

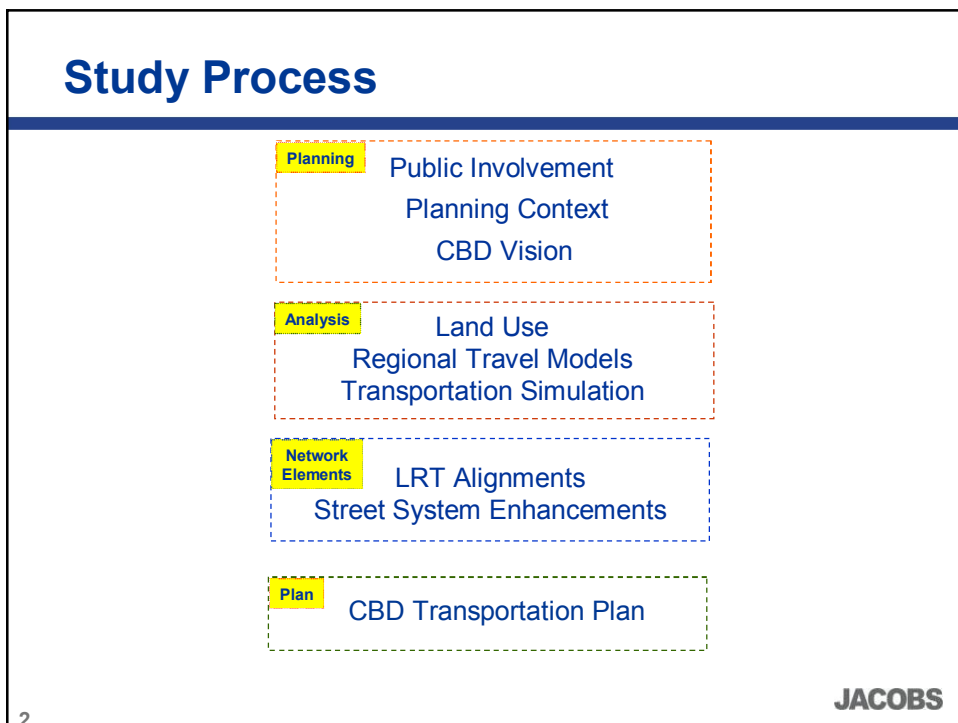
**Comprehensive
Transportation Plan**
for the
**Dallas Central
Business District**

**TexITE Summer Meeting
Amarillo, TX**

by
Behruz Paschai

June 15, 2007

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Project Elements

- Light Rail
 - Possible corridors for the 2nd transit mall
- Street Network
 - One-way to Two-way conversions
 - Closures
 - Enhancements
- Pedestrians
 - Pedestrian-way system

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CBD Network



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Project Awards



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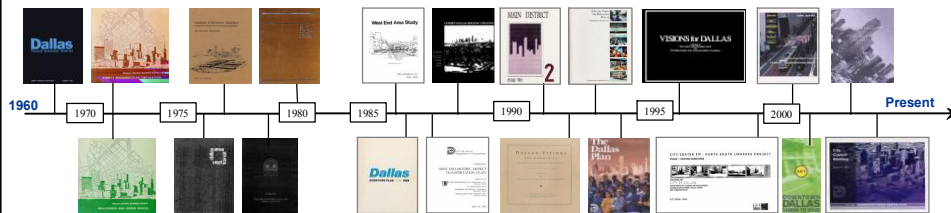
Data Collection



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Review of Previous Studies



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Pedestrian Activity Forecast

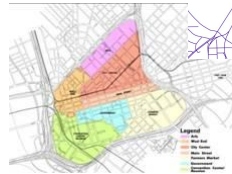
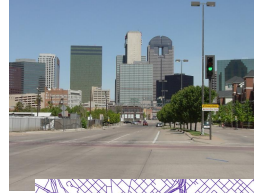
- Breakdown of collected data to activities created by
 - transit stations
 - parking facilities
 - employment areas
 - residential areas
 - background activities
- Year 2030 forecast
 - 2030 land-use plan
 - proposed future station locations

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Other Data

- Roadway lane configurations
 - field data
 - aerials
- Signal timing plans
 - City of Dallas
- On-street parking restrictions
 - City of Dallas
- Parking garage/lot locations, capacities, and access points
 - field data
 - aerials
 - other data
- CBD districts



