

Lessons from Mumbai SWM Project

Vijay Joshi
Senior Environment Specialist, RSES, ADB

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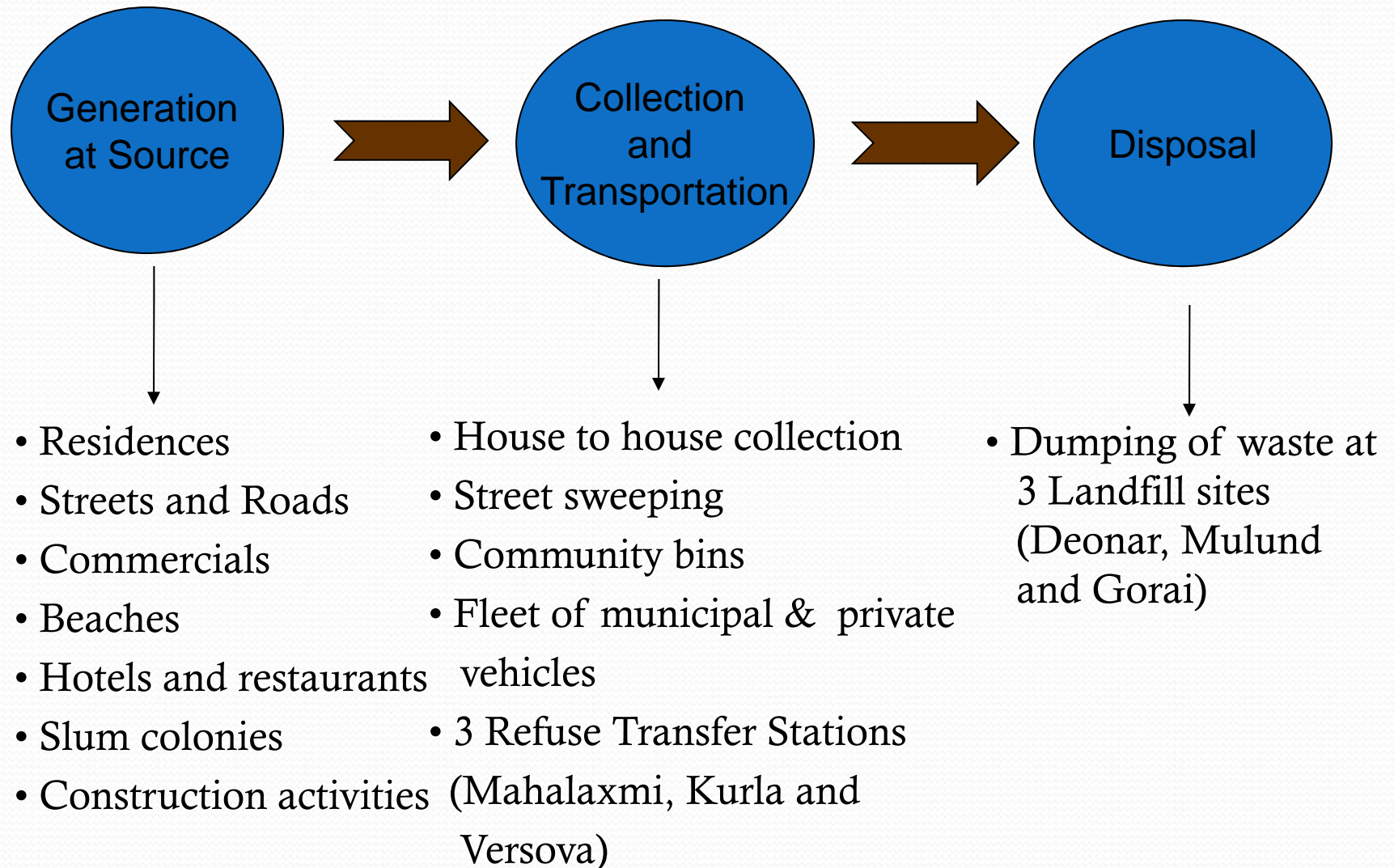
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Objective of SWM Plan for Mumbai

Technologically Suitable and Commercially Sustainable solution for managing MSW in Greater Mumbai for planning period of 25 years (2005-2030)

Status of SWM in 2005



Administrative Zones in Mumbai

- Greater Mumbai Municipal Area (437 Sq. Km.) comprises of 24 administrative wards

- The wards are aggregated into 3 regions

City region




- Zone 1 (Wards A, B, C, D, E)
- Zone 2 (Wards F(N),F(S),G(N),G(S))

