

FEASIBILITY STUDY ON PLANNING AND DESIGN TRUCK PARKING TERMINAL AT KANDLA PORT, GUJARAT

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International Conference

TRANSPORTATION INFRASTRUCTURE
PROJECTS – CONCEPTION TO EXECUTION
(TIP – CE -2019)



IIT ROORKEE
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CONTEXT

- Un-availability of truck parking areas at port premises leading to haphazard parking (e.g. along the roadway, on shoulder or within premises of KPT).
- Possible freight crime leading to large economic losses
- Increasing market requirements for a higher level of truck parking service in certain market segments. (e.g. high value goods, perishable/inflamable goods, long-distance trucking)

SCOPE OF STUDY

- Study of existing truck parking practices
- Cargo/Traffic forecasting based on historical data
- Parking demand forecast for the truck parking terminal
- Development of different scenarios for estimating demand for centralized parking at port area.
- Planning of Truck Parking terminal at Kandla Port including different facilities such as canteen, toilets, restrooms, M&R facility and all allied basic amenities
- Preparation of layout for proposed facility,
- Estimation of cost to set up the proposed facilities or amenities.
- Financial Analysis for different scenarios
- Recommending project feasibility on PPP basis
- Recommendation of congestion mitigation measures in KPT premises

METHODOLOGY

- 
- 1 • Problem identification / Reconnaissance Survey
 - 2 • Preliminary Survey and Data Collection
• Traffic surveys execution.
• Data Compilation and Analysis
 - 3 • Traffic Demand Forecasting for 10 years horizon with intermediate time periods



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- Analysis of Parking Demand (Retention time and vehicle type)

5

- Detailed Planning of truck parking terminal

6

- Financial evaluation (Feasibility)

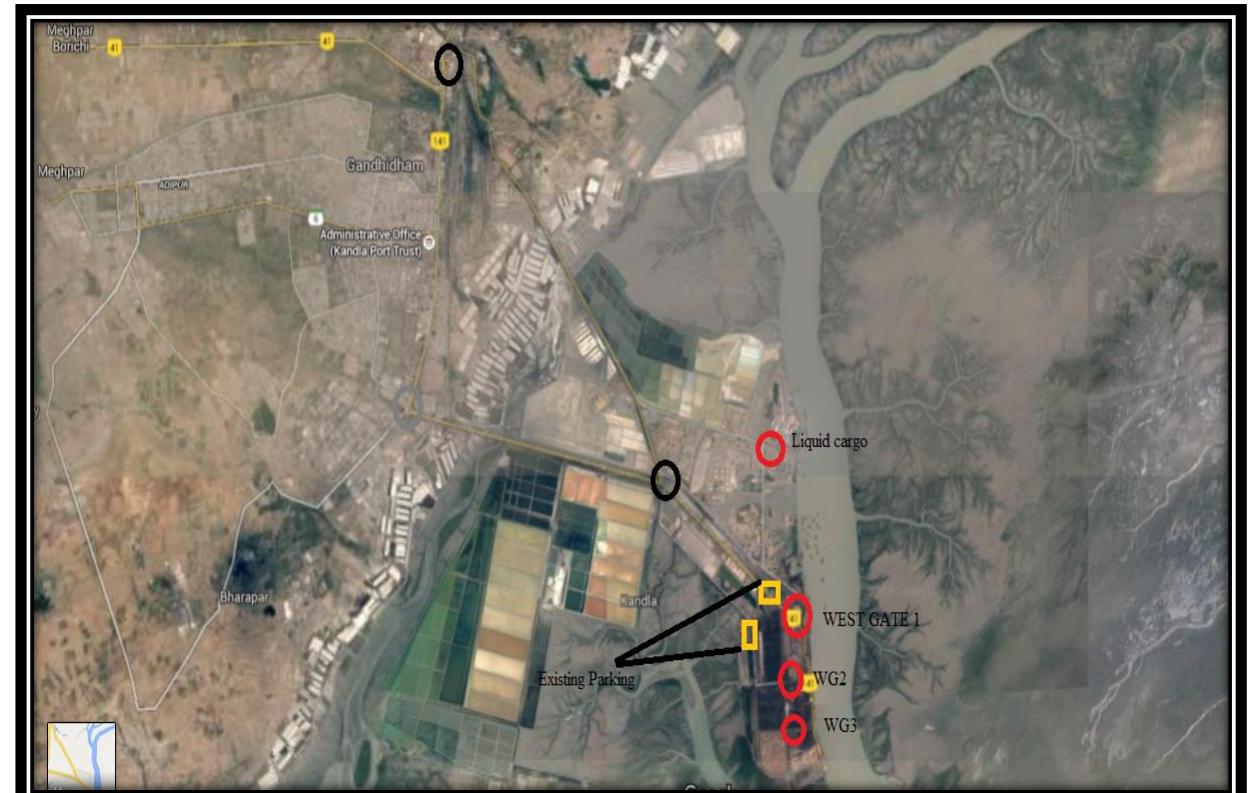
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- Alternatives for Implementation on PPP basis

METHODOLOGY : STAGE - I

Problem Identification / Reconnaissance Survey

- Representatives from WAPCOS, SVNIT and engineer in charge of project from KPTL visited the Kandla port premises.
- Assessment of current utilization at truck parking facilities and practices
- Identification of critical Junction
- Selection of tentative locations for traffic surveys

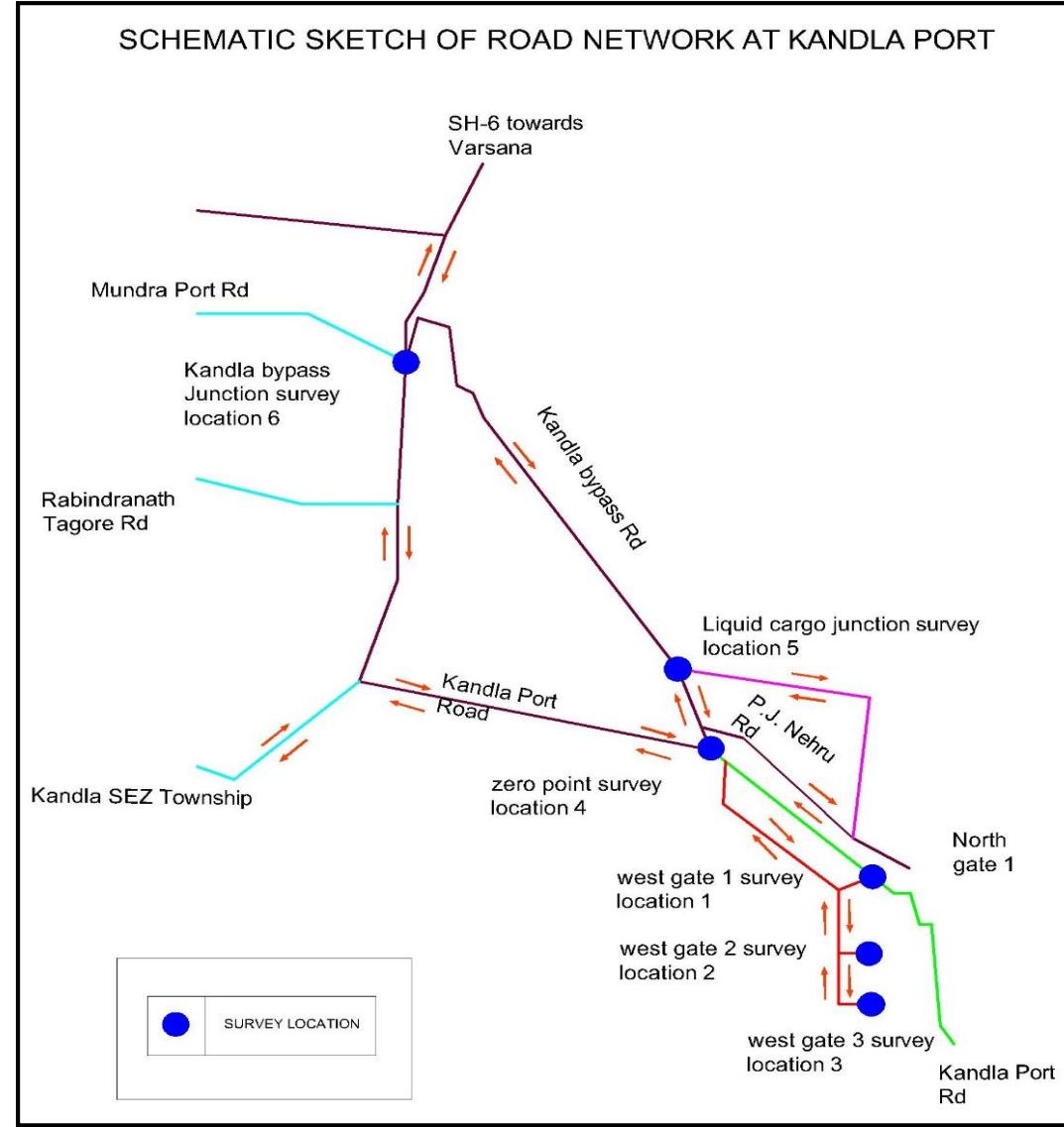


METHODOLOGY: STAGE - 2

A) Preliminary Survey

- Representatives from WAPCOS, SVNIT and engineer in charge of project from KPTL visited Kandla premises, critical junctions on the way to Kandla port and observed vehicle movements in each direction on the road network in Kandla premises.
- Final locations for surveys fixed (Fig.I)
- Surveys : Classified Vehicle Count (CVC), Origin-Destination Survey and Drivers' Interview Survey.
- Survey carried out by WAPCOS team for 7 days, 24 hours, between 1:00 am on 21/07/2016 and 1:00 am on 28/07/2016.

Fig. - I



B) Data collection

A) Primary Data

- Classified vehicle count in each direction at decided survey points for 7 days
- Origin & destination of trip, type of commodity, type of vehicle and retention time of vehicles at different locations. (152 samples collected)
- Truck driver interview (115 samples) : drivers' reaction for existing facilities at KPT premises, existing parking facilities and suggestions for parking facilities to be proposed

B) Secondary Data

- **Cargo handled (commodity and its type) during last ten years.**
- Large medium scale industries in surrounding region(s).
- Drawings indicating existing Road Network and facility-layout of KPT.
- Master plan of Kandla Port / Kandla Port Area.
- **Cargo handled by different modes of transportation in last 10 years.**
- **Entry – Exit data of empty and loaded trucks at WG-I, WG-2 and WG-3 for last 10 months on daily basis.**

I) Classified Vehicle Count

- Different category wise (of truck and trailer) data is collected.
- Data at entry and exit of each gate and critical junction is collected.
- Traffic count done by considering vehicle type as per RTO norms and converted in appropriate type as per IRC-03, 1983 guidelines.



Vehicle type as per RTO norms

Type	Capacity (MT)	Dimensions (FT)
Light Commercial Vehicle (LCV)	3.50	14x6x6
LPT	5.50	17x6x6
Full Truck Load (FTL)	9.00	18x7x7
Taurus	16.00	22x7x7
20 ft Open Truck	9.00	20x8x8
20 ft Trailer	20.00	20x8x8
40 ft trailer (double Axle)	22.00	40x8x8
40 ft Trailer (Triple Axle)	27.00	40x8x8
Semi Low Bed Trailer	22.00	40x8x10
Low Bed Trailor	22.00	40x10x12
Multi Axle Trailer (Hydraulic)	per Axle 7 MT	Depends

As per IRC -03, 1983 Vehicle Notation

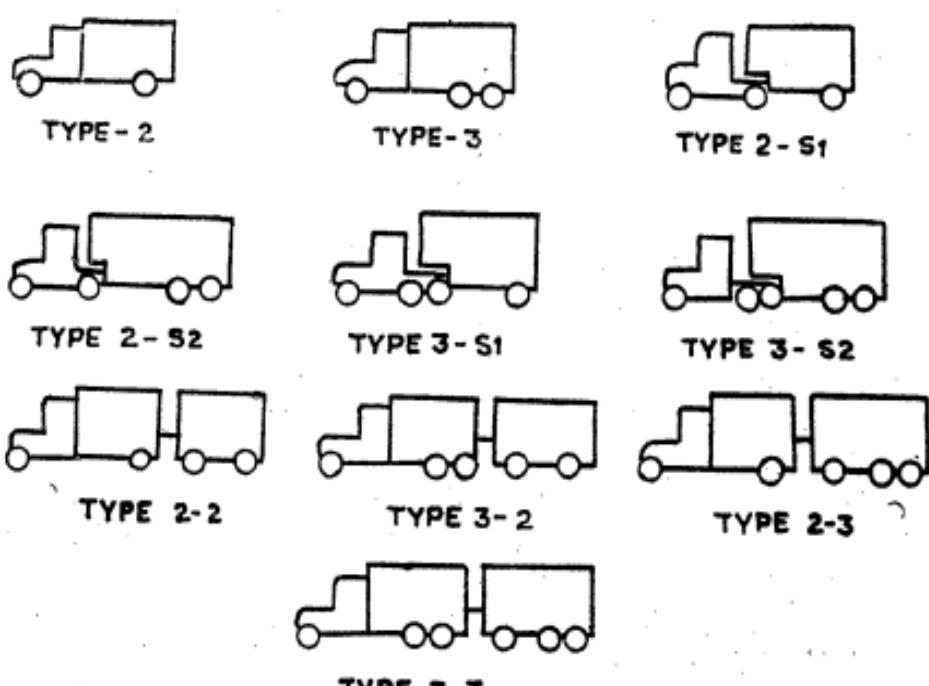


Fig. Vehicle Types

- 1st digit indicates no. of axles in truck or truck tractor.
- “S” indicates semitrailer.
- No. following immediately “S” indicates the no. of axles on semi trailer.
- Digit other than 1st when not preceded by “S” indicates a trailer and number of its axles.



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P.G. CENTRE IN TRANSPORTATION ENGINEERING AND PLANNING

CIVIL ENGINEERING DEPARTMENT

CLASSIFIED (TRUCK/CV) VEHICLE COUNT FOR GOODS TERMINAL PLANNING

Name of city: _____

Name of Port: _____ Date: _____ Direction: _____

Name/No. of Survey Pt.: _____

Time: _____ to _____

Sheet No.: _____

Time interval (5 mins)	Frame No.	Light Commercial Vehicle (LCV)	Truck				Trailer					Others (Specify)	Remarks	
			Long Platform (LPT)	Full Truck Load (FTL)	Taurus	20 ft. Open	20 ft.	40 ft. (double Axle)	40 ft. (Triple Axle)	Semi Low Bed	Low Bed	Multi Axle (Hydraulic)		
0-5	1													
5-10	2													
10-15	3													
15-20	4													
20-25	5													
25-30	6													

Name & Signature of the Enumerator with date: _____

2) Origin-Destination Survey

- Registration no. plate
- Origin and destination of trip
- Type of commodity
- Retention time of vehicle at port, port premises
- Distance between origin and destination
- Movement of goods (local/ regional)





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CIVIL ENGINEERING DEPARTMENT

Origin –Destination Survey at Truck /Goods Terminal

Name of city: _____
Name of Terminal: _____

Name of Port: _____
Time: _____

Date/Day: _____
Sheet No.: _____

Sr. No.	Truck/ Trailer Type	Origin	Destination	Goods/Commodity			Distance (Km)	Halt Duration in terminal (hour)	Remarks
				Distribution	Type	Tones			

Name & Signature of the Enumerator with date: _____

Coding: (A) Distribution: Local distribution-1 Regional distribution-2

(B) Type of Commodity: Food grain/Vegetables/Fruits-1, Minerals/Metals-2, Fertilizers/Chemicals-3, Building Materials-4, Leather product-5, Textile-6, Poultry-7, Household goods-9, Auto parts-10, Electronic goods-11, Others (Specify)-12

3) Drivers' Interview Survey

- Driver characteristics
- Trips detail
- Driver's requirement at parking facilities
- Driver's opinion regarding existing parking
- Driver's suggestions for proposed parking facilities





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Commercial Vehicle Driver Survey at KPT: Assessment of Parking Needs and Preferences

Name: _____ Age: _____ Date: _____ Time: _____

Type of Vehicle: _____ Registration No: _____

Section A: Background

1. Which of the following driver categories best describes you? (Please mark all that apply.)

- independent owner/operator
- independent owner/operator
- driver for an owner/operator
- driver for a *small-sized* carrier
- driver for a *mid-sized* carrier
- driver for a *large-sized* carrier
- other, please specify _____

2. Do you participate in TEAM driving? (Please mark only one box.)

Almost Always Frequently Sometimes Rarely Almost Never

3. Are you TYPICALLY a LONG-HAUL/REGIONAL or SHORT-HAUL/LOCAL driver?
(Please mark only one box.)

- long-haul (sleep away from home for work)
- short-haul (sleep at home)

Section B: Parking Patterns and Preferences

4. How many DAYS do you SLEEP AT HOME EACH MONTH? _____ days

5. In a TYPICAL week on the road, HOW MANY TIMES do you park in the following places for Long term rest (at least 4 hours of rest)? (Please write the number of times per week next to each.)
I sleep...

In a rest area parking lot _____ times per week
In a truck stop parking lot _____ times per week
In a parking lot not designated for truck parking (e.g., park & ride) _____ times per week
On the shoulder of the highway _____ Times per week
On an entrance/exit ramp _____ Times per week
In sleeper birth while team driver drives _____ times per week
At a loading/unloading location _____ Times per week
In a location not shown above (please specify) _____ times per week

6. Who TYPICALLY decides (Regulatory authorities) where you will stop to park? (Please mark all that apply.)

- I do
- my company does (e.g., dispatcher or other company employee)
- other, please specify _____

13. Below is a list of possible truck parking improvements.

PLEASE MARK THE 5 IMPROVEMENTS THAT YOU THINK WOULD HELP THE MOST.

- improve lighting
- increase security presence
- landscape to minimize hiding places for criminals/criminal activity
- improve amenities at rest areas
- build more *truck stop* parking spaces
- build more *rest area* parking spaces.
- *enforce* time limits on truck parking
- *eliminate* time limits on truck parking
- improve parking layout/configuration (e.g., more diagonal pull-through)
- improve signs and roadway information for parking facilities
- up-to-the-minute information on parking space availability
- provide alternative short term parking (on arrival/on departure/both) duration
- stop enforcement officers from waking driver
- educate drivers/dispatchers about planning parking facilities usage
- other, please specify _____

Section D: Information about This Trip

PLEASE NOTE: The following items pertain ONLY to THIS TRIP - from the time you left home until the time you return home.

14	Where did you pick up (or drop off) your last load?	City	State
15	Where will you drop off this load (or pick up the next load)?	City	State
16	Where is your home base (normal work reporting location)?	City	State

17. Right now, about how far are you away from home base (to the nearest Km)?

- 0-50 Km
- 50-100 Km
- 100-200 Km
- 200-400 Km
- 400 Km or more

18. On this trip, where did you last park your truck to sleep?

- I have not slept yet
- truck stop
- rest area
- ramp
- loading dock
- other _____

19. Where is the next place that you plan to park your truck to sleep?

- home
- truck stop
- rest area
- ramp
- loading dock

METHODOLOGY: STAGE-3

Data Analysis : I) Retention time analysis

Parking based on retention time

- Long term parking : 04 hrs. or more
- Medium term parking : 01 hrs. to 04 hrs.
- Short term Parking : less than 01 hrs.

