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Limited*

Enhancing accessibility & Innovations in Underground Construction

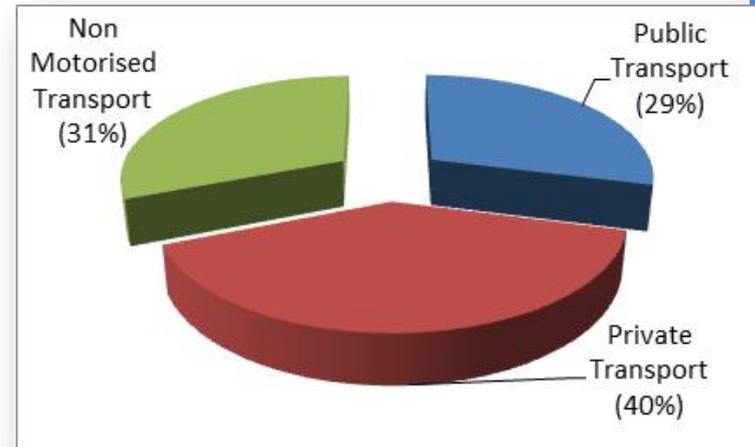
About Chennai City

- Chennai is known as the "Detroit of India" for its automobile industry
- Area
 - CMA – 1189 sq.km
 - City – 426 sq.km
- Demographic
 - CMA – 8.9 Million
 - City – 4.6 Million
- Annual Growth
 - CMA – 2.4%
 - City – 0.8%

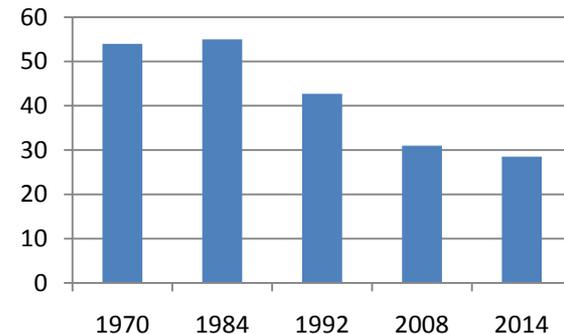


Mobility Pattern

- Total No of Vehicles – 4.75 Millions
- The two wheelers constitute 77% of registered motor vehicles
- Personalized vehicles (two wheelers & cars) account for close to 40% of the total trips
- Public Transport Scenario:
 - Bus – 4.5 Million trips/day
 - Sub Urban rail – 1.0 Million trips /day
 - MRTS – Around 0.12 Million trips/day
 - Metro – 0.65 Million trips/day (After Phase 1 Network Completion)



Modal Share



PT Share Trend

Chennai Metro Rail Network

- To Improve the share of Public Transport – Introduction of Chennai Metro Rail System
- Total Length – 54.1 Km – Along major arterial roads – Two Corridors
- Connecting important Transport hubs (Air/Rail/Road hub)
 - Chennai Airport
 - Chennai Central & Egmore station
 - Chennai Mofusill Bus Terminus (CMBT)
 - Suburban / MRTS Network – Washermenpet, Guindy, St. Thomas Mount Suburban and MRTS

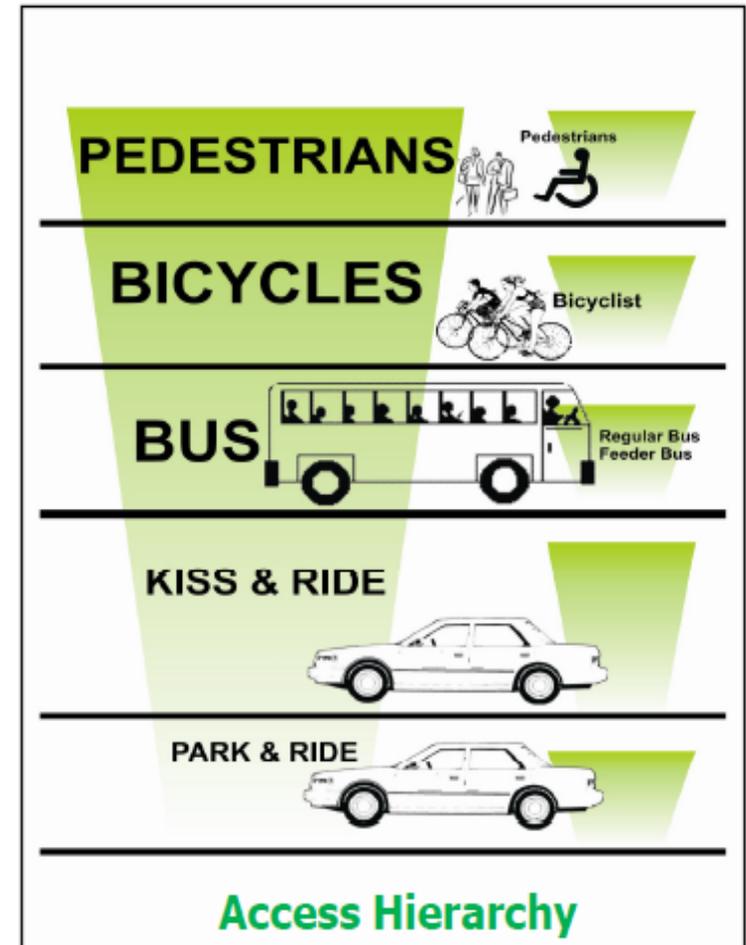


CMRL Initiatives: Towards Better Accessibility

- Implementation of Multi Modal Integration Strategy
- Metro Feeder Services by City Bus Transport Operators
- Formation of Chennai Central Square
- Merger of MRTS with CMRL
- Working Group of CUMTA
- Introduction of Non Motorized Policy

Multi Modal Integration

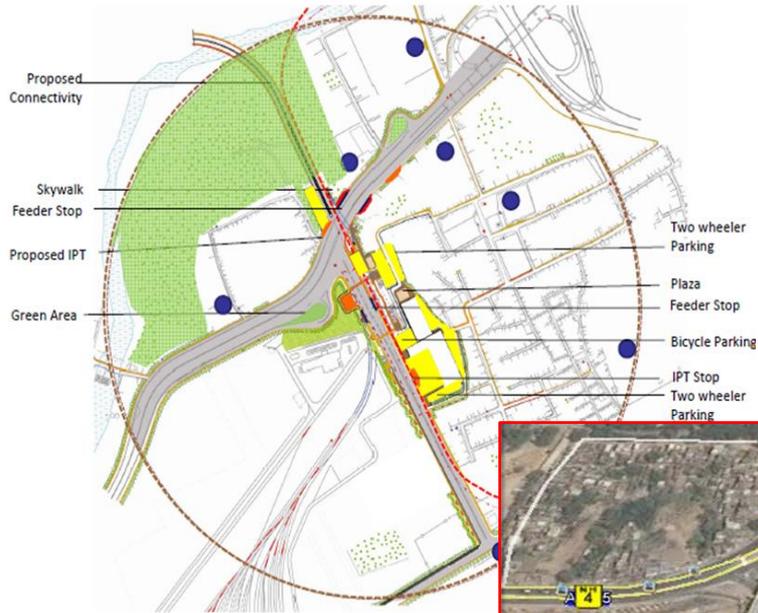
- Station Influence Area
 - 500 m (Walk)
 - 0.5-2.0 Km (IPT)
 - 2.0 – 5.0 Km (Feeder)
- Pedestrian Facilities
- Pick up & drop off facility
 - Bus/Feeder Bus
 - IPT
- Feeder services
- Parking Facilities
- Station Access Road Improvements
- Implementation:
 - 248 road/links
 - 30 Small Buses – 13 Routes



