

# WILDLIFE MANAGEMENT AND CONSERVATION PLAN

## INCLUDING

### ANIMAL PASSAGE PLAN





# **WILDLIFE MANAGEMENT AND CONSERVATION PLAN**

**INCLUDING**

## **ANIMAL PASSAGE PLAN**

*For*

**Mitigation of impact of linear structure: Itarsi - Betul (NH-46)**

from Km 63.00 (Existing Ch. 61.500) to 137.00 Km (Existing Ch. 135.455)  
passing through

***Satpura – Melghat Tiger Corridor***

*Prepared By*



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*Submitted by*



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# INTRODUCTION

**Name of the project** - Itarsi-Betul Road (NH-46)

**Project Proponents** - National Highway Authority of India

**Proposal Number** - FP/MP/ROAD/6492/2022 (Wild Life)

**Extent** - Km 63.00(Existing Ch. 61.500) to 137.00 Km (Existing Ch. 135.455) passing through Satpura – Melghat Tiger Corridor at two locations.

**Connecting Districts** - Hoshangabad (Narmadapuram) and Betul.

**Identified locations of Satpura-Melghat Tiger Corridor** - Two, in addition to this one location in Bhoura range of North Betul Forest Division was identified from where Tigers move from one tiger reserve to another. None of these locations are in notified Protected area.

The details of tiger corridor falling in Itarsi - Betul NH 46 are as follows:

TIGER CORRIDOR	Kms		FOREST DIVISION	RANGE	COMPTT. NUMBER
	From	To			
KESLA GHAT	61.500	67.380	NARMADAPURAM	ITARSI	130
"	"	"	"	"	131
"	"	"	"	"	132
"	"	"	"	SUKTAVA	P-44
BHOURA RANGE	0.940	88.64	NORTH BETUL	BHOURA	P-155
BARETHA GHAT	108.933	116.263	NORTH BETUL	BETUL	245
"	"	"	"	"	246
"	"	"	"	"	247

The forest compartments falling in the corridor have already been diverted vide order number F. No. 8-98/2012-FC of MoEFCC (Forest Conservation Division) on 23<sup>rd</sup> July, 2014.

**Total area falling in identified Tiger corridor** - 101.47 ha. (Non-Forest/Diverted forest Land) in 22.286 Km long stretch.

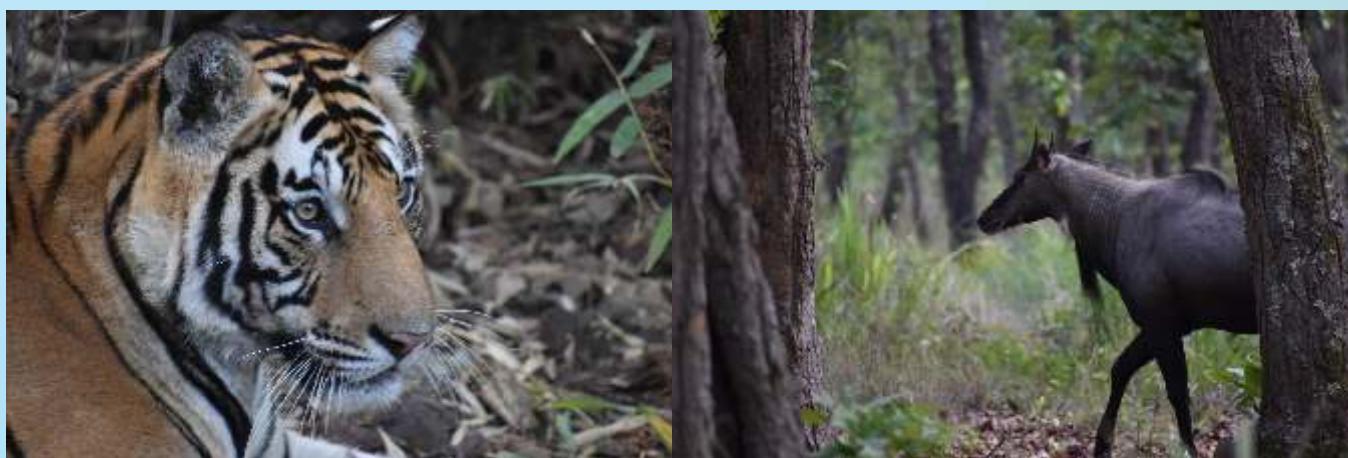
**Total Capital cost of the project** - 177.62 Crore only (Rs. One Hundred Seventy seven Crore and Sixty Two Lac only).

# NEED FOR WILDLIFE CONSERVATION AND MANAGEMENT PLAN

Corridors allow recolonization of sites where the population is locally extinct and reduce the danger of inbreeding. Corridors are especially important for large, landscape animals such as tigers, dholes, leopards and elephants. The National tiger Conservation Authority in collaboration with the Wildlife Institute of India has mapped-out 32 major Tiger corridors across the country. A tiger corridor is a stretch of land linking tiger habitats, allowing movement of tigers, prey and other wildlife. Without corridors tiger habitat can become fragmented and tiger populations isolated leaving the tigers vulnerable to localized extinction. The management mitigation through a Tiger Conservation Plan is mandatory under section 38V of the Wildlife (Protection) Act, 1972. The proposed widening of road passing through Satpura-Melghat Tiger corridor, which is one of the most potential corridors identified by the WII and connects Satpura Tiger reserve of Madhya Pradesh and Melghat Tiger reserve of Maharashtra, needs to have proper passages for the movement of tiger and other animals across it to maintain continuity of the habitat. It is important to maintain the functionality of the habitat as a viable corridor permitting gene flow of wild species between Satpura and Melghat.

In the 47<sup>th</sup> meeting of standing committee of NBWL held on 8<sup>th</sup> Feb 2018, it was recommended that user agencies involved in linear infrastructure development should take into consideration the advisories made by the Wildlife Institute of India while designing the linear infrastructures inside protected area, notified ESZ area around PA. Hence, linear infrastructure projects would be accompanied by an animal passage plan, if required, by the project proponents on the basis of these Wildlife Institute of India Guidelines and in consultation with the State Chief Wildlife Warden.

The passage plan is required to provide for measures, both structural and non-structural, to facilitate wild animals to cross the road without any fear or hesitation through Animal under passes so as to minimize the impact of habitat fragmentation.



# EXISTING SITUATION

## Disturbances in Habitat Corridors

**Railway line:** Railway line also passes through the corridor at various locations. Major threat is posed by Broad gauge railway line between Itarsi and Betul.

**Roads:** Several major roads cut across the corridor area. The most important ones are NH 59A, NH 69, Madhya Pradesh SH 19B, Madhya Pradesh SH 15 and Madhya Pradesh SH 26.

## Villages/ Towns/ Cities

There are four forest divisions in the corridor, namely, Chhindwara, Betul, Hoshangabad and Harda. There are several villages in these districts that falls under corridor.

## Other uses

Mostly, agriculture, horticulture, forestry, etc. are being practiced in this area.

## Government Lands

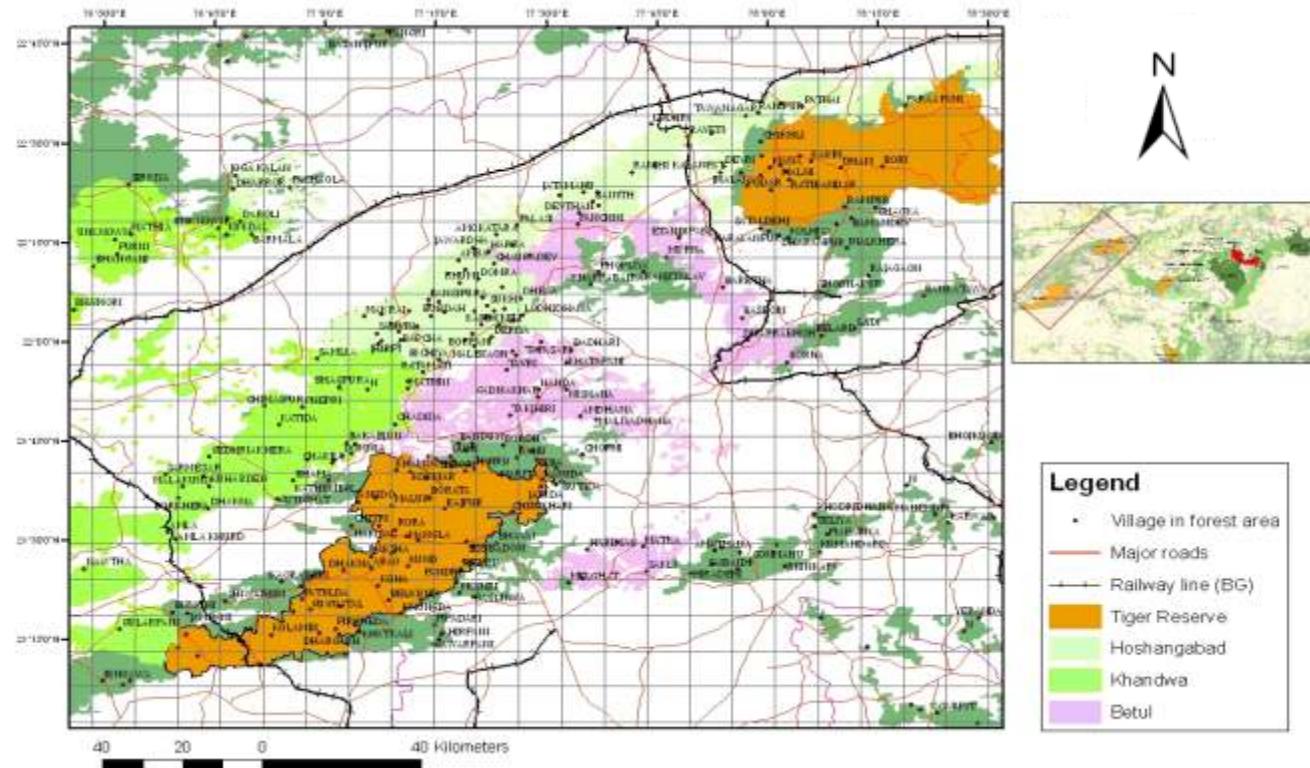
There are vast revenue patches in the corridor area.

## Statement of Significance

Wildlife corridors are significant as habitat loss and fragmentation are the two major contributors to continuing biodiversity decline across the forested landscapes in India. A holistic approach is needed to maintain natural ecosystems and ensure connectivity so that the ecological processes and various intricate ecological linkages like species migration, dispersal, nutrients recycling, pollination, food chains etc are maintained throughout the landscape.

Satpura - Melghat corridor is for connecting two very important habitats of tiger population in Madhya Pradesh and Maharashtra i.e. Satpura Tiger Reserve and Melghat Tiger Reserve. It is an important corridor between forest areas of Madhya Pradesh and Maharashtra ensuring contiguity of forests in Satpura and sustenance of tigers in Central Indian Landscape. This is necessary because it helps in maintaining biodiversity, allows tiger population to interbreed, permit movement of all animals and plants across a larger landscape and provide access to larger habitats, enable species to cross hostile area, increase their range and colonize new sites.

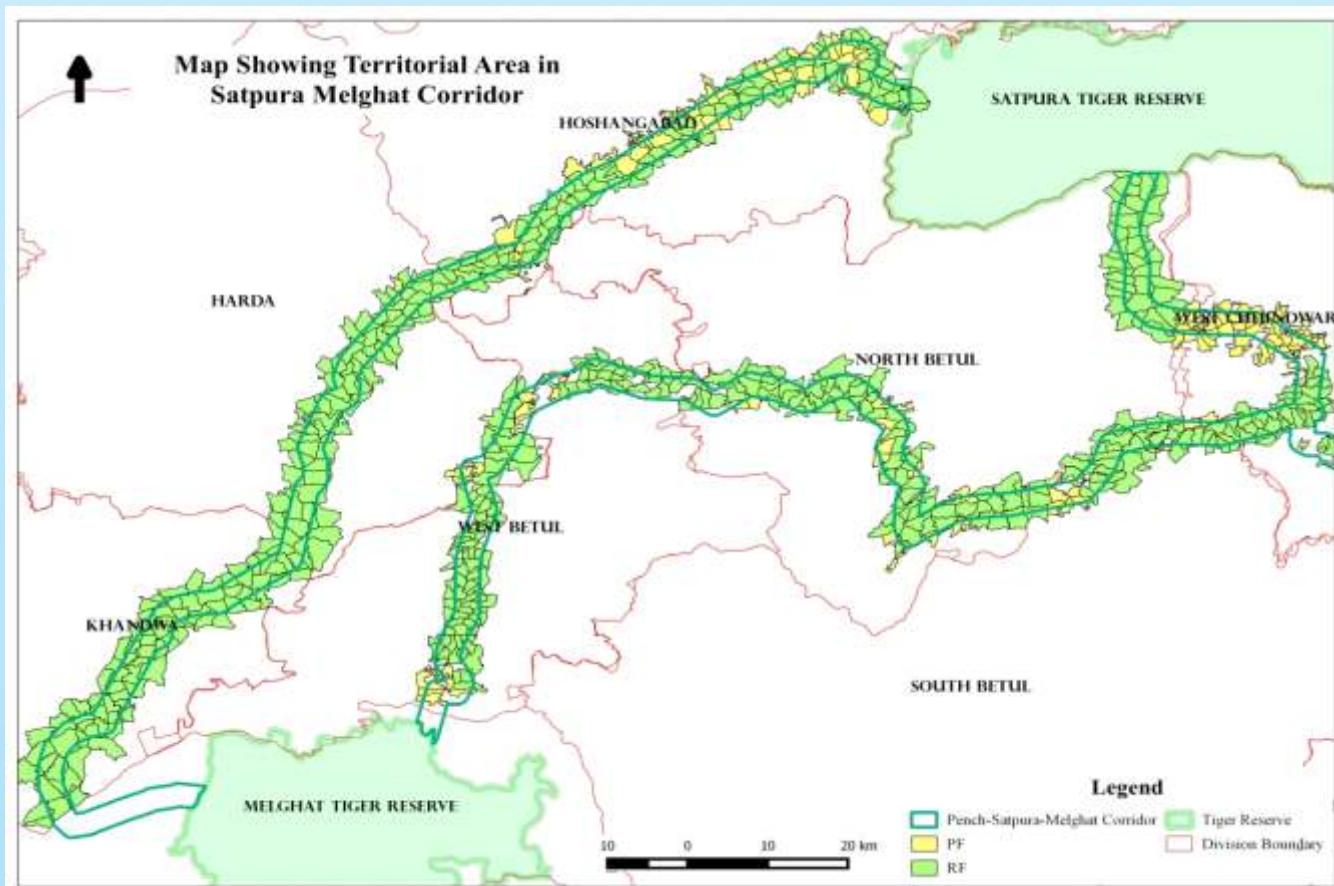
### Potential wildlife corridor forest between Satpuda and Melghat Tiger Reserve



### Legend

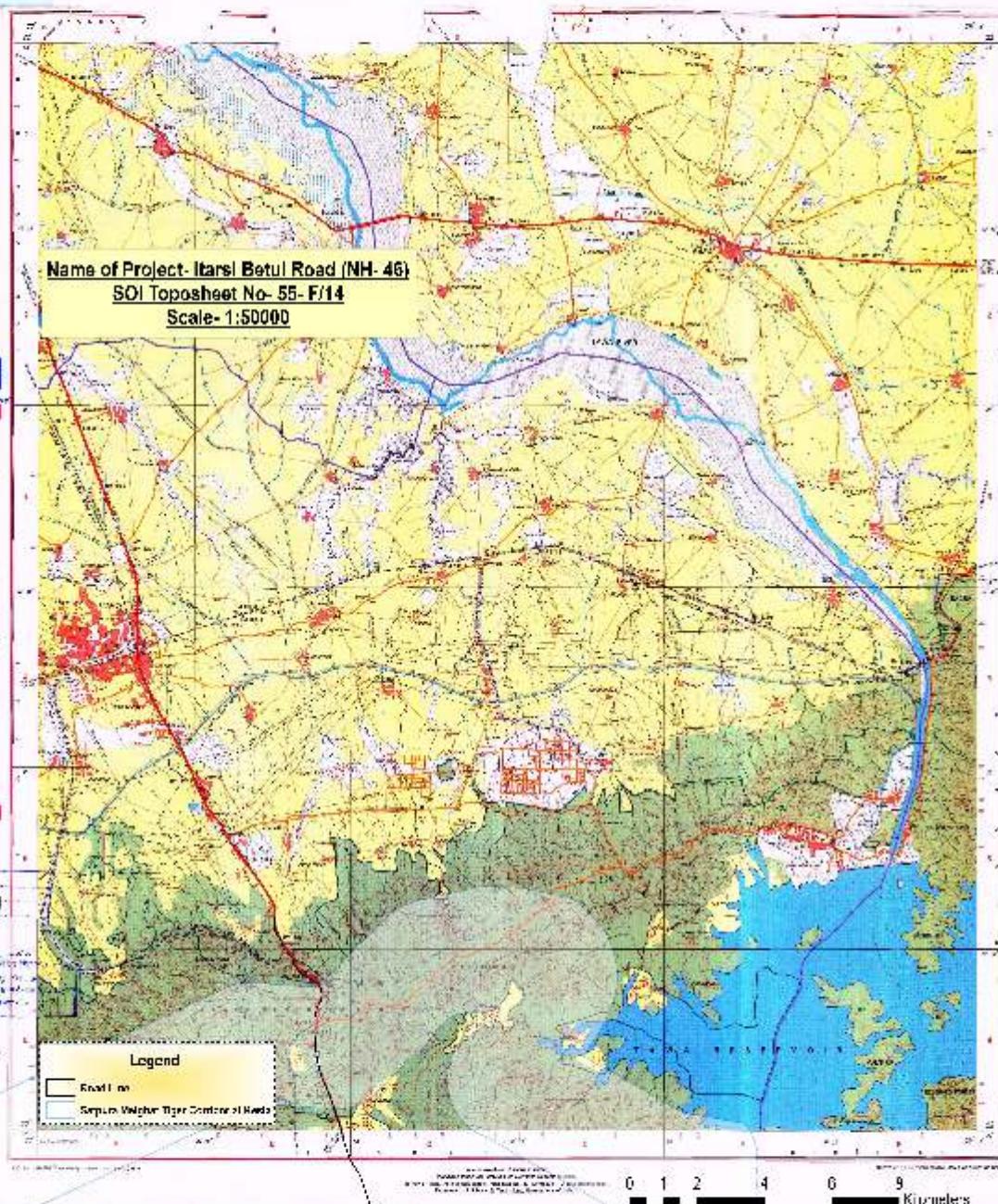
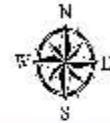
- Village in forest area
- Major roads
- Railway line (BG)
- Tiger Reserve
- Hoshangabad
- Khandwa
- Betul

### Map Showing Territorial Area in Satpura Melghat Corridor



MAP - SHOWING TERRITORIAL AREA IN SATPURA-MELGHAT CORRIDOR

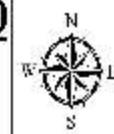
## SOI Map of Itarsi Betul Road (NH- 46) From 63+000 to 137+000 Tiger Corridor Located at Kesla, Hoshangabad (T)



## SOI Map of Itarsi Betul Road (NH- 46) From 63+000 to 137+000

Tiger Corridor Located at Bhoura

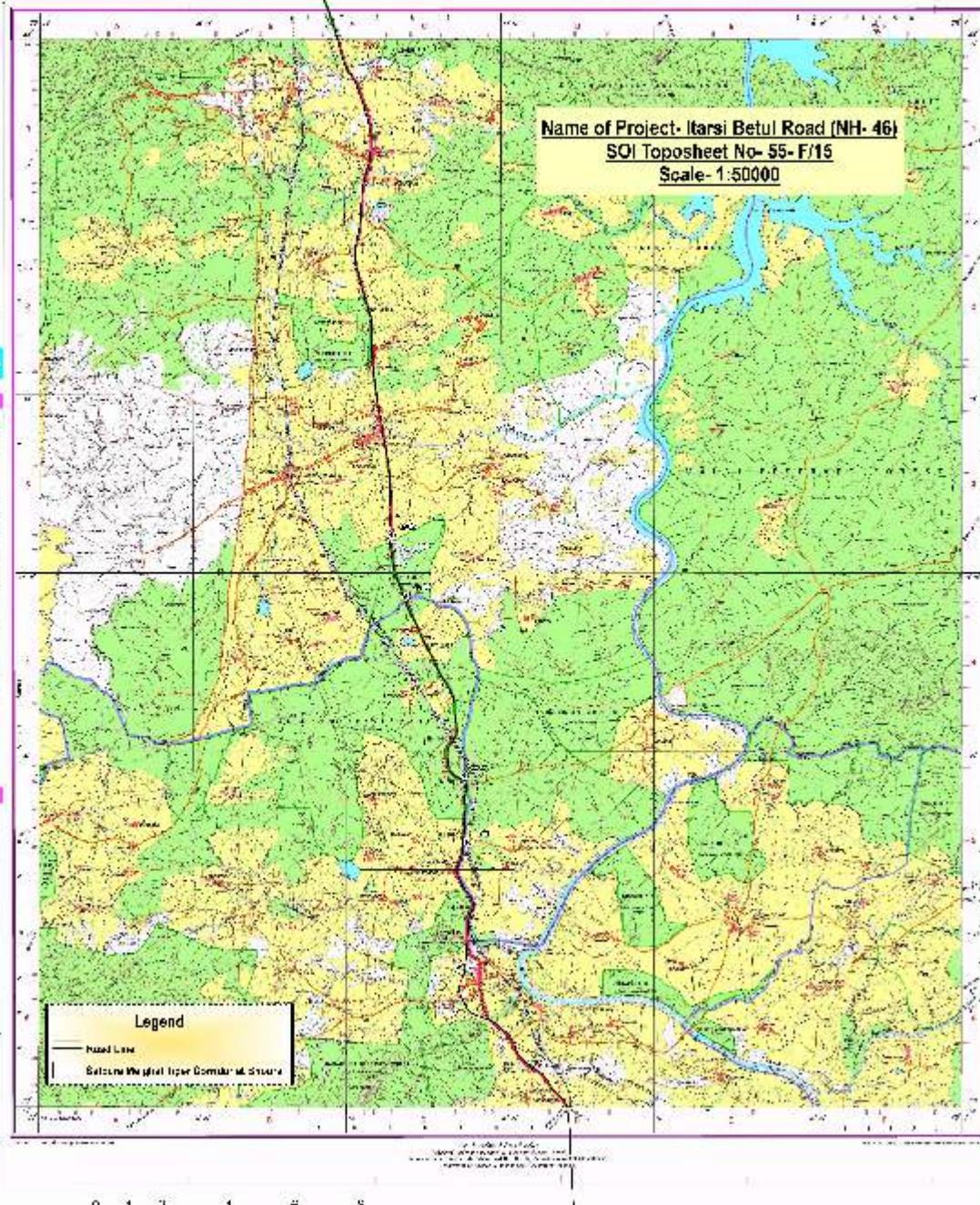
Hoshangabad (T) & Betul North (T)



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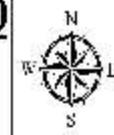
भारतीय राष्ट्रीय राजमार्ग प्राधिकरण



## SOI Map of Itarsi Betul Road (NH- 46) From 63+000 to 137+000

Tiger Corridor Located at Bhoura

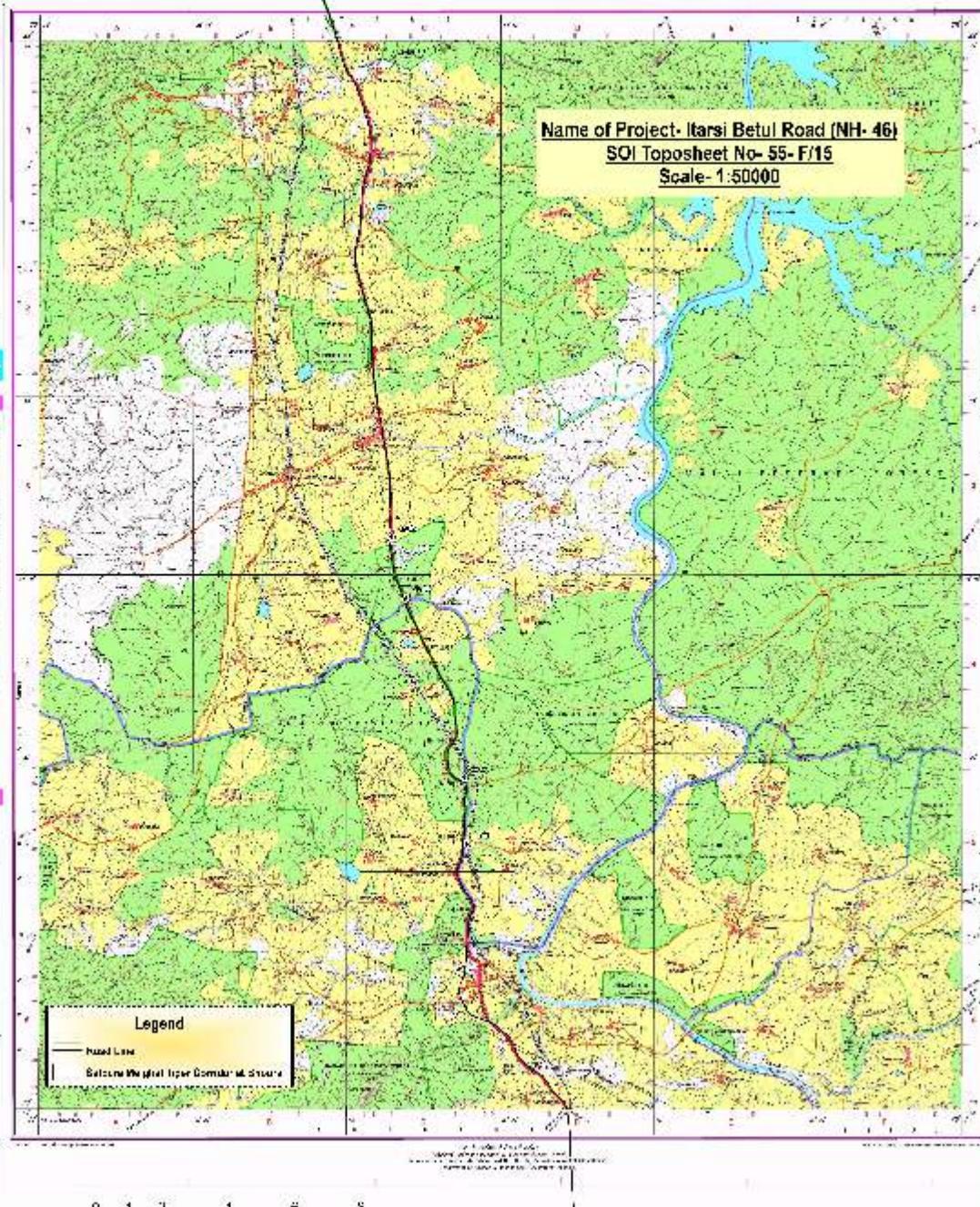
Hoshangabad (T) & Betul North (T)