Parking Bay size based on Commercial Vehicle segment

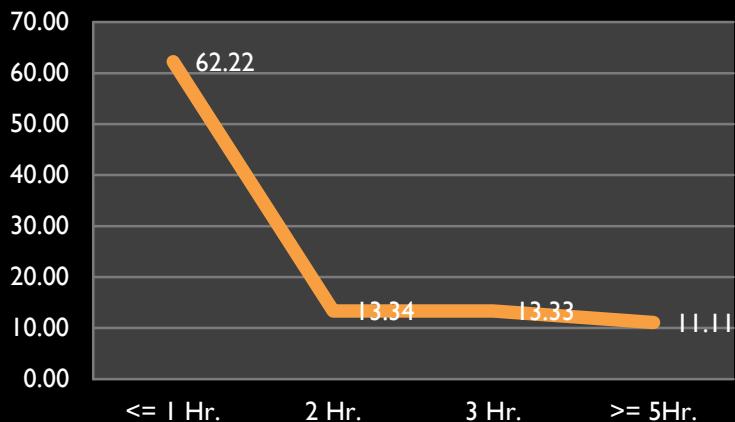
- 12 m x 3.5 m – Truck and tanker
- 19 m x 3.5 m – Trailer and semi trailer

As per IRC 03, 1983 length of Commercial Vehicles are as below

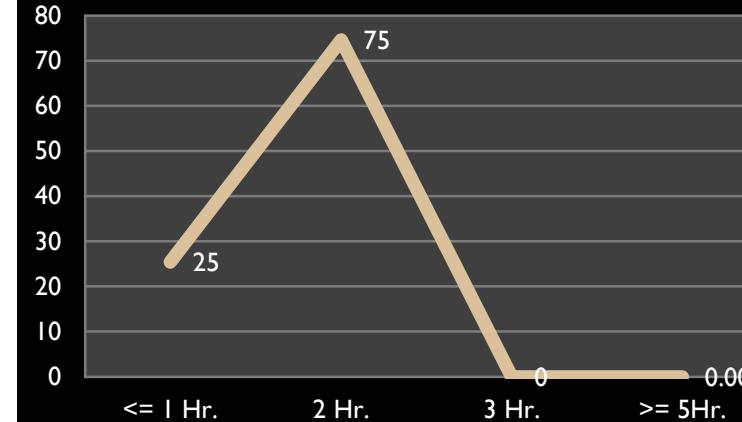
1. Truck : Maximum overall length contains two or more axles exclusive of front & rear bumper = 11 m
2. Trailer: Maximum overall length exclusive of front & rear bumper = 18 m
3. Width of commercial vehicle = 2.5 m

Percentage of trucks, trailers (including semi trailer) and tankers as per retention time varies from 1 hr. to more than 5 hr. [As per O-D survey data]

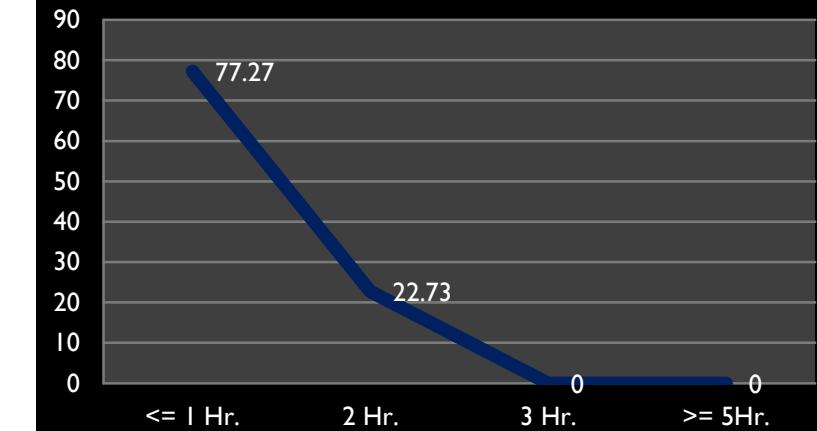
Percentage of Trailer as per Retention Time



Percentage of Truck as per Retention Time



Percentage of Tankers as per Retention Time



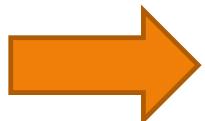
Percentage of trailer as per retention time

Percentage of truck as per retention time

Percentage of tanker as per retention time

2) Analysis of seasonal factors

Table- I
Monthly seasonal factors
calculated based on
historical data at gates



	Seasonal Factor					
	WG1		WG2		WG3	
	Entry	Exit	Entry	Exit	Entry	Exit
Sep	1.11	1.14	0.92	1.79	1.14	1.02
Oct	1.58	1.12	1.96	1.93	0.76	0.76
Nov	1.79	1.39	3.44	1.77	0.78	0.83
Dec	1.19	1.30	2.76	2.96	1.00	1.00
Jan	0.99	1.42	2.47	1.34	1.00	0.99
Feb	1.11	0.84	2.27	3.13	1.22	1.24
Mar	1.00	0.84	2.59	1.51	0.94	0.95
Apr	0.86	0.82	2.00	1.94	1.02	1.03
May	1.05	1.29	0.81	0.72	1.07	1.09
Jun	0.87	0.68	3.95	1.24	1.14	1.13
Jul	0.87	0.86	0.73	0.34	1.15	1.14
Aug	0.99	1.00	0.82	1.06	1.15	1.08

Table- 2
ADT calculated based
on seasonal factors as
per table -I



	ADT											
	WG I			WG2			WG3					
	Entry	Exit	Total									
Sep	2011	757	2768	283	2284	2567	422	402	825			
Oct	2860	740	3600	605	2463	3067	283	302	585			
Nov	3239	919	4158	1064	2262	3326	291	328	619			
Dec	2152	400	2552	853	3791	4644	370	395	765			
Jan	1790	939	2729	762	1719	2480	369	390	759			
Feb	2004	553	2557	702	4003	4705	450	492	942			
Mar	1809	553	2361	800	1926	2726	350	376	725			
Apr	1554	542	2095	618	2477	3094	377	408	785			
May	1899	853	2752	250	924	1174	396	432	828			
Jun	1573	447	2020	1220	1585	2805	423	448	871			
Jul	1581	571	2153	225	431	656	426	451	877			
Aug	1796	664	2460	254	1358	1612	424	427	851			

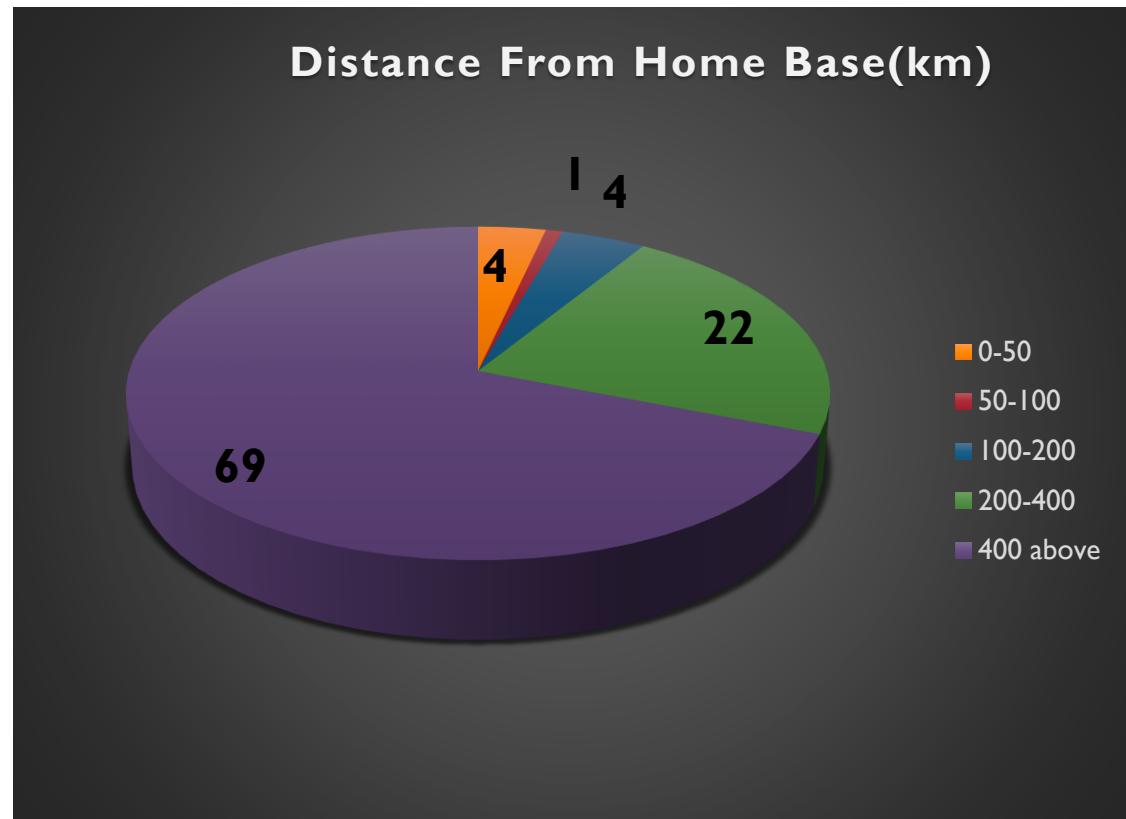
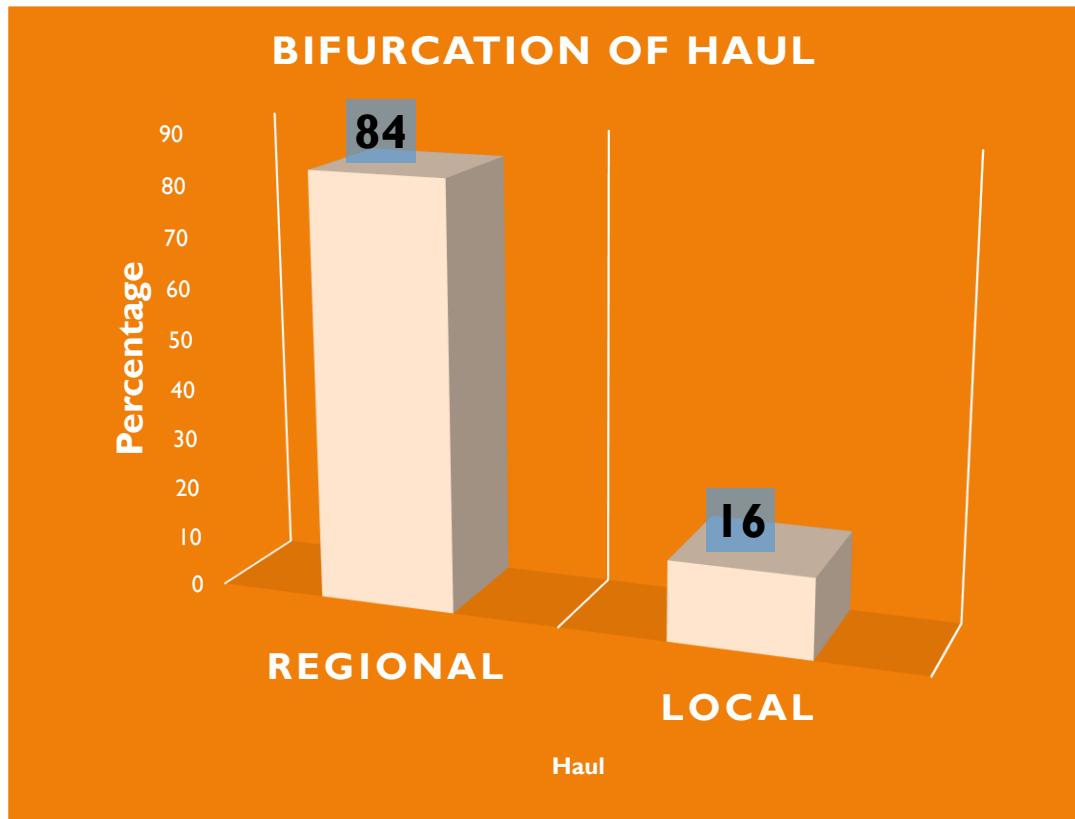
Where,
ADT = Average Daily Traffic in HCV/hour
HCV = Heavy Commercial Vehicle

Graphical representation of seasonal variation at each gate

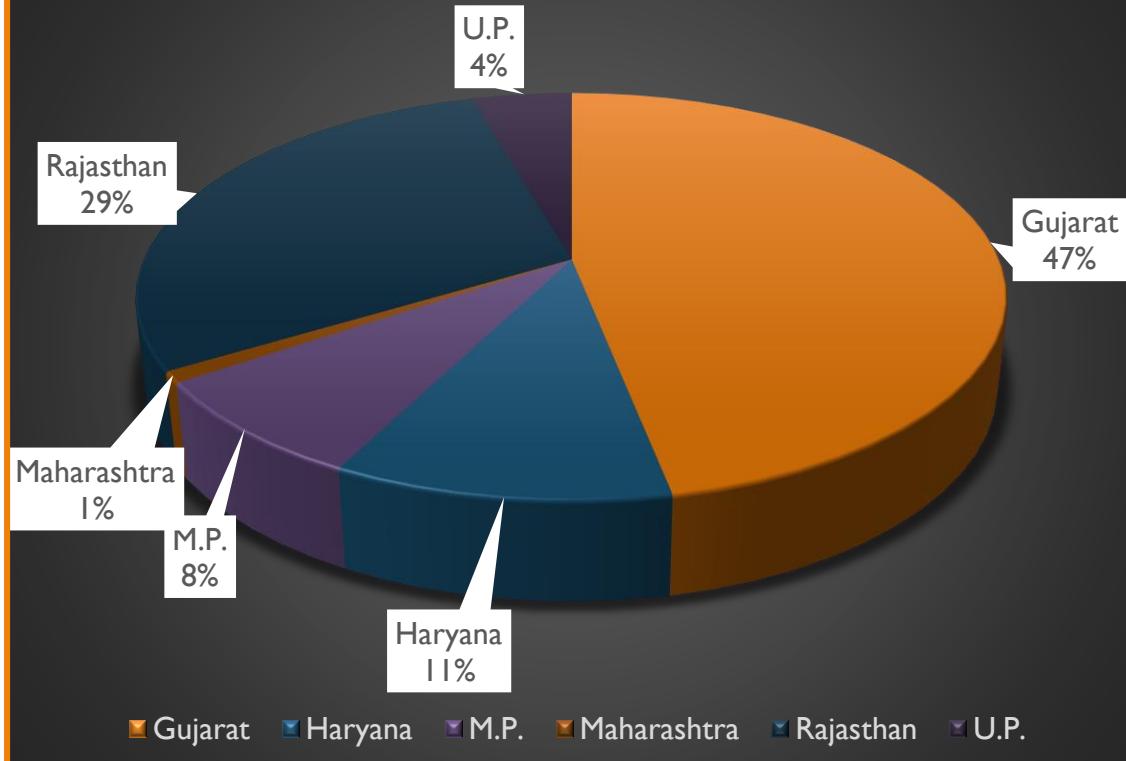


ADT – Average Daily Traffic (HCV/Day)

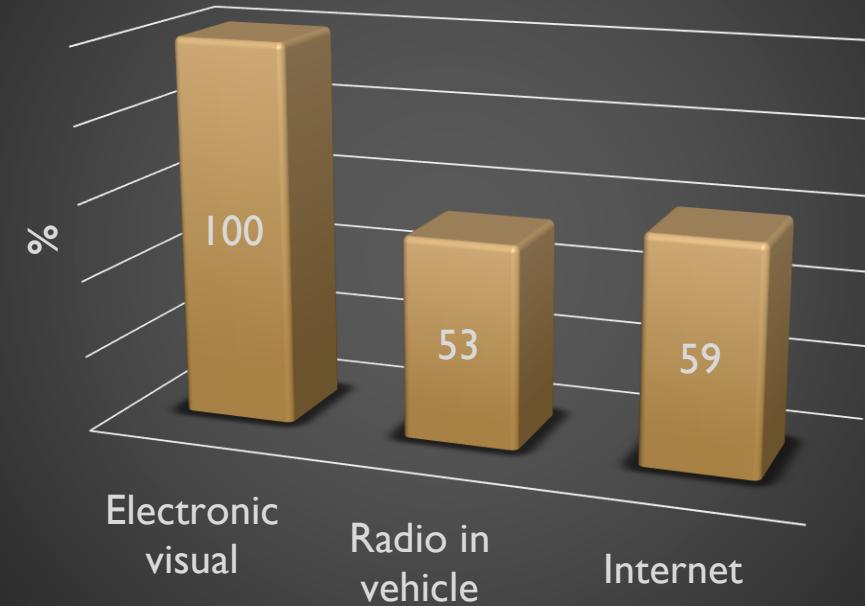
3) Analysis of Drivers' reactions at Kandla port



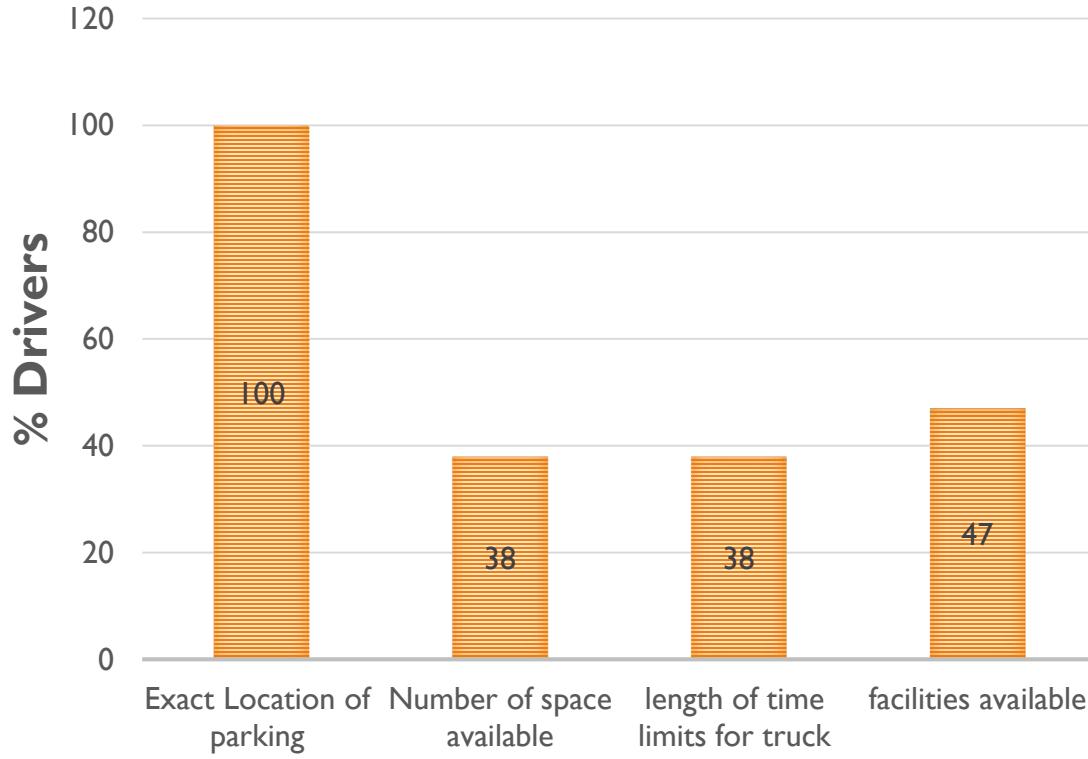
Home Base of Drivers



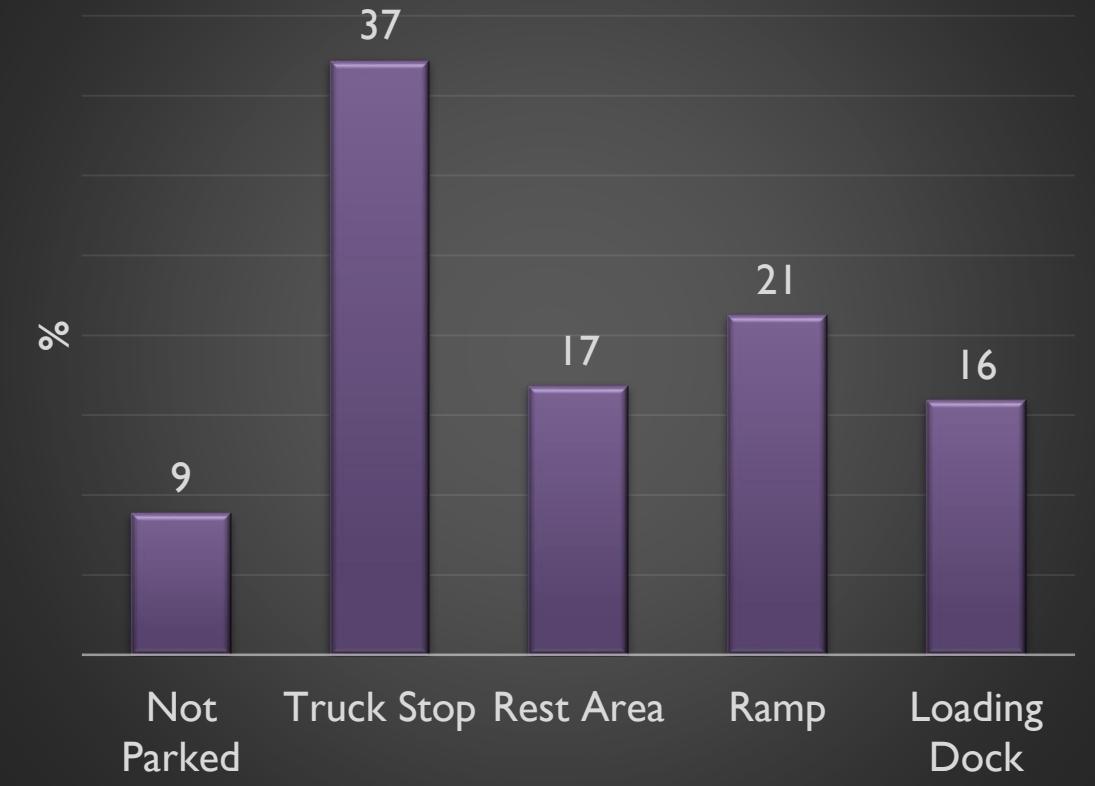
Opinion/suggestions on proposed Truck Parking facility



