MUMBAI–NAGPUR–
JHARSUGUDA
PIPELINE (MNJPL)
Connecting Coasts • Strengthening
Energy Security •
Transforming Central India
Hussain Ali, Team MNJPL

A 1,707 km Strategic Corridor Connecting Western Gas to Eastern Demand Centres

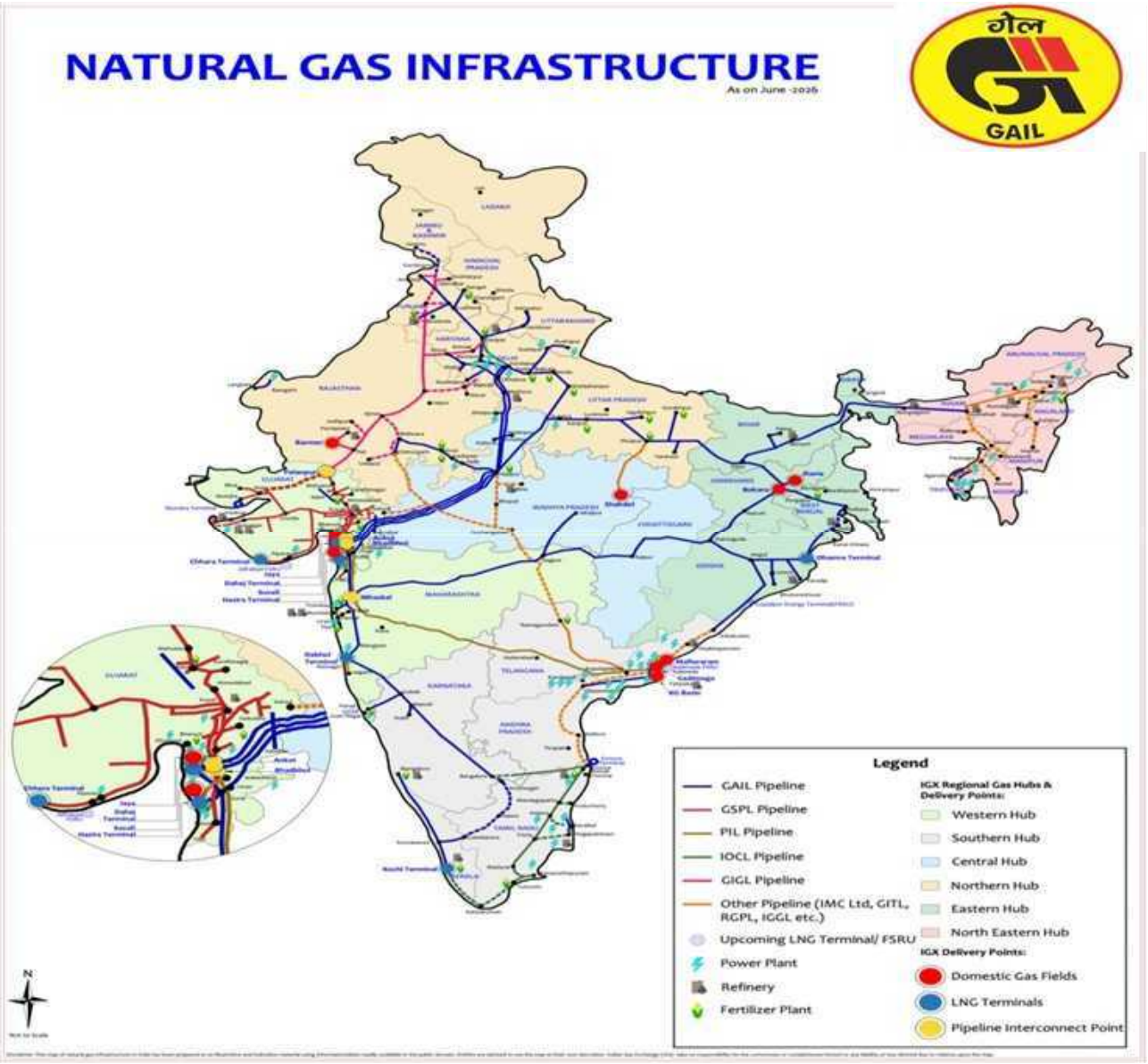
1,707 km
Total Pipeline Length
(MNPL: 694 km, NRJPL: 694 km, NCJPL: 319 km)

4 States
& 28 Districts Traversed

~₹7,100 Cr
Estimated Capitalization Cost

14.6 MMSCMD
Built-Up Transportation Capacity

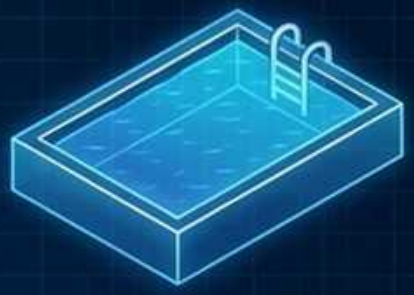
69
SV/IP Facilities



- National Gas Grid integration
- Western–Central–Eastern connectivity
- Industrial development
- CGD expansion -16 GAs
- Energy security
- Regional Transformation

188,000 Tonnes of Steel

Equivalent to the structural steel of more than 20 Eiffel Towers.

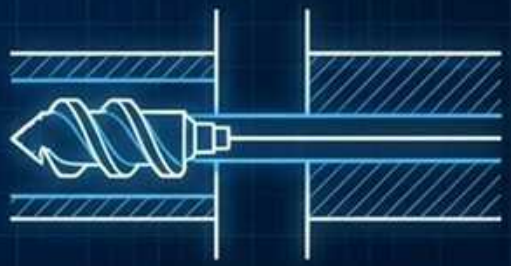


2.46 Million m³ Earthwork

Equivalent to excavating 1,000 Olympic-size swimming pools.

178.8 km Ecological Navigation

Pipeline traversing strictly regulated Forest areas (108.5 km) and sensitive Wildlife Corridors (70.3 km).



3,152 Obstacles Crossed

Including 268 complex Horizontal Directional Drillings (HDDs), with 11 exceeding 750 meters in length.

MUMBAI NAGPUR JHARSUGUDA PIPELINE (MNJPL)

PROJECT OVERVIEW & EXECUTION FOOTPRINT

Powering India's Industrial Growth with Clean, Reliable & Affordable Natural Gas

PROJECT AT A GLANCE

TOTAL LENGTH	DISTRICTS	STATES	SECTIONS
1,707 km	28	4	13

PROJECT MILESTONES

PNGRB AUTHORIZATION	BOARD APPROVAL DATE	COMPLETION DATE
15 May 2020	15 Jun 2020	31 May 2026

COST STRUCTURE (RS.)

APPROVED COST	REVISED COST	CAPITALIZATION COST
7,844 Cr	8,255 Cr	~7,100 Cr

PART A — MUMBAI – NAGPUR

LENGTH: 694 KM

ROUTE	Along Samruddhi Expressway Corridor
PMC	MECON
SECTIONS	3
NO. OF SV/IP LANDS	31
FOREST (AREA / LENGTH)	20.5 Ha. / 56.8 Km
WL CORRIDOR (AREA / LENGTH)	–
NO. OF CROSSINGS	1,091
HDD (NO. / LENGTH)	140 Nos. / 51.28 Km
HDD > 750 m (NOS)	5
LONGEST HDD (METER)	1,552 m

PART B — NAGPUR – JHARSUGUDA

LENGTH: 694 KM

ROUTE	GAIL ACQUIRED ROU
PMC	EIL
SECTIONS	6
NO. OF SV/IP LANDS	26
FOREST (AREA / LENGTH)	27.83 Ha. / 32.61 Km
WL CORRIDOR (AREA / LENGTH)	103.5 Ha. / 53.7 Km
NO. OF CROSSINGS	1,382
HDD (NO. / LENGTH)	91 Nos. / 23.8 Km
HDD > 750 m (NOS)	4
LONGEST HDD (METER)	905 m

