

Palava infrastructure planning

April 2013

Session plan



Potable water & Rain water harvesting	**10 AM – 11 AM**
STP and non-potable water	**11 AM – 12 noon**
Power infra and solar	**12 noon – 1 PM**
Solid Waste Management	**2 PM – 3 PM**
Transport and road network	**3 PM – 4 PM**

Session plan

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Potable water – key questions from last workshop



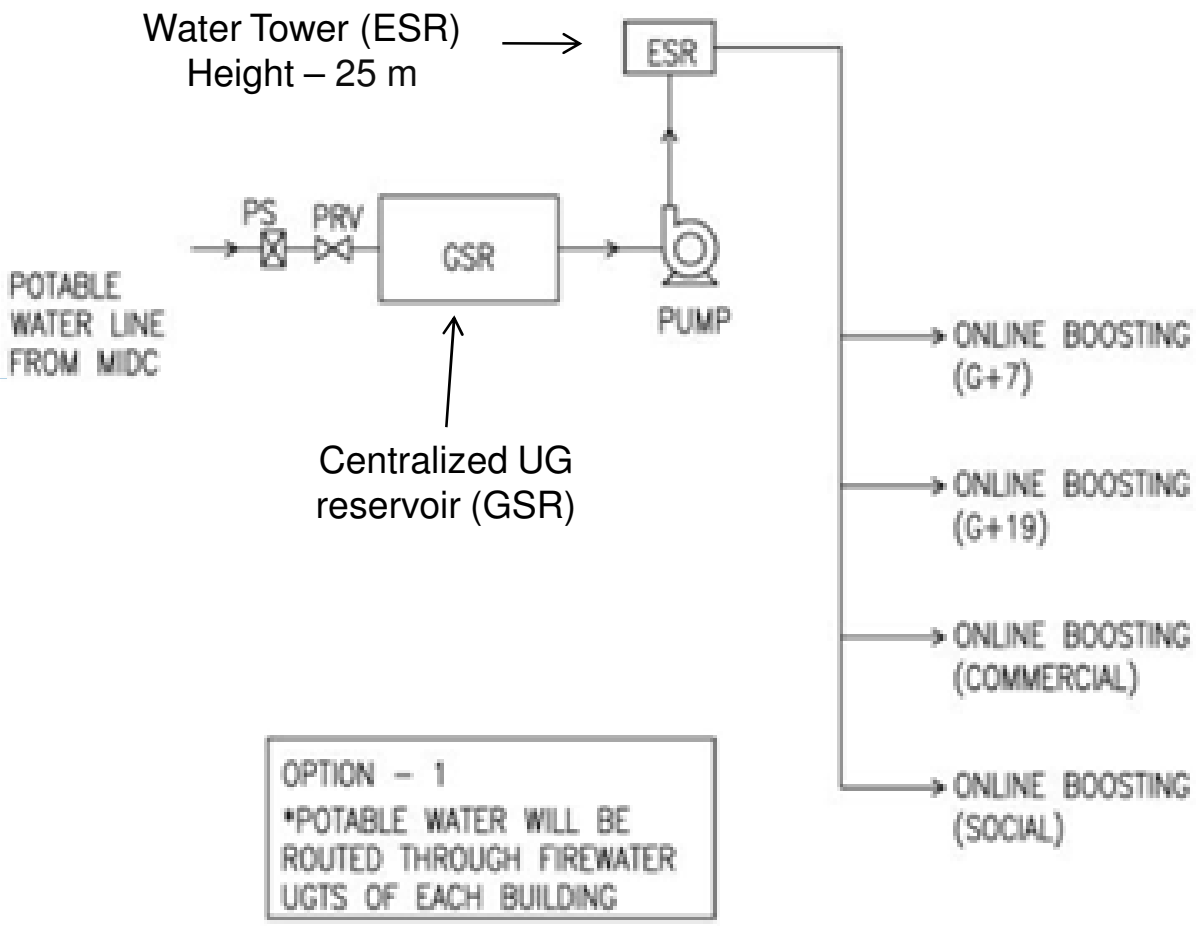
Assessment done

1. Analysis of distribution network – Centralized or decentralized storages
2. Feasibility and commercial implications of storage rain water harvesting

Further evaluation required

- Evaluation of apartment level water metering - **KAPL**
- Evaluation of rain water harvesting through ground water recharge – geo hydrological study awaited – **started**
- Details of smart network monitoring systems – **part of Cisco study**

Water distribution network Option 1 – Using a water tower removes the reliance on MIDC line pressure



Storage location

- GSR and ESR combined - 1 day storage
- Building level overhead tanks (OHT) – Half a day

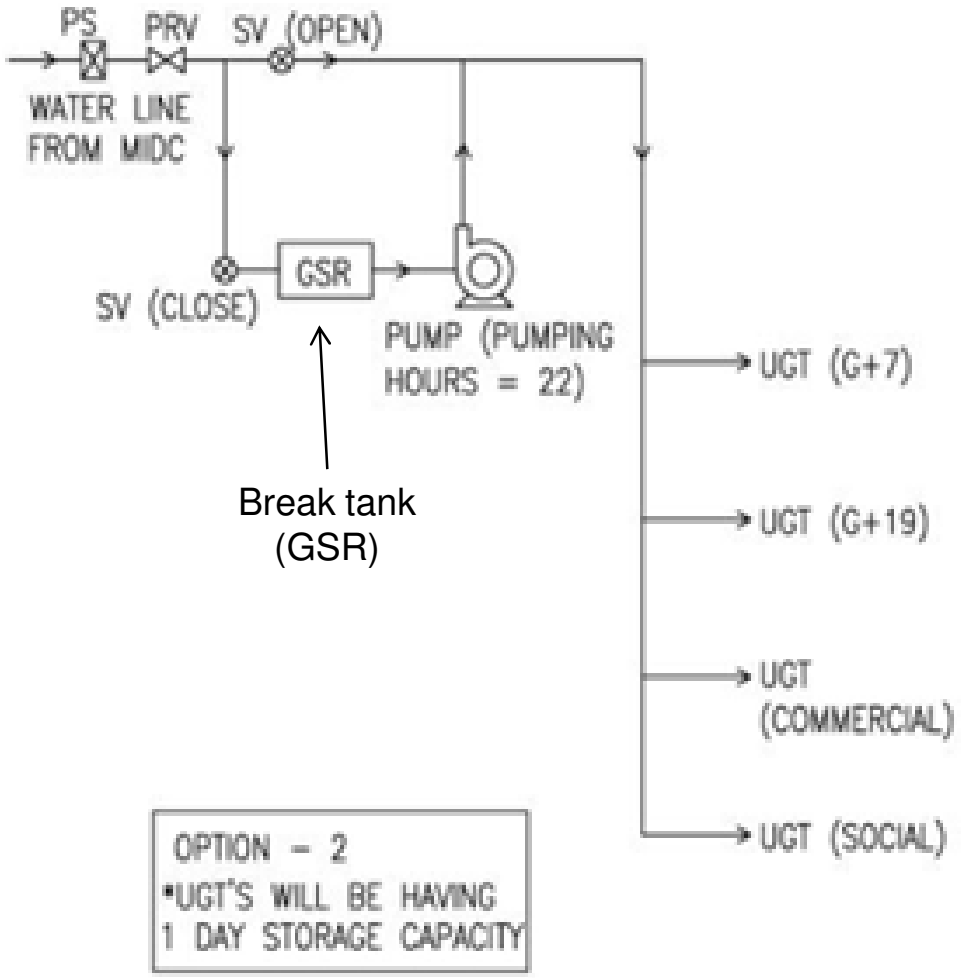
Normal operations

- GSR fills via MIDC line
- Water pumped from GSR to ESR
- Pumped from ESR to building OHT by online boosting

Back up operations (in case MIDC line pressure falls)

- Not required

Water distribution network Option 2 – Uses the current scheme with an addition of centrally located break tank



Storage location

- Block level UG tanks - 1 day storage
- Break tank (GSR) – 1.5 hours
- Building level overhead tanks (OHT) – Half a day

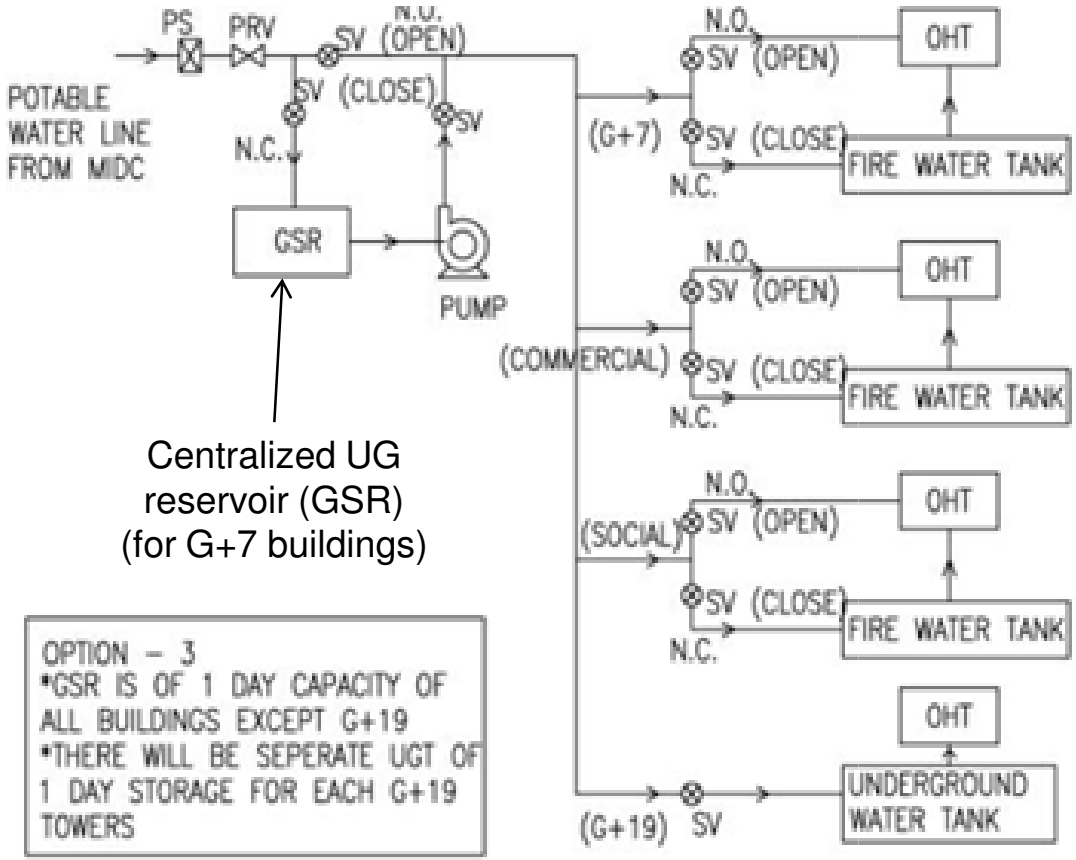
Normal operations

- Block UGT fills via MIDC line
- Water pumped from UGT to OHT

Back up operations (in case MIDC line pressure falls)

- MIDC line pressure breaks at GSR
- Water pumped from GSR to UGTs when MIDC pressure low to fill UGTs directly
- Water pumped from UGTs to OHTs as in normal operations

