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Looking Beyond Conventional: Alternate Approach to designing Sadar Bazar Metro Station

Presented by:

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SADAR BAZAR

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INTRODUCTION

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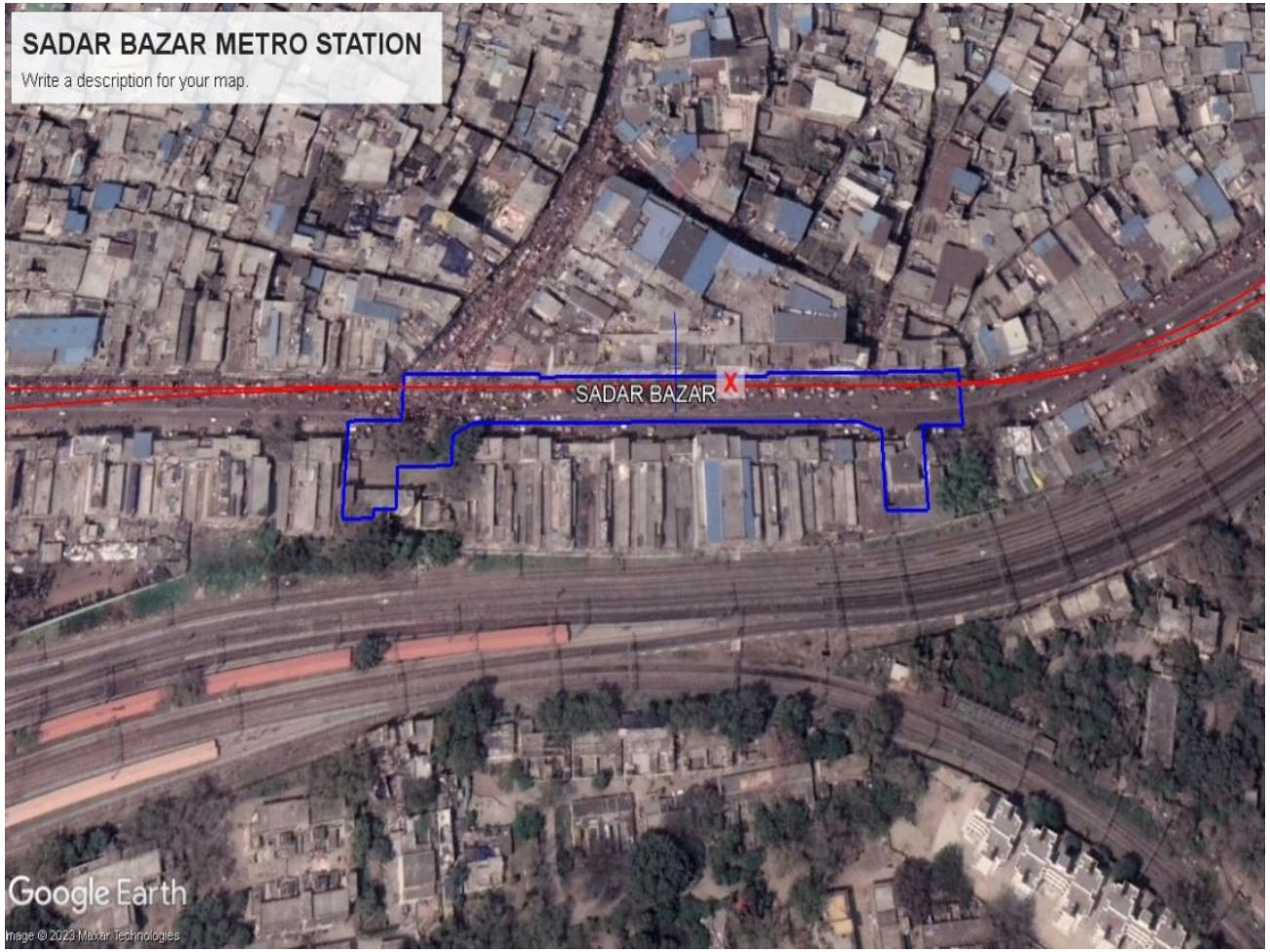
- Sadar Bazar Metro station is located in the main carriageway of the Qutub Road of the Sadar Bazar Market.
- It is a part of Line-8 ext of DMRC corridor of Janakpuri to Rama Krishna Ashram Marg.
- The initial adopted methodology has been revised at later stage to a more resilient and sustainable solution for the construction of the Sadar Bazar Metro Station