PART C — NAGPUR – JABALPUR

LENGTH: 319 KM

ROUTE	GAIL ACQUIRED ROU
PMC	Worley India Pvt. Limited
SECTIONS	4
NO. OF SV/IP LANDS	12
FOREST (AREA / LENGTH)	18.99 Ha. / 19.11 Km
WL CORRIDOR (AREA / LENGTH)	28.06 Ha. / 16.65 Km
NO. OF CROSSINGS	679
HDD (NO. / LENGTH)	37 Nos. / 9.6 Km
HDD > 750 m (NOS)	2
LONGEST HDD (METER)	984 m

MNJPL – IN TOTAL

TOTAL LENGTH	1,707 KM
TOTAL SV/IP LANDS	69
FOREST (AREA)	67.32 Ha.
FOREST (LENGTH)	108.52 Km
WILDLIFE CORRIDOR	70.35 Km
TOTAL CROSSINGS	3,152
TOTAL HDDs (NO.)	268
TOTAL HDD LENGTH	84.68 Km
HDD > 750 m (NOS)	11

1,707 KM TOTAL LENGTH | **13** CONSTRUCTION PACKAGES (SECTIONS) | **69** SV/IP LANDS | **3,152** CROSSINGS | **268** HDDs

ENGINEERING EXCELLENCE.
ENVIRONMENTAL CARE.
ENERGY FOR A BETTER INDIA.

Delivering Infrastructure with Innovation, Commitment and Care

MNPL – PART A

MUMBAI TO NAGPUR (694 KM)

24" NATURAL GAS PIPELINE ALONG SAMRUDDHI MAHAMARG

INTEGRATED INFRASTRUCTURE | CHALLENGING TERRAIN | ENGINEERING EXCELLENCE

INFRASTRUCTURE TODAY
CLEANER ENERGY TOMORROW

Samruddhi Mahamarg
A Corridor for a Stronger Maharashtra

- **694 km** Pipeline Length (Mumbai – Nagpur)
- **24 inch** Pipeline Diameter
- **10** Districts in Maharashtra
- **~70** Hill Crossings
- **~3 m** Utility Corridor (along expressway)
- **~209 km** Initial Hindrances (Jan 2022)

KEY INTERFACES

- Expressway Construction (16 packages)
- Major & State Highways
- Railway Crossings
- Rivers, Canals & Nalas
- Forest & Wildlife Areas
- Urban & Industrial Zones
- Existing Utilities

TOWARDS A GREENER TOMORROW

- Lower additional land acquisition
- Reduced social friction
- Minimised environmental footprint

COASTAL PLAIN (Mumbai – Thane)	WESTERN GHATS (Thane – Igatpuri)	UNDULATING TERRAIN (Nashik Region)	AGRICULTURAL BELT (Yeola – Aurangabad)	PLATEAU REGION (Aurangabad – Akola)	VIDARBHA REGION (Akola – Nagpur)
High population density & complex utility network	Steep gradients, tunnels & hill crossings	Rocky strata & challenging construction conditions	Agricultural land, multiple crossings & rural interfaces	Mixed soil strata, rivers/nallahs & wide work fronts	Agricultural & semi-urban areas with industrial potential

ELEVATION PROFILE ALONG MNPL – PART A

ELEVATION INSIGHTS

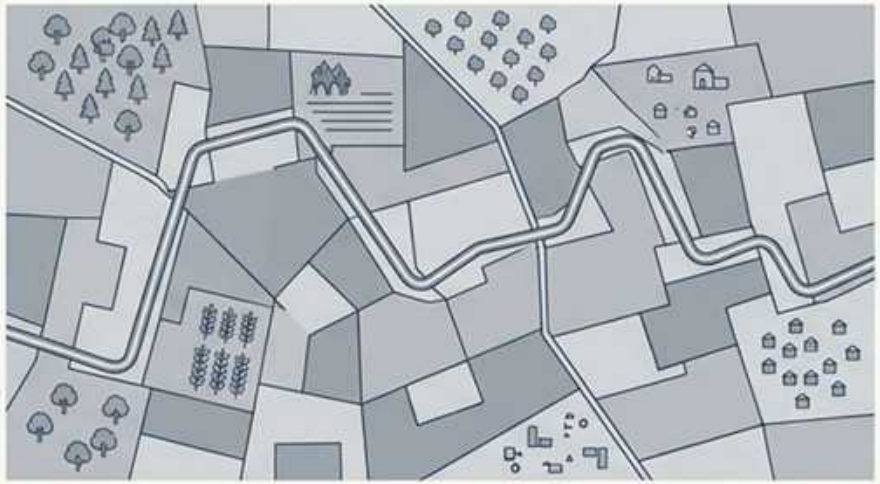
- Elevation varies from **~14 m** to **~760 m**
- Steep gradients in Sahyadri range
- **~70** hill crossings
- Significant elevation drop after Igatpuri towards plateau
- Terrain-specific construction methodology adopted

People | Safety | Integrity | Environment | Progress

NATURAL GAS. A STRONGER MAHARASHTRA. A BRIGHTER INDIA.

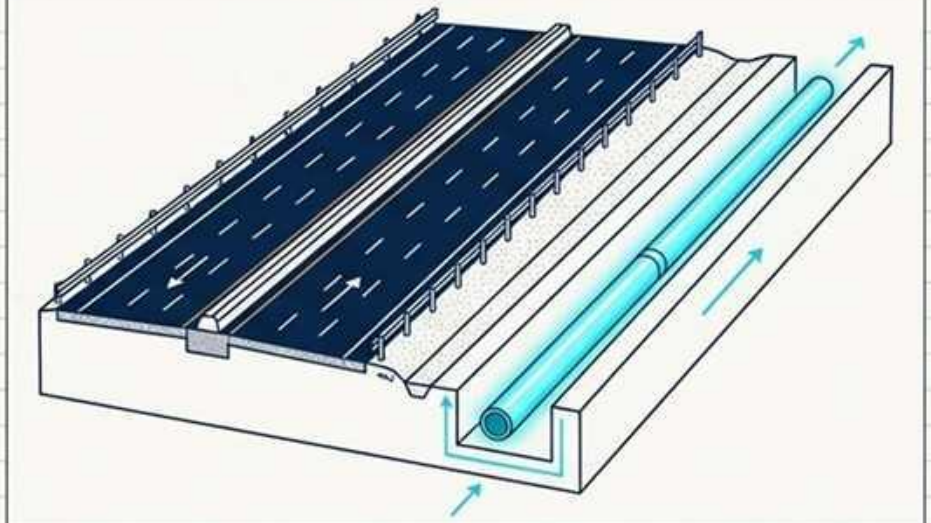
By aligning 96% of the route along the Samruddhi Mahamarg, MNPL executed the country's first **major pipeline within a concurrent expressway corridor.**

Traditional RoU Method



Scattered private land acquisition, widespread environmental footprint, fragmented logistics, high social friction.

The GatiShakti Model



670 km laid parallel to the expressway, drastically minimized private land acquisition, continuous RoU, and active revenue generation for the road authority.

