



Mumbai Metro Rail Corporation Ltd
MUMBAI METRO LINE 3 (Colaba-Bandra-SEEPZ)

A report on Proposed Cuffe Parade Station along the
Mumbai Metro Line 3

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MUMBAI METRO LINE 3

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Cuffe Parade Station Report

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1. Introduction

The proposed Mumbai Metro Line 3 (MML3) connecting Colaba-Bandra-SEEPZ is a completely underground rail corridor. The alignment is shown in figure no. 1 below. The construction of this line will involve tunnelling and station construction including the station at Cuffe Parade which is planned to be constructed by Cut and Cover and New Austrian Tunnelling Method (NATM) method. The project is scheduled to complete by 2020.

The purpose of this report is to address the concerns raised and to evaluate the alternative station locations suggested by Cuffe Parade Residents Association (CPRA).

This report provides a brief on the site preparation activities, the construction activities and construction period together with the anticipated environmental impacts during the construction phase of the project and the mitigation measures for the same. The report also provides details on the social aspects of this proposed station's construction and the associated traffic management plan for Cuffe Parade.

The traffic management plan during construction period of Cuffe Parade station is explained and details have been provided.

There are alternate station locations proposed by CPRA which have been assessed as infeasible and the drawings and details explaining the infeasibility of same have been provided in this report.

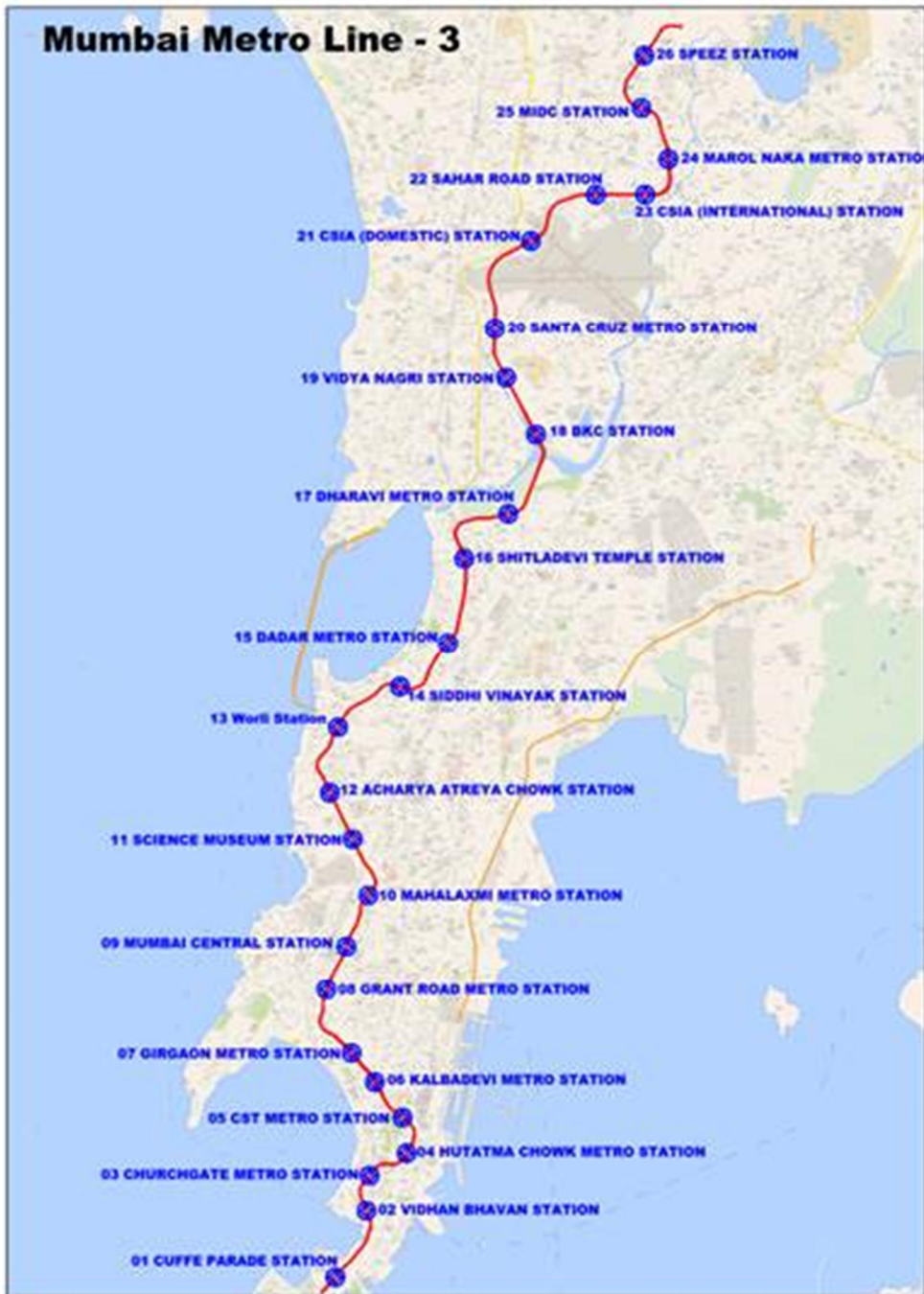


Figure No. 1 Mumbai Metro Line 3 Alignment Map

2. Site Preparation

The works site to be occupied for the construction of the Cuffe Parade station is shown in Figure 4. This works area will be surrounded by a barricade hoarding at least 2m high to ensure that impacts of the construction do not spill out of the site and to separate and protect the public from the works in progress.

Any project work starts with site preparation activities. The paragraphs below provide details on site preparation activities associated with the construction of the Cuffe Parade station.

The preparation of site for construction involves clearing of land required for construction of encumbrances; and management of activities such as traffic, utilities and social and environmental impacts during construction.

Firstly the MMRC shall transfer the possession of the land for civil works to the Contractor after peg marking of the alignment.

The Contractor shall verify the benchmarks soon after taking possession of the site. The Contractor, prior to initiation of site preparation activities, shall highlight any deviations/discrepancies in these benchmarks to the Engineer – Incharge in writing.

The contractor shall submit the schedules and methods of operations for various items during the construction operations to the Engineer – Incharge for approval. The Contractor shall commence operations at site only after the approval of the schedules by the Engineer -In charge.

The clearance of site shall involve the removal of all materials such as trees, bushes, shrubs, stumps, roots, grass, weeds, part of topsoil and rubbish. Towards this end, the Contractor shall adopt the following environmental mitigation measures:

- Limiting the surface area of erodible earth material exposed by clearing and grubbing;
- Conservation of top soil and stock piling , “Top Soil Salvage Storage and Replacement”; and
- Carry out necessary backfilling of pits resulting from uprooting of trees and stumps with excavated or approved materials to the required compaction conforming to the surrounding area.

To minimize the adverse impact on vegetation, only ground cover/shrubs that impinge directly on the permanent works shall be removed. Cutting of trees and vegetation outside the working area shall be avoided under all circumstances.