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CHALLENGES

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TRAFFIC CONGESTION

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MOVEMENT OF HEAVY VEHICLES FOR LOADING/UNLOADING OF GOODS

STREET VENDORS AND PEDESTRIAN CONGESTION

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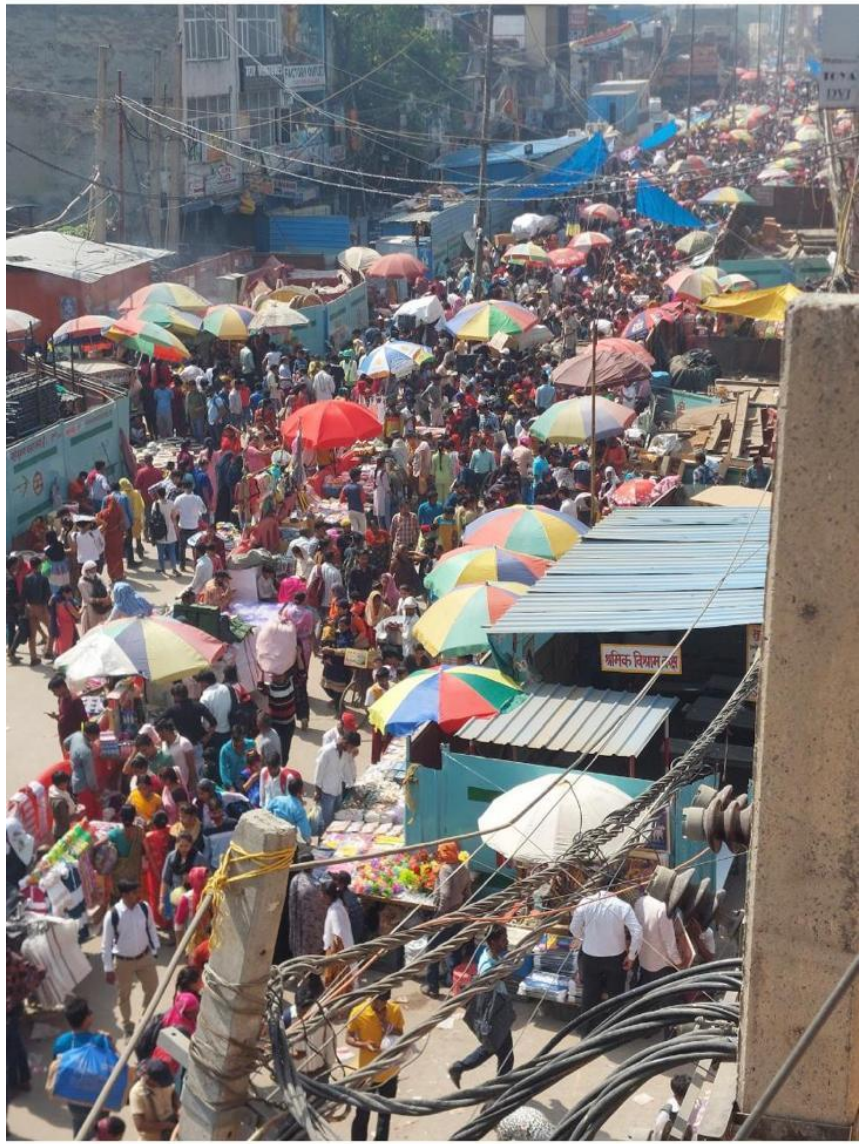
STREET VENDORS AND PEDESTRIAN CONGESTION



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Lack of available unoccupied land in the vicinity

Dilapidated Structure

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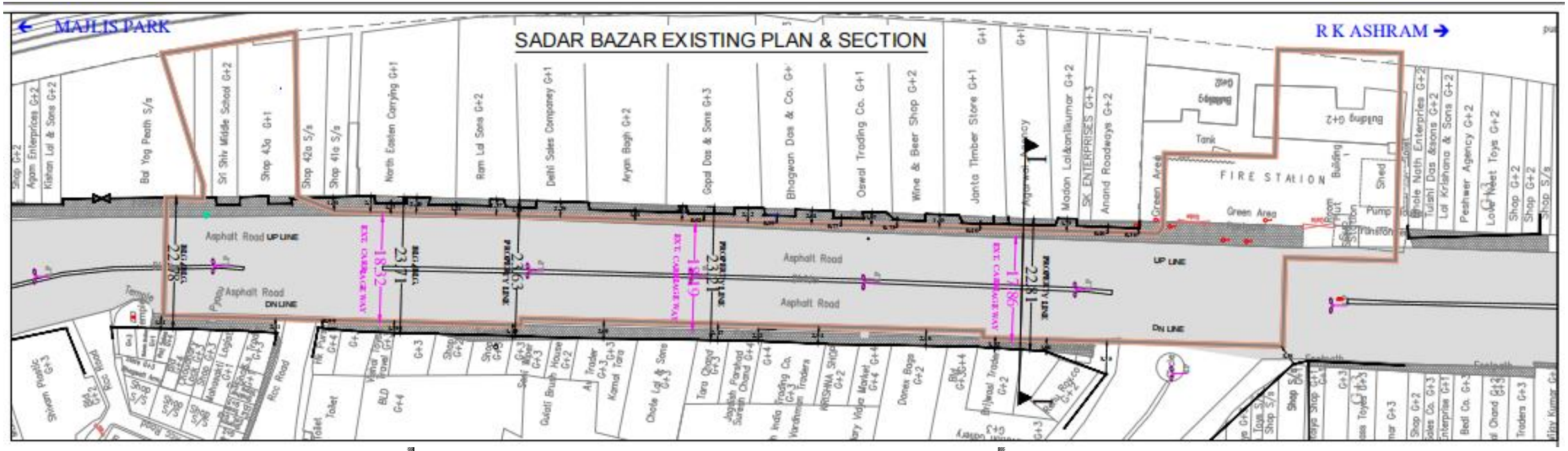
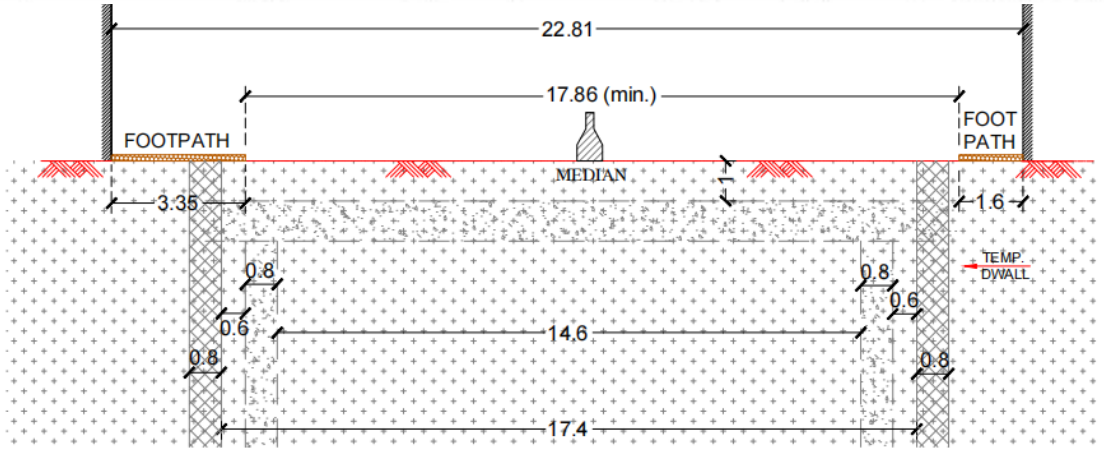
SADAR BAZAR STATION – EXISTING CROSS SECTION