⚠ **Constraint Created:** This paradigm shift solved land acquisition but created the severe operational constraint of a **fixed 3-meter working window.**

The Paradigm Shift: Executing Within a 3-Meter Utility Corridor

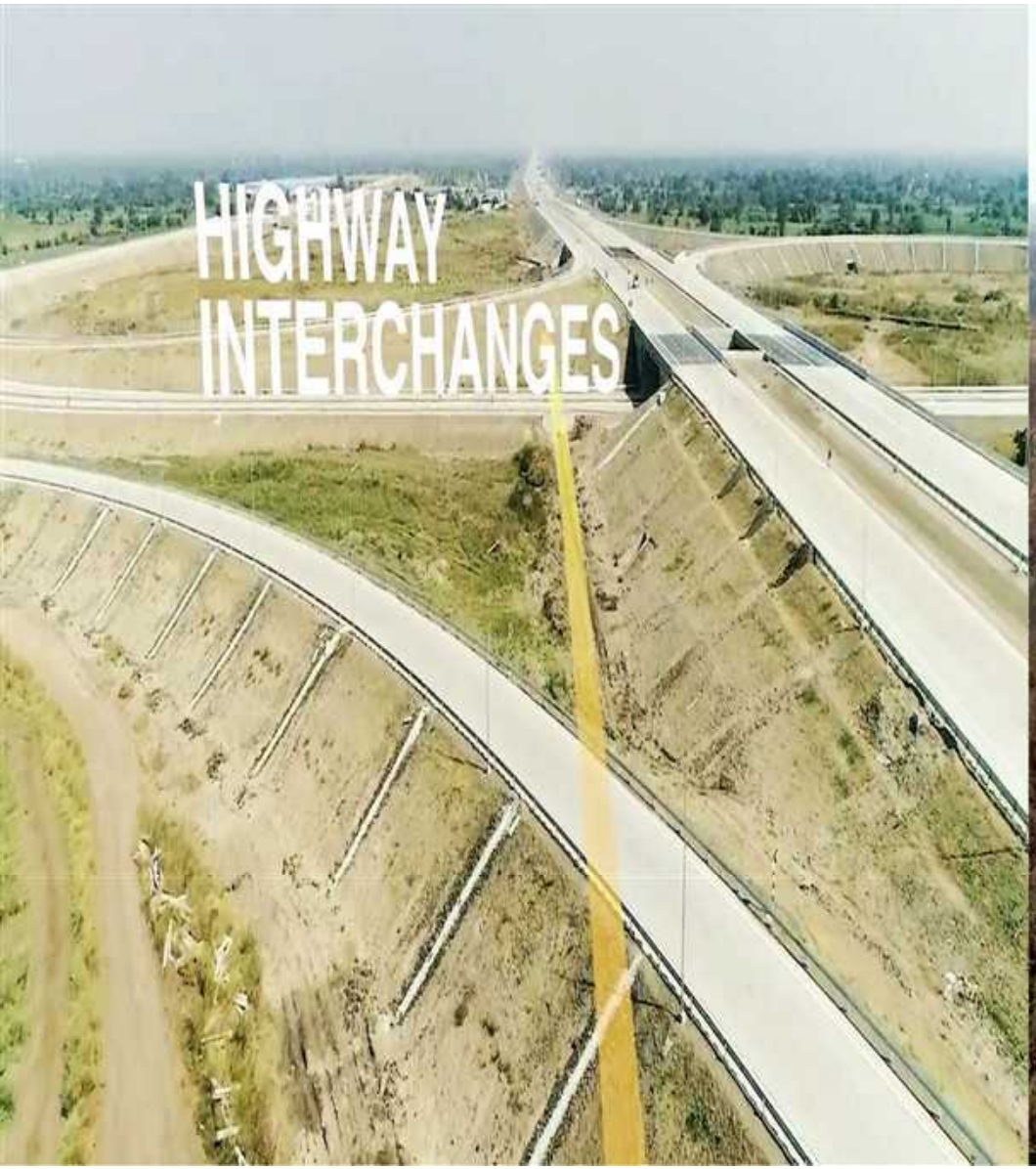
Conventional Pipeline Execution

- 20–30 meter Right of Use (RoU)
- Allows sequential planning, ample working width, and conventional equipment deployment.

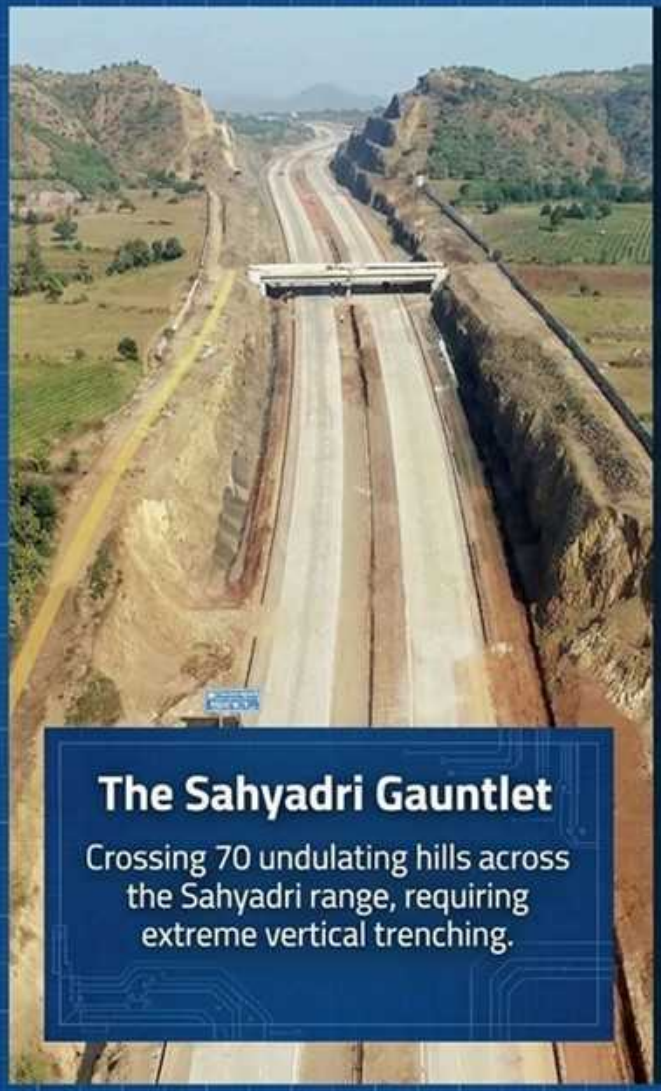
The MNJPL Reality

- Restricted to a narrow 3-meter utility strip
- Constructed concurrently alongside the massive, developing Samruddhi Mahamarg greenfield expressway.

Constructing a high-pressure natural gas pipeline to international standards while competing for access, space, and work-fronts with a live mega-highway project.

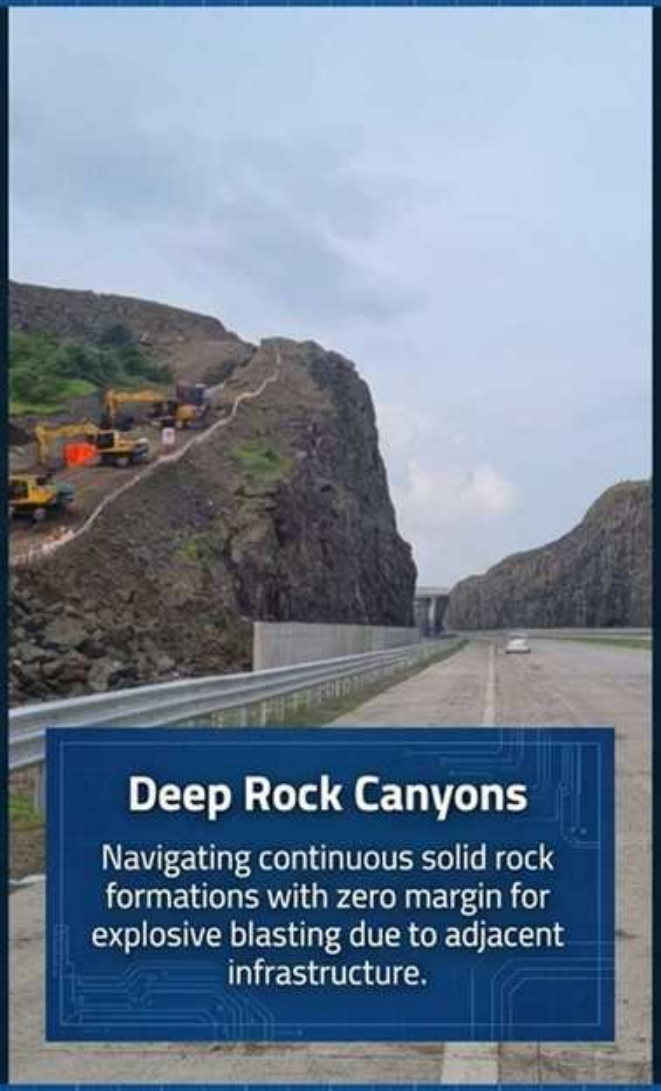

HIGHWAY
INTERCHANGES

kilometers had very Steep and continuous



The Sahyadri Gauntlet

Crossing 70 undulating hills across the Sahyadri range, requiring extreme vertical trenching.