No. F43L15  
Scale 1:50,000

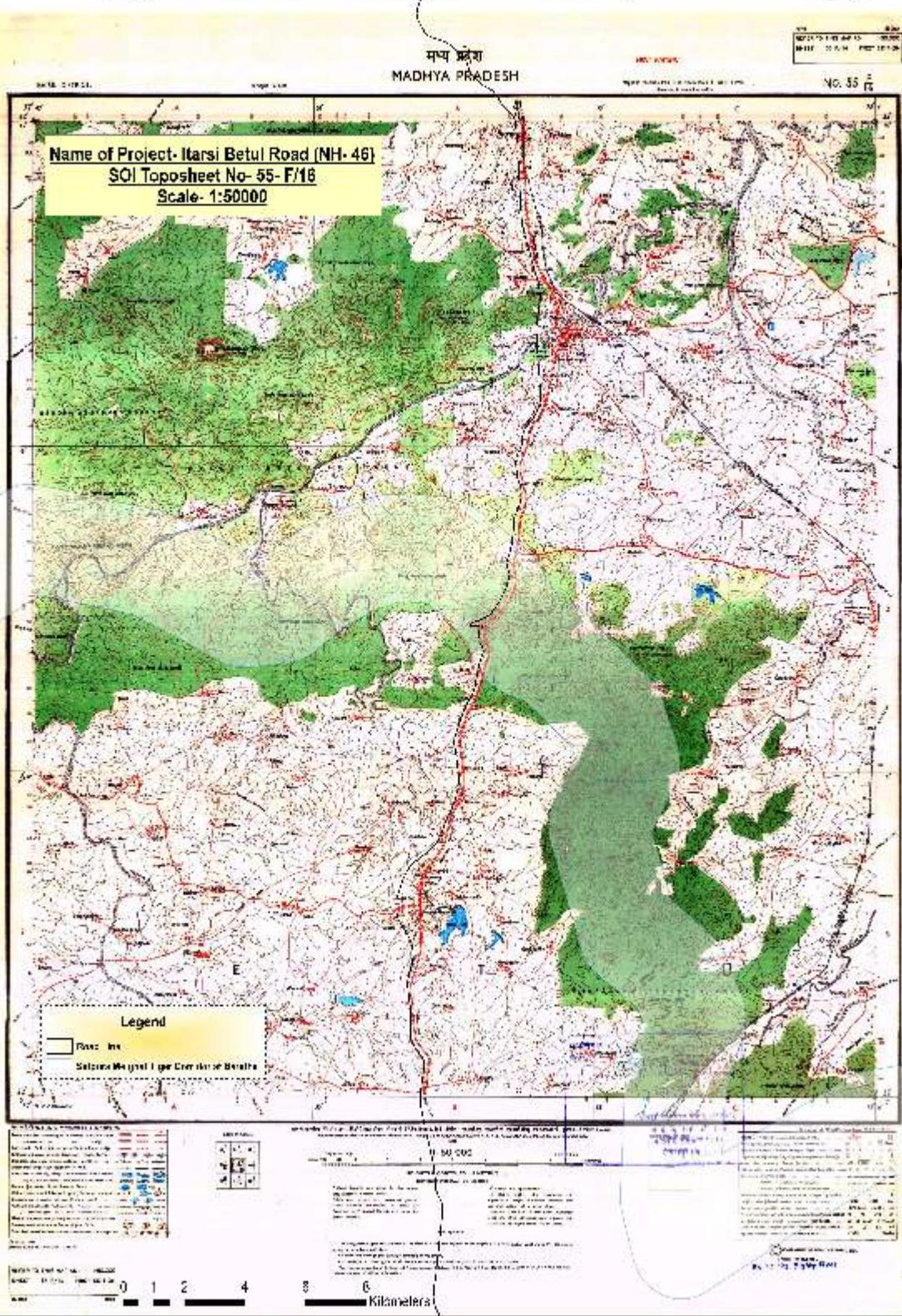


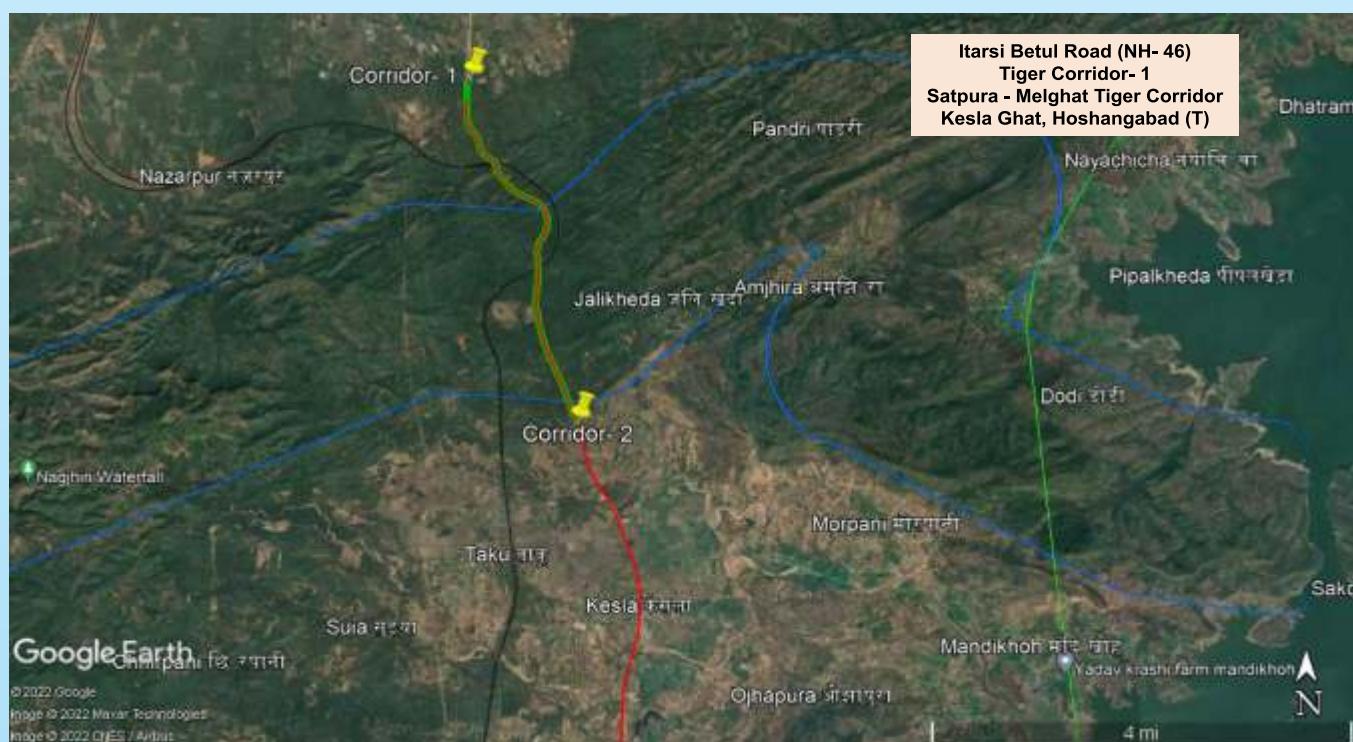
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NHAI

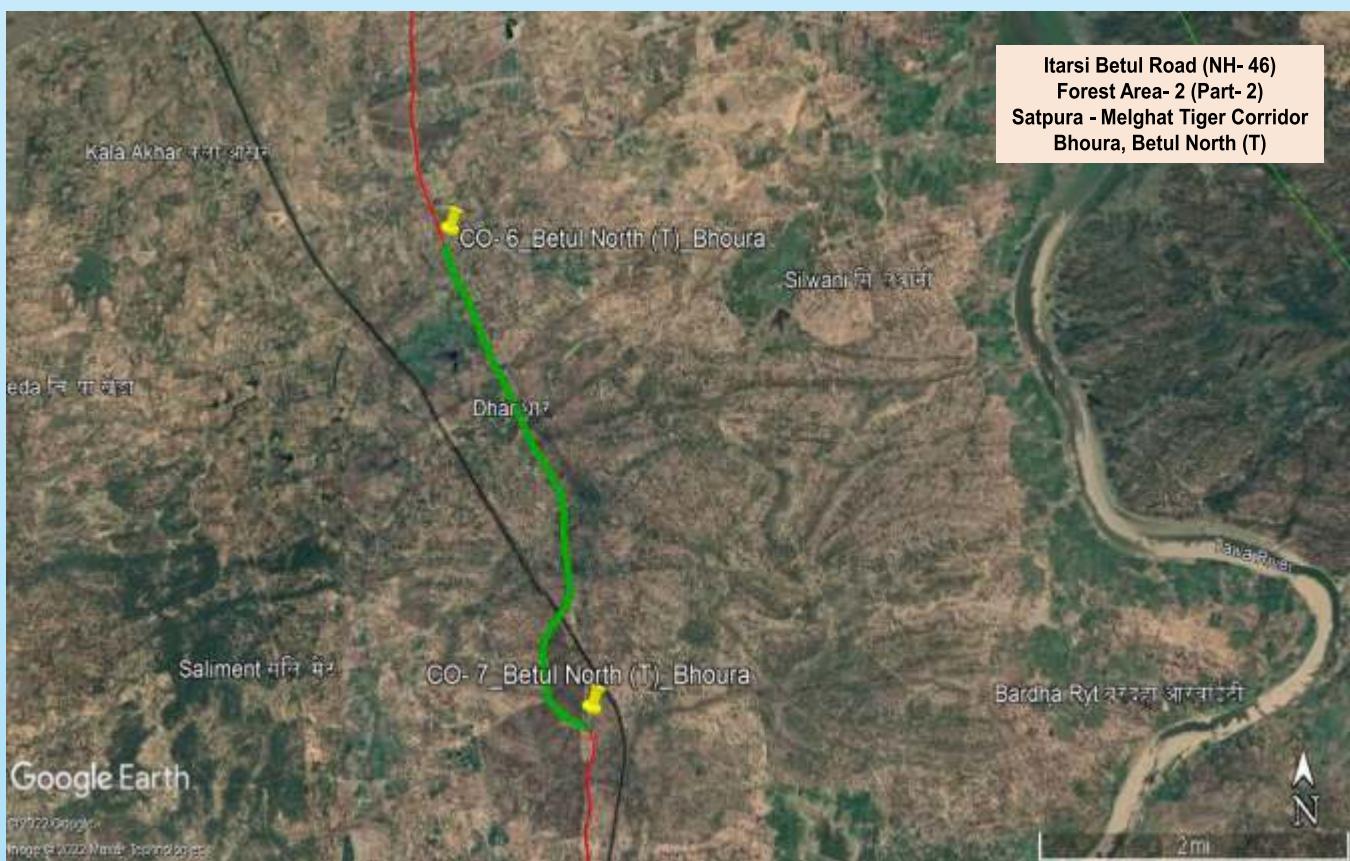


## SOI Map of Itarsi Betul Road (NH- 46) From 63+000 to 137+000

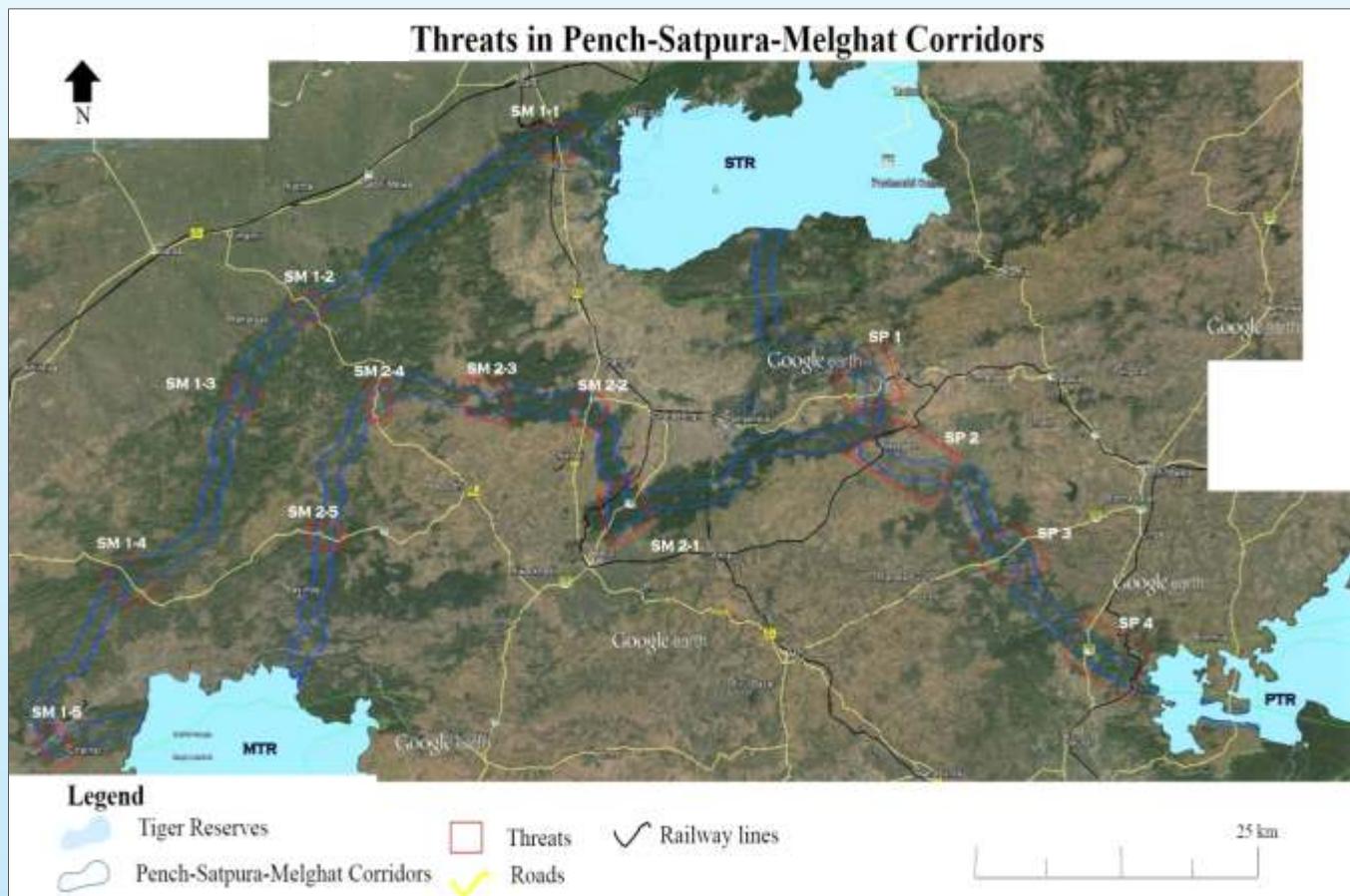
### Tiger Corridor Located at Baretha, Betul North (T)











### Natural Habitat Corridors

The main purpose of corridors is providing three essential functions, namely colonization, migration and interbreeding. The corridor which provide these functions naturally to the native species are called natural habitat corridor. The entire tract of the corridor is bestowed with biological diversity of different forest types with a considerable variation in the vegetation due to immense heterogeneity of soil, geology, temperature and moisture conditions.

### Remnant Habitat Corridors

Due to developmental activities, corridor gets fragmented and the connectivity is lost. The remaining portion of natural habitat is called a remnant, and such portions need to be connected, because when migration decreases, extinction increases.

### Regenerated Habitat Corridors

Regenerated habitat corridors result when re-growth occurs in a disturbed line or strip. Re-growth may be the product of natural succession or re-vegetation via planting. Re-growth in abandoned roadways, trails, and railroad right-of-ways are examples. Corridor width and configuration are dependent upon the nature of the previous disturbance. Regenerated corridor vegetation is often dominated by aggressive weedy species during the early stages of succession.

## Planted Habitat Corridors

These are corridors introduced via plantations, shelter belts etc.

### Vegetation Types

#### **Forest Types in Satpura Tiger Reserve**

The forests may be broadly classified into-

- Tropical dry deciduous
- Tropical moist deciduous
- Sub-tropical forest

#### **Forest Types in Melghat Tiger Reserve**

The forests of Melghat Tiger Project are of deciduous nature and have been classified as “Dry deciduous forests” in the Champion and Seth's classification and fall under the sub-group 5-A southern tropical dry deciduous forests.

**The forests of Hoshangabad are of following types:**

- Southern Tropical Dry Deciduous Teak Forests.
- Southern Tropical Dry Deciduous Mixed Forests.

**The forests of Harda are of following types:**

Tropical dry deciduous forest with teak as a dominant tree species

**The forests of Betul are of following types:**

- Tropical moist deciduous: slightly moist Teak forests
- Tropical dry deciduous: Dry Teak forests
- Southern dry mixed deciduous forest

This description of forest types and floral species therein underlines a continuum of related habitats across the corridor area.

### Major changes in the landscapes (Settlements/ other infrastructure).

Majorly, the landscape is fragmented by the network of railway lines and roads. A major broad gauge railway line Itarsi and Betul and different State highways and Itarsi-Betul National highway fragment the landscape at various locations.

### Administration and Organization.

Revenue and forest department are the main departments working in this corridor area.

# SALIENT FEATURES OF SATPURA MELGHAT CORRIDOR PLAN

The Tiger Conservation Plan of Satpura Tiger Reserve has a separate corridor plan for providing safe passage to wildlife between Satpura and Melghat Tiger reserves.

Wildlife cannot be managed in isolated pockets, as isolated populations of wild animals face the risk of extinction owing to insularization. Habitat fragmentation adversely affects wildlife due to decreased opportunity available for wild animal movement from different habitats. This in turn prevents gene flow in the landscape. The equilibrium theory of island biogeography predicts greater species richness in large wildlife areas or in smaller areas connected by habitat corridors owing to increased movements of wild animals. Such connecting habitats, apart from facilitating animal movements, also acts as refuge for spill over populations from the core areas. They may also act as smaller “source” by facilitating breeding and movement of native wildlife population to colonize adjoining habitats. Natural linear features like rivers or mountain ranges may act as boundaries for wildlife populations.

This indicative plan for management of corridor area addresses the vital issue of continuity of habitat between Satpura Tiger Reserve (STR) to facilitate the dispersal of gene flow of wildlife to the connecting Protected Areas in the Madhya Pradesh and adjoining state, Maharashtra.

## Visions, Goals, Objectives and Problems

### Vision

To holistically manage Satpura - Melghat Corridor to ensure connectivity between these two landscapes, so that the ecological processes and various intricate ecological linkages are maintained naturally throughout the corridor.

### Management Goals

The habitat in Satpura - Melghat Corridor has become fragmented at many places due to many developmental activities like roads and railways. Due to this, safe and undisturbed migration of wild population is getting restricted. This has resulted in adverse effects on gene flow from one place to another. There has also been rapid and manifold increase in human population in the villages within the corridor which adversely effects the movement, breeding and dispersal of wildlife. The major goal of management is to eliminate all such hindrances, provide safe migration, and maintain proper gene flow in the wild.

### Management Objectives

- To facilitate safe migration of wildlife from Satpura Tiger Reserve to Melghat Tiger Reserve and vice-versa.
- To restore connectivity in fragmented forest block/areas.
- Bio-diversity Conservation.
- Habitat Improvement in fragmented forest block/areas.

## **Problems in Achieving Objectives**

The major problems in achieving the goals stated above are lack of adequate scientific data from the field, existing development projects, grazing and fuel wood concerns, poaching threats, Human – wildlife conflict issues etc.

## **Strengths-Weaknesses-Opportunities-Threats (SWOT) Analysis**

### **STRENGTHS**

- The corridor is direct, almost aligned along the shortest distance between the reserves and for most parts, heavily forested.
- Presence of related forest types provides a continuous habitat.

### **WEAKNESSES**

- Existing development projects- railway line and road ways.
- The Itarsi tehsil is the weakest link of the corridor where the forest connectivity is broken and needs restoration.
- Very less scientific research has been done in this particular corridor.

### **OPPORTUNITIES**

- Opportunities in eco-tourism sector for the locals.
- Opportunities related to coordination and tie-ups with various NGOs that work in related sectors.
- Livelihood and conservation support by tiger conservation foundation and other line agencies.
- Development of robust monitoring system in whole area.
- Linkages will be established with police, judiciary, tiger cell, CCMB, Tiger reserve, District Magistrate to strengthen protection strategies.

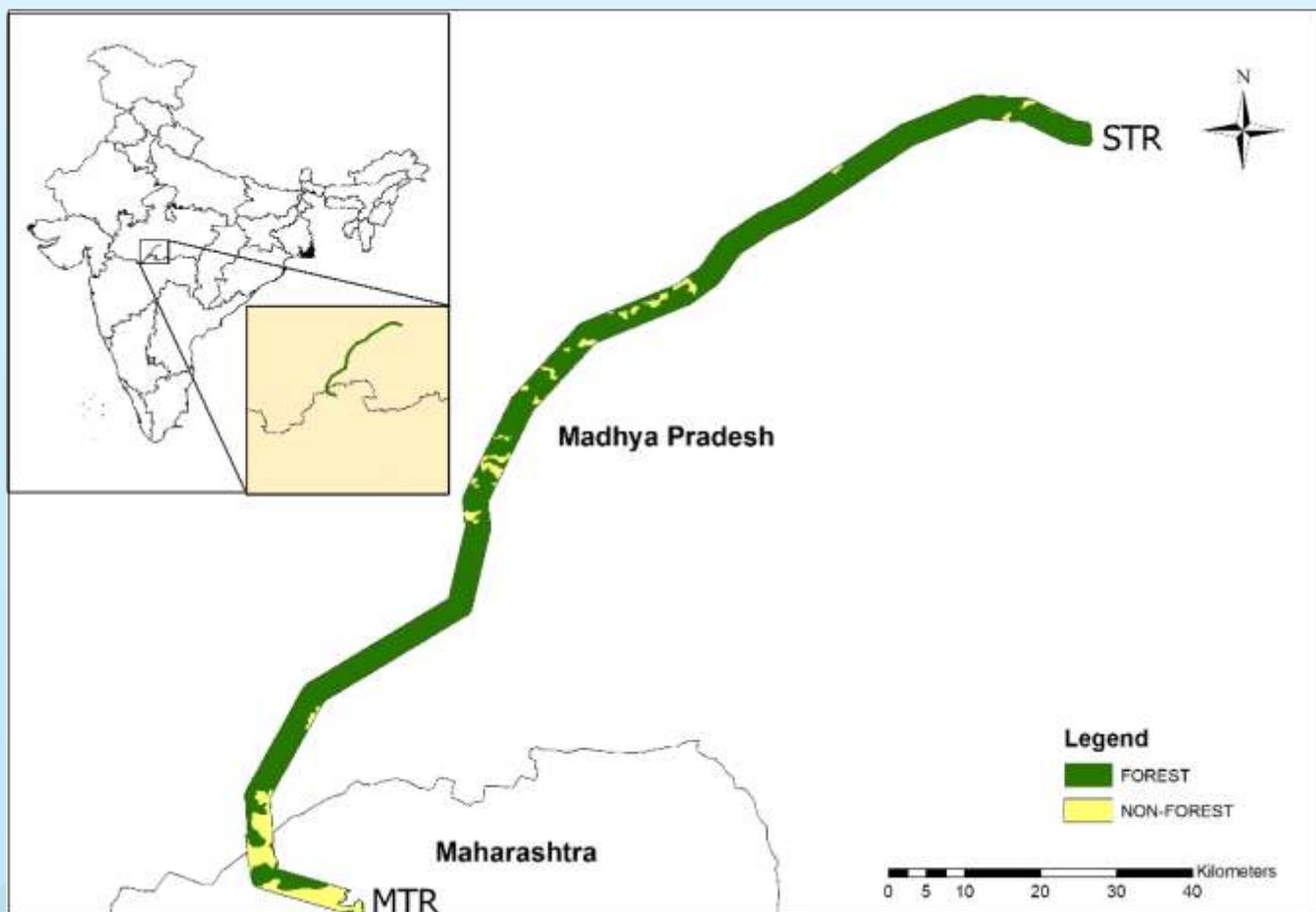
### **THREATS**

- Major threat to the tiger population in this particular wildlife corridor is fragmentation.
- Grazing and fuel wood concerns in the area of Nawegaon link.
- The forests are disrupted by agriculture and habitation. Large number of villages are present in the corridor area
- Increase in Human-wildlife conflicts.

## Management Strategies

### Delineation of Corridors and other habitat used by tigers and co-predators.

Satpura tiger reserve is connected to Melghat Tiger reserve by two possible corridors. The area details of the Satpura-Melghat corridor (1) emerging from western side of STR is given below-



### Forest and non-forest area in the corridor

Total Area-521.47 km<sup>2</sup>

Forest area-456.52 km<sup>2</sup>

Non-Forest Area-64.95 km<sup>2</sup>

No. of Villages-50

Area of villages-222.59 km<sup>2</sup>

The corridor passes through Satpura Buffer Zone and territorial forest divisions of Hoshangabad, Harda, North Betul and West Betul.

## Prioritization of linkages

Satpura-Melghat corridor (1) is mostly through forested landscape of Hoshangabad, Betul and East Nimar and currently has low intensity agriculture and human density. It would be timely to safeguard this corridor. Further developmental projects within this region should only be permitted with appropriate safeguards so as to maintain the functionality of the habitat as a viable corridor permitting gene flow of the wild species between Satpura and Melghat.

Part of the Satpura-Melghat corridor (2) is common with that of Satpura-Pench, which consists of degraded forest dispersed with various forms of human land uses like agriculture and mining. The habitat patch near Navegaon is the weakest link in the corridor and would benefit from restorative inputs. Western part of the corridor is again through patchy ridge top forests but current land use is not likely to be a barrier to tiger movement. Future development in this area should build in appropriate safeguards.

The Itarsi Tehsil is the weak link in the corridor (1), which needs immediate attention. This provides a major hindrance to the movement of wildlife. The major bottleneck is between Shahpur and Khari towns, as NH 69 and a railway line cuts across through the corridor between these two towns.

## Managerial approach

The need for ensuring ecologically compatible land uses in tiger reserves and corridors have been provided in sections 38O (g) and 38V (3) (b) of the Wildlife (Protection) Act, 1972. Further, under section 38V (3) (c) of the said Act, a provision has also been made to ensure that 'the forestry operations of regular forest divisions and those adjoining tiger reserves are not incompatible with the needs of tiger conservation'. In general, the managerial approach of buffer is applicable to tiger corridor areas as well. Intensive form of land uses like commercial mining, setting up of industries causing pollution and establishment of major hydro-electric projects, and discharge of effluents / solid wastes in natural water bodies etc. needs to be avoided in such areas.

- Crops to enhance the forest cover of the corridor like clonal eucalyptus, bamboo, subabool can be promoted in agro-forestry model.
- Horticulture crops like guava, custard apple and pomegranate, sahjan (*Moringa olifera*) can also be promoted in agriculture practises.
- Organic and no-till farming can also be promoted as being practiced by Mr. Raju Titus in his farm located near Hoshangabad-Bhopal road on left side just before Narmada Bridge. Arranging training and exposure visits for villagers is also good option.
- All kinds of developmental activities that can be detrimental to the corridor connectivity should be discouraged in the corridor area of minimum 3km width.
- No new structures or Developmental projects shall not be allowed in the areas of the corridor that are already threatened (marked in Map M-3).
- At places where the road/railway line crosses rivers/nallahs in the forest area, speed-breakers can be made on either side of the bridge/culvert because these are preferred paths for wildlife.
- There should be provision for creation of more openings at such places to provide safe passage for wildlife.

# LOCATION

- Itarsi Betul Road (NH- 46) From 63+000 to 137+000  
 Tiger Corridor Located at Bhoura, Narmadapura (T) & Betul North (T)

GPS CO-ORDINATES AT INTERSECTIONS			
ID	Latitude	Longitude	Forest Division
1	22°22'58.63"N	77°50'42.86"E	Narmadapuram (T)
2	22°22'7.28"N	77°50'57.04"E	Betul North (T)
3	22°19'34.86"N	77°51'54.24"E	Betul North (T)
4	22°19'5.08"N	77°51'54.11"E	Narmadapuram (T)
5	22°18'39.77"N	77°51'53.07"E	Narmadapuram (T)

Type of Area	Intersections		Total effected corridor area (Ha)	Proposed amount (Rs)
	Length (mt)	Width (mt)		
Tiger Corridor-2 (Part 1- Bhoura) Narmadapuram (T) Forest Division	1649	45	7.421	13.14 Cr
Tiger Corridor-2 (Part 2- Bhoura) North Betul (T) Forest Division	5351	45	24.08	42.65 Cr
Tiger Corridor-2 (Part 3- Bhoura) Narmadapuram (T) Forest Division, Part 1	958	45	4.311	7.64 Cr
Tiger Corridor-2 (Part 3- Bhoura) Narmadapuram (T) Forest Division, Part 2	788	60	4.728	6.28Cr

2. Itarsi Betul Road (NH- 46) From 63+000 to 137+000

Tiger Corridor Located at Barefa, Betul North (T)

GPS CO-ORDINATES AT INTERSECTION			
ID	Latitude	Longitude	Forest Division
1	22° 9'16.26"N	77°53'41.27"E	Betul North (T)
2	22° 6'2.85"N	77°52'44.26"E	Betul North (T)

Type of Area	Intersections		Total effected area (Ha)	Proposed amount (Rs)
	Length (mt)	Width (mt)		
Tiger Corridor-2 (Baretha Ghat) North Betul (T) Forest Division	7210	45	32.445	57.46 Cr

### 3. Betul Road (NH- 46) From 63+000 to 137+000

Tiger Corridor Located at Kesla, Narmadapuram (T)

Type of Area	Intersections		Total effected area (Ha)	Proposed amount (Rs)
	Length (mt)	Width (mt)		
Tiger Corridor-1 (Kesla Ghat) Narmadapuram (T) Forest Division	6330	45	28.485	50.45 Cr



# METHODOLOGY

1/ On-site field study –

- (i) Status of Flora
- (ii) Status of Fauna
- (iii) Crop cover density
- (iv) Water availability

2/ Analysis of data of All India Tiger estimation 2022, Working Plans, Compartment Histories, Fire incidences, Man animal conflict ( Human deaths/injuries, Cattle kills due to wild animals) in impact area.

3/ Consultation with stakeholders

4/ Incorporating prescriptions of Corridor Plan of Satpura Tiger Reserve and Working Plans of Narmadapuram (T) Forest division and North Betul (T) forest Division

(i) STATUS OF FLORA -

As per the working plan of the concerned divisions the list of flora found in the area is annexed as **Annexure-1**

(ii) STATUS OF FAUNA

As per the working plan of the concerned divisions the list of fauna found in the area is annexed as **Annexure-2.**

(iii) CROP COVER DENSITY

The crop cover density of forest compartments falling in adjoining forest area along the stretches is as follows:

Narmadapuram Forest Division

Comptt. No	Density	Crop Cover		
		Top canopy	Middle canopy	Under canopy
P-46	0.4	Teak, Saja, Palas, Lendia, Dhaora, Jamrasi, Kari, Mahua	Bhirra, Dudhiya, Aonla, Achar, Tendu	Lantana, Tendu, Palas
P-44	0.5-0.6	Teak, Saja, Dhaora	Tendu, Mahua, Kusum, Tinsa, Dhaora, Papada, Dendarikari	Rinjha, Kaken, Moyan, Amaltas, Palash
47	0.5	Teak, Saja, Lendia, Dhaora, Kari, Tinsa, Rinjha, Ghiriya, Moyan, Tendu	Bhirra, aonla, Achar, Tendu	Bamboo, Lantana, Marodphali

P-130	0.5	Teak, Saja, Dhaora, Tendu, Rinhja	Ghiriya, Tendu, Palas, Bel	Marodphalli, Ashar, Sarau, Dhawai
P-131	0.5	Teak, Saja, Dhaora, Papada, Haldu, Mahua, Salai, Moyan, Jamrasi, Kari	Ghiriya, Tendu, Palas, Bel, Aonla, Kaken, Kumbhi, Dudhiya, Achar	Marodphalli, Sarau
P-132	0.5	Teak, Saja, Dhaora	Ghiriya, Rinhja, Moyan, Lendia	Marodphalli, Sarau

#### North Betul Forest Division

155	0.2-0.6	Mahua, Moyan, Kusum, Palash	Bhirra, Dudhiya, Aonla, Achar, Tendu	Rinhja, Bel, Ghatol
156	0.2-0.5	Teak, Saja, Lendia, Palash, Pipal, Dhaora, Kari, Jamrasi, Kullu, Mahua, Harra, Bahera Moyan,	Bhirra, Dudhiya, Aonla, Achar	Ghatol, Bhirra, Lantana, Tendu
157	0.2-0.6	Mahua, Achar, Tendu, Saja, Palash, Dhaora, Jamrasi, Kusum, Fansi	Bhirra, Dudhiya, Aonla, Achar	Lantana, Tendu
244	0.5-0.7	Teak, Saja, Lendia, Pipal, Palash, Kari, Jamrasi, Kusum, Fansi, Neem	Bhirra, Dudhiya, Aonla, Achar, Tendu	Lantana
245	0.2-0.7	Teak, Haldu, Tinsa, Rohni, Amaltas, Shisham	-	Lantana, Palash Bel
246	0.5-0.7	Teak, Saja, Lendia, Pipal, Palash, Kari, Jamrasi, Kusum, Fansi, Neem, Dhaora	Bhirra, Dudhiya, Aonla, Achar, Tendu	Lantana, Marodphalli, Harsingar
247	0.5-0.7	Teak, Saja, Lendia, Pipal, Palash, Kari, Jamrasi, Kusum, Fansi, Neem, Dhaora, Haldu, Kasai, Bel, Kalam, Bargad, Chichola, Tondari, Astara	Bhirra, Dudhiya, Aonla, Achar, Tendu, Ghont, Mahua	Lantana
248	0.4-0.7	Teak, Saja, Lendia, Pipal, Palash, Kari, Jamrasi, Kusum, Fansi, Neem, Dhaora	Bhirra, Dudhiya, Aonla, Achar, Tendu,	Lantana, Dudhi

#### (iv) WATER AVAILABILITY

##### *Narmadapuram Forest Division*

- P-44 No source
- P-46 No source
- P-47 Nala on eastern border
- P-130 No water source
- P-131 No water source
- 132- No water source

##### *North Betul Forest Division*

- 155- 2 Tanks in Forest village Dhar
- 156- Seasonal nala on the boundary of C No 155-156
- 157- Nala
- 244- No water source
- 245- No water source
- 246- Nala
- 247- Ghoghra Khol Jhiriya
- 248- Nala

2/ Analysis of data of All India Tiger estimation 2022, Working Plans, Compartment Histories, Fire incidences, Man animal conflict (Human deaths/injuries, Cattle kills due to wild animals) in impact area.