UP LINE

EXISTING CROSS SECTION 1-1

DN LINE

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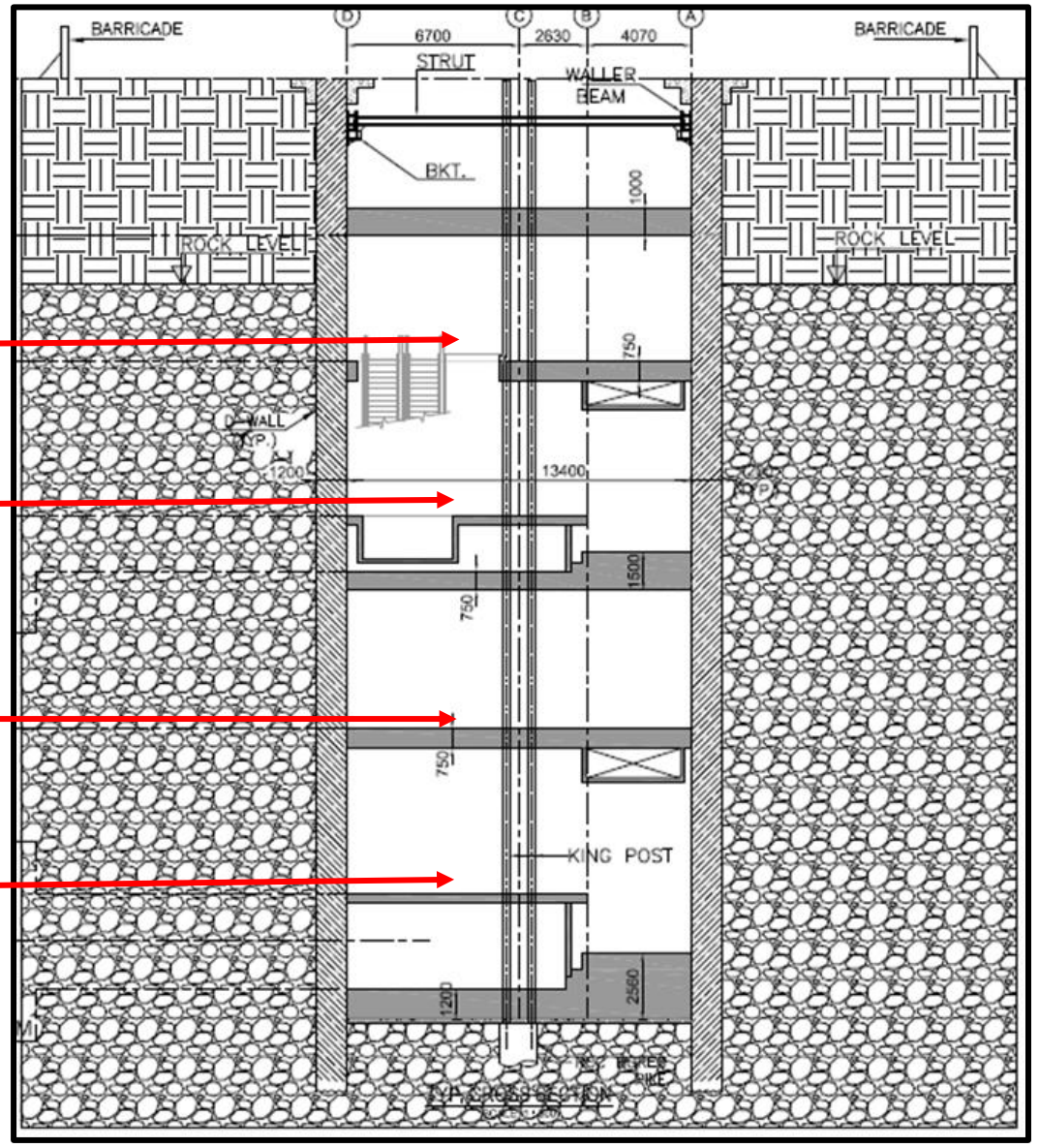
SADAR STATION CROSS SECTION (INITIAL PROPOSAL)

