JANMARG

Ahmedabad Bus Rapid Transit System

Project Under

JnNURM

Ministry of Urban Development,
Govt. of India.

Initiatives of

Ahmedabad Municipal Corporation

Ahmedabad Urban Development Authority
Gujarat Infrastructure Development Board
Urban Development Department, Govt. of Gujarat

Planning and Design Team:

CEPT University
In association with: LEA Associates, Delhi
ITDP, New York

Bus Rapid Transport System

- High quality
- Reliable
- Comfortable
- Fast
- Excellent outreach
- Cost effective

NOT JUST bus and road, It encompasses…..

- Development of high quality, thoughtfully planned infrastructure
- Supported by education and enforcement
- Adherence to traffic discipline
- Change in work culture
- Development of accessory facilities
- A total re-look at the public space

Why BRT?

- Suits a developing country's transport nuances- planning follows development
- No strong CBD
- Highly randomised development with localised trips
- Urban pull
- Need for decongestion
- Flexibility in routing
- Easily expandable

..Why BRT?

- Scope for both low density and high density passenger movement
- Project implementation easier
- Wider reach
- Leverages the full scope for public space and accessibility improvement
- Can be operated according to the city ethos
- Scope for public private synergy
- Environment friendly

Ahmedabad Today

- Area of 490 sq kms
- Population of 55.70 lacs-growing at almost 75 percent every ten years
- 14.5 lac vehicles, growing at the rate of a lac per year
- 2 wheelers-73 percent
- Bus trips 6.7 lacs per day
- Average trip length on bus 6.8 kms

Ahmedabad today

Ahmedabad’s vision - Janmarg

Planning of Janmarg

- Impact of growth and transport on the city
- Existing bus patronage and pattern of movement
- Connectivity of important origin and destinations
- Availability of right of way to build infrastructure
- Formation of strong network for flexible route operations
- Catalyst for area development - low income, low accessibility zones (old walled city)

THE TASK

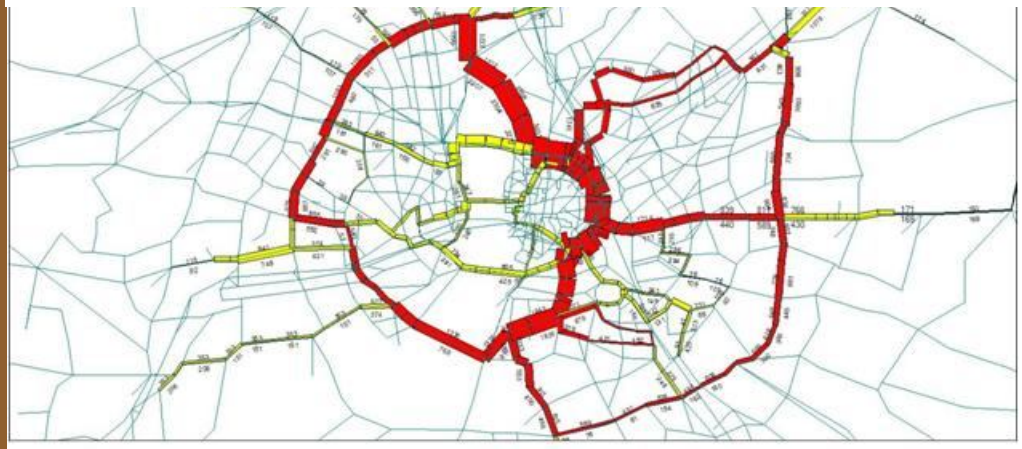
- Connectivity
  - Where to where
  - Routes
  - Frequency
- Infrastructure
  - Roads, designs
  - Buses,
- Fare, Operations, Finances
- Coordination
  - Other activities, e.g., storm water drainage
  - Contracts
- Management and Organisation structure

Understanding the Task

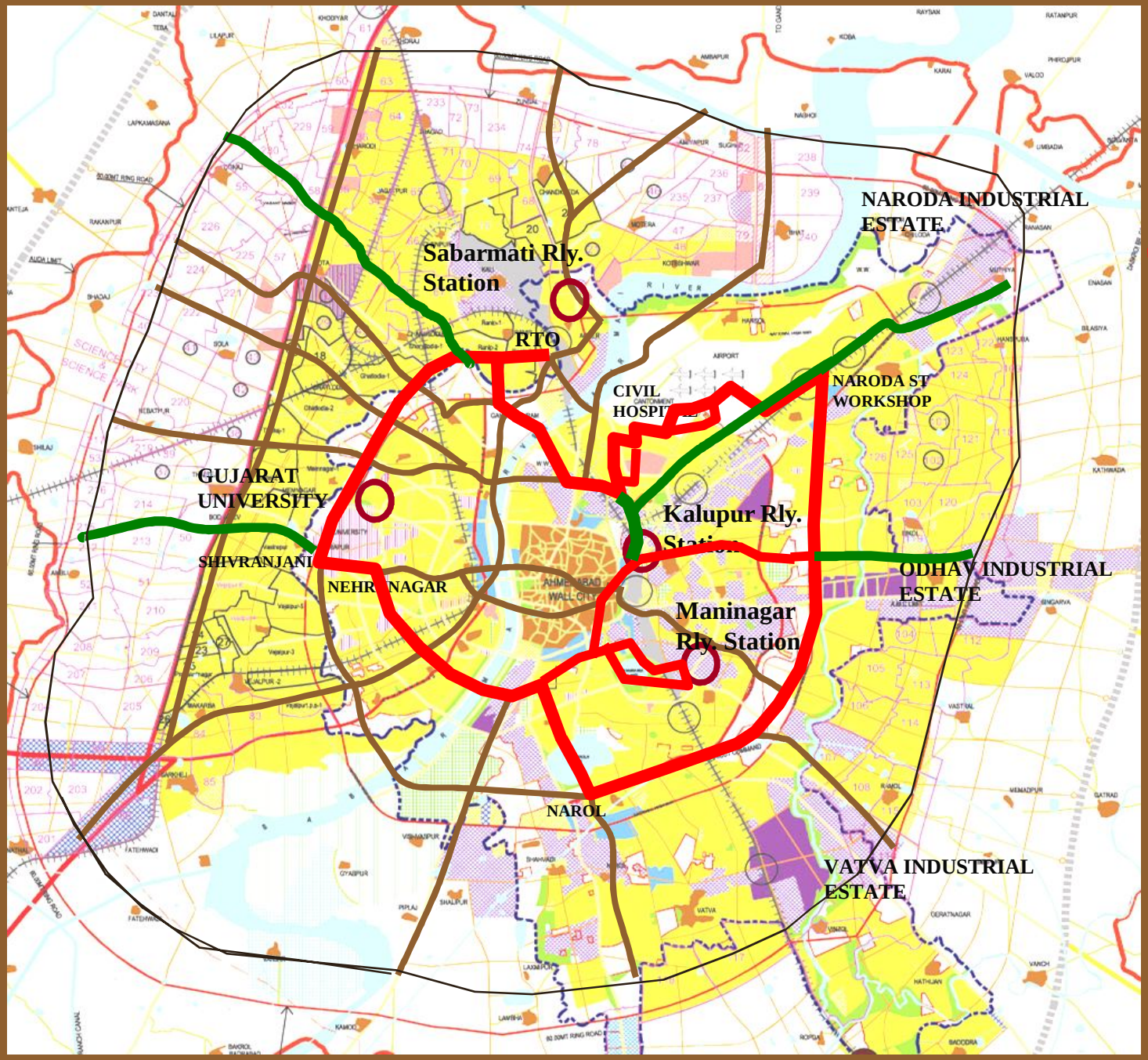
- No established bus transit market
- Managing apprehensions
- Capturing concurrent changes in bus transit to validate the planning
- Wide roads easier, narrow roads –a challenge
- Adaptation to local felt-needs
- Local body’s role central, has to be the execution head
- Interfacing with NHAI to gain access, Electric Companies, BSNL, Railways, gas company

Surveys for planning connectivity

- Household origin destination survey
- AMTS Frequency Occupancy Survey
- IPTS, Bicycle and Two wheeler frequency occupancy
- AMTS passenger origin destination survey



Janmarg



BRTS EXCLUSIVE CORRIDOR PHASE – 1

(58 kms.)

BRTS CORRIDOR PHASE 2

(34 kms.)

BRTS CORRIDOR PHASE – 3

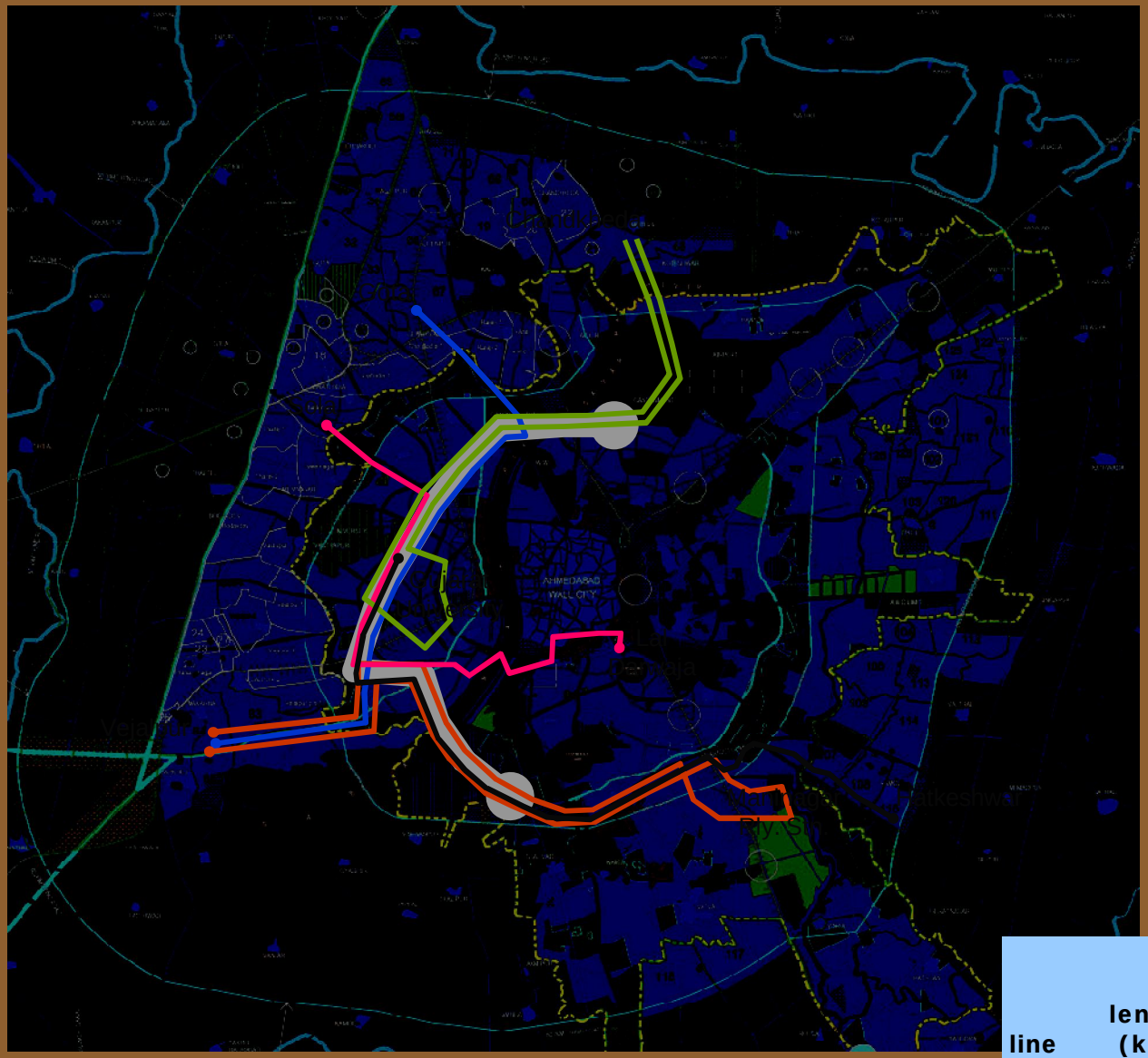
(125 kms.)

TOTAL – 217 Kms.