The analysis of wild animal data and direct sighting evidences indicates the presence of Tiger, Panther, Sloth Bear, Dhole (Wild Dogs), Sambhar, Spotted deer, Hanuman Langur, Rhesus macaque and occasional presence of Gaur or Indian Bison in the vicinity of the road passing through corridor. Concentration of monkeys and Langurs at Kesla ghat and Baretha ghat was observed.

The area is prone to forest fires. The wild animal deaths, especially herbivores, occur due to road/train accidents. There have been a few incidences of unnatural deaths of wild animals. Itarsi area is prone to poaching. Cattle kill number indicates presence of large carnivores in the area.

#### 3/ Consultation with stakeholders-

During the field visit, meetings were held with Field Director Satpura Tiger Reserve Mr. L Krishnamurthy, CCF Betul Mr. Praful Fulzele, DFO Narmadapuram Mr. D.K. Wasnik, DFO North Betul Mr. Rakesh Damor, SDO Shahpur, R O Itarsi, Bhaura and Betul. Local beat guards, range assistants and JFMC members were also present on the spot. Their valuable observations and suggestions have been included in the report.

#### 4/ Incorporating prescriptions of Corridor Plan of Satpura Tiger Reserve and Working Plans of Hoshangabad (T) Forest division and North Betul (T) forest Division

The impact mitigation measures are according to the prescribed and approved Indicative Corridor Plan of Satpura Tiger Reserve and guidelines prescribed by Wildlife Institute of India for linear structures. The Working Plans of the concerned divisions have a chapter for Bio diversity and Wildlife management but there are no specific provisions for area falling in corridor of Satpura – Melghat Tiger Reserve.

### **6. IMPACTS OF THE PROJECT ON WILDLIFE**

1/ Direct loss of habitat- The widening of the road (NH-46) will result in damage or destruction of existing vegetation such as trees, shrubs, herbs, climbers, tubers and grasses, which maybe valuable habitat for wildlife. This loss of habitat would result in a reduced carrying capacity of the landscape to sustain wildlife.

2/Degradation of habitat quality- Construction activities such as trenching, digging and presence of labour camps lead to invasion of exotic weeds, pollution due to solid or liquid wastes and emissions. The effects of heavy metals such as lead from motor vehicles on trees and soils, and numerous chemical elements arising from roads, vehicles, fuels and corrosion and wear and tear of vehicle components are recognized impacts. In addition, the habitat may become less attractive to wild animals due to noise, lights or human presence. Water, land and air pollution may adversely impact the general health and fertility of wild animals.

3/Habitat loss and fragmentation – Roads dissect contiguous habitat patches resulting in smaller patch sizes and higher edge-to-interior ratios, making them increasingly vulnerable to outside disturbance. The fragmentation of habitat into spatially isolated parts is a major cause of the decline of the biodiversity. The fragmentation process initiates a shrinking in available habitat, which in turn leads to a progressive reduction in species diversity in the landscape, with consequent isolation of species. The contraction in available habitat together with isolation becomes most important impact.

4/ Injury and mortality of wild animals due to road accidents- It is one of the major concerns while sanctioning such projects. The road induced injury and mortality probably has the most acknowledged effect on wildlife. A large number of wild animals such as reptiles, amphibians, rodents, birds, monkeys, deer, large cats and mega herbivores are injured or killed due to road accidents every year.

5/ Reduction in green cover due to cutting of trees – Road construction or widening requires cutting of trees, which in turn results in reduction of green cover and effecting the micro-climate of the area.

6/ Dust/Smoke (Air Pollution) – There is a marked increase in air pollution of the affected area, due to dust (especially during construction phase) and smoke from vehicles. If proper measures are not taken, the indirect negative impacts of air pollution are quite evident on adjoining flora and fauna.

7/ Noise Pollution- Noise induced physiological and behavioral changes – A large number of wild animals rely heavily on auditory signals for their sustenance, defense and reproduction. The precautionary principle suggests that all artificial sources of noise in a natural ecosystem should be minimized. Loud noise interferes with the communication system of wild animals, brings out “flight or fight” response and interferes with the behavior of both predator and prey. Noise pollution reduces bird population due to muffling of mating calls.

8/ Lighting- Impact of headlight glare on wild animals- all animals are adapted to rhythm of solar light and darkness and accordingly remain passive or active depending on their nature (diurnal or nocturnal). Artificial lights cause disturbance to wildlife, disorient birds, disturb breeding and foraging behavior in birds, repel spiders and beetles and influence behavior of nocturnal frogs. A flash of artificial light causes an animal to become temporarily blind, popularly called the “deer-in-the-headlights” effect, reducing its chances to avoid collisions with vehicles.

9/ Forest fires – Widening of road eventually leads to increase in number of vehicles plying on the road and also increase in human settlements. This indirectly results in increase in forest fire incidences in the zone of impact.

10/ Impact on soil – Widening of road affects the natural soils of the area- quality, texture, water holding capacity is negatively affected during construction phase. The productive capacity of the soil covered by the road is eliminated. Widening of road leads to soil contamination, soil erosion, destabilization of slopes, side-tipping spoils material, loss of properties, loss of fertility and diversion of natural surface water flow.

11/ Impact on water – Water bodies found in project area are likely to get polluted and affect its natural flow. As a result the aquatic life may get affected.

12/ Man-Animal Conflict – There is an increase in cases of Man-Animal Conflict due to increased presence of humans and shrinkage/fragmentation of habitat.



# GUIDELINES FOR MITIGATION OF IMPACTS ON WILDLIFE

## 7.1 MITIGATION MEASURES –

### 7.1.1 Regulatory or perspective measures:

- Speed control
- Control on feeding of animals on the road
- No stopping or parking of vehicles on the road passing through Tiger corridor

### 7.1.2 Habitat management measures:

- Clearing vegetation for improving visibility along the road
- Erecting animal proof fencing to prevent animals from entering the road
- Wild animal monitoring by Trap/CCTV cameras
- Construction of animal underpasses
- Fencing to guide animals to underpasses
- Retrofitting existing drainage culverts to facilitate crossing by wildlife

*Mitigation measures should be designed and implemented to meet the collective needs of all target taxa and biodiversity values of the landscape, designing for the biggest or most demanding species will often ensure that the needs of other species would simultaneously be met. However, in certain cases, additional measures may be required for particular taxa or functional groups to provide for specific needs.*

## SPECIES SPECIFIC MEASURES

*It is important to consider and design wildlife crossing and animal passages to cater for all the species, using the area affected by linear infrastructure, to improve the efficiency and effectiveness of mitigation solutions.*

### **Mitigation Measures for Tiger Landscapes**

*Underpasses and overpasses are potential engineering solutions for mitigating the impacts of linear infrastructure in tiger landscapes. The following designs and norms of for these infrastructures should serve as the minimum requirement for mitigation in such landscapes where elephants do not occur.*

*A minimum span of 30 m with the height of 5 m and width of 5 to 8 m work for most species in tiger landscapes. The 30 m span refers to clear open passageways - often these underpasses would have support pillars for the infrastructure and they should be excluded from the span measurement.*

*In critical tiger corridors, if linear structure is permitted at all - mitigation measures need to especially stringent: the span needs to be a minimum of 50 m with the same dimensions of height (5 m) and width (5-8 m).*

## **Density of mitigation structures**

*Besides the dimensions of the underpasses, the density or numbers of such structures per unit length of the infrastructure is a crucial consideration for mitigating impacts. A passageway of over 50 m per 1 km length of infrastructure in forested habitats and over 100 m/1 Km length of infrastructure in critical tiger corridors would ensure that habitat connectivity is maintained and fragmentation is avoided.*

*It is important that wild animal movement is channeled to the passageway for crossing the infrastructure by using appropriate funneling structures, either natural or artificial. At times it may be necessary, except at the underpasses and overpasses, to fence off the road when passing through wildlife habitat. This fence may be essential to avoid mortality of wildlife, prevent accidents and ensure the safety of humans. Where fences are not required or are not feasible along the entire length of the infrastructure corridor, specific mitigation measures will still be required in the vicinity of topographic features that are known to trap wildlife on road for example features like embankments need to be flattened as they act as traps for wildlife blinded in the headlamps of approaching vehicles.*

## **Visual Barriers**

*Visual barriers along the sides of infrastructure need to be installed in such a manner that the traffic is not visible from a distance or up close from the wild animal crossings. Care should be taken that vehicular lights do not escape the visual barrier at night as these visual clues could deter nocturnal species from using the underpass. Visual barriers can be camouflaged and enhanced by planting tall vegetation along the edges of the engineered structure.*

## **Sound Barrier**

*Underpasses need to be fortified with sound barriers to prevent any disturbance to wildlife that could potential use these structures for passage across the infrastructure. The importance of appropriate sound and visual barriers can not be over emphasized: without them, investments in constructing under can go to waste, as wildlife may never use them.*

## **Olfaction and other sensory enhancers**

*Target wild animals can be encouraged to use the overpass or underpass by enhancing its porosity to wildlife through enrichment. These enrichments consists of*

- a/ use of appropriate substrates like soil, leaf litter, gravel, herbaceous vegetation*
- b/ attractants like food plants, carrion, pheromones, dung of conspecific and scats in the case of carnivores like tigers. These enrichments require inputs from professional wildlife biologist and, if not appropriately used, can also act as deterrents to wildlife passage. Use of these enrichment approaches must be accompanied by rigorous evaluation and testing.*

## Structural measures for reducing animal mortality

Mitigation measures to reduce deaths due to transportation infrastructure involve a combination of approaches: erecting fences and walls to exclude wild animals, constructing structures such as underpasses and overpasses to allow animals to cross a road safely and erecting signage and warning systems. The integration of such features in road projects can be effective for a variety of wildlife, provided that a specific requirement of all the different taxa at risk is considered in their design.

The location and design of safe crossing for terrestrial mammals is an important way of reducing their mortality on roads.

### Designing of underpasses -

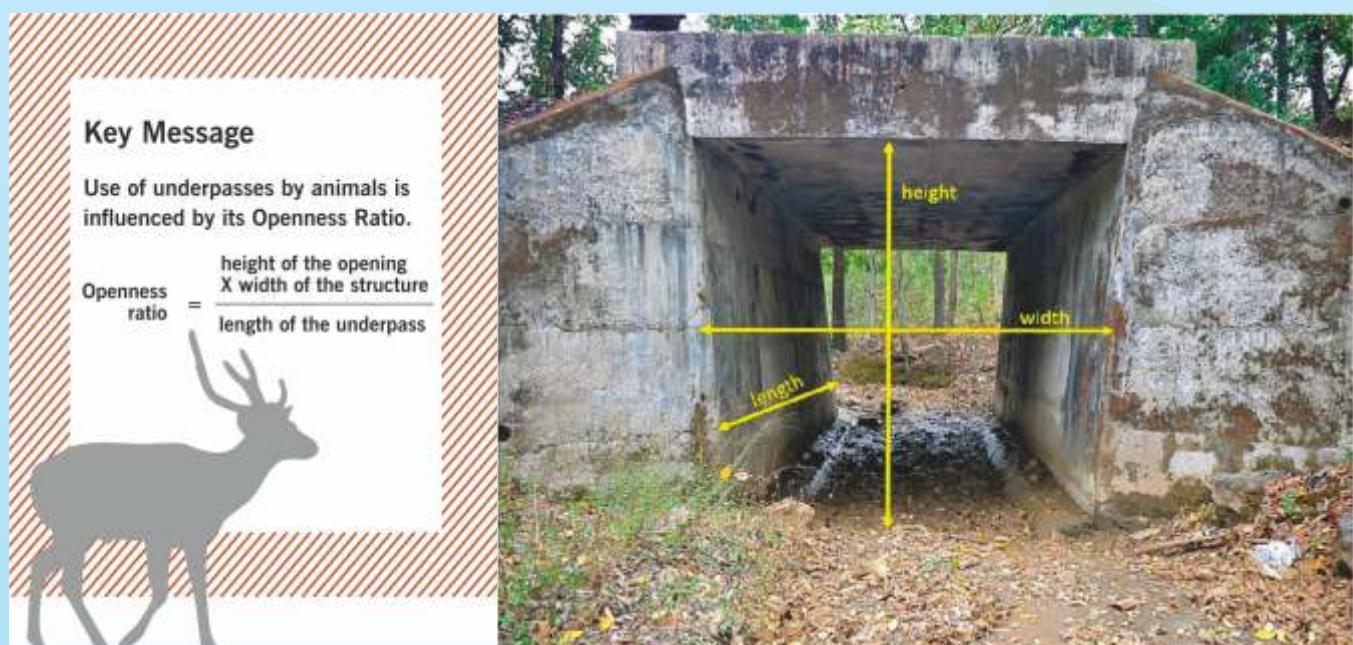
A crossing structure will only be effective if it is accessible and acceptable to the species that will potentially utilize it: its design and size can greatly influence its use.

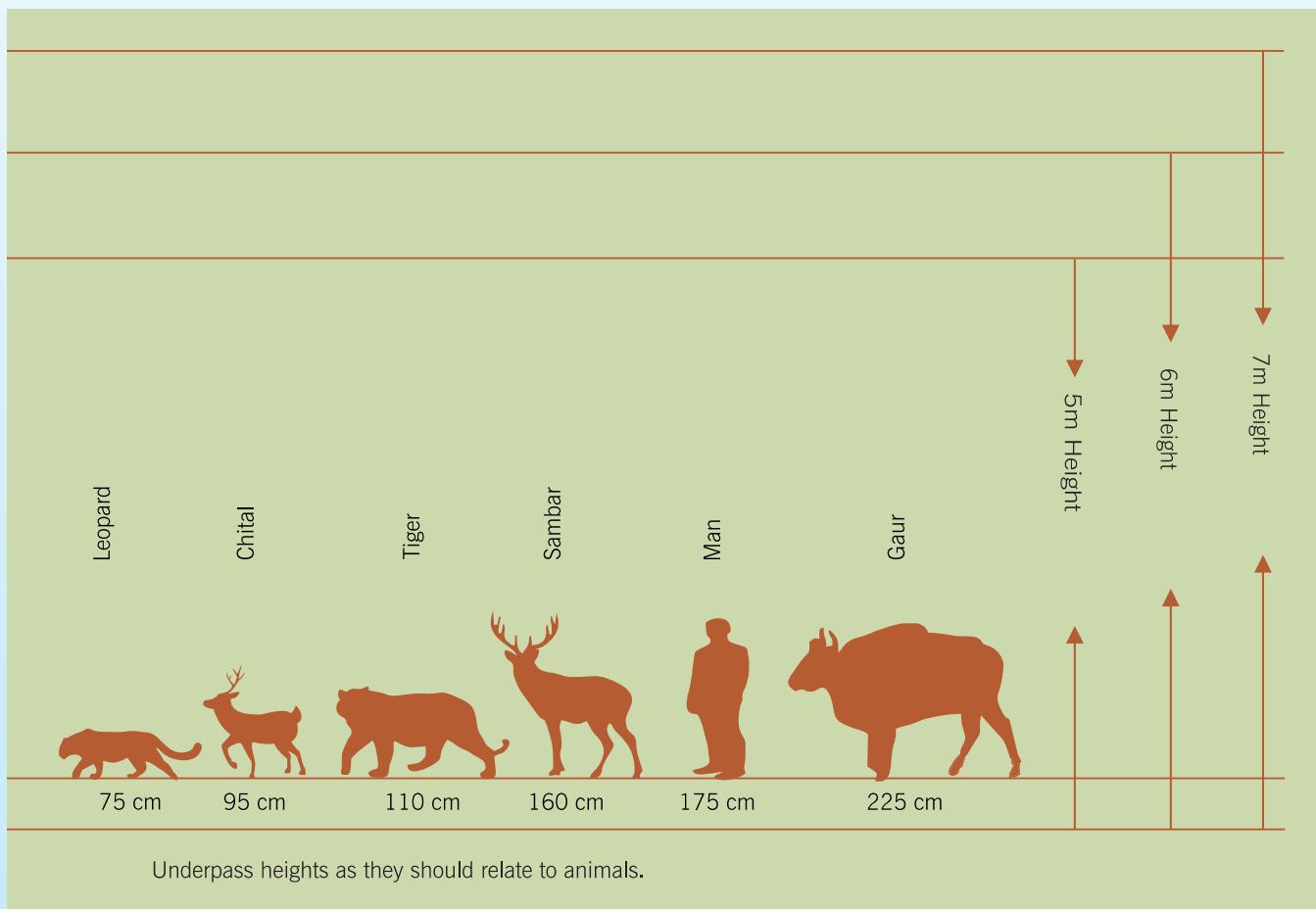
The body size of the animal and its behaviour (e.g. solitary or group living, diurnal or nocturnal) will influence the design of the structure. In general, the bigger these structures, the more they are used.

Where there is little or no research available to determine the appropriate dimensions of a crossing structure for a specific species- particularly if that animal is threatened or rare the design should err on the side of caution and cater for relatively large animals.

Structures with greatest use have heights at least equal to their width, and openings that allow unobstructed view of habitat. Underpasses have an 'openness ratio' or index of at least 2.0 to be effective (openness ratio is calculated by dividing the cross-sectional area of the underpass by the crossing distance; i.e. opening height x span length divided by width of the road).

The use of underpasses, for example, is negatively correlated with crossing length and positively correlated with openness index.





Some studies have reported moment rates as the single greatest factor influencing the risk of road mortality. Birds that typically fly short distances (e.g. from one tree to the next) may struggle to fly across a large open space, making them vulnerable to collision. Reptiles like snakes and turtles, which sometimes bask on the warm asphalt of the road to regulate their body temperatures, are at greater risk of being run over by speeding traffic.

### Measures for reducing bird hits

The adverse impact of roads and associated vehicular traffic on birds can be minimized through their careful design, controlling the disturbance they cause and reducing the availability of resources that attract birds next to roads.

### Mitigation measures specific to reptiles and amphibians

Herpetofaunal (reptiles and amphibian) road kill is often a function of species-specific ecological and life history traits, behaviour and moment patterns. The dispersing and migratory behaviour of herpetofauna makes them particularly vulnerable to the impacts associated with roads. They move between spatially separated breeding and foraging sites, and offer need to cross landscapes that are fragmented by roads. Their vulnerability is further increased by their relatively slow movement rates and by the fact that many species become immobile in response to approaching vehicles.

Seasonal amphibian moment also makes them particularly susceptible to road mortality. Their life stages comprise juvenile dispersal and adult migration. A decline in amphibian population can also result when their breeding sites and land habitats are interrupted by linear barriers like roads.

Daily cycles in thermal profiles of highways suggest that snakes that are active at night may be at greater risk, because the road is warmer than the surrounding grasslands early in the evening and, thus, may be thermally attractive to snakes at this time. Basking and thermo-regulatory behaviour thus prolongs their exposure to traffic and increases the likelihood of collisions.

Turtles are known to cover long distances seasonally, and persistent road mortality may cause a serious bottleneck in the affected population: adult turtles need considerable time to mature.

Passageways should be designed to minimize environmental gradients. Amphibians are particularly sensitive to moisture conditions and, thus, cement flooring of a passage may deter amphibian movement. Cement flooring is also likely to limit natural vegetation growth and may be unsuitable for cryptic animals. Passageways must provide an unbroken connection between the link habitats: there should not be gaps in the fencing of passages, and fencing or barriers should be made of durable material.

#### **Non structural measures for reducing mortality:**

The purpose of animal warning signs and detection systems is to prevent or reduce the number of Animal-Vehicle Collisions (AVCs). Animal Detection Systems (ADC) detect large animals before they enter the road corridors to alert drivers of their presence and warn drivers of collision risk.

Signs warning of wildlife are put up along stretches of roads where animals are known to occur or use local habitats, to caution drivers about the potential presence of animals. Such signs are already in use in wildlife areas. It is important to know that only signs that are place and time specific may be effective. All warning signs can be grouped into 5 categories -

1. Caution signs
2. Enhanced caution signs
3. Temporary wildlife warning signs
4. Dynamic message signs
5. Posters and billboards

Factors influencing the effectiveness of these signs are listed below: Animal detection systems are best installed at locations that have a history of AVCs, especially involving large mammals or where animals are known to pass frequently: daily or seasonally.

The distance between signs and the frequency of the signs should be decided according to the occurrence of AVCs in particular stretches of roads: the higher the incidence of AVCs, the greater the signage. Roadside vegetation should be cleared, especially near curves and embankments, to make the signs visible to motorists.

The size, shape, colour and material (reflective, non-reflective) of signs should be chosen to make the signs more effective.

Signs that highlight the conservation importance of the site through which the transportation corridor passes such as World Heritage site or National park can help garner support for reducing traffic speed and increased awareness for drivers, thereby helping to protect several threatened species.

## **Measures for noise attenuation**

*Noise pollution control and abatement is a mandatory activity especially when designing and planning a roadway project. Attenuation or reduction in noise due to vehicular traffic can be achieved by the use of noise barriers, limitation of vehicle speeds, alteration of roadways surface texture, limitation of heavy vehicles, use of traffic controls that smooth vehicle flow to reduce braking and acceleration, and tyre design. Costs of building in mitigation can be significantly reduced if the solutions are planned in the early stages of a roadway project*

*Noise may reduce the effectiveness of mitigation measures installed on roads to reduce the fragmentation and isolation of wildlife populations. It is therefore important to implement measures to reduce noise that has the potential to disturb human beings and wild animals.*

*Noise barriers are the most commonly used form of noise abatement. On roads and highways, noise barriers (sometimes referred to as 'noise walls' or 'sound walls') are intended to block or reduce highway noise from reaching and affecting activities near the highway. They do this primarily by blocking the direct path that sound must travel between the source of sound on the highway and the receiver exposed to the sound. Effective noise barriers can reduce noise levels by 10 dB(A) cutting the loudness of traffic noise by half.*

## **8. WILDLIFE CONSERVATION AND MANAGEMENT PLAN-**

### **(1) Components:**

- (i) Animal Passage Plan
- (ii) Wildlife Conservation/Management Plan

The plan has been prepared taking into consideration the guidelines made by Wildlife Institute of India and the provisions of Corridor Plan of Satpura Tiger Reserve as well as the prescriptions of Working Plans of Hoshangabad (T) and North Betul (T) forest division for Bio-diversity and Wild life conservation.

### **(i) ANIMAL PASSAGE PLAN-**

#### **Underpasses -**

To provide safe passage to wild animals, crossing the proposed road from one side to the other, RCC box and Girder type Bridges are proposed along with underpasses at strategic locations in consultation with Forest officers and Wildlife wing of M P Forest Department.

The details of proposed mitigation structures are as follows:

Tiger Corridor	Km.	Location	Previous Length	Proposed length(Min Ht. 5m) as per site visit dated 29.09.2022	Proposed length(Min Ht. 5m) as per meeting with CWLW	Remarks
Kesla Ghat (61.500 to 67.380)	62.300	22.536850 77.8199407 (Overpass)	-	60m (20+20+20)	65m (20+25+20)	
	62.400	22.542642 77.814906 (Tunnel)	3m	70m	70m	
	63.400	22.534971 77.822672	-	35.8 m (15+5.8+15)	35.8 m (15+5.8+15)	
	64.052	22.529724 77.824986	-	12	30	
	66.080	22.514617 77.824677	-	185 (6x20+25+2x20)	185 (6x20+25+2x20)	
Bhaura (80.940 to 88.640)	86.05	22.340032 77.862747	-	-	200 m (10x20)	As per terrain
Baretha Ghat (108.933 to 116.263)	109.89	22.146312 77.892730	140 m (7x20)	140 m (7x20)	140 m (7x20)	
	111.758	22.129139 77.889635	240 m (12x20)	280 m (14x20)	280 m (14x20)	
	112.317	22.125719 77.887307	60 m (3x20)	80 m (4x20)	80 m (4x20)	
	112.700	22.123123 77.884437	-	40 m (2x20)	40 m (2x20)	
	115.005	22.110493 77.882229	60 (3x20)	10 m (1x10)	10 m (1x10)	
	115.988	22.102044 77.879450	100 (5x20)	60 m (3x20)	140 m (7x20)	As per terrain

**Animal guiding fencing** - Both sides of the proposed road under passes along the corridor will be fenced (6' high after construction of 2' high wall) for guiding the Wild animals to animal Under Passes. This will prevent wild animals to cross the road and will direct them to pass through safe passages.

**Visual barriers and sound barriers** are proposed to be constructed along the road constructed over under passes in a similar fashion as constructed in NH passing through Pench Tiger reserve. Talking the topography of area and experienced crossings used by wild animals, especially Tigers, in the past, into consideration it is proposed to provide acoustic/noise/visual barriers important animal underpasses.

**Monkey Ladder** – Four monkey ladders are proposed -2 each at Kesla ghat and Baretha ghat, to facilitate road crossing by monkeys and Langurs to avoid accidents.



**Speed control**- Speed breakers will be constructed to control the speed of vehicles specially before the under passes and areas known for animal crossings. The design and frequency of the speed breakers will be as per the standard guidelines for National Highways.

**Signages**- To prevent or reduce the number of Animal-Vehicle Collisions (AVCs), signages will be put up at appropriate places for warning on following points-

*i) Control on feeding of animals on the road*- Signages will be put in various places where there is concentration of Rhesus macaque and Langurs to make public aware of the legal provisions against feeding of wild animals and its adverse effects. This will considerably reduce the risk of road accidents and also death of wild animals on road. It will also prevent predators to come after prey animals along the road.

*ii) No stopping or parking of vehicles on the road passing through Tiger corridor*- Several vehicles were seen parked near Dhabas and eating joints in the corridor area. This also causes littering of polythene and food wastes as also increases fire hazard. It is required that vehicles should not be allowed to stop in the corridor area and proper signages are prescribed at appropriate locations.

*iii) Spreading of litter* –During the field visit ,litter was seen lying along the roadside by the commuters. Hanuman Langurs and Rhesus Macaque were seen eating food wastes and crowding these sites. Litter attracts wild animals which in turn attracts predators causing wild life deaths due to AVC.

The **water availability** along side the road passing through corridor area is sufficient at present due to availability of water in various nallas and small rivulets. Soil and moisture conservation measures have also been taken up by the respective forest divisions under various schemes like Green India Mission, ESIP and

**Implementation of Working Plan.** In discussion with the Field Director Satpura Tiger reserve it was reiterated that no water holes or small tanks should be additionally constructed alongside the road passing through the corridor area to avoid wild animals from staying for long in the area which may subsequently lead to death of wild animals due to accidents. This point also came in discussion with DFO Narmadapuram, DFO North Betul and concerning Range officers and field staff and Beat guard East Baghdev pointed out that since the area is prone to illegal poaching, poisoning of water holes may take place if additional water bodies are created. Keeping this in mind the suggestions of the field staff and officers as also the purpose of corridor management in impact zone, no additional water bodies are required to be constructed in the area so that the wild animals pass through the impact zone as quickly as possible and do not stay for long.

**Monitoring of Wildlife movement** through under passes by means of CCTV cameras- The movement of wild animals through animal under passes will be done by deploying CCTV cameras so that proper management interventions may be considered. It will also give an idea of animals using the underpasses.

**Eco development activities/livelihood training/awareness in adjoining JFM committees** – It is essential to involve local communities in wildlife management activities through Eco development activities, livelihood training and awareness generation so as to ensure better protection of wildlife in the area. For this the user agency may provide amount to JFM committees for doing such activities based on annual plan prepared by respective territorial unit and approval by competent authority.



# SUMMARY AND FINANCIAL OUTLAY OF WILDLIFE CONSERVATION/ MANAGEMENT PLAN

S NO.	ITEM	UNIT	RATE	COST ESTIMATE* ( Cr)
1	Underpasses/Minor Bridges	12 Nos	-	152.87
2	Animal guiding fencing	1500x2 RMT	5000/ RMT	1.50
3	Visual/Sound Barrier ( Both sides of the road)	400X2 RMT	25000/RMT	2.00
4	Signages	40 No	20000/unit	0.08
5	Monkey Ladder	4 No	L.S.	0.20
6	Monitoring of WL movement	40 No	L.S.	0.05
7	Eco-development activities/ Training	L.S	L.S.	0.05
			<b>TOTAL -</b>	<b>Rs 156.75 Cr</b>

\* These are approximate cost estimates. The actual cost may vary during execution.