Water distribution network Option 3 – MIDC line pressure is directly used to fill G+7 overhead tanks and G+19 from UG tanks arrangement



Storage location

- For G+7 buildings – GSR
- For G+19 buildings – Block level UGTs - 1 day storage
- Building level overhead tanks (OHT) – Half a day

Normal operations

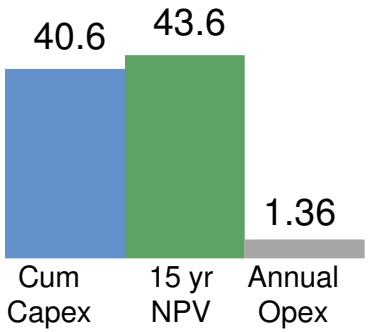
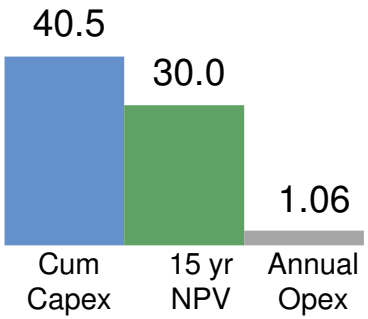
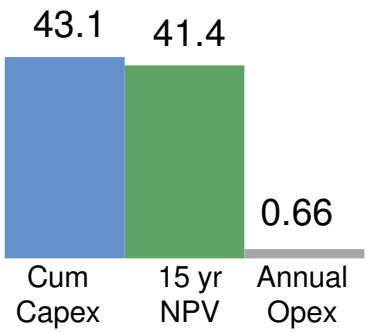
- G+7 building – OHT filled directly via MIDC line (assuming 4 bar pressure)
- G+19 building – Block UGT fills via MIDC line. Water pumped from UGT to OHT

Back up operations (in case MIDC line pressure falls)

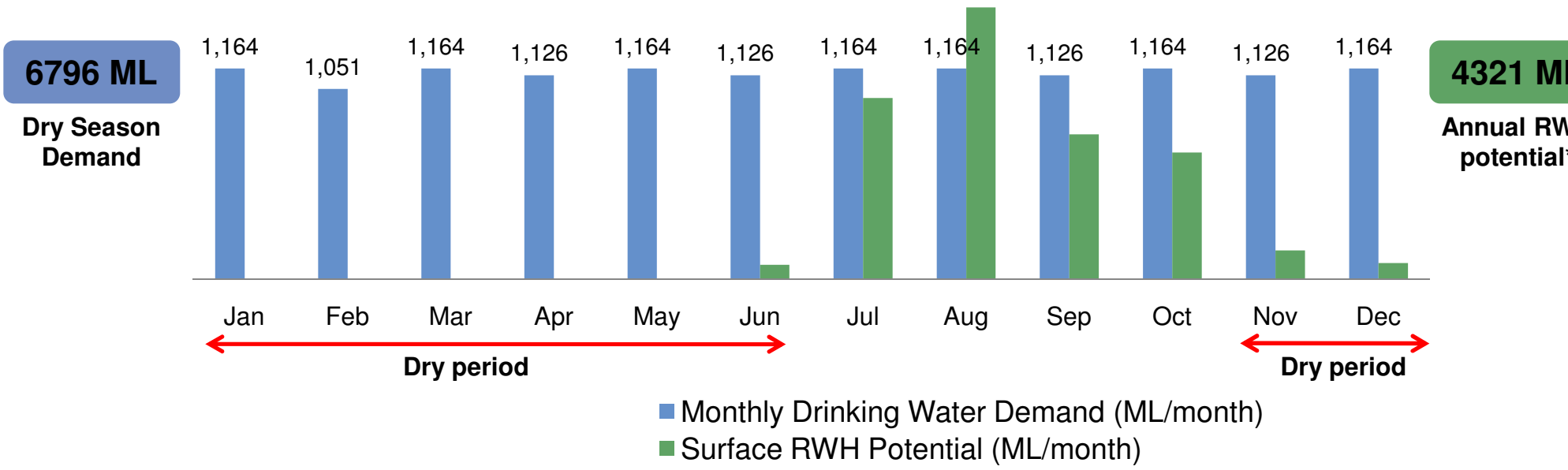
- MIDC line pressure breaks at GSR to fill G+7 OHTs directly
- Water pumped from GSR to G+7 fire tanks where back up pumps supply water to OHTs
- Water pumped from GSR to UGTs of G+19 and then to OHTs

All three options have similar capex but Option 2 (current scheme) is recommended for better capex phasing



	Option 1	Option 2	Option 3
Costs			
Pros	• Does not rely on MIDC line pressure • Single O&M location	• Capex on UGTs incurred with block construction. Better phasing • Higher system redundancy	• Utilizes MIDC pressure to fill G+7 OHTs directly. Lowers electricity costs
Cons	• Higher electricity cost as MIDC pressure is never used • All capex incurred upfront • Lower system redundancy	• O&M overheads due to large number of UGTs	• Requires 4 bar pressure in MIDC li to operate. Unlikely considering pressure in some parts of Rio ~1 ba • If MIDC line pressure falls, back up pumps are used which negates the opex advantage
Space	~3-3.5 acres for central reservoir	~1 acres for central break tank	~3-3.5 acres for central reservoir
		Recommended Option	

For achieving 50% self-sufficiency in potable water demand, need effective rain water storage of ~3400 ML per year for dry seasons



Catchment	Area (sqm)	Annual RWH (ML)
Rooftop	828,276	1,664
Plot Area	650,788	726
Greens	1,272,441	1,420
Roads	164,067	183
Gauchar	293,563	328
TOTAL	**3,209,135**	**4,321**

* Based on 2.48 m annual rainfall and 10% loss in first flush

Major holding capacities for RWH are under-ground tanks under MLCP and around blocks; with depth and area coverage as the main levers

			Storage capacity (ML)				Effective storage (ML)		
Master-plan element for RWH storage	**Area / unit (sqm)**	**Total Area (sqm)**	**Upto 3m depth**	**Upto 5m depth**	**Upto 10m depth**	**Losses**	**Upto 3m depth**	**Upto 5m depth**	**Upto 10m depth**
MLCP	--	31,855	96	159	319	20%	76	127	255
Quarry	2000 - 12000	46,773	NA	246	280	30-50% seepage loss and another 2m of annual evaporation	49	49	61
Khoni Pond	50000	50,000	150	NA	NA		25	25	25
River check dam (1m depth)			134				29	29	29
At Block Level (UGT equivalent)									
A 10% of building terrace area rainfall being stored	--	82,828	248	414	828	5%	236	393	787
B 20% of building terrace area rainfall being stored	--	165,656	497	828	1,657	5%	472	787	1,574
C 40% of building terrace area rainfall being stored	--	331,312	994	1,657	3,313	5%	944	1,574	3,147



Option	**Total rainwater storage (ML)** Upto 3m depth	Upto 5m depth	Upto 10m depth	**% of self-sufficiency target** Upto 3m depth	Upto 5m depth	Upto 10m depth
A	416	624	1,157	6%	9%	17%
B	652	1,017	1,944	10%	15%	29%
C	1,124	1,804	3,517	17%	27%	52%

Cost/unit of rain water stored are driven by increase in structural cost of the building & cost of storage tanks, partially offset by usage in WMM



Storage in Blocks

	Cost per cum, Rs		
	3m depth	5m depth	10m depth
Construction cost (incl. excavation)	12000	12000[1]	12000[1]
WMM (Offset)	(1000)	(1000)	(1000)
Net Cost	**11000**	**11000**	**11000**

MLCP

	Cost per cu m, Rs		
	3m depth	5m depth	10m depth
Excavation	432	702.2	1351.1
Tank Construction cost	5000	5000[1]	5000[1]
WMM (Cost Offset)	(1000)	(1000)	(1000)
Structural Cost Impact	2344		
Net Cost	**6,776**	**4,702**	**5,351**

Quarry

	Cost per cum, Rs	
	5m depth	10m depth
Excavation	972	1657
Tank Construction cost	3000	3000
WMM (Offset)	(1000)	(1000)
Net Cost	**2972**	**3657**

1. Base case – likely to increase with increased depth of storage

For achieving ~6% self-sufficiency by storage, total cost impact of Rs 500 Cr. Hence, more feasible option might be ground water injection

	Building	MLCP	Quarries	Others
Excavation costs	11	4	12	30
Storage const. costs	287	48	74	
Structural cost impact on buildings	NA	22	NA	NA
Plumbing & treatment cost	50	15	5	Included
Cost offset by usable material (e.g. roads)	(25)	(10)	(12)	NA
Total	**323**	**80**	**78**	**30**

Total spend of Rs 512 Cr.

- For base case (e.g. 6% of self-sufficiency target – Option A and 3m depth), capex spend of Rs 1.2 Cr per ML of water stored
- Cost impact of increasing storage option (closer to 50%) is under evaluation; but likely to be extremely high
- If 4,300 ML of rainwater could be stored in groundwater aquifers during monsoon, then extracted during dry seasons, might achieve closer to 50% target (to be validated by geo hydrology study)

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STP and non-potable water – key questions from last workshop



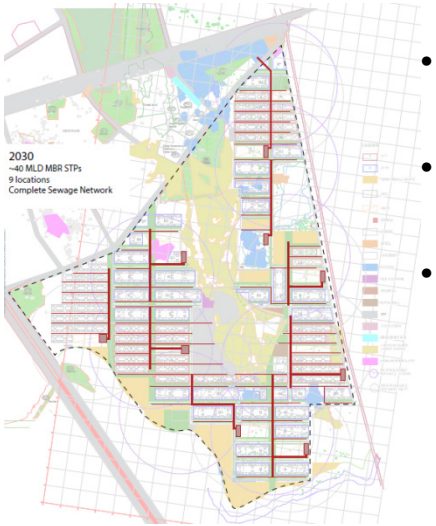
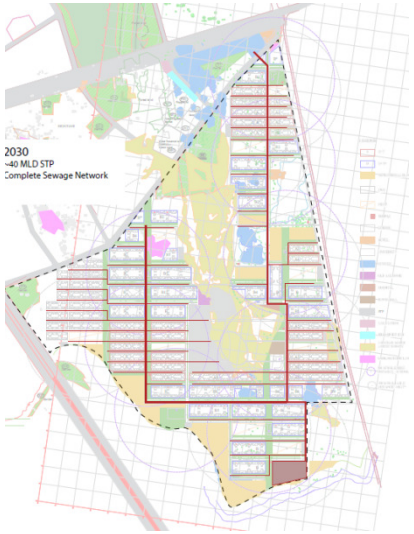
Assessment done

1. Whether single large STP centralized in one location or have multiple plants distributed across the master-plan
2. What are the technology options for city size STP's?
   - Evaluation on the basis of life-cycle costs
3. Key design parameters or levers that need to be incorporated
   - Implications on the master-plan

Further evaluation required

- Evaluation of bio-gas generation option for producing power for STP
- Business model of treated water – recommended to establish BOO / BOOT model with leading utility operators and charge directly to Palava residents / city operations – **ongoing discussions with GE**

Palava being green-field, decentralized option gives more flexibility in planning and reuse of treated water