The alignment of the station does not pass through forest areas the Colabra Woods and hence no trees or vegetation within the Woods are proposed for felling or clearing and the Woods should not be adversely affected by the works.

The felling of trees in the Maharashtra (Urban Area) is governed by the Section 8 of the Maharashtra (Urban Area) Protection and Preservation of Trees Act 1975, with all its amendments. Tree authorities scrutinize the tree cutting permission proposals ward wise and recommend best practises to protect trees and implementation of compensatory afforestation.

For all trees proposed for felling the BMC tree authority shall be consulted for identification of the presence of any rare/endangered species within the proposed metro alignment way. Protection of such species if found shall be as per the directions of the concerned department.

The locations for disposal of grubbing waste shall be finalized prior to the start of the works on any particular section of the alignment. The selection of the site shall be approved by the Engineer – in - charge.

In locations where erosion or sedimentation is likely to be a problem, clearing and grubbing operations should be so scheduled and performed that grading operations and permanent erosion and sedimentation control features can follow immediately, if the project conditions permit.

The designated sites duly approved by MMRC shall be cleared of its existing cover for setting up of the construction sites, camps and related infrastructure facilities, borrow areas and other locations identified for temporary use during construction.

3. Construction Activities

The construction of Mumbai Metro Line 3 will involve tunneling (both by Tunnel Boring Machine (TBM) and New Austrian Tunneling Method (NATM), station construction (both by cut & cover and NATM). The Cut and cover involves cutting, opening and back filling , however NATM is limited to excavation without opening. The Cuffe Parade station is planned to be constructed by Cut and cover method and NATM both. The Cut and Cover construction methodology involves construction of a rigid external wall socketed into rock using secant piles or diaphragm walls around the station periphery to isolate the excavation area from the external areas. The excavation to base level is to be undertaken within the protection of the external walls with temporary struts and or the permanent cast in situ concrete walls and slabs used to resist the lateral earth and hydrostatic pressures in addition to the surcharge and services/structural loads. The design of the walls, slabs and struts will ensure that the excavation settlements are kept within defined limits.

Main civil work at this station will involve construction of reinforced concrete diaphragm wall about 1 m thickness along the boundary of station, excavation of soil by deploying excavators, loaders, cranes etc., excavation of rock by mechanical method or by other permitted methods like controlled drill and blast /chemical splitting and/or controlled

blasting with all precautionary measures, construction of reinforced concrete slabs at different levels, installation of water proofing etc.

Assembly and launching of TBM is planned from the north end of the station and NATM tunnelling will be done from the south end.

The station construction area will have barricaded buffer zones, areas for movement of construction equipment, stacking of construction material, prefabricated tunnel segments, excavated material etc.

To facilitate construction related support activities, a Construction Depot will be established in MIDC open land north of Bus Depot which is away from Colaba Garden. Construction Depot will generally be used for storage of construction equipment, prefabricated tunnel segments, reinforcement cages, other steel structures needed during construction.

The TBM work site will be located at the northern end of the station and activities will include operations like launching and maintenance of TBM, mucking and muck storage, storage of segments, installation of segment gaskets, grout mixing and delivery, and access to the tunnel for men and materials etc.

Construction Timeline: These areas are anticipated be occupied for 3-4 years from the date of start of construction activity and shall be carried out following best engineering practices involving Environmental Management Plan. The Comprehensive Environmental Management Plan is prepared by MMRC which has been approved by the government of India and JICA.

The Figure 2, Figure 3 and Figure 4 on next three pages give the details of the Architectural plan and section plan