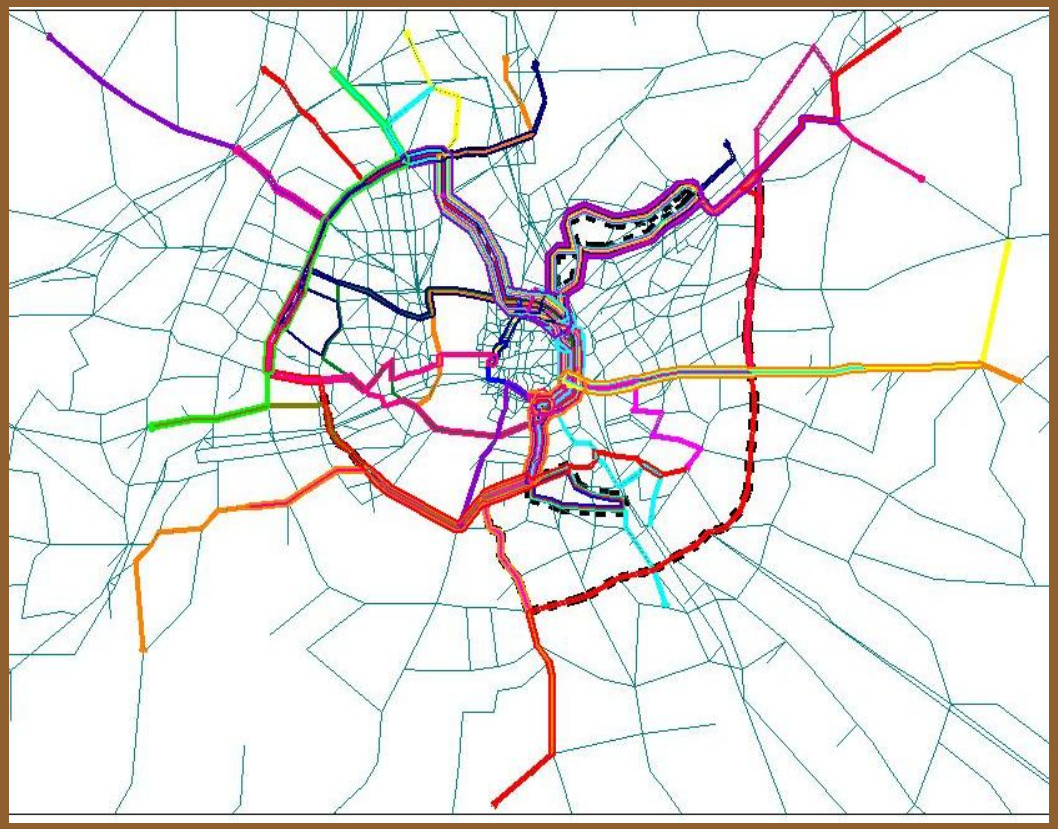
AMC LIMIT

Janmarg- Route

Package 1 - Phase 1



line	length (km)	frequency	fleet	boardings, daily	IPK
040-1	28.6	6.5	10	9576	5.7
n1	25.2	5.6	8	8082	6.4
n4	27.6	5.3	9	7740	5.9
n5	30.8	3.2	5	5166	5.7
n6	26.8	5.8	9	8874	6.3
total	**139.0**		**41**	**39438**	**30.0**



- **Bus Fleet size 220**
- **Total trips / day 2 lacs**

line	length (km)	frequency	fleet	boardings, daily	IPK
130	51.1	8.5	23	20673	5.3
017	32.5	3.2	6	5148	5.4
028	28.8	4.1	6	6507	6.1
034	17.4	2.7	3	3150	7.6
038-1	28.2	5.6	9	6957	4.9
040-1	28.6	6.5	10	9576	5.7
046	19.4	3.6	4	3600	5.7
046-1	19.6	6.2	7	7704	7.0
058	40.8	5.8	12	10575	4.9
063	39.5	4.9	10	9252	5.3
072	29.0	2.2	4	3573	6.3
076	34.7	5.0	10	7920	5.1
077	24.1	3.1	4	5715	8.5
079	21.9	9.0	11	11835	6.7
084	44.3	5.4	13	11736	5.5
112	20.8	2.6	3	3096	6.4
117	27.3	2.0	3	2826	5.6
129	56.8	2.5	8	9369	7.3
146-1	36.1	3.3	7	7578	7.0
148	27.1	4.3	7	5868	5.5
150	55.5	3.2	10	7974	5.0
n1	25.2	5.6	8	8082	6.4
n3	54.6	3.4	10	9657	5.7
n4	27.6	5.3	9	7740	5.9
n5	30.8	3.2	5	5166	5.7
n6	26.8	5.8	9	8874	6.3
total	**848.2**		**211**	**200151**	**156.9**

Janmarg- Route

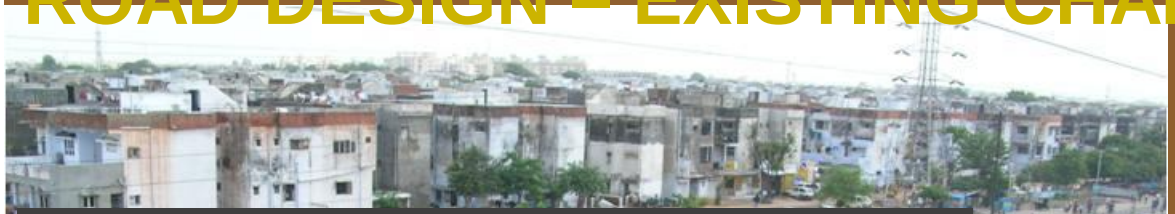
Complete Phase 1

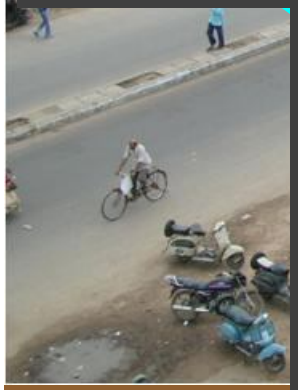
INFRASTRUCTURE

Roads

Buses

ROAD DESIGN – EXISTING CHARACTERISTICS





Existing RoW – 40 M

Used RoW – 18 M

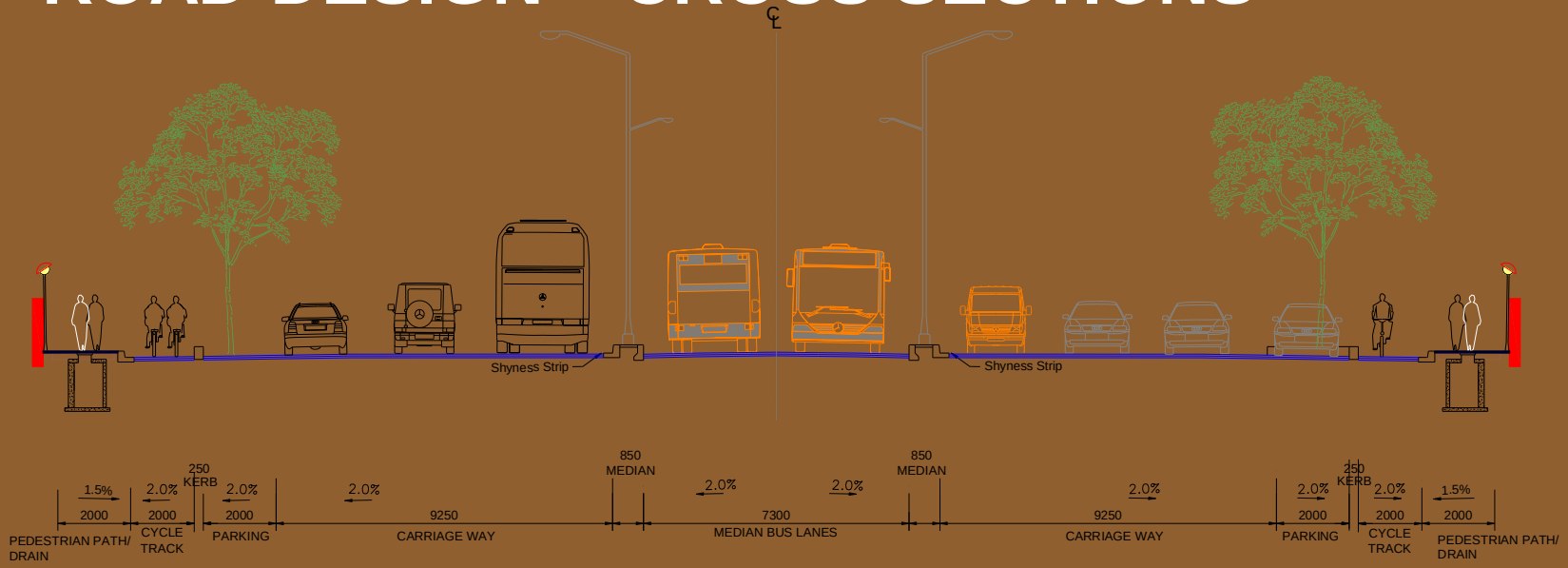
Un Used RoW – 22 M

DESIGN PROPOSAL

Dual Lane Carriage Way on either side

Development of Cycle Lane, Pedestrian Pathway, Parking

ROAD DESIGN – CROSS SECTIONS



ROAD CROSS SECTION – 40 m RoW – MEDIAN BUS LANE

2.0 m – Footpath

2.0 m – Cycle track

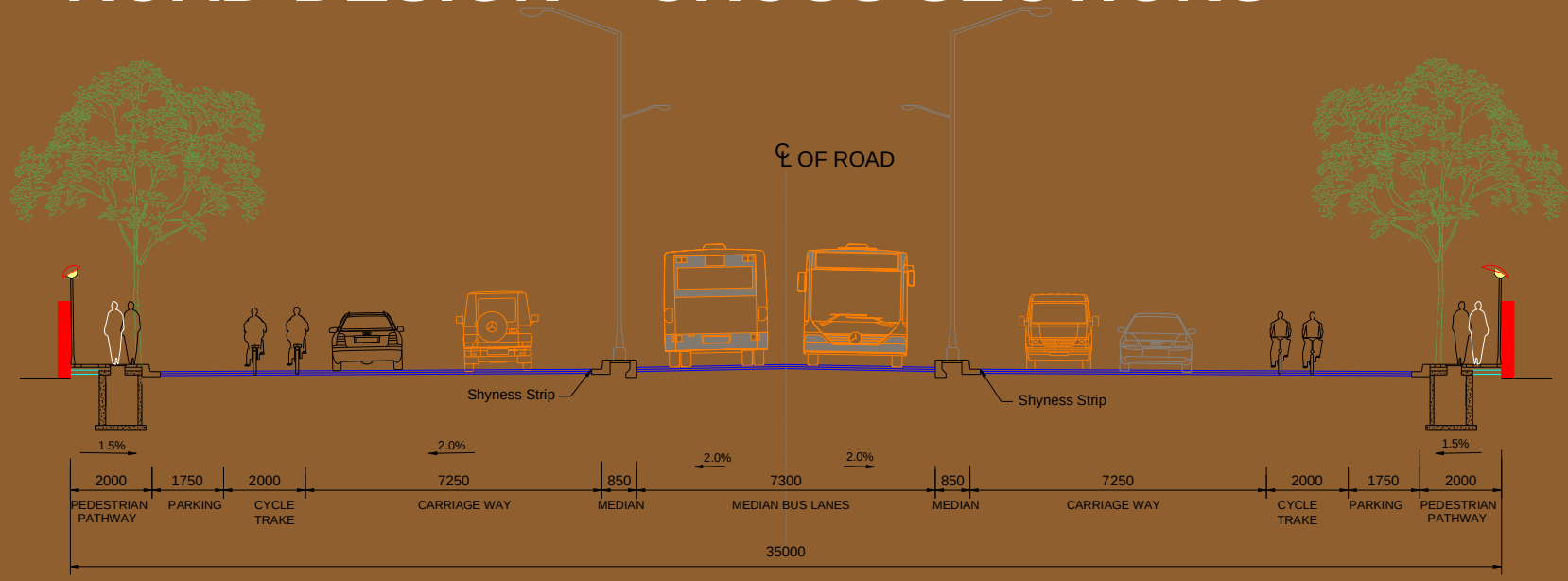
2.0 m – Parking

9.25 m – Mixed Traffic lane

0.85 m – footpath/Bus platform

7.3 m - BRT Lane

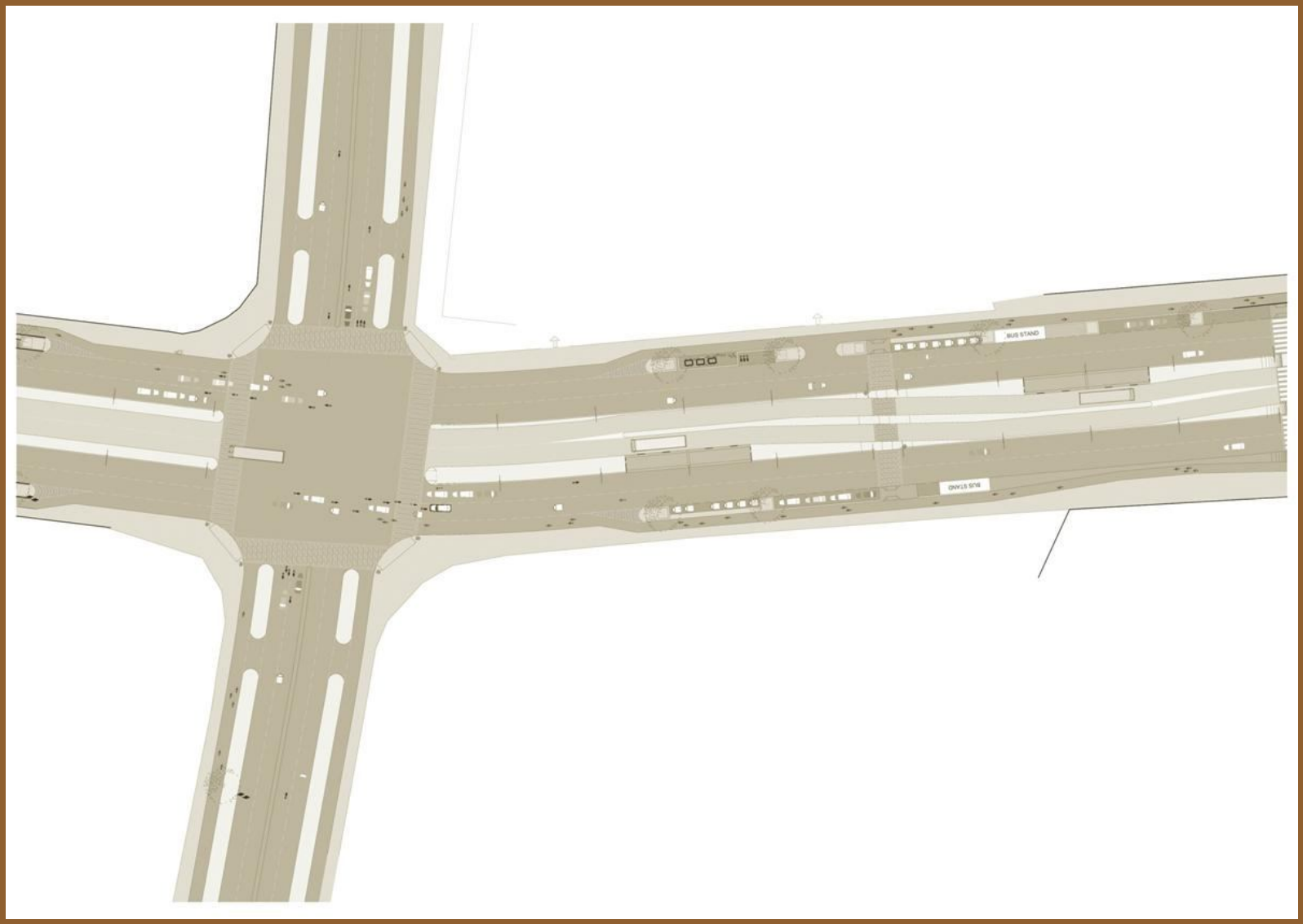
ROAD DESIGN – CROSS SECTIONS



ROAD CROSS SECTION – 35 m RoW – MEDIAN BUS LANE

- 2.0 m – Pedestrian Pathway
- 2.0 m – Parking
- 2.0 m – Cycle track
- 7.25 m – Mixed Traffic lane
- 0.85 m – footpath/Bus platform
- 7.3 m BRT Lane