	Decentralized STP scheme	Centralized STP scheme
		
	• One 6-7 MLD per "Zone" as per construction plan • Collector sewage networks within "Zone" • Treated water re-circulated locally within the respective Zones for flushing or other usage	• STP located at one location in trenches of 10 MLD • Main sewage trunk which connects to the collector networks in respective "Zones" • Treated water pumped back from this location back to respective "Zones"
Principles of planning STP's	• Most green-field developments are opting for this choice since requirement comes in phased manner • Reduces overhead of having main sewer trunks and transfer stations	• Mostly planned in brown-field and municipal level developments • Sewer trunks, transfer stations and remaining sewage infrastructure already exists in these cases • Generally treated water is not pumped back for reuse
India case studies	• GIFT has been designed with 4 decentralized STP's in phased manner for total 800 acres development • Chandigarh has sector level STP's of 10-12 MLD capacities	• Navi Mumbai (>50 MLD) STP recently commissioned

2

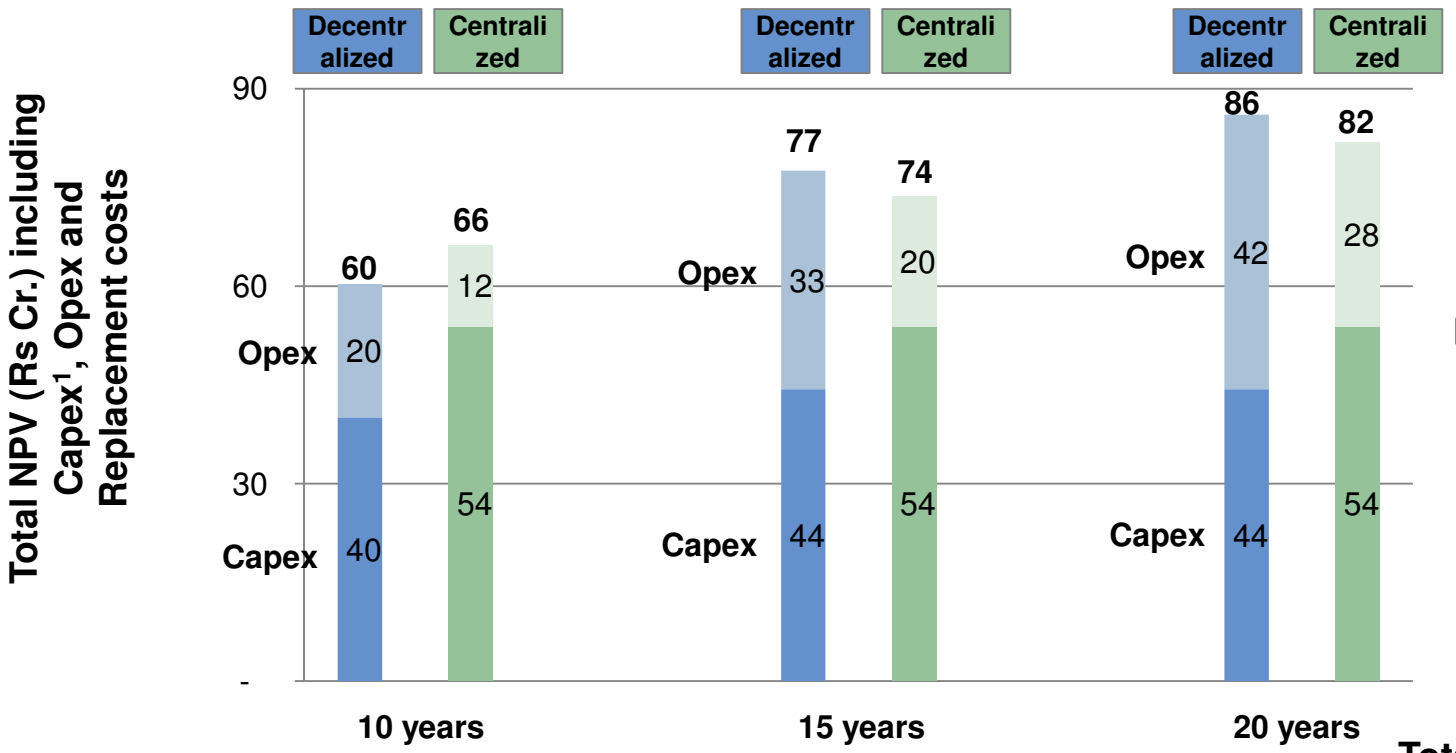
For total 48 MLD requirement in Palava, technology options evaluated are between MBR (centralized) and SBR with tertiary (decentralized)

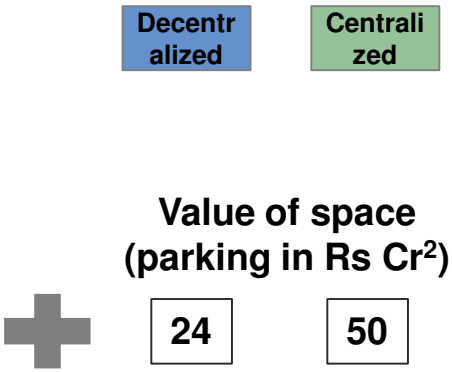


	MBR (Decentralized in 7 zones with 6-7 MLD capacity each)		SBR with tertiary (Centralized in 1 location with trenches of 10 MLD)	
Water quality	• Meets all regulatory and usage criterion		• Meets all regulatory and usage criterion (with tertiary)	
Processing time	• High – hence lower storage (civil costs)		• Low – hence higher storage (civil costs)	
Capex (Rs / kLD)	**Civil[1]**	**~8500**	**Civil[1]**	**~11000**
	Membrane	**~4500**		
	Plant	**~5500**	**Plant**	**~6300**
Opex (Rs / kLD/ year)	**~2900**		**~1900**	
Trunk sewer capex / opex	• Not applicable		• Rs 10-12 Cr. spend in laying trunk sewer lines	
Replacement	• Membranes to be replaced every 8-10 years		• No major replacement cost in first 15 years	

1. Above ground equalization / holding tanks considered

Lifecycle cost for both similar since Decentralized MBR has better phasing but higher opex; however, considerable space freed up in this option





Total present value (incl. cost of space[2])

MBR decentralized system

Total Area requirement of **4-4.5 acres** distributed across 6 zones and commercial / university complexes

Rs 111 Cr.

SBR with tertiary centralized system

Total Area requirement of **9-10 acres** in one single location

Rs 128 Cr.

1. Includes cost of trunk sewer line and recycled water network costs
2. Opportunity cost of land assumed as Rs 2 lakhs per open parking spot
3. Replacement of membranes at 8 years considered. No replacement considered for SBR

2

Risk assessment of both the options indicate decentralized MBR system to be more viable for Palava over long run



	MBR (Decentralized in 7 zones with 6-7 MLD capacity each)	SBR with tertiary (Centralized in 1 location with trenches of 10 MLD)
Demand risk	↑ • Ensures that system is built over time as per construction / possession schedule	↓ • Heavy upfront investment for centralized STP civil and trunk sewer lines
Short term under-loading	↑ • Min threshold for flushing velocity will be obtained sooner • Membrane and BoP will be installed in modular fashion hence minimal risk of under-loading	↓ • Daily flushing of the network will be required till initial 2-3 years • Might need to start with package STP's or septic tanks since min load (4-5 MLD) will be required to start the plant
Flexibility in network sizing	↔ • Not applicable	↓ • 1.5-2 m trench corridor for trunk sewers to be built upfront which limits flexibility in case of change in plans
Operational overheads	↓ • Higher since multiple plants need to be managed	↑ • Low
Technology upgrade	↑ • Can be upgraded easily since modular and distributed – might reduce operational costs or increase efficiency over time	↓ • Tied to one technology

3

Zone wise demarcation of STP requirement and allocation of area on master-plan needs to be done



Master-plan considerations

- For implementing decentralized option, logical zones need to be defined and local STP capacity calculated
- STP area requirement in case of MBR:
  - 4 MLD – ~1900 sqm
  - 6 MLD – ~2500 sqm
  - 8 MLD – ~3000 sqm

Design considerations

- All holding / equalization tanks need to go above ground since reduces the civil costs of the STP by ~30%
- STP area needs to be at least 20 m away from nearest habitable block and surrounded by landscape

Business model

- Ongoing discussions with GE (for MBR) for implementing BOO model
- Target price is 2.5 paise / liter of delivered water at present costs

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Power infrastructure – key questions from last workshop



Assessment done

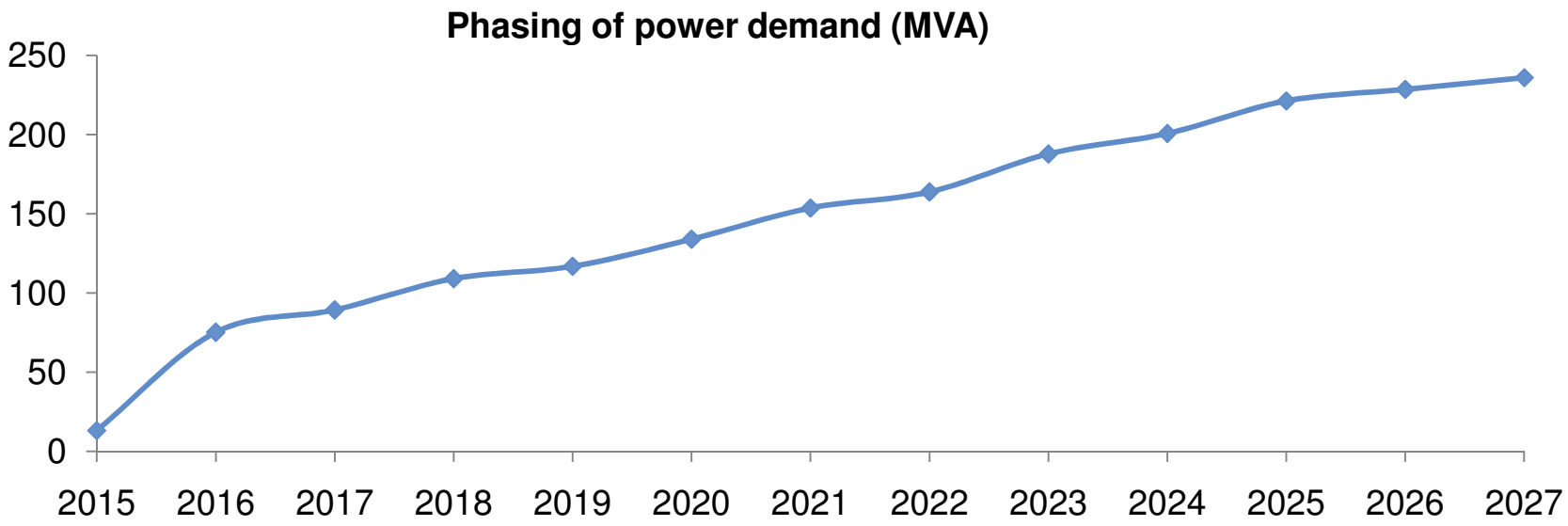
- 1 • Estimation and phasing of overall power demand
- 2 • Upstream design
  - 2a • Size and location of EHV
  - 2b • Whether intermediate switching stations required or not
  - 2c • Whether 22 kV (standard) or 11 kV distribution levels
- 3 • Downstream Design - Sub-station decision (traditional vs CSS) and location options within block design
- 4 • Solar Power
  - 4a • Potential location, size and business model for solar plant
  - 4b • Potential locations and constraints for solar street lights