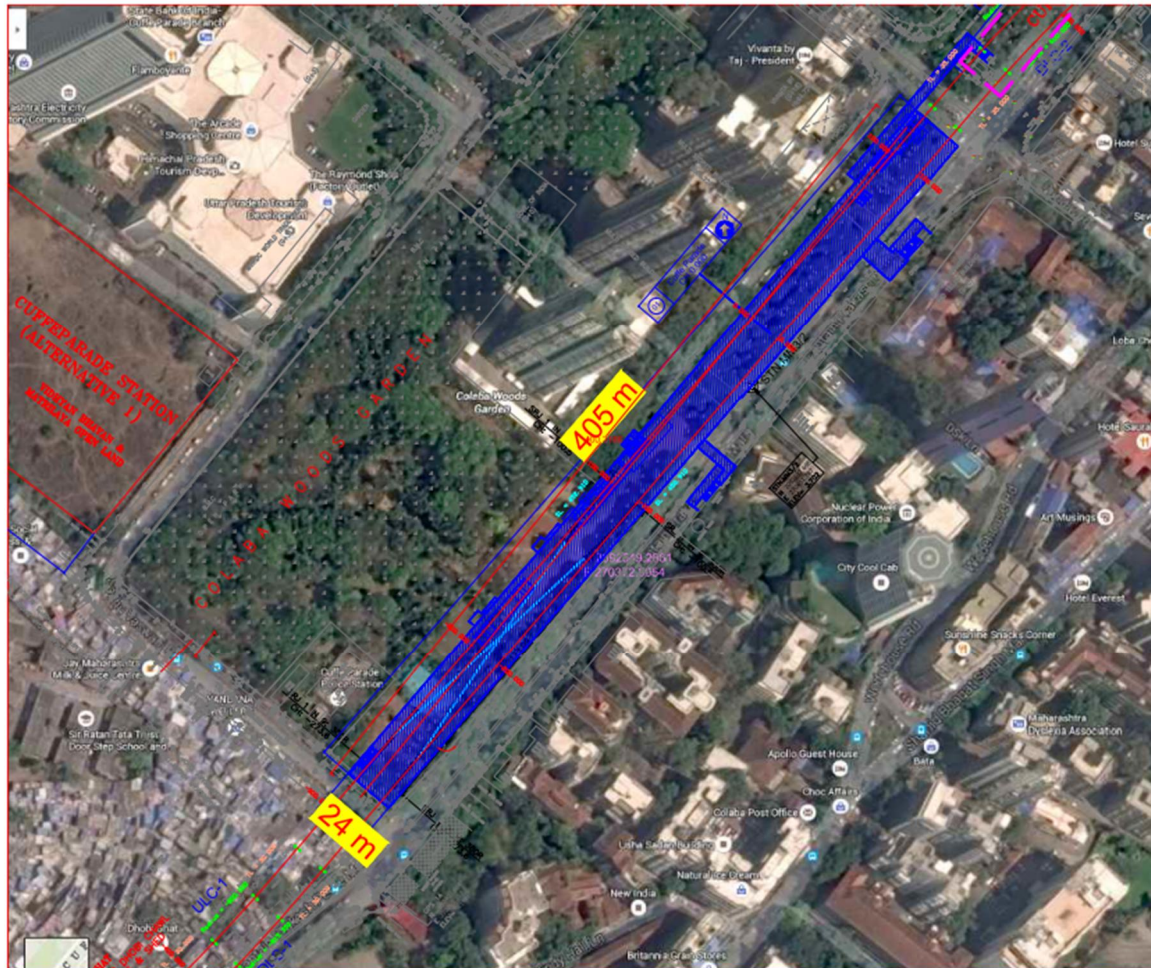


Figure 2 Plan of Proposed Cuffe Parade Station

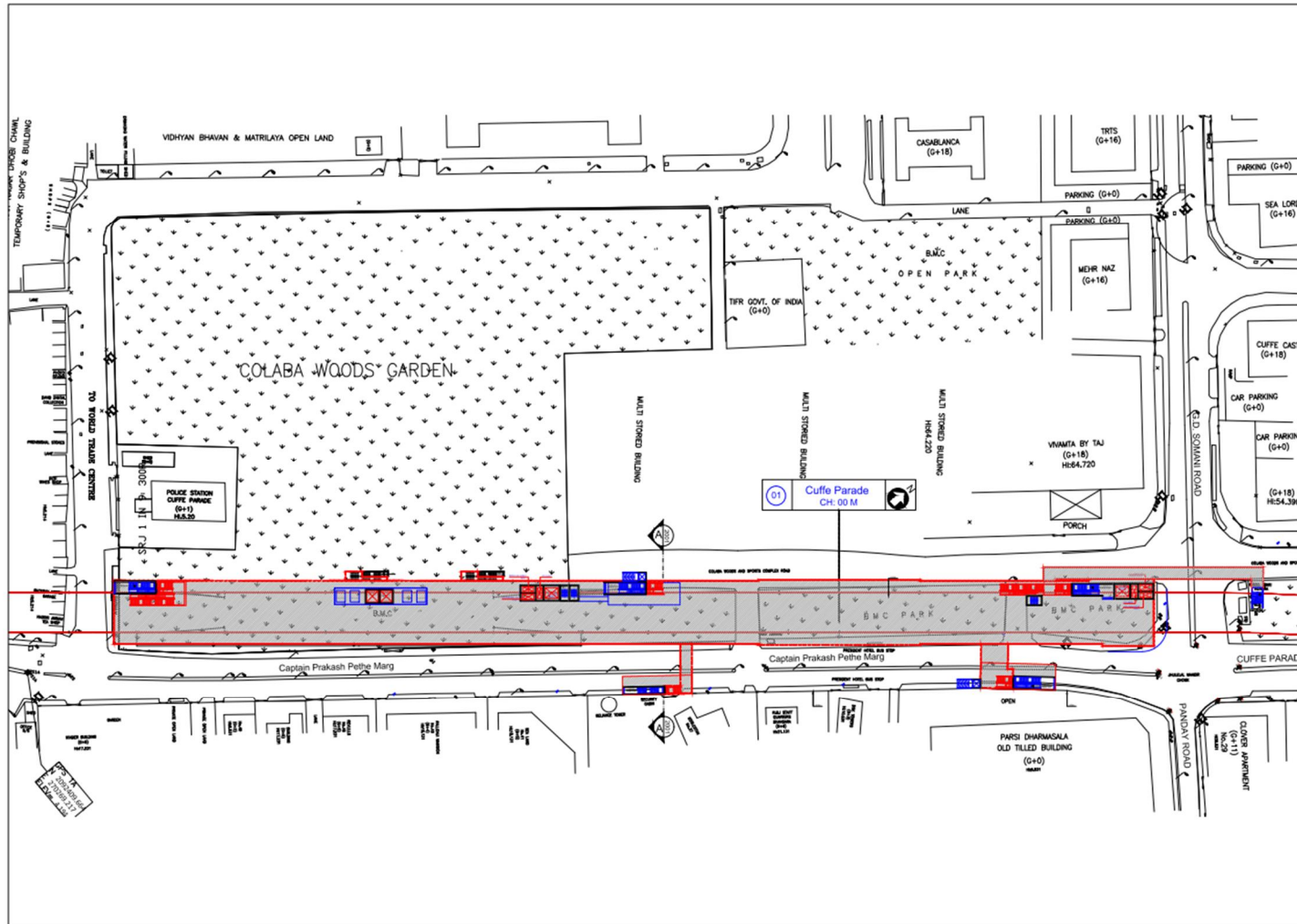


Figure 3 Architectural Plan of Proposed Cuffe Parade Station

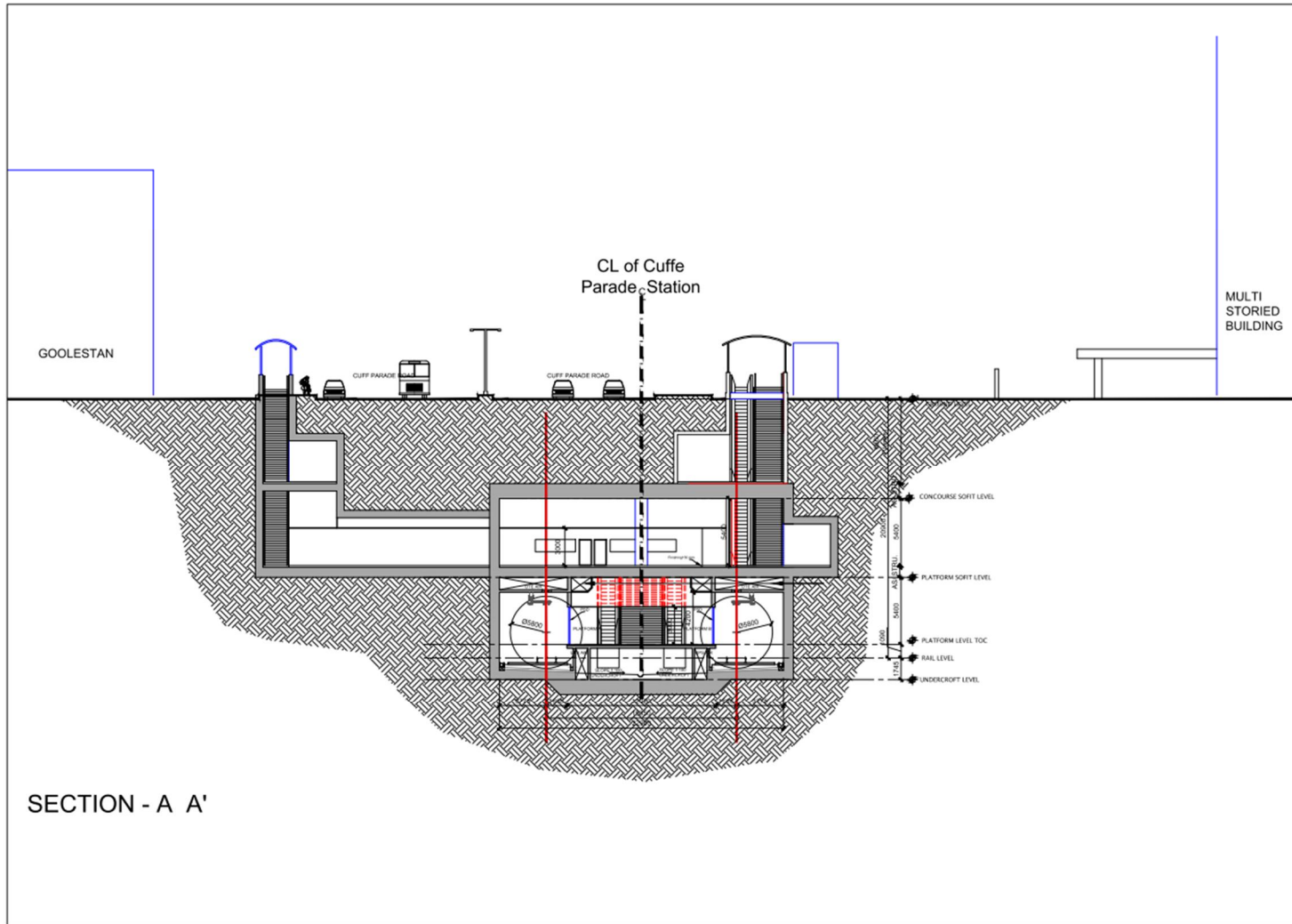


Figure 4 Section Plan of proposed Cuffe Parade Station

4. Environmental Impacts during construction and post construction phase of the project and mitigation measures

The Construction works can have indirect effects on the environs through noise, air and water. The construction has been planned to ensure that the impacts of the works on the environs are kept to within acceptable levels. This has been studied as part of the Environmental Impact Assessment and will be assured as part of the Environmental Monitoring and Audit exercise that will be undertaken during the construction to ensure impacts are kept within acceptable limits. Wherever the actual construction is found to have impacts in excess of the accepted levels the construction shall be halted and re planned with mitigation measures to ensure impact levels are respected.

The construction site area will be surrounded by a hoarding and drainage bund that will as much as practical keep the impacts constrained to within the site as well as separating and protecting the public from the works.

The Environmental Monitoring, Auditing and Mitigation plan shall cover the Noise, Air and Water aspects which are described in following sections

4.1 Mitigation of Air Pollution

The types of air pollution due to construction activities might include generation of dust, emission from construction machinery/vehicles etc. The measures for mitigation of impacts are given below.

- Take all necessary precautions to minimise fugitive dust emissions from operations involving excavation, grading, and clearing of land and disposal of waste. Also prevent emissions of fugitive dust from any transport during handling of materials, construction or storage activity.
- Transportation vehicles and other equipment to conform to emission standards fixed by Government of India or the State Government from time to time. Periodical checks of the vehicles to be carried out and remedial measures including replacement, if required, to be undertaken so as to operate within permissible norms.
- Provision of cover for dust generating material like debris and soil being transported from construction sites. All trucks carrying loose material to be covered and loaded with sufficient free- board to avoid spills through the tailboard or sideboards.
- Install barriers around the open construction sites before commencing the work. Dust control activities to be continued even during any work stoppage.
- The Contractor shall place material in a manner that will minimize dust production. Material shall be wetted each day, to minimize dust production.
- During dry weather, dust control measures must be used daily especially on windy, dry days to prevent any dust from blowing across the site perimeter.
- Sprinkle water at construction sites to suppress dust, during handling of excavation soil or debris or during demolition. Dust screens to be used, as feasible when additional dust control measures are needed especially where the work is near sensitive receptors.
- Provide a wash pit or a wheel washing and/or vehicle cleaning facility at the exits from work sites such as construction depots and batching plants. At such facility, high-pressure water jets will be directed at the wheels of vehicles to remove all spoil and dirt.
- All vehicles delivering materials to the site shall be covered to avoid spillage of materials.

- The Contractor shall take every precaution to reduce the level of dust emission from the batching plants up to the satisfaction of the Engineer in accordance with the relevant emission norms.