MMI Proposal – Road & Footpath Improvements

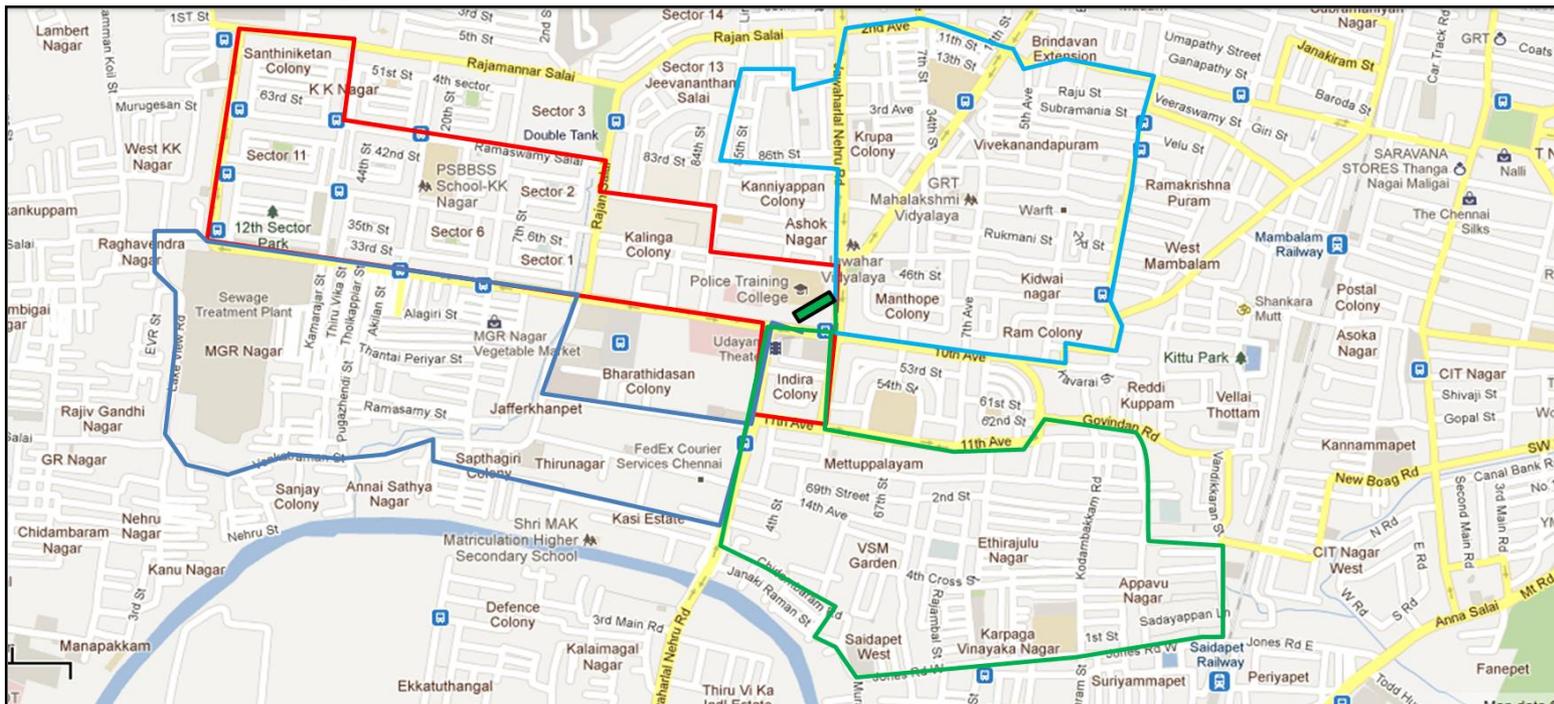
Sl.No	Station Name	No of identified roads/Links	Completed works	Balance
1	Koyambedu	22	20	2
2	CMBT	21	20	1
3	Arumbakkam	94	90	4
4	Vadapalani	62	46	16
5	Ashok Nagar	42	29	13
6	Ekkatuthangal	39	21	18
7	Alandur	48	35	13
Total		328	261	67

Koyambedu Metro Station - MMI Proposal



Metro Feeder Bus Services

- City Bus
 - 3843 Nos / 834 Routes
- Small Bus
 - 200 Nos / 86 routes
- CMRL Feeder Bus
 - Operated by MTC
 - 32 Nos/15 routes
 - Average lead – 6.0 Km



Ashok Nagar Metro Station – Feeder Bus Routes

MMI Proposal – Identified Feeder Bus Routes

Sl.No	Station Name	No of identified Routes
1	Koyambedu	4
2	CMBT	5 (Bus – 3 & IPT – 2)
3	Arumbakkam	2 (IPT)
4	Vadapalani	6
5	Ashok Nagar	4
6	Ekkatuthangal	2
7	Alandur	2
8	St. Thomas Mount	3
9	Little Mount	2
10	Guindy	3
11	Nanganallur road	3
12	Meenambakkam	2
13	Airport	3

- Operational Routes – 15 Nos
- Fleet Size – 32 Nos

Last Mile Connectivity Initiatives

Chennai Metro Rail Limited
CHENNAI METRO RAIL LIMITED

மணலித் துருத்தித் துருத்தித் துருத்தித்
FEEDER BUS SERVICE AVAILABLE

செரு
துர்கா
Nehru
Park

சென்னை
சென்ட்ரல்
Chennai
Central

வழி - எழும்புளி Via - Egmore

மினிஸ் டிஸ்டென்ஸ்
ஆர்டிங் எண் **₹96**



Seamless connectivity for metro commuters

CMRL has tied up with corporate big-wigs like OLA & UBER for enhancing and promoting last mile connectivity at several metro stations.



Disabled Friendly Stations

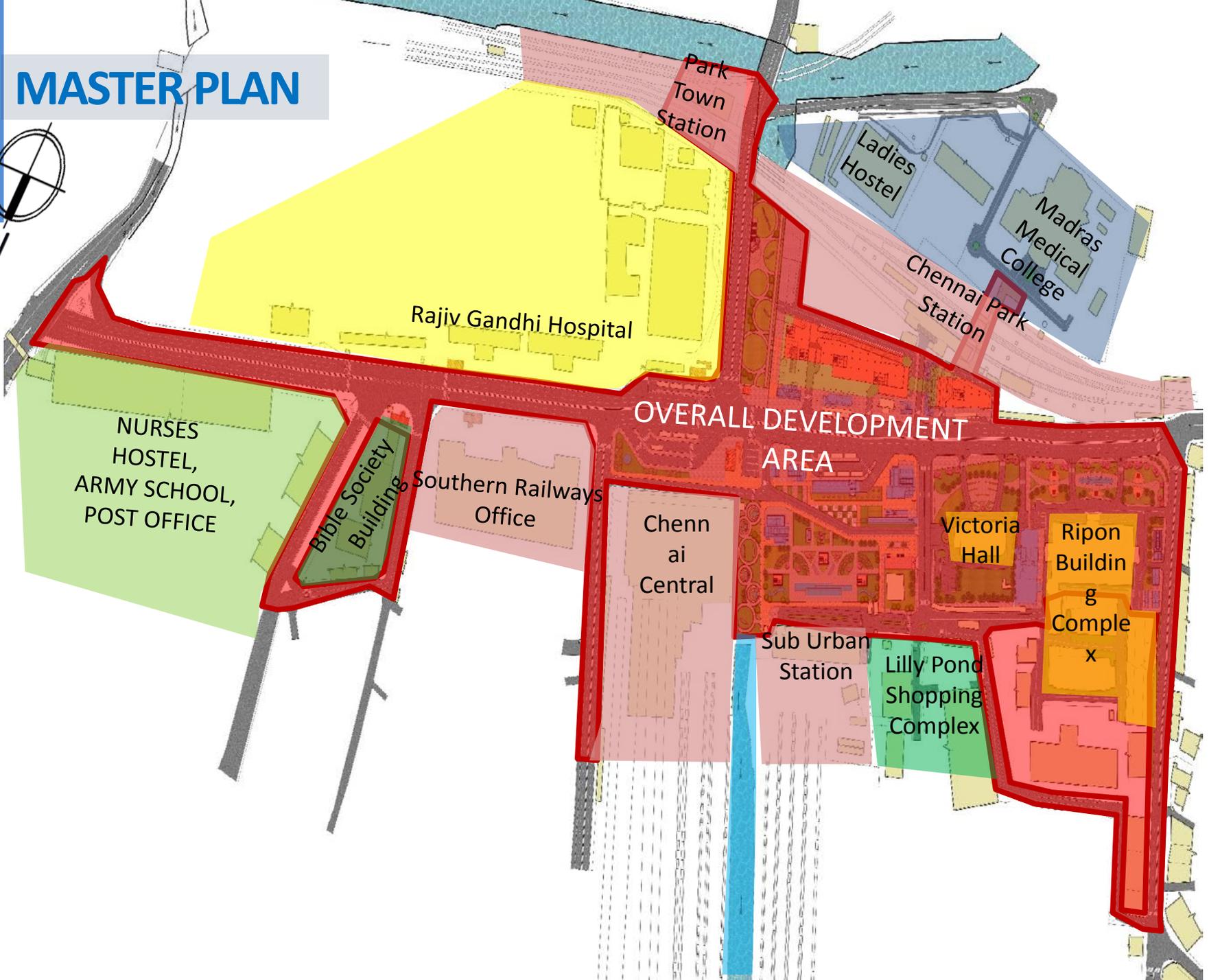
- Wheel chairs at all stations.
- Extra wide automatic Flap gates for wheel chairs.
- Tactile pathway for visually impaired.
- Special toilets for disabled persons.
- Provision of hand rail alongside stairs.
- Lifts provided with wide access doors, Hand rails, call buttons in braille at low height, Audio visual indication and call buttons.
- Signage at prominent locations provided for disabled and mobility restricted passengers.

