DALLAS MIDTOWN AUTOMATED TRANSPORTATION SYSTEM STUDY

Dallas Midtown Automated Transportation System Study

Study Review Committee Meeting #4

November 12, 2018

North Central Texas Council of Governments

JACOBS

WALKER CONSULTANTS

Safety Topic

Stress, depression and the holidays: Tips for Coping

1. Acknowledge your feelings
2. Reach out
3. Be realistic
4. Set aside differences
5. Stick to a budget
6. Plan ahead
7. Learn to say no
8. Don’t abandon healthy habits
9. Take a breather
10. Seek professional help if you need it

Source: Mayo Clinic. 2004. “Stress, depression and the holidays: Tips for Coping

Agenda

- Parking Strategy
- System Alignment Analysis
- ATS Station Location Analysis
- System Technology Alternatives
- Discussion
- Next Steps

Parking Strategy

SCOPE OF WORK AND CENTRAL QUESTION

In seeking to **maximize support of the ATS**, how do we determine **how much** new parking to build, and **where** to build it?

METHODOLOGY AND FINDINGS

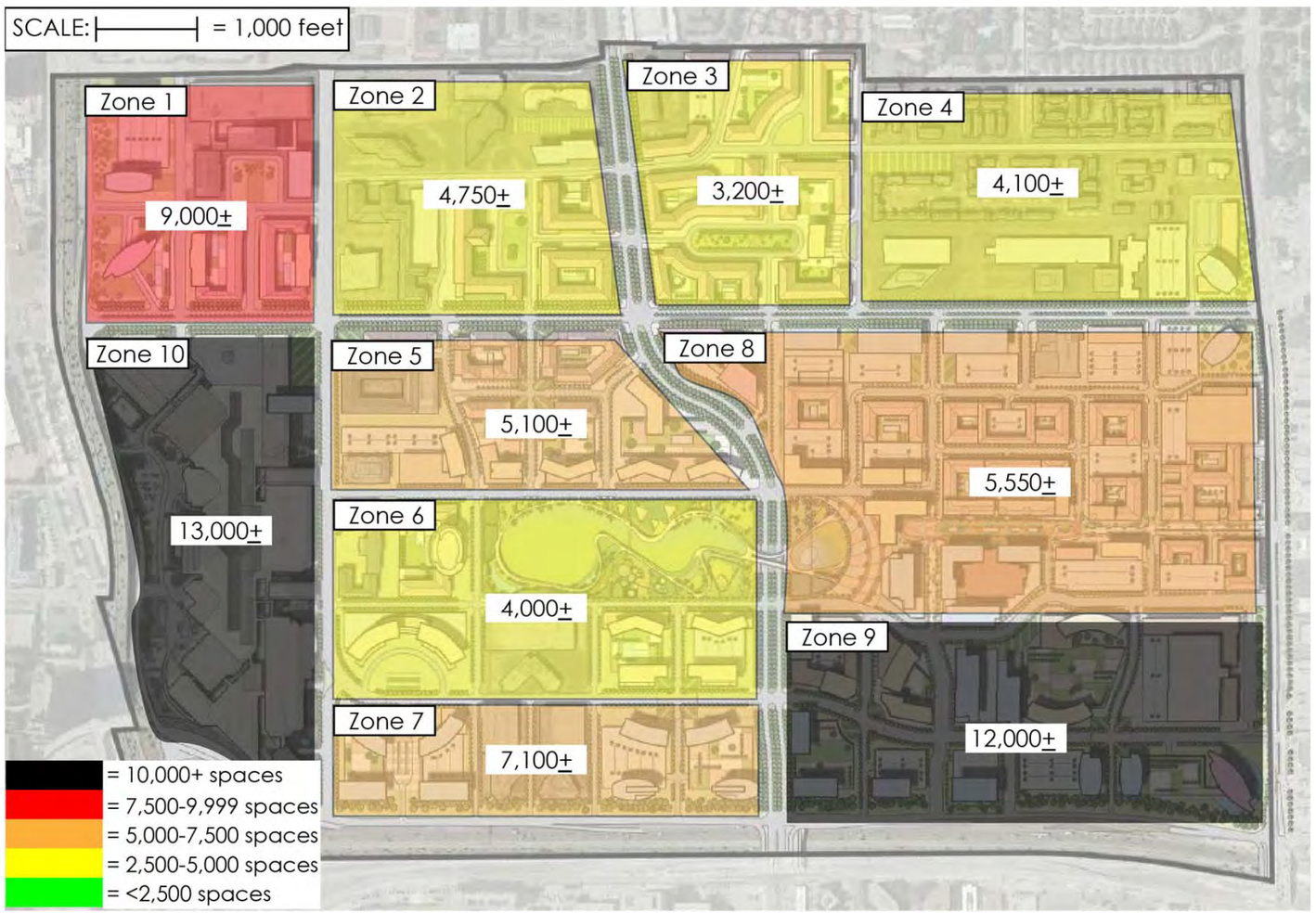
"Status Quo": Building Parking Per E**xisting Off-Street Parking Regulations**

- Use-based (certain number of parking spaces based on use square footage or number of units)
- Additive (no efficiencies assumed for sharing parking among uses)
- Individual (required for each and every project)

Use	Required Parking Ratio
Residential	1 BR: 1.15/unit 2 BR: 1.65/unit 3 BR: 2.00/unit
Office	3.33/1,000 sf
Hotel	1/room
Retail/Restaurant	4/1,000 sf

METHODOLOGY AND FINDINGS

“Status Quo”: Building Parking Per E**xisting Off-Street Parking Regulations**



Roughly **68,000 spaces** needed
$1.9 Billion in parking construction costs

METHODOLOGY AND FINDINGS

“Status Quo”: Likely Benefits

- Requires no amendments to existing PD or other parking-related ordinances
- Conservative, standard approach to parking
- Minimal coordination needed between separate private entities

METHODOLOGY AND FINDINGS

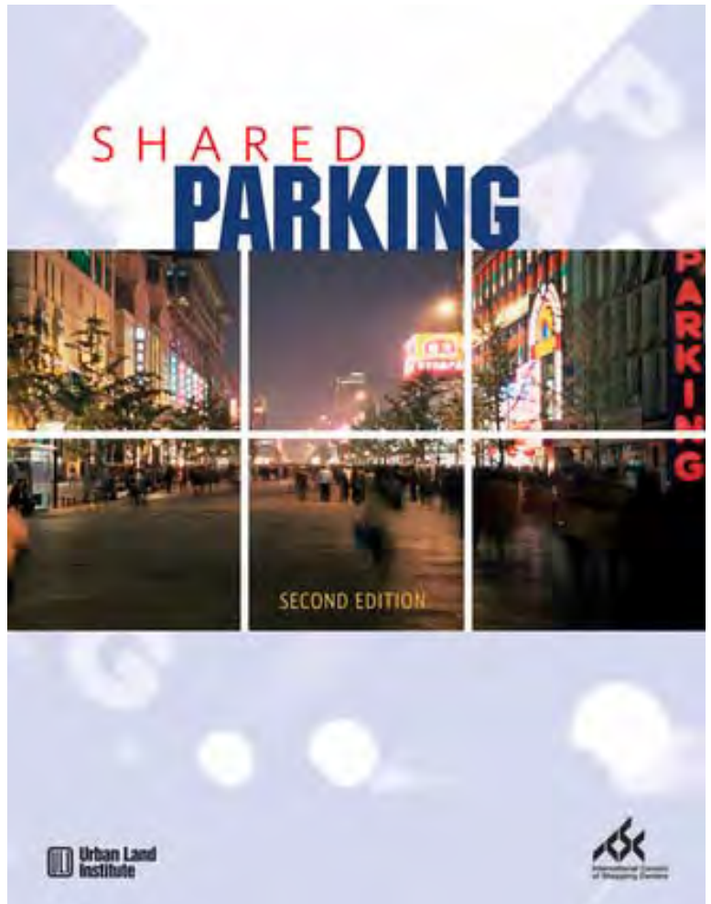
“Status Quo”: Likely Challenges

- ATS ridership internal to the site would be **effectively eliminated** as no predictable demand would exist—primarily driven by the increase in single occupancy vehicle trips to and through the site **(additional 50,000 +/-)**
- Any internally-derived ATS ridership would **rely solely on the personal whims/desires of riders, not predictable demand**
- Additional capital cost of **roughly $940 million**
- Roughly **3 million additional square feet of parking, with more parking built than needed to meet demand**

METHODOLOGY AND FINDINGS

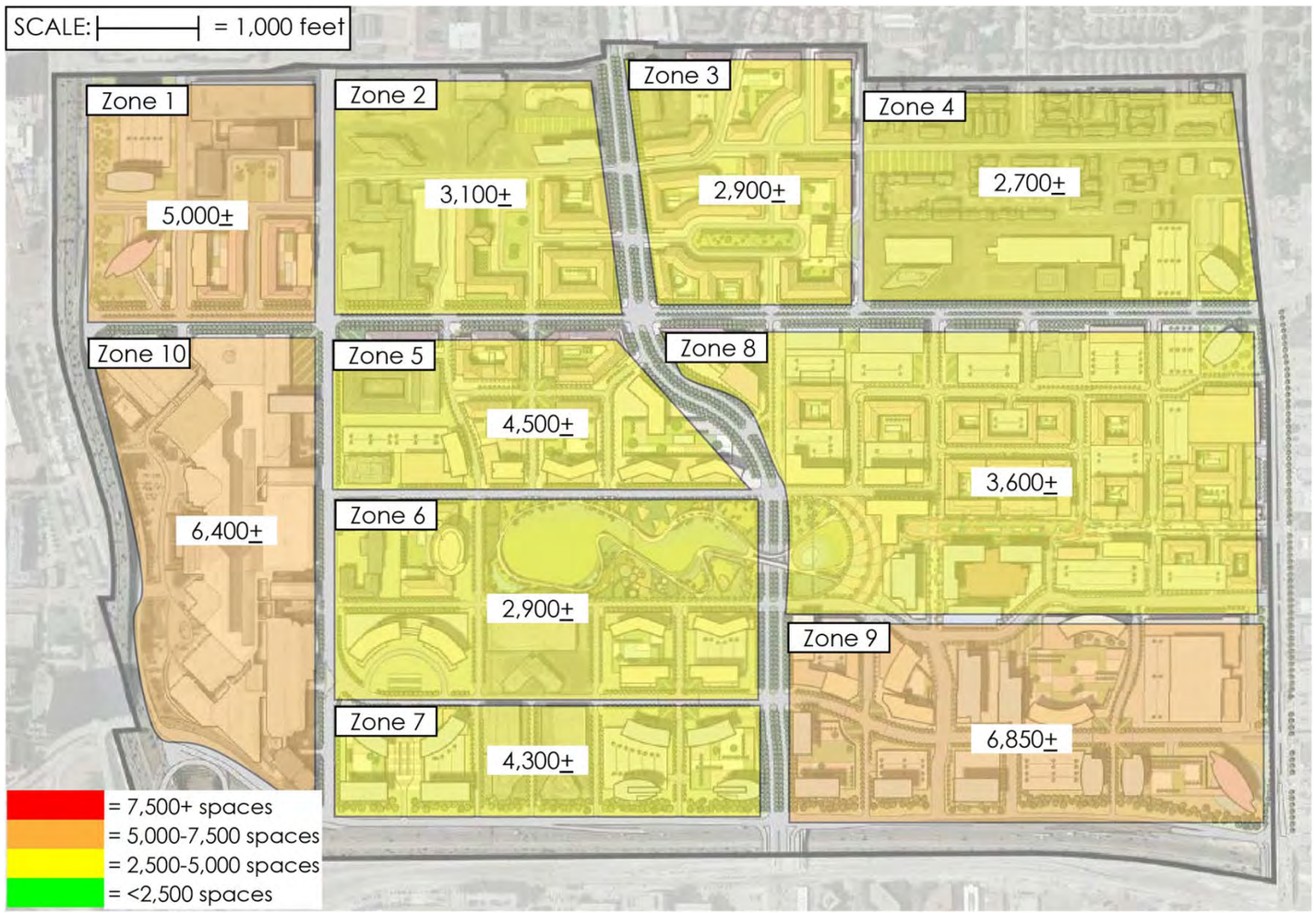
Shared Parking: Building Parking Per **Actual Demand**