## ANNEXURE - 1

I. LARGE TREES				
S. No.	Local Name	Standard Hindi Name	Botanical Name	Family
1	अचार	अचार	Buchanania lanza	Anacardiaceae
2	अर्जुन	अर्जुन, कोहा	Terminalia arjuna	Combretaceae
3	टाम	आम	Mangifera indica	Anacardiaceae
4	अमलतास	अमलतास	Casia fistula	Caesalpiniaceae
5	आमड़ा	आमरा	Bahunia malabarica	Caesalpiniaceae
6	अमबाड़ी		Antidesma diandrum	Euphorbiaceae
7	टंजन	अंजन	Hardwickia binata	Legumenaceae
8	करधई	करधई	Anogeissus accuminata	Combretaceae
9	कठगुलर	कठूमर	Ficus hispida	Moraceae
10	ऑवला	ऑवला	Emblica officinalis	Euphorbiaceae
11	इमली	इमली	Tamarindus indica	Caesalpiniaceae
12	कसई	कसई कसही	Bridelia retusa, Bridelia seuamosa	Euphorbiaceae
13	कारी	कारी दमसाल	Milusa tomentosa	Annonaceae
14	काला सिरस	काला सिरस	Albizia lebbek	Leguminosae (Mimosaceae)
15	कचनार	कचनार	Bauhinia veriegata	Caesalpiniaceae
16	कैवलोर	कैवलोर	Bauhinia purpurea	Caesalpiniaceae
17	कुंभी	भुई, कुंभी	Careya arborea	Myrtaceae
18	कुल्लू	कुल्लू	Sterculia urens	Sterculiaceae
19	कुसुम	कुसुम	Schleichera oleosa	Sapindaceae
20	केकड़	केकड़	Garuga pinnata	Burseraceae
21	कैथ	कैथा	Feronia limonia	Rutaceae
22	कटहल	कटहल	Artocarpus heterophyllus	Moraceae
23	केम (मुंडी)	मुंडी	Mitragyna parviflora	Rubiaceae

24	खैर	खैर	Acacia catechu	Leguminosae (Mimoseae)
25	गरारी	गरारी	Cleistanthus collinus	Euphorbiaceae
26	गमारी	खम्हार, खम्हेर	Gmelina arborea	Verbenaceae
27	गुलर	डूमर	Ficus glomerata	Moraceae
28	गुञ्जा	केकड़	Gardenia pinnata	Rubiaceae
29	चिचवा	चिचवा	Albizzia odoratissima	Legumenosae (Mimoseae)
30	चिरोल	चिरहोल	Holoptelea integrifolia	Legumenosae (Mimoseae)
31	जामुन	जामुन	Syzygium cumini	Myrtaceae
32	कांकर	कांकर	Lannea coromandalica	Anacardiaceae
33	तिन्सा	तिन्सा, तिलाव	Ougenia oojeinensis	Legumenosae (Papilionaceae)
34	तेन्दू	तेन्दू	Diospyros melanoxylon	Ebenaceau
35	तून	तून	Cedrela toona	Meliaceae
36	तोन्द्री	तोन्द्री	Casearia tomentosa	Samydaceae
37	धहपलास	धहमन	Cordia myxa	Boraginaceae
38	धामन	धामन, धनकट	Grewia tillaefolia	Tiliaceae
39	धावड़ा	धवा	Anogeissus latifolia	Combretaceae
40	धोबिन	धोबिल	Dalbergia paniculata	Leguminosae (Papilionaceae)
41	नीलगिरी	नीलगिरी, यूकेलिपट्स	Eucalyptus Spp	Myrtaceae
42	नीम	नीम	Azadirachta indica	Meliaceae
43	पलास	छेवला	Butea monosperma	Leguminosae (Papilionaceae)
44	पाखर	पकर	Ficus infectoria	Moraceae
45	पाडर	पाडर	Stereospermum suaveolens	Bignoniaceae
46	पांगरा	हडुआ	Erythrina suberosa	Legumenosae (Papilionaceae)
47	पीपल	पीपल	Ficus religiosa	Moraceae
48	पूला	बरंगा	Kydia calycina	Malvaceae
49	बड	बरगद, बर	Ficus bengalensis	Moraceae

50	बहेरा	बहेड़ा	Terminalia belerica	Combretaceae
50	बीजासाल	बीजा	Pterocarpus marsupium	Legumenosae (Papilionaceae)
51	बबूल	बबूल	Acacia nilotica	Legumenosae (Mimoseae)
52	बेल	बेल	Aegle marmelos	Rutaceae
53	भिरा	भिरा, भिरहा	Chloroxylon swietenia	Meliaceae
54	भौंरसाल	भरकुट	Hymenodictyon excelsum	Rubiaceae
55	महारुख	महारुख	Ailanthus excelsa	Simarubiaceae
55	महुआ	महुआ	Madhuca indica	Sapotaceae
57	मोखा	मोखा, घाठा	Schrebera swietenioides	Oleaceae
58	रिउंजा	रिउंसा	Acacia leucophloca	Legumenosae (Mimoseae)
59	रोहन	रोहन, रोहिना	Soymida febrifuga	Meliaceae
60	लसोड़ा	लबहेर, लसूड़ा	Cordia dichotoma	Boraginaceae
61	शीशम	काला शीशम	Delbergia latifolia	Legumenosae (Papilionaceae)
62	सफेद सिरस, गुरार	सफेद सिरस	Albizzia procera	Legumenosae (Mimoseae)
63	सागौन	सागौन	Tectona grandis	Verbenaceae
64	साज	साजा	Terminalia tomentosa	Combretaceae
65	सालई	सलई, सालेंह	Boswellia serrata	Burseraceae
66	सेजा	सेंजा, लेडिंया सेनहा	Legrerstroemia parviflora	Lythraceae
67	सेमल	सेमरा	Salmalia malabarica, Bombax ceiba	Malvaceae
68	सोनपाकर	कढबर	Ficus tomentosa	Moraceae
69	सोनपाडर	कोटरी	Radermachera xylocarpa	Bignoniaceae
70	हल्दू	हल्दू कलमी	Adina cardifolia	Rubiaceae

**II. SMALL TREES**

71	अमलताश	धनबहेर, करकचा		Leguminosae (Caesalpinieae)
72	अस्तरा	आमटा	<i>Bauhinia malabarica</i>	Leguminosae (Caesalpinieae)
73	अस्तो	अस्तो	<i>Bauhinia racemosa</i>	Leguminosae (Caesalpinieae)
74	ककई	कहई	<i>Flacourtie indica</i>	Flaeourtiaceae
75	गिलची	बर्णी	<i>Casearia graveclens</i>	Samyoaceae
76	गलगल	गबंदी	<i>Cochlospermum religiosum</i>	Bixaceae
77	गदहपलास	हरदुआ, पंजरा	<i>Erythrina suberosa</i>	Leguminosae
78	केवलार	केवलार	<i>Bauhinia purpurea</i>	Leguminosae (Caesalpinieae)
79	कठजामुन	कठजामुन	<i>Syzygium heyneanum</i>	Myrtaceae
80	कचनार	कचनार	<i>Bauhinia variegata</i>	Leguminosae (Caesalpinieae)
81	घोंट	घोंटहर	<i>Zizyphus xylopyra</i>	Rhamnaceae
82	चन्दन	चन्दन	<i>Santalum album</i>	Santalaceae
83	जमरासी	जमरासी	<i>Clacadendron glaucum</i>	Celastraceae
84	डीकामाली	डीकामाली पपरेल	<i>Gardenia resinifera</i>	Rubiaceae
85	दूधी	दूधी	<i>Holorrhena antidysentrica</i>	Apocynocea
86	तिलवन	तिलवन	<i>Wendlandia exserta</i>	Rubiaceae
87	पापड़ा	पापड़ा	<i>Gardenia latifolia</i>	Rubiaceae
88	फेटरा	खरहर	<i>Gardenia turgida</i>	Rubiaceae
89	बरना	बरना	<i>Crataeva religiosa</i>	Capparidaeae
90	बेर	बेर	<i>Zizyphus jujuba</i>	Rhamnaceae
91	बिलसेना	बिलसेधा	<i>Limonia acidissima</i>	Rutaceae
92	भिलमा	भिलमा	<i>Semicarpus anacardium</i>	Anacardiaceae
93	मैदालकड़ी	—	<i>Litsea glutinosa</i>	Lauraceae
94	मैनफल	मैनहर	<i>Randia dumetorum</i>	Rubiaceae
95	रोली	सिंदूरी, रोरी	<i>Mallotus philippinensis</i>	Euphorbiceae
96	लोखंडी	लोखंडी	<i>Ixora arborea</i>	Rubiaceae

### III. SHRUBS AND UNDER SHRUBS

97	अकोल	अकोला	<i>Alangium salvifolium</i>	Cornaceae
98	अडूसा	अडूसा	<i>Adhatoda vasica</i>	Acanthaceae
99	आपामार्ग	चिरचिटा	<i>Achyranthus aspera</i>	Amaranthaceae
100	अरंडी	अरंडी	<i>Ricinus Communis</i>	Euphorbiaceae
101	आक	आक	<i>Calotropis gigantea</i>	Asclepiadaceae
102	करोंदा	करोंदा	<i>Carissa opaca</i>	Apocynaceae
103	कालाबॉसा	अमेडा	<i>Colebrookia oppositifolia</i>	Labiata
104	कुरची	कुरची, केरिया	<i>Holarrhena antidysentrica</i>	Apocynaceae
105	कोरा	कोरा	<i>Pogostemon benghalensis</i>	Labiatae
106	काली मूसली	काली मूसली	<i>Curculigo orchiodis</i>	Amonillidaceae
107	केला जंगली	जंगली केला	<i>Musa sapientum</i>	Musaceae
108	कुर्क	कुर्क	<i>Gardenia gummifera</i>	Euphorbiaceae
109	खटुआ	खटुआ	<i>Antidesma diandrum</i>	Euphorbiaceae
110	खुर्सी	खुरसी	<i>Grewia rothii</i>	Tiliaceae
111	खरेता	जंगली मेंहदी	<i>Dodonea viscosa</i>	Saoindaceae
112	गुडसकरी	—	<i>Grewia hirsuta</i>	Tiliaceae
113	गोखरू	गोखरू	<i>Tribulus terrestris</i>	Zygophillaceae
114	गोधरू	—	<i>Xanthium strumarium</i>	Compositae
115	चिपटी	चेपटी	<i>Desmodium pulchellum</i>	Leguminosae
116	चिरेटा	चिरायता	<i>Andrographis paniculata</i>	Acanthaceae
117	जोंधरली	वनमसूरी	<i>Antidesma ghassembilla</i>	Euphorbiaceae
118	झड़नेरी	झखेरी	<i>Zizyphus nummularia</i>	Rhamnaceae
119	झाऊ	झाडू झाऊ	<i>Tamarix dioica</i>	Tamaricaceae
120	तुलसी	तुलसी	<i>Ocimum sanctum</i>	Labiatae
121	थुअर	थुअर	<i>Euphorbia nerifolia</i>	Euphorbiaceae

122	धवई	धवई	Woodfordia fruticosa	Lythraceae
123	निरगुडी	निरगुडी	Vitex negundo	Verbenaceae
124	नील	बिरहुल	Indigofera pulchella	Legumino sae (Papilionaceae)
125	पवार	चरोट, चकौड़ा	Cassia tora	Legumino sae (Caesalpnieae)
126	बनकपास	जंगली भिंडी	Thespesia lampas	Malvaceae
127	बनराहर	बनसहर	Moghania semialata	Leguminosae (papilionaceae)
128	बायबिरंग	बयबिरंग	Embelia robusta	Myrsinaceae
129	बेशरम	बेशरम	Ipomoea pes-caparac	Convolvulaceae
130	भटकटझया	भटकटझया	Solanum nigrum	Solanaceae
131	भृंगराज	धमीरा	Eclipta prostrata	Compositae
132	मरोरफली	ऐंठी		Helicterus isora
133	मोहती	मोहती	Vernonia divergens	Compositae
134	विद्यसिनी	श्रायमुनिया	Lantana camara	Verbenaceae
135	शतावरी	सतावर	Asparagus recemosus	Liliaceae
136	सीताफल	सीताफल	Anona squamosa	Anonaceae
137	हरसिंगार	सेहरुआ	Nyctanthes arbortristis	Oleaceae
138	वन तुलसी	वन तुलसी	Hyptis suaveolens	Labiateae
139	मकोर	मकोर	Zizphus oenopila	Rhammaceae
140	रतनजोत	रतनजोत	Jatropha curacas	Euphorbiaceae
141	विद्यसिनी	रायमुनिया, लेन्टाना	Latana aculeata	Verbenaceae

#### IV. CLIMBERS

142	किवांच	केवाच	Mucuna prurita	Liguminosae (Papilionaceae)
143	केवटी	क्योंटी	Ventilago alyculata	Rhamnaceae
144	गुंजा	केवटी	Aburs precatorious	Leguminosea
145	गौज	गुराड़, गुरड़ी	Millietia auriculata	Leguminosea (Papilionaceae)
146	डोंकरबेल	डोकराबेल	Ampelocissus latifolia	Vitaceae

147	ढीमरबेल	ढीमरबेल	<i>Ichnocarpus frutescens</i>	Apocynaceae
148	तुपबेल	अमाजिन	<i>Derris scandens</i>	Legminosae
149	दूधबेल	दूधबेल	<i>Vallaris solanus</i>	Apocynaceae
150	नसर्बल	मौरियन	<i>Butea parviflora</i>	Leguminosae (Papilionaceae)
151	नागबेल	दूधी	<i>Cryptolepis buchanani</i>	Combretaceae
152	पलासबेल	बदरोसिन	<i>Butea superba</i>	Leguminosae (papilionaceae)
153	पसारन	दूधी	<i>Clematis smilacifolia</i>	Ranunculaceae
154	बेचांदी	बैचांदी	<i>Dioscorea daanona</i>	Liguminosae (Papilionaceae)
155	भरन्डा	भरन्डा	<i>Pueraria tuberosa</i>	Rhamnaceae
156	मकोर	मकोर	<i>Zizyphus oenoplia</i>	Leguminosea
157	मालकांगनी	कुकन्दन	<i>Celastrus paniculata</i>	Leguminosea (Papilionaceae)
158	माहुल	मोहलाइन	<i>eksgykbu</i>	<i>Bauhinia vahlii</i>
159	रामदतौन	शेर दातौन	<i>Smilax zeylanica</i>	Vitaceae
155	रौनी	ऐल	<i>Acacia pennata</i>	Apocynaceae
160	सतावर	सतावर	<i>Asparagus racemes</i>	Liliaceae
161	पेपरवेल	पेपरवेल	<i>Combratum decandrum</i>	Combrataceae
162	फुलकट	गुड़मार	<i>Gymnema sylvestra</i>	Ascalapadaceae

## V. GRASSES

163	कांस	कांस	<i>Sacharum spontaneum</i>	Gramineae
164	कुष	कुसा	<i>Desmostachya bipinnata</i>	Gramineae
165	कुसुल	कुसुल, लांपा	<i>Heteropogon contortus</i>	Gramineae
166	खस	उरई	<i>Vetiveria zizanioides</i>	Gramineae
167	गुन्हेर	छिर्चा, घोड़	<i>Themeda quadrivalvis</i>	Gramineae
168	छीर	छिर	<i>Imperata cylindrica</i>	Gramineae
169	झानी	घडँच	<i>Aristida setaceae</i>	Gramineae
170	दूब	दूब	<i>Cynodon dactylon</i>	Gramineae

171	फुलबहारी	फुजबारी	<i>Thysanolaena maxima</i>	Gramineae
172	फूली	फुलहरा	<i>Apluda mutica</i>	Gramineae
173	भुरभुसी	भुरभुसी	<i>Eragrostis tenella</i>	Gramineae
174	भुरभुसी	छोटी भुटभूसी	<i>Eragrostis interrupta</i>	Gramineae
175	भूरवेल	कैल	<i>Dichanthium annulatum</i>	Gramineae
176	मूँज	मूँज	<i>Sacharus munja</i>	Gramineae
177	मोया	मोया	<i>Pennisetum hohenackeri</i>	Gramineae
178	रुसा	रुसा	<i>Cymbopogon martinii</i>	Gramineae
179	सबई	बगई	<i>Eulaliopsis binata</i>	Gramineae
180	भंजुरा	भंजुरा	<i>Apludavaria</i>	Gramineae
181	लहनमारवल	लहनमारवल	<i>Dichanthium annulatum</i>	Gramineae

## VI. OTHER PLANTS

182	अमरबेल	अमरबेल	<i>Cuscuta reflexa</i>	Convolvulaceae
183	छींद	छींद	<i>Phoenix acaulis</i>	Palmae
184	बंधा	बंधा	<i>Dendrophthoe falcata</i>	Loranthaceae
185	बांस	बांस	<i>Dendrocalamus strictus</i>	Gramineae
186	व्हेंडा	व्हेंडा	<i>Vanda terrs</i>	Orchidaceae

## ANNEXRE - 2

Animals CLASS- MAMMALIA					
S.No	Order	Family	Zoological Name	Local Name	English Name
1	Primates	Colobidae	Presbytia entellus	लंगूर	Common Langur
2	Primates	Circophtecidae	Macaca mulatta	बंदर	Rhesus macaque
3	Insectivora	Erinaceidae	Hemiechinus auritus Collaries	—	Hedgehog
4	Insectivora	Tupaiidae	Suncus murinus	छँछूदर	Musk-shrew
5	Chiroptera	Pteropodidae	Cynopterus sphinx	चमगादड़	Short nosed fruit bat
6	Pholidata	Pteropodidae	Manis crassicandata	सिलू	Indian pangolin,
7	Carnivora	Ursidae	Melursus ursinus	भालू रीछ	Sloth bear
8	Carnivora	Felidae	Panthera pardus	गुलबाघ, तेन्दुआ	Panther or Leopard
9	Carnivora	Felidae	Felis chaus	जंगली बिल्ली	Common Jungle cat
10	Carnivora	Hyaenidae	Hyaena	लकड़बग्गा	Striped hyaena
11	Carnivora	Herpestidae	Herpestes edwardsi	नेवला	Common Mongoose
12	Carnivora	Mustelidae	Melivora capensis	बिज्जू	Indian Ratel
13	Carnivora	Canidae	Canis aureus	गोदड़, सियार	Jackal
14	Carnivora	Canidae	Vulpes bengalensis	लोमड़ी	Indian fox
15	Carnivora	Canidae	Cuon alpinus	सोनकुत्ता	Wild dog
16	Rodentia	Sciuridae	Funambulus pennanti	गिलहरी	Common five Striped Squirrel
17	Rodentia	Muridae	Bandicota bengalensis	चूहा	Field rat

## BIRDS

S.No	Hindi Name	English Name	Zoological Name	Family
1	गोधीला	Openbill stork	<i>Anostomus oscitans</i>	Ciconidasae
2	दोख, जंधील	Painted stork	<i>Ibis ieucocephalus</i>	Ciconidae
3	किलचिया	Little Egret	<i>Egretta garzetta</i>	Ardeidae
4	पनकौआ	Little cormorant	<i>Phalacrocorax niger</i>	Phalacrocoracidae
5	अंजन	Gray Heron	<i>Ardea cinerea</i>	Ardeidae
6	अंधा, बगला	Paddy Bird, pond Heron	<i>Ardeola grayii</i>	Ardeidae
7	गाय बगला	Cattle egret	<i>Bubulcus ibis</i>	Ardeidae
8	बड़ाबगला	Large Egret	<i>Egretta thula</i>	Ardeidae
9	गलगल	White neck stork	<i>Ciconia episcopus</i>	Ciconidasae
10	गलगल	White stork	<i>Ciconia ciconia</i>	Ciconidasae
11	हरजिला ढेंक	Adjutant stork	<i>Leptoptilos dubius</i>	Ciconidasae
12	सफेद बुजा	White Ibis	<i>Threskiornis melanocephalus</i>	Threskiornithidae
13	सील्ही	Lesser Whistling	<i>Dendrocygna javanica</i>	Anatidae
14	सुरखाब	Brambling Duck	<i>Tadorna ferruginea</i>	Anatidae
15	केरा	Common teal	<i>Anas crecca</i>	Anatidae
16	खेरा	Blue winged Teal	<i>Anas querquedula</i>	Anatidae
17	पनाओ तिलारी	Shoveller	<i>Anas clypeata</i>	Anatidae
18	लोसिर	Red crested pochard	<i>Netta rufina</i>	Anatidae
19	कुरचिया	White eyed	<i>Arthya nyroca</i>	Anatidae
20	गुरगरी पनडुब्बी	Cottontail Duck	<i>Nettapus coromensis delianus</i>	Anatidae
21	नकटा	Nukta duck Combeduck	<i>Sarkidiornis melanotos</i>	Anatidae
22	दुबारू	Tufted pochard Tufted duck	<i>Nyroca fuligula</i>	Anatidae
23	कपासी	Blackwinged kite	<i>Elanus caeruleus</i>	Accipitridae
24	चील	Common pariah kite	<i>Milvus migrans</i>	Accipitridae

25	शिकरा	Shikra	Accipiter badius	Accipitridae
26	शाहबाज	Crested Hawk Eagle	Spizaetus cirrhatus	Accipitridae
27	ओकाब	Towny eagle	Aquila refax	Accipitridae
28	गिद्द	Bengal Vulture	Gyps bengalensis	Accipitridae
29	सफेद गिद्द	White scavenger Vulture	Neophron perenopterus	Accipitridae
30	राज गिद्द	King Vulture	Torgas calvus	Accipitridae
31	कोरुटिया	Kestrel	Falco finnunculus	Accipitridae
32	डोगरबिल	Crested Serpent Eagle	Spilomis cheela	Accipitridae
33	काला तीतर	Black partridge	Francolinus francolinus	Phasianidae
34	सफेद तीतर	Gray partridge	Francolinus Pondicerianus	Phasianidae
35	बटेर	Common or Gray quail	Coturnix coturnix	Phasianidae
36	काला तीतर	Painted Patrdge	Francolinus pictus	Phasianidae
37	लावा	Jungle Bush quail	Perdicula asiatica	Phasianidae
38	छोटी जंगली मुर्गी	Red spur fowl	Galloperdix spondica	Phasianidae
39	जंगली मुर्गी	Red jungle fowl	Gallus gallus	Phasianidae
40	मोर, मयूर	Common pea fowl	pavo cristatus	Phasianidae
41	बगला, सारस	Common crane	Lirus grus	Cruidae
42	सारस, केन	Sarus crane	Antigone antigone	Cruidae
43	कलीम / फैम	Moor hen	Porphyrio poliocephalus	Rallidae
44	जल मुर्गी	Purple moorhen	Gallinula chloropus	Rallidae
45	पिहुंआग	Pheasant tailed Jacana	Hydrophasianus chirurgus	Jacanidae
46	पीपी	Bronze winged Tacona	Metopidius indicus	Jacanidae
47	आहाद्री / राजचाहा	Painted Snipe	Rostratula benghalensis	Rostratulidae
48	गजपीन	Black winged stilts	Himantopus himantopus	Recurvirostridae
49	बरसिरी	Stone curlew	Burhinus oedicnemus	Burhinidae
50	छोटा बटान	Eastern golden plover	Pluvialia columbaus	Charadridae

51	सुरमा	Red shank	Tringa totanus	Charadridae
52	तितुरी	Red wattled lapwing	Lobivanellus indicus	Charadridae
53	तिरदी	Yellow wattled lapwing	Lobiplubea malabarica	Charadridae
54	चहा	Fantail snipe	Capella gallianago	Charadridae
55	तेहरी कुकरी	Indian whiskered tern	Chlidonias hybrida	Laridae
56	हरीयल	Common green pigeon	Treron crocopus phoenicoptera	Collumbidae
57	कबूतर	Blue rock pigeon	Columba livia	Collumbidae
58	घरफाखता	Indian ring dove	Streptopelia dicaoicto	Collumbidae
59	चिट्टा फाखता	Spotted dove	Streptopelia chinensis	Collumbidae
60	सिरौती फाखता	Red turtle dove	Streptopelia tranquebarica	Collumbidae
61	राय तोता	Large Indian Parakeet	Psittacula eupatria	Psittacidae
62	तोता	Rose ringed Parakeet	psittacula krameri	Psittacidae
63	दुईया तोता	Blossom headed Parakeet	Psittacula cyanocephala	Psittacidae
64	पपीहा	Cuckoo	Cuculus varius	Cuculidae
65	कोयल	Koel	Endynamis scolopaceus	Scolopaceae
66	मोखा	Coucal	Centropus sinensis	Cuculidae
67	पपीहा चातक	Pied crested Cuckoo	Clamator jacobinus	Cuculidae
68	उल्लू	Owl Bubo bubo	Stricidae	
69	जंगली चोघड़	Owlet	Glaucidium radiatum	Stricidae
70	चिपक	Common Indian night jar	Coproimulagus asiaticus	Caprimulgidae
71	बड़ा बतासी	Alpine swift	Apus melba	Apodidae
72	बबीलो बतासी	House swift	Apus affinis	Apodidae
73	किलकिला	Piedking fisher	Ceryle rudis	Alcedinidae
74	छोटा किलकिला	Common king fisher	Alcedo atthis	Alcedinidae
75	किलकिला	White breasted King fisher	Halcyon smyrnensis	Alcedinidae
76	कोरिला	Black capped king fisher	Haleyan pileata	Alcedinidae

77	बड़ा पतरिंगा	Blue cheeked bee eater	Merops superciliosus	Meropidae
78	पतरिंगा	Green bee eater	Merops orientalis	Meropidae
79	बड़ा पतरिंगा	Blue tailed bee-eater	Merops Philipinus	Meropidae
80	नीलकंठ	Indian roller Blue jay	Coracias benghalensis	Coracidae
81	हुद्दुद	Indian Hoopoe	Upupa epops	Coracidae
82	चलोतरा	Common hornbill	Tokus birostris	Bucerotidae
83	घनचुरी	Pied hornbill	Anthracoceres coronatus	Bucerotidae
84	छोटा बासाथा	Crimson breasted- barbot Coppersmith	Negalaima haemacephala	Capitonidae
85	कठफोड़ा	Golden backed woodpecker	Dinopim benghalense	Picidae
86	कठफोड़ा	Yellow fronted Pied woodpecker	Picoides manrattensis	Picidae
88	नवरंग	Indian pitta	Pitta brachyura	Pittidae
89	दियोरा	Black belied finch lark	Eremopterix grisea	Alaudidae
90	लेसरा	Indian cliffswall	Hirundo fluvicola	Hirundinidae
91	लेसरा	Wire tailed swallow	Hirundo smithii	Hirundinidae
92	कगला लटोरा	Rufous backed Shrike	Lanius schach	Lamidae
93	पीलक	Golden Oriole	Oriolus oriolus	Oriolidae
94	पीलक	Black headed oriole	Oriolus xanthomus	Oriolidae
95	भुजंग	King crow; Black Drongo	Dicrurus adsimilis	Dicuridae
96	पहाड़ी भुजंग	White bellied Drongo	Dicrurus caerulescens	Dicuridae
97	भीमराज	Large Racket tailed Drongo	Dicrurus paradiseus	Dicuridae
98	तगरिया बाबिल	Ashy Shallow shrike	Artamus fusus	Dicuridae
99	पावई	Grayheaded myna	Sturnus malabaricus	Sturnidae
100	आगिया	Rufous tailed	Ammon anes	Alaudidae
101	ब्रह्मण मैना	Black headed myna	Pogonornis sturnus	Sturnidae
102	तिलयर	Rosy pastar	Sturnus roseus	Sturnidae

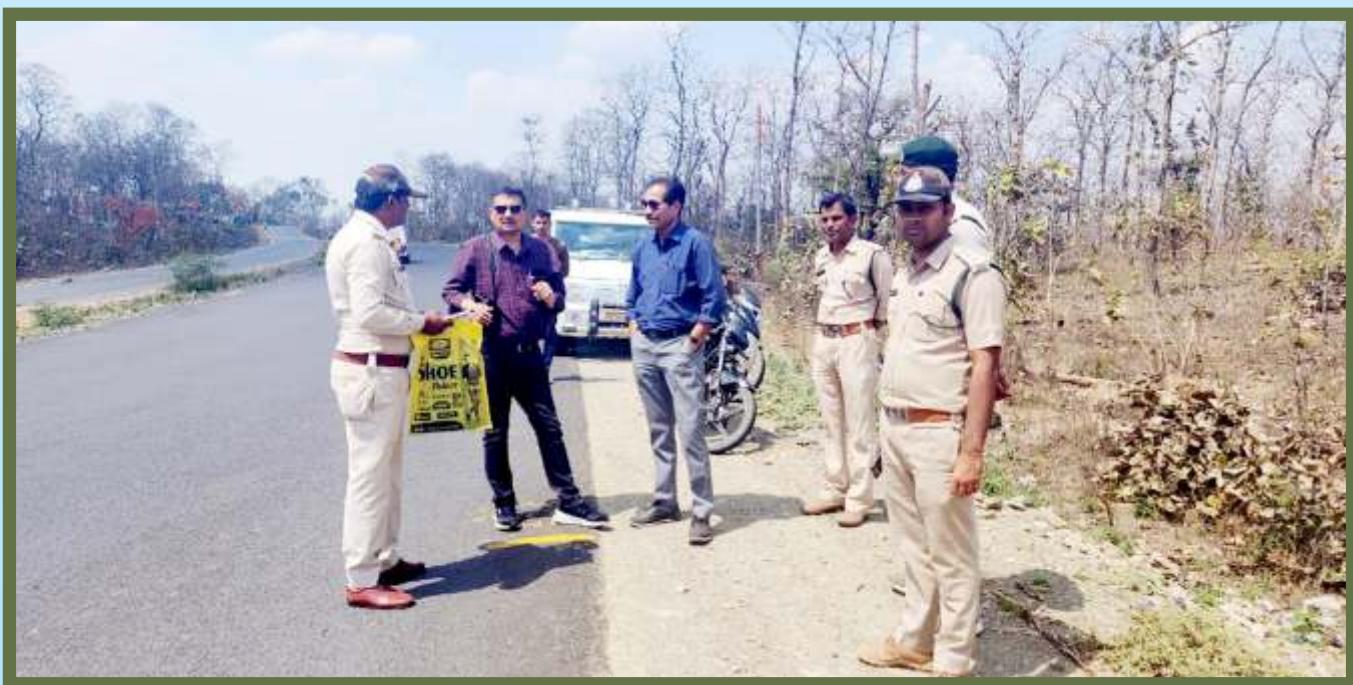
103	अबलक मैना	Piedmyna sturno	Pastor contra	Sturnidae
104	मैना	Common myna	Aerodo therestrists	Sturnidae
105	जंगली मैना	Jungle myna	Aethip sarfuscus	Sturnidae
106	कौआ	House crow	Corvus splendens	Corvidae
107	जंगली कौआ	Jungle crow	Corvus macrorhynchos	Corvidae
108	माहालट	Mahalot	Dendrocitta vagabunda	Corvidae
109	बुलबुल	Small minivet	Pericrocotus cinnamomaus	Campeghagidae
110	पहाड़ी बुलबुल	Scarlet minivet	Pericrocotus flammeus	Campeghagidae
111	कासया	Large Cuckoo	Coracina novachollandiae	Campeghagidae
112	शानबीजी	Iora Aegithina tiphia	Lrenidae	
113	रेवा	Green Bulbul	Chloropsis aurifrons	Lrenidae
114	हरेवा	Gold melted	Chloropsis ochinchensis	Lrenidae
115	पहाड़ी बुलबुल	Red whisked bulbul	Pycnonotus jocosus	Pycnontidae
116	बुलबुल	Red vented bulbul	Pyenonotus cater	Pycnontidae
117	सात बहन	Slaty heated Scimitar bulbular	Pomatorhinus schisticeps	Timalinae
118	सात भाई	Jungle babblar	Turdoides striatus	Timalinae
119	सात भाई	Quaker Babbler	Alcippe poioicephale	Timalinae
120	शमा	Tickell's bule flycatcher	Muscicapatickelline muscicapide	Muscicapinae
121	दूधराज	Paradise flycatcher	Terpsiphone paradisi	Muscicapinae
122	सन बुलबुल	Black naped blue flycatcher	Monarcha azurea	Muscicapinae
123	चकदिल	White spotted flycatcher	Rhipidura albicolor	Muscicapinae
124	चकदिल	White browed fantail flycatcher	Rhipidura aureola	Muscicapinae
125	फुटकी	Ashy wren warbler	Prinia socialis	Muscicapidae
126	शमा	Shama	Copsychus malbaricus	Muscicapidae
127	तिरतिरा	Red start	Phoenicurus ochruros	Turdinae