CHENNAI CENTRAL SQUARE

- Chennai central metro Station – Underground station accommodating stations of Corridor 1 and Corridor 2 in two levels.
- Proposal of developing around Central metro station includes underground parking, passenger facilities, MRTS stations, Suburban stations, Chennai Central Station, Bus terminal and with private modes of transport. – Multi modal integration.



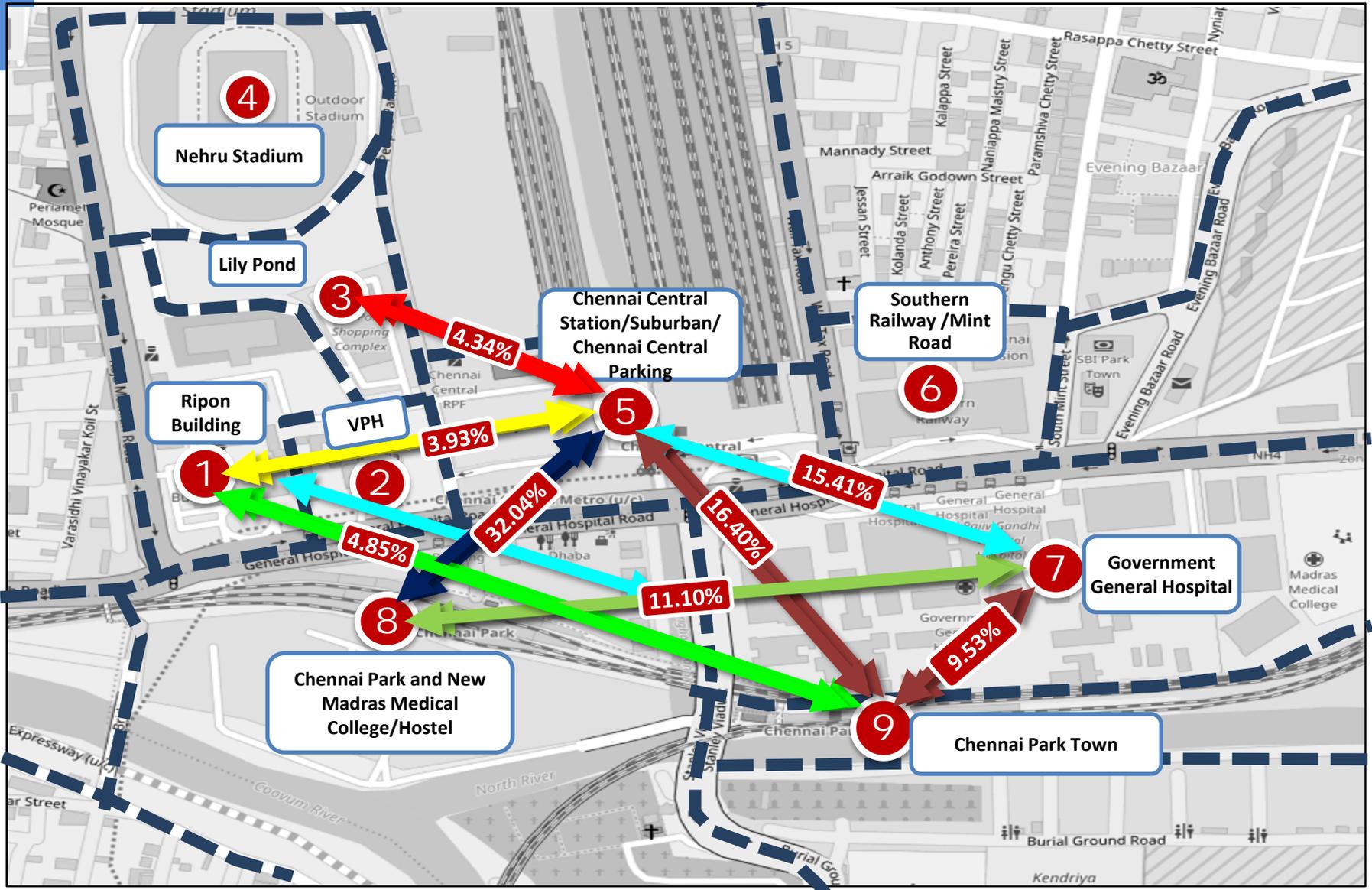
MASTER PLAN



Pedestrian Traffic Volume

Sl. No	Location	Pedestrian Volume
1	Chennai central railway station, central bus bay , FOB, Sub urban Railway station, Chennai Park and Park town railway station	422815
	Other Traffic Generators	
1	Rajiv Gandhi Hospital	20693
2	Rippon Building	49540
3	Lilly Pond Shopping Complex	32172
4	Wall tax road{Along the road}	64860
5	Pallavan Salai Flyover {Along the road}	48051
	Total Pedestrian Volume	638131