- Demand-based, taking into account:
  - Use-based parking ratios
  - % of people likely to drive single-occupancy vehicles
  - Ability of certain uses (e.g. office uses and residential uses) to share parking assets due to differences in hourly demand distribution



METHODOLOGY AND FINDINGS

Shared Parking: Building Parking Per Actual Demand



Roughly **42,000 spaces** needed
$1 Billion in parking construction costs

METHODOLOGY AND FINDINGS

Shared Parking: Likely Benefits

- **Support of the ATS** as parking is shared and not provided for each individual use, therefore necessitating alternative methods of internal mobility
- **Reduction of 50,000 (+/-) SOV trips at the peak hour**
- **Savings for developers and property owners** who no longer have to build and maintain their own parking (roughly $20-30K per space or a total projected savings of $940 million)
- **More efficient use of land** as parking is shared and centrally located- up to 3 million additional square feet to build active uses
- **More collective control** over parking-related capital expenditures and operational decisions

METHODOLOGY AND FINDINGS

Shared Parking: Likely Challenges

- Amendments to PD and parking-related ordinances required
- Establishment of management authority or entity to manage parking and parking- and transportation-related decisions required
- Less standard, but still widely-accepted approach to parking

METHODOLOGY AND FINDINGS

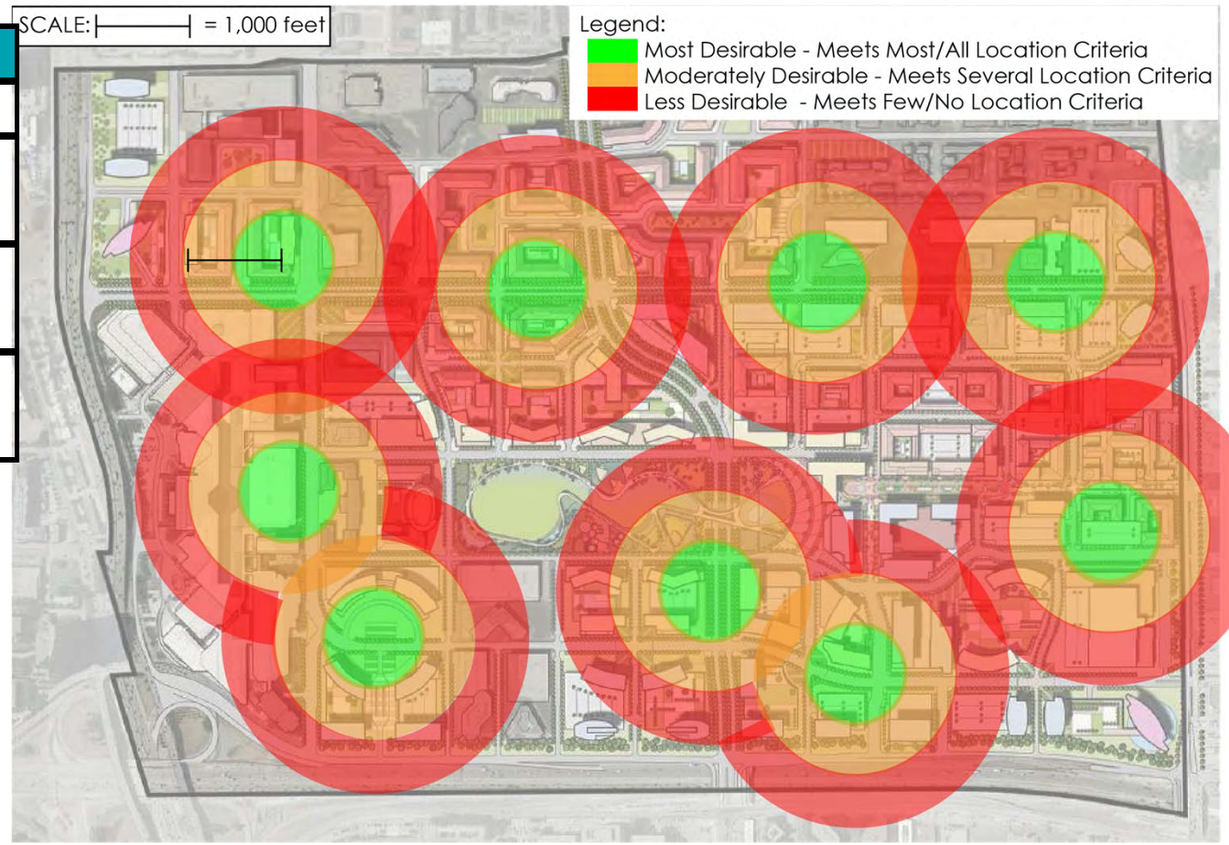
Option	Support of ATS	Parking Spaces Needed	Cost Implications	Land Implications
Status Quo	Encourages and facilitates use of SOVs for internal trips from use to use, eliminating effectively all internal demand for ATS	68,000	Would increase parking construction costs by nearly $1 billion	Would require 26,000 more parking spaces than Shared Parking scenario, increasing spatial needs for parking by roughly 3 million square feet
Shared Parking	Encourages and facilitates use of ATS through shared and centrally-located parking assets	42,000	Would result in nearly $1 billion in parking construction cost savings	Would right-size parking to demand, therefore reducing spatial need for parking by roughly 3 million square feet

METHODOLOGY AND FINDINGS

How do we determine **where** to build parking assets?

Criteria	Purpose/Intent
Proximity to ATS stop (< 1/10 mile preferred)	B+ walking distance LOS or better
Accessibility to main road	Reduce internal circulation and traffic on roads panned to be pedestrian/bicycle friendly
Potential to incorporate with transit	Support ridership goals of planned transit lanes, and provide a flexible, shareable parking supply
Potential for sharing among multiple uses	Efficient use of parking assets, reduction in the number of spaces needed to be built.

***Note: An LOS B+ or better walking distance would be 520 feet or less.**



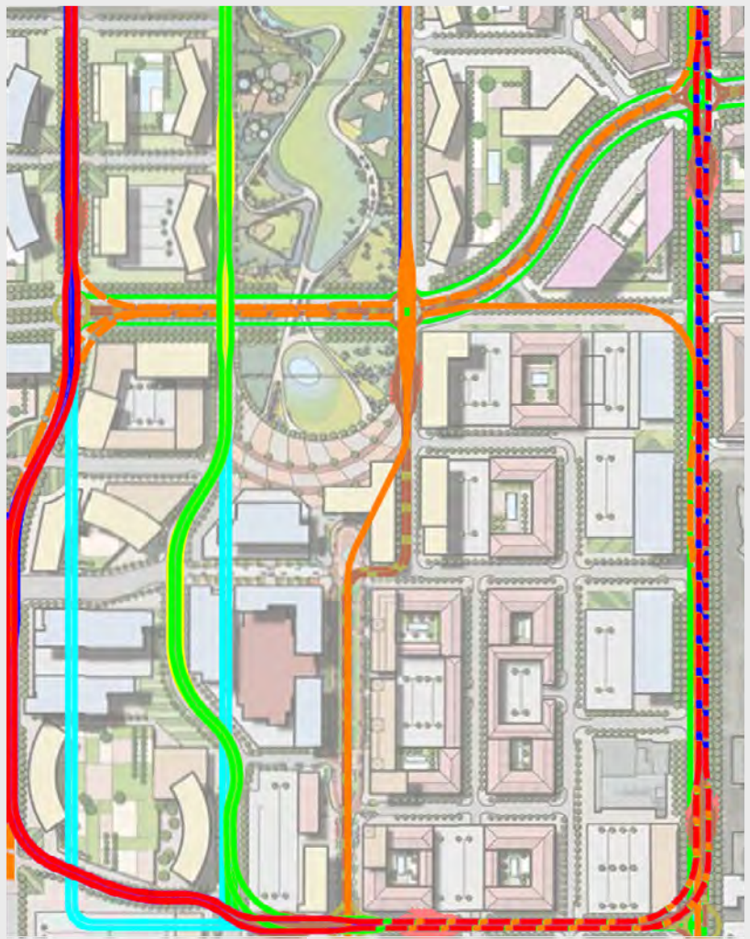
PARKING STRATEGY NEXT STEPS

What can the City do to create off-street parking requirements that **support ATS ridership** and **prevent overbuilding?**

- Collaborate with property owners and developers to create opportunities for parking asset construction and maintenance cost-sharing
- Consider amending off-street parking ordinances to eliminate minimum parking requirements and institute a maximum parking limit
- Offer allowances in off-street parking ordinances for shared parking and demand-based parking adjustments