EXPECTATION ABOUT INFORMATION REQUIRED BY DRIVERS

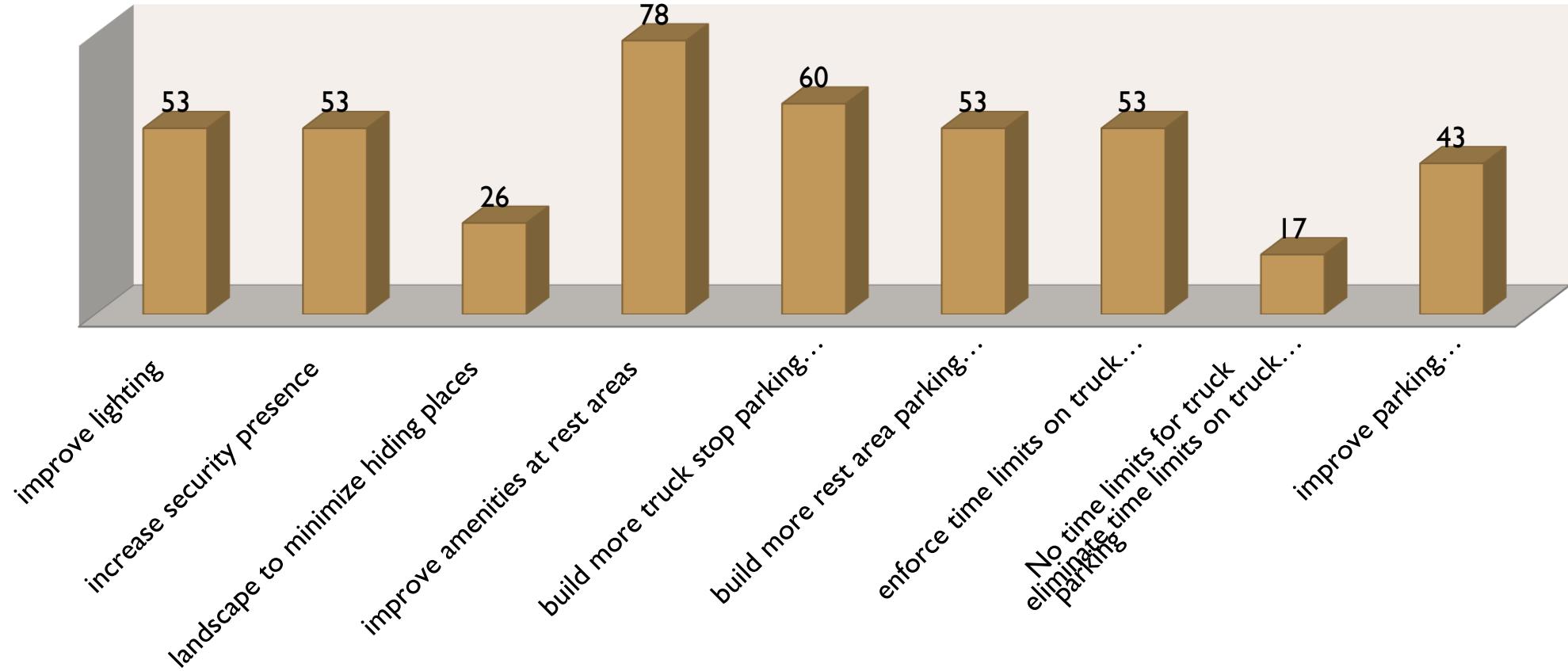


Location of last parked area



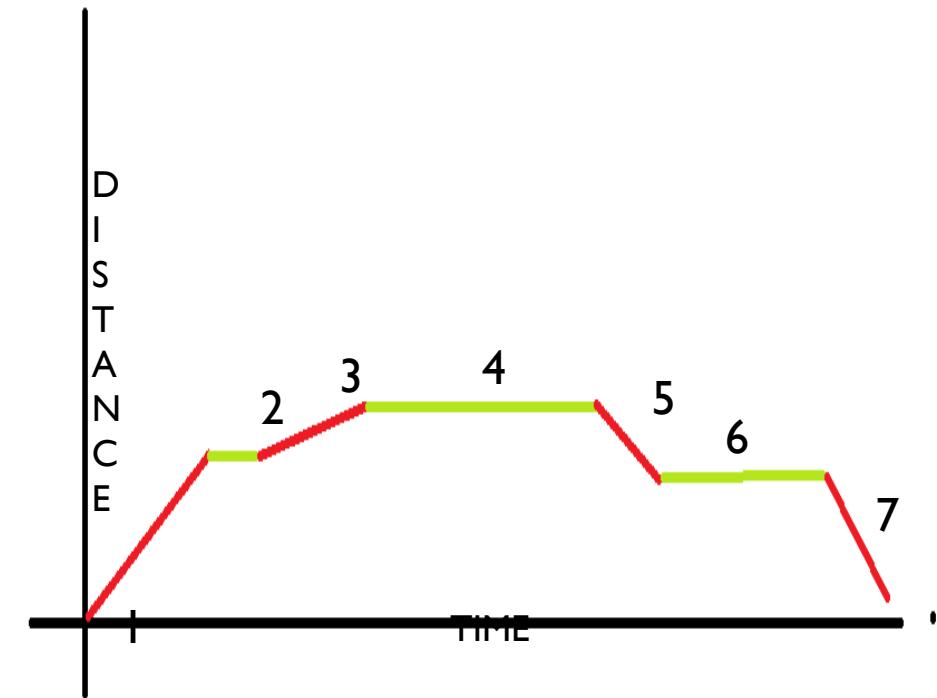
Truck parking improvements

■ Truck parking improvements



Activity Pattern of drivers after entering in port area

- 1- Driver enters the Kandla from Gandhidham by any truck
- 2-Truck stops for some time at the entry gate
- 3-Truck enters inside Kandla port area
- 4-Retention time including time required for loading and unloading
- 5-Truck leaves port area
- 6-Drivers stops for sometime for refreshment/rest
- 7-Driver starts journey towards destination



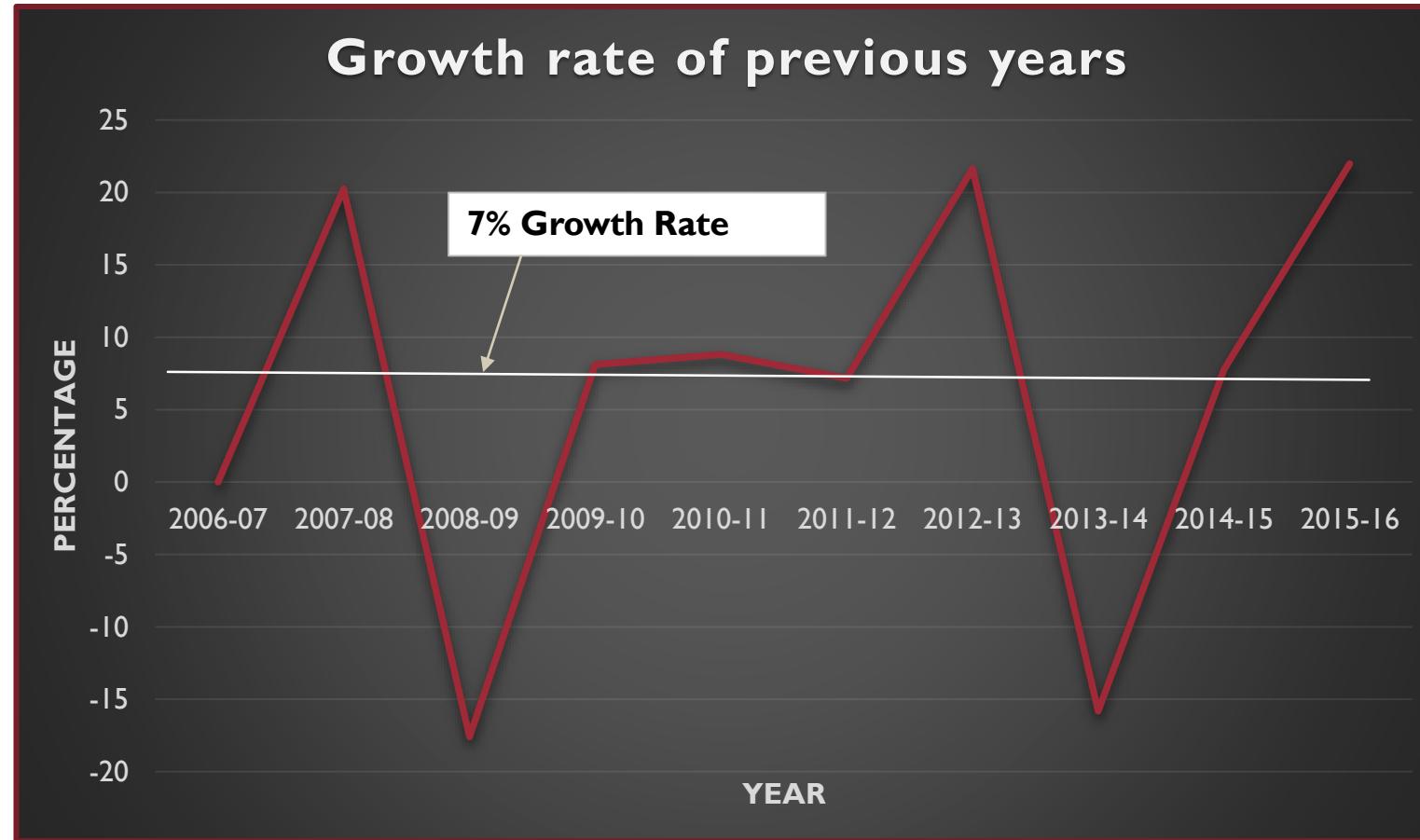
STAGE – 4

A) Analysis of parking demand

Base Year (2016-17)			
	TRUCK	TRAILOR	TANKER
<=1 Hr	760	1159	0
2 Hr	2279	248	111
3 Hr	0	248	0
>=4 Hr	0	207	0
Total	3039	1863	111

Demand of trucks and trailers as per available traffic data of Base Year (2016-17)

Trend of growth rate of cargo handled through road transport for last 10 years



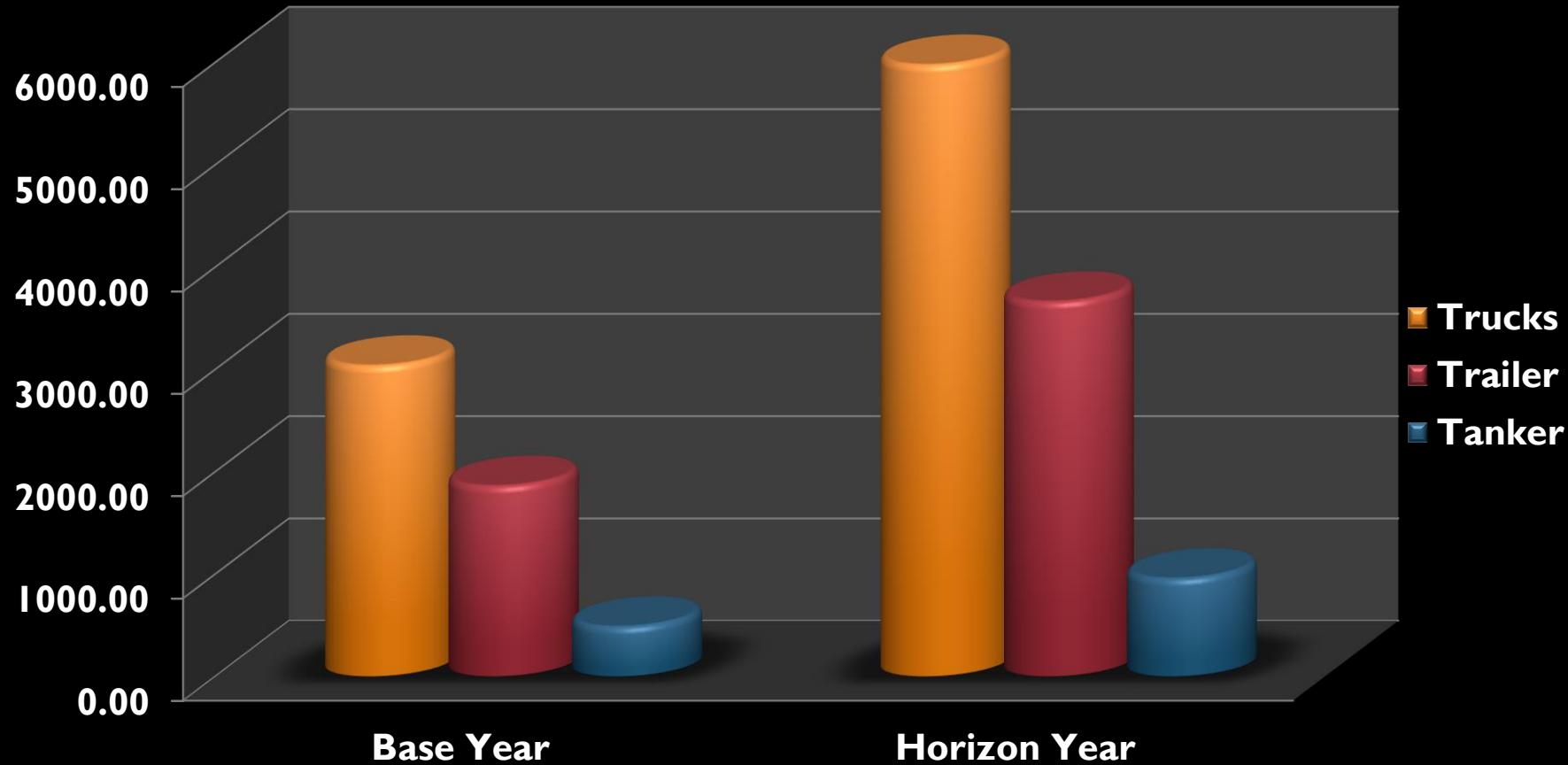
As per data provided

Demand of trucks and trailers for Horizon Year (2026-27) at 7% Annual Growth Rate

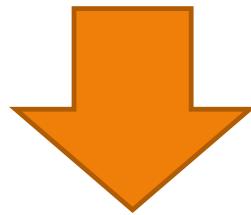
10 Year Horizon (2026-27)

	TRUCK	TRAILOR	TANKER
<=1 Hr	1495	2280	740
2 Hr	4484	488	218
3 Hr	0	488	0
>=4 Hr	0	407	0
Total	5979	3664	958

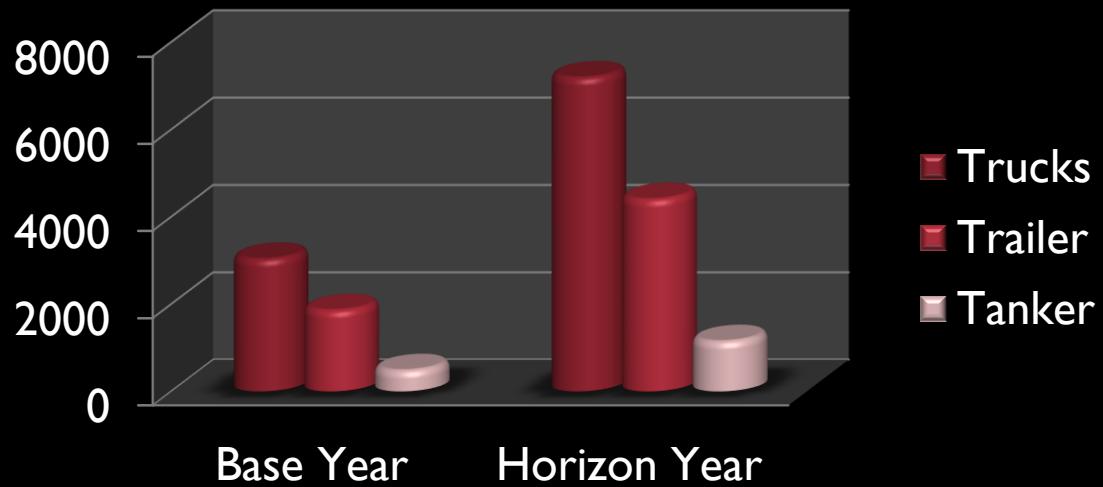
Demand (AADT) Forecast Based on 7% Growth Rate



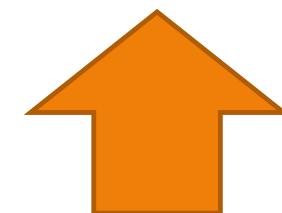
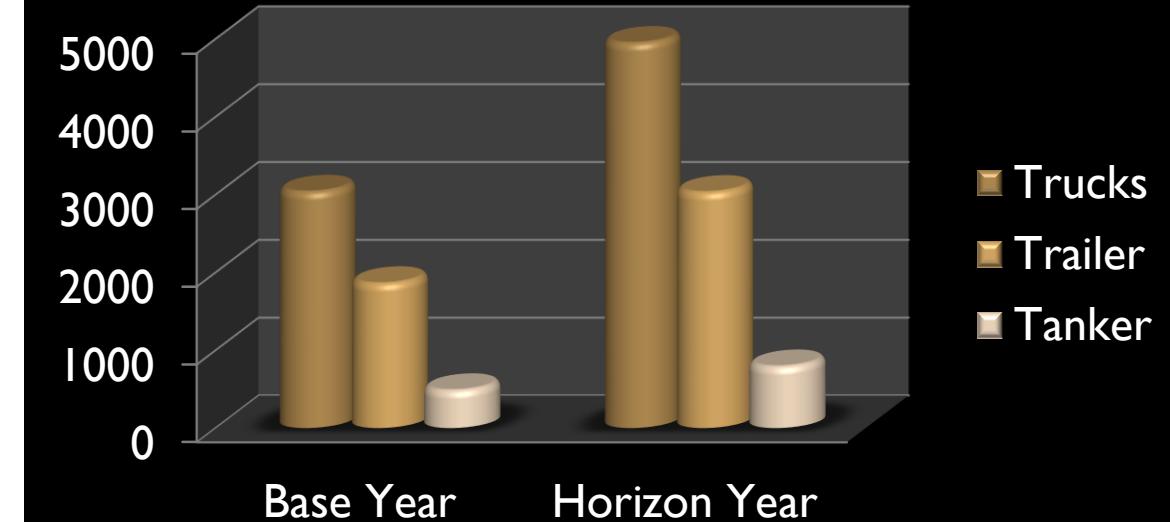
Demand Forecast – 9% Growth Rate



Demand Forecast Based on 9% Growth Rate



Demand Forecast Based on 5% Growth Rate



Demand Forecast – 5% Growth Rate

BAYS REQUIREMENT

Bays requirement evaluated considering following criteria

- A. Bays required for vehicles retained for more than 1.0 hour
- B. Bays requirement for vehicles retained for less than or equal to 1.0 hour

Option – 1 - Considering average retention time of vehicle = 1.0 hour

Option – 2 – Considering average retention time of vehicle = 0.5 hour

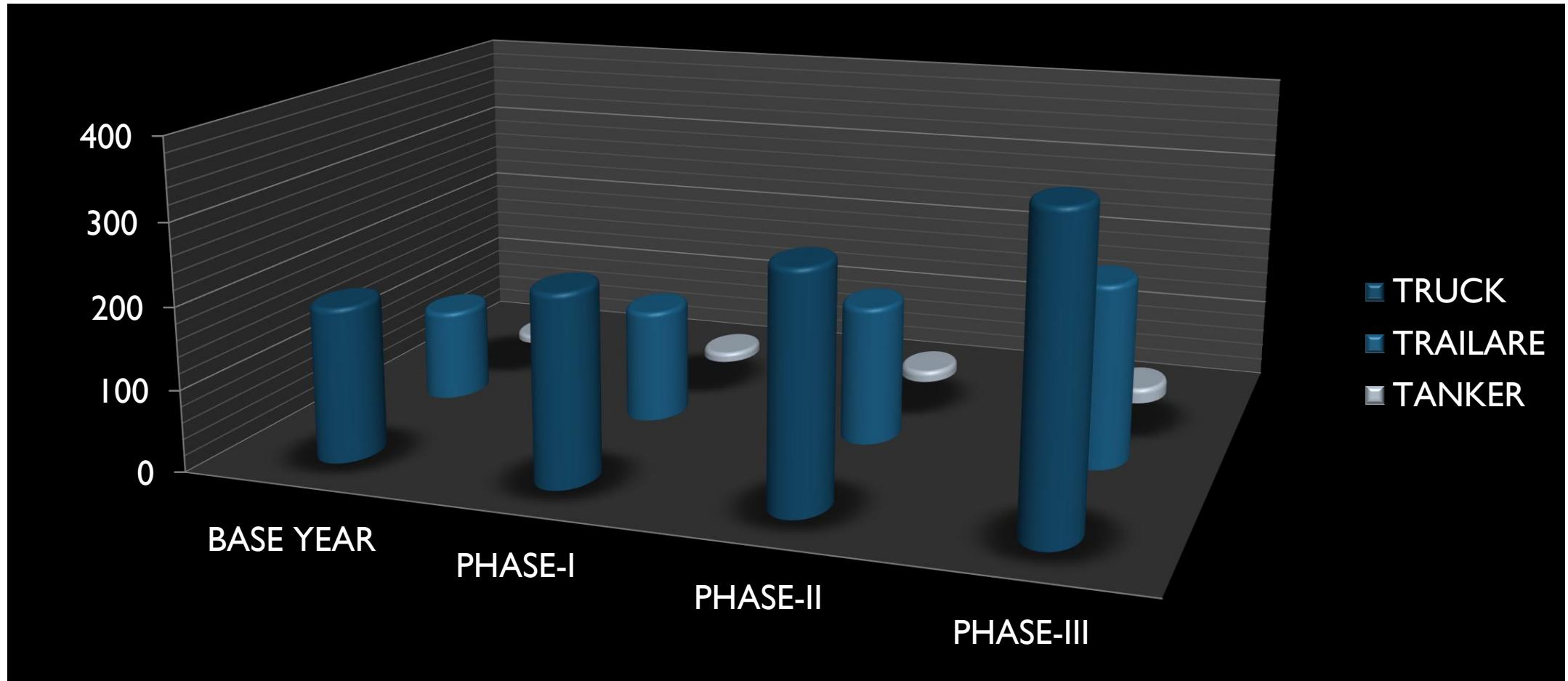
Retention time >1 hour period

Bays forecast @ 7% growth rate up to 2026-27

	BASE YEAR (2016-2017)	PHASE-I (2017-2020)	PHASE-II (2020-2023)	PHASE-III (2023-2027)
TRUCK	190	232	284	372
TRAILOR	114	140	171	224
TANKER	10	12	14	19
TOTAL	314	384	469	615