128	खरपिंडा	Collared Bushchat	Saxicola tarsnata	Turdinae
129	काला पिंडा	Pied Bushchat	Saxicola caprata	Muscicapidae
130	शमा	Blue headed Rock Thrush	Monticola cinclorhynchus	Turdinae
131	दैया	Magpie Robin	Copsychus saularis	Turdinae
132	कलचूरी	Indian Robin	Saxicolides falcata	Turdinae
133	राम गंगारा	Grey lit	Parus major	Paridae
134	राम गंगारा	Yellow checkdlit	parus xanthogenys	Paridae
135	कठफोड़िया	Chestnut Ballied Nuthatch	Sitta castanea	Sittidae
136	कठफोड़िया	Velvet fronted Nuthatch	Sitta frontalis	Sittidae
137	पिलकिया	Grey wagtail	Motacilla caspica	Motacillidae
138	धोबन	pied or White Wagtail	Motacilla alba	Motacillidae
139	खंजन	Large pied wagtail	Motacilla maderaspatensis	Motacillidae
140	पिलख	Yellow Wagtail	Motacilla glava	Motacillidae
141	फूलचुकी	Tickellus flower peaker	Dicaeum erythrarhynchos	Dicaedae
142	फूलचुकी	Fire Breasted fower Peaker	Dicaeum ignipectus	Dicaedae
143	शंकर खोरा	Purple sun Bird	Nectarinia asiatica	Nectarinidae
144	गोरैया	House Sparrow	Passer domesticus	Ploeiidae
145	बया	Weaver bird	Ploceus philippinus	Ploceidae
146	लाल मुनिया	Red munia	Estrilda amandava	Ploceidae
147	नकल नार	Black Headed Munia	Lonchura malacca	Ploceidae
148	पत्थर चितरा	Crested Bunbing	Melophus lathami	Emberizidae

## ANNEXURE- 3



Consultation meeting with Mr L. Krishnamurthy, Field Director, Satpura Tiger Reserve



Field discussion at Kesla Ghat



Under pass under construction at Kesla ghat



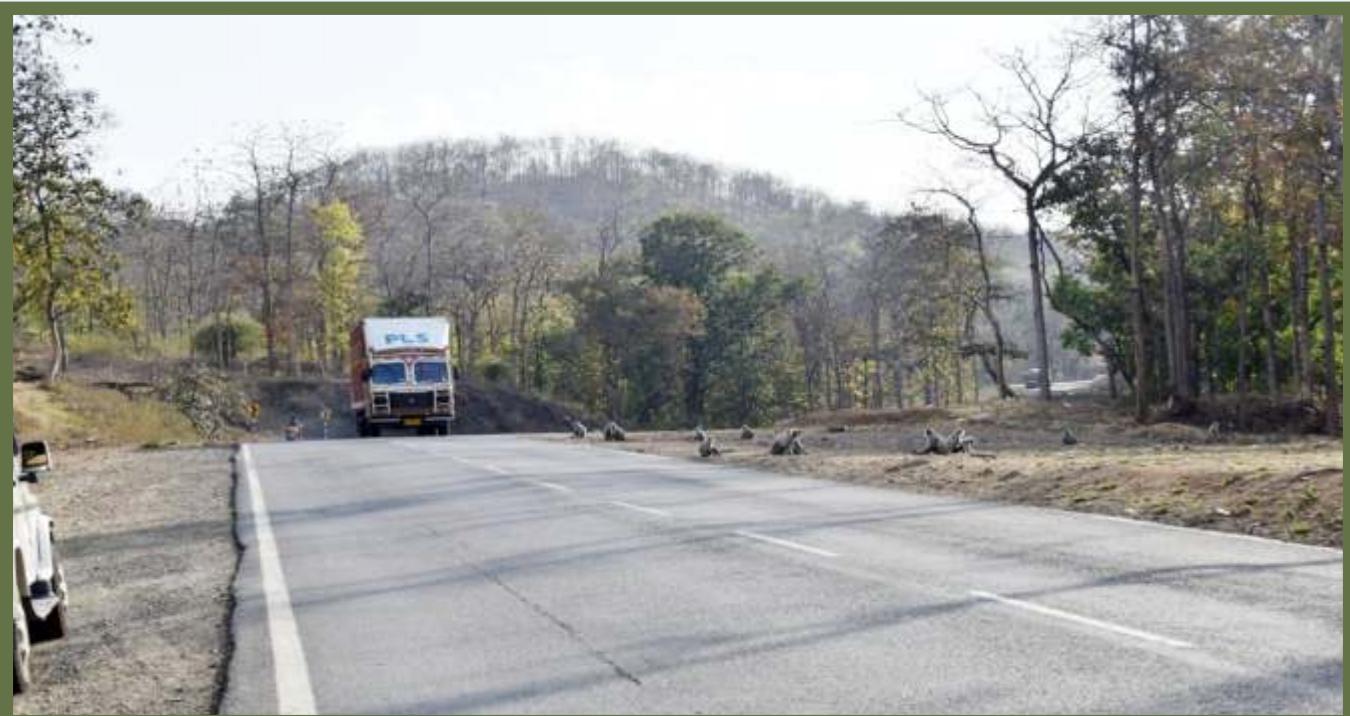
Water availability near Kesla ghat underpass



Vegetation along NH 46 at Kesla Ghat

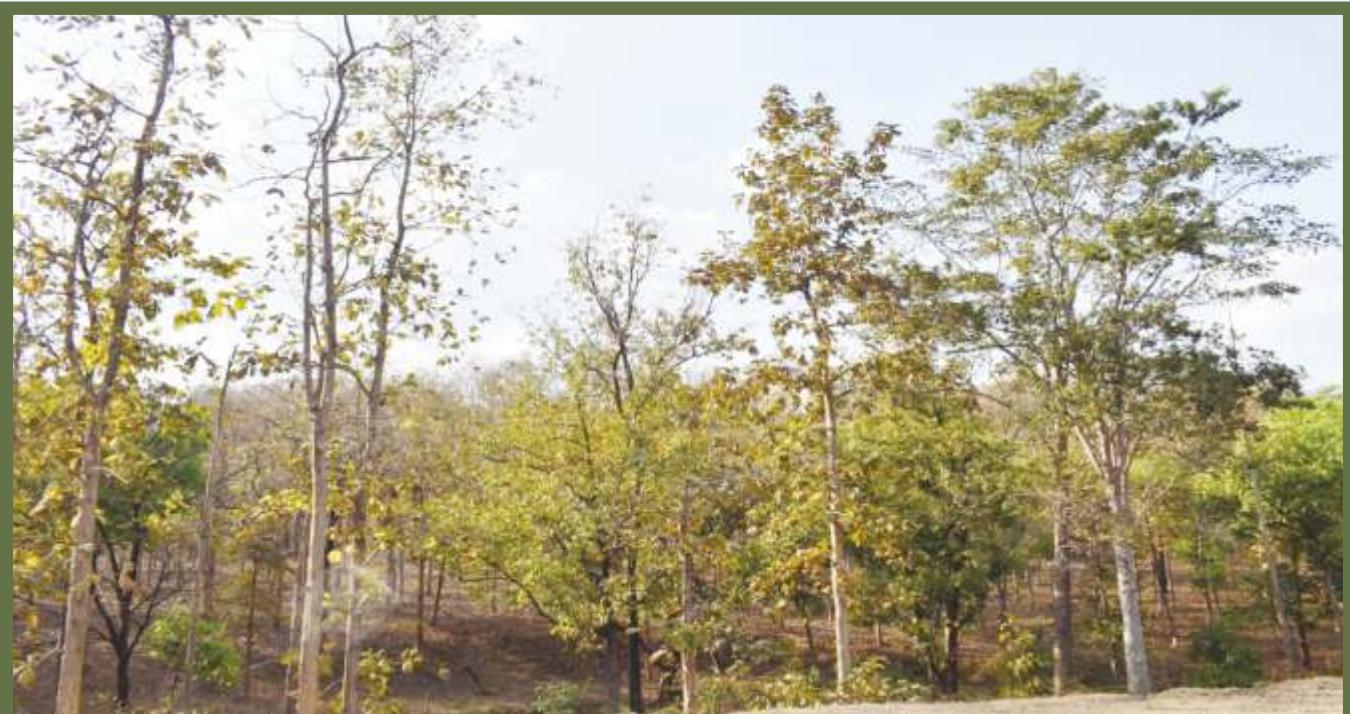


Inspection and discussion with staff at Kesla Ghat



Langurs sitting along NH 46 at Kesla Ghat





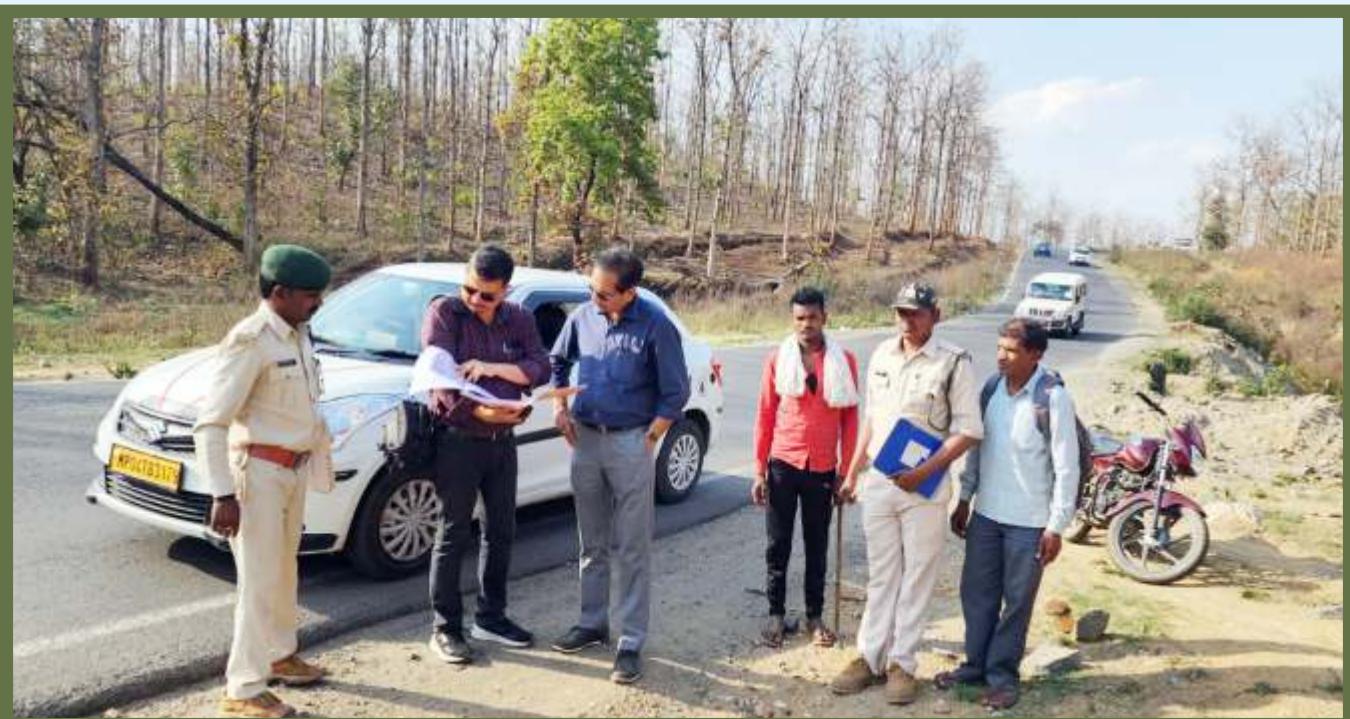
Forest cover along NH 46





Discussion with field staff in North Betul forest division





Data analysis and field verification





Field inspection in Bhaura area of North Betul forest Division



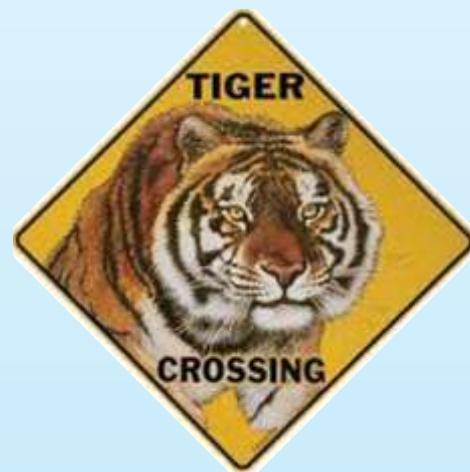


Notice boards displaying starting and end point of corridor in North Betul Forest Division