Deep Rock Canyons

Navigating continuous solid rock formations with zero margin for explosive blasting due to adjacent infrastructure.

Vertical Alignment

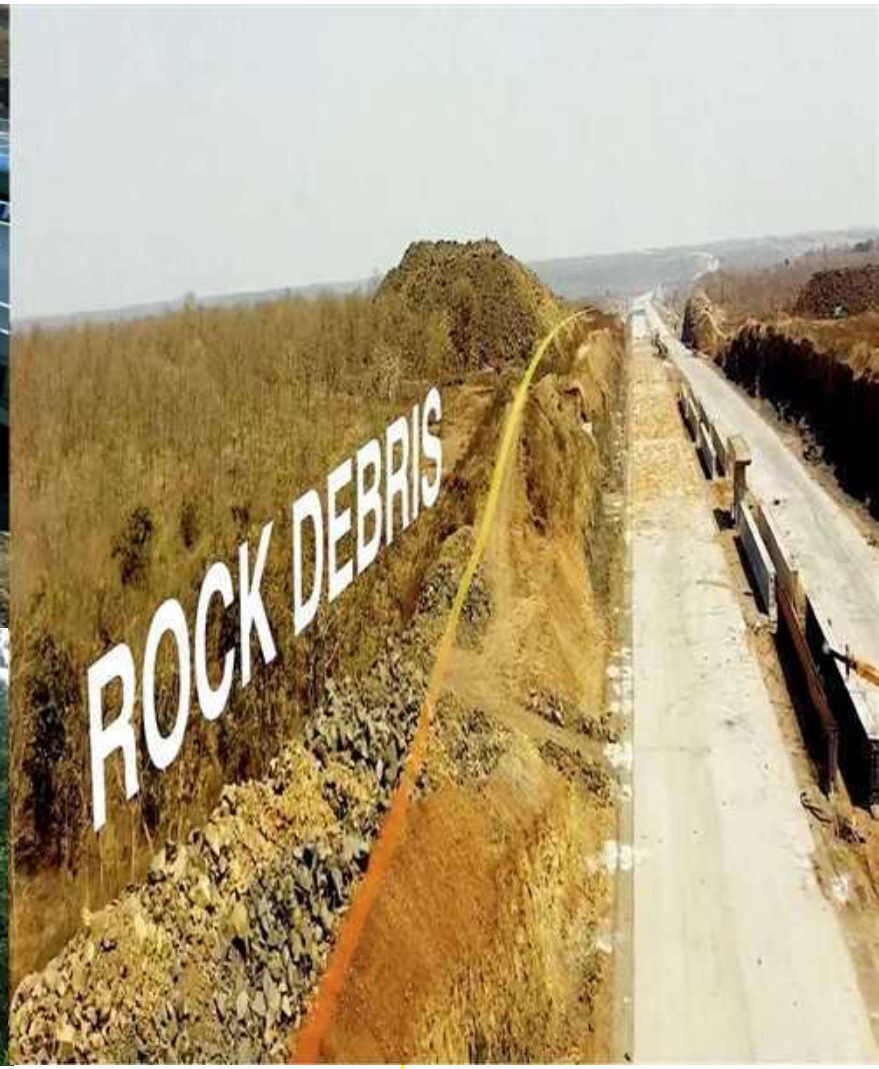
Designing specialized anchoring systems for severe inclines and highly undulated topographies.

Navigating Hindrances & Collateral Debris

209 km of RoU Hindrances (Recorded Jan '22)

- Rock Dump from Highway: **79 km**
- Farmer Issues: **61 km**
- Non-Availability of RoU: **39 km**
- Space Constraints in Hilly Areas: **18 km**
- Change in Soil Strata: **12 km**

Highway blasting resulted in massive rock debris filling the designated utility corridor, forcing continuous high-level interventions with MSRDC to physically clear the path.

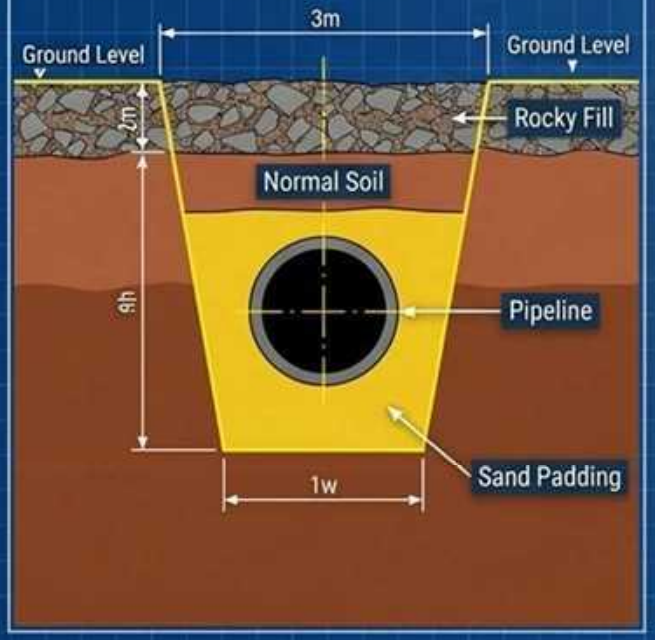


Hindrances resolved progressively by continuous follow up with MSRDC through multiple meetings by GAIL with MSRDC HO, MoP&NG and Govt. of Maharashtra

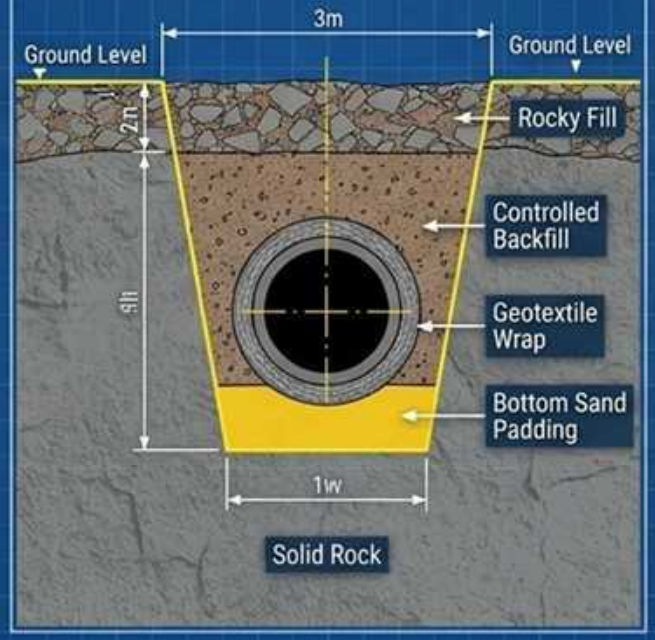
Geotechnical Interventions: Adapting to Compromised Soil

MSRDC filled the utility corridor with blasted rock below the Natural Ground Level (NGL). Laying directly on this compromises pipeline integrity, forcing three distinct engineered solutions over 12 km.