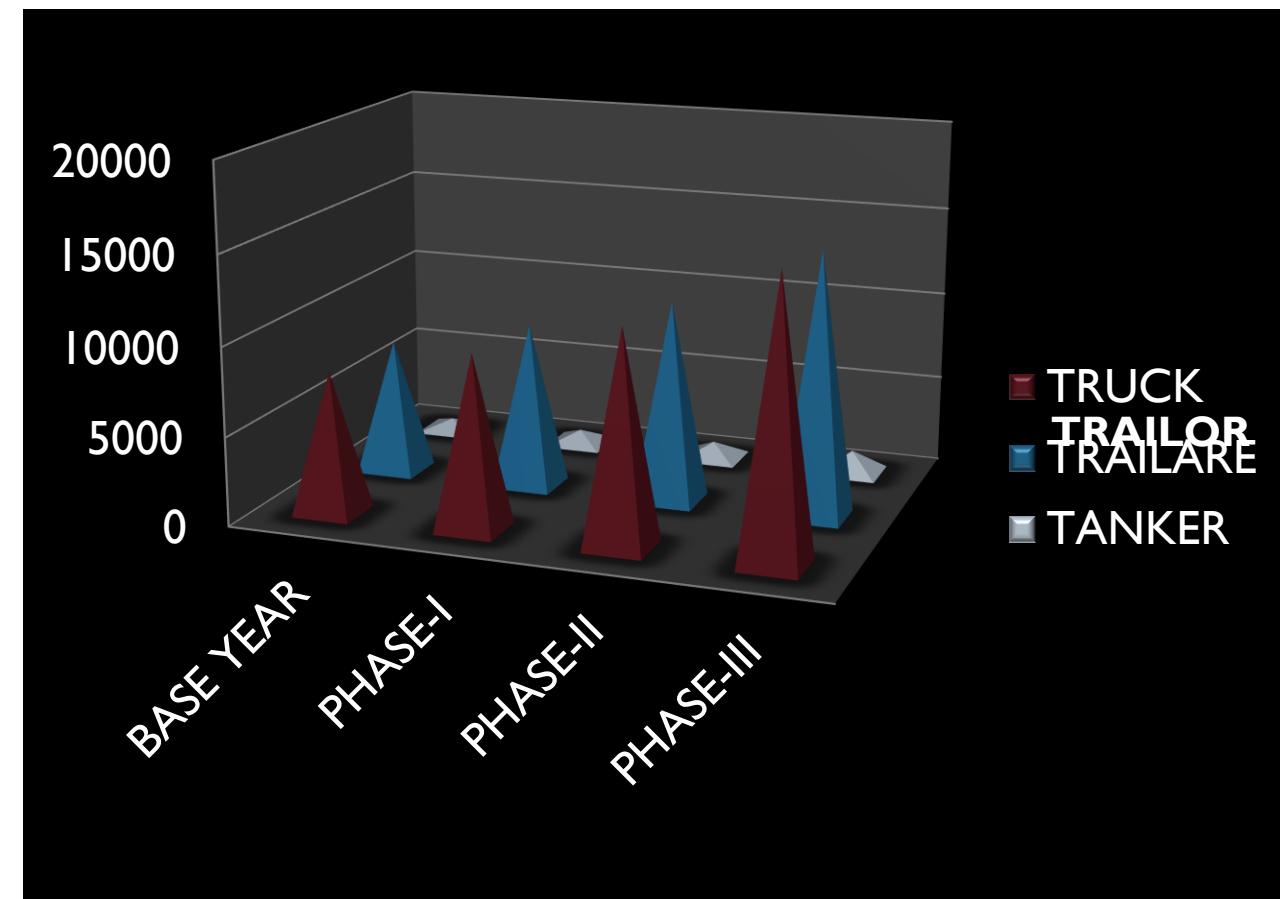
Bays forecast for various phases

Retention time >1 hr.



Total Bays Area Requirement for Parking at Centralized Truck Parking Terminal

	Area requirement for bays @ 7 % growth rate (sqm)			
	BASE YEAR (2016-2017)	PHASE-I (2017-2020)	PHASE-II (2020-2023)	PHASE-III (2023-2027)
TRUCK	7980	9786	12012	15708
TRAILOR	7581	9310	11372	14896
TANKER	665	798	931	1264
TOTAL	16226	19894	24315	31868



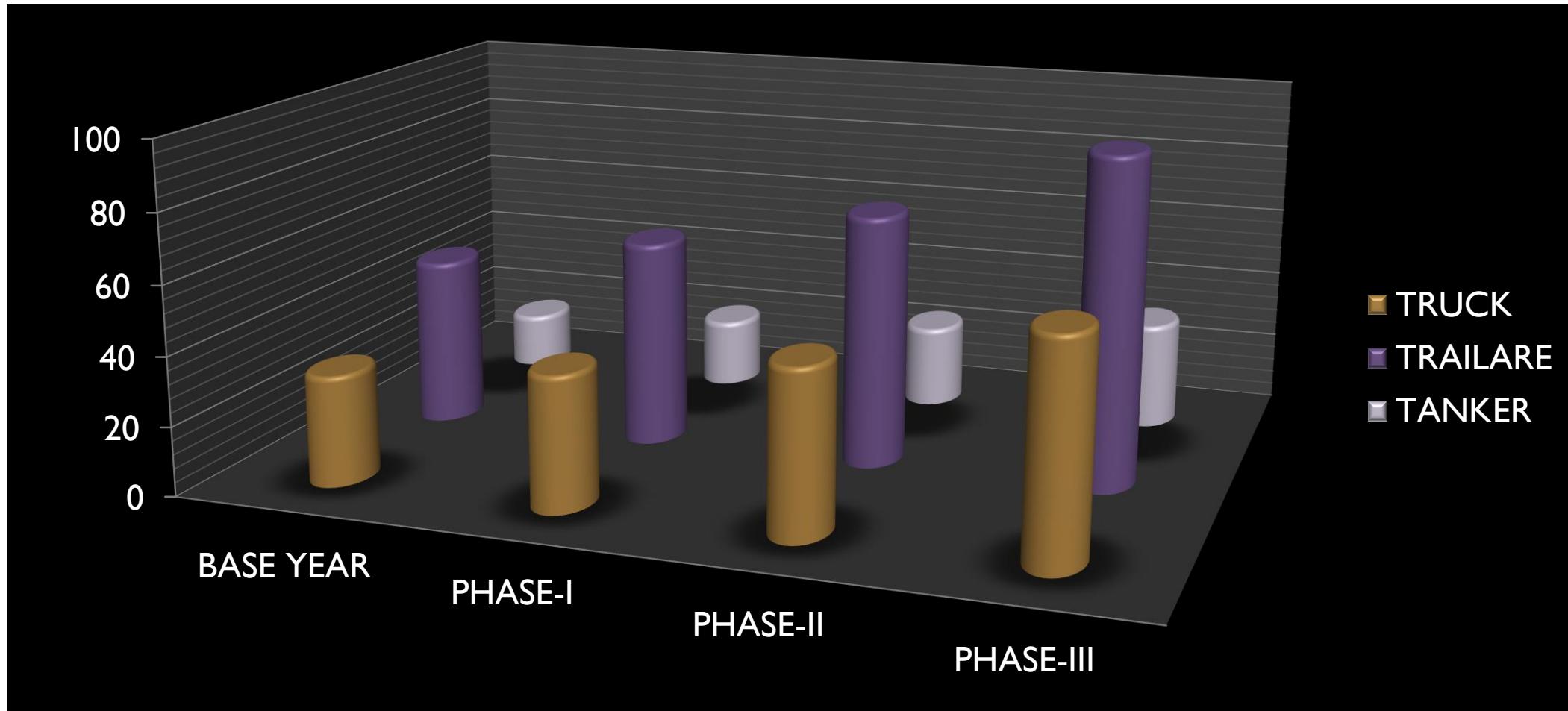
Retention time <1 hour period

Option I:Average Retention time = 1.0

Bays forecast @7% growth rate up to 2026-27				
	BASE YEAR (2016-2017)	PHASE-I (2017-2020)	PHASE-II (2020-2023)	PHASE-III (2023-2027)
TRUCK	32	40	49	64
TRAILOR	49	60	73	95
TANKER	16	20	24	31
TOTAL	97	120	146	190

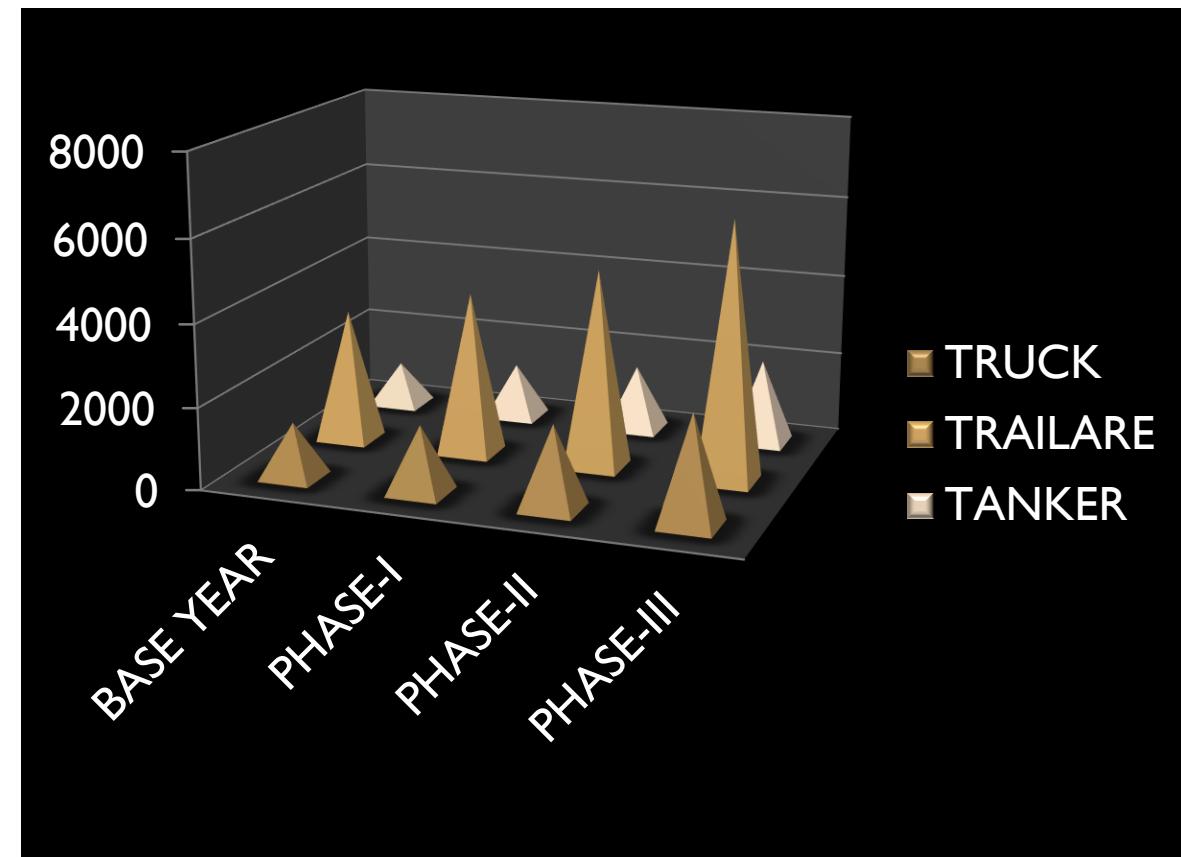
Bays forecast for various phases

Retention time <1 hr. (option I)



Total Bays Area Requirement for Parking at Existing Truck Parking besides WG-I (Option I)

Area requirement for bays @ 7 % growth rate (sqm)				
	BASE YEAR (2016-2017)	PHASE-I (2017-2020)	PHASE-II (2020-2023)	PHASE-III (2023-2027)
TRUCK	1344	1638	2016	2646
TRAILOR	3259	3990	4855	6318
TANKER	1064	1330	1596	2062
TOTAL	5667	6958	8467	11025



Retention time <1 hour period

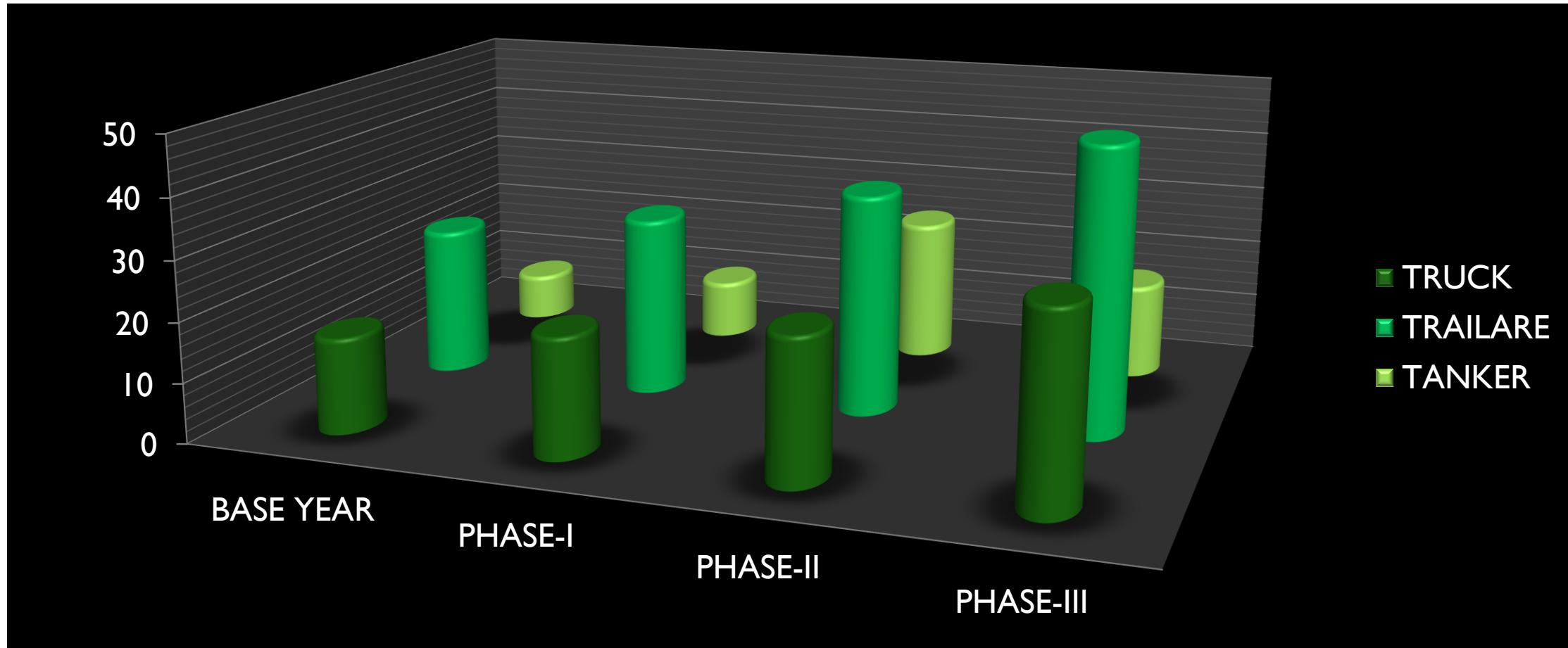
Option 2 :Average Retention time = 0.5 hour

Bays forecast @7% growth rate up to 2026-27

	BASE YEAR (2016-2017)	PHASE-I (2017-2020)	PHASE-II (2020-2023)	PHASE-III (2023-2027)
TRUCK	16	20	24	32
TRAILOR	25	30	37	48
TANKER	8	10	24	16
TOTAL	49	60	85	96

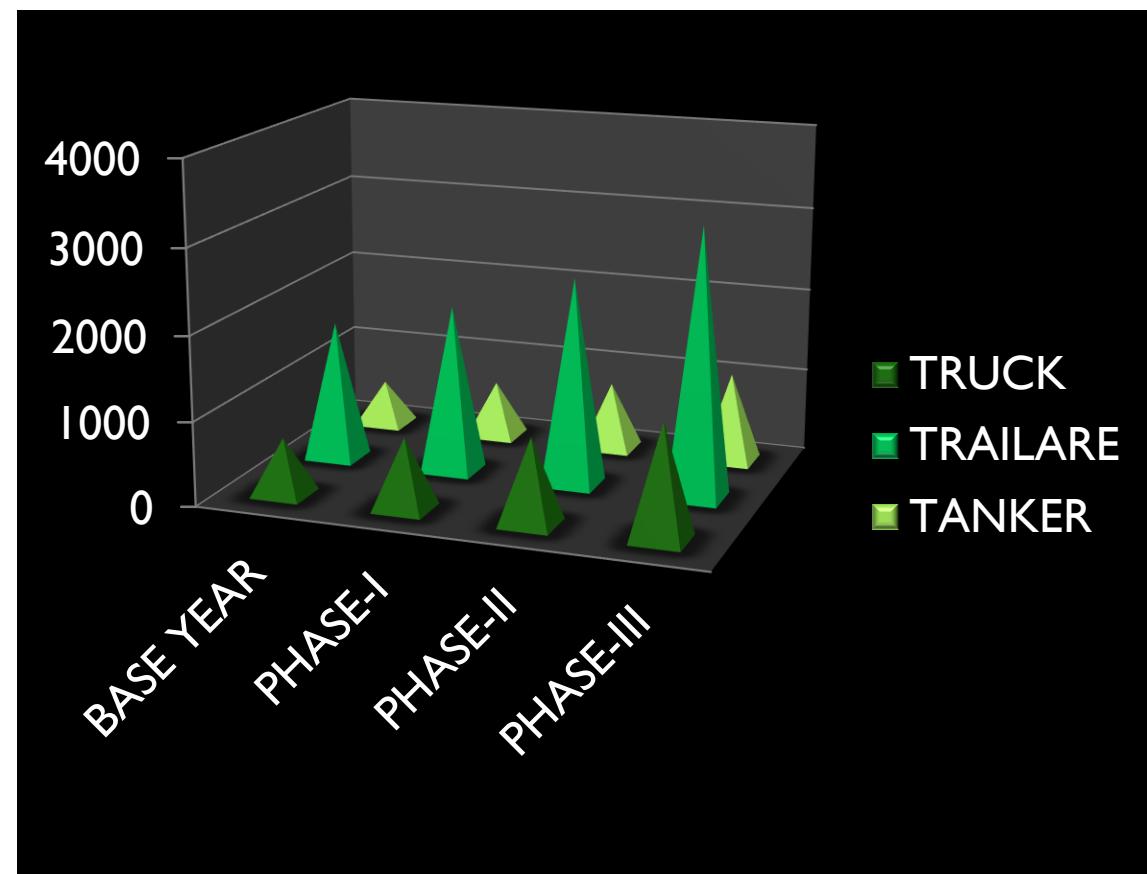
Bays forecast for various phases

Retention time <1 hr. (option II)



Total Bays Area Requirement for Parking at Existing Truck Parking besides WG-I (Option 2)

Area requirement for bays @ 7 % growth rate (sqm) (0.5 hr)				
	BASE YEAR (2016- 2017)	PHASE-I (2017- 2020)	PHASE-II (2020- 2023)	PHASE-III (2023- 2027)
TRUCK	672	840	1008	1344
TRAILOR	1663	1995	2461	3192
TANKER	532	665	798	1064
TOTAL	2867	3500	4267	5600



EXISTING INFRASTRUCTURE FACILITY AT PORT AREA

Storage Facilities

- Dry Cargo-14
- Oil Jetty-6

Container Handling Facilities

- 545 m.
- 40 Hectare Container Yard
- 6 Container Freight Station

Weigh Bridge

- 9 weigh bridges(2 of 40 MT, 1 of 50 MT, 1 of 60 MT, 2 of 80 MT, 3 of 100MT)

Road Network

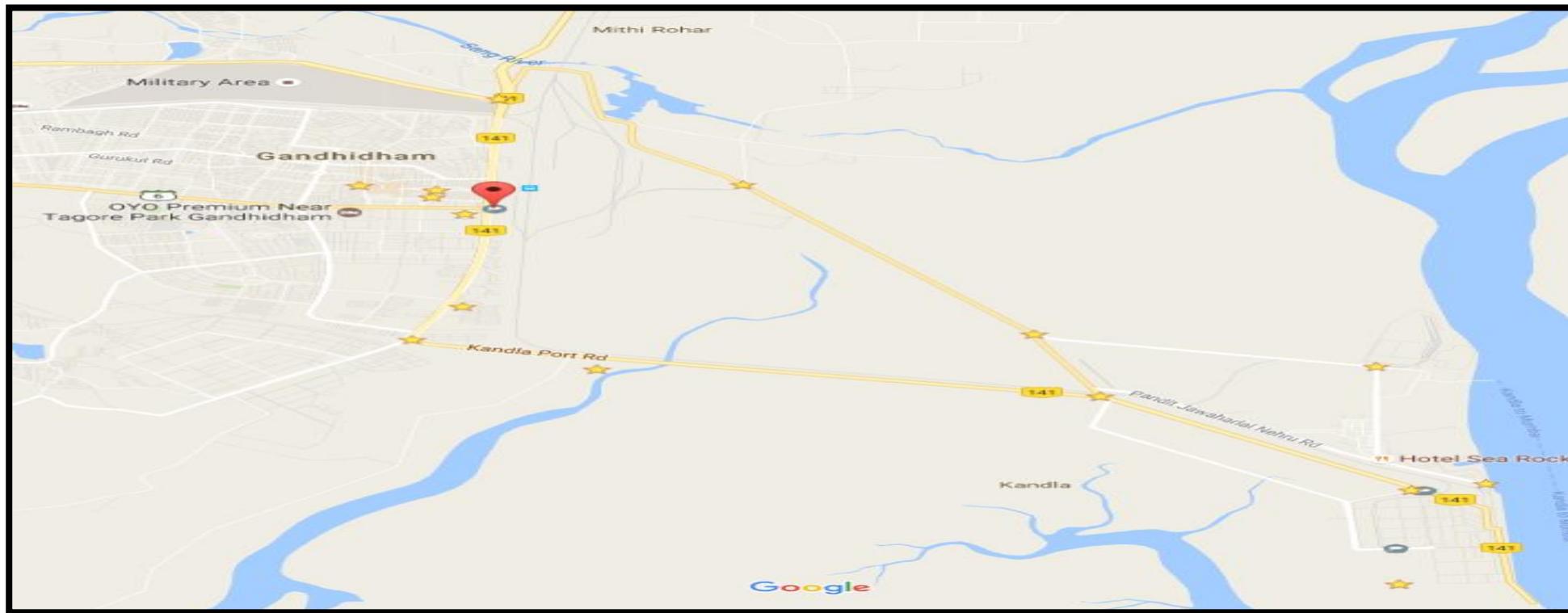
- Inside Cargo jetty area-30 km
- Outside Cargo Jetty Area- 31 km
- Railway Inside Cargo Jetty area -13 km