## ANNEXURE-3

### SIGNAGE IDEAS



### WILDLIFE CROSSING









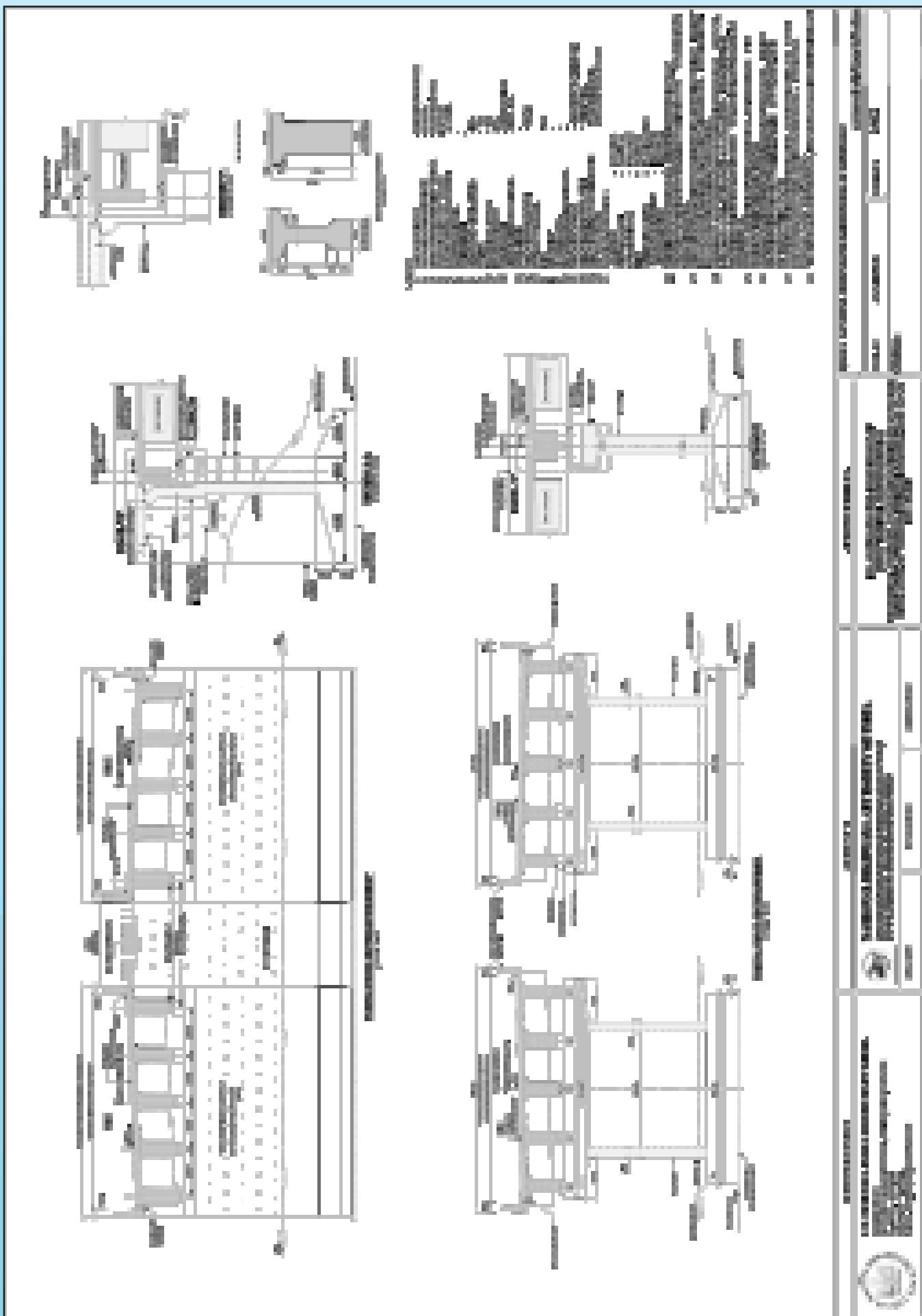
## TIGER CORRIDOR AREA

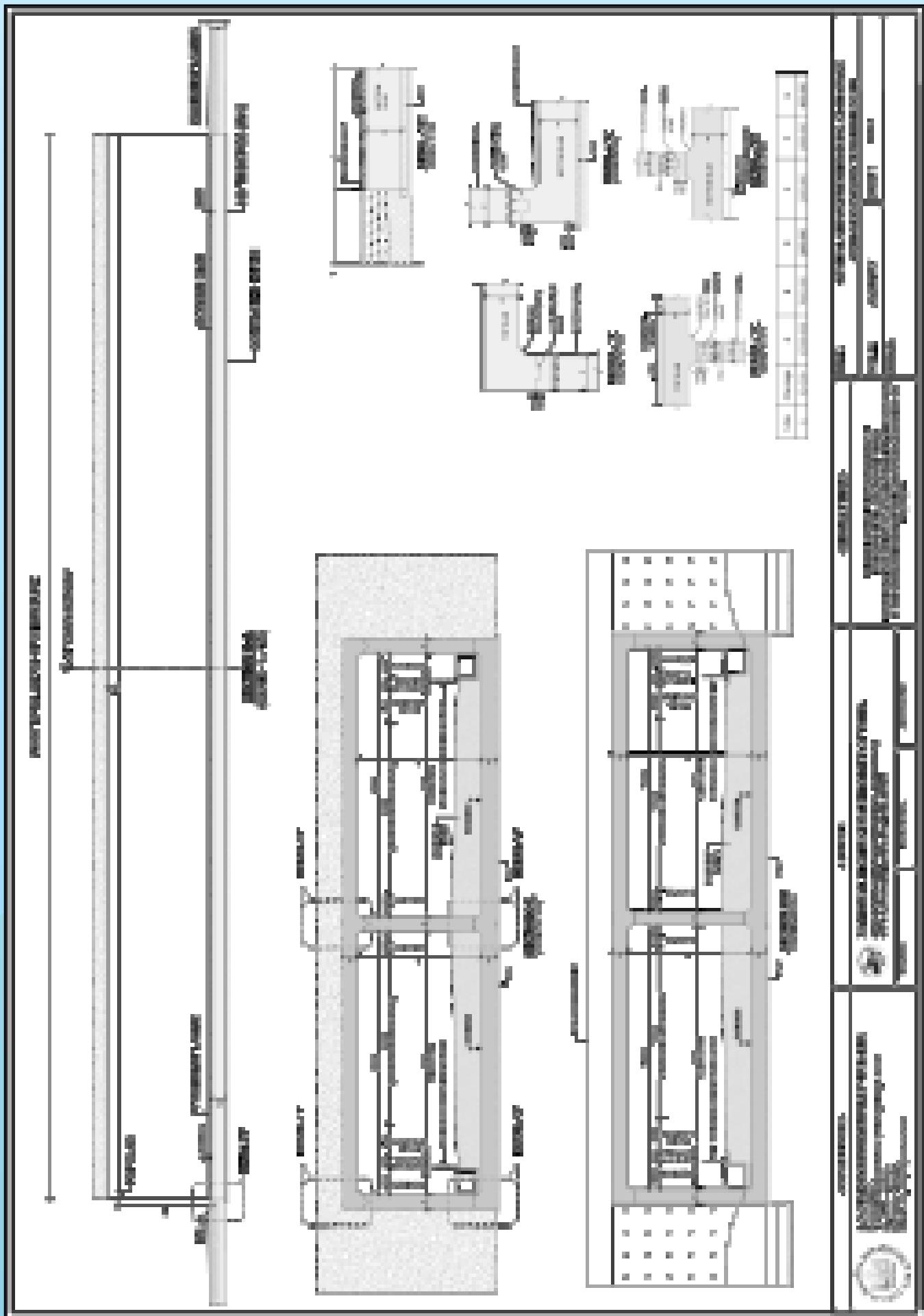
- DRIVE SLOWLY
- DO NOT FEED THE MONKEYS
- DO NOT SPREAD LITTER

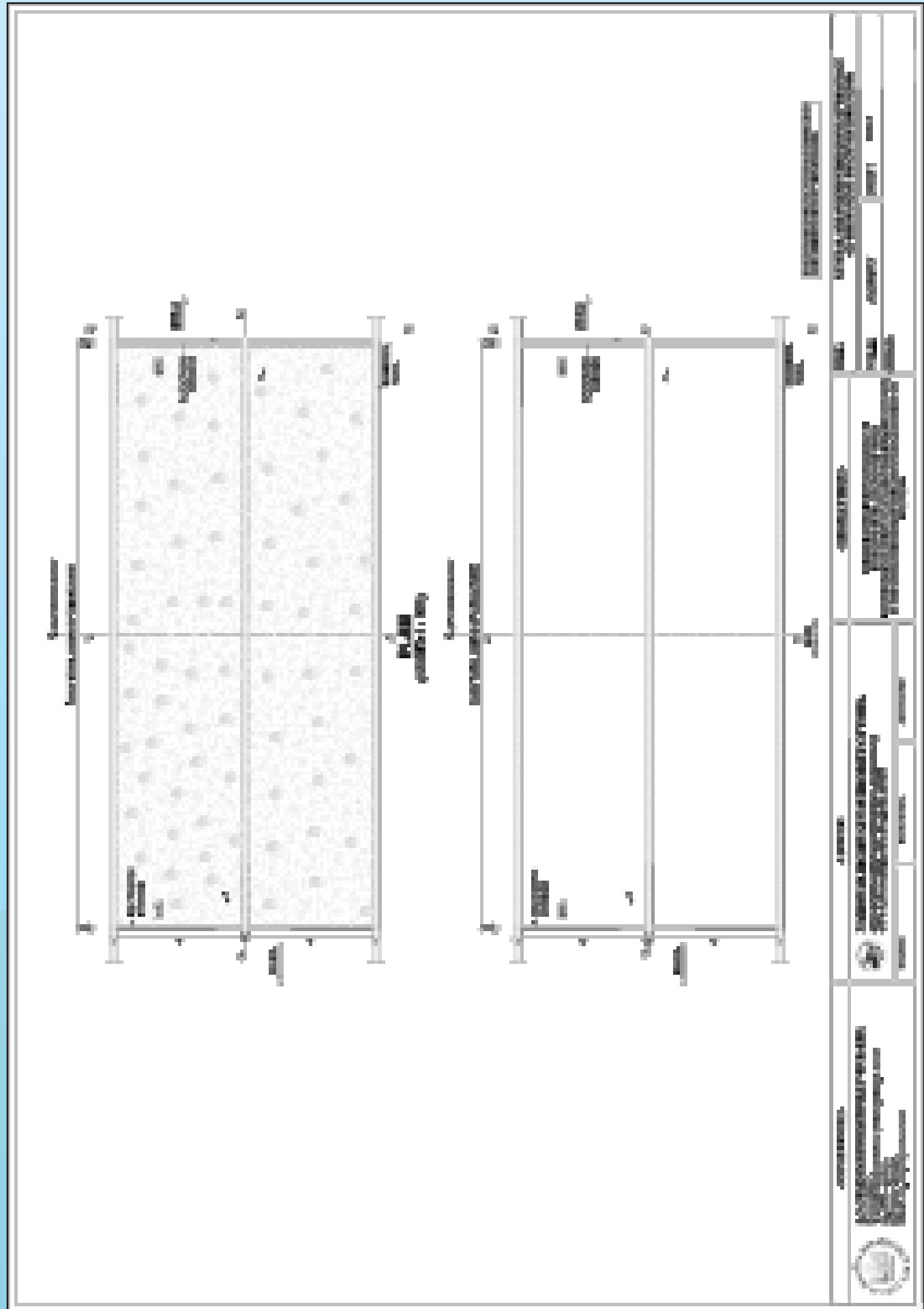


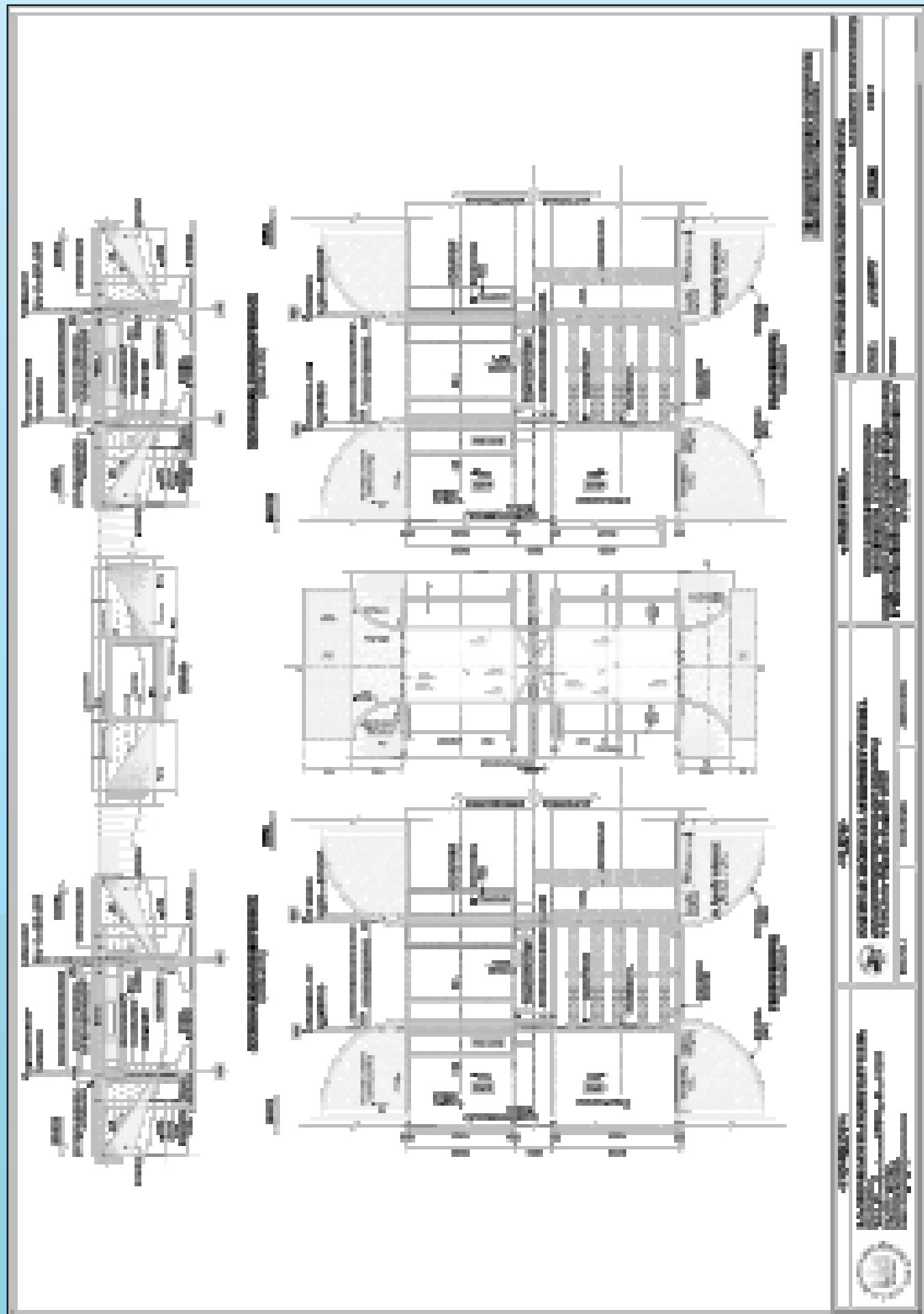
# General Arrangement Drawing

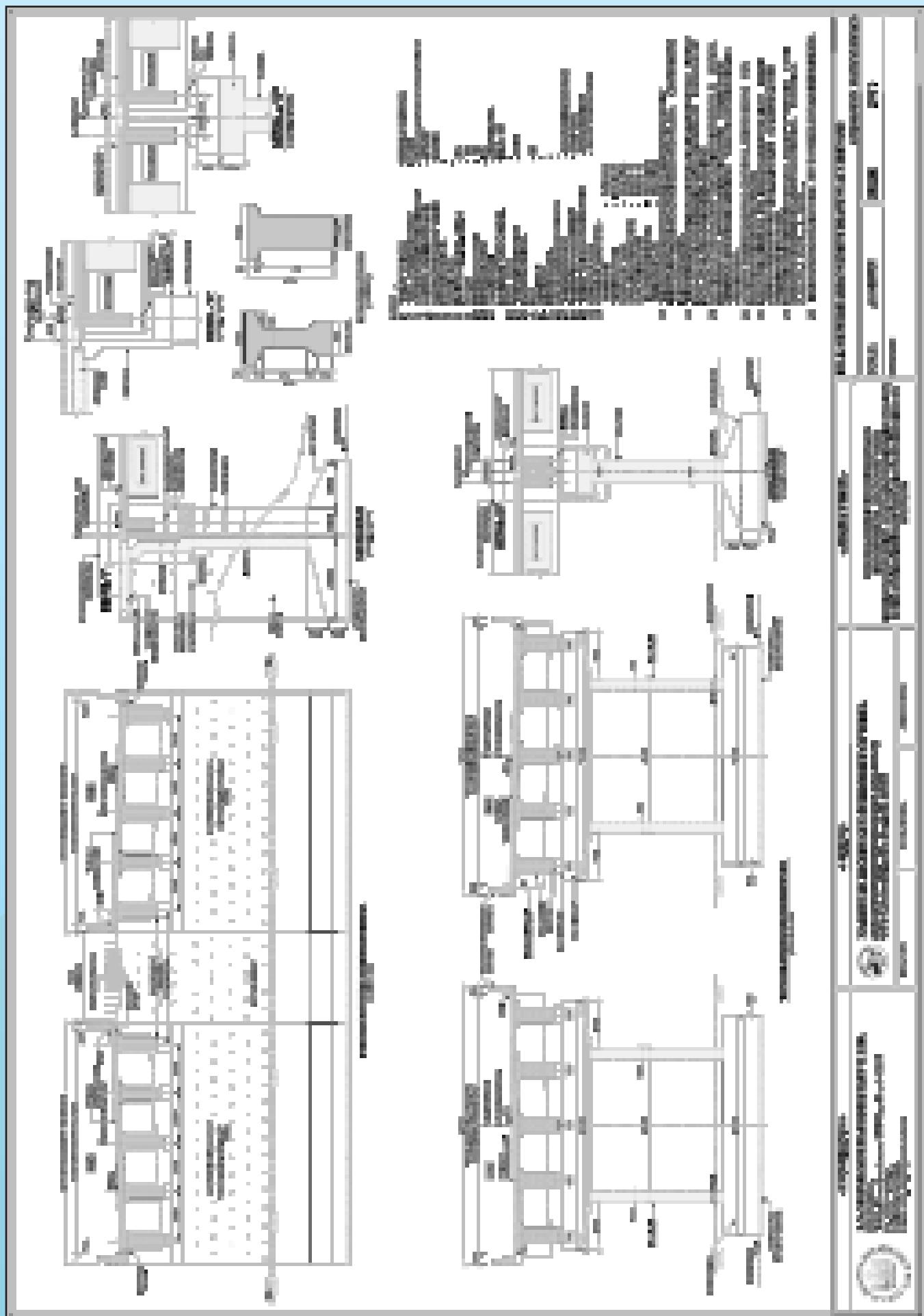




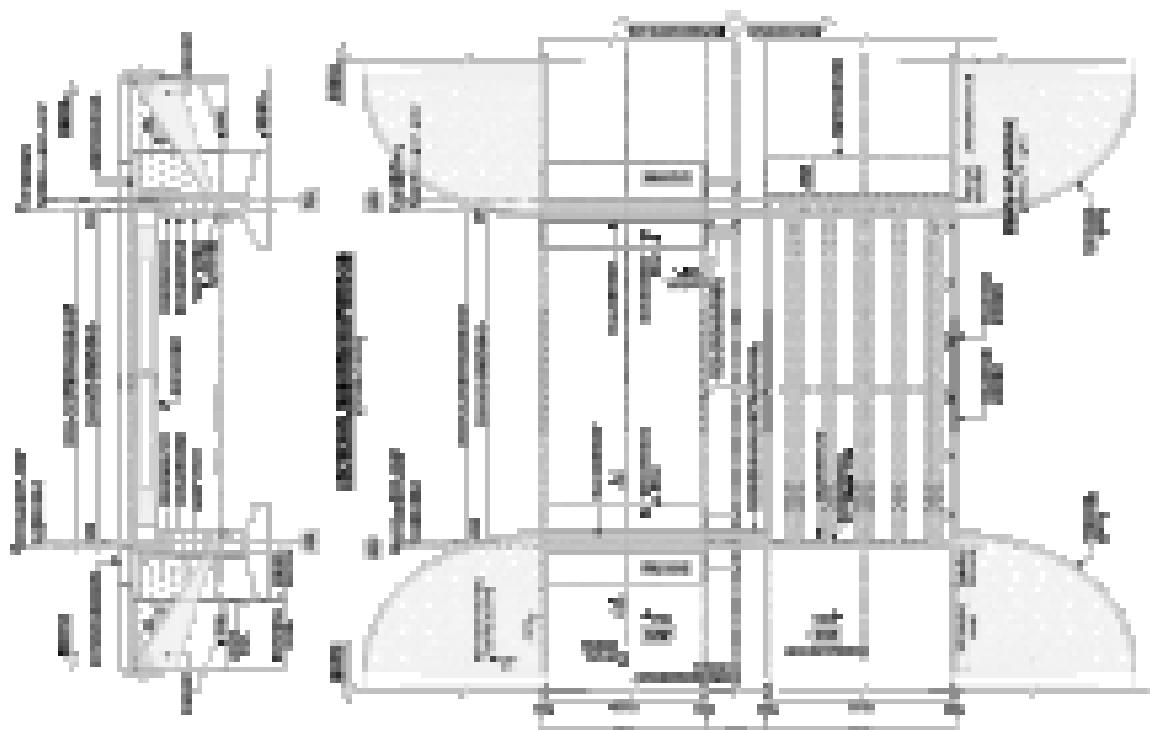




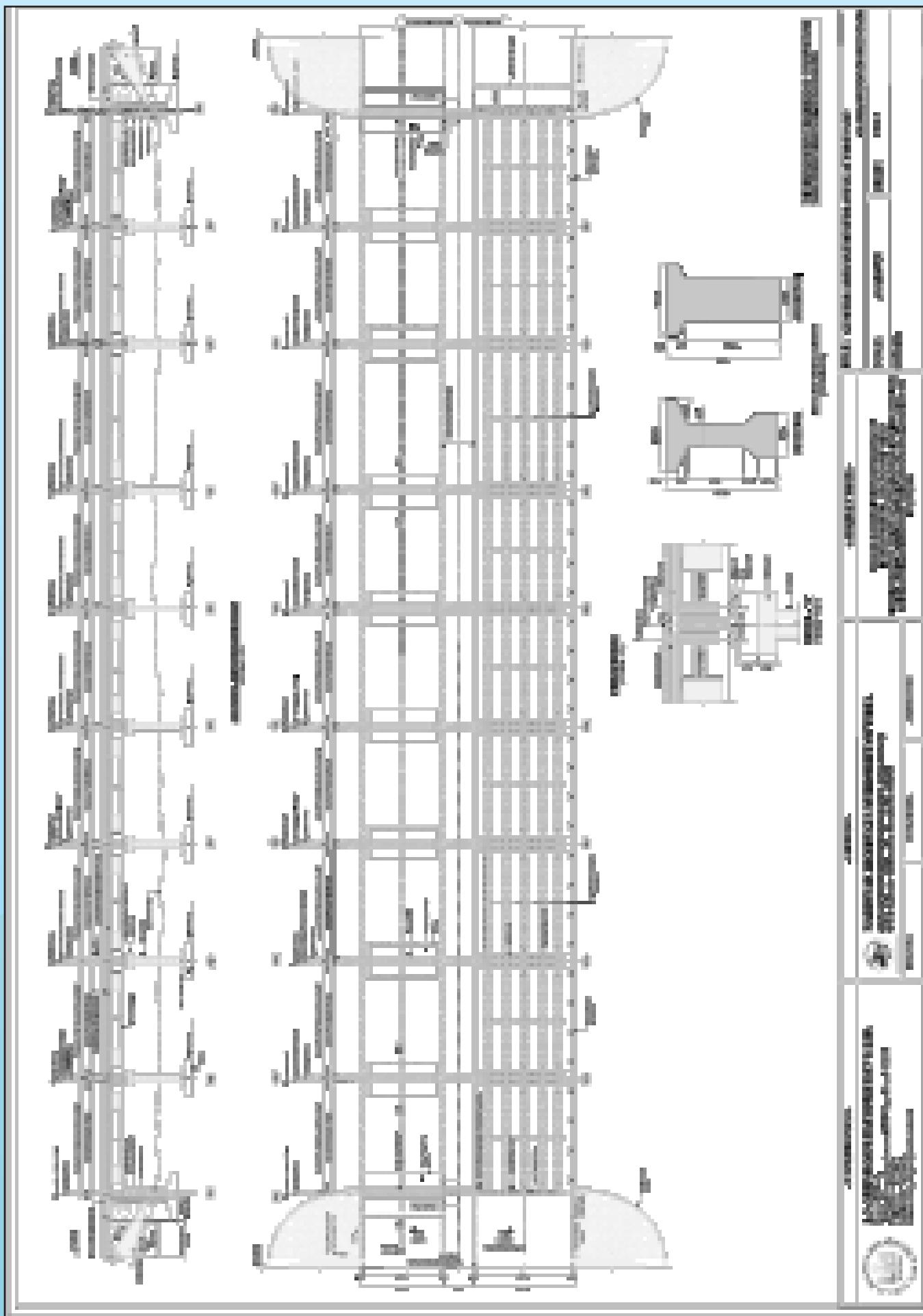


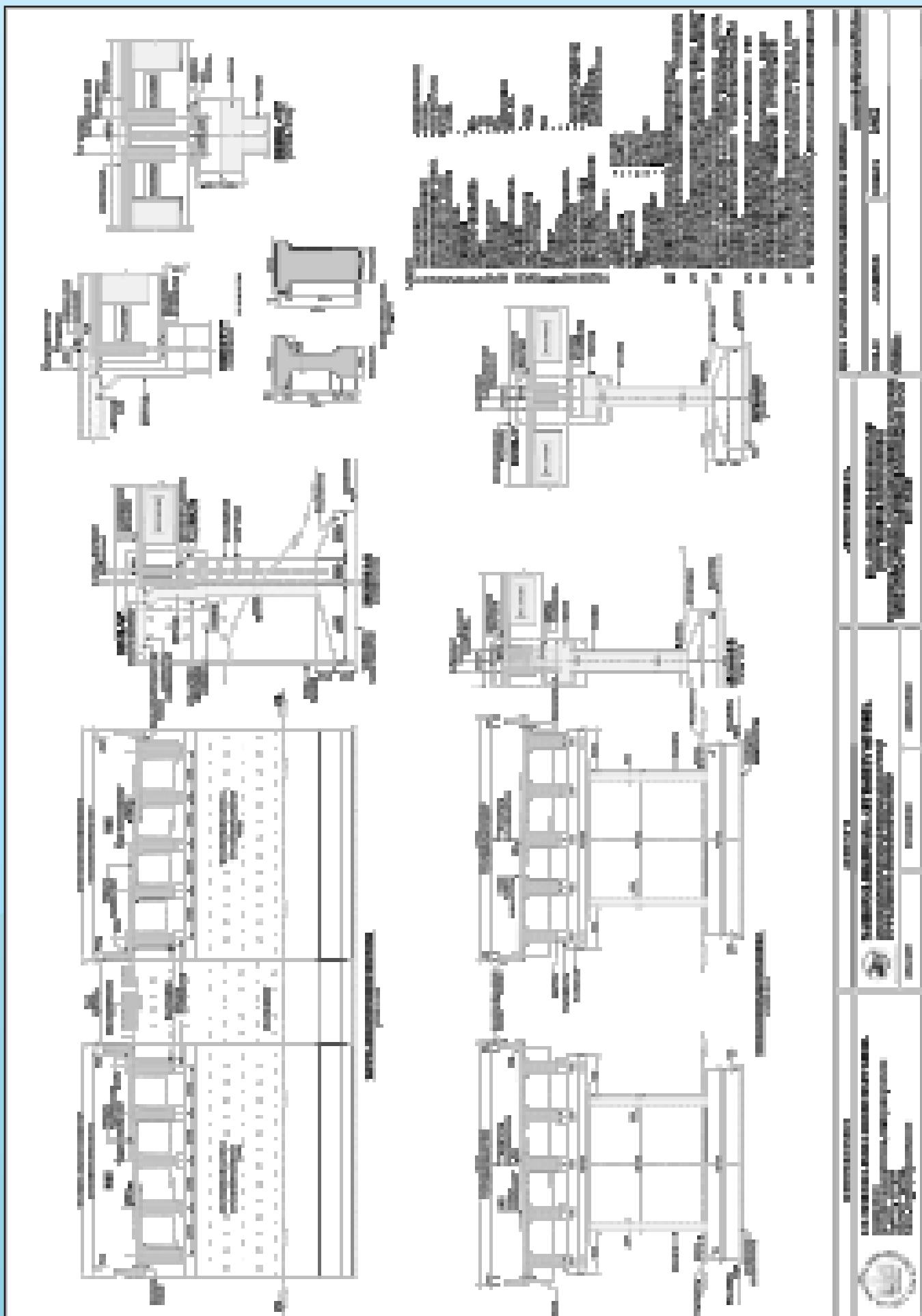


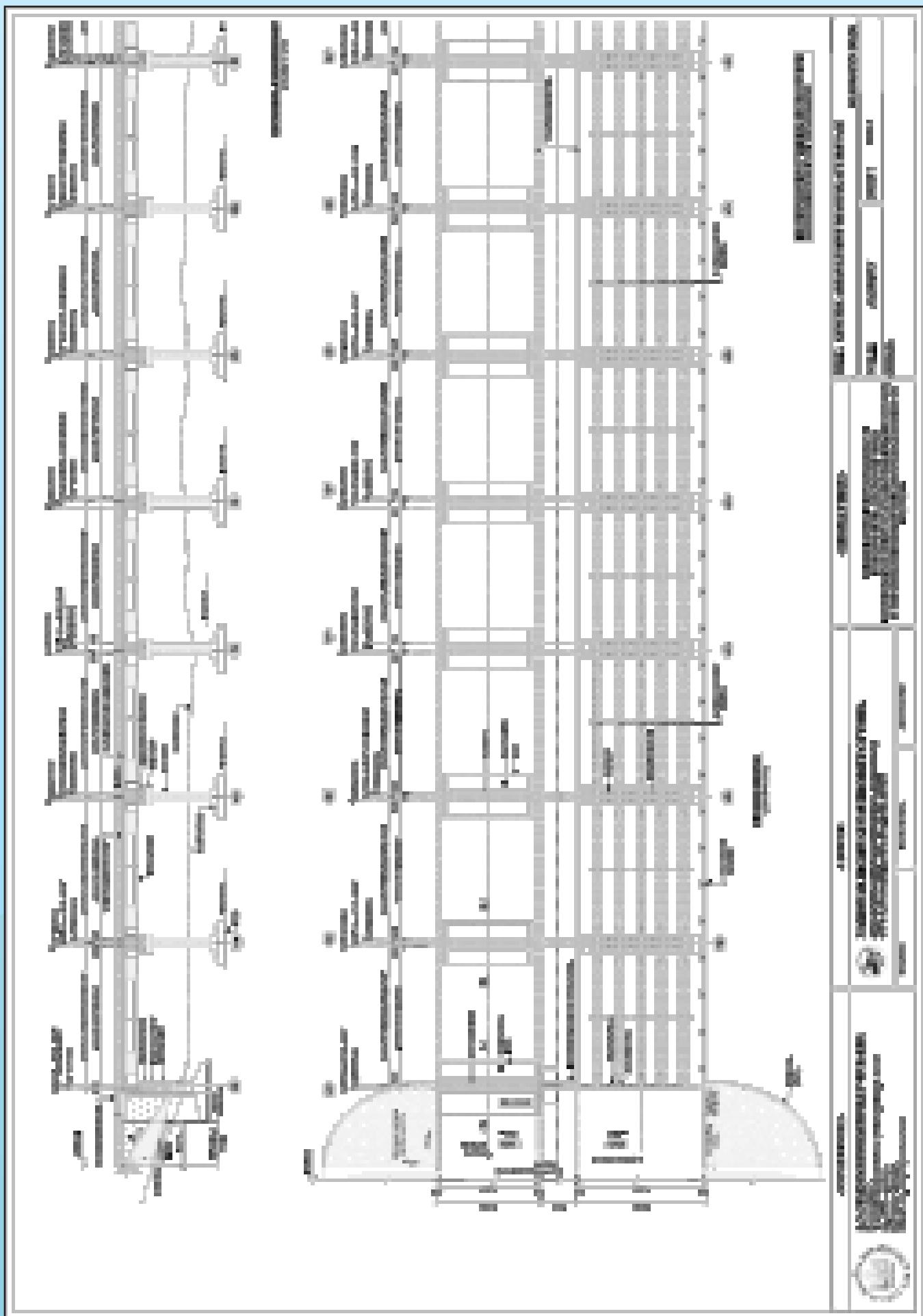




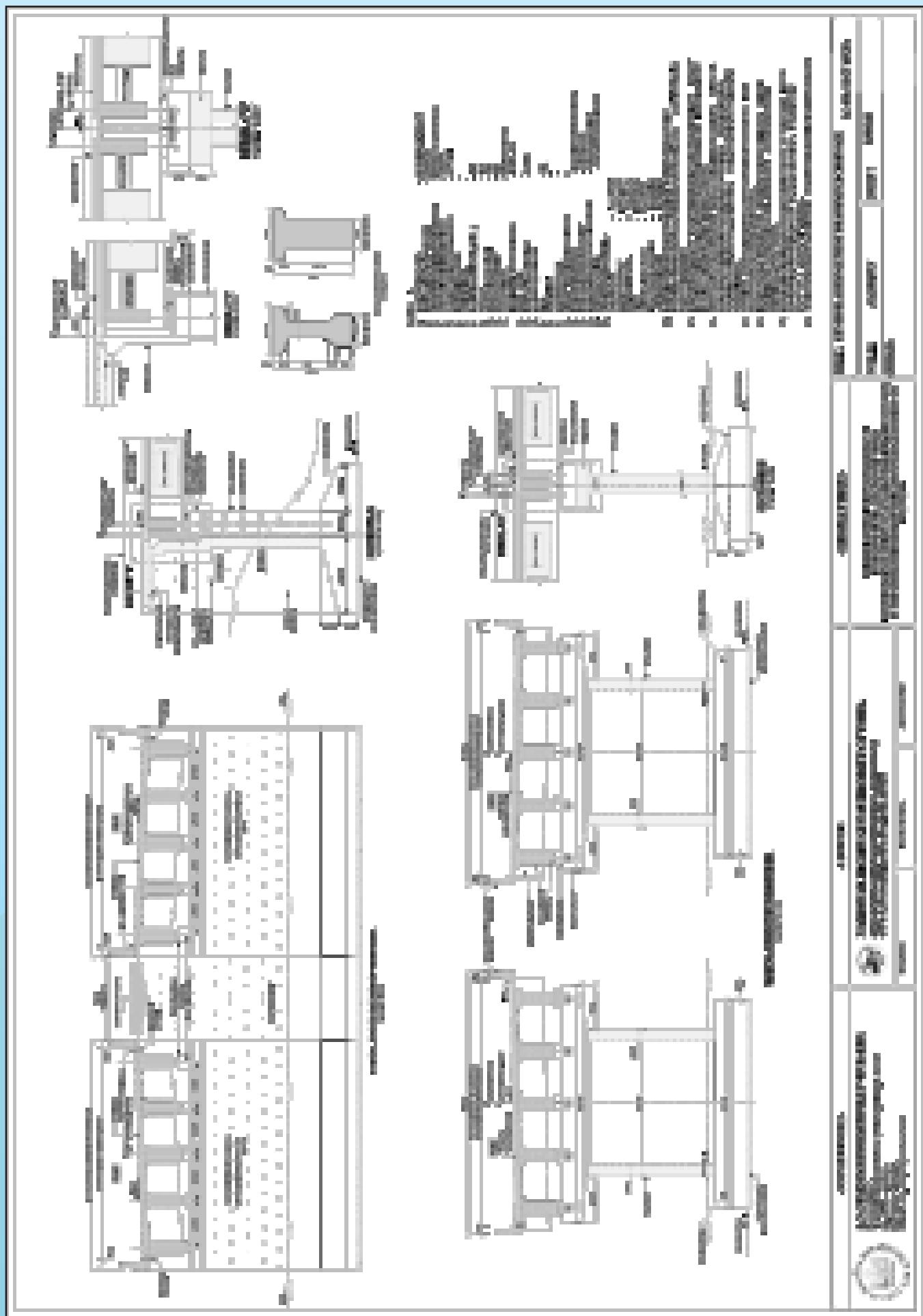


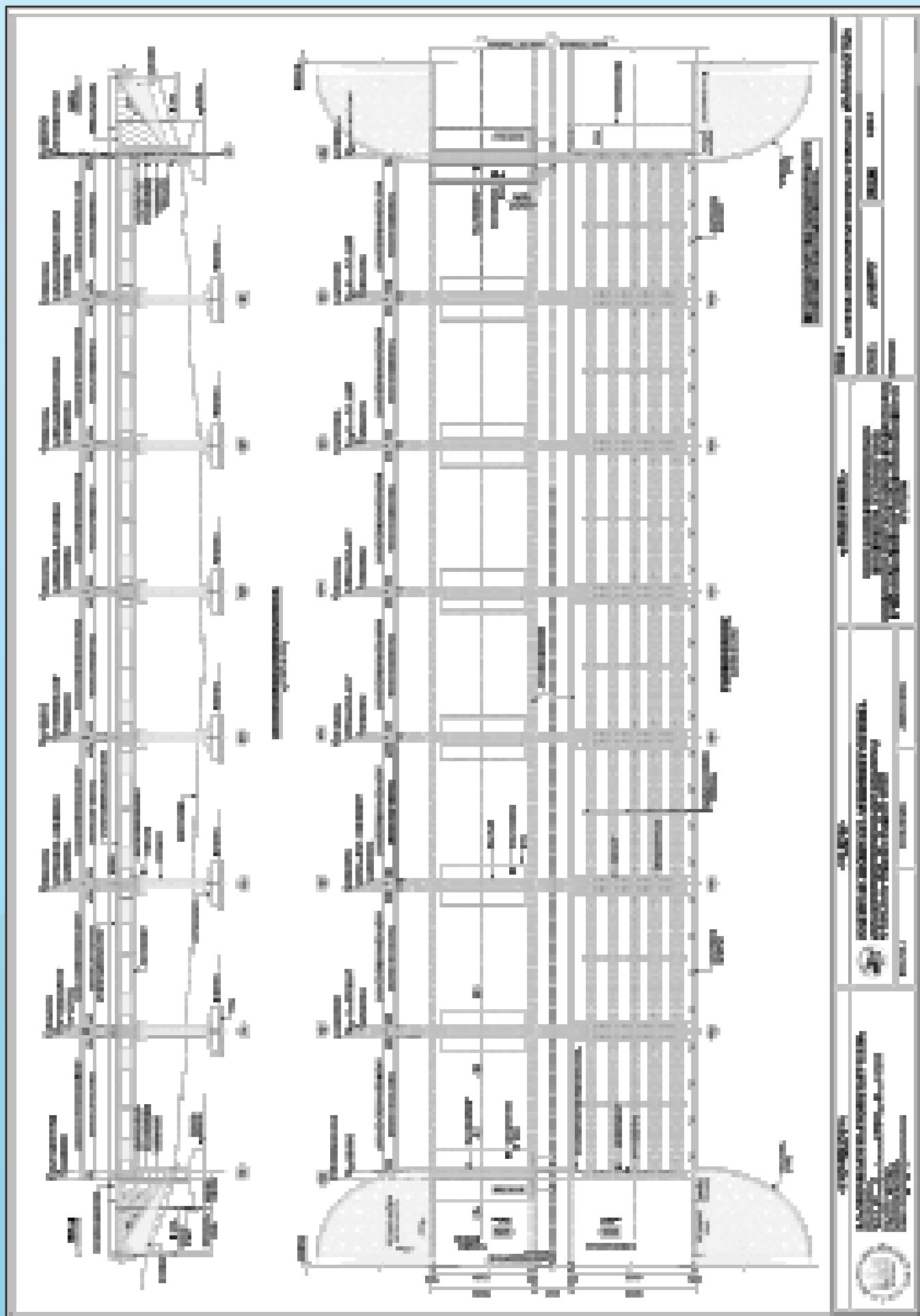




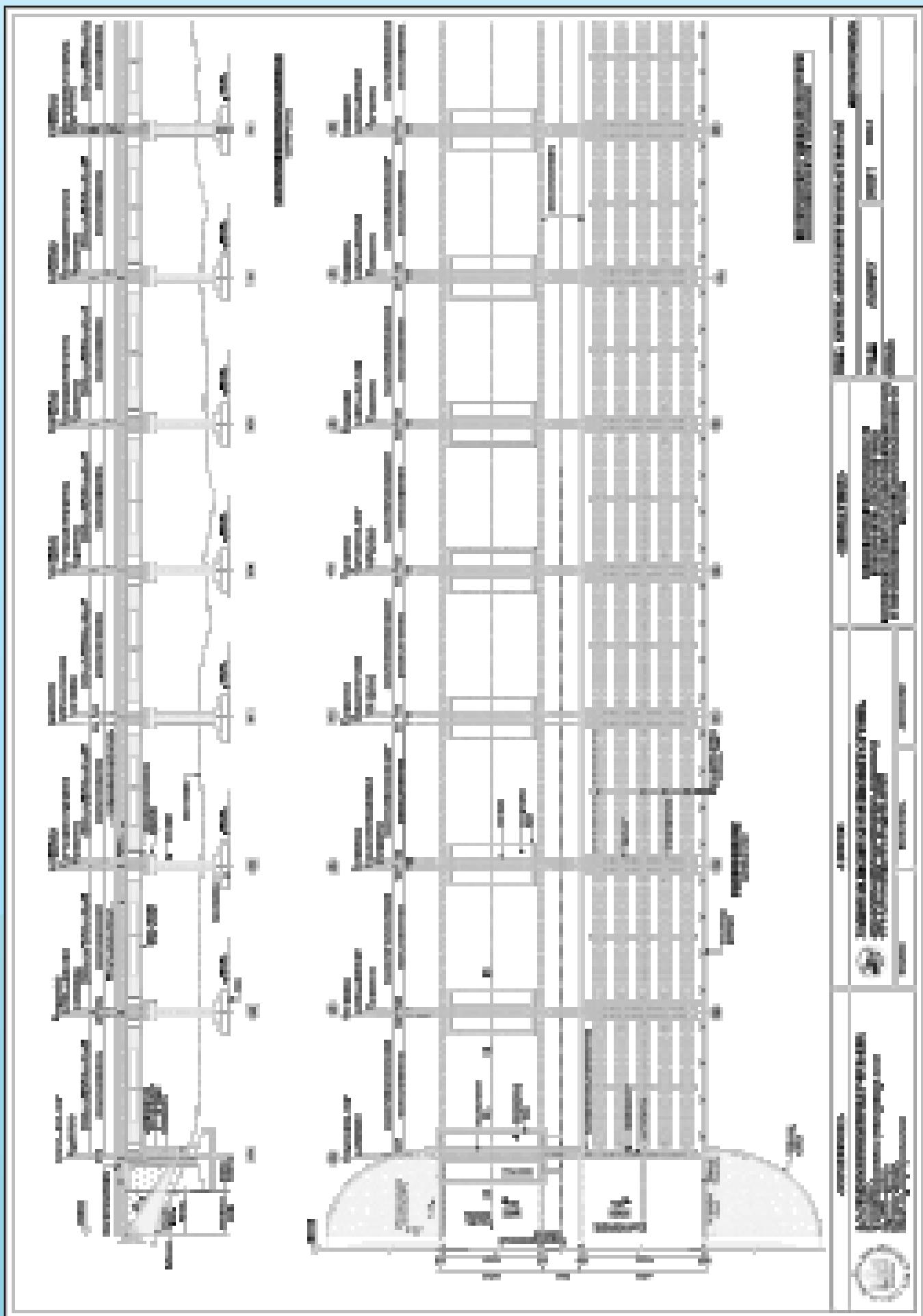


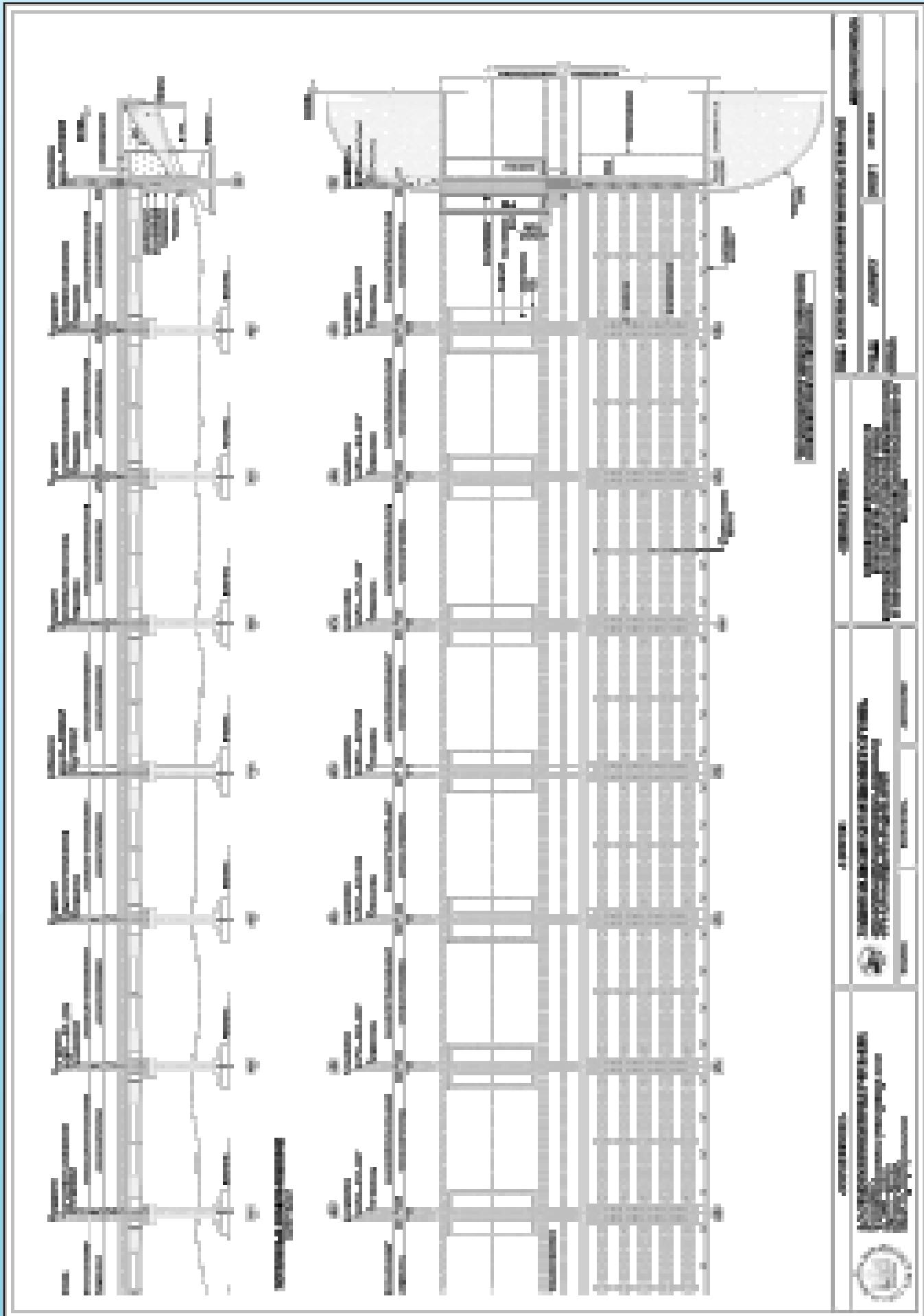




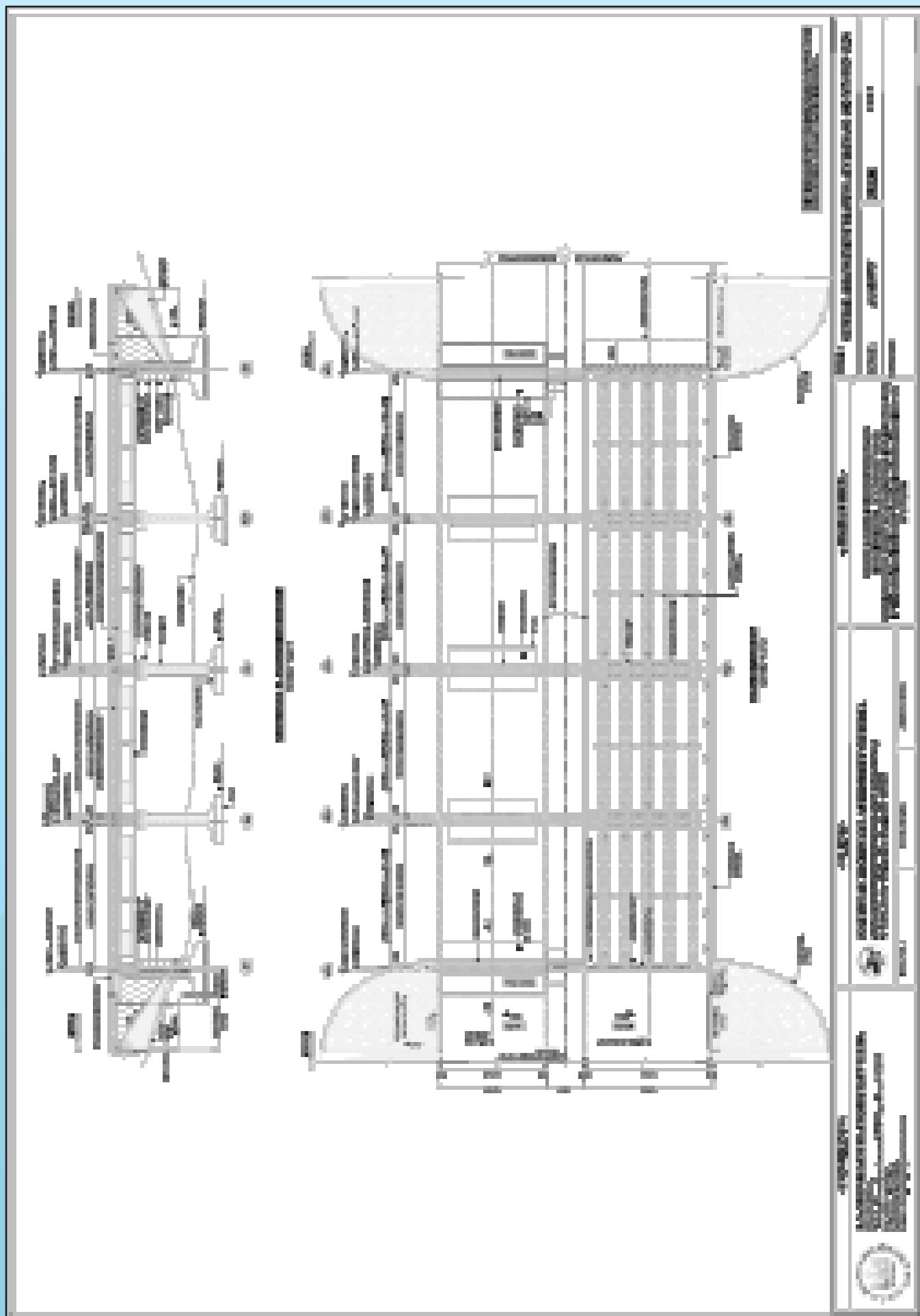


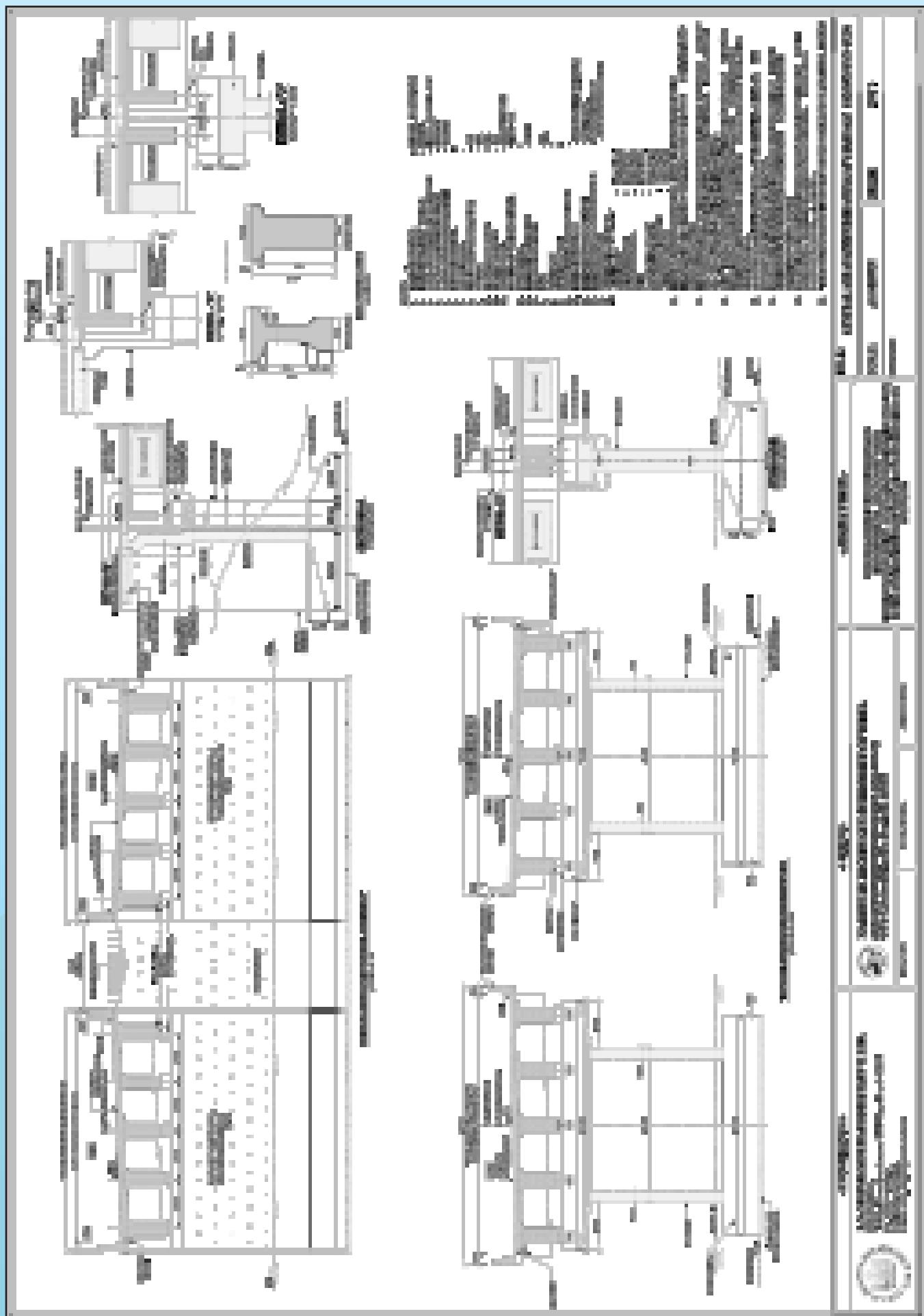


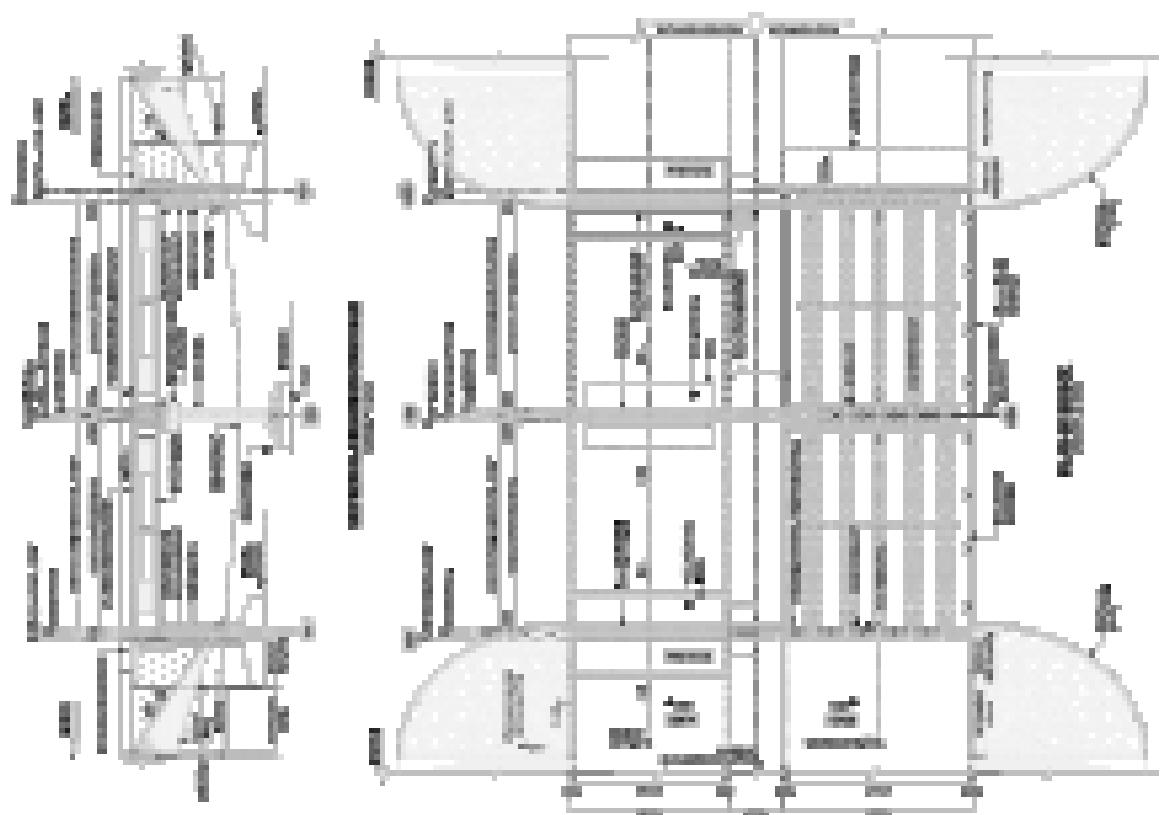




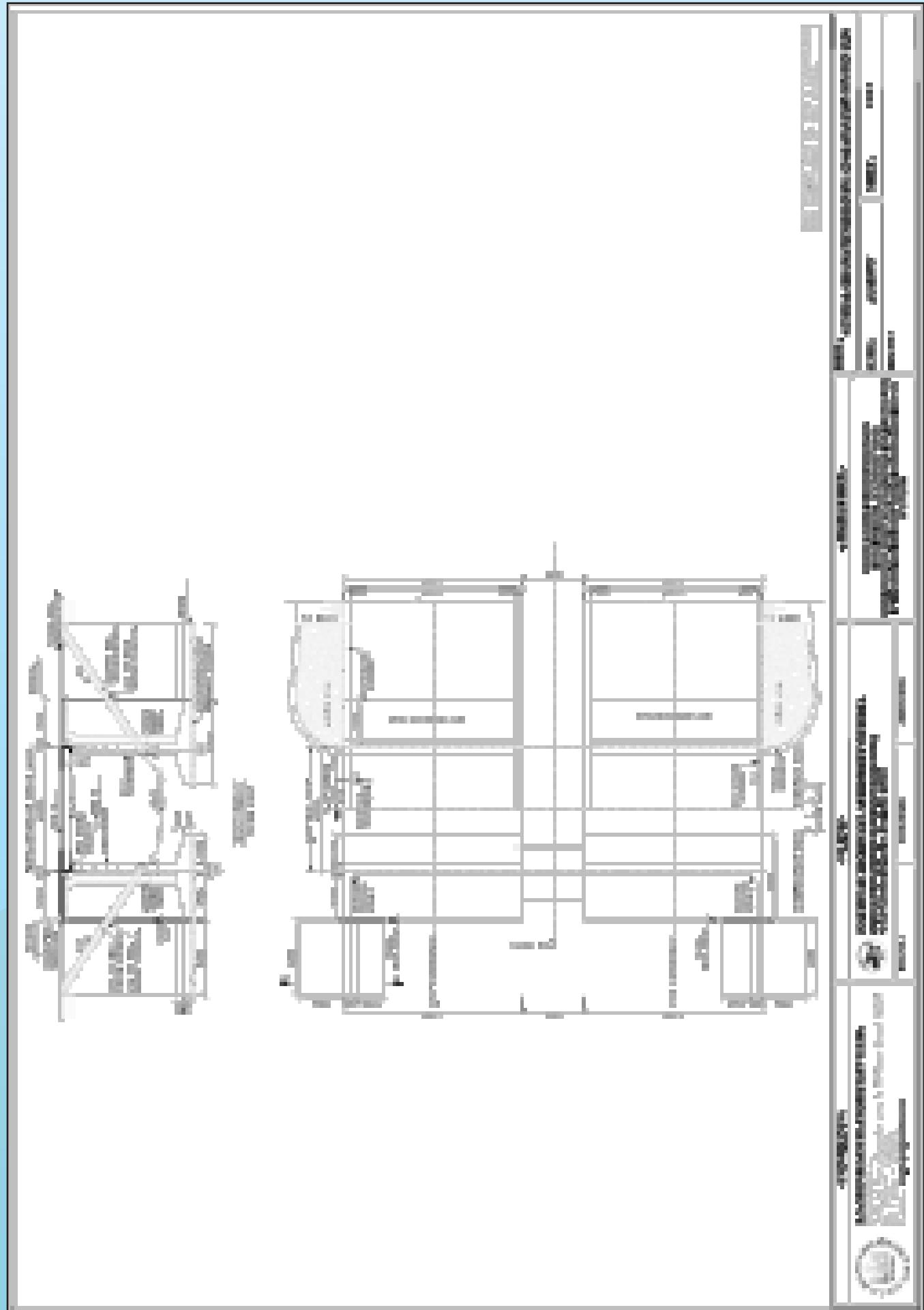


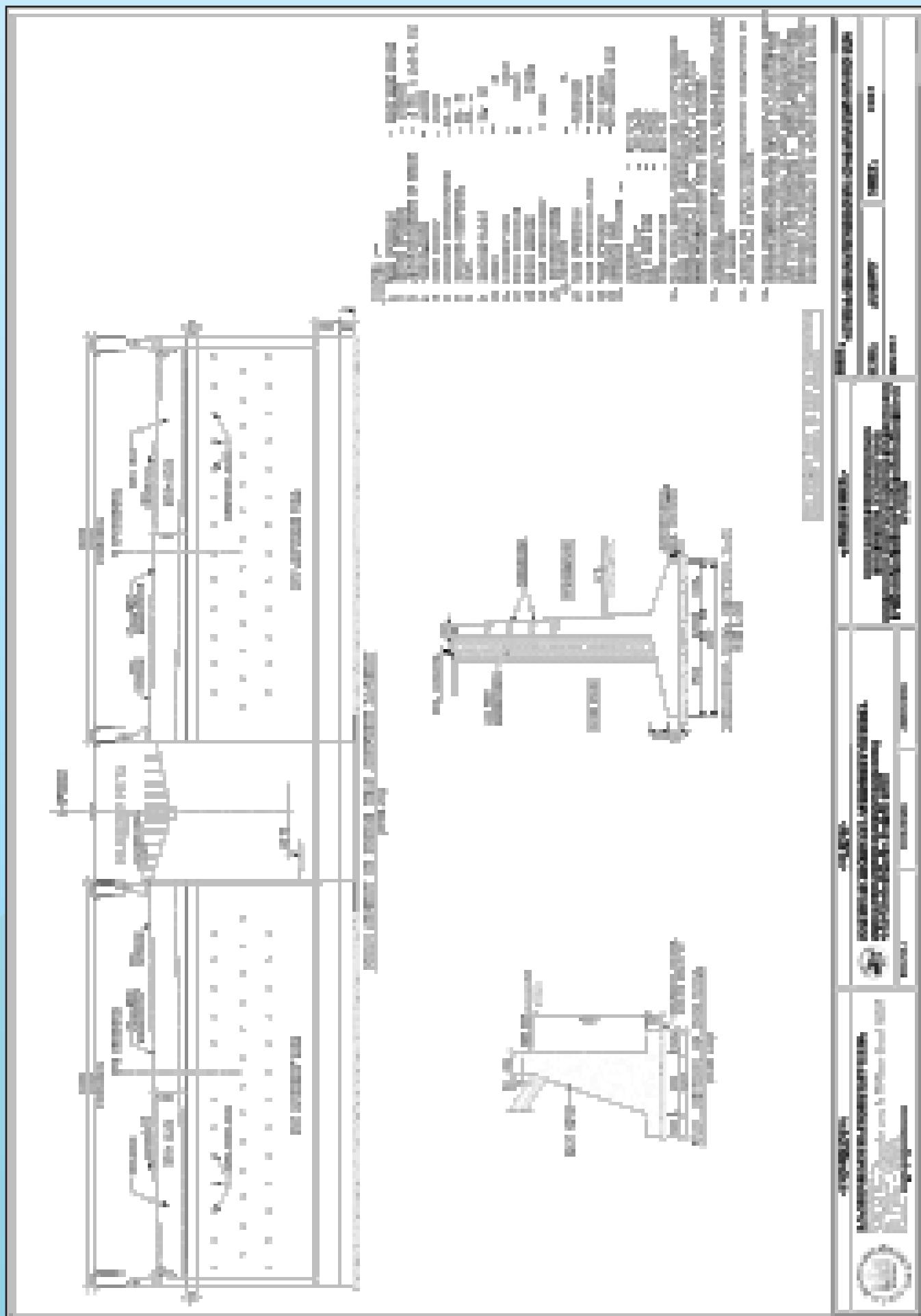


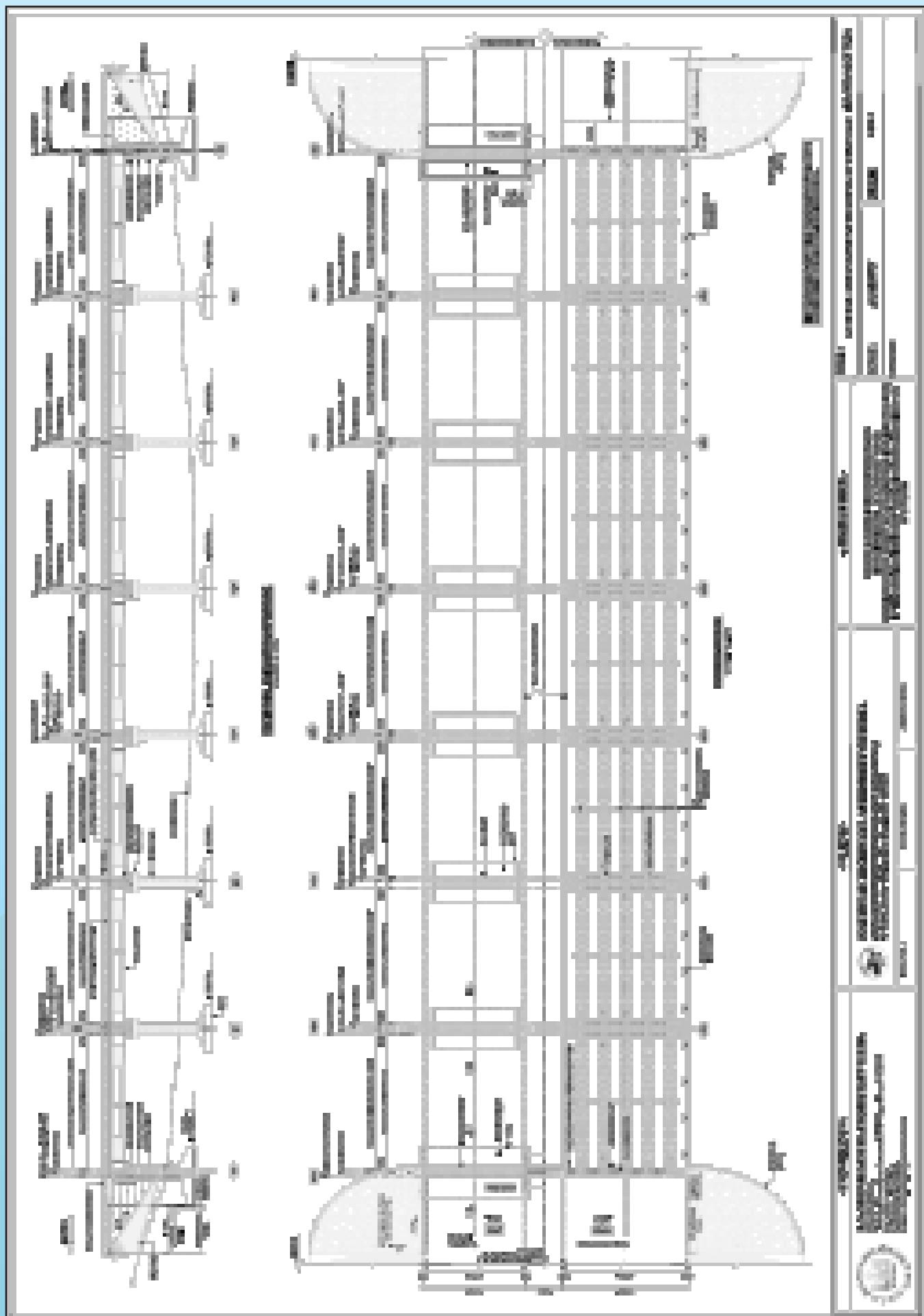




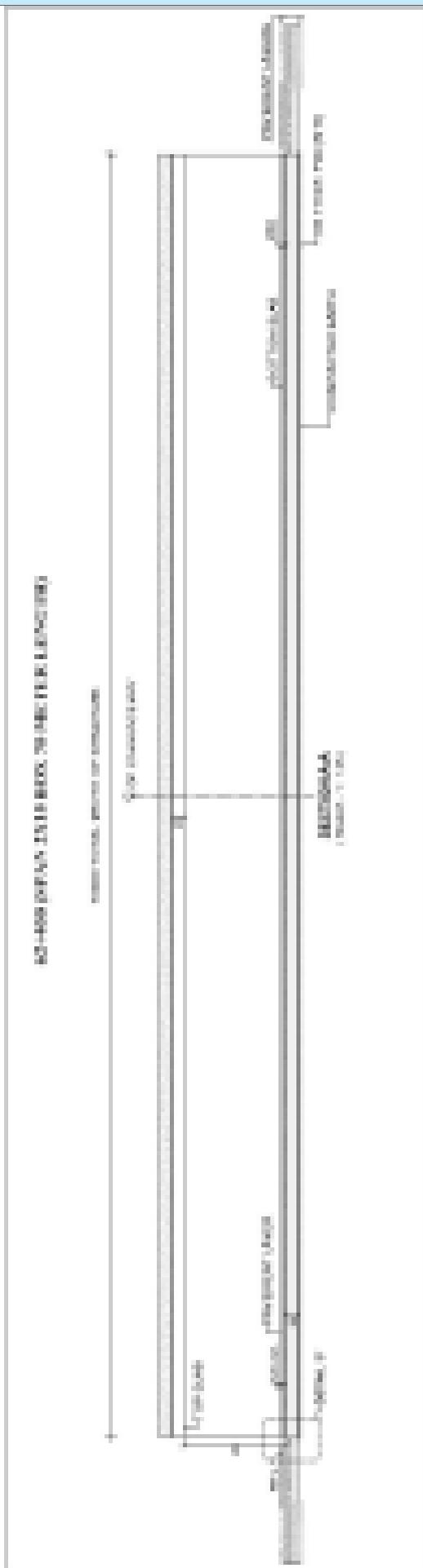


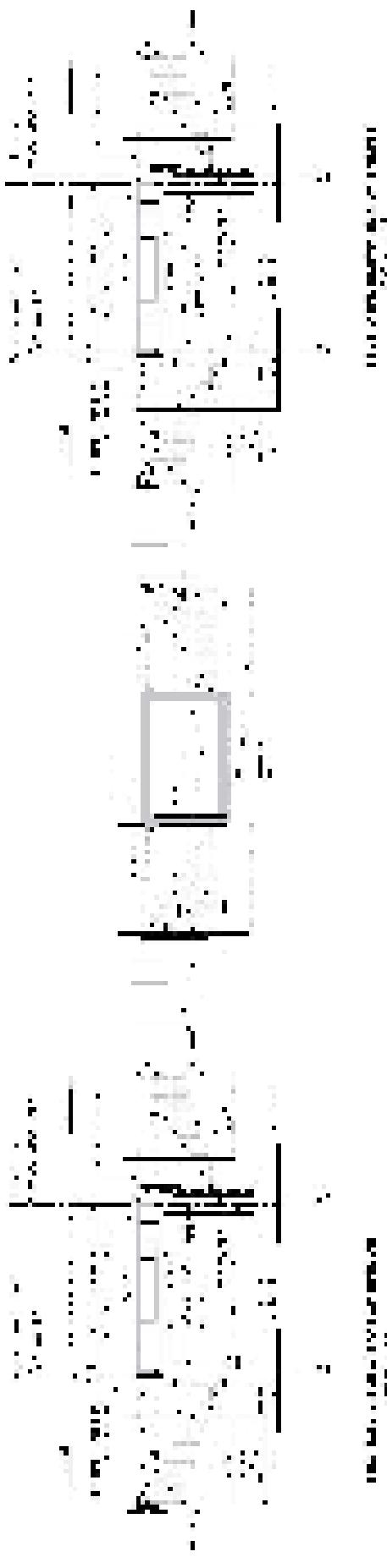




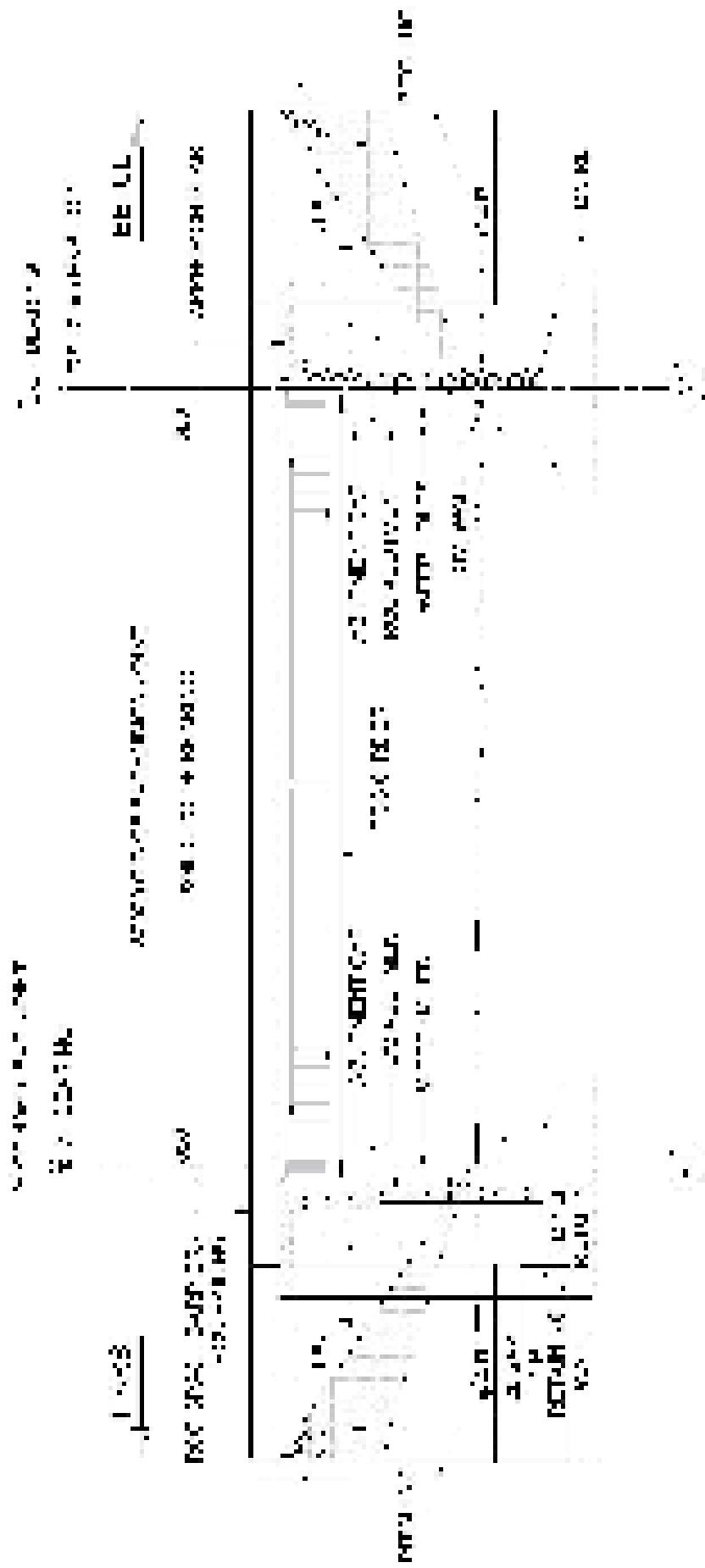




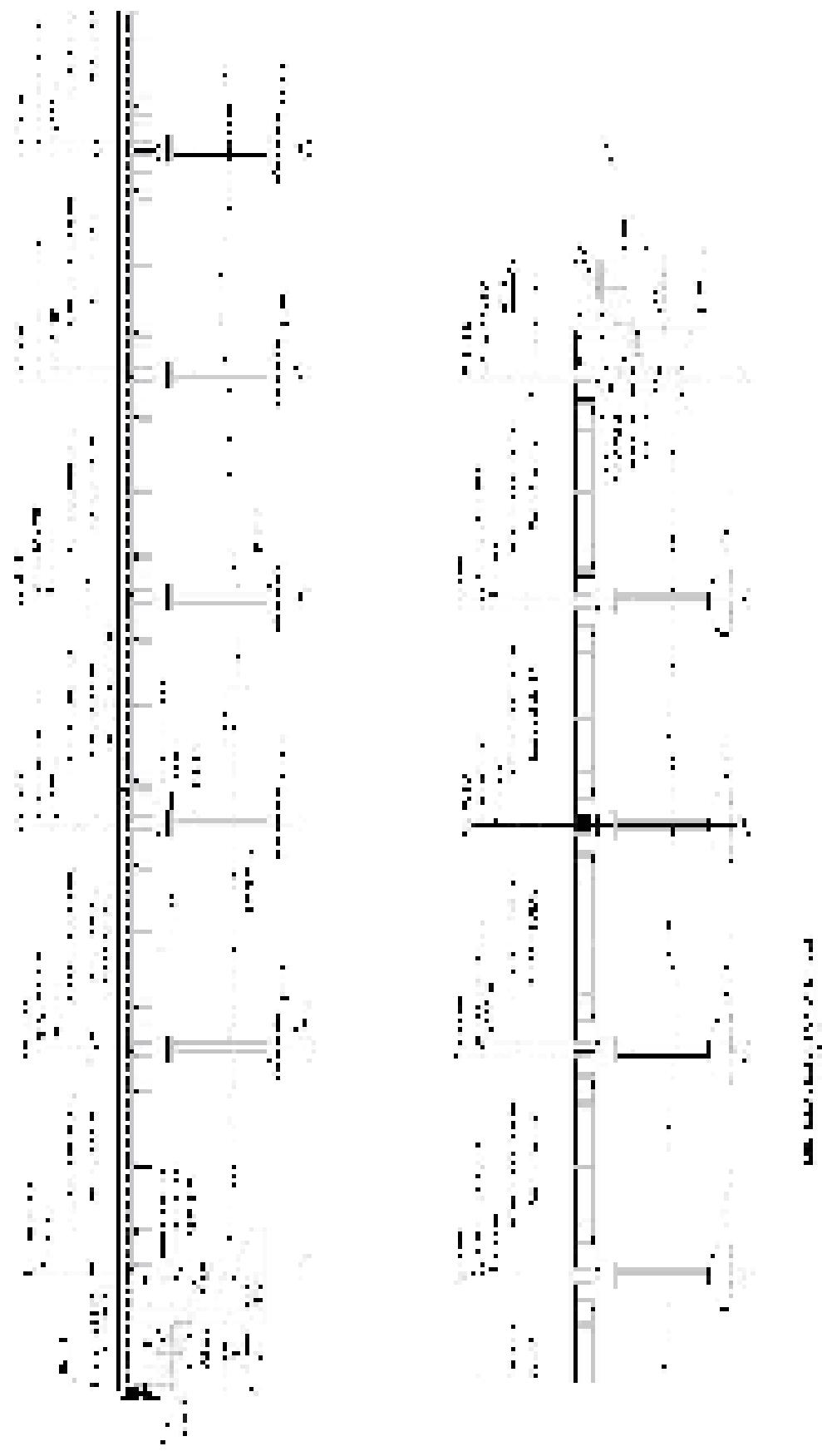