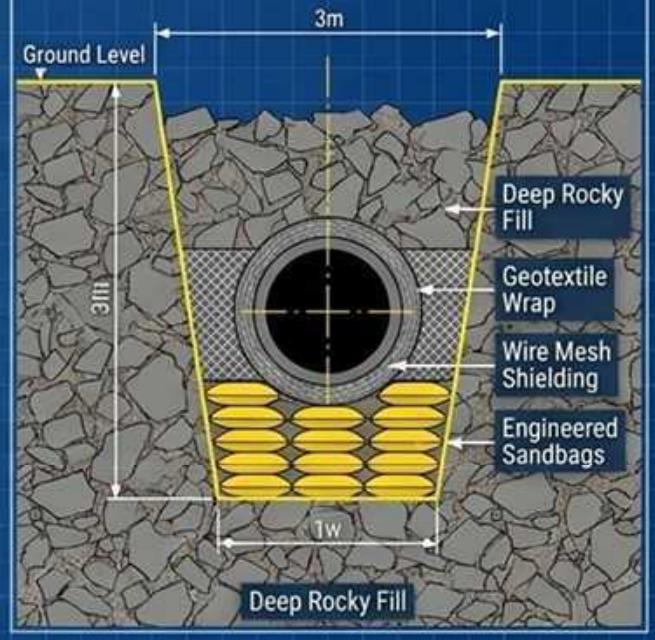
Case 01: Rocky Fill (<2.5m) over Normal Soil



Case 02: Rocky Fill (<2.5m) over Solid Rock



Case 03: Deep Rocky Fill (>2.5m)



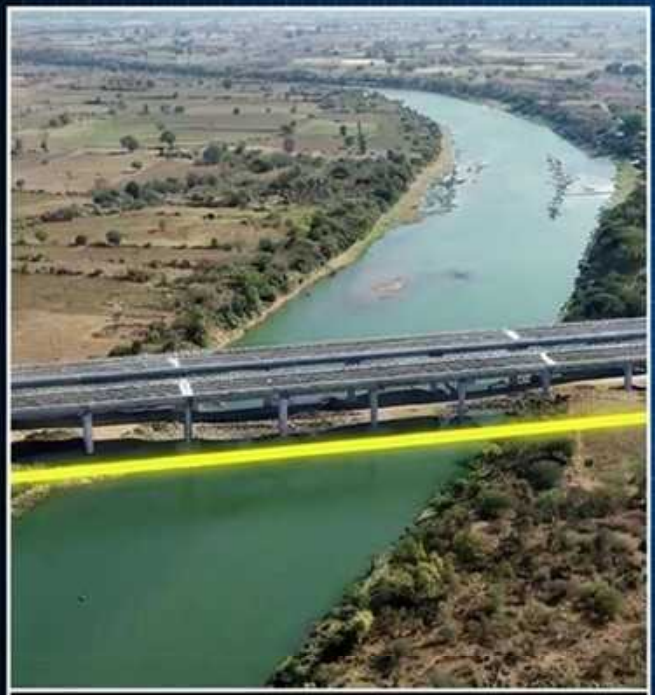
ASSUMPTIONS

- Availability of graded ROU at most of places.
- Fixed number of crossings identified during the survey.
- Non-requirement of Forest permissions.
- Availability of continuous 10-12 mtr. working strip.
- Pipeline laying will be completed before road opening

DURING EXECUTION

- Uneven ROU, Rock Dumps, altered soil strata
- Crossings increased manifold due to expressways Interchanges, steep cuts in hilly areas, tunnels, wildlife crossings, road embankments extending till edge of ROU, etc.
- Re-diversion permission had to be obtained from Forest Dept. as MSRDC did not include the same in their permission.
- Difficulty in obtaining continuous working strip
- Access for pipeline laying restricted due to delay in road construction.

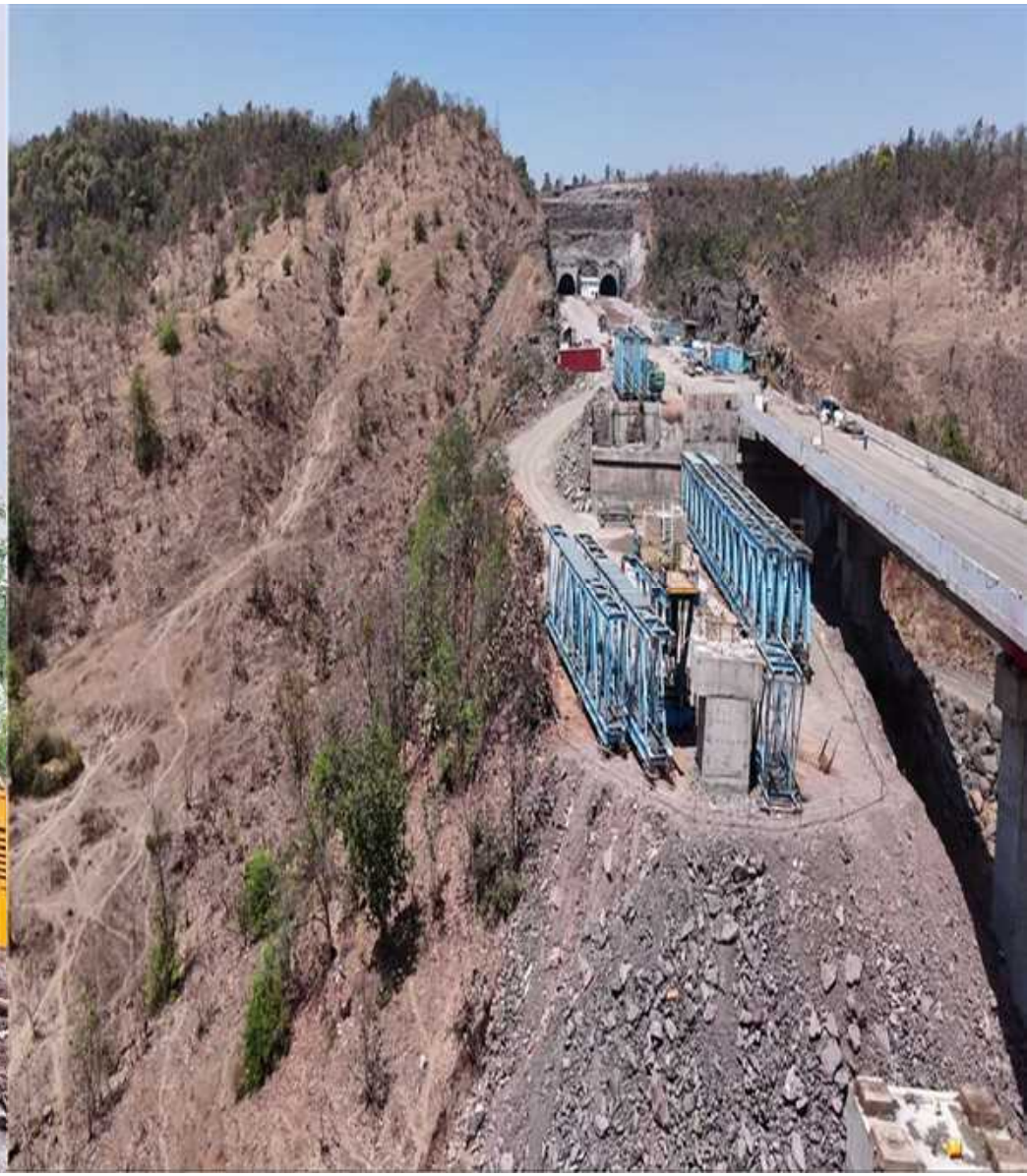
Conquering 3,152 Intersections



RIVERS: Deep subterranean routing beneath major water bodies to prevent scouring and environmental disruption.

RAILWAYS: Precision boring beneath active rail corridors without halting national freight or passenger traffic.