Fire Protection Facilities

- Fire Water Storage System
- Fire water system, Foam Systems
- Mobile Fire Fighting Equipment

LOCATION ANALYSIS FOR PARKING TO BE PROVIDED

I) Parking spaces near KPT administrative office on Gandhidham-Kandla road

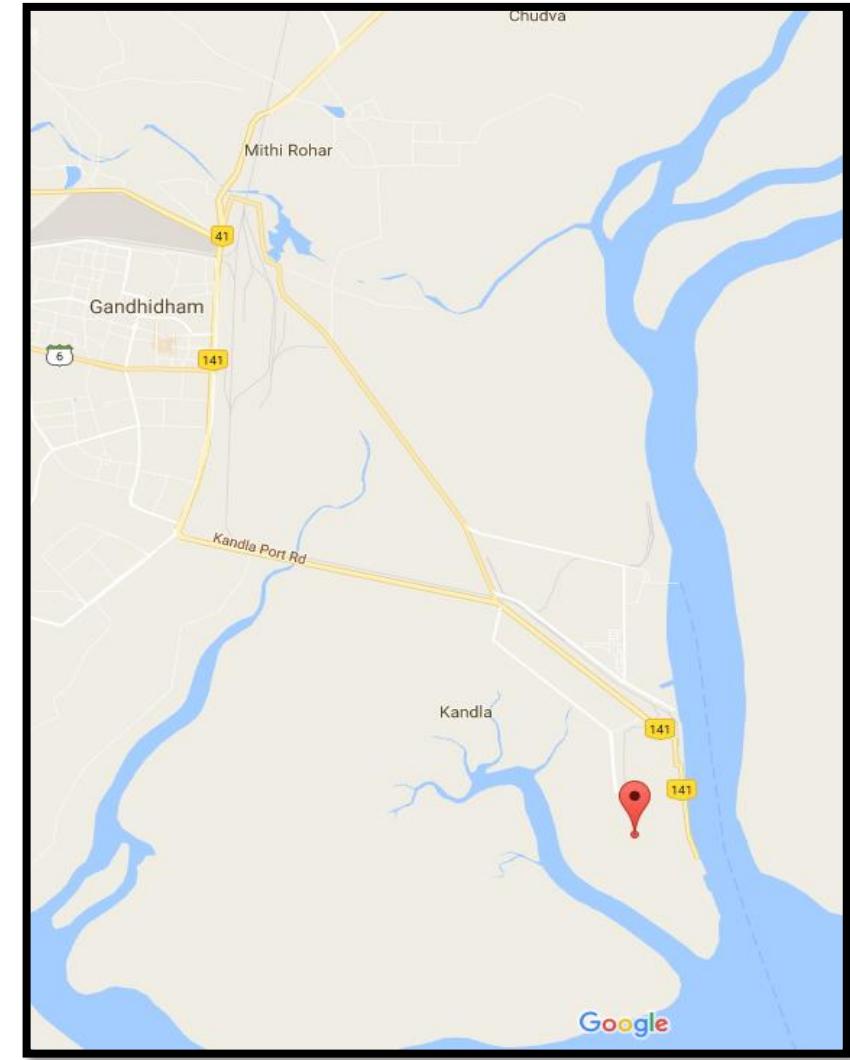




□Pros & Cons

- There is no investment for developing separate parking area.
- Regular payment of parking fees is required for acquired temporary parking spaces.
- Traffic of Gandhidham city and NH-8 is affected due to entry and exit of goods vehicles.
- It is uneconomical to provide Integrated facilities as land cost is more near city area.

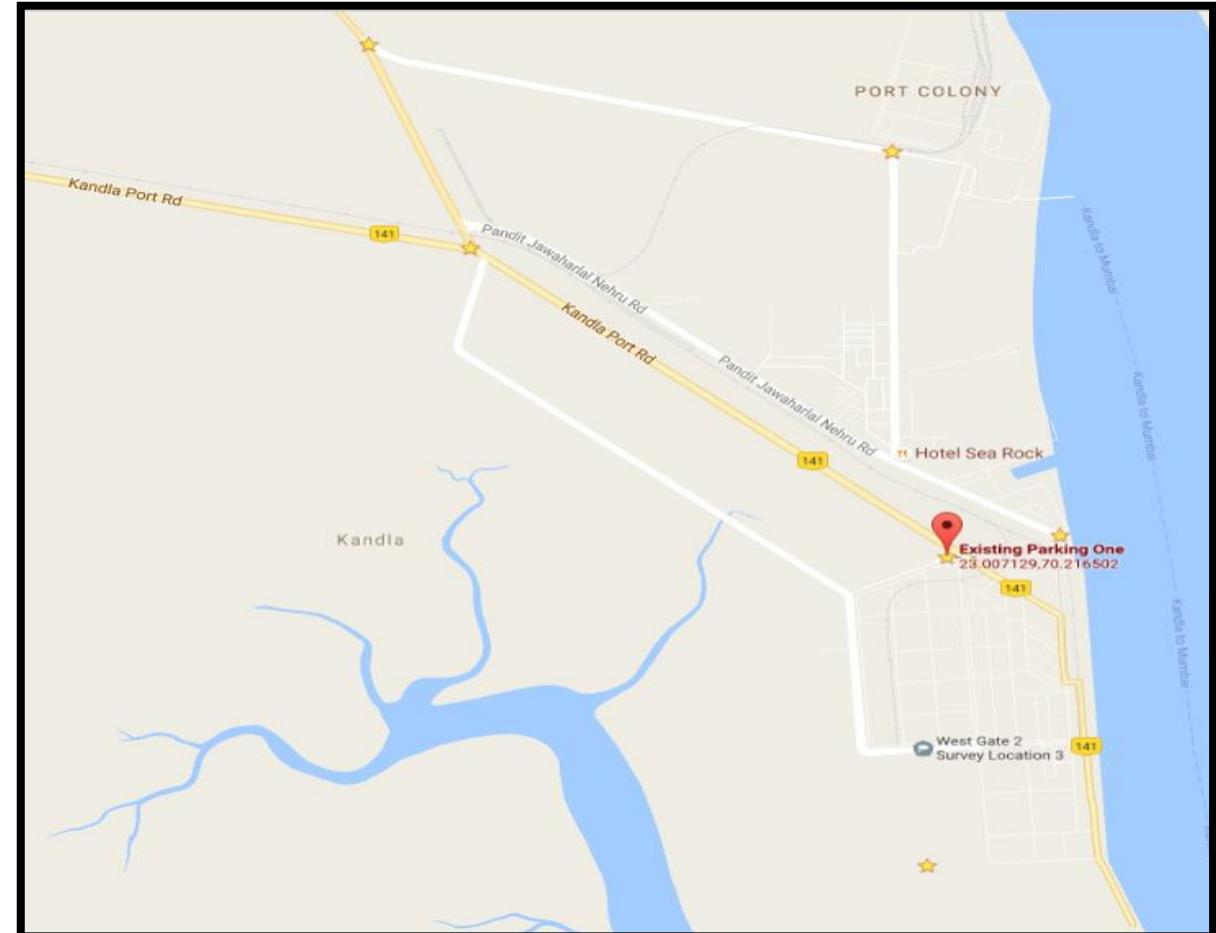
2) Area opposite to West Gate 2



Pros & Cons

- Easy access from WG-1,WG-2,WG-3
- It is closer to all main entry-exit of dry cargo gates.
- Traffic of main stream on NH-8 will not be affected due to entry and exit of vehicles from parking area
- Large area of vacant land available within the premises
- Unused land may be used for development of parking premises which may have economic benefits
- Facilities for refreshment of drivers can be easily provided here considering the space availability
- Proper utilization of available land resources can be done.
- Back water of sea can cause problems in proposed parking area.
- Low-lying area requires higher investment due to ground filling.
- Quite far from liquid cargo gate.

3) Existing parking besides West Gate - 01



Pros & Cons

- Easy access from WG-I, WG-2, WG-3
- It is closer to all main entry-exit gates.
- Large area of vacant land available within the premises and near to all main gates.
- Unused land may be used for development of parking premises which may have economic benefits
- Facilities for refreshment of drivers can be easily provided here considering the space availability.
- Proper utilization of available land resources can be made
- Entry or exit of truck from this parking affect the movement of CV coming out of WG-I
- Existing parking facility is not well planned and lacks all required basic amenities / facilities.
- Difficult to accommodate forecasted demand as area available is not sufficient

4) Space available at Kandla Bypass





Pros & Cons

- Traffic of main stream on NH-8A will not be affected due to entry and exit of vehicles from parking area
- Large area of vacant land available within the premises
- Unused land may be used for development of parking premises which may have economic benefits
- Greater possibility to integrate tankers with trucks and trailers for parking.
- Proper utilization of available land resources can be made
- Easy access for truck, trailers and tankers.
- City traffic in the vicinity of the port will be least affected.
- Transporters' offices are also located nearby Kandla by pass road, so may be more acceptable

FINALIZATION OF LOCATION

A) Location on Kandla Bypass Road

- Final location for centralized truck parking terminal is recommended along Kandla bypass
- Parking planned at this location will be for vehicles having retention time >1 hr only
- Space available to accommodate all vehicles is very difficult as space due to space constraint.



B) Existing Parking near WG-I (for Option I / Option II)

- Existing parking location is recommended to accommodate vehicles having retention time <1 hr.
- Easy access from WG-I, WG-2, WG-3
- Can fulfill the demand considering option II



C) Lay byes on road side along NH-8A and Kandla Bypass

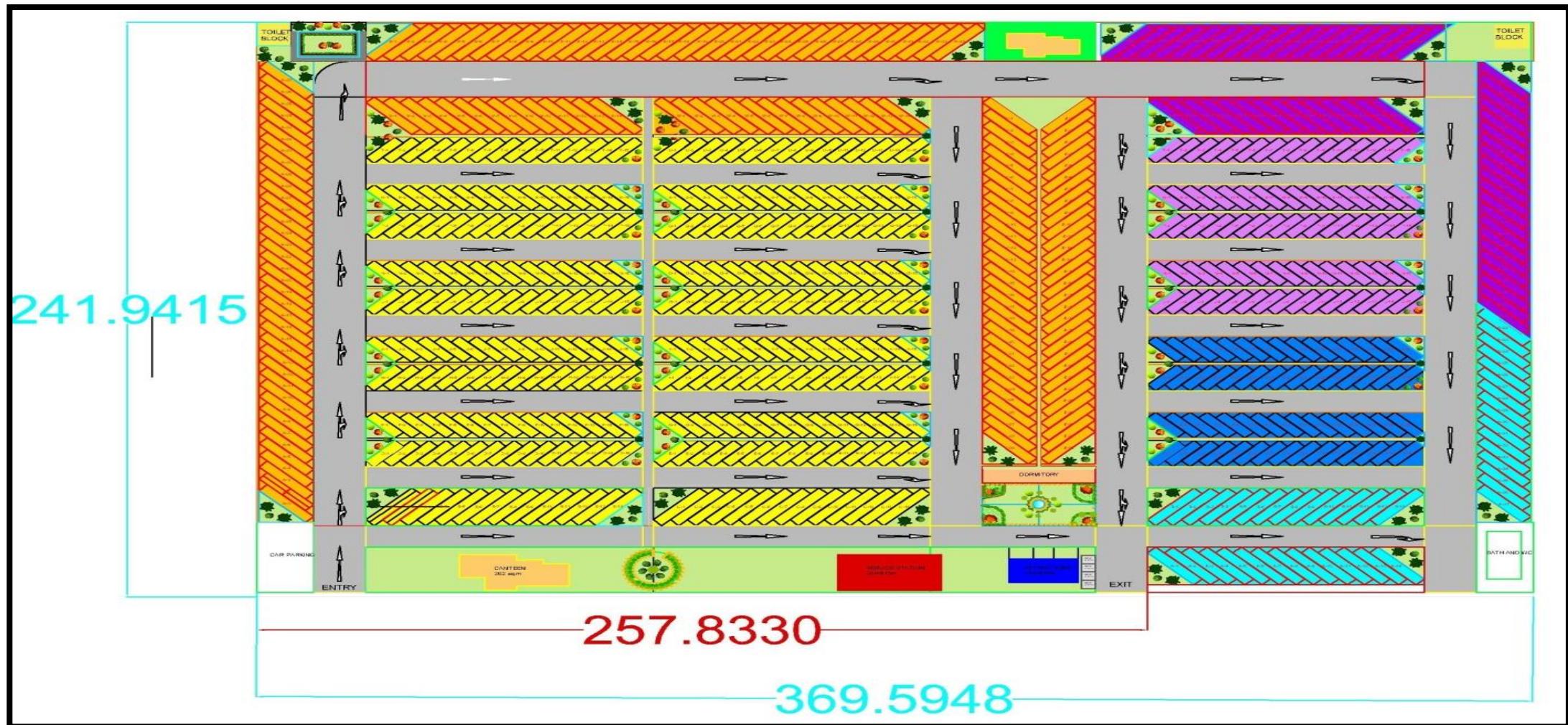
- Demand of vehicles stopping for less than 1.0 hour will be fulfilled partially using existing parking facility after improvement/reconstruction at WG-I.
- Lay byes are planned to be provided at 8 locations on NH-8A and also on Kandla bypass to facilitate short term demand partially
- 4 lay byes on Kandla bypass along the road side for tankers
- 2 lay byes for truck and trailer, each will be provided on NH-8A
 - 01 truck lay bye = 5 truck bays
 - 01 trailer/tanker lay bye = 04 trailer/tanker bays

PARKING LAYOUT

A) Centralized Truck Parking Terminal at Kandla Bypass

- The parking terminal is planned phase wise according to demand forecasted for vehicles with >1 hr. retention time.
- Phase I – 2017-20
- Phase II – 2020-23
- Phase III –2023-27

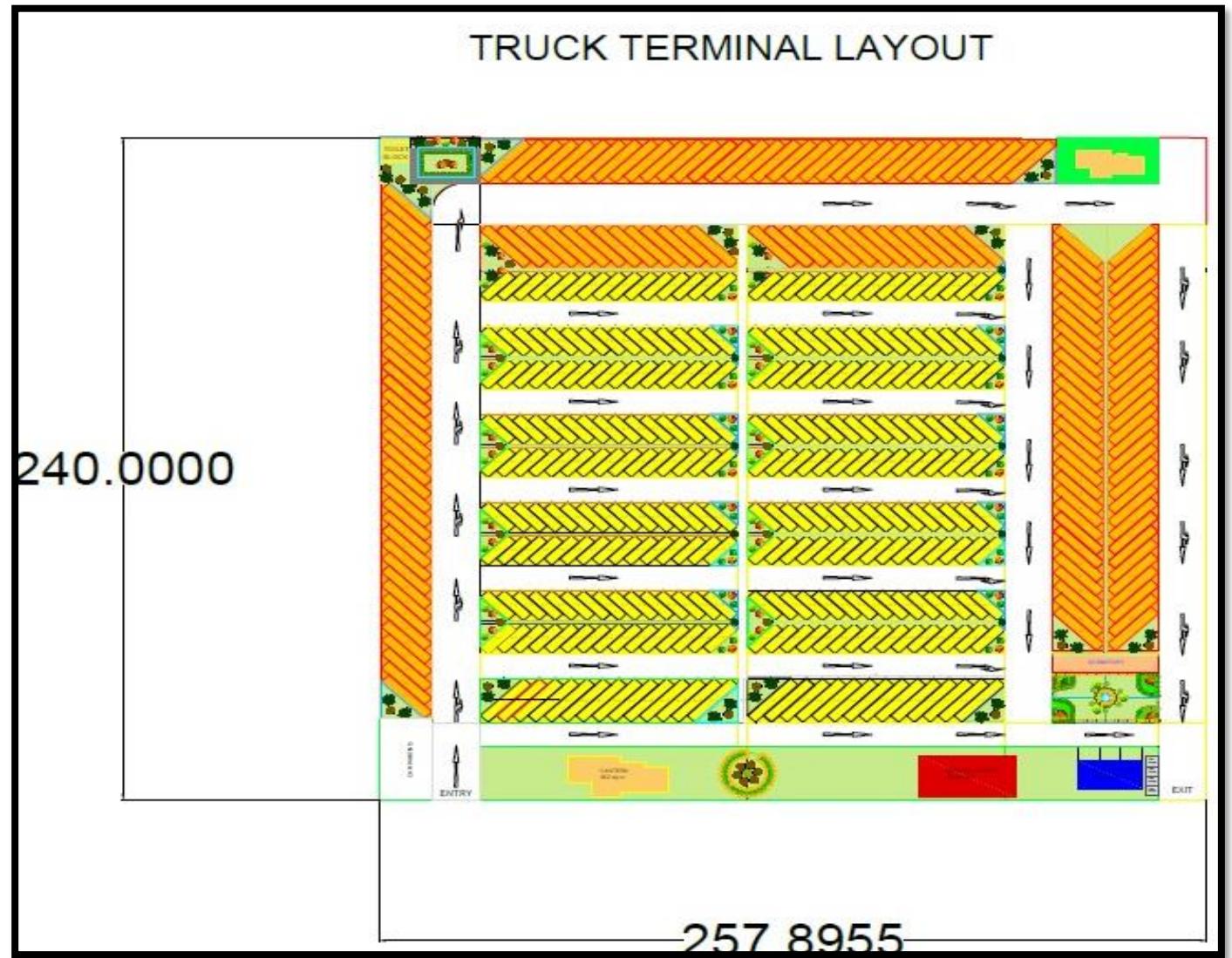
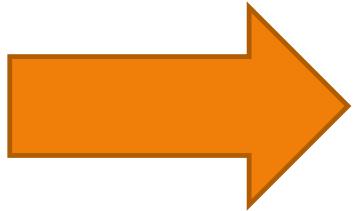
Layout of Centralized Truck Parking Terminal



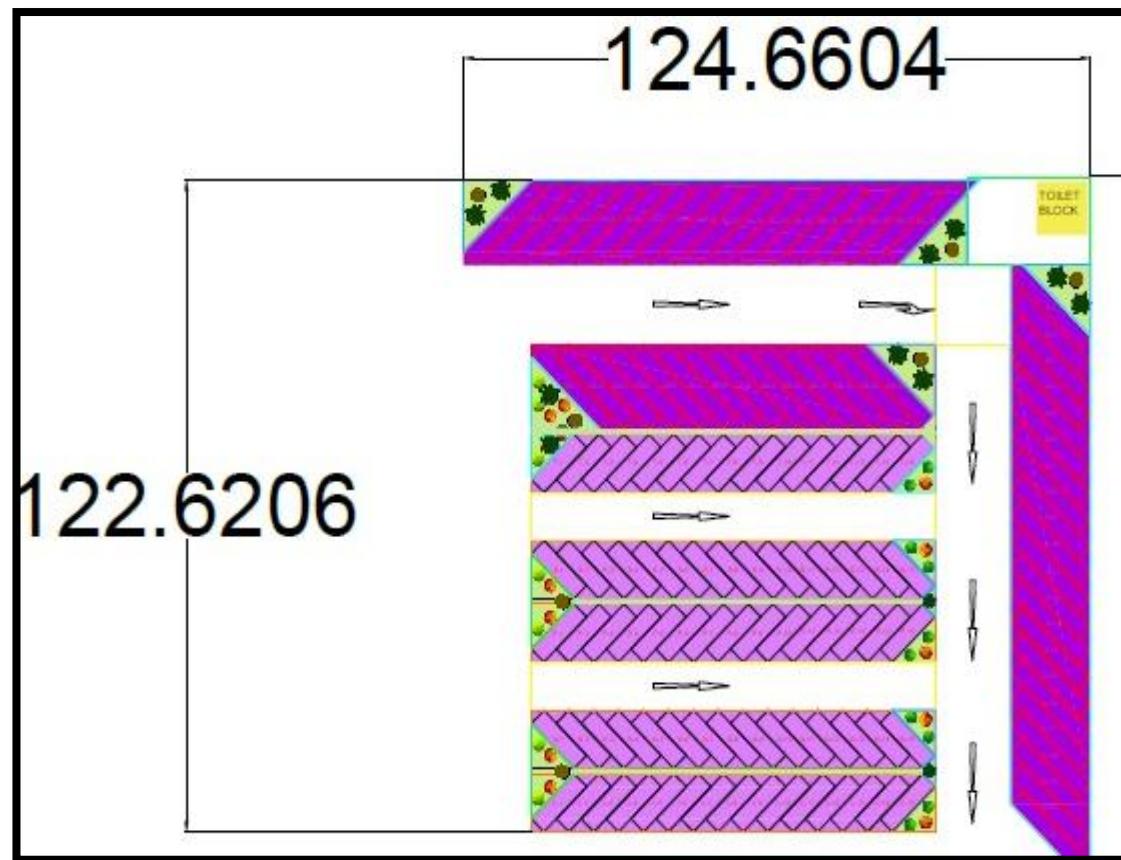
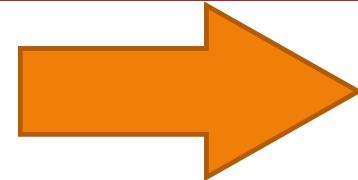
Numbers of bays for truck, trailer and tanker provided in centralized parking for each phase