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Parking Facilities



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Model Selection

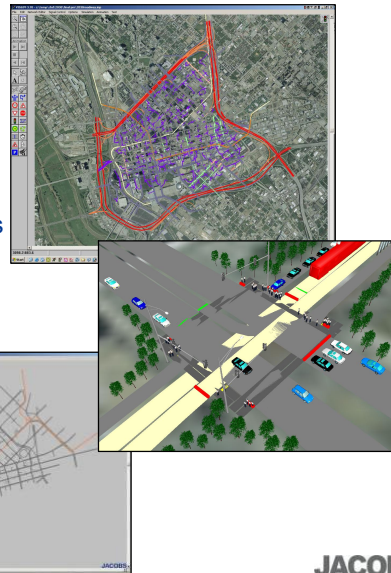


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Simulation Model Selection

- VISSIM's capability to
 - model various modes of travel
 - accept time dependent OD matrices
 - run dynamic assignment
 - program train signal control interfaces



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Dynamic Assignment

- Methodology advantages
 - time-dependent OD matrix as input
 - link with TDM data
 - network pre- and post-loading
 - vehicles are assigned routes
 - no circulating vehicles in the network
 - better lane-changing behavior
 - reduced bunching of turning vehicles at the intersections

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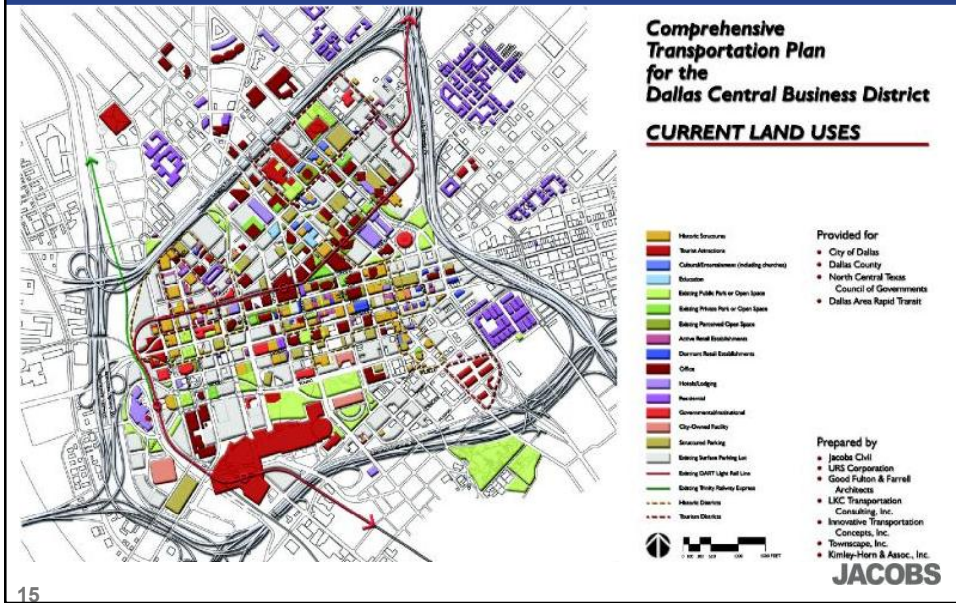
- 13

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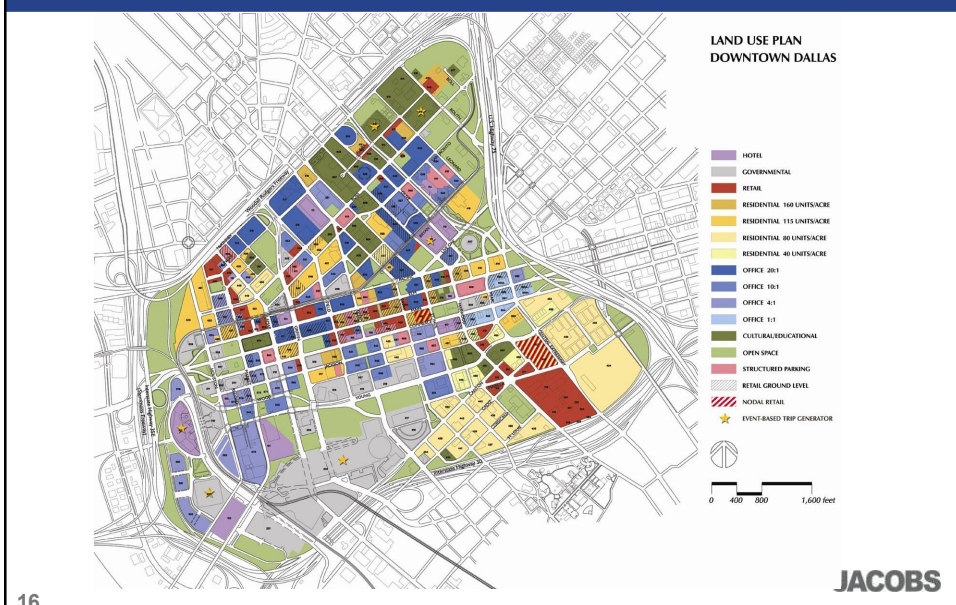
14