Concourse Level

Upper Platform Level

Intermediate Level

Lower Platform Level



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GEOLOGICAL CONDITIONS AND GROUND WATER TABLE

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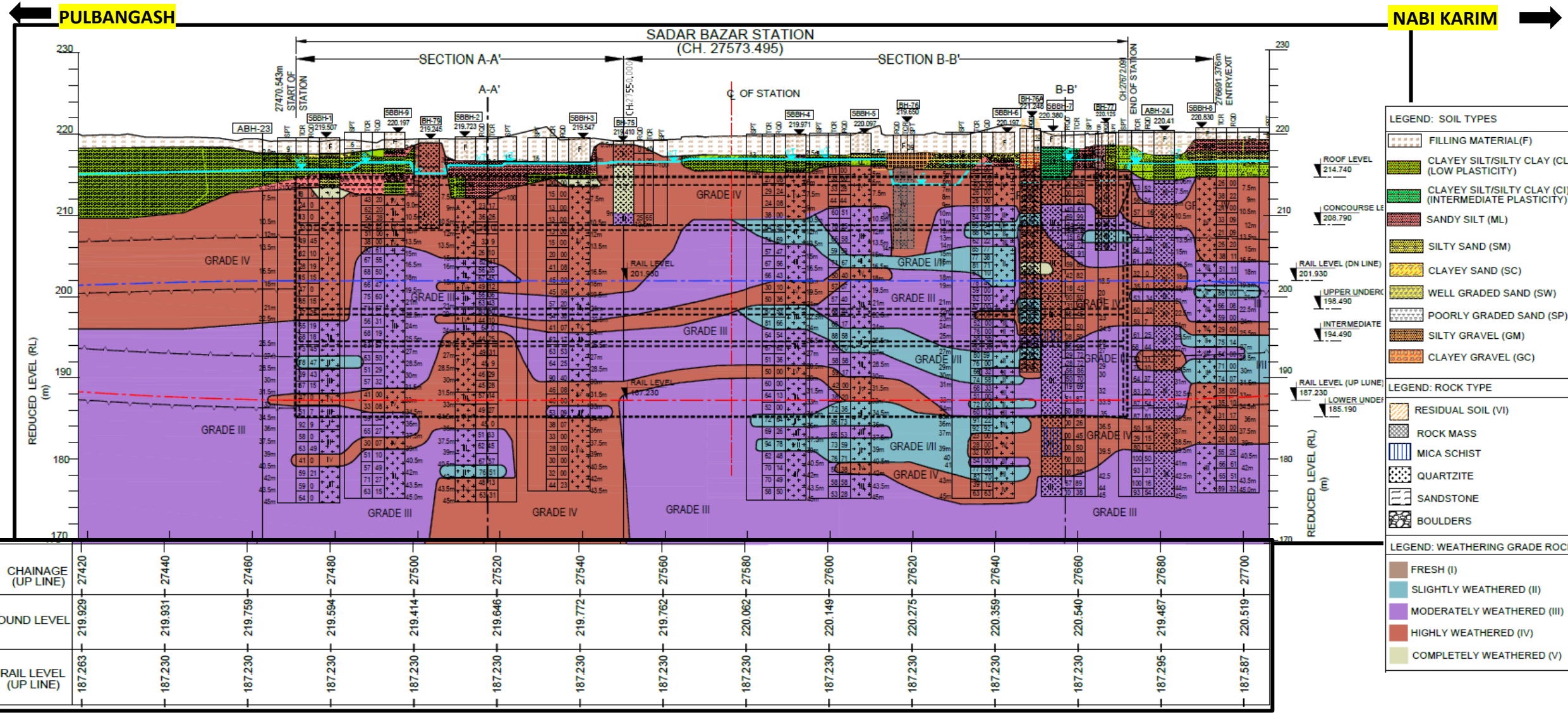
SADAR STATION GIR



CHAINAGE (UP LINE)	27420	27440	27460	27480	27500	27520	27540	27560	27580	27600	27620	27640	27660	27680	27700
GROUND LEVEL	219.929	219.931	219.759	219.594	219.414	219.646	219.772	219.762	220.062	220.149	220.275	220.359	220.540	219.487	220.519
RAIL LEVEL (UP LINE)	187.263	187.230	187.230	187.230	187.230	187.230	187.230	187.230	187.230	187.230	187.230	187.230	187.230	187.295	187.587

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- Unconfined compressive strength of rock varies from 50 MPa to 150 MPa, which indicates that the strength of rock is strong to very strong in nature.
- The ground water levels in this station zone vary between 2m to 3 m.

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FEASIBILITY STUDY

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- Typically, any UG station is constructed using either

a) top-down construction method or

b) bottom-up construction method.

In both options, severe construction challenges are envisaged, making the construction of the station with the proposed cross section of stacked platform practically unfeasible.

Option 1: Challenges in adopting Top - Down Construction

- Type of rock – quartzite (UCS - 75 MPa to 150 Mpa)
- Depth of Dwall Proposed – 38-40 m (approx.)
- Depth of the station - 33 m.

Considering the above aspects, the construction of the station by top-down construction is not feasible and is ruled out.

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Option 2: Challenges in adopting Bottom-Up Construction

Narrow width of available road: For the given dimensions of the station (depth: 33 m, width: 13.4m), the minimum clear width required at ground level for the execution of the station by the bottom-up construction method is approximately 30 m, whereas the available width is only 20 m.

Therefore, the available width is less than the required width, so bottom-up construction for the given depth of the station is not feasible considering the available narrow width and depth of the station.

Other feasibility issues with the initial proposal:

i. Excavation Productivity

ii. Large depths would have probably involved more escalators, deeper lifts, and staircases possibly resulting in the following issues:

a) Inconvenience to the passengers

b) E & M operations and maintenance

c) Sewerage and seepage sumps at 36 meters deep could have possibly entailed higher energy costs in operations.

iii. Deeper excavation shall involve large drawdown of Ground water:

- **In view of the above, it was proposed to look for a feasible option that optimized existing design, construction-friendly, meets timelines, is safe from a construction and operation point of view, and meets all functional requirements.**

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NATM PLATFORM TUNNEL PROPOSAL