Number of bays accommodated by centralized parking				
	BASE YEAR	PHASE-I	PHASE-II	PHASE-III
TRUCK	190	232	284	372
TRAILARE	114	140	171	224
TANKER	10	12	14	19
TOTAL	314	384	469	615

**Layout Plan for Phase
I**



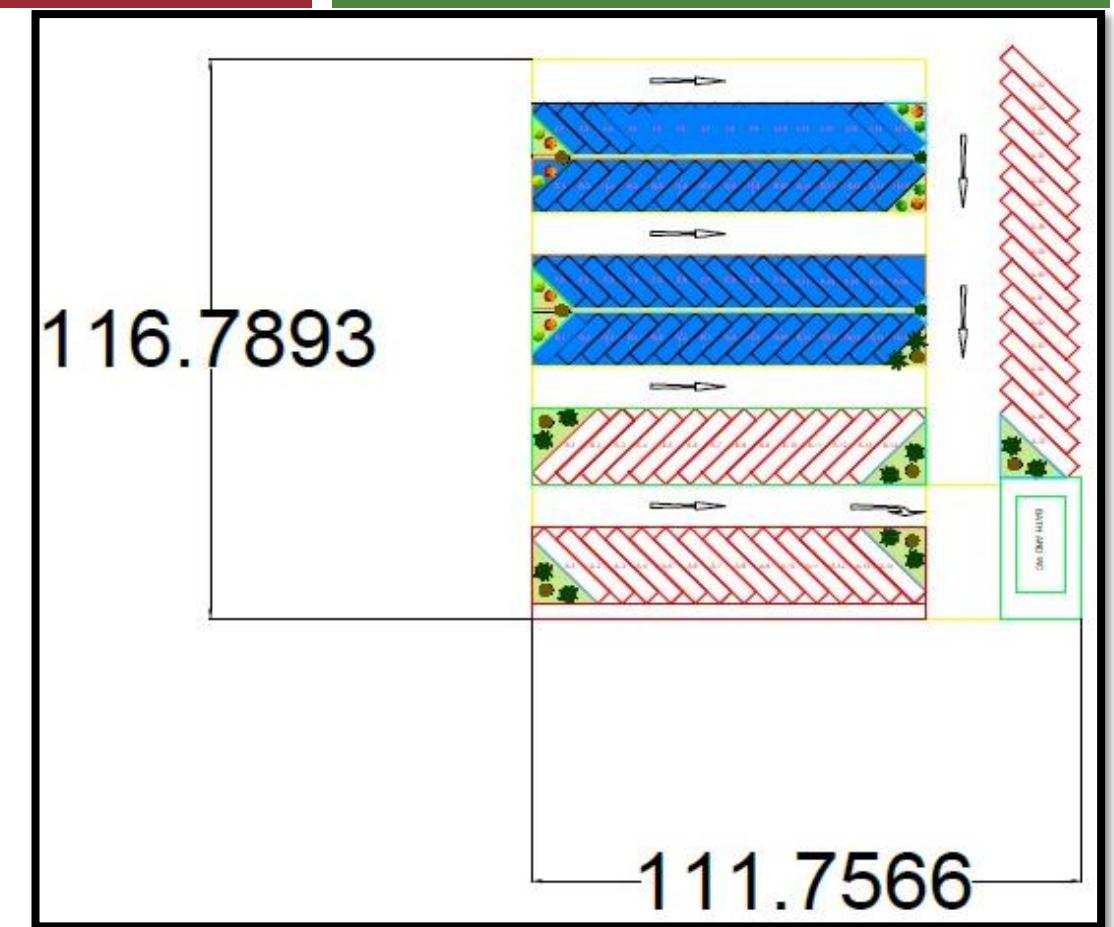
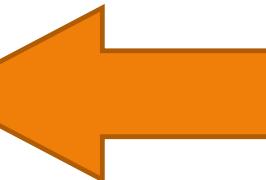
Layout Plan for Phase II



116.7893

111.7566

Layout Plan for Phase III



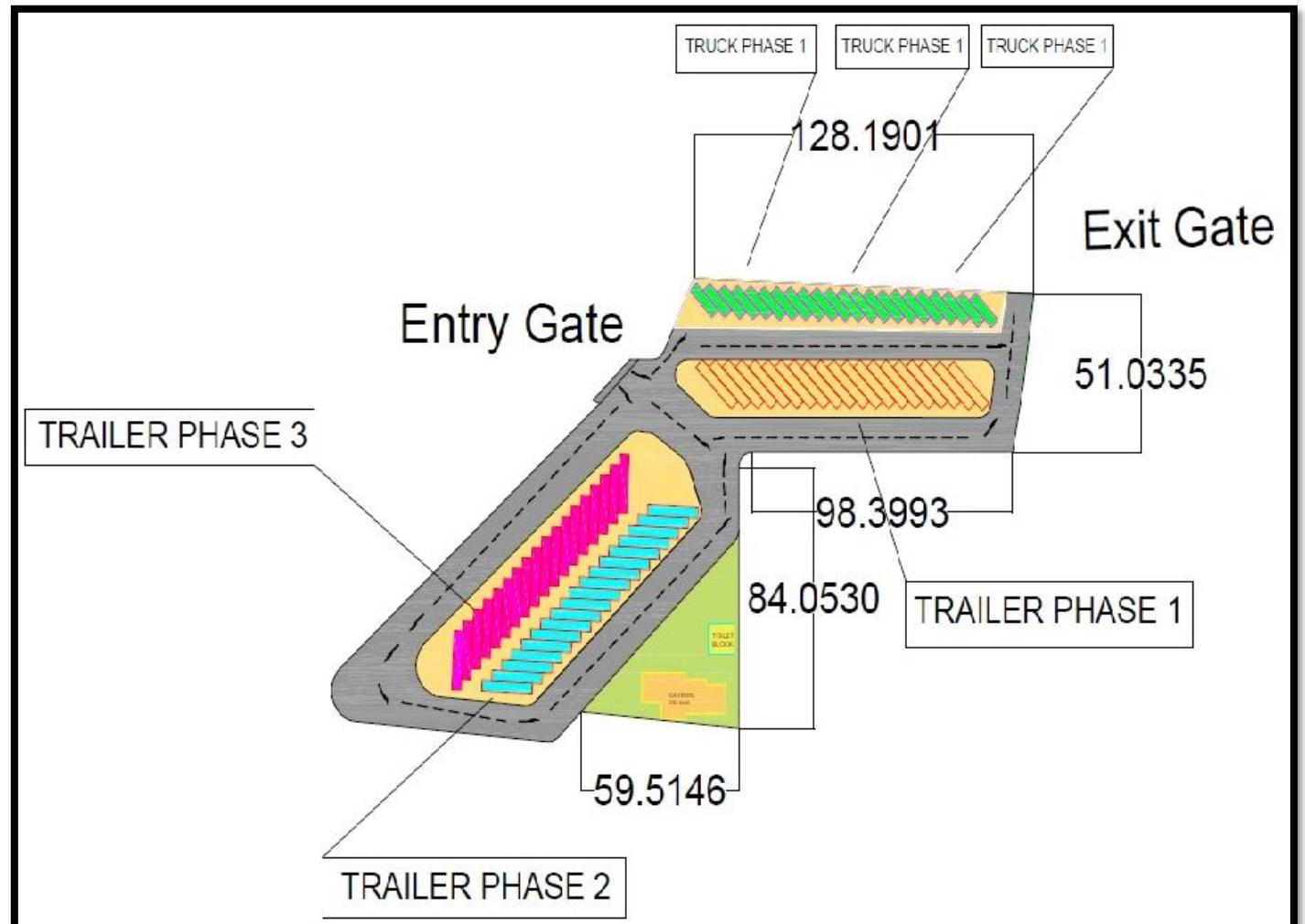
Amenities and facilities to be provided at Terminal

- Dormitory
- Restaurant / Canteen/ Refreshment centre
- Sulabh Sauchalay
- Bathroom
- M & R area including weigh-in-bridge
- Fuel Station
- Provision and Medical store
- Walkway for drivers
- Small parking area for other vehicles
- Area for preparing food (for drivers who cook food themselves)
- Garden landscaping

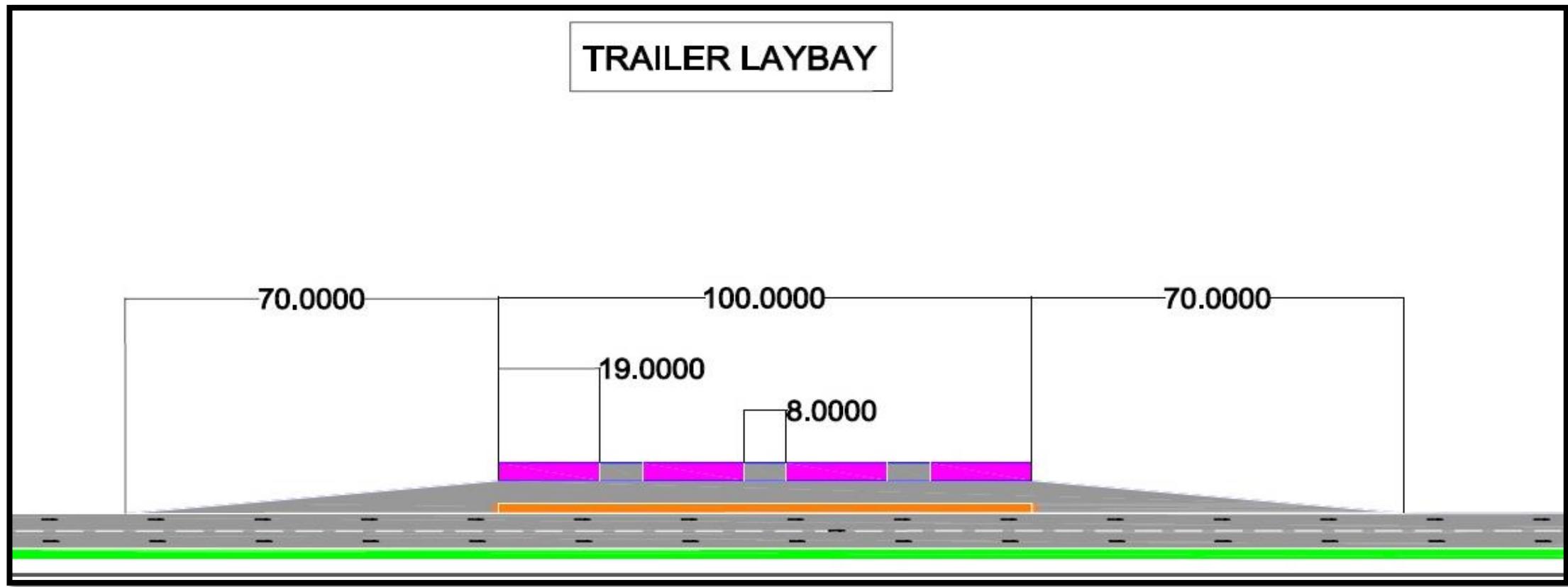
B) Existing Parking near WG-I (Retention time <1.0 hr.)

Amenities / Facilities Provided

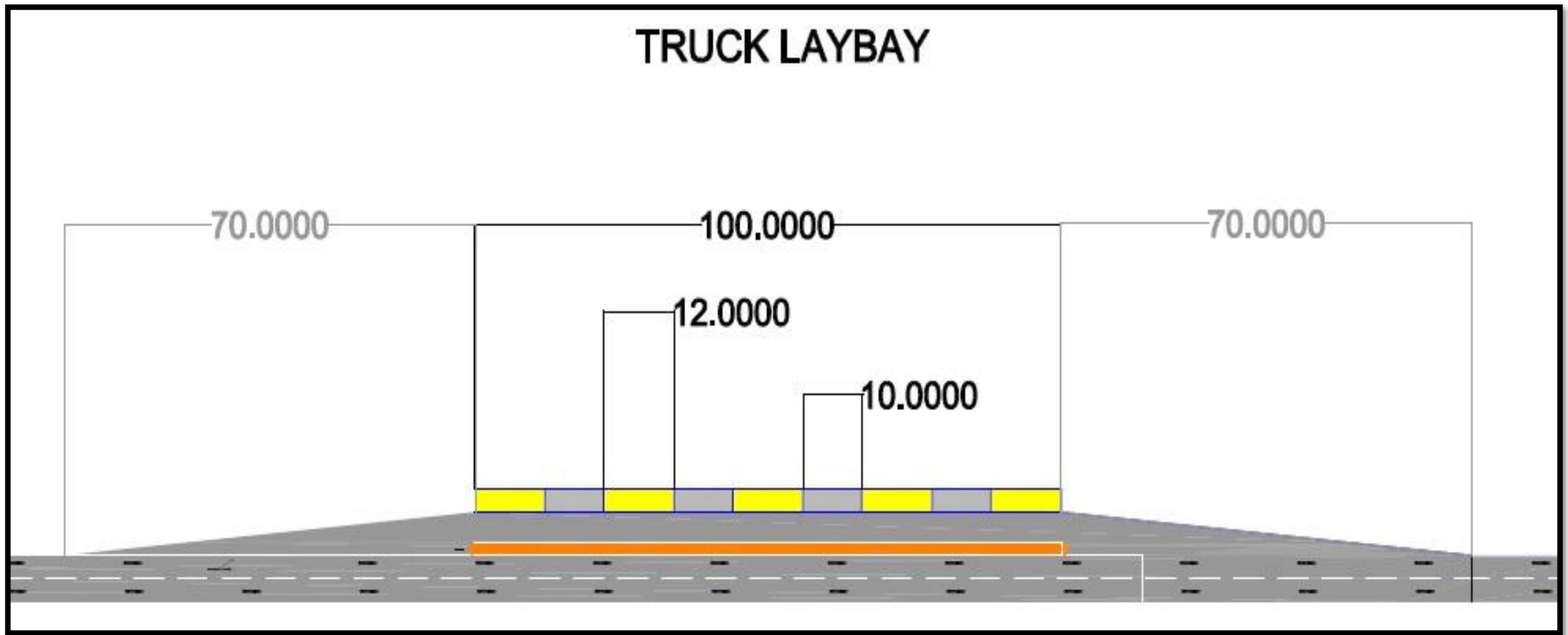
- Walkway for drivers
- Sulabh Sauchalay
- Canteen/Refreshment stall
- Medical store
- Garden landscaping



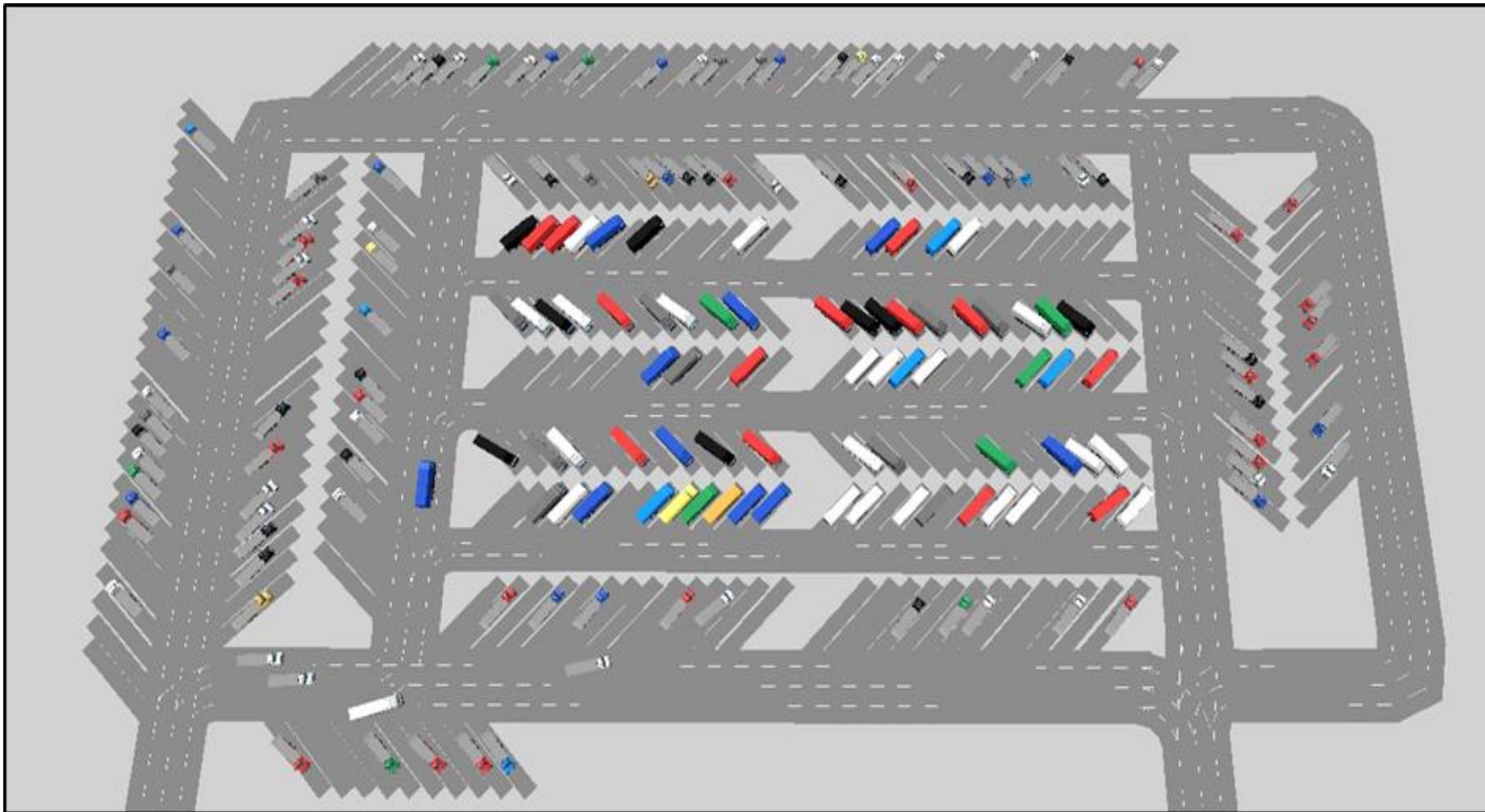
C) Lay byes planned for Truck, Trailer and Tanker with retention time <1.0 hr as per guideline of NHAI