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Land Use - Current



2030 Alternate Land Use Plan



Traffic Demand

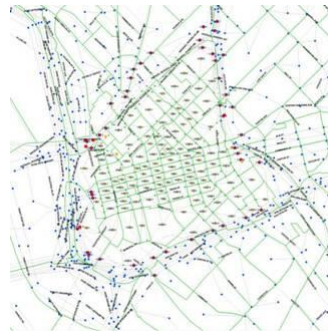
- Demographics
 - alternate 2030 demographics
- TransCAD Sub-area analysis
 - provided by NCTCOG
 - 1999 OD on 1999 network
 - Create 2003 VISSIM OD
 - 1999 OD on 2030 network
 - effect of change in access points
 - 2030 OD on 2030 network
 - create 2030 VISSIM OD

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OD Adjustments

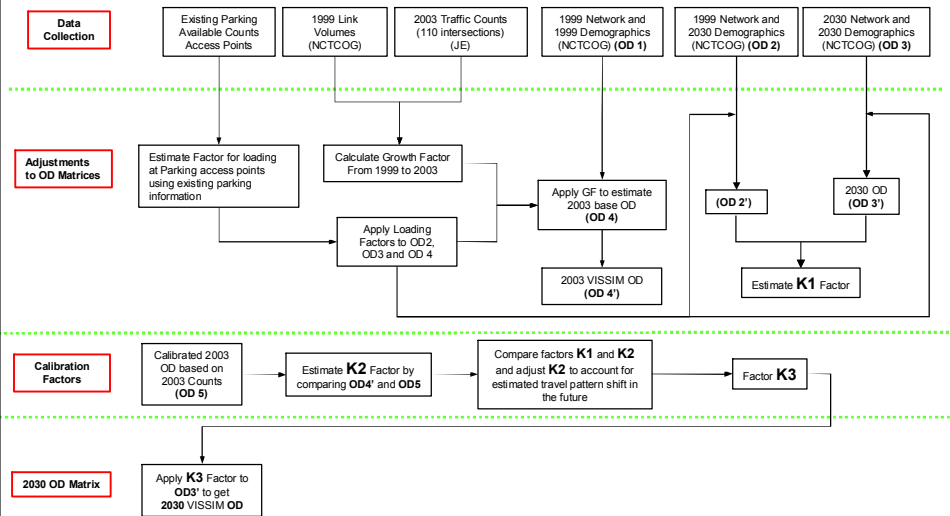
- OD modifications
 - actual zone access points
 - convert to VISSIM zone structure



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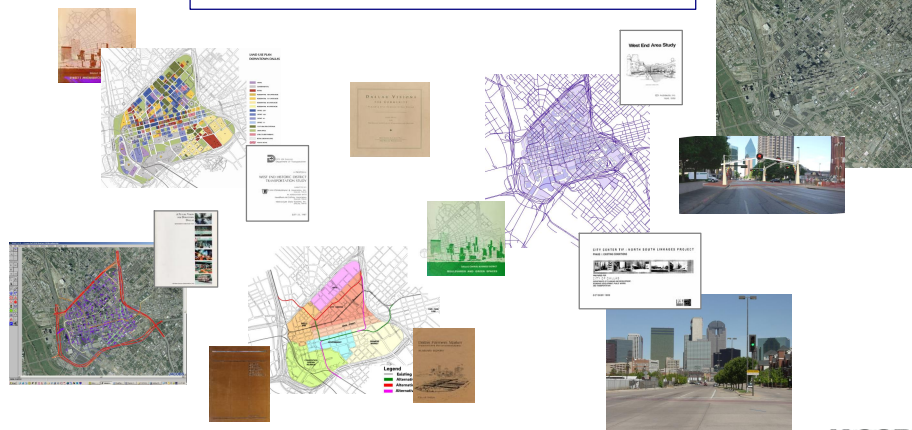
OD Adjustments