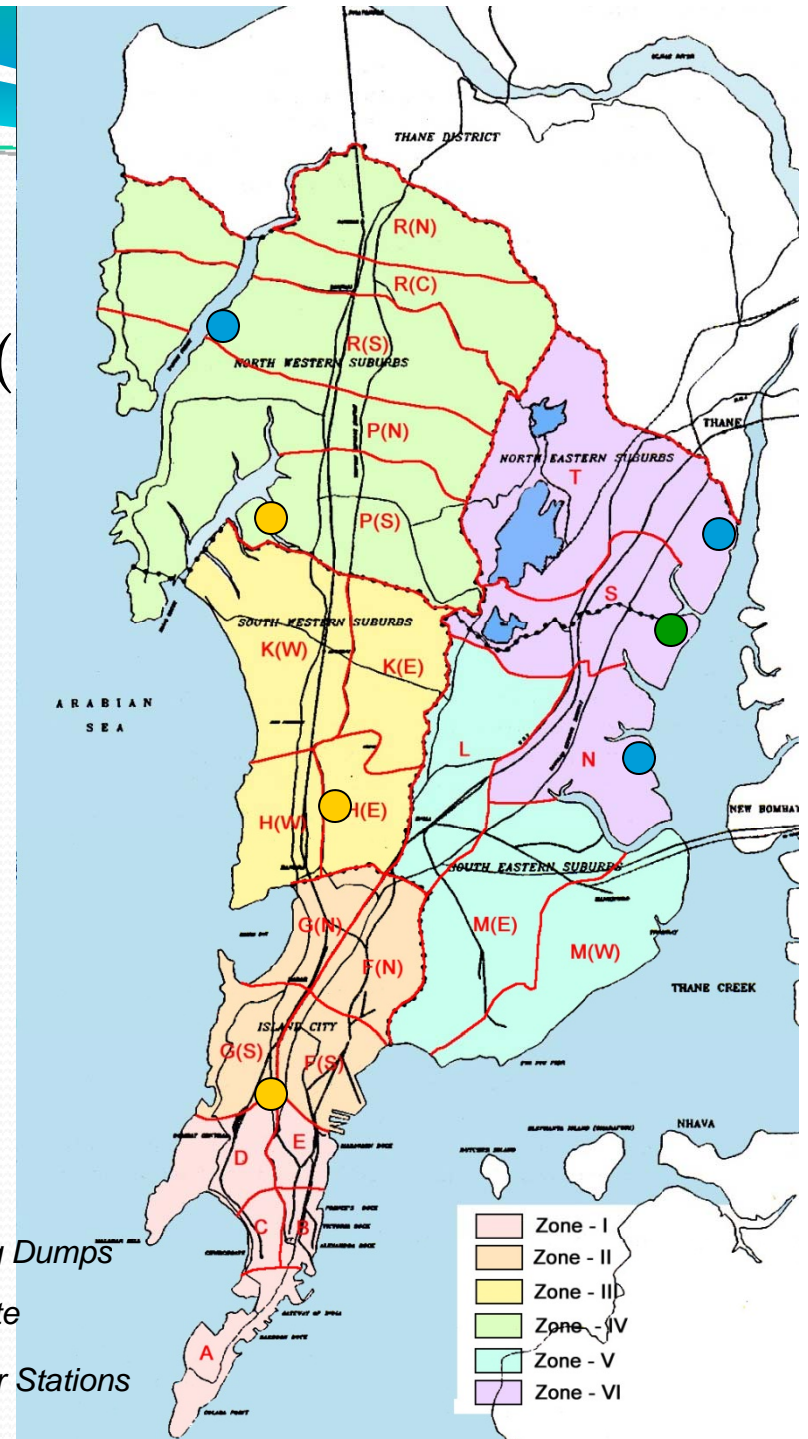
Western suburbs

- Zone 3 (Wards H(E),(H(W),K(E),K(W))
- Zone 4 (Wards P(N),P(S),R(N),R(C),R(S))

Eastern suburbs

- Zone 5 (Wards L, M(E),M(W))
- Zone 6 (Wards N, S, T)

-  Existing Dumps
-  New Site
-  Transfer Stations



Disposal of MSW

- MSW is disposed at three landfill sites by open dumping

Name of Site	Operational Since	Total Area (ha)	Height of Waste (m)*	Future life** (years)
Gorai	1972	20	10.2	2
Mulund	1968	25	7.5	2
Deonar	1927	132	8.0	8

- *A land admeasuring 141.7 ha. at Kanjur Village was handed over to MCGM by GoI through GoM.*

