‘mode specific constants’ in the travel forecasting process. These are factors that are used to modify travel demand models to recognize that there are factors beyond time and cost that may affect traveler choices. For example, it may be argued that travelers prefer a particular type of system such as rail over bus, because of the mode itself rather than because of differences in time and cost characteristics of the choices. These mode specific constants should be similar or the same in different urban areas.7

---

<table>
<thead>
<tr>
<th>High (5)</th>
<th>Medium-High (4)</th>
<th>Medium (3)</th>
<th>Medium-low (2)</th>
<th>Low (1)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Current capital condition</strong></td>
<td>- Average bus fleet age under 6 years. - Bond ratings less than 2 years old (if any) of AAA (Fitch/S&amp;P) or Aaa (Moody’s) or better</td>
<td>- Average bus fleet age under 8 years. - Bond ratings less than 2 years old (if any) of A (Fitch/S&amp;P) or A2 (Moody’s) or better</td>
<td>- Average bus fleet age under 12 years. - Bond ratings less than 2 years old (if any) of BBB+ (Fitch/S&amp;P) or Baa (Moody’s) or better</td>
<td>- Average bus fleet age 12 years or more. - Bond ratings less than 2 years old (if any) of BBB (Fitch/S&amp;P) or Baa3 (Moody’s) or below</td>
</tr>
<tr>
<td><strong>Completeness</strong></td>
<td>Capital plan includes: - 20-year cash flow - All assumptions are clearly explained - High level of detail - Fleet Management Plan - Extensive Sensitivity analysis - More than 5 years of historical data</td>
<td>Capital plan is complete, i.e. it includes: - 20-year cash flow - Key assumptions - Moderate level of detail - Fleet Management Plan - Sensitivity Analysis - More than 5 years of historical data</td>
<td>Capital plan is complete, i.e. it includes: - 20-year cash flow - Key assumptions - Missing some explanatory details - Fleet Management Plan - 5 years historical data</td>
<td>Capital plan is partially complete, i.e. it includes: - 20-year cash flow - Missing other items of supporting documentation (i.e. fleet management plan, key assumptions, historical data)</td>
</tr>
<tr>
<td><strong>Commitment of capital funds</strong></td>
<td>For final design - 100% of Non-Section 5309 New Starts Funds are committed or budgeted.</td>
<td>For final design - Over 75% of Non-Section 5309 New Starts Funds are committed or budgeted.</td>
<td>For final design - Over 50% of Non-Section 5309 New Starts Funds are committed or budgeted.</td>
<td>For final design - Over 25% of Non-Section 5309 New Starts Funds are committed or budgeted.</td>
</tr>
<tr>
<td><strong>Capital funding capacity</strong></td>
<td>The applicant has access to funds via additional debt capacity, cash reserves, or other committed funds to cover cost increases or funding shortfalls equal to at least 50% of estimated project costs.</td>
<td>The applicant has available cash reserves, debt capacity, or additional funding commitments to cover cost increases or funding shortfalls equal to at least 25% of estimated project costs.</td>
<td>The applicant has available cash reserves, debt capacity, or additional committed funds to cover cost increases or funding shortfalls equal to at least 10% of estimated project costs.</td>
<td>The applicant has a reasonable plan to cover only minor (under 10%) cost increases or funding shortfalls.</td>
</tr>
<tr>
<td><strong>Reasonable capital planning assumptions</strong></td>
<td>Financial plan contains very conservative capital planning assumptions and cost estimates when compared with recent historical experience.</td>
<td>Financial plan contains conservative capital planning assumptions and cost estimates when compared with recent historical experience.</td>
<td>Financial plan contains capital planning assumptions and cost estimates that are in line with historical experience.</td>
<td>Financial plan contains optimistic capital planning assumptions and cost estimates.</td>
</tr>
</tbody>
</table>

