

High Capacity Transit Task Force for the 2045 Long Range Plan

December 15, 2017



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Agenda Item 1.

Introductions

Rusty Senac, Chair



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Taskforce Charge

Coordinate with regional stakeholders to identify regional benefits, funding solutions and policy considerations to advance High Capacity Transit throughout the region.



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Agenda Item 2.

Peer (Example) Cities

Thomas Gray, H-GAC



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Peer Cities

- One or more characteristics in common with Houston/Galveston Region:
 - Urban form (lower-density, automobile-oriented)
 - Regional population size
 - Climate
 - Geography and topography
 - Relatively recent (within 40 years) HCT investment
 - Traffic congestion dynamics



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Peer Cities

- Not intended to be “apples-to-apples” comparison
 - Differing funding sources/authority
 - Differing governance structures
- Purpose is to provide examples/case studies from other regions
 - What did they do and how did they do it?
 - How can we tailor that experience to our region?



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Examples from Peer Cities

Country	City or Region	Economic Impact	Service Concepts	Innovative Funding
	Atlanta	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
	Austin		<input checked="" type="checkbox"/>	
	Cleveland	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
	Dallas/Fort Worth	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
	Denver	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>
	Los Angeles		<input checked="" type="checkbox"/>	
	Miami		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
	Seattle	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>
	Washington, DC	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
	Ottawa			<input checked="" type="checkbox"/>
	Vancouver		<input checked="" type="checkbox"/>	
	Dubai		<input checked="" type="checkbox"/>	

Agenda Item 3.

Findings of Economic Development Workgroup

Bob Eury, Central Houston Inc.
Jeremy Ebie, Phoenix Infrastructure Group

H-GAC HCT Taskforce Meeting: Economic Impact Workgroup Findings

December 15, 2017

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Discussion Agenda: High Capacity Transit Economic Impact Workgroup

Introduction

- Summary from September 29th and November 10th Taskforce Workgroup Sessions

Criteria

- Standard for analysis of Economic Impacts:
 - Individual
 - Business
 - Communities
- Exploration of traditional measures of economic impact

Peer City Economic Impact Analysis Review:

- Review of projects and their economic impact through standard criteria
 - Atlanta, Cleveland, Dallas, Denver, Seattle, Washington D.C.

Further Questions on Peer City Review

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Summary from Workgroup Session, September 29th and November 10th

- Individual, business and community economic impacts an appropriate way to identify, analyze and conclude economic impacts
- No clear identification on what defines a positive economic impact versus a negligible or a negative impact
 - Decongestion (analyze costs of congestion vs. benefits)
 - Rider savings or optionality the standard
 - Economic growth (GDP, tax revenue, etc.) the factor to be determinant of success
 - Counter-argument that growth will happen regardless of transit investment
- Not clear to define where each dollar goes in an input/output analysis
 - Impact and Growth can occur regardless of savings, investment, optionality, etc.
 - We need to attempt to identify the direct effects of investment and effect
- Peer City analysis presented as option to provide perspective:
 - Will possibly provide empirical themes across regions
 - Regional review may also provide some perspective on input output impact of investment
 - Peer City will also show what kind of investments produce what kind of effects potentially
- Mobility, as a positive effect
 - Cause of problems rather than resolving problems
 - Mobility and production

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Economic Impact Criteria/Standard

Beyond GDP, decongestion, and rail/route mileage, the Peer review can apply measures and methods for economic impact analysis. In each Peer City, we identified economic impacts that can be identified as achievements for HCT investment. We have identified each criteria as either a qualitative or quantitative impact.

Economic Impact Criteria for HCT Investments

- **Individual Citizen**
 - Optionality: Increased transportation options (*Qualitative*)
 - Mobility: Increased ability to travel efficiently (*Qualitative*)
 - Savings/Efficiency: Decreased transportation costs (*Quantitative*)
 - Safety: Increased safety in transportation (*Quantitative*)
- **Businesses/Employers**
 - Mobility and Market Access: Increased propinquity to customers and market clusters (*Quantitative*)
 - Access to employees: Increased ease of access to employee and employee centers and communities (*Qualitative*)
 - Economic Spatial Agglomeration: Increased ease of access to related and complimentary businesses and clusters (*Quantitative*)
- **Communities**
 - Connectivity to jobs and employment: Increased access for distant communities to business clusters (*Qualitative*)
 - Increased connectivity to other communities: Increased access of regional communities to each other (*Qualitative*)
 - Real property value enhancement: Increased real property value due to investment (*Quantitative*)
 - Value Capture: Ability to monetize assets and bring external capital to community through investment (*Quantitative*)

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Peer City Economic Impact Analysis Review

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Economic Impact Peer City Examples

Cities/Regions and Their Projects

Atlanta (MARTA)

Dallas, TX
(DART)

Denver
(FasTracks)

Washington, DC
(WMATA)

Cleveland
(Healthline/CSU)

Seattle
(East Link)

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Atlanta: Metropolitan Atlanta Rapid Transit Authority (MARTA)

Extensive rail and bus network connecting suburban counties and surrounding cities of Atlanta



Background Information

- 2016 Estimated MSA Population: 5,789,700
- 2010 Census MSA Density: 632
- Some topographic differences (hills), but no geographic limitations and similar climate
- MARTA (heavy rail; metro service) – first section opened 1979
- Modern streetcar (district circulator)
- 8th largest transit system in the US; largest in the Southeast

Transit Features

- Service area of 500 square miles
- BRT: 532 buses; 91 routes; 8,954 stops
- LRT: 38 stations; 48 miles of rail track; 318 cars

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Atlanta: Metropolitan Atlanta Rapid Transit Authority (MARTA)

Economic Impacts Realized

- \$2,625,073 Total economic activity generated annually
- *Businesses*: An expanded transit system plays a tremendous role in efficiently connecting people to jobs. 14 of the 18 fastest growing sectors in Atlanta employ workers who rely heavily on MARTA
 - In addition business near stations have experienced higher revenue performance.
- *Individuals*: Increased optionality employees as well as for Senior citizens
 - Expanded transit options allow some workers to access work opportunities not otherwise be available to them, as well as saving time and transportation costs
 - 24,864 Direct/indirect jobs supported annually
 - Nearly 180,000 workers in metropolitan Atlanta utilize MARTA for daily commute, including car owners
 - Atlanta ranked #1 in the U.S. with the biggest increase of seniors from 2000 (7.7%) to 2016 (11.4%).

Shortcomings

- Overall congestion goals have not yet been realized in the region

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Greater Cleveland Regional Transit Authority: Cleveland Healthline and Cleveland State University

Naming Rights Utilized to Capture BRT Line Value

Regional Information

- 2016 Estimated MSA Population: 2,055,612
- 2010 Census MSA Density: 6,166 persons/square mile
- Cleveland RTA (established 1975): 1 rapid transit; 2 interurban/light rail; 1 light rail: Waterfront 60 bus routes; 2 Bus rapid transits; 4 Freeway-Flyer

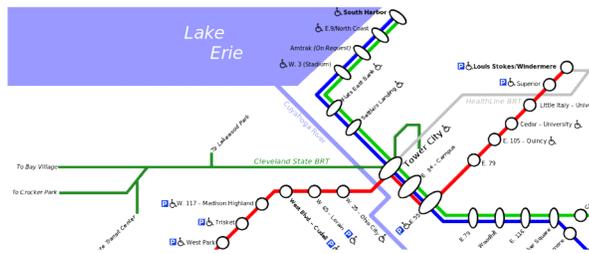


Healthline Contract

- RTA was the first transit system in the nation to sell naming rights sponsorships to its assets. The Healthline is sponsored by the Cleveland Clinic and University Hospitals, and connects the Medical Center to downtown. \$50mm of the \$200mm project was devoted to BRT, with the rest for road improvement.