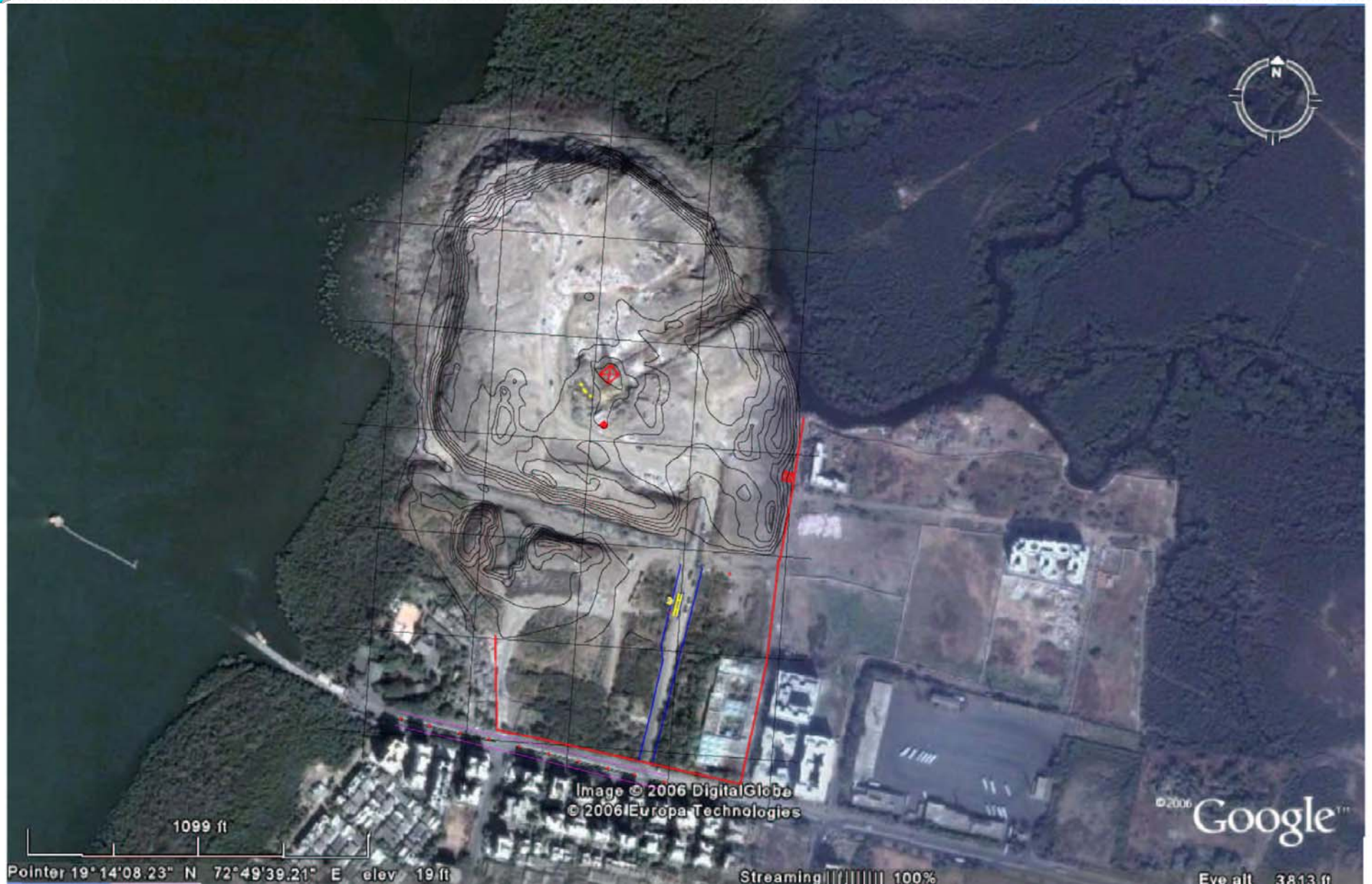
Aerial View of Deonar Disposal Site



Slums adjacent to Deonar Disposal Site



Aerial View of Gorai Disposal Site



Mangroves Adjoining Gorai Site



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Waste Dumping at Gorai Site



Waste Dumping at Gorai Site



Waste Spilled Over the Mangroves




Aerial View of Mulund Disposal Site



Residential colonies adjacent to Mulund Disposal Site





Management Plan for Treatment and Disposal of MSW

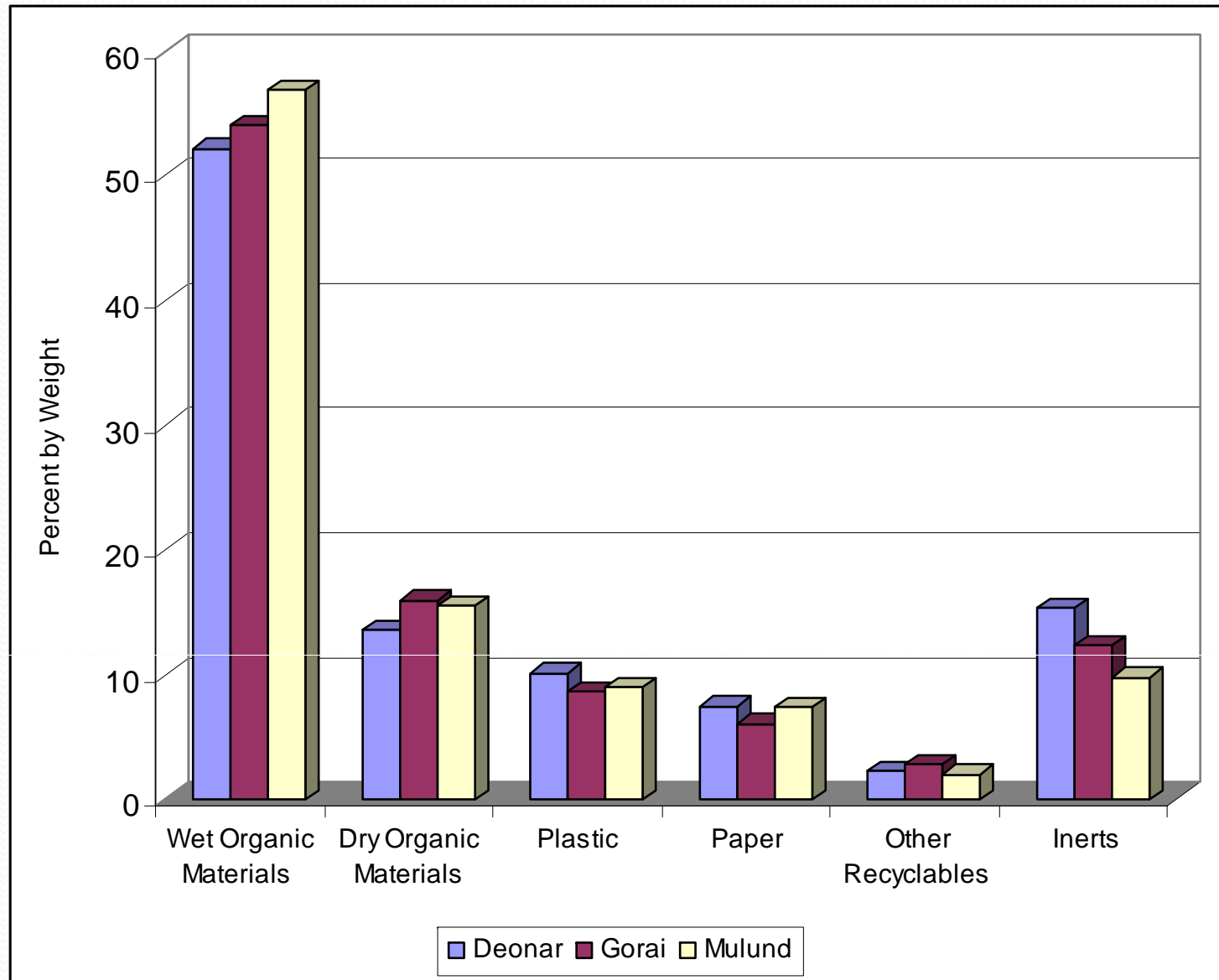


Context...

- Treatment and Disposal were areas of major deficiencies in SWM of Mumbai
- A comprehensive solution addressing long term (25 years) need for management of MSW and C&D waste was required
- A detailed study Commenced in July 2005 for development of integrated treatment and disposal plan for Mumbai

Aggregate Composition

(By Major Material Category Reaching Dumping Grounds)



Critical MSW Characteristics

- Content of high biodegradable waste (>50%), recyclable materials (18.6%), inerts (12.5%)
- High Moisture – about 50% in dry period, up to 65% in monsoon
- Low calorific value (below 1000 K Cal/Kg)

Technologies considered

- Aerobic composting
- Refuse derived fuel
- Bio-methanation
- Mass Burn (Incineration)
- Gasification/Pyrolysis
- Landfill as Bio-reactor
- Plasma Pyrolysis Vitrification (PPV)

Technology Evaluation Criteria

Reliability Filter

Proven Technology for Large Scale Application



Proven Internationally requires Caution before adopting for Mumbai

No Proven Track Record

Waste Suitability Filter



Suitability for Mumbai Waste

Can be made suitable by using Auxiliary Fuel

Unsuitable for Mumbai Waste

Environmentally Accepted Filter



Environmentally and Socially Accepted

Environmental Suspect/Does not Meet MSW Rules 2000



Shortlisted Technologies

- Composting
- Bio-methanation
- Refuse Derived Fuel for special waste
- **Bioreactor landfill**