DESIGN ELEMENTS



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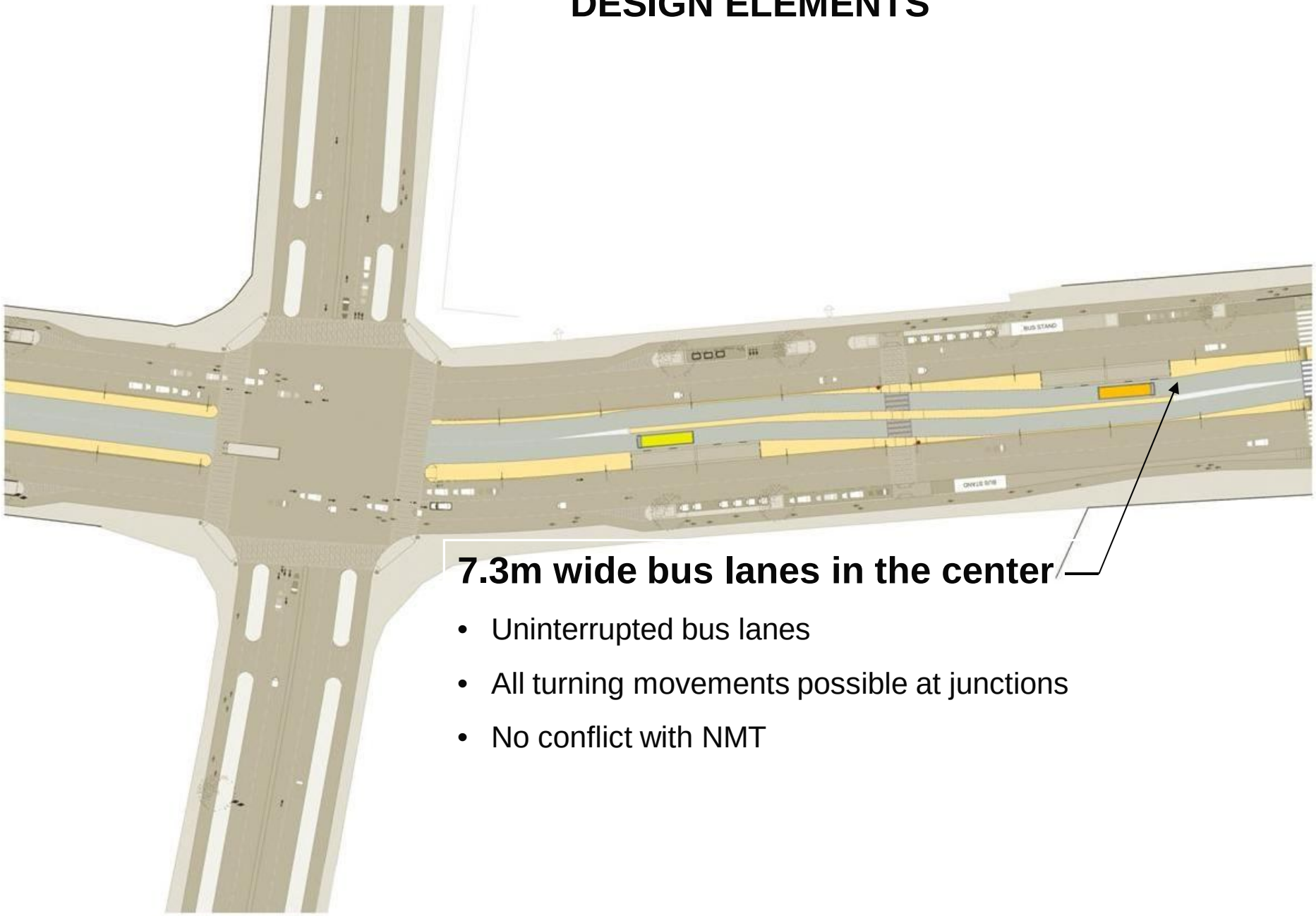
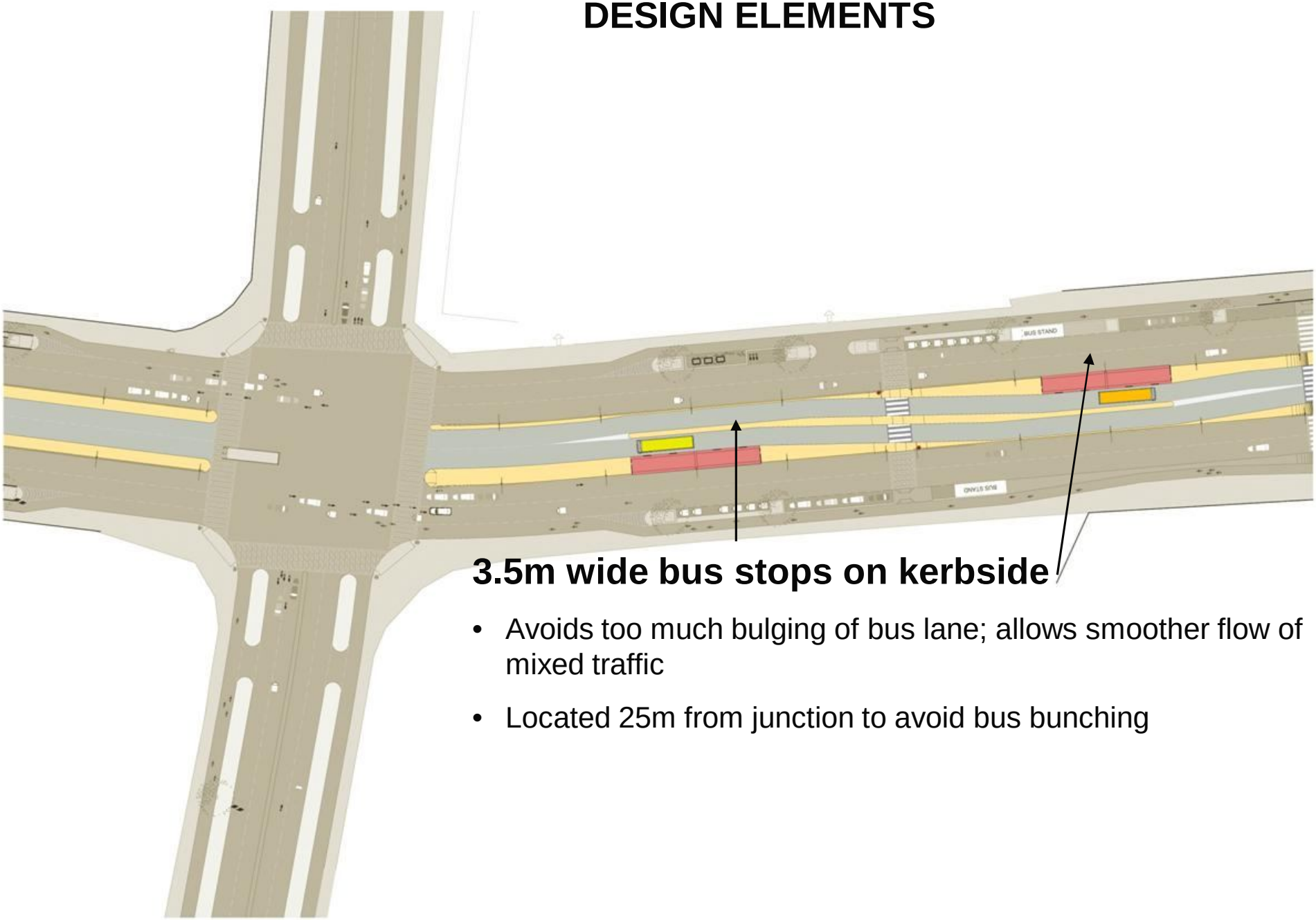


7.3m wide bus lanes in the center

- Uninterrupted bus lanes
- All turning movements possible at junctions
- No conflict with NMT

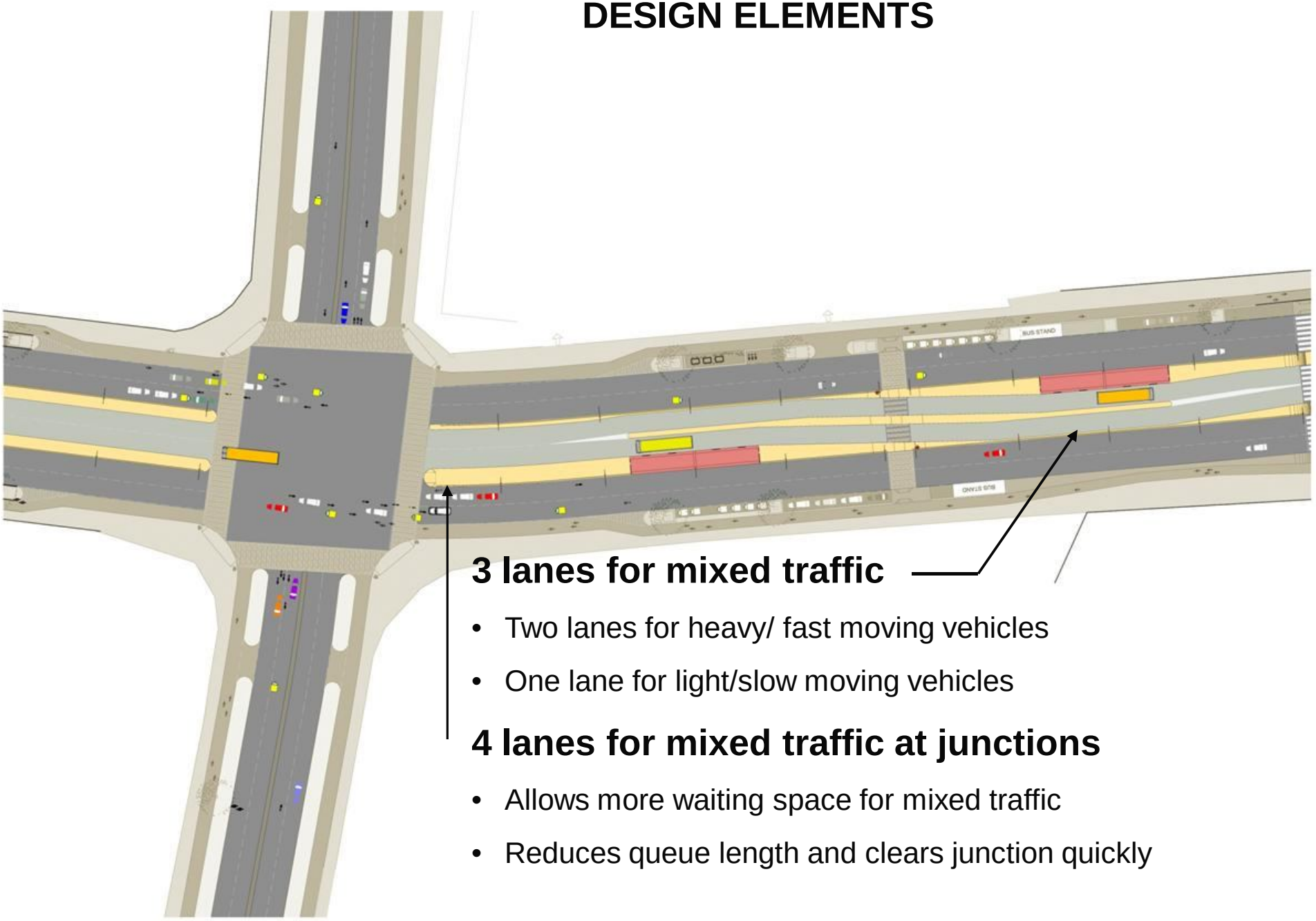
DESIGN ELEMENTS



3.5m wide bus stops on kerbside

- Avoids too much bulging of bus lane; allows smoother flow of mixed traffic
- Located 25m from junction to avoid bus bunching