Intra Zonal Movement : Pedestrian

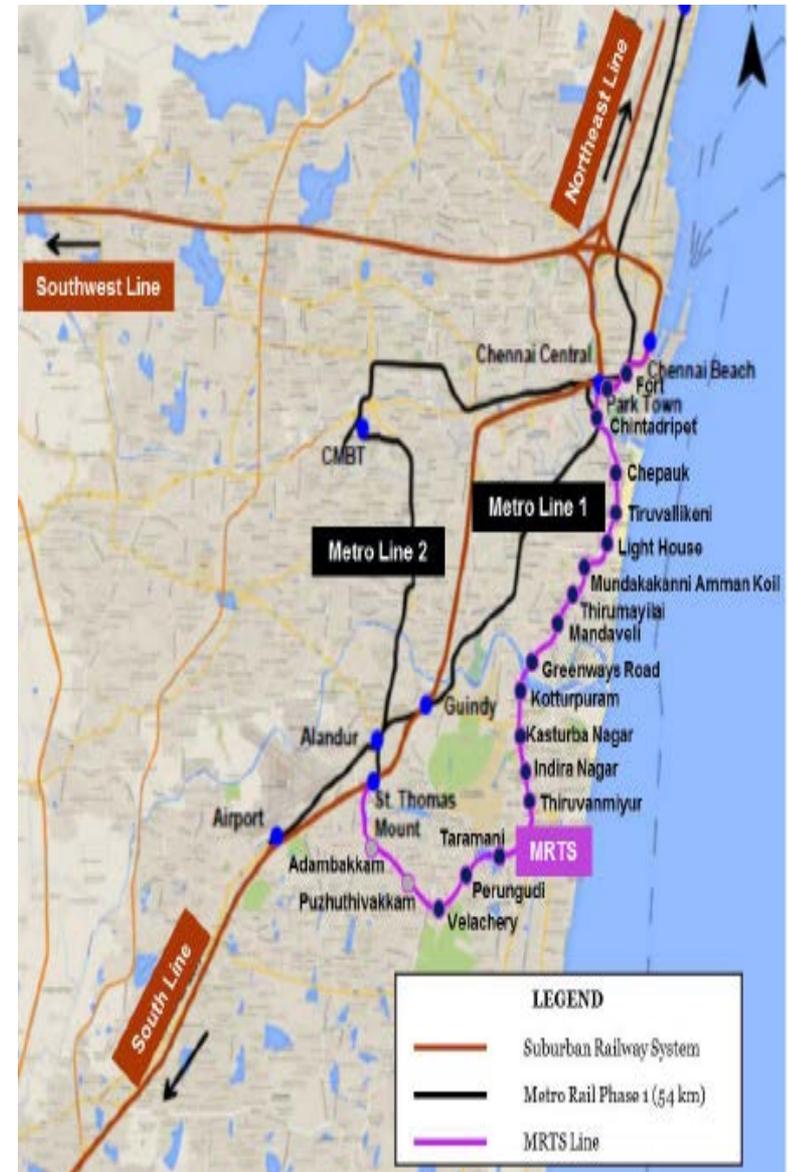


Vehicular Traffic

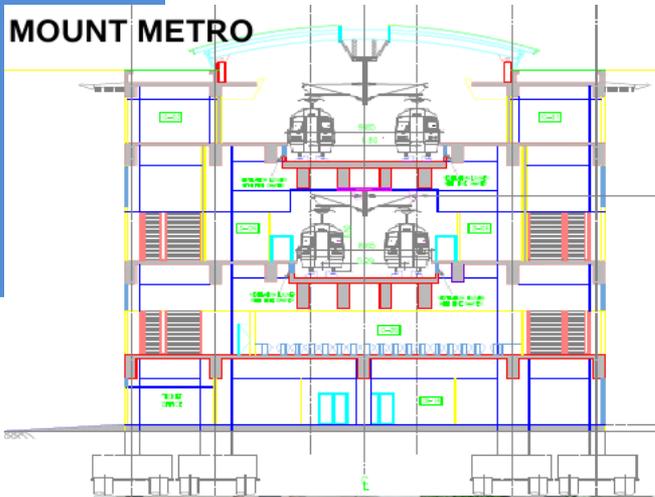
Daily Traffic			
Sl. No	Location	In terms of Numbers	In terms of PCU
1	Ponammalle (Veerasaamy road)	89029	106256
2	Ponammalle (Rajamuthaiya road)	33175	36396
3	Moore market	19310	22266
4	General Hospital road & Pallavan salai JN	124183	144322
5	Pallavan Salai Flyover	74050	81873
6	Wall tax road Jn and Pallavan salai Jn	122527	146730
7	Wall tax road	32996	38972
8	Govt Hospital between wall tax road Jn & evening Bazaar road	128314	141647
9	On PH road after GH	53970	61162
10	South Mint road	48278	56924

Merger of MRTS with CMRL

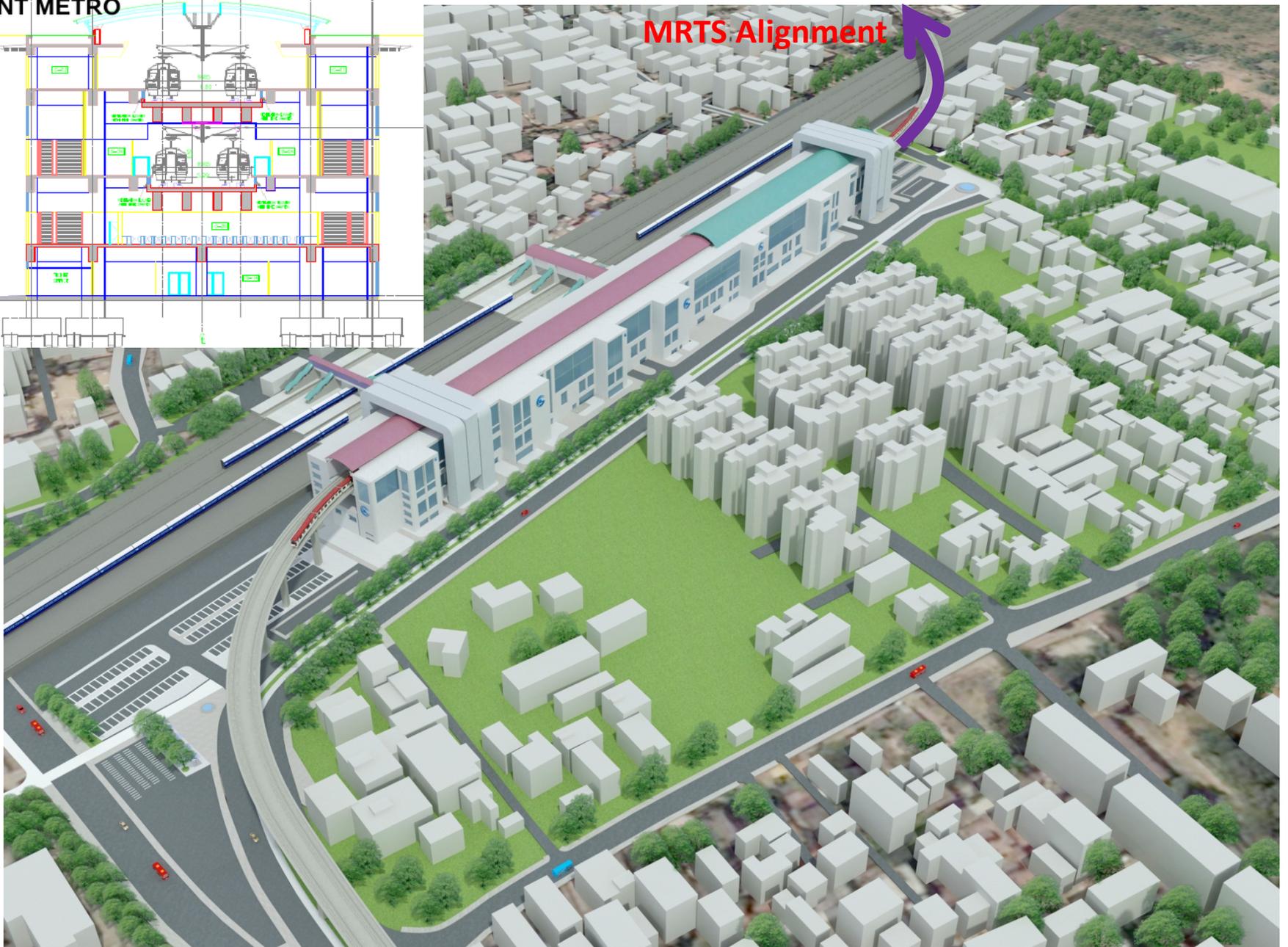
- Total length – 24.5 Km/ 21 Stations
- Operational – 19.5 Km/18 Stations
- Integrated with Metro at St. Thomas Mount
- Phase 1 of CMRL Project approval includes, the integration of MRTS with CMRL
- Tamil Nadu, a first mover in attempting to implement such an integration
- Detailed Study is under progress



MOUNT METRO



MRTS Alignment



St. Thomas Mount Integrated Station (Suburban, MRTS & Metro)

CUMTA

- CUMTA Act, 2010 – establishment of a Unified Metropolitan Transport Authority for Chennai Metropolitan Planning Area
- Formation of Executive Committee
- Formation of Four Working Committees:
 - Integration of Public Transport Modes
 - Infrastructure and promotion of Non Motorized Transport (NMT)
 - Resource Mobilization
 - Traffic Safety

Non Motorized Policy

- Introduction of Non Motorised Transport Policy – 2014 by Corporation of Chennai - First city to adopt Non-motorized Transport Policy
 - Increase the Modal share of NMT (at least 40%)
 - Ensure 80% of street have footpaths
 - Ensure 80% of street (Row >30m) – Cycle Track of 2m width
 - Improve Public Transport modal share
 - Reduce the number of Pedestrian & cyclist fatalities
 - Implementation – 50 Km.