Projected Population and MSW Generation

Year	Population (Million)	MSW Generated (TPD)	MSW reaching Dumping Grounds (TPD)*
2005	12.63	7,426	6000
2015	14.42	9,358	7500
2025	16.21	11,525	9200
2030	17.10	12,674	10,100

* Uncollected waste and reduction due to recycling estimated @ 20%

Strategy for Waste Management

Site	Waste Allocation (tons)	Total Area (ha)	Closure Needs (ha)	Available for future (ha)	Waste Processing/ Disposal Technology
Mulund	500	25	11	9	Partial Closure (PC) Bio-methanation + Sa. Landfill
Deonar	2000	132	52	80	(PC + Composting + Sa. Landfill
Kanjur	4000	141	nil	120	Composting + Sa. Landfill
Gorai	-	19.6	17.6	2	Full Scientific Closure
Total	6500	317.6	79	211	-

Site Management Plan for Gorai

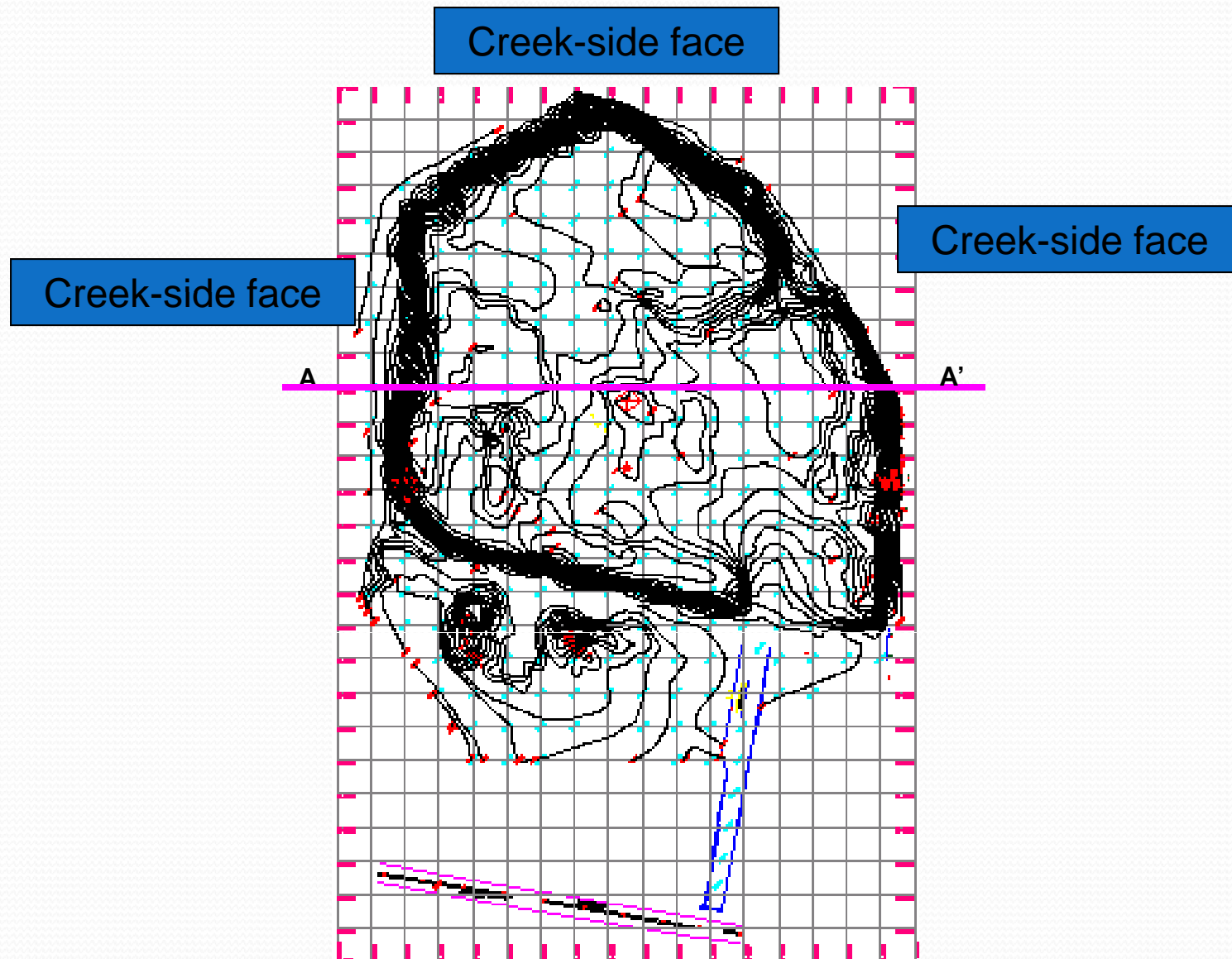
- Sheet Piling & site infrastructure
 - Provide sheet pile barrier on the creek-ward side to stop tidal intrusion into the waste
 - Develop ancillary infrastructure of boundary walls, roads and lighting
- Relocation of Waste and slope moderation
 - Shift the waste at site into about 360 m by 360 area
 - Raise the landfill to structurally recommended level of 20 m
 - Moderate side slopes to 1:3
 - Provide leachate collection and transportation system

Site Management Plan for Gorai

- Cover for final closure
 - Close the landfill by encapsulating it in impermeable cover
- Landscape
 - Develop the site as landscaped open area and a demonstration unit for segregation and in-house/premises processing of MSW