DESIGN ELEMENTS



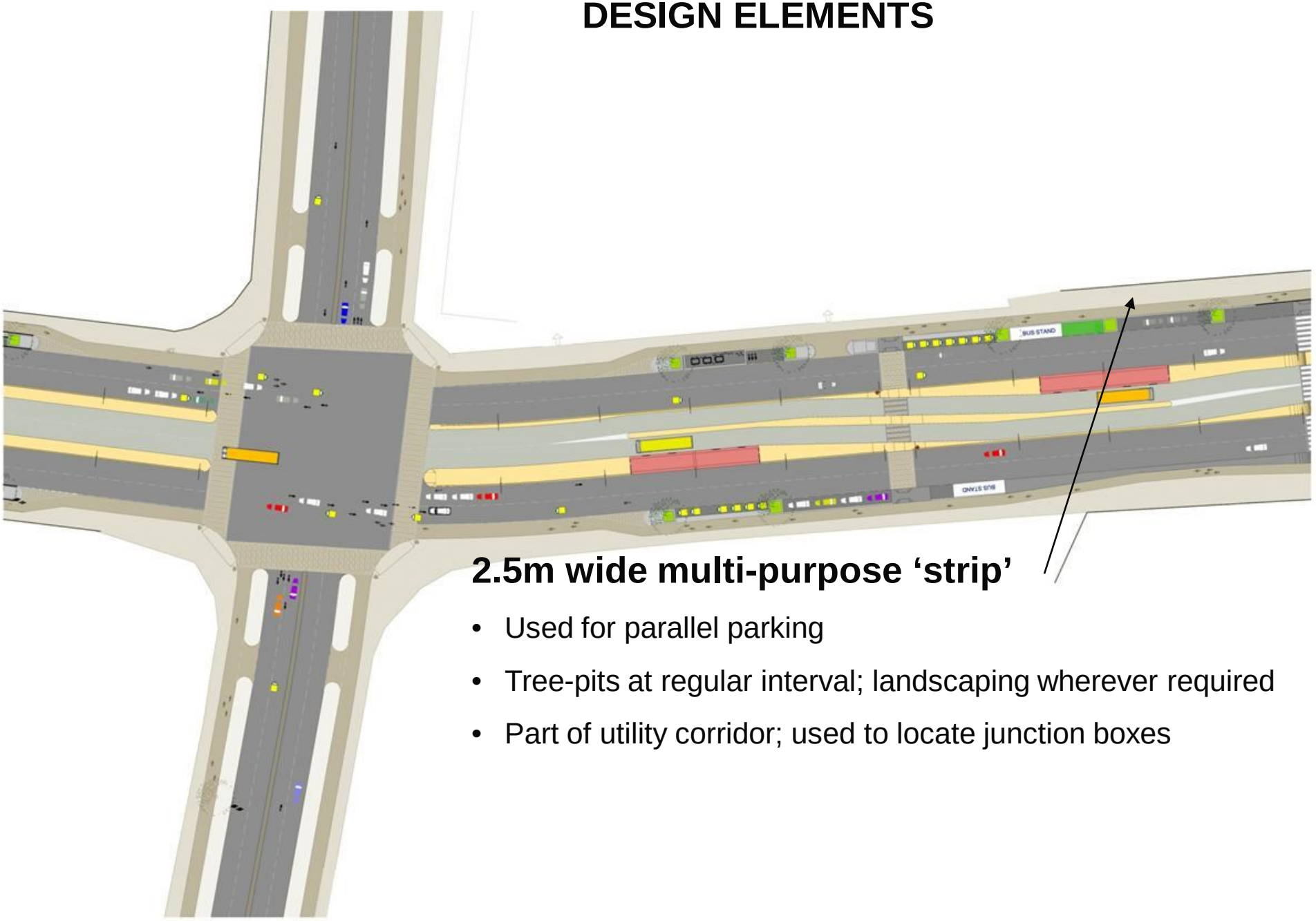
3 lanes for mixed traffic

- Two lanes for heavy/ fast moving vehicles
- One lane for light/slow moving vehicles

4 lanes for mixed traffic at junctions

- Allows more waiting space for mixed traffic
- Reduces queue length and clears junction quickly

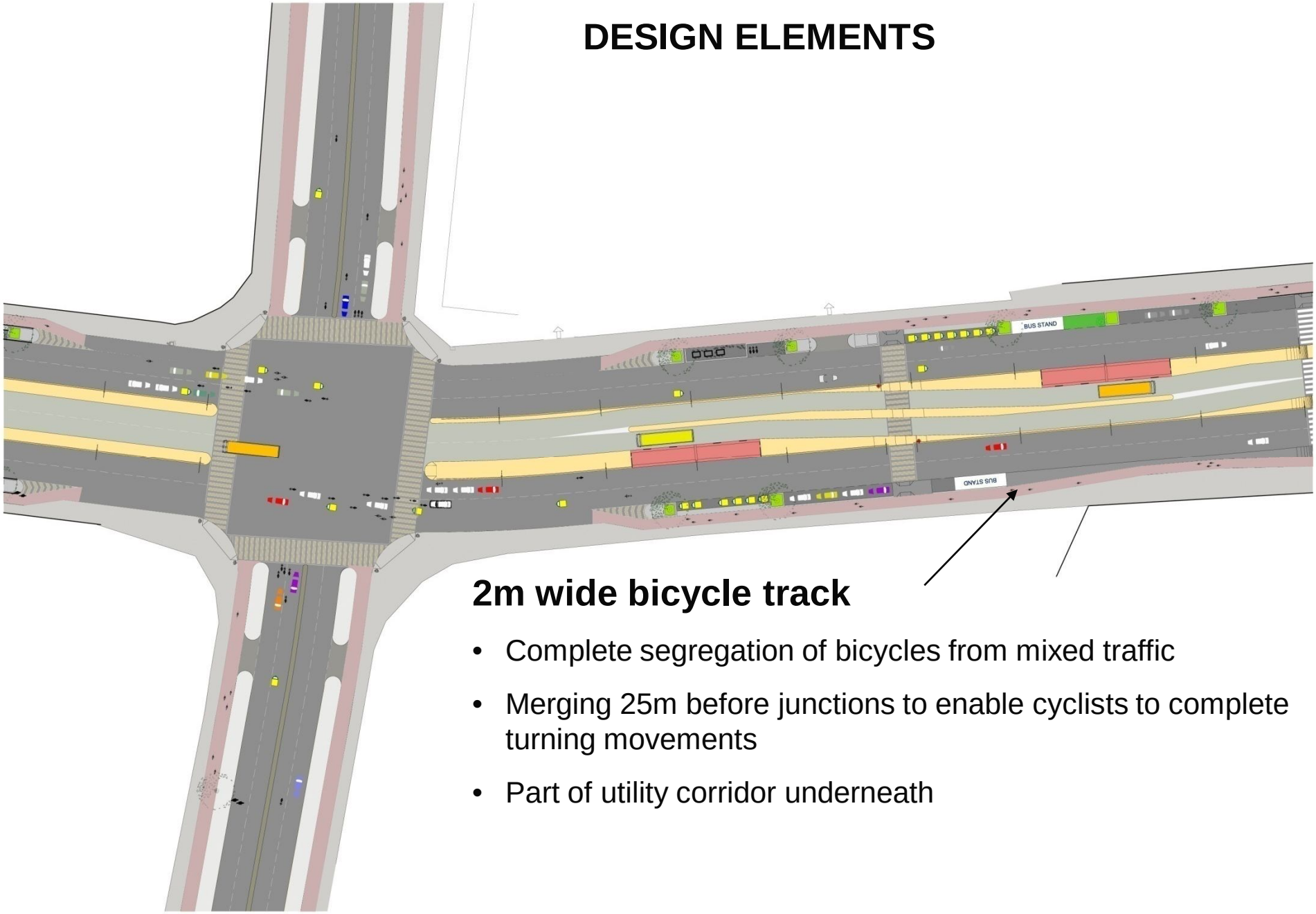
DESIGN ELEMENTS



2.5m wide multi-purpose ‘strip’

- Used for parallel parking
- Tree-pits at regular interval; landscaping wherever required
- Part of utility corridor; used to locate junction boxes

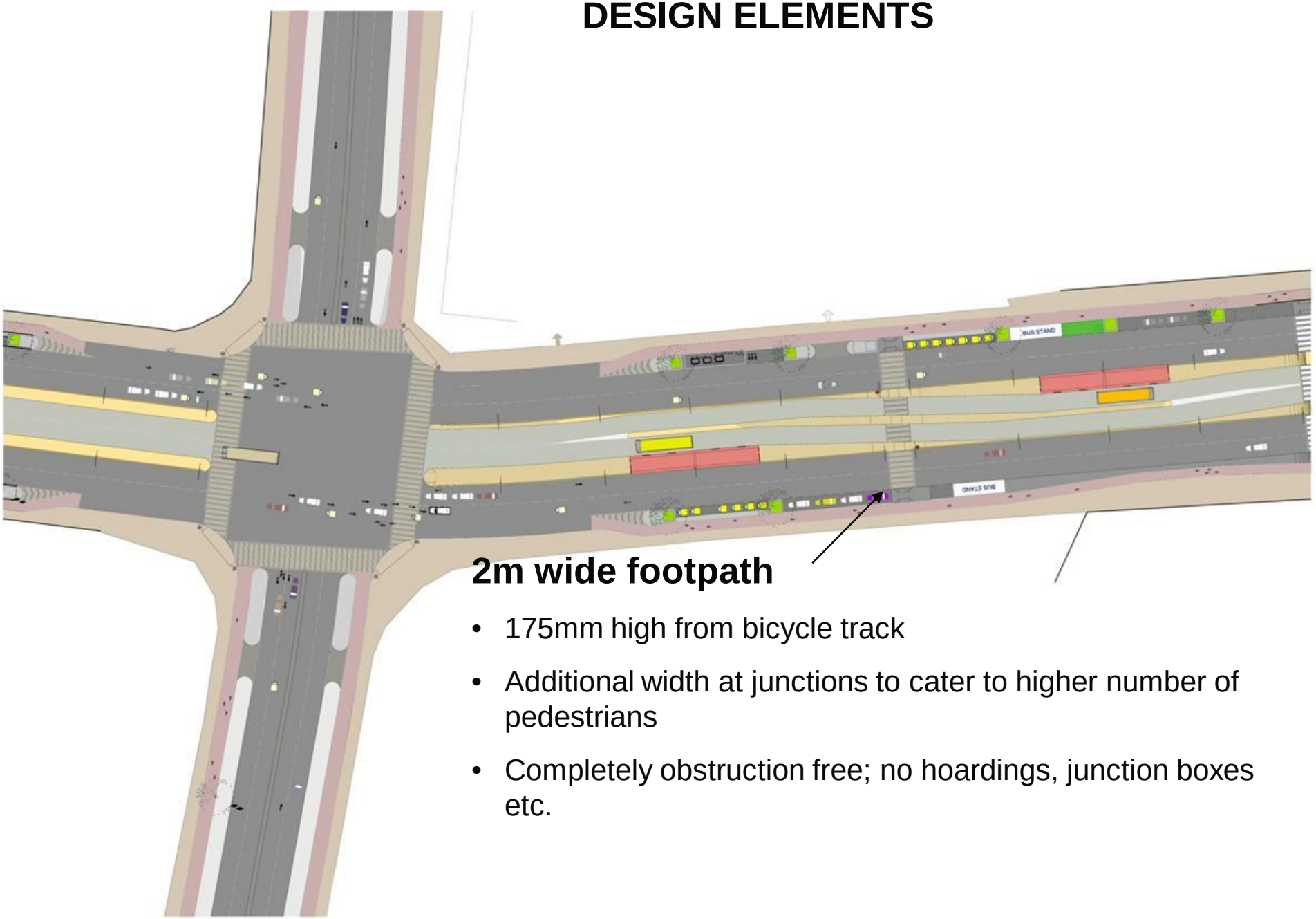
DESIGN ELEMENTS



2m wide bicycle track

- Complete segregation of bicycles from mixed traffic
- Merging 25m before junctions to enable cyclists to complete turning movements
- Part of utility corridor underneath

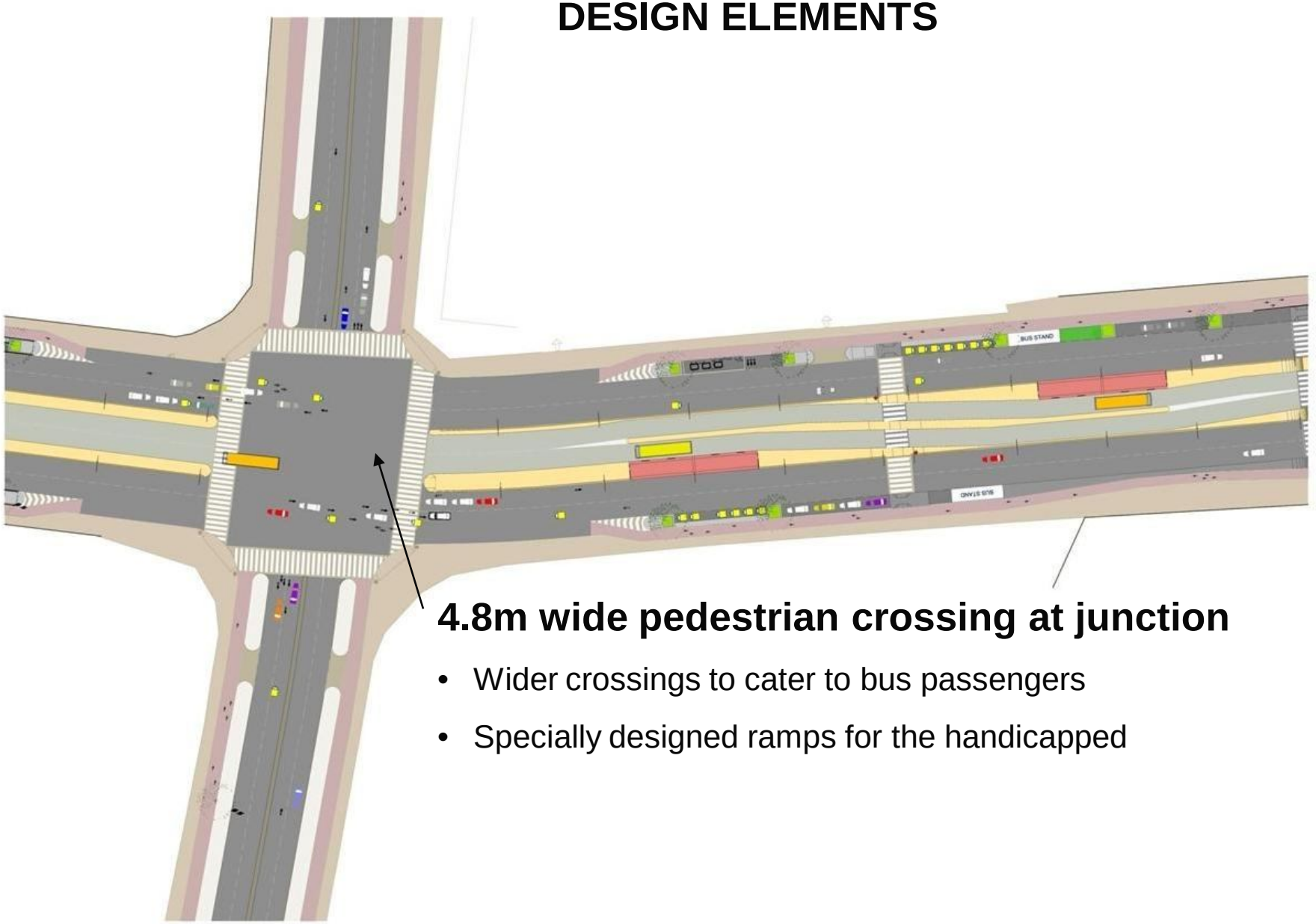
DESIGN ELEMENTS



2m wide footpath

- 175mm high from bicycle track
- Additional width at junctions to cater to higher number of pedestrians
- Completely obstruction free; no hoardings, junction boxes etc.