Before

BEFORE



Present

PRESENT



N.S.C Bose Road

Before

BEFORE



PRESENT

Present

BESANT NAGAR 2ND AVENUE



BEFORE

PRESENT





Innovations in Underground Construction

Reduction of underground station box size

Need for reduction of station box size

- Land availability is a major impediment
 - Caused delays in several infrastructure projects including Chennai Metro Rail Project Phase 1 construction
 - Delays due to litigation on account of land acquisition encountered
 - Partial handover affects the scheme of implementation and causes change in construction sequence, increase in number of temporary traffic diversion schemes, etc.
 - Delay in land handover has been the reason for several claims by contractor
 - Reduction in land acquisition is a need
- Enabled positive change in the community on account of lesser land acquisition to provide the public transportation network.

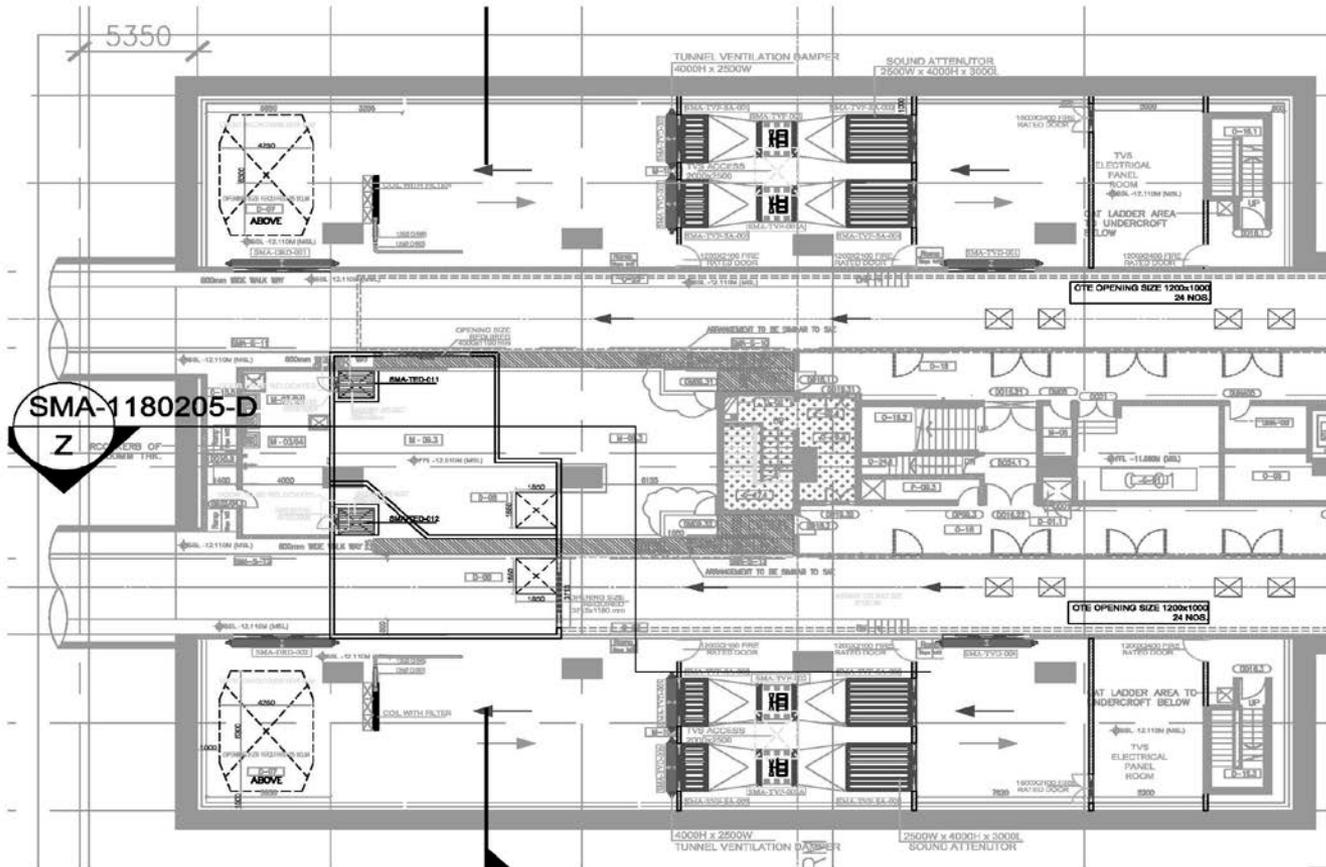
Methodology adopted

- Study of optimization of space utilization for the various systems that are integral components for the operation and smooth functioning of Metro stations.
- One of the major changes that helped in actualizing the small station concept is the redesign of the tunnel ventilation system. This has resulted in the arrangement of vertical fans, as against the horizontal fans as proposed in Phase 1.
- Revamping the space utilization concept of the stations

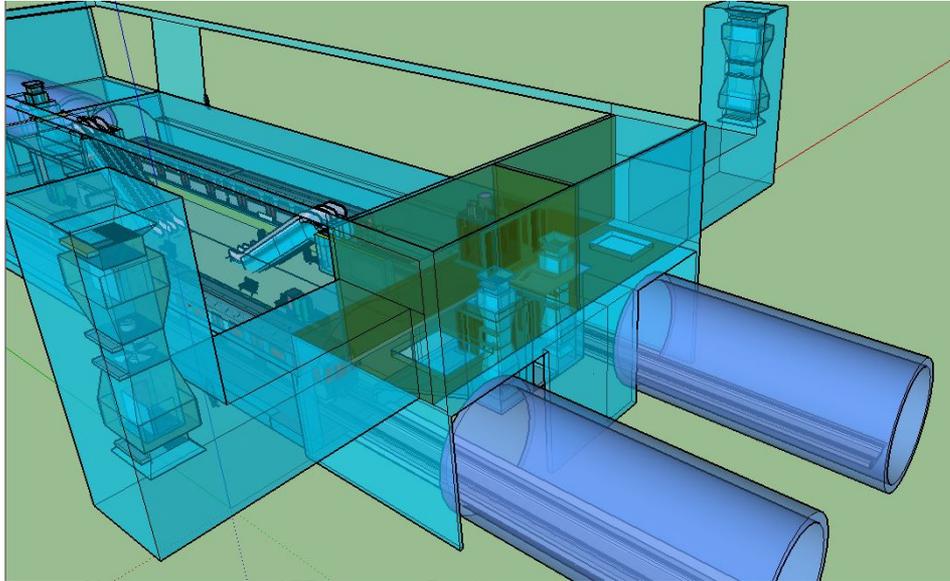
TVS fan position in existing Phase 1 Station

Phase 1 underground stations are accommodating 4 TVS fans kept horizontally.