System Alignment

ATS System Alignment



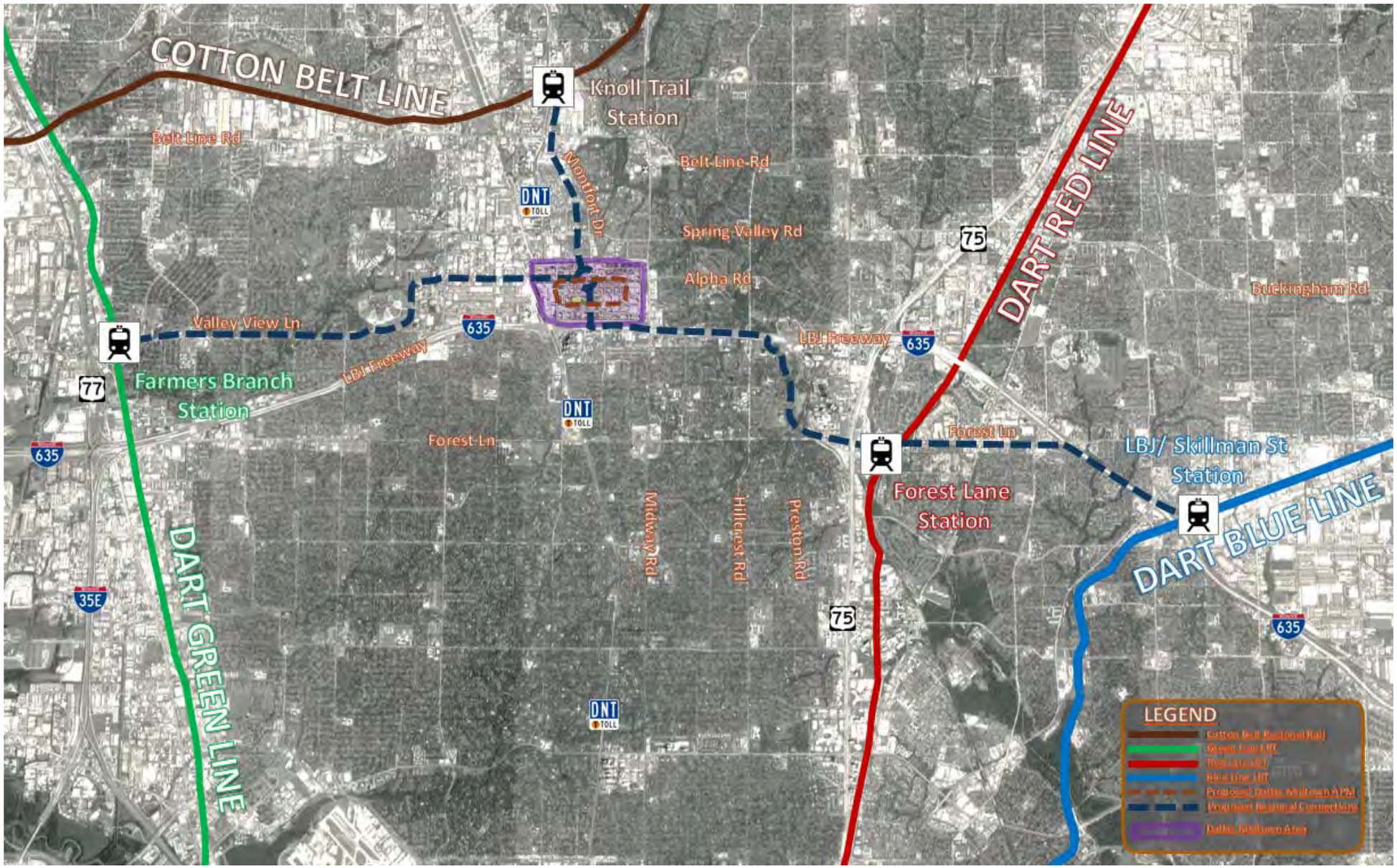
❖ Analysis Goals

- ➢ Use Dallas Midtown Plan to lay out possible internal circulation system alignments
- ➢ Consideration into constructability needs such as ROW, specialized infrastructure, thoroughfare access, etc.
- ➢ Provide system alignment that would enable operational efficiency as well as equal coverage of Dallas Midtown area
- ➢ Provide system that would enable efficient and convenient connections to regional transit connections

❖ Evaluation Criteria

- ➢ Does alignment meet analysis goals?
- ➢ Does alignment reach optimum walkability scores?
  - 0.10 mile catchment area (optimum walkable score)
  - 0.25 mile catchment area (passing walkable score)

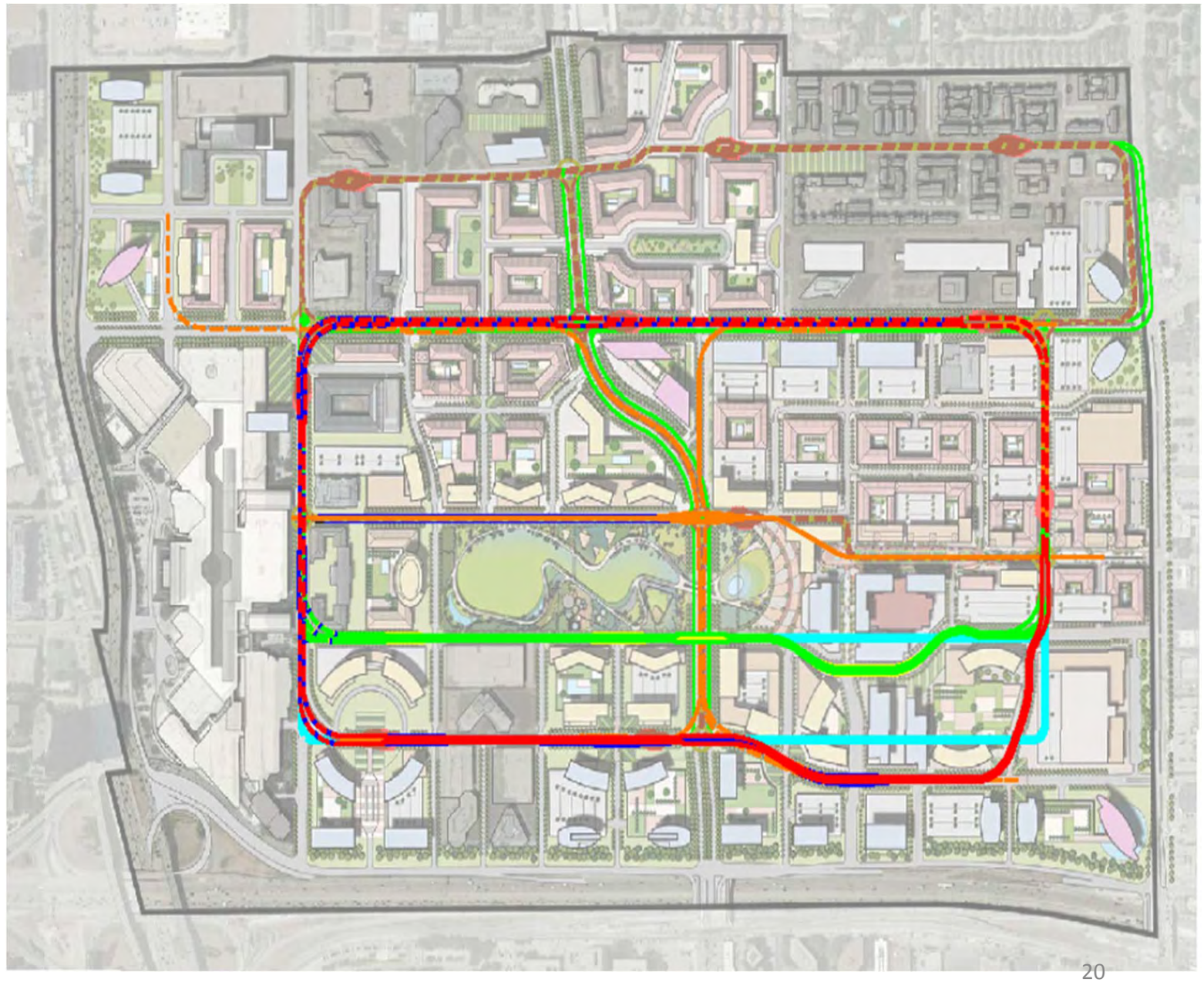
Alignment Overview



Alignment Alternatives

Key Factors

- Feasibility of alignment (ROW and vehicle technology)
- Optimization of alignment/ station locations
  - Transit catchment areas
  - Visibility/ wayfinding/ ease of use
- Level of Service (LOS)
  - Operational LOS
  - Failure management flexibility
- Multi-modal connectivity
- Scale Impacts
- Expandability
- Traffic Impacts
- Passenger Types



Option 1

System Length: 1.9 miles

Percent of total Midtown area within catchment area:

< 528’ (1/10 mile): **60%**

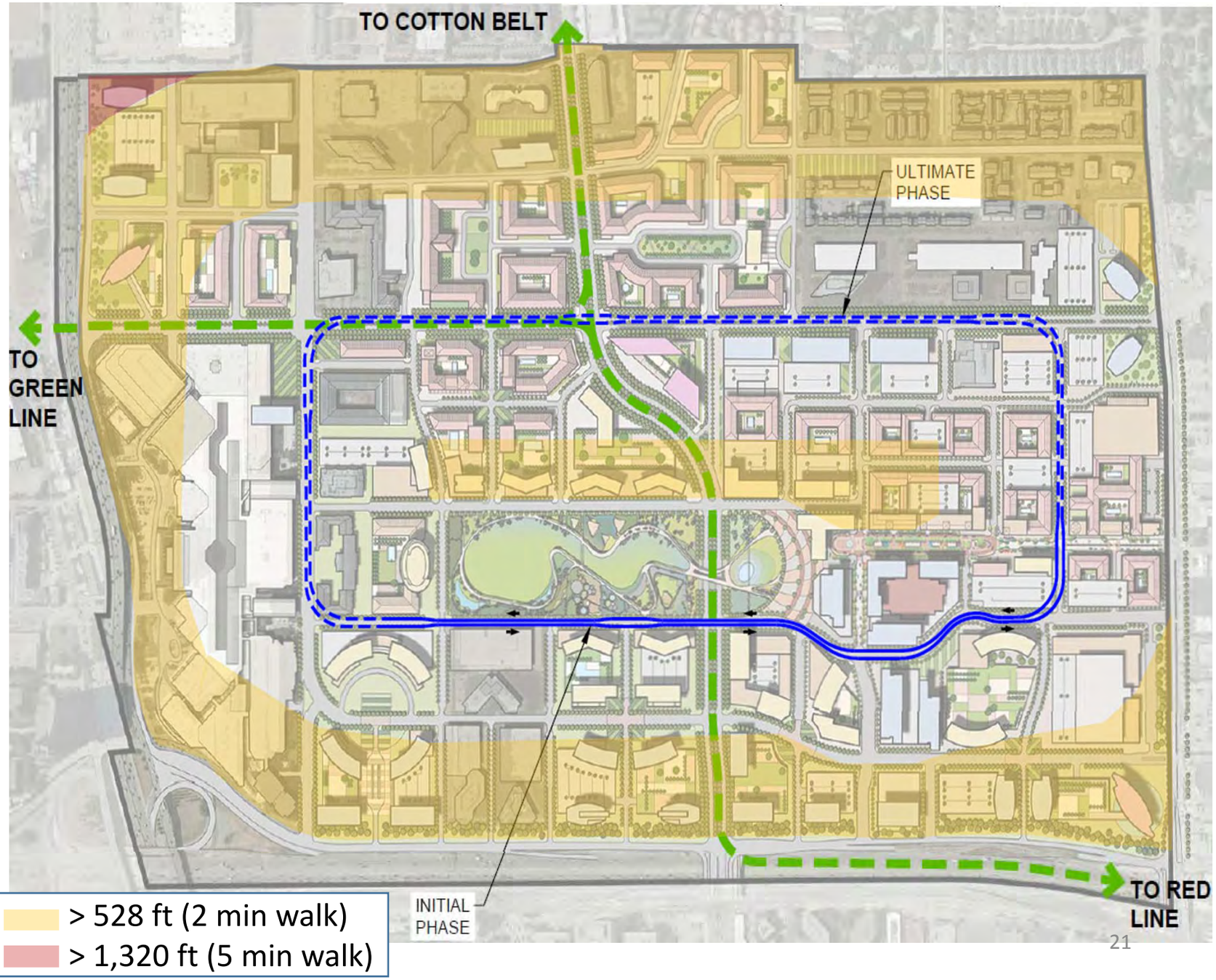
< 1320’ (1/4 mile): **99%**

Pros:

- Runs along side of park
- Uses more established James Temple Dr

Cons:

- Misses high-density LBJ development
- Potential safety conflicts along park (if at-grade)



Option 2

System Length: 2.2 miles

Percent of total Midtown area within catchment area:

< 528’ (1/10 mile): **70%**

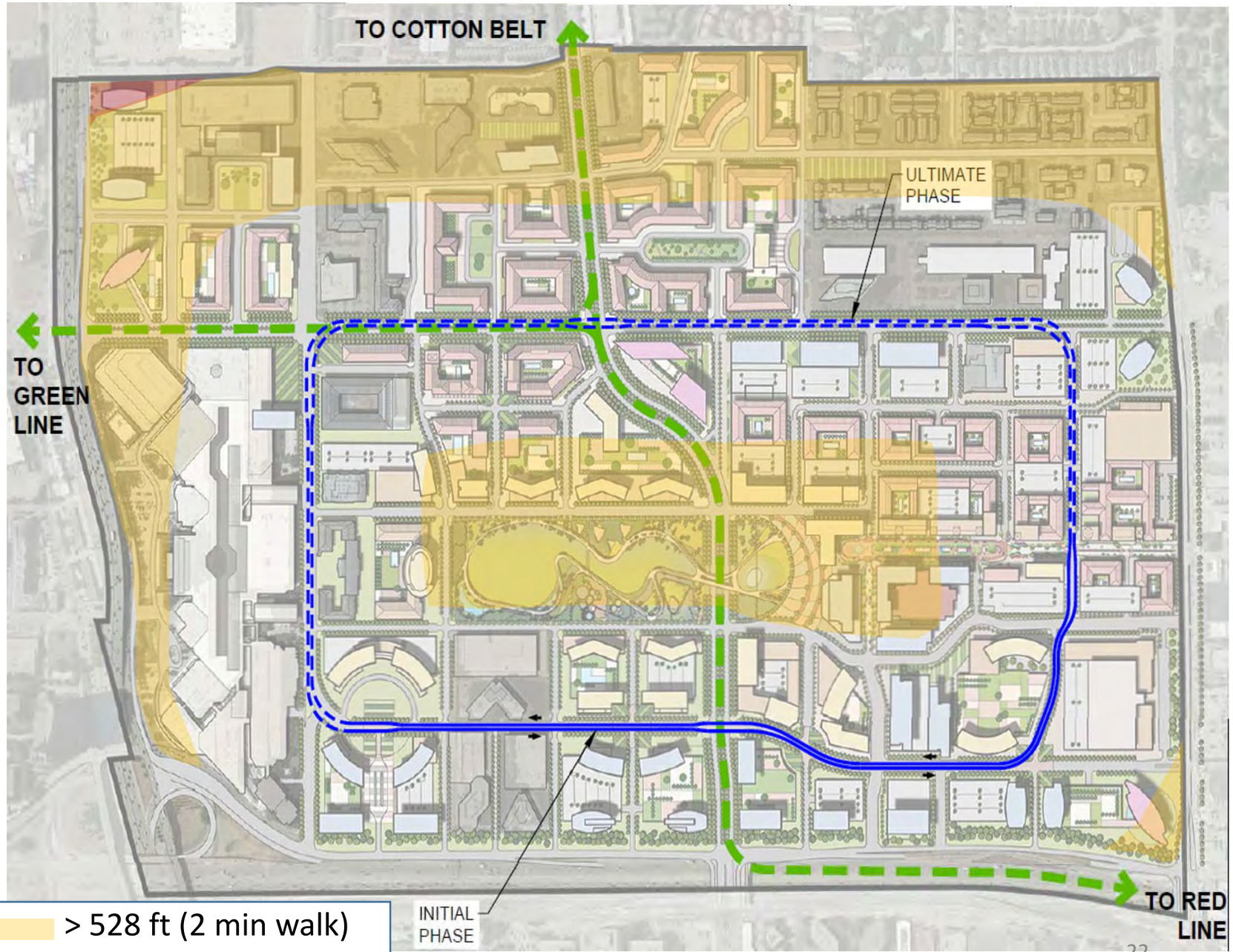
< 1320’ (1/4 mile): **99%**

Pros:

- ~ 5M SQFT of planned development along LBJ
- Could represent 15-20% of total district development
- Parking Catchment Area along boundary of Midtown

Cons:

- Existing ROW pinch along southern stretch
- Midtown Park would be ~800-3,000 feet away from ATS



ATS Station Location Analysis

ATS Station Location Analysis

❖ Analysis Goals

- ➢ Coordinate station locations with proposed parking strategy
- ➢ Locate possible station locations along preferred alignment that optimize connectivity to park, district development, roadway network and regional connections
- ➢ Develop conceptual station layout that enhances safety and circulation

❖ Evaluation Criteria

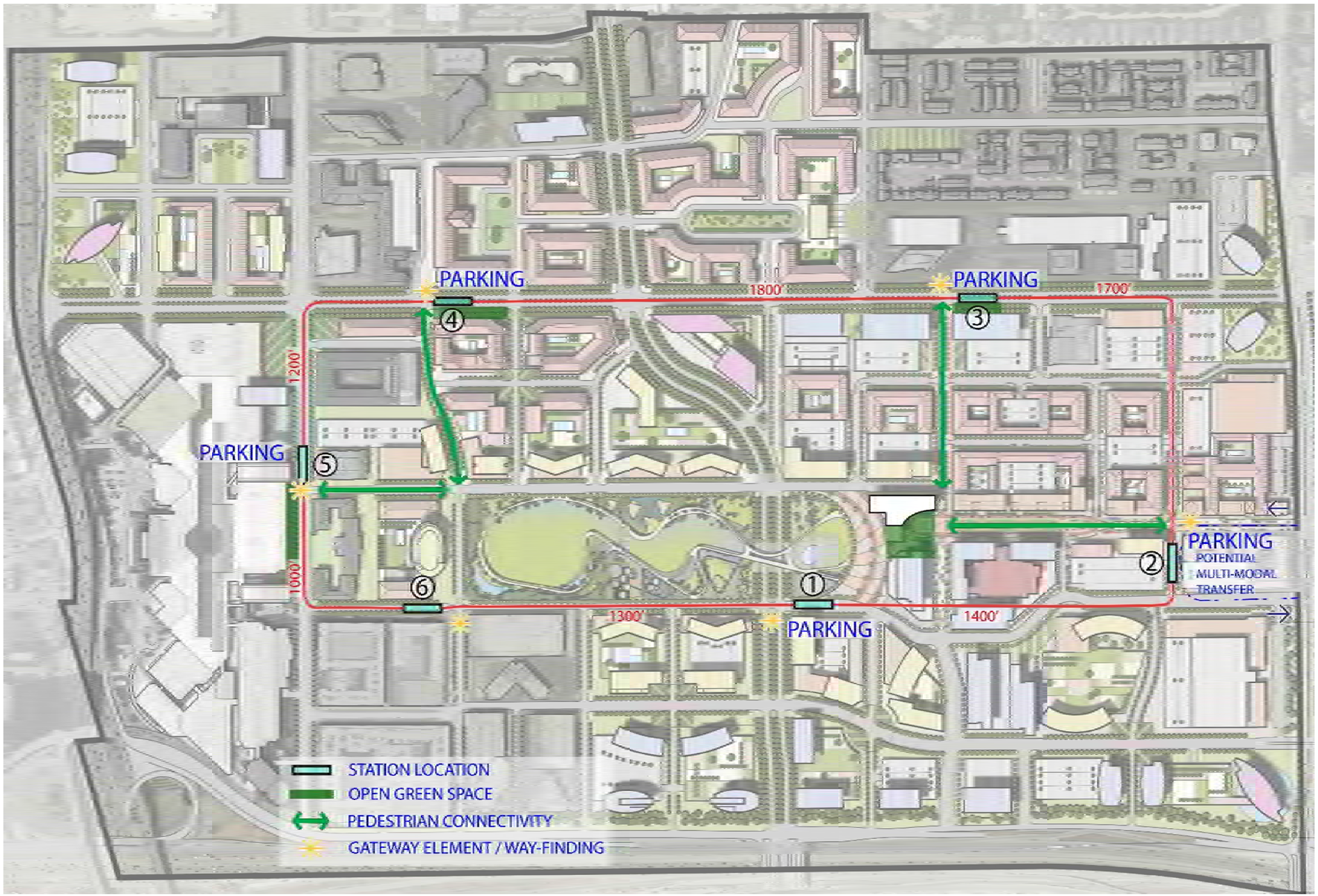
- ➢ ¼ Mile Station Spacing
- ➢ Parking Distribution / Vehicular Access
- ➢ Proximity to Midtown Park
- ➢ Sight Line / Visibility
- ➢ Multimodal Transfer
- ➢ Development Density / Land Use
- ➢ ROW Availability
- ➢ Civic Presence
- ➢ Street Character