FTA Capital Plan Rating Standards
## Operating Plan Rating Standards

<table>
<thead>
<tr>
<th>Current Operating Financial Condition</th>
<th>High (5)</th>
<th>Medium-High (4)</th>
<th>Medium (3)</th>
<th>Medium-low (2)</th>
<th>Low (1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Historical and actual positive cash flow. No cash flow shortfalls.</td>
<td>- Historical and actual balanced budgets. Any annual cash flow shortfalls paid from cash reserves or other committed sources.</td>
<td>- Historical and actual balanced budgets. Any annual cash flow shortfalls paid from cash reserves or annual appropriations.</td>
<td>- Historical and actual cash flow show several years of revenue shortfalls. Any annual cash flow shortfalls paid from short-term borrowing.</td>
<td>- Historical and actual cash flow show several years of revenue shortfalls, or historical information not provided.</td>
<td>- Current operating ratio is less than 1.0</td>
</tr>
<tr>
<td>- Current operating ratio exceeding 2.0</td>
<td>- Current operating ratio is at least 1.5</td>
<td>- Current operating ratio is at least 1.2</td>
<td>- Current operating ratio is at least 1.0</td>
<td>- Major Service cutbacks in recent years</td>
<td></td>
</tr>
<tr>
<td>- No service cutbacks in recent years.</td>
<td>- No service cutbacks or only minor service cutbacks in recent years</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Completeness</th>
<th>Operating plan includes:</th>
<th>Operating plan is complete, including:</th>
<th>Operating plan is complete, including:</th>
<th>Operating plan is missing no key components, i.e.:</th>
<th>Operating plan is missing some key components, i.e.:</th>
</tr>
</thead>
<tbody>
<tr>
<td>- More than 5 years of historical data</td>
<td>- More than 5 years of historical data</td>
<td>- More than 5 years of historical data</td>
<td>- 3 years or less of historical data</td>
<td>- No cash flow</td>
<td>- No historical data</td>
</tr>
<tr>
<td>- 20-year cash flow</td>
<td>- Key assumptions identified</td>
<td>- Key assumptions identified</td>
<td>- 20-year cash flow</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Key assumptions identified</td>
<td>- Moderate level of detail</td>
<td>- Key assumptions identified</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Extensive level of detail</td>
<td>- Sensitivity Analysis</td>
<td>- Missing some explanatory detail</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Commitment of O&amp;M Funds</th>
<th>For final design - 100% of the funds needed to operate and maintain the proposed transit project are committed or budgeted.</th>
<th>For final design – Over 75% of the funds needed to operate and maintain the proposed transit system are committed or budgeted.</th>
<th>For final design – Over 50% of the funds needed to operate and maintain the proposed transit system are committed or budgeted.</th>
<th>For final design – Sponsor has identified reasonable potential funding sources, but has received less than 50% commitments to fund transit operations and maintenance.</th>
<th>For final design - Sponsor has not received any funding commitments to fund transit operations and maintenance and has not identified any reasonable plan for securing funding commitments.</th>
</tr>
</thead>
<tbody>
<tr>
<td>For PE – Over 75% of the funds needed to operate and maintain the proposed transit system are committed or budgeted. The remaining funds are planned.</td>
<td>For PE - Over 75% of the funds needed to operate and maintain the proposed transit system are committed or budgeted. The remaining funds are planned.</td>
<td>For PE - Over 50% of the funds needed to operate and maintain the proposed transit system are committed or budgeted. The remaining funds are planned.</td>
<td>For PE - While no additional O&amp;M funding has been committed, a reasonable plan to secure funding commitments has been presented.</td>
<td>For PE - Sponsor does not have a reasonable plan to secure O&amp;M funding. No unspecified sources.</td>
<td>For PE - Sponsor has not identified any reasonable funding sources for the operation and maintenance of the proposed project.</td>
</tr>
</tbody>
</table>