Further evaluation required

- Potential partners for pre paid metering solution (beyond present partner ecosystem) – **Cisco study**
- Are there other models except the franchisee to get 24 X 7 power – **Lodha with MSEDCL**

Power demand load in Palava expected to ramp up from 15 MVA in initial years to 230-240 MVA in 10-12 years timeframe



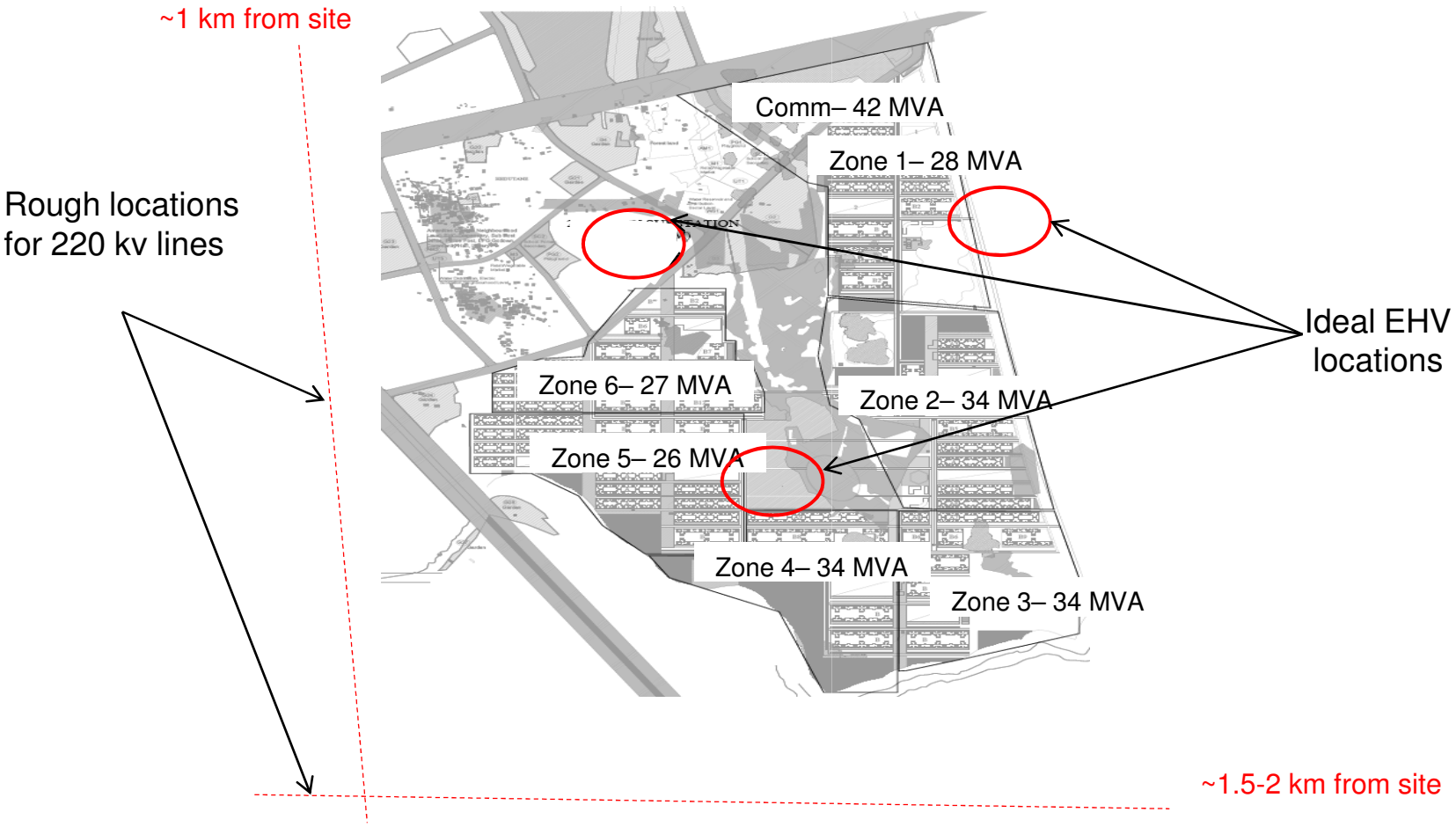


Key design & operations parameters

- Maintain distribution loss below 5% from initial period- Regulatory requirement for operating franchisee
- Provision for EHV substation upfront of around 200-225 MW capacity
- Provision for utility corridor required upfront to route HT lines from EHV to switch yard

2a

In the ideal scenario, multiple EHV substations located at key load centers are desired



Ideal scenario

- Multiple EHVs desired – to better distribute load
- Should be close to the load centre – North side of the plot preferred because of large load in the commercial area

2a

Subject to regulatory (Utility Co) and design constraints, three locations are feasible for a single 200-225 MW EHV

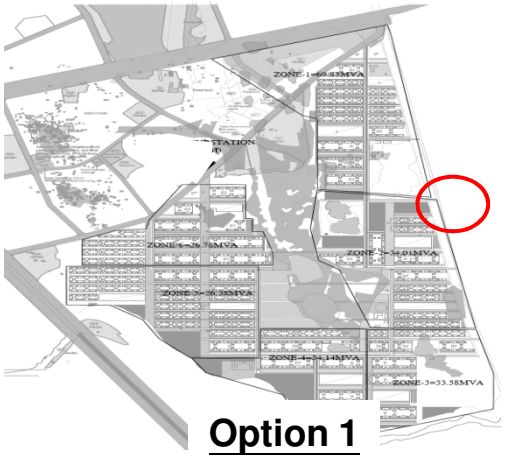
Regulatory Constraints

- At utility scale, EHV's are usually located around 20-30 kms apart. Unlikely that MSETCL would agree to multiple EHVs in a span of 2-3 kms
- MSETCL would want EHV to be as close to existing 220 kv lines – lines pass 1.5 km away on the south side and 1 km away on the east side

Design Constraints

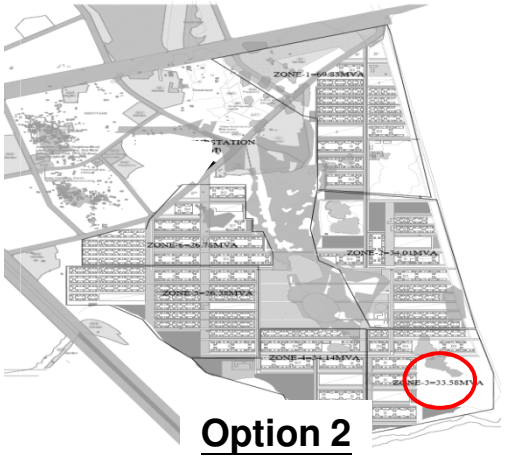
- EHV should not be inside project boundary to avoid 220 kv overhead lines coming inside– large clearances required from residential areas
- EHV should be on project periphery –
  - Large number of 22 kv lines originate from EHV. Length to be minimized to reduce cost
- EHV should be on north side of the river. Crossing the river after EHV would add to Lodha overhead

Probable locations



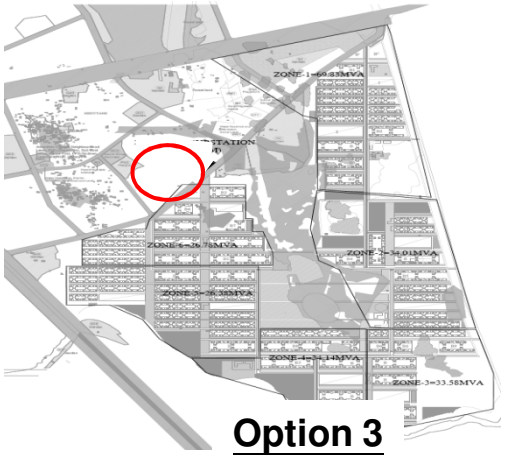
Option 1

Close to load centre but tougher ROW to bring 220 kv lines along road



Option 2

Farther from load centre. Land availability issue



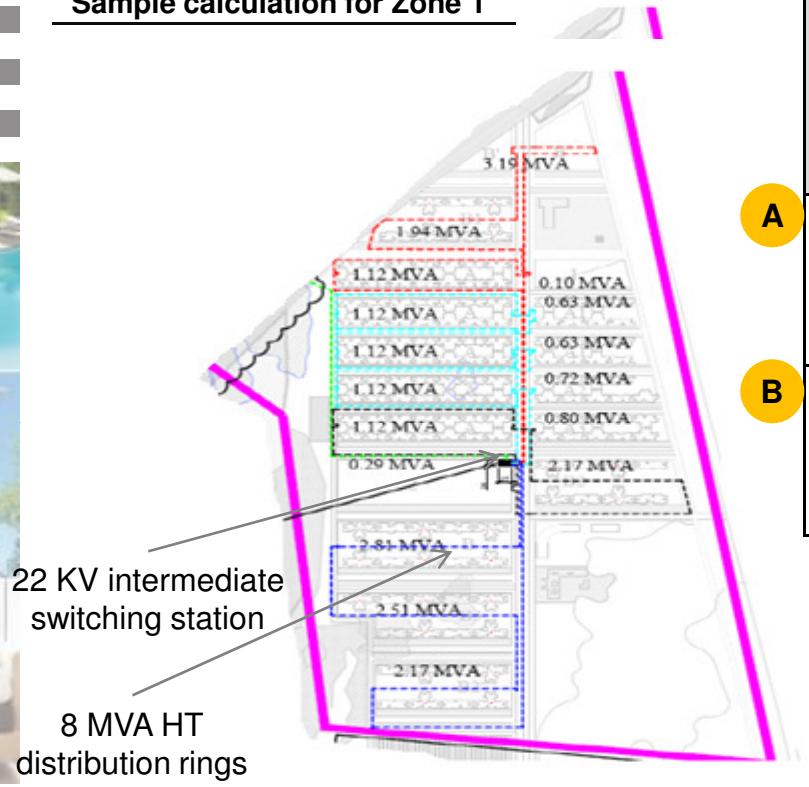
Option 3

Closer to commercial and Zone 1

2b

From EHV, intermediate switchyards are recommended for HT distribution to reduce cost of cable and width of utility corridor

Sample calculation for Zone 1



Schematic showing HT distribution using switching yards in Zone 1

	Options for HT distribution beyond EHV[1]	Capex of HT cable[2]	Width of HT cable corridor	Length of HT cable
A	HT cables from EHV feed block substation in ring main configuration	3.2 Cr.	1 m	15.1 km
B	HT cables terminate at intermediate switching station (in MLCP ~150 sqm)	2.9 Cr.	0.5 m	13.5 km

Recommendations:

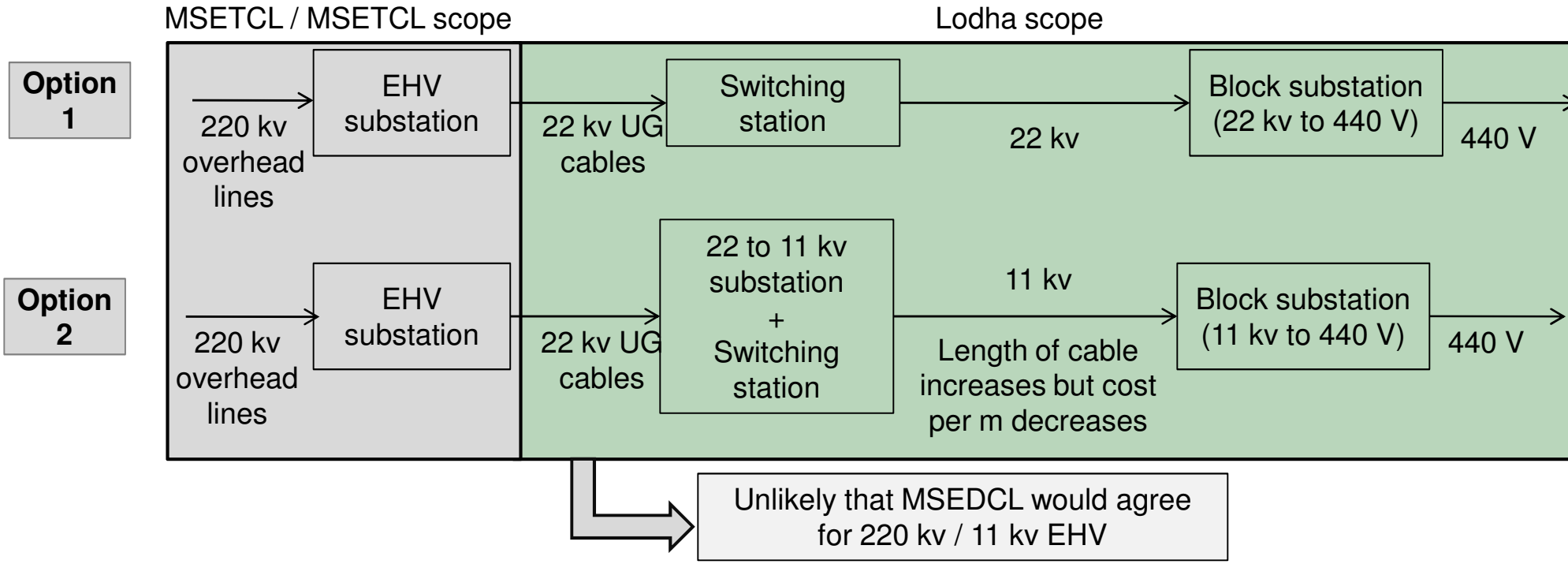
- Preferred to go with **Option B**
- Difference in cost and width of utility corridor would be much higher when evaluated for entire 236 MVA.
- Intermediate switching stations for every load centre of 30-35 MVA.

1.Analysis done for residential demand in Zone 1 – 28 MVA
2. Excluding any civil cost

2c

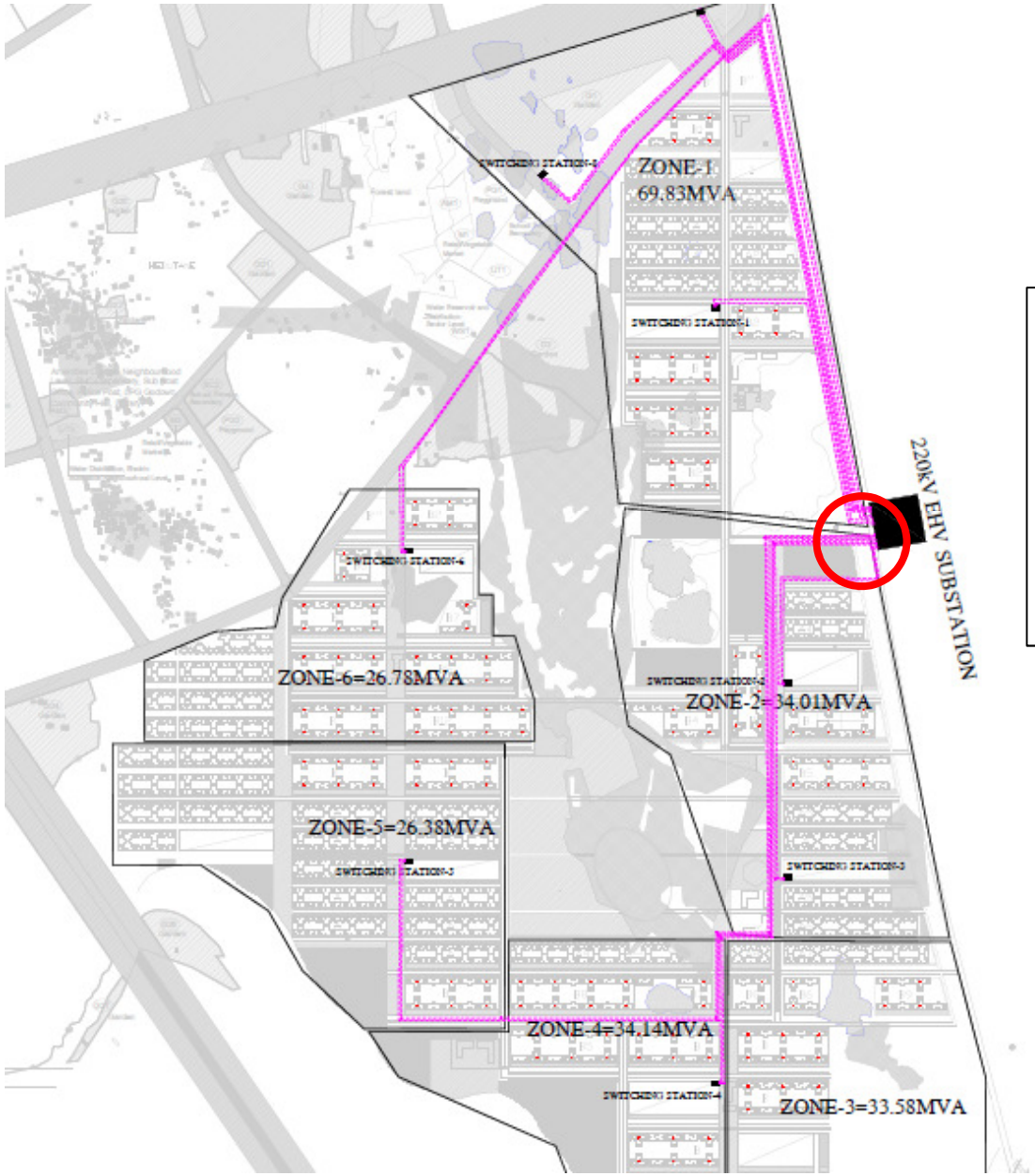
For HT distribution beyond switching stations, 22 kv lines recommended for optimizing cost and space





Options for line voltage between switching station and block substation	Total System Cost	Space requirement		
		Switchgear at switching station	Transformer at switching station	Cable Corridor
✓ **Option 1 - 22 kv**	Low	15m X 10m	NA	Less
Option 2 - 11 kv	High – Additional cost switchgear and transformers	30m X 10m (additional 11 kv switchgear required)	30m X 5m	More

Utility corridor to be planned for HT cable distribution as per the rough schematic below

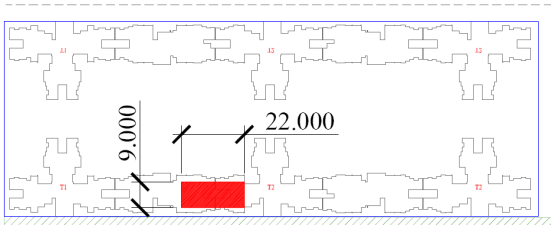
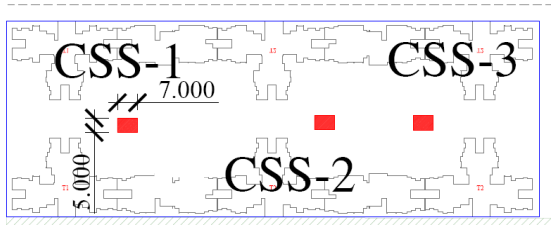
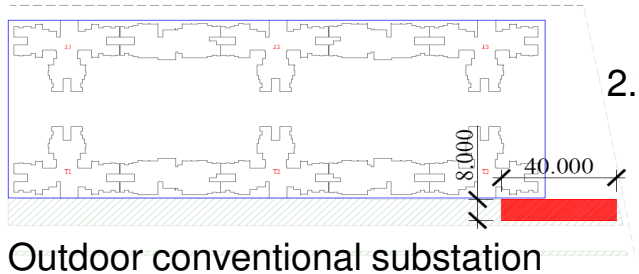


Sample schematic for Zone 1

- Total 10 m wide corridor required immediately after the EHV
- Corridor width widest at the start and tapers off as cable reaches individual switching stations
- Final location of the corridors will vary as per decision on switch yard and EHV location

3

For distributing to final block level, recommended to have outdoor CSS (Option 2 with some modifications) as most cost viable option

		Cost	Space required	Cable length	Key issues
Option 1	 Indoor conventional substation at ground floor	2.27 Cr.	200 sq mt	4.7 km	• 5m height required to accommodate equipments. • Loss of 2 apartments at ground floor and first floor • Structural changes required
Option 2	 Outdoor compact substations	1.97 Cr.	105 sq mt	1.9 km	• Access required to CSS for maintenance activities • Clearance of 5m width at lea at block entrance
Option 3	 Outdoor conventional substation	2.94 Cr.	320 sq mt	6.7 km	• Not feasible for A type block with lesser landscape space • Large LT cable length and hence losses

* Assumes B type block and 1250 kva CSS

3

Liaison and design constraints to be factored in for outdoor CSS implementation



Liaison Constraints

- CSS option subject to MSEDCL approval for using CSS – most likely under the franchisee route
- Successful implementation in Casa Rio would be an Important indicator

Design Constraints

- Space requirement –
  - 7m X 5m X 3m per CSS for 1250 kva (including 1m clearance on side and 0.5 m clearance on top)
  - 5m X 5m X 3m for smaller CSS sizes
- CSS should be easily accessible from road for maintenance purposes
- Should be located to minimize length of LT cable till each meter room.
  - One meter room per core to be provisioned. Larger meter room required for a G+19 building
  - Multiple cores under the same meter room cannot be accommodated as length of conduits and cable becomes very high
- For A type blocks, additional LT panel room (6m X 6m) required to increase number of outgoings per CSS
  - 1 LT panel room required for blocks with 12-18 cores
  - 2 LT panel rooms required for blocks with 19-24 cores

4a

Areas to be demarcated for solar power generation (800-1000 kW in phases of 200 kW) which can be used from start of construction