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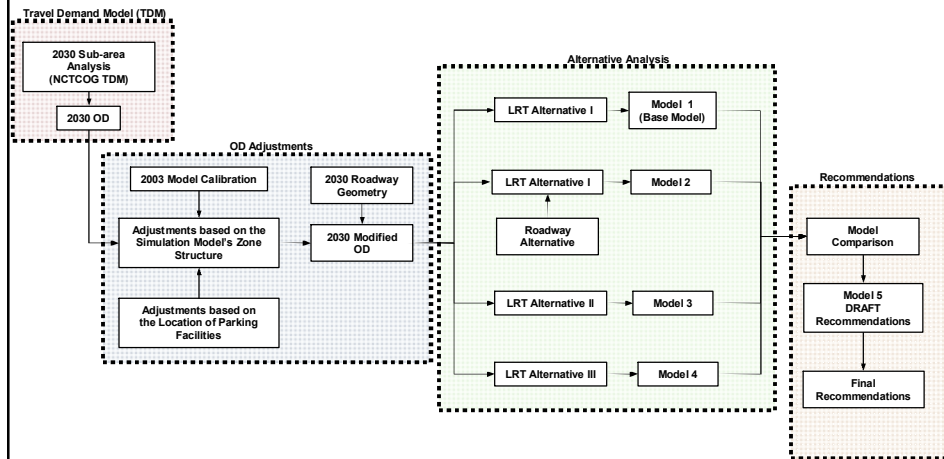
Analysis Methodology



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Modeling Process



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Model Calibration

- Methodologies
 - do nothing
 - static environments (TDMs) – import routes
 - does not appropriately reflect the effect of
 - » traffic control devices
 - » train signal pre-emption
 - » pedestrian priority
 - limited number of calibration reference points
 - may result in drastic change of the original OD matrix
 - dynamic environment
 - Iterative process
 - » can be partially to fully automated
 - Includes the effects of all traffic control devices

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Model Calibration Implementation

- Dynamic environment
 - 2003 network
 - based on 2003 collected turning movements
 - eliminate circuitous routes
 - apply cost/mile to balance usage of parallel roads
 - adjust OD matrix
 - 2030 network
 - routes change based on
 - » new demographics
 - » network modifications
 - eliminate circuitous routes found in the calibration step
 - check model convergence

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2030 VISSIM Model Assumptions

- Traffic signals
 - 80 seconds cycle length
 - LRT pre-emption
 - maximum pre-emption of 80 seconds
- Transit Operations
 - 5-minute headway on each LRT route
 - 2.5-minute headway on each transit-way mall
 - 30 seconds of dwell time at the LRT stations
 - 20 seconds of dwell time at the bus stations
 - bus routes along Main street re-routed along Elm street and commerce street
- At-grade LRT crossing operations
 - FIFO (First-in First-out)

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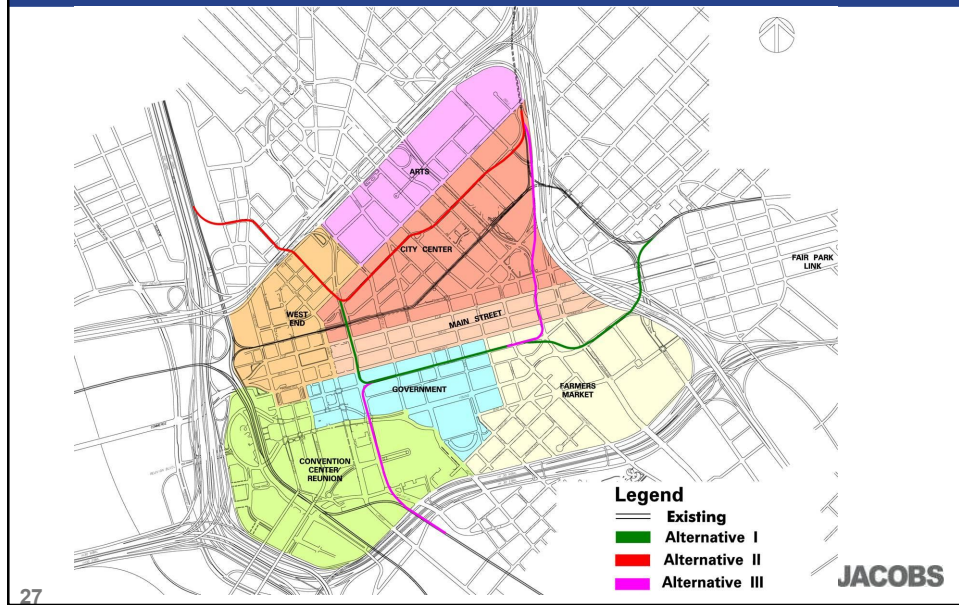
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[illegible]

26

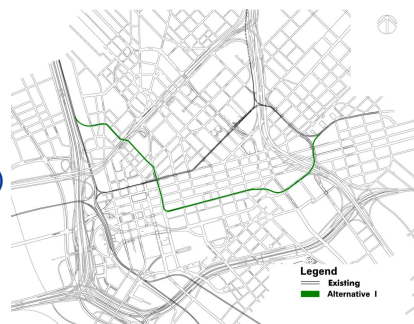
LRT Alternatives



2030 VISSIM Model Description

Model 1:

- Base Roadway Geometry
- LRT
 - Pacific/Bryan Alignment (Existing)
 - North Griffin-Jackson Alignment (Alternative I)



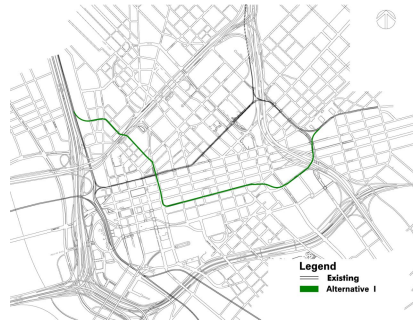
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2030 VISSIM Model Description

Model 2:

- Base Roadway Geometry plus Roadway Improvements
- LRT
 - Pacific/Bryan Alignment (Existing)
 - North Griffin-Jackson Alignment (Alternative I)



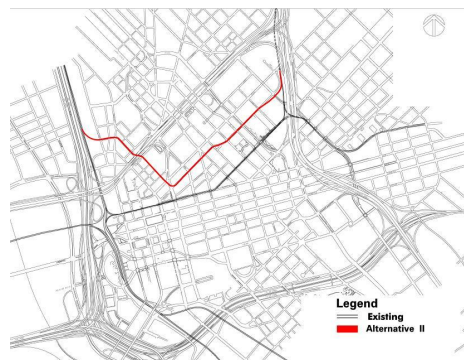
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2030 VISSIM Model Description

Model 3:

- Base Roadway Geometry
- LRT
 - Pacific/Bryan Alignment
 - North Griffin-San Jacinto Alignment (Alternative II)



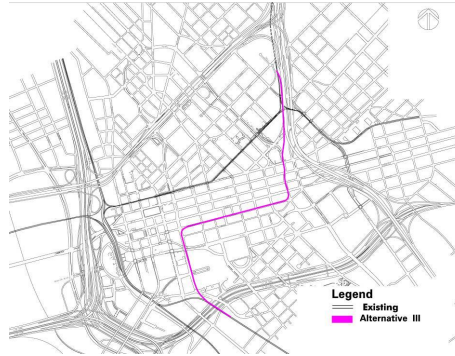
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2030 VISSIM Model Description

Model 4:

- Base Roadway Geometry
- LRT
 - Pacific/Bryan Alignment
 - South Griffin-Jackson-Pearl Alignment (Alternative III)



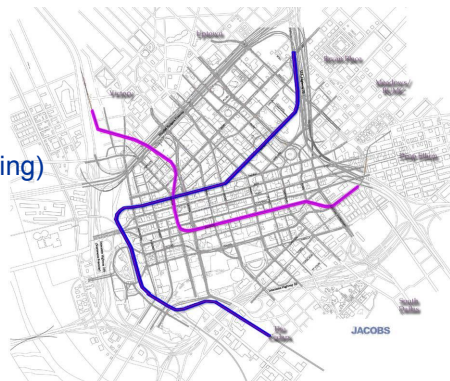
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2030 VISSIM Model Description

Model 5:

- Base Roadway Geometry plus Roadway Improvements
- LRT
 - Pacific/Bryan Alignment (Existing)
 - North Griffin-Lamar-Jackson Alignment (Alternative IV)



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Initial Findings (Common in all Models)

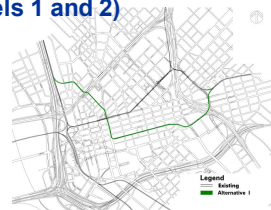
- **Vehicular Traffic Flow**
 - Capacity constraints at the intersection of Pearl and Central Expressway
 - Capacity constraints on eastbound Woodall Rodgers exit ramps at Pearl/Olive and Field/Griffin Streets

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Initial Model 1 Findings

- **LRT at-grade crossing** (Common in Models 1 and 2)
 - **Transit Operations**
 - Reduced LRT throughput
 - Increased LRT travel time
 - Increased number of non-station stops
 - **Vehicular Traffic Flow**
 - Reduced capacity at Ross and Griffin Streets intersection
 - Increased congestion on Elm and Main Streets
 - Increased congestion on Griffin and Lamar Streets



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Initial Model 3 Findings (in Comparison to Model 1)

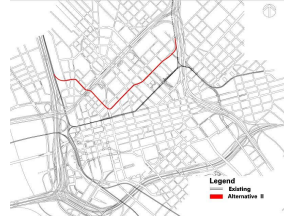
- **Conversion of San Jacinto Street to Transit Mall**