| O&M Funding Capacity | - Projected cash balances, reserve accounts or access to line of credit exceeding 50 percent (6 months) of annual operating expenses. | - Projected cash balances, reserve accounts or access to line of credit exceeding 25 percent (3 months) of annual operating expenses. | - Projected cash balances, reserve accounts or access to line of credit exceeding 12 percent (1.5 months) of annual operating expenses. | - Projected cash balances, reserve accounts or access to line of credit are less than 8 percent (1 month) of annual operating expenses. | - Projected cash balances are insufficient to maintain balanced budgets. |

| Operating Planning Assumptions | The assumptions supporting the operating and maintenance cost estimates and revenue forecasts are very conservative relative to historical experience. | The assumptions supporting the operating and maintenance cost estimates and revenue forecasts are conservative relative to historical experience. | The assumptions supporting the operating and maintenance cost estimates and revenue forecasts are consistent with historical experience. | The assumptions supporting the operating and maintenance cost estimates and revenue forecasts are optimistic relative to historical experience. | The assumptions supporting the operating and maintenance cost estimates and revenue forecasts are far more optimistic than historical experience suggests is reasonable. |
Alternatives Analysis, New Starts

E. Beimborn, University of Wisconsin-Milwaukee

Outline

- Overview
- The process at the local level
- FTA new starts process
- Project justification
- Financial rating
- Forecasting methods
- Small starts process
Overview

- New starts is the term used by the Federal Transit Administration for the process of funding major new fixed guideway transit facilities such as light rail transit lines, bus rapid transit, commuter rail or heavy rail transit.
- Systems may be eligible for federal capital funds to pay a portion of their costs.
- To receive funding, agencies must conduct a series of planning and analysis steps that meet specific guidelines and may also include a full environmental impact statement.

Overview

- New starts funding is limited and communities must compete with each other for funds.
- It is a competitive process, in that different projects are rated by FTA and only those ranked above others will be eligible for federal funds.
Resources

- Guidelines and procedures can change over time and the latest information should be used.
- These are posted on FTA web sites
  - the FTA annual report of the status of the new starts program
  - the process that is used to rate competing projects.
  - The FTA [manual for reporting instructions](http://www.fta.dot.gov/planning/newstarts/planning_environment_5203.html) for the new starts criteria
  - Information on FTA outreach meetings and new starts roundtables that provide briefings on the latest procedures

The process at the local level

- New start projects are often highly controversial at the local level
- Sources of local funding are a major hurdle to any project
- Implemented projects require an elected official such as a mayor or governor who serves as a political champion who expends considerable political capital to get project implemented
- If something is implemented, subsequent projects are less controversial
Referenda

- Often a referenda is needed to secure local capital and operating funds. Sales taxes are often used as a source of local funds.
- Many communities have had several referenda fail prior to approval.
- Referenda tend to be successful if they are multimodal (include bus, highway, bicycle, etc.) and have a comprehensive list of projects throughout the region rather than in a single corridor.

New Starts Process

- Project Development: Typically 6-12 Years
  - Alternatives Analysis: 1-2 years
  - Preliminary Engineering: 2-3 years
  - Final Design: 3-7 years
  - Construction: 3-7 years
  - Operation: 3-7 years
Environmental Review

- Most new starts projects require an environmental impact statement or an environmental assessment.
- An EA or EIS is done as part of the alternatives analysis when different modes and locations are examined. Must be completed prior to preliminary engineering.
- Begins with project scoping: What alternatives to be looked at?, what criteria will be used?

Alternatives:

- The alternatives analysis phase of the process involves the selection of a preferred technology and alignment.
- Alternative technologies that may be considered are light rail, heavy rail, commuter rail, bus rapid transit and others.
- Alternative locations of the systems must also be considered for each of the technologies.
Base Alternative:

- The base alternative is the best that can be done to provide transit service without the construction of some sort of fixed guideway.
- This alternative is used as a basis for comparison to 'build' alternatives.
- Benefits of a build alternative are found by comparing it with the base alternative.