Background

- In 2005, RTA began building the Silver bus rapid transit line.
- Naming rights for the line were purchased by the Cleveland Clinic and University Hospitals for twenty-five years. Additionally, naming rights for another line have been purchased by Cleveland State University



CSU Contract

- Contract for \$150K per year
- CSU sponsorship on 16 custom-designed buses; seat backs on all vehicles, and the 32 new bus stations and 243 stops and shelters along the route and in related materials.
- Line runs from downtown Campus to West Shore area.

Greater Cleveland Regional Transit Authority: Cleveland Healthline and Cleveland State University

Economic Impacts Realized

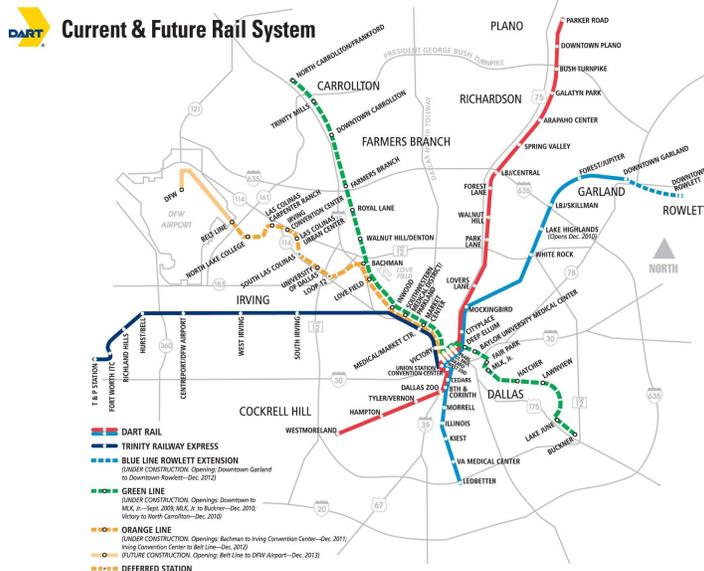
- **Business Employer Impacts:**
 - Increased exposure and access for CSU to student community
 - Increased exposure and access of the medical center to Greater Cleveland
 - 7.9 million square feet in commercial development since inception
- **Individuals/Employees Impacts:**
 - 13,000 new jobs
 - Increased optionality and mobility to medical and academic institutions
- **Community Impacts:**
 - 4,000 + new residential units
 - \$62 million generated in local taxes
- **Value Capture:**
 - \$180 million invested by Cleveland State University (CSU)
 - \$500 million invested by University Hospital
 - \$350 million invested by Cleveland Museum of Art
 - \$506 million invested by Cleveland Clinic Heart Center
 - \$27.2 million invested by Museum of Contemporary Art

Shortcomings

- None have really been noted; both the Healthline and the CSU line have been touted as successes

Dallas Metropolitan Area – Dallas Area Rapid Transit

Light rail, people mover and streetcar network connecting surrounding cities to the city core



Background Information

- 2016 Estimated MSA Population: 7,233,323
- 2010 Census MSA Density: 634 persons/square mile
- DART (Light Rail) – first section opened 1996
- TRE & DCTA A-Train (Commuter Rail)
- Streetcars: heritage (McKinney Ave Trolley) and modern (Dallas Streetcar)
- Las Colinas People-mover (Automated Guideway Transit)

Transit Features

- Date Opened: 1996
- Route Length: 83.8 miles
- Four Lines (Red, Orange, Blue, Green)
- 39 stations currently

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Dallas Metropolitan Area – Dallas Area Rapid Transit

Economic Impacts Realized

- Physical connection of outer Dallas region to City core, business clusters and employment centers
- **Business Impacts:**
 - Increased accessibility for employers across region
 - Development of commercial clusters: Over \$4 billion in economic activity due to DART system build-out
- **Community Impacts:** Over \$7 billion in development within .25 mi of DART rail stations since 2007; over \$40 million in annual tax revenue from new development
 - Real property value enhancement: 17% increase per year in first 4 years of DART inception
 - Over \$70 million in tax revenue yearly connected to DART station, LRT and BRT investments
- **Individual/Employee Impacts:** Over \$700 million in yearly labor income in businesses near stations

Shortcomings

- Overall congestion goals have not been realized in the Dallas region

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Denver Regional Transit Department: FasTracks

Extensive Development connecting Downtown Denver to the Airport and suburbs



Background Information

- 2016 Estimated MSA Population: 2,812,732
- 2010 Census MSA Density: 305 persons/square mile
- RTA Lines C D E F H R W (light rail; regional/metro service)– first section opened 1994
- RTA Lines A B (light rail; regional/commuter service) – first section opened 2016
- 122 miles of new light and commuter rail
- 18 miles of bus rapid transit (BRT)
- 57 new transit stations with Enhanced bus/rail connections with conveniently timed transfers PARK-n-RIDES 31 new Park-n-Rides 21,000 new parking spaces at rail and bus stations ENHANCED BUS NETWORK

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Denver Regional Transit Department: FasTracks

Economic Impacts Realized

- Over \$3 billion of activity in the local economy from since inception
- **Business Impacts:** Over \$1.4 billion injected into Denver economy from the project exclusively including, wages, subcontractors, equipment and services
- **Individual Impacts:** Estimated 12,000 full-time jobs along line since 2005
- **Value capture:** In the \$300 million private development of FasTracks hub Denver Union Station. Project was only possible through investment in regional LRT
- **Businesses and Individual Impacts:** Direct rail connection of the airport to downtown Denver eases access of business to downtown and provides optionality and mobility for citizens

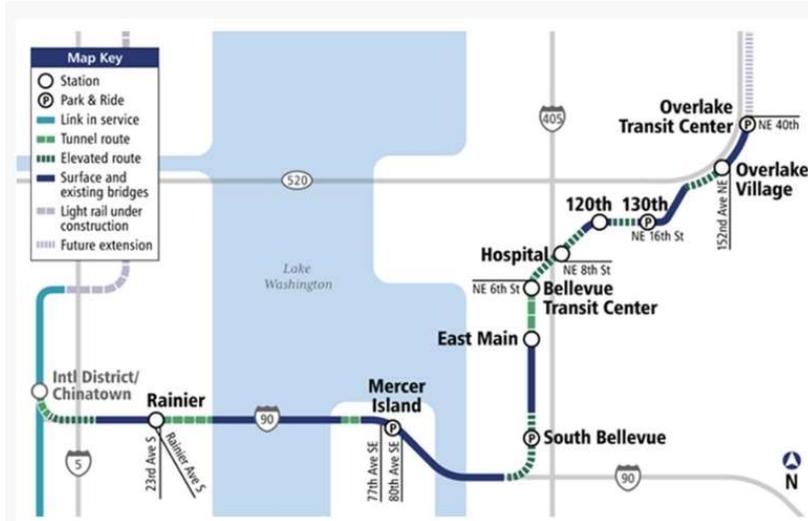
Shortcomings

- Mixed effect on decongesting the region. Some reports indicate that overall, the light rail corridors in operation have succeeded in lowering the rate of increase in the level of traffic on highways within the rail transit influence zone as compared to highways outside the influence zone.