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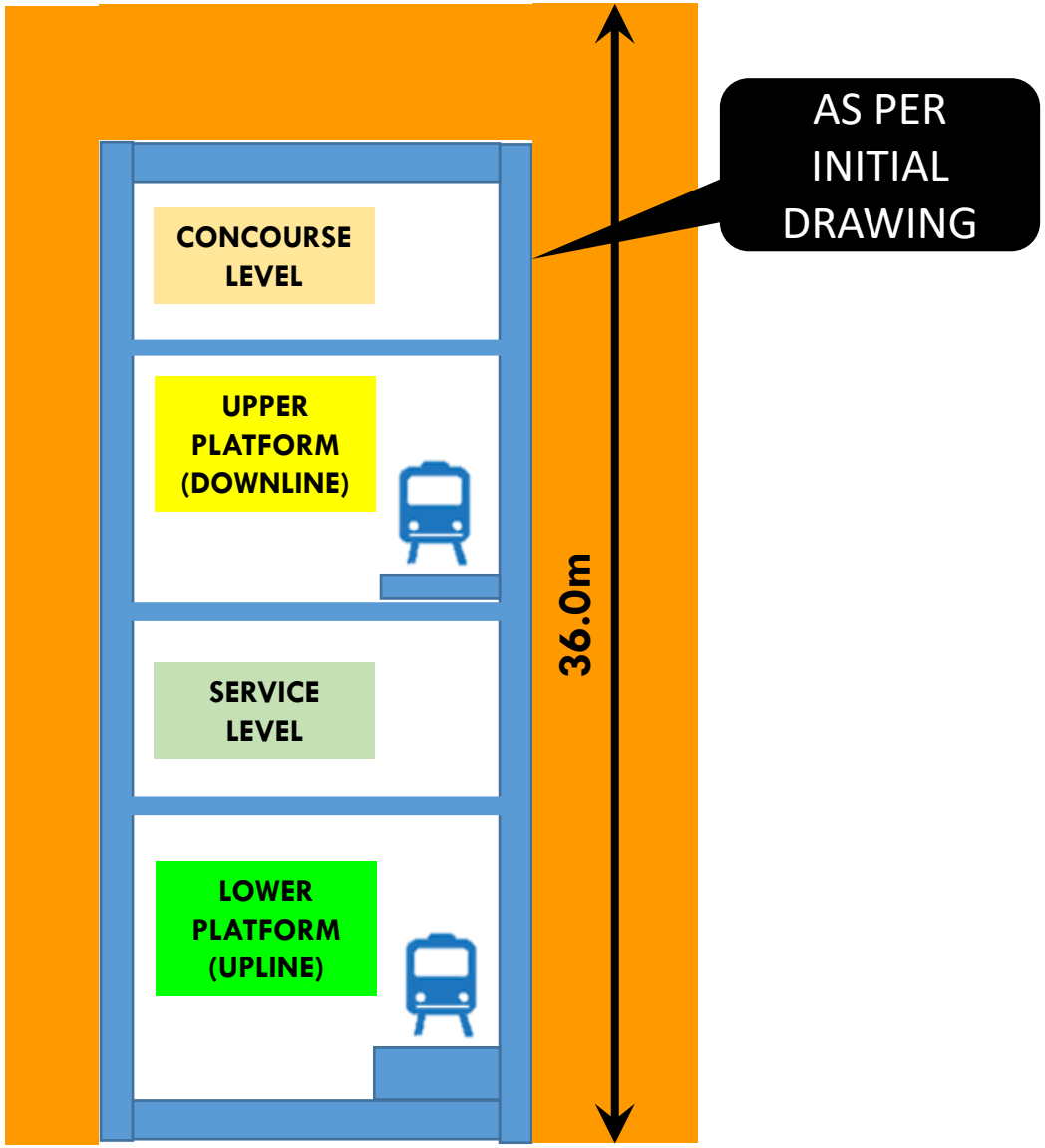
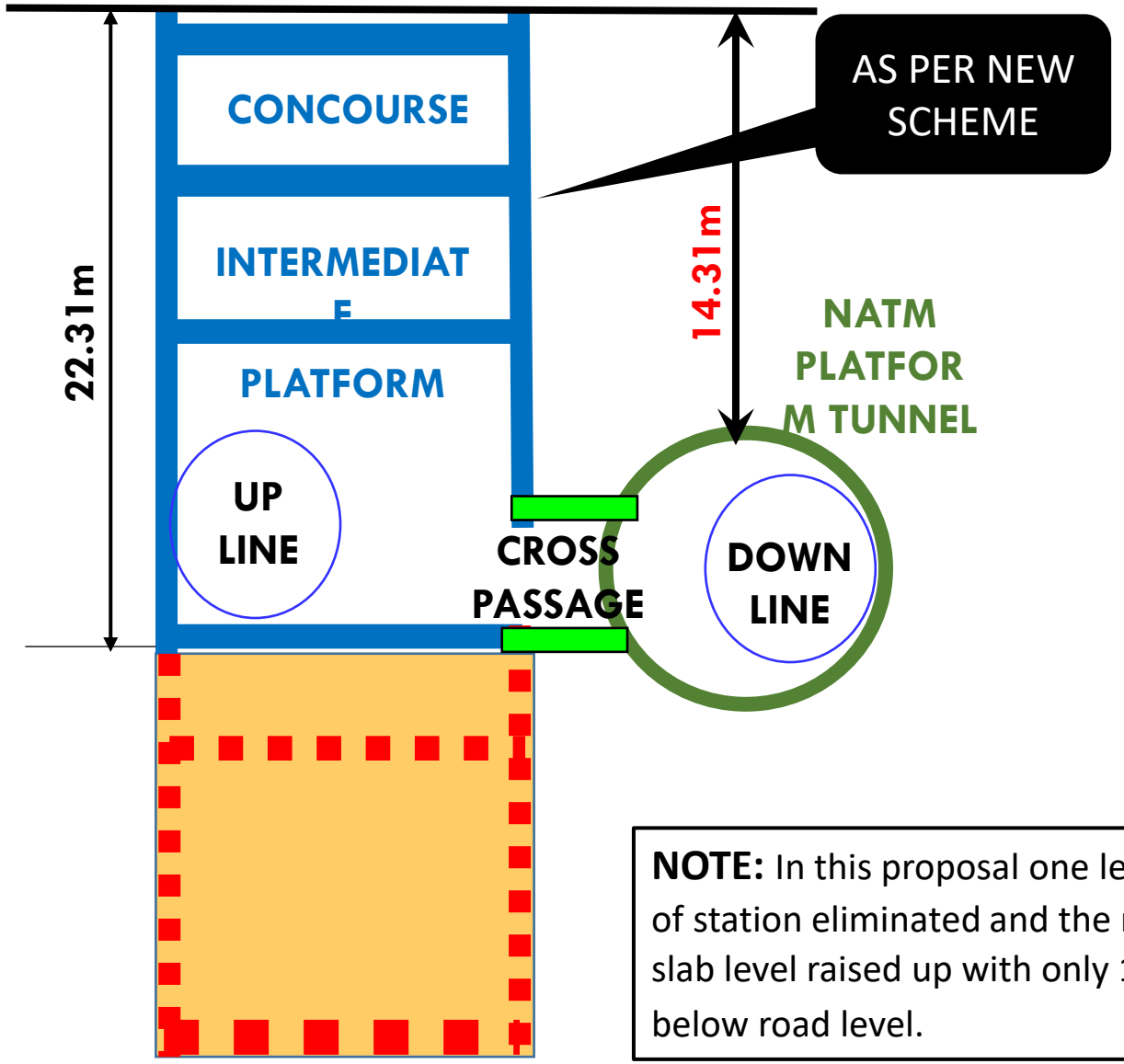
SADAR STATION CROSS SECTION INTIAL METHODOLOGY & AS PER NEW CONSTRUCTION METHODOLOGY





NOTE: In this proposal one level of station eliminated and the roof slab level raised up with only 1m below road level.