HIGHWAYS: Navigating complex webs of existing structural foundations and concrete embankments using advanced trenchless technology.



High-Elevation Constraints Drove the Adoption of Thruster-Assisted Pipe Pushing

The Challenge: Fugale Hill HDD (1,552m)

13° entry angle, hard rocky strata, continuous water inflow, restricted access.

The Setback

Conventional HDD pulling failed. High loads (exceeded by 50-100%) caused repeated pipe sticking and two thruster foundation failures.

The Engineered Solution

Deployed advanced thruster-assisted pipe pushing. Implemented mud mats, high-capacity foundations, surfactant application, and buoyancy-based recovery techniques.

268 Total HDDs Executed / 84.68 km Total Trenchless Construction across MNJPL.

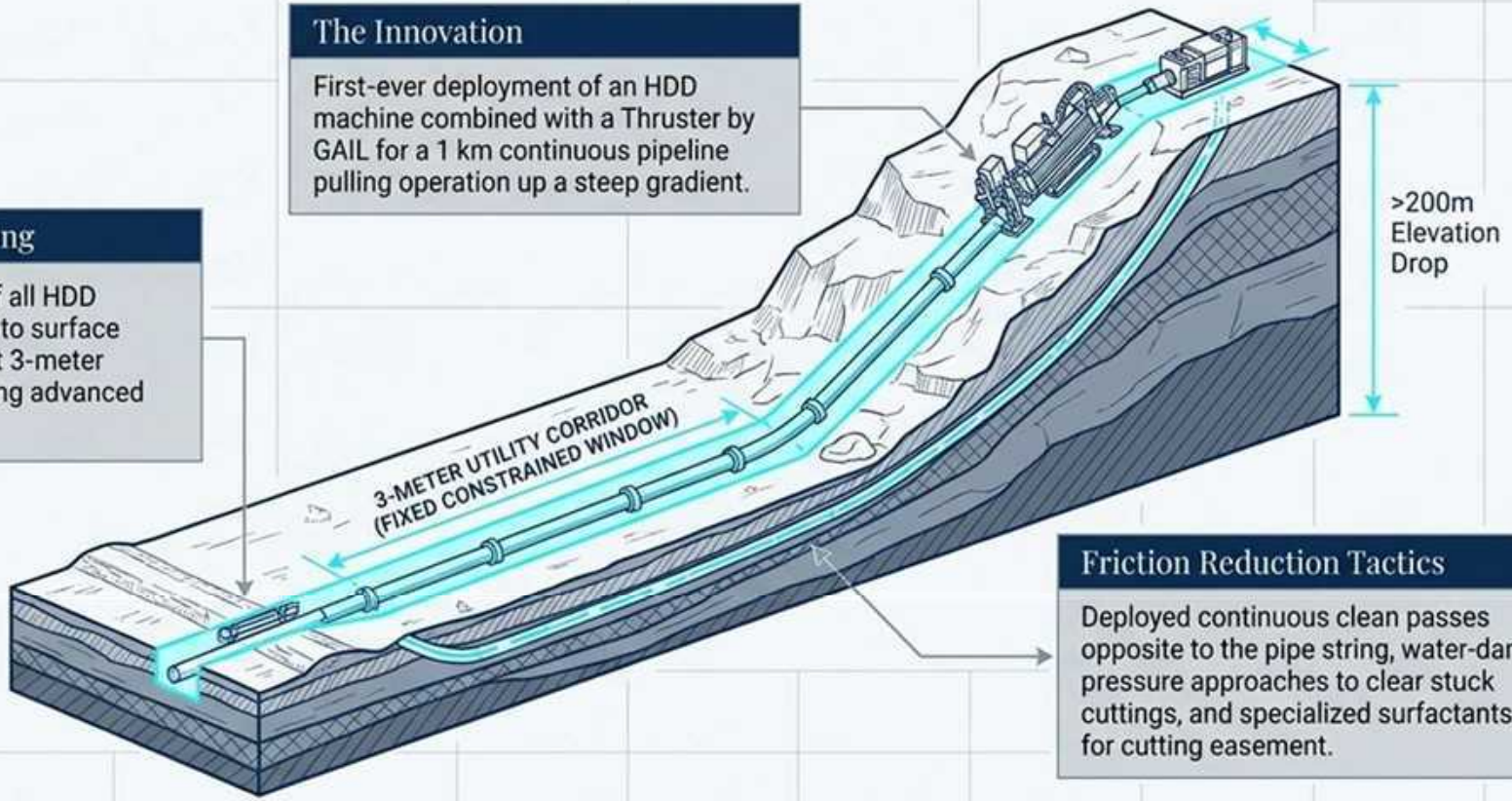
Extreme elevation drops and narrow entry/exit windows necessitated pioneering Horizontal Directional Drilling (HDD) technologies

The Innovation

First-ever deployment of an HDD machine combined with a Thruster by GAIL for a 1 km continuous pipeline pulling operation up a steep gradient.

Precision Engineering

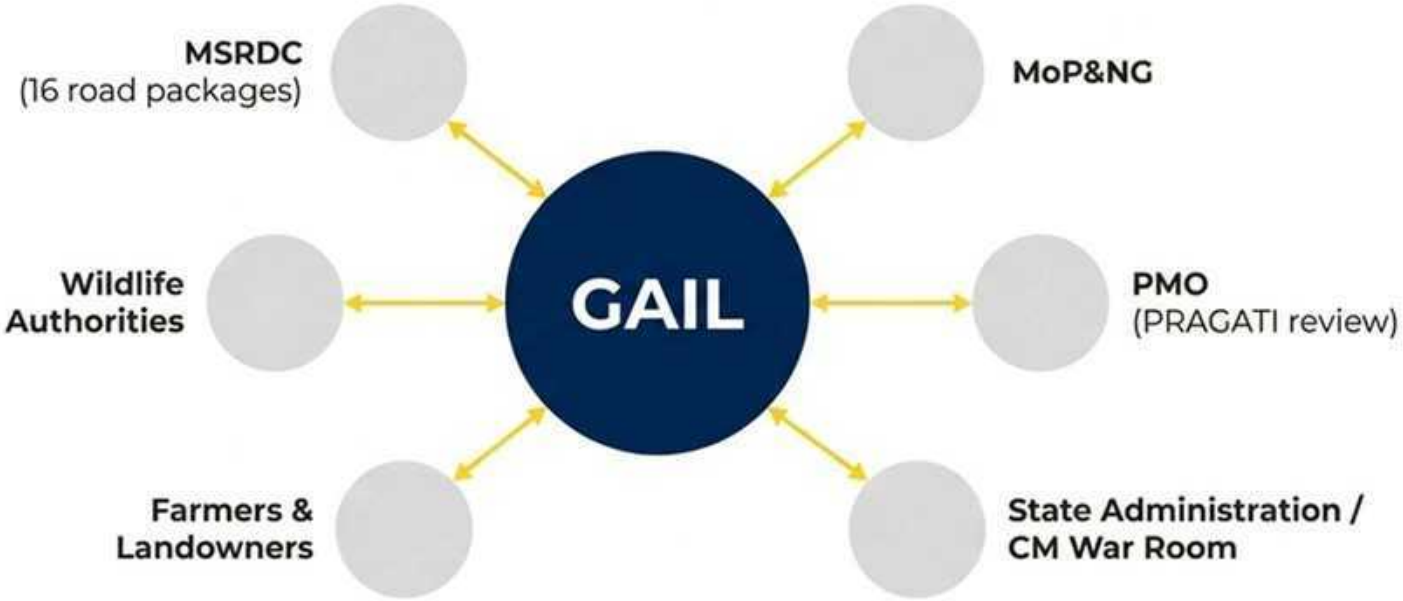
Entry and exit points of all HDD operations engineered to surface exactly within the strict 3-meter utility corridor limit using advanced Paratrackers.