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Seattle, Washington – East Link Extension: Central Puget Regional Transit Authority (Sound Transit)

Innovative Funding and Financing of Light Rail Project Connecting Suburbs to Employment Center in the City



Financing & Funding Approach
<ul style="list-style-type: none"> Total Project Size: \$4.03bn Private Investment: None TIFIA loans: \$1.33bn Sound Transit Tax Revenues: \$1.086bn Bond Proceeds: \$1.06bn Cash Contribution: \$281mm Grant Revenue: \$89mm City of Bellevue: \$184mm
Stakeholders Participating
<ul style="list-style-type: none"> Project Sponsors: Sound Transit; USDOT; City of Bellevue Lenders: US Department of Transportation; Sound Transit

Seattle, Washington – East Link Extension: Central Puget Regional Transit Authority (Sound Transit)

Economic Impacts Realized

- Project is early in development but the following impacts are anticipated:
 - Business Economic Impacts:** 40,000 jobs in construction and future economic development
 - Business and Community Impacts:** Connecting residential communities to over 200,000 existing jobs due to access to rapidly growing software and biotech industries in the greater metropolitan area
 - Individual Impacts:** Expected travel time savings expected to save \$65mm annually; 10,000 vehicle hours per day. Passenger optionality in transportation choice

Shortcomings

- Environmental and parkland protections have not been met

Washington DC/Maryland/Virginia: Washington Metropolitan Transit Agency (WMATA)

Multi-State Agency Formed to Develop Light Rail in DC Region; Growth of System in Coordination with Regional Growth



Background Information

- 2016 Estimated MSA Population: 6,131,977
- 2010 Census MSA Density: 1,084 persons/square mile
- METRO (Heavy Rail) – first section opened in 1976; continuously expanded

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Washington DC/Maryland/Virginia: Washington Metropolitan Transit Agency (WMATA)

Economic Impacts Realized

- Over \$15 billion in development within .25 mi of WMATA rail stations region-wide;
- **Business Impacts:** Between 1980 and 1990, 40% of the region's new retail and office space was built within walking distance of a Metrorail station
 - Over \$30 billion of commercial, office and retail growth near metro stations and lines
- **Individual Impacts:** Increased Optionality - 65% of Metrorail riders are considered to be choice riders; over 42% of bus riders are choice riders

Shortcomings

- Funding and financing have been a significant issue due to a lack of a designated revenue source; Life-cycle and maintenance have suffered as a result as well

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Agenda Item 4.

**Findings of
Service Concepts
Workgroup**

**Amanda Edwards, Vice Chair
J. Sam Lott, Texas Southern University**



**HCT Service Concepts Workgroup –
Phase 1 Findings Report**

**HCT Task Force Meeting
December 15, 2017**



Phase 1 Report Contents

- **SERVICE CONCEPTS WORKGROUP MISSION**
- **EVALUATION CRITERIA**
- **SERVICE CONCEPTS CLASSIFICATION**
- **SERVICE CONCEPTS PARAMETERS AND EXAMPLES**
- **DISCUSSION OF EMERGING TECHNOLOGIES**



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Workgroup Mission

- **Propose Recommended Corridors with preferred High Capacity Transit Service Concepts and Modes, as determined by workgroup criteria, simplified modeling output information and service concept attributes.**



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Workgroup Process

- Four workgroup meetings: September 29, October 20, November 13, December 1
- Extensive discussion about evaluation criteria, service categories, technologies and deliverables
- Three Levels of Service were developed
- Service concepts matrix refined by smaller group



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Proposed Evaluation Criteria

- Does the proposed option improve access and mobility to and from major activity centers such as:
 - Workplaces/Employment Centers?
 - Health and Education Centers?
 - Economic Centers?
 - High Capacity Transit Hubs?
- Does the proposed option present the best travel alternatives to heavily congested freeways and roadways?



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Proposed Evaluation Criteria cont'd

- Does the proposed option contribute to the economic development of the region or its standing as an international City/Hub?
- Does the proposed option enhance the full spectrum of livability (live, work, play; see H-GAC Livable Centers studies) for people of all incomes, abilities and ages?
- Does the proposed option allow sufficient flexibility to change service patterns as warranted by evolving demand?



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Proposed Evaluation Criteria cont'd

- Does the proposed option provide connectivity for an integrated multimodal HCT system with system-wide, cohesive connections from start-to-finish (for the maximum span of service hours possible)?
- Does the proposed option make the transit system more resilient in the event of extreme demand or catastrophe?
- Does the proposed option allow transit users and non-users to travel safely?
- Does the proposed option contribute to emissions reductions?



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Service Concept Classifications

- LOCAL
 - Local Circulation and Connectivity Service
 - District Circulator Service
 - First-Mile/Last-Mile Service
- SUBREGIONAL
 - Subregional Corridor and Internodal Service
- REGIONAL
 - Regional Commuter/Express Service
 - Mega-Region Service



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Definitions of Local Service Concepts

- Local Circulation and Connectivity Service – Conventional Public Transit modes operating primarily on-street on arterial network
- Local District Circulator – Conventional and unconventional modes providing circulation within a specific urban/employment District or Major Activity Center
- Local First-Mile/Last-Mile Service – Connecting service between a High Capacity Transit station and nearby Major Activity Center/District



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Definitions of Subregional Service Concepts

- **Subregional Corridor and Internodal Service** – Fixed route transit service (station spacing less than 3 miles) along high-demand corridors and between major trip-generation “nodes”



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Definitions of Regional Service Concepts

- **Regional Commuter/Express Service** – Longer distance express service (station spacing greater than 3 miles) between population centers and high employment/activity centers
- **Mega-Regional Service** – Very long distance service (greater than 100 miles) between the centers of two or more large metropolitan regions



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Service Concept Characteristics

- Right-of-Way (ROW)
- Speed (mph)
- Ridership Capacity (passengers per hour per direction – pphpd)
- Spacing Between Stops
- Level of Service – High, Medium and Low



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Level of Service Parameters

- Headways – “Maximum” frequency (in minutes) of transit vehicle service at a specific location
- Service Period – Portion of the day (in hours) that is provided transit service, typically identified separately for weekday and weekend service
- Days of Week – Number of Days a Week transit service is provided



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Local Service Concepts

HCT SERVICE CONCEPTS – TECHNOLOGY APPLICATION EXAMPLES



Local Circulation & Connectivity Service

Bus Rapid Transit

Example taken from Houston METRO
Bellaire Quickline BRT



Source: Kimley-Horn and Assoc.

Right-of-Way			Operations			Level-of-Service		
Street	Semi-Exclusive	Exclusive	Speed (miles/hour)	Ridership Capacity (1,000s/ hour/ direction)	Spacing Between Stops Low (Blocks), High (5+ mi.)	High	Medium	Low
X	X		15-25	1 – 4 *	Mid	15 Min; 20 Hrs; 7 Days	30 Min; 20 Hrs; 7 Days	60 min; 12 Hrs; 5 Days

* Presence of bypass lanes at Bus Rapid Transit stations can increase ridership capacity, but requires additional ROW



Local Circulation & Connectivity Service – Other Examples

Light Rail Transit

Example taken from
Houston METRO
Main Street LRT – Red Line



Local Fixed-Route Bus

Example taken from
Los Angeles METRO
Wilshire Blvd Bus Line



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Local District Circulator Service

Streetcar/Tram

Example taken from Dubai UAE
RTA Al Sufouh District Tram



Right-of-Way			Operations			Level-of-Service		
Street	Semi-Exclusive	Exclusive	Speed (miles/hour)	Ridership Capacity (1,000s/ hour/ direction)	Spacing Between Stops Low (Blocks), High (5+ mi.)	High	Medium	Low
X	X		10-15	1 – 8 *	Low	5 Min; 20 Hrs; 7 Days	15 Min; 20 Hrs; 7 Days	Special Events

* Upper end of ridership capacity assumes large trams with full load standing passengers, very close headways and dedicated ROW/stations



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Local District Circulator Service – Other Examples

Automated People Mover (APM) Transit

Example taken from Miami-Dade Transit Downtown Metromover



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Local First-Mile/ Last-Mile Service

APM System

Example taken from Dubai UAE RTA Metrorail FM/LM Connector to Bluewaters District