Project justification

- FTA asks for information on the following criteria to compare competing projects:
  - cost effectiveness,
  - transportation supportive land use policies and future patterns,
  - mobility improvements,
  - environmental benefits,
  - operating efficiencies, and
  - other factors.
  - Financial Information
- Economic Development and reliability of the forecasting methods used are also required by SAFTEA-LU
FTA Criterion

<table>
<thead>
<tr>
<th>Criterion</th>
<th>Measures/Categories</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cost Effectiveness</td>
<td>Incremental Cost per Hour of Transportation System User Benefit</td>
</tr>
</tbody>
</table>
| Transit Supportive Land Use and Future Patterns | Existing Land Use  
Transit Supportive Plans and Policies  
Performance and Impacts of Policies |
| Mobility Improvements           | Normalized Travel Time Savings (Transportation System User Benefit per Project Passenger Mile)  
Low-Income Households Served  
Employment Near Stations         |
| Operating Efficiencies          | System Operating Cost per Passenger Mile                                              |
| Environmental Benefits          | Change in Regional Pollutant Emissions  
Change in Regional Energy Consumption  
EPA Air Quality Designation       |
Use of Criteria by FTA

- FTA has found that the operating efficiency and environmental benefits criteria does not show significant differences between competing new starts projects nationwide and normally does not use this criteria to select projects.
- Projects are compared on the basis of cost effectiveness, land use, mobility improvements and other factors.

In general, a community will have a better ranking than others if:

- The proposed project leads to considerable overall savings in travel time, wait time or transfers.
- It is accompanied with transit supportive land use policies to enhance the community.
- It serves large numbers of low income households and jobs.
- It uses multiple funding sources that lower the Federal new starts share.
Specific Criteria

- Project Justification
  - Cost Effectiveness
  - Transit Supportive Land Use and Future Patterns
  - Mobility Improvements
  - Operating Efficiencies
  - Environmental Benefits
  - Other factors

- Financial Rating

Cost effectiveness Criteria

- Cost effectiveness measure is the total annual cost divided by the user benefits.
- User benefits are found by comparing the proposed project with a base alternative. User benefits consist of changes in the following trip characteristics:
  - In-vehicle time
  - Walk and wait time
  - Number of transfers
  - Mode specific constants
- This is done by including all modes
Cost Effectiveness - 2

- The costs of an alternative are the annualized total capital cost of the project in base year dollars and the annual operating and maintenance costs of the project.
- Local travel forecasting results are interpreted by software (Summit) developed by FTA to calculate cost effectiveness measures.
- Calculation of user benefits may require some modifications to the regional travel demand models.

Criteria for Transportation Supportive Land Use Policies

- This criteria looks at how well transit projects facilitate and enhance land use along their routes.
- Separate criteria are used preliminary engineering and/or final design.
- The general categories are:
  - characteristics of existing land use in the corridor,
  - the presence of transit supportive plans and policies and
  - the performance impact of the land use plans and policies.
Land use ratings are high if:

- Current levels of population, employment, and other trip generators in station areas are sufficient to support a major transit investment.
- Most station areas are pedestrian-friendly and fully accessible.
- Adopted and enforceable growth management and land conservation policies are in place throughout the region.
- Existing and planned densities, along with market trends in the region and corridor are strongly compatible with transit.
- Local jurisdictions have adopted zoning changes that strongly support a major transit investment in most or all transit station areas.

Land use ratings are high if:

- Transit agencies and/or regional agencies are working proactively with local jurisdictions, developers, and the public to promote transit-supportive land use planning and station area development.
- The transit agency has established a joint development program and identified development opportunities.
- Agencies have adopted effective regulatory and financial incentives to promote transit-oriented development.
- Public and private capital improvements are being programmed in the corridor and station areas which implement the local land use policies and which leverage the Federal investment in the proposed corridor.
Land use ratings are high if:

- A significant number of development proposals are received for transit-supportive housing and employment in station areas.
- Significant amounts of transit-supportive development have occurred in other transit corridors and station areas in the region.
- A significant amount of land in station areas is available for new development or redevelopment at transit-supportive densities. Local plans, policies, and development programs, as well as real estate market conditions, strongly support such development.

