Working Definitions

**Multimodal** means multiple modes of transportation. Multimodal systems enhance capacity across modes.

**Intermodal** means that multiple modes are connected. Intermodal systems are access and destination-oriented.

The current surface transportation network in the Twin Cities has evolved largely as a capacity-based system with a dominance of highway-based modes: cars and trucks.
Categories of surface modes:
In contemporary community design, there are two major categories of surface modes of transport:

- **Modes for the movement of freight:**
  rail/truck shipping, both containers and piggyback. Intermodal service is about 5% of the freight market for rail-proximate shippers in the Twin Cities.

- **Modes for the movement of humans/passengers:**
  self-powered modes such as pedestrian and bicycles; and passenger modes such as cars and transit.
Intermodalism requires that connectivity be maintained within each category of modes, but not necessarily connecting the categories. For example:

The mixing of truck traffic with neighborhood traffic is undesirable from the perspectives of efficiency and the other issues to be discussed here.

Yet, inevitably this mixing has occurred; is there another way to design and build communities to accommodate the differences in these systems?
In physical terms, integration of intermodalism and multimodalism across the two categories often means that:

*Human/passenger modes may be separated networks, often comprising redundant corridors, distinct from freight networks.*
Multimodalism historically has been both capacity and access/location-driven, and intermodal in its connectivity.

Boulevard & Parkway
Physical Separation of Modes in Human/passenger Systems

Trucks were and are excluded from boulevards and parkways.

The historical roots of multimodalism are based in the model of the boulevard and the parkway: separate lanes and grade-separated roads were and are given to individual modes.

The boulevard and the parkway are designed for capacity and safety as well as access to mixed use destinations.
There is a scale/location difference between the two systems:

**Freight System**
The rail to truck freight system is supersized, horizontal, location-sensitive with regard to distribution logistics
- global to 500 miles inbound-
- local distribution and,
- relatively independent in form and location from residential and institutional land uses.
There is a scale/location difference between the two systems:

**Human/passenger system**
The human/passenger system is human in scale and more destination-dependent.

However, suburbanization has enlarged the scale of the human elements in the system - such as the shopping center - to the point where two modes, the car and the truck - set the scale of the design, sometimes to the exclusion of other modes.
Design is an integrative, systemically-based beauty, not decoration or mitigation.

Design integrates social, economic, and political conditions and opportunities in a process that crosses disciplinary boundaries, to make physical forms of transportation and related uses efficient, productive, healthful, safe and secure.
What relationship might design have to reauthorization of TEA-21?

A Working Premise: Design Integration for Accessibility:
- Economic growth
- Public health
- Environmental health
- Security and safety
- Social cohesion
- Recreational linkage

"Each State shall carry out a transportation planning process that provides for consideration of projects and strategies that will--

(A) support the economic vitality of the United States, the States, and metropolitan areas, especially by enabling global competitiveness, productivity, and efficiency;

(B) increase the safety and security of the transportation system for motorized and nonmotorized users;

(C) increase the accessibility and mobility options available to people and for freight;

(D) protect and enhance the environment, promote energy conservation, and improve quality of life;

(E) enhance the integration and connectivity of the transportation system, across and between modes throughout the State, for people and freight;

(F) promote efficient system management and operation; and

(G) emphasize the preservation of the existing transportation system."
Our Research: Freight Systems and Human/passenger Systems

Five Design Principles:

- Efficiency of access and increased capacity across modes to stabilize VMT: human modal connection at points of destination, investment; freight connections independent of human location.

- Employment, service delivery and production as the principal determinants of destination planning and location.

- Multi-functional infrastructure including recreational.

- Spatial separation of human and freight intermodal locations for security and safety.

- Preservation of natural resources, especially ground and surface water as a lead indicator of environmental and public health.
Our research issues

Freight Systems
- What are the physical models for an integrated systems? For example, can the rail freight/intermodal system be integrated into Twin Cities/BNSF central corridor neighborhoods?

- Human/passenger Systems:
  - Using design to demonstrate potential scenarios, how could the Twin Cities build an intermodal human/passenger system as a way of stabilizing Vehicle Miles Traveled (VMT) while preserving efficiency?

- What are the larger regional implications of such commitments, particularly for shared resources such as water?
Intermodalism and Multimodalism in the Twin Cities Central Corridor, St. Paul

Freight System

In the Twin Cities, the historic central rail corridor serves as the cities’ intermodal corridor. For security, safety reasons, some of these yards are fenced.