Right-of-Way			Operations			Level-of-Service		
Street	Semi-Exclusive	Exclusive	Speed (miles/hour)	Ridership Capacity (1,000s/ hour/ direction)	Spacing Between Stops Low (Blocks), High (5+ mi.)	High	Medium	Low
		X	15-20	2 – 8 *	Low	2 Min; 20 Hrs; 7 Days	5 Min; 20 Hrs; 7 Days	15 Min; 12 Hrs; 7 Days

* Wide Range of Vehicle Sizes from 24 pass. to 100 pass., very close headways and protected ROW/stations



Houston-Galveston Area Council

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Local First-Mile/Last-Mile Service – Other Examples

Demand Response Zone
Houston METRO Acres Homes Community Connector



Rapid Bus

Example taken from Washington DC Circulator – Typical Route from Union Station To Navy Yard-Ballpark



Subregional Corridor and Internodal Service Concepts

HCT SERVICE CONCEPTS – TECHNOLOGY APPLICATION EXAMPLES



Subregional Corridor and Internodal Service

Automated Transit System (ATS)

Example taken from Dubai UAE RTA Metro -- Al Sufouh 2 Line



Right-of-Way			Operations			Level-of-Service		
Street	Semi-Exclusive	Exclusive	Speed (miles/hour)	Ridership Capacity (1,000s/ hour/ direction)	Spacing Between Stops Low (Blocks), High (5+ mi.)	High	Medium	Low
		X	25-35	6 – 28 *	Mid	15 Min; 20 Hrs; 7 Days	30 Min; 20 Hrs; 7 Days	60 min; 12 Hrs; 5 Days

* Grade separation and train length are variables affecting ridership capacity.



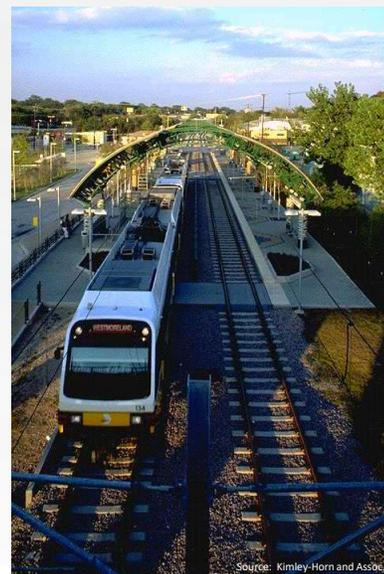
Subregional Corridor and Internodal Service – Other Examples

Bus Rapid Transit

Example taken from Los Angeles Metro’s Orange Line BRT



Source: Los Angeles METRO.



Source: Kimley-Horn and Assoc.

Light Rail Transit

Example taken from Dallas DART Red Line



Regional Commuter/Express Service Concepts

HCT SERVICE CONCEPTS – TECHNOLOGY APPLICATION EXAMPLES



Regional Commuter/Express Service

Commuter Rail

Example taken from Los Angeles Metrolink Commuter Rail System



Right-of-Way			Operations			Level-of-Service		
Street	Semi-Exclusive	Exclusive	Speed (miles/hour)	Ridership Capacity (1,000s/ hour/ direction)	Spacing Between Stops Low (Blocks), High (5+ mi.)	High	Medium	Low
	X	X	30-55	2- 7 *	Mid-High	15 Min; 20 Hrs; 7 Days	30 Min; 20 Hrs; 7 Days	60 min; 10 Hrs; 5 Days

* Grade separation and train length are variables affecting ridership capacity.



Regional Commuter/Express Service – Other Examples

Light Rail DMU

Example taken from
Austin Metrorail
Red Line to Leander



Express/Limited Stop Bus

Example taken from Woodlands
Township Express Park and Ride



Mega-Region Service Concepts

HCT SERVICE CONCEPTS – TECHNOLOGY APPLICATION EXAMPLES



Mega-Region Service

High Speed Rail

Example taken from Texas Central Partnership Japanese Shinkansen Technology



Right-of-Way			Operations			Level-of-Service		
Street	Semi-Exclusive	Exclusive	Speed (miles/hour)	Ridership Capacity (1,000s/ hour/ direction)	Spacing Between Stops Low (Blocks), High (5+ mi.)	High	Medium	Low
		X	125-150	2 – 4	High	30 Min; 20 Hrs; 7 Days	60 Min; 20 Hrs; 7 Days	180 min; 10 Hrs; 5 Days



Mega-Region Service – Other Examples

Intercity High Speed Rail

Example taken from Amtrak Northeast Corridor Service – Bombardier Acela Train



Source: Wikimedia

Intercity Passenger Rail

Example taken from Amtrak California Service through LA Union Passenger Terminal



Emerging Technologies and Autonomous Vehicles

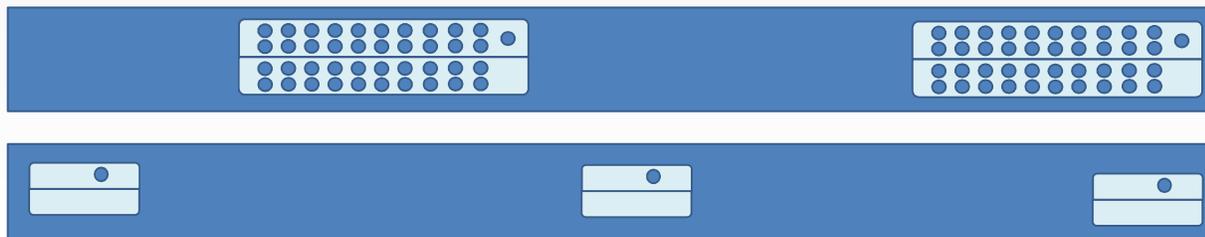


Emerging Technology Considerations

- Autonomous technology can be added to all transit modes (both bus and rail) and will make them better:
 - more frequent service
 - greater reliability
 - lower operating costs
 - more precise stopping at stations
 - faster service
 - greater capacity
- Large Transit vehicles (i.e., heavy rail, light rail, BRT) will get even more efficient
- Small autonomous shuttles may also be able to serve transit markets not served today

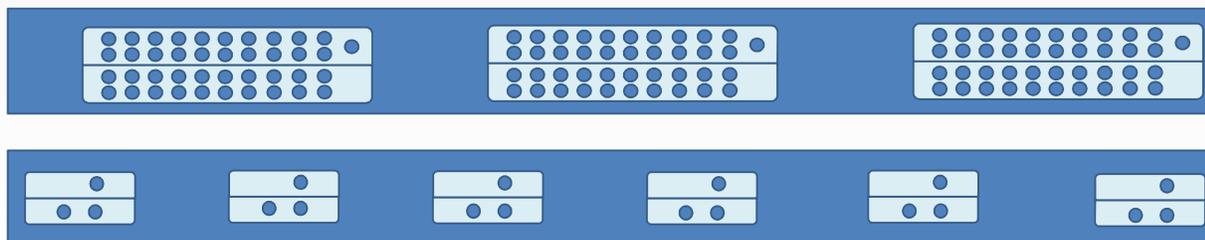
Even with autonomous vehicles, transit will still be more space efficient

- Present Day Example:
 - 100 feet of traffic lane carrying 0.5 people: Single occupant vehicle, 15 feet long at 65 mph, and a 2 second (roughly 200 ft) gap between vehicles
 - 100 feet of traffic lane carrying 17 people: 40 foot bus, all 40 seats full, 15 feet long at 65 mph, and a 2 second gap between vehicles
 - **Present Day Result:** Bus Transit carries 35 times as many people as single occupant car in the same travel-lane space



Even with autonomous vehicles, transit will still be more space efficient

- Future Example where the vehicles are autonomous
 - 100 feet of traffic lane carrying 3 people: Single occupant vehicle, 15 feet long at 65 mph, 20 foot gap between vehicles
 - 100 feet of traffic lane carrying 67 people: 40 foot bus, all 40 seats full, 15 feet long at 65 mph, 20 foot gap between vehicles