Option 1

Maximize connection from every station to Midtown Park

Potential regional connection and multi-modal transfer locations

Utilize existing / proposed thoroughfares for travel consistency



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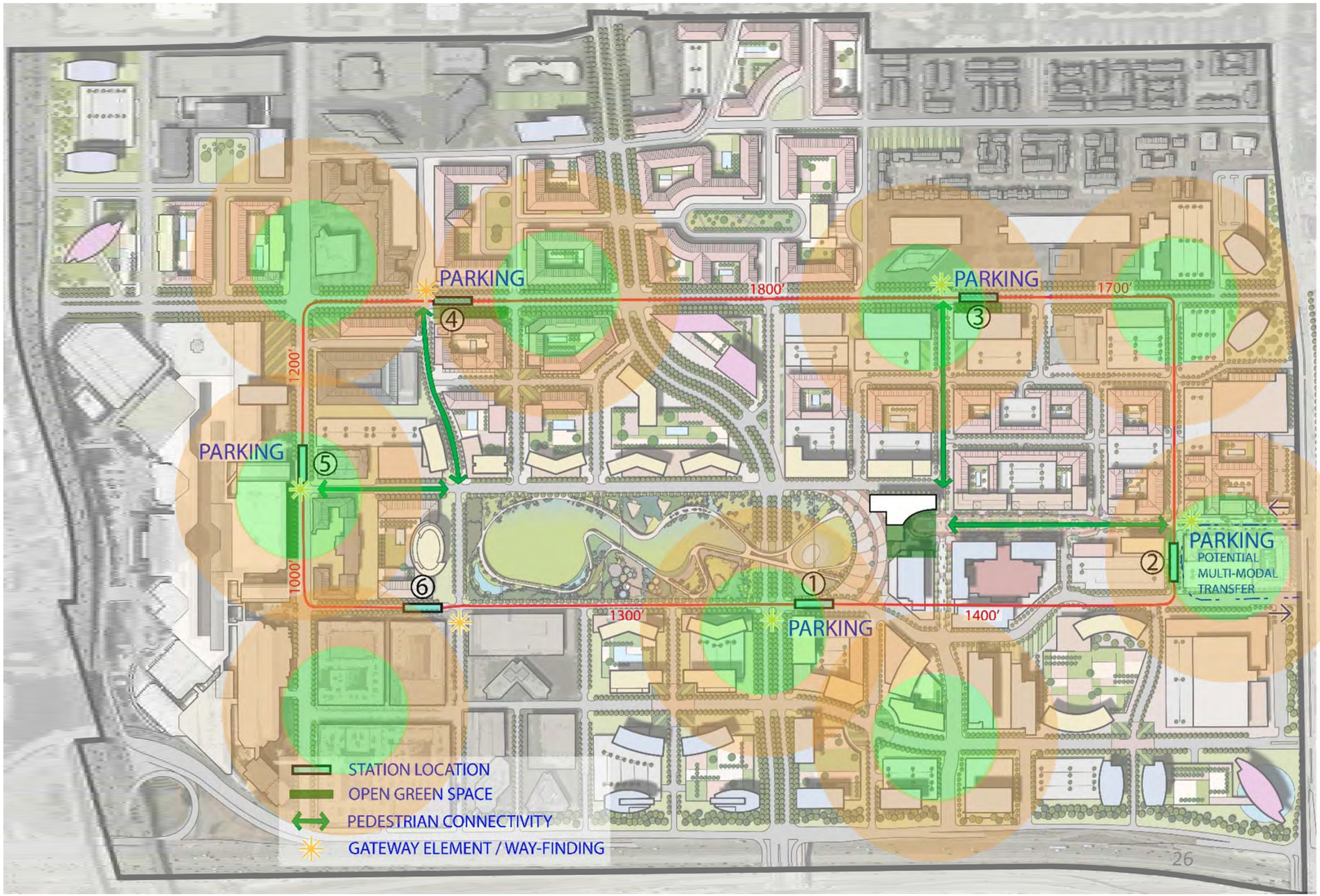
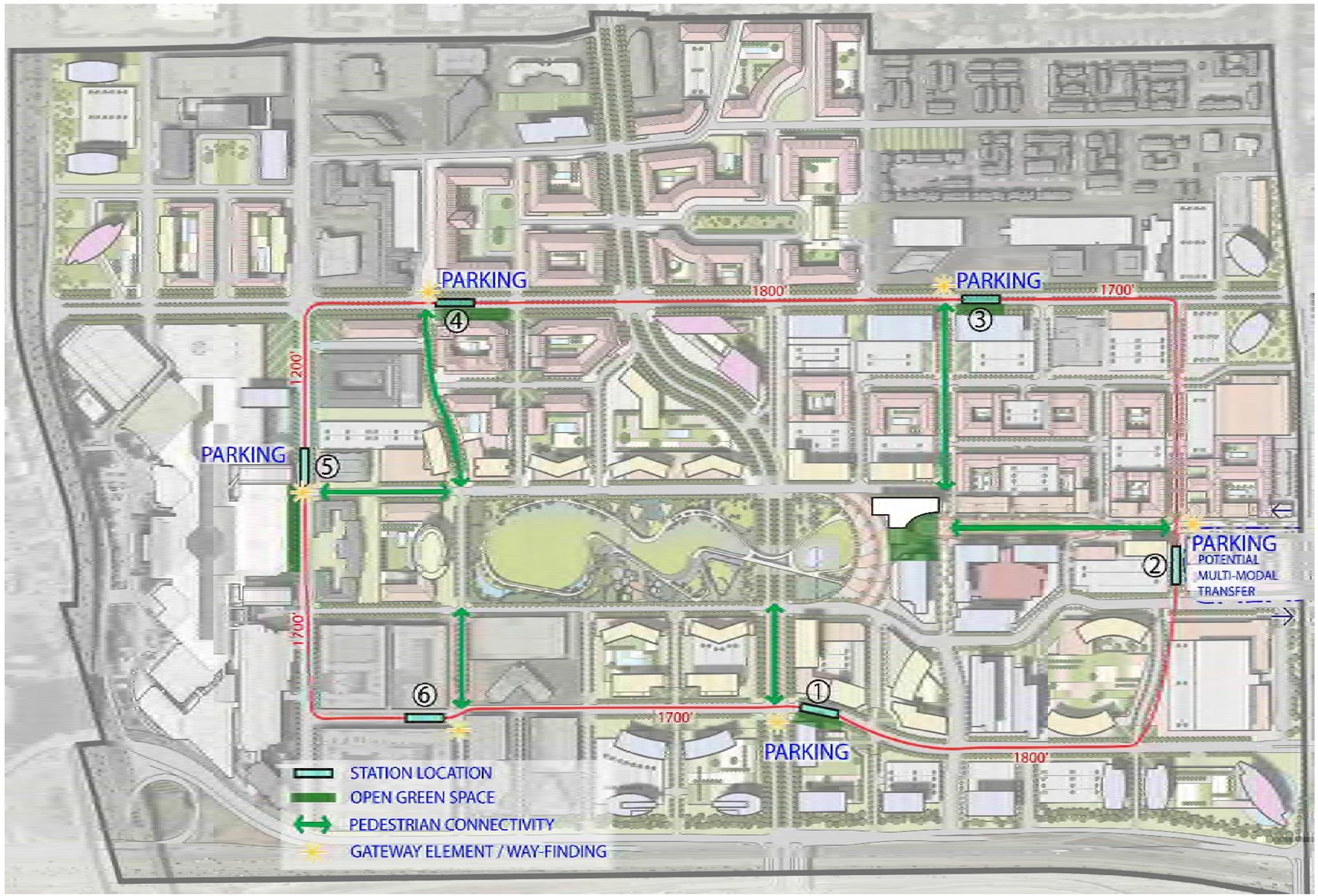