- All existing roads used by vehicles of the contractor, or any of his sub-contractor or supplies of materials or plant and similarly roads which are part of the works shall be kept clean and clear of all dust/mud or other extraneous materials dropped by such vehicles or their tyres.
- Plants, machinery and equipment shall be so handled (including dismantling) so as to minimize generation dust.
- All earthworks shall be protected in a manner acceptable to the Engineer to minimize generation of dust.
- Generation of dust should be suppressed during unloading of construction material and also during storage of the construction material.
- All vehicles, equipment and machinery used for construction shall be regularly maintained to ensure that pollution emission levels comply with the relevant requirements of SPCB and the Engineer.
- Commence advanced notification of works and undertake on-going consultation with potentially affected property owners and occupants;

4.2 Mitigation of Noise Pollution

- Establishing temporary noise barriers between construction worksites and sensitive activities (e.g. residential, schools, community facilities);
- Fitting noise-reduction measures to all plant and equipment engaged in above-ground construction works;
- Designing worksites to minimise potential noise impacts on nearby sensitive places;
- Planning construction activities to be undertaken at appropriate times of the day.

4.3 Vibration Control Measures

- Detailed vibration investigation shall be carried out prior to construction at locations where the alignment is close to historical / heritage structures.
- Pre-construction structural integrity inspections of historic and sensitive structures.
- Continuous vibration monitoring equipment shall be installed during construction.
- Vibration monitoring shall also be conducted inside as well as on the top of the building mainly for old structures and heritage buildings.
- The local residence staying in the buildings close to the proposed metro rail alignment shall be informed about the vibrations
- Install supporting wall piles to reduce vibration and settlement impact

4.4 Mitigation of Water Pollution

- The proposed project alignment is underground and tunnelling will be done through hard rock hence no major impact on flow of water, surface and ground water quality is anticipated.
- Any water pumped from excavations will be desilted before discharge back into the environment.
- Any water contaminated during construction shall be suitably treated, eg degreased, before discharge back into the environment.

- Water use will be optimised for all the activities onsite. Workers will be trained regarding the importance of water conservation through optimal use. Where ever possible water from the excavation will be used for wash down purposes.
- Groundwater monitoring shall be carried out at various locations as per decision of Engineer in Charge for the parameters pH, Dissolved Oxygen, BOD, COD, TDS, Chlorides, Nitrates, Sulphates, Total Nitrogen, Total Phosphates, oils and grease etc to ensure that the works are not having an adverse impact on the environment.

5. Social Aspects

As per the revised location plan of CUFFE PARADE station there are five existing shops situated on footpath and one toilet block affected by the construction. The toilet block will be demolished only after construction of new toilet block by the MCGM at suitable and convenient location. The five shops shall also be removed by MCGM after following due procedure and shall be relocated as per MCGM policy for such type of structures as already agreed by MCGM. No residential structures are affected during construction or after construction.