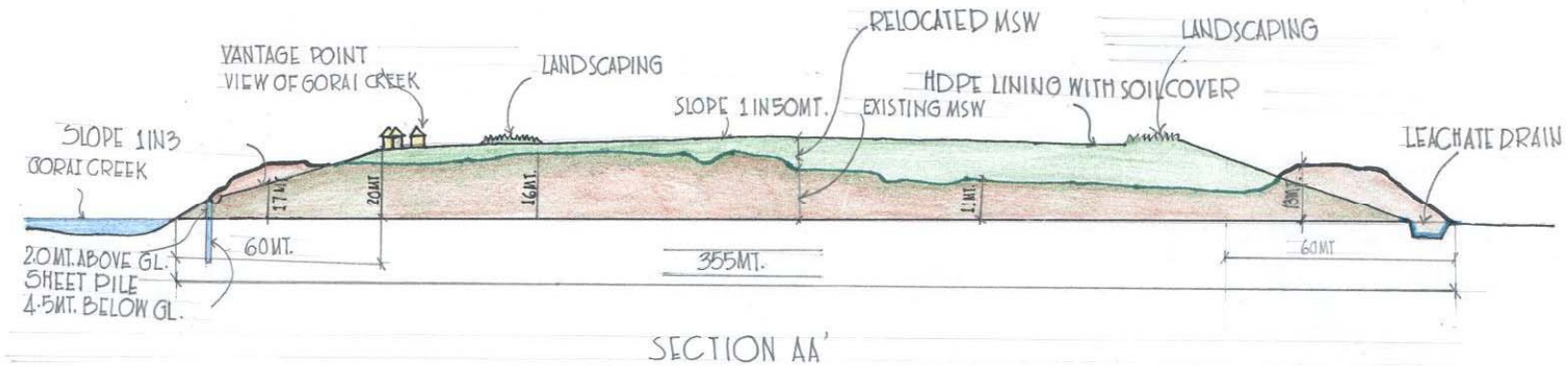
Site Management Plan for Gorai

Existing Contours

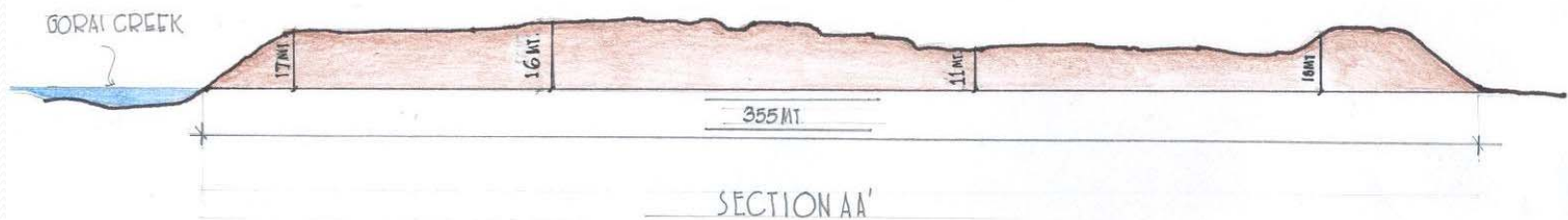


Site Management Plan for Gorai

Cross-section view at section AA'