Friction Reduction Tactics

Deployed continuous clean passes opposite to the pipe string, water-dam pressure approaches to clear stuck cuttings, and specialized surfactants for cutting easement.

Persistent Cross-Agency Escalation Converted Bottlenecks into Executable Work Fronts



Hindrance Resolution

Overcame 209 km of cumulative initial hindrances (rock dumps, RoU limits, farmer resistance) through proactive leadership and continuous inter-agency alignment.

Systemic Resilience

Navigated initial project authorization (May 2020) straight into severe COVID-19 pandemic lockdowns, maintaining momentum on surveys and statutory clearances.

Multi-Agency Escalation Was Critical to Maintaining Project Momentum

A pipeline contractor cannot out-engineer a blocked corridor. Persistent engagement at the highest levels transformed administrative roadblocks into actionable, on-ground decisions.

Management Resilience & Social Navigation

Pandemic Resilience

Authorized in May 2020. The project navigated strict COVID-19 lockdowns that initially stalled critical field surveys and delayed delayed permissions from Forest, Railway, and Highway authorities.

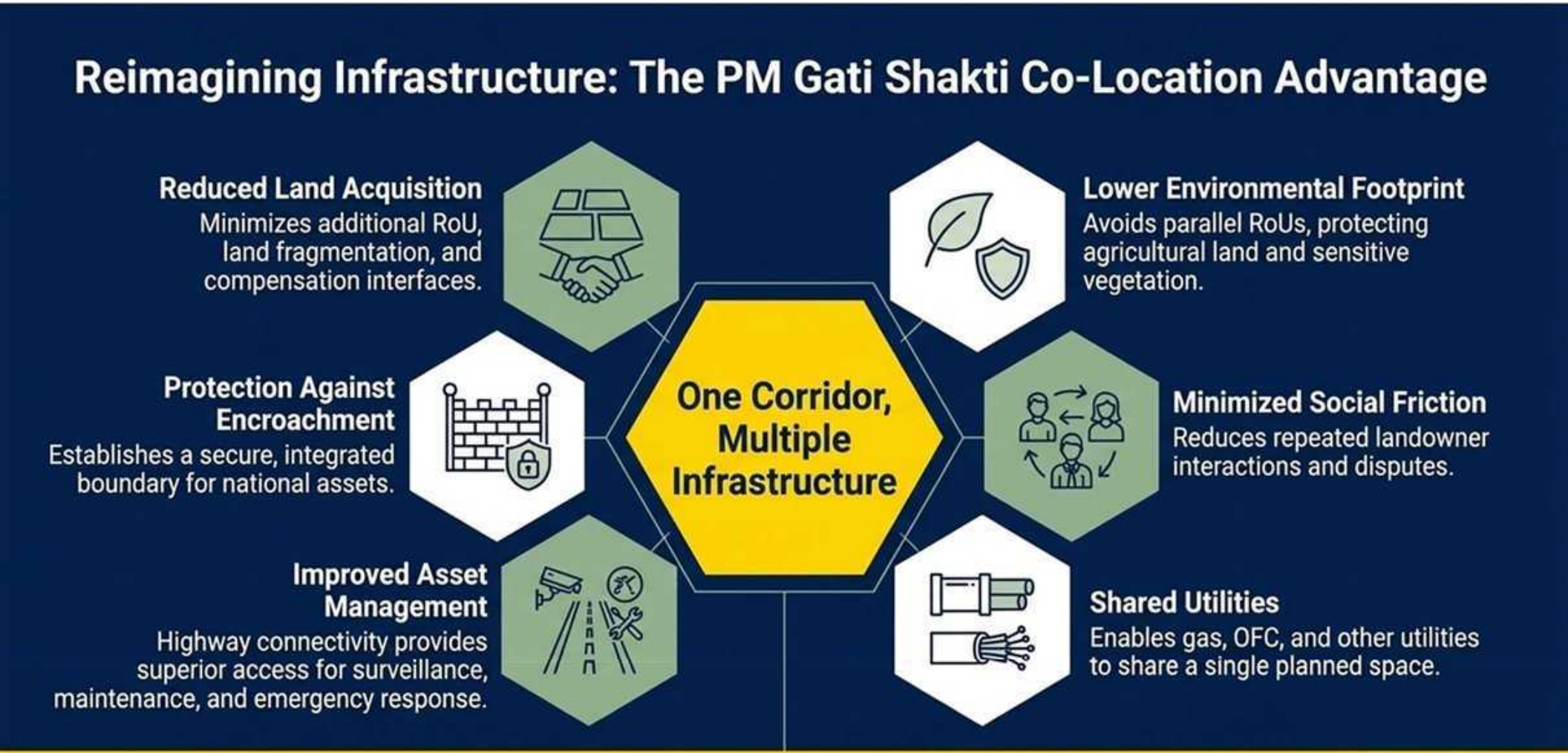
Multi-Contractor Synchronization

The MNPL section required continuous, tight operational coordination with 16 distinct construction packages of MSRDC, integrating traffic management and concurrent construction timelines.

Stakeholder Escalation

Overcame intense farmer resistance and High Court challenges for land acquisition. Resolved via relentless GAIL management engagement across PMG meetings, MoP&NG, MoEF, and Chief Secretaries.

Reimagining Infrastructure: The PM Gati Shakti Co-Location Advantage



MNJPL establishes a scalable blueprint for integrating utilities with future expressways.
The question is no longer if we should co-locate, but how we perfect the framework.

Project Capacity: 11.9 / 14.6 mmscmd
Completion Target: 31.05.2026
Approved Cost: ₹8,255 Cr (~₹7,100 Cr capitalized)
Jabalpur
Seoni
Raipur
Jharsuguda
Durg
Bhandara
Amravati
Nagpur
Gondia
Nashik
Aurangabad
Mumbai
1,707 km
Total Pipeline Length
28 Districts
Spanning 4 States: Maharashtra, MP, Chhattisgarh, Odisha
3 Distinct Sections
Mumbai-Nagpur: 694 km | Nagpur-Jharsuguda: 694 km | Nagpur-Jabalpur: 319 km

Execution of MNJPL Part B & C navigated severe constraints across land acquisition, local resistance, and complex ecological zones.

*Despite the strategic utility of the PM Gati Shakti corridor approach, NRJPL and NCJPL required **adaptive management** to overcome four distinct categories of project bottlenecks.*

RoU & Acquisition Hurdles

Govt Intervention Required

- **Severe Space Constraints: Limited utility strip along NH corridors** impacted 62 km of NRJPL (Mah-37 Km, Odisha-25 Km) and 2.5 km of NCJPL.
- **Acquisition Bottlenecks**: Secured 5 of 9 land parcels in Maharashtra & 6 of 10 in Madhya Pradesh via Govt intervention.
- **Protracted Litigation**: RT-Jabalpur land acquisition was **challenged twice** in the **High Court** in spite of formal government acquisition.

Socio-Political Friction

Sustained Resistance

- **Widespread Opposition:** Sustained resistance from farmers and landowners across Maharashtra and Chhattisgarh.
- **Organized Pushback**: Strong opposition led by the Bhartiya Kisan Union in Durg District, and localized farmers resistance in Janjgir Champa District.
- **Administrative Delays**: Significant lag in the formal appointment of Competent Authorities (CA) by respective state governments.

Ecological Clearances

Statutory Delays

- **NRJPL Sensitive Zones:** Delayed clearances for 32.61 km of protected Forest area and 53.70 km of critical Wildlife Corridors.
- **NCJPL Sensitive Zones:** Delayed clearances for 19.11 km of Forest area and 16.65 km of Wildlife Corridors.
- **Impact:** Multi-agency coordination severely delayed workfront availability in highly regulated green zones.