TVS Fans
Sitting at
Concourse
level

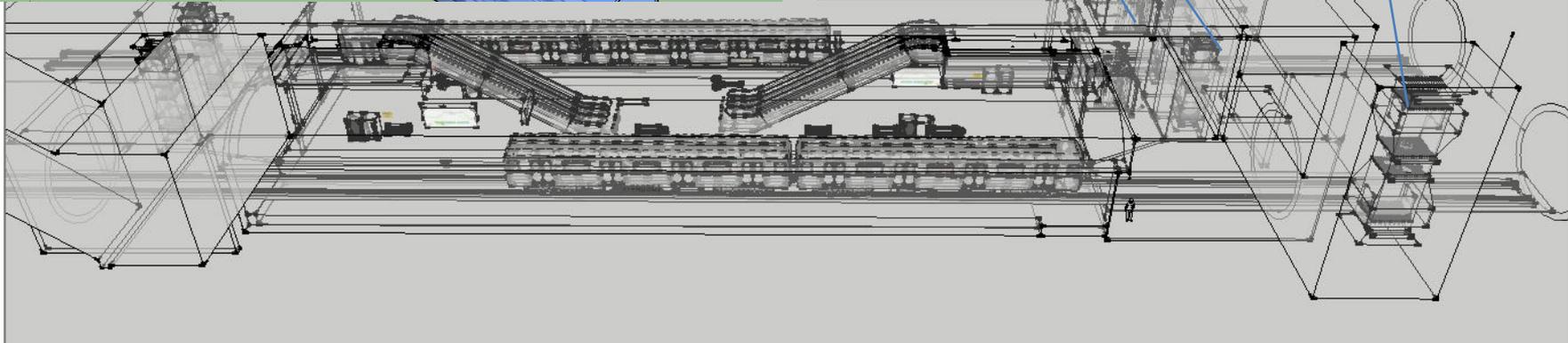


Arrangement of vertical fans - Schematic Model

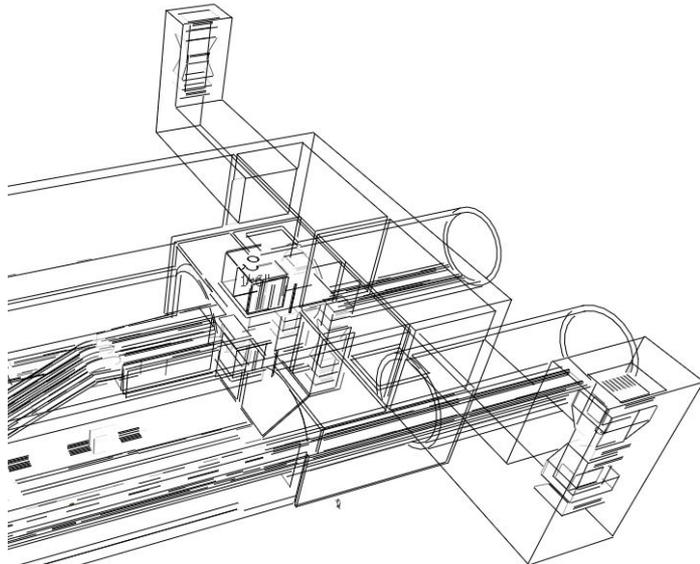
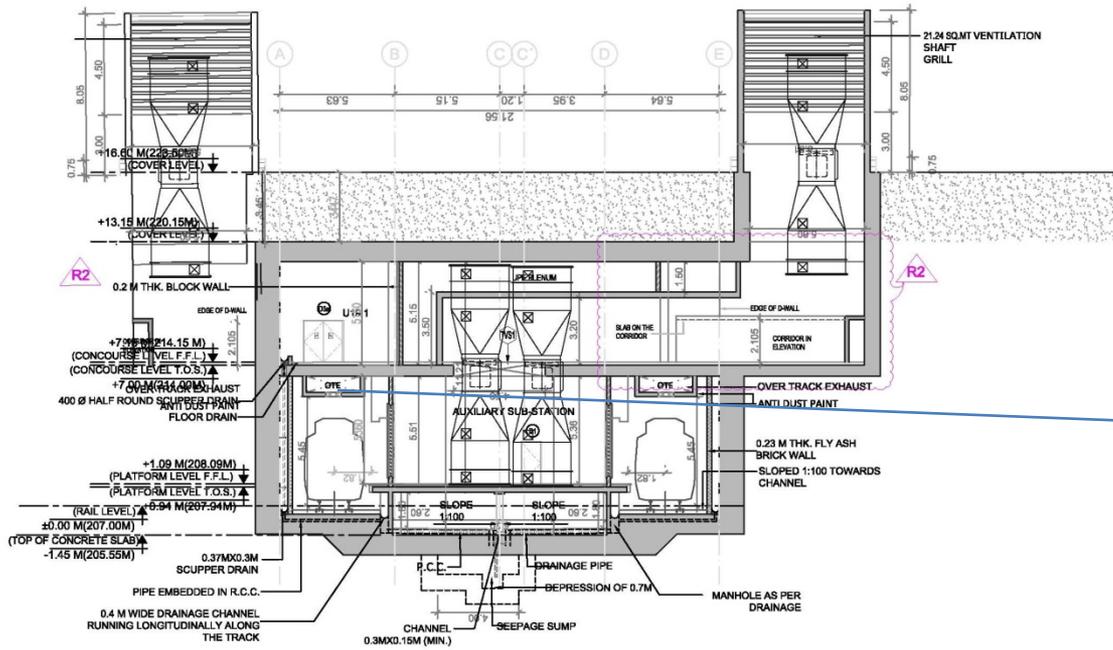


TVS Fans Starting outside the station box in Vent shaft.

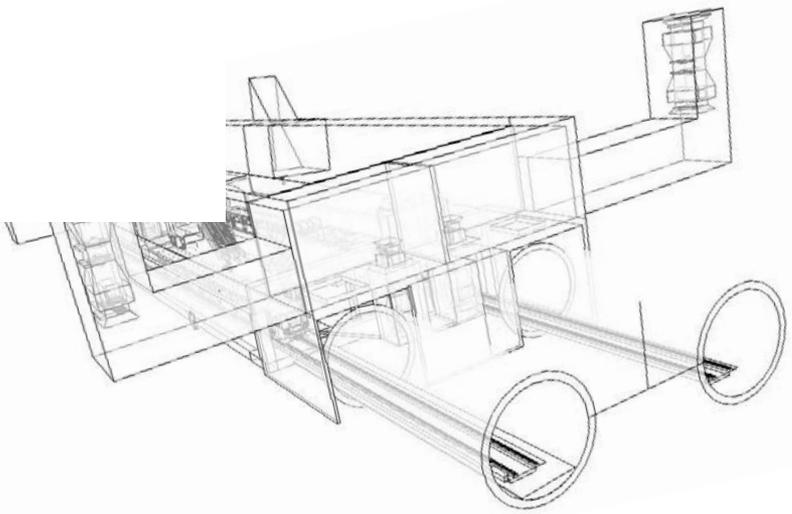
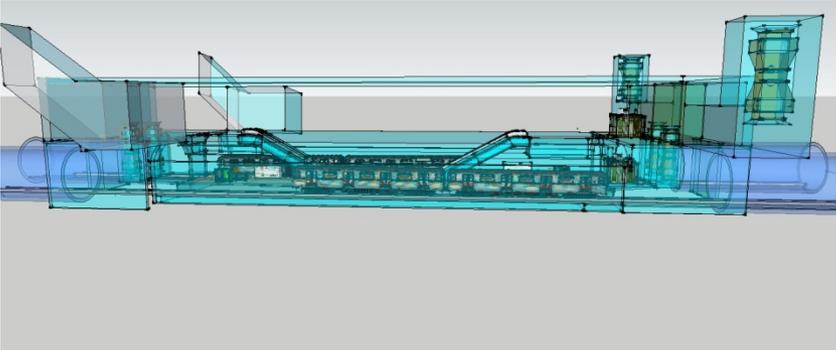
TVS Fans starting straight away from platform level