Intermodal freight in conflict with Inter/multimodal human traffic. Neighborhood residents cross the central corridor on the arterial streets that bridge it, however, because of the design of these streets Multimodal crossing by pedestrians or bicyclists is largely precluded.
Redevelopment of these corridors has been designed in suburban form:
- Office warehouse style buildings
- Parking in front
- Water features, not systems
- No multimodal crossings
- Increased truck traffic in neighborhoods
- Expanded scale of development increases the barriers to multimodal crossing
Design Research

To achieve integration in already built-up areas, the multimodal human/pasenger system must be both: separated from and hybridized with the horizontal physical form of the freight system.

Redevelopment in this corridor could allow multimodalism and intermodalism to be adjacent, but with separate right-of-ways.
This design makes a multimodal parkway edge between the neighborhood and the redeveloped parcels along a new, separate intermodal corridor.

The design removes trucks and parking lots from neighborhood streets & cleans stormwater runoff.
The research team has investigated a number of solutions to build key bridges on intermediate streets to preserve connectivity across the corridor, bikeway routes along the corridor, and to create bridgehead buildings to adapt existing bridges and allow connections between street and railroad grades.
Community Design: Multimodal and Intermodal

Oberstar Forum

Highway 61 South/Red Rock Commuter Corridor

Human/Passenger System
Red Rock
Minneapolis and St. Paul to Hastings

Cottage Grove
Jamaica Avenue
Station Area Development Study
Commuter Rail Oriented Design
Intermodal trips to commuter rail stations are ordinarily by car.

Time is the critical limiting factor.

Most commuters will not drive more than 15 minutes in large cities to get to stations.

The map shows that in Cottage Grove, at the edge of the MUSA the large crescent of land which is both under- or undeveloped within 10-12 minutes of the proposed Jamaica Avenue station site.
This site provides an opportunity to examine the separate spatial relationship of human/passenger intermodalism for commuter rail oriented development to freight intermodalism.

Industrial uses and zoning A large-scale automated intermodal distribution and warehouse facility is planned for this site.
Inter/Multimodal Access to Station Area
Commuter Rail Oriented Development & Station area at Langdon
• Multimodal hydro/collector streets and bikeways
### Density for Commuter Rail Transit

#### Highway 61 South/Red Rock Commuter Corridor

<table>
<thead>
<tr>
<th>Type</th>
<th>Units</th>
<th>Acres</th>
<th>Density</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single Family</td>
<td>215</td>
<td>31.82</td>
<td>6.76</td>
</tr>
<tr>
<td>Town Homes</td>
<td>784</td>
<td>59.2</td>
<td>13.24</td>
</tr>
<tr>
<td>High Density</td>
<td>120</td>
<td>2.27</td>
<td>52.89</td>
</tr>
<tr>
<td>Mixed Use</td>
<td>152</td>
<td>3.49</td>
<td>43.61</td>
</tr>
</tbody>
</table>

Densities in commuter rail communities can be as low as 2 - 3 dwelling units per acre.

This density is common in Woodbury and is lower than the average density of Cottage Grove.

- **Mixed use hydro/collector streets**

  Mixed use is necessary in such places to reduce vehicle miles traveled by making linked trips shorter and more likely to be taken in the pedestrian mode.
Applying the vision of the designers and developers of Highland Park, the design for the Cottage Grove subdivision site was based on:

- Connectivity/multimodality/intermodality in the street system - new types of hydro/collectors streets
- Open space systems that serve multiple purposes including connection of drainage to street system.

- No superblock type enclosed parks with fenced ponds
Storm drainage was calculated for baseline scenarios and compared with new patterns of development.

Runoff characteristics pre- and post development
Urbanization and Water Quality Protection: Regional Policy vs. Local Control

- The areas where suburban growth is occurring take their drinking water from the ground. Over 110 separate water utilities govern this resource.

- The Twin Cities’ drinking water comes from surface water.
In the lower and most of the middle third of the many Minnesota watersheds, stormwater runoff is piped directly to surface waters.

In the upper third of watersheds where urbanization is occurring, the design of the street and highway system and open spaces will determine whether stormwater can be infiltrated or treated (cleaned) before it reaches either surface or groundwater receiving zones.
Moving from the baseline to a new model in the Twin Cities:

Baseline Model: Dispersed patterns of suburban growth, largely disconnected, focused technological fixes. Most of the Twin Cities passenger network is not intermodal by design.

points of freight connectivity adjacent to habitation or investment in point-of-purchase type centers (container-based; highly centralized)

points of human connectivity and goods and service production/consumption will be dispersed on roadway network - provides opportunity for maximum independence.
Retrofitted intermodal production and freight facility, St. Paul

Moving from the baseline to a new model in the Twin Cities:

New Model: Dispersed, but concentrated, patterns of suburban growth – connected by redundancy of modes and multiple points of connectivity; new integrative technologies.

points of freight connectivity may not be points of habitation or investment in point-of-purchase type centers (container-based; highly secured, camouflaged or underground?)

points of human connectivity and goods and service production/consumption will be clustered or connected to provide opportunity for investment-vulnerability, but offer intrinsic high human values of face-to-face communication.
Some problems with the model:

- Twin Cities have intrinsically had a weak central place pattern with two cities, virtually independent of each other; bus service and recent patterns in development of county transit authorities, mirror this situation.