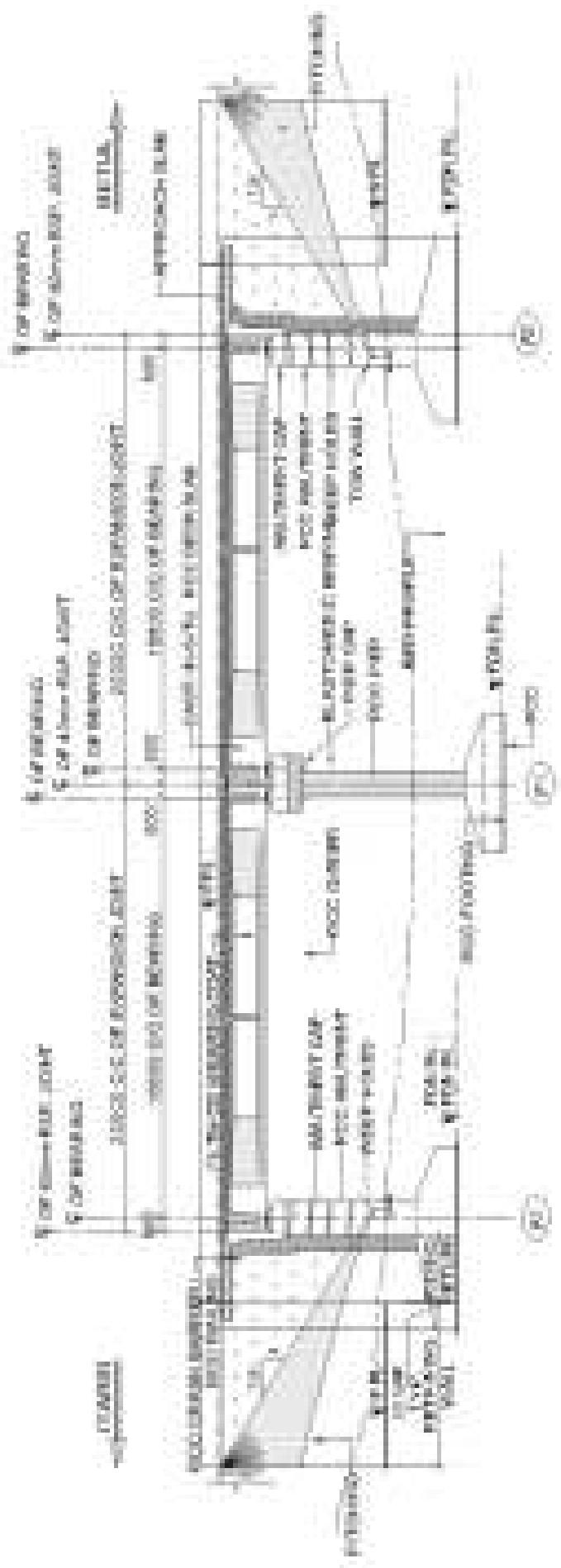


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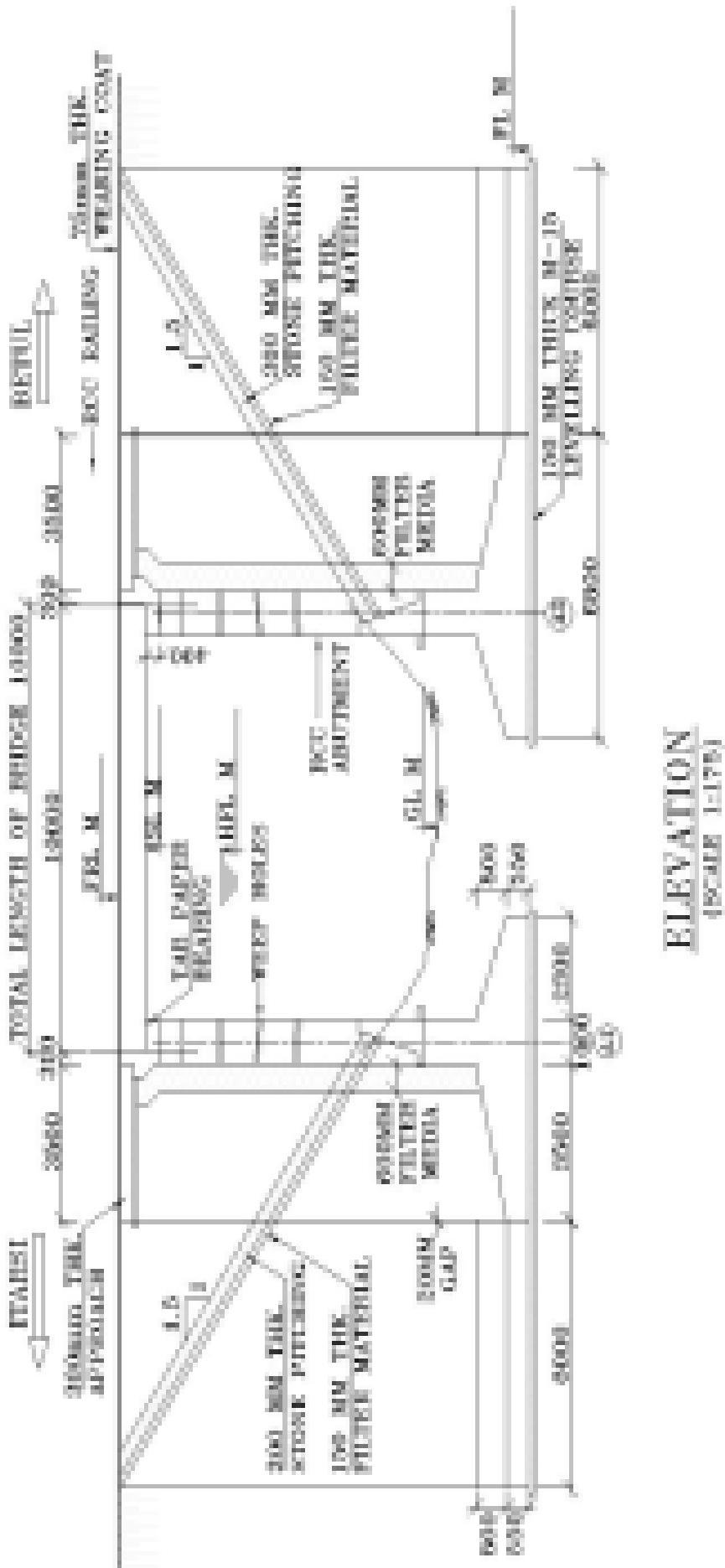


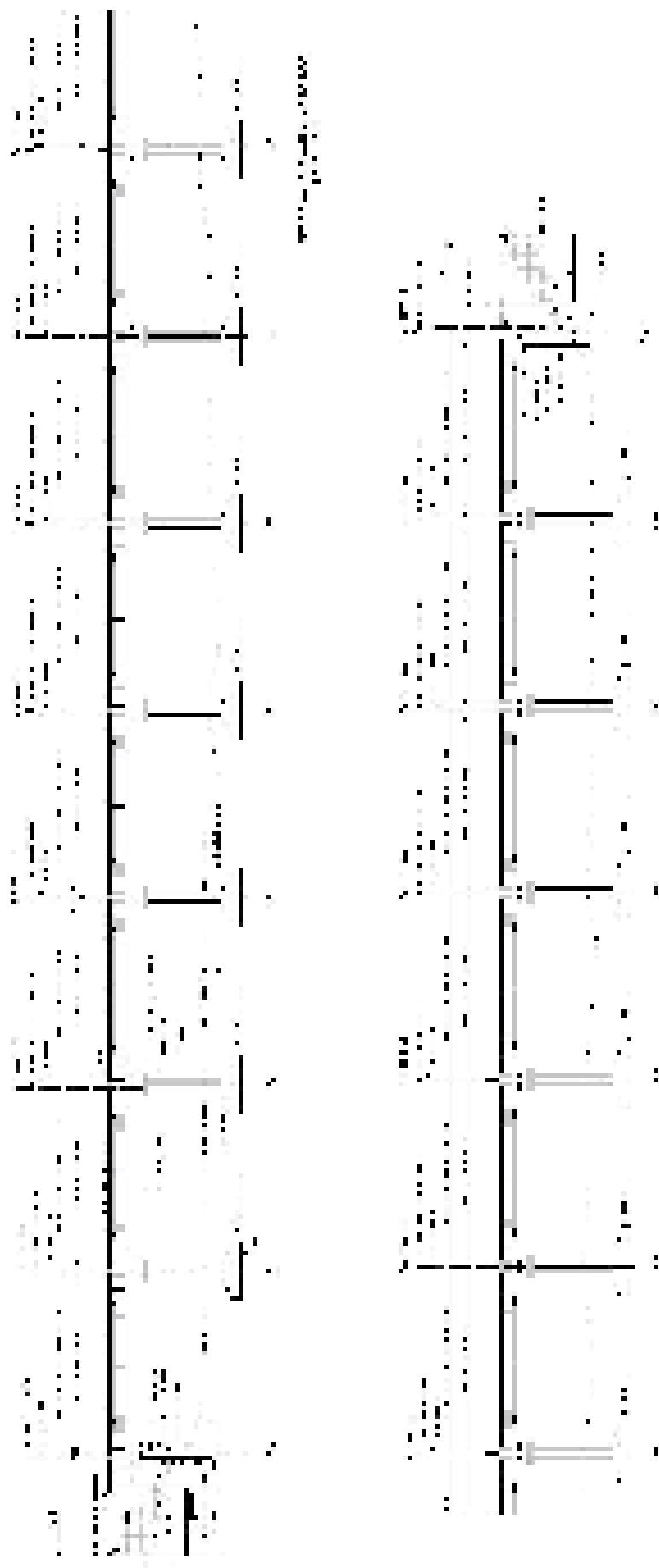
## 36. (15%) *MAXIM*

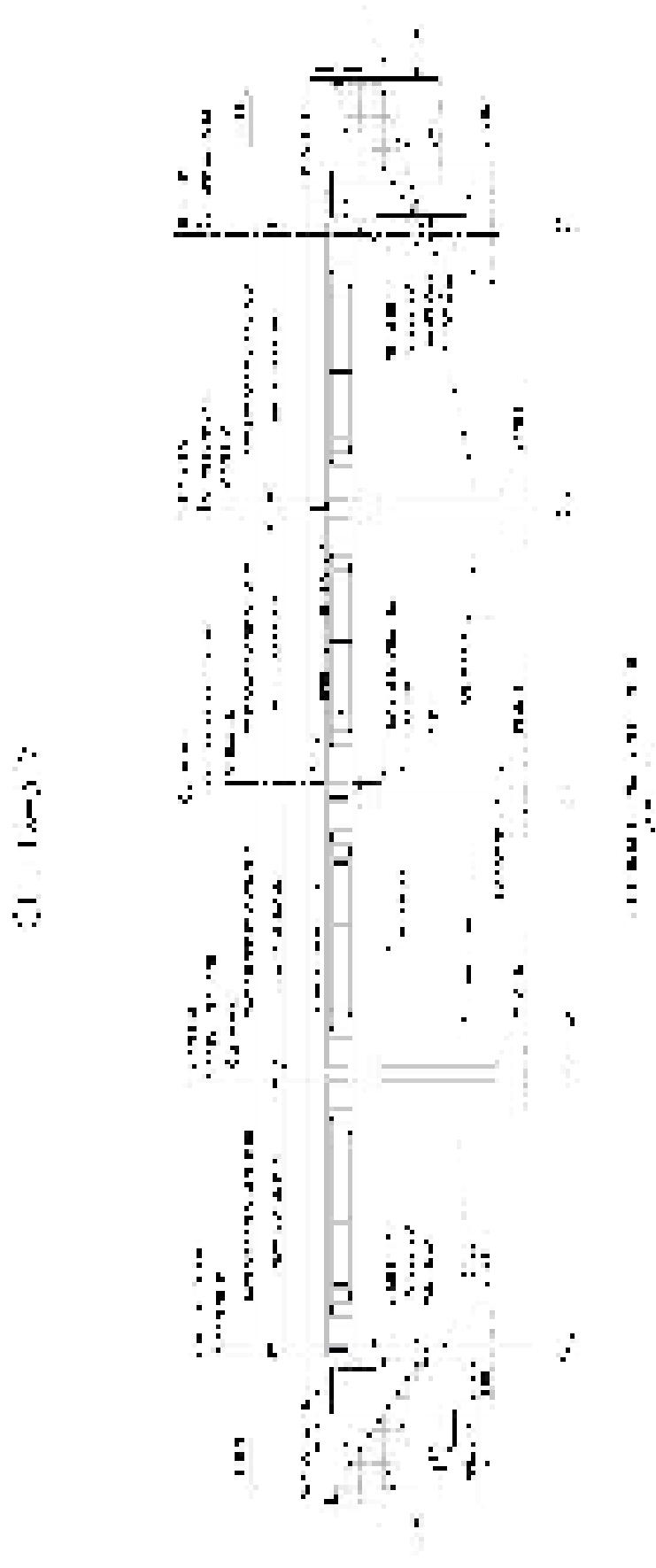




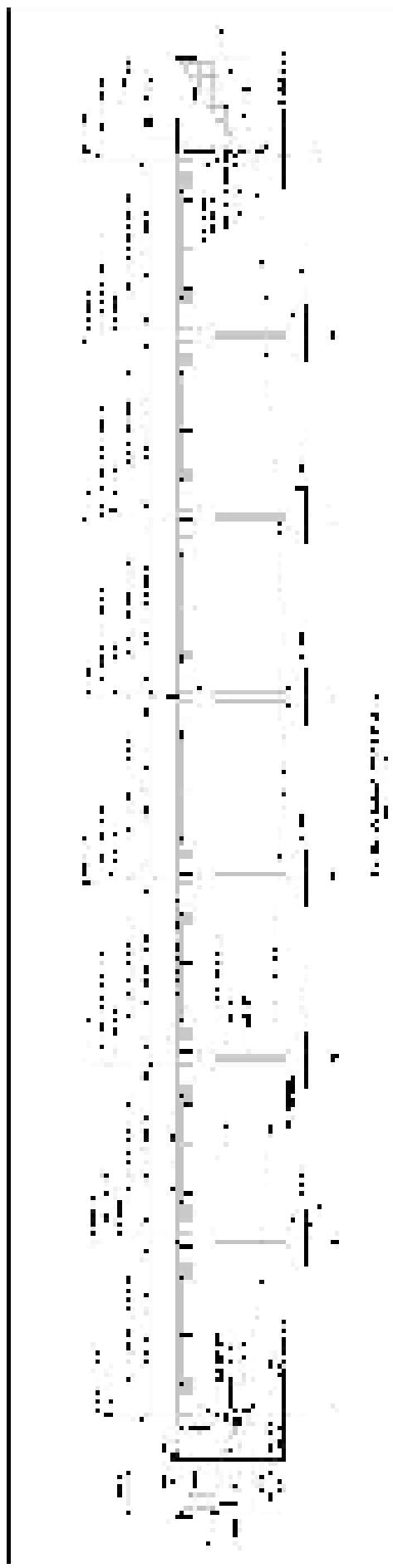
115+005(S) (SPAN 1X10)



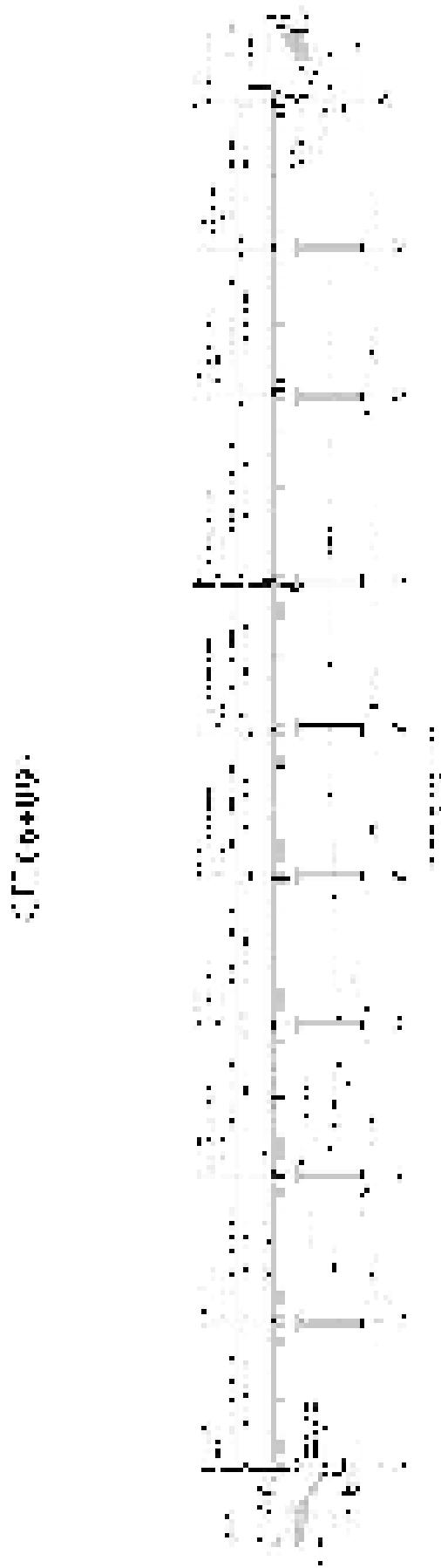




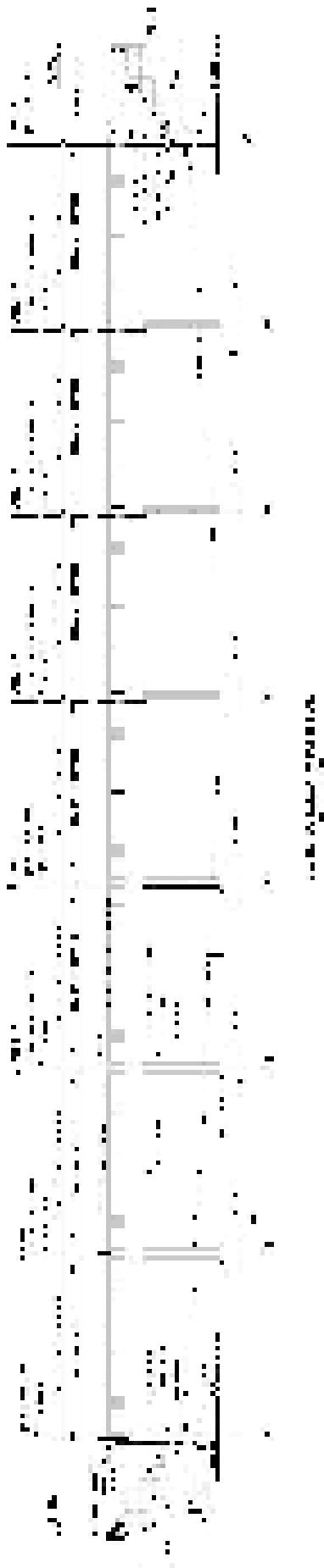
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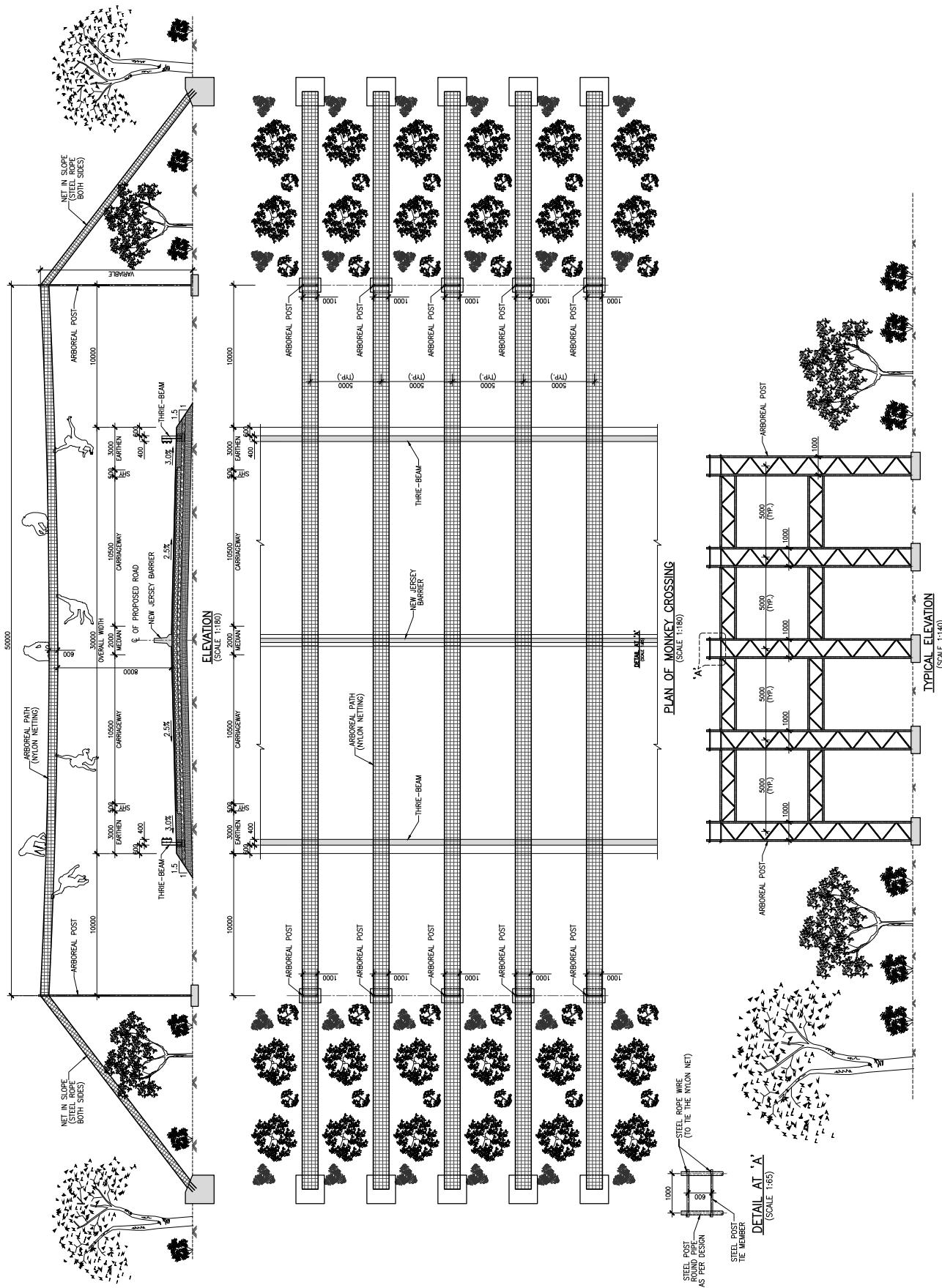


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# Monkey Canopy



## ACKNOWLEDGMENT

1. Shri Jasbir Singh Chauhan, CWLW & PCCF Wildlife, M.P.
2. Shri Sunil Agrawal, PCCF, CAMPA
3. Shri L Krishnamurthy, APCCF & Field Director, Satpura Tiger Reserve
4. Shri Praful Fulzele, CCF, Betul Circle
5. Shri Rakesh Damor, DFO, North Betul Forest Division
6. Shri D K Vasnik, DFO, Narmadapuram Forest Division
7. SDO Shahpur, North Betul Forest Division
8. Range Officer Itarsi, Bhaura, Betul
9. Draftsman Satpura Tiger Reserve, Narmadapuram Forest Division, North Betul Forest Division
10. Range Assistant and Beat guards of concerned forest area of Narmadapuram and North Betul Forest Division
11. JFMC members of adjoining forest areas along NH 46

*RRRE&F Solutions are grateful to Dr. L N Malviya and Col. M K Jain for providing the opportunity to prepare this plan. We also appreciate the timely help and support provided by Dr. Ankit Kumar.*

## REFERENCES

1. Indicative Corridor Plan of Satpura Tiger Reserve by Shri R P Singh.
2. Working Plan of Hoshangabad forest Division by Shri H U Khan.
3. Working Plan of North Betul forest Division by Shri R D Mahala.
4. Compartment Histories of compartments falling in NH 46.
5. Wildlife Institute of India guidelines on Eco friendly measures to mitigate impacts of linear infra structures on wildlife.
6. Report on 'Connecting tiger populations for long term conservation'. prepared for National Tiger Conservation Authority by Wildlife Institute of India.
7. Minutes of the 47<sup>th</sup> Meeting of Standing Committee of National Board of Wildlife.
8. Framing ecologically sound policy on linear intrusions affecting wildlife habitats -*Background paper for the National Board for Wildlife* - prepared by T. R. Shankar Raman, Nature Conservation Foundation
9. WWF report on Satpura-Melghat Tiger corridor.