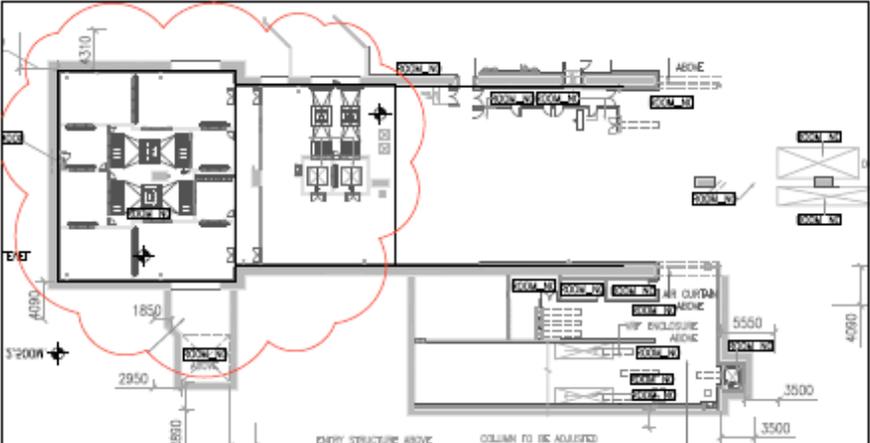
Section & Views



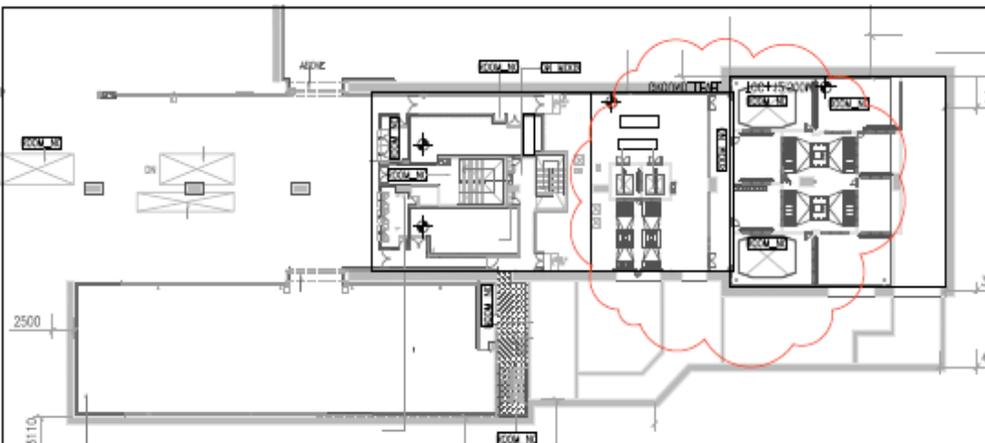
OTE Ducts can be sacrificed in this case



Phase – 1 Arrangement of Fans in Under Ground Station

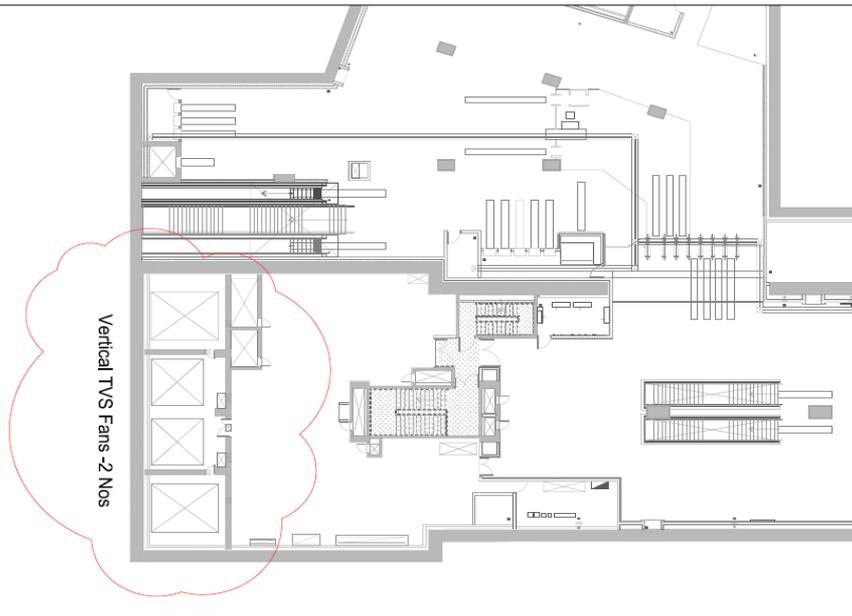


Station
LHS

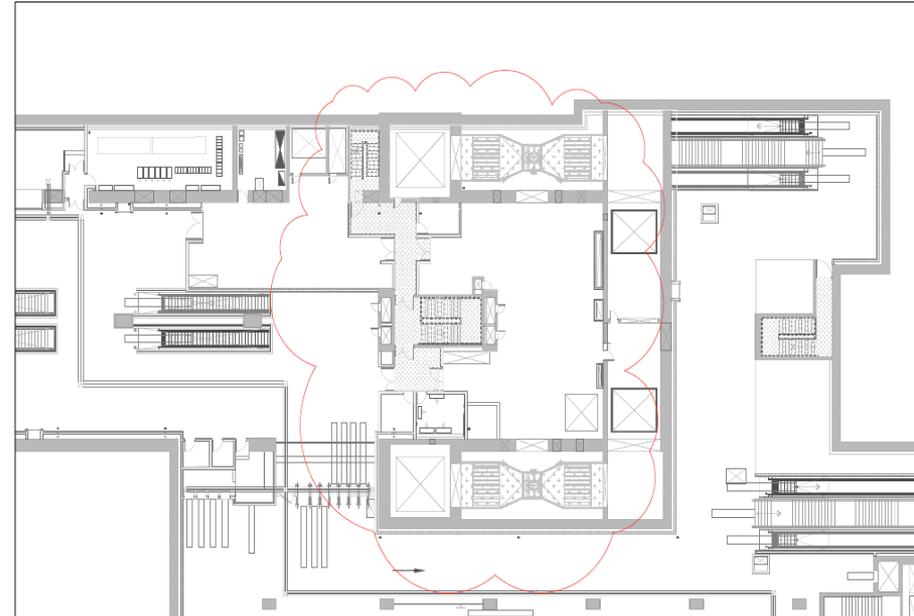


Station
RHS

Phase – 1 Extension : Arrangement of Fans in Under Ground Station

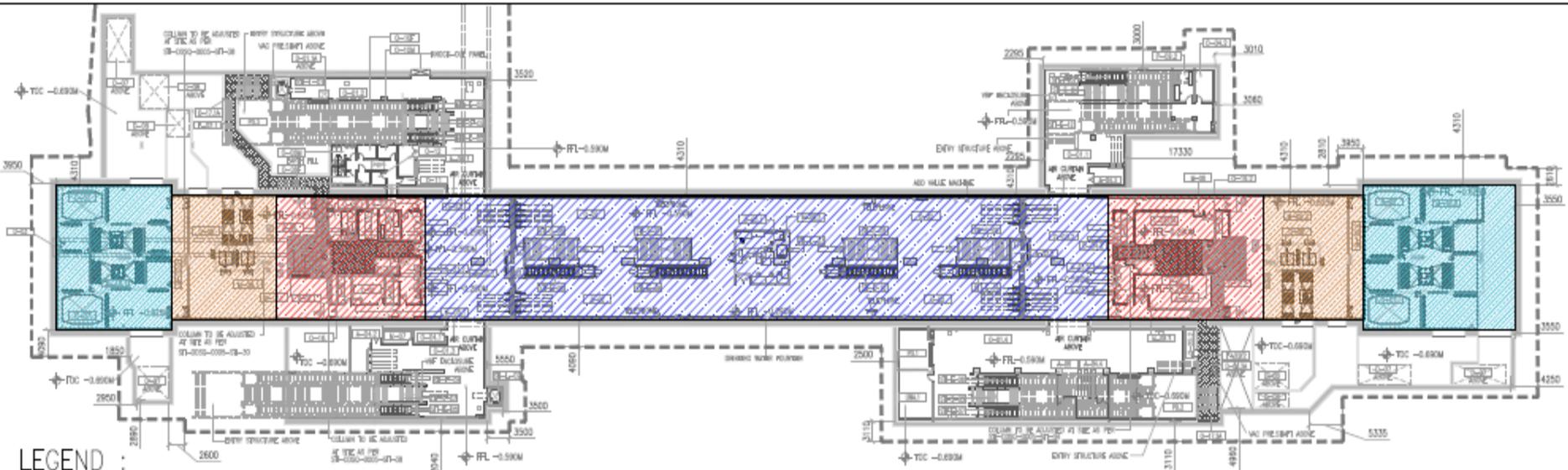


Station LHS



Station RHS

Phase – 1 Concourse Level – Space Utilization in Under Ground Station



LEGEND :