DESIGN ELEMENTS



4.8m wide pedestrian crossing at junction

- Wider crossings to cater to bus passengers
- Specially designed ramps for the handicapped

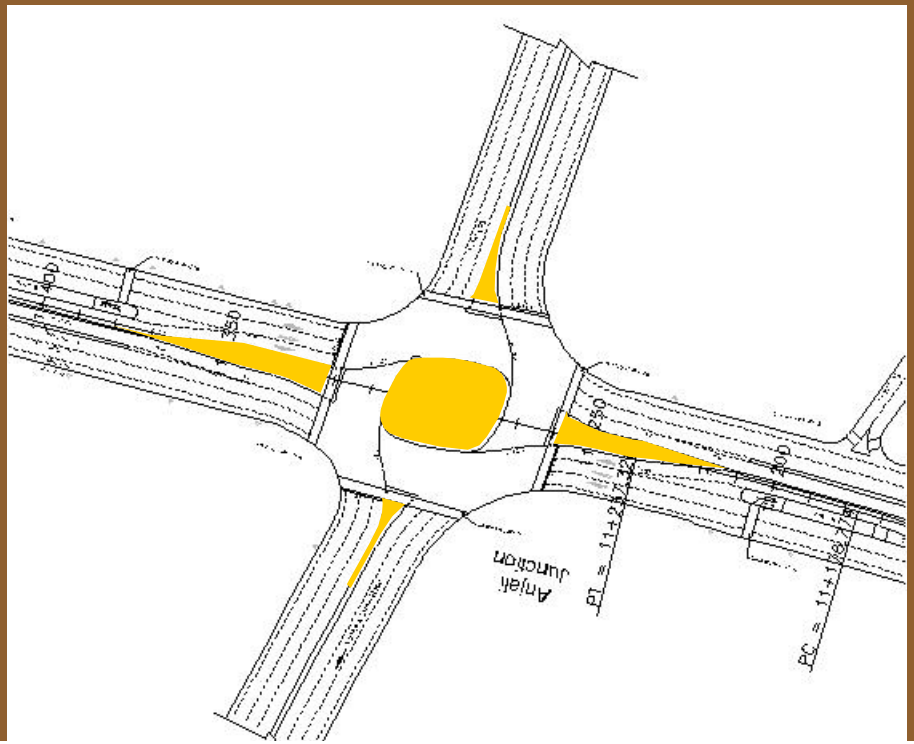
JUNCTION DESIGN

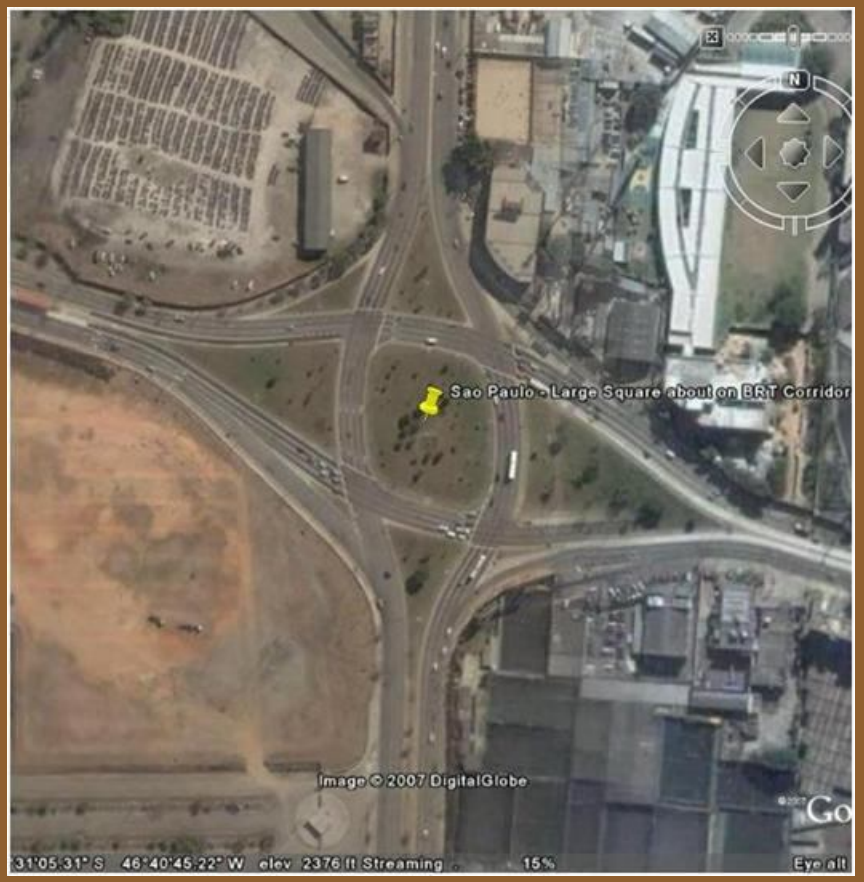
Four Phase Signals -Inefficient

Innovative Solutions to increase junction capacity

-Split Flyovers

-Two phase signal cycles (Design)





Bus specifications

- Low floor buses
- Large central doors on both sides for flexibility in operations
- Additional door in front of bus

Bus stop location and design

- At grade boarding
- Facility for future installation of off-board fare collection
- Advertising space for additional revenue
- Easy access for physically challenged
- Median or kerb side?

BUS STATION DESIGN

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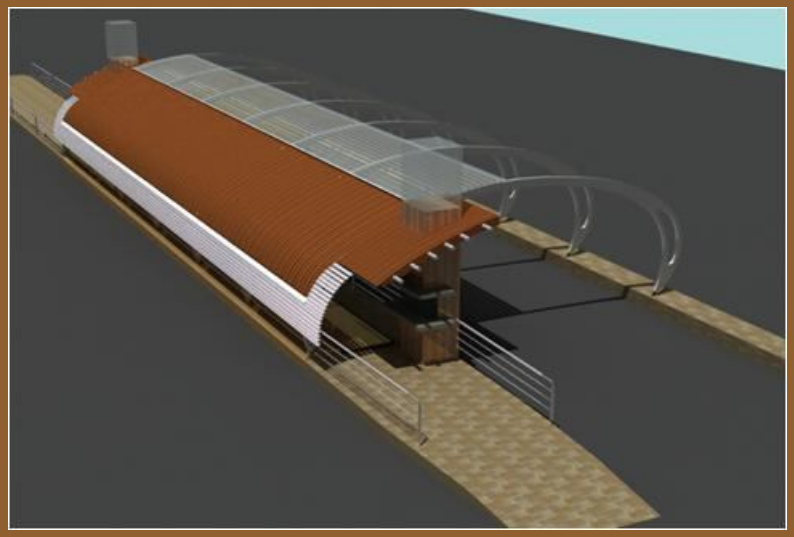
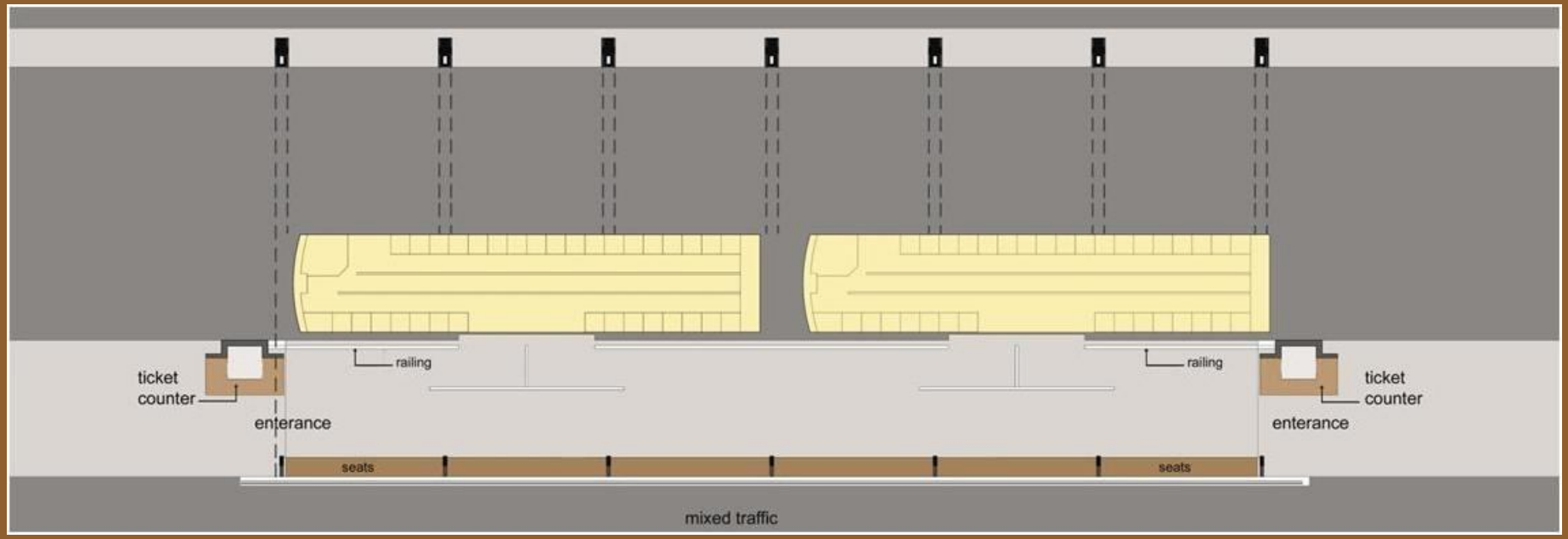
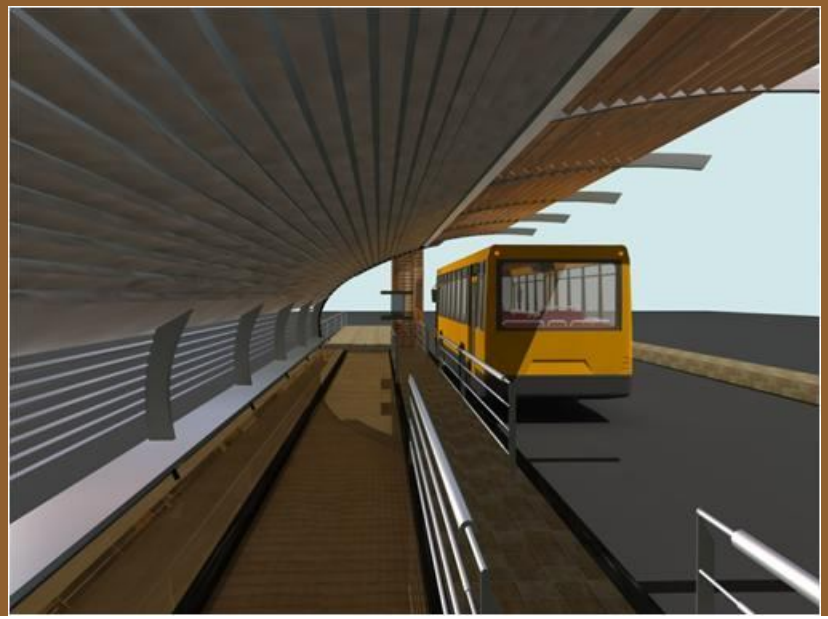
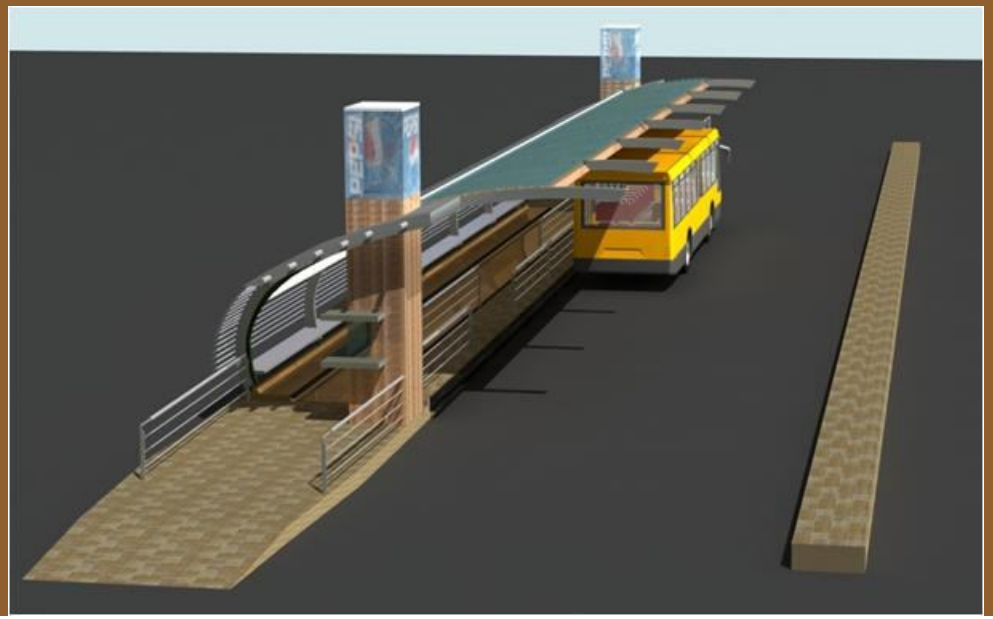