- **Transit Operations**

- Increased LRT throughput
 - Reduced LRT travel time
 - Minimized non-station stops

- **Vehicular Traffic Flow**

- Increased congestion on Ross Avenue
 - Increased travel time on Ross Avenue
 - Reduced congestion on Elm and Main Streets



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Initial Model 4 Findings (in Comparison to Model 1)

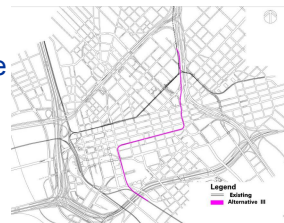
- **LRT grade-separated crossing**

- **Transit Operations**

- Grade-separation north of Pacific Avenue
 - Increased LRT throughput
 - Reduced LRT travel time
 - Minimized non-station stops

- **Vehicular Traffic Flow**

- Increased congestion on Pearl, eastbound Main and Commerce Streets
 - Increased travel time on Pearl Street
 - Insignificant effect on Griffin Street operations



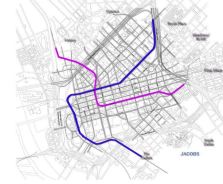
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Model 5 - General Findings

- **Vehicular Traffic Flow**

- Capacity constraints on eastbound Woodall Rodger exit ramps to Pearl/Olive and Field/Griffin Streets
- Capacity constraints on the westbound Woodall Rodgers Frontage Road at Field Street
- Capacity constraints at the portals in to CBD during the AM peak



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Model 5 - General Findings

- **Vehicular Traffic Flow**

- Importance of Griffin and Pearl Streets in accommodating the inbound traffic to CBD
- No considerable negative impacts on the traffic flow as a result of the proposed Pearl Street and Central Expressway two-way configuration and the elimination of their current intersection
- Interruption of traffic flow on northbound Ervay Street in the AM peak hour created by the proposed two-way configuration between Elm street and Commerce street

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Model 5 - General Findings

- **LRT Operations**

- Effects of LRT station dwell time reduction from 45 to 30 seconds:
 - Train throughput only increased by 2 trains per hour to 79 trains per hour (compared to the Model 1 results of 77 trains per hour)
 - Train delay increased by 30% under signal pre-emption operation and shorter LRT station dwell time
 - Signal has to provide the cross-street with a minimum green time prior to providing right-of-way to the train for departure

- **Pedestrian Activities**

- Dwell time reduction from 45 to 30 seconds:
 - Less crossing opportunity for pedestrian at station locations
- Extensive pedestrian delays due to the frequency of the trains

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Model 5 – Findings

- **The relocation of the LRT alignment to Lamar Street:**

- Significantly improved the traffic operations along the Griffin Street corridor
- Significantly increased the vehicle throughput at the Lamar Street/Griffin Street exit ramp from eastbound Woodall Rodgers
- Significantly increased the capacity of the Griffin Street and Ross Street intersection (more movements allowed during the train crossing intervals)
- Reduced the pressure on Woodall Rodgers eastbound frontage road

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Model 5 – Findings

- **The relocation of the LRT alignment to Lamar Street:**
 - Requires modifications to the west transit center to achieve the appropriate station length
 - Requires 4-lane right-of-way in the middle of Lamar Street
 - Traffic shift from Lamar Street to other parallel routes

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Corridor Evaluation

Analysis Summary			
	Model 1	Model 3	Model 4
Measures of Effectiveness			
Total Vehicular Delay (veh-hours)	1,773	1,590	1,501
Total LRT Delay (train-hrs)	2.5	0.9	1.3
Total Persons-Delay (person-hours)	3,301	2,350	2,431
Total Train Throughput (Trains per Hour)	77	88	88
Dallas CBD Vision			
Office	+	++	--
Residential	++	--	+
Retail	++	0	++
Pedestrian Operations	--	--	0
Transfers/System	++	--	--
Recommendation	✓	✗	✗

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Corridor Evaluation

<p>Model 5 Analysis Summary</p>		
	AM Peak Hour	PM Peak Hour
Measures of Effectiveness		
Total Vehicular Delay (veh-hours)	1,964	1,686
Total LRT Delay (train-hrs)	3.3	3.3
Total Persons-Delay (person-hours)	3,897	3,546
Total Train Throughput (Trains per Hour)	79	79
Dallas CBD Vision		
Office	++	++
Residential	++	++
Retail	++	++
Pedestrian Operations	--	--
Transfers/System	++	++
Recommendation		