Option 2

Maximize connection from every station to Midtown Park

Potential regional connection and multi-modal transfer locations

Utilize existing / proposed thoroughfares for travel consistency

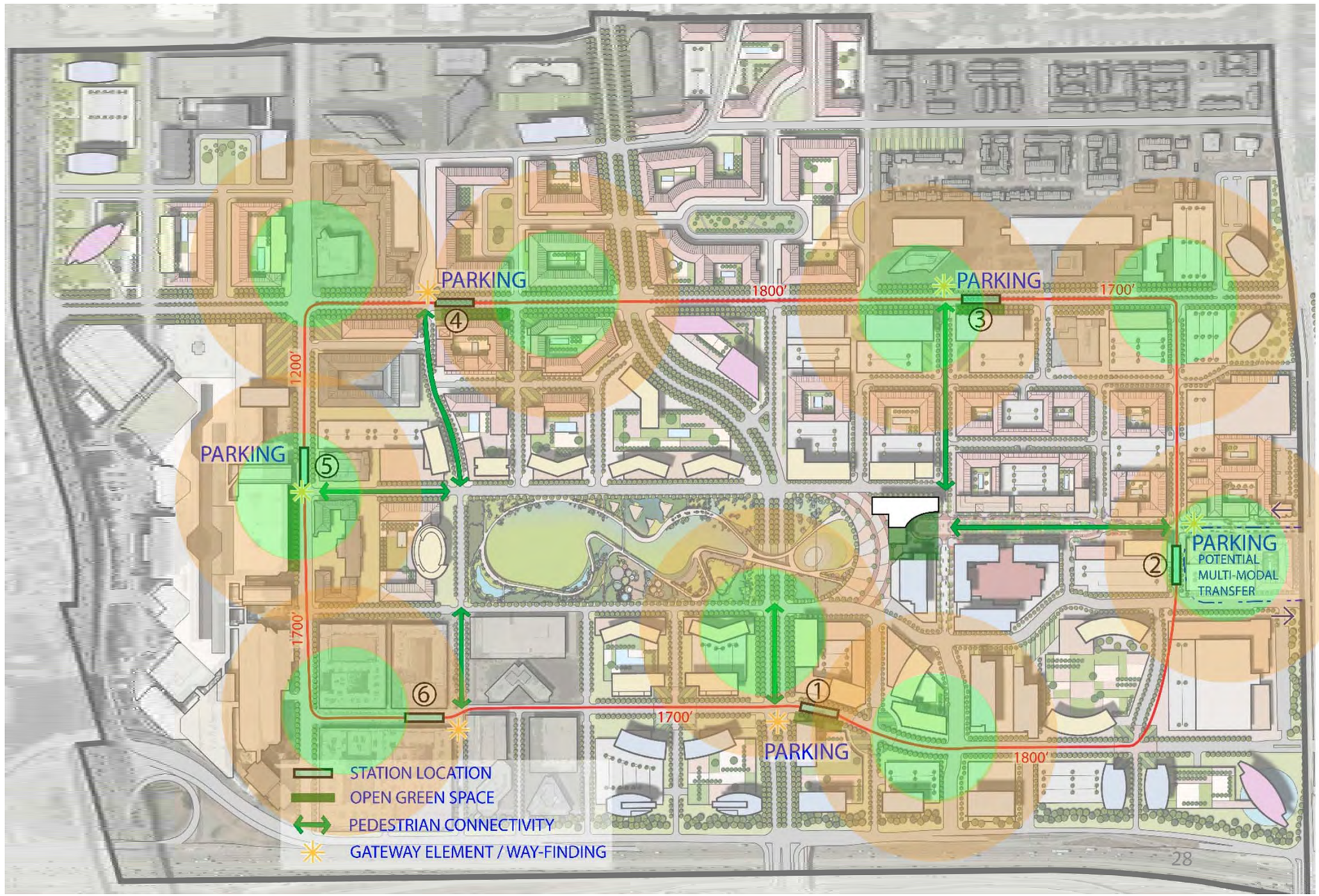


Option 2

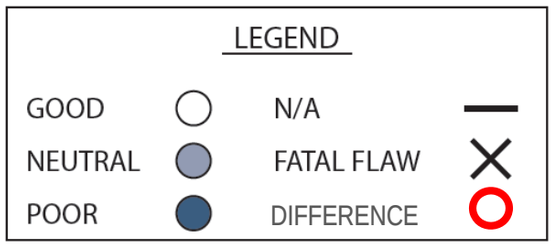
Maximize connection from every station to Midtown Park

Potential regional connection and multi-modal transfer locations

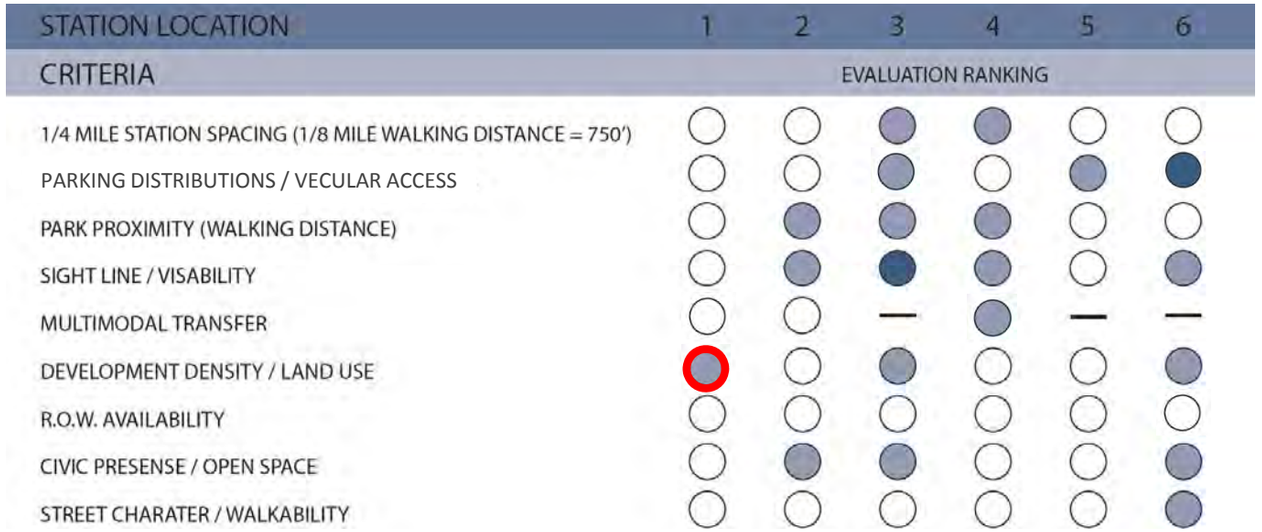
Utilize existing / proposed thoroughfares for travel consistency



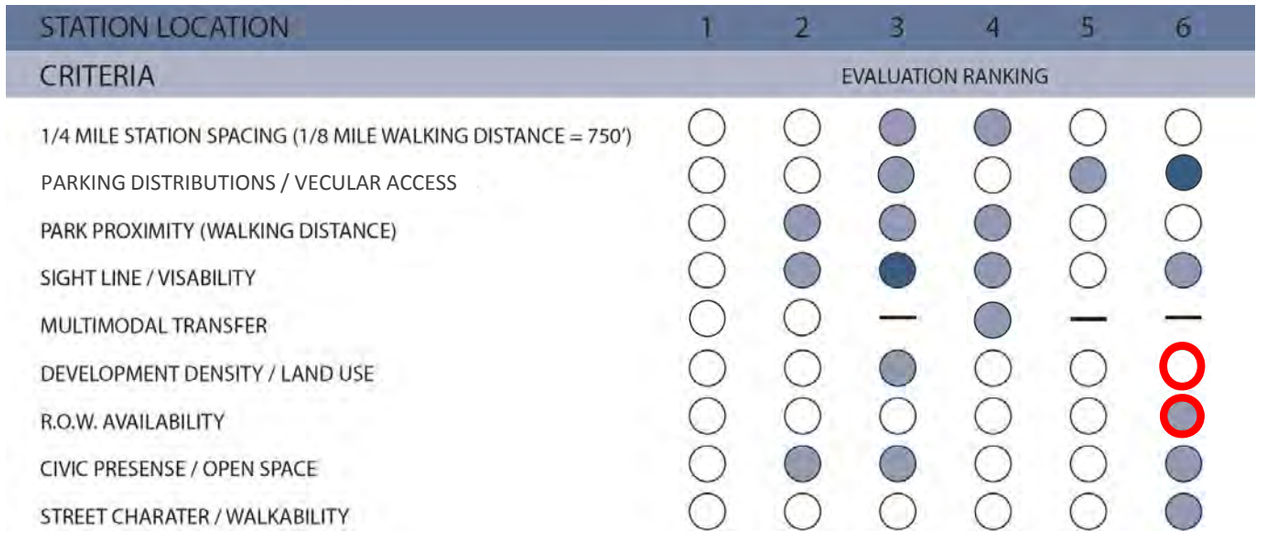
Station Evaluation Criteria Check

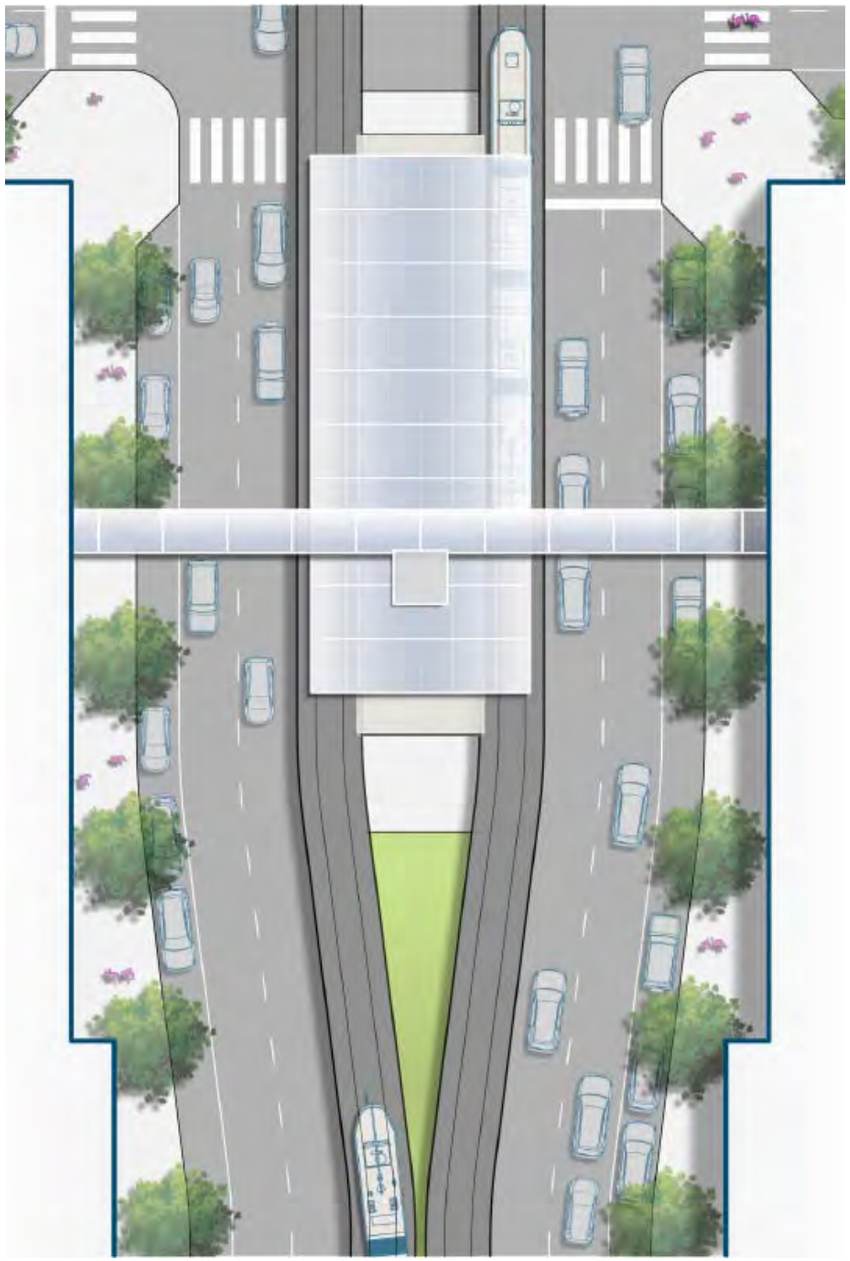


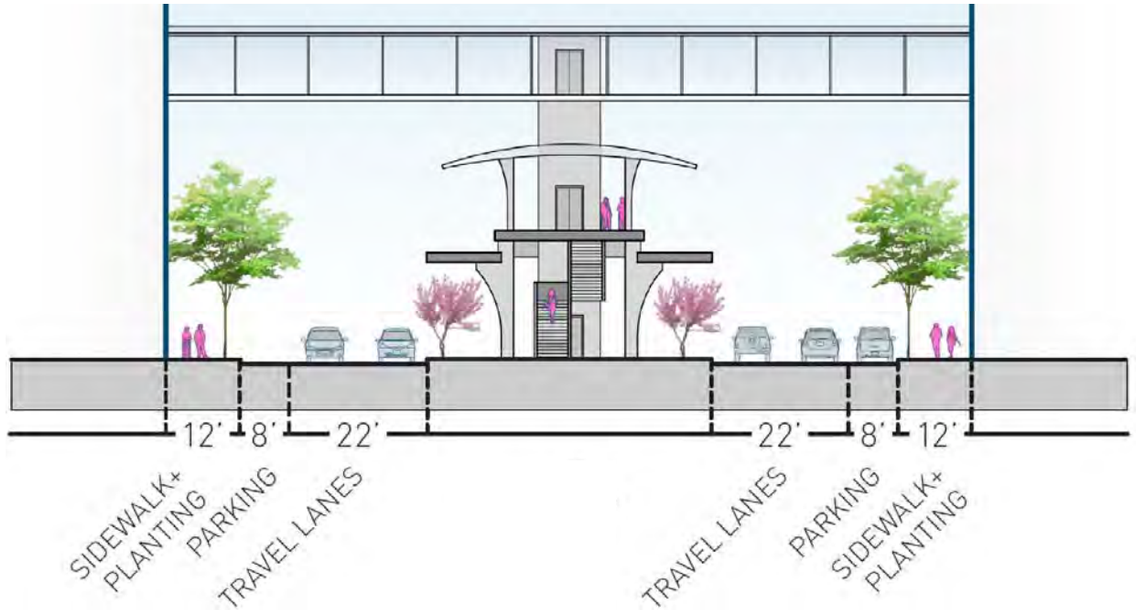
Option 1: ATS Alignment along Midtown Park