BUS STATION DESIGN





Activities prior to building Project infrastructure

- Clearing right of way near Wadaj and Astodia Chakla
- Building River Bridges Vasana-Pirana
- Utility Survey and Integration
- Building storm water drains and drainage infrastructure

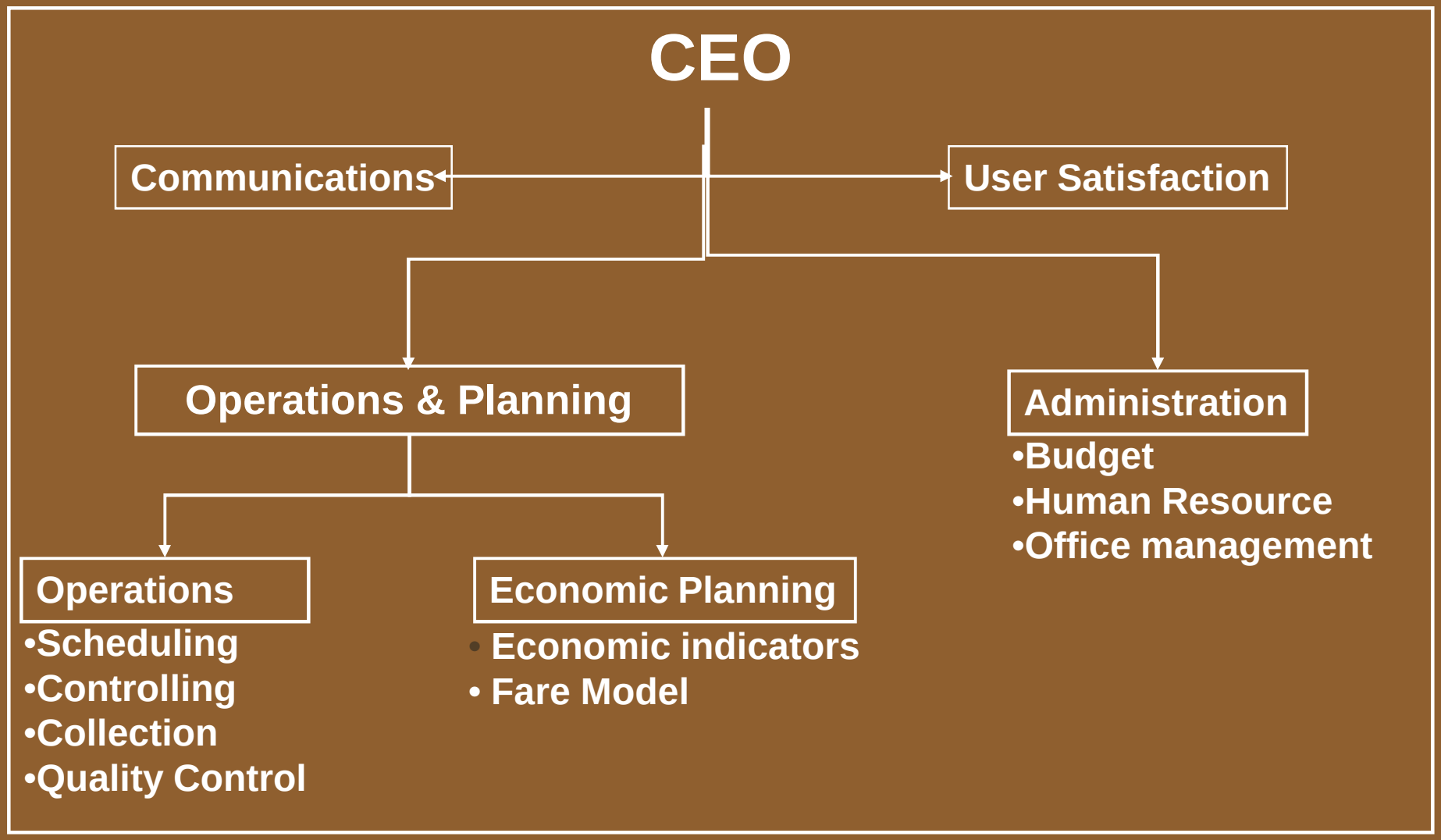
Physical progress

- RTO-Pirana 12.5 km – work started-EOD-June 2008
- Pirana-Danilimda-Maninagar-12 km-work started
- Narol-Naroda-13.6 km-work started
- Naroda-civil hospital-Dudeshwar-Wadaj-16 km-tender in process
- Shah Alam-ST bus stand-sarangpur-Soni ni chaawl-6 km-tender in process

Ahmedabad Janmarg Limited – SPV is formed

- Policy making and setting standards for the corridors and implementation
- Contracting
- Regulation
- Fixing user charges, fare structure and mobilizing finances
- Operations management
- Maintenance of infrastructure
- Provide barrier free access to the differently abled
- Advertising and marketing

Ahmedabad Janmarg Organisational Structure



Ahmedabad Janmarg Board of Directors

- **Commissioner, Ahmedabad Municipal Corporation**
- *(Chairman, Janmarg BRT)*
- **Representative of Ahmedabad Municipal Corporation**
- **Representative of Ahmedabad Municipal Corporation**
- **Representative of Ahmedabad Municipal Corporation**
- **Deputy Commissioner, Ahmedabad Municipal Corporation**
- **Transport committee chairman, AMTS**
- **Additional Commissioner, Traffic Police, Ahmedabad**
- **Secretary, UDD**
- **Ministry of Finance rep, Government of Gujarat**
- **Representative, AUDA**
- **Representative, Government of India**
- **Subject experts (2)**
- **Representatives of other stake holder (2)**

SPV Responsibilities and Expenditure

SPV Revenue

Stations:	Maintenance + Cleaning **+ Administration**
Fare Collection:	Hardware + Software + Communication Network Operation + Conductors + Clearing House **Administration**
Scheduling & Controlling	Hardware + Software + Communication Network Operation + **Administration**

Bus Operator Responsibilities and Expenditure

Operator Revenues
[Kilometer payment + Bus cost payment]

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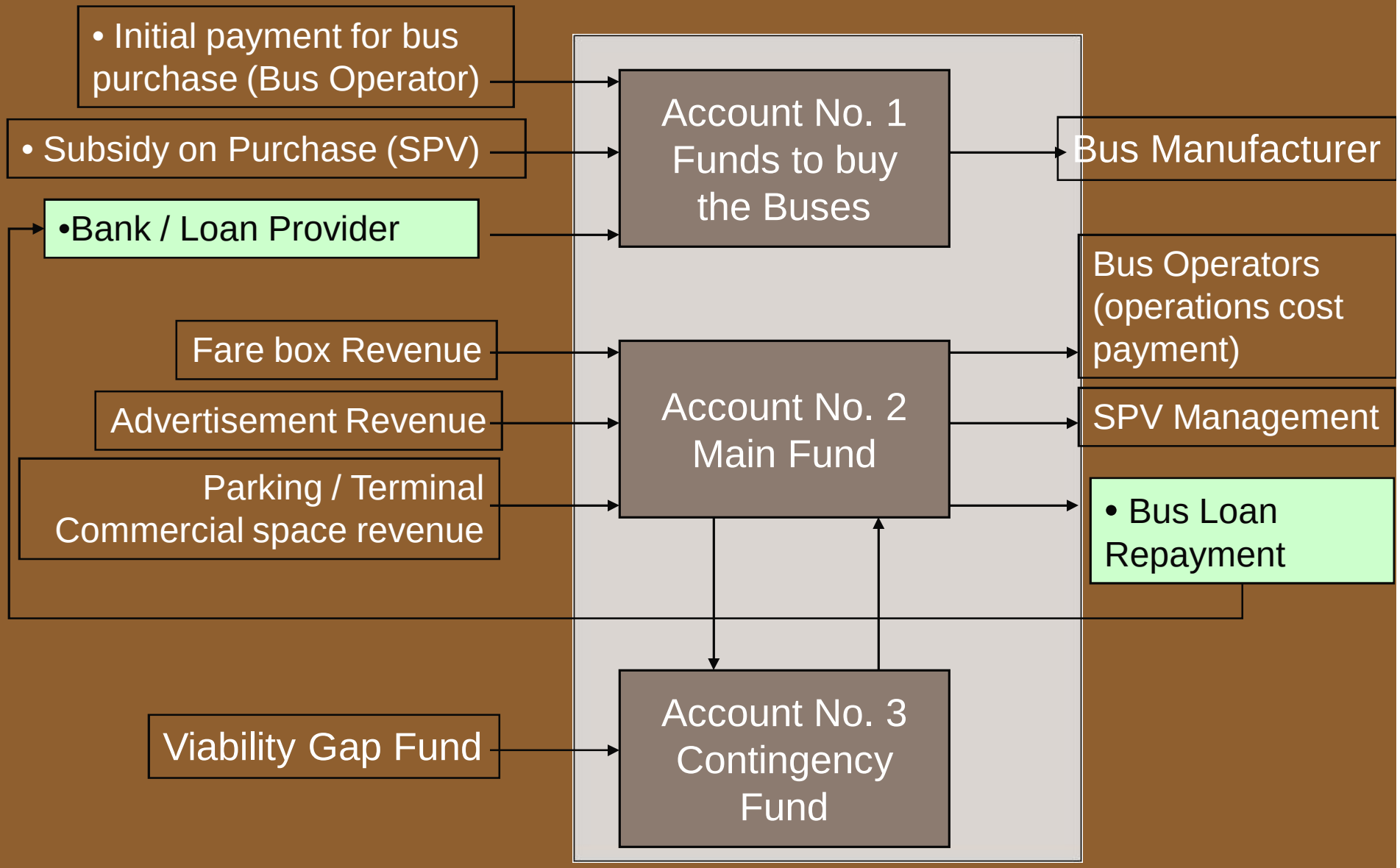
Bus Investment
Bus Maintenance
Bus Cleaning
Drivers
Fuel & Parts
Other Fixed Cost
Taxes + Profits

Fund flow and Escrow Fund



Contingency Fund

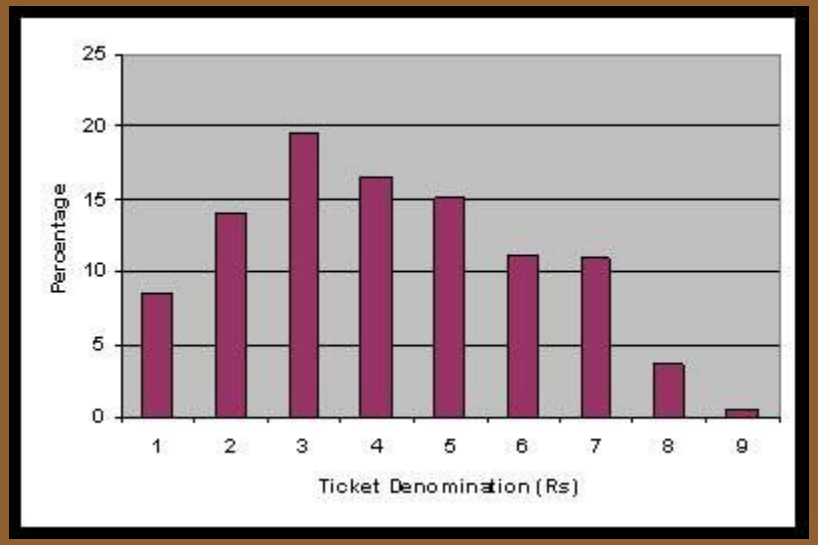
If, Revenue > Operational Costs

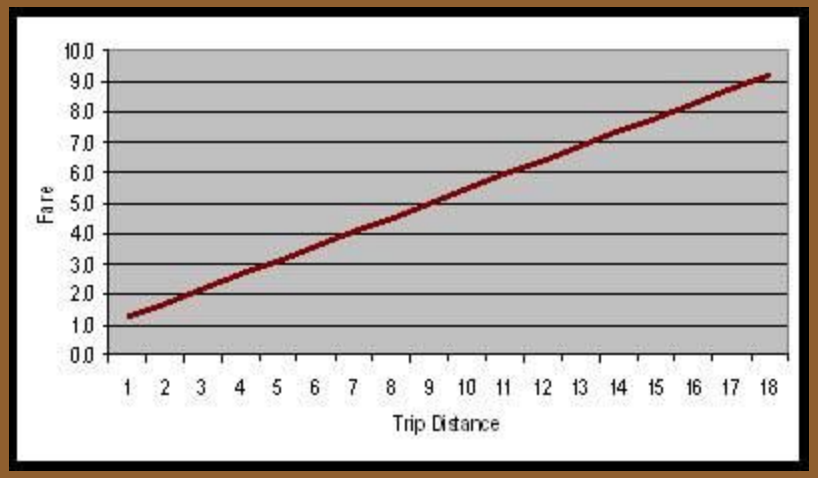
Revenues – Operational Costs = Contingency