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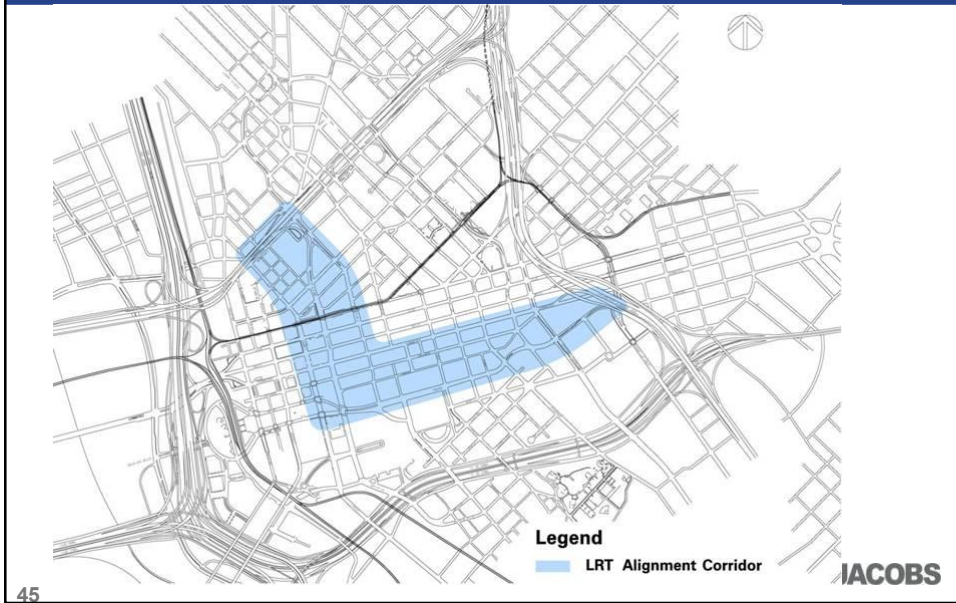
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Recommendations

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Recommended LRT Corridor



LRT Corridor Recommendations

- City Council adopted the Lamar / Field (NS) and Commerce / Young (EW) Corridor as the preferred corridor for the Second CBD Light Rail Line
- City Council recommended that DART proceeds into Alternatives Analysis with this corridor to identify the specific alignment
- City Council adopted a below-grade alignment – at a minimum – between Ross and Commerce

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Roadway Classification System

The map displays a network of roads within a central business district (CBD) area, which is shaded in light blue. The roads are color-coded according to their classification: green for Boulevards, dark grey for Major Thoroughfares, red for Pedestrian Ways, and light green for Park/Open spaces. Green star symbols indicate CBD Access Points, and a blue line marks the Recommended LRT Corridor. A legend in the bottom right corner provides the key for these symbols. A north arrow is located in the top right corner of the map area.

- Boulevard
- Major Thoroughfare
- Pedestrian Way
- Park/Open space
- CBD Access Points
- Recommended LRT Corridor

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West End Area



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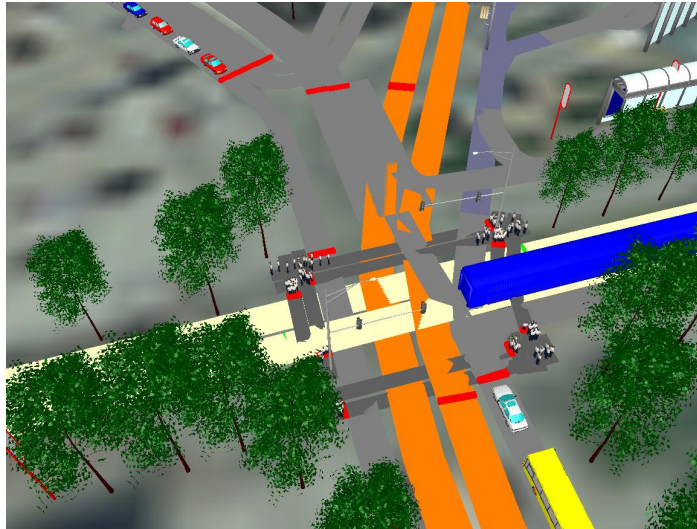
At-Grade LRT Crossing



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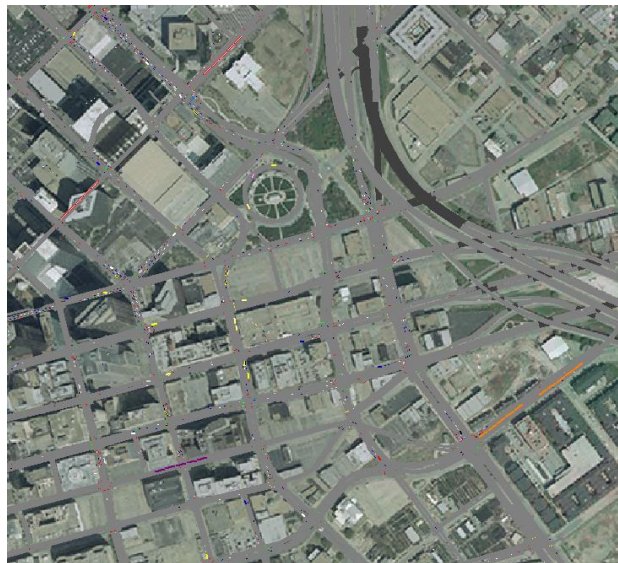
Pedestrian Crossing – Pacific & Lamar