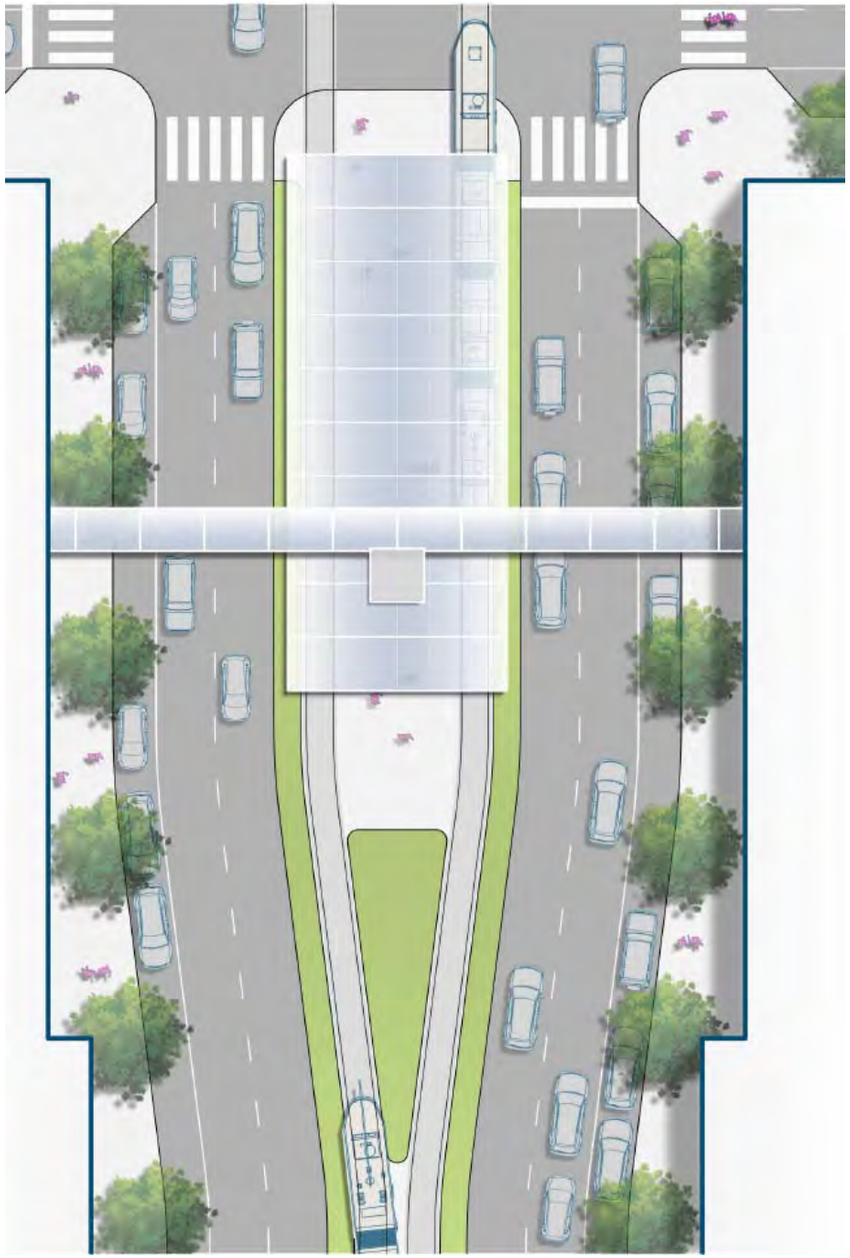
Option 2: ATS Alignment through LBJ Office Block

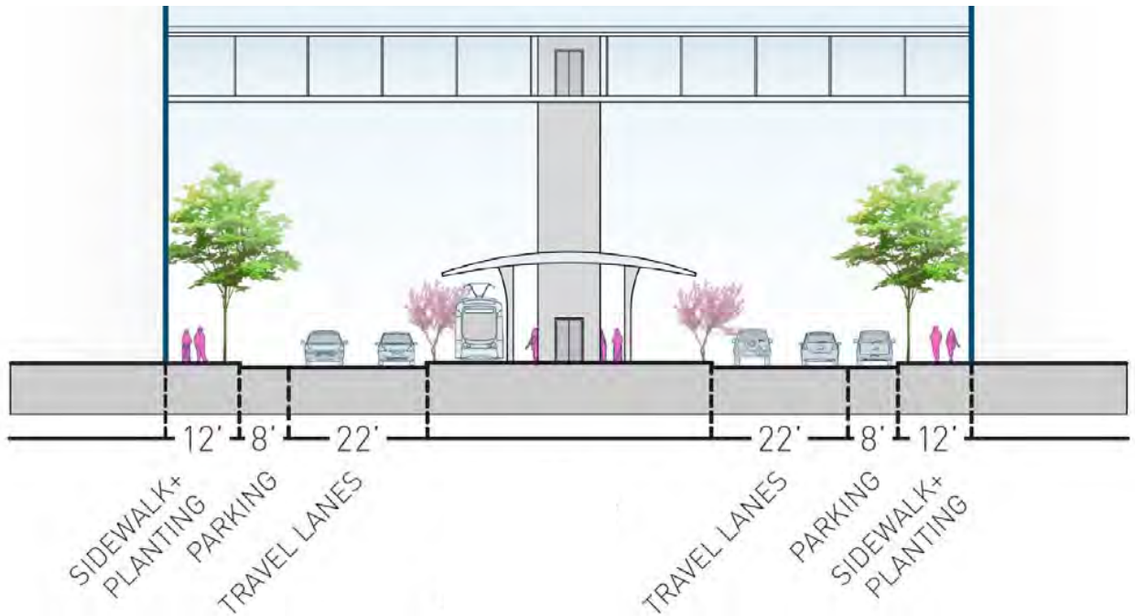






Elevated ATS Station Concept





Street-Level ATS Station Concept

System Technology Alternatives

System Technology Alternatives

❖ Analysis Goals

- ➢ Qualitatively evaluate automated technologies identified in Technology White Paper for system compatibility with Dallas Midtown demand / characteristics
- ➢ Estimate ridership demand for internal circulator and regional connections
- ➢ Select four diverse alternative technologies for further evaluation on operational efficiency within Midtown
- ➢ Identify operational compatibility and estimate cost for four alternative automated technologies

❖ Evaluation Criteria

- ➢ Performance
- ➢ Level of Service
- ➢ Urban Impact
- ➢ Cost
- ➢ Technology Maturity

Preliminary Screening

- Evaluated existing automated technologies
- Qualitative ranking based on performance against criteria

- Technologies that met criteria:
  1. Automated People Mover (APM)
  2. Monorail
  3. Cable-Propelled APM
  4. Group Rapid Transit
  5. Automated Vehicle Shuttle

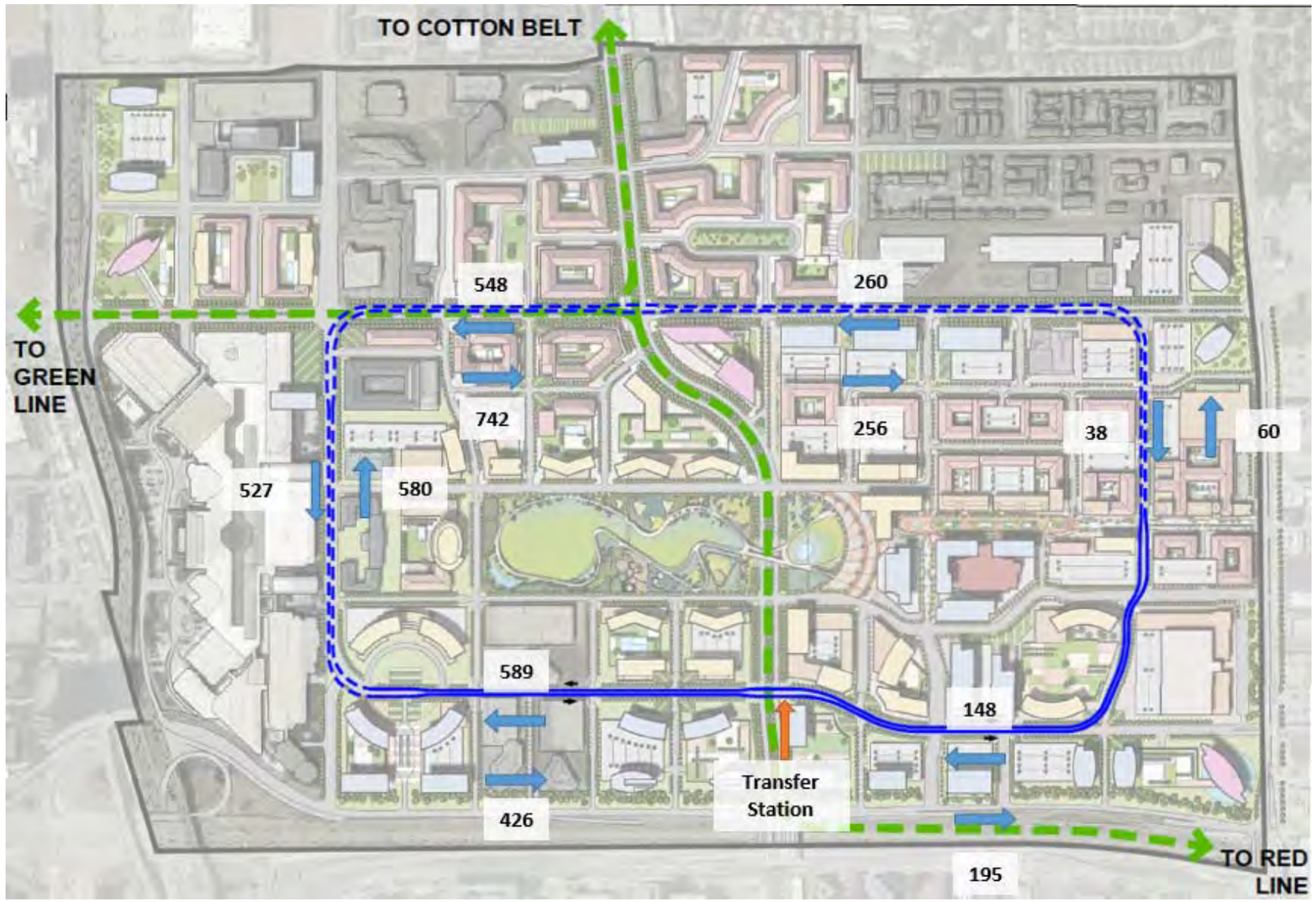
Evaluation Criteria	Automated People Mover (APM)	Monorail	Cable-Propelled APM	Gondolas	Aerial Tramways	Personal Rapid Transit (PRT)	Group Rapid Transit (GRT)	Automated Vehicle Shuttles / Autonomous Vehicles (AV)	Automated Vehicle Fleet (AF)
Performance	●	●	▲	X	X	X	▲	▲	X
Level of Service	●	●	●	▲	●	●	●	▲	●
Urban Insertion Impact	▲	▲	▲	●	▲	●	●	●	●
Cost	▲	■	▲	▲	▲	▲	▲	●	●
Technology Maturity	●	●	●	●	●	▲	▲	▲	▲