Principles

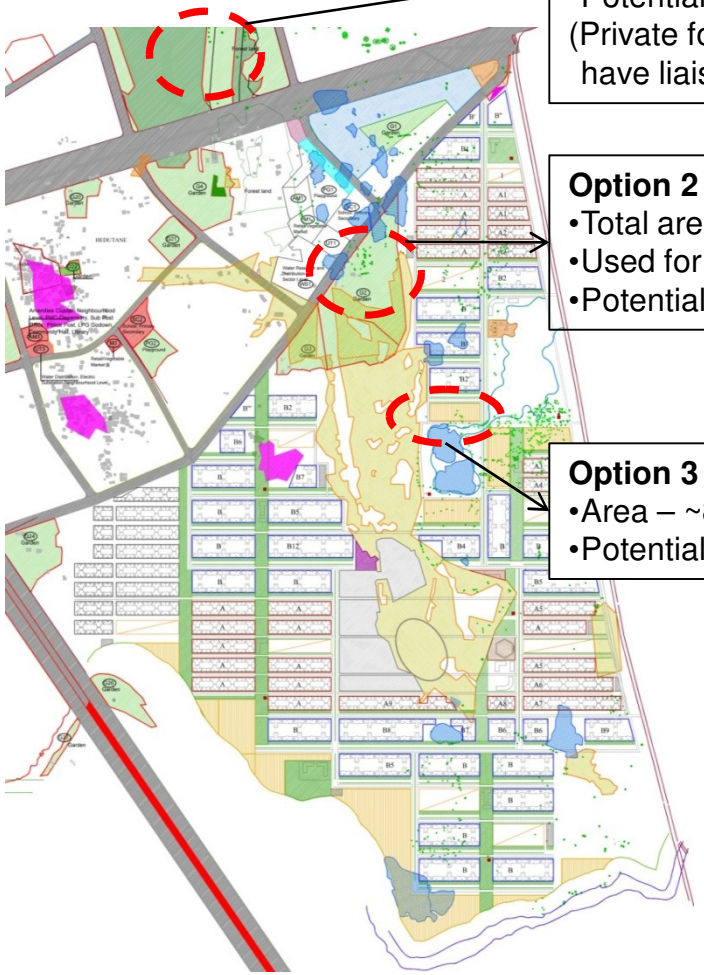
- Solar power to be used from start of construction
- To be moved to large common area loads like STP after construction completion
- Ideal plant size of 0.8 -1 MW to be made in phases of 200 KW
- ~4 acre per MW area required
- Ground mounted solar farm to be used as rooftop space not available from start

Design Constraints

- Area should be clear on the southern side to ensure sufficient irradiance
- Area should be within 300m of construction transformer to control losses
- Should be close to large common area loads for effective use post construction period

Commercial Implications (for 1 MW)

- BOOT model feasible with payments staggered over 15 years
  - Capex – 1.4 Cr.
  - Lease payments – Rs. 78 lakh per annum for 15 years
  - O&M cost – Rs. 15 lakh per annum escalating at 5% yoy
- Landed cost of energy – **INR 7.5 - 8 /KWh**



Option 1
•Area – TBD
•Required for solar – 4 acre
•Potential – 1 MW
(Private forest area. Might have liaison issues)

Option 2 (Central green)
•Total area – 14.5 acres
•Used for solar – 4 acres
•Potential – 1 MW

Option 3 (Aspi in Zone 1)
•Area – ~8200 sm
•Potential - 500-550 KW

4b

Solar street lights to be evaluated for the road running along the central spine in the north-south direction



Principles

- To be used on roads maintained by Lodha in the long term
- Payback period of ~3 years

Design Constraints

- Sufficient solar irradiance should be available
  - Street lamps should be on median. Single arm poles on sides usually are shadowed by buildings or trees
  - Road should be clear on the south side
- LUX levels required
  - Road – 15 lux
  - Parking – 8 lux
  - Landscape – 4 lux
  - Footpath – 2 lux
- For a 30 m wide two lane road, these LUX levels can be achieved with 12 m spacing between poles*
- For a 15 m wide two lane road, the same can be achieved with 15 m spacing between poles (7 m carriageway only)

Next Steps

- Shadow analysis to be conducted for roads sections identified to better understand effect of surrounding buildings
- Detailed design (including LUX and pole spacing) required for road sections identified post shadow analysis (especially for 40 m wide roads)

Likely road sections for solar street lights



LODHA
BUILDING A BETTER LIFE

*with 7 m carriageway, 4.5 m parking, 1.25 m landscape and 2 meter footpath

Key areas to be demarcated in master plan are for EHV substation (~12 acres) and solar power plant (~4 acres)



Master-plan implications

- ~12 acres land to be demarcated for EHV along the periphery of the project
- Locations for switchyards to be identified inside each zone. Approx size 15m X 10m per switchyard.
    - Should be centrally located
    - Easily accessible from roads
    - MLCP to be considered
- Block identified for ground mounted solar should not be built upon for 10-15 years. Plant can be shifted to block rooftop or another farm but only panel capex can be recovered (total life of panels is 25 years)

Session plan



Potable water & Rain water harvesting	**10 AM – 11 AM**
STP and non-potable water	**11 AM – 12 noon**
Power infra and solar	**12 noon – 1 PM**
Solid Waste Management	**2 PM – 3 PM**
Transport and road network	**3 PM – 4 PM**

Solid Waste Management – key questions from last workshop



Assessment done

1. What is the setup / process for Solid Waste Management?
2. Phasing and Capacity build up
3. Technology Evaluation
4. Cost Analysis

Further evaluation required

- Location of the following for longer term SWM facility – **Lodha + TCE**
  - Transfer Station
  - Processing plant
  - Landfill
- Business model for Operations – **Lodha**
- Design considerations: Provision of Garbage chutes – **KAPL**

1 Solid waste set-up for Palava needs to be a mix of on-site (segregation & collection) and off-site (processing) facilities



ON SITE: PALAVA 590 ACRES

Palava Utilities / Palava Facility Mgmt	**Waste Segregation**	Dry and wet waste to be segregated at apartment level and collected at building leve bins - ▪ Separate dry and wet waste bags to be provided to residents ▪ Awareness camps and incentive schemes to be designed to ensure maximum segregation at source
Outsourced / External agency*	**Waste collection**	Waste to be transferred from building level collection bins to community bins via Auto Trippers or Manual carts

OFF SITE FACILITY

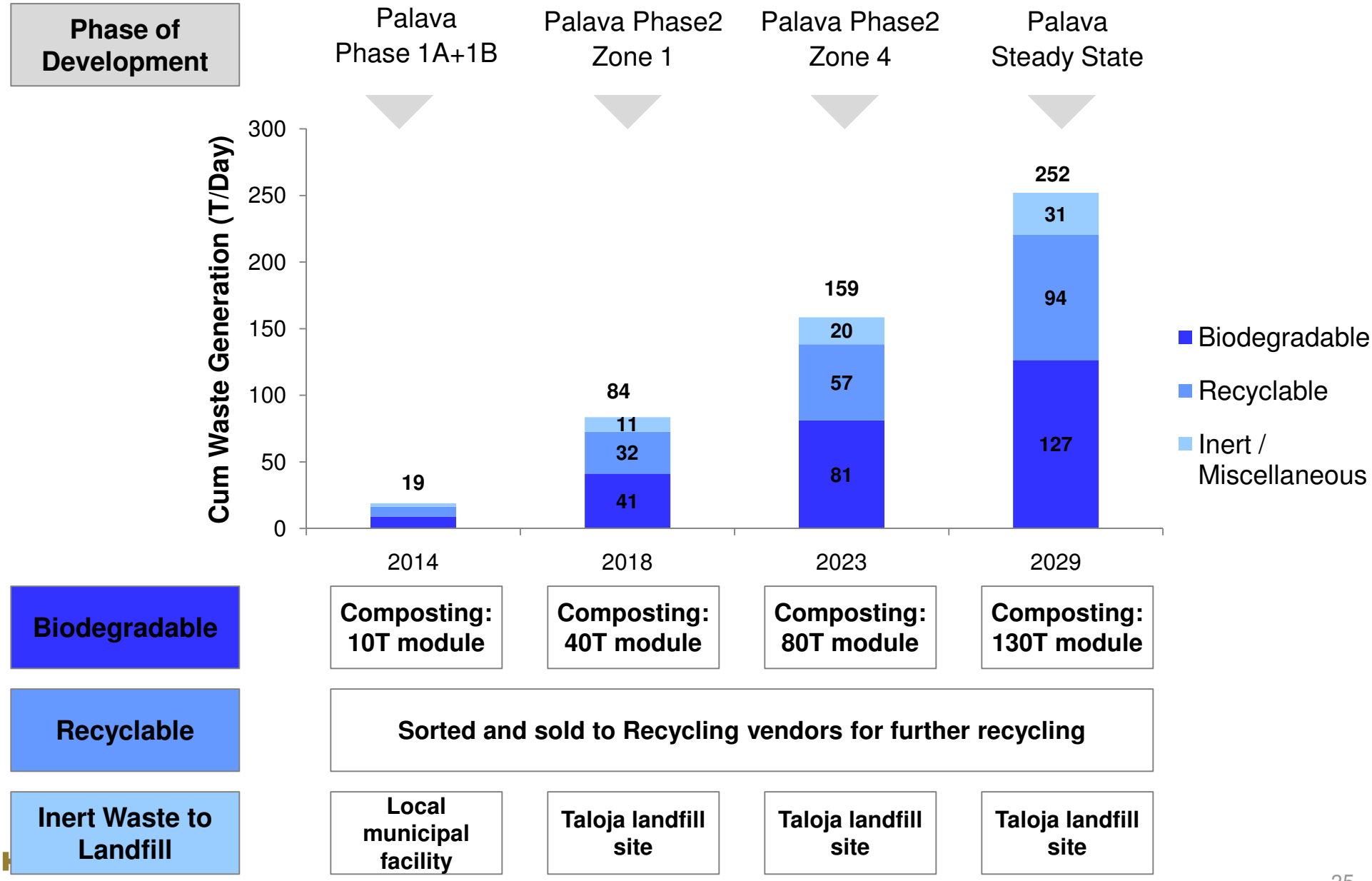
Waste to be collected from the community bins on site and transferred to the offsite Waste Processing and Material Recovery facility via Potable compactors

Outsourced / External agency*	**Waste Processing**	▪ Biodegradable / Organic waste to be processed and converted to manure / soil improviser. ▪ Recyclables to be sorted and sold to Recycling vendors for further recycling
Outsourced / External agency*	**Waste Disposal**	▪ Inert waste to be transferred from the processing facility to a scientific landfill site using portable compactor trucks.