	- M - 10
	- M - 09
	- System & O&M Rooms
	- Passenger Area

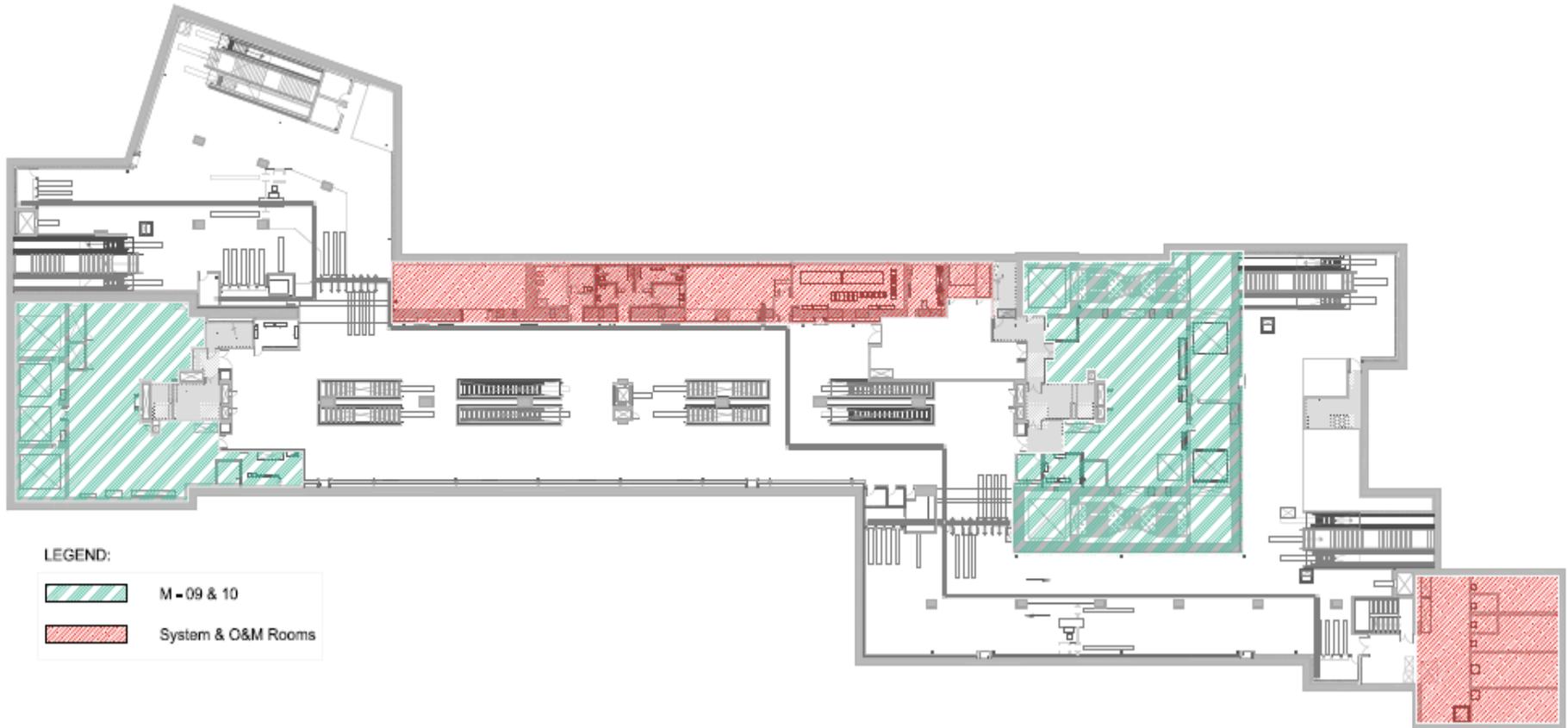
Phase – 1 Concourse Level – Space Utilization in Under Ground Station

- Total Length of Station Box 230 m.
- Public circulation area 140 x 22m.
- M – 10 (TVS Room) 1000 Sqm.
- M – 09 (HVAC Room) 620 Sqm.
- Back of House Area Accommodating System Rooms such as Communication Rooms, AFC Rooms, O&M Rooms etc 920 Sqm.

Phase – 1 Platform Level – Space Utilization in Under Ground Station

- Total Length of Station Box 230 m.
- Platform length 140 m.
- M – 10 (TVS Room) 350 Sqm.
- M – 09 (HVAC Room) 325 Sqm.
- System Rooms such as Communication Rooms, PSD Rooms, O&M Rooms etc 175 Sqm.

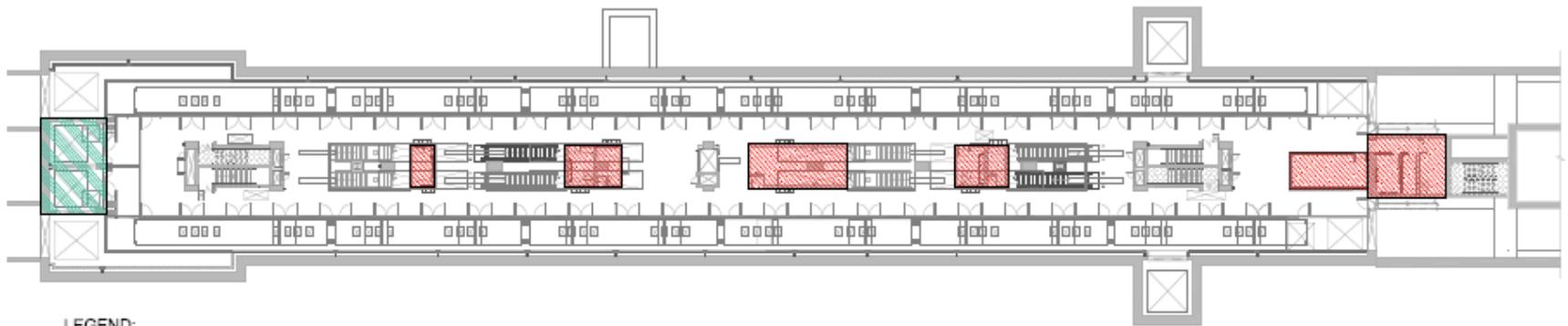
Phase – 1 Extension Concourse Level – Space Utilization in Under Ground Station



Phase – 1 Extension Concourse Level – Space Utilization in Under Ground Station

- Total Length of Station Box 150 m.
- Public circulation area 140 x 27m.
- M – 9 &10 (TVS & HVAC Room) 1300 Sqm.
- Back of House Area Accommodating System Rooms such as Communication Rooms, AFC Rooms, O&M Rooms etc 800 Sqm.

Phase – 1 Extension Platform Level – Space Utilization in Under Ground Station



LEGEND:



M 09 & 10



Systems & O&M Rooms

Phase – 1 Extension Platform Level – Space Utilization in Under Ground Station

- Total Length of Station Box 150 m.
- Platform length 140 m.
- M – 09 &10 (TVS Vertical Fan) 75 Sqm.
- System Rooms such as Communication Rooms, PSD Rooms, O&M Rooms etc 220 Sqm.

Positive design changes implemented

- System rooms have also been distributed to platform level, concourse level and ancillary building at street level.
- Arrangement of vertical fans, as against the horizontal fans as proposed in Phase 1.
- The length of the station box for underground station has been reduced to 150m from 230m.

Benefits reaped during Construction phase:

- Utility diversions reduced.
- Extent of site clearance reduced
- No. of trees cut has been reduced
- Reduction in materials consumed
- Reduced the construction period
- Reduction of social and environmental impacts around work areas

Expected outcome

- Optimization of space utilization improving efficiency of utilization
- Providing sustainable transport option
- Reduce the construction period and set the model for the optimization of the spaces.
- Achievement of reduced construction cost
- Drastic reduction in the operation and maintenance cost for small stations.
- The decrease in the power consumption, water utilization and supporting services after the construction period
- Motivates sustainable developments around the station
- Property development scope has been increased as funds for land acquisition is available
- Set the model for the optimization of the spaces.

Thank You!