Topographical Complexity

Advance Engineering

- **Undulating Terrain:** Highly irregular soil strata compromised pipelaying velocities.
- **Major Mountain Crossings:** Alignment required transversal routing through the formidable Vindhya and Satpura ranges.
- **Technical Pivot**: Forced abandonment of standard procedures for advanced engineering solutions and localized execution methodologies.

MNJPL Operates as a Digitally Monitored, Remotely Supervised Transmission Network

OFC Communication

24-core Optical Fibre Cable backbone providing seamless data transmission.

Centralized SCADA

IP-based platform integrating field telemetry with control centre automation.

Remote Operations

Digitally operated sectionalizing and pigging facilities.

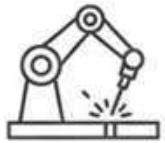
Telecom Infrastructure

SDH-based high-speed telecommunications network.

Pipeline Integrity

Real-time leak detection, Cathodic Protection monitoring, and CCTV surveillance.

Engineered Processes and Verified Quality Ensured Absolute Construction Integrity



RoU Preparation → Stringing & Trenching → Automated/Manual Welding → 100% AUT/X-Ray Inspection → Joint Coating & Lowering

ASME B31.8 | API 1104 | PNGRB T4S | OISD

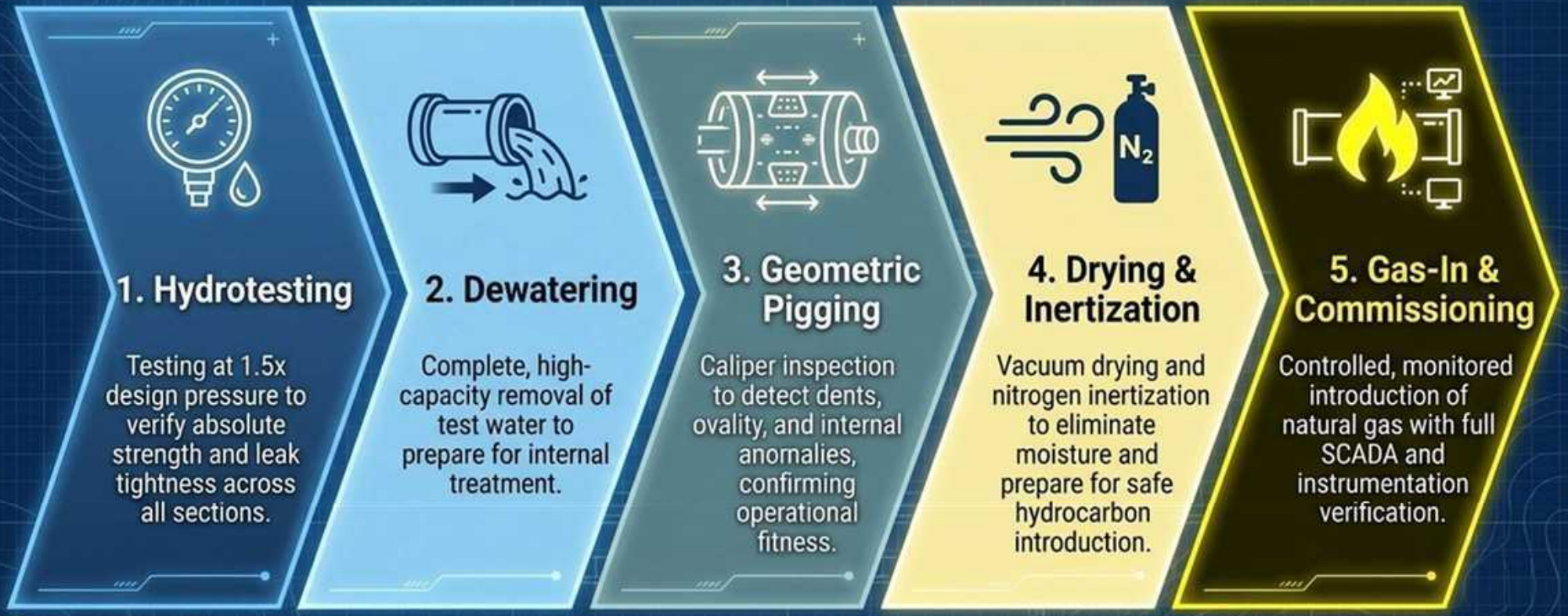
Compliant with Global & National Standards

~188,000 Tonnes of Steel Installed (Traceable from mill to site)

3,152 Complex Crossings Executed

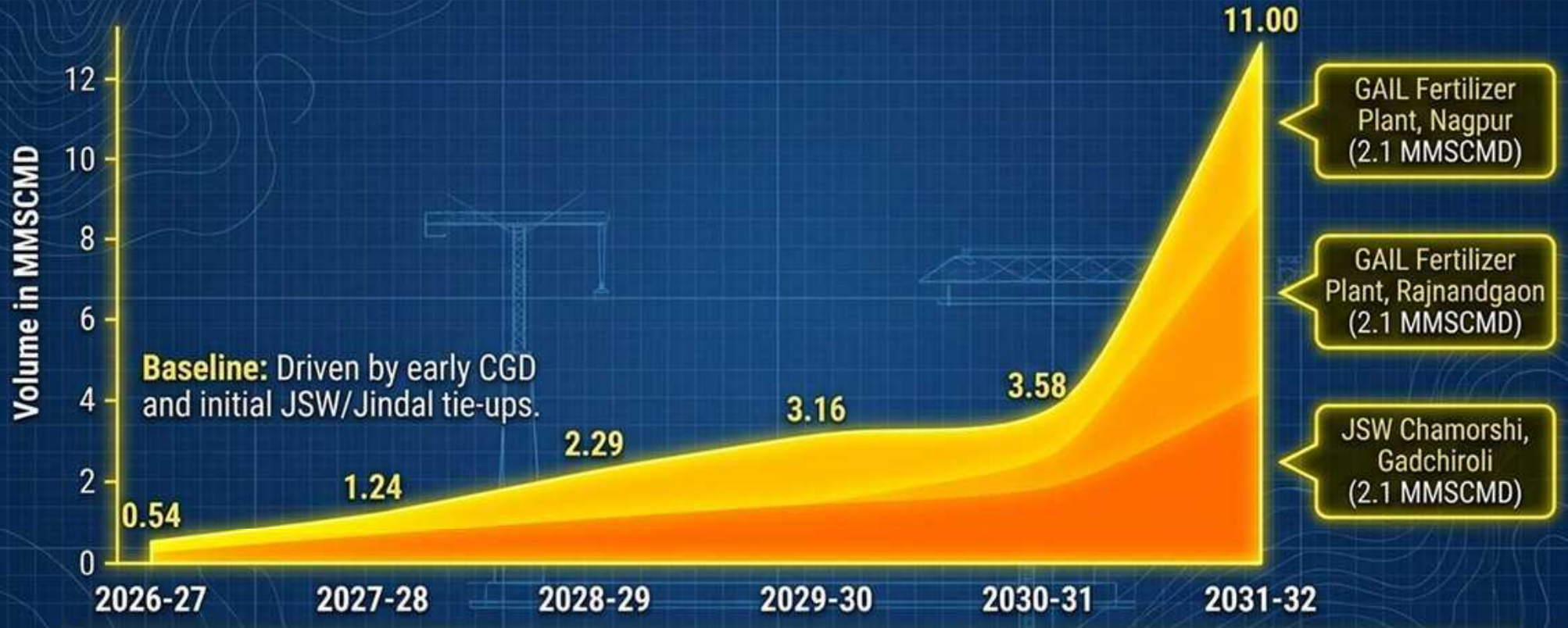
~2.46 Million m^3 of Earthwork

Pipeline Integrity: The Path to Commissioning



Engineered Topography

Fueling the Future: Regional Demand Trajectory (2026-2032)



TAKEAWAY: The MNJPL is not just meeting existing needs; it is the catalyst unlocking multi-gigawatt industrial capacity across central India.

Thanks