- The ring road has also weakened central place: the radii are no longer as dominant in ring configuration as the pull of the historical central place weakens.

- Highly developed sense of value of autonomy in the residential marketplace

- Lack of investment by railroads in consolidated freight intermodalism
### Community Design: Multimodal and Intermodal

#### Integrating Intermodalism and Multimodalism

<table>
<thead>
<tr>
<th>Seattle SoundTransit</th>
<th>Financial problems with the model?:</th>
</tr>
</thead>
<tbody>
<tr>
<td>The chair of the transit board is also the county executive:</td>
<td>Relative Costs of Intermodalism vs. the Current Trend: Commuter Rail</td>
</tr>
</tbody>
</table>

| “While ridership numbers for other transit agencies are flat in a sluggish economy, more and more people are choosing SoundTransit’s alternatives to gridlock.” | The costs of current trend |
| Sound Transit’s Sounder commuter rail service and STExpress regional bus system combined for more than seven million passenger boardings in 2002. | primarily road construction: increasing lane miles and maintaining the system in place are pulling away from revenues (Stinson and Ryan, TRG) |

| The costs of commuter rail/Northstar | |
| $302 million/state share $123 million: | |
| With a ridership of 5000 per day, the Northstar line could leverage $1.15 to each public dollar to construct without considering value of spinoff development to local communities |

- *Star Tribune* article on Anton, Anton, Lubov study of economic impact of Northstar, February 20, 2003
### Integrating Intermodalism and Multimodalism

#### The principal problem?: Federal policy integration with Local and State policy in Minnesota.

**Denver FasTracks**

Regional Transportation District proposal calls for a multibillion-dollar, 10-year expansion of mass transit, including 110 miles of new light-rail lines, diesel commuter trains and special lanes for buses and car-poolers. Building highways to accommodate the mass-transit lines, stations and park-n-rides likely would cost as much as $4.7 billion, doubling the estimated $4.7 billion cost of FasTracks, CDOT said.

Fragmentation of transportation design, implementation planning and taxing authority: a regional policy problem with control by state authority Regional policy making bodies and agencies such as Met Council have limited capacities to make integrative decisions that can succeed on a regional scale:
- land use is decided locally
- transportation systems are largely a matter of state planning and construction;
- taxation requires complex multiple agency agreements with no comprehensive regional authority in charge from start to finish.

**What is the role of the Federal government to create an intermodal landscape?**
The feasibility of a private terminal facility in Rosemount was deemed high, particularly given neighborhood opposition to expansion by BNSF in the central corridor; however, CP had adequate capacity at Shoreham and UP had no demonstrated market.

1. Additional research is needed.

Case Studies on Systems-Integrated Design/Policy Settings
Regional Authority/Financial models

- Dallas Intermodal Freight/Union Pacific
- Alameda (CA) Intermodal Corridor/UP/BNSF
- Seattle SoundTransit
- Denver FasTracks

**Minnesota Intermodal Railroad Terminal: Rosemount**

TEA-21/Federal Policy

the Objective:
Create and administer policy such that enhancement is seen as integrative environmental design that increases efficiency across modes and is systemically-based, not just a decorative add-on or mitigation.
### Environmental Streamlining Priority

"….introduction and use of new technologies such as Geographic Information Systems to study regional environmental issues in support of programmatic approvals, or closer coordination of transportation planning with other planning efforts such as land use planning, air quality planning, or watershed management and associated mitigation banking."

*from the TEA 21 website*

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### Environmental Review: Process Informed by Design:

An integrated approach could use GIS to develop place/environment-specific evaluations that add value.

But the level of detail and the ‘coverages’ of many GIS systems will not be detailed enough to ensure the best comprehensive solutions:

#### 2. Model Demonstration Project:

Expand *design* process to review identify composite values and costs (air, water, public health) for a large scale multi- and intermodal project:

**Costs/benefits**

- composite costs over time
- composite benefits over time