* For Waste Collection , Processing and Disposal, need to evaluate outsourcing to one or multiple agencies based on capability profiles of the available vendors

2

Total of ~250 Tn/day of waste load expected to be generated in Palava (Ph 1A, 1B, 2) at steady state



3

In-Vessel composting is the preferred technology for Biodegradable Waste Processing



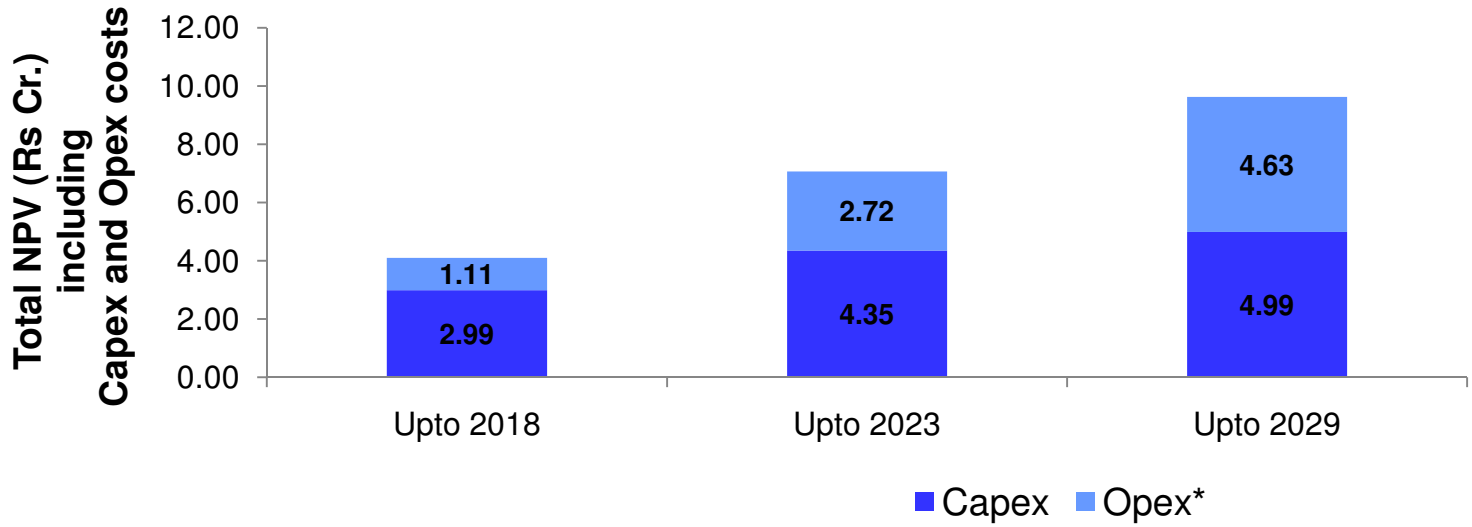
	Windrow Composting	In-Vessel Composting	Bio-methanation Composting
Land requirement (Acres, per 10T module)	0.75	0.3	0.5
Capex (Cr, per 10T module)	0.6	1.05	1.6
Opex (Lakhs, per 10T module annually)	15	5	10
By-Products	Manure: 2.5 T/Day	Manure: 2.0 T/Day	Bio Gas: 500 cum/day Power: 40kW/day Manure: 0.5 T/day
Technology / Process	Stricter control parameters owing to open setup; Lesser reliability in operations	Closed setup; Easy to control operations	Difficult to use/sell by-products on offsite facility; Qty generated is low

For large scale developments, Windrow composting is the preferred method. For Palava, In Vessel composting is the most optimum solution based on Land and Opex requirements

4

Landed cost per house-hold is ~Rs 40 per month (from collection to landfill), which impacts Civic Governance Fee by ~60 paise per year psf

Phasing of costs for offsite composting facility



Monthly Cost of Solid Waste Management per Household

	2018	2023	2029
Cost of In-Vessel Composting, Rs	12	17	29
Cost of Transport, Rs	6	7	8
Cost of Inert Waste Disposal (incl transport to landfill), Rs	20	25	43
TOTAL Cost per household, Rs	**38**	**48**	**80**

* Assumes Inert waste disposal via external vendor

Need to allocate land for Processing plant and/or Transfer station based on the landholding in the area and requirements for these processes



Processing Plant & Transfer Station

Option 1

Processing plant > 10 km

Processing plant (10-15 acres) outside master-plan+ Transfer station (5-8 acres) within master-plan site

Option 2

Processing plant < 10 km

Processing plant outside master-plan (10-15 acres). Transfer station not required

- Study conducted by TCE to evaluate location of Processing unit within 10 km of the master-plan (Lodha owned land near parcels Phase 2)
- No contiguous parcel which meets the guidelines of Processing Plant within 10 km; further evaluation required

Landfill

- Proposed short term solution is a tie up with local municipal facility
- Proposed long term solution is the Taloja Landfill (scheduled to be commissioned by 2016)

Business Model

No available vendors undertake end to end operations of the entire facility.

- Need to initiate process of selection of BOO contractors for Solid Waste treatment plants once the location of Processing plant / transfer station is finalized.

Design Considerations

Provision of Garbage chutes in the subsequent phases needs to be analyzed.

- 2 chutes and 1 collection point needs to be provisioned per building (core)
- Access of the garbage vehicle from road to the building level collection point

Session plan



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Transport and roads – key questions from last workshop



Assessment done

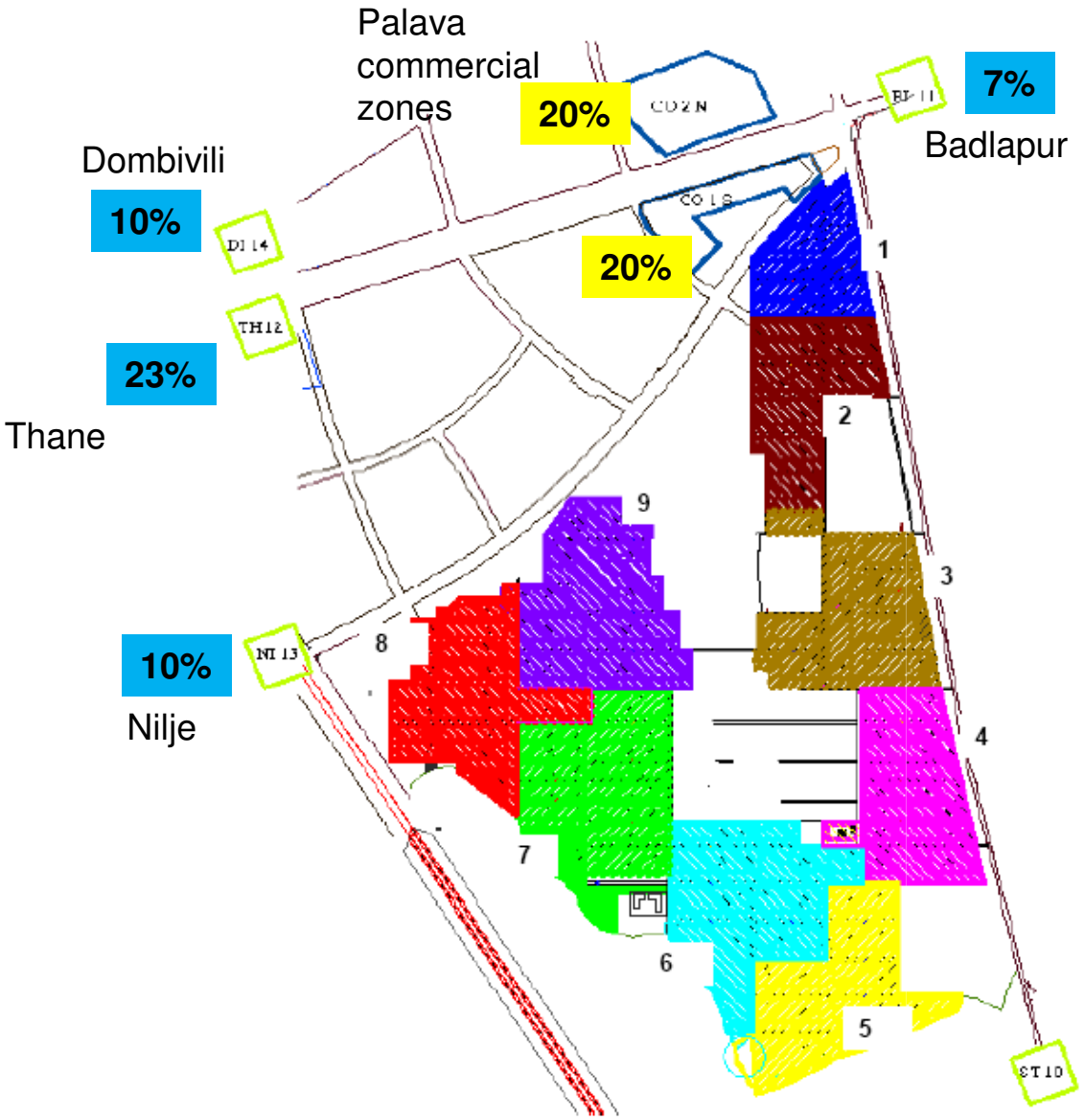
1. Traffic flow simulation across all road sections and intersections as per present master-plan
   - Key issues
2. Bus Circulation
3. Security implications on master-plan and control of various entry / exit points

Further evaluation required

- Number and frequency of buses required for internal bus trips – **TCE**
- Estimate size of transport hub required for cabs, buses and autos – **TCE**

Almost 60% of total trips are external primarily towards Thane, Dombivili and Nilje (left side of the master-plan)





- High outbound traffic towards western side of the plot towards Thane, Dombivili and Nilje station
- Key intersections need to be developed for easing traffic flow (in next pages)

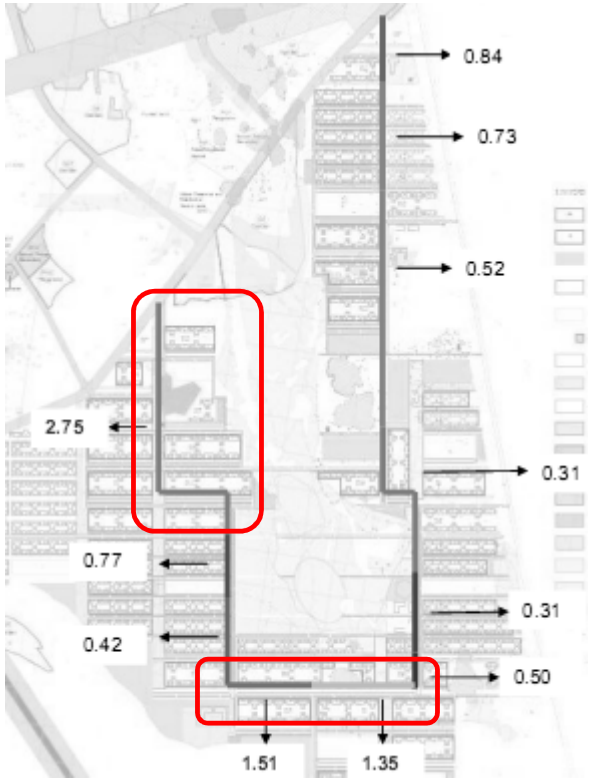
Key assumptions

- Trip rates assumed as 1.5 trips / DU
- Each MLCP assumed as centroid from where trips originate / end
- External dummy zones designated as described in map
- Peak hour traffic assumed as 25% of total traffic
- Trip assignment done using the shortest path All or Nothing assignment algorithm