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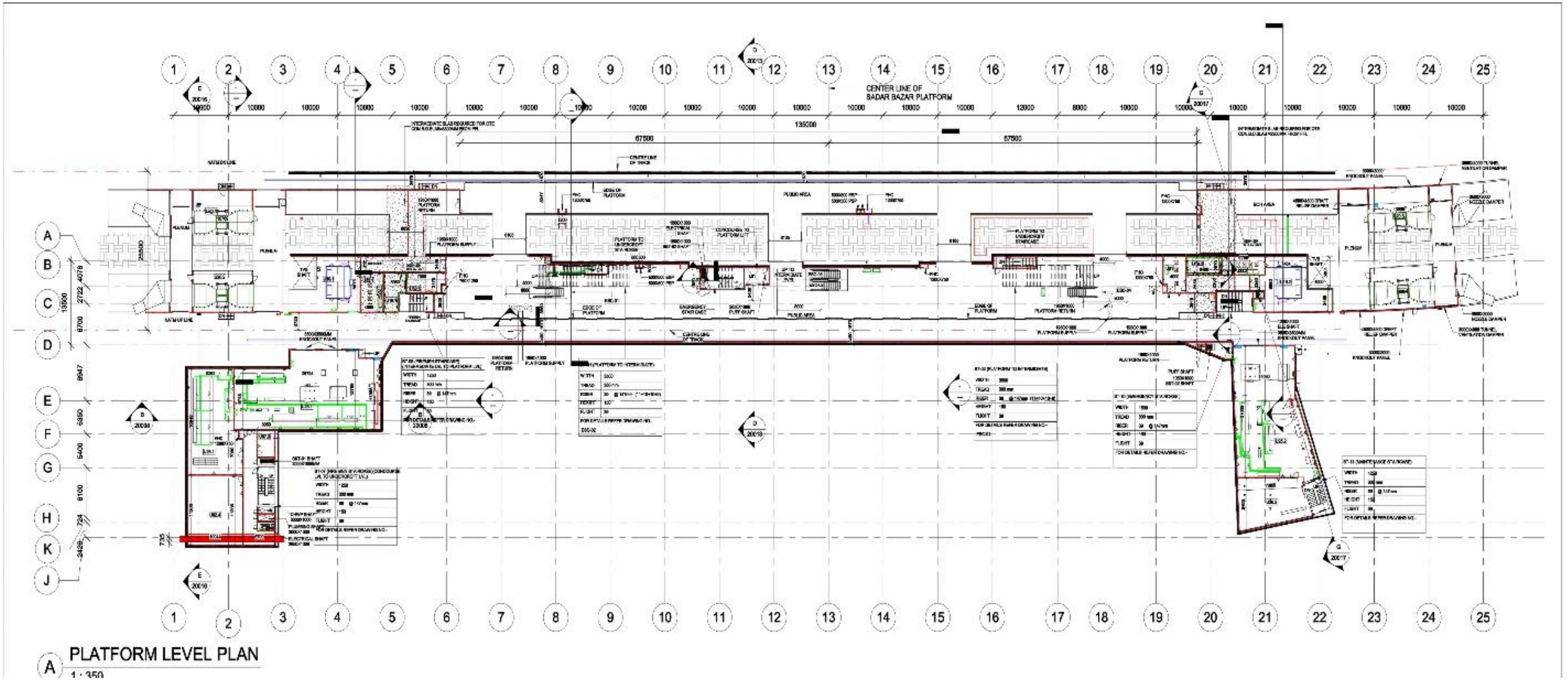
PLAN WITH NATM PLATFORM



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The changes to the upline and downline alignment and position of the NATM platform tunnel are as follows:

1) The upline vertical alignment has moved to the level of the current downline, and the horizontal alignment is being maintained at the current position towards the existing Sadar Bazar railway station within the proposed station box.

2) The current downline vertical alignment has moved a little down, and the horizontal alignment is being shifted outside the station box away from the existing Sadar Bazar railway station to form the NATM tunnel accommodating platform and track.

3) NATM tunnel of 30 metres (approx.) introduced on both ends of the Station box for accommodating TVF fans and its accessories.

With the above changes in alignment, the lower platform level could be discarded, and the services of this level have been accommodated at the intermediate level. The upper undercroft level has moved down slightly to match the platform level of the proposed NATM tunnel. The downline NATM platform tunnel has been connected to the cut and cover box through NATM cross passages at undercroft level.