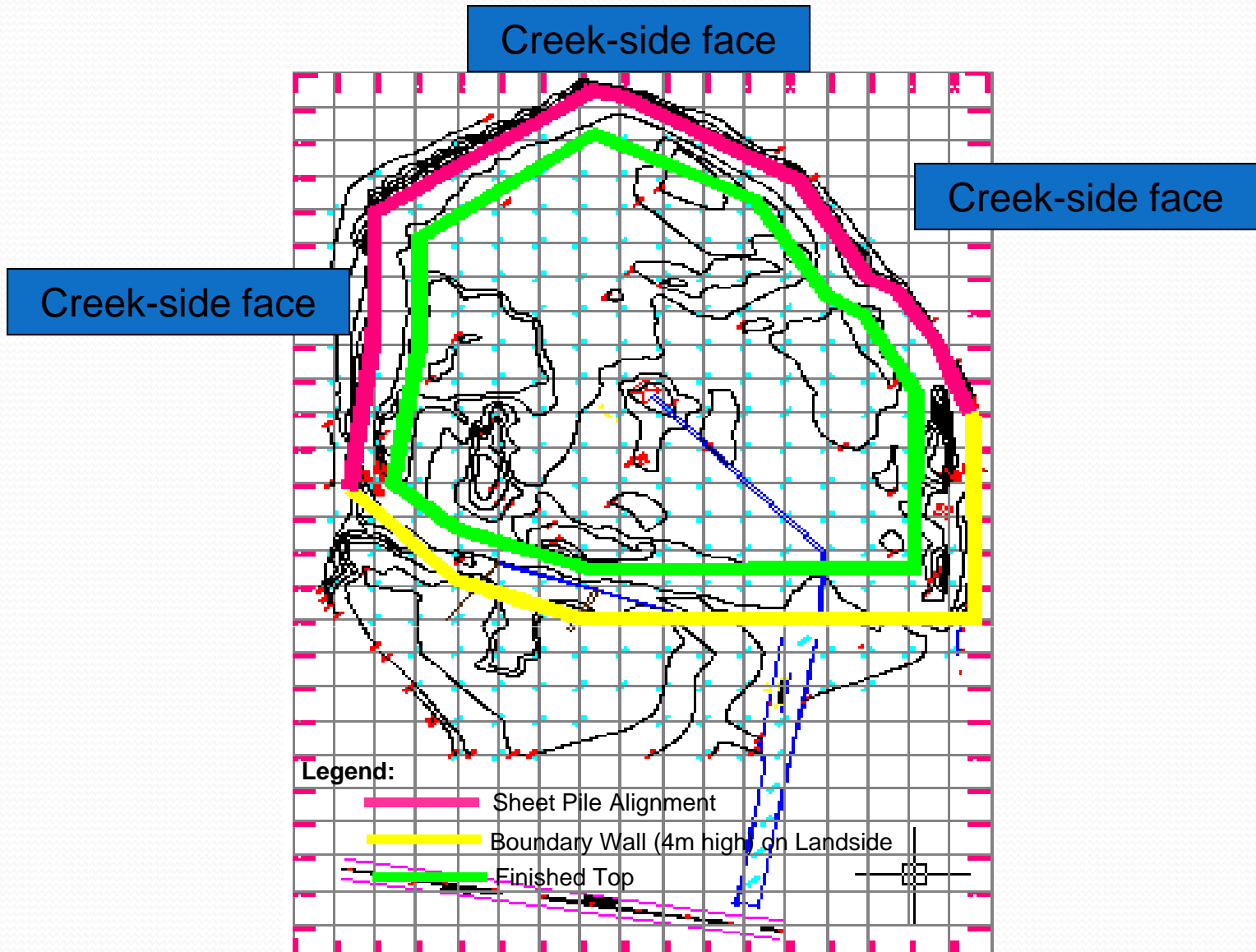


TYPICAL SECTION - PROFILE AFTER CLOSURE OF THE SITE



TYPICAL SECTION - EXISTING PROFILE OF DUMP

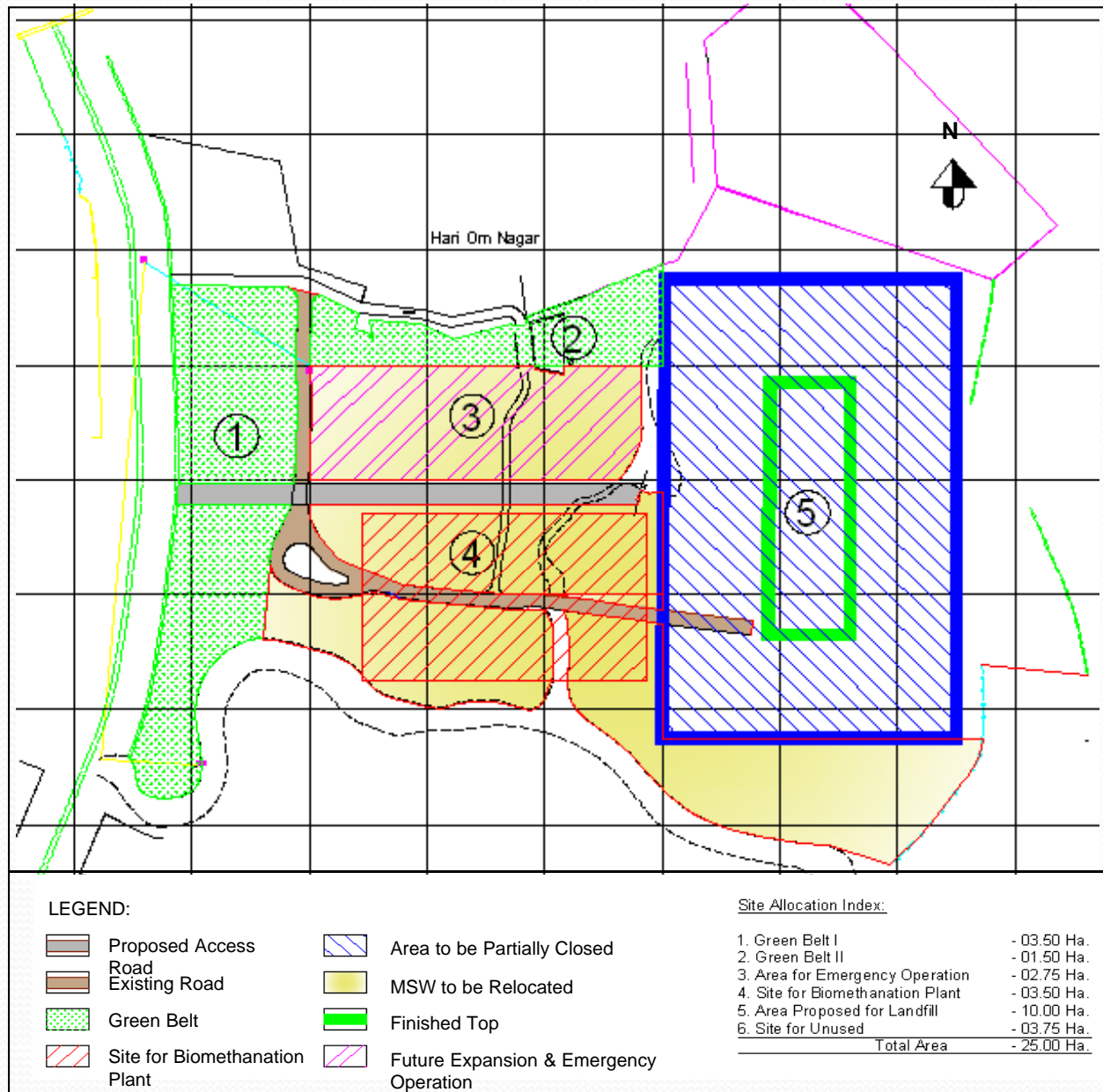
Sheet-pile arrangement and finished levels