Even with autonomous vehicles, transit will still be more space efficient

Conclusions:

- Autonomous single occupant cars in the future will still carry fewer people than Bus Transit does today in the same space
- **Future Capacity Advantage:** Autonomous buses will carry:
 - 23 times as many people as single-occupant autonomous cars
 - 10 times as many as 3-pass. shared-ride autonomous cars
- **Unchanging Capacity Limitation:** Capacity also limited by loading/unloading rates for both cars and transit at stations/stops – “People won't get faster”



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Autonomous vehicles do not automatically make congestion go away

If autonomous vehicles are not shared:

- same number of vehicle miles traveled as today
- same number of parking spaces required as today
- ability to do work during commute means people may choose longer commutes
- intersections (shared with pedestrians, bikes, likely non-autonomous vehicles) still limit capacity of roads



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Autonomous vehicles do not automatically make congestion go away

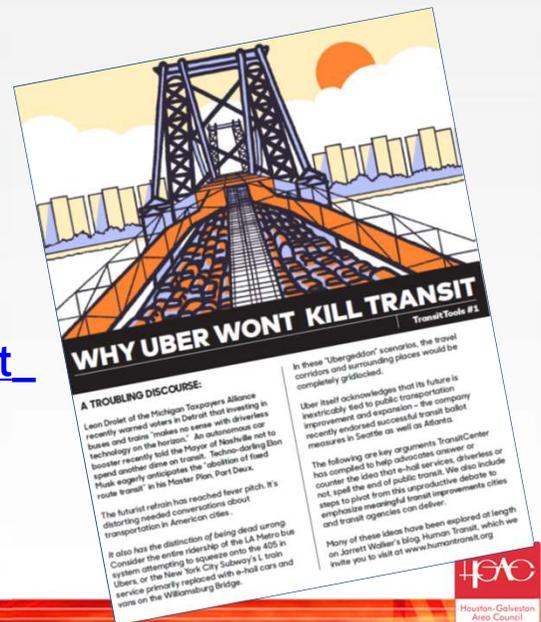
If autonomous vehicles *are shared*:

- more vehicle miles as empty vehicles wait, travel to next pickup
- more curb space required for loading and unloading (which may mean fewer travel lanes are available)
- parking still required to store spare vehicles outside rush hour
- ability to do work during commute means people may choose longer commutes
- intersections (shared with pedestrians, bikes, likely non-autonomous vehicles) still limit capacity of roads

Emerging Technology Considerations

A good resource on this topic:

http://transitcenter.org/wp-content/uploads/2016/12/FactSheet_Final.compressed.pdf



Agenda Item 5.

**Findings of
Innovative Funding Opportunities
Workgroup**

**Tom Lambert, METRO
Jeremy Ebie, Phoenix Infrastructure Group**



**H-GAC HCT Taskforce Meeting:
Innovative Funding Workgroup Findings**

December 15, 2017

Discussion Agenda: High Capacity Transit Innovative Funding Workgroup

Introduction

- Summary from September 29th Taskforce Workgroup Session, October 26th Workgroup Call and November 26th Webinar

Criteria

- Review standard for analysis of Innovative Funding:
 - Asset: BRT or LRT
 - Tools utilized: Traditional, innovative or combination
 - Project Participants

Peer City Innovative Funding Review:

- Review of projects and their funding structures via standard criteria
 - Cleveland, Denver, Miami, Ottawa, Seattle, Virginia, Washington D.C.

Further Questions on Peer City Review

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Summary from Workgroup Sessions, September 29th, October 26th and November 27th

Primary discussion points:

- Managing and mitigating funding costs and risks for traditional v. innovative structures
 - Transactional costs and costs of capital
 - Funding costs VS funding risk
- Interaction with other workgroups (Phase II focus)
 - The role that funding plays with service components
 - The economic impact that certain funding structures provide and the economic impact risks managed through particular funding structures
- Peer region discussions
 - Inclusion of BRT projects
 - Inclusion of funding for projects ancillary to BRT and LRT (sidewalks, utilities, etc)
 - Inclusion of traditional financing tools (e.g. tax increment financing, municipal bonds, sales taxes etc.)

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Innovative Funding Dynamics and Analysis Criteria

In analyzing and understanding the various funding structures available for HCT investment, the workgroup will be best served by applying some standards and parameters to its perspective

Asset Class:

- Bus Rapid Transit
- Light Rail Transit
- Multimodal
- Other form of transportation (including HOV expansion and utilization)

Funding Tools Utilized (Sample):

- General Obligation Bonds
- Revenue Bonds
- Tax Increment Financing
- Private Equity/Capital
- Sales Taxes
- Federal funding and financing (TIFIA, RRIF, etc.)

Project Participants (Sample):

- Private Investors
- Local stakeholders
- State DOTs
- Private Operators
- State/Provincial Interests and Agencies

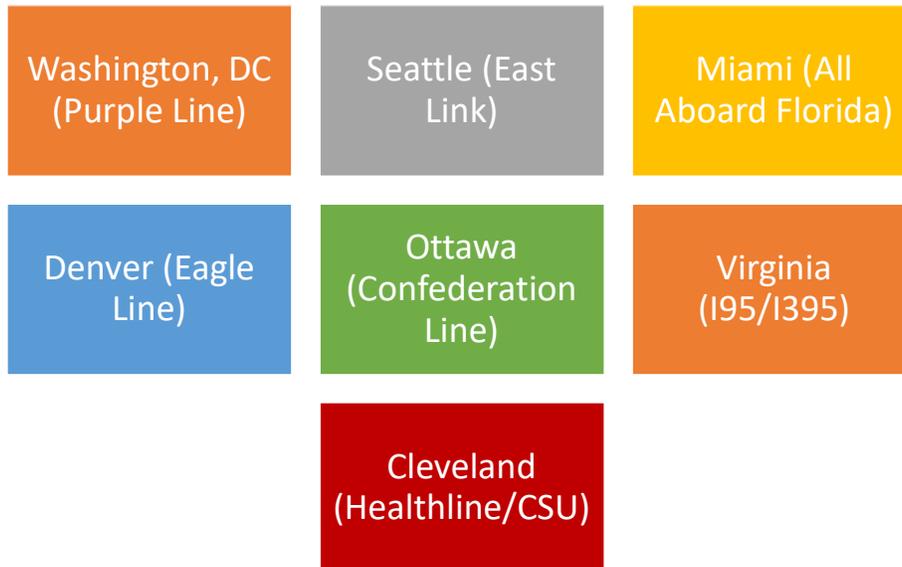
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Innovative Funding: Peer City Case Studies

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Innovative Funding/Financing Peer City Examples