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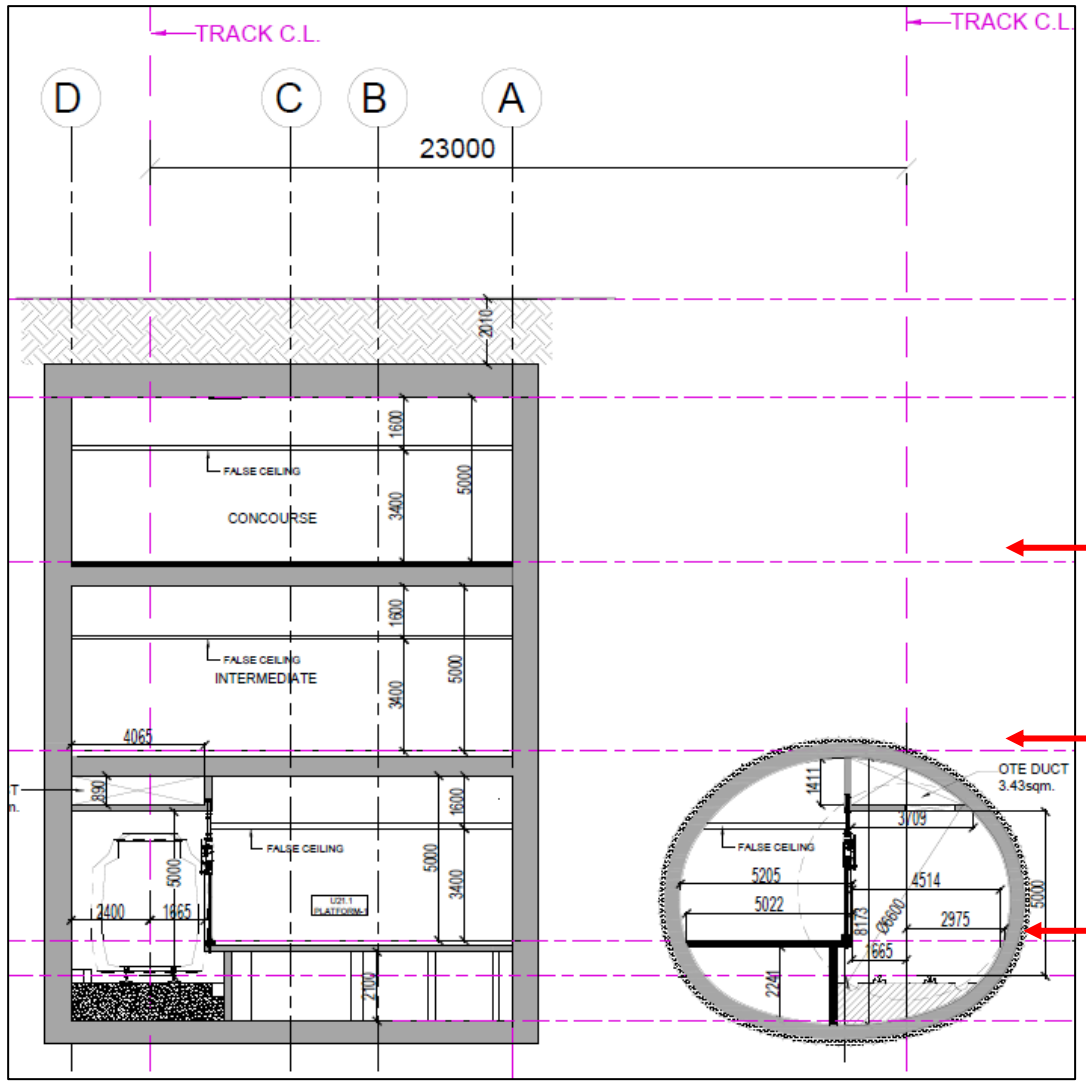
SADAR BAZAR STATION – SECTION