The area where basketball court is shown is affected during construction work of underground metro station. After completion of underground station play area and garden shall be restored back as per existing facility.

During construction activity temporary alternate entry to the Garden shall be provided.

As regards to concern echoed by "ROTARY CLUB OF BOMBAY" about the kids attending the "study centre at the garden, it is observed that at present there is no permanent structure or any temporary shed found constructed in the zone of construction activity, it is therefore presumed that open space is being used for the kids study centre and therefore function or activities of this centre can be kept going on at nearby available huge open space already available within the garden area since the garden area is sufficiently large.

There is no significant cognizable social impact from the construction as the amenities and area usage are being relocated to nearby area close to existing location. The site has been inspected very recently by JICA team who visited this location on 10.09.2015.

The Labour camps are not located near this station area and contractors shall provide adequate sanitation arrangements. There shall be dedicated sanitation provided for the project staff and workers.

6. Traffic Management during construction

MMRC along with GC has prepared traffic diversion plan for the project area along the alignment of Mumbai Metro Line 3. The Contractor shall implement these plans in consultation and confirmation from the government traffic police department as per the construction schedule and activities planned in the project.

The actual details of the traffic management during construction is an activity specific to the contractors method of construction but the Consultant has envisaged conceptual traffic management schemes for Cuffe Parade station that cause minimize disturbance to road users (pedestrians and Vehicles) of the road network adjacent to the station construction area. During actual construction Contractors will be required to devise and implement suitable traffic management schemes that ensure a reasonably smooth flow of traffic during construction.

It has been observed that the local residents utilise the space for parking along the road in the proposed project area. The contractors shall provide adequate parking facility off street and parking demands can be suitably addressed.

It is proposed to temporarily take possession of half the road width along Captain Prakash Pethe Marg for construction purpose. North bound traffic on Captain Prakash Pethe Marg would be diverted through Sadhu Vaswani Road and GD Somani Road. South bound traffic would travel along the existing half way width of Captain Prakash Pethe Marg. The details are presented in the Figure given below.






- Legend:
-  Metro Track alignment
 -  Station Box
 -  Traffic Diversion

Figure 5 Traffic Management plan for proposed Cuffe Parade Station

7. Green area around Cuffe Parade Station

The total land required for Cuffe Parade Station is 12,995 m² out of which 12,257 m² is required temporarily during construction and only 738 m² is required permanently for above ground structures. The construction of the station will be done by cut-and-cover method and the temporary land which is being used during construction shall be restored to its existing condition with value addition to the existing garden's aesthetic look. The present construction area for Cuffe Parade station is completely outside the Colaba Woods garden (please refer attached Figure 6 which shows the Colaba Woods Garden fence line and construction works areas).

MMRC has taken great care to minimise the construction space by reducing the works area by about 2340 m² (Refer Figure 6). Also please refer the photographs attached below which shows that MMRC's construction space is outside the Colaba Woods fence.

The impact of construction activities on the native and full grown trees falling inside the construction zone adjoining the station footprint (shown in green colour) will also be minimized to a large extent by efficient planning of construction space.

The Station box of about 400 m length and 25 m width will be constructed. The Station is completely underground and only small structures like entry , exit points, ventilation shaft will be above ground. It is to be noted that the trees proposed to be removed are relatively less in view of the footprint of station box area. This is because most of the area involved is presently occupied by facilities such as a tennis court, a basket-ball court, a children's play-area a plant-nursery (containing mostly potted plants and bagged saplings) and a public walkway.

A detail survey of tree inventory has been conducted and the survey report details are given below. Table 1

Table 1

Sr. No.	Station Name	Trees proposed to be Retained	Trees proposed to be Removed	Total Trees
1	Cuffe Parade	121	261	382

The trees which have been proposed to be removed are mostly native species and there are no rare and endangered species which are proposed to be removed for construction of this station. The detail list of trees is given below:

Table 2

Common name	Botanical name	Tree count
African tulip tree	<i>Spathodea campanulata</i>	2
Amba	<i>Mangifera indica</i>	5
Areca palm	<i>Dyopsis lutescens</i>	2
Asupalav	<i>Polyalthia longifolia</i>	19
Australian Babhul	<i>Acacia auriculiformis</i>	2
Bhend	<i>Thespesia populnea</i>	1
Coconut	<i>Cocos nucifera</i>	30
Dalimb	<i>Punica granatum</i>	1
Dead	-	1
Deshi Badam	<i>Terminalia catappa</i>	3
Fan Palm	<i>Livistonia chinensis</i>	3
Ficus species	<i>Ficus longifolia</i>	1
Fishtail Palm	<i>Caryota urens</i>	5
Gulmohar	<i>Delonix regia</i>	6
Jamun	<i>Syzygium cumini</i>	4
Jungli Badam	<i>Sterculia foetida</i>	2
Karanj	<i>Pongamia pinnata</i>	1
Lychee	<i>Litchi chinensis</i>	1
Mosambi	<i>Citrus limetta</i>	1
Neem	<i>Azadirachta indica</i>	1
Pimpal	<i>Ficus religiosa</i>	6
Pimpali	<i>Ficus infectoria</i>	1
Putranjiva	<i>Putranjiva roxburghii</i>	1
Ramphal	<i>Annona reticulata</i>	1
Royal Palm	<i>Roystonea regia</i>	4
Saptaparni	<i>Alstonia scholaris</i>	7
Savar	<i>Ceiba pentandra</i>	2
Shewaga	<i>Moringa oliefera</i>	2
Sitaphal	<i>Annona squamosa</i>	1
Sonchapha	<i>Michelia champaca</i>	3
Sonmohar	<i>Peltpphorum pterocarpum</i>	77
Supari	<i>Areca catechu</i>	2
Tabebuia	<i>Tabebuia argentea</i>	2
Tecoma	<i>Tecoma gaudichaudi</i>	2
Umbrella tree	<i>Brassia actinophylla</i>	3
Vilayati Chinch	<i>Pithecellobium dulce</i>	55
Wad	<i>Ficus benghalensis</i>	1
Total trees		261

Undi (*Callophyllum inophyllum*) is commonly found growing in Konkan coast including in Mumbai (Worli – Koliwada, Mahim Koilwada, Andheri, Versova and Madh areas). Similarly Ambada (*Spondias pinnata*) is also found in hilly regions like Mazgaon Hill, BARC Hills, Sion fort area, SGNP and elsewhere. Variegated Ficus is an overgrowth of ornamental plant commercially sold in market. Mysore fig (*Ficus mysorensis*) is also found growing at several areas as mentioned above and at Maharashtra Nature Park, Rani Baug. Similar is the case with Mabolu (*Diospyros malabarica*) which is native to Sahyadris and found to be planted in many other gardens and wooded areas of Mumbai.

Our current survey report confirms that none of the plants proposed to be cleared away is designated as rare or threatened by either the Indian Wildlife (Protection) Act or the IUCN Red List.