If, Revenues < Operational Costs

Operational Costs = Revenues + Contingency

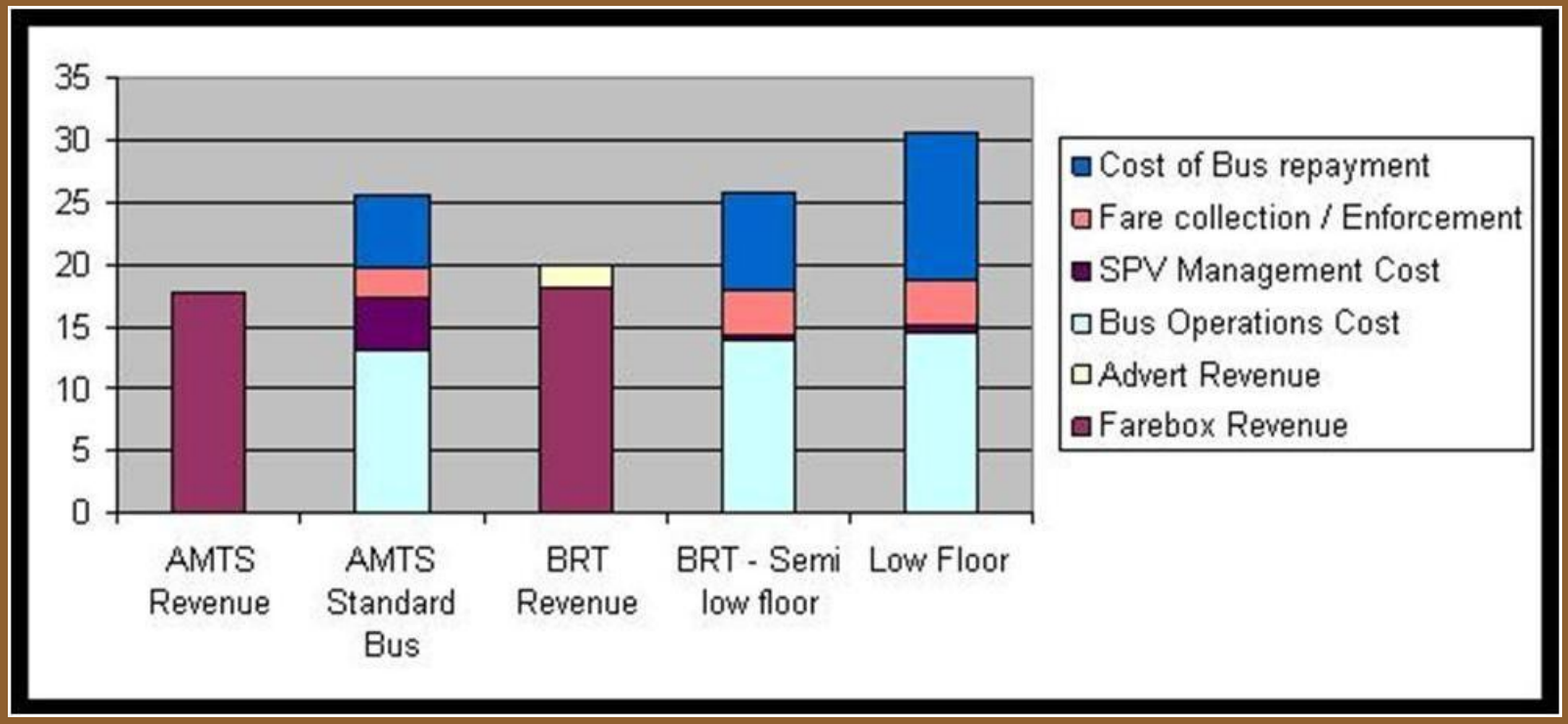
AMTS Fare Structure





- Average Trip distance 6.8km (short trips compared to other cities of the similar size
- Average Fare Rs. 4.20
- Two thirds of tickets sold are for Rs. 2-5
- Passenger price sensitive, distance based fare appropriate

Revenues and costs



Revenues can pay for operations cost but partial cost of rolling stock would have to come from viability gap fund

Phase-I operations plan

(Revenues and costs)

Bus Fleet	211 buses
Daily passenger trip	2 Lakhs
Annual Deficit with Low Floor bus (existing cost)	14.6 crores
Deficit if fare increased by 20% and taxes on bus are removed - Low Floor	6.39 crores
Annual Deficit with Semi low-floor bus (existing cost)	8.7 crores
Deficit if fare increased by 20% and taxes on bus are removed - Semi low-floor	1.71 crores

We propose to create an 'Urban Transport Fund' for viability gap funding under JnNURM

For a good business

- Monitoring of passenger demand on real time basis for optimum frequency and utilisation of rolling stock
- Strong contracting clauses and close monitoring
- Secure, efficient and simple fare collection systems
- Continuity in the team from inception to operation
- Integration of existing bus services in terms of routes and fare integration in terms of public transport pass and tickets
- Reducing transfers

For good business

- Strong in house capacity of the team through training
- Good communication plan
- Creating conducive public spaces like parking slots for **Janmarg** passengers
- Creation of state of art maintenance depots
- Strong maintenance regimen for the operators
- Ability to modify passenger fare when costs of operations increase

Bus Operation Contracts

• No permanent route allocation. Only kilometer contract. This allows changing the number of buses allocated on each route on a regular basis based on change in passenger movement patterns.

• Payment to operators would be in two parts. First part is payment for bus cost which would remain constant and paid on monthly basis. Second part would be variable based on number of operated kilometers paid on weekly basis.

• No minimum km guarantee per day. Guarantee of km only over a longer period of time (financial quarter / annual / entire term of contract). This allows variation in allocated km from day to day to optimize operations.

• Rate per kilometer is fixed based on formula which is adjustable on external factors like fuel cost, inflation indicators etc.

• Rate per kilometer would be sufficient for bus operator to provide good maintenance but not so high that the system has to be heavily subsidized

• Fines would be charged in number of payable kilometers for the operator. Money collected from fines would be redistributed amongst good performers

Our Plan

- Build physical infrastructure in phases
- SPV core team to be made functional at once
- Tender for bus operations to be finalised in Dec 2007
- Bus procurement process to start in Jan 2008
- Bidding for ITS hardware and software by Jan 2008
- Hardware and software for fare collection and real time monitoring equipment to be in place by May 2008

Our Plan

- Training of operation personnel in phases from April 2008
- Communication plan of Janmarg to be started in January 2008.
- Installation of integrated signaling system by April 2008
- Operational Plan to be put in place by Dec 2007
- Establishment of maintenance depots by May 2008

..Janmarg operations to start in Aug 2008.

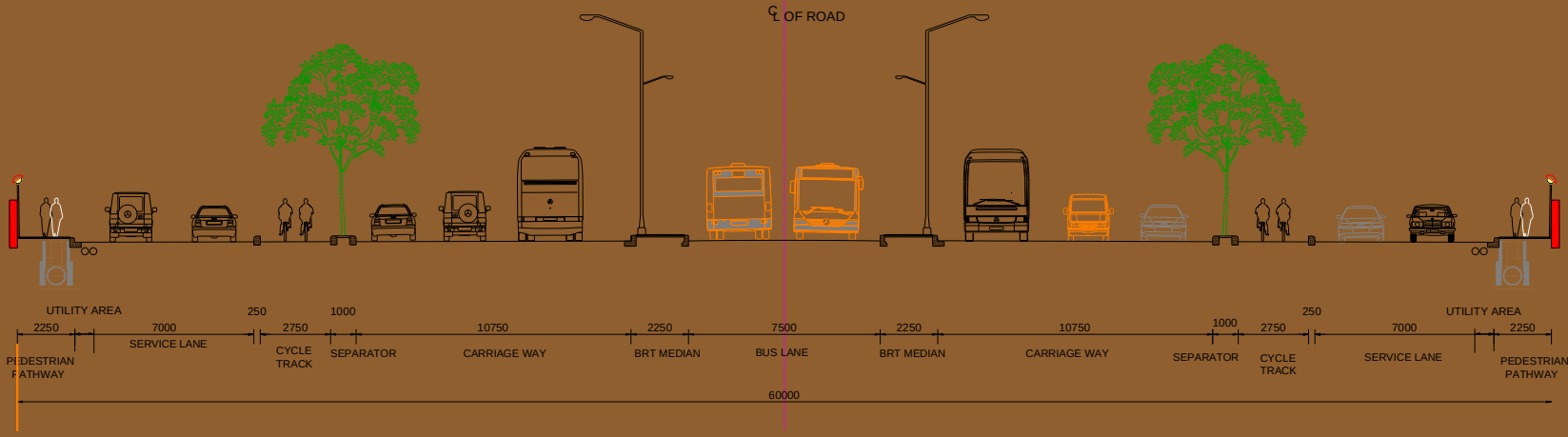
Issues in project execution

- Effective coordination between designers, contractor and construction manager
- Judicious interpretation of tender clauses after consultation
- Facilitation of fund flow
- Quality control
- Site issues-utility damages, private structure damages, trees relocation, traffic regulation
- Implementation of adequate safety measures-cordoning of the work-site, helmets and gears for the workmen, reflector boards,etc..
- Public information dissemination

The team believes in

- Flexibility
- Quick decisions
- Dialogue
- Persistence
- Continuous Improvement
- Interest of project above everything
- Micro-detailing
- **Long Term vision**

ROAD DESIGN – CROSS SECTIONS



ROAD CROSS SECTION – 60 m RoW

2.25 M - Pedestrian Pathway

7.0 M – Service Lane

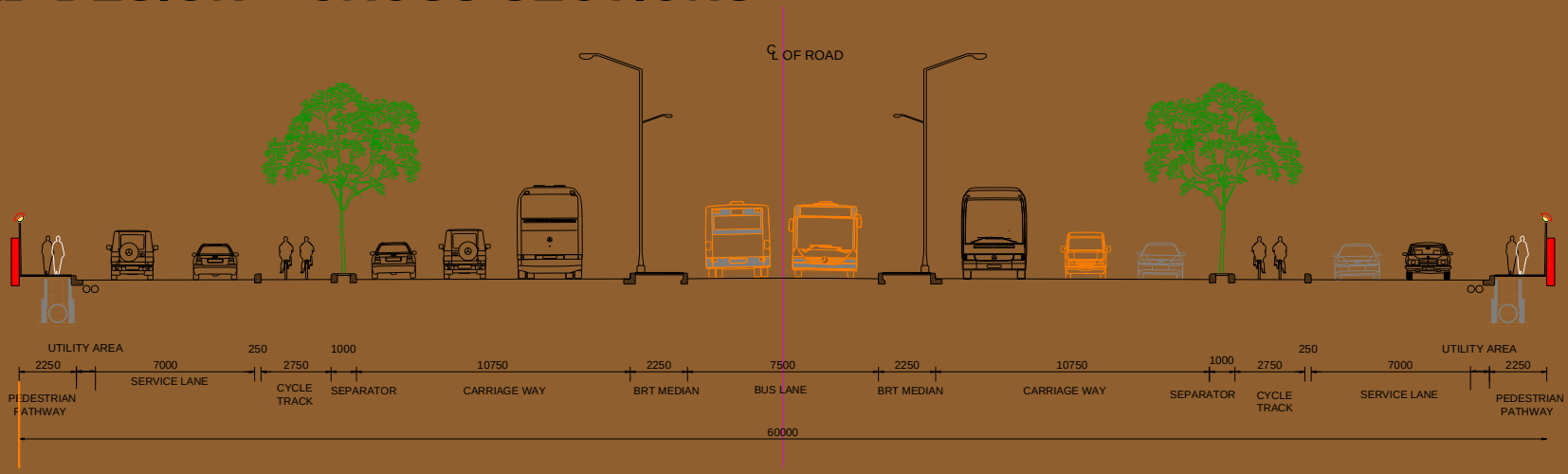
2.75 M – Cycle Track

10.75 M – Carriage Way

2.5 M – Separator between Carriageway and Bus Lane (Shrubs/Green)

7.5 M – Bus Lane

ROAD DESIGN – CROSS SECTIONS



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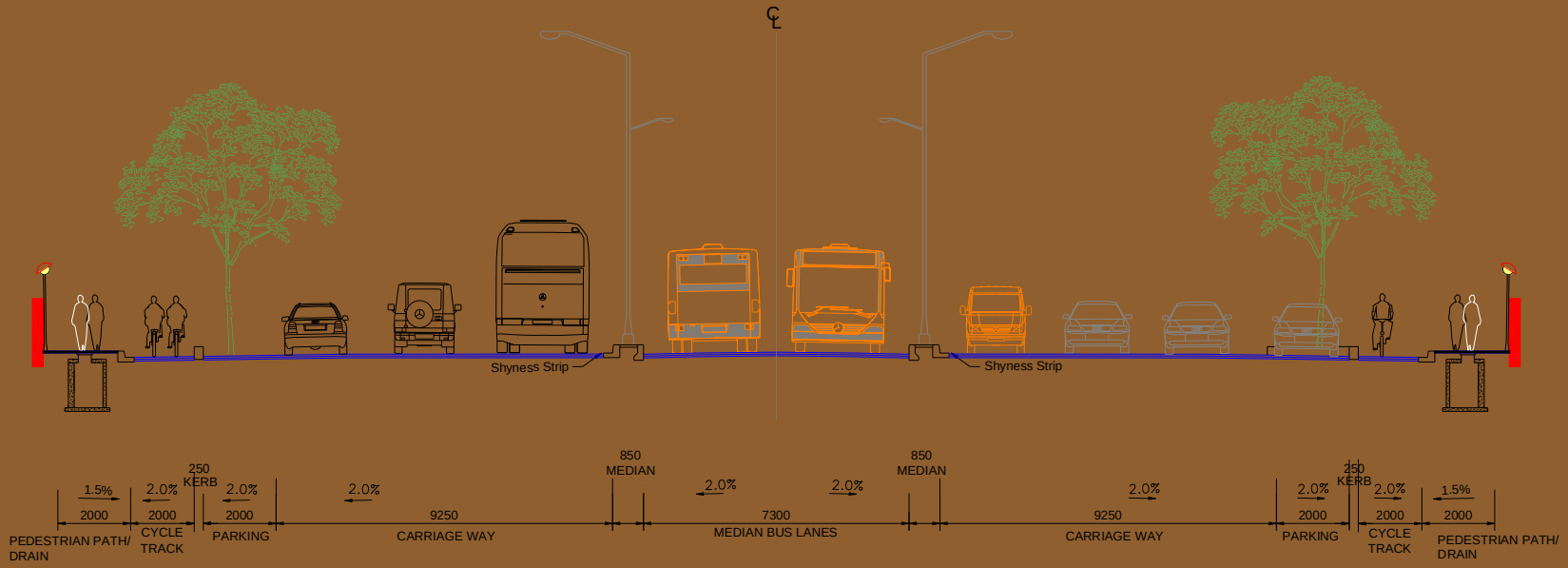
7.5 M – Bus Lane