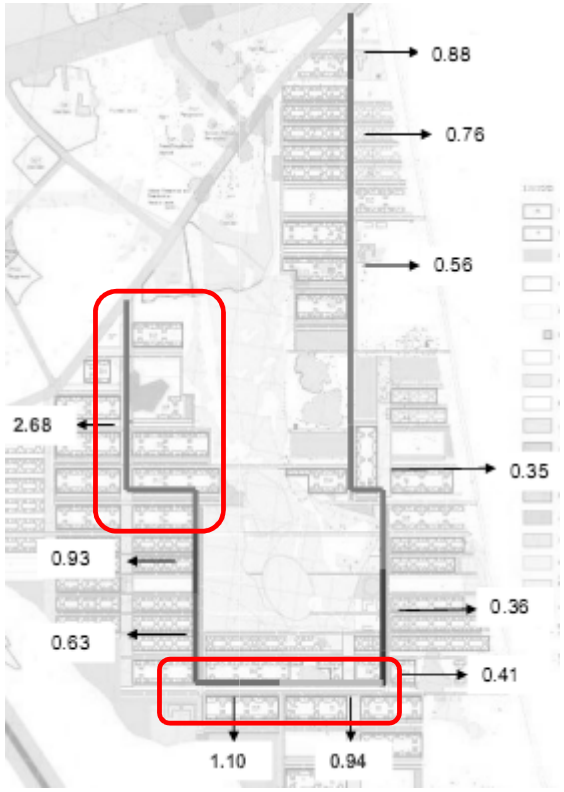
External trips

Internal trips

Some of the road sections (highlighted) have V/C ratio > 0.9 which needs to be addressed to ease traffic congestion at steady state



Scenario 1: 40% of total trips towards Thane, Dombivili and Nilje (left side of the master-plan)



Scenario 2: 60% of total trips towards Thane, Dombivili and Nilje (left side of the master-plan)

- V/C Ratios on some sections in the south and west remain high in both Modal Split Scenarios indicating need to address these intersections

- High V/C ratios on some roads that will need to be addressed
- No of intersections towards the western side of the master-plan might need to be revised

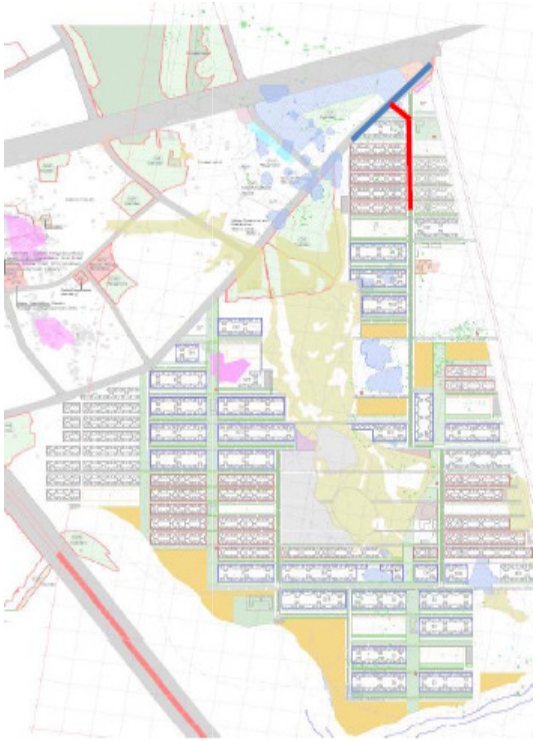
Recommendations

1. Increase the number of intersection points with the DP road towards left
2. Increase width of carriage way on these road sections
3. Other operational measures such as blocking intersections that occur at close intervals; traffic signals

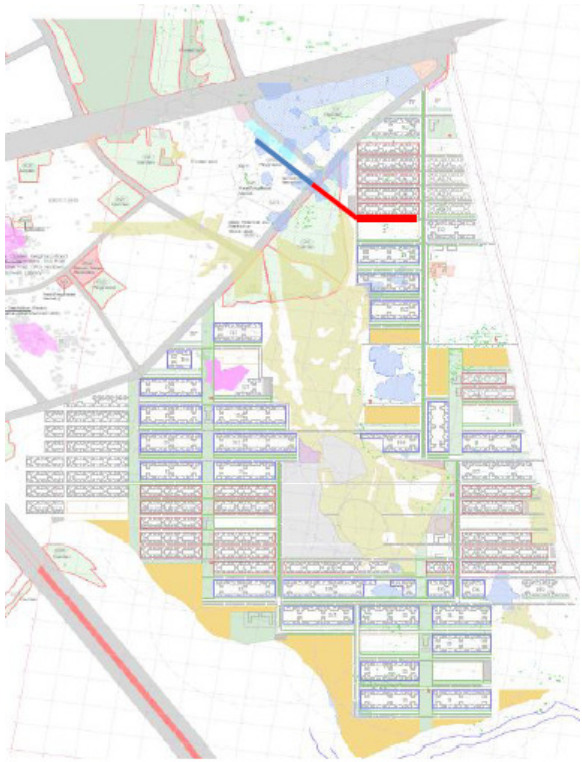
Recommended to have a central primary spine road and revisit some key intersections



- TCE recommendation – proposed section to be planned as a 4 lane divided carriageway



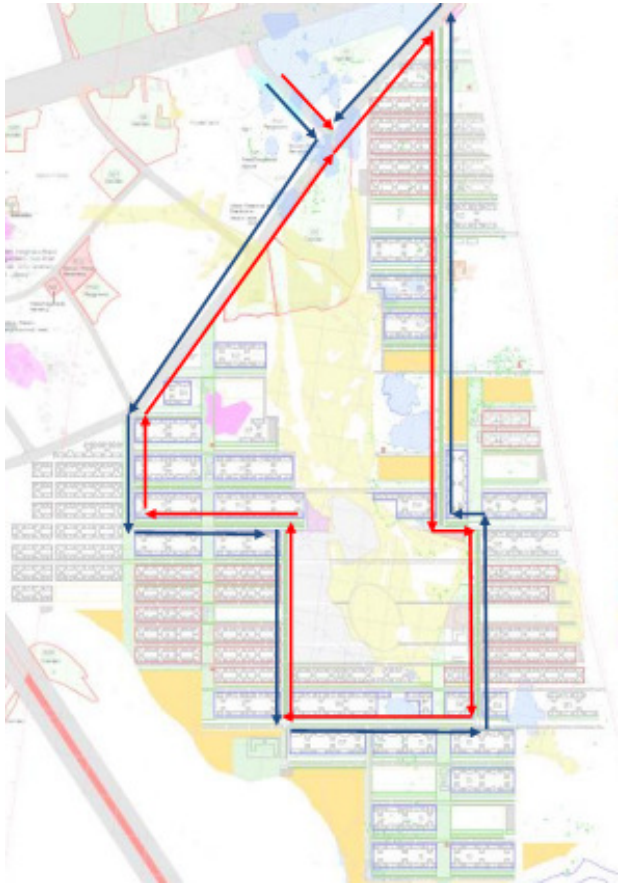
- Byron recommendation – intersection to be right angled 3-way junction since main entry into development and considerable public transport flow



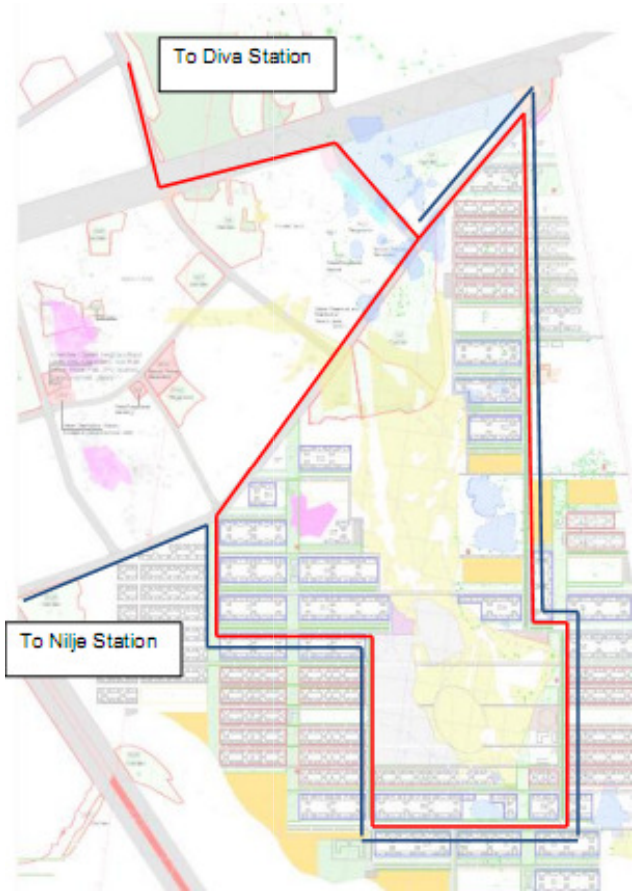
- Byron recommendation – direct primary street access to adjoining transport hub planned for direct access to buses

2

~280 bus trips per day are to be catered to the external zones from within the development



Connectivity to Transport Hub



Connectivity to Diva and Nilje stations

Key assumptions

- Buses will only run along the main road in the proposed development.
- The two railway stations, Diva and Nilje and the commercial zone, will be directly connected by bus.
- Bus connectivity to the other three external zones will be from the Transport Hub.

3

Key principles for security and control of access have been defined



City level principles

- Palava is an 'open' city on the lines of New York. Along these lines, it is necessary to:
  - Provide adequate security at the level of the building and the block level
  - Effectively secure the city's outer boundaries/limits
  - Make the city safe for residents and visitors by appropriate measures to protect common areas

Common facilities

- All city level common facilities and select Sector level common facilities (club, pool, Sector greens) to be fenced and access control (preferably turnstile) using Palava Smart Card (PSC). One access point will be for wheelchairs/strollers, which will be operated by a human guard (in addition to PSC) and be CCTV monitored.
- These spaces will operate only during 'day light' hours viz. 6 am to 8 pm

Block / building level

- Building entry to be controlled by buzz pad + swipe card driven access gates, with alarm connected to Central Security if gate is open for > 60 s after last authorized entry
- CCTV monitoring of lobby
- Each cluster's physical boundaries should be fenced, with limited no of entry/exit points for pedestrians and vehicles. This fencing could be any variety of a perimeter fence (not necessarily a solid compound wall).

Compound wall

- The boundaries of the city (adjacent to which Lodha is not likely to commence development within 10 years) should be earmarked and safeguarded with compound wall, as per the Compound Wall Policy.

3

For Phase 2, compound wall for the city with key access points monitored and with block/amenity level control need to be incorporated



Common facilities (e.g. Neighborhood greens):
1. Compound wall with day operations only (6 am to 8 pm)
2. Access controlled entries/exit

City boundary:
1. Compound wall => Cost implication Rs 3-4 Cr
2. Free access from surrounding public roads e.g. DP road or Taloja bypass into Palava, but monitored

Public facilities (e.g. Gauchar land, lake-front development):
1. No compound walls
2. Free access for all individuals

Block level:
1. Fencing around the block (along breadth) => Cost implication Rs ~5 Cr.
2. Entry points from road (along length) to respective building with card based access control
3. Common entry point from sides with boom barriers / turnstiles + visitor access with authentication

Other areas (e.g. University):
1. Separate compound wall with limited and controlled entry points

Other open questions on transportation planning

Phasing of External Roads

Priority order of development of roads flanking Palava needs to be analyzed based on their impact on traffic situation within Palava

Operations

- Evaluate need for signalized junctions and other measures to mitigate congestion at peak hours
- Number of buses for internal / external transport

Road Section Design

- Detail of Intersection with Pipeline roads needs to be developed.
- The junction of Pipeline road with Taloja road (top right) needs to be developed

Other Design Considerations

- Need clarity on highlighted road sections
- MLCP 8 road access to be evaluated
- Parking for public transport needs to be identified
- Sizing and Design of Transport hub