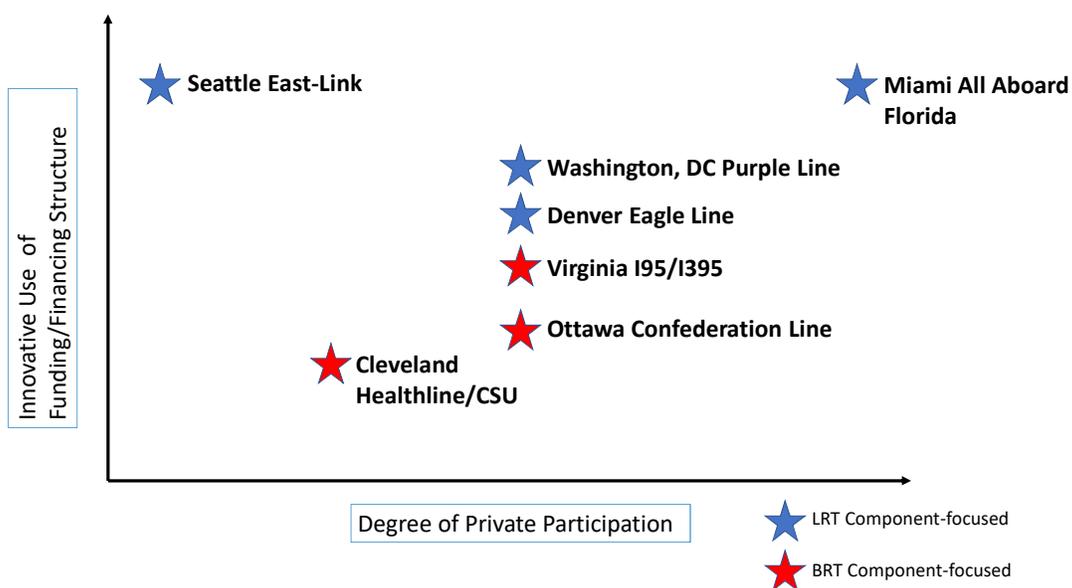
Cities/Regions and Their Projects



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Innovative Funding/Financing Peer City Examples

Cities/Regions and Their Projects: Degree of Private Participation and Use of Innovative Funding/Financing Structures



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Washington DC/Maryland – Purple Line Project - Maryland Transit Authority (MTA)

P3 with Federal Funding: Contracted agreement to design, build, operate, finance and maintain 16-mile light rail system connecting counties

Regional Information

- 2016 Estimated MSA Population: 6,131,977
- 2010 Census MSA Density: 1,084 persons/square mile
- METRO (Heavy Rail) – first section opened in 1976; continuously expanded

Background Information

- Montgomery and Prince George's Counties for decades were designated for a single light rail line connecting the two and providing a transit link between the two.
- Prohibitive costs for a potential project, combined with limited bonding capacity for MTA and the state of Maryland made this potential project difficult via traditional finance.



Financing & Funding Approach

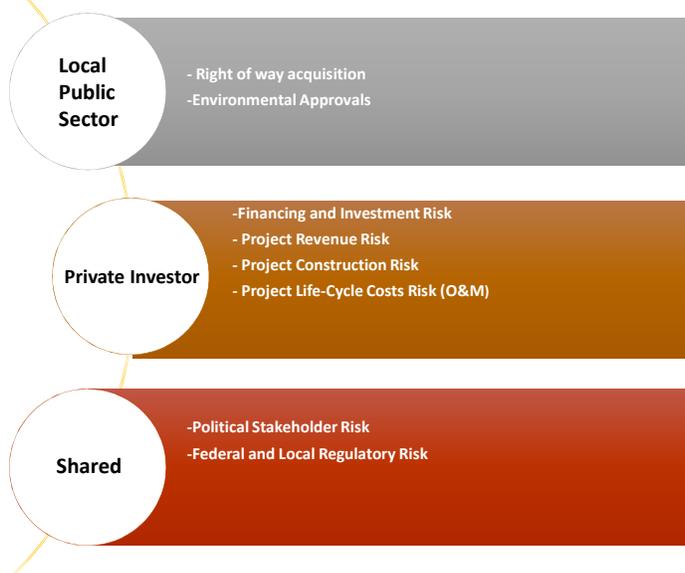
- Total Project Size: \$5.6bn
- Private Investment: \$138mm
- TIFIA loans: \$875mm
- Private Activity Bonds: \$313mm
- Note that Silver Line extension of WMATA included the development of a special tax district for counties within the lines path.

Stakeholders Participating

- Project Sponsors: Maryland Dept. of Transportation, Maryland Transit Agency
- State leader: US Department of Transportation
- SPV: Purple Line Transit Partners, LLC

Washington DC/Maryland – Purple Line Project - Maryland Transit Authority (MTA)

Risk/Responsibility Allocation



Purple Line: Risk Transfer Summary

The Purple Line Project transferred several financial and project risks that due to scale and scope were difficult for the state and MTA to handle alone:

- The Private sector assumed all project financing (\$5.6bn) and financial risk from the Public Sector
- Private sector assumed all life-cycle costing risk for the project over a 36-year period
- Other significant project-related risks to the project shared between the two parties

Seattle, Washington – East Link Extension: Central Puget Regional Transit Authority (Sound Transit)

Innovative structure to finance 15 mile light rail transit extension and HOV lane expansion connecting population and employment centers.

Regional Information

- 2016 Estimated MSA Population: 3,798,902
- 2010 Census MSA Density: 586 persons/square mile
- METRO (Heavy Rail) – first section opened in 2009; monorail in 1962

Background Information

- The Seattle/Bellevue region featured growing sales and income tax bases that were able to support rail projects, but the overall scale of this project was too large for the debt profile for Sound Transit or the surrounding cities.
- Sound Transit could, however, serve as the counterparty for a TIFIA loan from the federal government and utilizing the region's tax base. Loan analysis would be up to USDOT.



Financing & Funding Approach

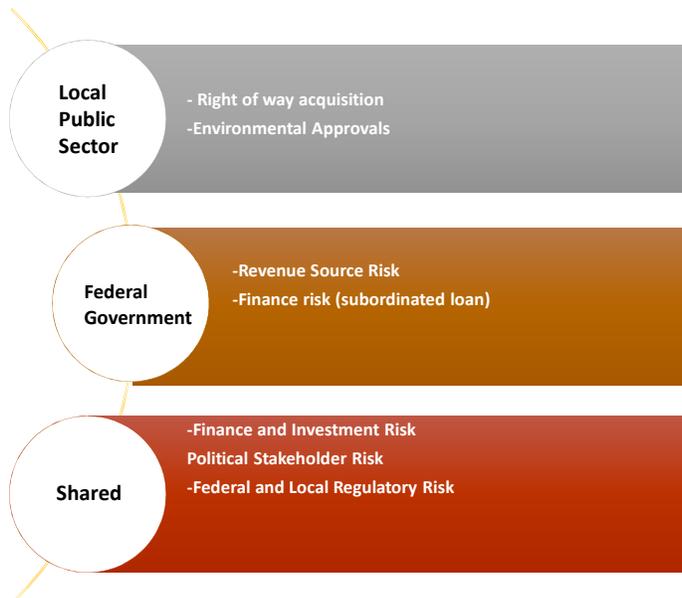
- Total Project Size: \$4.03bn
- Private Investment: None
- TIFIA loans: \$1.33bn
- Sound Transit Tax Revenues: \$1.086bn
- Bond Proceeds: \$1.06bn
- Cash Contribution: \$281mm
- Grant Revenue: \$89mm
- City of Bellevue: \$184mm

Stakeholders Participating

- Project Sponsors: Sound Transit; USDOT; City of Bellevue
- Lenders: US Department of Transportation; Sound Transit

Seattle, Washington – East Link Extension: Central Puget Regional Transit Authority (Sound Transit)

Risk/Responsibility Allocation



East Link: Risk Transfer Summary

Through the East Link Project, the federal government transferred several financial and project risks that due to scale and scope were difficult for the region and Sound Transit to handle alone:

- The federal government assumed over 25% of the project risk, providing over \$1.3bn in subordinated debt
- The loan is currently the largest ever made by the TIFIA program
- USDOT also provided grants to the project

Miami, Florida: All Aboard Florida

Entirely privately financed light-rail project connecting Orland to Florida

Background Information

- 2016 Estimated MSA Population: 6,066,387
- 2010 Census MSA Density: 1096 persons/square mile
- METRO (Heavy Rail): Metrorail (heavy rail; metro service) – first section opened 1984; Metro-mover (automated transit; district service) – downtown, first opened 1986

Background Information

- FDOT has long identified an opportunity in connecting the populous cities along the Atlantic Coast/I-95/Florida Turnpike of Florida by light rail.
- The costs for an innovative and effective rolling stock and rail project were prohibitive, along with the complexity of procurement via traditional methods.