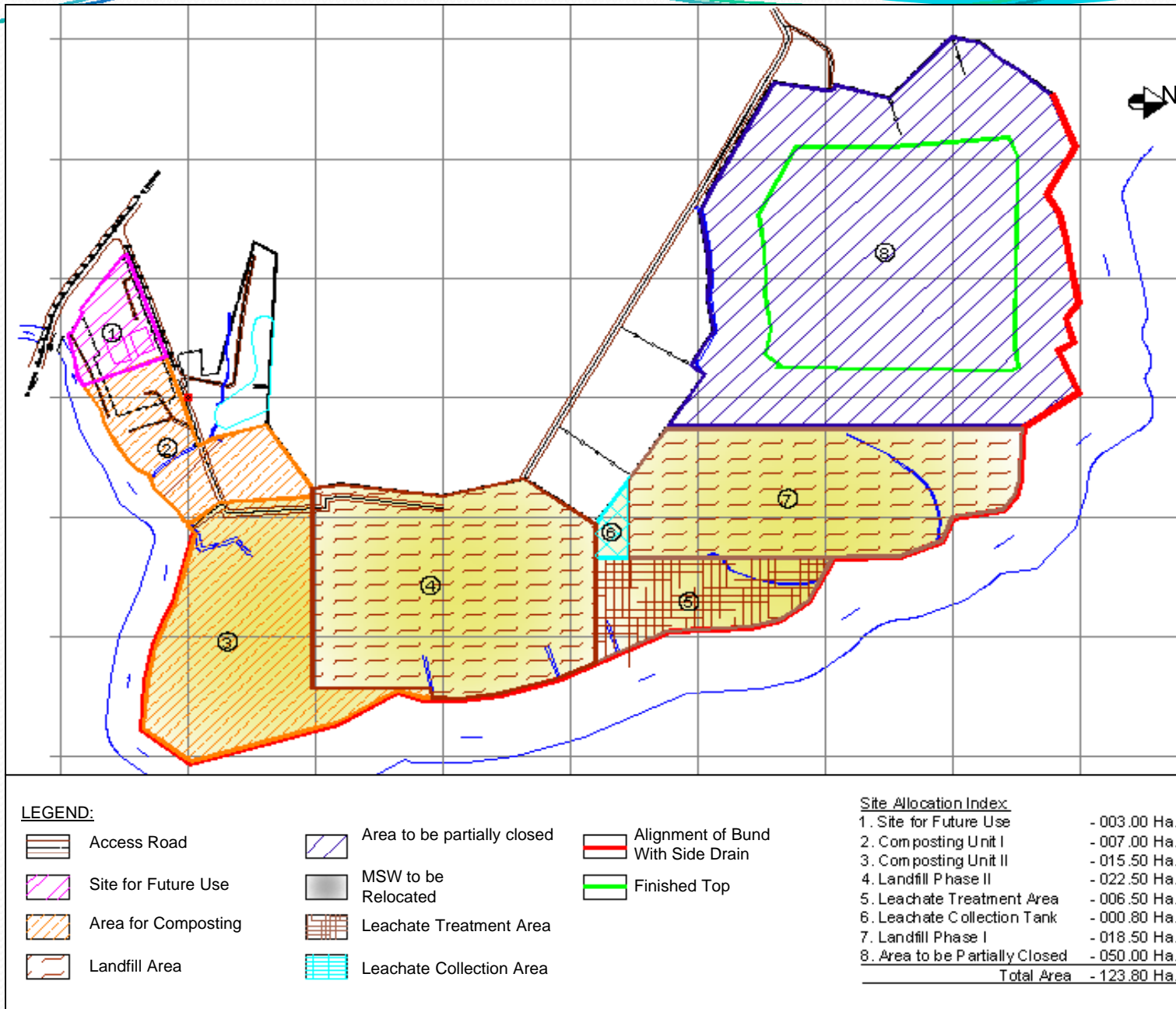
Gorai Landfill – Post Closure



Management Plan for Mulund Site

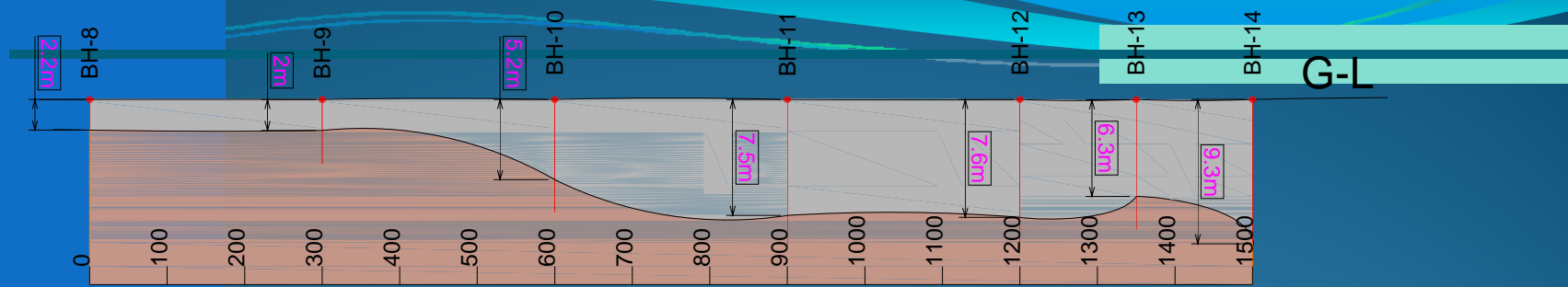


Management Plan for Deonar Site



Projected MSW Reaching Kanjur Village Site

Year	MSW (TPD)	MSW (TPD)
2005	6100	3500
2010	7100	4500
2015	8100	5500
2020	8900	6300
2025	9800	7200
2030	10500	7900



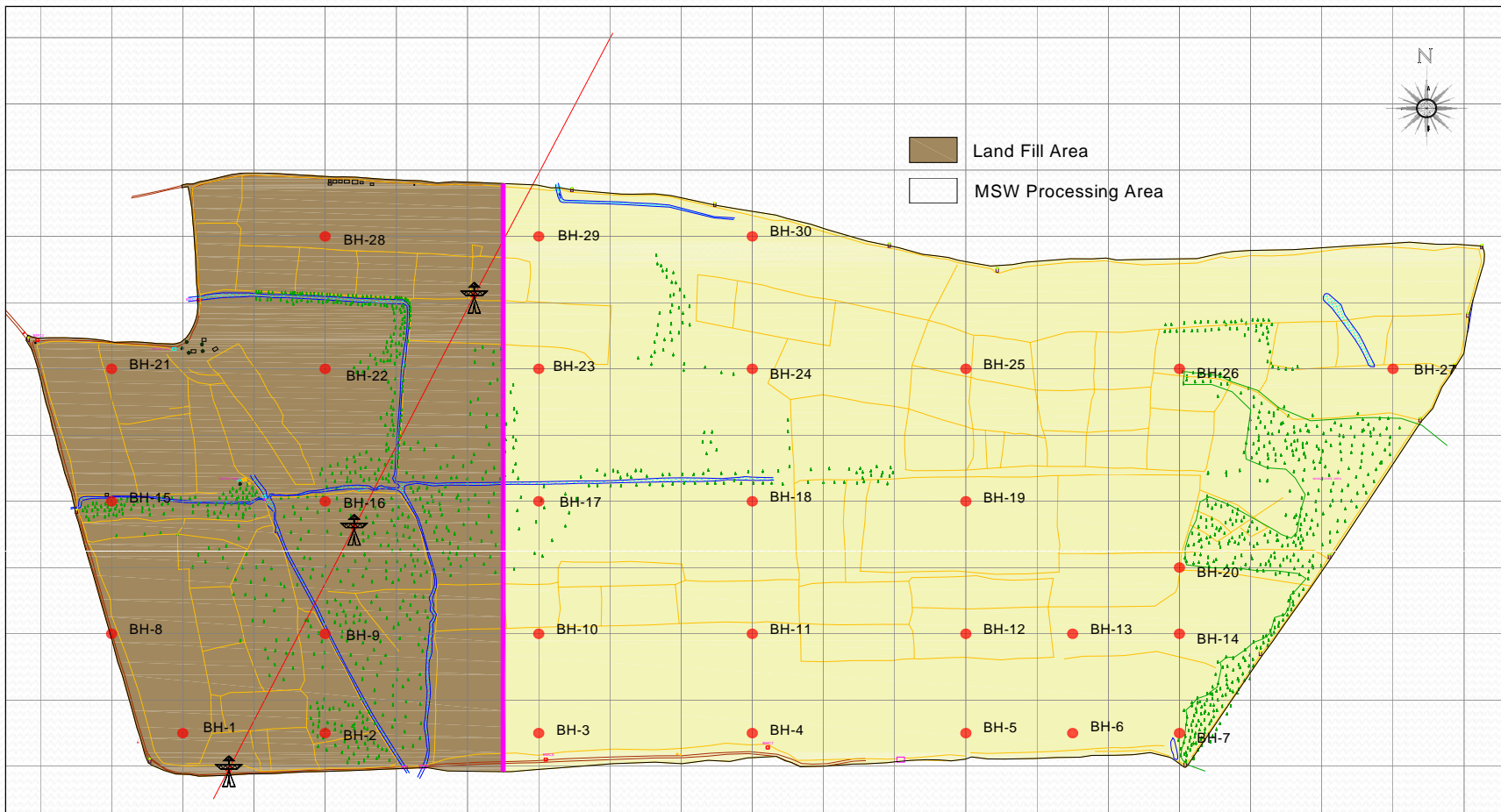
Section H-H

Soft Basalt (Rock) / Grey Concretions

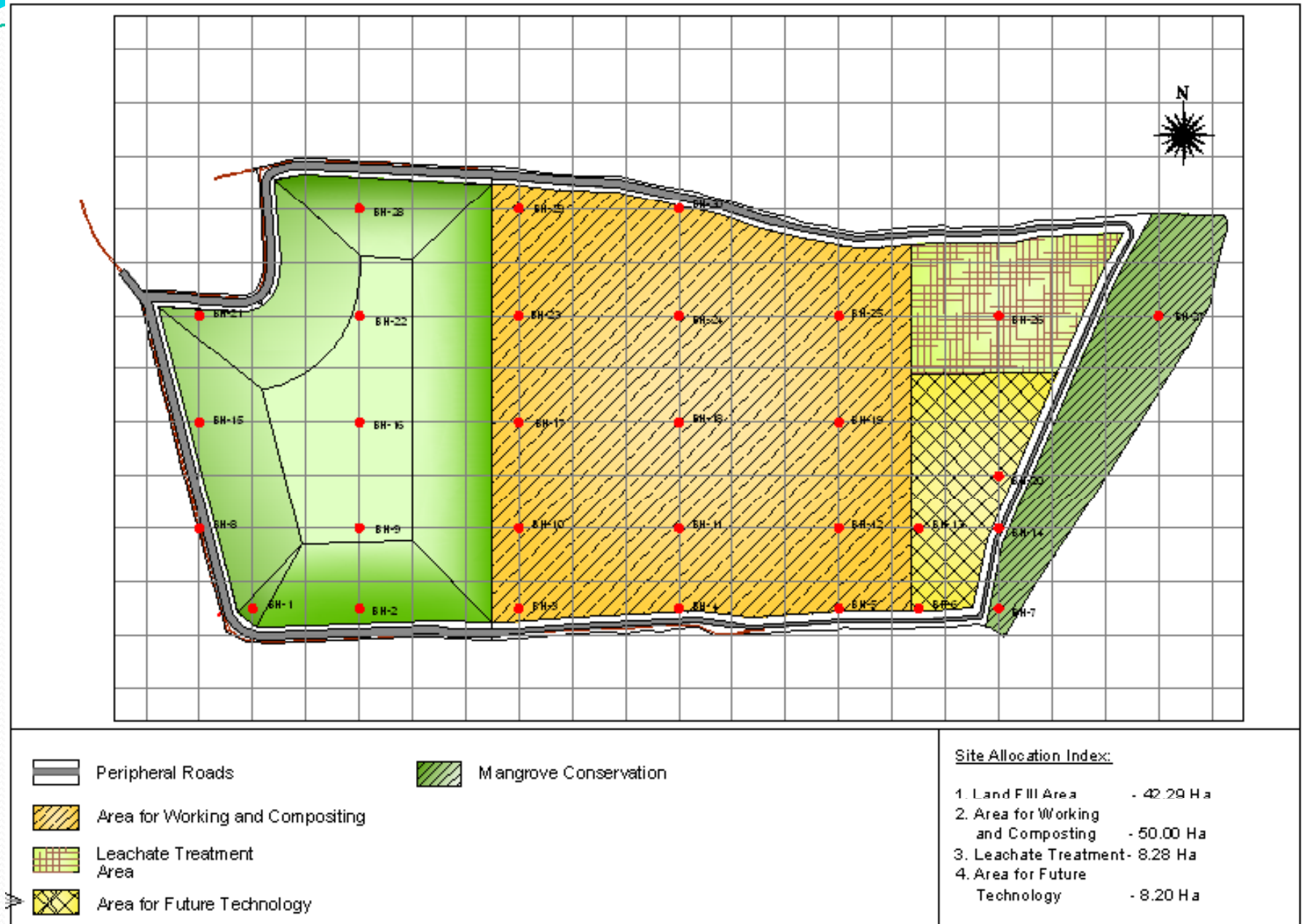
Light Brownish / Blackish Grey clayey silt



Management Plan for Kanjur



Management Plan for Kanjur





Lessons

- Holistic solution for a practical time horizon in necessary for effective SWM through PPP
- Availability of sufficient land area for implementing technologically appropriate solution is important
- Environmental and social issues need to be resolved adequately and upfront
- The qualification criteria must weed out inexperienced bidders
- Branding by an internationally recognized player could be very useful to instill confidence