As regards the claim of CPRA regarding the rarity of some plants in the Colaba Woods garden, which lie in close proximity to the proposed project area, it is observed that:

- 1) None of the species mentioned by CPRA, namely *Koelreuteria paniculata*, *Nephelium chinensis* and *Toona hexandra*, fall within the footprint of the construction, and therefore, are safe from being cleared away.
- 2) None of the said species are native to the Mumbai region and have been artificially planted in the Colaba Woods. Thus, their occurrence being rare in Mumbai is not only understandable, but also of little ecological significance. None of the said species are rare species by any account.

With the rigid concrete external wall the ground settlements impacts of the station construction beyond the wall should be negligible and in particular the Colaba wood should not be adversely affected by the excavation.

Proposed mitigation measures for protection of trees around Cuffe Parade Station:

1. Existing trees to be retained and carefully protected during construction
2. Erection of protective fence at the outer limit of the critical root zone of trees to be retained, which is defined as the distance around the tree at a radius 10 times the diameter of the tree
3. Keeping the critical root zone area free of any equipment or construction materials
4. Avoiding any physical damage to the branches or trunks of the tree
5. Ensure that no fumes from construction are directed towards the tree canopy
6. Spraying of water periodically to settle the dust arising from construction / excavation activity
7. If pruning is required due to construction related activities, it will be carried out under the supervision of a qualified arborist/horticulturist
8. No waste water, chemicals or any construction debris will be dumped at site around the trees
9. Compensatory tree plantation as stipulated by Tree authority

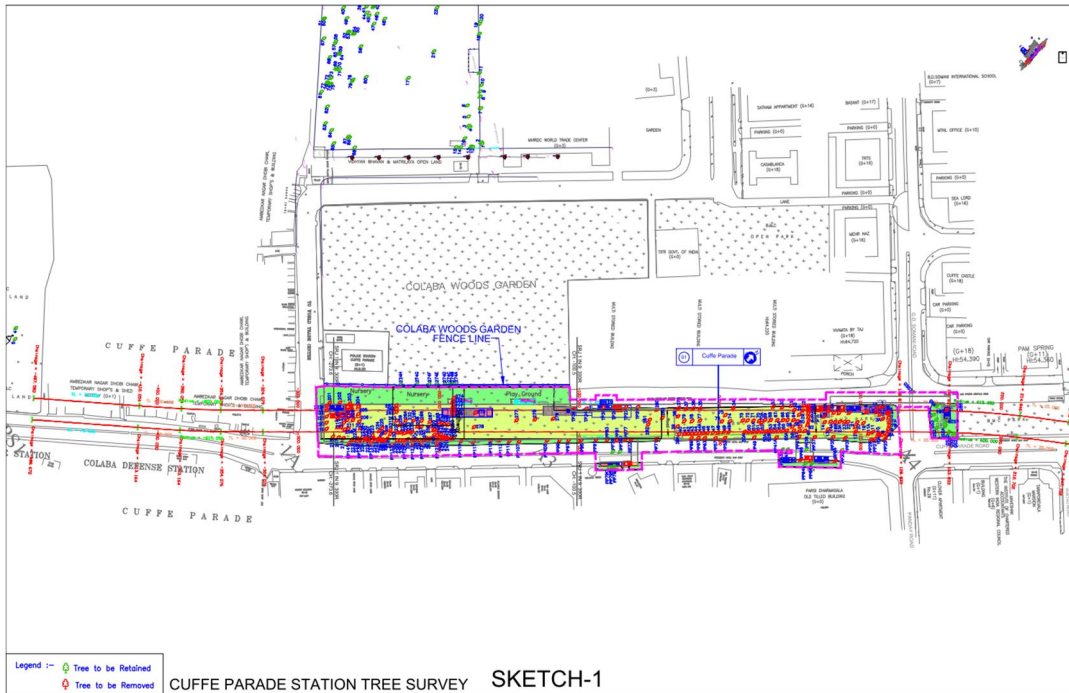


Figure 6 Figure Showing the Colaba Woods Garden fence line and construction works areas

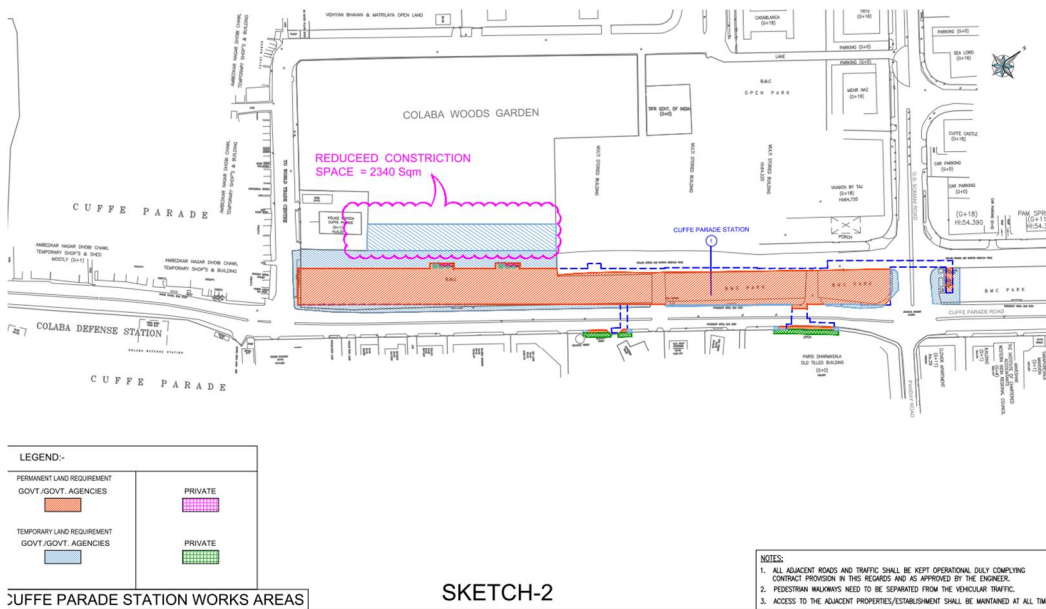


Figure 7 Figure reductions in Works area



Figure 8 Temporary Construction Yard Area



Figure 9 Boundary of Temporary Construction Yard to Colaba Wood Garden Fence line



Figure 10 MML 3 Construction Yard boundary line w.r.t Entrance Gate to Colaba Wood Garden



Figure 11 MML 3 Construction area boundary line in Nursery area w.r.t Colaba Wood Garden fence line

8. Assessment of alternate locations for Cuffe Parade Station suggested by Cuffe Parade Station Resident’s Association

8.1 Alternative 1 (Next to WTC, in the large empty barren plot owned by MMRDA)

The Cuffe Parade station is the terminal station at the southern end of the Mumbai Metro Line – 3 (MML-3) alignment. Being a terminal station of the alignment it requires to have a cross-over and stabling lines to achieve operational efficiency. To accommodate a cross-over the station box is required to have 405m length.