Financing & Funding Approach

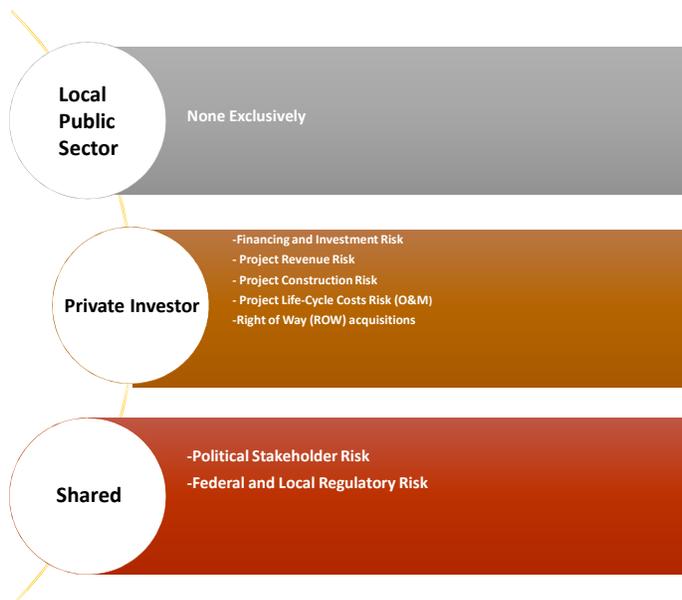
- Total Project Size: \$2.5bn
- Private Investment: Over \$1billion in cash equity including ROW land purchases; \$345 in cash equity in project
- All Aboard will be participating in all passenger revenues
- Project includes Miami Central Station, a private real estate project including 11 acres and 3 million sq ft of retail and office space above and beneath the rail tracks.

Stakeholders Participating

- All Aboard Florida (A private entity consisting of investors and developers including Fortress Fund); US Department of Transportation; FDOT; Cities along rail route including Miami and Orlando

Miami, Florida: All Aboard Florida

Risk/Responsibility Allocation



All Aboard Florida: Risk Transfer Summary

All Aboard Florida (AAF) is an example of the private sector assuming all significant risks to a project in return for project concessions. Details of this transfer include:

- AAF will assume all project financing and investment risk, including \$345 of it's own equity. The RRIF loan, if granted, will be an obligation of AAF with the federal government as the lender.
- AAF has required land and ROW agreements on its own
- All construction, operation and maintenance risk belongs to AAF
- FDOT and the Florida regions connected to the project have set obligations on AAF for performance

Denver Regional Transit Department: Eagle Rail Project

Private, Federal and Local Tools: Complicated and Innovative Funding and Financing of Light Rail Project Connecting Downtown to Airport

Background Information

- 2016 Estimated MSA Population: 2,812,732
- 2010 Census MSA Density: 305 persons/square mile
- RTA Lines C D E F H R W (light rail; regional/metro service)– first section opened 1994
- RTA Lines A B (light rail; regional/commuter service) – first section opened 2016

Background

- Denver RTD realized the need to finance a rail line from the airport to its downtown. As the region entered into a P3 to finance the downtown train station, a P3 was also being considered for the rail.
- The cost of the rail line was prohibitive for RTD to do alone, a combination of private and federal support would need to be utilized.



Financing & Funding Approach

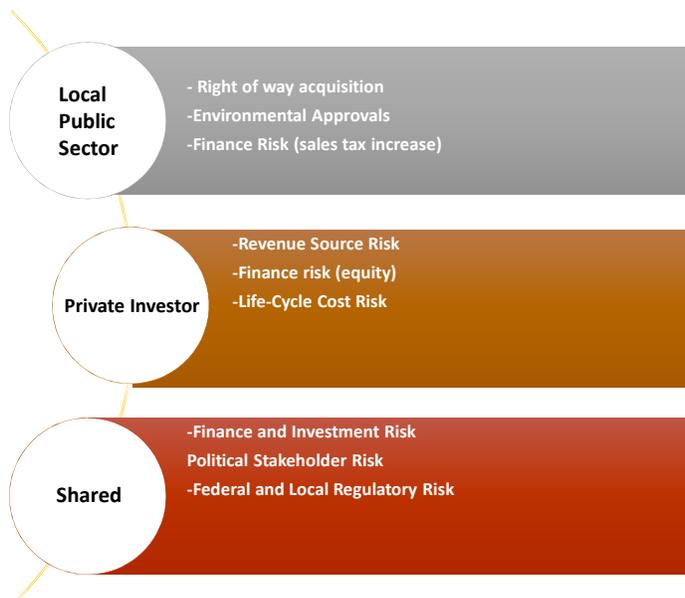
- Total Project Size: \$1.64bn
- Public Sources of Funding:
 - TIFIA Loan
 - Regional Sales Tax (two .4% increases)
 - \$44mm from Denver RTD
 - Includes TIF District for Union Station Metropolitan District based on .4% sales tax increase
- Private Sources of Funding:
 - \$54mm in equity from private investor

Stakeholders Participating

- Project Sponsors: Denver Regional Transit Department
- Private Investors: Fluor-led consortium
- Regional towns and the City of Denver; Denver International Airport

Denver Regional Transit Department: Eagle Rail Project

Risk/Responsibility Allocation



Denver Eagle Rail: Risk Transfer Summary

Through the Eagle Rail Project, Denver RTD has connected the airport to downtown Denver by leveraging private funding and construction capabilities while transferring significant risk.

- RTD will maintain the right to set and collect fares from the project
- The private investor/developer will be paid an “availability payment”, an amount quarterly based on performance of project
- Total payments made directly by RTD is \$44mm in service payments, leveraging over \$1.6bn in projects
- In Denver, the Eagle Rail ends at Union Station, an innovative P3 project itself

Ottawa Confederation Line phase 1 and 2

Private, Federal and Local Financing: Design, Build, and Finance for a rail, expansion of highway, and development of 12.5km bus transit line

Background Information

- \$2.1 billion Light Rail Transit (LRT) system that will run primarily along the City of Ottawa's existing Transit way from Tunney's Pasture in the west to Blair Station in the east.
- Intermodal Connection: Project includes financing of highway along transit route, as well as development of stations connecting transit users to bus rapid transit (BRT)
- Public-private partnership (P3) between the City of Ottawa and RTG, with financial commitments from the Government of Canada and the Province of Ontario.



Financing & Funding Approach

- Construction Budget Funding
- Gas taxes - \$449M
- Development charges - \$291M
- Transit taxes - \$190M
- Federal and provincial grants - \$1.2BN

Transaction Snapshot

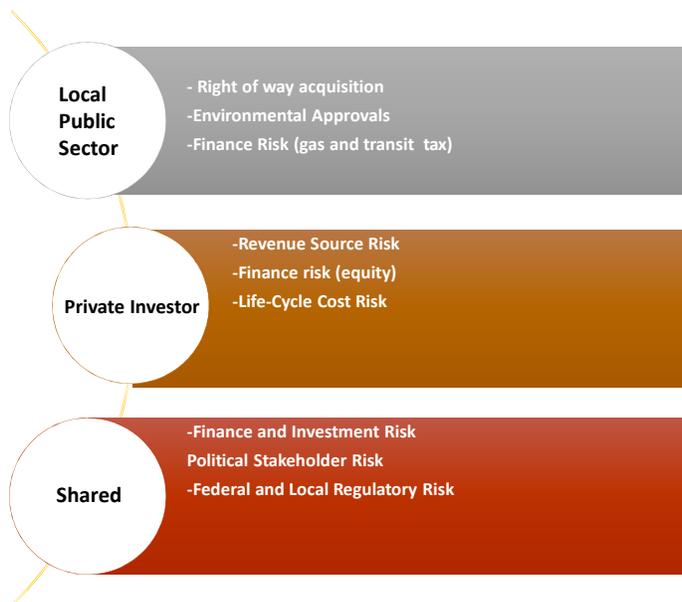
- Term: 30 Years
- Long term debt: \$225M
- Long term equity: \$75M
- Short term debt: \$232M