TRUCK LAYBAY



PROPOSED PARKING LAYOUT SIMULATED IN VISSIM-8

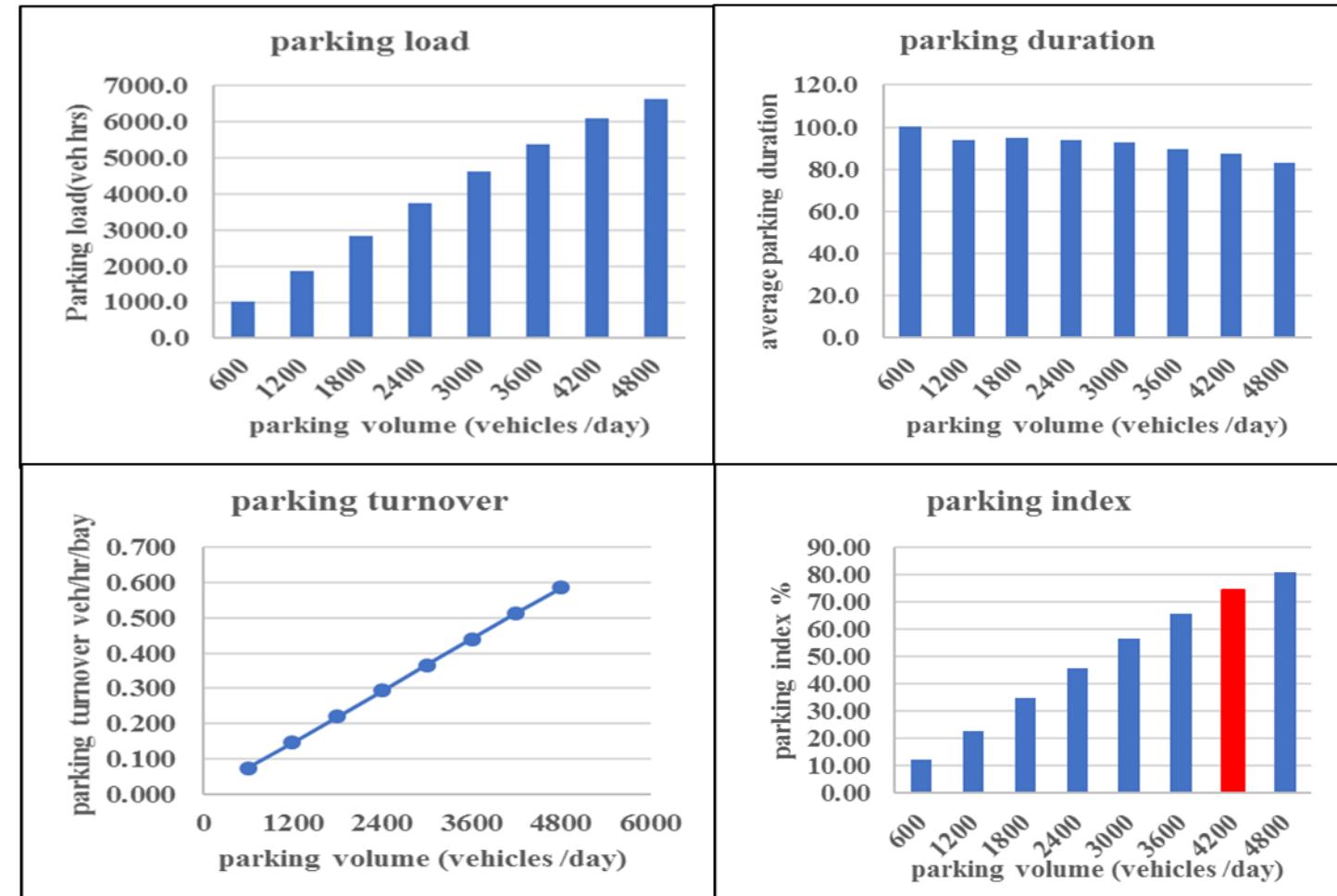
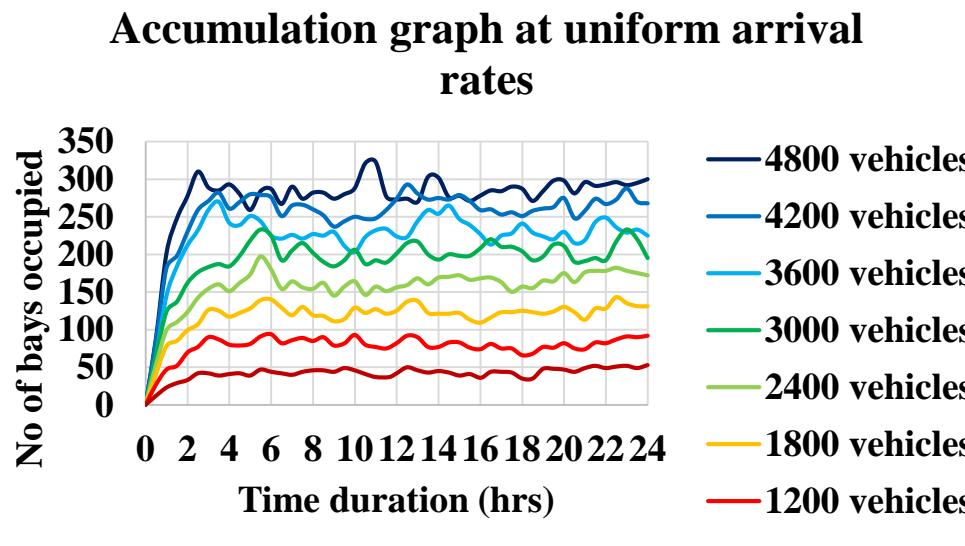


EVALUATION OF PARKING TERMINAL

With the help of developed simulation parking model, three different scenarios are evaluated to test the performance of parking terminal and also helps to understand the operational feasibility of the parking terminal. Which includes

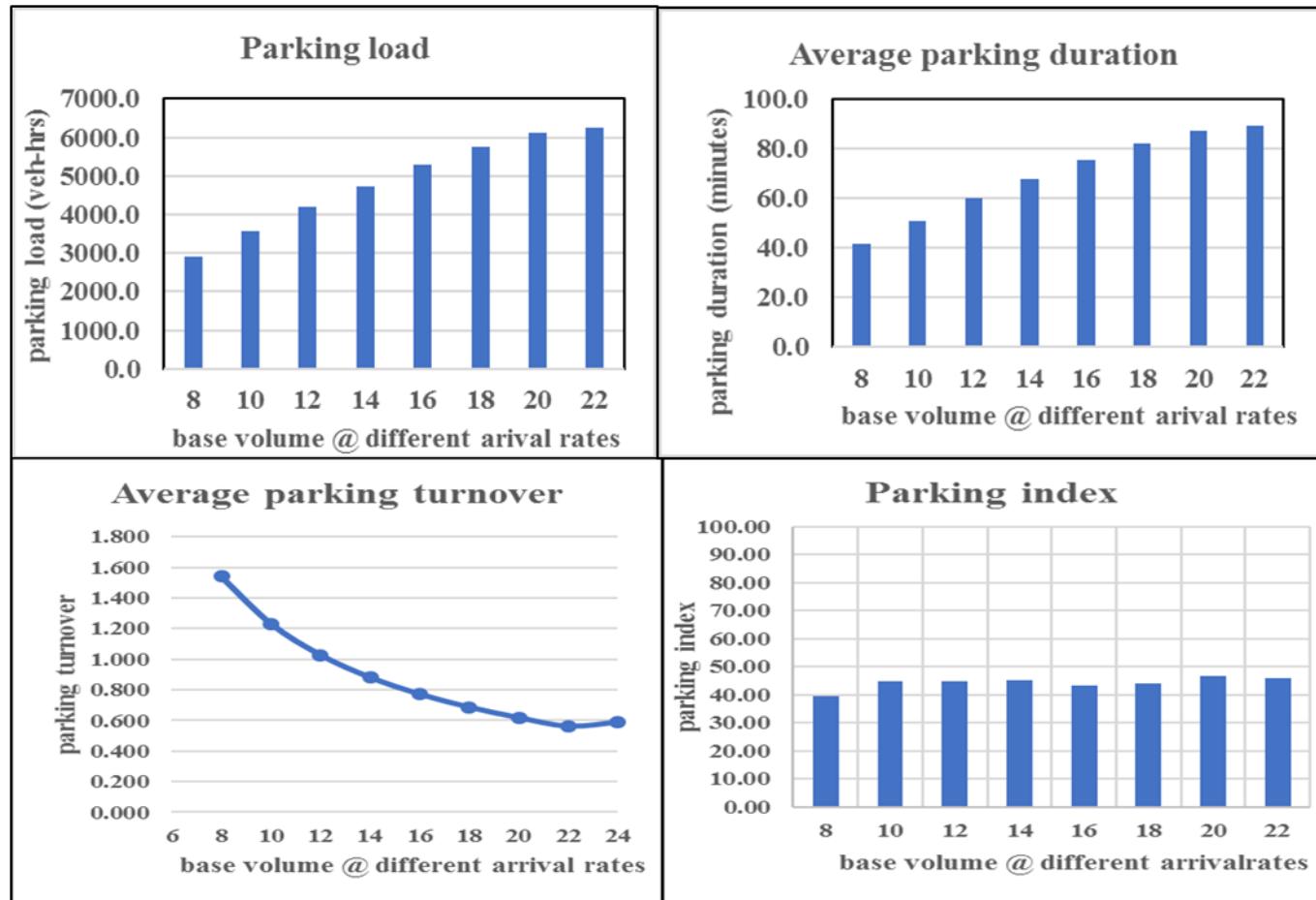
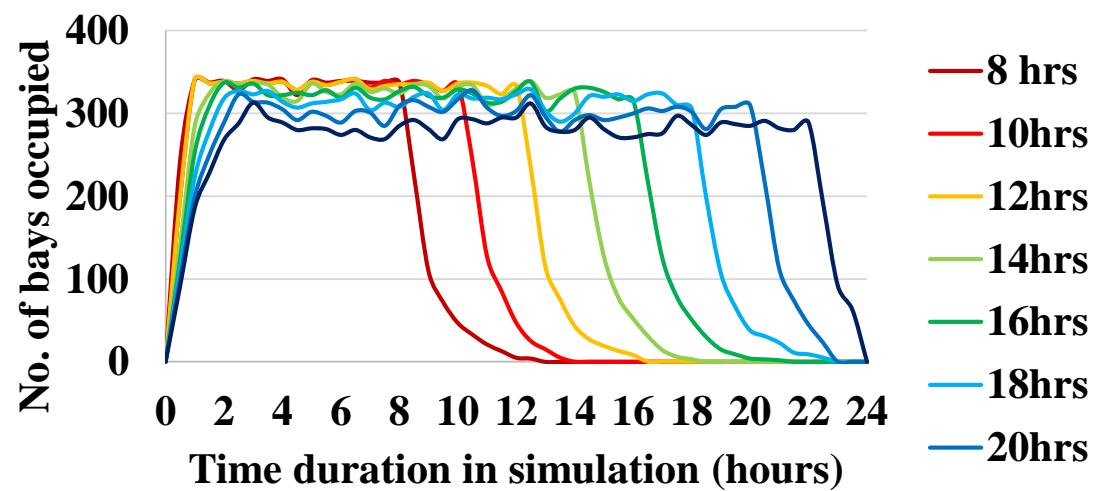
- Scenario 1: Impact on Parking System When Vehicles are Arriving at Different Volumes with Uniform Arrival Rate
- Scenario 2: Impact on Parking System When designed Volume of vehicles are arriving at different arrival rates
- Scenario 3: Impact on Parking System When parking duration has been varied by half an hour from the estimated parking time.

SCENARIO I: IMPACT ON PARKING SYSTEM WHEN VEHICLES ARE ARRIVING AT DIFFERENT VOLUMES WITH UNIFORM ARRIVAL RATE

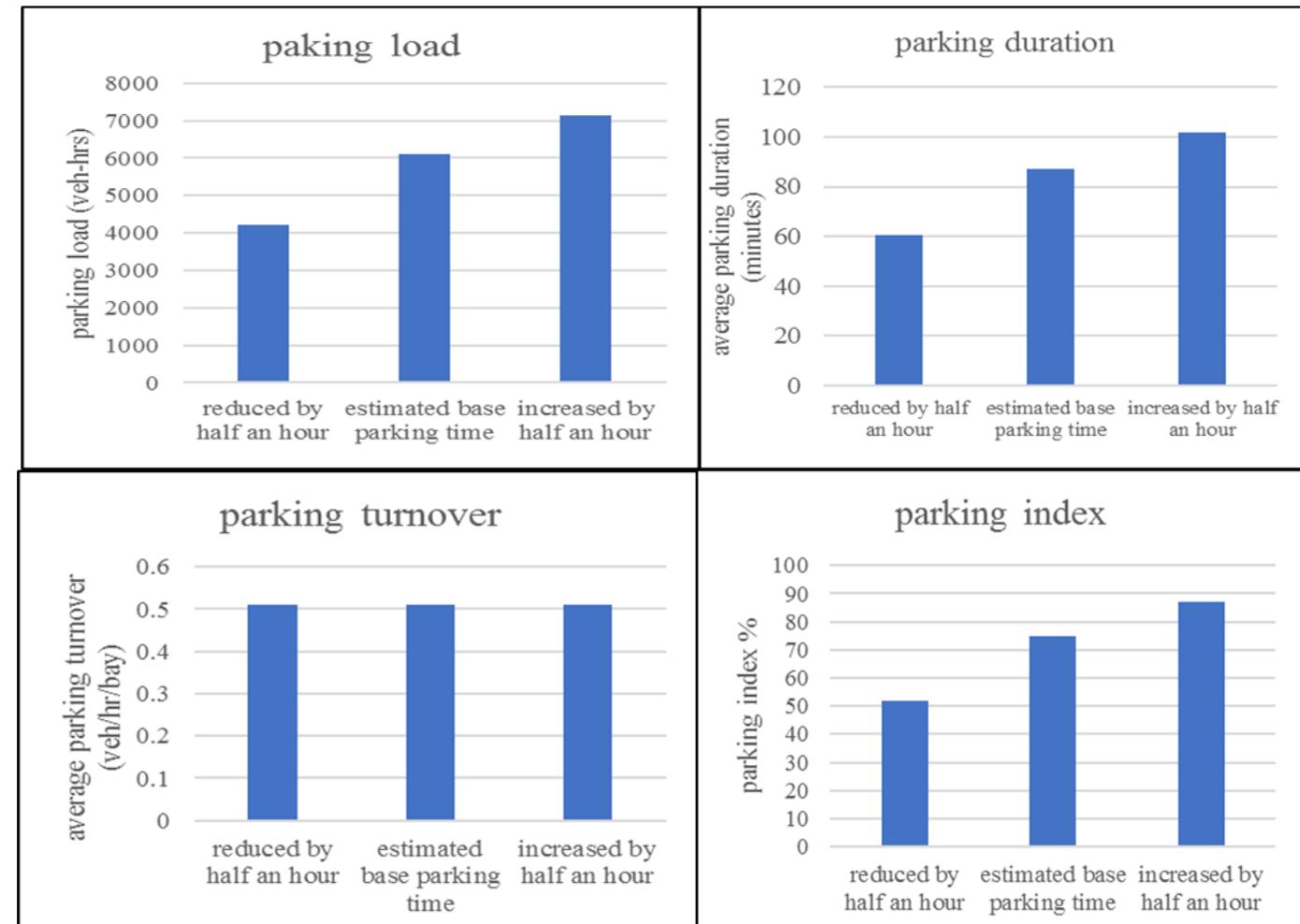
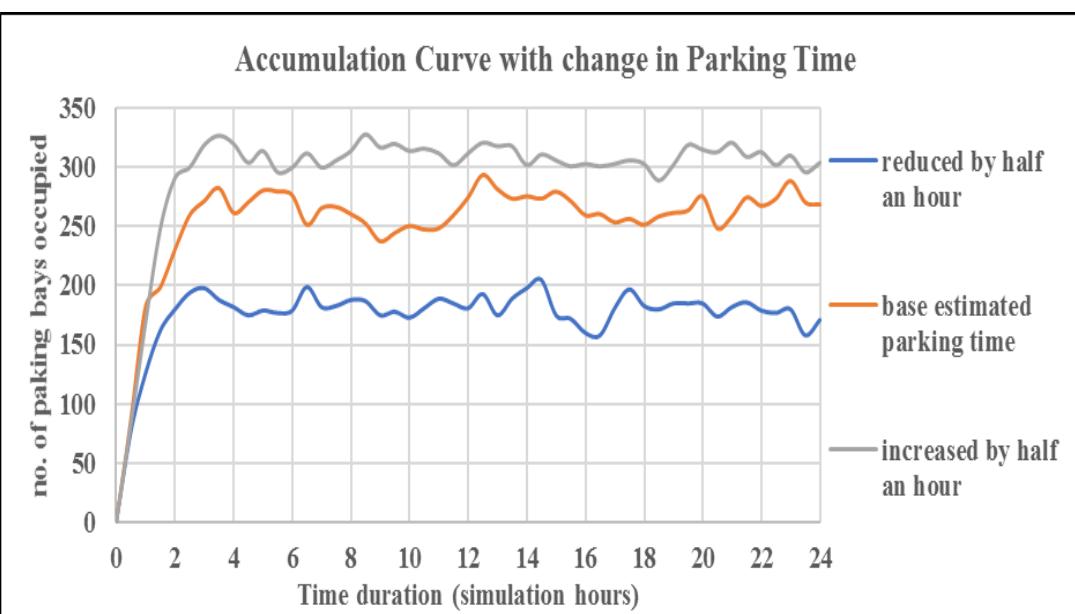


SCENARIO 2: IMPACT ON PARKING SYSTEM WHEN DESIGNED VOLUME OF VEHICLES ARE ARRIVING AT DIFFERENT ARRIVAL RATES

Accumulation Graph @ different arrival rates



SCENARIO 3: IMPACT ON PARKING SYSTEM WHEN PARKING DURATION HAS BEEN VARIED BY HALF AN HOUR FROM THE ESTIMATED PARKING TIME



ANALYSIS OF COST AND REVENUE

- Estimate the total cost of project prepared for different traffic scenarios for the horizon period of 10 years. The revenue generated from the parking charges and other amenities provided in the parking terminal, lay-bay and KPT area would lead and justify the financial feasibility of the project. Traffic has been estimated for the horizon year from the data collected in the field and past traffic records available with KPT. Parking demand growth rate of 7% has been forecasted in order to get the future traffic for the analysis period. The generated revenue has been estimated for three different scenarios visually 100%, 80% and 70% parking occupancy in the parking terminal. The following procedure has been adopted in order to get the detailed estimate of the project and at the same time generated revenue from the facilities provided.
- Revenue estimation is carried out for 100%, 80%, and 70% parking occupancy.
- Variable cost (maintenance cost) is quite meager as compared to fixed cost.
- Construction period is taken as 1 year so there is no revenue for construction period.
- Analysis is done for traffic growth rate of 5% 7% and 9% per year.
- Inflation rate is taken as 5% per year.
- Discount rate is considered as 12% per year.

PROBLEM

- The initial cost of construction of a truck parking terminal including maintenance cost over the project duration in the net present value term is Rs. 220 Million.
- The number of vehicles at the end of construction year is as follows:
 - Truck – 1100
 - Trailors – 800
 - Tankers – 2500
- The client required to give the project on PPP mode for 10 years period and wishes to receive benefit at 16 percent of construction cost from concessioner for the entire project duration.
- The parking charges for Trucks and Tankers is kept at Rs. 50 whereas for Trailors is Rs. 80.
- Consider the vehicle growth rate at 7% and inflation rate of 5% per annum.
- Determine the NPV of the project considering discount rate of 12%.
- Assume 100 percent occupancy of parking spaces provided.

COST ESTIMATE

Estimation of construction cost of Centralized Truck Parking Terminal including all amenities and compound wall had been carried out by considering following criteria

- **Construction cost (Fixed cost)**
- **Maintenance cost (Variable cost)**
- **Total cost = fixed cost (Construction Cost) + Variable cost (Maintenance Cost)**
- **Schedule Of Rates (SOR) of Kandla**

PHASE	TOTAL COST FOR 7% GROWTH RATE OF TRAFFIC (Cr.)	DISCOUNTED TOTAL COST 7% GROWTH RATE OF TRAFFIC (Cr.)
I	16.22	16.22
II	4.39	3.12
III	4.68	2.37
TOTAL CONSTRUCTION COST(Rs.)	25.28	21.71

ANALYSIS OF COST AND REVENUE

➤ Revenue Estimation

- ❑ The revenue generated from the parking charges and other amenities provided in the parking terminal, lay-bay and KPT area will lead to justify the financial feasibility of the project.
- ❑ A parking demand growth rate of 7% has been forecasted in order to get the future traffic for the analysis period.
- ❑ Revenue estimation is carried out for 100%, 80%, and 70% parking occupancy.
- ❑ Revenue from parking of trucks and trailers according to the duration of parking segregated as
 - ✓ short term (1 hour),
 - ✓ medium term (3 hours)
 - ✓ long term (5 hours)
- ❑ Variable cost (maintenance cost) is quite meager as compared to fixed cost
- ❑ Construction period is taken as 1 year so there is no revenue for construction period.
- ❑ Analysis is done for traffic growth rate of 5% 7% and 9% per year.
- ❑ Inflation rate is taken as 5% per year.
- ❑ Discount rate is considered as 12% per year.
- ❑ Vehicles of parking period up to 1 hour will go into Lay- byes.