Mobility Improvement Criteria

- Mobility improvements are measured in three ways:
  - normalized travel time savings as measured in transportation
  - user benefits per passenger mile,
  - Number of low income households served and number of jobs served.
- User benefits are measured the same as with the cost effectiveness strategies, using savings in in-vehicle travel time, walk time, wait time, transfers and mode specific constants.
- Jobs and households served within ½ mile of the stations on the proposed system are estimated and reported as jobs pre station and low income households per station.
Operating Efficiency Criteria

- Operating efficiencies are measured by system operating costs per passenger mile. This is done by comparing total operating costs of the system with the new start vs. the baseline alternative.

- However, FTA has found that the operating efficiency criteria does not show significant differences between competing new starts projects nationwide and does not use this criteria to select projects.

Environmental Benefits

- Environmental benefits deal with air quality effects. If the project is in a non-attainment area for air quality and pollution levels are reduced the project gets a high rating, if the project is in an attainment area and reduces pollutants, it gets a medium rating.

- Other environmental factors while important locally are not considered by FTA in their ratings because they have found that there are not major differences between competing projects among different cities.
Other Factors

FTA will also consider other factors when evaluating projects. These include:
- Environmental justice and equity
- Access to employment and welfare to work initiatives
- Livable communities and local economic development
- Innovative financing procurement and construction techniques
- Cost effectiveness with alternative land use related to economic development impacts
- Any other factor that provides additional benefits

Financial Rating

FTA separately looks at the financial rating of the project. Three factors are included:
- the share of costs from other funds than the new starts funds,
- the proposed capital financing plan and
- the ability of the agency to fund the operating and maintenance costs of the entire system once the new project is built.

Funding for the project can come from federal new starts money, other federal sources, state or local funds.

A project with a high percentage of non-new starts money will be rated higher than one than has a lower share.
Capital Funding Plan

- The capital funding plan is evaluated based on
  - the current capital condition,
  - completeness of plan,
  - commitments for funding
  - funding capabilities and
  - the reasonableness of assumptions and estimates.

Operating and Maintenance plan

- The operating and maintenance plan is rated based on
  - current operating financial condition,
  - completeness of plan
  - commitments for operating and maintenance funds
  - funding capacity and
  - reasonableness of assumptions and estimates
Forecasting Methods

- Travel demand models used to forecast future demand, cost analysis procedures and other procedures to assess impacts should meet certain standards.
- Methods should use “consistent and defensible measures, reliable data and analytical data consistent with best practices and FTA requirements”
- There should be agreement on these methods by participating agencies.
- See: http://www.fta.dot.gov/16352_18399_ENG_HTML.htm

Mode Specific Effects?

- Will people use a particular mode because of the mode itself or because of its time and cost characteristics alone?
- For example, it could be that travelers prefer to use a light rail system over bus, because of they prefer the comfort and aesthetics of light rail over that of a bus rather than because of the light rail has time and cost advantages.
Mode Specific Constants?

- FTA will allow ‘mode specific constants’. These modify travel demand models to recognize that there are factors beyond time and cost that may affect traveler choices.
- If used, mode specific constants should be similar or the same as in different urban areas.

Off peak and special event travel?

- Off peak – lunch time travel, evenings, weekends, etc.
- Special events: sporting events, festivals, entertainment activities, etc.
- Some modes – those with a highly visible fixed guideway such as light rail, heavy rail tend to generate more ridership in off peak times or for special events than other modes.
- These are not normally estimated as part of regular demand forecasts and need a separate analysis. The ridership impact over time can be substantial, especially if the mode is well located to serve these locations.
Large starts, small starts

SAFTEA-LU provides for simplified methods for smaller projects (less than $75 million funding and total cost less than $250 million)