● - Candidate technology provides lower risk for evaluation criterion
▲ - Candidate technology provides moderate risk for evaluation criterion
■ - Candidate technology provides higher risk for evaluation criterion
X - Candidate technology cannot meet evaluation criteria

Ridership Update

Ridership Estimate Assumptions

- Full district build-out *(according to approved demographics from SRC 2)*
- Regional connections
  - Red and Blue Line
  - Green Line
  - Cotton Belt
- Shared parking strategy*
- 6 ATS stations in Midtown*
- “Option 2” alignment*



*Assumptions not previously included in ridership estimate during August SRC 3 presentation

Selection of 4 Alternatives








Selection Criteria

- Qualitative Screening
- Ridership Demand Estimates
- Infrastructure Needs
- System Compatibility
- Diverse Technologies

Automated People Mover

Monorail

Group Rapid Transit

Autonomous Vehicles

Operational Characteristics

	APM	Monorail	GRT	AV
Passenger Capacity	**105/car**	**100-150**/2-car train set	**12-21**/vehicle	**6-12**/vehicle
Fleet Size (per direction)	(2) One-car trains – each direction, one spare – **total – (5) cars**	(2) Two-car train sets each direction, one spare – **total (5) two-car train sets**	(9) Cars each direction, 4 spares – **total 22 cars**	(15) Cars but loop size restricts total cars to (13)* - each direction, 5 spares – **total 31 cars**
Headway Capabilities & Max. Speed	• **2-4 minute** Capability • **50 mph**	• **2-4 minute** Capability • **50 mph**	• **1 minute** • **30 mph**	• **1 minute** • **12-13 mph**
System Maturity	1971	2005 – (small Monorail)	2011	2016
Construction Disruptions	• Guideway foundations in Roadway / Median • Maintenance facility structure	• Guideway foundations in Roadway / Median • Maintenance facility structure	• Dedicated travel lane • DSRC communications with traffic signals • Maintenance facility structure	• Dedicated travel lane • DSRC communications with traffic signals • Maintenance facility structure
Environmental Impacts	• Guideway • Structure • Visual Impact	• Guideway • Structure • Visual Impact	• **None** (Electric vehicle)	• **None** (Electric vehicle)
Land Use Requirements	• **Specialized infrastructure** along alignment • Maintenance facility / parking footprint	• **Specialized infrastructure** along alignment • Maintenance facility / parking footprint	• Can use **typical roadway** infrastructure • Maintenance facility / parking footprint	• Can use **typical roadway** infrastructure • Maintenance facility / parking footprint
Expandability	**Major construction** and vehicle procurement	**Major construction** and vehicle procurement	**Highly expandable**	**Highly expandable**

*AV alternative would not have the space to meet the system demand at full build-out under current ridership assumptions

**GRT is currently operating on specialized infrastructure but it moving to capabilities that will enable it to act like AV on typical roadway infrastructure

Fleet / Capacity Analysis

Analysis Assumptions:

- Peak demand: 742 passengers/hr
- Headways: < 5 minutes
- Dwell time: 20 seconds
- Track length: 2.2 miles
- Station count: 6

	APM	Monorail	GRT	AV
Full loop duration per load	6 min 42 sec	6 min 42 sec	6 min 42 sec	13 min
Required headway	**3 min 21 sec**	**3 min 21 sec**	**1 ½ min**	**1 min**
Max number of revenue vehicles needed	(2) One-car trains – each direction	(2) One-car trains – each direction	9 cars each direction	13 cars each direction
Passenger Capacity	1800 p/hr	1800 p/hr	840 p/hr	720 p/hr
Operational Efficiency	**41%**	**41%**	**88%**	**103%**

Systems Cost Analysis

	APM	Monorail	GRT	AV	LRT*
Right of Way ($M/mile)	$11	$11	$8.5	$8.5	$8.5
Utilities ($M/mile)	$3	$3	$3	$3	$3
Traffic Improvements ($M/mile)	$2	$2	$1	$1	$1
Stations ($M/station)	$25.5	$25.5	$22	$22	$22
Vehicles (/car)	$3M	$2.5M	$360k	$300k	-
O&M Cost ($M/year)	$5	$5	$1.4	$0.5	-
Maintenance Facilities ($M)	$2	$2	$0.25	$0.25	-
Construction ($M/mile)	$40	$50	$1.5	$1.5	$80

TOTAL SYSTEM COST ($M)	APM	Monorail	GRT	AV	LRT
Internal Circulator (2.2 mile loop)**	$293	$313	$172	$173	-
Regional Connections (14 miles)***	$988	$1,128	-	-	$1,471

* LRT considered for regional connections only and assumed to be at-grade with no consideration into special characteristics such as vehicles, bridges, tunnels, etc.
** Only include total system implementation costs, annual O&M costs not included
*** Does not include Vehicle, O&M or Facilities costs as operational analysis was not performed for regional connections

Discussion

Discussion and Recommendations

❖ **Discussion Goals**

- Participant discussion to determine final recommendations
- Consensus regarding recommendations for final report

Next Steps

Next Steps

- **Study Conclusion Timeline**
  - December January – Team to work on implementation and governance options
  - March/April – Team to produce Final Report
  - Late April – Final Report Submitted
- **Future SRC Meetings**
  - Late January
    - Present Implementation Options and Analysis
    - Present Governance Options and Analysis
  - Early March
    - Finalize Implementation Options
    - Finalize Governance Options
    - Finalize Final Project Recommendations for Final Report
- **Future Public Meetings**
  - December 11th, 2018 – One Galleria Tower
  - Spring 2018- TBD

Thank you for attending!

❖ Dallas Midtown Parking Study

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❖ Dallas Midtown ATS Study

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Extra Information

Preliminary Screening (expanded)

Evaluation Criteria		Automated People Mover (APM)	Monorail	Cable-Propelled APM	Gondolas	Aerial Tramways	Personal Rapid Transit (PRT)	Group Rapid Transit (GRT)	Automated Vehicle Shuttles / Autonomous Vehicles (AV)	Automated Vehicle Fleet (AF)
Performance	*Capacity (pphpd) / Ability to Meet Passenger Demand*	●	●	●	■	●	X	●	▲	X
	Speed	●	●	●	▲	●	●	●	▲	●
	Geometry / Configuration	▲	▲	▲	■	■	●	●	●	●
	Expandability	▲	▲	■	X	X	▲	▲	●	●
	Operating Range	●	●	●	●	●	▲	▲	▲	▲
	Failure Management / Availability	●	●	▲	■	■	▲	▲	▲	▲
Level of Service	*Trip Times*	●	●	●	▲	●	●	●	▲	●
	Headways / Wait Time	●	●	●	●	●	●	●	●	●
	Minimal Transfers	●	●	●	●	●	●	●	●	●
	Safety	●	●	●	■	▲	●	●	▲	▲
Urban Insertion Impact	*Acceptable Noise or Vibration Levels*	●	●	●	●	●	●	●	●	●
	Visually Acceptable Infrastructure	▲	●	●	▲	■	●	●	●	●
	Impacts to Existing Infrastructure	▲	▲	▲	●	▲	●	●	●	●
	Fixed Facilities Space Requirements	▲	▲	▲	●	▲	●	●	●	●
	Constructability	▲	▲	▲	▲	▲	▲	▲	●	●
Cost	*Capital Cost Comparison*	▲	■	▲	▲	▲	●	●	●	●
	O&M Cost Comparison	▲	■	▲	▲	▲	▲	▲	●	●
Technology Maturity	*Service-Proven Technology*	●	●	●	●	●	●	▲	■	■
	Supply and Manufacturing Capability	●	●	●	●	●	▲	▲	▲	▲
	Operations & Maintenance Capability	●	●	●	●	●	▲	▲	▲	▲
	Commercial Considerations	●	●	●	●	●	●	●	▲	●

● - Candidate technology provides lower risk for evaluation criterion

▲ - Candidate technology provides moderate risk for evaluation criterion

■ - Candidate technology provides higher risk for evaluation criterion

X - Candidate technology cannot meet evaluation criteria

Vehicle Characteristics

	APM	Monorail	GRT	AV
Length (ft)	37-40	25-48	13-16	13-15
Width (ft)	8.5-9.5	8-10	7	6 -7
Height (ft)	11-12	14-17	9	8 - 9
Weight (AW0) (lbs)	32K-33K	28K-55K	5K-9K	4-5K
Capacity (persons)	100-105	100-150	12-21	6-12
Maximum Speed (mph)	50	50	30	12-13