➤ Methodology adopted for financial analysis:

- ✓ Based on 16% of construction cost benefit as desired by KPT
- ✓ Based on analysis of BOT

➤ Based on 16% of construction cost benefit as desired by KPT

- ✓ Determination of Net Present Value (NPV) and adjustment of parking cost so as to obtain NPV equal to benefit desired by KPT

ANALYSIS FOR FINANCIAL EVALUATION @5% GROWTH RATE FOR 70% OCCUPANCY FOR KPT DESIRED BENEFIT

Sr. no	Year	Cost of Construction (Outflow)	Discounted Construction Cost	Maintenance Cost (Outflow)	discounted maintenance cost	Total discounted cost	Revenue (Inflow)	discounted revenue	Net benefit(NPV)
		Col.1	Col.2= (Col.1 /1.12^n)	Col.3	Col.4= (Col.3 /1.12^n)	Col.5= Col.2+Col.4	Col.6	Col.7= (Col.6 /1.12^n)	Col.8= col.5-col.7
1	2016-17	16	16	0.000		16.217	0.000	0.000	-16.217
2	2017-18			0.061	0.054	0.054	3.799	3.392	3.338
3	2018-19			0.064	0.051	0.051	3.989	3.180	3.129
4	2019-20	4	3	0.067	0.048	3.169	4.188	2.981	-0.188
5	2020-21			0.070	0.045	0.045	4.398	2.795	2.750
6	2021-22			0.074	0.042	0.042	4.617	2.620	2.578
7	2022-23	5	2	0.077	0.039	2.409	4.848	2.456	0.047
8	2023-24			0.081	0.037	0.037	5.091	2.303	2.266
9	2024-25			0.085	0.034	0.034	5.345	2.159	2.124
10	2025-26			0.090	0.032	0.032	5.613	2.024	1.992
11	2026-27			0.094	0.030	0.030	5.893	1.897	1.867
			22		0.412	22		TOTAL NPV=	3.686

Financial analysis summary table for all possible cases as per KPT desired benefit											
Sr. no.	Parking Occupancy		100%			80%			70%		
	Growth rate		5%	7%	9%	5%	7%	9%	5%	7%	9%
1	Case-I Parking price annually changes	NPV (cr.)	15	18	24	8	10	14	4	6	10
2	Case-II Parking price changes Phase wise	NPV (cr.)	16	20	25	8	12	15	5	8	11
3	Case-III Parking price constant	NPV (cr.)	15	18	22	7	10	13	4	6	8

Parking Charges for possible cases as per KPT desired benefit										
	Parking prices at very first year and last year of parking facilities(INR)									
Sr.no	Retention time(hours)	Year	Trucks			Tailors			Tankers	
1	Case-I Parking price annually changes	2017-18	25	30	35	30	35	40	30	35
		2026-27	39	54	70	47	62	78	47	62
2	Case-II Parking price changes Phase wise	2017-18	25	30	35	30	35	40	30	35
		2026-27	43	51	60	51	60	68	51	60
3	Case-III Parking price constant	2017-18	25	35	45	40	50	60	40	50

ANALYSIS OF COST AND REVENUE

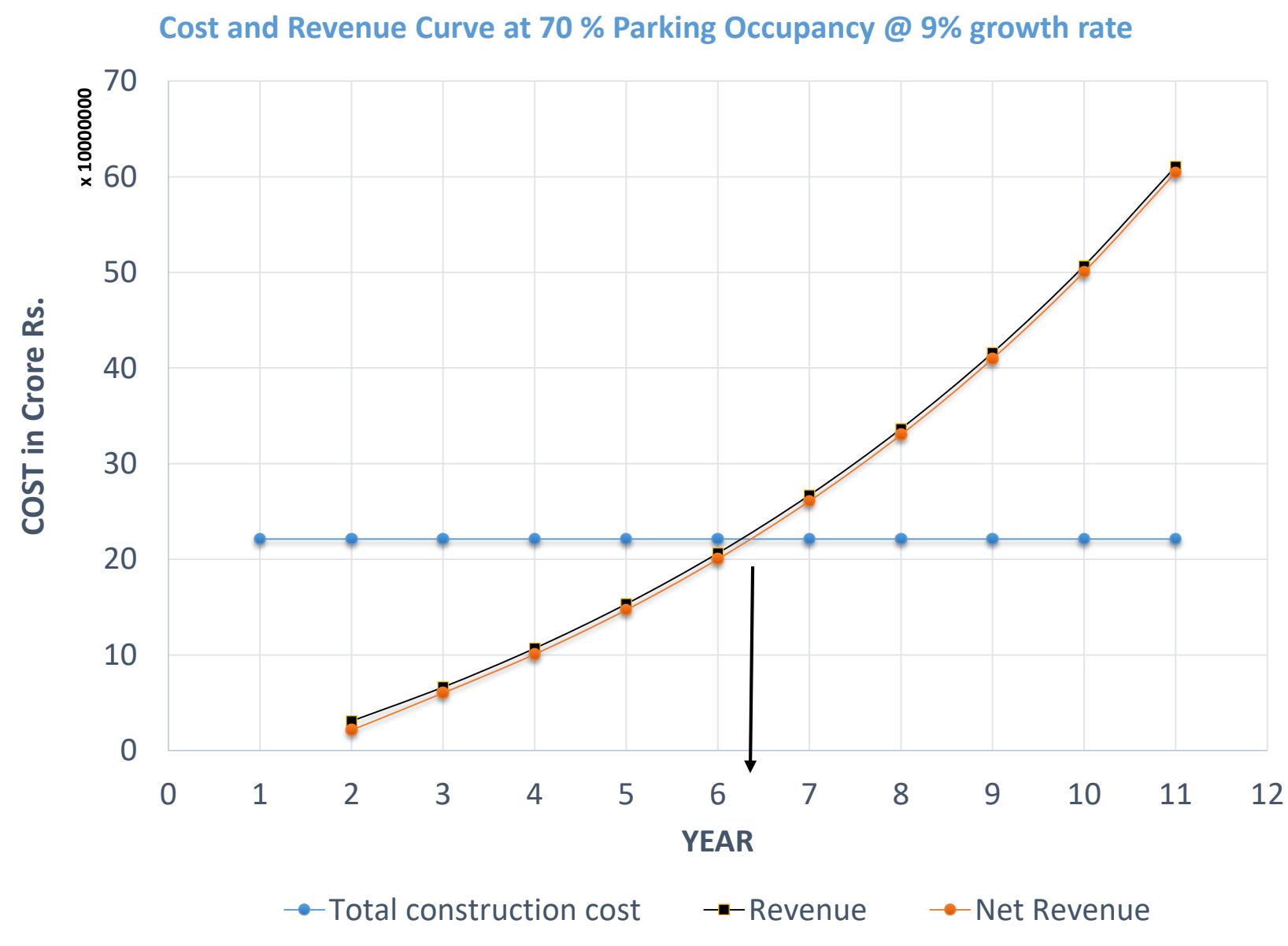
➤ Based on analysis of BOT

- ✓ Determination of Break Even Point (BEP) based on Total cost of construction and Revenue generated
- ✓ Annuity to be paid annually = $\frac{r(1+r)^n}{(1+r)^n - 1} \times \text{Present cost of construction}$

ANALYSIS FOR FINANCIAL EVALUATION @9% GROWTH RATE FOR 70% OCCUPANCY(CONSTATNT PRICE) FOR BOT

Sr. no	Year	Cost of Construction (Outflow)	Discounted Construction Cost	Maintenance Cost (Outflow)	discounted maintenance cost	Total discounted cost	Total cumulative cost (construction + maintenance cost)	Revenue (Inflow)	Cumulative Revenue	discounted revenue	discounted cumulative revenue	Net benefit(NPV)	Annuity	Net Revenue =Revenue discounted (Inflow)-Annuity
	Col.I	Col.2= (Col.2/1.1 ^{2^n})	Col.3	Col.4= (Col.3/ 1.12 ⁿ)	Col.5= (Col.2+ Col.4)	Col.6= Col.1+ Col.3	Col.6	Col.7	Col.8= (Col.6/1.12 ⁿ)	Col.9=(Col.7/1.12 ⁿ)	Col.10	Col.II	Col.II= col.8- col.II	
1	2016-17	16.22	16.22	0.0000	0	16.217	16.22	0	0	0	0	-16.217	0	0
2	2017-18			0.0606	0.054	0.054	16.28	3.09	3.098	2.77	2.77	2.712	0.63	2.14
3	2018-19			0.0636	0.051	0.051	16.34	3.54	6.64	2.83	5.59	2.774	0.63	6.01
4	2019-20	4.39	3.12	0.0668	0.048	3.169	19.53	4.05	10.69	2.89	8.48	-0.284	0.63	10.07
5	2020-21			0.0701	0.045	0.045	19.60	4.63	15.33	2.95	11.42	2.902	0.63	14.70
6	2021-22			0.0736	0.042	0.042	19.67	5.30	20.63	3.01	14.43	2.968	0.63	20.01
7	2022-23	4.68	2.37	0.0773	0.039	2.409	22.12	6.06	26.70	3.07	17.51	0.665	0.63	26.07
8	2023-24			0.0812	0.037	0.037	22.20	6.94	33.64	3.14	20.65	3.103	0.63	33.01
9	2024-25			0.0852	0.034	0.034	22.29	7.93	41.58	3.21	23.85	3.172	0.63	40.95
10	2025-26			0.0895	0.032	0.032	22.38	9.08	50.66	3.28	27.13	3.243	0.63	50.04
11	2026-27			0.0940	0.030	0.030	22.47	10.38	61.05	3.35	30.47	3.315	0.63	60.43
												TOTAL NPV (cr.)= 8		

Financial analysis summary table for all possible cases as per BOT												
Sr. no.	Parking Occupancy			100%			80%			70%		
	Growth rate			5%	7%	9%	5%	7%	9%	5%	7%	9%
1	Case-I Parking price annually changes	NPV (cr.)	13	17	21	6	9	12	3	5	8	
2	Case-II Parking price changes Phase wise	NPV (cr.)	15	19	22	8	11	13	4	7	8	
3	Case-III Parking price constant	NPV (cr.)	16	20	35	9	12	23	5	8	17	



Parking charges for possible cases as per BOT

		Parking prices of parking facilities(INR)									
Sr.no	Retention time(hours)	Years	Trucks			Tailors			Tankers		
			1hr	3hr	5hr	1hr	3hr	5hr	1hr	3hr	
1	Case-I Parking price annually changes	2017-18	20	30	40	30	40	50	30	40	
		2026-27	31	47	62	47	62	78	47	62	
2	Case-II Parking price changes Phase wise	2017-18	20	30	35	30	35	40	30	35	
		2026-27	34	51	60	51	60	68	51	60	
3	Case-III Parking price constant	2017-18	30	40	45	35	40	50	35	50	

Estimated Cost of Centralized Truck Parking Terminal at Kandla Port

SR.NO.	ITEM	TOTAL COST (Crores Rupees)
1	COST OF PARKING PAVEMENT	10.69
2	TOTAL COST OF COMPOUND WALL	0.71
3	TOTAL COST OF TRUCK BAY (PER BAY)	0.19
4	TOTAL COST OF TRAILOR LAY BAY (PER BAY)	0.31
5	TOTAL COST OF RESTAURANT	0.16
6	TOTAL COST OF DORMITORY	0.25
7	TOTAL COST OF REPAIR AND MAINTENANCE	0.28
8	PETROL PUMP COST	0.05
	TOTAL COST	12.64
	OVERHEAD COST (10%)	1.26
	GROSS TOTAL COST	13.90

REVENUE GENERATION

- Estimation of total cost of project has been prepared for the horizon period of 10 years.
- Parking demand @ growth rate of 7% is considered
- Discount rate is considered as 12% and inflation rate is considered as 5% per year.
- Revenue estimation is carried out for 00%, 80%, and 70% parking occupancy
- Vehicles of parking period <1 hour will go into Lay- byes and existing parking planned.
- Parking cost for <4 hr. has been considered at Rs. 20/- per truck and Rs.25/- per trailer
- Parking cost for >4 hr. has been considered at Rs. 50/- per truck and Rs. 80/- per trailer.
- Addition of 10% extra revenue from other facilities like dormitory etc. excluding parking

ESTIMATION OF NET PRESENT VALUE

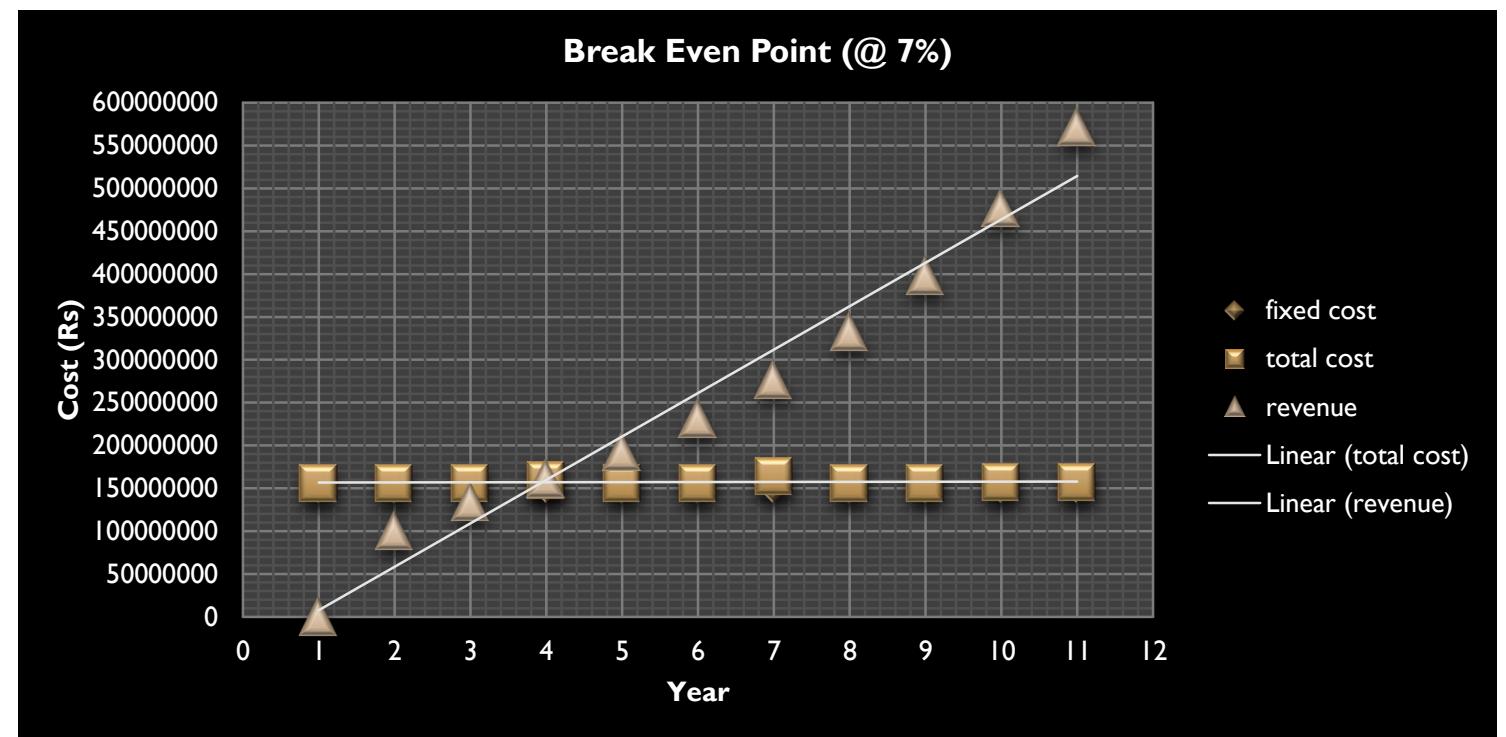
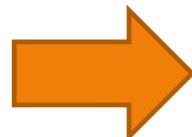
Inflation rate of 5% and Discount rate of 12% has been considered to estimate the NPV value (1-year commissioning time)

Year	Construction Cost (Crore Rs.)	Maintenance Cost (Crore Rs.)	Discounted Construction Cost (Crore Rs.)	Discounted Maintenance Cost (Crore Rs.)	Total Discounted Cost (Crore Rs.)	Benefit (Crore Rs.)	Total Discounted Benefit (Crore Rs.)	Net Discounted Benefit (Crore Rs.)
Col. 1	Col. 2	Col. 3	Col. 4 = Col. 1 / (1.12)^n	Col. 5 = (Col. 3) / (1.12)^n	Col. 6 = Col. 4 + Col. 5	Col. 7	Col. 8 = (Col. 7) / (1.12)^n	Col. 9 = Col. 8 - Col. 6
0	14.60		14.60	0.000	14.60	0		-14.60
1		0.034		0.031	0.031	7.63	6.816	6.78
2		0.036		0.029	0.029	9.00	7.179	7.15
3	0.35	0.038	0.25	0.027	0.276	10.12	7.201	6.93
4		0.040		0.025	0.025	11.37	7.224	7.20
5		0.042		0.024	0.024	12.77	7.246	7.22
6	0.76	0.044	0.39	0.022	0.407	14.35	7.269	6.86
7		0.046		0.021	0.021	16.12	7.292	7.27
8		0.048		0.019	0.019	18.11	7.314	7.29
9		0.051		0.018	0.018	20.35	7.337	7.32
10		0.053		0.017	0.017	22.86	7.360	7.34
TOTAL	15.71				15.47		NPV Total =	56.74

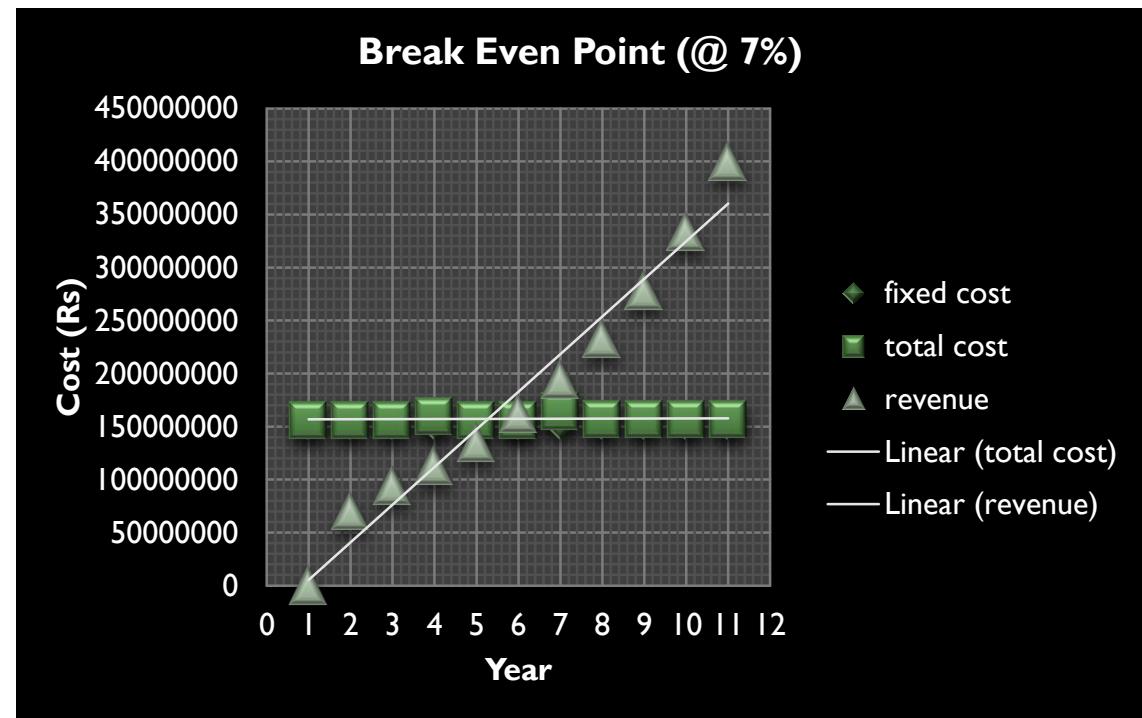
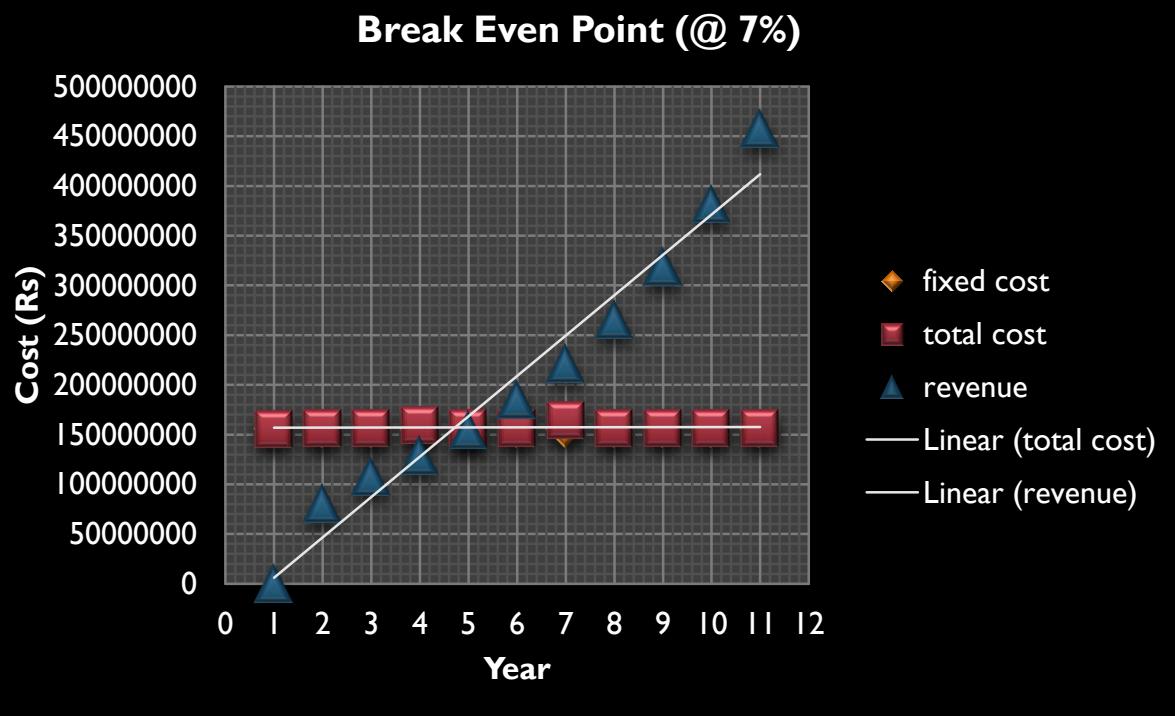
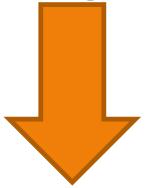
BREAK EVEN ANALYSIS

Break Even Analysis is carried out by considering different scenarios / possibilities at Parking Terminals

**100% occupancy @ 7%
Growth Rate, Parking
Rates Changes Annually**



**80% occupancy @ 7%
Growth Rate, Parking
Rates Changes Annually**



**70% occupancy @ 7% Growth
Rate, Parking Rates Changes
Annually**



Summary of NPV and BEP for various scenario

Sr. no.	Parking Occupancy	100%			80%			70%			
		Growth rate	5%	7%	9%	5%	7%	9%	5%	7%	9%
1	Case-I Parking price annually changes	NPV (+ve or -ve)	+	+	+	+	+	+	+	+	+
		Break Even point year (n th year)	6	5-6	5	8-9	7	6	10-11	8	7
2	Case-II Parking price changes Phase wise	NPV (+ve or -ve)	+	+	+	+	+	+	-	+	+
		Break Even point year (n th year)	7-8	6	5	9	7-8	6-7	-	9	7-8
3	Case-III Parking price constant	NPV (+ve or -ve)	-	+	+	-	-	+	-	-	-
		Break Even point year (n th year)	-	8-9	7	-	-	9-10	-	-	-



Thanks...