Small Starts project must either
- (a) meet the definition of a fixed guideway for at least 50% of the project length in the peak period, or
- (b) be a corridor-based bus project with the following minimum elements:
  - Transit stations,
  - Traffic signal priority/pre-emption,
  - Low-floor buses or level boarding,
  - Branding of the proposed service, and
  - 10 minute peak/15 minute off peak headways or better while operating at least 14 hours per weekday

Small starts process

- Alternatives: the number considered must continue to meet the requirements of NEPA, good planning practices, and proper identification of project costs and benefits for funding recommendations.
- Project Justification: will include land use, cost effectiveness, and other factors (such as economic development), and Local Financial Commitment
- Small starts projects will be rated based on a shorter time frame, i.e. opening year, and less data.
- Other technically acceptable ridership forecasting procedures, besides the traditional four-step model, will be allowed with FTA concurrence.
- See: http://www.fta.dot.gov/planning/newstarts/planning_environment_222.html
Very small starts

- Even simpler procedures for very small projects
- Very small start projects are simple, low risk projects that:
  - Do not include construction of a new fixed guideway (qualifying projects include arterial BRT or rail service on existing track);
  - Are in corridors with existing riders who will benefit from the proposed project that exceed 3,000 per average weekday with passenger loadings of at least 1,000 riders at the terminal stations; and
  - Have a total capital cost less than $50 million and less than $3 million per mile, exclusive of rolling stock.

Acknowledgements

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Transit Technology Alternatives

Fixed Guideway Systems

(see http://www.apta.com/research/info/define/index.cfm)

Heavy rail - HR

Heavy Rail is a system that is totally separated from its surroundings and operates in a tunnel (subway), on elevated tracks or on a separated right of way. It typically has elaborate stations, and operates in multiple car trains and has the highest capacity of any transit mode. It is electrically powered with power typically collected from a third rail. It is the dominant system of transit in very large urban areas such as New York, Washington, D. C., Chicago, the San Francisco Bay area in the U.S. and elsewhere in the world (London, Paris, Toronto, Mexico City, Tokyo, etc.)

There are two basic types of systems, those built over 100 years ago in major cities and new systems built since about 1960. Changes in existing systems can include: new equipment, spot improvements, quieter, lower weight vehicles and station improvements.

Figure 1  Chicago Elevated (Heavy Rail system)
New heavy rail systems or lines in the U.S have been built in the San Francisco Bay area, Los Angeles, Washington, DC, Miami, and Baltimore. These use automatic control systems, card based fare collection, elaborate stations, and are completely grade separated. Costs vary depending on the complexity of construction and can vary between $100 million to over one $1 billion per mile.

Figure 2: Bay Area Rapid Transit System, Fremont, California
Light Rail - LRT

Light rail can operate on existing streets and areas as well as on separated rights of way. It normally uses overhead wires to collect power and some view it as a modern version of the streetcar. There are many systems in Europe and Asia (typically called trams) and new systems and modernized systems in the U.S. such as in Shaker Heights (Cleveland) Ohio, Boston, San Francisco, San Diego, Sacramento, Portland, Salt Lake City, Dallas, New Jersey, St. Louis, Minneapolis, Denver, and Houston, with other systems under construction.

Figure 3: Portland Oregon Light Rail system
New Light Rail systems feature new vehicles and are electrically powered with overhead power. Vehicles operate in highway medians, on streets, with at grade intersections or on old railroad or totally new right-of-ways. Stations (stops) are simple. Light rail has a lower cost and capacity than heavy rail. Light Rail can be an evolutionary system which upgrades over time to heavy rail.

Figure 4 San Diego Light Rail at San Ysidro, California

Figure 5: Light Rail in downtown Minneapolis
Commuter Rail -CR

Commuter rail services operate as passenger trains over conventional railroad tracks. They can be electrically powered or operate in trains pulled by diesel locomotives. They are used in large cities such as New York, Chicago, Philadelphia, Boston, San Francisco, Washington, D.C. as well as an emerging mode in other cities. The service is typically used by commuters traveling from suburbs to central city service over regular railroad tracks. It can use push-pull equipment which doesn't require turning at the end of the line and high capacity, double deck, cars.