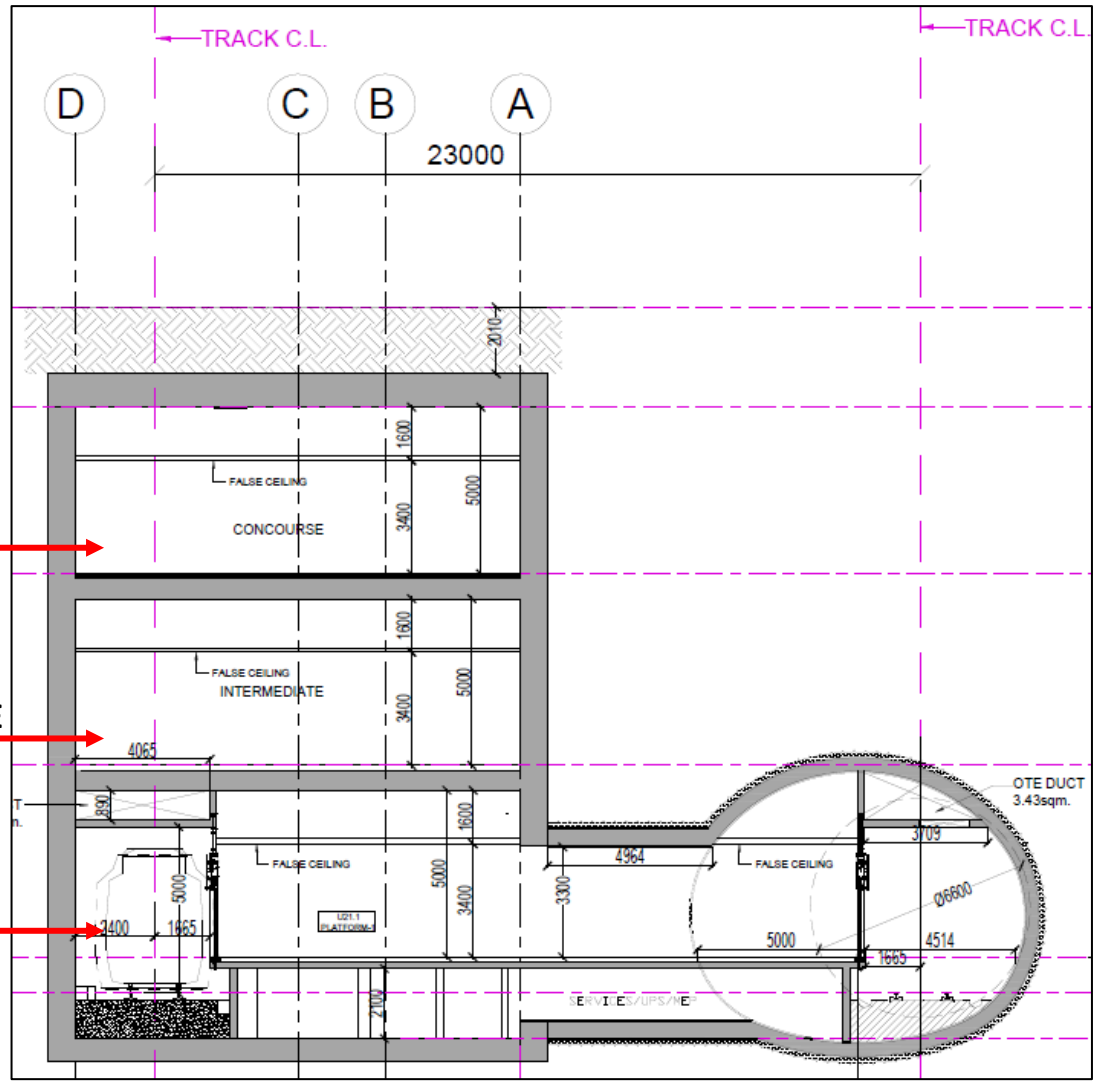


CROSS SECTION WITHOUT CROSS PASSAGE

CONCOURSE LEVEL

INTERMEDIATE LEVEL

PLATFORM LEVEL



CROSS SECTION WITH CROSS PASSAGE FOR PUBLIC ACCESS

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ADVANTAGES OF THE CHOSEN METHOD

i. **Safe and timely construction is feasible with this method.**
ii. **TBM tunneling can be carried out independently and will not be held up for station work.**
iii. **Better Lifecycle Cost**
iv. **Safer & quicker Emergency Evacuation of Passengers**
v. **Passenger's Convenience**

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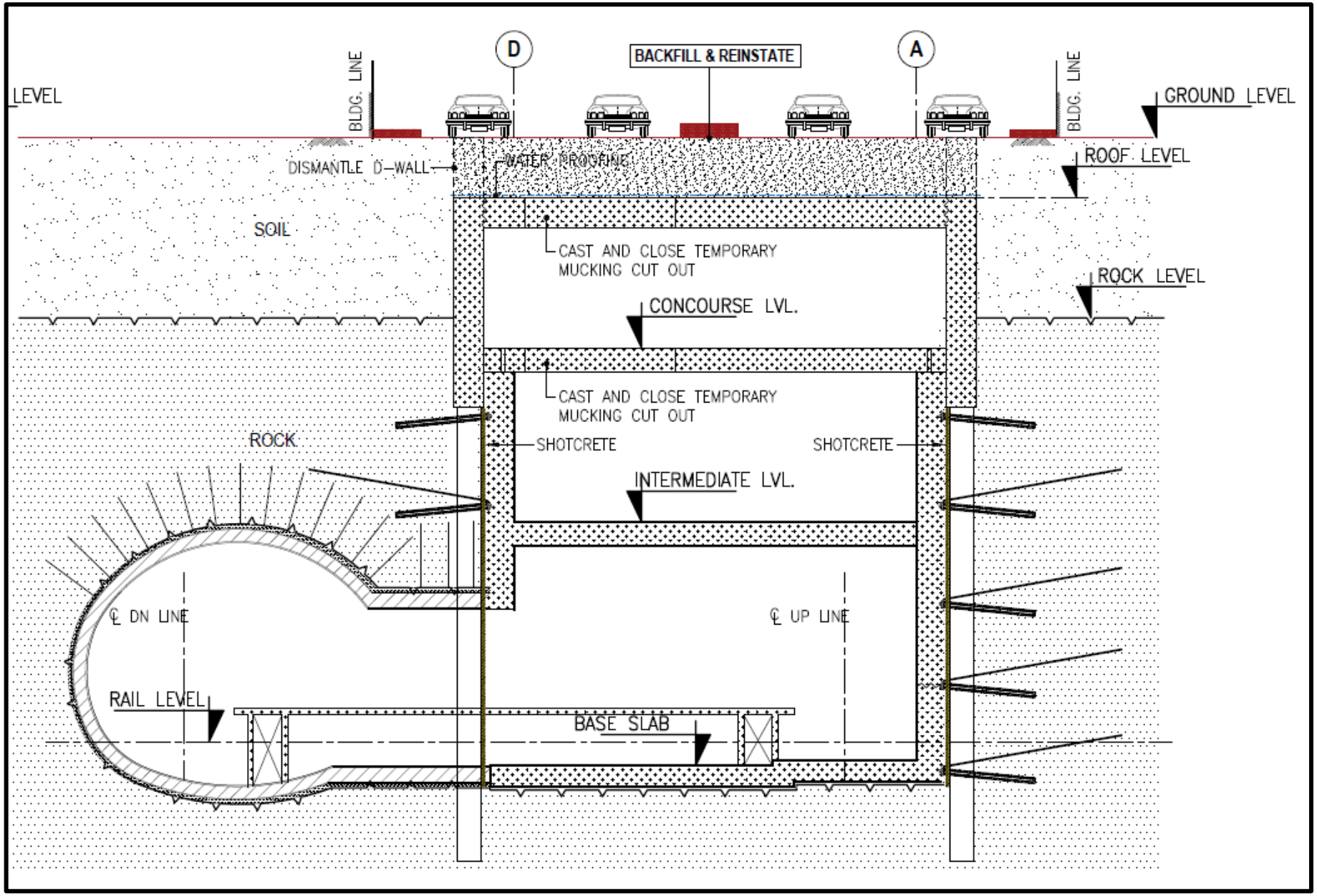
SADAR STATION CROSS SECTION WITH TOP DOWN AND BOTTOM-UP COMBINATION



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CONCLUSION

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• In conclusion, the revised construction methodology represents a significant step forward in enhancing efficiency, safety, and cost-effectiveness in the construction process as well as in the operation and maintenance costs for Delhi Metro Rail Corporation Ltd. This methodology integrates innovative approaches and advanced technologies to address key challenges in the construction of the Sadar Bazar Metro Station.

• The revised proposal is without compromising any functional requirements of DMRC; on the other hand, it is more passenger-friendly and will have fewer operations and maintenance costs for DMRC

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THANK YOU