Stakeholders Participating

- Project Sponsor: City of Ottawa
- SPV: Rideau Transit Group GP
- Bank lenders: Sumitomo Mitsui, National Bank of Canada, Scotiabank, MUFG
- Long term lenders (bond): Sun Life, National Bank Financial
- Equity providers: ACS, SNC Capital, EllisDon
- Procurement Advisor: Infrastructure Ontario

Ottawa Confederation Line phase 1 and 2

Risk/Responsibility Allocation



Ottawa Confederation Line Summary

Through the Confederation Line Project the Province of Ontario and the City of Ottawa will continue in the following roles:

- Infrastructure Ontario is working with the City of Ottawa to design, build, finance and maintain the Ottawa Light Rail Transit (OLRT) - Confederation Line -- the first of several phases to implement light rail transit in the City of Ottawa.
- The project also includes building and financing the widening of Highway 417.
- The OLRT will be publicly owned; it will be integrated into the City of Ottawa's existing transit service, OC Transpo and will be aligned with the city's Transportation Master Plan.
- The City of Ottawa will continue to set transit fare rates and customer service standards.

Virginia Department of Transportation: I95/I395 HOV/Bus/HOT Lanes

Private, Local, Federal: Complicated and Innovative Funding and Financing of HOV and BRT Service; Expansion for LRT above Express Lanes

Regional Information

- 2016 Estimated MSA Population: 6,131,977
- 2010 Census MSA Density: 1,084 persons/square mile
- VRE (DC/Virginia Regional/Commuter Rail) – First opened in 1992

Background

- VDOT partnered with Fluor-Transurban in the development of high-occupancy toll (HOT) lane projects for Interstates 95/395 and the Capital Beltway/Interstate 495. The I-95/395 project expands the existing HOV lanes on I-95/395 from two to three lanes
- Two HOV/Bus/HOT lanes have been added in each direction.
- BRT and LRT transit enhancement station and line improvement



Financing & Funding Approach

- \$253 million PABs issue; a \$300 million subordinated TIFIA loan; and \$280 million in private equity. The PABs are the senior debt on the project
- All financing sources for the project are backed by tolls and other project revenues.
- VDOT directly contributed \$83 million at financial close combination of Federal and state funds.

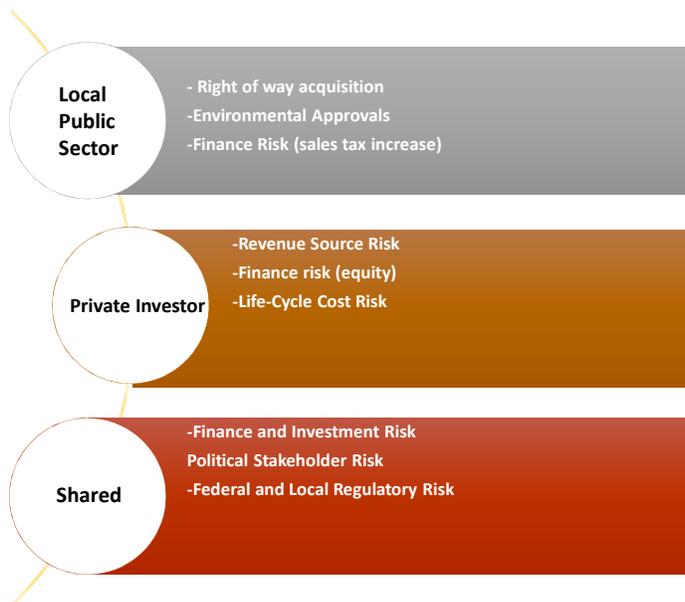
Stakeholders Participating

- VDoT
- VRE
- USDOT (TIFIA lenders)
- Fluor-Transurban (Private Investors)

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Virginia Department of Transportation: I95/I395 HOV/Bus/HOT Lanes

Risk/Responsibility Allocation



I95/I395 HOV/HOT/Bus Lanes

Through the I95/I395, the state of Virginia will support multiple modes of transportation by using each system to support the other. The private sector will take on the risk for developing these mechanisms:

- **Generating guaranteed transit funding:** The project will utilize a portion of toll revenues for annual funding for transit, like improved bus service
- **Develop via private investors and tolling:** The project will increase capacity by adding an additional HOV lane to create three reversible lanes on I-395 and extend the benefits and travel options of the 95 Express Lanes farther north
- **Funding continued efficiency:** Conducting a transit and transportation demand management (TDM) study to identify projects to be funded through an annual transit payment

Greater Cleveland Regional Transit Authority: Cleveland Healthline and Cleveland State University

Value Capture: Naming Rights Utilized to Capture BRT Line Value

Regional Information

- 2016 Estimated MSA Population: 2,055,612
- 2010 Census MSA Density: 6,166 persons/square mile
- Cleveland RTA (established 1975): 1 rapid transit; 2 interurban/light rail; 1 light rail: Waterfront 60 bus routes; 2 Bus rapid transits; 4 Freeway-Flyer

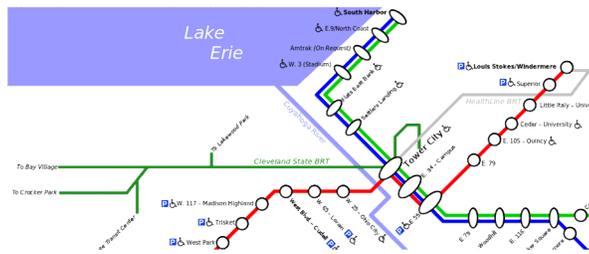


Healthline Contract

- RTA was the first transit system in the nation to sell naming rights sponsorships to its assets. The HealthLine is sponsored by the Cleveland Clinic and University Hospitals, and connects the Medical Center to downtown. \$50mm of the \$200mm project was devoted to BRT, with the rest for road improvement.

Background

- In 2005, RTA began building the Silver bus rapid transit line.
- Naming rights for the line were purchased by the Cleveland Clinic and University Hospitals for twenty-five years. Additionally, naming rights for another line have been purchased by Cleveland State University



CSU Contract

- Contract for \$150K per year
- CSU sponsorship on 16 custom-designed buses; seat backs on all vehicles, and the 32 new bus stations and 243 stops and shelters along the route and in related materials.
- Line runs from downtown Campus to West Shore area.

Greater Cleveland Regional Transit Authority: Cleveland Healthline and Cleveland State University

Additional Options for Value Capture with HCT assets

Joint Development Rights

Development on Transit Agency Property

Naming Rights

Developer or Sponsorship payments/in-kind contributions to municipal agency

Parking Fees

District or City-wide parking fees

Special Assessment Districts

District landowners pay based on assessed value or area

Tax Increment Financing

Tax Increments from districts around station

Agenda Item 6.

Next Steps / Phase II

Alan Clark, H-GAC



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Next Steps

- **Phase I deliverables complete early Jan 2018**
- **Phase II: develop recommendations**
 - **Apply what we've learned to the Houston/Galveston region**
 - **Analysis and recommendations are high-level (many details will require further study)**
- **Present to TPC in August 2018**



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Phase II

- Continued workgroup activity
 - What service concepts are appropriate
 - What funding opportunities are possible
 - What will economic impact be?
- Collaboration between workgroups
- Corridor focus groups will provide feedback
- Develop a network of connected services



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High Capacity Transit Task Force for the 2045 Long Range Plan

THANK YOU!



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