Figure 5: Virginia Railway Express Commuter Train, Washington D. C. Union Station
Figure 6: Maryland Commuter Rail, Washington, D. C. Union Station

Figure 7: Coaster, San Diego, California
Bus Rapid Transit - BRT

Bus rapid transit operates similar to a rail system but without the tracks. Bus rapid transit systems feature separated right-of-way or exclusive lanes, signal priority, off line fare collection, and express service between stops. Examples: Boston; Shirley Highway in Virginia; Pittsburgh, Bogotá, Columbia; Los Angeles. BRT systems tend to have lower construction cost than light rail. Buses can do local collector routes on regular streets and then use busway for higher speeds.

Figure 8: Bogotá, Columbia Bus Rapid Transit system

General background: The Federal Transit Administration has extensive information on Bus Rapid Transit in their Characteristics of Bus Rapid Transit for Decision Makers report. See:


Case Study: The Bottineau Boulevard Busway in Minnesota provides a case study of a project being considered see:

http://www.metrotransit.org/improvingTransit/bottineauBRT/index.asp
Transit Malls, exclusive lanes

In a number of cities, transit systems have priority usage on existing local streets with special features to facilitate transit service. These could be for transit only such as a transit mall, specific lanes for transit or regulations that favor transit service over other modes. These can be used by buses or by light rail systems. Very often they use extensive street furniture and amenities that favor pedestrian and bicycle users, especially when done in an urban central business district. They also often used for special events such as art fairs and may have street vendors as well.

Figure 9: Transit Mall on Nicollet Avenue, Minneapolis, Minnesota, USA
Figure 10: Light rail station in downtown Minneapolis, right of way shared with highway traffic
Bus/Bus and Bus/Rail and Rail/Rail Connectivity

An important part of any system is to create good local connections between collector systems such as a local bus and the fixed guideway systems. This is often done at outlying stations which combine park and ride facilities and a bus terminal or at a central city terminal. In some cases the facility also can include retail activity and services.

Figure 11: Minneapolis Light rail/bus transfer at 46th Street station

Figure 12: Portland Light rail/bus transfer station
Figure 13: San Diego Bus/Light Rail transfer at Old Town Station

Figure 14: Commuter rail/Light rail transfer station, San Diego
People Movers, AGT Automatic Guideway Transit, PRT--Personal Rapid Transit

A small automated vehicle, with no operator, that provides service on separated guideway (“horizontal elevator”). These systems have been used in airports (Seattle, Atlanta, Tampa, Dallas, Newark) and also in Miami, Detroit, and Jacksonville downtowns.

Figure 15: Dallas Airport People mover

Dual Mode

Vehicle operates on fixed guideway and also on regular streets, its own feeder. (PRT with on-board power source, or PRT pallets.) There are limited actual applications of these systems.
Monorail

Monorail is a fixed guideway transit system similar to Heavy rail which uses only one rail rather than two. Two types: suspended and supported. New systems of supported monorail are being built in Japan, then use less space than heavy rail, and perhaps lower construction costs. They have limited application elsewhere.

![Supported Monorail, Seattle Washington](image)

Figure 16: Supported Monorail, Seattle Washington

![Suspended monorail, Wuppertal Germany](image)

Figure 17: Suspended monorail, Wuppertal Germany
Paratransit

Paratransit are a family of transit like services which normally do not operate on a fixed route or fixed schedule. These include the following:

Dial-a-Ride (telephone contact), Manual dispatched--or computer dispatched. It is often used to provide alternative transport for people with disabilities. It may be more expensive than conventional bus because of overhead, lower productivity. But it may be better for outlying areas, small towns. Normally uses a smaller vehicle and can operate in a variety of patterns:
  - many to many
  - many to one (gather)
  - one to many (scatter)
  - subscription
  - fixed route, fixed schedule
  - package carrier

Shared ride taxicab is a dial-a-ride service which is open to all persons. It uses a zone fare system and can accommodate persons with disabilities as well as regular users. Rental cars, car sharing, Jitney, Subscription bus, Van pool, Car pool have all been classified as Paratransit.