The plot location proposed by the residents is only about 170m long and cannot accommodate a 405 m long station box (please refer Figure 1 below for illustration). Moreover if the station box is shifted off the road in the plot suggested by residents, then the station box would be inside the Colaba Woods which is not recommended.

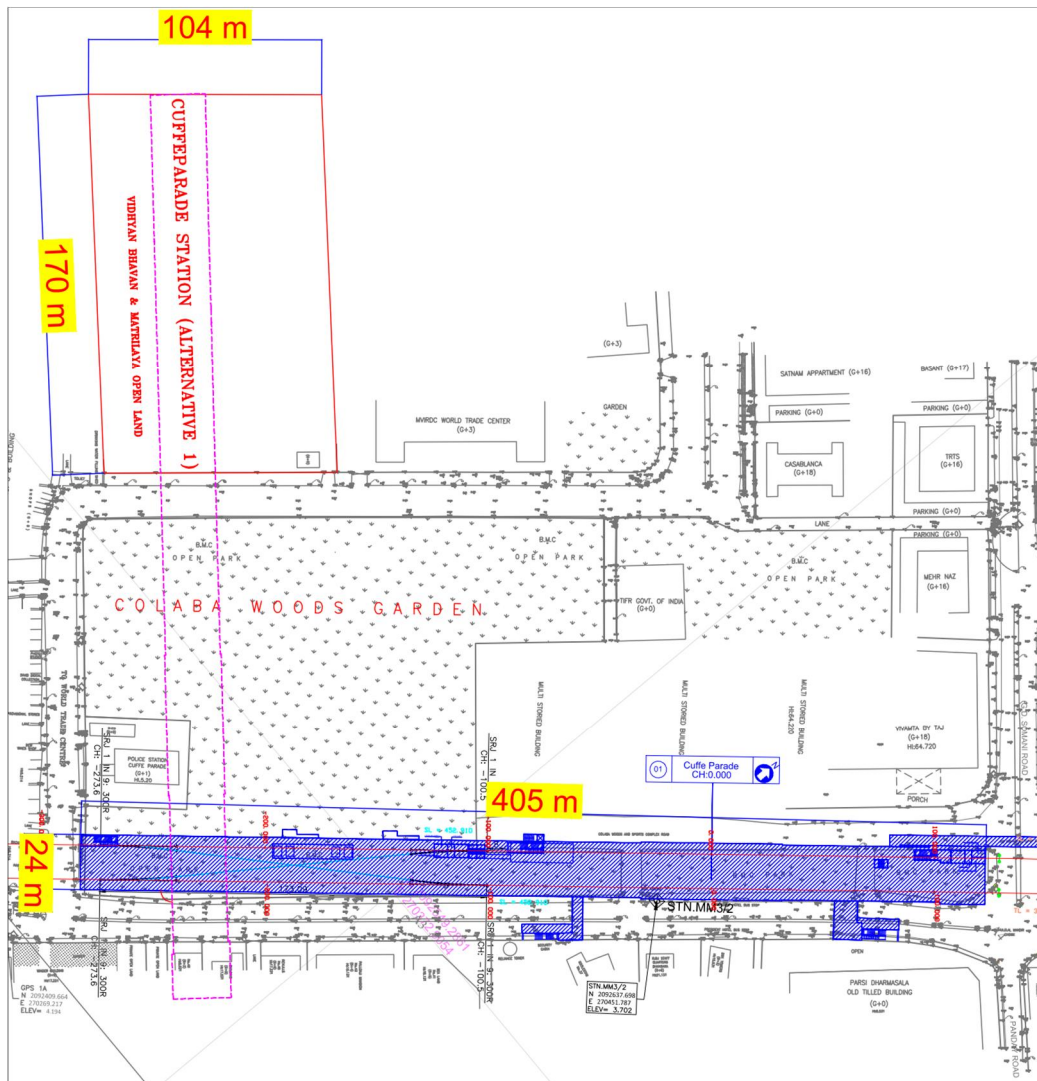


Figure 12: Illustration of Alternative 1

8.2 Alternative 2 (End Metro 3, temporarily, at Vidhan Bhavan Station)

The alignment cannot be terminated at Vidhan Bhavan as the 405m long station with a cross-over required at the end of the alignment cannot be accommodated at the proposed Vidhan Bhavan station location. The plot where the Vidhan Bhavan station is proposed is only about 255m long (refer Figure 2 for illustration). Due to the proximity of station box to the high security areas such as Vidhan Bhavan, Mantralaya a long station box (to accommodate cross-over) is not feasible to construct with the station in its current position. Moreover the alignment on the south as well as north of the station box is on curve and therefore it is not feasible to design a cross-over station at this location.

Resident’s suggestion of constructing a Coastal Road connecting NCPA to Cuffe Parade would defeat the purpose of providing a sustainable and environment friendly mass transit option to the southern parts of the city.