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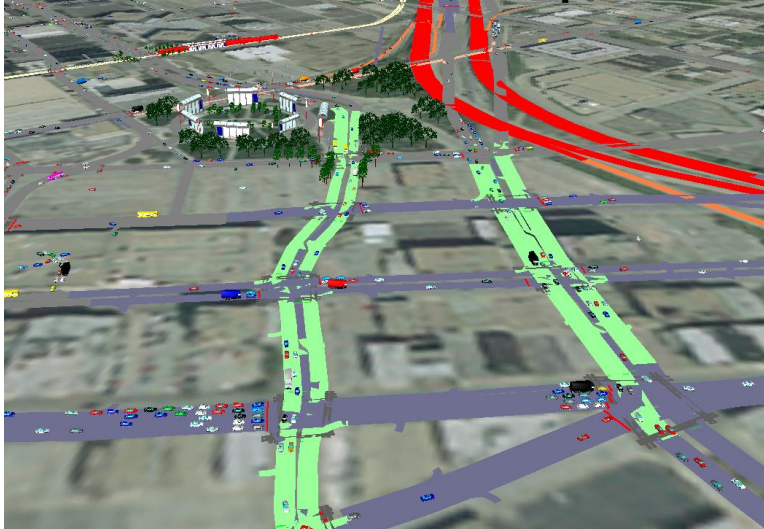
Farmers Market Area



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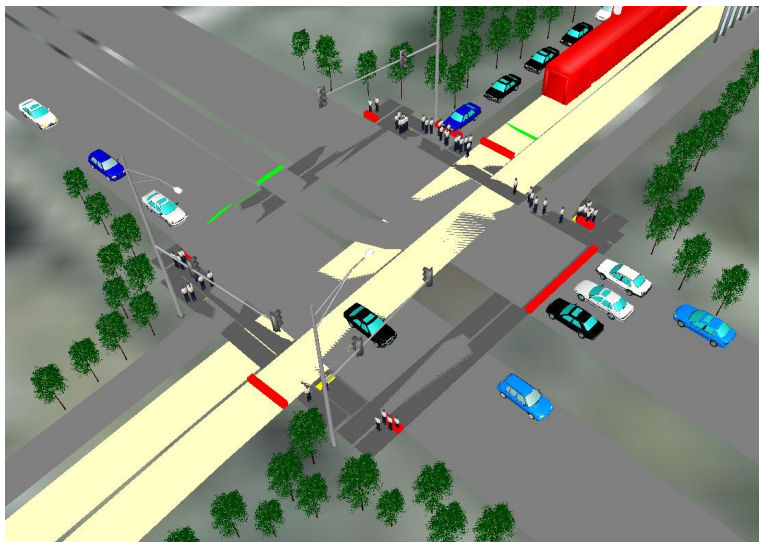
Pearl and Central Expressway



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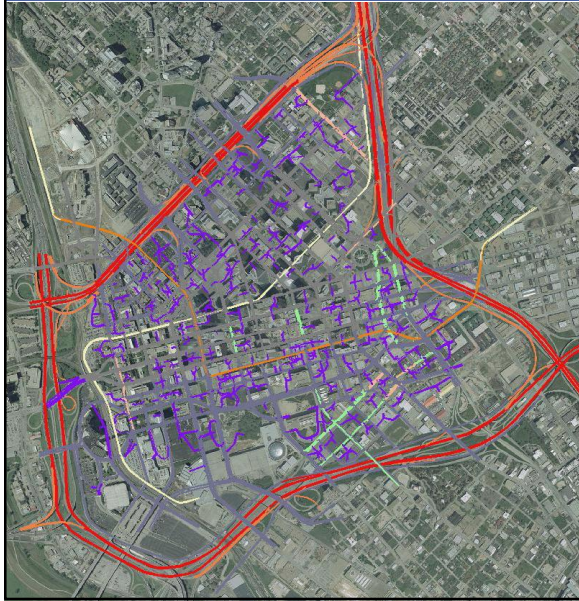
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Pedestrian Crossing – Pearl and Bryan



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