ROAD DESIGN – CROSS SECTIONS



ROAD CROSS SECTION – 40 m RoW – MEDIAN BUS LANE

2.0 m – Footpath

2.0 m – Cycle track

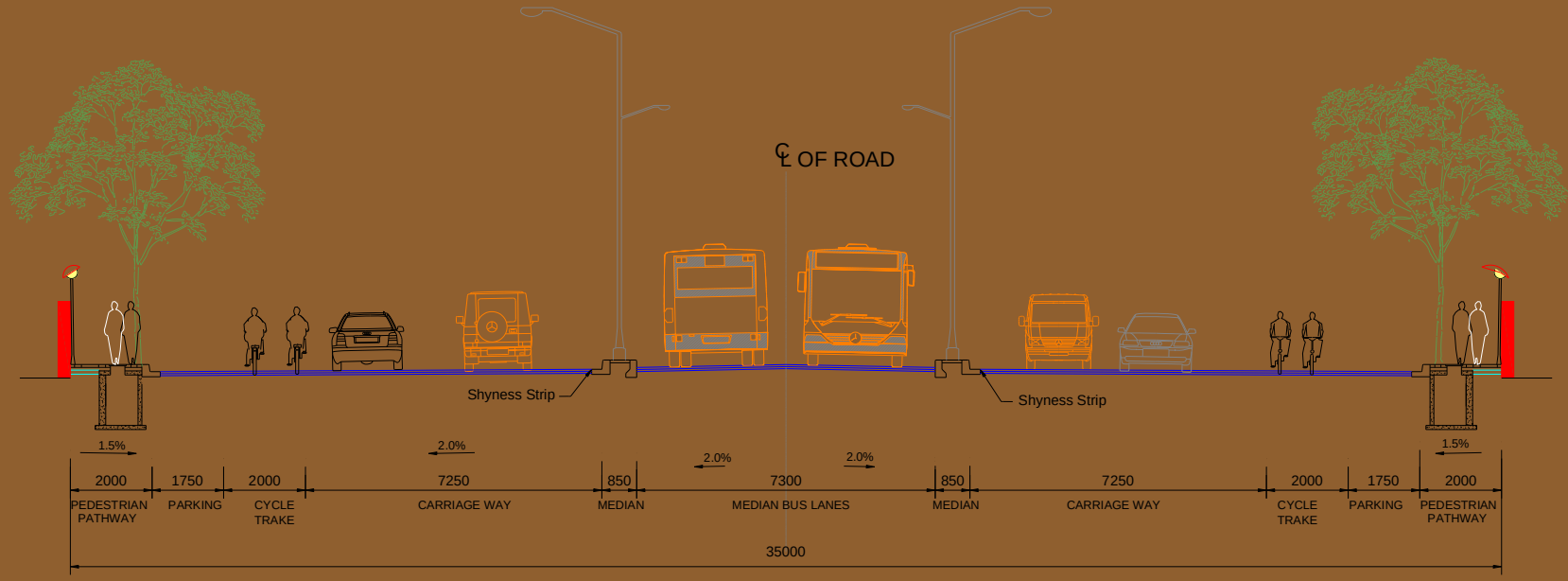
2.0 m – Parking

9.25 m – Mixed Traffic lane

0.85 m – footpath/Bus platform

7.3 m - BRT Lane

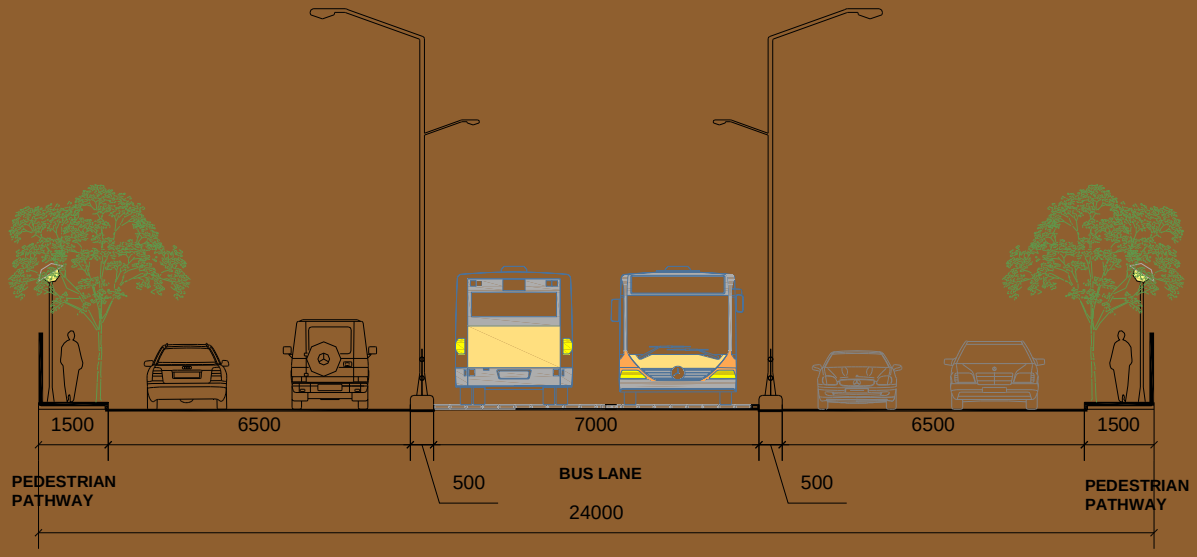
ROAD DESIGN – CROSS SECTIONS



ROAD CROSS SECTION – 35 m RoW – MEDIAN BUS LANE

- 2.0 m – Pedestrian Pathway
- 2.0 m – Parking
- 2.0 m – Cycle track
- 7.25 m – Mixed Traffic lane
- 0.85 m – footpath/Bus platform
- 7.3 m BRT Lane

ROAD CROSS SECTION – 24 m RoW – MEDIAN BUS LANE



Two Way Bus lane

ST workshop – Memco Junction

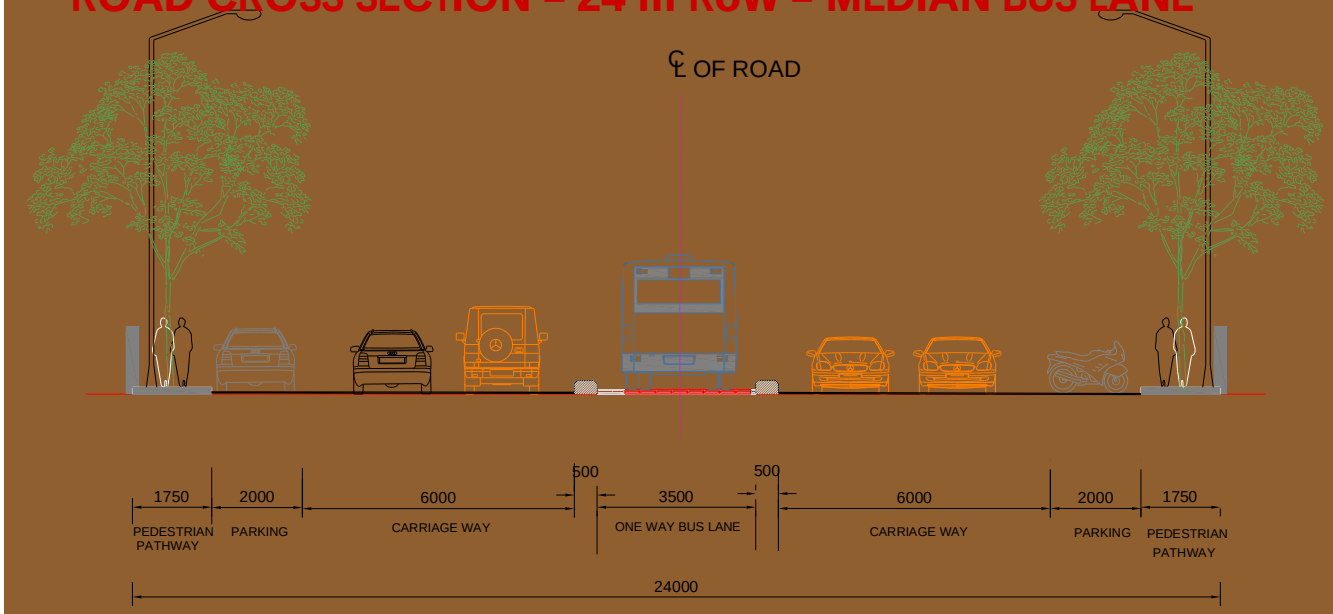
1.5 m – Pedestrian Pathway

6.5 m – Mixed Traffic Lane

0.5 m – Bus Median

7.0 m - BRT Lane

ROAD CROSS SECTION – 24 m RoW – MEDIAN BUS LANE

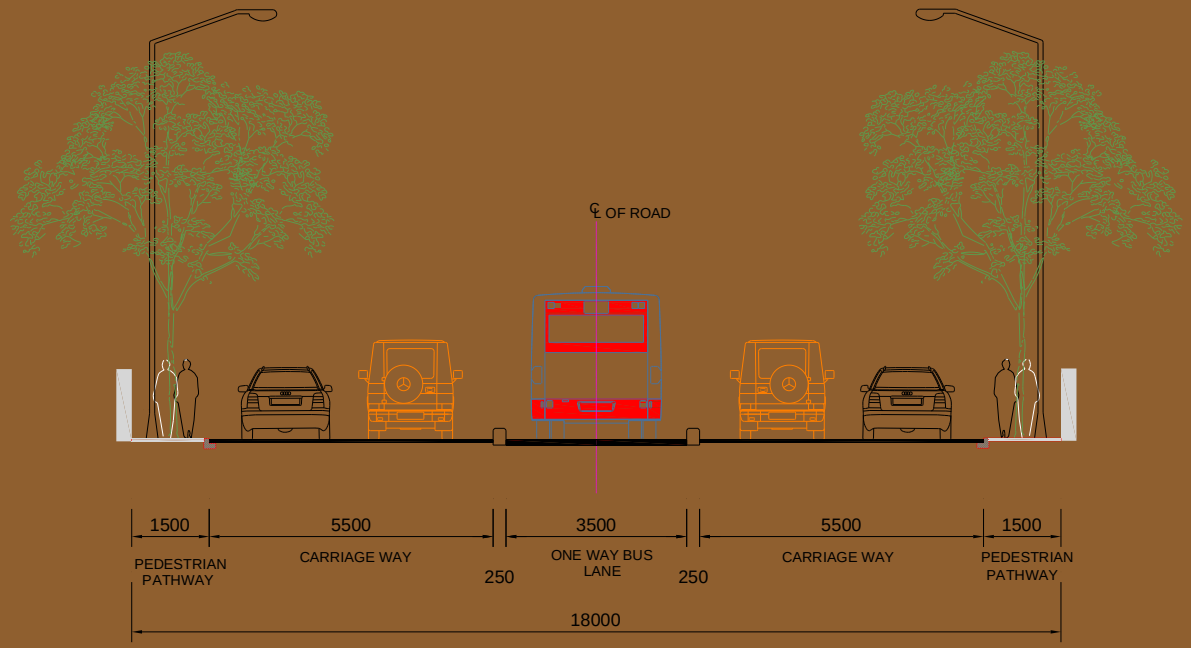


One Way Bus lane

Pushpakunj – Maninagar station Link

- 1.75 m – Pedestrian Pathway
- 2.0 m - Parking
- 6.0 m – Mixed Traffic Lane
- 0.5 m – Bus Median
- 3.5 m - BRT Lane

ROAD CROSS SECTION – 18 m RoW – MEDIAN BUS LANE



One Way Bus lane

Civil Hospital Link

1.5 m – Pedestrian Pathway

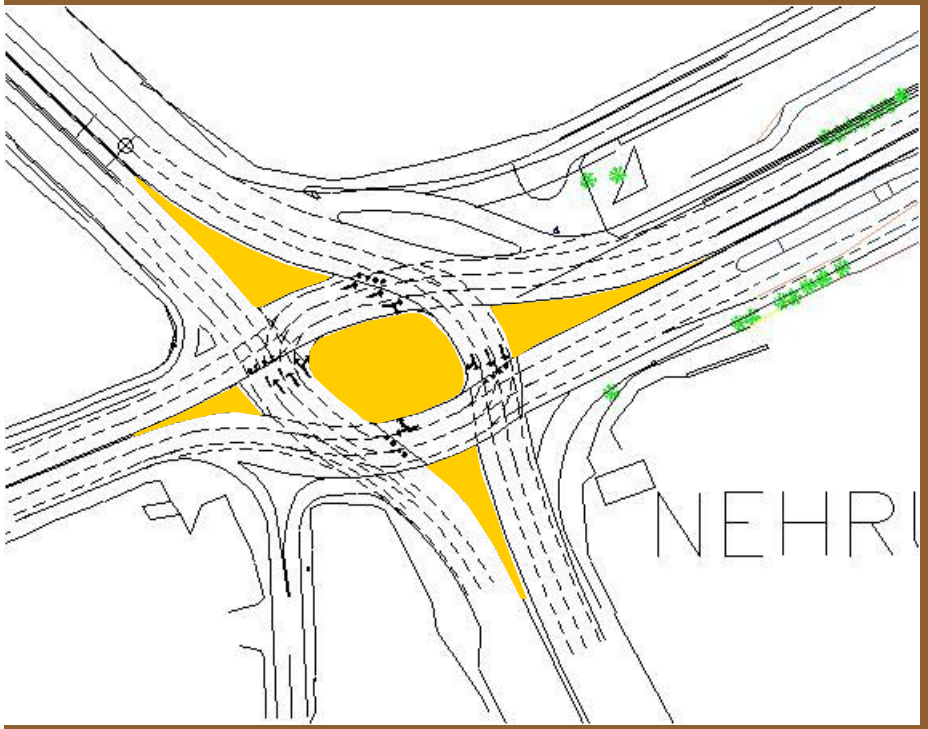
5.5 m – Mixed Traffic Lane

0.25 m – Bus Median

3.5 m - BRT Lane

JUNCTION DESIGN

CASE: NEHRUNAGAR



CASE: SAO PAULO