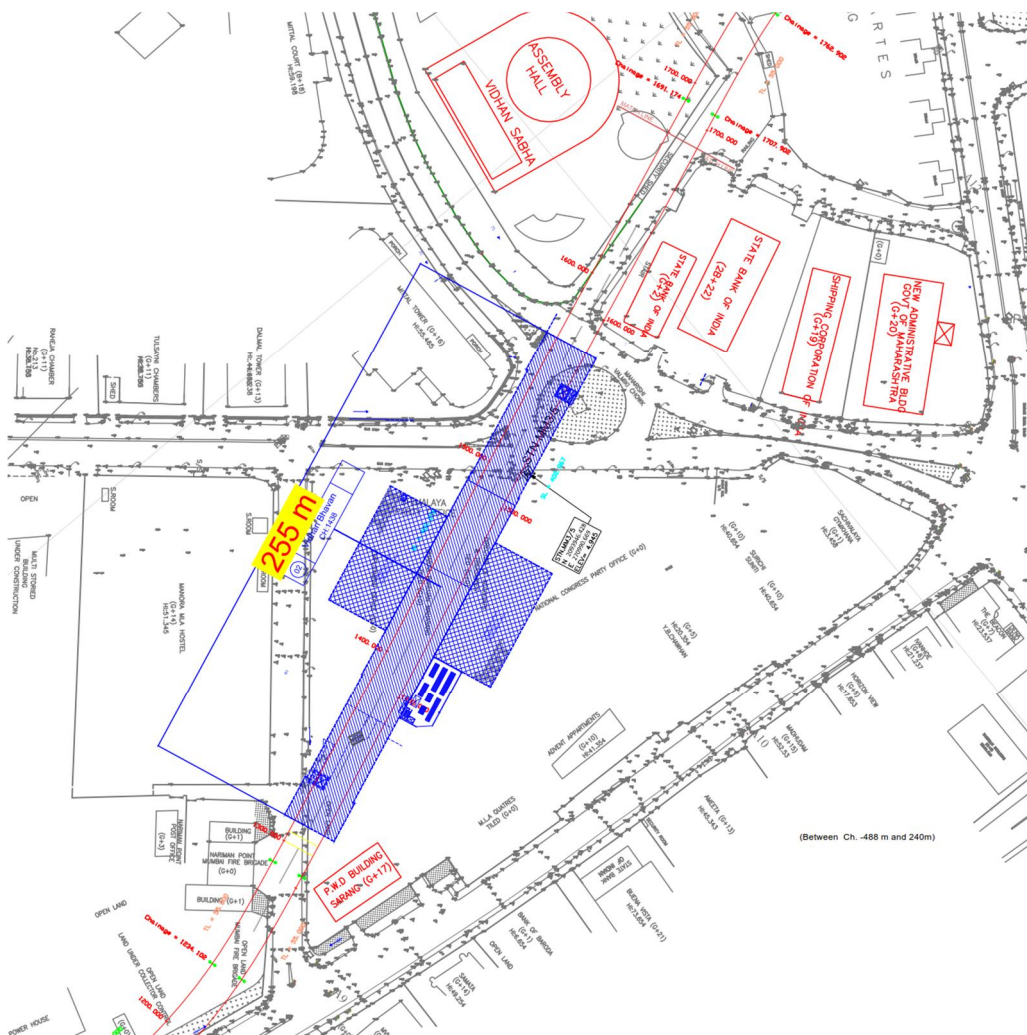


Figure 13 : Illustration of Alternative 2

8.3 Alternative 3 (BMC Garden plus adjoining Plot 105 for parking)

It should be noted that currently the station box is located in BMC Garden plot. The “vacant garden” plot referred in Alternative 3 is only 288m long and therefore it cannot accommodate the station with a cross-over and stabling lines (refer Figure 3 for illustration) and the station construction would extend into adjacent areas. This scheme though feasible would require confirmation of land availability.

Similarly the terminal station could be relocated to be within General Jaganath Rao Bhosale Road between Cuffe Parade Station and Vidhan Bhavan stations provided a 400 m straight portion is available and land is available permanently for entrances and ancillary buildings and temporarily for construction and traffic diversions.

The proposal of connecting Plot - 105 with a Coastal Road would defeat the very purpose of providing mass transit option to the Cuffe Parade as noted above.

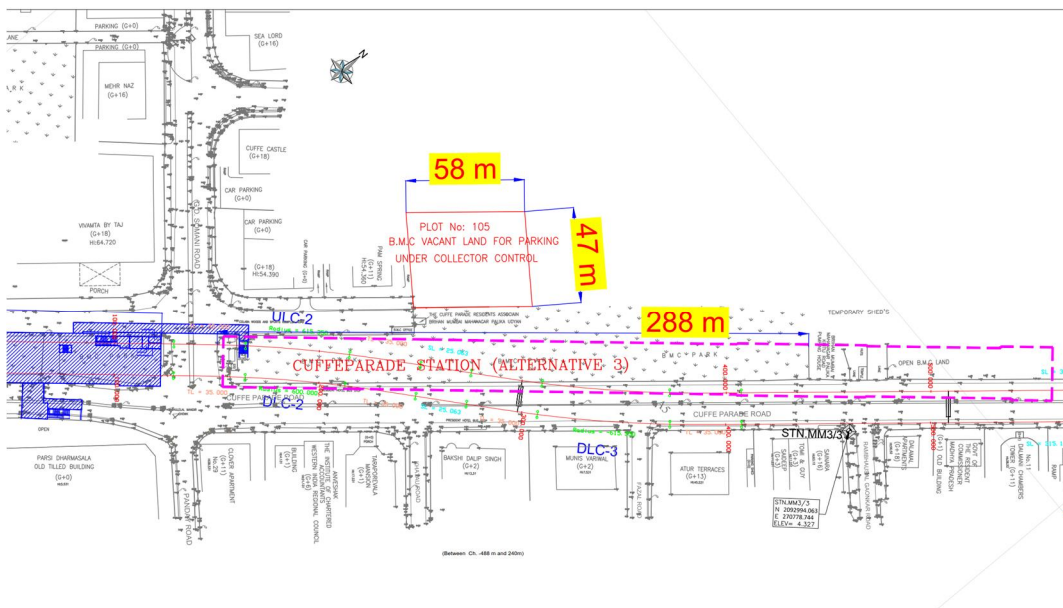


Figure 14 : Illustration of Alternative 3

8.4 Alternative 4 (South towards the Dhobi Ghat and Bus depot)

The area of Dhobi Ghat is densely populated and is home to the economically weaker sections of the society. Therefore moving the station box towards the Dhobi Ghat may require displacement of large number of residents. Currently the stabling lines on the south side of Cuffe Parade station are planned to be constructed using advanced New Austrian Tunneling Method (NATM) to prevent displacement of these residents.

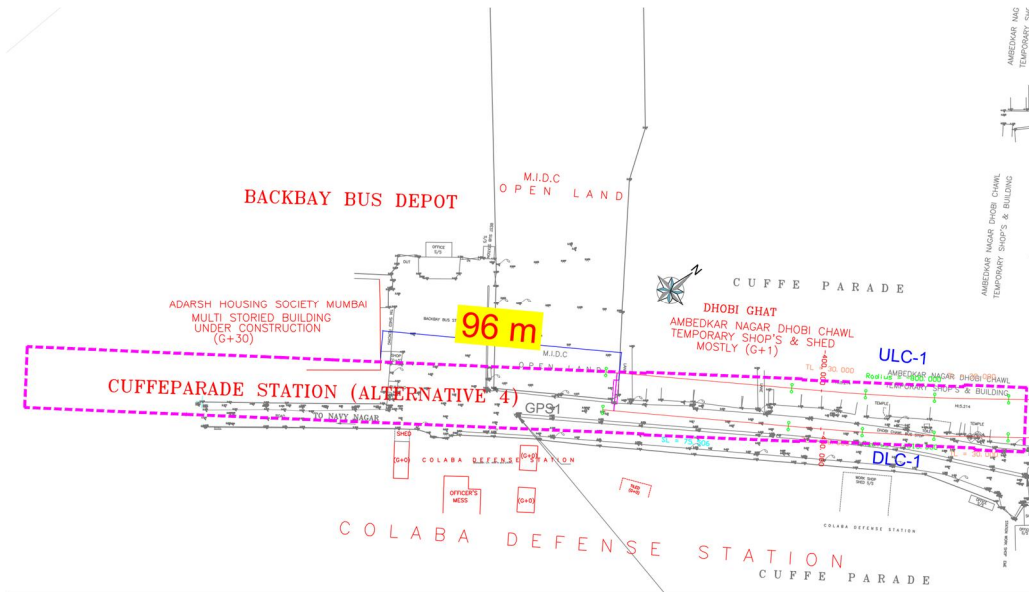


Figure 15 : Illustration of Alternative 4