Figure 18: Dial a Ride, Haddonfield, New Jersey
Transit Fixed Guideway Alternatives

E. Beimborn, University of Wisconsin-Milwaukee

Fixed Guideway Alternatives

- Fixed guideway alternatives require the construction of a track or guideway and stations for vehicle operation.
- Most common options are heavy rail, light rail, commuter rail or bus rapid transit.
- Some areas also consider people mover systems or monorail.
- Have substantially different costs, capacities and levels of service.
Heavy Rail

- Completely separated from streets by subway, elevated or separate right of way
- Elaborate stations, operates in multiple car trains, high capacity, electrically powered with third rail.
- Dominant system of transit in very large urban areas such as New York, Washington, D. C., Chicago, San Francisco Bay Area in the U.S. and elsewhere in the world (London, Paris, Toronto, Mexico City, Tokyo, etc.)

Chicago Elevated
Bay Area Rapid Transit

Light Rail Transit

- Operates on existing streets and areas as well as on separated rights of way. It normally uses overhead wires to collect power.

- Vehicles operate in highway medians, on streets, with at grade intersections or on old railroad or totally new right-of-ways. Stations (stops) are simple. Light rail has a lower cost and capacity than heavy rail.
Portland, Oregon Light Rail

San Diego Light Rail
Commuter Rail

- Operates as passenger trains over conventional railroad tracks. They can be electrically powered or operate in trains pulled by diesel locomotives.
- Typically used by commuters traveling from suburbs to central city service over regular railroad tracks. It can use push-pull equipment and high capacity, double deck, cars.

Virginia Railway Express, serves Washington, D.C.
Maryland Commuter Rail, serves Washington, D. C.

Bus Rapid Transit

- Bus rapid transit operates similar to a rail system but without the tracks. Bus rapid transit systems feature separated right-of-way or exclusive lanes, signal priority, off line fare collection, and express service between stops.
- Buses use regular streets for local collection and then use busway for higher speeds.
Bogotá, Columbia Bus Rapid Transit

Transit malls, exclusive lanes

- transit systems have priority usage on existing local streets with special features to facilitate transit service.
- These could be for transit only such as a transit mall, specific lanes for transit or regulations that favor transit service over other modes.
- These can be used by buses or by light rail systems.
- Very often they use extensive street furniture and amenities that favor pedestrian and bicycle users,
Minneapolis - Nicollet transit mall

Minneapolis downtown light rail station
Bus/Bus and Bus/Rail connectivity

- An important part of any system is to create good local connections between collector systems such as a local bus and the fixed guideway systems.
- This is often done at outlying stations which combine park and ride facilities and a bus terminal.
- The facility also can include retail activity and services.

Minneapolis bus/light rail station
Portland Light rail/bus transfer station

Other technologies

- Automated Transit, People Mover, Personal Rapid Transit:
  - small automated vehicle, with no operator, that provides service on separated guideway ("horizontal elevator").
  - Used in some airports and also downtowns.
- Monorail: fixed guideway transit system similar to Heavy rail which uses only one rail rather than two.
  - Two types: suspended and supported.
Dallas airport people mover

Supported Monorail - Seattle
Suspended monorail, Wuppertal, Germany

Paratransit

- Not a fixed guideway system
- Paratransit are a family of transit like services which normally do not operate on a fixed route or fixed schedule. These include the following:
  - Dial a Ride
  - Shared ride taxi
  - Van pools and car pools
  - Subscription bus
  - Jitney
Haddonfield New Jersey Dial a Ride

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- Photo credits: Bogotá BRT photo by Carlos Alba, all others by E. Beimborn